forestry, fisheries & the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

Report of the National Environmental Consultative and Advisory Forum pertaining to the Appeals relating to Eskom's Power Stations

to

The Minister of Forestry, Fisheries and the Environment:

Ms Barbara Creecy

8 March 2024

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1. INTRODUCTION TO THE REPORT AND FORUM MEMBERS

The Minister of Forestry, Fisheries and the Environment established the National Environmental Consultative and Advisory Forum ("**the Forum"/ "NECA Forum**"), under section 3A of the National Environmental Management Act, No. 107 of 1998 ("**NEMA**") to *"conduct an extensive consultative process with key interested and affected parties to assess and present all significant relevant research and analysis in a public forum for review and interrogation, and to report to the Minister on the outcome."*

The Forum has been tasked with presenting the Minister with practical options to resolve the issues arising in respect of non-compliance with the Minimum Emission Standards ("**MES**") and applications for the issuance of Provisional Atmospheric Emission Licenses ("**PAELs**").

The legislative framework provides for a list of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment. Companies that could not meet the prescribed MES within the legislated timeframes could apply, in terms of the Regulations issued under the National Environmental Management: Air Quality Act, No. 39 of 2004 ("NEMAQA"), for a postponement of the compliance timeframes to the National Air Quality Officer ("NAQO").

During 2019, the NAQO received the last applications for postponements and suspensions of the timeframes to comply with the new plant standards and applications for PAELs. The NAQO granted some of the applications for postponement and suspension of the MES compliance timeframes and some of the applications for PAELs, and refused others. These decisions of the NAQO led to a number of appeals pertaining to different facilities owned by various emitters.

The Forum's terms of reference provided for a broad scope of work that was predominantly focused on Eskom SOC Limited ("Eskom"). To the extent that the Forum was able to make a recommendation to the Minister in relation to appeals relating to other emitters, it has done so in separate reports. Specifically, it has submitted to the Minister a report relating to ArcelorMittal, Hulamin, Green Oil and Lubricants and Sasol's Secunda operations.

The composition of the Forum was provided for in its terms of reference, which stated that the Forum shall consist of a maximum of six members with relevant qualifications and extensive knowledge on air quality matters with respect to human health, economics, engineering, energy and environmental management. The terms of reference further provided for the appointment of a Chairperson by the Minister.

The following persons were appointed to the Forum by the Minister:

Mr. Peter Harris (Chairperson)

Mr Peter Harris is an attorney and the founding partner of Harris Nupen Molebatsi Inc.

Associate Professor Aneesa Vanker

Dr Aneesa Vanker is a paediatric pulmonologist who has developed her academic career as a clinician scientist in the field of environmental lung health in children. She currently holds the position of Associate Professor in the Department of Paediatrics and Child Health at Red Cross War Memorial Children's Hospital, University of Cape Town.

Her research field is on the environmental determinants of child lung health in a low and middle-income country (LMIC) setting and holds a doctoral degree (2018) on this subject. The title of her PhD was *"The impact of indoor air pollution and tobacco smoke exposure in a South African Birth Cohort.*" Her research has already shown the vulnerability of early-life as a window of susceptibility to environmental exposures and her ongoing research involves understanding the longitudinal effect of environmental exposures especially for non-communicable respiratory conditions, with the goal of identifying implementable solutions to mitigate these risks.

The work has positioned her as a leader in the environmental determinant of child lung health in an African setting focusing on the impact of air pollution and tobacco smoke exposure on birth and child health outcomes in peri-urban communities and resulting in a number of local and international collaborations. This has been leveraged to create awareness in both the scientific community and through media to strengthen advocacy around the issue, including a Parliamentary Colloquium on "*Climate, Air Pollution, Energy and Health"* (November 2018)

leading to a call for action to the South African Health Minister and the formation of the Public Health Association of South Africa Special Interest Group on Climate, Energy and Health. She is a keen advocate for solutions to reduce environmental exposures through multisectoral engagement and a collaborative approach engaging with stakeholders beyond the health sector.

Mr. Avishkar Ramandh

Mr. Avishkar Ramandh started his tenure working at the CSIR where he pioneered and innovated a photochemical modelling study for the Southern African Development Community (SADC). Thereafter, he worked for 16 years in the petroleum, chemicals, energy and mining sectors, mainly on air quality projects in Southern Africa as well as Asia, the Middle East, North America and Europe.

He has directed research, innovation and supported South Africa's air quality management strategy through a broad understanding of the environmental arena, multi-sector stakeholders and state-of-the-art technologies.

Dr. Emily Tyler

Dr Emily Tyler is an energy and climate mitigation economist of 25 years' experience, who brings the lenses of complexity thinking and complex systems theory to her work. Located predominantly in the advisory and thinktank space, Emily has focused on developing country contexts, specifically that of her home country, South Africa. Specific areas of expertise include energy and climate policy, carbon pricing and budgeting, climate finance, power sector modelling for policy, corporate and investor carbon strategies, the political economy of energy, and low carbon transition planning.

Emily is currently working with Meridian Economics, a Cape Town based energy and climate advisory firm, and holds an Honorary Research Associate position at the University of Cape Town's African Climate and Development Institute. She serves on a number of steering committees in her field and is frequently engaged in transdisciplinary research initiatives, publishing regularly in both domestic and international journals.

Emily holds a Doctorate in complexity studies, a Masters in Advanced Financial Management and an Honors in Economics from the University of Cape Town, and a Bachelor of Commerce (Economics and Psychology) from Rhodes University.

Mr. Etienne Rübbers

Mr Etienne Rübbers is an engineer with expertise working on the interfaces of technology, business and the environment. He consults in the renewable sector and assists companies with their Just-Energy-Transition, the development of SA's electricity transmission grid and with Public-Private Partnership (PPP) projects.

He is a board member of SANEA (the South African National Energy Association), is a management committee member of SAIPPA (the South African IPP Association) and a member of the BUSA Energy Sub-Committee.

He has 25 years' experience in the energy sector and has had roles in project development, commercial management and technical design, working for companies such as Sasol, Dow Chemical and Shell.

He holds a BSc Engineering degree from the University of Witwatersrand, an MSc in Industriële Bedrijskunde from KU Leuven (Belgium), a BCom (Hons) from UNISA and is a CFA Charterholder.

Ms Lauren Hermanus

Ms Lauren Hermanus currently works as a research associate at the African Centre for Cities, a research centre based on Cape Town focused on providing research on urban crisis on the African Continent. She has over ten years' experience working in sustainable development research and practice with a focus sustainable energy transition. Particularly the socio-technical, how the social, governance and political aspects interact with technical transformations. She was worked with the Just-Transition at a national level. She has worked in private and public sectors, government, and NGOs with a focus on sustainable energy innovation, urban resilience, and green economic development. She holds a bachelor's degree in politics, philosophy and economics, and an honours degree in philosophy, a master's degree in Complexity thinking, Systems thinking and poststructuralist ethics from the

University of Stellenbosch and a master's degree in development policy and practice from the University of Cape Town.

Dr. Maphuti Kwata

Dr Maphuti Kwata currently works as a researcher at the Water and Environment Unit at the Council for Geoscience in Pretoria. She has been working at the Council for Geoscience since 2005. Dr Kwata's expertise focuses on environmental monitoring and research (air quality modelling and monitoring, dust exposure on the former asbestos mining, climate change, water quality monitoring and management). Environmental Laws and transfer of knowledge and skills on air quality monitoring and management. Looking at the dust impact from different commodities, so far, she has done research on gold and coal. Now she is looking at the exposure on mercury on coal and gold fields. Dr Kwata holds a bachelors degree from the University of Limpopo, honours and masters (MSC) degrees from the University of Pretoria and a PHD from UNISA.

Participation of Forum Members:

It should be noted that all of the Forum members are highly qualified and experienced professionals with significant reputations in their individual fields of expertise. The Forum members, to a greater or lesser extent contributed their time willingly, with great professionalism, despite being appointed on an extremely low reimbursement rate for their services, which was considerably less than the professional rates that they would charge for their services. This made the work of the Forum very difficult, as some Forum members, in certain instances, were compelled to prioritise their consultancy work for their clients in order to secure their income and livelihood.

In early 2024, the Minister received a letter of resignation from Dr Maphuti Kwata due to issues of availability and work commitments. The membership of the Forum of Ms Lauren Hermanus

was terminated in early 2024 due to her non participation in meetings of the Forum and work of the Forum.

The curricula vitae of the Forum members that continued to participate in the project are attached hereto as Annexure 1.

It is clear that certain Forum members viewed their work on the Forum as part of a national duty and service and they are to be commended for their hard work and expertise, which they brought to the Forum over a period of 18 months. As the Chairman, I am grateful to the Forum members for their time and expertise.

2. DISCLAIMER

The information contained in these documents is confidential, privileged and only for the intended recipients and may not be used, published or redistributed without the prior written consent of the DFFE.

The opinions expressed are in good faith and while every care has been taken in preparing these documents, the NECA Forum makes no representations and gives no warranties of whatever nature in respect of these documents including, but not limited to, the accuracy or completeness of any information, facts and/or opinions contained therein.

Certain commercially sensitive information and documentation was furnished to the Forum on condition that it be treated as strictly confidential. A non-disclosure agreement was entered into with Eskom to this effect, wherein the NECA Forum agreed that:

> *"2.1. That all information sent by Eskom to the Council for Scientific and Industrial Research ("CSIR") for the purposes of conducting power system modelling may only be used for the modelling exercise and not for further use or be given to a third party.*
>
> *2.2. That the existing Non-Disclosure Agreement ("NDA") between the Department of Forestry, Fisheries and the Environment ("DFFE") and Eskom is sufficient to regulate the disclosure of information provided from Eskom to the NECA forum.*
>
> *2.3. That information pertaining to the cost of the implementation of abatement technology and the costs relating to contracts regulating the provision and supply of coal to Eskom will be kept confidential."*

In the event that this Report is made publicly available, confidential information will be redacted.

The Forum thanks Mr Bryan McCourt of Eskom for his responsiveness to the Forum's ongoing requests for information and documentation.

It should be noted that much of the information supplied by Eskom was frequently updated and such updates were not always clearly communicated to the Forum. To illustrate the challenge faced by the Forum in this regard, on 4 March 2024, four days before the Forum was due to submit its final report, Eskom addressed a letter to the Forum advising it that [redacted]

The Forum was not furnished with resources to fund research, which was an impediment to our work. Forum members resorted to raising funding externally for the power system modelling component, from the European Climate Foundation. The Forum is very grateful for the Foundation's support.

While every effort has been made to ensure that the Forum relies on the most accurate and up-to-date information, it shall not be responsible for any oversight in this regard and this report, including the recommendations contained herein, must be understood against the above backdrop.

3. ABBREVIATIONS

Abbreviation	Term
AEL	Air Emission License
AELA	Air Emission Licensing Authority
AQ	Air Quality

AAQ	Ambient Air Quality
Baseline	The emission load that Eskom would have emitted in 2023 had its coal fleet complied with the MES new plant standards
BAT	Best Available Technology
BIP	Baked in Progress, the reference scenario constructed for the Forum power system modelling
BPEO	Best Practicable Environmental Option
Capex	Capital cost
CBA	Cost Benefit Analysis
CBAM	Carbon Border Tax Adjustment Mechanism
COP	Conference of the Parties
CoUE	Cost of Unserved Energy
CRPD	Chronic Respiratory Disease
CSIR	Council of Scientific and Industrial Research

CSP	Concentrated Solar Power
DFFE / the Department	The Department of Forestry, Fisheries and the Environment
DHP	Dust Handling Plant
DMRE	Department of Mineral Resources and Energy
DSI	Direct Sorbent Injection
EAF	Energy Availability Factor
E-BAM	Is a portable real-time beta gauge designed for accurate and precise measurement of fine particulate matter
Eskom ERP 2022	Eskom Emission Reduction Plan 2022
ESP	Electro-static precipitators
ESRG	Energy Systems Research Group (of the University of Cape Town)
EV	Electric Vehicle
ERP 2022	Emissions Reduction Plan that was approved by the Eskom Board in July 2022.

FFB	Fabric Filter Bags
FGD	Flue Gas Desulphurisation
GHG	Greenhouse Gases which include, CO_2, CH_4, N_2O, Sulphur hexafluoride (SF_6), Perfluorocarbons (PFCs), and Hydrofluorocarbons (HFCs);
GO	General Overall – scheduled maintenance on PS units to do preventative maintenance, ensure mechanical integrity and HSE requirements (e.g. pressure testing of the boilers to ensure they are safe and will not explode). During this time the PS is offline and cannot generate electricity. GOs are required every 5-6 years, and the duration of a GO is ± 90 days.
GST	Global Stocktake Report
GW	GigaWatts: an indication of power plant capacity
GWP	Global Warming Potential which is standardised to a CO_2 equivalent (CO_2eq)
HPA	Highveld Priority Area Area that includes the following Eskom Power Stations:

	Arnot, Camden, Grootvlei, Hendrina, Kendal, Kusile [outside of this assignment's scope], Kriel, Komati, Majuba, Matla and Tutuka.
HFPS	High Frequency Power Supply
HQ	Hazard Quotient – quantify potential risk to health. HQ less than or equal to one there is a negligible risk to human health, HQ above one indicates a potential risk to human health
Hybrid Vehicle	Vehicles that use an Internal Combustion Engine plus a battery for regenerative braking (e.g.Toyota Prius)
I&AP	Interested and Affected Parties
ICE vehicle	Internal Combustion Engine
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IRP	Integrated Resource Plan
JETP	Just Energy Transition Partnership
JETP-IP	Just Energy Transition Partnership Investment Plan

IQAir	Swiss technology company that monitors AQ globally to improve air quality through information and collaboration.
IVRS	Integrated Vaal River System
LCOE	Levelised Cost of Electricity
LEDS	Low Emissions Development Strategy
LNB	Low NO_X burners
LNG	Liquified Natural Gas
LRTAP Convention	Long-range Transboundary Air Pollution Convention
MCDA	Multi-Criteria Decision Analysis
MCWAP	Mokolo-Crocodile Water Augmentation Project
MES	Minimum Emissions Standards
Ml	Million liters
Minister	The Minster of Forestry, Fisheries and the Environment
mg/Nm^3	Milligrams per normal cubic meter

Mpumalanga area	Area that includes the following Eskom Power Stations: Arnot, Camden, Grootvlei, Hendrina, Kendal, Kusile [outside of this assignment's scope], Kriel, Komati, Lethabo, Majuba, Matla and Tutuka.
MW	MegaWatts: an indication of power plant capacity
MWh / KWh	MegaWatt hour KiloWatt hour: a measure of energy output
MT	MegaTonnes: a measure of the volume of air emissions
MTSAO	Medium Term System Adequacy Outlook
NAEIS	National Atmospheric Emission Inventory System
NAQO	National Air Quality Officer
NDC	National Determined Contribution, South Africa's commitment to GHG reduction under the Paris Agreement of the United Nations Framework Convention on Climate Change
NECA Forum	National Environmental Consultative and Advisory Forum
NECD	National Emission Ceilings Directive
NECOM	National Energy Crisis Committee

NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NERSA	National Energy Regulator of South Africa
NID	New Flue Gas Desulphurisation
NH3	Ammonia
NO_X	Nitrous Oxide emissions which consist of the various oxides of nitrogen including NO and NO_2.
Opex	Annual operational and maintenance costs
PA	Priority Area
PAEL	Provisional Air Emissions Licence
PCC	Presidential Climate Commission
PM	Particulate Matter - this includes PM_{10} and $PM_{2.5}$ PM_{10} is particulate matter with a size less than 10 µm

	$PM_{2.5}$ is particulate matter with a size less than 2.5 µm
PS	Power Station
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RMIPPPP	Risk Mitigation Independent Power Producer Procurement Programme
SAAQIS	South African Air Quality Information System
SARB	South African Reserve Bank
SDA	Semi-Dry spray dryer absorber
SETS	Sectoral Emissions Targets (GHG Emissions)
SO_2 or SO_X	Sulphur dioxide emissions
SO_3 dosing	Dosing of sulphur trioxide (SO_3) to the flue gas to the ESPs in order to improve the ESP's efficiency and increase the removal of PMs
Solar PV	SolarPhotovoltaics
tCO_2e	Tonnes of Carbon Dioxide Equivalent

TOR	Terms of Reference
tpa	Tons per annum
tpd	Tons per day
UAE Consensus	United Arab Emirates Consensus (forged at COP 28)
UCLF	Unplanned Capability Loss Factor
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compounds
VRESS	Vaal River Eastern Sub-System
VTAPA	Vaal Triangle Airshed Priority Area that includes the Lethabo Power Station
WACC	Weighted Average Cost of Capital
WBPA / Waterberg area	Waterberg- Bojanala Priority Area which includes the Matimba and Medupi Power Stations
WFGD	Wet Flue Gas Desulphurisation

WUL	Water Use Licence

4. TERMS OF REFERENCE OF THE FORUM

On 12 May 2022, the terms of reference governing the Forum's work were published in Government Gazette 46355. These terms of reference provided that "*the work of the panel must be completed within a maximum period of 6 months."* In addition, the tenure of the appointment for the members of the Forum was limited to twelve months from the date that the Minister issued a letter of appointment to the members.

It became apparent that the initial timeframe provided for the completion of the Forum's work was insufficient.

Accordingly, the Minister published revised terms of reference to extend the timeframe of the Forum's work and provided that the work of the panel must submit its report in February 2024. However, in terms of Government Gazette 48921, the tenure of the panel will continue until 17 August 2024. Other than this revision, these terms of reference are, in substance, the same as those published in May 2022.

Both terms of reference are attached hereto as Annexure 2 and 3 respectively.

4.1. Overall objective and functions of the Forum

The overall objective of the forum is described in paragraph 2 of the terms of reference, as follows:

> "*The purpose of the Forum will be to conduct an extensive consultative process with key interested and affected parties to assess and present all significant relevant research and analysis in a public forum for review and interrogation, and to report to the Minister on the outcome."*
>
> "*The report referred to above will provide the Minister with practical options to resolve the issues arising in respect of Eskom's non-compliance with the MES and the issues arising from the applications for PAELs, taking into consideration the Minister's constitutional and legislative mandate and the country's international commitments,*

constitutional right of the people to an environment that is not harmful to their health and well-being, the energy crisis and the local economic climate."

The functions of the Forum are addressed in paragraph 3 of the terms of reference which states as follows:

"*3.1 The Forum will conduct the following functions:*

3.1.1 Review the documentary and technical reports listed below and those available at DFFE including:

3.1.1.1 History of MES and decisions of the National Air Quality Officer to date, as well as the various implications for PAELs;

3.1.1.2 Summary of MES and PAEL appeals currently before the Minister; and

3.1.1.3 Eskom's compliance and non-compliance history with MES.

3.1.2 Review of documents and technical reports with respect to:

3.1.2.1 Health impacts of air emissions and the constitutional right of people to an environment that is not harmful to health and well-being;

3.1.2.2 Costs of compliance with MES by Eskom and the co-benefit from reducing that pollution;

3.1.2.3 What it means for the Eskom's coal fleet to meet the lower bound of the 2021 Nationally Determined Contribution Update (South Africa's "Fair Share" on a 1.50 trajectory)?

3.1.3 Undertake preliminary hearings in which all interested parties are able to participate and make verbal and written submissions.

3.1.4 Conduct one on one consultations with key interested and affected parties to understand their positions in more detail.

3.1.5 Conduct consultations with:

3.1.5.1 Department of Water and Sanitation;

3.1.5.2 Department of Mineral Resources ("DMRE");

3.1.5.3 Department of Public Enterprises;

3.1.5.4 Department of National Treasury;

3.1.5.5 Department of Science and Innovation;

3.1.5.6 Department of Trade, Industry and Competition;

3.1.5.7 Members of the Executive Councils responsible for the environment in the Provinces;

3.1.5.8 the South African Local Government Association.

3.1.6 Visits to affected communities in airsheds affected by Eskom power stations and the applications for PAELs that are subject to appeal.

3.1.7 Conduct detailed technical and energy modelling work to address key questions arising from consultations.

3.1.8 Propose practical resolutions on matters of air pollution to ensure that compliance with the MES can be achieved in a manner that gives consideration to the following:

3.1.8.1 The energy crisis that the country is facing;

3.1.8.2 The socio-economic implications (e.g., jobs, livelihoods, etc) for each proposed option;

3.1.8.3 The economic and health impacts associated with the non-compliance with the MES;

3.1.8.4 The legal implications for each compliance pathway and present recommendations;

3.1.8.5 Propose funding mechanism/s to implement the most suitable pathway to achieve compliance with the MES.

3.1.9 Consideration of evidence and submissions, drafting of report with recommendations;

3.1.10 Presentation of findings to the Minister;

3.1.11 Further consultation, if necessary, thereafter consideration of comments and finalisation and submission of the final report to the Minister; and

3.1.12 Additional work that may be identified before or during commencement of project activities that would result in improving the outcome of the project may be undertaken, subject to agreement amongst the parties concerned. Such work would be subjected to Ministerial approval should it result in additional costs to the project budget."

This report and the annexures thereto seek to document the Forum's work and, in so doing, will address the various deliverables and functions, as provided for in the terms of reference. In section 5 below, detail is given to how the Forum approached its task and what it understood its primary task to be.

4.2. Work referred by the Minister

In addition to the work relating to Eskom, which is explicitly identified in the terms of reference, during its tenure, the Minister drew on the expertise of the Forum in relation to a number of other matters.

In late 2022, the Forum was tasked with making recommendations to the Minister in respect of appeals relating to applications made by ArcelorMittal South Africa Limited, Hulamin Limited and Green Oil and Lubricants.

During 2023, a number of issues pertaining to the damaged stack at Kusile and the various applications made by Eskom in relation thereto, were referred to the Forum for consideration Eskom.

In addition, the Forum was requested to consider the draft Regulations for Implementation and Enforcement of the Priority Area Air Quality Management Plans and provide input on certain issues arising therefrom.

In the latter part of 2023, and with the concurrence of Sasol Limited, the NECA Forum was referred Sasol's appeal to the Minister arising from the NAQO's refusal of its application in terms of section 12A of the MES.

In February 2024, a second Sasol appeal to the Minister was referred to the NECA Forum, for consideration.

These additional pieces of work have been reported on separately to the Minister and will not be referred to in any detail in this Report.

4.3. Role of the DFFE

In terms of paragraph 14.2 of the TOR, "*the Department will provide the Forum with the necessary legal support and shall bear the full administrative, travel and accommodation cost of all expenses incurred as a result of the workings of the Forum in relation to the aforementioned objections."*

The Department also fulfilled the role of Secretariat and, in that capacity, provided assistance to the Forum with regard to the logistics of the public participation process.

It should be noted that there was close liaison between the Forum and the Department in relation to a variety of aspects of the work of the Forum. In particular, the assistance of the Department was requested in arranging meetings with the relevant national departments, as set out in the terms of reference of the Forum. In certain instances, this proved difficult and the assistance of Director-General Nomfundo Tshabalala was also enlisted. Details of the consultations and meetings are set out in more detail in section 10 below.

In addition to the above, meetings were also held with Minister Creecy in order to report on the Forum's progress and to receive directions in relation to the work of the Forum.

There was also liaison and meetings with Adv. Farhana Patel, the head of the Appeals section advising the Minister in relation to procedural and legal matters. The assistance of Adv. Patel is appreciated.

5. WORKPLAN OF FORUM AND WORK COMPONENTS

5.1. The Forum's project plan:

Under paragraph 5 of its TOR, the Forum was directed to furnish the Minister with a project plan within 10 days from the date of their appointment. This was done by the Forum and relevant extracts from the project plan are set out below. The full workplan is attached hereto as Annexure 4.

The project plan was prepared in a short period of time and at the very outset of the Forum's work. It captured what, at the time, the Forum understood its task to be and how it would undertake that task and the Forum commenced its work in accordance with this plan. That said, and as referred to elsewhere in this report, a number of challenges arose throughout the 18-month period in which the Forum's work has been conducted and therefore aspects of the forward-looking project plan were adapted as and when circumstances changed.

The information contained in the workplan was set out under the following headings:

- Project risks;
- Approach and high-level project plan, which was summarised in the following diagram:

- Power system modelling analysis;
- Consultations with all stakeholders, where detail was given as to the Forum's intended approach to the Public Participation Process. This is reported on in detail in the relevant section 10 of this report;
- Analysis of evidence and submissions; and
- Drafting of report to the Minister.

5.2. The Forum's work component

The interaction of the engagement and analytical processes of the Forum's work is shown in Figure 1 below, highlighting the analytical tools and evidence used.

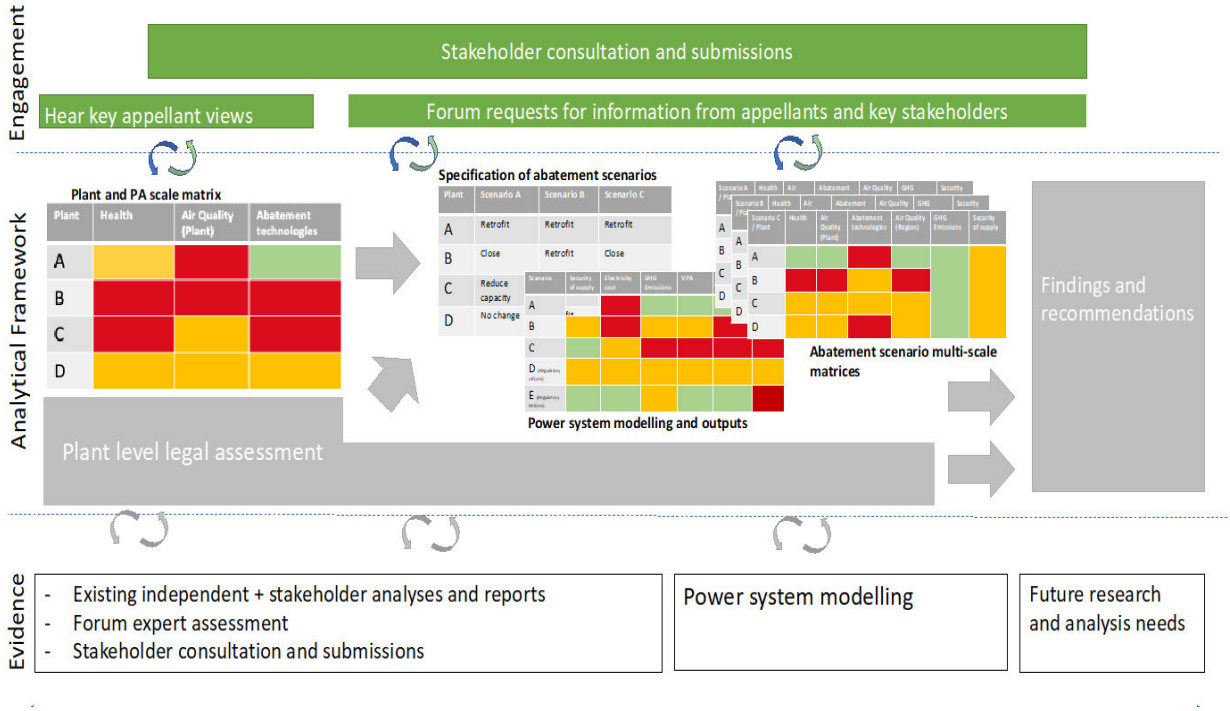

Figure 1: Stakeholder Consultations and Submissions

6. LEGISLATIVE FRAMEWORK

One of the limitations encountered by the Forum was the applicable legislative framework. Cited below are the relevant provisions from a number of pieces of legislation that were considered by the Forum and informative case law that constitutes legal precedent.

6.1. Constitution

The Constitution is the supreme law of the Republic of South Africa. The Bill of Rights, contained in Chapter 2 of the Constitution, is a cornerstone of democracy in South Africa and it enshrines the rights of all people in the country.

Of particular relevance to the work of this Forum, is the right contained in section 24 of the Constitution:

> "***24. Environment*** *– Everyone has the right –*

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

6.2. NEMA

In the preamble of NEMA, it is noted that everyone has the right to an environment that is not harmful to their health or well-being, but it recognises that, for many inhabitants of South Africa, this right has not been realised.

Chapter 1 of NEMA encapsulates the National Environmental Management Principles, which principles, "*serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment."*[1] and *"Guide the interpretation, administration and implementation of this Act [NEMA], and any other law concerned with the protection or management of the environment."*[2]

This Forum was established in terms of section 3A of NEMA which stipulates that,

> "***3A. Establishment of fora or advisory committees.*** *– The Minister may by notice in the Gazette –*
>
> *(a) establish any forum or advisory committee;*

[1] Section 2(1)(c) of NEMA.

[2] Section 2(1)(e) of NEMA.

(b) determine its composition and functions; and

(c) determine, in consultation with the Minister of Finance, the basis and extent of the remuneration and payment of expenses of any member of such forum or committee."

Chapter 9 of NEMA provides for the administration thereof and of specific environmental management acts, which includes NEMAQA. Section 43 of NEMA governs the appeal process, which is the subject of the Forum's work, and stipulates as follows:

"43. Appeals.—

(1) Any person may appeal to the Minister against a decision taken by any person acting under a power delegated by the Minister under this Act or a specific environmental management Act.

(1A) Any person may appeal to the Minister against a decision made in terms of this Act or any specific environmental management Act by the Minister responsible for mineral resources or any person acting under his or her delegated authority.

(2) Any person may appeal to an MEC against a decision taken by any person acting under a power delegated by that MEC under this Act or a specific environmental management Act.

(3) [Repealed in 2014]

(4) An appeal under subsection (1), (1A) or (2) must be noted and must be dealt with in the manner prescribed and upon payment of a prescribed fee.

(5) The Minister or an MEC, as the case may be, may consider and decide an appeal or appoint an appeal panel to consider and advise the Minister or MEC on the appeal.

(6) The Minister or an MEC may, after considering such an appeal, confirm, set aside or vary the decision, provision, condition or directive or make any other appropriate decision, including a decision that the prescribed fee paid by the appellant, or any part thereof, be refunded.

(7) An appeal under this section suspends an environmental authorisation, exemption, or any other decision made in terms of this Act, or any provision or condition attached thereto, except for a directive or other administrative enforcement notice that is aimed at addressing significant harm to the environment, issued in terms of this Act or any other specific environmental management Act.

(8) A person who receives a directive in terms of section 28 (4) may lodge an

appeal against the decision made by the Director-General or any person acting under his or her delegated authority, the Director-General of the department responsible for mineral resources or any person acting under his or her delegated authority, the provincial head of department or any person acting under his or her delegated authority, to the Minister, the Minister responsible for mineral resources, the MEC or municipal council, as the case may be, within three days of receipt of the directive, or within such longer period as the Minister, the Minister responsible for mineral resources, MEC or municipal council may determine.

(9) Despite subsection (7), pending the finalisation of the appeal, the Minister, Minister responsible for mineral resources, the MEC or municipal council, as the case may be, may, on application and on good cause shown, direct that –

(a) the environmental authorisation, exemption or any other decision made in terms of this Act or any other specific environmental management Act, or any provision or condition attached thereto may wholly or in part, not be suspended; or

(b) the directive or any administrative enforcement notice that is aimed at addressing significant harm to the environment, issued in terms of this Act or any other specific environmental management Act or part thereof, be suspended.

(10) A person who receives a directive and who wishes to lodge an appeal in terms of subsection (8) may make representations to the Minister, the Minister responsible for mineral resources or MEC, as the case may be, to suspend the operation of the directive or any part of the directive pending the finalisation of the appeal.

(11) After considering the appeal lodged in terms of subsection (8) and any other relevant information, the Minister, the Minister responsible for mineral resources or MEC, as the case may be—

(a) may confirm, modify or cancel a directive or any part of a directive; and

(b) may specify the period within which the person who received the directive must comply with any part of the directive that is confirmed or modified."

6.3. NEMAQA

The NEMAQA was enacted to reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; and for specific air quality measures.

Section 21 of NEMAQA makes provision for the publication of a list of activities which result in atmospheric emissions and which the Minister or MEC reasonably believes have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage and further that this notice must establish MES applicable to these listed activities.

In terms of section 22 of the NEMAQA, no person may, without a PAEL, or an AEL, conduct an activity listed on the national list anywhere in the Republic or listed on the list applicable in a province anywhere in that province.

Chapter 5 of NEMAQA provides for the detailed process and procedure applicable to PAELs and AELs. Section 39 stipulates the factors to be taken into account by licensing authorities. This section states that,

> *"**39. Factors to be taken into account by licensing authorities**.—When considering an application for an atmospheric emission licence, the licensing authority must take into account all relevant matters, including—*
>
> *(a) any applicable minimum standards set for ambient air and point source emissions that have been determined in terms of this Act;*
>
> *(b) the pollution being or likely to be caused by the carrying out of the listed activity applied for and the effect or likely effect of that pollution on the environment, including health, social conditions, economic conditions, cultural heritage and ambient air quality;*
>
> *(c) the best practicable environmental options available that could be taken—*
>
> > *(i) to prevent, control, abate or mitigate that pollution; and*
> >
> > *(ii) to protect the environment, including health, social conditions, economic conditions, cultural heritage and ambient air quality, from harm as a result of that pollution;*
>
> *(d) section 24 of the National Environmental Management Act and any applicable environmental impact assessment done, the decision taken on the application of the environmental authorisation, and any applicable notice issued or regulation made pursuant to that section;*
>
> *(e) any relevant tradable emission scheme;*
>
> *(f) whether the applicant is a fit and proper person as contemplated in section 49;*

(g) the applicant's submissions;

(h) any submissions from organs of state, interested persons and the public; and

(i) any guidelines issued by the Minister or MEC relating to the performance by licensing authorities of their functions."

Section 59 of NEMAQA provides for exemptions and states as follows,

"***59. Exemptions*** –

(1) (a) Any person or organ of state may, in writing, apply for exemption from the application of a provision of this Act to the Minister.

(b) No exemption from a provision of section 9, 22 or 25 may be granted in terms of paragraph (a).

(2) An application in terms of subsection (1) must be accompanied by reasons.

(3) (a) The Minister may require an applicant applying for exemption to take appropriate steps to bring the application to the attention of relevant organs of state, interested persons and the public.

(b) The steps contemplated in paragraph (a) must include the publication of a notice in at least two newspapers circulating nationally -

(i) giving reasons for the application; and

(ii) containing such other particulars concerning the application as the Minister may require.

(4) The Minister may –

(a) from time to time review any exemption granted in terms of this section; and

(b) on good grounds withdraw any exemption.

(5) The Minister may on such conditions and limitations determined by the Minister delegate any of the powers contained in this section to –

(a) the MEC responsible for air quality in a province; or

(b) a metropolitan or district municipality."

6.4. Regulations

6.4.1. Published List of Activities ("Listed Activities"/ "List of Activites")

6.4.1.1. History of the MES contained in the List of Activities

Environmental rights and the corresponding obligations are contained in section 24 of the Constitution. Section 24(a) grants everyone – citizens and non-citizens alike – an unqualified[3] right to an environment that is not harmful to their health or well-being and, by implication, simultaneously imposes an obligation on the state and the inhabitants of the Republic to refrain from acting in a manner that creates such an environment.

Section 24(b) confers upon everyone, the right to have the environment protected, for the benefit of present and future generations and, accordingly, enjoins the state to take reasonable legislative and other measures that are geared towards, *inter alia*, preventing pollution and ecological degradation.

Pursuant to the injunction in section 24(b), Parliament enacted a series of environmental statutes, one of which being NEMAQA, which was assented to on 19 February 2005 and commenced on 11 September 2005.

According to the objects provision of NEMAQA, the Act was enacted to generally give effect to section 24(b) of the Constitution, with a view to enhancing the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people. More specifically, the Act was enacted to protect the environment by providing reasonable measures for (i) the protection and enhancement of the quality of air in the Republic; (ii) the

[3] This is not to say that the right to an environment that is not harmful to the health or well-being of the inhabitants of the land cannot be limited. On the contrary, like every other right contained in Chapter 2 of the Constitution, it can be limited in terms of section 36, provided that the limitation is reasonable and justifiable in terms thereof. "Unqualified", in this context, simply means that the scope or content of the right is not limited by any internal qualifiers or modifiers such as those found, for example, in section 16.

prevention of air pollution and ecological degradation; and (iii) securing ecologically sustainable development while promoting justifiable economic and social development.

One of the mechanisms in NEMAQA, designed to achieve the above objects, is found in section 21 of NEMAQA. Section 21(1) provides that the Minister must, by notice in the *Gazette*, publish a list of activities which result in atmospheric emissions and which the Minister reasonably believes have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage.

Section 21(3)(a) of NEMAQA, states that the notice containing the Listed Activities must establish MES in respect of a substance or mixture of substances resulting from a Listed Activity. The MES must include the permissible amount, volume, emission rate or concentration of that substance or mixture of substances that may be emitted. Section 21(3)(c) requires the notice to indicate the date on which the notice containing the Listed Activities and the MES takes effect.

On 31 March 2010, the then Minister of Water and Environmental Affairs, Ms Buyelwa Patience Sonjica ("**Minister Sonjica**"), published a notice in terms of section 21, which identified several activities as Listed Activities and the prescribed MES for the said activities ("**List of Activities**").[4]

The List of Activities contains ten categories of Listed Activities, each comprising of smaller subcategories.

In addition to setting the MES for each category, the List of Activities, in paragraph 5, prescribes the time in which all AEL holders, that are subject to the Notice, are required to comply with the prescribed MES. It initially provided that:

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[4]List of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including, health, social conditions, economic conditions, ecological conditions or cultural heritage in GN 248 *GG* 33064 of 31 March 2010 ("**List of Activities**").

"*(8) New plant must comply with the new plant minimum emission standards as contained in Part 3 from 01 April 2010.*

(9) Existing plant must comply with minimum emission standards for existing plant as contained in Part 3 by 01 April 2015, unless where specified.

(10) Existing plant must comply with minimum emission standards for new plant as contained in Part 3 by 01 April 2020, unless where specified."[5]

Paragraph 6 of the List of Activities headed "*postponement of compliance timeframes*", makes provision for AEL holders to make an application to the NAQO for the postponement of the above stated compliance timeframes for an existing plant. The paragraph, prior to the amendments effected by way of Government Notice 1207 of 31 October 2018, only made provision for the NAQO, with the concurrence of the Licensing Authority, as contemplated in section 36 of NEMAQA,[6] to grant a postponement of the compliance timeframes, for existing plants, for a period not exceeding 5 years.

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[5] The language in this provision has been amended to specifically mention the date when emitters are required to comply with the prescribed MES. It is worth pointing out that the time periods themselves have not changed, only the language. The new paragraph 5 reads:

"*(8) New plant must comply with the new plant minimum emission standards as contained in Part 3 from **01 April 2010**.*

*(9) Existing plant must comply with minimum emission standards for existing plant as contained in Part 3 by **01 April 2015**, unless where specified.*

*(10) Existing plant must comply with minimum emission standards for new plant as contained in Part 3 by **01 April 2020**, unless where specified*." (Own emphasis.)

[6] Section 36 of NEMAQA states that:

"*(1) Metropolitan and district municipalities are charged with implementing the atmospheric emission licensing system referred to in section 22, and must for this purpose perform the functions of licensing authority as set out in this Chapter and other provisions of this Act, subject to subsections (2), (3) and (4).*

In order to ensure compliance with the MES and the timeframes, paragraph 8 of the Notice requires AEL holders to submit annual emission reports in the form specified by the NAQO.

On 22 November 2013, the List of Activities was, again, amended.[7] The MES prescribed for solid fuel combustion installations and the compliance timeframes applicable to all categories of Listed Activities were, however, not altered.

Further, in May 2020, the incumbent Minister of Forestry, Fisheries and the Environment, Minister Creecy, amended the List of Activities and, save for introducing a new special arrangement in respect of Category 1.1, the Notice was largely left unchanged.

The newly introduced special arrangement provides that *existing plants*[8] shall comply with a new plant emission limit of 1000mg/Nm^3 for SO_2.

6.4.1.2. List of Activities (as amended)

The relevant provisions from List of Activities, in its current form, are set out below.

Paragraphs 11 to 14, provide for a postponement of compliance timeframes. These provisions stipulate that,

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(2) If a metropolitan or district municipality has delegated its functions of licensing authority to a provincial organ of state in terms of section 238 of the Constitution, that provincial organ of state must for the purposes of this Act be regarded as the licensing authority in the area of that municipality.

(2A) A provincial organ of state must be regarded as the licensing authority if a listed activity falls within the boundaries of—

(a) more than one metropolitan municipality;

(b) more than one district municipality; or

(c) both a metropolitan and district municipality."

[7] List of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage in GN 893 *GG* 37054 of 22 November 2013.

[8] For the definition of "existing plant", see above note 5.

"*(11) As contemplated in paragraph 5.4.3.5 of the National Framework for Air Quality Management in the Republic of South Africa, published in terms of Section 7 of this Act, an application may be made to the National Air Quality Officer for the postponement of the compliance time frames in paragraph (9) and (10) for an existing plant.*

(11A) An existing plant may apply to the National Air Quality Officer for a once-off postponement with the compliance timeframes for minimum emission standards for new plant as contemplated in paragraph (10). A once-off postponement with the compliance timeframes for minimum emission standards for new plant may not exceed a period of five years from the date of issue. No once-off postponement with the compliance timeframes with minimum emission standards for new plant will be valid beyond 31 March 2025.

(11B) An existing plant to be decommissioned by 31 March 2030 may apply to the National Air Quality Officer before 31 March 2019 for a once-off suspension of compliance timeframes with minimum emission standards for new plant. Such an application must be accompanied by a detailed decommissioning schedule. No such application shall be accepted by the National Air Quality Officer after 31 March 2019.

(11C) An existing plant that has been granted a once-off suspension of the compliance timeframe as contemplated in paragraph (11B) must comply with the minimum emission standards for existing plant from the date of granting of the application and during the period of suspension until decommissioning.

(11D) No postponement of compliance timeframes or a suspension of compliance timeframes shall be granted for compliance with minimum emission standards for existing plant.

(12) The application contemplated in paragraph (11A) and (11B) must

include –

(a) An air pollution impact assessment compiled in accordance with the regulations prescribing the format of an Atmospheric Impact Report (as contemplated in Section 30 of the Act), by a person registered as a professional engineer or as a professional natural scientist in the appropriate category;

(b) a detailed justification and reasons for the application; and

(c) a concluded public participation process undertaken as specified in the National Environmental Management Act and the Environmental Impact Assessment Regulations made under section 24(5) of the aforementioned Act.

(12A)

(a) An existing plant may submit an application regarding a new plant standard to the National Air Quality Officer for consideration if the plant is in compliance with other emission standards but cannot comply with a particular pollutant or pollutants.

(b) An application must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards.

(c) The National Air Quality Officer, after consultation with the Licensing Authority, may grant an alternative emission limit or emission load if –

(i) there is material compliance with the national ambient air quality standards in the area for pollutant or pollutants applied for; or

(ii) the Atmospheric Impact Report does not show a material

increased health risk where there is no ambient air quality standard.

(13) The National Air Quality Officer, with the concurrence of the Licensing Authority as contemplated in section 36 of this Act, may in respect of an application for once-off postponement with compliance timeframes with minimum emission standards for new plant as contemplated in paragraph (11A), or a once-off suspension of compliance timeframes with minimum emission standards for new plant as contemplated in paragraph (11B) -

(a) grant the application with or without conditions; or

(b) refuse the application with written reasons."

With the exception of Port Rex, subcategory 1.1 of the MES, relating to Solid Fuel Combustion Installations, is the section applicable to all of Eskom's plants in respect of which there was an appeal.

Subcategory 1.1 provides for the following MES:

Description:	Solid fuels combustion installations used primarily for steam raising or electricity generation.		
Application:	All installations with design capacity equal to or greater than 50MW heat input per unit, based on the lower calorific value of the fuel used.		
Substance or mixture of substances		**Plant status**	**mg/Nm^3 under normal conditions of 10% O_2, 273 Kelvin and 101.3kPa.**
Common name	**Chemical symbol**		
Particulate matter	N/A	New	50
		Existing	100
Sulphur dioxide	SO_2	New	500
		Existing	3 500
Oxides of nitrogen	NO_x expressed as NO_2	New	750
		Existing	1 100

As stated above, with effect from 27 March 2020, the MES for subcategory 1 were amended to state that *"existing plants shall comply with a new plant limit of 1000 mg/Nm^3 for sulphur dioxide (SO_2)"*. This increased the applicable limit from 500 mg/Nm^3 as provided for in the table above.

6.4.2. National Appeal Regulations

The Appeal Regulations were made under section 44(1)(a) read with section 43(4) of NEMA and were published in GNR.993 of 9 December 2014, Government Gazette No. 38303.

The purpose of the Appeal Regulations is to *"regulate the procedure contemplated in section 43(4) of the Act [NEMA] relating to the submission, processing and consideration of, a decision on an appeal."*

The appeals considered by the Forum are thus governed by the National Appeal Regulations, read with NEMA.

6.4.3. National Framework (including reference to establishment of Priority Areas)

The 2017 Framework was published in terms of section 7(5) of NEMAQA in Government Gazette No. 41996, on 26 October 2018.

In paragraph 1.3 of the 2017 Framework its purpose is set out as being *"to achieve the objectives of the AQA, and as such the National Framework provides a medium-to long-term plan of the practical implementation of the AQA .The Framework provides mechanisms, systems and procedures to promote holistic and integrated air quality management through pollution prevention and minimisation at source, and through impact management with respect to the receiving environment from local scale to international issues. Hence, the National Framework provides norms and standards for all technical aspects of air quality management."*

On page 61 of the 2017 Framework under paragraph 5.4.3.4 reference is made to the once-off suspension. In this regard, it is stated that,

> *"Existing facilities that will be decommissioned by 2030 may apply for a once-off suspension of compliance timeframes with new plant standards for a period not*

beyond 2030. An application must be accompanied by a clear decommissioning schedule and no such application shall be accepted after 31 March 2019."

6.4.4. Applicable Case Law

On 18 March 2022, Collis J handed down judgment in the matter of *The Trustees for the time being of Groundwork Trust and another v The Minister of Environmental Affairs and four others.* In its submissions to the Forum, the CER refers to this case as the "*Deadly Air Case*".

There were a number of issues which the Court was called on to decide, including: Whether there has been a breach of section 24(a) of the Constitution and the proper interpretation of section 20 of NEMAQA, in particular "*whether section 20 provides for discretionary power to make regulations or whether it provides for an obligation or duty to do so…"*

At paragraph 241, Collis J's order included the following:

"*It is declared that the poor air quality in the Highveld Priority Area is in breach of residents' section 24(a) constitutional right to an environment that is not harmful to their health and well-being.*

It is declared that the Minister of Environmental Affairs ("Minister") has a legal duty to prescribe regulations under section 20 of the National Environmental Management: Air Quality Act 39 of 2004 to implement and enforce the Highveld Priority Area Air Quality Management Plan ("Highveld Plan")."

The Forum is cognisant of the significance of this judgment and its far-reaching impact.

7. ESKOM'S INITIAL APPLICATIONS

In 2018 and 2019, Eskom submitted a number of applications to the NAQO for postponement and suspension of compliance timeframes with new plant standards. In October 2021, the NAQO decided these applications. Certain of Eskom's applications were successful, others were partially successful, and a number were refused by the NAQO. A discussion of these applications and decisions are described per power plant below:

7.1. Eskom's Duvha Power Plant ("Duvha")

On page 7 of Eskom's motivation, which accompanied its application, Eskom states as follows,

> *"In summary, the suspension and alternative limits and postponement requested for Duvha is:*
>
> *1) Postponement of the new plant PM limit between 1 April 2020 and 31 March 2025 and an alternative daily limit of 80mg/Nm3 for units 4,5 & 6 until decommissioning (2030-2034).*
>
> *2) An alternative daily limit for SO2 of 2600 mg/Nm3 from 1 April 2020 until decommissioning (2030-2034).*
>
> *3) An alternative daily limit of 1100 mg/Nm3 NOx between 1 April 2020 and decommissioning (2030-2034)*
>
> *Based on the remaining life of the Duvha power station, the techno-economics and cost benefits assessment any additional measures other than what was committed to above is not financially viable.*
>
> *It is requested that the proposed limits only apply during normal working conditions, and not during start-up and shut-down, upset conditions and maintenance periods."*

Eskom's request is also set out in table 1 on page 6 of Eskom's motivation for its application, which shows the applicable limits contained in Duvha's AEL and the requested emission limits:

	Current Limit (from AEL)			Requested Emission Limits*		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
Particulate Matter Unit 1-3	100	Daily	Immediately	50	Daily	1 April 2020
	50		1 April 2020			
Particulate Matter Unit 4-6	100		Immediately	80		
	50		1 April 2020			
Sulphur dioxide Unit 1-3	3500	Daily	Immediately	2600	Daily	1 April 2020
	2300		1 April 2020 – 31 March 2025			
	500		1 April 2025			
Sulphur dioxide Unit 4-6	3500		Immediately			
	2300		1 April 2020 – 31 March 2025			
	500		1 April 2025			
Nitrogen oxides Unit 1-3	1100	Daily	Immediately	1100	Daily	
	1100		1 April 2020 – 31 March 2025			

	Current Limit (from AEL)			Requested Emission Limits*		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
	750		1 April 2025			1 April 2020
Nitrogen oxides Unit 4-6	1100		Immediately			
	1100		1 April 2020 – 31 March 2025			
	750		1 April 2025			

**The requested emission limits above are in mg/Nm^3 at 273 K, 101.3 kPa, dry and 10% O_2.*

In paragraph 5 of Eskom's motivation, it sets out the reasons for applying for a postponement. In this regard, it is stated that, *"Such reasons are set out below and include the fact that emissions from Duvha will not result in non-compliance with National Ambient Air Quality Standards (NAAQS), together with a suite of undesired environmental consequences of compliance with the MES including associated water demands, transport impacts and increases in waste and carbon dioxide (CO2) production. These undesired consequences together with the financial costs of compliance (such as an increase in the electricity tariff) must be weighed up against the benefits that will accrue as a result of compliance with the MES. It is Eskom's view that the benefit of compliance does not justify the non-financial and*

financial costs of compliance (see section 5.5. below for the details of the cost implication of MES compliance).”

Eskom’s reasons for the application are grouped together as follows:

- Remaining life of the power station – Duvha is currently scheduled to be decommissioned between 2030 and 2034. It is Eskom’s submission that it is not financially viable to retrofit Duvha with FGD abatement technology given its current operating life.

- Water availability – It is Eskom’s assertion that the water demands of FGD are significant and FGD is not a judicious use of water in an extremely water scarce country such as South Africa.

- Environmental implications of FGD – There are environmental consequences of FGD relating to the use of limestone and the requirement to transport it as well as relating to the production of gypsum as a by-product.

- Impact on Ambient Air Quality – in this regard, it is stated that *“Duvha Power Station is located in the Mpumalanga Province, 15 km southeast of eMalahleni. The surrounding land use includes coal mining, brick manufacturing, agriculture and residential areas, Duvha therefore operates in an area of elevated ambient SO2 as a result of multiple other sources. This elevated loading is reflected in the ambient air quality measurements where non-compliance with the National Ambient Air Quality Standards (NAAQS) is evident in Witbank (2015 and 2016) and Komati (2016) for daily and annual average concentrations. For actual SO2 emissions at Duvha Power Station the predicted annual average SO2 concentration is significantly less than the national ambient SO2 standard of 50 µg/m3 [and] does not exceed the national ambient air quality standards of 125 µg/m3. The impact of Duvha’s emissions on ambient air quality has been comprehensively assessed in the accompanying independently compiled Atmospheric Impact Report (Annexure A).”*

- Cost implications of compliance with the MES – Eskom’s financial implications of compliance with the MES, most especially the financial implications of compelling

existing plants to comply with 'new plant' standards, is presented in Eskom's motivation in more detail. According to Eskom, there are direct financial costs and electricity tariff implications of compliance.

Below is a summary of what Eskom applied for in 2019 and the NAQO's decision taken in respect thereof:

S 21 Category	Appliance	Postponement Sought	Emission Standards			
			Minimum Emission Standards			Decision
			Pollutant	2015	2020	
Subcategory 1.1: Solid Fuel Combustion Installation	Units 4-6	80mg/Nm^3 from 1 April 2020 until 2025 80 mg/Nm^3 decommissioning (2030-2034)	PM	100	50	Alternative limit request until decommissioning is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a), (b) and 12A(c)(i)). Postponement until 31 March 2025 is declined because the facility did not demonstrate the intention to comply with the new plant standard of 50mg/Nm^3

	6 Units	2600 mg/Nm^3 from 1 April 2020 until decommissioning (2030-2034)	SO_2	3500	1000	Alternative limit request until decommissioning is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a), (b) and (c)(i). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 2300mg/Nm^3 from 1 April 2020 to 31 March 2025 thus remains in place.
	6 Units	1100 mg/Nm^3 from 1 April 2020 until decommissioning (2030-2034)	NO_x	1100	750	Alternative limit request until decommissioning is declined because as the facility does not comply or meet the requirement of GN 1207 of 2018 (12A)(a) and (12A)(b). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 1100mg/Nm^3 from 1

						April 2020 to 31 March 2025 thus remains in place.

The NAQO, in its decision, summarised above, imposed on Eskom the following further conditions, set out in the decision dated 30 October 2021:

- *"This decision will have to be reflected in your Atmospheric Emission Licence (AEL) to be of force and effect. Therefore, you must liaise with the relevant AELA in this regard as soon as possible so that the required amendments, variations and additions to your AEL can be effected.*

- *In addition, you are required to submit a quarterly progress report on the implementation of your compliance road map and commitments that you made in support of the postponement application for Duvha Power Station.*

- *You are also required to provide a progress report on implementation of offset projects where applicable, as well as other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the Department of Forestry, Fisheries and the Environment's financial year."*

- *Eskom Duvha Power Station's requirement to implement an offset programme to reduce PM pollution in the ambient/receiving environment as your facility is located in the Highveld Priority Area remains in place."*

7.2. Eskom's Matla Power Plant ("Matla")

On page 7 of Eskom's motivation, Eskom states:

- "*In summary the postponements and alternative limits requested for Matla are:*

1) *Unit 1-4 Postponement of the new plant PM MES between 1 April 2020 to 31 March 2025 and an alternative daily limit of 200 mg/Nm^3 from 2020 until March 2021 (when ESP upgrades complete). An alternative limit of 100mg/Nm^3 from April 2021 to March 2025. An alternative limit of 80 mg/Nm^3 from April 2025 onwards.*

2) *Unit 5 & 6 Postponement of PM new plant MES and an alternative limit of 100 mg/Nm^3 from 2020 to March 2025. An alternative limit of 80 mg/Nm^3 from 2025 onwards.*

3) *Postponement of the new plant SO_2 standard and an alternative daily limit for SO_2 of 2600 mg/Nm^3 from 1 April 2025 onwards.*

4) *Postponement of NOx new plant MES and an alternative daily limit of 1200 mg/Nm^3 from 1 April 2025 until March 2027 (retrofit complete). Compliance of the standard at 750 mg/Nm^3 from 1 April 2027 onwards.*

Based on the remaining life of the Matla power station, the techno-economics and cost benefits assessment shows that any additional measures other than what was committed to above is not financially viable.

It is requested that the proposed alternative limits only apply during normal working conditions, and not during start-up or shut-down, upset conditions and maintenance periods."

This is also set out in table 2 on page 6 of Eskom's motivation for its application, which shows the applicable limits contained in Matla's AEL as well as the requested emission limits:

	Current Limit (from AEL)			Requested Emission Limits*		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
Particulate Matter	200 (Units 1-4)	Daily	1 April 2015 – 1 March 2020	200** (Units 1-4)	Daily	1 April 2020
	50	Daily	1 April 2020	100 (Units 1-4)	Daily	1 April 2021
				80 (Units 1-4)	Daily	1 April 2025
	100 (Units 5 &6)	Daily	1 April 2015 to 31 March 2020	100 (Units 5 & 6)	Daily	1 April 2020
	50	Daily	1 April 2020	80 (Units 5 & 6)	Daily	1 April 2025
Sulphur dioxide	3500	Daily	1 April 2015	3500	Daily	1 April 2020
	2600	Daily	1 April 2020 – 31 March 2025			
	500	Daily	1 April 2025	2600	Daily	1 April 2025
Nitrogen oxides	1200	Daily	1 April 2015 – 31 March 2020	1200	Daily	1 April 2020
	750	Daily	1 April 2020	750	Daily	1 April 2027

In paragraph 5 of Eskom's motivation, it sets out the reasons for applying for a postponement. In this regard, it is stated that, "*such reasons are set out below and include the fact that emissions from Matla will not result in non-compliance with National Ambient Air Quality Standards (NAAQS), together with a suite of undesired environmental consequences of compliance with the MES including associated water demands, transport impacts and increases in waste and carbon dioxide (CO_2) production. These undesired consequences together with the financial costs of compliance (such as an increase in the electricity tariff) must be weighed up against the benefits that will accrue as a result of compliance with the MES, It is Eskom's view that the benefit of compliance does not justify the non-financial and financial costs of compliance (see section 5.5. below for the details of the cost implication of MES compliance).*"

The NAQO's decision in respect of Eskom's application for Matla

Below is a summary of what Eskom applied for in 2019 and the NAQO's decision taken in respect thereof:

S 21 Category	Appliance	Postponement sought	Emission Standards			
			Minimum Emission Standards			Decision
			Pollutant	2015	2020	
Subcategory 1.1: Solid Fuel Combustion Installation	Units 1-4	200mg/Nm^3 from 1 April 2020 100 mg/Nm^3 from 1 April 2021 80 mg/Nm^3 from 1 April 2025 until decommissioning	PM	100	50	Alternative limit request until decommissioning is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a) and (12A)(c)(i)).
	Units 5-6	100 mg/Nm^3 from 1 April 2020 80 mg/Nm^3 from 1 April 2025				Postponement from 1 April 2020 to 31 March 2025 is declined because the facility did not demonstrate the intention to comply with the new plant standard of 50 mg/Nm^3.
	6 Units	3500 mg/Nm^3 from 1 April 2020	SO_2	3500	1000	Postponement/ alternative limit request until

		2600 mg/Nm^3 from 1 April 2025 until decommissioning by 2034				decommissioning declined because the facility do not comply or meet the requirement of GN1207 of 2018 (11A), (12A)(a) and (12A)(b). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of **2600 mg/Nm^3** from 1 April 2020 to 31 March 2025 thus remains in place.
	6 Units	1200 mg/Nm^3 from 1 April 2020 750 mg/Nm^3 from 1 April 2027	NO_x	1100	750	Alternative limit request declined because the facility does not comply or meet the requirement of GN 1207 of 2018 (12A)(a) and (12A)(b). Postponement request until 31 March 2025 declined because the facility does not show the intention to comply with the new plant standards of 750 mg/Nm^3.

The NAQO's decision, summarised above, was subject to the following further conditions, as set out in its decision dated 30 October 2021:

1. *"The decision will have to be reflected in Eskom's AEL to be of force and effect. Therefore, Eskom must liaise with the relevant AELA as soon as possible so that the required amendments, variations and additions to its AEL can be effected.*

2. *Eskom is required to submit a quarterly progress report on the implementation of its compliance road map and the commitments that it made in support of its postponement application for its Matla Power Station.*

3. *Eskom is also required to provide a progress report on implementation of offset projects where applicable, as well as other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the DFFE's financial year.*

4. *Eskom's Matla Power Station's requirement to implement an offset programme to reduce PM pollution in the ambient/receiving environment, as the facility is located in the HPA, remains in place.*

5. *The decision may be reviewed by the NAQO with the concurrence of the AELA should AAQ conditions in the affected area of the plant not conform to AAQS.* "

7.3. Eskom's Medupi Power Plant ("Medupi")

On page 4 of Eskom's motivation, which accompanied its application in respect of its Medupi Power Plant, Eskom states as follows,

"A MES postponement decision was issued to Medupi in 2015 and again in 2018 in respect of compliance to the MES SO2 limit. With the amendments of the MES regulations in October 2018, it is necessary to submit this application for alternative limits and the postponement for SO2. Eskom has applied and received a condonation for the late submission of an application for Medupi until November 2019, and an initial application

was made by that date. This document is an update of the November 2019 application with some revised information (in particular an updated Atmospheric Impact Report and motivation) as Eskom committed to in the November 2019 application and with edits after the Public Participation completed in August 2020."

"Medupi already achieves the 50 mg/Nm3 Particulate Matter (PM) daily for 'new' MES limits and meets the "new" plant standards for nitrogen oxide (NOx – 750 mg/Nm3), as such no changes in terms of either of these pollutants is requested.

Eskom has an existing postponement decision granting a monthly limit of 3500 mg/Nm3 for SO2 until 31 May 2025. From 1 April 2025 Eskom is required to comply with a SO2 limit of 1000 mg/Nm3. Previous planning indicated that FGD would be installed at Medupi 6 years after completion of each unit thus between 2021 and 2026. Unfortunately, there have been significant delays in the implementation of the project and in confirming funding. This in combination with the deterioration in Eskom's financial position, the negative environmental impacts and the limited health benefits associated with the FGD implementation has led to a re-evaluation and consideration of an alternative approach in respect of SO2 reduction. The alternative approach considers the enablement of a Just Energy Transition Strategy for Eskom and further investigation into less costly SO2 reduction technologies. Eskom is thus requesting a postponement from compliance to the new plant MES until 31 March 2025 with an alternate limit of 4000 mg/Nm3 monthly from 2020 until 2030. Achieving the new plant limit of 1000 mg/Nm3 post-2030 would be subject to a review of alternative less costly SO2 reduction technology and the level of compliance with ambient air standards.

A strict interpretation of the amendment of the MES regulations in 2018 has potentially restricted the legal mechanisms which would provide the authorities with the ability to grant the required time for the investigation of less costly SO2 reduction technologies and Eskom's financial recovery. This application should thus also be considered as a request for exemption from compliance with the present MES timeframes to the Minister of DEFF, as allowed for in terms of section 59 of NEMAQA, if so required." (Sic)

A summary of the indulgence sought by Eskom is recorded on page 9 of its Motivation, as follows:

> *"In summary, the application submitted for Medupi is:*
>
> *(i) Alternative monthly SO2 limit of 4000 mg/Nm3 from 1 April 2020 until 31 March 2030.*
>
> *(ii) Alternative monthly SO2 limit from 1 April 2030 until decommissioning will be proposed based on the SO2 emission reduction technology selected if a suitable technology is identified.*
>
> *Medupi will comply with the new plant standard for PM and NOx and no change in respect of these pollutants is requested. In terms of the existing license and postponement decisions, it is understood that the previously granted postponement of the SO2 limit will remain in place until 2025 as a minimum (compliance to a monthly limit of 3 500 mg/Nm3). Based on the techno-economics and with due consideration of the issues described in this application, any additional measures other than what was committed to above and the emission limits requested are not financially viable. The monthly averaging period has been requested due to the variability in coal quality which results in days where a daily limit is exceeded and others where the emissions are below the daily limit."*

Eskom's request is also set out in table 1 on page 9 of its motivation, which shows the applicable limits contained in Medupi's AEL as well as the emission limits requested:

Point source SV0002, 0011,0012, 0013,0014 and 0015	Current Limit (from AEL)			Requested Emission Limits+		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
				To be proposed based on technologies		1 April 2030
Nitrogen Oxide (NO_x)	750	Daily	1 April 2015	750	Daily	1 April 2020

+The requested alternate emission limits above are in mg/Nm³ at 273 K, 101.3 kPa, dry and 10% O_2.
** Limit as per 2018 MES application grant (LP/ES-MT/WDM/20170825)*

Point source SV0002, 0011,0012, 0013,0014 and 0015	Current Limit (from AEL)			Requested Emission Limits+		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
Particulate Matter (PM)	50	Daily	1 April 2015	50	Daily	1 April 2020
Sulphur Dioxide (SO_2)	3500	Monthly*	1 April 2015	**4000**	**Monthly**	1 April 2020

In paragraph 6 of Eskom's motivation, it sets out the reasons for applying for a postponement. The following reasons are listed, and each is then elaborated on in its Motivation:

(i) Coal quality and the high sulphur content of Waterberg coals;

(ii) Delays in FGD project timeframes and further study time requirements;

(iii) The cost of SO2 reduction and Eskom's financial position;

(iv) Water use associated with SO2 reduction;

(v) Waste, sorbent and energy impacts of SO2 reduction technologies;

(vi) The state of air in the Waterberg and the predicted impact of Eskom's application;

(vii) The potential impact on national electricity supply; and

(viii) Eskom's Just Energy Transition Strategy and climate change response.

The NAQO's decision in respect of Eskom's application for Medupi

Below is a summary of what Eskom applied for in 2020 and the NAQO's decision taken in respect thereof:

S21 Category	**Appliance**	**Postponement period sought**	**Emission Standards**			
			Minimum Emission Standards (mg/Nm^3)			**Decision**
			Pollut-ant	**2015**	**2020**	
Subcategory 1.1: Solid Fuel Combustion Installations	6 Units	4000mg/Nm^3 (monthly) from 1 April 2020 until decommissioning	SO_2	3500	1000	Alternative limit is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a)(b).

		1000 mg/Nm^3 (monthly) from 1 April 2030 until decommissioning				Postponement of compliance with the minimum emission standards for new plant beyond 2025 is declined as the facility does not comply or meet the requirement of GN1207 of 2018, (11A). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of **3500mg/Nm^3** from 1 April 2020 to 31 March 2025 thus remains in place.

The NAQO's decision, summarised above, was subject to the following further conditions, as set out in its decision dated 30 October 2021:

1. *"The decision will have to be reflected in Eskom's AEL to be of force and effect. Therefore, Eskom must liaise with the relevant AELA as soon as possible so that the required amendments, variations and additions to its AEL can be effected.*

2. *Eskom is required to submit a quarterly progress report on the implementation of its compliance road map and of its commitments made in support of its postponement application for its Medupi Power Station.*

3. *Eskom is also required to provide a progress report on the implementation of offset projects where applicable, as well as of other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the DFFE's financial year.*

4. *Eskom's Medupi Power Station is required to implement an offset programme to reduce SO_2 pollution in the ambient/receiving environment, as the facility is located in the WBPA. A definite offset implementation plan is expected from Eskom's Medupi Power Station within 90 days from the date of issue of the decision."*

7.4. Eskom's Tutuka Power Plant ("Tutuka")

On page 3 of Eskom's motivation, which accompanied its application, Eskom summarises its application as follows,

"*Eskom herewith formally makes an application to the National Air Quality Officer (NAQO) for postponement of the compliance timeframes associated with the Minimum Emission Standards (MES) and asks for alternative limits for particular matter (PM) and nitrogen oxides (NOx) and sulphur dioxide (SO2) for its Tutuka Power Station. This application also asks for reconsideration of the limits granted to Eskom in response to Tutuka Power Station's previous postponement application that was made in 2014.*

Tutuka is installing a Fabric Filter Plant (FFP) to reduce particulate emissions as per its previous postponement request but due to delays this will only be completed by

2027. An alternate daily PM emission limit of 300 mg/Nm3 or a monthly limit of 200 mg/Nm3 is thus requested until 2027, the station will comply with the MES limit once the FFP is installed. In order to reduce NOx emissions the station is planning to install low NOx burners. This project will be completed by 2026 and an alternative limit of 1200 mg/Nm3 is requested until then, the station will comply with the NOx MES once the project is complete. To reduce SO2 to the new plant level of 1000 mg/Nm3 would require installation of Flue Gas Desulphurisation (FGD) which is not considered appropriate for Tutuka and an alternate limit of 3000 mg/Nm3 is requested for the station until decommissioning."

In table 3 on page 7 of Eskom's motivation, it sets out the maximum emission rates as listed in Tutuka's AEL, which are the emission rates that were granted to it pursuant to a postponement application it made in 2015 and which currently apply to the plant:

Pollutant Name	**Maximum release rate**		
	Limit value (mg/Nm^3)	**Date to be achieved by**	**Average period**
PM	350	1 April 2015 – 31 December 2018	Daily
	200	1 January 2019 – 31 December 2019	Daily
	100	From 1 January 2020	Daily
SO_2	3400	1 April 2020 – 31 December 2025	Daily
NOx	1200	1 April 2015-31 March 2020	Daily
	750	From 1 April 2020	Daily

A summary of the requested emission limits for Tutuka Power Station are depicted in table 5 of its Motivation, as follows:

Pollutant Name	Maximum release rate		
	Limit value (mg/Nm^3)	Date to be achieved by	Average period
PM	300 (daily) OR 200 (monthly)	1 January 2019 – 31 March 2027	Daily OR Monthly
	50	From 1 April 2027 onwards	Daily
SO_2	3000	1 April 2020 – 31 March 2025	Daily
	3000	From 1 April 2025 – onwards	Daily
NOx	1200	1 April 2020-31 March 2026	Daily
	750	From 1 April 2026 onwards	Daily

In paragraph 8 of its motivation, Eskom sets out the reasons motivating Tutuka's postponement application. Eskom explains the cause of PM, NO_x and SO_2 pollution and addresses the technology options for emission reduction as well as its abatement technology retrofit schedule.

In relation to abating PM pollution, Eskom states that "*Tutuka is working towards completing a full FFP retrofit to ensure compliance with the "new plant" emission limit of 50 mg/Nm^3. Eskom is further considering non-FFP solutions to bring the plant into compliance with the new plant standards."*

In terms of NO_x emission reduction, it is stated that "*Tutuka Power Station currently emits unabated NO_x emissions as the station's original design did not include LNB [low nox burner] technology. Tutuka is working towards completing a full LNB retrofit to ensure compliance with the 'new plant' emission limit of 750 mg/Nm^3, with which the station is currently not complying with most of the time."*

With regard to SO_2 emission abatement, Eskom states that "*SO_2 emissions are released as a result of the sulphur content in the coal. Flue gas desulphurization (FGD) technology is the only effective control measure to reduce SO_2 emissions. The FGD is a process which passes flue gas through alkaline solution/media. FGD technology is expensive, requires significant quantities of water, creates a new waste stream and increases greenhouse gases. Only the*

new power stations, namely Kusile and Medupi, are scheduled for being equipped with FGD Plants, while a pilot project is being executed to determine the correct technology to install at Matimba and Kendal power station. Tutuka Power Station currently emits unabated SO_2 emissions as the station's original design did not include FGD technology."

According to its Motivation, Eskom intends to complete the retrofit of FFP at its Tutuka power plant in 2027 and of LNBs by 1 April 2026.

The NAQO's decision in respect of Eskom's application for its Tutuka power plant

Below is a summary of what Eskom applied for in 2018 and the NAQO's decision in respect thereof:

S 21 Category	Applianc e	Postponement Sought	Emission Standards			
			Minimum Emission Standards			Decision
			Polluta nt	201 5	202 0	
Subcatego ry 1.1: Solid Fuel Combustion Installation	6 Units	300 mg/Nm^3 (daily) or 200mg/Nm^3 (monthly) from 1 January 2019 until 31 March 2027	PM	100	50	Alternative limit request beyond 2025 is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A) (a) and (12A) (c)(i). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 100mg/Nm3 from 1 January 2020 to 31 March 2025 thus remains in place.

		3000mg/Nm3 from 1 April 2020 3000mg/Nm^3 from 1 April 2025 until decommissioning	SO_2	3500	1000	Alternative limit until decommissioning is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A) (a) and (12A) (b). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 3400mg/Nm^3 from 1 April 2020 to 31 March 2025 thus remains in place.
		1200 mg/Nm^3 from 1 April 2020 to 31 March 2026 750 mg/Nm^3 from 1 April 2026 onwards	NO_x	1100	750	Postponement/alternative limit beyond 2025 is declined as the facility do not comply or meet the requirement of GN 1207 of 2018 11A, (12A) (a) and (12A) (b). Postponement of compliance with the minimum emission standards for new

						plant is granted with a limit of 1100mg/Nm3 from 1 April 2020 to 31 March 2025.

The NAQO's decision, summarised above, was subject to the following further conditions, set out in the decision dated 30 October 2021:

(a) *"This decision will have to be reflected in your Atmospheric Emission License (AEL) to be of force and effect. Therefore, you must liaise with the relevant AELA in this regard as soon as possible so that the required amendments, variations and additions to your AEL can be effected.*

(b) *You are required to submit a quarterly progress report on the implementation of your compliance road map and commitments that you made in support of the postponement application for Eskom Tutuka Power Station.*

(c) *You are also required to provide a progress report on implementation of offset projects where applicable, as well as other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the Department of Forestry, Fisheries and the Environment's financial year.*

(d) *Eskom Tutuka Power Station's requirement to implement an offset programme to reduce Particulate Matter (PM) pollution in the ambient/receiving environment as your facility is located in the Highveld Priority Area remains in place.*

(e) *A detailed compliance roadmap must be submitted to the Department a year from the date of issue of this decision.*

(f) The decision may be reviewed by the NAQO with the concurrence of AELA should ambient air quality conditions in the affected area of the plant not conform to ambient air quality standards."

7.5. Eskom's Lethabo Power Plant ("Lethabo")

On page 4 of Eskom's motivation, which accompanied its application, Eskom states as follows,

> "*Lethabo already achieves the 'existing plant' MES of 100 mg/Nm^3 Particulate Matter (PM), 1100 mg/Nm^3 for Nitrogen oxides (NO_x) and 3500 mg/Nm^3 for Sulphur dioxide (SO_x) emissions. However, the Power Station will not be able to comply with the "new plant" MES of 50 mg/Nm^3 until the planned SO_3 plant upgrade and High Frequency Power Supply (HFPS) installation is completed by 2025 and as such a postponement of the new plant standard until 2025 is requested. The technology choice for Lethabo does however not guarantee compliance to the new plant limit and as such an alternate limit of 80 mg/Nm^3 until station decommissioning is requested. The station cannot comply with the new plant limit of NO_x limit of 750 mg/Nm^3 and an alternative limit of 1100 mg/Nm^3 is being requested. Similarly the station is unable to comply with the new plant limit of 1000 mg/Nm^3 for SO_2 and an alternate limit of 2600 mg/Nm^3 is being requested."*

A summary of the indulgence sought by Eskom is recorded on page 6 of its Motivation as follows:

> "*In summary the postponement requested for Lethabo is: A postponement of the PM new plant MES until 2025 (when the planned retrofits are complete) with an alternative daily limit of 100 mg/Nm^3 until then and thereafter an alternate daily limit of 80 mg/Nm^3. For SO_2 a postponement of the new plant standard is requested until 2025 with an alternative limit of 3500 mg/Nm^3 and thereafter an alternate daily limit of 2600 mg/Nm^3 is requested until decommissioning in 2040. For NO_x postponement of the new plant standard until 2025 is requested and thereafter an alternative daily limit of 1100 mg/Nm^3 is requested until station decommissioning.*

Based on the remaining life of the Lethabo power station, the techno-economics and cost benefit assessment any additional measures other than what was committed to above and the emission limits requested is not considered a socio-economic benefit and will not result in increased health impact.

It is requested that the proposed alternative emission limits only apply during normal working conditions, and not start-up or shut-down, upset conditions and maintenance periods." (sic)

Eskom's request is also set out in table 1 on page 6 of its motivation, which shows the applicable limits contained in the Lethabo power plant's AEL as well as the requested emission limits:

	Current Limit (from AEL)			Requested Emission Limits***		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
Particulate Matter	100	Monthly	1 April 2015	100	Daily	1 April 2020
	100	Daily	1 January 2016	80	Daily	1 April 2025
	50	Daily	1 April 2020			
Sulphur dioxide	3500	Daily	1 April 2015	3500	Daily	1 April 2020
	2500		1 April 2020	2600	Daily	1 April 2025
Nitrogen oxides	1100	Daily	1 April 2015	1100	Daily	1 April 2020
	1100		1 April 2020	1100	Daily	1 April 2025

The requested interim emission limits above are in mg/Nm^3 at 273 K, 101.3 kPa, dry and 10% O_2.

In paragraph 5 of Eskom's motivation, it sets out its reasons for applying for a postponement. The following reasons are listed, and each is then elaborated on in its motivation:

(i) Remaining Power Station Life

(ii) Water Availability

(iii) Environmental Implications of FGD

(iv) Impact on Ambient Air Quality

(v) Cost implications of compliance with MES

(vi) Project Delays

The NAQO's decision in respect of Eskom's application for its Lethabo power plant

Below is a summary of what Eskom applied for in 2020 and the NAQO's decision in respect thereof:

S21 Category	**Appliance**	**Postponement period sought**	**Emission Standards**			
			Minimum Emission Standards (mg/Nm^3)			**Decision**
			Pollutant	**2015**	**2020**	
Subcategory 1.1: Solid Fuel Combustion Installations	6 Units	100mg/Nm^3 (monthly) from 1 April 2020 80mg/Nm^3 (monthly) from 1 April 2025	PM	100	50	Alternative limit request until decommissioning is declined as the facility does not comply or meet the requirement of GN 1207 of 2018,

						(12A)(a) and (12A)(c)(i). Postponement from 1 April 2020 to 31 March 2025 declined because the facility did not demonstrate the intention to comply with the new plant standard of 50 mg/Nm^3.
		3500mg/Nm^3 (monthly) from 1 April 2020 and 2600mg/Nm^3 (monthly) from 1 April 2025 to decommissioning by 2040	SO_2	3500	1000	Postponement/alternative limit request until decommissioning declined because the facility does not comply or meet the requirement of GN 1207 of 2018 (11A), (12A)(a) and (12A)(b). The requirement to comply with the minimum emission standards for new plant as stated in

						the 2015 postponement decision with a limit of 2500mg/Nm^3 from 1 April 2020 to 31 March 2025 thus remains in place.
		1100mg/Nm3 (monthly) from 1 April 2020 1100mg/Nm^3 (monthly) from 1 April 2025 to decommissioning	NOx	1100	750	Postponement/alternative limit request until decommissioning declined because the facility does not comply or meet the requirement of GN 1207 of 2018 (11A), (12A)(a) and (12A)(b). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 1100mg/Nm^3 from

						1 April 2020 to 31 March 2025 thus remains in place.

The NAQO's decision, summarised above, was subject to the following further conditions, set out in the decision dated 30 October 2021:

a) "*This decision will have to be reflected in your AEL to be of force and effect. Therefore, you must liaise with the relevant AELA in this regard as soon as possible so that the required amendments, variations and additions to your AEL can be effected.*

b) *You are required to submit a quarterly progress report on the implementation of your compliance road map and commitments that you made in support of the postponement application for Eskom Lethabo Power Station.*

c) You are also required to provide a progress report on implementation of offset projects where applicable, as well as other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the Department of Forestry, Fisheries and the Environment's financial year.

d) *Eskom Lethabo Power Station's requirement to implement an offset programme to reduce Particular Matter (PM) pollution in the ambient/receiving environment as the facility is located in the VTAPA Priority Area remains in place.*

e) *The decision may be reviewed by the NAQO with the concurrence of AELA should ambient air quality conditions in the affected area of the plant not conform to ambient air quality standards*."

7.6. Eskom's Matimba Power Plant ("Matimba")

On page 4 of Eskom's motivation, which accompanied its application, Eskom states as follows:

"A MES postponement decision was issued to Matimba in 2015 and again in 2018 in respect of compliance to the MES SO_2 limit. With the amendments of the MES regulations in October

2018, it is necessary to submit this application for alternative limits. Eskom has applied and received a condonation for the late submission of an application for Matimba until November 2019, and an initial application was made by that date. This document is an update of the November 2019 application with some revised information (in particular an updated Atmospheric Impact Report and motivation) as Eskom committed to in the November 2019 application and with edits after the Public Participation completed in August 2020."

"Matimba already achieves the 100 mg/Nm^3 Particulate Matter (PM) daily for 'existing' MES limits and the "existing" limit of nitrogen oxide (NOx – 1100 mg/Nm^3). However, Eskom's Matimba Power Station will not be able to comply with the 750 mg/Nm^3 daily 'new plant' MES for NOx, the new plant and existing plant SO_2 limit of 1000 mg/Nm^3 and 3500 mg/Nm^3 respectively, and the 50 mg/Nm^3 daily PM limit, consistently. As such Matimba is requesting an alternative monthly PM limit of 50 mg/Nm^3, a monthly NOx limit of 750 mg/Nm^3 as well as a monthly SO_2 limit of 4000 mg/Nm^3, until decommissioning of the station.

Eskom has a present postponement decision granting a monthly limit of 3500 mg/Nm^3 monthly limit for SO_2 until 31 May 2025. Eskom will be unable to meet the SO_2 new plant daily limit of 1000 mg/Nm^3 from 2025 without the installation of Flue Gas Desulphurisation (FGD) technology – which Eskom argues in this application, is not warranted or appropriate." (Sic)

A summary of the indulgence sought by Eskom is recorded on page 9 of its motivation, as follows:

"In summary, the application submitted for Matimba is an:

*(i) Alternative **monthly** limit of 50 mg/Nm^3 for PM from 1 April 2020 until decommissioning.*

*(ii) Alternative **monthly** limit of 750 mg/Nm^3 for NOx from 1 April 2020 until decommissioning.*

*(iii) Alternative **monthly** limit of 4000 mg/Nm^3 for SOx from 1 April 2020 until decommissioning.*

The emission limits proposed in this application are informed by plant design, plant operations, coal quality and the existing regulatory requirements.

In terms of the existing license and postponement decisions, Matimba has until 1 April 2025 to comply with the SO_2 limit. It is understood that the previously granted postponements of limits (monthly limit of 3500 mg/Nm^3) will remain in place until 2025 as a minimum.

Based on the techno-economics and with due consideration of the issues described in this application, any additional measures other than what was committed to above and the emission limits requested are not financially viable…."

Eskom's request is also set out in table 1 on page 9 of Eskom's motivation, which shows the applicable limits contained in the Matimba power plant's AEL and the requested emission limits:

	Current Limit (from AEL)			Requested Emission Limits*		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
Units 1, 2 and 3 (PM)	50	Daily	1 April 2020	50	**Monthly**	1 April 2020
Units 4, 5 and 6 (PM)						
Units 1, 2, and 3 (SO2)	3500	Monthly*	1 April 2020	**4000**	**Monthly**	1 April 2020
Units 4, 5 and 6 (SO2)						
Units 1, 2 and 3 (NOx)	750	Daily	1 April 2020	750	**Monthly**	1 April 2020
Units 4, 5 and 6 (NOx)						

**The requested alternate emission limits above are in mg/Nm3 at 273 K, 101.3 kPa, dry and 10% O2.*
** Limit as per 2018 MES application grant (LP/ES-MT/WDM/20170825)*

In paragraph 6 of Eskom's motivation, it sets out the reasons for applying for a postponement. The following reasons are listed, and each is then elaborated on in its motivation:

a) *Coal quality and the high Sulphur content of Waterberg coals;*

b) *Plant performance and the need for operational flexibility;*

c) *The remaining life of Matimba power station;*

d) *The cost of SO_2 reduction and Eskom's financial position;*

e) *Water availability and water use associated with SO_2 reduction;*

f) *The environmental implication of SO_2 reduction (waste, sorbent and energy impacts);*

g) *The state of air in the Waterberg and the predicted impact of Eskom's application;*

h) *The potential impact on national electricity supply; and*

i) *Eskom's Just Energy Transition Strategy and climate change response.*

With regard to the coal quality in the Waterberg area, Eskom states, in its motivation, that,

> *"The root cause of the high SO_2 emissions experienced is the high sulphur content in the coal supplied to the station by the Exxaro Grootegeluk Coal Mine…In the short to medium-term, there is no simple remedy to the situation, and all potential solutions bring along with them significant operational, environmental and financial implications. Load losses, coal beneficiation practices, alterations to existing coal contracts and options to source coal from other mines are all options that have been looked into to find potential solutions but have proven not to be feasible.*
>
> *To better manage coal quality, Eskom is monitoring the sulphur content of the coal daily, and, where high levels are seen, the station engages with the mine to increase off-take from low sulphur mine sources. The mine and station are also engaging in coal quality forecasting and blending low and high sulphur areas in the mine to improve the average quality of the station feed."*

The NAQO's decision in respect of Eskom's application for its Matimba power plant

Below is a summary of what Eskom applied for in 2020 and the NAQO's decision in respect thereof:

S21 Category	Appliance	Postponement period sought	Emission Standards			
			Minimum Emission Standards (mg/Nm^3)			Decision
			Pollut-ant	2015	2020	
Subcategory 1.1: Solid Fuel Combustion Installations	6 Units	50mg/Nm^3 (monthly) from 1 April 2020 until decommissioning	PM	100	50	Alternative limit is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a) and (12A)(c)(i).
		4000mg/Nm^3 (monthly) from 1 April 2020 until decommissioning	SO_2	3500	1000	Alternative limit is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a) and (12A)(b). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 3500mg/Nm^3

						from 1 April 2020 to 31 March 2025 thus remains in place.
		750mg/Nm^3 (monthly) from 1 April 2020 until decommissioning	NOx	1100	750	Alternative limit is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a).

The NAQO's decision, summarised above, was subject to the following further conditions, set out in its decision dated 30 October 2021:

a) "*This decision will have to be reflected in your AEL to be of force and effect. Therefore, you must liaise with the relevant AELA in this regard as soon as possible so that the required amendments, variations and additions to your AEL can be effected.*

b) *You are required to submit a quarterly progress report on the implementation of your compliance road map and commitments that you made in support of the postponement application for Eskom Matimba Power Station.*

c) *You are also required to provide a progress report on implementation of offset projects where applicable, as well as other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the Department of Forestry, Fisheries and the Environment's financial year.*

d) *Eskom Matimba Power Station's requirement to implement an offset programme to reduce SO_2 pollution in the ambient/receiving environment as the facility is*

located in the Waterberg-Bojanala Priority Area. A definite offset implementation plan is expected from Eskom Holdings SOC Limited (Matimba Power Station) within 90 days from the date of issue of this decision.

e) *The decision may be reviewed by the NAQO with the concurrence of AELA should ambient air quality conditions in the affected area of the plant not conform to ambient air quality standards*."

7.7. Eskom's Kendal Power Plant ("Kendal")

On page 6 of Eskom's motivation, which accompanied its application, Eskom summarises its application as follows:

1) Postponement of the new plant standard for PM between 1 April 2020 to 31 March 2025 and an alternative daily limit of 100 mg/Nm3 and an alternative daily limit of 85 mg/Nm3 for PM from 1 April 2025 until decommissioning (2039 - 2044);

2) Postponement of the new plant standard for SO2 and an alternative daily limit for SO2 of 3000 mg/Nm3 from 1 April 2025 until decommissioning (2039 - 2044);

3) A postponement of the NOx new plant limit and an alternate limit daily limit of 1100 mg/Nm3. From 1 April 2025 Eskom requests a monthly limit of 750mg/Nm3 until decommissioning (2039-2044). No postponement for the PM standards is requested.

It is requested that the proposed limits only apply during normal working conditions, and not during start-up or shut-down, upset conditions and maintenance periods."

	Current Limit (from AEL)			Requested Emission Limits***		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
Particulate matter	100	24 hours	1 April 2015	100	Daily	1 April 2020
	50		1 April 2020	85	Daily	1 April 2025
Sulphur Dioxide	3500	24 hours	1 April 2015	3500	Daily	1 April 2020
	2600		1 April 2020 – 31 March 2025	3000	Monthly	1 April 2025
	500		1 April 2025			
Nitrogen Oxide	1100	24 hours	1 April 2015	1100	Daily	1 April 2020
	750		1 April 2020	750	Monthly	1 April 2025

*

****The requested interim emission limits above are in mg/Nm^3 at 273 K, 101.3 kPa, dry and 10% O_2.***

In paragraph 5 of its motivation, Eskom sets out its reasons for applying for a postponement in respect of its Kendal Power Station. In this regard, it is stated that,

> "*As mentioned above, the application for postponement and alternate limits must be accompanied by reasons. Such reasons are set out below and include the fact that emissions from Kendal will generally not result in non-compliance with National Ambient Air Quality Standards (NAAQS), the decommissioning of Kendal will occur between 2039 and 2044 (according to the 50-year life plan); together with a suite of undesired environmental consequences of compliance with the MES including associated water demands, transport impacts and increases in waste and carbon dioxide (CO2) production. These undesired consequences together with the financial costs of compliance (such as an increase in the electricity tariff) must be weighed up against the benefits that will accrue as a result of compliance with the MES. It is Eskom's view that the benefit of compliance does not justify the non-financial and financial costs of compliance. (see section below for the details of the cost-benefit analysis completed). None of these reasons should be seen as exclusive (i.e. it is not one reason alone that prevents compliance) but rather all in combination. Before presenting these various reasons, the reader is referred to Annexure A the AIR, Annexure B the Summary Atmospheric Impact Report and Annexure C the CBA.*

The motivation then addresses several aspects of the above, in more detail, under the following headings:

a) Remaining Power Station Life and Project Development timelines

b) Water Availability

c) Environmental Implications of FGD

d) Impact on Ambient Air Quality

e) Cost Implications of Compliance with the MES

f) Project Delays

The NAQO's decision in respect of Eskom's application for its Kendal Power Plant

Below is a summary of what Eskom applied for in 2019 and the NAQO's decision in respect thereof:

S 21 Category	Appliance	Postponement Sought	Emission Standards			
			Minimum Emission Standards			Decision
			Pollutant	2015	2020	
Subcategory 1.1: Solid Fuel Combustion Installation	6 Units	100mg/Nm^3 from 1 April 2020 until 31 March 2025 85 mg/Nm^3 from 1 April 2025 till decommissioning (2039-2044)	PM	100	50	Alternative limit request until decommissioning is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A(a) and 12A(c)(i)). Postponement until 31 March 2025 is declined because the facility did not demonstrate the intention to comply with the new plant

						standard of 50mg/Nm^3
		3000 mg/Nm^3 from 1 April 2025 until decommissioning (2039-2044)	SO_2	3500	1000	Alternative limit request until decommissioning is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a), (12A)(c)(i). Postponement of compliance timeframe of 3000 mg/Nm^3 (monthly) is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (11A) and (12A)(b). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 2600mg/Nm^3 from 1 April 2020 to 31 March 2025 thus remains in place.
		1100 mg/Nm^3 alternative day limit	NO_x	1100	750	Alternative limit request until decommissioning

		750 mg/Nm^3 (monthly) from 1 April 2025 till decommissioning (2039-2044)				is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a). Postponement of compliance with the minimum emission standards for new plant is granted with a limit of 1100mg/Nm^3 from 1 April 2020 to 31 March 2025.

The NAQO's decision, summarised above, was subject to the following further conditions, set out in its decision dated 30 October 2021:

a) "*This decision will have to be reflected in your AEL to be of force and effect. Therefore, you must liaise with the relevant AELA in this regard as soon as possible so that the required amendments, variations and additions to your AEL can be effected.*

b) *You are required to submit a quarterly progress report on the implementation of your compliance road map and commitments that you made in support of the postponement application for Eskom Kendal Power Station.*

c) You are also required to provide a progress report on implementation of offset projects where applicable, as well as other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the Department of Forestry, Fisheries and the Environment's financial year.

d) *Eskom Kendal Power Station's requirement to implement an offset programme to reduce Particulate Matter (PM) pollution in the ambient/receiving environment as your facility is located in the Highveld Priority Area remains in place.*

e) *The decision may be reviewed by the NAQO with the concurrence of AELA should ambient air quality conditions in the affected area of the plant not conform to ambient air quality standards*."

7.8. Eskom's Majuba Power Plant ("Majuba")

On page 6 of Eskom's motivation, which accompanied its application, Eskom summarises its application as follows:

"*It is requested that the proposed alternative limits only apply during normal working conditions, and not during start-up or shut-down, upset conditions and maintenance periods.*

In summary the postponement for Majuba requested is:

1. *Postponement of the SO_2 new plant MES and an alternative limit of 3000 mg/Nm^3 from 2025 onwards;*
2. *An alternative limit of 1400 mg/Nm^3 monthly for NO_x until 2026 (completion of low NO_x retrofit) and compliance to the new plant standard from there onwards.*

No postponement for the PM standards is requested."

	Current Limit (from AEL)			Requested Emission Limits*		
	Limit value	Averaging period	Date to be achieved by	Limit value	Averaging period	Date to be achieved by
Particulate Matter	100	Daily	1 April 2015	50	Daily	1 April 2020
Sulphur Dioxide	3500	Daily	1 April 2015	3500	Daily	1 April 2020
				3000	Daily	1 April 2025
Nitrogen Oxides	1500	Daily	1 April 2015-31 March 2020	1400	Monthly	1 April 2020
				750	Daily	1 April 2026 until decommissioning

**The requested interim emission limits above are in mg/Nm^3 at 273 K, 101.3 kPa, dry and 10% O_2.*

In paragraph 5 of its motivation, Eskom sets out its reasons for applying for a postponement in respect of it Majuba Power Station. In this regard, it is stated that,

> "*As mentioned above, the Application for postponement must be accompanied by reasons. Such reasons are set out below and include the fact that emissions from Majuba will not result in non-compliance with National Ambient Air Quality Standards (NAAQS), project delays and a suite of undesired environmental consequences of compliance with the MES including associated water demands, transport impacts and increases in waste and carbon dioxide (CO_2) production. These undesired consequences together with the financial costs of compliance (such as an increase in the electricity tariff) must be weighed up against the benefits that will accrue as a result of compliance with the MES. It is Eskom's view that the benefit of compliance does not justify the non-financial and financial costs of compliance. …None of these reasons should be seen as exclusive (i.e. it is not one reason alone that prevents compliance) but rather all in combination. Before presenting these various reasons, the reader is referred to Annexure A, in which various information is presented on the Majuba Power Station."*

The motivation then addresses several aspects of the above, in more detail, under the following headings:

a) Remaining Power Station Life
b) Water Availability
c) Environmental Implication of FGD
d) Impact on Ambient Air Quality
e) Cost Implications of Compliance with the MES
f) Project Delays

The NAQO's decision in respect of Eskom's application for its Majuba power plant

Below is a summary of what Eskom applied for in 2018 and the NAQO's decision in respect thereof:

S 21 Category	Appliance	Postponement Sought	Emission Standards			
			Minimum Emission Standards			Decision
			Pollutant	2015	2020	
Subcategory 1.1: Solid Fuel Combustion Installation	6 Units	3500mg/Nm^3 from 1 April 2020 until 31 March 2025 3000 mg/Nm^3 from 1 April 2025 until decommissioning by 2051.	SO_2	3500	1000	Postponement of compliance timeframe with the minimum emission standards beyond 2025 is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (11A). Alternative limit request is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A)(a) and (12A)(b). The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of 3200 mg/Nm^3 from 1 April 2020 to 31 March 2025

						thus remains in place.
		1400mg/Nm^3 (monthly) from 1 April 2020 750 mg/Nm^3 from 1 April 2026 until decommissioning by 2051.	NO_x	1100	750	Alternative limit is declined as the facility does not comply or meet the requirement of GN 1207 of 2018, (12A) (a) and (12A)(b). Postponement application beyond 31 March 2025 is declined as the facility does not comply or meet the requirement of GN 1207 of 2018 (11A). Postponement issued from 1 April 2020 to 31 March 2025 with the emission limit of **1300 mg/Nm^3.**

The NAQO's decision, summarised above, was subject to the following further conditions, set out in its decision dated 30 October 2021:

a) "*This decision will have to be reflected in your Atmospheric Emission Licence (AEL) to be of force and effect. Therefore, you must liaise with the relevant AELA in this regard as soon as possible so that the required amendments, variations and additions to your AEL can be effected.*

b) *You are required to submit a quarterly progress report on the implementation of your compliance road map and commitments that you made in support of the postponement application for Eskom Majuba Power Station.*

c) *You are also required to provide a progress report on implementation of offset projects where applicable, as well as other reporting requirements included in the AEL. The reports must be submitted to the NAQO and the AELA following the Department of Forestry, Fisheries and the Environment's financial year*.

d) *Eskom Majuba Power Station's requirement to implement an offset programme to reduce Particulate Matter (PM) pollution in the ambient/receiving environment as your facility is located in the Highveld Priority Area remains in place.*

e) The decision may be reviewed by the NAQO with the concurrence of AELA should ambient air quality conditions in the affected area of the plant not conform to ambient air quality standards."

7.9. Eskom's Hendrina, Kriel, Grootvlei, Camden and Arnot Power Plants ("Hendrina", "Kriel", "Grootvlei", "Camden" and "Arnot" respectively)

As will be explained in more detail below, these five power stations are dealt with together, by the Forum, for the reason that all five power stations are due to close by 2030 and thus are eligible for a once-off suspension of compliance timeframes for new plant standard in terms of 11B of the Listed Activities.

The table below summarises Eskom's applications to the NAQO in respect of these five power stations and the NAQO's decision in respect of each:

PLANT	DECOMISSIONING DATE[9]	POLLUTANT/S FOR WHICH SUSPENSION IS SOUGHT	DECISION BY NAQO
Arnot	**2026 – 2029**	**SO_2**	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2025 to 31 March 2030 with a limit of **2500mg/Nm^3** during this period. The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of **2500mg/Nm^3** from 1 April 2020 to 31 March 2025 thus remains in place.
		NO_x	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2020 to 31 March 2030 with a limit of **1000mg/Nm^3** during this period.
Camden	**2023 – 2025**	**SO_2**	Suspension of compliance timeframe with the minimum emission standards for new plant is granted. The requirement to comply with the minimum emission standards for new plant as

[9] Taken from Generation 2035 shutdown plan memorandum to Generation GE (dated July 2021) – furnished to the Forum by Eskom. On the 4th of March 2024, the Forum was advised that the shutdown dates for certain of these plants have changed. However, at the time of submission to the NAQO, the shutdown dates contained in this table were as they are presented here.

			stated in the 2015 postponement decision with a limit of **3500mg/Nm^3** from 1 April 2020 to 31 March 2025 thus remains in place.
		NO_x	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2020 to 31 March 2030 with a limit of **1100mg/Nm^3** during this period.
Grootvlei	**2026 – 2027**	**PM**	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 202 to 31 March 2030 with a limit of **100mg/Nm^3** for the North and South stack during this period.
		SO_2	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2025 to 31 March 2030 with a limit of **3500mg/Nm^3** during this period. The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of **3500mg/Nm^3** from 1 April 2020 to 31 March 2025 thus remains in place.
		NO_x	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2020 to 31 March 2030 with a limit of **1100mg/Nm^3** during this period.
Hendrina	**2023 – 2025**	**SO_2**	Suspension of compliance timeframe with the minimum emission standards for new plant is

			granted from 1 April 2025 to 31 December 2026 with a limit of **3200mg/Nm^3** during this period. The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of **3200mg/Nm^3** from 1 April 2020 to 31 March 2025 thus remains in place.
		NO_x	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2020 to 31 December 2026 with a limit of **1100mg/Nm^3** during this period.
Kriel	**2026 – 2030**	**SO_2**	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2025 to 31 March 2030 with a limit of **2800mg/Nm^3** during this period. The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of **2800mg/Nm^3** from 1 April 2020 to 31 March 2025 thus remains in place.
		PM	Suspension of compliance timeframe with the minimum emission standards for new plant standard is granted from 1 April 2020 to 31 March 2030 with a limit of **100 mg/Nm^3** for the

<table>
<tr><td></td><td></td><td></td><td>North and South stack during this period.[10]</td></tr>
<tr><td></td><td></td><td>NO_x</td><td>Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2025 to 31 March 2030 with a limit of 1100mg/Nm^3 during this period.[11]</td></tr>
<tr><td colspan="4">

For all five plants the applications were for all 6 units and the suspension sought is from 2020 to 2030.
The applicable MES to all five plants is for subcategory 1.1, Solid Fuel Combustion Installations:

<table>
<tr><th>Pollutant</th><th>2015 (mg/Nm^3)</th><th>2020 (mg/Nm^3)</th></tr>
<tr><td>SO_2</td><td>3500</td><td>1000</td></tr>
<tr><td>PM</td><td>100</td><td>50</td></tr>
<tr><td>NO_x</td><td>1100</td><td>750</td></tr>
</table>
</td></tr>
</table>

The Forum enquired with the NAQO, Dr Gwaze, about the interpretation of the phrase *"The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of [different for each plant] from 1 April 2020 to 31 March 2025 thus remains in place",* as contained in the NAQO's decisions. Dr Gwaze provided the clarity requested and explained that these decisions mean that the plants were granted a

[10] For PM at Kriel, Eskom requested a postponement from new plant standards with a limit of 125 mg/Nm^3 from 1 April 2020 until 31 March 2025 at the North Stack, which was rejected by the NAQO. This rejection is not referred to or made clear in the NAQO's decision for Kriel, dated 30 October 2021.

[11] For NOx at Kriel, Eskom requested a postponement from new plant standards with a limit of 1600 mg/Nm^3, which was rejected by the NAQO. This rejection is not referred to or made clear in the NAQO's decision for Kriel, dated 30 October 2021.

suspension of compliance timeframes with the MES for new plant from 1 April 2020 to 31 March 2030 with a particular limit, (which varies from plant to plant) that applies during this period (**Annexure 5**).

What is common between all of the power stations that appear in the table above is that Eskom plans to decommission them by 2030. Due to the timing of decommissioning, Eskom explains in each of its applications that the timelines for developing FGD abatement technology at any of these plants is too lengthy to justify it in the circumstances, particularly when one considers other factors, such as the cost of installation and the issues related to water scarcity. This forms part of Eskom's reasons for why it seeks the once-off suspensions.

It should also be noted that in terms of the suspensions sought by Eskom, with the exception of Kriel, it does not seek to emit in excess of the existing plant standards and the indulgence sought relates strictly to a suspension of compliance with new plant standards.

Eskom's applications for each power plant were accompanied by the following:

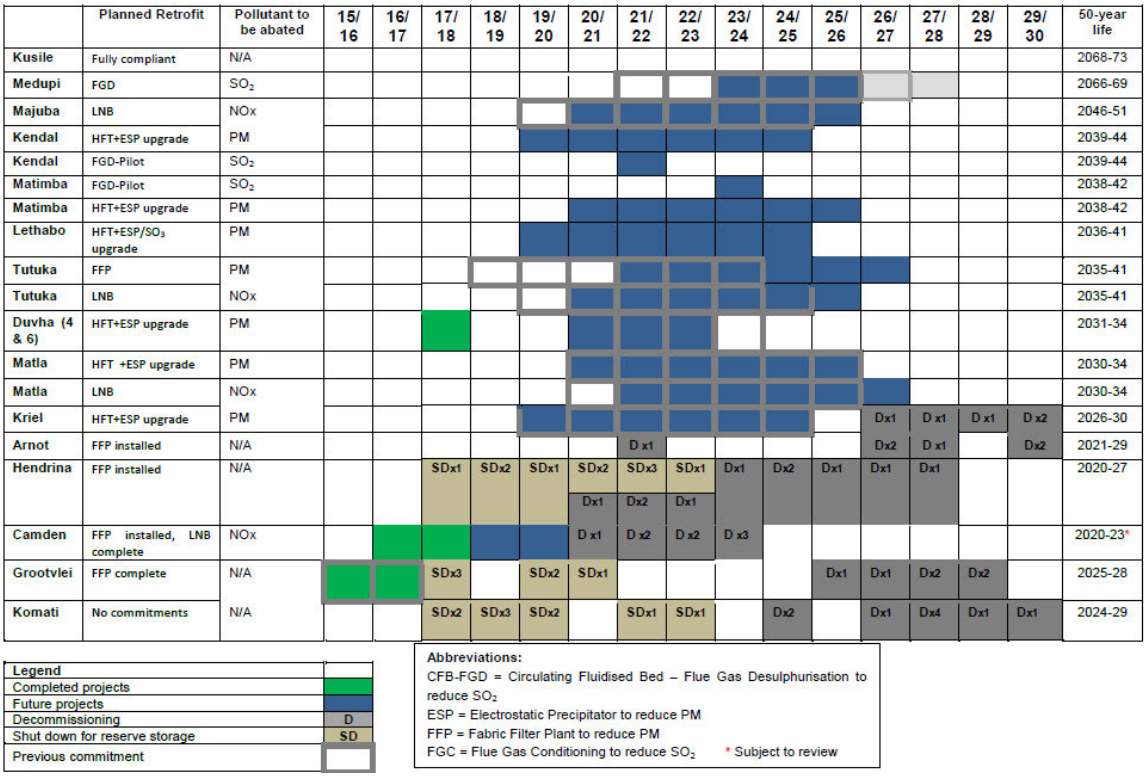
- Atmospheric Impact Report;
- Summary Atmospheric Impact Report;
- Health Impact focused cost benefit analysis; and
- Public participation report.

In addition to the above, Eskom's application in respect of its Grootvlei power plant also included a review of a 2018 Final Report[12] in the context of updated ambient concentrations of PM dispersion modelling results (2020).

Eskom made several applications, not just for the five power plants which are the subject of this section of the report. With these applications, Eskom submitted a document titled,

[12] Annexure C2 of Annexures submitted to the NAQO in support of Eskom's application.

"*Applications for suspension, alternative limits and/or postponement of the minimum emission standards (MES) compliance timeframes for Eskom's coal and liquid fuel fired power stations – Summary Document",* dated March 2019. Figure 1 of the aforementioned document, on page 7, is titled, "*Committed emission abatement retrofits and power station decommissioning dates to illustrate Eskom's overall atmospheric emissions reduction plan*."[13] As can be seen from the below figure (Figure 2), it includes the date by which Eskom intends decommissioning the five power.



	Planned Retrofit	Pollutant to be abated	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	50-year life
Kusile	Fully compliant	N/A																2068-73
Medupi	FGD	SO_2																2066-69
Majuba	LNB	NOx																2046-51
Kendal	HFT+ESP upgrade	PM																2039-44
Kendal	FGD-Pilot	SO_2																2039-44
Matimba	FGD-Pilot	SO_2																2038-42
Matimba	HFT+ESP upgrade	PM																2038-42
Lethabo	HFT+ESP/SO_3 upgrade	PM																2036-41
Tutuka	FFP	PM																2035-41
Tutuka	LNB	NOx																2035-41
Duvha (4 & 6)	HFT+ESP upgrade	PM																2031-34
Matla	HFT +ESP upgrade	PM																2030-34
Matla	LNB	NOx																2030-34
Kriel	HFT+ESP upgrade	PM												Dx1	D x1	D x1	D x2	2026-30
Arnot	FFP installed	N/A							D x1					Dx2	D x1		Dx2	2021-29
Hendrina	FFP installed	N/A			SDx1	SDx2	SDx1	SDx2	SDx3	SDx1	Dx1	Dx2	Dx1	Dx1	Dx1			2020-27
								Dx1	Dx2	Dx1								
Camden	FFP installed, LNB complete	NOx						D x1	D x2	D x2	D x3							2020-23*
Grootvlei	FFP complete	N/A			SDx3		SDx2	SDx1					Dx1	Dx1	Dx2	Dx2		2025-28
Komati	No commitments	N/A			SDx2	SDx3	SDx2		SDx1	SDx1		Dx2		Dx1	Dx4	Dx1	Dx1	2024-29

Legend	
Completed projects	
Future projects	
Decommissioning	D
Shut down for reserve storage	SD
Previous commitment	

Abbreviations:
CFB-FGD = Circulating Fluidised Bed – Flue Gas Desulphurisation to reduce SO_2
ESP = Electrostatic Precipitator to reduce PM
FFP = Fabric Filter Plant to reduce PM
FGC = Flue Gas Conditioning to reduce SO_2 * Subject to review

Figure 2: Committed emission abatement retrofits and power station decommissioning dates to illustrate Eskom's overall atmospheric emissions reduction plan

From the Forum's engagement with Eskom, it became apparent that the information contained

[13] For purposes of consistency, Eskom's "Figure 1" will be described in this report as Figure 2.

in Figure 2 may have changed in view of the electricity crisis in South Africa, that has worsened since Eskom submitted its applications to the NAQO. Eskom, on the 4th of March 2024, provided written clarity to the Forum and confirmed that Arnot, Camden, Grootvlei, Hendrina and Kriel would close in 2030. The Forum has also been made aware of the fact that there are units at Eskom's Hendrina, Grootvlei, and Duvha power plants that have been shut down permanently and the parts thereof are being used for maintenance of other operational units at Eskom.

The NAQO granted Eskom's application in full for Arnot, Camden, Hendrina and Grootvlei and in relation to Kriel, the NAQO granted Eskom an indulgence but with stricter limits than those applied for by Eskom. The NAQO's decision in respect of Kriel, dated 30 October 2021 does not clearly indicate that Eskom's applications for these more lenient limits were rejected.

The NAQO's decision in respect of each power station is subject to a number of conditions. For the purposes of this report, the relevant conditions, applicable to all five power plants are as follows:

- *"This decision will have to be reflected in your Atmospheric Emission License to be of force and effect. Therefore, you must liaise with the relevant Atmospheric Emission Licensing Authority in this regard as soon as possible so that the required amendments, variations and additions to your Atmospheric Emission License can be effected….*

- *…the Atmospheric Emission License will not be renewed beyond the suspension date as stipulated in the table above. Furthermore, the decommissioning plan for Eskom [insert station name] must be submitted to the Department a year from the date of issue of this decision."*

Despite 30 October 2022 being one year from the date of issue of the NAQO's decisions, because these decisions are the subject of an appeal, the implementation of the decisions is stayed and the time periods are suspended.

7.10. Eskom's Port Rex Power Plant ("Port Rex")

The table below summarises Eskom's application to the NAQO and the NAQO's decision in respect thereof:

PLANT	DECOMISSIONING DATE[14]	POLLUTANT/S FOR WHICH SUSPENSION IS SOUGHT	DECISION BY NAQO
Port Rex	**No later than 2030**	**PM**	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2020 to 31 March 2030 with a limit of **75 mg/Nm^3** during this period.
		NO_x	Suspension of compliance timeframe with the minimum emission standards for new plant is granted from 1 April 2025 to 31 March 2030 with a limit of **600mg/Nm^3** during this period. The requirement to comply with the minimum emission standards for new plant as stated in the 2015 postponement decision with a limit of **600mg/Nm^3** from

[14] In Eskom's motivation, accompanying its application for a suspension of new plant MES standards (available at: https://saaqis.environment.gov.za/) it states on page 5 that station decommissioning will be no later than 2030 (currently anticipated by 2026).

<table>
<tr><td></td><td></td><td></td><td>1 April 2020 to 31 March 2025 thus remains in place.</td></tr>
<tr><td colspan="4">The applicable MES for this application s is for subcategory 1.2, Liquid Fuel Combustion Installations:
<table>
<tr><th>Pollutant</th><th>2015 (mg/Nm^3)</th><th>2020 (mg/Nm^3)</th></tr>
<tr><td>PM</td><td>75</td><td>50</td></tr>
<tr><td>NO_x</td><td>1100</td><td>250</td></tr>
</table></td></tr>
</table>

Eskom's application to the NAQO was accompanied by the following documents:

- Atmospheric Impact Report Port Rex (2020)
- A Health impact focused cost benefit analysis (Highveld MES applications 2019)
- Eskom's summary Atmospheric Impact Report
- The 2nd round of Public Participation for Port Rex Power Station's MES application (Aug 2020)

It should be noted that, in terms of the suspensions sought by Eskom, it does not seek to emit in excess of the existing plant standards and the indulgence sought relates strictly to a suspension of compliance with new plant standards, until decommissioning.

Eskom's application in respect of Port Rex was successful in its entirety.

The NAQO's decision was, however, subject to a number of conditions. For the purposes of this report, the relevant conditions, applicable to Port Rex, are as follows:

- *"This decision will have to be reflected in your Atmospheric Emission License to be of force and effect. Therefore, you must liaise with the relevant Atmospheric Emission Licensing Authority in this regard as soon as possible so that the required*

amendments, variations and additions to your Atmospheric Emission License can be effected….

- *…the Atmospheric Emission License will not be renewed beyond the suspension date as stipulated in the table above. Furthermore, the decommissioning plan for Eskom Port Rex Power Station must be submitted to the Department a year from the date of issue of this decision."*

Despite 30 October 2022 being one year from the date of issue of the NAQO's decision, because this decision is the subject of an appeal, the implementation thereof is stayed and the time periods are suspended.

8. APPEALS BEFORE THE MINISTER

In terms of section 43(1) of NEMA, any person may appeal to the Minister against a decision taken by any person acting under a power delegated by the Minister under a specific environmental management Act, such as NEMAQA.

Accordingly, Eskom submitted an appeal (Annexure 6) to the Minister in terms of which it appealed:

1) The Postponement Application decisions for the Matla, Duvha, Matimba, Medupi and Lethabo power stations, which were all refused by the NAQO in their entirety. These decisions are categorised by Eskom as "*Adverse Decisions*"; and

2) The Postponement Application decisions for Majuba, Tutuka, Kendal and Kriel, which were all partially granted. These decisions are categorised by Eskom as "*Partial Refusals*".

The NAQO's decisions in respect of the following power stations were in Eskom's favour: Grootvlei, Arnot, Komati, Camden, Hendrina, Acacia and Port Rex.

It should be noted that the portions of the NAQO's decisions for the Majuba, Kendal and Tutuka power stations as well as the NAQO's decisions for the Camden, Hendrina, Arnot,

Komati, Grootvlei and Kriel power stations are the subject of an appeal lodged jointly by groundWork Trust ("**groundwork**") and Earthlife Africa.

In addition, the NAQO's decision in respect of the Port Rex power station, which was in Eskom's favour, was the subject of an appeal lodged by an individual appellant, Mr Michele Rivarola.

The initial applications to the NAQO were made per power station. The NAQO then issued decisions per power station, which decisions are the subject of appeals. Although Eskom submitted a consolidated appeal because it relies on the same grounds of appeal for the different categories of decisions, ultimately the appeal authority will make a recommendation to the Minister as to the outcome of an appeal, per power station.

It will be clear, from the details set out below, that Eskom's applications to the NAQO were made a number of years ago and the NAQO's decisions were made over two years ago. Due to the effluxion of time, the factual circumstances of each power plant, and Eskom itself, may have changed. As part of its TOR, the Forum has requested updated information, in particular in relation to actual emissions and abatement retrofits. To the extent that Eskom has furnished the Forum with updated information, the Forum has given due consideration thereto because it would not be constructive to place reliance on outdated information.

8.1. Eskom's appeal

As explained above, Eskom submitted a consolidated appeal in response to the NAQO's decisions in respect of several of its coal-fired power stations. The decisions by the NAQO comprised what Eskom classifies as "*positive decisions*", "*adverse decisions*" and "*partial refusals*". Eskom did not submit an appeal per power station and rather responded to the decisions as per its classification thereof.

Eskom, prior to setting out its grounds of appeal, raised a *point in limine*, which is summarised as follows:

"*In summary, the NAQO has misconstrued the DFFE's mandate. The DFFE is required to take into account sustainable development in environmental management and when taking the Decisions. Furthermore, the NAQO failed to place people at the forefront of environmental management in reaching the Decisions. There is, therefore, a disagreement concerning the exercise of the NAQO, DFFE and Minister's functions which may significantly affect the environment. Alternatively, there is disagreement regarding the protection of the environment in an appeal before the Minister. Eskom submits that the disagreement is worthy of the Minister appointing a facilitator to call and conduct meetings of interested and affected parties and hereby requests the minister to do so in accordance with section 17(2) of NEMA, should the Minister find section 17(1) of NEMA to be inapplicable."* (Our emphasis added)

In arguing its *point in limine,* Eskom also asserts that the meanings of "*sustainable development*" and "*just energy transition*" are in dispute. According to Eskom, the reasons given by the NAQO for its decisions "*suggest that the NAQO has adopted a strict interpretation of the MES considering only the protection of the environment. The NAQO claims in Reasons for the Decisions that considerations such as "insufficient water, gypsum and financial costs of implementing the decisions, closure of seven (7) stations; and associated 19 000 MW of supply to the national grid" fall outside the DFFE's mandate."*

Eskom takes issue with the NAQO's assertion that the MES "*were first published in 2010 and Eskom has made minimal effort to fully comply with the standards."* According to Eskom, "*this is factually incorrect…"*.

Eskom contends, further, that the NAQO's decisions, "*do not result in the coordination and harmonisation of policies, legislation and actions relating to the environment",* as is required by principles 2(4)(l) and (m) of NEMA, which provide that there must be inter-governmental coordination and harmonisation of policies, legislation and actions relating to the environment and that actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.

Eskom also quoted what it deems to be the relevant principles that apply to the actions of all organs of state that may significantly affect the environment (taken from section 2 of NEMA):

"(2) Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.

(3) Development must be socially, environmentally and economically sustainable….

(4)(b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option…

(4)(d)(i) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment"

Eskom, in its appeal, and in the context of the legislative provisions quoted above, then makes the following assertion:

"It is submitted that the NAQO's Decisions are at odds with the abovementioned environmental principles for a number of reasons, including:

- *The principles in section 2(2) and section 2(3) of NEMA contemplate that people and their needs must be at the forefront of environmental management and that development must be socially, environmentally and economically sustainable. The NAQO has failed to place people and their needs at the*

forefront of environmental management in that, on her own version, she neglected to consider the fact that her Decisions would result in the closure of power stations and an associated 16000 to 30000 MW of supply to the national grid. This lack of capacity cannot practically be provided for and as a result Eskom would need to implement stage 8 load shedding immediately and stage 15 loadshedding by 2025. Although there is no express right to energy and/or electricity in the Constitution, it is submitted that such a right is implied. Without electricity, it is virtually impossible to realise many of the other rights contained in the Constitution, for example, without electricity, it is impossible to store certain life-saving medication, including vaccinations, which ultimately infringes on the right to healthcare. The right to housing, water, property, life and dignity are some of the other rights that could be infringed by a lack of electricity."

Additional submissions made in support of Eskom's *point in limine*, include:

1. *"The NAQO favours the environment above social and economic considerations in the sustainable development enquiry instead of balancing the three pillars of the sustainability enquiry, which is what is required to inform environmental management…"*

2. *"Regarding air quality, upon which the NAQO appears to have focused on in making her decision, the factors affecting air quality in the priority areas are complex. In the Highveld and Vaal Triangle priority areas, monitoring confirms that PM is in general non-compliance to the National Ambient Air Quality Standards (NAAQS). There is, however, general compliance to the NOx standard and whilst SO2 levels are high, much of the region is in compliance with the SO2 standard."*

3. *"In respect of SO2, monitoring has not shown exceedance of any of the NAAQS standards for any averaging periods between 2016 and 2020. Dispersion modelling*

for baseline emissions, which should align with the monitoring data, does, however, predict exceedances of the NAAQS for hourly and daily results, illustrating the trend for modelling to over predict short-term concentrations…The over prediction of short-term simulations may extend to the other scenarios. It is, however, not appropriate to say that no exceedances of the standard can be anticipated at sensitive receptors based on the hourly and daily modelling. The simulated annual average emissions for SO2, a more reliable data set, does predict compliance to the NAAQS for all the scenarios at all sensitive receptors with the exception of Medupi AQMS (adjacent to the station). Given this, the significant impact of installing FGD (water, waste, and financial…) at both Medupi and Matimba must also be critically considered in decision making."

<u>Eskom's First Ground of Appeal: Decisions are unlawful, irrational and unreasonable – relevant considerations were not considered:</u>

1. Eskom states that, *"in the Reasons for the Decisions, the NAQO stated that 'Eskom is advised to make a request to the Ministers of the Departments they listed in a letter to the NAQO dated 30 March 2021, for consideration of all the other factors that are outside the Department of Forestry, Fisheries and the Environment (DFFE) mandate, such as insufficient water, gypsum and financial costs of implementing decisions; closure of seven (7) stations; and associated 19 000 MW of supply to the national grid.' This statement by the NAQO suggests that the NAQO did not take any of the abovementioned factors into consideration when making the Decisions…the Decisions are unlawful and fall to be set aside. In particular, the considerations ignored all go to the sustainable development enquiry, which is required when exercising any decision-making powers in terms of NEMA and/or NEMAQA."*

2. In support of this ground of appeal, Eskom contends further that, *"Multiple units at the coal-fired stations will not be able to operate in compliance with the limits imposed in the Decision. Based on performance trends, an initial assessment of the impact of the Decision, in terms of generating capacity that will become unavailable…the impact is*

estimated to be 16 000 MW (37% of the presently installed coal station capacity) immediately as stations are unable to meet the immediate limits in respect of PM and NOx. By 2025 when the existing SO2 postponements lapse and multiple stations are expected to comply with the new plant SO2 limit, this increases to 30 000 MW (69% of Eskom's total installed coal station capacity)."

3. Eskom lists the costs of compliance with the MES and gives examples to illustrate the point that from a social, employment, economic, environmental and energy security perspective, compliance is simply untenable. Emphasis is placed on the fact that the installation of certain abatement technology has a negative impact on the environment due to South Africa being a water scarce country and the by-product of such processes potentially creating more waste, which must be carefully disposed of. According to Eskom, the NAQO's failure to consider the costs of compliance and, in particular, the cost of installing an FGD, is a further example of the irrationality of the NAQO's decision.

4. According to Eskom, *"By neglecting to consider the consequences or implications of the Decisions (including megawatt losses to the grid, which will have other consequences, including job losses and significant impacts to South Africa's economy), the Decisions are rendered irrational and/or unreasonable. Without having due regard to the consequences of the Decisions (including environmental consequences, such as insufficient water and increased CO2 emissions) as well as those to people and South Africa as a whole, the NAQO could not adequately explore and select the best practicable environmental option. In order for a decision to be rational, the means must be rationally connected to the ends. But if the ends (which includes the consequences / effects of a decision and the mischief that the legislation tries to achieve, which is sustainable development and environmental protection) were not considered by the NAQO, the Decisions could never have been rational*."

"The NAQO justifies her approach as being consistent with the MES. It is submitted that given the purpose of the MES, its recognition of transitional measures, the

imperative of the JET and the sustainable development enquiry mandated in NEMA, the NAQO's interpretation of the MES, which essentially elevates the environment as a sole criterion for decision making, would give rise to absurdities in both law and in fact."

Eskom's Second Ground of Appeal: Decisions are unlawful, irrational and unreasonable – failure to give adequate consideration to the Atmospheric Impact Report, the fact that AAQ generally complies with the applicable NAAQS and an acceptable margin of safety:

1. *"Eskom is but one of many air quality impacting sources. Compliance with the ambient air quality standards in the Highveld and Vaal priority areas with respect to NO_2 and SO_2 are variable and, in general, there is compliance with the NAAQS. In the WBPA, there is compliance to the NAAQS for PM, NOx and SO_2."*

2. *"…it should be recognised that Eskom's emission reduction plan and the JET programme will see the progressive reduction in PM, NOx, SO_2 and CO_2 over time. Implementing the emission reduction plan and installing more efficient emission control technology will reduce Eskom's emissions. The decommissioning of the older stations and increased use of the newer, less emitting Medupi and Kusile will also result in a substantial decrease in Eskom's emissions over time. For example, it is projected that compared to a 2020 baseline that by 2035 Eskom's relative PM emissions will reduce by 58%, SO2 by 66% and NOx by 46%."*

Eskom's Third Ground of Appeal: Decisions are unlawful, irrational and unreasonable – conditions imposed are irrational:

"The Decisions, although partial or negative, nevertheless impose conditions requiring offset programmes to be implemented and reporting requirements…In circumstances where the Postponement Applications were refused, it is inappropriate and unlawful to attach binding conditions to adverse decisions. This is clear from regulation 13(b) of the

MES, which provides that the NAQO may refuse the application with written reasons. The regulation does not empower the NAQO to impose conditions in a negative decision."

The relief sought by Eskom in its appeal is as follows:

"*Eskom respectfully requests the Minister to positively exercise the discretion granted to her in terms of section 17(1) of NEMA, and to refer the matter for conciliation prior to making a decision on this appeal….In the alternative, Eskom submits that section 17(2) of NEMA is applicable and hereby requests the Minister to appoint a facilitator to call and conduct meetings of interested and affected parties with the purpose of reaching an agreement to refer a difference or disagreement to conciliation…Should the Minister reject Eskom's request for the matter to be referred to conciliation, we respectfully request the Minister to set aside the negative and partial Decisions and substitute them with position decisions that grant the Postponement Applications for all of the reasons and on the grounds of appeal set out above."*

8.2. groundWork and Earthlife Africa appeal ("CER Appeal")

The groundWork Trust ("**groundWork**"), as the first appellant, and Earthlife Africa, as the second appellant, submitted an appeal to the NAQO in response to the various decisions that were made in respect of Eskom's numerous applications for postponements and suspensions of compliance timeframes. The appellants are represented by the Centre for Environmental Rights and thus this appeal shall be referred to as the "CER Appeal" (Annexure 7).

In the CER Appeal, it is stated that, "*on 30 October 2021, the First Respondent [the NAQO] issued decisions in response to each of Eskom's applications covering 14 coal-fired power stations, as well as Eskom's liquid-fuel power stations. By and large, the Appellants accept the decisions, in accordance with the List of Activities, as amended, the AQA, NEMA, and the Constitution. As set out above, this appeal is limited to the decisions concerning Eskom's Kendal, Tutuka, Majuba, Camden, Hendrina, Arnot, Komati, Grootvlei, and Kriel power stations.*"

Several general submissions are made in the CER Appeal, which include its interpretation of the legislative framework. In this regard, it is stated, *inter alia*, that,

> "*In the light of the above, we reiterate that the 2017 Framework is the "national Framework for achieving the objectives of [the AQA]"*[15] *and it "binds all organs of state in all spheres of government". Eskom may not lawfully apply for postponements, suspensions or alternative emission limits,* ***unless and until the ambient air quality within air-shed priority areas where a power station is located, is compliant with the NAAQS.*** *As explained below, this is not the case; and for this reason alone an application should be summarily rejected…."*
>
> From its analysis of the List of Activities, the CER states that,
>
> "*…the following key points are patently clear:*
>
> *48.1 as an organ of state, significant emitter and a major source of air pollution in South Africa, Eskom is legally required, at all times, to limit its emissions to help ensure NAAQS compliance and reduce its impacts on public health.*
>
> *48.2. in limited circumstances, including demonstration of compliance with existing plant standards and NAAQS, only one postponement, per pollutant, is permitted for the 2020 MES, and such postponement may not extend beyond 5 years (i.e. all plants must meet the 2020 MES by 31 March 2025;*
>
> *48.3. Eskom may not lawfully apply to postpone its compliance with the MES, or apply to suspend MES compliance, unless and until the ambient air quality within the three priority air-shed areas where their power stations are located are in compliance with the NAAQS – this is not the case;*

[15] See paragraph 1.3 of the 2017 Framework.

48.4. an Eskom power station that will be decommissioned by 31 March 2030, may apply for a once-off suspension of compliance with new plant MES, provided the application is accompanied by a detailed decommissioning schedule;

48.5. alternative emission limits that are weaker than the existing plant MES, may not be considered, let alone granted; and

48.6. an application for an alternative limit must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards, and there must be [material] compliance with the NAAQS in the area for pollutant or pollutants applied for.

49. Based on the above legal framework, several aspects in a number of the First Respondent's decisions must be dismissed as unlawful and therefore set aside by the Minister as the appeal authority. Before turning to the grounds of appeal where it is demonstrated that the First Respondent has, with respect, erred in a number of the decisions issued, we highlight a part of the concluding paragraph in the First Respondent's cover letter that accompanied the decisions, also dated 30 October 2021:

> *"The Minimum Emission Standards (MES) were first published in 2010 and Eskom has made minimal effort to fully comply with the standards."*

50. We submit that, in addition to assessing the following grounds of appeal against the applicable legal framework, this excerpt should be understood as the overriding epilogue for the Second Respondent's approach to the MES over the past decade. The legal quagmire in which Eskom finds itself is almost entirely self-inflicted."

The CER Appeal seeks to challenge the following decisions, on the grounds set out below:

1) The decision to grant Majuba power station a postponement of compliance timeframes for the NO_x new plant standard from 1 April 2020 to 31 March 2025 and directing the power station to comply with a limit of 1300 mg/Nm^3 is unlawful.

"*The First Respondent's decision denied Eskom's request for an alternative limit of 1400mg/Nm_3 from 1 April 2020 for the Majuba power station. It further denied Eskom's request for postponement beyond 31 March 2025. We do not dispute these decisions. However, the NAQO authorised Eskom's request to postpone compliance with new plants standards from 1 April 2020 to 31 March 2025 with a limit of 1300mg/Nm^3.This is even weaker than the existing plants standard for NOx, which is 1100mg*."

"*Allowing Eskom to emit at levels that undermine the existing plant standards is a blatant violation of Section 11D of the amended List of Activities. Section 11D of the List of Activities makes it clear that no postponement of compliance timeframes or a suspension of compliance timeframes shall be granted for compliance with MES for existing plant standards. The First Respondent's decision allows for an untenable position that would entitle any emitter to apply for and be granted an emission limit that is weaker than the already lenient standards for existing plants, notwithstanding the explicit intention in the Listed Activities and the MES — that the existing plant standards must be the bare minimum limit. The NAQO's decision renders redundant the already weak MES. It is a deliberate weakening, and therefore contravention, of the applicable laws that were put in place to protect public health and wellbeing. The NAQO's legal position is unlawful as well as contrary to section 24 of the Constitution*."

"*It is also determinative that the Majuba power station is situated in the HPA, where after more than 14 years since the declaration, air quality in the HPA has not improved, and remains non-compliant with the NAAQS. Air quality monitoring data publicly available on the South African Air Quality Information System (SAAQIS) website shows that air quality in the HPA continues to be extremely poor and unsafe for its residents*."

"*As contemplated in terms of paragraph 5.4.3.4 of the 2017 Framework, only in such cases where the areas in which the power stations are based are in compliance with NAAQS — which the HPA, is not — can postponement of compliance, suspension of compliance, or alternative limit applications even be*

considered. In terms of section 1(a)(ii) of PAJA, the powers to exercise administrative action are derived from the law and only extend insofar as the legislation allows. Therefore, we submit that granting any of these applications for coal-fired power stations in the HPA or any other priority area is ultra vires the Constitution, the AQA, the amended List of Activities, the 2017 Framework, and the provisions of NEMA."

"*Moreover, with reference to the table provided in Annexure A1, Majuba power station is categorised as a 'mid-life' station with a scheduled end-of-life of 2046. Although the Appellants oppose the running of this station to its end-of-life toward compliance with South African's increasing Nationally Determined Contribution, and Constitutional obligations, to limiting global warming to 1.5 C, Majuba power station should be fully compliant with the new plant MES for all three pollutants, by this stage of the MES compliance timeframe.*"

2) The decision to grant Kendal power station a postponement of compliance timeframes for the NO_x new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1100mg/Nm^3 is unlawful.

"The First Respondent authorised Eskom's request to postpone compliance with the NOx new plant standard at Kendal power station from 1 April 2020 to 31 March 2025 with a limit of 1100mg/Nm3. This would allow Eskom to only have to comply with the existing plant standard. This decision is unlawful.

As is the case with Majuba power station, Kendal power station is also located in the HPA. This alone bars the NAQO from authorising postponement applications for Kendal power station, in accordance with 5.4.3.4 of the 2017 Framework.

In addition, Eskom's reasons for its application, many of which, we submit, are specious and insincere, do not reasonably explain why, despite over 10 years of notice, it delayed in taking meaningful steps to comply with the MES, especially at a 'midlife' power station with a scheduled end-of-life date of 2039. This failure runs

contrary to the 2017 Framework's requirement that Eskom provide "a detailed justification and reasons for the application.[16]

Save for the recent amendments in November 2018, and increase of the SO2 new plant limit in 2020, the MES in respect of solid fuel coal-fired power stations have not changed since 2010. The process of putting together the List of Activities commenced in about 2004 and over an approximate 5-year period, a multi-stakeholder process was convened to determine and set appropriate MES for the List of Activities. Eskom was integral to this process. Eskom knew of the impending emissions limits and inevitable compliance action during the mid-2000's, giving it many years' advance warning that it would need to make the necessary plans and investments to come into compliance with MES.

Aside from the impending obligations of the MES (at the time), Eskom had knowledge of the direct health impacts of its coal-fired power stations, based on the 2006 studies referred to in LAC's February 2019 submissions; these provided sufficient reason for Eskom to ensure that it was implementing the necessary abatement measures to effectively mitigate the impacts of its coal-fired power stations, in compliance with its section 28 NEMA duty of care. Indeed, as an organ of state, it had and continues to have, a duty to respect, protect, promote and fulfill the rights in the Constitution; in particular, but not limited to, section 24.42 In other words, Eskom was legally compelled to act well before the MES were even published in 2010.

In summary, Eskom provides no reasonable explanation as to why it has waited more than 8 years since the List of Activities came into force, or more than 3 years from when the 2015 postponement application was granted, to begin – and/or adequately progress and plan for - the abatement equipment installations which

[16] Section (12)(b).

would allow it to comply with the new plant MES at Kendal power station, as well as Majuba and Tutuka (addressed below) power stations."

3) The decision to grant Tutuka power station a postponement of compliance timeframes for the NO_x new plant standard from 1 April 2020 to 31 March 2025 and directing the power station to comply with a limit of 1100mg/Nm^3 is unlawful.

"Similarly, Tutuka power station is also a 'midlife' station with a scheduled end of life date of 2035, and Tutuka power station is also located in the HPA. We reiterate the above submissions in this regard."

4) The decision to grant a suspension of compliance timeframes for the Camden, Hendrina, Arnot, Komati, Grootvlei, and Kriel power stations without detailed and clear decommissioning schedules accompanying the applications is unlawful.

"As already mentioned above, Eskom as an organ of state and a significant emitter is bound by the 2017 Framework, the List of Activities, AQA, NEMA, and the Constitution.

Paragraph 11B of the List of Activities provides that "an existing plant to be decommissioned by 31 March 2030 may apply to the National Air Quality Officer before 31 March 2019 for a once-off suspension of compliance timeframes with minimum emission standards for new plant. Such an application ***must*** *be accompanied by a* ***detailed decommissioning schedule****. No such application shall be accepted the National Air Quality Officer after 31 March 2019".*

This explicit requirement is not only re-enforced in the 2017 Framework, in relation to an application for a once-off suspension of compliance timeframes with new plant MES, but it goes further, requiring that an Eskom power station ***must*** *provide a "****clear decommissioning schedule****". If an existing facility is granted a suspension of the compliance timeframes — which we submit Eskom ought not to have been granted — it is required by the List of Activities and the 2017 Framework to comply with existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest.*

The First Respondent granted Eskom's application for the suspension of compliance until decommissioning by 2030 for six coal-fired power stations namely: Hendrina; Arnot; Camden; Komati; Grootvlei; and Kriel – the 'old' stations, per ***Annexure A1****.*

We refer to Eskom's Summary Motivation Report, in particular Figure 1[17] *in the report, which presents the "decommissioning dates" per Eskom power station. We submit that as legally required by the List of Activities and the 2017 Framework, it is not a "detailed" or "clear" decommissioning schedule. It is our firm stance that it is not permissible for the First Respondent, with the licensing authorities, to consider the suspension applications in the absence of clear detailed decommissioning schedules stations, let alone grant the applications. This is unlawful and the suspension of compliance decisions must be set side. We submit that Eskom's decommissioning dates do not constitute a "detailed" or a "clear" decommissioning schedule per station for the following reasons:*

> *67.1. The decommissioning information in Figure 1 and/or the explanatory text around it should specify the commencement dates/planned commencement dates, in addition to the key actions and timelines to enable the decommissioning of at least the 6 stations included in the suspension application.*
>
> *67.2. As a minimum, Figure 1 and/or the explanatory text around it ought to specify the commencement date/planned commencement date of the necessary regulatory requirements to authorise the decommissioning process, including, inter alia:*

[17] In this document, Figure 2.

67.2.1. as a Listed Activity, the closure of an existing Eskom coal-fired power station must conduct a basic impact assessment in accordance with the amended EIA Regulations, 2014. This should include details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts, particularly the coal ash dumps; and

67.2.2. considering the social impact of decommissioning an Eskom power station, and Eskom's duties as an organ of state, we submit that it is both necessary and appropriate that an inclusive and transparent social and labour closure plan is developed for the decommissioning process. This should account for, among other critical issues, the redeployment of staff employed at the station.

67.3. The processes identified above require both lead-time and budget – Eskom's decommissioning table addresses neither. The Hendrina power station was supposed to commence with decommissioning from 2018 and Camden power station from the beginning of 2020, yet there appears to be no decommissioning schedule, plan, or financial resources allocated to these processes. In fact, we note with extreme concern in ***Annexure A1****, that the decommissioning dates for both Hendrina power station and Camden power station have reportedly been pushed out; Camden by as much as 5 years.*

67.4. In addition, we submit that Eskom ought to have provided a detailed and clear decommissioning schedule that at least reflects the plans and process referred to above, under the following conditions before or at the time of its application for suspension:

67.4.1. the clear detailed decommissioning schedule should have been made available for public comment as part of this application process and ought to be available every 6 months through to 2030 for the purposes of progress monitoring; and

67.4.2. the five oldest plants that have reached their schedule end of life dates, namely: Komati; Arnot; Hendrina; Camden; and Grootvlei ought to have provided evidence of decommissioning arrangements, as required by law or otherwise, a;

67.5. We therefore submit that the decommissioning table in Figure 1 does not satisfy the List of Activities and 2017 Framework requirements for a detailed and clear decommissioning schedule. Notwithstanding the NAAQS non-compliance requirement and the anticipated health impacts attributed to Eskom's 'old' power stations, the suspension applications should be dismissed on this basis.

We further submit that the condition that decommissioning schedules must be submitted a year from the date of issue of the decisions — by 30 October 2022 — does not cure the invalidity of the First Respondent's decisions, when the List Activities and the 2017 Framework require clear and detailed decommissioning schedules to be submitted as a pre-requisite for the suspension applications to be considered in the first instance. The granting of the suspension of compliance to the six 'old' stations is unlawful and should be set aside." (Sic)

In conclusion, the CER Appeal states that the NAQO's decisions to grant a postponement of compliance timeframes to the Majuba, Kendal and Tutuka 'midlife' power stations, and suspensions of compliance timeframes to the six 'old' stations'[18] in the absence of detailed and clear decommissioning schedules, are contrary to, *inter alia*, the amended List of Activities, the 2017 Framework, NEMA and the Constitution.

The relief sought by the CER is that the specified decisions of the NAQO be declared unlawful and be set aside.

[18] The six includes Komati, which has since closed.

8.3. Mr Michele Rivarola's ("Mr Rivarola") appeal

The DFFE provided the NECA Forum with a single Appeal Response Report in respect of Port Rex (Annexure 8). According to the Appeal Response Report, three grounds of appeal were raised:

- "*1. SA is a signatory to COP 26 and in addition through its President has given a firm commitment to the reduction in emissions of greenhouse gases. NOxs have high global warming potential (in excess for 100 times CO2) and their emissions from existing plant can be economically reduced and abated by using specific existing technology. There is no logical reason for not enforcing current air quality standards, costs Is not and should not be a determining criterion.*

- *2. Every person's right to a clean environment that is not harmful to their health is a right that is enshrined in the Constitution in at S24. The right extends to the custodianship. There are reasonable measures available to prevent pollution and ecological degradation however by granting relaxations of the current air quality standards (which are already lax in comparison to many other countries' air quality standards) the department is not applying its mind to the preservation of such rights for current and future generations. The department's decisions are dictated by pure and short sighted economics as there is no price that can be put on environmental health and preservation.*

- *3. No consideration has been given to the effects of the emissions (in particular particulate) on either adjacent populated areas such as factories or residential areas on the other side of the Buffalo River. As a minimum a complete CFD model under prevailing wind conditions from both the east and the west should have been carried out to establish where particulate is likely to come to rest."* (sic)

As stated above, the NECA Forum undertook public participation processes at the power plants which are the subject of its work. The details of the process undertaken are set out in section 10.2 of this report. As explained, the Forum met with all appellants prior to undertaking the formal public participation process. In this regard, a meeting with Mr Rivarola was held via

MS Teams on 11 November 2022 (Annexure 18).

Although Mr Rivarola could not attend the public participation process in person, prior to it taking place, Mr Rivarola submitted certain questions (Annexure 19) he had for Eskom to the Chairperson of the Forum. During the course of the public participation process, held on 16 November 2022, these questions were put to Mr Peter Nelson ("**Mr Nelson**"), who is Eskom's Environmental Officer and attended the public participation consultation on behalf of Eskom.

EXTRACT FROM MINUTES OF NEMA 3A STAKEHOLDER CONSULTATION WORKSHIP HELD ON 16 NOVEMBER 2022 AT BUFFALO CITY	
Questions	**Responses**
<u>Airshed Report</u> • The Airshed report is dated August 2020 and should perhaps be updated to reflect additional and more recent data, not only data that is older than 3 years. ➢ • The Airshed report fails to identify surrounding industrial activities in areas where air quality is important in terms of PM emissions and potential for acid rain.	Mr Nelson stated that the Airshed report was done a few years ago by looking at emission factors of 100% performance. However, he explained that Port Rex was operating at 0.4%. He further explained that the impact of the station was not going to change over time and indicated that Eskom was currently burning twice the amount of diesel as they did when the study was done. Mr Nelson also indicated that they have not been receiving complaints from the community. Mr Nelson stated that there is a need to look at cumulative impacts of pollution, including that from other facilities in the area but that it is only the relevant authority that can look into the cumulative effects.
<u>Emissions</u> Whilst the power station is small and, quantitatively speaking, emissions are not, in the bigger scheme of things, as severe as from larger generating units the following are not being considered: • NO_xs have both ozone depleting and global warming potentials and certain NO_xs, when combined with wate,r can produce acid rain; • SO_2 can also contribute to global warming and combines with water vapour to produce acid rain; and	Mr Nelson stated that the issue of acid rain depends on local and atmospheric conditions. He stated that the station is only operated in times of great need due to the cost of diesel and the impact on the atmosphere is low when compared against the impact of diesel burned by trucks on the road.

• The precipitation of excess PM has a negative effect not only on human space but also the surrounding industries and industrial processes.	
<u>Mitigation and Amelioration Measures</u> There is little or no mention of available or optimal mitigation and/or amelioration measures, which entail: • additional flue gas scrubbing systems; • Additional flue gas filtration systems; • Changing fuels or blending fuels with low or zero sulphur content • Burning fuels with low or zero sulphur content • Modifying fuel with combustion processes and the controls of the fuel combustion process to reduce the emission of NO_xs • Reducing the horizon of the application to a maximum of 5 years	Mr Nelson stated that Eskom was looking at shutting down the power station in 2026 but may have to push the date to 2030. However, he explained that it was not allowed to extend the process beyond 2030. **Modification**: the cost is extremely high. Eskom looked at the cartelistic type of convention, and the cost was not justifiable. **Sulphur content:** Eskom uses the lowest sulphur content fuel (diesel-0.05 ppb sulphur content) available in the area even though there is additional cost of such diesel.

8.4. Responding statements

Regulation 5 of the National Appeal Regulations provides that, "*the applicant, the decision-maker, interested and affected parties and organ of state must submit their responding statement, if any, to the appeal authority and the appellant within 20 days from the date of receipt of the appeal submission."* Pursuant to this provision, the appeal authority received and provided the Forum with a responding statement from the CER and the NAQO, who was the decision-maker. These responding statements, which are attached hereto as Annexures 9 and 10, respectively, are summarised below.

8.4.1. CER's Responding Statement

In its responding statement, dated 2 May 2023 (Annexure 9), to Eskom's appeals, the CER commenced its submissions by stating that,

> *"The effect of Eskom's "updated" Minimum Emission Standards Application on Eskom's appeal and the 2021 NAQO Decisions remain unclear, nor have the Second and Third Respondents been formally notified of this application or provided with an opportunity to comment as per section 12 of the MES, which refers to the public participation process set out in terms of the NEMA and Regulations 41 to 44 of the Environmental Impact Assessment Regulations for public comment processes. In any event, it is noted that the timeframes for the lawful submission of postponement and suspension applications have now long passed. As such, Eskom cannot permissibly bring any further postponement or suspension applications. The List of Activities and the 2017 Framework are very clear in this regard.*
>
> *Eskom seeks to appeal the NAQO Decisions on their postponement applications in respect of its Matla, Duvha, Matimba, Medupi and Lethabo power stations which were all refused by the NAQO in their entirety."*

The CER then indicated that it supported the NAQO's decision to refuse some of Eskom's applications but disagreed with the decisions to grant alternative limits for Tutuka, Majuba and Kendal power stations, and went on further to state that the decision was unlawful. The CER further stated that it was unlawful to grant a suspension of compliance timeframes in respect of the Kriel, Camden, Hendrina, Arnot, Komati and Grootvlei power stations without a detailed and clear decommissioning schedule accompanying the application.

The CER noted Eskom's appeals but stated that it did not provide affected parties with copies of its appeal submissions, thereby failing to adhere to regulation 4(1). The CER also stated that Eskom's *points in limine* lack merit in that the NAQO applied clear provisions and requirements, as set out in the regulations, when deciding the postponement applications.

The CER further stated that the mandate and core function of the DFFE is to manage, protect and conserve South Africa's environment and natural resources, which is informed by section

24 of the Constitution, and clarified in the 2017 Framework. Moreover, the Minister's role is to provide national norms and standards to ensure coordinated, integrated, and cohesive quality governance.

The CER's view of the alleged misalignment of sustainable development and the just energy transition is addressed below.

The CER stated that Eskom failed to meet the clear requirements set out in the MES and 2017 Framework. The CER considers Eskom's contention that a "*strict*" interpretation of the MES is untenable. It asserts that the purpose of the List of Activities and the MES is in line with the principles of sustainable development and they aim to control atmospheric emissions which may be detrimental to the environment, including social, economic and ecological conditions or cultural heritage.

The CER stated that the MES was developed through the consideration of sustainable development and its various aspects, thus the NAQO was required to consider the legal requirements for postponements and suspension of compliance with the MES.

The CER disagreed with the notion that Eskom's existing and intentional mode of operation, including its approach to compliance with air pollution laws, over the past decade, attained or contributed towards sustainable development, as it failed to show good faith and genuine effort to comply with the MES. This, they say, is evidenced by the criminal prosecution regarding Kendal power station and Eskom's failure to install FGD at Medupi despite allegedly receiving loans for this as early as 2010.

The CER further contends that the way Eskom operates its facilities, even as projected in the JET and ERP 2022, is inadequate to achieve a version of sustainable development that is consistent with the Constitution. The CER submitted that sustainable development is integrally linked with the principle of *"intergenerational justice"* which requires the state to consider the long-term effect of pollution. Furthermore, according to the CER, the poor air quality in the

HPA has persisted for many years and the court held in the *Deadly Air*[19] case that this was a violation of residents' rights in terms of section 24 of the Constitution. According to the CER, Eskom and other industrial polluters' non-compliance with the MES goes against *"development that pays attention to the costs of environmental destruction"* and Eskom's understanding of sustainable development in a constitutional society is flawed.

In response to Eskom's JET Strategy, the CER stated that it has failed to demonstrate a reduction in emissions. The CER objects to a *"phased-in approach"* to compliance considering the High Court judgment confirming that the rights in section 24 of the Constitution are immediately realisable.

The CER encouraged Eskom to accelerate the phase-out of coal and the roll-out of solar PV and/or wind power generation demand on the grid which would have the effect reducing loadshedding as this would reduce energy poverty and air pollution. The CER is of the view that clean renewable electricity alternatives to enable the disconnection of these polluting facilities will save lives and reduce health costs.

The CER referred to evidence indicating the health impacts of the emissions of coal-fired power stations. An example being that of Dr. Holland's report on the assessment of health impacts and associated economic costs of emissions from Eskom's coal plants in 2017, where it was found that severe sickness (chronic bronchitis and sshtma) and death (from lung cancer, heart disease, pulmonary disease, strokes, and lower respiratory infection) are attributable to Eskom's emissions.

In addition, the CER referred to the report of the SO_2 panel, which considers several technologies that are available to reduce SO_2 emissions. The CER rejects assertions that any of the NAQO's decisions requires Eskom to specifically install Wet-FGD, thus Eskom is encouraged to explore alternative abatement options.

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The CER stated that any economic, energy supply and other benefits that may arise from non-compliance with the MES are far outweighed by the social, health and economic harm likely to be caused by the air pollution resulting from non-compliance and adoption of the ERP 2022.

In response to Eskom's first ground of appeal, the CER submits that Eskom appears to be misdirecting itself, as compliance with the MES is a legal issue and complying with the law is non-negotiable. Furthermore, while alleging that the environment is being considered above all, Eskom fails to acknowledge deadly health impacts of non-compliance. The CER again stated that none of the decisions direct Eskom to install FGD as there are other SO_2 abatement methods available.

The CER stated that there are no safe levels of exposure to several pollutants and that Eskom's application of margin of safety as a determining factor is even more reason to refuse its appeal, considering the thousands of lives that could be saved by enforcing the NAAQS (and the MES).

In response to Eskom's third ground of appeal, the CER indicated that it does not object to measures being taken to supply households with cleaner energy sources, however that cannot replace current regulatory and legal requirements. The CER considers offsetting air pollution by reducing some sources of emissions and not others, as a failure to protect the rights and health of all South Africans, particularly vulnerable communities living closest to the power stations, coal mines and trucking routes, which will continue to be severely harmed by these sources regardless. As such, it contends that Eskom's continued reliance on the contribution of other less significant sources of emissions is a muddying of the immediate issue of compliance with the law.

8.4.2. NAQO's Responding Statement

The NAQO furnished a responding statement in respect of Eskom's appeal regarding the NAQO's "*adverse decisions*" regarding the postponement applications in respect of the Duvha, Matimba, Medupi and Lethabo power stations, and the NAQO's "*partial refusals*" in respect of the Majuba, Tutuka, Kendal, and Kriel power stations (Annexure 10).

The NAQO's statement is summarised below:

In response to paragraph 1 of Eskom's appeal, regarding the background of the matter, the NAQO noted the introduction and confirmed that she issued decisions on Eskom's applications in line with the provisions of section 21 of NEMAQA. She further confirmed that an application may be made to the NAQO for the postponement of the compliance timeframes.

The NAQO indicated that Eskom's application for condonation or extension of time to submit its appeal, in terms of regulation 4(1)(b) of the National Appeal Regulations, has been referred to the DFFE's appeals section.

She also referred paragraphs 3.1 to 3.3 of the Appeal to the DFFE's appeals section. These paragraphs relate to Eskom's *points in limine* regarding the Minister's power to refer the matter to conciliation or to convene a facilitated discussion.

In response to Eskom's submission that the definitions of sustainable development and just energy transition are *"in dispute"*, the NAQO noted that a risk averse and cautious approach is necessary for purposes of sustainable development, which considers the limitations of current knowledge in respect of consequences of decisions and actions. Moreover, she stated that she must promote the protection of the environment by providing reasonable measures to prevent pollution and degradation and for securing ecologically sustainable development while promoting justifiable social and economic development at no sacrifice to the environment and human health. Her decision not to grant decisions in favour of some of Eskom's power stations was based on her view that such a decision would have been unlawful, particularly those in relation to the alternative emissions limit applications.

The NAQO stated that any challenges to the rationale or alleged unsustainability of the MES should have been dealt with at the inception of the MES through the consultation channels provided, and not through the appeal process. She asserts that her decision was based on the requirements of compliance with the MES and the section 21 Notice.

The NAQO reiterated her submission on sustainable development as being an important constitutional consideration with respect to people and their needs being at the forefront of environmental management. She disagreed with the notion of that the case of *Joseph and Others v City of Johannesburg and Others* 2010 (4) SA 55 (CC) pertained to a duty to provide

electricity and stated that the court's decision was based on procedural fairness as the tenants were entitled to a pre-termination notice and an opportunity to make representations prior to the disconnection. The NAQO further bases her decision on promoting the right to an environment that is not harmful to human health or wellbeing while simultaneously promoting sustainable ecological and justifiable economic and social development.

The NAQO noted that access to energy, energy security, efficiency and sustainable development are recognized as objectives of the Electricity Regulation Act 4 of 2006 and the National Energy Act 34 of 2008. In response to what constitutes sustainable development and just energy in a developing country as well as the relevance of sustainable development in decision-making, she again referred to her previous submissions on sustainable development and section 24 of the Constitution.

The NAQO stated that she considered all relevant matters and factors under section 39 of NEMAQA with the same gravitas and noted that the MES was different and entailed a paradigm shift in realising environmental rights in the Constitution. She stated that various platforms have been established to ensure the Constitutional rights are realised.

In response to Eskom's submission that the NAQO based her decision on incorrect considerations, she reiterated her previous assertion that Eskom should not use the appeal process to challenge the rationale of the MES. Furthermore, in response to the submission that she did not consider the full suite of development issues in relation to air quality, she reiterated that refusal of Eskom's application was due to the fact that its power stations, located in the Priority Areas, were not compliant with the national standards set out in the regulations.

In relation to the first ground of appeal, the NAQO reiterated her previous submission in relation to sustainable development and that Eskom's request for an AEL is unlawful due to non-compliance with national standards. She further stated that Eskom has been aware of the legal requirements since 2010 and is entitled to use its discretion to select appropriate technology in the absence of such prescriptions.

In relation to the second ground of appeals, she reiterated her previous submission in relation to the requirement to comply with the MES and the section 21 Notice, as these are the provisions governing postponement applications, as well as her submission on Eskom's AEL request being unlawful.

In response to Eskom's third ground of appeal, the NAQO disagreed with the assertion that her decisions to impose conditions on offset plans for these stations was unreasonable and stated that Eskom applied for a postponement in 2015, where favourable decisions were made for some of its power stations, some of which are valid until 31 March 2025 and were still valid in 2021. A negative decision made in 2021 meant that the affected station needed to the revert to the decision made in 2015, which required some stations to develop and implement offset plans in 2015 – this requirement applied only to stations located in the Priority Areas. She indicated that approved plans do not exist for Medupi and Matimba, despite the fact that Eskom was required to submit these within 90 days of the 2021 decisions.

8.5. Analysis of appeals

There are 14 appeals pending before the Minister in respect of which the Forum has been asked to advise. As can be gleaned from the Forum's TOR, it was asked to make recommendations to the Minister based on a consideration of a wide range of factors and after taking into account information and input from a variety of stakeholders and sources.

As its point of departure, the Forum considered the legal merits of the applications made to the NAQO and the pending appeals. The Forum has grouped the power stations as per the appeal submissions.

8.5.1. Matla, Duvha, Matimba, Medupi and Lethabo

The NAQO refused to grant what was requested by Eskom in its applications for these plants and the NAQO's decisions are the subject of an appeal by Eskom.

Point in limine- Eskom makes a number of submissions in support of its main *point in limine,* which is that section 17(1) of NEMA, alternatively, section 17(2) is applicable in the

circumstances. As its primary relief, Eskom seeks to have a disagreement about the functions of the DFFE, the NAQO and the Minister referred to conciliation.

It is clear from section 18 of NEMA that the outcome of a conciliation is not binding and where conciliation does not resolve the matter, the parties can decide whether they wish to refer it to arbitration. Furthermore, in the event of no agreement having been reached, the report of the conciliator may contain his or her recommendations in relation to how the matter may be resolved.

The Forum is not mandated, in its TOR, to consider a referral to conciliation. That said, it would appear that the outcome of the Forum's work, including this report which contains recommendations to the Minister, is a substantially similar outcome to that which would result from conciliation. In addition, the Forum is mandated to consider a wider range of information, from a number of parties, and is constituted by a multi-disciplinary team that is equipped to traverse the issues raised by Eskom in more detail and with more accuracy than a single conciliator would be.

It bears mention that, as a part of the Forum's deliberations, they have held numerous meetings with Eskom, with the objective of ascertaining from Eskom what steps have been taken to ensure compliance and the details pertaining to the installation of abatement equipment which will assist compliance. These meetings were exploratory in nature and were held with the objective of ascertaining options for agreement and compliance.

To the extent that the DFFE and Eskom have held differing views as to the interpretation of certain legislative provisions, the Forum has engaged with both parties in an attempt to find a common understanding. Constantly liaising with the DFFE and Eskom around interpretation of legal options and the exploration thereof with a view to ensuring compliance with the regulatory framework by Eskom is de facto conciliation by the Forum.

First ground of appeal – if Eskom's argument is taken to its logical conclusion, it is suggesting that the NAQO must make a decision, based on a number of competing factors, that will result in Eskom being granted an indulgence that does not comply with the List of Activities and MES and which will condone Eskom polluting in excess of the MES. While it is understood that the subordinate legislation must be interpreted with consideration for the principles contained in

Chapter 2 of NEMA and to give effect to the Constitution, this does not give the NAQO carte blanche to overlook the MES and the provisions contained in the List of Activities. Eskom's challenge ought to be directed to the List of Activities itself as it is the Forum's view that the NAQO is not afforded the power that Eskom purports.

Second ground of appeal – Eskom contends that the NAQO failed to give proper consideration to its AIRs and the AAQ.

In terms of regulation 12A of the List of Activities, an applicant must comply with a number of requirements. Firstly, in terms of regulation (12A)(a), an existing plant "*may submit an application regarding a new plant standard to the National Air Quality Officer for consideration if the plant is in compliance with other emission standards but cannot comply with a particular pollutant or pollutants."* Secondly, in terms of regulation (12A)(b), "*An application must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards."* Thirdly, in terms of regulation (12A)(c), the NAQO, in consultation with the licensing authority may grant an alternative emission limit or emission load if – "*there is material compliance with the national ambient air quality standards in the area for pollutant or pollutants applied for;"* or "*the Atmospheric Impact Report does not show a material increased health risk where there is no ambient air quality."*

The First and Second requirements must be complied with in addition to at least one of the two requirements set out in regulation (12A)(c). Therefore, compliance with the NAAQS and a positive AIR are not factors which, on their own, must result in granting the indulgence contemplated in regulation 12A of the List of Activities.

It is the Forum's reading that compliance with the provisions of regulation (12A)(a) of the List of Activities is peremptory and therefore, if an applicant does not comply with that provision, it is not eligible for an indulgence in terms of regulation 12A. In relation to a number of these plants, Eskom is applying for an alternative limit in terms of all three pollutants regulated by the MES and it is on that basis disqualified from applying in terms of regulation 12A. Material compliance with the NAAQS and consideration of an AIR would only become relevant where an applicant meets the pre-requisite criteria set out in regulations (12A)(a) and (12A)(b). In

relation to Lethabo, Matimba and Medupi, the alternative limits applied for in respect of certain pollutants exceed existing plant standards which, on the Forum's reading of this provision, is not permissible.

Third ground of appeal – Eskom relies on regulation 13(b) of the List of Activities to argue that the NAQO is not permitted to impose decisions where an adverse decision in respect of an application has been made.

The Forum agrees that, to the extent that the NAQO made an adverse decision, she is not empowered to, in addition, impose new conditions.

That said, to the extent that conditions were imposed on Eskom based on a previous decision which predated Eskom's applications in or about 2019, those conditions would continue to apply.

Conclusion

The Forum is of the view that the grounds of appeal relied on by Eskom for these power stations are not sufficiently persuasive to warrant a recommendation that the NAQO's decisions be set aside, as requested by Eskom. As will become clear from the reading of this report, the Forum seeks to make a recommendation in respect of these power stations that takes into account a number of factors which it is mandated to consider and that go beyond the narrow legal merits of the appeal. After more extensive analysis, a recommendation in relation to these plants is made in section 14 of this report.

8.5.2. Majuba, Tutuka, Kendal and Kriel

Eskom's application in respect of these plants was partially granted by the NAQO and they are thus classified by Eskom as "*partial refusals*". As set out above, the CER appealed those portions of the NAQO's decision which grant Eskom what it applied for.

Eskom relied on the same grounds as those analysed in the preceding section and thus they will not be repeated here.

In relation to Majuba, the CER appeal seeks to challenge a very narrow portion of what Eskom

applied for and what it was granted.

In terms of regulation 11A of the List of Activities, "*An existing plant may apply to the National Air Quality Officer for a once-off postponement with the compliance timeframes for minimum emission standards for new plant as contemplated in paragraph (10). A once-off postponement with the compliance timeframes for minimum emission standards for new plant may not exceed a period of five years from the date issue. No once-off postponement with the compliance timeframes with minimum emission standards for new plant will be valid beyond 31 March 2025."* Although Eskom requested a NO_x limit of 1400 mg/Nm^3 until 31 March 2026, the NAQO only granted Eskom a postponement until 31 March 2025, with an emission limit of 1300 mg/Nm^3, which is in excess of the existing plant standard, as correctly stated in the CER Appeal.

Regulation 11D of the List of Activities clearly states that no postponement of compliance timeframes or a suspension of compliance timeframes shall be granted for compliance with the minimum emission standards for existing plants. In other words, the NAQO is not empowered by these regulations to grant an emission limit that is "weaker" than existing plant standards. In this regard, the submission made in the CER Appeal is persuasive. This legal argument was also relied on by the CER in relation to its appeal of the NAQO's decision in respect of Kendal.

In relation to Tutuka, the CER's appeal seeks to challenge the NAQO's decision to the extent that it granted Eskom a postponement for compliance with the MES for NO_x until 31 March 2025, with a corresponding limit of 1100 mg/Nm^3, which is stricter than what was applied for.

It would appear that the NAQO's decision to grant Eskom this postponement was consistent with clause 11A of the List of Activities however the CER contends that a decision of this nature is in conflict with the 2017 National Framework.

Much of the 2017 National Framework mirrors the wording of and the requirements stipulated in the List of Activities. However, on page 61 of the 2017 National Framework, it introduces the following caveat to applications for the postponement and suspension of compliance timeframes, which is not contained in the List of Activities,

"A proponent of a Listed Activity will be allowed to apply for a postponement or suspension of the compliance date and such an application be considered based on the following conditions being met:

…

Ambient air quality in the area is in compliance with the applicable National Ambient Air Quality Standards…"

The CER Appeal places reliance on the above provision and contends that because Tutuka is in the HPA, the AAQ in the area is not in compliance with the NAAQS and, therefore, Eskom's postponement application was ineligible for consideration and the NAQO's decision must be set aside. As addressed elsewhere in this report, it is the Forum's understanding that NO_x pollution has improved in this priority area and the hourly NO_2 NAAQS of 106 ppb was seldom exceeded after 2012.

The Forum is aware that Kriel was categorised as a "partial refusal" by Eskom. The appeal in respect of Kriel is addressed below under section 8.5.3.

Conclusion

The Forum is of the view that the grounds of appeal relied on by Eskom for these power stations are not sufficiently persuasive to warrant a recommendation that the NAQO's decision be set aside, as requested by Eskom. As will become clear from the reading of this report, the Forum seeks to make a recommendation in respect of these power stations that takes into account a number of factors which it is mandated to consider and that go beyond the narrow legal merits of the appeal. After more extensive analysis, a recommendation in relation to these plants is made in section 15 of this report.

8.5.3. Hendrina, Kriel, Grootvlei, Arnot and Camden

The CER's appeal in respect of these plants is essentially based on one ground only, namely that Eskom failed to submit to the NAQO, with its applications, a clear and detailed decommissioning schedule, as required by the law. It is the CER's submission that the NAQO

has no discretion to accept an application of this sort without a detailed decommissioning schedule and accordingly, the applications should not have been considered in the first instance. The relief sought by the CER is that the NAQO's decisions in respect of these applications be declared unlawful and set aside.

The CER set out what, in its view, ought to be included in a clear and detailed decommissioning schedule. It is unclear on what this is based in view of the fact that there are no legislated requirements for a decommissioning schedule nor is it a term that is defined in any legislation.

While it is appreciated that much of the information that the CER expected to be contained in a decommissioning schedule is valuable for many stakeholders, the NECA Forum cannot agree that it is a legislative requirement to include such information in a clear and detailed decommissioning schedule.

The concept of a "decommissioning schedule" is not defined in either the Listed Activities or the 2017 Framework. No definition for "detailed decommissioning schedule" or "clear decommissioning schedule" exists in the applicable legislative framework either.

In order to evaluate the ground of appeal, it is necessary to determine the following issues:

- Whether "Figure 2: Committed emission abatement retrofits and power station decommissioning dates to illustrate Eskom's overall atmospheric emissions reduction plan"[20] and the accompanying explanations submitted by Eskom constitute a decommissioning schedule; and

- If so, whether it satisfies the legislatively imposed threshold of "clear and detailed".

On the face of it and in the absence of a definition, Figure 2 appears to be a decommissioning schedule. It details, *inter alia*, the year by which Eskom plans to decommission various

[20] Figure 2 of this report is described by the CER in its appeal as "Figure 1".

stations.

The NAQO does not refer to decommissioning schedules or a lack thereof in any of the decisions. The NAQO does, however, impose an additional condition on these power plants, which is that they submit a decommissioning PLAN in the timeframe stipulated.

It is implied from the NAQO's decision that Eskom's application satisfied the requirements in terms of the documentation to be submitted. It is inferred that the NAQO imposed the condition of submitting decommissioning plans within the stipulated time-period to solicit further information from Eskom in respect of the decommissioning set forth in Figure 2. The NAQO afforded Eskom one year within which to submit this information, which demonstrates an appreciation for the complexity of producing such a plan and the multi-faceted issues arising from the decommissioning of a power plant.

The NECA Forum cannot assume that the NAQO conflated a "decommissioning schedule" with a "decommissioning plan", as alleged by the CER. In the absence of evidence to the contrary, the two terms must be read to have different meanings.

It is noted that the CER has misconstrued the condition imposed by the NAQO in the decisions. The NAQO's decisions required Eskom to submit a decommissioning plan within one year from the decision and not a decommissioning schedule as asserted by the CER in paragraph 67.6 of its appeal.

The Forum notes that Eskom categorises Kriel as one of the plants for which it received a partial refusal. The reason for this is that with its application for suspension of compliance timeframes with minimum emission standards for new plant, Eskom requested a limit of 125 mg/Nm^3 for PM for its North Stack until 2025, which is in excess of existing plant standard and for NOx, it requested a limit of 1600 mg/Nm^3 which is also in excess of existing plant standard. Eskom thus appealed this partial refusal and relies on the same grounds of appeal as set out in section 8.1 above.

Recommendation

In view of the above, it is the NECA Forum's submission that the ground of appeal relied on

by the CER is not legally sound and ought to be dismissed.

The Forum is also not persuaded by Eskom's grounds of appeal insofar as they relate to Kriel. Paragraph 11C is very explicit that if an existing plant has been granted once-off suspension of the compliance timeframes in terms of paragraph 11B, it must comply with minimum emission standards for existing plant from the date of granting of the application and during the period of suspension until decommissioning. Thus, to the extent Eskom wants the NAQO's decision to grant it a suspension in terms of 11B to remain in place, it cannot with that be granted limits that are weaker than existing plant standard for NO_x and PM.[21]

It is recommended that the Minister makes a decision to uphold the NAQO's decision in respect of Hendrina, Grootvlei, Arnot, Camden and Kriel, including the conditions imposed by the NAQO on Eskom in respect thereof.

It is submitted that the Minister should consider adding to the NAQO's condition to submit a decommissioning plan, and stipulate the minimum requirements for such a document. In this regard, and considering the fact that there is no legislation or framework setting out what a decommissioning plan ought to contain, the Forum proposes below what, at a minimum, the decommissioning plan should address (Annexure 11):

i. General information about the power plant;

ii. Engineering/activity plan;

iii. Cost of decommissioning and fully funded financing plan;

iv. Rehabilitation and / or repurposing plan;

[21] The Forum is aware that Eskom is undertaking retrofits for abatement of PM and has undertaken to optimize the plant to minimise NOx to within existing plant limits. In view of this, if Eskom is in a position to comply with existing plant standard for all pollutants, a suspension in terms of 11B shall be sufficient for Kriel to be in compliance.

v. Public consultation and stakeholder engagement strategy / plan - A part of this needs to be specific to directly affected parties (employees, contractors, suppliers, service providers, etc). Organised labour needs to be engaged noting that Eskom is not alone in ending the life of projects and dealing with the consequences, workforce downscaling, etc. There are lessons to be learned from other sectors and operations, two of which are (i) how to avoid genuine efforts at finding resolutions being hijacked by special interest groups (ii) how to moderate expectations, especially because Eskom is an SOE, with many citizens viewing SOEs as having an infinite pool of resources (money) to meet every need, demand, etc. The point is that this is not 'ordinary'/'run-of-the-mill' stakeholder engagement (it is tailored, specific, focussed, and extremely complex because there will be many competing needs and desires).

vi. A socio-economic conditions and impact assessment report (Local economic development; employment; health; diversification plan);

vii. Health and safety risk assessment;

viii. Air Quality Impact assessment;

ix. Geotechnical assessment (restoration of the land; water waste);

x. Local economic development and diversification plan; and

xi. Alternatives to decommissioning.

The purpose of this would be to hold Eskom accountable to its commitments with regard to decommissioning. It should also not be seen as a condition which is unduly burdensome to comply with nor one that sets a precedent that has unintended consequences.

The Minister is empowered to uphold the NAQO's decision and vary the conditions contained therein by the provisions of section 43(6) of the NEMA, which states that, "*The Minister or an MEC may, after considering such an appeal, confirm, set aside or vary the decision, provision, condition or directive or make any other appropriate decision, including a decision that the*

prescribed fee paid by the CER, or any part thereof, be refunded."

Conclusion

The five power plants which have been dealt with in this section of the Report, namely, Hendrina, Grootvlei, Arnot, Camden and Kriel are, according to Eskom, due to be decommissioned by 2030.

Accordingly, all five power plants applied for once-off suspensions of compliance timeframes with the MES for new plant.[22] It follows that these plants must therefore comply with the limits contained in the NAQO's decision for each plant, until their decommissioning. It follows further that these plants must be decommissioned by 2030 and, under no circumstance, can operate beyond this date, as it would completely undermine the regime in terms of which they have been afforded an indulgence.

The issue in dispute raised by the CER relates to the nature of Eskom's application and a technical interpretation of whether it complied with the requirements. The ground of appeal does not *per se* go to the issue of emissions or a dispute in respect of compliance with the MES because it is quite clear that the legislative framework intended to include a mechanism which afforded older plants, and in particular those due to be decommissioned by 2030, an indulgence.

In the circumstances, the NECA Forum is of the view that the CER's appeal and Eskom's appeal for Kriel should be dismissed and the NAQO's decisions be upheld with the variance of conditions as recommended above.

It is also recommended that Eskom should submit decommissioning plans within 12 months of the announcement of the Minister's decision. The decommissioning plans in respect of each of the above power stations should follow the format set out above and in Annexure 11.

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[22] Kriel applied in addition for alternative limits for PM and NOx. Which application was refused by the NAQO. A decision which in the Forum's view is legally correct.

8.5.4. Port Rex

Although Port Rex is a gas turbine station rather than a coal-fired power station, it fits within the same category as the Hendrina, Kriel, Grootvlei, Arnot and Camden power stations for the reason that it will be decommissioned by 31 March 2030 and thus made an application to the NAQO under regulation 11B of the List of Activities.

Port Rex: Analysis of the NAQO's decision and the appeal

In terms of regulation 11B of the List of Activities,

"An existing plant to be decommissioned by 31 March 2030 may apply to the National Air Quality Officer before 31 March 2019 for a once-off suspension of compliance timeframes with minimum emission standards for new plant. Such an application must be accompanied by a detailed decommissioning schedule. No such application shall be accepted by the National Air Quality Officer after 31 March 2019."

Eskom has indicated that Port Rex is scheduled to be decommissioned by 2030 and this was confirmed by Mr Nelson at the public hearing held on 16 November 2022 in East London. Accordingly, Port Rex falls within the category of power plants to which this provision relates. This provision grants the NAQO the power to grant power plants a suspension of compliance with the MES for new plant and that is what Eskom applied for in respect of its Port Rex power plant.

It should be noted that regulation 11B of the Listed Activities states that an application in terms of that provision must be accompanied by a decommissioning schedule. To the Forum's knowledge, Eskom did not submit a decommissioning schedule for Port Rex in the way it did for its coal fleet. It is recommended that the Minister, in determining the appeal, should consider directing Eskom to furnish the DFFE with a decommissioning schedule (if one has not been submitted) and a decommissioning plan.

Regulation 12 of the Listed Activities provides for additional requirements in respect of what an application in terms of regulation 11B must include:

- An air pollution impact assessment compiled in accordance with the regulations prescribing the format of an AIR (as contemplated in Section 30 of the Act), by a person registered as a professional engineer or as a professional natural scientist in the appropriate category;

- detailed justification and reasons for the application; and

- a concluded public participation process undertaken as specified in NEMA and the Environmental Impact Assessment Regulations made under section 24(5) of the aforementioned Act.

In the Forum's view, and based on the information provided to it, Eskom's application for Port Rex substantially complies with regulation 12 of the Listed Activities.

Mr Rivarola's appeal does not directly challenge the legal basis for the NAQO's decision. The grounds of appeal are broad and appear to take issue with the regulatory framework which the NAQO applied. Each ground will be addressed in turn below.

First Ground of Appeal

In his first ground of appeal, Mr Rivarola notes South Africa's international undertakings in respect of emission reductions. This general point does not in itself present a persuasive challenge to the NAQO's exercise of power in terms of Eskom's Port Rex application.

Mr Rivarola alleges further that *"there is no logical reason for not enforcing current air quality standards, costs is not and should not be a determining criterion"*. In the Forum's view, in this particular case, the NAQO is enforcing air quality standards and acting within the confines of the List of Activities, which envisages the type of concession that the NAQO's decision grants. To be specific, the NAQO's decision requires Port Rex to emit at a level that is equal to or lower than existing plant standards and the effect of the decision is to grant Port Rex a suspension of compliance timeframes for new plant standards only.

It is the Forum's view that this ground of appeal should be dismissed.

Second Ground of Appeal

The second ground of appeal is based on the constitutional right enshrined in section 24 of the Constitution. It is alleged that the DFFE's decisions (which the Forum assumes includes the NAQO's decision in respect of Port Rex) *"are dictated by pure and short sighted economics as there is no price that can be put on environmental health and preservation."*

This ground of appeal is very vague and unsubstantiated. It is unclear how the economic impact of compliance on Eskom would inform the DFFE or the NAQO's decisions.

While the Forum absolutely accepts the obligations that are imposed on various parties to uphold and ensure that environmental rights enshrined in the Constitution are respected and upheld, the Forum does not accept this as a basis for overturning the decision taken by the NAQO in respect of Eskom's Port Rex application.

In view of the above, the Forum recommends that this ground of appeal be dismissed.

Third Ground of Appeal

Mr Rivarola's third ground of appeal is that no consideration has been given to the effects of the emissions on adjacent populated areas, such as factories or residential areas.

This ground of appeal is based on assumptions that contradict the position advanced by Mr Nelson during the public hearing. Mr Nelson emphasized the infrequent use of Port Rex as a peaking station and indicated that there have been no complaints received from the surrounding community with regard to emissions.

It should also be noted that Port Rex is not in a priority area nor situated in a location with particularly bad air quality. The threshold with which Port Rex must comply is thus contained in the Listed Activities.

In addition, Eskom submitted, with its application for Port Rex, a very lengthy AIR. The Forum notes that this document is dated 2020 however that is because the application was made in 2020 and there is no obligation on Eskom to have updated this report since. From the

submissions made by Mr Nelson in 2022 at the public consultation, it seems that the impact of Port Rex's emissions have not deteriorated since.

Mr Rivarola does not appear to contest the findings of this report nor specify what particular concerns he believes would be confirmed if an updated study were conducted.

In the Forum's view, this ground of appeal should be dismissed.

Recommendation

In the circumstances, the NECA Forum is of the view that the appeal should be dismissed in its entirety and that the NAQO's decisions be upheld.

It is recommended further that in upholding the NAQO's decision, the Minister retain the condition imposed by the NAQO that Eskom must submit a decommissioning plan, but it is recommended that the Minister also provide some detail as to what ought to be included therein.

In this regard, section 8.5.3 sets out, in detail, the proposed contents of a decommissioning plan.

The Forum wishes to emphasise that this recommendation is based on the assumption that Eskom will decommission Port Rex before 2030, as it has stated on several occasions.

9. PROBLEM DEFINITION AND ANALYTICAL APPROACH

9.1. Interpreting the primary question before the Forum

The Forum has interpreted its main task, contained in its TOR, as being to provide recommendations to the Minister on how Eskom's coal fleet can achieve sustainable compliance with the MES. To proceed with this task, two aspects require further definition:

First is that of **'**sustainable compliance'. In this context, sustainable compliance is understood to be the ability of each coal-fired power plant to remain in compliance with its legal requirements whilst considering the additional objectives of the multiple dimensions highlighted by the TOR. These are identified as follows, (including a shortened version in parenthesis) for reference purposes:

i. Health impacts arising from non-compliance (health)
ii. Ambient air quality (air quality)
iii. The energy crisis the country is facing (security of electricity supply)
iv. Cost of compliance by Eskom (considered as both stand-alone abatement technology retrofits costs and the implications of abatement for the cost of supplying electricity)
v. Socio-economic considerations (socio-economic)
vi. Meeting the lower bounds of the NDC (1.5 degrees compatible) and South Africa's international climate commitments (Greenhouse Gas (GHG) emissions)

In the case of the Eskom's coal-fired power plants, the multiple objectives that need to be balanced to achieve 'sustainable compliance' apply at different scales, which can be simplified as being plant, municipal, air quality Priority Area (PA) or power system scale, and must be considered as such. For example, the implications of plant closures due to lack of MES compliance will have a *socio-economic* impact at a municipal and PA scale in the form of both direct and indirect job and livelihood loss.

The *air quality* impact of any one plant is felt both in the plant's immediate vicinity (Municipality), but also at the PA scale given the dynamics of air dispersion.

Health impacts from a coal-fired power plant correspondingly arise both locally in the communities within the immediate vicinity of the plant, and in populations within the region and beyond, as determined by air dispersion dynamics.

Eskom, as a company, will bear the costs relating to retrofits to abate emissions, load reductions or closure of individual power plants before the end of their economic life. Given the central role of Eskom in the power system and the extent of the appeals, these costs to Eskom will also reflect in the *cost of provision of electricity* to the country. Whilst the costs of individual plant retrofits are determined at a plant scale, given the systemic nature of electricity supply, the cost of electricity provision is most appropriately assessed at the scale of the national power system.

Similarly, whether *electricity supply is adequate*, an acute challenge for South Africa currently, is also most accurately assessed at the power system scale. This is not least because all but one of Eskom's coal-fired plants, representing the bulk of power generation in the country, are facing legal challenges. The impact of reducing air emissions at any one plant on adequacy of electricity supply depends on the dynamics of the power system as a whole.

The cost and adequacy of national electricity supply also has a number of important second order effects at the national scale: Inadequate power supply hampers social services such as education, health and healthcare, and water and sewerage supplies. Economic activity and investment which supports job creation and enables social welfare expenditure through tax revenues, are associated with reliable and affordable power. Taking plants offline to retrofit, and reducing coal plant load will have an impact on the electricity system's *GHG emissions*, and from there the country's ability to meet its international climate commitments such as its Nationally Determined Contribution (NDC). Further, the carbon intensity of the power supply has a cost implication under national and international carbon pricing regimes, with important second order effects for economic activity and investment.

Each multi-dimensional objective considered is depicted in Table 1 below and elaborated on in the discussion in section 12. For analytical tractability, we have made loose associations at each scale between different scale definitions used in the various relevant fields and disciplines relevant to our task. We acknowledge that these are not strictly aligned, but because they are never strictly applied in our approach, this is not a major concern – the association assists in structuring the analysis. Therefore, plant scale is associated with the concept of a

municipality, air quality PA at both a provincial and regional level and power system to both Eskom's coal fleet and national scales. We foreground the environmental regulatory and power system terminology throughout the analysis to better communicate the logic of the approach.

Scale / Dimension	Plant / Municipal	Priority Area	Power system
MES Compliance	x	x	x
Air quality	x	x	
Health impacts	x	x	
Security of electricity supply			x
Electricity cost	x		x
Affordability of MES compliance and impact on SA's finances		x	x
Socio-economic	x	x	
GHG emissions			x

Table 1: The multiple dimensions relevant to sustainable compliance with the MES require consideration at various scales

The TOR does not assign priority or weighting to any of the above dimensions. We therefore aim to consider these equally in our assessment. However, the entry point and focus remains on the MES as constraining air pollutants from Eskom's coal-fired power plants.

This brings us to the second component requiring interpretation, that of 'the MES' itself. This we have interpreted broadly because, as our report will show, the current formulation of the MES quite simply does not allow for anything that approaches sustainable compliance across

the multiple dimensions outlined above. We therefore required a broader interpretation in order to respond to our brief. Our working interpretation of 'the MES' is therefore a real world one, focused, in the first instance, on the impact of plant-scale emissions on air quality and health.

More specifically, we assume that the required impact of plant scale emissions on AAQ and health must broadly equate to that achieved by the current MES concentration limits. Unlike the other dimensions under our consideration, which we consider relatively (larger, smaller), air emissions have a calibrated optimal level which can potentially be quantified. We acknowledge upfront the inherent complexity in determining this equivalence and achieving this quantification and note that this is a contested space. Our analysis beyond the current MES concentration based regulatory framework is therefore only indicative.

For our working interpretation, we retain the requirement for 'the MES' air quality restrictions to apply to individual plants, described in the plant AEL, which is a power plant scale instrument. We also acknowledge that the MES regulations work in concert with regulations pertaining to the AAQ of particular airsheds (local and PA), and the Priority Area Management Plans and their associated regulations governing Priority Area AAQ.

From this discussion, for analytical purposes, the task before the Forum can therefore be restated as being to provide recommendations to the Minister on how Eskom's coal fleet can achieve an MES-equivalent impact on air quality and health, whilst considering multiple additional dimensions which impact at different scales. This task is multi-disciplinary, requiring multi-disciplinary skills and perspectives which, to a large extent, were represented by the Forum members.

Given its breadth and complexity – each of the dimensions we were asked to assess are significantly complex and contested in their own right – the Forum needed to find tools and ways of working and communicating that enabled continuous translation between fields and disciplines. To achieve this, we have focused on breadth, identifying the priority issues in each

dimension, and summarising these to consider their interaction with others. Apart from the legal analysis, we have therefore focused on understanding the interaction between the priority issues in each dimension. We believe this to be appropriate in the light of the current levels of uncertainty, particularly in the power system space.

9.2. The Forum's analytical approach

To engage with our task, we first undertook a thorough legal assessment of the relevant legislative framework (section 6), and appeals before the Minister (Section 8). On the basis of this assessment, we find in Section 8.5.3 that the appeals in respect of the five oldest plants that have been granted suspensions from new plant standards, due to them being decommissioned by 2030, can lawfully be dealt with on a procedural basis.

In relation to the remaining plants, the legal framework is prescriptive and binding. The Forum's recommendations in relation to all of the appeals currently before the Minister are dealt with in section 14 below.

The issue of sustainable compliance with the MES is a complex and multi-sectoral problem with national ramifications and consequences. Given this situation, we contemplate potential alternative regulatory approaches to air pollution that achieve equivalent or improved impacts on air quality and health compared to that of the MES concentration limits. This is elaborated upon in section 15.

There are two main mechanisms to achieve a reduction in air emissions from a coal-fired plant:

1. Retrofitting the plant with abatement technologies; and
2. Burning less coal by
    a) running plants at lower capacity rates,
    b) running plants less often, or
    c) not running then at all.

The ability to run a coal-fired plant at lower capacity rates or less often is contested. Whilst this may not be technically optimal, this is being done in other jurisdictions as electricity systems are undergoing a transition to cleaner and more decentralised forms. It is worth noting that in South Africa the fleet is currently unintentionally running at far lower capacity rates than is considered optimal. The Forum therefore retains these as options to be considered, but in no instance does its analysis or recommendations depend on them.

Different forms of regulation can activate different mitigation mechanisms. Concentration limits can only be met through retrofitting abatement technology (1) or plant closure (2c). Load limits (constraining the quantity of emissions) allow for all of the mechanisms above. Putting prices / levies on pollution penalises plants financially. Depending on their calibration, levies need not necessarily result in mitigation in the short term. However, pricing emissions will force economic decision making as to whether the required emission reductions are achieved through mechanisms 1 or 2. Over time, prices / levies will influence dispatch decisions away from burning non-abated coal. Pricing emissions also potentially creates a source of funding for mitigation or compensation projects. We consider these issues further in section 11.10.

In order to support the process of both potential regulatory reform and establishing an interim solution/s, we offer the Minister a way of thinking about the multi-dimensional and multi-scalar aspects of achieving sustainable compliance with the MES, together with an initial analysis that can inform further regulatory work and legal processes.

The Forum's approach is grounded in the well-established field of Multi-Criteria Decision Making[23], with numerous applications to the South African energy and environmental sphere[24]. Because the various dimensions are impacted at different scales, we employ tools that focus

[23] Following authors such as Ralph Keeny and Russel Ackoff

[24] For example Beck et al, 2006, Heinrich et al, 2006, the Department of Environmental Affairs Mitigation Potential Analysis, 2014)

on these different scales. A Plant, Municipal and Priority Area (PA) Matrix focuses on the plant and PA scale, whilst power system modelling considers the power system scale. These tools are elaborated on and applied in section 12. This way of thinking is high level and is designed to support and accommodate additional analyses as needed, in the form of many different types of tools. Cost Benefit Analyses (CBA), in particular, may be necessary given the extent to which these are relied on in the air quality regulatory space. We reflect further on additional tools towards the end of this section.

The interaction of the tools in the Forum's approach are depicted at a high level in the diagram below.

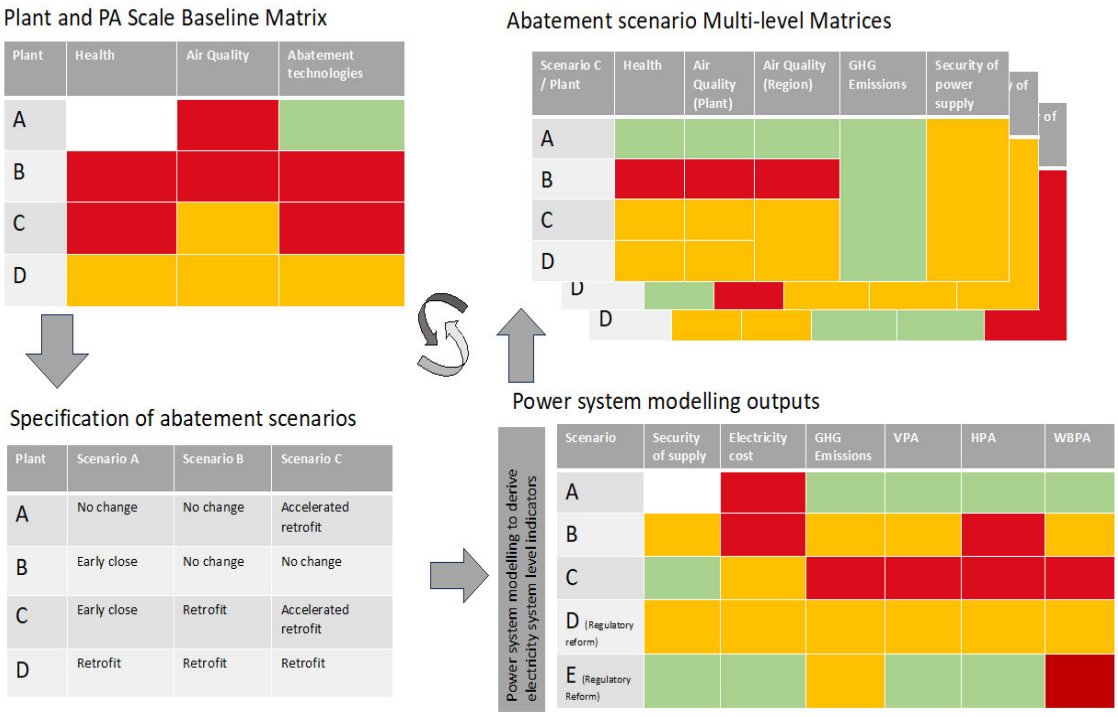

Figure 3:The Forum's multi-scale, multi-dimensional approach

The Plant, Municipal and PA Baseline Matrix is developed to reveal the current status, per power plant, of the various dimensions which are impacted at plant, municipal and PA scale.

This baseline provides information to support the development and assess the outcomes of various MES regulatory options. The evidence for the current impact or contribution of each dimension is summarised per plant and coded using a traffic light system.

Various regulatory scenarios are then considered using power system modelling.

The Forum commissioned a power system analysis from the Council for Scientific and Industrial Research (CSIR)[25], which uses Plexos energy modelling software. This is the same software used by Eskom and the DMRE to generate the South African Integrated Resource Plan for electricity sector planning. Plexos is an energy market simulation tool, which can be used for multi-objective decision optimisation, typically through introducing constraints or pricing non-financial dimensions and optimising for least cost[26].

The Forum's power system modelling therefore prioritises local air quality and least cost, by constraining local air emissions in least cost optimisation runs. The CSIR Plexos model has limited options as to how local air quality emission constraints can be modelled. Individual power plant pollutant concentrations cannot be imposed as constraints. Rather, these are inputs to the model, associated with the installation of various abatement technologies. Total volumes of pollutant (tonnes) can be constrained at plant, cluster of plants, or total system scale. The imposition of a levy on pollutants can work through the least cost-optimisation. The remaining power system indicators (GHG emissions and security of electricity supply) are compared between scenarios[27].

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[25] The output of which is contained in Annexure 29: Energy system modelling of South African electricity supply sector by Mr Warrick Pierce (CSIR). to the Report.

[26] Underlying least-cost optimization characterizes most Plexos model useage, for reasons of analytical tractability.

[27] Typical Plexos modelling includes a cost of unserved energy in order to make the model function reasonably. (Otherwise the least-cost option would likely be to not produce any electricity).

The outputs of these model runs assist in understanding the implications of each scenario for power system scale indicators (cost of electricity, security of electricity supply and GHG emissions), together with PA indicators for air quality, in the form of total annual PM, NO_x and SO_x emissions from the Eskom fleet for the three Priority Areas of the Vaal, Waterberg and Highveld.

The power system and PA scale implications are then considered in combination in a Multi-Dimensional, Multi-Scale Matrix assessment which considers the impact of each regulatory scenario at the plant, municipal, PA and power system level, coding for positive (green), neutral (orange) or negative (red) progress compared to a reference case where nothing further is done on air emissions.

Individually and when used in the approach described above, these tools provide a way of keeping all dimensions of the challenge of regulating Eskom's coal-fired plant emissions in sight when developing regulatory approaches going forward. Further, the multi-dimensional, multi-scale matrix in particular provides a way of collating and viewing information that is highly field / discipline specific. One of the challenges of a multi-dimensional problem is that of achieving a common language to consider multiple areas of deep disciplinary expertise.

10. COMMUNITY AND STAKEHOLDER ENGAGEMENT

The information provided to and considered by the Forum is extremely voluminous. This information was obtained through a number of engagements, written requests and from different sources during the course of the Forum's work.

Eskom's applications to the NAQO were made almost five years ago and the NAQO's decisions were issued more than two years ago. As expected, material facts on which these applications and decisions were based, have changed. The consistent flow of information and documentation to the Forum was important to ensure that it had the most up to date information. Therefore, the Forum welcomed updated factual information from stakeholders and confirmed with the DFFE's legal team that it was within the Forum's TOR to consider this information. The Forum did not invite nor receive updated legal submissions in respect of any of the appeals that were lodged.

10.1. Dissemination of information

By agreement and at the Forum's request, a website was made available to which documentation was uploaded for public attention and consumption. This included details regarding the public participation process, minutes of meetings, the applications made to the NAQO, the NAQO's decisions; appeals submitted and responding statements. The website URL is: https://saaqis.environment.gov.za/

10.2. Overview of process

In terms of its TOR, the NECA Forum was required to:

> *"… to conduct an extensive consultative process with key interested and affected parties to assess and present a significant relevant research and analysis in a public forum for review and interrogation, and to report to the Minister on the outcome. The report will provide the Minister with practical options to resolve the issues arising in respect of non-compliance with the MES and applications for issuance of PAELs, taking into consideration the Minister's constitutional and legislative mandate and the country's international commitments, health and wellbeing of people, the energy crisis and the local economic climate.*
>
> *3.1.3 Undertake preliminary hearings in which all interested parties are able to participate and make verbal and written submissions.*
>
> *3.1.4. Conduct one on one consultations with key interested and affected parties to understand their position in more detail.*
>
> *3.1.5 Conduct Consultations with:*
>
> *3.1.5.1. Department of Water and Sanitation*
>
> *3.1.5.2. Department of Minerals and Energy*
>
> *3.1.5.3. Department of Public Enterprises*
>
> *3.1.5.4. Department of National Treasury*

3.1.5.5. Department of Science and Innovation

3.1.5.6. Department of Trade, Industry and Competition

3.1.5.7. Members of the Executive Councils responsible for the environment in the provinces.

3.1.5.8. The South African Local Government Association

3.1.6. Visits to affected communities in airsheds affected by Eskom power stations and the applications for PAELs that are subject to appeal."

The NECA Forum had to consider the applications submitted by the emitters and any appeals lodged in respect of the NAQO's decisions to grant or reject the applications. Therefore, the NECA Forum consulted all I&APs and other stakeholders regarding all the applications and appeals that formed part of its TOR.

There were two components to the consultation process, these will be discussed in greater detail below. This section of the report will address the public consultation meetings with all I&APs held between 14 November 2022 to 24 November 2022 at venues situated in close proximity to Eskom's power stations. It will then address the NECA Forum's consultations with various stakeholders through one-on-one meetings or group meetings, depending on the sector to which the stakeholders belong. These meetings commenced in September 2022 and ended in February 2024.

10.3. Methodology and Approach

The NECA Forum adopted the following approach to its consultation process:

Desktop review

The NECA Forum reviewed the relevant documentation submitted by the emitters and appellants to determine the manner in which the public consultations could be undertaken, as well as to identify contact details of persons with whom to consult. Furthermore, the DFFE furnished the NECA Forum with a database listing the contact details of I&APs and other stakeholders.

Mapping and identifying I&APs and other stakeholders

The NECA Forum used the information provided, referred to above, to identify who to consult as well as the relevant geographic locations in which to hold the public consultation meetings. The Forum categorised individuals, groups and/or entities as follows:

- Category A – The Emitters
- Category B – The Appellants (which included emitters)
- Category C – Air Quality Control Officers and Municipalities
- Category D – Civil Society Organisations
- Category E – Public Sector / Government Departments
- Category F – Trade Union Federations
- Category G – Affected Communities
- Category H – Business Organisations / Industry

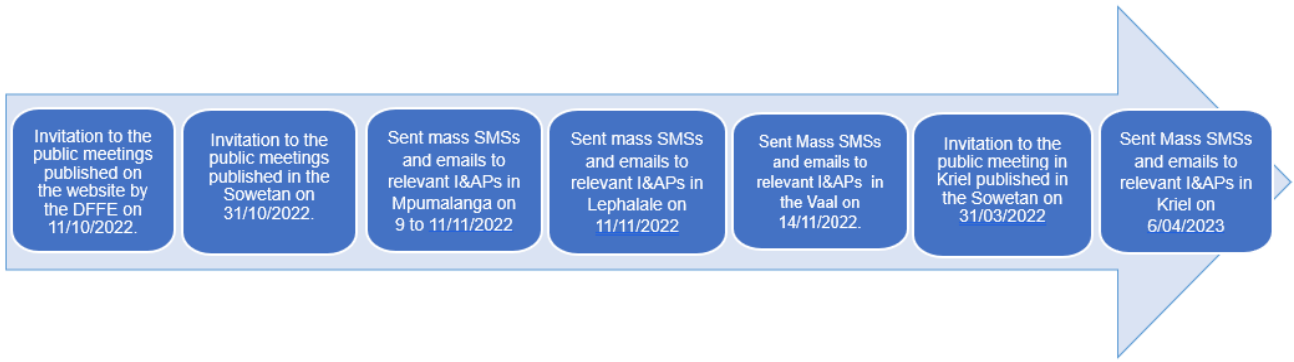
Drafting and submission of the stakeholder engagement plan and management program

In terms of the TOR, the DFFE was responsible for providing secretarial support to the NECA Forum and, as such, it had to arrange all the logistics related to the public community and stakeholder meetings.

A stakeholder management plan was formulated which set out the specific processes to be followed to ensure that all I&APs and other stakeholders were consulted. Attached to the stakeholder management plan was a programme setting preliminary dates on which consultations had to be undertaken. Despite some challenges, the NECA Forum managed to consult numerous I&APs and other stakeholders.

The Forum submitted the above stakeholder management plan and management program to the DFFE on 11 October 2022. A copy of the management plan is annexed hereto as Annexure 12.

10.4. Publication of notices and invitations to attend community meetings and stakeholder engagements



As the secretariat, the DFFE's role was to ensure that various notices were placed on notice boards accessible to I&Aps and published in provincial and local newspapers, based on jurisdiction and boundary lines and, if possible, broadcasted on community-based radio stations.

Notices of the public meetings in relation to communities and community organisations based and/or residing in areas affected by the business of the emitters had to be published 30 days prior to the date of the consultations.

In view of the above, the DFFE placed notices on its website (https://www.dffe.gov.za/event/deptactivity/minimumemissionstandards_publicconsultations#introduction) and on the SAAQIS website (https://saaqis.environment.gov.za). The notices inviting all I&APs to public consultation hearings were published on these websites on or about 11 October 2022.

A similar notice was published in the Sowetan newspaper on 31 October 2022. Another notice was published in the Sowetan on the 31 March 2023, inviting the community and I&APs to the public meeting in Kriel. Both notices are attached as Annexure 13.

In addition to the above, and to assist the DFFE to reach as many people as possible, the HNM Team sent mass SMSs and emails to I&APs listed on the databases provided by the DFFE. Further messages and emails were sent to remind I&APs of the public meetings. In this regard, some documents listed hereunder are annexed to this report as Annexure 14:

- A report from the SMS portal indicating that approximately 800 SMSs were sent to I&APs between 9 and 11 November 2022;
- Copies of the emails sent to I&APs between 9 and 11 November 2022;
- A report from the SMS portal indicating that about 50 SMSs were sent to I&ApPs on 5 and 6 April 2023, informing community members of another public meeting to be convened in Kriel on 4 May 2023;
- Copies of the emails sent to I&ApPs regarding the public meeting in Kriel; and
- A report from the SMS portal indicating that about 300 SMSs were sent to I&APs between 5 and 6 April 2023 inviting them to submit written representations or comments to the Forum on or before 10 May 2023.

Other stakeholders listed under categories A, B, C, D, E, G and H, were given at least 2 weeks' notice of the consultations.

10.5. Community Consultations and Engagements

The NECA Forum convened public consultation meetings, from 14 November 2022 to 24 November 2022 in the Vaal, parts of Mpumalanga, Lephalale, Saldanha Bay, East London; and Pietermaritzburg. Electronic links were sent out to I&APs to ensure that I&APs that could not physically attend the meetings, could attend virtually.

The purpose of the public meetings was to give I&APs an opportunity to engage with the NECA Forum, emitters, the appellants and the DFFE regarding matters related to the applications and appeals in respect of the postponement and suspension of compliance timeframes and the issuance of PAELs.

The public meetings in respect of the applications by GOAL and Hulamin were convened on the 15 November 2022 and 21 November 2022, respectively. The Report and recommendations, including the community consultation report in relation to the appeals relating to the emitters was submitted to the Minister on 15 February 2022. As such, this section of the report will only address community consultations and other engagements held in respect of Eskom's power stations.

The public meetings were held on the dates and at the venues listed hereunder, and copies of the programme and minutes of the meetings are annexed (Annexure 15A-I) to this report:

I. The consultation in Witbank was held at the A New Hotel on the 14 November 2022 in relation to the Duvha and Kendal power stations.

II. The consultation in Hendrina was held at the Kosmos City Hall on the 15 November 2022 in relation to the Hendrina, Arnot and Komati power stations.

III. The consultation in Kriel was held at the Ga-Nala Community Hall in Kriel on 16 November 2022 in relation to the Kriel and Matla power stations. It is important to state that this meeting was interrupted by community leaders and ended without concluding the business of the day.

IV. The consultation regarding the Port Rex power station was held at the Premier Regent Hotel in East London on 16 November 2022.

V. The consultation in Ermelo was held at Mayor's Parlour on 17 November 2022 in relation to the Camden and Tutuka power stations.

VI. The consultation in Amersfoort was held at the Ezamakuhle Community Centre on 18 November 2022 in relation to the Majuba power station.

VII. The consultation in the Vaal was held at the Riviera Hotel on 22 November 2022 in relation the Lethabo power station and ArcelorMittal's plant in Vanderbijlpark.

VIII. The consultation in Standerton was held at the Stanwest Community Hall in Standerton on 23 November 2022 in relation to the Grootvlei and Tutuka power stations.

IX. The consultation in Lephalale was held at the Bosveld Guest House in Limpopo on 24 November 2022 in relation to the Matimba and Medupi power stations.

In respect of the meetings referred to above, the DFFE arranged:

I. the venues;

II. shuttles to transport community members to and from their areas and the venues;

III. refreshments for those attending the meetings; and

IV. all the other logistics related to the meetings.

As stated above, the public consultation meetings were held at various venues across the country and as such, these had to be facilitated by different people. The facilitators were:

1. Mr Peter Harris – the chairperson of the NECA Forum;

2. Mr Charles Nupen – an attorney at HNM and a certified mediator;

3. Ms Tshegofatso Monnana-Motaung – an attorney at HNM and a certified mediator;

4. Ms Rethabile Mogkatle – an attorney at HNM and a certified mediator; and

5. Ms Sereeka Ananmalay – an attorney at HNM and a certified mediator.

10.5.1. Public meeting in Kriel

As previously indicated, the Forum, assisted by the DFFE, made several attempts to convene a public meeting in Kriel in relation to the Kriel and Matla power stations. However, despite all efforts, due to the logistical challenges and safety concerns, it was decided by the DFFE that the Forum would not convene a public meeting in Kriel.

In view of the above, it is important that we set out the steps taken in an effort to arrange a public meeting in the area. The steps are set out hereunder:

1. The first attempt at conducting the hearing took place on 16 November 2022. The hearing was interrupted by the councillors from the municipality in Kriel ("**the councillors**"). The councillors alleged that they did not receive adequate notice of the public hearing. On the councillors' instructions, community members vacated the venue, and the meeting was postponed**.**

2. The second attempt at convening the public hearing was on 4 May 2023. However, a day before the public hearing, the DFFE was informed by an official from the eMalahleni Municipality that only local service providers could be utilised for both catering services and the transportation of community members to and from the community centre. The DFFE explained to the official that all arrangements, including the appointment of service providers, must comply with the DFFE's supply chain processes. Due to potential safety concerns that could have arisen should the request not have been met, the DFFE elected to postpone the hearing.

3. The third attempt to convene the public hearing was on 21June 2023. The DFFE followed the National Treasury process to procure services by requesting local service providers to submit quotations. The DFFE did not receive any quotations and requested the municipality to facilitate responses. Only one quotation was submitted for catering. The quotation was exorbitant compared to the market value. As such, the DFFE could not accept the quote and the DFFE elected to postpone

the hearing as it feared for the safety of the DFFE and Forum members attending the hearing.

10.5.2. Eskom's presentation

Eskom presented at all the public hearings related to its applications and appeals (Annexure 16). Eskom was, in the main, represented by Mr Bryan McCourt at the public meetings but he was, from time-to-time, joined by power station general managers, as well as certain executives such as Ms Deidre Herbst, Generation Environmental Manager.

Eskom provided a brief explanation of its applications for the postponement and/or suspension of compliance timeframes with MES in respect of its power stations. Eskom explained that the NAQO granted applications in its favour in relation to the following power stations: Acacia, Arnot, Camden, Grootvlei, Hendrina, Kriel and Port Rex.

It also explained that the NAQO declined its postponement applications in relation to the following power stations: Duvha, Kendal, Lethabo, Majuba, Matimba, Matla, Medupi and Tutuka. In this regard, Eskom indicated that it submitted applications to appeal the NAQO's decision to reject its applications for postponement.

Eskom acknowledged that there is pollution emitted by its power stations, but emphasised its commitment to solving the problem and complying with the MES. It added that many of its power stations were very old and there have been many discussions regarding whether to fix the old plants or build new ones.

Eskom highlighted that it has been working hard to comply with the MES but indicated that it was concerned about the impact this would have on the country. Some of the concerns raised included economic issues related to job losses as well as the prospect of increased stages of load shedding.

Eskom indicated that some of its solutions to comply with the MES are contained in its 2035 JET Strategy. Eskom stated that it intends to close nine power stations by 2035 and implement its offset programme. In this regard, it stated that JET will cost Eskom approximately R60 billion which will bring positive results over the long term. It emphasised that shutting down

the power stations in 2035 would result in a 22 GW capacity reduction, thus leading to a total emission load reduction in line with the JET.

Eskom indicated that it preferred the solutions contained in its 2022 Emission Reduction Plan because some of the options are more practical and affordable. Some of the solutions include:

1. Projects directed at reducing PM emissions at the Kendal, Matimba, Lethabo, Tutuka, Duvha, Matla and Kriel power stations;

2. Projects directed at reducing NO_x emissions at the Majuba, Lethabo and Tutuka power stations;

3. Projects directed at reducing $S0_2$ emissions at the Kusile and Medupi power stations; and

4. Air quality offset programmes for the Highveld and Vaal Airshed Priority Area.

10.5.3. The CER's presentation

The CER presented at the public hearings held at Witbank, Hendrina, Amersfoort and Lephalale regarding its clients' appeals against Eskom's applications. During the meeting at Witbank, the CER's client, the Vukani Environmental Justice Alliance ("**VEJA**"), also contributed to the presentation. At the meeting in Hendrina, the CER's client, groundWork, also contributed to the presentation.

The CER stated that Eskom was aware that it had to comply with the MES but that many years had passed, and it had done nothing to ensure that it was compliant. It explained that its clients were against the NAQO's decision to approve Eskom's application for postponement of the compliance timeframes in respect of Majuba, Kendal, Tutuka, Camden, Arnot, Komati, Grootvlei and Kriel. The CER emphasised that Eskom's non-compliance with the MES was in breach of the Constitution.

With reference to the '*deadly air case'*, the CER indicated that Eskom's non-compliance has contributed to health issues caused by the pollution emitted from Eskom's power stations. VEJA emphasised the harm caused by pollution in relation to people getting sick and consequently dying as a result of the emissions. In this regard, the CER was of the view that

Eskom must compensate people that had fallen ill as a result of the emissions from its power stations.

Furthermore, the CER indicated that it was concerned that Eskom, despite the law requiring that it do so, failed to submit decommissioning plans in respect of the power stations it planned to shut down.

10.5.4. General issues and concerns raised by communities

Following the presentations by the emitters, the DFFE and CER, the chairpersons opened the platform to all members of the communities and stakeholders to ask questions and give their input. Some of the concerns raised and questions asked at the public meetings were similar in nature and will be dealt with under specific headings below. However, certain concerns were specific to a particular area/plant and as such, we will specify at which meeting the issues were raised.

Furthermore, it is important to note that some of the concerns raised at the meetings were not relevant to the subject matter and as such, these have not been addressed in this report. It is our understanding that the DFFE noted the queries and shared the information with the relevant institutions within government.

Some communities were concerned that they were not represented adequately at the public meetings. They felt the arrangements were poorly managed because members of the communities were not aware of the meetings and as such, people could not attend the meetings. In addition, people were unhappy with some of the venues chosen to host the public meetings because they indicated that they struggled to access such venues as they were far away from where they reside.

In response to the above, the DFFE apologised for failing to notify community members well in advance about the meetings and use effective methods of communication. The DFFE reiterated that it was not "*aggressive enough*" in raising awareness regarding the consultation process.

The DFFE indicated that the meetings were held at different types of venues based on factors such as, the availability of the venues in specific areas. The DFFE explained that it used a combination of private conference venues and community centres to host the public meetings.

There were requests by stakeholders that the public meetings be rescheduled. In this regard, the Forum and DFFE considered the turn-out (the number of people that attended the meetings) and were of the view that many of the public meetings were well attended and it would not be necessary to reschedule the meetings.

In addition to the above, the chairpersons also explained that all I&APs could submit written representations or comments and their input would be incorporated into the report to the Minister. The initial date for the submission of written representations and comments was 30 November 2022, however this date was extended to 31January 2023, and then further extended to 10 May 2023.

In view of the extension of time granted to the Forum by the Minister, it was decided that all I&APs and other stakeholders would be given a further opportunity to submit written representations and comments by 30 November 2023.

10.5.5. Specific concerns

10.5.5.1. Compliance with MES by Eskom

There were varying concerns regarding Eskom's compliance with the MES as well as the implications of non-compliance. Some people were of the view that Eskom should not be forced to comply with the MES while others strongly believed that Eskom had no other option but to comply with the law. We set out the concerns below.

Several community members expressed concern regarding Eskom's non-compliance with the MES. They stated that Eskom's continued non-compliance with the MES would contribute to increased air pollution and consequently, affect their health.

Community members stated that there was no indication that Eskom planned to comply with the law. They justified this by stating that Eskom knew and was made aware, several years

ago, that it had to comply with the MES but did nothing to reduce its emissions. Eskom was accused of lying about its intention to comply with the MES.

Some community members enquired about measures the government was taking to regulate Eskom's power stations to ensure compliance with the law. In this regard, people wanted Eskom to be punished for its inability and/or failure to comply with the law.

The communities questioned the accuracy of the data presented by Eskom regarding the sources of air pollution, especially the allegation that it emanated largely from domestic households. People were unhappy with this allegation and felt Eskom was blaming communities and individuals, whilst it and the mining activities were the biggest contributors to air pollution in the area.

Community members were also of the view that if Eskom believed that the burning of domestic fuel was the main contributor to air pollution, then it should provide informal settlements with electricity to reduce the impact of air pollution.

On the other hand, some people were concerned that forcing Eskom to comply with the law could force Eskom to shut down some of its power stations. They questioned what would happen to people's jobs and the land if the power stations were decommissioned. Community members said they feared the consequences of unemployment as well as increased levels of reduced electricity supply.

In addition, some people felt that Eskom should be given more time to fix the stations in order to reduce pollution and comply with the law.

Moreover, in areas such as Lephalale, community members were concerned that shutting down power stations would turn the areas into "*ghost towns*". They indicated that the power stations attracted economic activity to the areas. For example, mining companies were established for the sole purpose of supplying the power stations and therefore, the mines would also close down if the stations were to shut down.

A community member asked what Eskom's plans and strategies were to raise the R60 billion required to reduce emissions. The cost of compliance with the MES was a big concern, especially in the light of the financial values Eskom shared in its presentations. People felt the

cost of abatement technology required to reduce emissions, such as FGD or NO_X burners, would be too expensive.

However, some community members indicated that Eskom was given money by the World Bank to install FGDs. In this regard, they requested Eskom to account for what happened to the money from the World Bank. Further, it was suggested that Eskom was not doing enough to install technology to reduce emissions such as SO_2.

Some community members did not believe Eskom's "*excuse*" that it is too costly to comply with the MES. Others questioned why the government was not giving Eskom money to address the emissions problem because they were of the view that this would limit the negative implications, such as shutting down power stations.

The DFFE responded to the concerns above by stating that:

1. The government was not forcing Eskom to close any of its power stations but wanted Eskom to reduce emissions. The DFFE added that it was aware of some measures that could be implemented by Eskom to ensure that Eskom complies with the law.

2. In terms of the law, facilities that are unable to comply with the MES could apply for a postponement or suspension from complying with the MES. The decision to grant that postponement is determined on the merits of each facility and if permission is granted, then certain conditions would accompany the permission.

3. Eskom submitted various postponement applications for a number of its power stations. The DFFE indicated that some of Eskom's applications were successful, and others were rejected.

4. The DFFE indicated that there were many contributors to air pollution. The DFFE acknowledged the impact of pollution hence the rejection of some of Eskom's applications. The DFFE stated that it did not want to make things difficult for Eskom but that the DFFE's mandate is to protect peoples' health and the environment.

5. It was recognised that the DFFE had to be more aggressive regarding raising awareness within communities in respect of air pollution and regarding some of the measures put in place to address the situation.

6. The DFFE stated that the legislation deals with a variety of pollutants and that air pollution is assessed by looking at various sources.

10.5.5.2. Eskom's response to the above concerns

Eskom stated that it will comply with the law. It stated that it initially applied for postponements in 2015 and again in 2020. Eskom explained that it has, since 2015, done work at several power stations to reduce emissions.

It indicated that some of the NAQO's decisions in relation to its application were that Eskom must immediately implement a PM limit of 50 mg/m^3. Eskom stated that it was informed that if it could not meet the plant limits, it must shut down the plants. It is important to indicate that the DFFE refuted Eskom's allegation and stated that Eskom was only notified that it had to comply with the law.

Eskom explained that it is expected to comply with certain limits by 2025. In this regard, the general manager of Tutuka, Mr Sello Mametja, indicated that Tutuka's emissions should be at $1000mg/cm^3$ by 2025. He stated that Eskom started reducing emissions at unit 6 of Tutuka to ensure that the station would be compliant by 2025 and that the rest of the units would follow at a later stage.

Eskom stated that Grootvlei was currently compliant. Eskom indicated that sometimes the station exceeded the PM limit, but that it was working hard to ensure that it remained within the limits.

Eskom also indicated that it was installing low NO_x burners to reduce NO_X Emissions at its Lethabo power station. In addition to this, the general engineering manager at Lethabo, Mr Nathi Mazibuko, indicated that some of the technology used to reduce PM include high frequency transformers, and the upgrade of the precipitators.

Furthermore, Eskom used the Grootvlei, Lethabo and Tutuka power stations as case studies to demonstrate that there was an intention to comply with the law. Eskom indicated that it was directing all its resources towards mechanisms that would enable it to comply with the MES.

Eskom advised that the implications of retrofitting a power station would result in the shutting down of its units for a period of time. Eskom indicated that the shutdown period would vary from station to station, but it could take anything from 1 year upwards.

Eskom's representatives present at the public meetings could not respond to the question regarding what happened to the funds Eskom received from the World Bank. However, the representatives indicated that the installation of FGD at the Medupi was delayed and that the first unit would only be installed in 2027. In addition, they also indicated that FGDs were installed at Kusile.

Eskom explained that due to the costs associated with installing new technology, it would request financial assistance from the government, the South African National Nuclear Energy Corporation and other funders to enable it to fund some of its plans to reduce emissions.

10.5.5.3. The health impact of air pollution

Community members complained that emissions from Eskom's power stations negatively affected their health. The concerns are set out below.

People enquired about whether Eskom had any records of the number of people that were dying as a result of air pollution.

The CER stated that Eskom needed to be pragmatic about how it was going to deal with the health impacts caused by air pollution. It was suggested that Eskom should compensate people suffering from illnesses caused by the emissions from its power plants.

Communities were of the view that Eskom was not doing enough to address air pollution and that this resulted in sickness and death. Further, Eskom's presentation did not sufficiently address the health impacts of emissions and how it planned to address this issue.

People also stated that emissions from some power stations such as Majuba were resulting in children and the elderly contracting respiratory diseases, such as asthma.

Further, community members indicated that they were not comfortable with the gas stoves provided by Eskom in respect of its offset project. People's sentiments were that gas stoves are not safe.

Community members were concerned that the DFFE and Eskom did not invite other departments, such as the health department, to the public meetings. They were of the view that these departments could share information related to health, in particular, respiratory diseases and other ailments resulting from the emissions.

Community members indicated that the Matimba power station created a lot of noise pollution, and that this was causing hearing problems for people in the community. A community member was concerned that continued exposure to the noise, especially for children, will have long lasting effects. Some people proposed that the station be closed while others suggested that Eskom invest in technology that can reduce the noise levels.

In response to the communities' concerns, the DFFE stated that it was working closely with the Department of Health regarding the impact of air pollution on the surrounding communities.

In response to the community concerns, Eskom stated that:

1. Government would need to advise Eskom on what role it could play in the health sector.

2. It could not make any undertaking regarding compensating people for health issues allegedly caused by emissions from its power plants. Eskom, however, indicated that it had built a number of clinics in various communities and that these were handed over to the government. Eskom could not share data on how many health facilities it had built nor could it share the location of these facilities.

3. There were costs associated with complying with the law and the key was to balance the cost of health versus the cost of complying with the law.

4. Participating in the offset project was voluntary and as such, it indicated that people who were unsure about the health implications of using gas stoves could opt out of the process.

10.5.5.4. Employment

Community members were concerned that the closure of some of Eskom's power stations would lead to major job losses, increasing the number of unemployed people in their communities. Below we set out the concerns regarding employment that were raised at the public meetings:

People were of the view that closing power stations would not only affect those employed by Eskom but will affect people working in the supply value chain of Eskom. In this regard, mineworkers and engineers would lose their jobs, whilst students and graduates would lose out on training opportunities at Eskom and the coal mines.

Another community member stated that any potential employment or skills development programmes must also be extended to people older than 35 years old.

Community members lambasted the decision to close the Komati power station as this contributed to unemployment in the area. In addition to this, people were aggrieved that workers that were employed at Komati were not transferred to other power stations.

Other community members added that the construction of the Medupi power station did not contribute to any significant changes, nor did it create jobs for people in the surrounding areas.

People were concerned about whether the implementation of the JET Strategy would affect employment. One of the concerns related to whether people working in the coal sector would be trained and given skills to work in the renewable sector.

Community members were dissatisfied about the statistics generated by Eskom regarding how the JET Strategy would impact employment. Specifically, that 300 new jobs would be created for every 100 jobs lost.

A community member asked about the timeframes regarding job losses due to the closure of power stations. Specifically, Eskom was asked how long it will take to re-employ people once the JET proceeds.

Some community members argued that they should be compensated if the power stations close down. They suggested that the compensation should be in the form of employment or training for employment in the renewable energy sector.

Some community members were aggrieved as they felt that Eskom was making them choose between employment, their health, complying with the law and loadshedding. In this regard, concerns were raised about how Eskom's reluctance to comply with the MES will have an effect on employment.

Eskom's response to the concerns raised regarding the impact on employment, should it comply with the MES and/or shut down some of its power stations, is addressed below.

1. Eskom stated that it did not have sufficient information regarding the impact the closure of some of the power stations would have on its supply value chain.

2. It also stated that it was working with the government to ensure that facilities were created to help people find employment. It mentioned that all the information was available on its website and that it worked with all stakeholders to raise awareness, including schools.

3. Eskom stated that it had submitted applications for a postponement, and that it wanted to repurpose some of the power stations to generate electricity using alternative methods and create new jobs. It indicated that the people working at the Komati power station would be transferred to other stations, whilst others would be trained in renewable energy generation.

4. Eskom indicated that the statement that there would be a loss of 100 000 jobs was based on an estimate of the predicted losses at Eskom, as well as the losses in other industries that are part of its supply chain. It added that job losses were concerning.

10.5.5.5. Offset Programme

Concerns were raised by varying community members regarding the implementation and cost of the offset programme. The process involves Eskom replacing coal stoves with gas stoves,

providing gas heaters and cylinders, and the insulation of ceilings. The concerns below were raised:

- Whether Eskom had "*concrete plans*" in relation to the implementation of the offsets. It was suggested by some that the information in relation to the cost and implementation of offsets should be made public.
- Whether an effective offset programme could reduce pollution created indoors.
- It was stated that this was not the first time that Eskom had proposed offsets as a solution to deal with indoor air pollution. The implementation of the offset programme was slow and as a result, community members would continue using coal as there were no alternatives.
- People indicated that they could not afford to purchase gas should they exchange their coal stoves for gas stoves. They added that coal stoves were easier to use than gas stoves.
- Some community members indicated that they were not interested in exchanging their coal stoves for gas stoves. Further, some community members considered the coal stoves as a part of their history and "*heritage*" because their grandparents and parents used coal stoves.
- Whether Eskom could give community members electric stoves instead of gas stoves.

In response to concerns raised regarding the offset programme, Eskom stated that:

1. It had exchanged approximately 250 stoves in KwaZamokuhle near the Majuba power station.
2. People had a choice regarding whether to participate in the project. Eskom added that it was planning to provide about 33 000 households with gas stoves by 2027.
3. The biggest contributor of air pollution was the use of coal for cooking. It added that the offset project aims to reduce air pollution.

4. It acknowledged that the price of gas could be more expensive compared to electricity but that that would depend on usage. Eskom further stated that it would not provide any further financial support to households to purchase gas and people would need to make their own provisions to purchase gas.

5. It was aware that gas stoves could be harmful, especially to children. Eskom also acknowledged that it needed to explain to communities how to manage the risks associated with gas stoves prior to giving people the stoves. It reiterated that the offset project would result in people being healthier.

6. As part of the programme, it would install ceilings because this would make the houses warmer in winter and cooler in summer. Eskom added that in addition to the gas stove, each household would also receive a gas heater and two gas cylinders.

7. The offset programme focused on RDP houses only and not informal houses, despite the fact that these were also contributing to the pollution.

8. An effective offset programme could reduce air pollution as the use of domestic fuel would decrease.

10.5.5.6. Just Energy Transition Strategy

There were concerns raised about the impact of the JET Strategy and whether it was feasible to implement. Some of the issues raised by the community include:

1. That Eskom should establish information centres to disseminate information regarding the JET Strategy. People wanted details about the JET Strategy, as well as its impact on communities and small businesses.

2. That community members were not supportive of the JET. One community member stated that he supported the use of mixed energy in dealing with South Africa's energy crisis but did not support the JET Strategy because he felt that its implementation was unrealistic.

3. The presentation from Eskom did not detail how the JET Strategy would impact their employment prospects, as well as how it would affect their land and livelihoods.

4. It was not clear why there was a difference between the current abatement system projected to cost R300 billion as opposed to the JET Strategy that would cost R60 billion to implement.

In response to the above, the DFFE indicated that:

1. JET was the responsibility of the Presidential Climate Commission and not the NECA Forum. However, it stated that the community would be consulted on JET;

2. JET was not strictly related to reducing air pollution. Secondly, the DFFE stated that the Integrated Resource Plan addressing the mixed energy use approach was developed by the DMRE; and

3. the purpose of public meetings was to discuss the postponement applications and not JET.

In response to the concerns about the JET Strategy, Eskom stated that:

1. the JET plan was a government policy. It stated that Eskom was not the only player and that independent power producers would also be involved in the generation of energy;

2. it was trying to find opportunities for small businesses within the community with the long-term view of partnering with them in the implementation of its JET Strategy;

3. it was working hand-in-hand with the government to implement the JET Strategy. Eskom indicated that the purpose of JET is to reduce CO_2; and

4. it required external funding to fund its JET Strategy.

10.5.5.7. Renewables

There were various concerns raised regarding the implementation of renewables.

- Some community members did not want the existing power plants to be destroyed and instead wanted them to be used in addition to solar power plants and other forms of renewable energy to generate electricity.
- Some community members supported the use of mixed energy, referring to the use of both renewables and non-renewables to generate more electricity.
- Concerns were raised regarding whether the roll out of renewable energy was realistic. Specifically, whether it was possible to replace coal-fired power stations with renewable energy such as solar panels or wind farms.
- Concerns were raised regarding the provision of solar panels. Specifically, there was a concern regarding the identity of the service providers used by Eskom to provide the solar panels.

In relation to the concerns raised regarding renewable energy, Eskom:

- indicated that government was still considering the Integrated Resource Plan which would guide Eskom on the matter;
- stated that some people that worked at Komati would be transferred to other stations, whilst others would be trained in renewable energy generation; and
- could not respond to the question regarding the service providers Eskom was using to provide solar power.

10.5.5.8. Community engagements

There were concerns regarding the lack of community engagement by both Eskom and the DFFE. The following concerns were raised by community members:

- They were not aware of many of the issues raised by Eskom such as the MES, the closure of power stations and the JET. In addition, they wanted better communication and notification from Eskom and the DFFE.

- The DFFE never consults the community. In this regard, they wanted better access to DFFE offices so that they could engage with officials regarding issues such as pollution and employment.

- The DFFE was not playing an active role in notifying and educating the community on the issues presented by Eskom. They wanted the DFFE to educate them on issues arising from the applications and appeals that were the subject of the public hearings.

In relation to the above, the DFFE stated it has a unit called Environmental Education that focuses on empowering communities by hosting information workshops.

In response to the issued raised above, Eskom stated that it found that empowering communities allowed people to engage effectively with the issues affecting them. Eskom added that it will endeavour to properly consult community members in future, especially regarding the JET.

10.5.5.9. Other concerns raised at specific public meetings in relation to Eskom

In relation to the community meeting held in Witbank regarding the Duvha and Kendal power stations, the community:

- asked what Eskom planned to do with the excess ash, located at the ash dumps, emanating from its power stations. The community indicated that Eskom should give small businesses access to the dumps as they could use the ash to make bricks which could be sold for profit;

- enquired about the status of the criminal case against Eskom in relation to exceeding plant standard limits at the Kendal power station;

- enquired about Eskom's transmission lines; and

- enquired whether Eskom would deviate from complying with its Broad Based Black Economic Empowerment (B-BBEE) requirements to comply with the MES and proceed with its JET Strategy, and how that would affect unemployment.

In response to the above, Eskom stated that:

- It was working on installing high transformers to deal with ash at Duvha and Kendal. It further indicated that between 2 and 3 units have been finalised and the work was on-going with regards to the transformers;
- The issue regarding giving access to ash dumps to communities had not been resolved;
- The case involving Kendal power station was still ongoing; and
- In relation to the question regarding B-BBEE, its representatives present at the public meeting were from the environmental department and therefore could not respond to whether it would be complying with B-BBEE provisions.

In Amersfoort, regarding the Majuba power station, community members stated that there were clinic facilities in the area, however these were not sufficient as they only operate during the week. They stated that community members must go to the clinic in town if they sustained injuries or fell ill over the weekend or at night. In response, Eskom stated that it was not in a position to address the issue related to the functionality of the health facilities as these belonged to the government. However, the general manager of Majuba, Mr Solly Ngcashi, stated that Eskom funded the building of schools, clinics, old age homes and police stations in the area. He further added that Eskom established initiatives like taking care of school-going girls to ensure that their academic careers are not disturbed by distributing personal care packages.

At the meeting held in Standerton regarding the Tutuka and Grootvlei power stations, a community member emphasised the need to upgrade the community hall and requested Eskom to adopt the hall. She concluded by asking for training through the community works programmes. In response, the DFFE stated that there were units within the local and provincial government responsible for awareness activities and that some work had been done within the community. The DFFE, however, acknowledged that there was room for improvement.

10.6. Stakeholder Engagements

As part of its TOR, the NECA Forum was required to conduct engagements with other stakeholders.

The NECA Forum engaged various stakeholders through one-on-one or sector specific meetings. These meetings commenced in September 2022 and ended in February 2024. The nature of these meetings varied from introductory meetings to discussions related to technical aspects of the NECA Forum's TOR, including gathering information to assist the NECA Forum to execute its mandate.

The Forum met with Eskom, in relation to its postponement and suspension applications that were unsuccessful and the CER, in respect of the NAQO's decisions to postpone or suspend compliance timeframes for some of Eskom's power stations.

The HNM Team prepared minutes for the majority of the meetings, however some meetings were not documented because they were technical in nature or confidential information was disclosed/discussed. In this regard, the NECA Forum was required to strike a balance between guaranteeing the confidentially of the information supplied by stakeholders to enable them to express their views freely and openly, and the Forum's commitment to be as transparent as possible about the details of all discussions it held with stakeholders. The minutes of the meetings that were minuted are annexed to this report as Annexure 17A-D.

Furthermore, and based on factors such as the complexity of the information shared and stakeholders' requests for further consultations, the Forum convened multiple meetings with some stakeholders.

Notwithstanding the aforesaid, the NECA Forum confirms that its members acted in good faith and with impartiality in all its engagements with stakeholders.

10.6.1. Engagements with the DFFE and the NAQO

It was agreed that the NECA Forum would meet regularly with officials of the DFFE to discuss progress on the work of the Forum and address other administrative issues. The Forum also

convened meetings of a technical nature with the DFFE and the NAQO, including provincial air quality officers.

A list of the meetings convened with the DFFE is set out hereunder and, where applicable, minutes of the meetings are annexed to the report (Annexure 17A).

Date	Description
23 August 2022	Meeting between the NECA Forum and DFFE
07 September 2022	Meeting between the NECA Forum and DFFE
30 September 2022	Meeting between the NECA Forum and DFFE
26 October 2022	Meeting between the NECA Forum and DFFE
8 November 2022	Meeting between the NECA Forum and the NAQO
11 November 2022	Meeting between the NECA Forum and DFFE
08 December 2022	Meeting between the NECA Forum and DFFE
10 January 2023	Meeting between the NECA Forum, the DFFE and the NAQO (technical)
2 February 2023	Meeting between the NECA Forum and DFFE (administrative)
14 April 2023	Meeting cancelled due to unavailability of the DFFE.

18 May 2023	Meeting between the NECA Forum, the DFFE and the NAQO.
31 May 2023	Meeting between the NECA Forum, the DFFE and the CSIR.
20 November 2023	Meeting between the NECA Forum and the DFFE
17 January 2024	Meeting between the NECA Forum and the DFFE

10.6.1.1. Summary of the discussions with the DFFE and NAQO

The nature of the meetings with the DFFE ranged from progress updates to meetings of an administrative nature. Some of the topics discussed during these meetings include:

- The workplan of the Forum, the Forum's deliverables and the timeframes for the completion of certain tasks.
- The logistics for the public hearings. In this regard, the DFFE agreed that, as the secretariat, they would be responsible for organising the public meetings and would assist the Forum with their travel and hospitality arrangements. With respect to the organisation of the hearings, the DFFE indicated that they would publish notices in national newspapers and provide translators.
- The status of appeals in terms of the NEMAQA. The DFFE clarified that an appeal in terms of section 43 is a wide appeal which enables the Minister to consider new information to the extent that the new information is relevant and had been made available to all I&APs.

Further discussions related to:

- Entities the Forum was required to meet. The DFFE indicated that this would not only be limited to appellants and emitters, but all I&Aps, such as business associations and government departments.

- The resources the DFFE could make available to the Forum. The DFFE clarified that the Forum may access resources such as health studies or any analyses they may require.
- The technical aspects of the Forum's method matrix and the power system modelling.
- Documents the Forum required the DFFE to upload on its website. Some of the documents uploaded included records of the public hearings, technical studies from Eskom and varying presentations from stakeholders, such as the CER and the National Union of Metalworkers of South Africa.

10.6.2. Engagements with Eskom

The NECA Forum convened several meetings with Eskom. The purpose of the meetings was to gain a solidarity understanding of its reasons for applying for the suspension and/or postponement of compliance timeframes of the MES. In addition, other meetings with Eskom were convened to gather information on the technical aspects related to their power plants.

The NECA Forum also conducted a site visit at Kusile. Eskom explained the FGD technology and demonstrated how it works.

The NECA Forum also met with the former Chief Executive Officer ("**CEO**") of Eskom, Mr Andre De Ruyter, and members of his executive team, to discuss Eskom's plans to comply with the MES.

Furthermore, Eskom attended all the public consultation meetings held between 11 and 24 November 2022 and presented its reasons for applying for the postponement and/or suspension of the compliance timeframes of the MES, including its view on why its applications should be granted.

Eskom also submitted a number of documents to support its applications and appeals and to assist the Forum to better understand matters related to its operations. Save for those that were confidential, the documents provided by Eskom were uploaded on the SAAQIS website.

A list of the meetings convened with Eskom are set out hereunder. Some of the meetings were technical in nature and, as such, no agendas or minutes were prepared.

Date	Description
27 September 2022	Introductory meeting between Eskom and the NECA Forum regarding TOR and related matters.
03 October 2022	Part 1 – Eskom's presentation on emission control technologies.
06 October 2022	Part 2 – Eskom's presentation regarding reduction of emissions and a discussion on FGD and NO_x.
12 October 2022	Meeting between Eskom and the NECA Forum discussing the cost of retrofitting its power stations.
13 October 2022	Meeting between Eskom and the NECA Forum discussing the cost of retrofitting its power stations.
18 October 2022	Meeting between Eskom and the NECA Forum discussing the Energy Planning Model.
21 October 2022	Meeting between Eskom and the NECA Forum discussing Eskom's 2035 JET Strategy.
25 October 2022	Eskom presentation on health-related cost benefit analysis
28 October 2022	Meeting between Eskom and the NECA Forum
31 October 2022	Meeting between Eskom and the NECA Forum discussing the development of a new pumped-storage facility

1 November 2022	Meeting between Eskom and the NECA Forum
31 January 2023	Meeting with the former chief executive officer, Mr Andre de Ruyter, and Eskom executives.
15 February 2023	Site visit at Kusile.
17 March 2023	Discussion regarding the MES conceptual framework developed by the Forum.
4 April 2023	Discussion regarding Medupi.
14 April 2023	Meeting regarding power sector modelling and obtaining inputs from Eskom.
3 May 2023	Meeting between Eskom and the NECA Forum discussing the assumptions and the scope of modelling details
19 May 2023	Meeting between Eskom and the NECA Forum
2 June 2023	Meeting between Eskom and the NECA Forum
27 September 2023	Meeting between Eskom and the NECA Forum discussing MES exemptions
5 October 2023	Meeting to discuss details of the non-disclosure agreement between Eskom and the NECA Forum

16 November 2023	Meeting between Eskom and the NECA Forum discussing health-related issues
5 December 2023	Meeting between Eskom and the NECA Forum discussing MES costing
16 January 2023	Meeting between Eskom and the NECA Forum discussing contextual information relating to the Lethabo, Matla and Duvha power stations
18 January 2024	Meeting between Eskom and the NECA Forum discussing the potential to accelerate the current PM projects
1 February 2023	NECA Forum presentation to Eskom of the initial modelling results

Summary of the discussions with Eskom

The first engagement was an introductory meeting relating to the NECA Forum's TOR. Furthermore, Eskom stated that:

- It had engaged several stakeholders regarding the challenges related to its emissions;
- It was concerned that the legal framework limited its options to address emissions; and
- Stakeholders must consider all the alternatives and what is good for the country considering the impact the alternatives will have on the economy and energy supply.

Other topics discussed during the subsequent engagements included the reduction of emissions, alternative methods such as: the installation of FGDs; the cost of retrofitting some of its power stations; Eskom's energy planning model, its JET Strategy, the MES conceptual framework, decommissioning dates, loadshedding, and technical requirements for installing abatement technologies.

10.6.3. Engagements with the CER

The NECA Forum held several meetings with the CER. A list of the meetings convened with the CER are set out hereunder. The available minutes and agendas for the meetings are annexed to this report (Annexure 17B).

Date	Descriptions
9 September 2022	This was the initial meet and greet during which the NECA Forum explained TOR to the CER.
9 November 2022	At this meeting, the CER presented its clients' grounds of appeal to the NECA Forum.
6 April 2023	Discussions regarding the assessment matrix developed by the Forum.
27 June 2023	Discussions regarding mitigation measures.
10 July 2023	Meeting between the CER and the NECA Forum discussing how data from low-cost sensors can assist the Forum
8 February 2024	NECA Forum presentation – Presentation of the NECA Forum's power system modelling and analytical framework

Summary of the discussions with the CER

At the first engagement held on 9 September 2022, the Forum presented its TOR. The Chairperson highlighted the fact that the TOR required the Forum to engage various stakeholders and include the information gathered from the engagements in its report to the Minister.

The CER explained that it was a group of activist lawyers that defended the rights of communities and civil society organisations in relation to an environment that is not harmful to the health or well-being of present and future generations.

The CER stated that through litigation, advocacy as well as supporting and training activities, its objective is to advance its vision of a more equal society, free of fossil fuels, in which environmental and climate justice is realised and where all people and the planet can flourish.

The CER emphasised the need for transparency. As such, the Forum undertook to be as transparent as possible, subject to the condition that certain information may be confidential. In addition, the Forum stated that the research and analytical work might not be accessible, but the members of the Forum will make the information available, if possible.

Mr Thomas Mnguni from groundWork, one of the CER's clients in this matter, stated that it was important for community members to be informed about the purpose of the public consultations. Furthermore, he indicated that clear plans ought to be developed to address air pollution.

At the second engagement held on 9 November 2022, the CER explained its mandate and its clients' position in respect of the NAQO's decision to postpone or suspend the compliance timeframes regarding Eskom.

The CER reiterated its position that the NECA Forum must be transparent, in that the work of the Forum must be done openly and publicly to build trust in its processes and outcome. To achieve this, the CER specified some measures it believed the Forum should adopt, which included:

- Publishing all documents which the Forum relied on and considered (including all reports and draft documents);
- Publishing all public hearings; and
- Concluding as many consultations as possible within the public domain.

The CER further enquired into whether:

- it would be given an opportunity to engage with Eskom's appeals – appeals in which it and the public have an enormous interest;
- it would be granted access to the records and notes of engagements with the other appellants; and
- the Forum would be able and willing to conduct these sessions (the one-on-one meetings) on an open platform.

The CER prepared meeting notes attached hereto marked annexure 20B. The CER recorded that:

"First, we would like to make the following crucial contextual points:

1. This is an issue about public health and human lives.

2. Secondly, this is a human rights issue (rights which are entrenched in SA's Constitution). Earlier this year, the Pretoria High Court confirmed – in a case about the Highveld Priority Area - the same area where the majority of facilities in question today are located – that the rights of people living in this area are being breached on a daily basis due to the unacceptable levels of air pollution. The case is referred to as the Deadly Air case. One of our clients in this appeal (groundWork) is an applicant in that court case. The court held that the section 24 rights to an environment that is not harmful to the health and wellbeing is immediately realisable. Constitutional rights are being breached in circumstances where the companies in question are contributing to a public health crisis, causing billions in health costs, and contributing to death and illness. Importantly, there is an option of transitioning to cleaner alternatives to avoid these harms and rights

infringements. We understand all too well the complexity of the situation. But when it comes to human rights and human lives – the deaths of vulnerable people including children and the elderly is simply too high a price to pay for electricity – particularly when feasible, affordable alternatives are available.

3. Eskom and AMSA have a long history of noncompliance with emission limits. Based on monitoring data, Eskom continues to exceed limits in its atmospheric emission licences, largely with impunity. AMSA has, for decades, not complied with various environmental laws, including Hydrogen Sulphide (H2S) emission standards. It faced criminal prosecution for these H2S exceedances and was issued with a fine as penalty in 2020. Eskom has allowed its emissions performance to deteriorate over the past few years (since 2016), to the extent that there are numerous exceedances of its current Atmospheric Emission Licence (AEL) limits, which in several cases are more lenient that the 2015 Minimum Emission Standards (MES) limits. A 2018 health assessment of Eskom's monthly emission reports for the period April 2016 – December 2017 was completed by energy and air quality specialist Dr. Ranajit Sahu. This study reviewed data from 14 of Eskom's coal-fired power stations, excluding Kusile which is still under construction. Dr Sahu's assessment found that 13 of Eskom's coal-fired power stations reported nearly 3,200 exceedances of applicable daily Atmospheric Emission Licences (AEL) limits for particulate matter (PM), sulphur dioxide (SO2), and oxides of nitrogen (NOx), during a 21-month period. An aggravating finding from the assessment is that many of these reported exceedances were significantly greater than the applicable AEL emission standards. Eskom has conceded that "it is common cause that the Minimum Emission Standards (MES) serve to ensure that there is compliance with the National Ambient Air Quality Standards (NAAQS)."

4. Importantly, this is also about compliance with the law – laws adopted by Parliament and regulations promulgated by the Minister. Compliance with the law is not negotiable. Prior to promulgation, these laws and minimum emission standards were negotiated over many years with polluting industry. Since then, not only has industry been granted enormous leniency in relation to these laws, but it has succeeded in significantly weakening some of them.

In our letter to this Forum of 8 September 2022, we set out our clients' demand for clear and strict timeframes for this process. Given the urgency of the need to address the ongoing rights infringements, resulting ill-health and deaths, which are caused by the unacceptable levels of air pollution from persistent non-compliance with MES at a number of the facilities to be considered in this process, we asked that the work of this Forum be undertaken as expeditiously as possible. This, in circumstances where compliance with MES would play a major role in reducing high levels of air pollution and make a significant contribution to remedying the breach of Constitutional rights, and in circumstances – such as the AMSA case – where an appeal decision is already woefully overdue (by more than a year) in terms of the legislated time periods."

Furthermore, the CER summarised its grounds of appeal in relation to the decisions granted in favour of Eskom. It also explained that it would not give further information in respect of the grounds related to AMSA's application, because of the review proceedings launched by AMSA due to the Minister's decision to suspend the appeal process pending the outcome of the Forum's processes.

The third engagement was held on 6 April 2023. At this meeting, the Forum presented the matrix of criteria the members developed to assess each appeal. At this meeting, the CER:

- Stated that the Forum ought to consider a cost benefit analysis because it did not trust the modelling undertaken by government. Furthermore, the modelling must take into account the '*deadly air case'* judgment.
- Enquired whether the Forum would consider pollution at a plant level and mitigation measures. The Forum's response to this enquiry was in the affirmative and it further indicated that it was looking at abatement technologies and would interrogate Eskom's offset project.
- Indicated that the consultations should have included discussions regarding the health implications of air pollution. Further, that Eskom must consider renewable energy as opposed to relying on coal and gas. In addition, it highlighted that communities did not understand some of the issues discussed during the public consultation process.

The fourth engagement was held on the 27 June 2023 regarding the CER's proposal on mitigation measures to reduce emissions. Mr Brandon Abdinor from the CER presented on the following:

- Firstly, he contextualised the issues around mitigation. He stated that the findings and ideas related to potential mitigation strategies that could be prescribed to reduce the impact of non-compliance with the MES. He added that these measures are formulated in the context of the Kusile power station and were not intended to provide an *"out"* for Eskom to comply with the law.

- He discussed the notion of a *"meaningful and effective health impact mitigation programme"*. He indicated that this would, for example, include mobile clinics for diagnoses; outreach programmes in the form of education and orientation sessions; securing formal collaboration with the public health sector and other necessary decision-makers to support the genesis and operation of the mobile clinics; and ensuring targeted critical respiratory-related care and services to affected individuals that do not have access to adequate healthcare.

- He outlined a couple of concerns emanating from communities. These were that "*individuals in the area derive very little adequate healthcare from the public health system, local clinics are ill equipped to diagnose and treat sufferers of respiratory ailments, community members most often feel left to fend for themselves against harms that they have no control over".*

- He provided a number of additional solutions which included the establishment of a register of health cases caused by air pollution and the appointment of dedicated liaison personnel within the public health sector. Furthermore, he was of the view that the National Department of Health must be involved in research projects that seek to determine the health impacts caused by non-compliance with the law.

- In addition to the meetings, the NECA Forum addressed questions to and requested clarity on certain aspects of its submissions from the CER. Below, we summarise the Forum's questions to the CER.

In response to whether the CER considered the socio-economic impact on communities should power stations shut down and how any adverse impact could be mitigated, the CER stated that,

> "● *Continued running of polluting coal plants in non-compliance with the law and to the detriment to surrounding communities is arguably not the most sensible route to creating employment. Communities should not have to choose between their health and employment.*
>
> ● *Although we recognise that there are socio-economic implications related to the closure of the coal plants, it is also imperative that Eskom and industry comply with health standards that protect communities and are essential for guaranteeing the constitutional right to a safe and healthy environment. Eskom and the government have had 15 years to comply. Their negligence and inaction should not be rewarded by allowing them to further harm communities.*
>
> ● *It is worth also pointing out the adverse socio-economic impacts of coal plants that continue to operate in non-compliance with emission standards. In this respect, we are referring to the external costs associated with Eskom's air pollution, which are borne by people living in the vicinity of the power stations, and by the government."*

In response to how to address and mitigate the reduction of electricity generated due to the shutting down of power stations and the installation of abatement equipment to reduce emissions, the CER stated that it was not an expert in the technologies used to remove emissions nor waste disposal. In this regard, the CER referred to the recommendations made by the panel appointed by government to look into SO_2, *"which lists one of the disadvantages of Wet FGD as a parasitic power use of 1-2% of the rated output of the boiler*". In addition, it stated that, *"it is inappropriate for us or our clients to propose solutions to a problem Eskom has created and perpetuated for itself - a problem it has known about (with our clients' warning) since 2010. Eskom should utilise the opportunity to bring clean renewable energy alternatives online urgently.".*

The Forum asked whether the CER considered the impact of (a) increased water consumption and supply; (b) the sourcing and tracking of lime feed and gypsum; and the environmental impact of (a) and (b) in the removal of SO_X. The CER reiterated that it was not an expert in the technologies used to remove emissions nor waste disposal. It further stated that, "*it is important to point out that there are technologies to abate SO2 that use fundamentally less water. It is well established that the reduction of air pollution at coal plants through pollution control technologies comes with other environmental risks to water, soil and climate, but that does not negate the legal and moral obligation to reduce air pollution*.".

In relation to its view on job losses as a result of implementing the JET Strategy, the CER stated that it was not an expert in this area however that, "*it is inevitable that coal is on its way out. It is too costly and too harmful to health and climate change. It is our responsibility, both as environmental justice organisations and as attorneys on behalf of our community clients, to defend their rights, their health and their wellbeing from coal pollution*.".

In relation to a question about re-skilling people that worked in the coal sector, the CER indicated that, "*The Just Transition Implementation Plan should outline detailed plans for a diversified economy and identify sectors requiring skilled workers. Reskilling should start long before coal-powered PS are retired as is similarly required by Social and Labour Plans in the coal mining sector. To determine reskilling requirements, existing skills need to be defined and career and employment paths need to be identified… Partnerships need to be established with the Sector Education and Training Authorities (SETA's) and institutions of learning to assist with reskilling costs as well as with potential employers to assist with the transition"*.

The CER strongly disagreed that offsets could improve the overall AAQ. It stated that it had no objection "*to measures being taken to supply households with cleaner energy sources, but this can in no way replace current regulatory and legal requirements. Reducing indoor pollution from cooking and heating should be done in addition to, not instead of, reducing outdoor air pollution*". In addition, it stated that there was no legislative framework for offsets and that, "*there are a number of potentially significant risks associated with the use of air quality offsets that could, amongst others, result in ongoing non-compliance and exceedances of air quality standards to the detriment of the public as a whole.*".

10.6.4. Engagements with other Civil Society Organisations

The first meeting was scheduled for 10 November 2022, but had to be postponed due to a low turn-out. Following this, the Forum was advised that certain persons, to whom email invitations were sent, had left the organisations.

Due to the low turn-out at the first meeting, the HNM Team requested the CER and civil society organisations to extend the invitation to other organisations that would be interested in the subject matter.

Having sent additional invitations and reminders for the meetings, the NECA Forum managed to convene two meetings with civil society organisations. A list of the meetings convened with the civil society organisations are set out hereunder (Annexure 17D).

Date	Descriptions
10 November 2022	A meeting was convened however, due to low turn-out the meeting had to be postponed.
24 January 2023	A second meeting was held between the Civil Society Organisations and the NECA forum, and a request was made to convene another meeting.
14 February 2023	A third meeting was held between the Civil Society Organisations and the NECA forum.

10.6.4.1. Summary of the discussions with other Civil Society Organisations:

At the engagement held on 24 January 2023, the Forum presented its TOR and informed attendees that the public consultation process was undertaken between 11 and 24 November 2022. In addition, the organisations were also informed that the public hearing that was

scheduled to take place in Kriel, on 16 November 2022, did not proceed and that one would be arranged at a later date.

The civil society organisations enquired, amongst other things, whether:

- the DMRE could attend future meetings because some of the emissions emanated from mining activities;
- the air quality regulations had been revised to include penalties for failures, by emitters, to prepare, submit and implement air quality management plans; and
- the health impact analysis would look into communities that suffer from chronic illnesses.

Furthermore, one of the attendees was concerned about the lack of attendance by community-based organisations and stated that these organisations encounter various challenges regarding access to information.

In response to the issues raised at the meeting held on 24 January 2023, members of the Forum stated that they would look into a variety of factors linked to health and planned to meet with other departments and stakeholders. They stated that the DFFE had not finalised the air quality regulations.

At the engagement held on 14 February 2023, the organisations raised the following:

- Issues of transparency and the disclosure of documents by the Forum;
- The lack of awareness about the consultation process;
- Concerns that many of the Forum members did not attend the meeting;
- That the Minister's hands were tied because she has no option but to comply with the law;
- Confirmation of their support for the submissions made by the CER to the Forum; and

- A request that the Forum consider implementing additional monitoring stations in Saldanha Bay.

10.6.5. Engagements with the National Departments

The first meeting with the national departments was convened on 30 November 2022 however, due to a low turn-out, it was agreed that the NECA Forum would convene another meeting. The meeting was attended by officials from the Department of Trade Industry and Competition; the Department of Health and the Department of Human Settlements.

In view of the above, several emails were addressed to the DFFE requesting that it provide updated contact details for the national departments.

The NECA Forum managed to convene another meeting on 30 March 2023 with some of the national departments such as the Department of Human Settlements and the Department of Agriculture, Land Reform and Rural Settlements. However, the turn-out was still low. No substantive discussions took place in this regard and further, the national departments requested more time to review the TORs and potentially revert to the Forum with their submissions.

It should be noted that the Chairperson of the Forum engaged with the Director-General of DFFE, Ms. Nomfundo Tshabalala to request the assistance of her office in arranging meetings with certain departments as the responsibility for arranging meetings lay with the DFFE. Notwithstanding clear interventions, the attendance of meetings by certain departments was low.

Date	Descriptions
30 November 2022	An introductory meeting between the National Departments and the NECA Forum to discuss the TOR was held.

24 January 2023	A meeting was organised but had to be cancelled because of low attendance.
30 March 2023	A second meeting between the National Departments and the NECA Forum was held.

10.6.6. Engagements with Municipalities

The Forum convened a meeting with municipalities on 10 November 2022.

Concerns raised by the municipalities included their lack of awareness regarding their role, in particular, whether they were expected to enforce the regulations or hold back to allow the NECA Forum to fulfil its mandate.

In addition, other concerns raised included clarification regarding the Forum's mandate and whether the municipalities could assist the Forum in providing databases containing information of I&APs.

10.6.7. Engagements with the Presidential Climate Commission

The Forum met Dr Crispian Olver ("**Dr Olver**"), the executive director of the Presidential Climate Commission ("**PCC"**), on 13 October 2022. The purpose of the meeting was to discuss the method used by the PCC to conduct its public consultation process to enable the NECA Forum to gain a better understanding of the process, as it was required to undertake a similar process.

Dr Olver indicated that the PCC procured the services of an entity, OneWorld, to manage all the logistics related to the process. He further stated that the PCC consulted various stakeholders and the engagements were streamed live on various media platforms.

He explained that the role of the PCC was to try to forge a consensus regarding the JET. It was agreed that the Forum's role was different because its consultation process was limited

to the appeals and applications submitted by emitters, civil society and other organisations in respect of specific power stations and facilities.

The second engagement, held on 5 December 2022, was with Mr Steve Nicholls, the Head of Mitigation at the PCC, regarding power sector modelling. A third engagement was held on 09 November 2023, with Mr Nicholls, regarding loadshedding.

In addition, the PCC responded to various points of clarity raised by the Forum. In a letter to the PCC, dated 15 December 2022, the Forum stated that it was reported that about 3000 jobs would be created for every job lost in the coal sector due to the implementation of the JET.

In addition, the Forum requested the PCC to:

- Quantify what the change in unemployment will be in the HPA and WBPA, if the MES regulations were applied.
- Indicate whether there will be any lag between when jobs are lost and when they are created, and how many months/years the lag would be.
- Provide an estimate of direct, indirect and induced job losses in the coal sector when power stations shut down.
- Indicate what type of re-skilling would be required for employees in the coal sector to get new jobs.

The PCC responded by stating that, *"The 11 industries most affected by the low-carbon transition in SA could expect to lose about 302,000 direct jobs but gain as many as 815 000 direct jobs over the same period. Assuming a job multiplier of 2, about 0.6 million jobs while 1.6 million jobs will be lost. In addition, the PCC has cited studies from the National Business Institute (NBI) and the CSIR indicated that while employment in the coal sector will decline, employment will increase in new energy industries.".*

The PCC stated that the employment strategy of the PCC which was still being developed, but that it "*seeks to mitigate job losses and positively impact communities by identifying all sustainable livelihood activities within communities that are directly impacted by the JET."*

The PCC indicated that whether new jobs will be created will depend on the scope of the JET. Citing the study from the World Bank CCDR titled "*South Africa Country Climate and Development Report*", the PCC stated that jobs could be lost in the chemicals, other petroleum, coal, and electrolysis sectors. It added that this will likely impact Mpumalanga and Lephalale. However, jobs will be created in the fuel cells, hydrogen, electric machinery, other metal ores and platinum group metals sectors. The PCC stated that it was difficult to predict how many jobs would be created as this would also depend on a range of policies and the implementation of such polices.

The PCC stated that Eskom indicated that,

> *"the impact studies are in progress with only Komati Power Station having been completed. Based on options for repowering and repurposing of the Komati Power Station sites with solar PV wind energy, battery storage synchronous condenser and containerised microgrids, about 8 700 temporary jobs supported by construction, including 2,200 created on site over 5 years (53% of losses mitigated) and a further 2 150 sustainable jobs could be created once all projects are operational (incl. 660 direct jobs) (52% of losses mitigated)."*

The PCC also stated that despite having started working on possible re-skilling of people, it did not have any explicit data. However, the PCC stated that the SANEA Energy Skills Roadmap provides information on new skills and competencies that could be required in the energy sector. The PCC added that the CSIR Research on Skills for JET speaks to the skills requirement (upskilling and reskilling) for the Renewable Energy sector.

The PCC stated that 46% of South African exports are at risk if South Africa does not de-carbonize. Therefore, it emphasised the importance for the country to achieve a net zero economy.

10.6.8. Engagement with Port Rex Appellant

The NECA Forum engaged Mr Rivalora on 11 November 2022 regarding his appeal against the NAQO's decision to grant Eskom a postponement in relation to complying with the MES at Port Rex.

Mr Rivalora informed the Forum that, due to prior commitments, he was unable to attend the public meeting scheduled for 16 November 2022 and undertook to send his input by email.

Mr Rivalora submitted written representations via email on 11 November 2022. A copy of the email is attached hereto marked annexure 19. His email stated the following:

> *"Airshed Report*
>
> - *The Airshed report is dated August 2020 and should perhaps be updated to reflect additional and more recent historical and not only data that is older than 3 years*
> - *The Airshed report fails to identify surrounding industrial activities where air quality is important in terms of particulate emissions and potential for acid rain*
>
> *Emissions*
>
> - *Whilst the power station is small and quantitatively speaking emissions are not in the bigger scheme of things as severe as in larger generating units the following are not being considered:*
> - *Noxs have both ozone depleting and global warming potentials (GWP of app 300) in the atmosphere with and estimated half-life of between 100 and 150 years. Certain Noxs can combine with water and produce acid rain*
> - *SO2 contributes to global warming and combines with water vapour produces acid rain*
> - *The precipitation of excess particulate matter has a negative effect not only on human spaces but also on the surrounding industries and industrial processes*

Mitigation and Amelioration Measures

- *There is little or no mention of available or optional mitigation and/or amelioration measures which entail:*
- *Additional flue gas scrubbing systems*
- *Additional flue gas filtration systems*
- *Changing fuels or blending fuels with low or zero sulphur content*
- *Burning fuels with low or zero sulphur content*
- *Modifying the fuel combustion process and the controls of the fuel combustion process to reduce the emission of Noxs*
- *Reducing the horizon of the application to a maximum of 5 years".*

10.6.9. Engagements with Sasol

The NECA Forum convened two meetings with Sasol. The first engagement took place on 6 December 2022. The Forum presented its TOR and explained the various engagements that were conducted with other stakeholders and I&APs.

Date	Description
06 December 2022	Introductory meeting held between Sasol and the NECA Forum.
05 July 2023	Meeting held between Sasol and the NECA Forum regarding Sasol's application in terms of section12A of the NEMAQA.

Summary of the discussions with Sasol

Sasol welcomed the opportunity to present its decarbonisation strategy and how it planned to improve the quality of ambient air in its areas of operations. However, it informed the Forum that the discussion regarding its position on air quality management must proceed on a without prejudice basis.

Sasol explained that its decarbonisation approach on the just energy transition in the short to medium-term includes assessing and defining interventions that could be adopted to reduce GHGs emitted from its plants. In addition, it stated that its medium to long-term goal is to transform its operations by replacing coal as the primary source of its production process.

Moreover, Sasol informed the Forum that it has ensured that it is largely compliant with the MES by focusing on its air quality improvement roadmap, which it hoped will be fully implemented by 1 April 2025, in line with the postponement granted.

Sasol indicated that it had identified a feasible method to comply with the standards by integrating the reduction of GHGs and SO_2 in its boilers. It also added that it has significantly invested in air quality offset programmes.

Regarding whether the Forum would be considering Sasol's application, the Forum clarified that, at that stage, its application and appeal was not part of the Forum's scope of work.

A summary of the Forum's questions and Sasol's responses thereto are set out below.

The Forum enquired about the following:

> *"MES regulations relate to the concentration of pollutants which a process may emit. The limits are the same irrespective whether the point of emission is at altitude (top of a stack) or at ground level. The point of emission impacts the dispersion of the pollutants and the resulting AAQ. The Forum would like to understand Sasol's view of the merits of having different MES limits dependent on the height of the point of emission.*
>
> *Sasol has highlighted an integrated air quality and GHG strategy. Sasol has mentioned that SO2 remains a challenge and a Clause 12A application has been submitted to the*

DFFE to enable SO2 compliance for Sasol post 2025. Due to the integrated nature and complexity of the Sasol operations, shutting down the Steam Plant due to SO2 MES non-compliance could potentially result in a shutdown of the Secunda facility. It is noted that engagements were historically held with the previous NAQO, who has subsequently moved to the Presidential Commission on Climate Change. Has Sasol had a discussion & engagement with the new National Air Quality Officer and on the current Clause 12A application?

Sasol has mentioned "applying a wider lens to available legal mechanisms". There may be mechanisms outside of the "current" MES legal framework that allow for the principle of "flexibility with accountability" that enables sustainable air quality improvement aligned to the National Environmental Management Act 107 of 1998. Can Sasol please elaborate on the above."

A summary of Sasol's response is set out below:

- Sasol stated that the MES are too rigid in that they do not allow for specific/unique conditions of a plant/facility to be taken into consideration. Further, the MES do not consider any of the conclusions from relevant atmospheric impact studies that could provide insight into how these unique conditions within its operations impact on AAQ.

- Sasol suggested that South Africa could adopt engineering practices (GEP referred to in the United States Environmental Protection Agency). The Clean Air Act 42 U.S.C. 7401 et seq. (1970) specifies the requirement regarding the height of stacks. Sasol explained that the GEP stack height requirement is designed and imposed to ensure that emissions from a stack do not result in excessive ambient concentrations due to aerodynamic effects from nearby structures or terrain features. Sasol indicated that dispersion results from taller stacks are considered when evaluating the impact of emissions on communities. These evaluations are similar to atmospheric impact assessments as provided for in NEMAQA and applicable regulations. Sasol stated that if these conditions are met, the facility may apply for a higher emission rate.

- Sasol indicated that it had numerous engagements with the NAQO, Dr Patience Gwaze, since she took office in April 2022. It stated that the nature of these engagements ranged from ongoing air quality performance and associated challenges. It reiterated that it would continue to engage Dr Gwaze and her office in relation to the intended amendments to the MES and the regulatory developments regarding the HPA and the associated Air Quality Management Plan.

- In addition, it stated that following an invitation, Sasol presented its air quality compliance journey and GHG reduction progress to the Parliamentary Portfolio Committee on the Environment, Forestry and Fisheries ("**PCEFF**").

- Sasol was of the view that a "*wider lens approach*" is required to address the way air quality is regulated and managed in the country. It stated that this approach *"would, through the regulatory framework, allow existing and mature plants to improve ambient air quality progressively and sustainably, with due consideration of the integrated nature of its operations and associated emissions footprint".*

- Sasol stated that tangible AAQ can be achieved through an approach which leverages a variety of air quality management tools in a flexible manner. It stated the following in relation to adopting a rigid concentration limit:

  "The unintended consequence of adopting only a rigid concentration basis for the MES is that sources with a negligible impact on ambient air quality can trigger a Listed Activity, thereby subjecting the source to application and adherence to the MES as per the various listed categories. In our view, these small sources should not, as a consequence, be subjected to costly and unjustifiable abatement, given the requirement to achieve minimum emission limits applicable thereto. The application of the duty of care (as provided for in section 28 of NEMA) or via designating these as declared emissions as provided for in the National Environmental Management: Air Quality Act, to manage emissions of these sources, for example, provides fit for purpose flexibility as opposed to relying solely through a system which is exclusively dependent on regulation of point source emissions through standards."

- Sasol suggested pollutant loading as a way of measuring air quality when evaluating an airshed. In addition, reliance on pollutant loading as a mechanism to demonstrate compliance with the MES would enable flexibility with the necessary accountability in achieving regulatory air quality improvement objectives.

10.6.10. Engagements with Trade Unions

The NECA Forum convened three meetings with trade unions. Invitations were sent to members of the varying trade unions (Annexure 17D). The first meeting, held on 21 February 2023, was attended by representatives from United Association of South Africa ("**UASA**") and the National Union of Metalworkers of South Africa ("**NUMSA**").

The meeting scheduled for 4 April 2023 was cancelled due to the unions having another engagement at the National Economic Development and Labour Council ("**NEDLAC**").

The next meeting, held on 16 March 2023 was attended by the Congress of South African Trade Unions ("**COSATU**"); the National Union of Mineworkers ("**NUM**"); Solidarity and the South African Equity Workers Union ("**SAEWU**"). For the benefit of the unions that were unable to attend the first meeting, the Forum again presented its TOR.

Date	**Trade Unions**
21 February 2023	Introductory meeting between the Trade Unions and the NECA Forum held.
16 March 2023	Second introductory meeting between the Trade Unions and the NECA Forum held.
04 April 2023	Meeting cancelled due to a NEDLAC conference.
18 April 2023	Third meeting between the Trade Unions and the NECA Forum.

15 May 2023	Fourth meeting held between the Trade Unions and the NECA Forum cancelled due to Eskom/ Union wage negotiations.

Summary of the discussions with the trade unions

The unions enquired into whether appeals had already been submitted by emitters. The Forum confirmed that this was done.

In addition, the unions asked the Forum's view on socio-economic issues as well as whether there are socio-economic studies that the Forum considered. In response, the Forum indicated that it was developing a matrix which would consider a range of issues, including socio-economic matters.

In response to a question regarding power sector modelling, the Forum informed the unions that the CSIR was the appropriate public sector organisation with the capability and capacity to undertake the process. The Forum added that the modelling only focused on matters that could occur in the future.

The trade unions requested the Forum to convene more engagements. They were concerned that representatives from organised labour were not at the meeting. The unions indicated that it was important for labour to attend the meetings because they needed to understand what was happening at plant level.

Other concerns noted with respect to pollution included what additional mitigation and prevention measures could be implemented to alleviate pollution and address the effects thereof.

In response to a question from the Forum, the unions indicated that some work was done regarding remedial measures and programmes or opportunities to address workers' needs in relation to air quality in specific areas. However, they stated that the work done was not adequate and more was required.

A further meeting was held on 18 April 2023 and was attended by representatives of NUMSA, Solidarity and the UASA. Concerns were raised about the type of documentation, information

and studies the Forum was relying on as some resources could be biased and not peer reviewed. Most of the meeting focused on the NECA forum's presentation of the matrix as well as a submission from NUMSA regarding its position on compliance with the MES.

NUMSA stated, amongst other things, the following:

- It fully supports that emitters must comply with the MES as this will result in an environment that is not harmful to the health and well-being of people.
- Compliance must be enforced in the light of the cost implications and at a reasonable pace considering South Africa's unique circumstances, such as load shedding.
- Compliance with the MES will result in stage 8 load shedding for every hour the units are down and stage 15 in 2025. This would adversely affect South Africa's GDP and will have a severe impact on Eskom's assets and revenue, which will result in widespread job losses due to retrenchments.
- Given the MES compliance timelines, the cost of retrofitting most plants will constitute fruitless and wasteful expenditure.
- Furthermore, load shedding will negatively impact access to healthcare and childrens' rights to education.
- In view of the above, compliance with MES must be balanced against the unintended consequences of shutting down coal-fired plants and the infringement of certain constitutional rights.

In addition, the UASA undertook to share information with the Forum. In this regard, the UASA addressed an email to the Forum on 31 March 2023 and attached to the email was a document, titled *"SEIFSA Load Shedding Impact Assessment on the Metals and Engineering Sector" ("***assessment report**"), prepared by the Steel and Engineering Industries Federation of Southern Africa ("**SEIFSA**"). The assessment report states that,

> *"The energy crisis that is gripping South Africa presents the most significant risk and binding constraint to the economic prospects of the country. The crisis not only has implications regarding the investment prospects of the country. The crisis has been*

particularly damaging on the metals and engineering sector, a sector which is the backbone of industrialisation and to which electricity, particularly baseload electricity, is fundamental to its survival.

Employment:

- *The employment losses, mostly attributable to companies responding to the energy crisis over the reference period, indicate some very concerning trends.*
- *A quarter of companies indicated that they have had to reduce head count in response to the electricity crisis, by as much as a quarter of their employment, equating to 9 432 people.*
- *A third of the sample indicated that they are working short-time due to the electricity crisis.*

Production:

- *The respondents to the survey indicated production declines as much as 34.2% (weighted) as a result of the electricity crisis.*
- *Based on the model in the table below, SEIFSA has calculated that production 1: in the sector is estimated to contract by 2.2% in 2023.*
- *However, factoring in the results from this survey, the forecast for the 2023 year deteriorates to - 5.3% for the 2023 year.*
- *Over the last 15 years, net-investment into the sector has been on the decline, which has led to the value of fixed capital stock deteriorating at -0.3% (CAGR), threatening the competitiveness of the sector.*
- *It is therefore concerning that 42.6% of companies have indicated that they have cancelled investment and/or expansion plans owing to the uncertainty presented by the electricity crisis.*
- *The value of these investments amounts to R2.64 billion with the potential of creating 1620 new jobs. The split of the nature of investment is included below.".* (sic)

In addition, Solidarity submitted its written representations dated 23 May 2023 and again, these are addressed substantively in this report at paragraphs **xx.** Solidarity stated the following:

> *"Solidarity is of the view that consideration relating to these exemptions need to strike a balance between what is best for workers, communities and the environment. The principle of zero harm should serve as a guideline in this instance. Short-, medium- and long-term focus on zero harm require a step approach which means that some objectives will be prioritized in the interim with a clear road map to achieving the end goals later on.*
>
> *The challenge in this situation is to manage the current crises, stabilize companies and the economy, manage current environmental hazards to which communities are exposed to and to build a path for a cleaner future. This requires sober engagements and a fair balance between saving lives, livelihoods and ensure the sustainability of the environment and a company. All are equally important.*
>
> *Solidarity is a registered trade union organizing in the energy, coal and mining sectors. Solidarity supports the call to move away from carbon intensive and pollutant heavy forms of energy generation and economic productivity to clean energy.*
>
> *Workers in the energy, mining and coal industries have long felt the cost of pollution to their physical well-being. They also live in communities that are heavily impacted by the high emission levels residents are exposed to.*
>
> *Many South Africans die prematurely or attract lung illnesses consequently. Clean energy offers a solution to move away from such pollution heavy ways of energy generation and economic productivity.*
>
> *South Africa's JET however combines not only the need to tackle the climate change crisis, but also an energy generation deficit and a high unemployment*

rate. All three are existential crises for workers, the economy, and the state. All three must be tackled simultaneously.

The economy is still battling to recover and emerge from Covid-19, the lockdown and a recession, a high unemployment rate, a decade of state capture and corruption that has crippled Eskom and many other state institutions.

Solidarity reluctantly agrees with the motivations provided by the various companies for exemption and propose that planning and steps to address the outstanding environmental requirements be incorporated as part of the exemption in the form of reciprocal commitments. This is not a decision we take lightly. But one we feel is necessary to save livelihoods and lives.

Whilst there are serious job security risks if the exemptions are not approved, the economy will continue to bleed from rampant and growing levels of loadshedding, thousands of companies will close and many more thousands of jobs will be lost, and tax revenues to fund public services will be lost.

Solidarity supports the granting of the exemptions for the requested timeframes.
Whilst supporting the temporary exemptions, urgent steps are required to minimise the negative impact the emissions have on workers and communities." (sic)

The fourth meeting between the trade unions and the NECA Forum was scheduled for 15 May 2023. However, due to NUMSA's ongoing wage negotiations with Eskom, the meeting was postponed to another date.

10.6.11. Engagements with Business Organisations

The Forum engaged business organisations namely, Business Unity South Africa, Business Leadership South Africa and the Minerals Council of South Africa (collectively referred to as "Business") on 16 February 2023. Invitations were sent to all major business associations

however a number of business organisations did not respond to the invitation. Meeting invites and minutes of the meetings are attached hereto as Annexure 17D.

Business enquired into whether the Forum would hold themselves accountable to South Africa's international commitments and asked who was representing affected communities. In response, the Forum indicated that accountability to international commitments rests with the DFFE and the DIRCO. In addition, the Forum explained that communities were represented by community organisations and political parties in the public consultation meetings. Business Unity South Africa confirmed that they would make a submission to the Forum. The submission from Business Unity South Africa was never received by the Forum.

10.6.12. Engagements with the South African Local Government Association (SALGA) and Members of the Executive Council responsible for the environment in the provinces (MECs)

The NECA Forum attempted to convene meetings with the MECs to be held on 20 May 2023 and SALGA, to be held on 25 May 2023. Both meetings were cancelled due to a lack of availability on part of the MECs and SALGA.

In view of the above, the Forum requested the DFFE to arrange other meetings. The Forum planned to meet the MECs and SALGA separately. However, SALGA was unable to attend the meeting scheduled for 13 July 2023 and, instead, attended the meeting held on 6 July 2023. A copy of the agenda and invitation is attached hereto as annexure 17D.

The MECs were unable to attend the meeting. However, they were represented by officials from their respective provincial departments. The meeting was attended by SALGA, the Gauteng Department of Agriculture and Rural Development ("**GDARD**") and the Limpopo Department of Agriculture and Rural Development ("**LDARD**"). A further meeting was unable to be arranged with the remaining MECs. The available meeting invites and minutes of the meeting are attached hereto as Annexure 17D.

Date	**Description**
20 May 2023	Introductory meeting between the MECs and the NECA Forum scheduled but postponed due to a lack of confirmation.
25 May 2023	Introductory meeting between SALGA and NECA Forum scheduled but postponed due to a lack of confirmation.
06 July 2023	Introductory meeting between SALGA, the MECs and the NECA Forum held.
13 July 2023	Further meeting between SALGA and the NECA Forum was cancelled due to a lack of availability from SALGA.

Summary of discussion

The meeting was introductory in nature and during the meeting, the Forum presented its TOR.

Mr Losiyo Mkwana ("**Mr Mkwana**") from the GDARD asked whether the Forum's work would include proposing solutions to Eskom. Mr Mkwana also asked what the extension of the running of the power stations would mean for the country's future CO_2 emissions. He added that although there were no power stations in Gauteng, people in the province are affected by emissions coming from the Vaal and Mpumalanga.

The Forum's Chairperson confirmed that the Forum would propose solutions for Eskom to consider.

Ms Tlouane from the LDARD stated that she supported the process. She also acknowledged that the Forum had a tough task because they must formulate solutions that balance peoples' health and the economy.

Due to the fact that the other MECs, as well as their representatives, were not present at the meeting, the DFFE undertook to arrange a second meeting.

In addition to the above, NECA Forum members also met with various stakeholders to gain a better understanding of analytical and technical aspects relevant to their work. Details of these meetings are set out below.

Date	Organisation	Description
31 October 2022	Meridian Economics	Meeting with Dr Peter Klein from Meridian Economics regarding the feasibility of rolling out of renewable energy.
30 January 2023	The South African Photovoltaic Association ("**SAPVIA**")	Meeting to discuss the speed at which new Photovoltaic (**PV**) plants could be installed in South Africa Part 1.
1 February 2023	SAPVIA	Meeting to discuss the speed at which new PV plants could be installed in South Africa Part 2.
16 February 2023	SAPVIA	Continuation of the discussion with SAPVIA.
24 April 2023	The Carbon Trust	Meeting to discuss the Coal Asset Transition Accelerator - Presentation on the preliminary modelling and framework results in relation to the early phase out of coal-fired power plants in South Africa.

10.6.13. Meeting with National Treasury

In terms of its TOR, the NECA Forum was required to consult with National Treasury. Having been unsuccessful in previous attempts to arrange a meeting with it, the NECA Forum requested that the DFFE arrange a meeting with National Treasury on its behalf. The DFFE, on or around 01 November 2023, informed the NECA Forum that they were successful in their attempt to arrange a meeting and scheduled the meeting for 14 November 2023. The available meeting invite and minutes of the meeting are attached hereto as Annexure 20.

Summary of discussion

The Forum presented its TOR to National Treasury. The discussion largely revolved around the accessibility of the VGBE report, the feasibility of imposing a carbon tax on particular emitters, the imposition of levies/trading schemes on emitters, conditionalities on capital spend and, lastly, issues relating to the Public Finance Management Act 1 of 1999 and imposing potential conditions on emitters. The Forum requested a further engagement with National Treasury around the feasibility of imposing air emission taxes and levies, without response.

10.7. Summary of Stakeholder submissions

The Forum received a number of written submissions from stakeholders as part of the public participation process. What follows, is a summary of each, in no particular order.

10.7.1. CER's Submission on behalf of groundwork and Earthlife Africa dated 31 January 2023 (Annexure 21)

Background

On or about 9 February 2022, the Centre for Environmental Rights on behalf of groundWork and Earthlife Africa ("**CER**") appealed the decisions of the NAQO in respect of the following Eskom plants ("**the appeal**") (Annexure 7):

- Camden;
- Hendrina;

- Arnot;
- Komati;
- Grootvlei;
- Kriel;
- Majuba; and
- Tutuka.

The CER's stance is that *"insofar as Eskom's compliance with the MES is concerned, the law is clear on Eskom's legal obligations in relation to the applicable standards…and compliance with the law is not negotiable*."

The Applicable Legal Requirements

According to section 49 of NEMAQA, in order to establish whether a person is "*fit and proper*" for the purposes of granting them an AEL, the licensing authority must consider whether such person has contravened or failed to comply with the provisions of the NEMAQA or any other legislation applicable to air quality. Notably Eskom has a history of contraventions of the NEMAQA and would not qualify as a fit and proper person for the purposes of being granted an AEL.

In terms of paragraph 5.4.3.4 of the National Air Quality Framework ("**Framework**"), "*Eskom may not lawfully apply for postponements, suspensions, or alternative emission limits, unless and until the ambient air quality within the area where a power station is located, is compliant with the NAAQS*". This is not the case for many of the plants in question and therefore Eskom's applications, in respect of these plants, should be summarily rejected.

The legal requirements as set out in NEMAQA, the Framework and the List of Activities are as follows:

- "*Existing plants had to comply with more lenient standards by 1 April 2015 and they had to adhere to stricter new plant standards by 1 April 2020, subject to successful applications to postpone or suspend compliance where the explicit criteria for these applications have been satisfied*";

- In limited circumstances, only one postponement, per pollutant, is permitted for the 2020 MES, and such postponement may not extend beyond 5 years;

- Emitters may not lawfully apply to postpone or suspend their compliance with the MES unless and until the ambient air quality within the three priority airshed areas where their power stations are located are in compliance with the NAAQS;

- "*A facility that will be decommissioned by 31 March 2030, may apply for a once-off suspension of compliance with new plant MES, provided the application is accompanied by a detailed decommissioning schedule*";

- "*Alternative emission limits that are weaker than the existing plant MES, may not be considered, let alone granted*"; and

- "*An application for an alternative limit to a new plant standard must demonstrate a previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards, and there must be compliance with the NAAQS in the area for pollutant or pollutants applied for*".

"The law is patently clear that alternative emission limits that are weaker than the existing plant MES, may not be granted."

The High Court judgment of *Groundwork Trust and Another v Minister of Environmental Affairs and Others [2022] ZAGPPHC 208* confirmed that government is in breach of peoples' section 24 and other Constitutional rights in the Highveld Priority Area.

The laws, referenced above, were put into place to protect public health and Constitutional rights.

Eskom power stations are responsible for the “lion’s share” of air pollution within the Highveld Priority Area.

The section 3A consultative process

The section 3A consultative process must be conducted with the following minimum requirements:

- Transparency – stakeholders must have access to all relevant records, documentation and minutes of the Forum’s consultative meetings;
- Clear and strict timeframes in respect of the Forum’s work;
- The applicable legal requirements and appeal processes cannot be forfeited or prejudiced – the CER has a right to be notified of Eskom’s appeal, provided with the appeal and be given an opportunity to respond to it. In addition, the status, process and timeframes going forward for Eskom’s current and latest updated MES application are ambiguous. The CER has written to the Department regarding these issues but has yet to receive a response.
- The CER maintained the stance that the NAQO’s decisions to grant postponement of compliance to the Majuba, Kendal, and Tutuka “midlife” power stations, and suspensions of compliance to the six “old” stations in the absence of detailed and clear decommissioning schedules, are contrary to, inter alia, the amended List of Activities, the 2017 Framework, NEMA, and the Constitution.

CER’s Eskom Appeal Submissions

The CER has argued that “*along with the criteria that the area in which a station is located must be in compliance with the NAAQS, the 2017 Framework also requires Eskom to demonstrate that its emissions are not causing direct adverse impacts on the surrounding environment. We submit that,…Eskom was unable to satisfy this specific requirement in its applications*” in respect of the 8 power stations forming the basis of its appeals.

Generally, the CER argued that Eskom has been unable to demonstrate, in its applications, that its emissions are not causing direct adverse impacts on the surrounding environments.

The CER appealed the following aspects of the NAQO's decisions in respect of the below listed power stations:

Camden

"The Decision to grant suspension of compliance for…Camden power station without [a] detailed and clear decommissioning schedule accompanying the application", which is unlawful in that section 11B of the List of Activities requires a clear decommissioning schedule to accompany any application for suspension of compliance and states that no applications for suspension of compliance shall be accepted by the NAQO after 31 March 2019.

"Eskom ought not to have been granted a suspension of the compliance timeframes in the first case – however since they have been granted [this suspension] in any event, the NAQO ought to have required that Eskom comply with the existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest…"

Hendrina

"The Decision to grant suspension of compliance for…Hendrina power station without [a] detailed and clear decommissioning schedule accompanying the application", which is unlawful in that section 11B of the List of Activities requires a clear decommissioning schedule to accompany any application for suspension of compliance and states that no applications for suspension of compliance shall be accepted by the NAQO after 31 March 2019.

"Eskom ought not to have been granted a suspension of the compliance timeframes in the first case – however since they have been granted [this suspension] in any event, the NAQO ought to have required that Eskom comply with the existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest…"

Arnot

"The Decision to grant suspension of compliance for…Arnot power station without [a] detailed and clear decommissioning schedule accompanying the application", which is unlawful in that section 11B of the List of Activities requires a clear decommissioning schedule to accompany any application for suspension of compliance and states that no applications for suspension of compliance shall be accepted by the NAQO after 31 March 2019.

"Eskom ought not to have been granted a suspension of the compliance timeframes in the first case – however since they have been granted [this suspension] in any event, the NAQO ought to have required that Eskom comply with the existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest…"

Komati

"The Decision to grant suspension of compliance for…Komati power station without [a] detailed and clear decommissioning schedule accompanying the application", which is unlawful in that section 11B of the List of Activities requires a clear decommissioning schedule to accompany any application for suspension of compliance and states that no applications for suspension of compliance shall be accepted by the NAQO after 31 March 2019.

"Eskom ought not to have been granted a suspension of the compliance timeframes in the first case – however since they have been granted [this suspension] in any event, the NAQO ought to have required that Eskom comply with the existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest…"

Grootvlei

"The Decision to grant suspension of compliance for…Grootvlei power station without [a] detailed and clear decommissioning schedule accompanying the application", which is unlawful in that section 11B of the List of Activities requires a clear decommissioning schedule to accompany any application for suspension of compliance and states that no applications for suspension of compliance shall be accepted by the NAQO after 31 March 2019.

"Eskom ought not to have been granted a suspension of the compliance timeframes in the first case – however since they have been granted [this suspension] in any event, the NAQO ought to have required that Eskom comply with the existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest…"

Kriel

"The Decision to grant suspension of compliance for…Kriel power station without [a] detailed and clear decommissioning schedule accompanying the application", which is unlawful in that section 11B of the List of Activities requires a clear decommissioning schedule to accompany any application for suspension of compliance and states that no applications for suspension of compliance shall be accepted by the NAQO after 31 March 2019.

"Eskom ought not to have been granted a suspension of the compliance timeframes in the first case – however since they have been granted [this suspension] in any event, the NAQO ought to have required that Eskom comply with the existing plant MES during the suspension period until decommissioning by 31 March 2030, at the latest…"

Majuba

"The decision to grant Majuba power station postponement of compliance with the NOx new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1300mg/nm3", which is unlawful in that the limit granted exceeds the existing plant standard for NOx of 1100mg/nm3.

The decision is further unlawful in that it is contrary to section 24 of the Constitution as well as the 2017 Framework considering Majuba's location within the Highveld Priority Area.

Tutuka

"The Decision to grant Tutuka…power station postponement of compliance with the NOx new plant standard from 1 April 2020 to 31 March 2025 and directing the station to comply with a limit of 1100mg/nm3…Tutuka power station [is] located in the HPA. This fact alone bars the NAQO from authorizing postponement applications…"

10.7.2. Additional Submissions by the CER to the Forum and DFFE on new reports and information (Annexure 22)

Eskom's Emission Standard Exceedances and Compliance Track Record

Eskom's pollutant emissions from 2021-22 demonstrates the extent of Eskom's high emissions and its inability to comply with even its postponed weak Atmospheric Emission License standards.

National Environmental Compliance and Enforcement Report (NECER) 2021/22

Eskom has a track record of AEL non-compliance, the details of which are set out in the NECER.

Eskom's underestimated and underreported emission exceedances

"*In addition to the non-compliances, Eskom has a staggering track record of exceedances of limits in its AELs – a number of which go unreported and underestimated."*

In this regard, a 2019 report by an air pollution expert demonstrated that between April 2016 and December 2017, 14 coal fired power stations reported 3217 exceedances of applicable daily AEL limits. The two most frequent exceedances occurred at Lethabo (PM and NOx), Matla (NOx), Matimba (SO2), Kriel (PM), Duvha (PM) and Kendal (PM).

In a report titled "*Eskom Power Station Exceedances of Air Emission License Limits and Emission Intensity from April 2021 to March 2022*", the following findings were made:

- "*Eskom's 15 power stations reported 2309 exceedances of AEL limits between April 2021 and March 2022. Most of these exceedances were for PM (2003 exceedances by 13 stations) followed by NOx (194 exceedances by 6 stations) and Sox (112 exceedances by 3 stations)."*
- *"Regarding PM exceedances, the worst offenders, with over 100 exceedances per year, were Lethabo, Kendal, Matla, Kriel, Tutuka and Matimba."*

- *"When it comes to Sox exceedances, most power stations did not exceed their AEL limits for Sox in 2021-2022. In 2021-2022, three Eskom power stations exceeded their AEL limits for Sox a combined total of 112 times. The worst offender was Kusile, with 103 exceedances (Kusile was not operating in 2016-17)."*

- *"With respect to NOx, in 2021-2022, 6 Eskom power stations exceeded NOx limits a combined total of 194 times. The worst offender by far was Camden, with 117 exceedances. However, this is an overall improvement from 2016-2017, when 7 out of 14 stations exceeded AEL limits for NOx."*

The Extent and Impact of Eskom's Air Emissions

"There is an undeniable link between exposure to the harmful pollutants emitted by Eskom and the development of respiratory and other illnesses amongst residents of Priority Areas. Further, the effects of the air pollution also have economic implications due to the public health costs."

In a study conducted by Dr. Mike Holland, assessing the impacts and associated economic costs of Eskom's emissions in 2017, with a specific focus on the role of PM 2.5, it was found that the following impacts are attributable to Eskom's emissions: "*2239 deaths per year: 157 from lung cancer; 1110 from ischaemic heart disease; 73 from chronic obstructive pulmonary disease; 719 from strokes; and 180 from lower respiratory infection; 2781 cases of chronic bronchitis per year in children aged 6 to 12; 2379 hospital admissions per year; 3 972 902 days of restricted activity per year; 94 680 days of asthma symptoms per year in children aged 5 to 19; and 996 628 lost working days per year*."

The concern here is Eskom's contribution to secondary PM 2.5 as a result of the cumulative SO2 and NOx emissions from its coal fired power stations.

Eskom's Emission Intensity

The above report also makes, inter alia, the following findings in respect of emission intensity between April 2021 and March 2022:

- "*Eskom's coal-fired power stations had an average PM emission intensity of 0.33g/kWh…"*

- "*Regarding Sox, Eskom's coal-fired power stations emitted an average of 9.50 grams of Sox per kilowatt hour…"*

- "*When it comes to NOx, Eskom's coal-fired power stations emitted an average of 4.29 g NOx/kWh…"*

The report compares the emission intensity of Eskom's coal-fired power stations with those of China and the US. In this regard, the CER states that the report's findings reveal *"the unacceptable levels of air pollution due to Eskom's coal-fired power stations, especially in comparison to other countries – including countries notorious for highly polluting industries, like China."*

The Health Impacts of Eskom's Non-Compliance with MES

A report compiled by the Centre for Research on Energy and Clean Air projects emissions, air quality impacts and the resulting health and economic impacts of air pollution from Eskom's coal power plant fleet under different scenarios of compliance with the MES and makes the following key findings, as referenced by CER (and, according to CER, shows the deficiencies in Eskom's retrofit plan, from a health perspective):

- "*Full compliance with the MES would reduce emissions of SO2 by 60%, PM by 50%, NOx by 20% and mercury by 40%, compared with a scenario of no improvements in emission control technology*."

- "*Eskom's proposed retrofit plan…would only reduce SO2 by 13%, NOx by 11% and Hg by 3% compared with a scenario of no improvements in emission control technology*" – CER's main concern is around the small reduction in SO2 emissions as SO2 has "*by far the largest health impacts…, due to the formation of secondary PM 2.5*"

- "*Eskom's retrofit plan only realizes one quarter of the health benefits associated with compliance with the MES, due to the dismal failure to address SO2 emissions*."

- "*Under Eskom's planed retirement schedule and emission control retrofits, emissions from the company's power plants would be responsible for a projected 79 500 air pollution-related deaths from 2025 until end-of-life. On a cumulative basis until the end-of-life of the power plants, compliance would avoid a projected 34 400 deaths from air pollution and economic costs of R620 billion*…"

- "*full compliance with the MES at all plants that are scheduled to operate beyond 2030 would avoid a projected 2300 deaths per year from air pollution and economic costs of R42 billion per year*"

- "*Other avoided health impacts would include 140 000 asthma emergency room visits, 5900 new cases of asthma in children, 57000 preterm births, 35 million days of work absence and 50 000 years lived without disability*"

- "*Requiring the application of best available control technology at all plants, instead of the current MES, by 2030, would avoid 57000 deaths from air pollution and economic costs of R1000 billion compared to the Eskom [retrofit] plan*."

Highveld Health Study: Final Integrated Report: (medical and household survey and HHRA and Human Health Impacts)

In this report, commissioned by the DFFE, it was estimated that there would be "*a 5 125 decrease in PM10 attributable mortality if annual PM10 NAAQS were met. In the PM2.5 analysis, it was estimated that if PM2.5 annual NAAQS were met, there would be a 4 881 decrease in PM2.5 attributable mortality. The report notes* 'It is essential to improve air quality to meet NAAQS and to save lives'."

Households that used coal and gas, especially, as their main source of energy for cooking or heating had a higher percentage of upper respiratory tract illness (URTI). There was almost double the risk of lower respiratory tract illness (LRTI) in houses that used dirty fuels (identified as coal, wood, paraffin and gas in this study (although gas is relatively cleaner than the three

former fuels)) compared to electricity. Recognizing that energy stacking and multiple fuel use was found, a household not using electricity as its main fuel for heating or cooking is therefore more closely associated with respiratory tract illnesses.

It is noted that the report also confirmed that *"lung function showed a decrease after exposure to PM10, PM2.5, SO2, CO and NOx.*"

Feasibility for Eskom to Abate SO_2 Emissions: SO_2 Panel Report Findings and Recommendations

*"This report looks at the health impacts of SO2 emissions and acknowledges the adverse e effects of SO2. It states: '*around the world, SO2 is known to have major impacts on human health that cannot be ignored. South Africa's dire inequality and inequity means that the vulnerable and indigent communities are most affected by SO2*.' It recognizes that even in instances when SO2 levels meet the NAAQS, adverse respiratory health impacts related to SO2 exposure occur…*

[One of] the recommendations derived from the analysis use the cost of available and proven technologies to assess the economics of applying the MES values of 250, 500 and 1000 mg/Nm3. The panel undertook a health impact-based Cost-Benefit Analysis which accounts for the benefits associated with mitigating the health impacts of emissions as well as the costs involved in the mitigation. It found that in both of the scenarios it considered, it is economically beneficial from the national point of view and technically feasible for Eskom plants with less that 5 years of remaining lifetime…to meet the 1000 mg/Nm3 limit."

"The Report concludes that 'it is technologically feasible and economically beneficial' for all plants that will be operational after-2030 to meet an MES of 1000mg/Nm3 or lower. I is technologically and economically justifiable for most plants to meet either 250mg/Nm3 or 500mg/Nm3. The results of the CBA show that the highest economic benefits are achieved when plants included in this study meet MES limits of 1000mg/Nm3 and lower. For most plants, limits of 500mg/Nm3 and 250mg/Nm3 provide the highest benefits. Notably, the recommendations of the panel in this Report are not prescriptive."

"Delaying compliance increases the economic costs incurred due to SO2 emissions with little effect on the cost of compliance, as most of he cost is a once-off investment cost."

"…this panel finds that there are multiple options for the Department to implement MES that will lead to positive societal benefits, including improved public health and positive net impact on GDP and employment."

"According to the Panel, the scenario which sets emission limits consistent with the application of best available technology ("BAT scenario"), taken as 250mg/Nm3, on all sources by 2030 on all plants, delivers a 92% reduction in SO2 emissions. This would require a 14.6% increase in the electricity tariff. The Maximum social benefit option, which sets emission limits consistent with the application of BAT, delivers 85% reduction in public health costs and requires a 13% increase in the electricity tariff."

"*Ultimately, there are positive net benefits to the introduction of the FGD technology*".

groundWork and Earthlife Africa's Preliminary Response to Eskom's Appeal and "Updated MES Application"

"*Eskom and the DFFE failed to provide us and our clients with Eskom's appeal documents despite numerous requests*".

"We note that the timeframes for the lawful submission of postponement and suspension applications have now long passed. As such, Eskom cannot permissibly bring any further postponement or suspension applications."

Eskom's appeal

Preliminary Comments on the Substance of Eskom's Appeal

"People should not have to choose between jobs and their health or between electricity and their health – all are crucial."

"Eskom has known that it must comply with the MES for a long time…People cannot pay for Eskom's failure to plan with their lives and well-being."

"We submit that 'economic activity that sacrifices people's health can never be labelled as sustainable or justifiable'*. Therefore, Eskom must bear the cost of compliance."*

"This is also about compliance with the law"

10.7.3. Alternative Information and Development Centre's ("AIDC") Submission on the Applications for Postponement/Suspension of MES Compliance Timeframes including the Related Appeals and the NECA Forum Process (Annexure 25)

The AIDC endorsed the submission of the CER dated 31 January 2023 and, in addition, seeks to submit that "*Debt is central to why Eskom cannot meet its MES. AIDC had long been urging the government to adopt a number of financial measures which would free Eskom from its mountainous debts*."

In this respect, the AIDC referenced three reports / articles, which are briefly summarised below (Annexure 22A):

Eskom Transformed: Achieving a Just Energy Transition for South Africa

Introduction

"This report presents a case for a modern national power utility – a New Eskom."

Eskom's crisis is attributable to corruption, mismanagement and poor decisions.

Most of Eskom's problems are a direct consequence of the "*energy for profit*" paradigm

The rise of renewable energy is "a *story of public funds being used to drive a 'reform' agenda that adds up to slow motion privatization of public energy systems*".

Background and Context

Eskom's Debt Crisis

"*There are two bottom lines:*

1.1.1. Eskom can no longer service its debt without support; and

1.1.2. Eskom cannot be allowed to fail."

"The debt is increasing as is its rate of growth"

Renewable Energy Challenges

"*The failures of the current model of liberalized power systems, including '*marketised*' public utilities like Eskom, have been well documented. These failures include underinvestment, job losses, deteriorating service and rising energy poverty*. The need to correct these failures is by itself sufficient reason to reclaim public energy systems so that they can serve the public good."

The '*selection and concentration'* strategy is "*seemingly the only choice for a country lacking the resources, technologies or capital for nurturing key industries*."

Global Renewable Energy Growth

"*It is not possible here to explain all of the features of the crisis of neoliberal policy. They include: the failure to introduce an effective price for greenhouse emissions; the appalling waste of public money in the form of subsidies for private renewable energy companies; the almost complete lack of progress in terms of controlling, let alone reducing, energy demand*."

"In the power sector in particular, two inconvenient truths must be confronted:

> *Modern renewable power (mostly wind and solar) is only inching forward as a proportion of energy generated and used…*
>
> *The limited progress that has been made in bringing renewable energy into the global power sector has been almost entirely due to public subsidies of various kinds. Subsidies are being used to make profitable what would not otherwise be profitable."*

"…new wind and solar is still quite a long way behind new fossil-based power generation."

"In the context of rising energy use, any incremental shift in the proportion of renewables to fossil-generated power is, from a climate perspective, largely irrelevant. Emissions will continue to rise, albeit a little less quickly than if there had been no renewables deployed at all."

"…newly installed wind and solar is still trailing behind the power generated by newly installed coal and gas."

"…As a general rule, in order to generate comparable amounts of electricity in a given time period, far higher amounts of wind and solar capacity must be installed than might be the case for coal or gas."

"In addition, new coal and gas power stations will potentially be generating electricity for up to 40 years, whereas new wind and solar installations will need to be replaced after just 20 years or so. When both rising demand and capacity factors are taken into account, the growth of renewable energy that occurred over the past ten years is not as impressive as it might first appear. And certainly not at the level which would displace fossil fuels and mitigate climate change."

"Falling prices lead to falling profits and these lead to falling levels of investment" in renewable energy – *'three fall effect'*

"each MW of renewable energy capacity normally costs more than a MW of coal or gas."

"…the REI4P programme is contributing to Eskom's crisis."

"There are system balancing and other grid issues that come with [renewable energy]."

"As more renewable energy comes online, the technical complications and financial burdens increase. The LCOE, which shows renewables becoming increasingly competitive, ignores the costs either of backing up renewables' supply with reserve capacity, and of integrating renewables into the system."

"As a general rule, the deeper the penetration of renewables, the higher the retail price for electricity."

"…in recent years 'little or no investment in conventional plant has taken place, except where it has support via some form of capacity remuneration system'. Capacity payments are needed in order to 'ensure sufficient reliable capacity is available by providing payments to encourage investment in new capacity or for existing capacity to remain open'."

"…the costs of the IPP program, which includes the REI4Ps, have contributed more than 14 percent to the overall increase in Eskom's revenue requirement…It seems certain that this projected peak in costs associated with the REI4P programme is behind the South African government's efforts…to renegotiate the IPP contracts for both coal and renewables."

"Eskom's existing fleet currently produces power that is cheaper than the REI4P average. The costs of building the power stations were recovered (amortised) long ago and therefore when costs for fuel, operations and maintenance, and labour are added together Eskom's coal-generated power is still cheaper per kW/hr than renewables from the IPPs, by some distance. For example, the IPPs were granted R15 billion in the fiscal years 2016 and 2017, compared to the R3 billion it would have cost Eskom to produce the same amount of electricity."

"Eskom has attempted to obstruct the IPPs at every turn. It has delayed signing contracts and dragged its feet when connecting IPP power to the grid. It claims that the 20-year PPAs agreed during the various REI4P bid windows have made a significant contribution to its current financial difficulties. The government has rejected this claim, arguing that Eskom incurs no costs from the REI4P program because the costs associated with the power purchased under the program are a 'pass through'."

"Set against the background of falling demand for electricity, rising fuel costs, and non-payment by many municipalities, the guaranteed payment of above-market prices for electricity generated by the private wind and solar operations is, in effect, not a 'pass through' but a guaranteed profit-yielding 'pass back' of Eskom revenue to the IPPs, while the remaining revenues generated by electricity sales that are available to the utility in order to cover other costs grow appreciably smaller."

"The future of South Africa's energy system, and the health of its people, cannot be held hostage by cost per kW/hr to generate electricity. Furthermore, if the case for an energy

transition rests disproportionately on price, it pulls attention away from the many other reasons that make decarbonization both positive and necessary. And, when arguments about 'least cost options' and 'competitive renewables' do not fit comfortably with the facts, the facts get twisted, distorted and 'repackaged' to fit the arguments."

"IRP 2019 states that renewable energy, most of it variable wind and solar, will provide 40 percent of the country's electricity by 2030. But if this massive increase in renewable energy deployment is pursued by way of an expanded REI4P, then a number of negative outcomes appear very likely.

- *South Africa will lose its energy sovereignty. According to IRP 2019, by 2030 more than half of South Africa's generating capacity, and virtually all of its renewables capacity, will be operating under long term PPAs with companies that are not based in South Africa…;*

- *REI4P expansion exposes South Africa to the uncertain economics of the IPP system – what looks like cheap renewable energy today may be considerably more expensive several years from now, especially if there is less coal, gas or nuclear with which to 'compete' and South Africa becomes dependent on renewable energy to ensure its energy security.*

- *Eskom's death spiral will intensify – if all the wind and solar supplying the system operates within the current IPP system with PPAs, Eskom will be an economic basket case as a result of having to purchase large volumes of variable wind and solar energy while at the same time having to upgrade the grid in order to manage the effects of a large increase in non-dispatchable (variable) power.*

- *There is likely to be no viable plan to deal with the technical challenges of variable power.*

- *The current investment crisis will grow more severe.*

- *The intensification of the 'death spiral' will likely lead to more businesses and residents going off the grid."*

"Many of the policy contradictions…could be resolved if the neoliberal 'energy for profit' policy framework was consigned to history…the case for social ownership of renewables emerges as the only viable option for energy transition in South Africa."

Our Proposals – An Alternative Solution to the Debt Crisis

Use GEPF to fund Eskom

"*The alternative to the GEPF's 'fully funded model' is another pension fund model called* Pay-as-you-go – *In this scheme, the current contributions from working members, plus the scheme's current investment incomes, should be enough to cover all benefits paid to retired members 'as you go along'.*"

"*Even if the GEPF takes a 'hair cut' on its claims on Eskom and moderates its claims on the South African government, and even if the market value of its total funds has fallen from R1.8 trillion in March 2019 to around R1.5 trillion in March 2020, the scheme will still run a surplus…To change the terms of Eskom's debt to GEPF is not to destroy financial wealth. It is to move money from a place where 'maximised returns on investments' are not needed, not required by the GEP Law and not rational from the point of view of the vast majority of citizens*."

"*An additional way to reduce and restructure Eskom's debt is to repudiate odious debt*."

"Social ownership is the best option in terms of energy self-determination and job creation, it also provides a needs-based framework whereby technical problems can be addressed without having to address investor concerns. In addition, it offers the most feasible option for the decarbonizing of the energy system, which is important for several reasons, including dealing with climate change as well as industrial and economic development."

"Full privatization is implausible and the 'hybrid model' is unsustainable because an expanded role for IPPs will further erode Eskom's revenue. This will mean maintenance and upgrades will fall short of what is required."

"We propose short term non-market solutions via the gigantic state pension fund GEPF to release Eskom from its unproductive debt burden. We propose non-market financing strategies to start publicly owned RE investment programs and the winding down of coal power."

"At least 70 percent of renewables generation nationally by 2050 is cost optimal, replacing all plants that decommission over time and meeting new demand with the new optimal mix."

"…in a report released in February 2019, the ERC proposed two scenarios for the large-scale deployment of renewable energy, namely 'the least cost option' scenario and a more aggressive 'least cost climate mitigation' scenario. Both scenarios see the potential for wind and solar energy to make up, respectively, 38 percent and 57 percent of electricity supply by 2030 and, again respectively, 88 percent and 96 percent by 2050."

"Additional renewable energy capacity in the region of 100GW above current levels by 205 will also incur a range of 'system costs' or 'network costs'. These are costs associated with intermittency, transmission, and, when it occurs, the earlier than necessary displacement of existing capacity (primarily coal)."

"A US study on the cost and emissions-related impacts of mandating utilities to reach renewable energy targets concluded that 'system costs' constituted an 'important barrier to substantially increasing renewable energy's share of generation and meaningfully decreasing carbon dioxide emissions'."

Another study noted: 'These system changes and technology upgrades represent an extensive investment on the part of utilities, rate payers, and equipment manufacturers, and a huge change in the way the power system is operated and designed. These changes will not come overnight and will require many decades to implement as well as considerable engineering planning and development to determine the balance of features and capabilities needed against cost and complexity of implementation. Nonetheless, these are the approaches that are needed to move to high-penetration PV, and the industry needs to begin work now on research and development so that the technologies, tools, and approaches will be available in a timely manner'. And another: 'The share of transmission requirements for

renewables relative to their share of generation highlights the importance of accounting for the associated costs as part of the total cost of renewable energy'."

"The existing grid may have little or no capacity to accommodate additional generation. Grid constraints are becoming more prevalent as the REI4P progresses, and the limited spare capacity, especially in areas with good resources in depleted…"

"We have already noted that much of Eskom's 33000 km transmission lines are between 30 and 40 years old, and a third of the lines are at least 40 years old. The DPE notes that new investment is needed simply to sustain the existing system…But if the current policy framework is extended into the future and unbundling proceeds as the DPE has proposed, Eskom TE will be caught in its own custom-made death spiral. It will be expected to be the 'single buyer' of energy generated by a large number of IPP projects; it will have the responsibility of installing a historically unprecedented amount of battery storage; and it will have to put in place power cables and other technologies needed to accommodate a minimum to 100 GW of renewables…"

"'There could be a role for mission-driven international capital if there were a commitment by Eskom to accelerate emissions reduction'. A reformed Eskom could make such a commitment but should at the same time press radical reform of the current global trade investment framework…South Africa can spearhead an international campaign around a public goods approach that could demand turning the ecological debt of the North into direct, no-strings-attached investment capital for the energy transition in energy-intensive developing countries."

"The deployment of renewable energy involves more upfront costs than is the case with fossil fuel generation. According to one source, 'the difference in upfront capital costs between renewables and fossil generation ranges from 3.5 to 7 times. And these multiples do not take into account storage requirements. In the case of utility-scale solar PV, the picture is more extreme. It is the high upfront cost of renewables that has convinced governments that the IPP system is an attractive alternative. The value of the PPA does not show up as public debt, because the costs are passed on to consumers over a 20-year period. Problem solved. But the PPA contract is a transfer of public money to private interests, By protecting the private investor from market competition, the costs of the protection through an 'out of market' price

turned into a 20-year contract is paid by Eskom, the state (in cash infusions to 'bail out' Eskom), or by consumers."

"'Key to whether renewable energy projects get beyond the drawing board, or the permitting process, is what is known in the sector as 'bankability'. All the green power technologies involve heavy upfront capital expenditure [and] the expense of keeping installations going once built is modest…But the money to cover upfront capital expenditure needs to be raised…[Getting that funding] will depend on whether those involved have a high level of confidence that the project will make adequate returns…so almost all non-hydro renewable energy projects built have gone ahead thanks to some sort of contact securing the electricity selling price that their owners would receive'."

"Of course, an energy transition involving projects that could generate revenue for several decades means that debt financing is an obvious option. And since the wind, solar and hydroelectric technologies are capital intensive, the cost of borrowing money is critically important."

"According to the Public Services International Research Unit: 'the overwhelming majority of renewable energy has been developed by public sector or non-profit organisations, not by private companies…Moving to public ownership therefore makes it easier to develop renewable energy systems, rather than using public money to offer financial 'incentives' for private companies to choose investments in renewables…'"

<u>Tackling the Governance Crisis</u>

"*The principles listed below…show how state-owned enterprises such as Eskom could be democratized and become more efficient and effective in the delivery of electricity and other essential public services:*

- *Access, affordability and equity;*
    - *"…many households still cannot afford to use the power to which they are connected; the provision of a basic allocation of free electricity is insufficient for basic household needs, in particular in the context of decaying infrastructure*

and service standards. Millions of users are forced to burn paraffin, wood and coal instead of using electricity, which negatively impacts on air quality, health and public safety."

- *Quality and efficiency;*
- *Environmental sustainability;*
- *Public ethos;*
- *Participation; and*
- *Transparency and accountability."*

Conclusion

"*In this research we have argued that a transition to renewable energy that is driven through the market at IPPS will not only fail to deliver sufficient electricity to those most in need – the poor and working class – but will also hold back the transition to renewables happening at the speed and scale that we need, to meet sufficiently ambitious greenhouse gas emission reduction targets."*

"What we are proposing focuses on the following three elements:

- *Build a 'New Eskom', fully public and serving the people;*
- *Secure a democratic and just energy transition;*
- *Work towards socially owned renewable energy."*

"We are proposing the following:

Conduct a forensic audit of Eskom's debt. Some of that debt is odious and must be declared so and repudiated. For the remainder, the Eskom debt must be restructured in such a way that billions of rands are not used from the fiscus to bail out Eskom, but surpluses in government institutions like the UIF and GEPF are invested in Eskom, subject to the utility's

fundamental transformation along the lines of democratic accountability and the transition to renewable energy.

Halt any plans to unbundle Eskom. Government has chosen to adopt a process of unbundling and deepening corporatization, rather than explore viable options. Unbundling will cause job losses and drive electricity as a profit-making enterprise rather than a fundamental public service."

"Build global cooperation (rather than competition) around the use of renewable energy technologies in the interests of stopping runaway climate change and the health of our people. This will mean loosening the stranglehold of international trade law with its intellectual property restrictions, and allowing for greater deployment of the technology, facilitated, in many cases, by Public-Public partnerships."

"End the REI4P programme and focus instead on building/rebuilding skills, competencies and technologies internally to take on the rollout of renewable energy."

"Develop a planned approach to the shift to a low-carbon economy. The planning process must also take into account an honest appraisal of the technical challenges, such as storage, that will be faced in the shift to renewables, and develop strategies to deal with these."

"Use public financing to build a public system, not subsidise a for-profit one."

"Build a future Eskom according to key public ethos principles. These include ensuring affordable access for all; providing quality and efficiency, as well as environmental sustainability; subjecting all decision-making and operational running decisions to public ethos criteria; expanding public participation in Eskom decision-making processes; and ensuring transparency and accountability in the running of Eskom."

"Rather than breaking down and dividing up, we are calling for a thorough restructuring and reorganization, along different principles:

- *Cooperation rather than competition;*
- *Meeting public need rather than financial profit lines;*

- *Accountability and transparency rather than opaqueness and obfuscation; and*
- *Open public funding rather than private sector subsidization."*

Eskom's Death Spiral Caused by Policies and Political Choices

"Eskom's request for a tariff hike is a symptom of Eskom's failure to deliver reliable, affordable and physically accessible electricity caused by its unsustainable financing model."

"…what stifled the utility before and during years of parasitic corruption, now known as state capture, is a contradiction between its public ownership and its corporatized mandate. This creates an impossible task – to provide electricity as a universal public good, while at the same time needing to make Eskom profitable by selling electricity to people, who for the most part are unable to afford it."

"In response to narrowing revenue and profit streams alongside ballooning debt, Eskom continuously applies for tariff hikes , which only anger citizens and produce more instances of non-payment, which then hinders the utility's ability to maintain its infrastructure (or build new generation capacity) and compel it to seek out more loans and more tariff hikes while increased use of renewables closes off other streams of revenue, resulting in a death spiral."

"To reverse societal collapse, Eskom must become a truly public entity that functions to deliver reliable, safe and affordable electricity to all citizens regardless of their socioeconomic position. Its operations must be transparent and accountable to democratic institutions, its World Bank debt cancelled, and direct public procurement by the government must occur to maintain and install new capacity. Most importantly, the transformation of Eskom into a public good is vital in South Africa's transition to renewable energy, an effort that is pivotal in protecting our present and future."

What to do with Eskom? Going beyond and behind the seemingly obvious solutions

"*Meridian Economics, the highly regarded energy consultancy, has detailed the enormous range of incentives and other measures required to guarantee the 'partnership' with the private sector. For instance, apart from the lucrative 15-year power purchase agreements for what is*

supposed to be a two-year emergency, Meridian suggests that if those companies that won bids in window 5 are going to bring their bids to finality, they should be awarded an additional 30% increase on the original price they agreed to build their plants…The National Planning Commission has already endorsed Meridian's recommendations and has even proposed the revoking of all 'red tape', such as 'local content requirements' – meaning jobs for South African workers, and orders for South African companies – that are said to stand in the way of the rapid deployment of IPP generation of electricity. The cost of these recommendations is enormous. They are merited only because they are dwarfed by the ongoing cost of rolling blackouts. Be that as it may, at least some of these costs will end up with the already unaffordable electricity being even more unaffordable for more people."

"Privatised renewable energy, however, cannot provide either the pace or scale required…"

"…the government can take measures that facilitate the direct procurement of renewable energy generation capacity, by bypassing capacity auctions and long-term power purchase agreements."

"The government can insist that the EU, US and the UK immediately honour their commitment to mobilise $8.5-billion of financial assistance to accelerate the transition away from coal. However, this financing must be grant-based and free of privatization-focused conditionalities."

10.7.4. Solidarity Strategy Institute's Submission – Suspension and Postponement of Compliance with Minimum Emissions Standards and Issues of Provincial Emission Licenses (Annexure 23)

"Need to strike a balance between what is best for workers, communities and the environment. – the principle of zero harm should serve as a guideline"

"This requires…a fair balance between saving lives, livelihoods and ensuring the sustainability of the environment and a company. All are equally important."

"South Africa's JET however combines not only the need to tackle the climate change crisis, but also an energy generation deficit and a high unemployment rate."

"Solidarity reluctantly agrees with the motivations provided by the various companies for exemption and propose that planning and steps to address the outstanding environmental requirements be incorporated as part of the exemption in the form of reciprocal commitments. This is not a decision we take lightly. But one we feel is necessary to save livelihoods and lives."

10.7.5. Steel and Engineering Industries Federation of South Africa's (SEIFSA) Load Shedding Impact Assessment on the Metals and Engineering Sector

The submission under consideration by the Forum was issued by SEIFSA on or about 24 March 2023 (Annexure 24).

According to SEIFSA, the loadshedding crisis which South Africa is currently facing *"has been particularly damaging on the metals and engineering sector, a sector which is the backbone of industrialization and to which electricity, particularly baseload electricity, is fundamental to its survival".*

"The M&E sector constitutes 26.5% of the manufacturing sector, based on output, and 2.6% of the country's gross domestic product (GDP) on a value-add basis."

"The M&E sector has been in a structural recession since the global financial crisis of 2008/9, with production recording a 1.2% contraction on a compound annual basis over this 15-year period. Given the less supportive global economic environment and the impact of domestic rigidities, chiefly, the energy crisis, production in the sector is expected to contract further by 2.2% in 2023. Unfortunately, employment in the sector has mirrored the production trends contracting at -1.1% (CAGR) and contributing to the country's unemployment crisis."

"The intensifying electricity crisis now presents the most prevalent economic risk to the sector."

In terms of the loadshedding impact assessment conducted by SEIFSA, inter alia, the following was noted (the survey measured the impact of the energy crisis between February 2022 and February 2023):

- Employment losses, mostly attributable to companies responding to the energy crisis

- A quarter of the companies surveyed had to reduce their head count by as much as a quarter of their employment; and
- A third of the companies surveyed indicated that they are now working short time.

- Production
  - "*The respondents to the survey indicated production declines as much as 34.2% (weighted) as a result of the electricity crisis*"
- Investment
  - *"42.6% of companies have indicated that they have cancelled investment and/or expansion plans owing to the uncertainty presented by the electricity crisis";* and
  - *"The value of these investments amounts to R2.64 billion with the potential of creating 1620 new jobs."*
- In relation to the alternative energy investments made by the sector, SEIFSA's survey led to, *inter alia*, the following conclusions:
  - "*79.2% of companies indicated that they have had to install alternative electricity sources in the last 12 months…"*
  - *"…companies are sacrificing scare long-term capital to fulfil an immediate survival, presenting long-term implications regarding the sustainability of the sector."*
- On the issue of input costs SEIFSA found, *inter alia*, the following:
  - "*On a weighted average basis, companies have indicated increases to monthly operating costs to the extent of 24.9% from the extensive use of generators*".

10.7.6. Presidential Climate Commission's ("PCC") Response to NECA Forum Queries (Annexure 24A)

At the outset, the PCC referred the NECA Forum to several reports, which it deemed relevant to the issues raised by the NECA Forum. The NECA Forum considered these reports when reaching its findings and recommendations.

PCC Response Summary

"*The PCC agrees with the assessment that more jobs will be created in new energy industries than will be lost in coal*." – "*this is true when considering the jobs in the construction and maintenance of renewable energy infrastructure*" and bearing in mind that the infrastructure will need to be reconstructed approximately every 20 years.

"Job creation is expected in the non-coal mining sectors and in renewables."

When considering Mpumalanga, the CSIR has concluded that *"unless there is a very high penetration of renewables in Mpumalanga, there are still likely to be net-job losses."*

"There is a mistiming between when coal jobs will be lost and when new jobs will be created, especially if the renewable energy rollout is delayed. Coal losses will be fairly predictable as they are driven by prescribed closure schedules. This mistiming would potentially be exacerbated should plants need to shut down to comply with the air quality minimum emissions standards."

"The new energy job gains may not be in the same geographic location as the jobs lost…As a result, job creation efforts need to extend to the localization of new energy component manufacture, renewable energy component recycling and more general regional economic diversification."

"The jobs may not be comparable in terms of skills, permanence, collective bargaining protection and wages. The jobs created may therefore not support as many people per household as existing jobs, which is of course offset by there being many more jobs in new energy."

"It is uncertain what the impact of coal closure and opportunity creation will have on migrant labour."

"According to the CCDR, jobs are expected to be lost in the chemicals, other petroleum, coal and electrolysers sectors while jobs will be created in the fuel cells, hydrogen, electric machinery, other metal ores, platinum group metals and electricity (RE)."

"The jobs created is…a direct result of decisions we make…:

Jobs will be created in the Highveld Priority Area, Waterberg Priority Area and elsewhere in South Africa.

"*There will almost certainly be a lag between jobs lost and gained …The lag can be reduced by effective forward planning that engages with communities and workers, a strong investment programme backed by clear industrial policy and a long-term skills development programme. Strong stakeholder coordination and alignment will be required."*

In relation to Komati Power Station, the PCC notes the following:

- *"Of the 810 jobs that were supported in 2020…an estimated 19 jobs would be retained to maintain infrastructure with 791 jobs being at risk.*
- *The Komati Power Station supported 4270 direct and indirect jobs"*

Eskom has commissioned studies to understand the impact of power station shutdowns on the society and economy in respect of the following additional power stations, the outcomes of which are not yet available:

- Grootvlei;
- Hendrina;
- Camden;
- Arnot;
- Matla;
- Kriel;
- Duvha
- Tutuka; and
- Kendal.

In relation to Komati, and "*based on options for repowering and repurposing the sites with solar PV wind energy, battery storage synchronous condenser and containerized microgrids about 8700 temporary jobs supported by construction, including 2200 created on site over 5 years (53% of losses mitigated) and a further 2150 sustainable jobs could be created one all projects are operational (incl. 660 direct jobs) (52% of losses mitigated).*"

"*46% of South African exports are at risk if South Africa does not de-carbonise.*"

10.7.7. Sasol – Response to Queries from the National Environmental Consultative and Advisory Forum (Annexure 24B)

1. "*The set of Minimum Emissions Standards (MES), in our view, is rigid in that it does not allow for specific/unique conditions of a plant/facility to be taken into consideration in the regulation thereof.*" – these considerations *"have a significant impact on the dispersion of the plume and ultimately the ambient air quality".*

2. *"Moreover, the MES does not provide for the consideration of conclusions from relevant atmospheric impact studies (that could provide insight into how these unique conditions within operations impact ambient air quality) to inform how that facility is sustainably regulated."*

3. *"There is some precedent for taking stack height and associated dispersion benefit into consideration when setting emission limits."*

4. *"The GEP stack height requirement is designed and imposed to ensure that emissions from a stack do not result in excessive ambient concentrations of a pollutant…"*

5. *"It is recognised that taller stacks may have a transregional impact but that it can be managed by assigning emission budgets to the facilities in question."*

6. In relation to its assertion that there may be mechanisms outside of the current MES legal framework that allow for the principle of *"flexibility with accountability"* that enables sustainable air quality improvement aligned to NEMA, Sasol stated the following:

6.1. "*Air quality improvement [should be] regulated and managed in a manner that enables the plant/facility to have flexibility on the 'how', but with accountability" – "this will shift the aim of improved air quality away from requiring plants/facilities to comply with the provisions of various regulatory requirements in a fragmented and rigid way…This will also potentially allow for optimization of efforts and integration of air quality improvement and other regulatory imperatives such as GHG reduction and waste minimization."*

6.2. The measurement of compliance

6.2.1. "Compliance with the MES can be governed and measured in two ways – by pollutant concentration or pollutant load."

6.2.2. "Assessing pollutant load would be a more accurate approach to evaluating the contribution of individual facilities' impact on the receiving environment…However, we support that this is on the proviso that the emission mass of a given pollutant of a facility is also demonstrated, through appropriate monitoring or modelling, not to have significant ambient impact."

6.3. The use of the bubble approach

6.3.1. "*Under a bubble approach, emissions from different point sources within a facility are all regarded as if it originated under a single enclosed 'done' or 'bubble'." – "this is an effective way to provide flexibility with accountability".*

6.4. Pollution Prevention Plans

6.4.1. "The benefits of enabling facilities to achieve air quality improvement via flexible PPP include:

6.4.1.1. Facilities can develop a fit for purpose approach to achieve desired outcomes;

6.4.1.2. Enabling the alignment of various, fragmented air quality requirements to be achieved via a single mechanism to achieve a common goal;

6.4.1.3. It enables air quality improvements through a holistic, onsite emission footprint reduction;

6.4.1.4. It enables interrelated pollutants to be managed in an optimized way to manage primary and secondary impacts;

6.4.1.5. It enables integrated environmental management where interrelated environmental impacts can be optimally managed; and

6.4.1.6. *It enables simultaneous mitigation through on and offsite measures*."

6.5. Exemption

6.5.1. "*We remain of the view that the other mechanisms…are more fit for purpose mechanisms and therefore, consideration should be given to the application of these to avoid a reliance on exemptions which may be a less appropriate vehicle for enabling flexible and sustainable air quality improvement."*

10.8. Forum's consideration of the input from various stakeholders and I&APs

In this section, the Forum addresses some of the comments, input and issues gathered from the public consultation meetings and other meetings with a variety of stakeholders. The discussions, at all the consultations, were robust and informed the work of the Forum. In particular, the discussions informed, amongst others, the consideration of critical factors contained in section 11 of this report, alternative options with regards to the current regulatory regime in section 14 and the recommendations in section 15.

10.8.1. Community Consultations and Engagements

The Forum is aware that a small fraction of members of the community raised concerns regarding the logistics related to the public meeting. Insofar as the concerns could be addressed by the members of the Forum at the public meetings, this was done, and some of the concerns were addressed by officials of the DFFE. There were however a number of

issues, such as the venues chosen to host the meetings, that could not be resolved. In this regard, the DFFE, as the secretariat for the consultation process, undertook to learn from the process and the Forum requests the DFFE to be mindful of the issues raised as these could assist it in public meetings held in the future.

With specific reference to matters related to air quality, the Forum noted the following recommendations from the public meetings:

- Strict compliance with the MES, through the installation of the necessary technology.
- Reliance on mixed sources of energy supply, with includes coal-fired power stations and renewable energy.
- Compensation for illnesses caused by emissions from Eskom's power stations.
- Eskom to allocate money to be used for the improvement of health facilities.
- Educational outreach programmes to assist communities to better understand the impact of air pollution on their health, the various pollutants, and different sources of air pollution.
- Eskom to upskill people as this will enable them to seek better employment opportunities.
- Improved monitoring of pollution and wider publication of the results from the monitoring stations.
- More information must be shared with communities regarding the impact of the JET, particularly on employment. The job losses at Komati, due to the closure of the power station, was used to demonstrate Eskom's failure to consult the affected communities.
- An acceleration of Eskom's offset programme and, where the current programme is impractical to implement, Eskom must electrify people's homes or consult with communities about practical alternatives instead of providing gas stoves and cylinders that communities will struggle to use and will have to pay to refill the LPG cylinders.

- Eskom must give communities access to the ash dumps as this will enable people to create goods from the ash and start small businesses.

In view of the above, the Forum fully supports some of the recommendations made at the public meetings. Eskom must comply with the MES and, if possible, it must assist communities to improve their health through various initiatives that can alleviate the impact of pollution. It is important to note that, while health is an important issue, the Forum is not in a position to recommend that Eskom provide financial compensation to communities for health-related issues. The Forum may, however, recommend that Eskom contributes to the improvement of health facilities and provides mobile screening services in communities.

The Forum agrees with the recommendation that the implementation of the offset programmes must be accelerated, and this issue is addressed in greater detail in section 11.4.3 of the report. It is clear that Eskom has, in many instances, been tardy in this area and has pushed back the implementation deadlines for the offset programme. Furthermore, the Forum also agrees that Eskom must implement offset programmes that are fit for purpose.

In relation to the ash dumps, this is a business decision and while Eskom has been made aware of the request from the public, the Forum is not in a position to recommend that Eskom give communities access to the dumps. The Forum can, however, recommend that Eskom give this serious consideration as it is a concern that was raised at several public meetings.

Furthermore, the Forum fully supports the recommendation that Eskom undertake outreach programmes to educate communities about the impact of air pollution and that Eskom consults communities on processes that will have a substantial impact on communities, such as the closure of power stations. As stated in section 8.5.3 of the report, the Forum provided an outline of a decommissioning plan that must be submitted by Eskom to the DFFE, and the plan requires Eskom to undertake a comprehensive consultation process.

10.8.2. The Forum's response to CER's input regarding the SO_x Panel Report

The world has changed in three fundamental ways since the SO_2 panel undertook their work. Loadshedding, whilst present since 2007, had not yet become as visible and severe as it did at the end of 2022. Second, the issue of climate change has risen up the global agenda,

impacting the future economic prospects of burning coal via increased financing, insuring, and carbon pricing costs. Relatedly, Eskom's financial situation has been revealed as highly precarious. Finally, whilst the Panel was focusing on a New Plant MES limit of 500mg/Nm^3, the DFFE doubled the limit to 1000mg/Nm^3 during the Panel's tenure.

The Panel's extensive research and documentation on all aspects of SO_2 emissions from burning coal is extremely useful to the Forum and is referenced throughout this report. However, unfortunately the three changes discussed above reduce the usefulness to the Forum of a large portion of the analytical outcomes, including the CBA and the macro-economic analysis. (The Panel undertook a two-dimensional CBA, considering health benefits and abatement technology costs, and a macro-economic analysis extending the CBA results in terms of linkages across the macro-economy, describing economic costs and employment benefits).

With regard to loadshedding, energy security is now a key consideration for the Forum, given the socio-economic impacts of the current levels of loadshedding.

The second issue, the changes to the economics of burning coal into the future, under the rapidly accelerating global pricing of CO_2 emissions, impact both Eskom (by implication the fiscus) and the economy through embedded electricity CO_2 emissions pricing. Because these issues were not visible to the Panel, power system modelling was not prioritised by the Panel, rendering the analysis unable to engage meaningfully with issues of power generation economics and adequacy. Finally, the doubling of the New Plant MES limit significantly alters the analytical question and may alter the mix of recommended technologies and costs.

The Forum has therefore engaged selectively with the Panel's findings, focusing on the rich research work undertaken, above the modelling work and recommendations. Further, the Forum does not agree with the SO_x report's findings on the feasibility of SO_x abatement retrofits for the following reasons:

- The feasibility of retrofitting a power station that was not initially designed to allow for SO_x abatement equipment is challenging given space constraints, the FGD's impact

on the upstream and downstream unit operations, water and sorbent requirements, and the age of the power station, and

- The time it would take to install a SO_X retrofit would be a period of ± 6 years if they are done in the scheduled GOs. The rationale of SO_X retrofits to power stations close to retirement is difficult to justify.

POTENTIAL ALTERNATIVES TO WET FGD

SO2 is a gas formed when sulphur is exposed to oxygen at high temperatures during fossil fuel combustion, oil refining, or metal smelting. SO2 is toxic at high concentrations, and its air pollution effects are associated with the formation of acid rain and aerosols. SO2 dissolves in cloud droplets and oxidizes to form sulfuric acid, which can fall to Earth as acid rain, snow, or form sulphate aerosol particles in the atmosphere.

The removal of SOX is done using limestone or lime via the chemical reactions:

- Using limestone: $CaCO_{3(s)} + SO_{2(g)} \rightarrow CaSO_{3(s)} + CO_{2(g)}$
- Using lime: $Ca(OH)_{2(s)} + SO_{2(g)} \rightarrow CaSO_{3(s)} + H_2O_{(l)}$

Both of these processes produce gypsum and also emit additional CO2. In the case of lime, the CO2 is released when the limestone is calcined to lime which may be done off-site.

The quantity of SOX emissions from a power station is dependent on the sulphur content of the coal used. All the sulphur in the coal will form SOX in the boilers, and if SOX is not captured, it will be emitted into atmosphere through the stack.

Various technologies are available to reduce the sulphur content in the coal before it is burnt. In view of this, when compared to abatement technology for PM and NOx, SOX abatement technologies are expensive due to the capital cost required, the operational costs (water and sorbent) and the required parasitic power.

The SOX Panel report states that, apart from WFGD, there are alternative mature commercial technologies to abate SOX from the tail-pipe flue gases, and these include dry-FDG and semi-dry FGD. The Panel further states that there a number of developing technologies such as

"New Integrated Desulphurization (NID), Circulating Dry Scrubbing (CDS, also CFB scrubbing), SNOX™ and ReACT. SDA and CDS have substantially lower water demand and capital costs than Wet FGD".[28] As stated above, the Forum did not have the resources to undertake a CBA and could only undertake a high-level technical review of the SOX abatement technologies. The Forum was therefore not in a position to determine the appropriateness of the technologies proposed by the SOX panel and endorsed by the CER. Save for mentioning the technologies, the SOX Panel did not set out any specific details related to the proposed technologies, the Forum provides a brief overview of the mature and developing technologies below.

- **Mature technologies**

Wet flue gas desulphurisation (Wet FGD)

Wet FGD is predominantly used worldwide to abate SOX emissions from utility power plants, especially large capacity plants. WFGD can be used using a number of reagents like lime, magnesium-supplemented lime and soda-ash. Limestone is commonly used as the reagent for wet FGD, but the process produces high levels of gypsum as a by-product.

In South Africa, the wet limestone full oxidation process is one of the main options that have been considered for MES of 500 mg/Nm3 or lower, as this systems has a high efficiency (typically >90%) for SOX removal and make efficient use of the calcium (Ca) content of the lime.[29] The flue gas is fed into an absorber tower where it gets cooled and saturated with slurry. Flue gas[30] then moves upward through spray zone of the absorber. Here slurry is

[28] SO2 Report, pages 9 - 11 and page 18.

[29] EPA, Air Pollution Fact Sheet, EPA-452/F-03-034.

[30] Flue gas (sometimes called exhaust gas or stack gas) is the gas that emanates from combustion plants and which contains the reaction products of fuel and combustion air and residual substances such as particulate matter (dust), sulphur oxides, nitrogen oxides, and carbon monoxide.

scattered in opposite direction to flue gas flow. This completes the removal of SOX process, and gypsum is produced. The SOX removal efficiencies are as high as approximately 98%.

Semi-dry absorption and Circulating Dry Scrubbing (CDS, also CFB scrubbing)

Spray-drying absorption (SDA) and circulating fluidised bed (CFB) are examples of this type of FGD system. These technologies use lime rather than limestone. In respect of older power stations, this alternative technology will require replacement of the electrostatic precipitator (ESP) by a bag filter. The semi-dry absorption technology is better adapted for lower sulphur fuels (<2%), such as the coal used in the Highveld. Emissions of some heavy metals are also reduced. Further, semi-dry absorption technology, compared to wet FGD, involve lower capital costs, is simple to operate and there are fewer process steps (dewatering of the product is not required) and the consumption of water is significantly lower. Emissions of some heavy metals are also reduced. The efficiency of SOX abate through semi-dry process is typically in the approximately 90%.

Dry sorbent injection (DSI)

DSI is the FGD solution with the lowest capital cost. The system involves the injection of dry sorbent material (typically trona or sodium bicarbonate, which considerably increases the reagent cost; alternatively, lime can be used) into the ductwork or, less commonly, higher up in the flue gas system following the boiler. A higher Ca:S ratio (typically >2), results in higher operating costs for equivalent SO2 removal rates. Dry injection systems are generally applied to smaller units (typically <300MW), and when lower removal efficiencies are required. DSI can typically achieve removal efficiencies ranging from 50% to 70% using lime; higher efficiencies require sodium-based reagents. Larger installations are, however, possible with low-sulphur coals or where the emission standards are less stringent.

- **Developing technologies**

A number of technologies have been developed which are mostly aimed at smaller scale processes, these include:

Novel Integrated Desulphurization (NID)[31]

NID is a semi-dry FGD developed by Andritz where a lime slurry solution is mixed with recirculating dust before being injected into a specialised duct where the SO2 and other acid gases (SO3, HCl, HF, etc.) undergo various reactions before being removed from the flue gases. Depending on the flue gases composition and the level of emissions reduction to achieve, an optimized recirculation rate is set before removing the end products in a fabric filter or electrostatic precipitator. NID is an ideal technology to act as a multi-pollutants control equipment in industrial applications with fuels having complex or variable compositions. An advantage of NID technology is that it has a compact footprint and requires approximately half the space than that required by a normal SDA unit.

CDS (Circulating Dry Scrubber) – CFB (Circulating Fluidized Bed)[32]

CDS is a semi-dry FGD process in which flue gas is passed through a mixture of limestone, products of reaction and fly ash (depending on the location of the filling) on a CFB. SO2 is extracted in proportion of up to 99%, all SO3 and HCl being also extracted. CFB semi-dry process is relatively simple technology, limestone or hydrated lime are usually used as

[31] https://www.andritz.com/products-en/environmental-solutions/clean-air-technologies/combined-flue-gas-cleaning/novel-integrated-desulfurization#:~:text=The%20semi%2Ddry%20desulfurization%20combines,Fabric%20Filer%20or%20Electrostatic%20Precipitator).

[32]https://www.researchgate.net/publication/324442137_Study_on_current_state_and_future_trends_of_flue_gas_desulphurization_tehnologies_A_review#pf3

adsorbent in CFB process and injected at the reactor base. Water can also be added to moisten the flue gas to improve SO2 and macro particles extraction.

SNOX™[33]

SNOX™ is proprietary technology from Topsoe, a company based in Denmark which produces various science and engineering products. Conventional FGD methods are plagued by high operating costs, massive limestone consumption, and production of contaminated gypsum that must be deposited. SNOX™ takes the challenges of conventional FGD by combing the removal of SOX, NOX, and PM with commercial-grade sulfuric acid production. This unique process significantly reduces the costs associated with compliance. It also eliminates waste and material logistics, consumes no water or reagents for the desulfurization, and creates a cost-effective alternative to traditional FGD.

Because of the high energy-efficiency of a SNOX™ unit, a boiler, combustor, or power plant equipped with SNOX™ will typically achieve an improved energy effectiveness of 5%, which means a drop in specific CO2 emissions of a similar percentage. Unlike the use of limestone, the SNOX™ flue gas cleaning process does not, in itself, emit CO2. The sulphur is recovered in the form of commercial grade concentrated sulfuric acid, and the nitrogen oxides are converted to harmless free nitrogen. Combustible particulates like soot are burned in contact with the catalyst in the SNOX™ unit. Other particulates are separated and made available as a dry powder, without polluting any by-products. This technology has only been used with boilers much smaller than Eskom's units and mostly on boilers fuelled by liquid fuels such as fuel oil and petcoke (i.e. not coal)

Regenerative activated coke technology (ReACT)

ReACT, developed by Mutsui, is an integrated multipollutant control approach that removes SOX, NOX, and mercury from coal-fired plants by absorption with activated coke to attain

[33] https://www.topsoe.com/sulfur-pollution

emissions levels found at natural gas–fired plants. One big advantage of this technology is that it uses only a fraction of the water used by conventional wet flue gas desulfurization. The ReACT process design for SO2 control routinely removes 20% to 40% NOX as a co-benefit, and the process can be configured to achieve 50% to 70% NOX removal or higher by adding secondary injection of ammonia into the regenerator. The Isogo 2 x 265 MW coal-fired PS in Yokohama City in Japan[34], was one of the initial commercial ReACT units. ReACT units have mostly been used for power stations with a capacity of around 200 MW.

SNOX*TM* and ReACT technologies are mostly used where very low emissions are required (typically less than 10 mg/Nm3), however this also comes at a cost.

Some of the developing technologies are variants of the mature technologies. These developing technologies are mostly aimed at smaller processes which require the abatement of multi-pollutants particularly in industrial applications where the flue gases have variable compositions and very low quantities of emissions are permitted.

10.8.3. The Forum's response to other submissions

In addition to its input referred to above, the CER relied on the study conducted by Dr. Mike Holland who canvassed the significance of Eskom's emission exceedances and the detrimental effect it has on the wellbeing of humans and further to put into perspective the intensity of Eskom's emission exceedance. The emissions are described as unacceptable especially when compared to other countries with notoriously higher polluting industries. The Forum reviewed Dr. Holland's study, and this is dealt with in section 11.3.

Furthermore, the CER is of the strong view that the Minister's hands are tied in that the MES provisions are very prescriptive and, considering judgment in the Deadly Air case, she has no other option but to dismiss Eskom's applications. In this regard, the Forum agrees that Eskom

[34] https://www.powermag.com/react-reduces-emissions-and-water-use/

must comply with the law however, it is important to note that this issue requires a multifaceted approach which has been addressed in this report.

On the other hand, AIDC blames debt as the main reason for Eskom's inability to comply with existing legislation in respect to emission limits, consequently underinvestment, job losses, deteriorating service and rising energy poverty have largely impacted its failure.

The AIDC notes that despite Eskom's existing fleet producing power that is cheaper than REI4P average and significantly cheaper than renewables from the IPP, little to no investment has been made in the conventional plants. Furthermore, if the renewable energy providing 40% of the country's generating capacity is pursued by expanded REI4P, this will bring about several negative outcomes for South Africa, such as loss of energy sovereignty, exposure to uncertain economics of the IPP system, intensifying of Eskom's death spiral (causing more migration of the grid), the lack of viable plans to confront technical challenges of the variable power and the increase in severity of the current investment crisis.

The AIDC recommends a pension fund model called pay-as-you-go used to cover all benefits paid to retired members through contributions and investment incomes as well as the repudiation of Eskom's odious debt including short term non-market solutions via GEPF to release Eskom from its unproductive debt burden. Furthermore, it proposed the halting of any unbundling plans as this will cause job loss and drive electricity as a profit-making enterprise rather than a fundamental public service. Ending the REI4P programme, building global cooperation around the use of renewable energy technologies, developing a planned approach to shift to a low-carbon economy and building an Eskom according to key public ethos principles are also recommended.

The AIDC submits than an unsustainable financing model is the fundamental cause for Eskom's constant request for tariff hikes, consequently exacerbating its ability to maintain its infrastructure and thus a reflection of its inability to deliver reliable, affordable, and physically accessible electricity. It adds that Eskom truly becoming a public entity, thereby alluding to the de-monetization of the utility, will reverse societal collapse.

In view of the AIDC's submissions, the Forum agrees that the funding model for any abatement technology must be sustainable however, the reality is that Government will have to assist with funding and ultimately that cost may be passed on to taxpayers or electricity consumers. In addition, determining the funding model can really only be considered once a decision has been made regarding the appropriate abatement technology that should be implemented.

The Solidarity Strategy Institute submitted (section 10.7.4) that livelihood, environmental sustainability, and the sustainability of a company are all of equal importance and thus require a fair balance. In addition, such balance must be exercised when determining what is best for workers, communities, and the environment. The organisation supports the motivations for exemption and proposes that addressing environmental requirements from part of the exemption. In this regard, Forum agrees with this recommendation and has demonstrated in this report that the members have conducted a comprehensive balancing exercise which takes into account aspects related to health, employment and the environment.

The Forum has also noted SEIFSA's submissions that the metal and engineering sector is the backbone of industrialization however, that it has been adversely affected by the loadshedding crisis and it is expected that this would cause a contraction in the production sector by 2.2% on a compound annual basis in 2023, which is an increase to the record of 1.2% of the preceding. The intensifying energy crisis has also led to companies facing employment losses, production declines, cancelled investments, the requirement for alternative electricity sources and an increase in monthly operating costs. In view of this, the Forum has considered various mechanisms to mitigate loadshedding and has, in this regard, provided alternative solutions to minimise the impact of the energy crisis.

11. CONSIDERATION OF CRITICAL FACTORS

11.1. Air Quality Considerations

11.1.1. Background

Air quality management is the process by which air quality is assessed and response strategies are developed and introduced. AAQS are an internationally recognised tool for the management of air quality in order to protect human health and the environment.

In order to formulate an AAQ management strategy for a particular area, the ambient pollution concentrations in the atmosphere must first be determined. Use can be made of either AAQ monitoring or atmospheric dispersion modelling to accurately determine the air quality concentrations at a specific location. These AAQ concentrations are then evaluated against the AAQS to determine compliance.

11.1.2. National Ambient Air Quality Standards (NAAQS)

NEMAQA reformed the law regulating air quality in order to protect the environment. NEMAQA is characterised by a paradigm shift from managing air pollution exclusively by the control of emissions from individual point sources to a holistic approach based on controlling ambient concentrations in the receiving environment. Thus, the effects-based approach of NEMAQA requires the setting of NAAQS, with the objective of protecting human health and well-being (Table 2). The NAAQS include both a *"limit value*" and a "frequency of exceedance". The "*limit value"* refers to a concentration based on scientific knowledge, with the aim of minimising harmful effects on human health. The "*frequency of exceedance"* refers to the tolerated number of times a limit value can be exceeded in one calendar year.

These NAAQS standards are set out in the table below.

Pollutant	Average Period	Concentration	Frequency of Exceedance	Compliance Date
Nitrogen Dioxide (NO_2)	1 hour	106 ppb	88	Immediate
	1 year	21 ppb	0	Immediate
Inhalable particulate matter less than 2.5 µm in diameter ($PM_{2.5}$)	24 hour	40 µg/m^3	4	Immediate until 31 December 2029
	24 hour	25 µg/m^3	4	1 January 2030
	1 year	20 µg/m^3	0	Immediate until 31 December 2029
	1 year	15 µg/m^3	0	1 January 2030
Inhalable particulate matter less than 10 µm in diameter (PM_{10})	24 hour	75 µg/m^3	4	Immediate
	1 year	40 µg/m^3	0	Immediate
Sulphur Dioxide (SO_2)	10 minutes	190 ppb	526	Immediate
	1 hour	134 ppb	88	Immediate

	24 hour	48 ppb	4	Immediate
	1 year	19 ppb	0	Immediate

Table 2:NAAQS Standards

11.1.3. Compliance with the NAAQS: Ambient Monitoring Results

11.1.3.1. Declaration of Priority Areas

The VTAPA was declared a priority area in April 2006 (Government Gazette Notice No. 365 of 21 April 2006, as amended by Notice 711 of 17 August 2007) due to the concern of elevated pollutant concentrations within the area, specifically of PM.

On 23 November 2007, the HPA was declared in terms of section 18 of the NEMAQA. The declaration was based on the fact that air quality in the area was consistently exceeding the NAAQS.

On 15 June 2012, the Minister of Water and Environmental Affairs: Bomo Edith Molewa published a notice in the national Gazette (No. 35435 and Notice No.495 of 15 June 2012), announcing her final declaration of the WBPA. This is an area comprising the Bojanala District in the North-West Province and what is generally considered a "*pristine*" environment (Waterberg District), therefore requiring a proactive and preventative "*flagship"* approach to the history of air quality management in South Africa. This is in line with the NEMA precautionary principle that entails the application of preventative measures in situations of scientific uncertainty, where a course of action may cause harm to the environment.

Eskom's Lethabo power station is located in the VTAPA whilst its Matimba and Medupi power stations are located in the WBPA. Eskom's Hendrina, Grootvlei, Camden, Arnot, Duvha, Kriel, Majuba, Tutuka, Kusile and Matla power stations are situated in the HPA. Figure 4 illustrates the geographical location of Eskom's power stations.

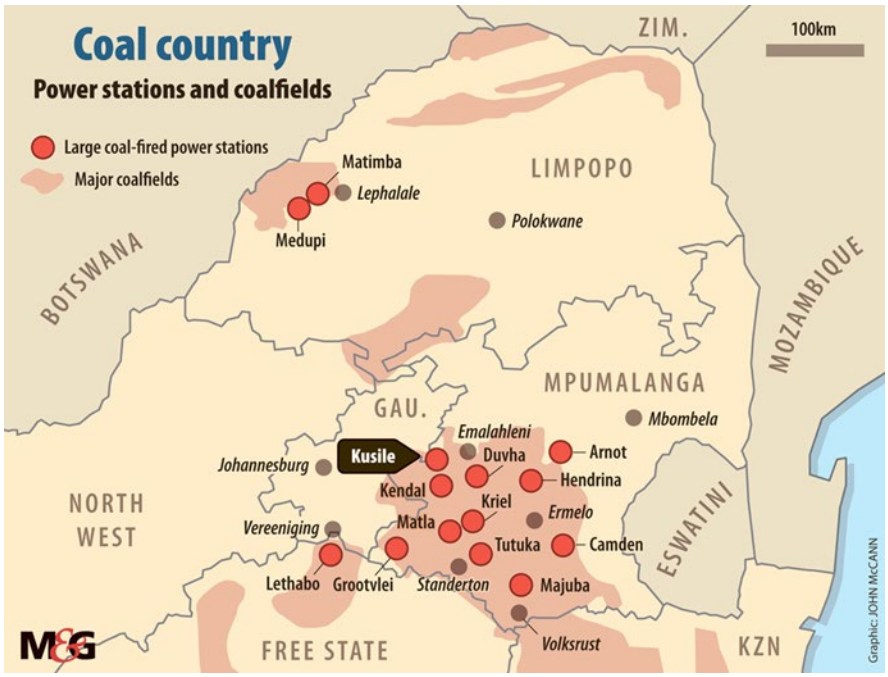


Figure 4 : Location of Eskom Power Stations (Source: Mail & Guardian /John McCann, 2019)

11.1.3.2. VTAPA NAAQS Compliance

The AAQ assessment made use of available AAQ data from SAAQIS, District Municipalities and industries. Data was obtained for the period 2007-2016 to assess AAQ trends. It reiterated that the Eskom Lethabo power station is located in the VTAPA.

SO_2 Compliance: Long term trends, from 2007 to 2016, in SO_2 concentrations showed compliance with the NAAQS at most of the stations for most of the time. Trends in SO_2 concentrations over 10 years showed small decreases at Diepkloof, Zamdela, Randwater and Eco Park but slight increases over time at Kliprivier, Three Rivers and AJ Jacobs.

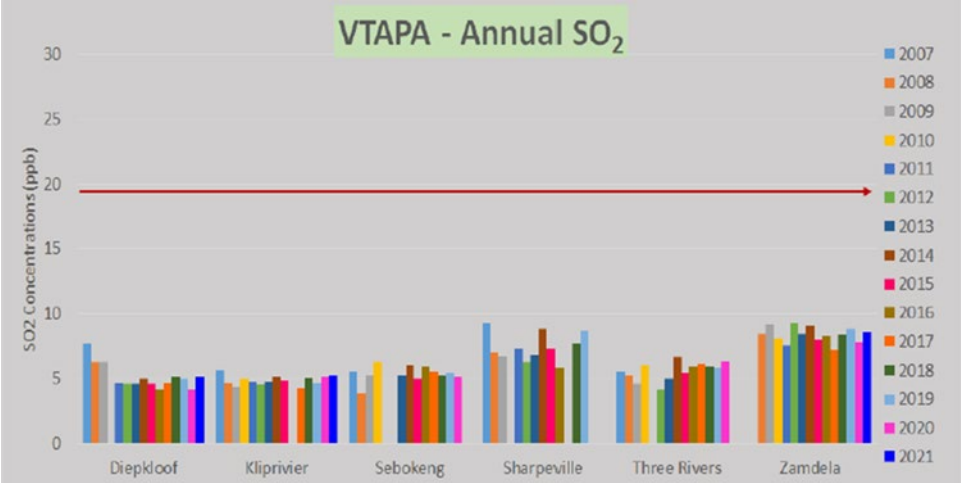


Figure 5:VTPA SO2 annual average trend for the period 2007 to 2021 (DFFE State of Air Report, 2022)

PM Compliance: PM_{10} concentrations exceeded the NAAQS at most of the stations for most years except at Eco Park, where annual PM_{10} emissions have been compliant with the NAAQS since the establishment of the station. The highest concentrations were recorded at Zamdela. Annual average $PM_{2.5}$ concentrations were non-compliant with the NAAQS, for most of the period assessed, except for AJ Jacobs, where no annual exceedances were noted between 2014 and 2016.

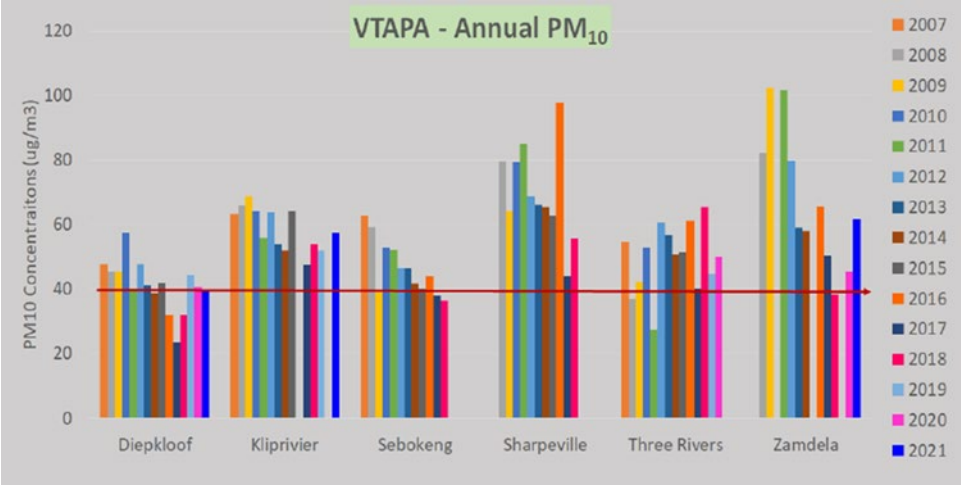


Figure 6: VTPA PM10 annual average trend for the period 2007 to 2021 (DFFE State of Air Report, 2022)

NO_2 Compliance: Annual average NO_2 concentrations exceeded the NAAQS at Diepkloof (for all the years except 2011), Kliprivier (2009 and 2010), Sebokeng (2015) and Sharpeville (2015). Hourly NO_2 concentrations were also non-compliant with the NAAQS at Sebokeng in 2015, with the lowest concentrations recorded at the Randwater station. Monthly NO_2 concentrations have decreased slightly at the Leitrim station, while concentrations have increased at the Diepkloof, Three Rivers, Zamdela and AJ Jacobs stations. At the other stations, the ambient NO_2 concentrations remained the same. Most of the stations recorded NO_2 concentrations from all directions at low wind speeds. Observations from the stations located in high traffic areas, with a strong contribution during low wind speeds, were most likely from vehicle exhaust emissions (VTAPA AQMP, 2020), characterised by a myriad of agricultural, commercial, industrial and residential land use activities, which are all located in close proximity to one another. Thus, there is a broad spectrum of SO_2 emission sources for the area. These include industrial emissions, domestic fuel burning, vehicle tailpipe emissions, biomass burning, water treatment works, agricultural activities and numerous other fugitive sources.

11.1.3.3. HPA NAAQS Compliance

Since the declaration of the HPA and subsequent development of the AQMP, there has been an improvement in AAQ monitoring for the period 2007 to 2022 (DFFE, 2022). The number of monitoring stations have increased from 23 to 31 (reporting on SAAQIS). However, a large majority of AQMS in the HPA have a very low data availability (less than 75%) for the pollutant being measured. It is reiterated that the Eskom Hendrina, Grootvlei, Camden, Arnot, Duvha, Kriel, Majuba, Tutuka, Kusile and Matla power stations are located in the HPA.

SO_2 Compliance: While there was a clear improvement in AAQ monitoring since the development and implementation of the HPA AQMP i.e. in 2013, the hourly averages for SO_2 monitored data are still showing a number of exceedances of the hourly NAAQS of 134 ppb. These exceedances occur at a large majority of the stations for most of the years in terms of the HPA AQMP review (DFFE, 2022). It is noted that there is an increased level of compliance with the daily NAAQS of 48 ppb. What is also clear is a pronounced increase in compliance from 2014 to 2020, with consistent compliance noted at the Club, Bosjesspruit, Camden and

Majuba power stations (DFFE, 2022). The annual average ambient SO_2 concentrations recorded at the AQMS indicate adequate compliance with the annual NAAQS of 19 ppb (DFFE, 2022). This trend is illustrated in Figure 7.

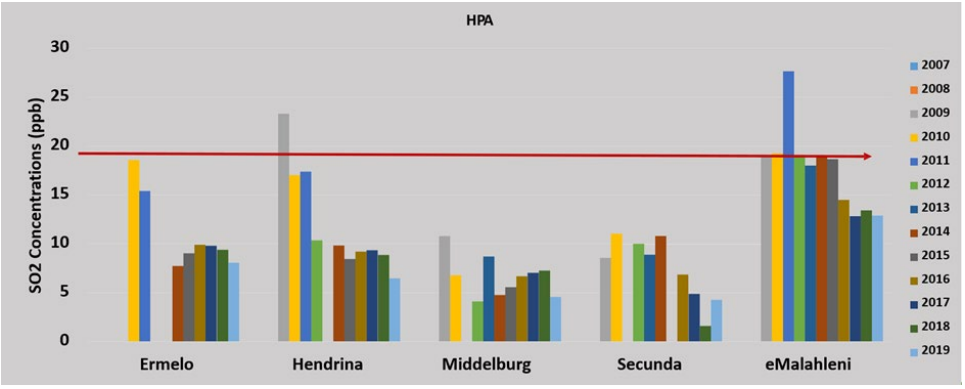


Figure 7: Measured SO_2 annual average ambient air quality concentrations for the period 2007-2019 for the HPA ambient air quality monitoring network (DFFE, 2020)

PM Compliance: An analysis of the available monitored data (2007-2020) illustrates that while there was a clear improvement in AAQ monitoring since the development and implementation of the HPA AQMP i.e. in 2013, ambient PM_{10} concentrations were still elevated over many areas in the HPA with exceedances of the PM_{10} daily NAAQS of 75 µg/m³.

The inception of AQMP implementation in 2013 has resulted in a variation in the status of compliance with the annual NAAQS of 40 µg/m³ across the entire region. The analyses of the annual trends illustrate that some areas have witnessed significant improvements i.e., Club Camden and Elandsfontein from 2012 to 2020. Conversely little-to-no improvement and even further deterioration has taken place at some sites i.e. Komati, Bosjesspruit and Majuba (DFFE, 2022).

NOx Compliance: The hourly NO_2 NAAQS of 106 ppb was seldom exceeded after 2012, with exceedances taking place at the Elandsfontein and Club AQMS. It is also important to note that consistent exceedances of the NAAQS were noted at the Club AQMS prior to 2012, with a clear improvement thereafter, again speaking to the development of the priority area AQMP and the subsequent implementation from 2012, having an important bearing on the observed improvements (DFFE, 2022).

11.1.3.4. WBPA NAAQS Compliance

The 2022 State of the Air Report and National Air Quality Indicator (DFFE, 2022) evaluated NAAQS compliance at AAQ monitoring stations for the WBPA. This was conducted for the period 2013 to 2021. Only AAQ monitoring stations that met the minimum requirements (DFFE, 2022) for data recovery were included in the assessment. It is reiterated that Eskom's Matimba power station is located in the WBPA.

SO_2 Compliance

Long term trends, from 2013 to 2021, for SO_2 concentrations showed full compliance with the NAAQS at all of the stations. Trends in SO_2 concentrations over 10 years showed small decreases at most stations.

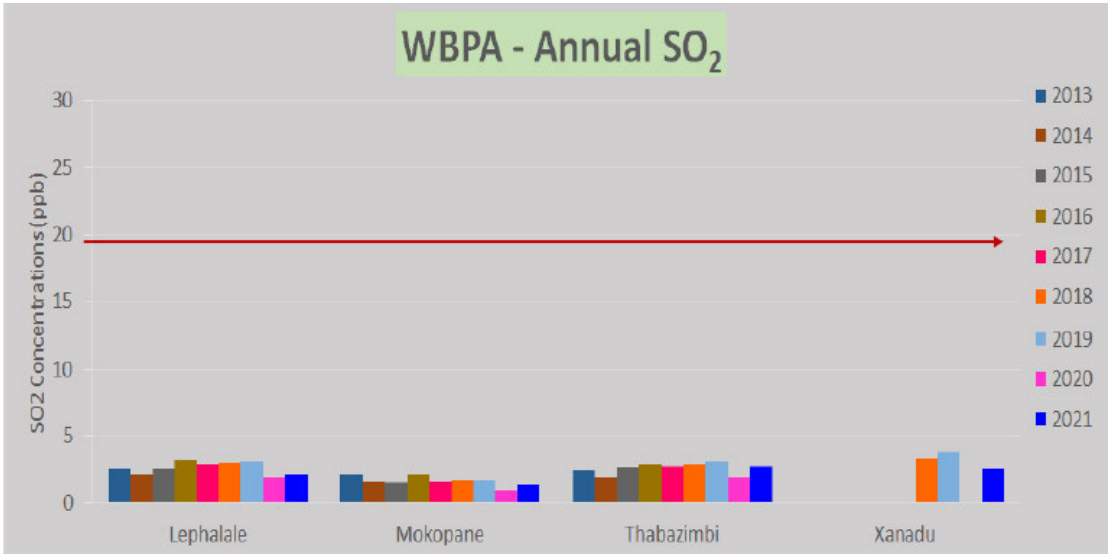


Figure 8: WPA SO2 annual average trend for the period 2013 to 2021 (DFFE State of Air Report, 2022)

PM Compliance

Both PM_{10} and $PM_{2.5}$ concentrations for the period 2013 to 2021 were in full compliance at Lephalale whereas exceedances of the NAAQS were noted at Mokopane, Thabazimbi and Xanadu. As illustrated in Figure 10, these peak concentrations occur at these stations in

winter, due to increased residential fuel burning for space heating and cooking. It is noted that the Eskom power station is located in the Lephalale airshed.

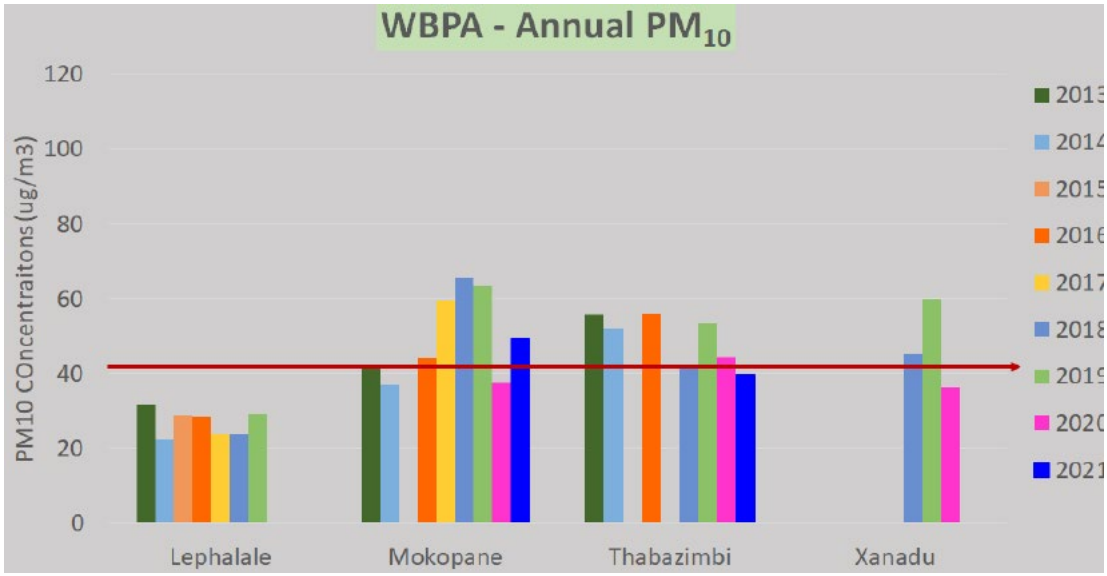


Figure 9: WPA PM10 annual average trend for the period 2013 to 2022 (DFFE State of Air Report, 2022)

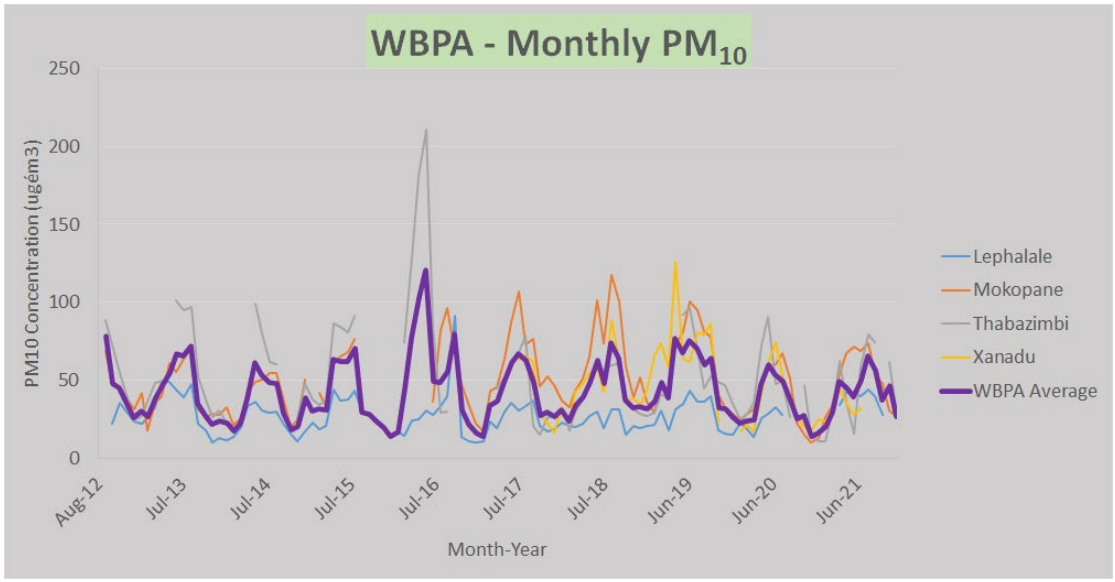


Figure 10: WPA PM10 monthly average trend for the period 2013 to 2021 in winter (DFFE State of Air Report, 2022)

11.1.4. Compliance with the NAAQS: Dispersion Modelling Results

Understanding these atmospheric pathways of important species and quantifying the flux of material along these pathways is fundamental to the study of air pollution and atmospheric science (Ramandh, 2010). Air pollution modelling is an attempt to describe the interrelation between emissions, atmospheric concentrations and deposition using a set of mathematical equations that simulate these conditions.

The impact of Eskom's emissions on AAQ has been comprehensively assessed in independently compiled Atmospheric Impact Reports (AIR).[35]The purpose of the AIRs was to assess the likely implications of a postponement and the requested alternative emissions limits on human health and the environment in respect of each Eskom power station. Additionally, an air quality report, considering the cumulative impact of all the Eskom stations over the HPA was completed.

11.1.4.1. Dispersion Model Results for each Eskom Power Station

Dispersion modelling of the current emissions for SO_2, NO_x and PM_{10} from the individual Duvha, Kriel, Hendina, Kendal, Lethabo, Majuba, Tutuka, Matla and Matimba power stations indicates compliance with the relevant SO_2, PM_{10} and NO_x NAAQS for all averaging periods (Table 3). It is noted that this AIR should be read, however, in conjunction with the Summary AIR that contains the predicted concentrations as a result of the combined emissions from all the Eskom power stations.

[35] Accessed at https://www.naledzi.co.za/public-documents-naledzi.php .

Averaging period	Scenario 1 - Actual Emissions	Scenario 2 - New plant MES compliance
	SO_2 (µg/m³)	
1-hour	Yes	Yes
24-hour	Yes	Yes
Annual	Yes	Yes
	NO_2 (µg/m³)	
1-hour	Yes	Yes
Annual	Yes	Yes
	PM_{10} and $PM_{2.5}$ (µg/m³)*	
24-hour	Yes	Yes
Annual	Yes	Yes

** includes $PM_{2.5}$ predicted for the transformation of SO_2 and NO_2 to particulate form.*

Table 3: Summary of compliance with the NAAQS for AAQ predicted for each of the emissions scenarios modelled for each Eskom power station individually

11.1.4.2. Dispersion Model Results for the Cumulative Impact of All Eskom Power Stations in the HPA

In addition to the individual AIR completed for each power station, an air quality report, considering the cumulative impact of the Eskom stations over the HPA was completed. The analysis included three scenarios, which considered (1) the actual emissions, (2) emissions if the MES was complied with and (3) emissions if six power stations are decommissioned by 2030. For scenario 1 (current Eskom actual emissions), the predicted ambient SO_2 and NO_2 compiled with the respective NAAQS throughout the Highveld modelling domain. Exceedances of the 24-hour NAAQS for PM_{10} is predicted in an area between the Matla and Kriel power stations. The predicted annual average concentrations for PM_{10} comply with the NAAQS over the Highveld. Exceedances of the annual and 24-hour NAAQS for $PM_{2.5}$ are predicted to occur close to some power stations. The particulate exceedances are attributed to low-level fugitive sources (Eskom stockpiles and ash dumps) and the conversative model assumption to model all particulates regardless of size fraction, as PM_{10} and as $PM_{2.5}$. It is noted from the analysis that the non-compliance with the NAAQS is not due to Eskom alone,

but the power stations are important contributors to the air quality seen to prevail across the Highveld.[36]

11.1.4.3. Other considerations

Today, if Lethabo was forced to comply with the MES, it would need to shut down, resulting in a loss of 3558 MW to the SA grid.

The installation of abatement equipment cannot be done while Lethabo is generating electricity - the power station will need to be offline while the equipment is being installed. Once the abatement equipment has been installed, the abatement equipment will require parasitic power which will reduce the quantity of electricity supplied to the grid.

11.1.4.4. Emissions intensity

Figure 11, Figure 12 and Figure 13 below summarise the PM, SOX and NOX emissions of each PSs that retires post 2030 stations and compares them to the coal fleet's average.

[36] Ibid.

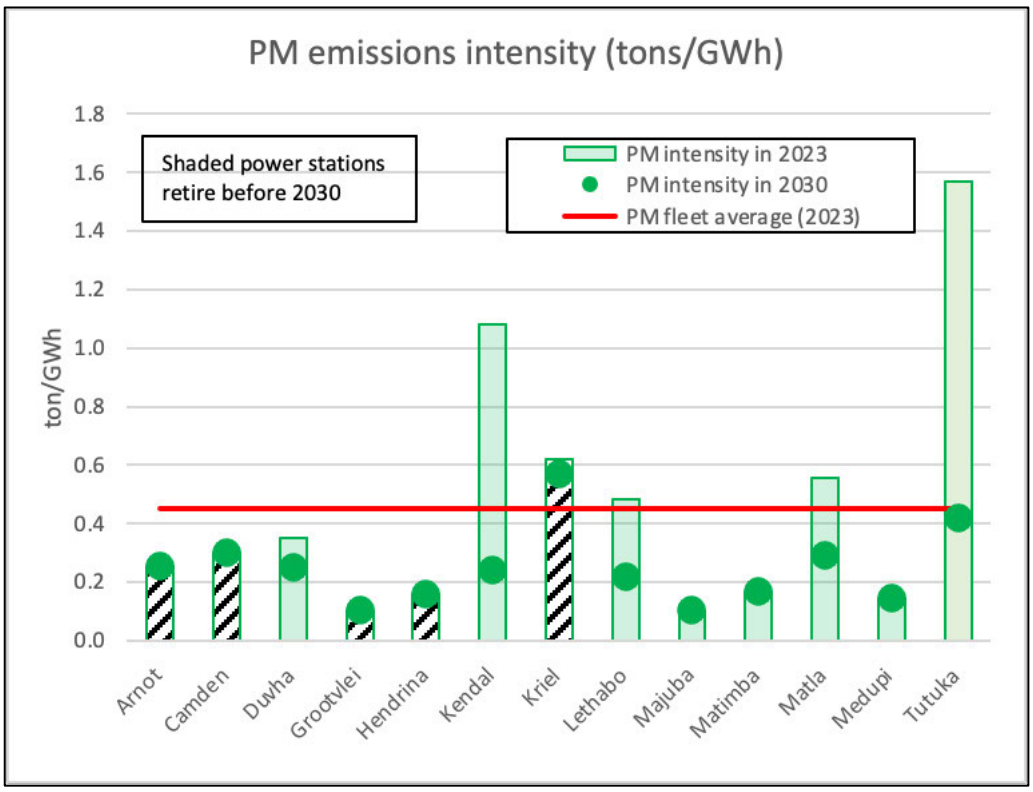


Figure 11: Power station PM emission intensity relative to the coal fleet' average

In the case of PMs, Kendal, Kriel, Lethabo, Matla and Tutuka all have emissions that are higher than the coal fleet's average.

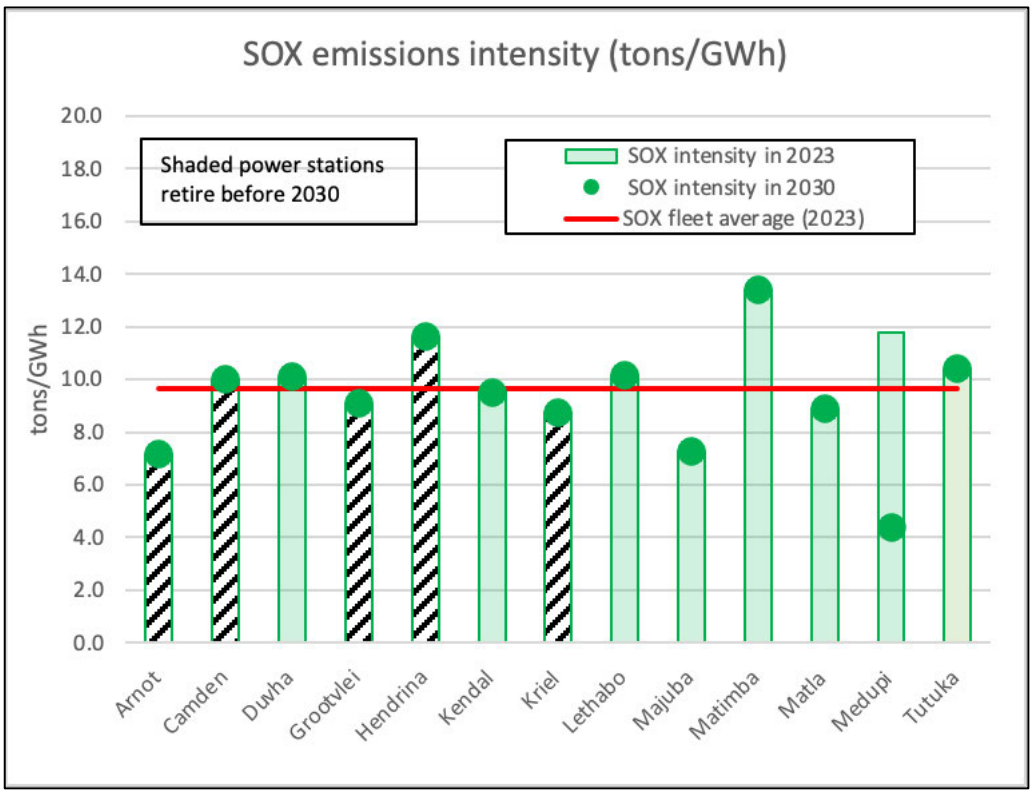


Figure 12: Power station SOX emission intensity relative to the coal fleet' average

The coal from the Waterberg area has a high sulphur content so it is unsurprising that Matimba and Medupi have the highest SO_X emission intensities in Eskom's coal-fleet.

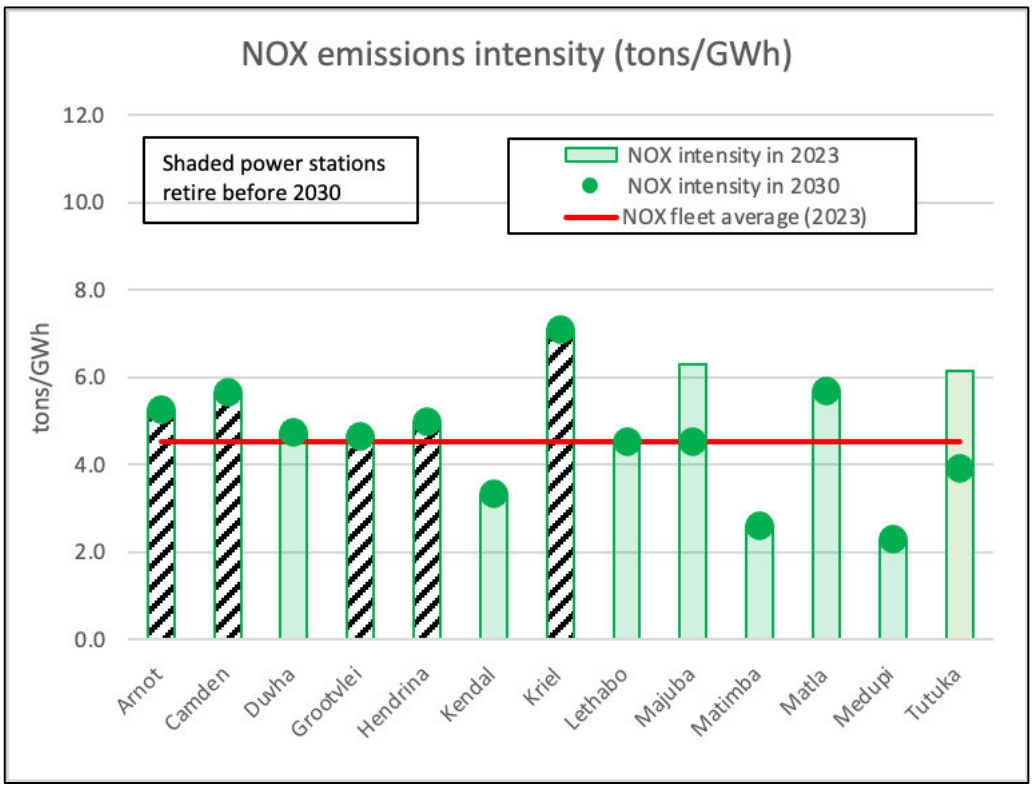


Figure 13: Power station NOX emission intensity relative to the coal fleet' average

The higher NO_X emission intensity power stations, as shown in the graph above, will either retire by 2030 (Arnot, Camden, Grootvlei, Hendrina and Kriel), have burner retrofits (Lethabo, Majuba and Tutuka), or there will be NO_X burner optimisation and load reduction (Arnot, Duvha, Grootvlei, Kriel and Matla).

11.1.5. Emissions data per power plant

The Eskom power station fleet's historical concentration of emissions for the period April 2019 to September 2022 were analysed and they are presented graphically for each of the power stations for the pollutants PM, SO_X and NO_X. The emission concentrations were contrasted to the MES in terms of existing plant and new plant standards.

11.1.5.1. Emissions from Duvha

In 2022/23, Duvha's emissions were 7.6 tons of PMs, 85.9 tons of SO_X and 43.9 tons of NO_X.

PM emissions are highly variable and in the recent periods there have been numerous exceedances of even existing plant standards. Duvha's SO_X and NO_X emissions are relatively constant but exceed new plant standards and fall between existing and new plant standards.

The historical emission concentrations from Duvha per pollutant are illustrated in the figures below.

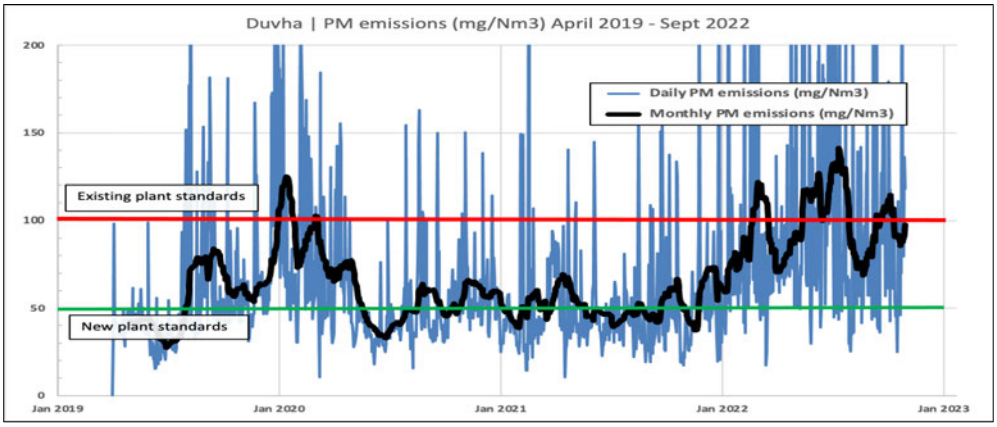


Figure 14: Duvha PM Emissions

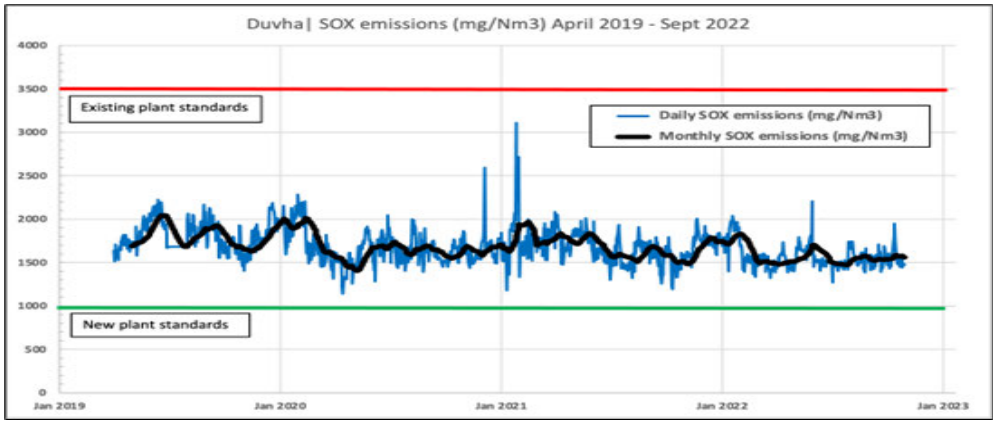


Figure 15: Duvha SOX Emissions

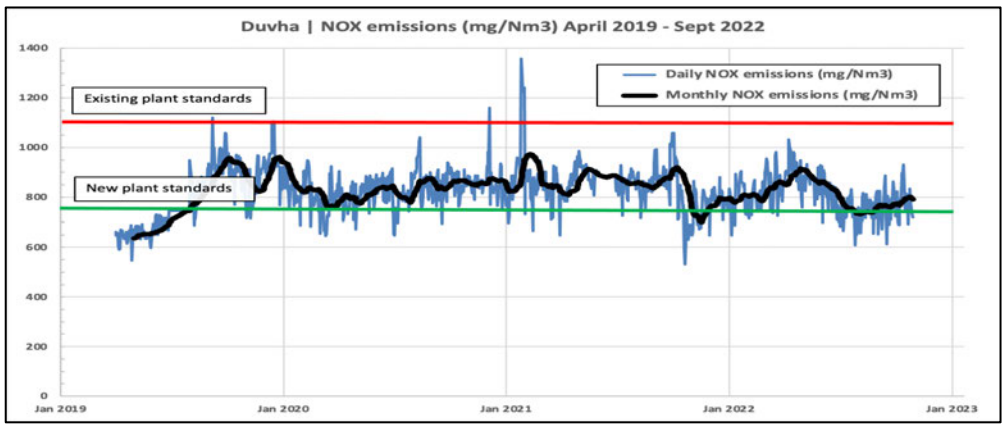


Figure 16: Duvha NOX Emissions

11.1.5.2. Emissions from Kendal

Kendal applied for a postponement for compliance with the MES for PM, SO_X and NO_X. In 2022/23, Kendal emitted 51.1 tons of PMs, 126.5 tons of SO_X and 47.9 tons of NO_X.

PM emissions are high, are very variable and exceed MES existing plant standards. SO_X emissions are approximately mid-way between MES new plant and MES existing plant standards. NO_X emissions are around MES new plant standards, but not consistently.

The charts below show the historical emissions concentrations from Matimba for the period April 2019 - Sept 2022.

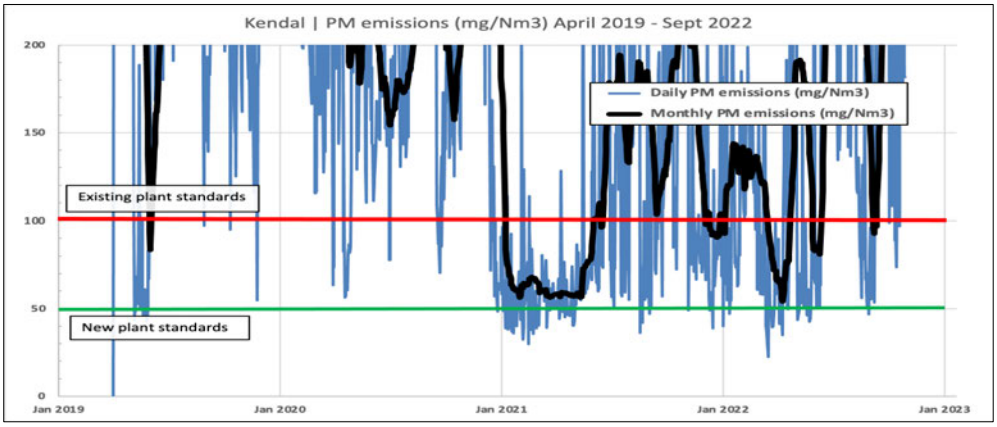


Figure 17: Kendal PM emissions

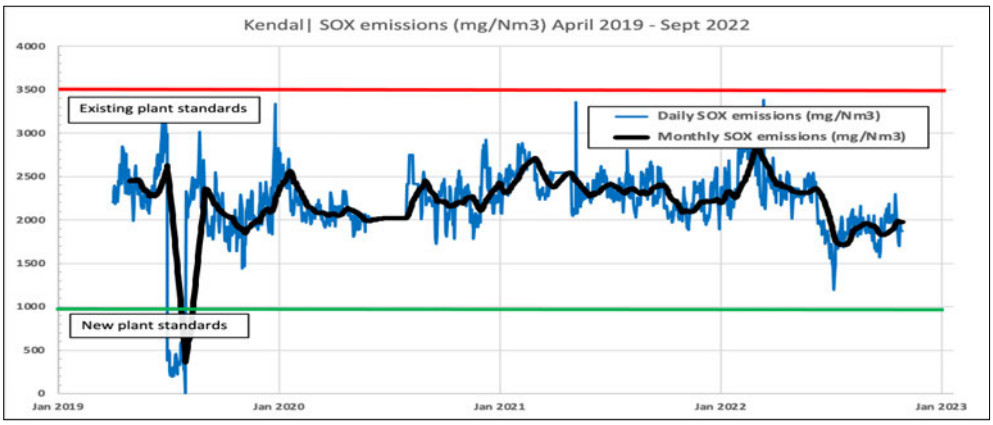


Figure 18: Kendal SOX emissions

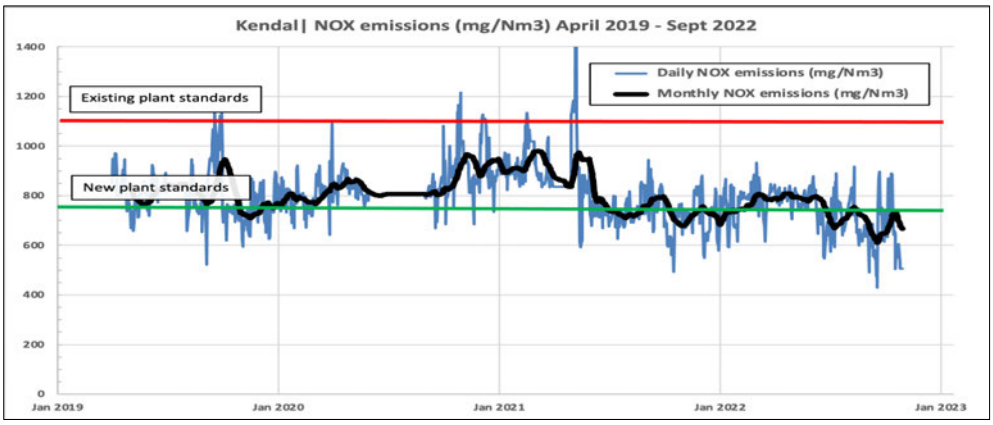


Figure 19: Kendal NOX emissions

11.1.5.3. Emissions from Lethabo

Lethabo applied for postponements/alternate limits in respect of PM, SO_X and NO_X. Lethabo's contribution to the AAQ relate to PM, SO_x and NO_x. In 2022/23, Lethabo emitted 11.3 tons of PMs, 183.7 tons of SO_X and 99.5 tons of NO_X.

Lethabo's PM emissions are variable and the 6-month moving average shows that the emission concentrations average around the existing plant standards. Lethabo's PM emissions exceed new plant standards by a wide margin and there are numerous incidences of PM emissions exceeding existing plant standards.

SO_X and NO_X emissions are approximately mid-way between new plant standards and existing plant standards. SO_X and NO_X emissions are less variable than PM emissions.

The charts below show the historical emissions concentrations of Lethabo for the period April 2019 - Sept 2022.

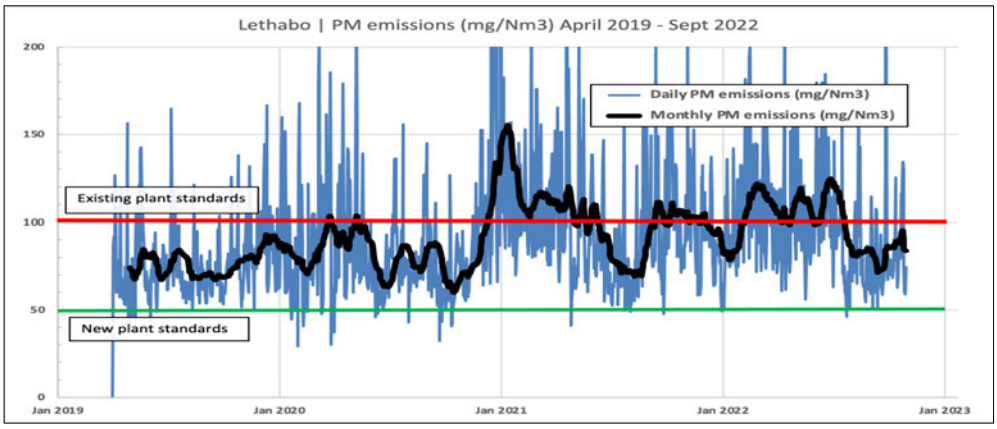


Figure 20: Lethabo PM emissions

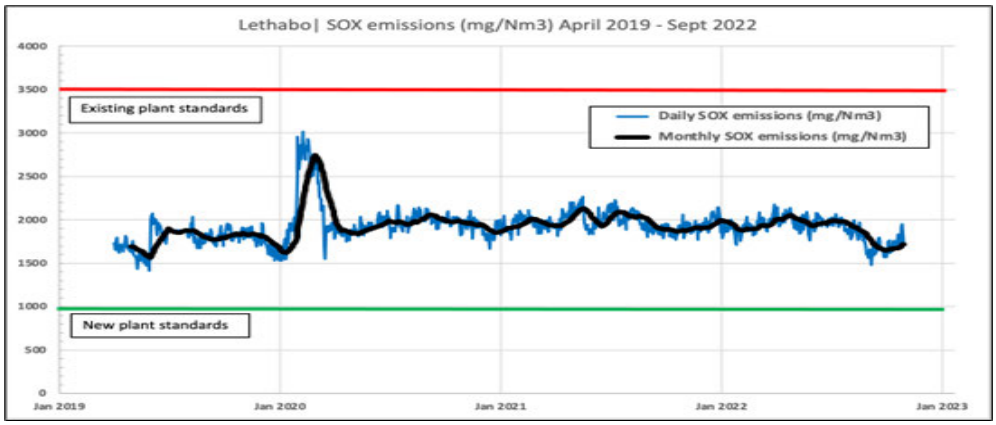


Figure 21: Lethabo SOX emissions

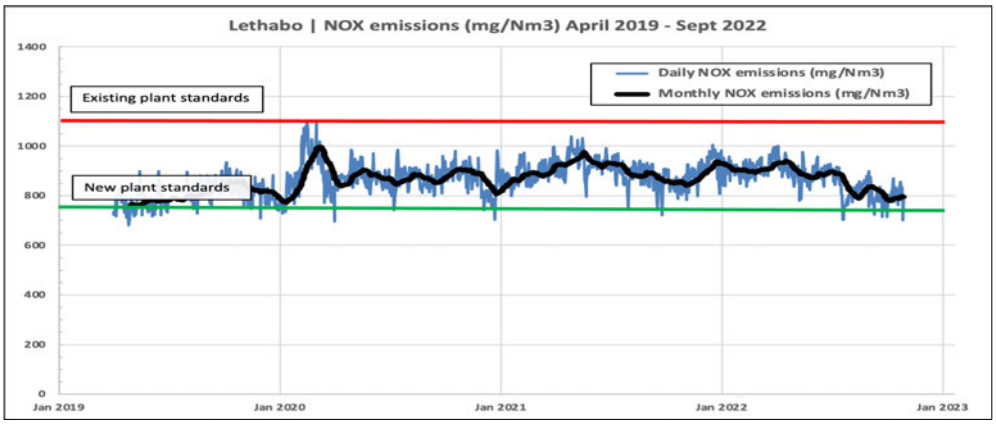


Figure 22: Lethabo NOX emissions

11.1.5.4. Emissions from Majuba

Majuba applied for postponements and alternative limits for SO_2 and NO_x. In 2022/23, Majuba emitted 1.6 tons of PMs, 120.2 tons of SO_X and 102.7 tons of NO_X.

Majuba's PM emissions are stable and are consistently below new plant standards. There is only one period, in January 2022, when PM emissions exceeded new plant standards. SO_X and NO_X emissions fall between existing and new plant standards. In the case of NO_X emissions, there are a few instances of non-compliance with existing plant standards, but these instances could be during start-up/shut-down conditions.

The charts below show the historical emissions concentrations from Kendal for the period April 2019 - Sept 2022.

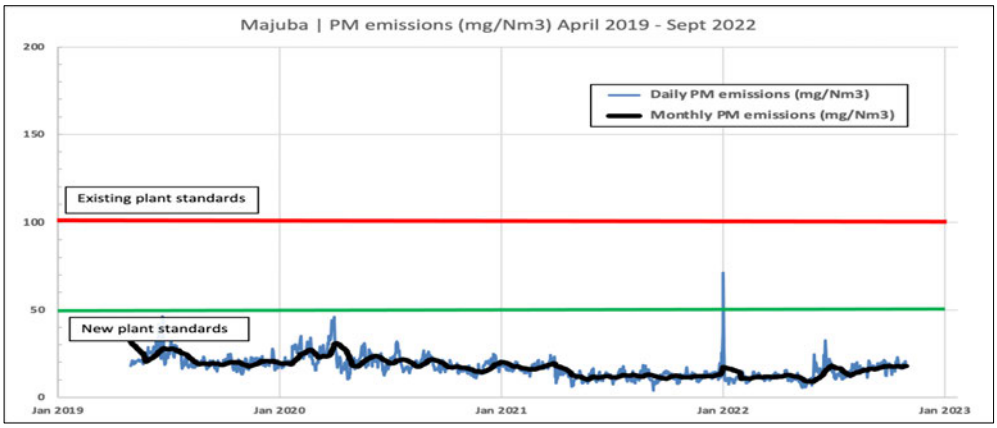


Figure 23: Majuba PM Emissions

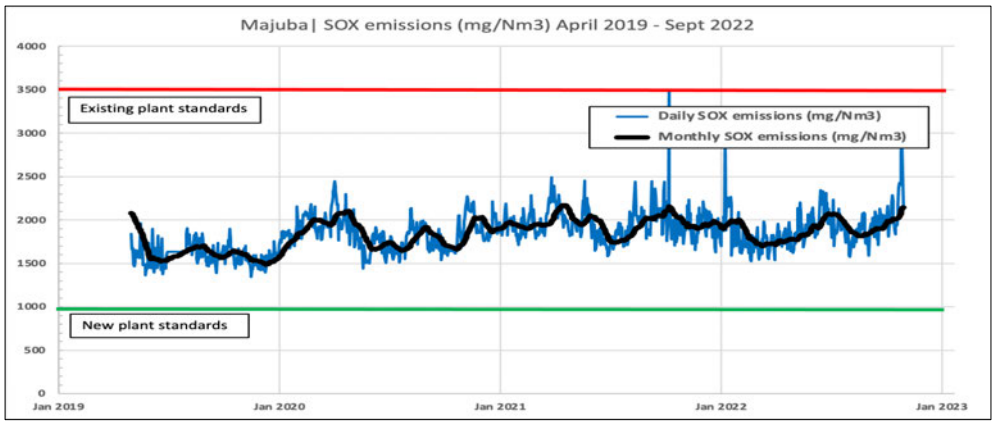


Figure 24: Majuba Sox emissions

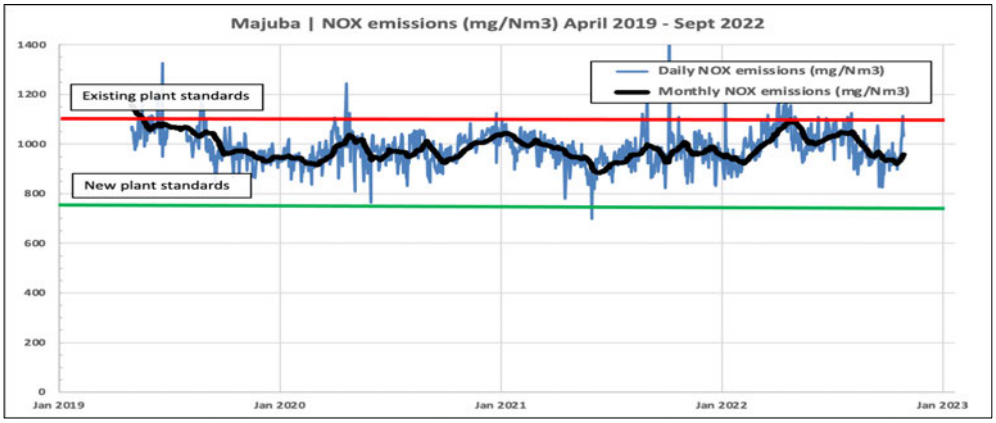


Figure 25: Majuba NOX emissions

11.1.5.5. Emissions from Matimba

Matimba applied for postponements in respect of SO_2, NO_x and PM. In 2022/23, Matimba emitted 4.18 tons of PMs, 307.5 tons of SO_X and 59.5 tons of NO_X.

Matimba's PM emissions are stable and consistently below new plant standards, with the exception of a few instances. The SO_X emissions fall between existing plant and new plant standards. In the case of NO_X emissions, there is consistent compliance with new plant standards, with the exception of a few instances.

The charts below show the historical emissions concentrations from Matimba for the period April 2019 - Sept 2022.

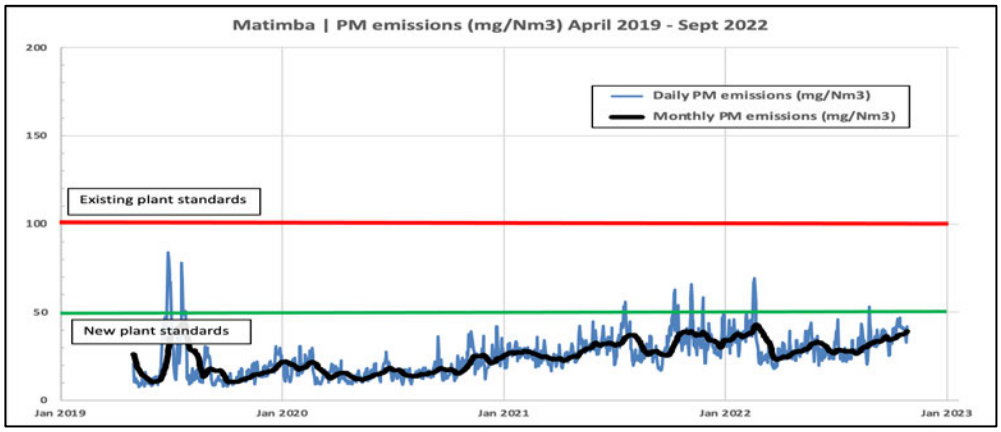


Figure 26: Matimba PM emissions

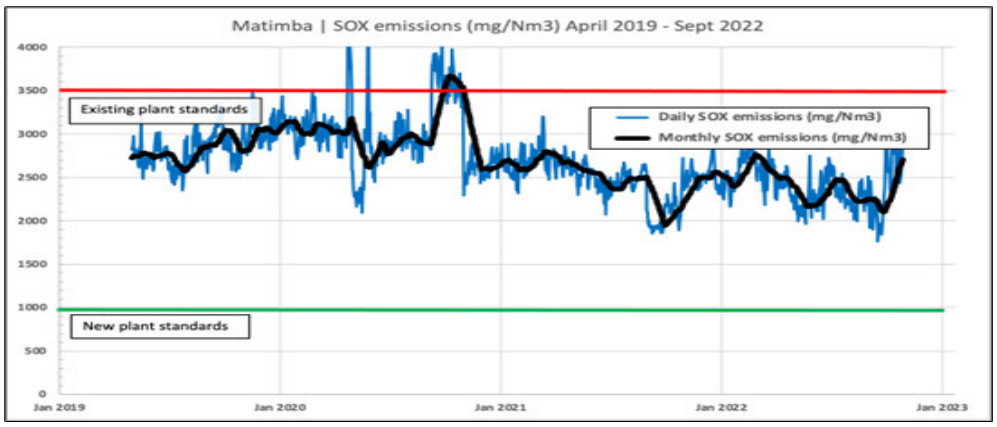


Figure 27: Matimba SOX emissions

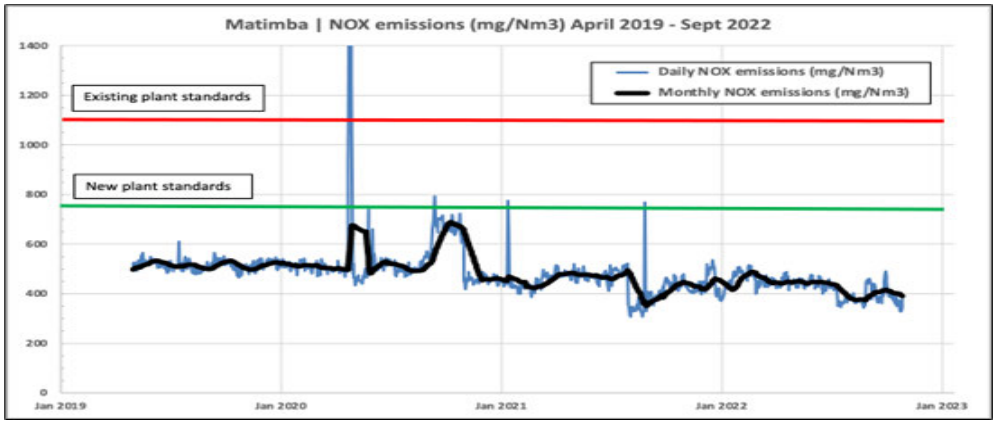


Figure 28: Matimba NOX emissions

11.1.5.6. Emissions from Matla

Matla's contribution to the AAQ relate to PM, SO_X and NO_X. In 2022/23, Matla emitted 18.1 tons of PM, 41.1 tons of SO_X and 92.3 tons of NO_X.

Matla's PM emissions are variable and consistently exceed existing plant standards, while SO_X and NO_X emissions are between existing plant and new plant standards.

The actual historical emission concentrations from Matla per pollutant is illustrated in the figures below.

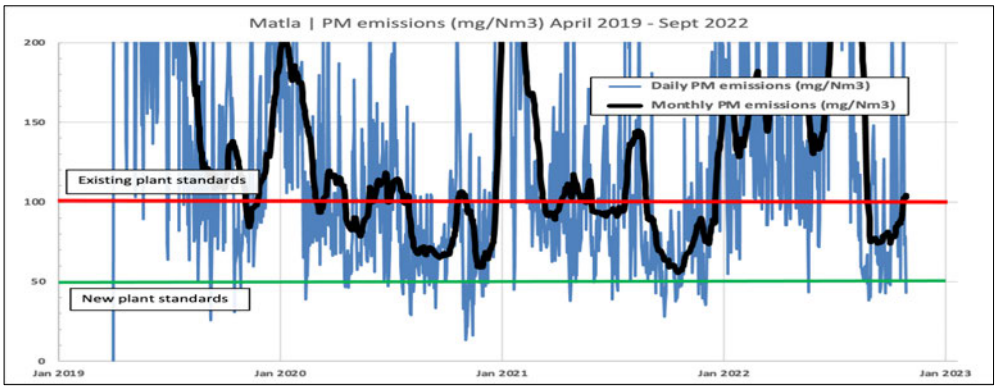


Figure 29: Matla PM emissions

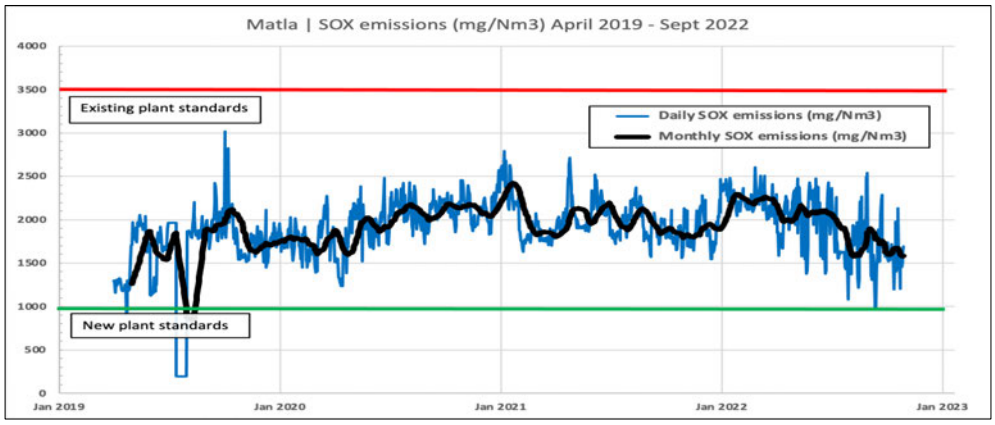


Figure 30: Matla SOX emissions

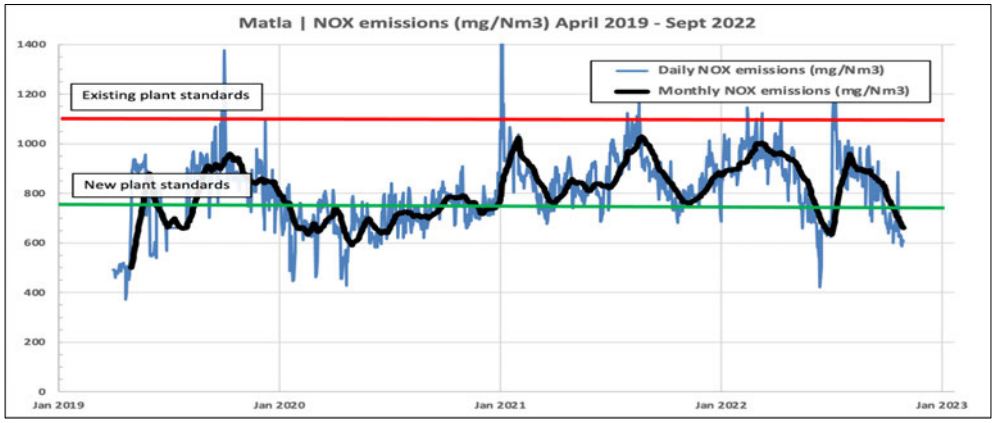


Figure 31: Matla NOX emissions

11.1.5.7. Emissions from Medupi

Medupi applied for a postponement in respect of SO_X. In 2022/23, Medupi emitted 3.2 tons of PM, 241.3 tons of SO_X and 50.5 tons of NO_X.

Medupi's PM and NO_X emissions consistently comply with new plant standards. SO_X emissions, on the other hand, exceed new plant standards. Medupi's SO_X emissions will only comply with new plant standards once it has been retrofitted with its FGD unit, which is scheduled to be completed by 2029.

The charts below show the historical emissions concentrations from Medupi for the period April 2019 - Sept 2022.

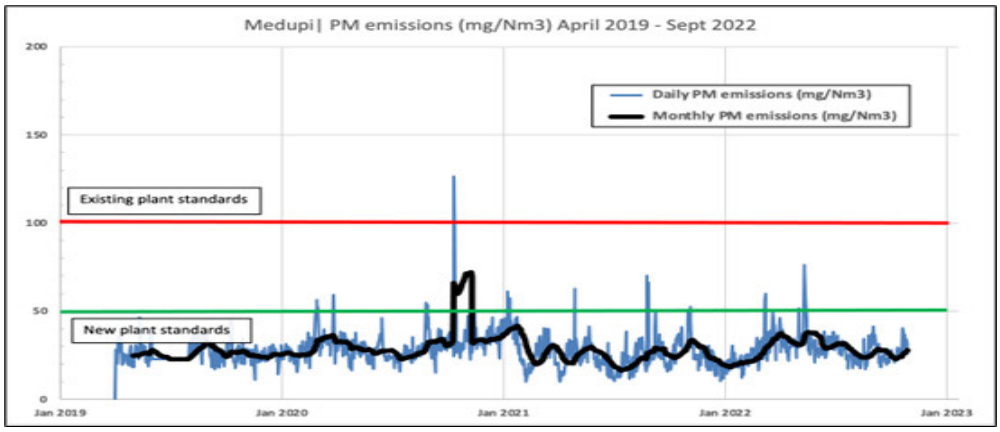


Figure 32: Medupi PM emissions

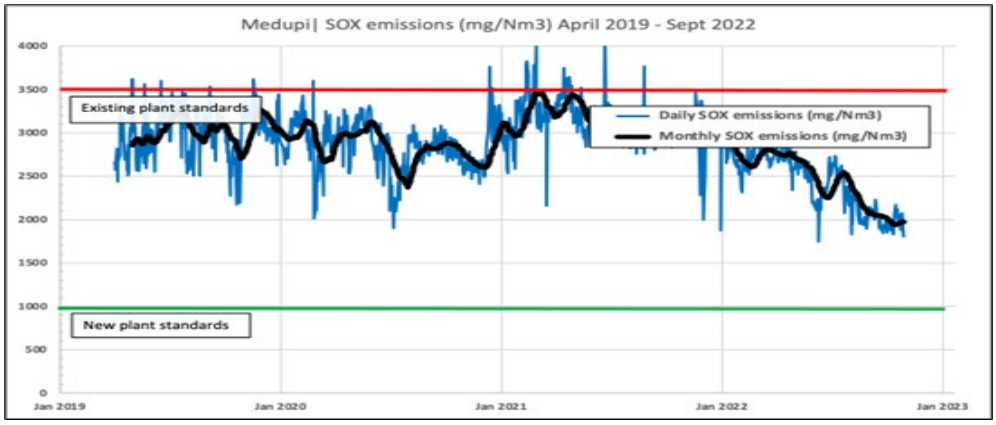


Figure 33:Medupi SOX emissions

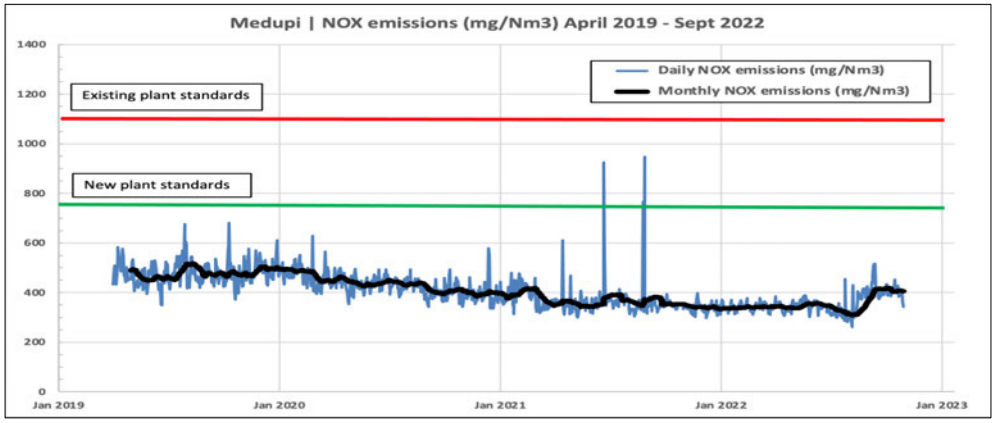


Figure 34: Medupi NOX emissions

11.1.5.8. Emissions from Tutuka

Tutuka has applied for alternative limits in respect of SO_2, NO_x and PM. In 2021/22, Tutuka emitted 13 661 tons of PM, 88 611 tons of SO_X and 52 462 tons of NO_X.

The charts below show the historical emissions concentrations of Tutuka for the period April 2019 - Sept 2022. The PM emissions from Tutuka consistently exceed existing plant standards. Tutuka's SO_X and NO_X emissions are between existing plant and new plant standards.

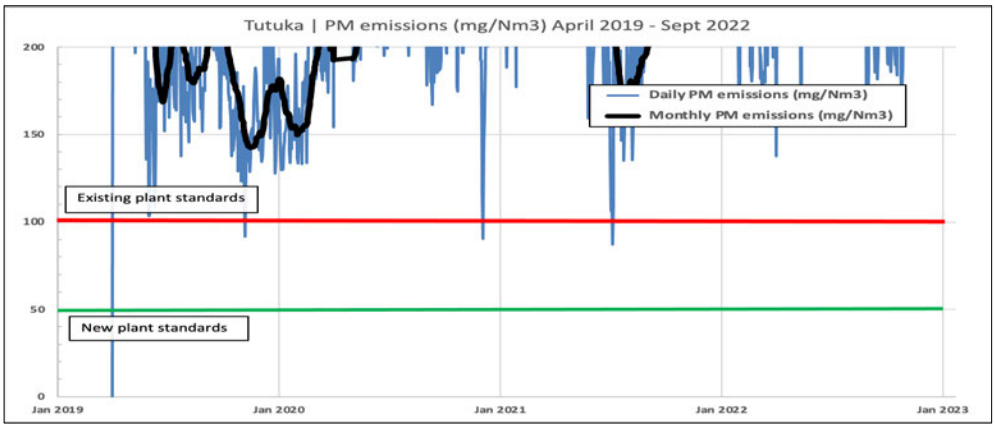


Figure 35: Tutuka PM emissions

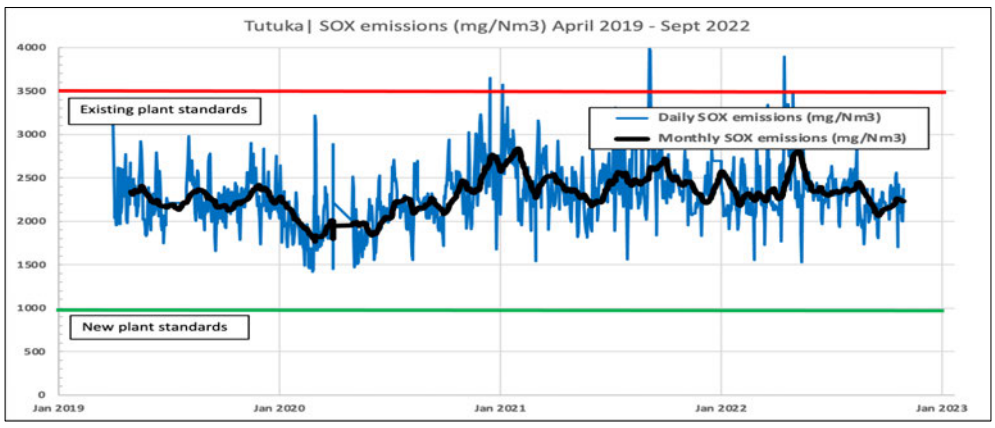


Figure 36: Tutuka SOX emissions

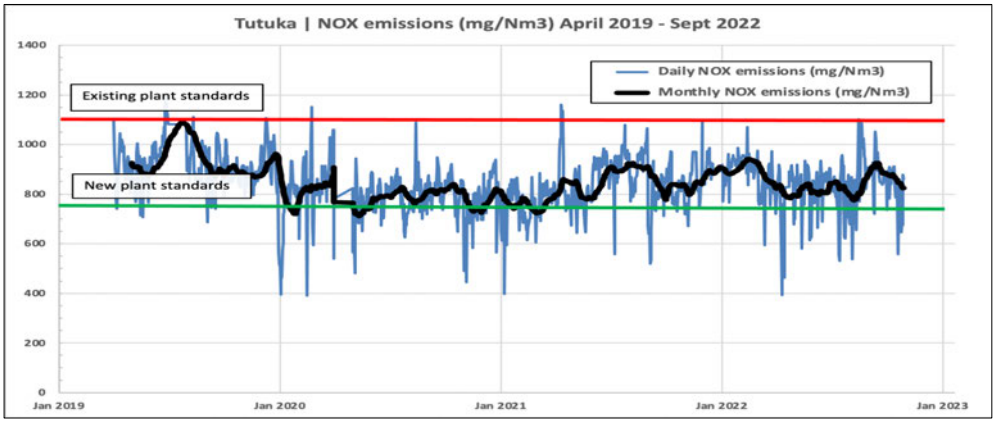


Figure 37:Tutuka NOX emissions

11.1.6. Eskom's history of compliance with the MES

Pursuant to its TOR, the Forum obtained from the NAQO's office, a summary of its records regarding the history of MES indulgences granted to Eskom in terms of the 2015 and 2021 postponement decisions and a history of Eskom's compliance or non-compliance with the MES and justifications provided. In terms of the latter, the NAQO provided its records for the period 2018 to 2023. The full extent of the information provided is attached hereto as Annexure 25. The information is in the format set out below, as an example. It shows the exceedances per facility per month.

Facilities	Exceedances by facilities per month													
			Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	June 2018	July 2018	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Comment
	Medupi	SO_2	E	E	NR	E	E	E	NR	NE	NR	NE	NE	NR	The reports showed that the performance of SO_2 for Units 4, 5, & 6 against the AEL limit is mostly in non-compliance except for the month of August, October and November.
	Majuba	SO_2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	The annual report mostly showed compliance in the performance of PM, SO_2 and NO_x for Units 1- 6 against the AEL limit.
		PM	NE	NE	NE	E	NE	NE	NE	NE	NE	NE	NE	NE	
		NO_x	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	
	Duvha	SO_2	NE	NE	NE	NE	NE	E	NE	NE	NE	NE	NE	NE	Mostly there is an evidence of compliance with the SO_2. On the other hand, the performance of NO_x is mostly in compliance, while non-

		NO_2	E	E	NE	E	NE	E	NE	NE	NE	NE	NE	NE	compliance was observed only in four 2018.
	Tutuka	SO_2	NE	NE	NE	NR	NR	NR	NR	NR	NR	NR	NR	NR	The report showed that the performance of PM, SO_2 and NOx for Units 1-6 against the AEL limit is in compliance only from January till March. Reports from April till December were not submitted despite the email request sent to the facility.
		PM	NE	NE	NE	NR	NR	NR	NR	NR	NR	NR	NR	NR	
		NO_2	NE	NE	NE	NR	NR	NR	NR	NR	NR	NR	NR	NR	
	Kriel	PM	E	E	E	E	NE	NR	NE	NE	E	NE	E	NR	The report showed the performance of PM for both South and North stacks were in non-compliance most of the time. In contrary, SO_2 and NOx for Units 1, 2, 3, 4, 5 & 6 against the AEL limit was mostly in compliance.
		SO_2	NE	NE	NE	NE	NE	NR	NE	NE	NE	NE	NE	NR	
		NO_2	NE	NE	NE	NE	NE	NR	NE	NE	NE	NE	NE	NR	
	Matla	PM	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	The emission report received was of poor quality and the graphs were in
		SO_2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	

		NO_x	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	black and white and not legible. A clear and legible emission report was requested but there was no response from the facility.
	Lethabo	PM	E	E	E	E	E	E	E	E	E	E	E	E	Although Units 1 - 3 for all pollutants was off from December till March, most Units showed compliance with SO_2 and NOx for Units 4 - 6. However, Units 4 -6 were in non-compliance with PM against the AEL limit.
		SO_2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	
		NO_x	NE	NE	NE	E	NE	NE	NE	NE	NE	NE	E	E	
	Kendal	SO_2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	All the Units were in compliance with the SO_2 limit for the period under review. The exception was PM for most Units, which showed non-compliance.
		PM	E	E	E	E	E	E	E	E	E	E	E	E	
	Camden	NO_x	NR	NR	NR	NE	NE	NE	NE	NR	NR	NE	E	E	The report showed the performance of SO_2 and NOx for Units 1-4 against the AEL limit was in compliance for five months of the reporting period.
		SO_2	NR	NR	NR	NE	NE	NE	NE	NR	NR	NE	E	E	

															However, reporting for the preceding months was not done.
	Grootvlei	PM	NE	NE	NE	NR	NE	NR	NR	NE	NE	NR	NE	NE	The report showed the performance of PM, NOx and SO_2 against the AEL limit was in compliance most of the time.
		SO_2	NE	NE	E	NR	E	NR	NR	NE	NE	NR	NE	NE	
		NOx	NE	NE	E	NR	E	NR	NR	NE	NE	NR	NE	NE	
	Hendrina	SO_2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	The report showed the performance of SO_2 and NOx for all Units against the AEL limit were in compliance all the time.
		NOx	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	
	Arnot	SO_2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	The report showed the performance of SO_2 and NOx for all Units against the AEL limit were in compliance all the time.
		NOx	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	
	Matimba	SO_2	NE	NE	NE	NE	NE	NE	NE	NE	NE	E	NE	E	The reports showed that the performance of SO_2 for all Units against the AEL limit is mostly in compliance. As indicated in the reports where there is exceedances, the lens on the gaseous emission monitor is faulty resulting in inaccurate emission data readings.
	Komati	SO2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NR	NE	The report showed compliance in the performance of SO_2 and NOx for all Units against the AEL limit.
		NOx	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NR	NE	
	Acacia	NOx	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	Compliance audit conducted by the licensing authority concluded zero non-compliance with the AEL limit.
	Port Rex	NOx	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	Annual emission testing is required to quantify NOx emissions. According to the April 2017- March 2018 report, the test result were below the pollutant specific hourly emission limit for PM, SO_2 and NOx showing that Port Rex is in compliance with the AEL limit.

Table 4: A summary of its records regarding the history of MES indulgences granted to Eskom in terms of the 2015 and 2021 postponement decisions and a history of Eskom's compliance or non-compliance with the MES 5

11.2. Local Environmental Impacts

There are various environmental cross-media impacts that must be taken into account when assessing if an abatement technology is feasible or practically possible to implement.

11.2.1. Water

Eskom receives the bulk of its water from the Vaal River System, with most power stations in the study area reliant on the Vaal River Eastern Subsystem ("VRESS") and Grootvlei being supplied from the Vaal Dam (Eskom, 2014). In its report, Eskom notes that the VRESS and the Vaal Dam systems are interlinked, as water can be transferred from one system to another. Eskom estimates that the installation of FGD at all of its units will require an additional 70 million m^3 per annum of water or an increase of Eskom's total water consumption by an estimated 20% (Eskom 2014).

The water demands of FGD increase the water required by a wet-cooled power station, for example Lethabo by some 20% (around 42 million m^3 /annum without FGD, to more than 51 million m^3 / annum with wet FGD). The Lethabo power station, being a wet-cooled power station, already uses large quantities of water.

South Africa is a water-deficient country, with evaporation rates exceeding precipitation rates in most parts (DWAF 2004). An Internal Strategic Perspective (ISP) study was conducted in 2004 to inform the Department's view (Department of Water Affairs, South Africa) of water resource management (DWAF 2004). Resource modelling indicated that by 2025, interventions would be required to supplement a shortfall of 44 million m^3 of water per annum (DWAF 2004). As a result of this study's recommendations, the Large Bulk Water Reconciliation Strategy Study for the Vaal River System was undertaken to identify and recommend interventions that will ensure a positive water balance (DWAF 2006). In the short term, resource modelling that was conducted indicated that unless unlawful water use can be eliminated and supply side savings measures are not at least partially effective, a water-deficit situation will ensue, and therefore additional supply infrastructure is likely to be required (DWAF 2006).

Eskom is a strategic water user, which in a water deficit situation, would mean that other users will have to reduce consumption to ensure supply to Eskom.

11.2.1.1. Water savings

The Water Use Licence (WUL) of each power station is illustrated in Table 6: Water Use Licences (WUL) across Eskom's coal fleet which shows an aggregate WUL of 403 000 Ml per

year. This will increase to 413 000 Ml per day if the WFGD projects are implemented at Medupi and Majuba. Eskom used an average of 320 000 Ml of water per annum over the past 10 years[37].

The forecasted consumption of water by Eskom's power stations in the HPA amounts to 179 litres per person per day, which is almost as much as 237[38] l/day. When the coal-fired power stations are retired, the additional water will be made available for other uses. The water saving is important for an arid country such as South Africa.

The water savings are also important for JET because the agriculture, livestock rearing and food processing sectors have been identified by the PCC to play key roles in creating jobs in Mpumalanga post coal.

This reiterates the preferred long-term solution to retire Eskom's coal-fired power stations as opposed to extending their life by installing abatement equipment and, in particular, WFGD given its high water consumption.

[37] Eskom water use fact sheet document "ENV0001RawWaterSupply.pdf"

[38] Average water consumption in South Africa is 237 litres/person/day (l/c/d), which is higher than the world average of about 173 l/c/d https://doi.org/10.2166/wp.2021.157

Power station	Priority area	Retirement year (last unit)	Wet / dry cooling
Arnot	HPA	2029	Wet
Camden	HPA	2025	Wet
Duvha	HPA	2034	Wet
Grootvlei	HPA	2027	Wet
Hendrina	HPA	2025	Wet
Kendal	HPA	2044	Dry
Kriel	HPA	2030	Wet
Lethabo	VTAPA	2041	Wet
Majuba	HPA	2051	3 Dry, 3 Wet
Matimba	WBPA	2042	Dry
Matla	HPA	2034	Wet
Medupi	WBPA	2071	Dry
Tutuka	HPA	2030	Wet
SUB-TOTAL	HPA		
	VTAPA		
	WBPA		
TOTAL (or South Africa)			

Table 6: Water Use Licences (WUL) across Eskom's coal fleet[39]

11.2.2. Waste

The quantity of lime required for the operation of FGD was quoted by Eskom in its respective postponement applications. Eskom will require significant tons per annum of lime. Limestone consumption, for the production of lime, varies with limestone properties, end-product specification, limestone purity, etc, but generally two tons of limestone are required for each ton of lime produced.[40] Additionally, two parts of CO_2 are produced for every part of lime produced.

[39] Data from "Consistent data set Eskom generating plant 2023.pdf"

[40] (DME 2005)

WFGD uses limestone as feedstock and produces gypsum waste material. This gypsum could potentially be dumped, due to market oversupply. Furthermore, the large volumes of gypsum produced will need to be stored in additional/new landfills that can accommodate these huge quantities. It should also be noted that the specifications for saleable gypsum are quite stringent and it is not certain that these specifications will be met by Eskom. A waste disposal system will therefore be required for the FGD by-product.

Potential sorbent issues

A significant quantity of sorbent would be required to operate the FGD at Lethabo. This sorbent will need to be transported from the Northern Cape. This will most probably necessitate the development of associated rail infrastructure. The transport of the sorbent would result in environmental impacts, notably GHG and fugitive dust emissions.

11.3. Health Considerations

Clean air is fundamental to the health and wellbeing of people. This is reiterated in the updated World Health Organisation (WHO) 2020 Air Quality Guidelines ("**WHO Air Quality Guidelines**"), which are a cumulation of global efforts to offer quantitative health-based recommendations for air quality management. These recommendations are expressed as long or short-term concentration limits for a number of key air pollutants, recognising that exceedances of these limits can place public health at significant risk.[41]

The WHO Air Quality Guidelines also recognise the strong body of evidence that explores the negative effects of air pollution on different aspects of health. It is now evident that negative effects on the health of people can arise at even lower concentrations of air pollution than previously understood and/or accepted.

[41] World Health Organization. WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide. Geneva: World Health Organization; 2021 2021.

It has also since been recognised that there is significant morbidity and mortality linked with air pollution exposure on an annual basis and the morbidity rate attributable to air pollution is now estimated to be on a par with other major global health risks such as unhealthy diets and tobacco smoking.

In relation to the risk factors associated with poor air quality, it should be noted that a link has been established between air pollution and noncommunicable diseases such as ischaemic heart disease, stroke, chronic obstructive pulmonary disease, asthma and cancer.

In an attempt to mitigate against the negative effects of air pollution exposure, air quality guidelines have been introduced on a global level. However, challenges remain in the enforcement of these guidelines, particularly in low and middle-income countries, including those in Sub-Saharan Africa.

The field of air pollution and health has evolved rapidly over the years. While there is limited epidemiological and health related data from South Africa, landmark US studies, assessing particulate matter (PM) exposure and its effects on respiratory health were undertaken and the methodology adopted can be applied to local context. [42]

Notwithstanding the limited South African based data available to it, South Africa, in aligning itself with the position adopted in the WHO Air Quality Guidelines, promulgated, *inter alia*, the National Ambient Air Quality Standards, imposing limits on the concentration levels of certain pollutants in the receiving environment.

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[42] **Pope CA, 3rd, Thun MJ, Namboodiri MM, Dockery DW, Evans JS, Speizer FE**, et al. Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults. Am J Respir Crit Care Med. 1995;151(3 Pt 1):669-74; **Dockery DW, Pope CA, Xu X, Spengler JD, Ware JH, Fay ME**, et al. An Association between Air Pollution and Mortality in Six U.S. Cities. New England Journal of Medicine. 1993;329(24):1753-9

When trying to establish the health impacts of exposure to poor air quality, various guidelines exist and were considered by the Forum. These are summarised, in part, below:

11.3.1. Current Air Quality Guidelines Considered by the Forum

World Health Organisation (WHO) – Global Framework

Definitions:

- Air Quality Guidelines (AQG) - the lowest levels of exposure for which there is evidence of adverse health effects.
- Interim Targets (IT) - air pollutant levels that are **higher** than the AQG levels, but which authorities in highly polluted areas can use to develop pollution reduction policies that are achievable within realistic timeframes.

Key pollutants considered and in respect of which there are recommended guidelines for "short" averaging periods:

- Particulate matter ($PM_{2.5}$ and PM_{10})
- Ozone (O_3)
- Nitrogen dioxide (NO_2)
- Sulphur dioxide (SO_2)
- Carbon monoxide (CO)

Applicability of guidelines:

- Both outdoor and indoor environments globally.

South African Guidelines:

Ambient Air Quality Standards

In terms of section 9 of the National Environmental Management: Air Quality Act, the National Ambient Air Quality Standards (NAAQS) were promulgated to regulate concentration limits for PM, SO_2, NO^2, CO, O_3 and Benzene. In other words, the NAAQS define targets for air quality

management and establish the permissible amount or concentration of a particular substance based on what a particular receiving environment can tolerate without significant deterioration.

Pollutant	Averaging time	Concentration	Frequency of exceedance per year	Compliance date
Sulphur dioxide (SO_2)	10 minutes	500 µg/m^{3-} (191 ppb)	526	Immediate
	1 hour	300 µg/m^3 (134 ppb)	88	Immediate
	24 hours	125 µg/m^3 (48 ppb)	4	Immediate
	1 year	50 µg/m^3 (19 ppb)	0	Immediate
Nitrogen dioxide (NO_2)	1 hour	200 µg/m^3 (106 ppb)	88	Immediate
	1 year	40 µg/m^3 (21 ppb)	0	Immediate
Ozone (O_3)	8-hour running avg.	120 µg/m^3 (60 ppb)	11	Immediate
Carbon monoxide (CO)	1 hour	30 mg/m^3 (26 ppm)	88	Immediate
	8-hour (calc on hourly avg.)	10 mg/m^3 (8.7 ppm)	11	Immediate
Lead (Pb)	1 year	0.5 µg/m^3 (19 ppb)	0	Immediate
Benzene (C_6H_6)	1 year	10 µg/m^3 (3.2 ppb)	0	Immediate
		5 µg/m^3 (1.6 ppb)		1 Jan 2015

Particulate matter (PM_{10})	24 hours	120 µg/m^3	4	Immediate
		75[1] µg/m^3	4	1 Jan 2015
	1 year	10 µg/m^3	0	Immediate
		5[1] µg/m^3	0	1 Jan 2015
Particulate matter ($PM_{2.5}$)	24 hours	65 µg/m^3	4	Immediate
		40[2] µg/m^3	4	1 Jan 2016
		25[3] µg/m^3	4	1 Jan 2030
	1 year	25 µg/m^3	0	Immediate
		20[2] µg/m^3	0	1 Jan 2016
		15[3] µg/m^3	0	1 Jan 2030

Table 7: Ambient Air Quality Standards

Minimum Emission Standards ("**MES**")

The Minimum Emission Standards were also promulgated in terms of NEMAQA. In the simplest terms, the purpose of these standards is to impose concentration limits on specified pollutants produced by specific point sources within an emitting facility / plant.

National Air Quality Framework

The DFFE has also published guidelines which speak to the fact that health concerns may occur at lower levels than those set out in the MES. This framework classifies air quality in bands which correspond with the severity of the health impacts which can be expected.

Colours	AQ Level	Levels of Health Concerns	Bands	NO_2(µg/m³)	O_3(µg/m³)	SO_2(µg/m³)	CO(µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10}(µg/m³)
Green	Low	Good	1	0 –66	0 –26	0 –115	0 –1000	0 –22	0 –40
			2	67 –133	27 –53	116 –231	1 001 –20 000	23 –43	41 –80
			3	133 –200	54 –80	232 –350	20 001 –30 000	44 –65	81 –120
Yellow	Moderate	Moderate	4	201 –267	81 –107	351 –400	30 001 –35 000	66 –75	121 –130
			5	268 –334	108 –134	401 –450	35 001 –40 000	76 –85	131 –140
Orange	Unhealthy	Unhealthy	6	335 –400	135 –160	451 –500	40 001 –45 000	86 –95	141 –150
			7	401 –467	161 –187	551 –550	45 001 –50 000	96 –105	151 –160
Red	Very Unhealthy	Very unhealthy	8	468 –534	188 –213	551 –600	50 001 –55 000	106 –115	161 –170
			9	535 –601	214 –240	601 –650	55 000 –60 000	116 –125	171 –180
Hazardous	Hazardous	Hazardous	10	>602	>241	>651	> 60 000	>126	>181

Table 8: Severity of the health impacts

Health impacts may be ubiquitous however, certain pollutants are more strongly associated with specific health conditions. The key health impacts considered are listed below:

Critical health outcomes associated with selected air pollutants

i. All-cause (non-accidental) mortality;
ii. Cause-specific mortality, as per the International Statistical Classification of Diseases and Related Health Problems[43], due to **lung cancer**[44] or **cardiovascular**[45]or **respiratory**[46] related diseases;
iii. Hospital admissions and emergency room visits related to **asthma**[47]; and
iv. Hospital admissions and emergency room visits related to **ischaemic heart disease IHD**[48], specifically myocardial infarction[49].[5]

[43] International Statistical Classification of Diseases and Related Health Problems43, 10th edition (ICD-10), 2016 version (WHO, 2016b).
[44] ICD-10 codes C30–C39.
[45] ICD-10 codes I00–I99.
[46] ICD-10 codes J00–J99.
[47] ICD-10 code J45.
[48] ICD-10 codes I20–I25.
[49] ICD-10 codes I21–I22.

11.3.2. Health Risk Assessment – Terms of Reference ("TOR")

The Health Risk Assessment[50] considered by the Forum aimed to do the following:

i. Estimate the risks of past, current and/or future exposure to air pollution and of the changes in exposure that may result from, *inter alia*, the implementation of planned policies.
ii. Report results in terms of the number of attributable deaths or cases of disease, years of life lost or disability adjusted life-years.
iii. Report on the change in life expectancy attributable to the total exposure to air pollution or to a change in such exposure.

Given the scope and limited timeframe and resources afforded to the Forum to complete this process, a comprehensive health assessment was not feasible. The review of health impacts associated with coal-powered energy station emissions was therefore based on existing studies and reviews previously conducted.

Conducting a health impact modelling study was considered by the Forum, and a cost-benefit analysis conducted, however, challenges with obtaining health outcome data, funding and the lack of specific expertise to conduct modelling exercises of this nature led the Forum to conclude that conducting such a study was not feasible. This must be noted as a limitation.

Therefore, and in accordance with the Forum's TOR, a literature review was conducted on the health impacts of emissions from Eskom's power stations.

[50] Tools for health risk assessment calculation are widely available from WHO (AirQ+) or other sources (such as the US EPA BenMAP-CE) (Sacks et al., 2020).

11.3.3. Previous Health Risk Studies Conducted

The health impacts of emissions from Eskom's power stations, particularly in the Mpumalanga Highveld Priority Area in South Africa, have been extensively studied and documented by various experts and organizations and the emissions from large stationary sources, such as coal-fired power plants, have been found to contribute to a range of health issues, posing a significant concern for public wellbeing. The outcomes of these studies are discussed in more detail below.

11.3.3.1. DFFE 2019: Highveld Health Report

This report by the DFFE presents a comprehensive assessment of the health impacts associated with emissions from power stations in the Highveld region. The study focuses on the Highveld region in South Africa and aims to understand the health implications of various factors, including environmental conditions and human activities.

The report has three main components:

- **Household Survey:**
  The household survey component involves collecting data from residents in the Highveld region. This likely includes information on demographics, living conditions, and lifestyle factors that could impact health.
- **Health Risk Assessment:**
  The health risk assessment evaluates potential risks to the residents' wellbeing, based on environmental and lifestyle factors. This may include exposure to pollutants, dietary habits, and other elements contributing to health risks.
- **Health Impacts:**
  The health impact study examines the actual health impacts of the identified risks. This could involve analysing health outcomes, prevalence of diseases, and other health-related indicators within the studied population.

The report combines findings from the household survey, health risk assessment and health impact study to provide a holistic understanding of the health situation in the Highveld region.

It presents a synthesis of data from which to draw conclusions about the relationships between environmental factors, lifestyle choices, and health outcomes and which allows for a more comprehensive understanding of the complex interactions between environmental and social factors affecting the health of the population in the study area.

This study was key in evaluating the health impacts associated with emissions at a plant level, for the Highveld Eskom Power Plants.

11.3.3.2. Dr Andrew Gray: Impacts due to Large Stationary Source Emissions in and around South Africa's Mpumalanga Highveld Priority Area

Dr. Andrew Gray's report provides insight into the specific impacts of emissions from 14 large stationary sources, emphasizing the challenges faced in the Mpumalanga Highveld Priority Area.[51]

Important results from the modelling and health risk assessment include:

- Ambient $PM_{2.5}$ pollution from the 14 facilities **caused between 305 and 650 early deaths** in the area in 2016. The three worst offenders were Lethabo power station (57 to 122 early deaths), Kendal power station (46 to 99 early deaths), and Kriel power station (34 to 76 early deaths). If the 14 facilities were required to comply with the 2020 MES, this would reduce early deaths by 60%, **preventing between 182 and 388 early deaths** in and around the HPA annually.

- Cumulative emissions from the 14 facilities created acute exposures in 2016 that exceeded the WHO's guidelines for daily or hourly averages for all pollutants. The

[51] *Purpose* - air- pollution dispersion model and health risk assessment for 14 industrial facilities (12 Eskom coal-fired power stations, the Sasol Synfuels chemical facility and the NatRef refinery), located in and around the Mpumalanga Highveld Priority Area (HPA) of South Africa.

highest 24-hour average exposure of $PM_{2.5}$ was 45 µg/m^3, nearly twice the WHO standard of 25 µg/m^3. These conditions occurred around Kendal, Kriel, and Duvha power stations. The highest 24-hour average exposure of SO_2 was 241.4 µg/m^3, over 1200% of the WHO standard of 20 µg/m^3. The highest NO_2 one-hour average was 2020 µg/m^3, over 1000% of the one-hour average standard of 200 µg/m^3. Implementing the 2020 MES would completely eliminate the WHO guideline exceedances for 24-hour average PM_{10} and 24-hour average $PM_{2.5}$ and would significantly reduce the number of exceedances for 24-hour average SO_2 and one-hour average NO_2 throughout the modelled area.

- **All 120 sensitive sites** (primarily schools and hospitals) analysed in the model **exceeded** the WHO's 24-hour average SO_2 guideline (20 µg/m^3) in 2016 due to emissions from the 14 facilities. The modelled average peak 24-hour SO_2 concentration across all 120 sensitive sites was 66.4 µg/m^3 in 2016, with a maximum of 178 µg/m^3 at Duvha Primary School. Under the 2020 MES, the average concentration at the sensitive sites would be reduced to 13.61µg/m^3. Implementing the 2020 MES at the facilities would bring SO^2 exposures at 93% of the sensitive sites (all but nine) within the WHO guideline.

- **Unhealthy, acute exposures to NO_2 occurred at 28 of the 120 sensitive sites** in 2016, exceeding the WHO one-hour average NO_2 guideline concentration of 200 µg/m^3. The worst acute exposure was at Camden Combined School, at 1079 µg/m^3. Under the 2020 MES, there would still be 14 sites at which the 200 µg/m^3 would be exceeded (led by Camden Combined School (588 µg/m^3)). The average peak one-hour average NO_2 concentration, across all 120 sites, was 191µg/m^3 in 2016. Under the 2020 MES, the average peak one-hour average NO_2 concentration of all 120 sites would be reduced to 115 µg/m^3.

- The 14 facilities are responsible for the lion's share of air pollution allowed by the NAAQS. In 2016, emissions from the 14 facilities accounted for:

    - 92% of the daily ambient SO_2 limit;

- 85% of the hourly ambient SO_2 limit;
- 82% of the hourly ambient NO_2 limit; and
- 68% of the daily ambient $PM_{2.5}$ limit.

These levels of contribution indicate that the NAAQS cannot be achieved without reducing pollution from these sources. Given the hundreds of other sources of air pollution (particularly of PM and NO_2) in and around the HPA, these 14 facilities contribute alarmingly high — and relatively easily reducible — percentages of national limits.

If these sources were to comply with the 2020 MES, their contribution to ambient air pollution would substantially decrease, accounting for:

- 20% of the daily ambient SO_2 limit (79% reduction from 2016);
- 21% of the hourly ambient SO_2 limit (75% reduction from 2016);
- 53% of the hourly ambient NO_2 limit (35% reduction from 2016); and
- 28% of the daily ambient $PM_{2.5}$ limit (59% reduction from 2016).

Major reductions of SO_2 emissions from the 14 sources are necessary to reduce the high levels of secondary $PM_{2.5}$ (from sulphate particles), which contributes to $PM_{2.5}$ NAAQS exceedances in and around the HPA. Compliance with the 2020 MES would result in SO_2 emissions from the facilities being reduced by **78%** relative to 2016 emissions, NO_2 emissions from the facilities would be reduced by **43%** and PM_{10} emissions from the facilities would be reduced by **51%**.

The 14 modelled sources are responsible for substantial $PM_{2.5}$ exposures across at least 30% of the entire modelled area. If the sources complied with the 2020 MES, the relatively high concentrations of $PM_{2.5}$ would be completely eliminated, resulting in healthier air for the large populations in Johannesburg and Pretoria.

11.3.3.3. Dr Peter Orris: Coal Plant Emissions and Public Health

Dr. Peter Orris' report focuses on the broader implications of coal plant emissions on public health, offering a perspective on a national and regional scale.

11.3.3.4. Dr Mike Holland: Health impacts of coal-fired power plants in South Africa

Dr. Mike Holland's report delves into the health impacts specifically associated with coal-fired power plants in South Africa, shedding light on the gravity of the situation.

This independent study estimated that Eskom's coal-fired power stations cause around 2,200 deaths annually as well as various health issues like asthma, bronchitis which lead to hospital admissions.

It should be noted that Eskom, that is responsible for most of the air pollution, initially planned to decommission several coal-fired plants by 2030. However, a 2022 Emissions Reduction Plan altered these timelines. In addition, the South African government is considering further delays, beyond 2030, which will potentially have public health impacts.

The report employs a methodology involving emissions projections, atmospheric modelling using the CALPUFF air quality monitoring system, and a health and economic impact assessment framework to evaluate the consequences of delayed decommissioning, including projecting substantial health impacts, including deaths, asthma cases, preterm births and economic costs.

The closure of Komati, an Eskom coal-fired power plant, has already shown positive health benefits, avoiding deaths and economic costs. However, the potential delay in decommissioning other plants could lead to severe health consequences, with projections indicating thousands of additional deaths, increased respiratory issues, and substantial economic costs.

The report emphasises the importance of timely decommissioning to reduce health risks, operational costs, and facilitate a transition to cleaner energy sources. Delaying

decommissioning could exacerbate air pollution-related health problems, adding economic burdens to society.

11.3.3.5. DFFE 2018: Cost Benefit Analysis including Dr Ranajit Sahu's expert critique

The DFFE's 2018 Cost-Benefit Analysis, along with Dr. Ranajit Sahu's expert critique, adds an economic dimension to the discussion, exploring the balance between the costs and benefits associated with reducing power plant emissions.

Dr Ranajit Sahu: Comments on the Series of Applications for Suspension of the Minimum Emissions Standards (MES) Compliance Timeframes for Various Eskom Coal-Fired Power Plants

Dr. Ranajit Sahu's comments provide additional expert insights, particularly focusing on compliance timeframes for the MES and the implications for public health.

11.3.3.6. SO_2 Expert Panel Report – Currently before the Minister

The SO_2 Expert Panel Report, currently under review by the Minister, contributes to the ongoing assessment of SO_2 emissions, which are a key component in power plant emissions, and the impact these emissions have on public health.

The report clearly highlights the recognised health impacts of SO_2 emissions and notes the harmful health impacts thereof, even at levels below the NAAQS, especially on vulnerable populations (including children). In this regard, the report states that there is "*local evidence that even when SO_2 levels meet NAAQS, adverse respiratory health impacts related to SO_2 exposure occur, especially among children".*

Further, the report also notes that morbidity associated with air pollution exposure data is lacking and so is intersectoral and Department of Health data. The report states that "*no local concentration response functions and little local health data are available that can be used to comprehensively calculate impacts on morbidity. Morbidity impacts are likely to be orders of*

magnitude greater than any of the likely underestimated mortality impacts calculated to date for SO_2 in South Africa."

These constraints in the form of a lack of health data as well as the inability to access such data, if it is available, were also encountered by this Forum.

11.3.3.7. Health impacts of delaying coal power plant decommissioning in South Africa by Lauri Myllyvirta and Jamie Kelly

In October 2023, the Centre for Research on Energy and Clean Air (CREA) published a study which identifies South Africa as the 7th largest coal producer globally, with its coal-fired power stations contributing to climate change and air pollution. It found that air pollution, mainly from coal combustion, is associated with severe health impacts, including diseases such as heart disease, pulmonary issues, cancer, and more. Further, it ascertained that air pollution is the second leading cause of premature mortality in Africa, with specific hotspots, including the Mpumalanga Highveld and Vaal Triangle.

11.3.4. Applying the Multidimensional Matrix

The above references collectively underscore the urgency of addressing the health implications associated with Eskom's power station emissions, providing a basis for policy considerations and potential interventions to mitigate the adverse effects on the population.

As stated above, owing to the scope of the task, funding limitations and time constraints, the Forum was unable to conduct an independent Human Health Risk Assessment (HHRA), nor a Cost Benefit Analysis (CBA). An extensive literature review of health outcomes resulting from coal-fired power plants in South Africa was undertaken. Data from existing studies that aimed to assess human health outcomes was then extracted and included in the multidimensional matrix. Significant limitations of this approach were that data was not current and, in the majority, pre-dated the South African energy crisis. Existing studies also utilised differing methodology in their analyses and health outcome data were not standardised.

11.3.5. Plant level assessments - understanding health outcomes at a plant level

Health outcomes were considered per power plant located in each of the priority areas.

In the Highveld Priority Area (HPA), the health outcomes of the Duvha, Matla, Tutuka, Kendal and Majuba coal-fired power plants were considered. The health outcomes of the Lethabo coal-fired power plant, which is located in the Vaal Triangle Airshed Priority Area (VTAPA), were considered and so were the health outcomes of the Matimba and Medupi coal-fired power stations in the Waterberg-Bojanala Priority Area (WBPA).

11.3.5.1. Highveld Priority Area (HPA) - Duvha, Matla, Tutuka, Kendal and Majuba

The Matla, Kendal and Duvha power stations are located in the Emalahleni Local Municipality (Nkangala) in Mpumalanga, which falls within the HPA. The Tutuka power station is located in the Lekwa Local Municipality in the Gert Sibande District of Mpumalanga and the Majuba power station is located between Volksrust and Amersfoort, which fall under the Pixley Ka Seme Local Municipality, in the Gert Sibande District Municipality of Mpumalanga. The Gert Sibande District also falls within the HPA.

The health impact data available is based on this geographic location and is limited, however, the health implication data for the specific local towns is less available. In obtaining this data, to assess the health impacts of key pollutants, health risk assessments were undertaken using modelled exposure data (the chemical transport model, CAMx, was utilised to simulate ambient air pollution in each area).[52]

Potential health risks and impacts were analysed across 3 areas:

1. Human Health Risk Assessments (HHRA) were conducted in order to quantify potential risks to health using a “Hazard Quotient (HQ)” - if the HQ is less than or

[52] Highveld Health Study: Draft Integrated Report Data Analysis (household survey, health risk assessment, and health impacts 2019)

equal to one there is a negligible risk to human health whereas an HQ above one indicates a potential risk to human health, as the simulated ambient concentrations exceed the benchmark. The NAAQS were used as benchmark values to estimate the HQ for each pollutant studied (Table 1 below). For short-term exposure estimates, the 99th percentile of the hourly and daily time series' were used (these represent a reasonable worst case) and the annual average concentration was used to represent long-term exposure.

Table 1: National Ambient Air Quality Standards (NAAQS) used as benchmarks in HHRA

Pollutants	Averaging period	NAAQS µg/m^3 (ppb)
PM_{10}	24-hour	75
	One year	40
$PM_{2.5}$	24-hour	40
	One year	20
SO_2	1-hour	350 (134)
	24-hour	125 (48)
NO_2	1-hour	200 (106)
	1-year	40 (21)

2. Vulnerability Assessments were conducted to establish the relative vulnerability of communities; and

3. Impact Assessments were conducted to ascertain the impact that meeting air quality standards for $PM_{2.5}$, PM_{10} would have on mortality.

In conducting these assessments, risk characterisations for SO_2, $PM_{2.5}$ and PM_{10} were considered however, NOx was not considered because of its low-risk characterisation.[53]

Risk characterisation for SO_2 exposure.

[53] Only air pollution sources were considered.

The acute effects of short-term exposure to SO_2 include upper respiratory irritation and bronchoconstriction, which will also exacerbate asthma. For the HPA, the HQ for 1-hour exposure was >1, particularly in the central area, where these power stations are located. Similarly, for the 24-hour exposure models, the HQ was also notably >1, suggesting that SO_2 exposure contributes significantly to health risks in this area.

Risk characterisation for PM_{10} exposure

While large in size and less respirable, the toxic effects of PM_{10} are still recognised. Associations were found between short-term PM_{10} exposure and hospital admissions for cardiovascular and respiratory conditions (even for symptoms in asthmatics) as well as between short-term exposure to PM_{10} and mortality.[54]

In the Emalahleni and Pixley Ka Seme areas, for short-term (1-hour) exposure, the HQ was >1 but the HQ for 24-hour exposure was predominantly <1.

Risk characterisation for $PM_{2.5}$ exposure

The smaller particle size of $PM_{2.5}$ allows for deeper penetration into the lungs, causing irritation and reduced lung function. The acute effects of short-term exposure to $PM_{2.5}$ include upper respiratory irritation and bronchoconstriction, which will also exacerbate asthma.

Long-term exposure can contribute to lung cancers, resulting in an increased risk of hospital admissions and premature mortality.

The HQs calculated for the risk of acute health effects in respect of 24-hour $PM_{2.5}$ exposure showed a potential risk for the HPA with an HQ>1. This was also seen for chronic exposure using annual $PM_{2.5}$ averages.

[54] WHO, 2013

This was prevalent across all power plants, highlighting particulate matter as an important pollutant impacting health in the HPA.

Vulnerability assessment

Derived vulnerability assessment scores measure the relative pollution burdens and vulnerabilities in the individual.

The population factors assessed included age (younger than 15 and older than 65), chronic medication use, overcrowding and use of alternate fuels for household activities.

Social determinants of health were also included such as employment, living below the poverty line and living in informal housing.

For communities near the Duvha and Matla power plants, the vulnerability scores were low, but these require further assessment in order to specifically understand the local communities' vulnerabilities. Similarly, the population characteristics score for communities in the Pixley Ka Seme local municipality, showed that people living in this area were relatively more sensitive to air pollution. However, when adjusted for pollution burden and population size, the vulnerability scores were also low. These scores, however, need further assessment to specifically understand the local communities' vulnerabilities, particularly in a municipality which shows an increased sensitivity.

Impact of meeting NAAQS air pollution levels on mortality.

There will be a negligible decrease in all-cause mortality (a 1-5% decrease) in the HPA if the annual NAAQS for PM_{10} and $PM_{2.5}$ were met but the precise impact requires further assessment to specifically understand and account for a local community's vulnerabilities.

Prevalence of health outcomes

A community survey of people living in Emalahleni was conducted in July 2017 and included 369 households and 1388 individuals. This survey provides data on acute and chronic health

issues[55] and found that, compared to other communities surveyed within the HPA, the prevalence of both acute and chronic symptoms of people living in Emalahleni was moderate.

Other factors to consider

The additive effect of other pollutant sources must be considered. While it is difficult to disaggregate the exposures, the cumulative effect thereof may also contribute to health outcomes.

In this regard, when considering the prevalence of indoor air pollution resulting from household energy sources, in Emalahleni, paraffin was reported as an important energy source for cooking (27% of homes surveyed) and heating (25% of homes surveyed).

Further, it was found that 53% of the homes located in this area experienced traffic and trucks passing by their homes and 20% of the individuals interviewed reported smoking while 18% reported being exposed thereto.

11.3.5.2. Vaal Triangle Airshed Priority Area (VTAPA) - Lethabo

Lethabo is situated near Viljoensdrif in the Fezile Dabi District in the Free State, which falls within the Vaal Triangle Priority Area (VTPA). Health impacts data available is from the Vaal Triangle Airshed Priority Health Study (August 2016) and is based on this geographic location, however, the health implications for the specific local towns are less available and this poses a limitation.

The human health risk assessment was performed using monitored data to determine the potential for adverse effects on people, in the VTAPA, from exposure to the criteria air pollutants (SO_2, NO_2 and PM_{10}).

[55] Highveld Health Study: Draft Integrated Report Data Analysis (household survey, health risk assessment, and health impacts 2019)

To assess the health impacts of key pollutants, a child respiratory health study[56], including lung function tests, were conducted in four schools within the community study areas. An assessment of human health risks resulting from exposure to air pollution was also conducted between 2013 and 2014.

The Child Health Study component included interviews and lung function tests on school aged children.

During these studies, the prevalence of pre-defined health conditions were calculated. Health outcomes were grouped as illnesses or conditions of the lung (bronchitis, asthma and tuberculosis), those related to the upper respiratory system (ear infection, hay fever and sinusitis), and those often related to lifestyle (hypertension, diabetes, high cholesterol and heart failure).

The community study of the population of Zamdela had the lowest prevalence of acute and chronic illnesses and conditions, despite them being diagnosed with hay fever, sinusitis and asthma. However, ambient air quality monitoring in Zamdela showed exceedances of the NAAQS for NO_2 and PM_{10}. This, despite the fact that, in terms of acute health outcomes in the preceding 2 weeks of the conducted study, doctors or nurses registered that Zamdela had the highest percentage of its population that had hay fever (2.54%) and asthma, compared to the 3 other studied areas in the VTAPA. While, on the other hand, Zamdela had the lowest prevalence of the majority of chronic illnesses surveyed.

Human health risk assessment – NO_2

The acute health effects of exposure to NO_2 include upper and lower respiratory symptoms (such as inflammation and exacerbation of asthma) and chronic effects are associated with an increase in the susceptibility of respiratory infections and a reduction in lung function. The risk assessment also indicated a potential for acute effects in the communities within the

[56] Department of Environmental Affairs Vaal Triangle Air-Shed Priority Area Health Study: Summary and Main Findings (August 2016)

Zamdela station's sphere of influence (based on 2013 data). Further, there was also an increased risk for chronic symptoms associated with NO_2 exposure.

Human health risk assessment -SO_2

The acute effects of exposure to SO_2 include upper respiratory irritation and bronchoconstriction, which will also exacerbate asthma. The risk assessment showed that based on the 2013 levels measured, it was unlikely for people to experience these effects,, however, USA-EPA data from 2009 found that in those that are vulnerable (eg. children and elderly), or with pre-existing chronic conditions (eg. Asthma) even small increases in exposure can be detrimental, with acute exacerbations. Further co-exposure of pollutants can also increase risk.

Human health risks: PM

The health effects of PM are related to the size thereof (the smaller the particle, the deeper it may penetrate into the lungs) and the chemical composition of the particles. Studies have shown that PM (not only PM_{10} but fine and ultra-fine particles as well), has short and long-term (both immediate and delayed) health effects, such as cardiovascular effects and atherosclerosis (thickening of artery walls), as well as causing birth defects and respiratory illness in children[57].

The Zamdela community is at high risk for PM exposure related health effects.

Vulnerability assessment

Population factors assessed included age (younger than 15 and older than 65), chronic medication use, overcrowding and the use of alternative fuels for household activities. Social

[57] WHO 2013

determinants of health were also included such as employment, living below the poverty line and living in informal housing.

Derived vulnerability assessment scores measure the relative pollution burdens and vulnerabilities in an individual. Based on the guidelines of the Cal-EPA (2014), a score between 1 and 10 was derived for each vulnerability indicator for each sub-place in the VTAPA. Each population characteristic score was then multiplied by the population size in the specific sub-place to derive a vulnerability score. The most vulnerable sub-places in terms of sensitivity to air pollution and ability to cope with the effects of air pollution are those with a vulnerability score of 6 and above. For Zamdela the vulnerability score was 4-6, however, when multiplied by the pollution burden, the screening scores were high (6-8), suggesting risk for adverse health outcomes.

Child Health Study

This study included children with a median age of 10, from 4 schools in the VTAPA. Key health outcomes, including lung function, were assessed.

Logistic regression models were used to look for associations between air pollution levels and health outcomes. While the school in the Zamdela area did not have an increased risk, when compared to the other schools, more recent assessment are needed.

VTAPA Health Study

A baseline health assessment study was conducted in the VTAPA during 2013 and 2014. The study comprised of a community survey in four communities and a child respiratory health study (including lung function tests) in four schools within the community study areas. Human health risks, resulting from exposure to air pollution, were also assessed.

<u>The key findings of the study were:</u>

Ambient concentrations measured at the DFFE and South African Weather Services (SAWS) stations in 2013 indicated **no risk from SO_2** exposure but indicated risk from NO_2 exposure

in Zamdela. PM_{10} was also found to be a concern, with the highest concentrations of PM_{10} recorded in Sharpeville.

From the community survey, **risk factors for respiratory illnesses were mostly associated with energy use** (the use of coal for cooking and paraffin for heating), **overcrowding and hygiene practices** (burning or burying of refuse or failure to regularly remove refuse) **as well as lifestyle** (active and passive smoking and alcohol use) - the main factors affecting the vulnerability of areas to the effects of air pollution involved socio-economic conditions and energy use.

11.3.5.3. Waterberg-Bojanala Priority Area (WBPA)

Matimba

Matimba, as part of the WBPS, is confirmed to be an air pollution hot spot. However, there is limited health impact data for this area. A recent review[58] aimed to explore the associations between air pollution and health for this area and found only a few studies that collected human health data in relation to air pollution exposure for this area. There is also limited plant level specific data available and the health impact data available is regional.

The 2006 Eskom commissioned project, "*Air pollution and health risk analysis of operations of current and proposed Eskom power stations located in the Limpopo province*", undertaken by airshed planning professionals, was based on 2001 census data (it must be noted that these findings are dated, especially as the population size is likely to have changed). However, this project found that only about 22 000 people were estimated to live within approximately 25 km of the Matimba power station, with the majority of these people residing upwind of the power station. Given such exposure, health risks due to SO_2, PM_{10} and NO_2 emissions exposure from the Matimba power station, household fuel burning and brickmaking are estimated to result in

[58] (Clean Air J. vol.33 n.1 Pretoria 2023 http://dx.doi.org/10.17159/caj/2023/33/1.14887)

approximately 1.5 premature mortalities and approximately 140 respiratory related hospital admissions per year.

It was also estimated that emissions from the existing Matimba power station operations were responsible for approximately 80% of premature mortalities and approximately 50% of the respiratory related hospital admissions predicted to occur.

In relation to the effects of exposure to specific pollutant emissions, it was estimated that exposures to SO_2 were responsible for 82% of the total non-accidental mortalities and 38% of the respiratory related hospital admissions. Exposure to PM_{10} emissions was predicted to be responsible for 17% of the total non-accidental mortalities and 57% of the respiratory related hospital admissions. While NO_2 was found to be the least significant of the three pollutants considered in terms of total morbidity and mortality, estimated to account for only 1% of the total non-accidental mortalities and 5% of the respiratory related hospital admissions.

The Myllyvirta study of 2014, on the other hand, involved a single-source regression analysis of a number of power stations, including Matimba, and considered the 2012/13 annual emissions of PM, SO_2 and NO_x that exceeded the MES (using 2010 population data - an estimated population size of 50 million). The relevant risk factors for cause-specific mortality per 10µg/m^3 increase in annual average ambient $PM_{2.5}$ exposure were lung cancer[59], Ischaemic heart disease[60], chronic obstructive pulmonary disease[61], Stroke[62]and acute lower respiratory tract infections in children under 5 years of age[63].

In addition to the above, a Land Use Regression Model study was conducted to estimate the ambient $PM_{2.5}$ emission concentrations from coal-fired power stations and their associated

[59] 1.14
[60] (IHD): 1.26
[61] (COPD): 1.05
[62] 1.12
[63] ALRI (<5 yrs): 1.1

health risks[64] (district municipality-level population data was used to derive population-weighted $PM_{2.5}$ concentrations). The study found that emissions from coal-fired power stations contribute between 1.8% and 5.6% of all deaths attributable to $PM_{2.5}$ exposure in the study area identified (areas affected by $PM_{2.5}$ emissions from power stations in the whole of South Africa). The study also found that coal-fired power station emissions contribute to a relatively higher proportion of premature deaths in areas where power stations have the highest contribution to ambient $PM_{2.5}$ concentrations[65].

In conclusion, it has been found that there is a distinct lack of air quality. Reviewed articles of conducted studies[66] identified air quality as a problem, with ambient air quality levels often exceeding relevant NAAQS.

Medupi

In terms of Eskom's Health Impact Cost Benefit Analysis conducted in November 2018, the health impacts caused by air pollution at Medupi are:

> *"Respiratory Mortality: The lung is the internal organ most vulnerable to infection and injury from the external environment because of its constant exposure to ambient air. Respiratory mortality includes deaths due to chronic obstructive pulmonary disease (COPD), asthma, acute lower respiratory tract infections, tuberculosis (TB), and lung cancer (FIRS, 2017). Diseases of the respiratory system make up 9.4% of total deaths in South Africa (StatsSA, 2018).*
>
> *Cardiovascular Mortality: Cardiovascular mortality includes death attributable to myocardial ischemia and infarction, heart failure, ischaemic heart disease and cardiac arrest. Cardiovascular diseases fall within International Classification of Diseases*

[64](Simelane and Langerman 2020, https://www.naca.org.za/uploads/2020_NACA_Conference_Proceedings_Full_Papers.pdf)
[65] Ibid.

[66] (Clean Air J. vol.33 n.1 Pretoria 2023)

(ICD) codes I00-I152. Long-term exposure to nitrogen dioxide is associated with increased cardiovascular mortality (Maji et al., 2017). In South Africa, diseases of the cardiovascular system make up 18.5% of total deaths (SAMRC, 2016).

Cerebrovascular Mortality: Stroke, transient ischemic attack, aneurysms, and vascular malformations are all types of cerebrovascular disease. Cerebrovascular diseases have ICD codes I60-I69. Exposure to particulate matter is associated with increased cerebrovascular mortality (Gutiérrez-Avila et al., 2018). Cerebrovascular diseases are responsible for 5.7% of natural deaths in South Africa (StatsSA, 2018).

Diabetes Mellitus Mortality: Diabetes mellitus is a group of diseases where a person has high blood glucose (blood sugar), either because insulin production is inadequate, or because the body's cells do not respond properly to insulin, or both. Diabetes diseases have a classification of E10 (Type 1) and E11 (Type 2) in the International Statistical Classification of Diseases (ICD) (WHO, 2016b). Long-term exposure to particulate matter is associated with a significant increase in diabetes-related mortality (Brook et al., 2013). Diabetes Mellitus is estimated to be responsible for 6.2% of natural deaths in South Africa (StatsSA, 2018)."

11.3.6. Considering Health Impacts within the Multidimensional Model

The absence of standardised health outcome data makes direct comparisons between plants challenging. However, all studies highlight important health impacts, associated with the various pollutants, on the local communities. Considering the multi-dimensional model, particulate matter (both PM_{10} and $PM_{2.5}$) is most significantly associated with adverse health outcomes and increased mortality across the regions in which the power plants are located. Importantly, SO_x is a contributor to PM and the health impacts associated with this should be noted.

Considering each priority area:

HPA: PM and SO_x are both associated with an HQ>1 (indicating potential health risks) for all power plants across the 3 local municipalities, with Tutuka having more vulnerable communities living within the area. NO_2 however, was not considered in studies undertaken in

the HPA as the exposure was considered a low health risk. However, it must be noted that for Majuba, the major pollutant of concern is NO_x. NO_x was, nevertheless, not considered because of its low-risk characterization. This limited the health impact assessment for this power station.

VTAPA: The Human Health Risk Assessment (HHRA) showed a high risk of PM related health impacts, moderate risk of NO_x related health impacts and a low risk of SO_x related health impacts.

WBPA: Differing health risk profiles per power plant were established within the area. For Matimba, PM and SO_x exposure were found to both be associated with significant adverse respiratory health outcomes and mortality and NO_x associated health risks were less prevalent. Further, both PM and SO_x were found to be associated with a moderate increase in mortality and respiratory related hospital admissions. For Medupi, it was found that PM is associated with significant health risks however, no significant health outcomes were found to be associated with SO_x and NO_x emissions. However, moderate increases in all-cause mortality associated with the emissions of all pollutants, were established.

In critically exploring these factors, it is evident that PM related health-outcomes are more prevalent across all areas.

Undoubtedly, there are significant health impacts, particularly on the surrounding communities, associated with emissions, from coal-fired power stations, which are above acceptable standards. Quantifying the extent of these impacts requires reliable data and consideration of the complex factors that influence individual health.

11.4. Socio-Economic Assessment

As previously indicated, the Forum member appointed to address aspects related to socio-economic issues stopped participating in the process. In this regard, a decision was taken that this aspect of the Forum's work would be outsourced to other experts. The DFFE assisted the Forum to identify and appoint the relevant experts. Ms J Adam and Dr R-D Heinsohn were tasked with advising on various aspects related to the socio-economic conditions in the HPA,

WBPA and the VHPA in respect of communities situated in proximity to Eskom's power stations.

This section of the report is divided into three sub-sections, the information contained in the plant level assessment section was compiled by the HNM Team; the general overview of the socio-economic assessment was conducted by Ms Adams and Dr. Heinsohn; and the information in the section on Eskom's offset programmes is derived from data provided by Eskom.

11.4.1. Plant Level Assessments

11.4.1.1. The socio-economic situation of the District and Local Municipality

Eskom's Duvha, Matla and Kendal power stations are located in the Emalahleni Local Municipality ("**Emalahleni LM**") in the Nkangala District Municipality ("**Nkangala DM**"), Mpumalanga.

Nkangala DM is one of three districts in Mpumalanga and is located in the northwest part of the province. Nkangala DM is the smallest district in Mpumalanga, covering an area of 16,758 km², which makes up 22% of Mpumalanga's total area. The District is classified as a Category C municipality as it has municipal executive and legislative authority in an area that includes more than one municipality. Nkangala DM is comprised of six local municipalities, namely Victor Khanye, Steve Tshwete, Emakhazeni, Thembisile Hani, Dr JS Moroka, and Emalahleni LM.

Emalahleni LM covers an area of 2 678 km^2 and is a Category B municipality situated in the western region of the Mpumalanga province. The southern region of Emalahleni LM is a part of the Energy Mecca of South Africa, as it contains vast coal reserves and power stations.

Leadership and financial situation

The Nkangala DM is not under intervention. In the audit for the 2021-2022 financial year, the Auditor General ("**AG**") found no evidence of unauthorised expenditure, but did find evidence of irregular and fruitless and wasteful expenditure in the Nkangala DM. As at the time of the AG's audit, the Nkangala DM's total expenditure did not exceed its total revenue, its liabilities

did not exceed its assets, and there was no uncertainty regarding its ability to continue operating. According to the AG, the Nkangala DM has effective risk management controls in place. Overall, the district received clean audits for the past four consecutive financial years.[67]

The above suggests that the Nkangala DM is one of the most well-managed districts in Mpumalanga. This is particularly illustrated by the fact that it is not under intervention, has received clean audits for the past four consecutive financial years, is not a going concern risk, and has effective risk controls in place. According to the AG, while a clean audit is not always an indicator of good service delivery and does not always correlate directly to the lived experience of all the communities in a municipal area, it has been observed that municipalities with institutionalised controls and systems to plan, measure, monitor and account for their finances and performance, and to stay within the rules, often also have a solid foundation for service delivery.

Emalahleni LM, on the other hand, is currently under intervention. During the 2021-2022 audit conducted by the AG, it was discovered that the municipality lacks effective risk management controls. The AG expressed concerns about the condition of the municipality's records and record-keeping systems, as well as the daily and monthly controls. Furthermore, the AG found that the municipality's in-year and year-end reporting, as well as its compliance monitoring systems, require intervention.

The AG uncovered evidence of unauthorised expenditure amounting to over R 909 million, irregular expenditure of R 806.2 million, and fruitless and wasteful expenditure of R 273.8 million. The total expenditure for the 2021-2022 audit exceeded the revenue for that year, and the AG opined that the budget for the following financial year would have to pay for part

[67] Municipalities with clean audits are characterised by sound financial and performance management disciplines and perform their functions in accordance with applicable legislation. They plan adequately, implement effectively and report on performance in a credible manner. They further manage projects effectively so that deficiencies are identified and rectified promptly and so that timelines, budgets and quality standards are adhered to. The well-functioning control environment and good systems present at these municipalities form a solid foundation from which councils can prioritise improving their performance and service delivery further.

of the previous year's expenditure. The AG also expressed uncertainty about whether the municipality would be able to continue operating.

In the 2021-2022 financial year, Emalahleni LM received a qualified audit opinion for the fifth consecutive year.[68]

Evidently, Emalahleni LM may lack good leadership and is, as a result thereof, currently under intervention. The degree of unauthorised, irregular, and fruitless and wasteful expenditure is also of concern. As indicated above, the state of the administration of the municipality has the potential to hinder the delivery of essential services to the communities.

Population and living conditions

According to the censuses conducted by Statistics South Africa ("**Stats SA**") in 2011 and 2022, the Nkangala DM had a population of 1 308 129 in 2011 and Emalahleni LM had a population of 395 466. In 2022, the population of both municipalities increased, Nkangala DM's population increased to 1 588 684 and Emalahleni LM's to 434 238.

In 2011, approximately 33.3% of the population in the Nkangala DM were living below the lower-bound poverty line ("LBPL") and that increased to 45% in 2021. By comparison, the percentage of the population in Emalahleni LM living below the LBPL was 22% in 2011 and 28% in 2016.

There were 356 902 households in Nkangala DM in 2011 and 119 873 in Emalahleni LM. In 2022, the number of households in Nkangala DM and Emalahleni LM increased by over 35%, to 483 169 and 164 573 respectively.

To put matters into perspective, the population in the Nkangala DM grew by over 21.4% between 2011 and 2022, while the poverty rate in the district increased by 11% during that

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[68] A qualified audit opinion is issued where "*the financial statements contain material misstatements in specific amounts, or there is insufficient evidence for us to conclude that specific amounts included in the financial statements are not materially misstated*." See "Audit terminology" at https://www.agsa.co.za/AuditInformation/AuditTerminology.aspx.

same time. The population of Emalahleni LM by comparison increased by 9.8% between 2011 and 2022 and the percentage of people living below the LBPL increased by 6% during the same period.

In addition to the poverty rate, the past 11 years have also witnessed an increase in the number of households without access to refuse disposal. The percentage of households without access to refuse disposal services in Nkangala DM increased from 6.3% in 2011 to 6.4% in 2022, which marks a 0.1% increase, and from 6.8% to 9.7% in the Emalahleni LM, indicating a 2.8% increase overall. The relatively insignificant growth in the number of households without a refuse system in Nkangala DM, and the rather significant growth in the number of households without access to refuse disposal in the Emalahleni LM is consistent with the AG's findings and opinion regarding the correlation between clean audits and service delivery.

Lack of access to services such as, for example, refuse disposal has the potential to give rise to air pollution-related issues. Lack of access to refuse disposal services causes communities to set up illegal waste dumping sites. GHGs, such as methane and CO_2, as well as other gases emanate from the dumping sites as a result of the decomposition of the waste. Furthermore, communities also burn the waste to make more space for additional waste and use the fire to generate energy for cooking and keeping themselves warm. These GHGs contribute to air pollution, adversely affecting the AAQ in these areas. As such, it is important for the relevant authorities to address this issue. Eskom can also extend its waste management project, currently underway in Fezile Dabi and Sedibeng district, to other communities in the Highveld Priority Area.

Unemployment rate and employment levels in the municipality

In 2011, there were approximately 377 322 people employed in the Nkangala District and 152 303 were unemployed.

In 2021, the Nkangala District had the highest unemployment rate in the province at 37.5%, followed by the Ehlanzeni District Municipality at 36.5%. The Gert Sibande District had the lowest unemployment rate of the three districts at 30%.

The unemployment rate in the Emalahleni LM was 27.3% in 2011 and 28.2% in 2021, marking a 0.9% increase over the 11 years. The youth (15-34 years of age) unemployment rate was 36% in 2011 and 41% in 2021.

According to the data supplied by Eskom, there are 807 employees and 884 contractors at its Duvha power station, 685 employees and 460 contractors at Matla, and 735 employees and 647 contractors at Kendal. It is not clear how many of this number reside in the Nkangala DM or the Emalahleni LM.

In 2011, there were 869 905.8 people of working age in the Nkangala DM and 281 571.8 in the Emalahleni LM. The working-age population in the Nkangala DM grew to 1 069 184.3 in 2022 and that in Emalahleni LM increased to 305 268.3.

If, in 2022, all of Eskom's employees and contractors employed at Duvha were resident in the Nkangala DM, the number of employees and contractors at the plant would constitute 0.16% of the total working-age population. Matla and Kendal's contribution would be similar.

If all the employees and contractors at Duvha were resident in the Emalahleni LM, that would amount to 0.56% of the working-age population. Matla's would constitute 0.38% and Kendal's 0.45%.

Assuming that all of Eskom's employees and contractors at Duvha, Matla and Kendal were resident in the Nkangala DM, they would amount to 0.39% of the total working-age population in the District. If they were all resident in the Emalahleni LM, they would constitute 1.38% of the total working-age population.

It bears mention that not every member of the working-age population is employed and thus the above percentages may be slightly higher.[69]

The above suggests that Eskom's plants are not the main or a major employer in either Nkangala or Emalahleni. Further, it is unlikely that all of Eskom's employees at Duvha reside in the Nkangala DM and/or the Emalahleni LM.

Despite the fact that Eskom is not the largest employer in the Nkangala DM or the Emalahleni LM, the operation of the power station has a direct impact on the overall employment levels and economy, be it in the informal or formal economy. For example, the mines in the area sell their coal to Eskom and other industries and these mines employ quite a number of local people. Informal traders sell their goods on the side of the road to people working and living in the area and local businesses service Eskom and the mines.

Current levels of electricity access (connections and use, plus offsets plus other fuels)

Cooking

According to the 2011 Census results, 73.2% of households in the Nkangala District used electricity from the mains as their primary source of cooking fuel. 10.7% of households used paraffin, 8% used wood, 5.8% used coal, and 1.9% used gas for cooking. Furthermore, 0.1% of households used solar, animal dung, and other sources respectively. Additionally, 0.2% of households did not have any means to cook their food.

In the 2016 Community Survey that was conducted by Stats SA, 79% of households in Nkangala indicated that they used electricity for cooking, indicating a 5.8% increase from 2016

[69] The unemployment rate provided by Statistics South Africa is calculated from what it terms "economically active" individuals, not working-age individuals. Economically active individuals are a subset of the working-age population. So, if one wanted to determine Eskom's contribution to the total employment, one would either need the actual number of people that are employed, as opposed to the percentage of employed and unemployed people. Where that is not available, one would at least need the number of economically active individuals, which can be used to determine the actual number of employed individuals from the unemployment and employment percentage figures.

in electricity usage for cooking purposes. Of the remaining households, 20.5% reported using other sources and 0.4% did not have any means to cook their food.

According to the 2022 Census, households in the Nkangala District used different types of fuel for cooking. These sources included electricity (65.4%), gas (23.5%), wood (4.5%), paraffin (4.2%), coal (2%), solar (0.1%), and other (0.1%). 0.1% of households did not have any means of cooking their food.

Although there was an increase in the use of electricity between 2011 and 2016, the number decreased significantly in 2022. The data demonstrates that in the Nkangala District there was a migration towards gas as a source of energy for cooking, the figure increased from 1.9% in 2011 to 23.5% in 2022.

According to the 2011 Census report, 70.8% of households in Emalahleni had access to electricity for cooking. Among the remaining households, 21.5% used paraffin, 3.5% used coal, 2.3% used gas, 1.6% used wood, 0.1% used solar, and 0.1% used other sources of energy. 0.1% of households did not have any means to cook.

In 2016, the percentage of households in Emalahleni that relied on electricity to cook their food decreased to 69.7%. The percentage of households that used other sources of energy was 30%, and 0.3% did not have any means to cook.

By contrast, in 2022, 59.1% of the households in Emalahleni relied on electricity for cooking, 28.8% used gas, 9% used paraffin, 1.6% used coal, 1.3% used wood, 0.1% used solar, and 0.1% used other sources. 0.1% of households do not have any means to cook.

Heating

In 2011, the majority of households (63%) in Emalahleni used electricity for heating purposes. 13.3% of the households used coal, while 4.8% used paraffin, 4.3% used wood, and 2.4% used paraffin. About 0.2% of the households used solar and 0.1% used animal dung to generate heat. 11.9% of the households did not have any means to heat their homes.

Lighting

In 2011, 85.7% of households in the Nkangala District used electricity to illuminate their homes. 12.5% of households used candles, 1.1% used paraffin, 0.2% used gas, and 0.2% solar. 0.3% of the total households did not have any means to illuminate their homes.

According to the 2016 Community Survey, 85.7% of the households in the Nkangala District used electricity for lighting, 14% used other sources and 0.3% did not have any source of energy to illuminate their homes.

As at 2022, a vast majority of households (91.7%) used electricity to illuminate their homes. While 5.6% of households used candles, 1.5% used solar energy, 0.7% used paraffin, 0.3% used gas, and 0.1% used other sources for lighting. Approximately 0.1% of the households did not have access to any means of illuminating their homes.

The figures above indicate a shift towards using electricity as a source of lighting, rather than other fuel sources. Given that the shift appears to be taking place simultaneously with the growth of the population, there is an inference to be made that access to electricity is increasing in the Nkangala District.

Based on data from the 2011 Census, it was found that 73.4% of households in Emalahleni had access to electricity for lighting purposes. The remaining households used alternative sources of energy such as candles (23.3%), paraffin (2.5%), solar (0.2%), and gas (0.2%). 0.4% of households lacked the necessary resources to light up their homes.

In 2016, 72.3% of the households in the Emalahleni municipality used electricity as a source of energy to generate light, 27.4% used other sources and 0.3% lacked the necessary means.

As at 2022, electricity was the predominant source of energy for generating light for households in Emalahleni, at 84.1%. 11% of households used candles, 2.7% used solar, 1.5% used paraffin, 0.4% relied on gas, and 0.2% relied on other sources for lighting. 0.1% of households did not have access to lighting for their homes.

A comparison of the two years demonstrates a shift towards electricity and solar as sources of energy for lighting.

The cause of the above-observed trends is not clear. What is, however, clear is that there is limited evidence that suggests a correlation between the trends and Eskom's offset programme. The trends could, for example, be attributed to the onset of loadshedding, a migration catalysed by the rising cost of electricity in comparison to the cost of other fuels such as gas. It could also be attributed to access to certain fuels over others.

Eskom's offset programme

As part of its efforts to improve the air quality in the areas around its power stations, Eskom has introduced an offset programme which seeks to reduce emissions from domestic solid fuel burning by assisting households to move to a cleaner source of energy (electricity with LPG backup), providing households with cleaner-burning heating and/or cooking devices (such as a low emission coal/wood stove), and reducing the need for heating by better insulating houses, where possible.

Eskom has identified two specific areas around the Duvha power station where it intends to implement its offset programme, namely Masakhane and 2 000 households in eMalahleni, an area closest to Duvha, where there is potential for offsets. With regards to Matla, Eskom has identified two specific areas around the Matla power station where it intends to implement its offset programme, namely Emzinoni and eligible neighbouring farms. As regards the Kendal power station, it identified the following areas: Phola, Eskom Triangle, Khayalethu Village, Olympic community, Makhosi community, Arbor, and neighbouring farms.

General

According to SALGA, Emalahleni is one of four local municipalities in Mpumalanga that has a Small-Scale Embedded Generation ("**SSEG**") Framework. Emalahleni allows SSEG onto its network and has an official SSEG application process.

11.4.1.2. Tutuka

The socio-economic situation of the district and municipality – Tutuka

The Tutuka power station is located in the Lekwa Local Municipality ("Lekwa LM") in the Gert Sibande District Municipality ("Gert Sibande DM"), Mpumalanga. Tutuka's first unit went commercial on 1 June 1985 and the last unit on 4 June 1990.

Gert Sibande DM is the largest of three districts in the Mpumalanga Province, covering an area of 31 840 km^2. According to the classification scheme established by the Constitution, this municipality is a Category C municipality as it has municipal executive and legislative authority in an area that includes more than one municipality. Gert Sibande DM is comprised of seven local municipalities namely: Govan Mbeki, Chief Albert Luthuli, Msukaligwa, Dipaleseng, Mkhono, Dr Pixley ka Isaka Seme and Lekwa LM.

Lekwa LM is a local municipality located in the south-east of the Gert Sibande District and has a total area of 4585 km^2. It lies in large open plains of the highveld and is considered to be rural. Lekwa LM is a Category B municipality.

Leadership and financial health

According to the AG's audit for the financial year 2020-2021, there was no unauthorised, irregular, or fruitless and wasteful expenditure in Gert Sibande DM. Furthermore, the municipality's liabilities did not exceed its assets and there was no uncertainty about the district's ability to continue operating. The AG did, however, find that Gert Sibande DM's total expenditure in 2020-2021 financial year exceeded its total revenue and that the budget for the new financial year would have to cover the previous year's expenditure. Overall, the District received a clean audit outcome, the third in the past five years.

In the 2021-2022 financial year, the district regressed and received an unqualified audit opinion. The Gert Sibande DM did not have any instances of unauthorised, irregular, or wasteful expenditure. As in the previous year's audit, there was no uncertainty about the district's ability to continue operating and its liabilities did not exceed its assets. Similar to the previous financial year, the AG found that the district's total expenses in the 2021-2022 financial year exceeded its total revenue, and therefore the budget for the following year would have to cover these expenses.

Lekwa LM is currently under intervention and the audit conducted by the AG during its 2021-2022 audit revealed that the state of its internal controls requires intervention. The AG found that the municipality did not have proper record keeping, daily and monthly controls, in-year and year-end reporting, and review and monitoring compliance systems. Furthermore, the AG opined that there is uncertainty about whether the municipality will be able to continue operating. Overall, the municipality received its third consecutive disclaimed audit opinion.

The AG reports, for the financial years 2020-2021 and 2021-2022, suggest that the Gert Sibande DM is relatively well-managed. This is particularly evidenced by the fact that the district has received three clean audits in the past five years. It has managed to keep its asset base above its liabilities for at least two consecutive financial years and there has not been any uncertainty about its ability to continue operating during the period. Furthermore, there have not been any instances of unauthorised, irregular, or fruitless and wasteful expenditure in the past two financial years.

In stark contrast to the Gert Sibande District, the reports suggest that Lekwa LM lacks good and effective management and, as a result, has been placed under intervention. The municipality has received three consecutive disclaimed audit opinions. In addition, it evidently lacks effective risk management controls, and the AG expressed concern about its ability to continue operating.

While a clean audit does not always serve as an indicator of good service delivery and does not always correlate directly to the lived experiences of all the communities in a municipal area, according to the AG, it has been observed that municipalities with institutionalised controls and systems to plan, measure, monitor and account for their finances and performance, and to stay within the rules, often also have a solid foundation for service delivery. The state of Lekwa LM's leadership is thus a particular cause for concern, particularly for those who are resident in the municipality.

In such municipalities, there is or likely to be poor service delivery. Businesses, such as Eskom, may play a role in alleviating the unintended and undesired void created by dysfunctional municipalities and experienced by the communities. This makes Lekwa LM a potential candidate for a fit-for-purpose offset programme.

Population and living conditions

According to the censuses conducted by Stats SA in 2011 and 2022, the Gert Sibande DM had a population of 1 043 194 in 2011 and Lekwa LM's population was 115 662. Gert Sibande DM's population increased to 1 283 459 in 2022 and that of Lekwa LM grew to 119 669.

Of the total population in Gert Sibande DM in 2011, 37.5% of them were living below the LBPL. In Lekwa LM, during the same period, 31.7% of the population was living below the LBPL. The poverty rate in Gert Sibande DM increased to 49.5% in 2019 and to 44.5% in Lekwa LM in 2021, signifying an increase in excess of 10% in both municipalities.

In 2011, there were 273 485 households in Gert Sibande DM and 31 071 in Lekwa LM. The number of households in Gert Sibande DM and Lekwa LM increased in 2022 to 378 182 and 38 583 respectively. Of the total households in Gert Sibande DM in 2011, 8% of them did not have access to refuse disposal services, which decreased to 4.9% in 2022. In Lekwa LM, 3.9% of the total households in 2011 had no refuse system, which increased to 6.2% in 2022.

Service delivery, in this regard, appears to have improved in the Gert Sibande DM, whereas it deteriorated in the Lekwa LM. While there is no definite correlation between audit opinions received from the AG and service delivery, there may be some merit to that assertion in the case of the Gert Sibande DM and Lekwa LM. As is evident from the above, access to refuse disposal systems in Gert Sibande DM improved while that in Lekwa LM declined.

Poor service delivery, in the case of access to refuse disposal systems, can have an adverse effect on the AAQ in a particular region, particularly where communities resort to setting up their own illegal waste dumping sites and/or burning the refuse. GHGs such as methane and CO_2, as well as other gases, emanate from the dumping sites as a result of the decomposition of the waste. Furthermore, in those instances where communities burn the waste – whether to make more space for additional waste or to use the fire to generate energy for cooking and keeping themselves warm – the resultant emissions invariably contribute to air pollution, affecting the AAQ in these areas. As such, it is important for the relevant authorities to address this issue, however Eskom can also extend its waste management project, currently underway in the Vaal area (Sharpeville), to other communities in the HPA.

Unemployment rate and employment levels in the municipalities

In 2011, there were at least 109 659 (43.9%) unemployed people in the Gert Sibande DM, and 11 895 (25.9%) in the Lekwa LM. During the same year, there were 249 638 employed people in the Gert Sibande DM and 34 118 in the Lekwa LM. Despite the rising population in both municipalities in the 10 years following, the unemployment rate in both municipalities decreased. The unemployment rate in the Gert Sibande DM decreased to 30% in 2021 and that in the Lekwa LM dropped to 22.1%.

According to the data supplied by Eskom, it employs 712 people and there are 301 contractors at its Tutuka power station, but it is unclear how many are from the Gert Sibande DM or the Lekwa LM. Notwithstanding the limited data, what is available can be used to draw some inferences about Eskom's possible contribution to employment in both municipalities.

In 2011, there were 666 600.97 people of working-age in the Gert Sibande DM and 76 799.57 in the Lekwa LM. That figure grew in 2022 to 867 618.28 in the Gert Sibande DM and 83 528.96 in the Lekwa LM. If, in 2022, all of Eskom's employees and contractors employed at Tutuka were based in the Gert Sibande DM, the number of employees and contractors at the plant would constitute 0.12% of the total working-age population there. If they were all resident in the Lekwa LM, they would constitute 1.2% of the Lekwa LM's working-age population.

It bears mention that not every member of the working-age population is employed and thus Eskom's contribution to employment in both municipalities may be marginally higher.

Despite the fact that Eskom is not the largest employer in this area, the operation of the power station has a direct impact on the overall employment levels and economy, be it in the informal or formal economy. For example, the mines in the area sell their coal to Eskom and other industries and these mines employ quite a number of local people. Informal traders and local businesses sell their goods on the side of the road to people working and living in the area.

Current levels of electricity access (connections and use, plus offsets plus other fuels)

Cooking

According to the 2011 Census, the households in the Gert Sibande DM used the following sources of fuel for cooking purposes: electricity (62.9%), wood (19.4%), coal (10.8%), paraffin (3.8%), gas (2%), animal dung (0.6%), solar (0.1%), and other (0.1%). About 0.3% of households did not have any means to cook their food.

As per the Census Report of 2022, 61.4% of households in the Gert Sibande DM used electricity as their main source for cooking, 19.8% used gas, 12.8% used wood, 4.1% used coal, 1.5% used paraffin, 0.1% used solar, 0.1% used animal dung, and 0.1% used other sources. Additionally, 0.2% of households did not have any means to cook their food.

There was a slight decrease in households using electricity in the Gert Sibande DM, from 62.9% in 2011 to 61.4% in 2022. The data also indicates a significant migration towards cooking with gas, from 2% in 2011 to 19.8% in 2022. There was also a sharp decrease in the use of coal for cooking, from 10.8% in 2011 to 4.1% in 2022.

In the 2011 Census, it was reported that 80.5% of the households in the Lekwa LM had access to electricity for cooking. Of those who did not have access to electricity, 1.1% used gas, 3.8% used paraffin, 0.1% made use of solar energy, 5.4% burned wood, 7.6% used coal, 1.3% utilised animal dung, 0.1% used other means and 0.2% did not have any means to cook.

As of 2022, the majority of households (75.6%) in the Lekwa LM had access to cooking through the mains. A significant percentage of households (17.5%) used gas, while only a small percentage used paraffin (1.4%), solar (0.1%), wood (2.9%), coal (2.1%), or animal dung (0.1%). Unfortunately, some households did not have any means to cook.

The above data for the Lekwa LM is in line with the data for the Gert Sibande DM. The data clearly illustrates a progressive shift in cooking fuel preference towards gas and away from coal and wood. The use of gas increased from 1.1% in 2011 to 17.5% in 2022, while the use of coal and wood decreased by 61.84% and 46.3% respectively.

It bears mentioning that 18.8% of households in the Gert Sibande DM, in 2022, used fuel sources other than electricity and gas to cook, whereas that figure was less than 7% in the Lekwa LM.

Heating

In 2011, the majority of households (60.5%) in the Lekwa LM used electricity for heating purposes. Only 2% of the households used gas, while 1.4% used paraffin and 0.2% used solar. About 6% of the households used wood, 21% used coal, and 1.4% used animal dung as a heating source. However, 6.8% of the households did not have any means to heat their homes.

Lighting

In 2011, the majority of households (83.4%) in the Gert Sibanda DM used electricity to illuminate their homes. 14.9% used candles, 0.8% used paraffin, 0.4% used gas, and 0.3% used solar power. Approximately 0.3% of the households did not have access to any means of illumination for their homes.

In 2022, 91.3% of households reported using electricity to illuminate their homes, which marked an increase in electricity usage. Candles remained the second most used source of light, although overall usage dropped to 5.7%. The usage of gas, solar, and other sources of energy increased to 0.8%, 0.9%, and 0.1% respectively, while the use of paraffin dropped to 0.6%.

According 2011 Census data, 88.6% of the households in the Lekwa LM had access to electricity for lighting. The remaining households used the following sources of energy: gas (0.7%), paraffin (1.1%), solar (0.2%), and candles (9.1%). Only 0.2% of the population lacked the necessary resources to light up their homes.

As of 2022, 94.8% of households in the Lekwa LM used electricity for lighting, while 0.1% used gas, 0.7% used paraffin, 3.7% used candles, 0.4% used solar, and 0.1% relied on other sources. It is worth noting that just 0.3% of households did not have access to lighting for their homes.

The above figures for the Gert Sibande DM and the Lekwa LM demonstrate that electricity is the preferred source of energy for lighting purposes. This also illustrates that there is an increase in the number of households that have access to electricity in the area.

11.4.1.3. Lethabo

The Lethabo power station is located in the Metsimaholo Local Municipality ("Metsimaholo LM") in the Fezile Dabi District Municipality ("Fezile Dabi DM"), Free State Province.

Fezile Dabi DM, formerly named Northern Free State District Municipality, is a district municipality situated in the north of the Free State Province. At 20 674 km^2, it is the smallest of the four districts in the province. According to the classification scheme established by section 155(1) of the Constitution, Fezile Dabi DM is a Category C municipality as it has municipal executive and legislative authority in an area that includes more than one municipality. Fezile Dabi DM is made up of four local municipalities, namely Mafube, Moqhaka, Ngwathe, and Metsimaholo LM.

Metsimaholo LM is a local municipality located in the northern part of the Fezile Dabi DM. It covers a geographic area of 1717 km^2, making it the smallest of the local municipalities in the Fezile Dabi DM. It shares municipal executive and legislative authority with the Fezile Dabi DM, which makes it a Category B municipality.

Leadership and financial health

The Fezile Dabi DM is not currently under intervention. Notwithstanding this, the AG's 2021-2022 audit report identified several issues with the municipality. The AG reported that the municipality's internal controls/risk management systems require intervention. Intervention was specifically required in the areas of record keeping, reviewing and monitoring compliance, and in-year and year-end reporting. The municipality's daily and monthly controls also required intervention.

The AG also reported unauthorised expenditure amounting to R 56.2 million, irregular expenditure of R 43.3 million, fruitless and wasteful expenditure of R 4.1 million, and a budget

deficit of R 12 million. The past five financial years in the Fezile Dabi DM are characterised by the same pattern of expenditure.

Overall, the District received a qualified opinion. It is worth pointing out that this was the third consecutive financially qualified opinion with findings that the municipality received and the fourth in the past five years. In the 2018-2019 financial year, the district received a disclaimed audit opinion, which marked a regression.

Metsimaholo LM is in a similar condition to Fezile Dabi DM. While it is also not currently under intervention, the AG's 2021-2022 audit report revealed several issues with the municipality, most of which are similar to those identified in the Fezile Dabi DM. Like the Fezile Dabi DM, Metsimaholo LM also lacks effective risk management systems and controls. In particular, the municipality lacks proper record keeping, daily and monthly controls, in-year and year-end reporting, and compliance reviewing and monitoring systems. According to the AG's report, Metsimaholo LM's internal controls require intervention.

The AG's 2021-2022 audit report also identified unauthorised expenditure of R 141.4 million, irregular expenditure of R649.2 million, and fruitless and wasteful expenditure of R 40 million. Despite this, the municipality's total expenditure did not exceed its total revenue, meaning that there was no budget deficit for the 2021-2022 financial year. According to the AG, as at the time of reporting, Metsimaholo LM's liabilities did not exceed its assets and there was no uncertainty about the municipality's ability to continue operating.

Overall, the Metsimaholo LM received a qualified audit outcome, marking its fifth consecutive qualified outcome since the 2017-2018 financial year.

On the whole, the above data suggests that the leadership in both the Fezile Dabi DM and the Metsimaholo LM needs to improve. As indicated above, both municipalities lack effective internal controls. According to the AG, their internal controls require intervention and the past five financial years have been marked by unauthorised, irregular, and fruitless and wasteful expenditures in the millions. Furthermore, municipalities have received at least four qualified audit opinions in the past five years. These issues have the potential to hinder the delivery of basic essential services to the communities under the leadership of the district.

Population and living conditions

In the 2011 Census report, Stats SA reported that there were 488 036 people living in the Fezile Dabi DM and 149 108 living in the Metsimaholo LM. In 2022, the population in the Fezile Dabi DM and the Metsimaholo LM increased to 509 912 and 158 391 respectively.

In 1996, over half of the population (51.5%) of the Fezile Dabi DM was living below the LBPL. The situation improved in 2005 and improved further in 2014. In 2005, the percentage of the population living below the LBPL dropped to 45.4% and further decreased to 33.4% in 2014.

According to the 2011 Census, there were 144 971 households in the Fezile Dabi DM and 45 752 in the Metsimaholo LM. The percentage of households without access to refuse systems in 2011, was 3.3% in the Fezile Dabi DM and 3.5% in the Metsimaholo LM. In 2022, the number of households in the Fezile Dabi DM increased to 145 539 and to 49 060 in the Metsimaholo LM, and the percentage of households without refuse disposal systems decreased to 2.9% in the Fezile Dabi DM and increased to 3.9% in the Metsimaholo LM.

There appears to have been a marginal improvement in access to refuse disposal systems in the Fezile Dabi DM and an equally marginal regression in the Metsimaholo LM. Access to refuse disposal is an issue of service delivery. Municipalities bear a responsibility to provide these basic and other services to communities.

Poor service delivery, in the case of access to refuse disposal systems, can have an adverse effect on the AAQ in a particular region, particularly where communities resort to setting up their own illegal waste dumping sites and/or burning the refuse. GHGs, such as methane and CO_2, as well as other gases emanate from the dumping sites as a result of the decomposition of the waste. Furthermore, in those instances when communities burn the waste – whether to make more space for additional waste or to use the fire to generate energy for cooking and keeping themselves warm – the resultant emissions invariably contribute to air pollution affecting the AAQ in these areas. As such, it is important for the relevant authorities to address this issue, however Eskom can also extend its waste management project, currently underway in the Vaal area (Sharpeville), to other communities in the HPA.

While it is not clear what the cause of the population growth is, it can be said that, in general, population growth could be indicative of the migration of persons either to secure job opportunities or to where they have already secured job opportunities. For the Fezile Dabi DM, where the population number increased significantly (21867), but the number of occupants per household only increased by 568, this could demonstrate an influx of newcomers, opting to live with relatives, friends or roommates.

Unemployment rate and employment levels in the municipalities

According to the 2011 Census, the unemployment rate in the Metsimaholo LM was 32.1% and the youth unemployment rate was 41.6%.

Current levels of electricity access (connections and use, plus offsets plus other fuels)

Cooking

According to the 2011 Census, 85.3% of the households in the Fezile Dabi DM used electricity for cooking purposes, 6% used paraffin, 3.7% used gas, 2.9% used wood, 1.3% used coal, 0.4% used animal dung, 0.2% used solar, and 0.1% used other means. 0.2% of households did not have any means to cook their food.

In 2022, the percentage of households that used electricity for cooking purposes declined to 74.5%. The use of paraffin, wood, coal, animal dung, solar and alternative sources also experienced a noticeable decline. Paraffin usage dropped to 2.6%, wood to 1.1%, coal to 0.3%, and solar declined to 0.1%. The use of animal dung and other alternative sources of fuel decreased to 0%. By contrast, the percentage of households that relied on gas for cooking purposes surged to 21.1%, more than five times the usage observed in 2011. 0.2% of the households in 2022 remained without an energy source to cook their food.

The above figures illustrate a clear shift towards gas as the preferred source of fuel for cooking. The trend observed in the Fezile Dabi DM is similar to that which can be gleaned from Metsimaholo LM's fuel usage. The increase in the use of gas and the decrease in the use of electricity reflects a shift in consumer preferences.

According to the 2011 Census, 83.1% of households in the Metsimaholo LM used electricity to cook, 8.7% used paraffin, 6.3% used gas, 1% used wood, 0.3% used coal, 0.1% used animal dung, 0.1% used solar and another 0.1% used alternative sources of fuel. 0.2% lacked the necessary means to cook their food.

In 2022, save for gas and solar, all the sources of fuel that were used for cooking in 2011 experienced a decline in usage. Electricity usage declined to 64.1%. paraffin, wood and coal usage decreased by almost half, to 4.4%, 0.5% and 0.1% respectively. While the percentage of households using solar remained unchanged at 0.1%, the percentage of households that used gas grew to 30.6%, almost five times the usage observed in 2011. Animal dung and other alternative sources of fuel fell out of use and 0.2% of the households remained without fuel sources to prepare their food.

These figures strongly suggest that households in the Metsimaholo LM are also migrating towards gas as a source of energy to cook their food.

Heating

According to the 2011 Census, 67.7% of the households in Metsimaholo LM used electricity for heating purposes in 2011. The remaining households used gas (5.4%), paraffin (5.1%), coal (4.4%), wood (3.4%), solar (0.3%), and animal dung (0.2%). 13.4% of the households lacked the necessary means to heat their homes.

Lighting

According to 2011 Census data, 89.8% of the households in the Fezile Dabi DM used electricity to light their homes. The remaining households used candles (8.3%), paraffin (1.3%), solar (0.3%) and gas (0.1%). Only 0.2% of households lacked the necessary resources to light up their homes.

In 2022, there was a notable increase in the percentage of households that relied on electricity to illuminate their homes in the Fezile Dabi DM. The percentage of households using electricity for lighting purposes increased to 94.3%. The use of solar, gas and alternative sources of energy increased to 1.1%, 0.2% and 0.1% respectively. While candles remained

the second most used source of energy for lighting purposes, the percentage of households that used this source of light declined to 3.4%. Paraffin also saw a decline in usage (0.8%). 0.1% of the total households remained without the means to illuminate their homes.

In 2011, 86.4% of households in the Metsimaholo LM used electricity to illuminate their homes, 10% used candles, 3% used paraffin, 0.2% used gas and another 0.2% used solar. 0.2% of the households did not have access to any means of illumination for their homes.

In 2022, there was an increased reliance on electricity and solar energy for purposes of illumination in the Metsimaholo LM; electricity usage increased to 89.3% and solar rose to 2.8%. There was a moderate increase in the use of gas (0.3%) and other alternative sources of energy (0.2%). The use of candles and paraffin decreased by almost half, to 5.6% and 1.8% respectively. The percentage of households without means to light their homes also decreased by half to 0.1%.

A comparison of the two years, at both district and municipal level, demonstrates a shift towards electricity for lighting. It also demonstrates an increase in access to electricity as a source of lighting given that there is a significant decrease in the use of candles. This could be indicative of changes in the household income and affordability, but also awareness of the pollution, and the negative impact on indoor air quality caused by the burning of candles and paraffin.

11.4.1.4. Matimba and Medupi

The Matimba and Medupi power stations are located in the Lephalale Municipality ("Lephalale LM") in the Waterberg District Municipality ("Waterberg DM"), Limpopo.

The Waterberg DM is the largest of the five districts in Limpopo, covering an area of 44 914km^2. According to the classification scheme established by the Constitution, this district municipality is a Category C municipality as it has municipal, executive and legislative authority in an area that includes more than one municipality. The Waterberg DM is comprised of five local municipalities, namely, Bela-Bela, Lephalale, Modimolle-Mookgophong, Mogalakwena and Thabazimbi.

The Lephalale LM is a local municipality located in the northwestern part of the Waterberg DM and comprises an area of 13 794km². Lephalale shares municipal executive and legislative authority with the latter, making it a Category B municipality.

Leadership and financial health

According to the AG's audit for the financial year 2020-2021, there was no unauthorised, or fruitless and wasteful expenditure in the Waterberg DM, however it did find irregular expenditure in the sum of R 3.5 million. Furthermore, there was no uncertainty about the District's ability to continue although its total expenditure exceeded its total revenue, meaning that the following year's budget would be required to set off that amount. Overall, Waterberg received a clean audit outcome.

In the 2021-2022 financial year, the Waterberg DM did not have any instances of unauthorised, irregular or wasteful expenditure. As in the previous year's audit, there was no uncertainty about the district's ability to continue operating. Furthermore, its liabilities did not exceed its assets. In terms of financial management controls, there were good ratings for proper recording keeping, in-year and year-end reporting as well as its processes for reviewing and monitoring compliance. However, the daily and monthly controls were ranked as concerning. As in the previous year, the district received an unqualified with no findings audit opinion.

All of the above suggests that the Waterberg DM is relatively well managed. A review of the previous five years illustrates that the municipality's leadership has been gradually improving. In the 2017-2018 financial year, it received a qualified outcome, whereafter it received two consecutive unqualified with findings audit opinions (2018-2019 and 2019-2020 financial years). As indicated above, in the 2020-2021 and 2021-2022 financial years, the Waterberg DM received clean audit outcomes. According to the AG, clean audit outcomes do not always indicate good service delivery, but it has been observed that municipalities with institutionalised controls and systems to plan, measure, monitor and account for their finances and performance, and to stay within the rules, often also have a reasonably good foundation for service delivery.

The Lephalale LM is not under intervention. However, the audit conducted by the AG during 2021-2022, revealed that the internal controls are concerning and require intervention. The AG found that the municipality did not have proper recording and in-year and year-end reporting. Interventions were required for daily and monthly controls and review and monitoring of compliance. There was no concern over the municipality's ability to continue operating, nor was there a deficit for the year in relation to the total expenditure exceeding the total revenue.

Despite the above, the AG uncovered unauthorised expenditure to the tune of R 5.9 million, irregular expenditure amounting to R 277.9 million, and fruitless and wasteful expenditure amounting to R 21.1 million. It bears mentioning that the same pattern of expenditure can be observed in the municipality's financial records over the past five years. Overall, the Lephalale LM received an unqualified audit, with findings, which was the same as the previous two years.

The Lephalale LM, like the Waterberg DM, has been on a positive trajectory. It received qualified audit opinions in the 2017-2018 and 2018-2019 financial years. Thereafter, it received three consecutive unqualified audit outcomes (2019-2020, 2020-2021, and 2021-2022 financial years). Notwithstanding the positive improvement, there is still a concerning trend of unauthorised, irregular, and fruitless and wasteful expenditure in the municipality. This has the potential to hinder the financial stability and health of the municipality, and ultimately service delivery.

Population and living conditions

According to the censuses conducted by Stats SA, in 2011 and 2022, in 2011, the Waterberg DM had a population of 679 336 and the Lephalale LM's population was 118 864. In 2022, the Waterberg DM's population increased to 762 862 while that of Lephalale LM grew to 125 198 in 2022. The poverty rate in the Waterberg DM has seen a moderate increase between 2011 and 2020, from 6.5% to 9%.

Over at least a 10-year span, the population in the Waterberg DM has increased by 83 526 and Lephalale LM's population increased by 83 526. While the cause of the observed growth is not clear, it is possible that it could be a result of a growth in job opportunities and/or the

emergence of suitable conditions for the establishment of small businesses which, in turn, attract people for employment opportunities.

In 2011, there were 179 858 households in the Waterberg DM and 30 639 in the Lephalale LM, which increased in 2022 to 248 526 and 43 832 respectively. 7.1% of the households in the Waterberg DM in 2011 and 10.5% of those in the Lephalale LM, during the same period, did not have refuse disposal systems. In 2022, the percentage of households without refuse disposal decreased to 5.9% in the Waterberg DM and 7.4% in the Lephalale LM.

There seems to be an improvement in service delivery in relation to access to refuse disposal systems. It has, however ,been relatively marginal, considering the length of the period under consideration.

Poor service delivery in relation to refuse systems raises several environmental concerns, one of which being the impact on the AAQ in the region. Poor service delivery, in the case of access to refuse disposal systems, can have an adverse effect on the AAQ in a particular region, particularly where communities resort to setting up their own illegal waste dumping sites and/or burning the refuse. GHGs, such as methane and CO_2, as well as other gases emanate from the dumping sites as a result of the decomposition of the waste. Furthermore, in those instances where communities burn the waste – whether to make more space for additional waste or to use the fire to generate energy for cooking and keeping themselves warm – the resultant emissions invariably contribute to air pollution affecting the AAQ in these areas. As such, it is important for the relevant authorities to address this issue, however Eskom can also extend its waste management project, currently underway in the Vaal area (Sharpeville), to other communities in the HPA.

Unemployment rate and employment levels in the municipalities

In 2011, the Waterberg DM had an unemployment rate of 21.8%. By 2021, the rate increased to 28.3%. However, as of 2021, it had the lowest unemployment rate of all five districts in Limpopo. In the Lephalale LM, the unemployment rate was 22.2% in 2011 and in 2021 it was 23.5%.

The slight increase in unemployment rates can be a product of an array of potential challenges to employment, such as fluctuations in the business cycles which could lead to expansion or recession, thereby affecting employment opportunities. Furthermore, automation and technological innovations could also impact job displacement, particularly in industries that rely on manual labour. Lastly, a discrepancy in the education required by employers and the skills possessed by the workforce may also contribute to structural unemployment.

Current levels of electricity access (connections and use, plus offsets plus other fuels)

Cooking

According to the 2011 Census results, 65.5% of households in the Waterberg DM used electricity from the mains for cooking, 7% used paraffin, 2.5% used gas, 0.1% used coal, 0.1% used solar and 24.6% used wood, while 0% of people used animal dung or alternative sources of energy. Furthermore, only 0.1% of households did not have access to any source of energy to cook. According to the same census, 60.2% of households in the Lephalale LM used electricity from the mains, 3% used gas, 7.2.% used paraffin and 29.2% used wood, none of the households used animal dung and 0.1% used coal, solar and alternative sources of energy. Similarly to the Waterberg DM, 0.1% of the population had no means to cook their food in 2011 and 2022.

According to the 2022 Census, households in the Waterberg DM used different types of fuel for cooking. 52.1% used electricity from the mains, 27% used gas, 2.3% used paraffin,18.2% used wood, 0.1% used solar and alternative sources while none of the households used coal or animal dung. Similarly, in 2011, only 0.1% of households had no means to cook. In Lephalale LM, 43.3% of households used electricity from the mains, 29.6% used gas, 2.7% used paraffin, 24.1% used wood, none of the households used solar or animal dung and 0.1% of the households used alternative energy sources. Similarly, in 2011, only 0.1% had no means to cook.

What is evident is that between 2011 and 2022, there was a significant reduction in the use of coal for cooking, while there was a significant increase in the use of gas (24.5% in the Waterberg DM and 26.6% in the Lephalale LM). There was also a decrease in the use of

electricity (13.4% in the Waterberg DM and 16.9% in the Lephalale LM) to cook. It is noteworthy that a significant percentage of households in the Waterberg DM and Lephalale LM in 2022 still used wood as a fuel source for cooking food.

The increase in the use of gas and the decrease in the use of electricity reflects a shift in consumer preferences or the observed trend could be due to the rising levels of load-shedding.

Heating

In 2011, the majority of households in the Lephalale LM used electricity for heating (60.4%), 0.9% used gas, 4.7% used paraffin, 0.5% used solar, 20.9% used wood and 0.1% used coal and animal dung. None of the households used candles or alternative sources of energy for heating and 12.7% had no means of heating.

Lighting

According to the 2011 Census, the majority of households (86.7%) in the Waterberg DM used electricity to light their homes, 0.1% used gas, 11.7% used candles, 0.9% used Paraffin, 0.3% used solar and 0.2% had no means to light their households.

According to the 2022 Census, the majority of households (92.9%) used electricity to light their homes, 0.3% used gas and paraffin, 4.4% used candles, 1.7% used solar, 0.1% used alternative sources and 0.2% had no means to light their household.

Based on data from the 2011 Census for the Waterberg DM, 85.3% of households used electricity for lighting, 0.5%, used paraffin, 0.1% used gas, 13.6% used candles , 0.3% used solar and 0.2% had no means to light their household.

Based on data from the 2022 Census, 93% of households in the Waterberg DM used electricity from the mains to light their homes, 0.2% used gas, 0.5% used paraffin, 5.1% used candles, 1% used solar, 0.1% used alternative sources and 0.2% had no means to light their household.

11.4.1.5. Majuba

The Majuba power station is located in the Dr Pixley ka Isaka Seme Local Municipality ("**Dr Pixley ka Isaka Seme LM**") in the Gert Sibande District Municipality ("**Gert Sibande DM**"), Mpumalanga.

The Gert Sibande DM is the largest of three districts in the Mpumalanga Province, covering an area of 31 840 km^2. According to the classification scheme established by the Constitution, this municipality is a Category C municipality as it has municipal executive and legislative authority in an area that includes more than one municipality. The Gert Sibande DM is comprised of seven local municipalities namely: Govan Mbeki, Chief Albert Luthuli, Msukaligwa, Dipaleseng, Mkhondo, Dr Pixley ka Isaka Seme and the Lekwa LM.

Dr Pixley ka Isaka Seme is a local municipality located in the south of the Gert Sibande District, comprising an area of approximately 5227.98km^2. It shares municipal executive and legislative authority with the Gert Sibande District, which makes it a Category B municipality.

Leadership and financial health

According to the AG's audit for the 2020-2021 financial year, there was no unauthorised, irregular, or fruitless and wasteful expenditure in the Gert Sibande DM. Furthermore, the municipality's liabilities did not exceed its assets and there was no uncertainty about the district's ability to continue operating. The AG did, however, find that the Gert Sibande DM's total expenditure in the 2020-2021 financial year exceeded its total revenue and that the budget for the new financial year would have to cover the previous year's expenditure. Overall, the District received a clean audit outcome, its third in the past five years.

In the 2021-2022 financial year, the district regressed and received an unqualified audit opinion. The Gert Sibande DM did not have any instances of unauthorised, irregular, or fruitless and wasteful expenditure. As in the previous year's audit, there was no uncertainty about the district's ability to continue operating and its liabilities did not exceed its assets. Similar to the previous financial year, the AG found that the district's total expenses in the 2021-2022 financial year exceeded its total revenue, and therefore the budget for the following year would have to cover these expenses.

According to the AG's audit report for the 2020-2021 financial year, there was no instability in the council in the Dr Pixley ka Isaka Seme LM during the financial year under review. While there was no unauthorised expenditure in the municipality, the AG found irregular expenditure of R 42.2 million, and fruitless and wasteful expenditure amounting to R 29 081. The AG noted that the irregular expenditure in the municipality was related to supply chain management.

Although the municipality's liabilities did not exceed its assets in the 2020-2021 financial year, its total expenses exceeded its revenue for that year resulting in a budget deficit. The AG opined that there is no uncertainty about the municipality's ability to continue operating. The Dr Pixely ka Isaka Seme LM received a qualified audit opinion, an improvement from the previous financial year (2019-2020).

While the Dr Pixley ka Isaka Seme LM is not currently under intervention, according to the findings made by the AG, in the 2021-2022 audit, the condition of the municipality's internal risk management controls is concerning. The AG found the municipality's record keeping, daily and monthly controls, and in-year and year-end reporting to be particularly concerning. Furthermore, the AG found that the municipality's compliance reviewing and monitoring systems require intervention.

In the 2021-2022 audit, there was no unauthorised expenditure in the Dr Pixley ka Isaka Seme LM but there was, however, fruitless and wasteful expenditure of R 2.3 million, and irregular expenditure of R 48.3 million. Dr Pixley ka Isaka Seme LM's total liabilities did not exceed the municipality's total assets in the 2021-2022 financial year, but the total expenditure did exceed the total revenue and the LM had a budget deficit of R 68.8 million. On the AG's assessment, there is no uncertainty regarding the municipality's ability to continue operating. The AG gave the municipality a financially unqualified audit opinion, which marks an improvement from the 2019-2020 financial year.

The AG reports for 2020-2021 and 2021-2022 suggest that the Gert Sibande DM is relatively well-managed. This is particularly evidenced by the fact that the district has received three clean audits in the past five years. It has managed to keep its asset base above its liabilities for at least two consecutive financial years and there has not been any uncertainty about its

ability to continue operating during the period. Furthermore, there have not been any instances of unauthorised, irregular, or fruitless and wasteful expenditure in the past two financial years.

A review of the past four audit outcomes received by the Dr Pixley ka Isaka Seme LM suggests that the municipality is making efforts to improve. In the 2018-2019 and 2019-2020 financial years, for example, the municipality received disclaimed audit outcomes. The municipality improved in the 2020-2021 financial year and received a qualified audit outcome and improved again in the 2021-2022 financial year, receiving a financially unqualified audit opinion.

The Dr Pixley ka Isaka Seme LM's leadership is not, however, perfect. A review of the municipality's expenditure over the past five years reveals a disturbing trend, particularly in respect of irregular and fruitless and wasteful expenditure. In the 2017-2018 financial year the municipality had irregular expenditure amounting to R 2.6 million. That increased to R 6.4 million in the 2018-2019 financial year and, thereafter, to R 32.4 million in the 2019-2020 financial year. In 2020-2021, the irregular expenditure rose to R 42.2 million and increased further in the 2021-2022 financial year to R 48.3 million.

The above trend is also seen in the municipality's fruitless and wasteful expenditure. In the 2017-2018 financial year, the fruitless and wasteful expenditure was a meagre R 2 251. It increased by over 100% in both the 2018-2019 and 2019-2020 financial years, to R 7 807 and R 5 703 respectively. Thereafter, the figure saw a significant increase, in the 2020-2021 financial year, to R 29 081, whereafter it surged to R 2.3 million in the 2021-2022 period.

In the 2021-2022 financial year, the AG noted that 91% of the municipality's debts are not recoverable, an increase from the previous year's figure of 87.5%.

While a clean audit does not always serve as an indicator of good service delivery and does not always correlate directly to the lived experiences of all the communities in a municipal area, according to the AG, it has been observed that municipalities with institutionalised controls and systems to plan, measure, monitor and account for their finances and performance, and to stay within the rules, often also have a solid foundation for service delivery.

The above trends thus, especially where the municipality lacks effective risk management controls, have the potential to impede the municipality's ability to provide its inhabitants with essential services and eradicate unemployment and poverty. This may require businesses in the district and local municipalities to provide certain services to the communities to alleviate their plight.

Population and living conditions

According to the censuses conducted by Stats SA in 2011 and 2022, the Gert Sibande DM had a population of 1 043 194 in 2011 and the Dr Pixley ka Isaka Seme LM's population was 83 235. The Gert Sibande DM's population increased to 1 283 459 in 2022 and that of the Dr Pixley ka Isaka Seme LM grew to 115 304.

In 2011, the percentage of people living below the LBPL in the Gert Sibande DM and the Dr Pixley ka Isaka Seme LM was approximately 37.5% and 46.6% respectively. The percentage of the population living below the LBPL in the Dr Pixley ka Isaka Seme LM increased to 51.3% in 2016 and that in the Gert Sibande DM increased to 49.5% in 2021.

In 2011, there were 273 485 households in the Gert Sibande DM and 19 838 in the Dr Pixley ka Isaka Seme LM. In 2022, there was a notable increase in the number of households in the Gert Sibande DM (378 182) and the Dr Pixley ka Isaka Seme LM (32 972). Of the total households in the Gert Sibande DM, 8% did not have access to refuse disposal services, but this figure dropped to 4.9% in 2022. In the Dr Pixley ka Isaka Seme LM, 10.2% of the households did not have access to refuse disposal systems in 2011, which decreased to 5.2% in 2022.

Insofar as refuse services are concerned, it would seem that service delivery in both the Gert Sibande DM and the Dr Pixley ka Isaka Seme LM improved. This is somewhat consistent with the trend observed in the audit opinions received by both municipalities over the past five years.

Service delivery concerning refuse disposal systems should not be readily overlooked by municipalities and those who are concerned with the AAQ in a particular region. Lack of access to refuse disposal services causes communities to set up illegal waste dumping sites.

GHGs, such as methane and CO_2, as well as other gases emanate from the dumping sites as a result of the decomposition of the waste. Furthermore, communities also burn the waste to make more space for additional waste and use the fire to generate energy for cooking and keeping themselves warm. These GHGs contribute to air pollution affecting the AAQ in these areas. As such, it is important for the relevant authorities to continue improving access to refuse systems. In order to ensure that every household has access to a refuse system, Eskom can consider extending its waste management project, currently underway in the Vaal area (Sharpeville), to other communities in the HPA.

Unemployment rate and employment levels in the municipalities

In 2011, at least 249 638 people were employed and 109 659 were unemployed (43.9%) in the Gert Sibande DM. In 2021, the Gert Sibande DM had the lowest unemployment rate in the province at 30%, followed by the Ehlazeni District Municipality at 36.5%. The Nkangala district had the highest unemployment rate of the three districts at 37.5%.

According to the 2011 Stats SA Census, there were 21 885 economically active (employed or unemployed but looking for work) people in the Dr Pixley ka Isaka Seme LM, 13 979 (63.9%) being employed and 7 906 (36.1%) being unemployed. 11 354 of the economically active people in the municipality were youth (15–34 years of age) and, of those, 45.1% were unemployed.

Current levels of electricity access (connections and use, plus offsets plus other fuels)

Cooking

According to the 2011 Census, 62.9% of the households in the Gert Sibande DM used electricity for cooking purposes, 19.4% used wood, 10.8% used coal, 3.8% used paraffin, 2% used gas, 0.6% used animal dung, 0.1% used solar and 0.1% used other means. About 0.3% of households did not have any means to cook their food.

As per the Census Report of 2022, 61.4% of households in the Gert Sibande DM used electricity as their main source for cooking, 19.8% used gas, 12.8% used wood, 4.1% used coal, 1.5% used paraffin, 0.1% used solar, 0.1% used animal dung, and 0.1% used other sources. Additionally, 0.2% of households did not have any means to cook their food.

There was a slight decrease in households using electricity in the Gert Sibande DM, from 62.9% in 2011 to 61.4% in 2022. The data also indicates a significant migration towards cooking with gas, from 2% in 2011 to 19.8% in 2022. There was also a sharp decrease in the use of coal for cooking, from 10.8% in 2011 to 4.1% in 2022.

According to the 2011 Census, 52.3% of the households in the Dr Pixley ka Isaka Seme LM cooked their food using electricity, 30% used coal, 10.6% used wood, 3.2% used animal dung, 1.8% used paraffin, 1.6% used gas, 0.1% used solar energy, 0.1% used other sources and 0.3% did not have means to cook their food.

In 2022, the use of electricity for cooking purposes in the Dr Pixley ka Isaka Seme LM increased to 60.7%. In addition, there was an increase in the percentage of households that used gas (18.3%) and solar (0.3%). Wood usage remained, by and large, unchanged (10.7%). This was also true for other alternative sources of fuel (0.1%). The use of coal, paraffin and animal dung declined to 8.8%, 0.5% and 0.5% respectively. There was also a decrease in the percentage of households that did not have any means to cook their food (0.1%).

Insofar as cooking is concerned, the figures for both the Gert Sibande DM and the Dr Pixley ka Isaka Seme LM illustrate a shift towards gas and away from coal and, in the case of the Gert Sibande DM, wood as well. Gas usage in the Gert Sibande DM increased from 2% to 19.8%. Coal usage decreased from 10.8% to 4.1%, and wood usage from 19.4% to 12.8%. In the Dr Pixley ka Isaka Seme LM, the use of gas increased from 1.6% to 18.3%. Coal usage decreased by over 20%, from 30% to 8.8%. While electricity usage in both municipalities increased in 2022, it remained relatively low compared to, for example, that in the Lekwa LM (75.6%).

The percentage of households in the Gert Sibande DM that used fuel other than electricity and gas, in 2022, was 18.8%. In the Dr Pixley ka Isaka Seme LM, that figure was 21%. This suggests, potentially, that the migration to electricity and/or gas, for the purposes of cooking, in the Gert Sibande DM and the Dr Pixley ka Isaka Seme LM has not been as efficient or effective, meaning that there is scope for Eskom's offset programme to be implemented in this district.

Heating

In 2011, 39.2% of the households in the Dr Pixley ka Isaka Seme LM used electricity for heating purposes, 37.8% used coal, 11.4% used wood, 3.9% used animal dung, 1.6% used gas, 0.9% used paraffin, and 0.1% used solar. 5% of the households did not have any means to heat their homes.

Lighting

In 2011, a majority of households (83.4%) used electricity in the Gert Sibanda DM to illuminate their homes. 14.9% used candles, 0.8% used paraffin, 0.4% used gas and 0.3% used solar power. Approximately 0.3% of the households did not have access to any means of illumination for their homes.

In 2022, the percentage of households in the Gert Sibande DM that used electricity to light their homes increased to 91.8%. Gas (0.9%) and solar (0.8%) usage also increased. The use of candles and paraffin dropped to 5.7% and 0.6% respectively. The percentage of households that relied on alternative sources of energy remained the same at 0.1% and 0.2% of households did not have any means to illuminate their homes, which signifies a 0.1% decrease in the percentage of homes without access to lighting sources.

According to 2011 Census data, 85.2% of the households in the Dr Pixley ka Isaka Seme LM had access to electricity for lighting. The remaining households used the following sources of energy: candles (13.4%), paraffin (0.7%), gas (0.2%), and solar (0.2%). Only 0.3% of households lacked the necessary resources to light up their homes.

As of 2022, there was an increase in the percentage of households in the Dr Pixley ka Isaka Seme LM using electricity for lighting (91.8%). Candles remained the second most used source of energy for lighting purposes, even though overall usage declined to 6.4%. Paraffin also saw a decline in usage (0.2%). The use of solar, gas and alternative sources of energy increased to 0.8%, 0.5% and 0.1% respectively. The percentage of households without any access to lighting sources dropped to 0.2%.

The above figures demonstrate that electricity is the preferred source of energy for lighting purposes in both the Gert Sibande DM and the Dr Pixley ka Isaka Seme LM. The figures also

suggest that there is an increase in the number of households that have access to electricity in the area.

Eskom's offset intervention programme

As part of its efforts to improve the air quality in the areas around its power stations, Eskom has introduced an offset programme which seeks to reduce emissions from domestic solid fuel burning. The programme is aimed at assisting households to move to cleaner sources of energy by replacing coal stoves with electric/gas stoves and providing gas heaters and LPG gas cylinders, as well as reducing the need for heating by installing ceilings to insulate houses, where possible.

Eskom identified at least seven areas in the Gert Sibande DM, where it intends to roll out its offset programme. Of the seven, only three are proximate to the Majuba power station, namely Ezamokuhle, Daggakraal and Sinqobile.

Further details of Eskom's programme and the progress thereof are discussed elsewhere in this report. For present purposes, it suffices to say that there is no direct correlation between the trends observed above and Eskom's offset programme. Furthermore, there appears to still be potential for Eskom's programme to be implemented in the Gert Sibande DM and the Dr Pixley ka Isaka Seme LM.

11.4.2. Expert report on socio-economic assessment

The information in this section is derived from the report prepared by Dr R-D Heinsohn and Ms J Adam in respect of the socio-economic conditions around Eskom's power stations (Annexure 26).

The experts were, as per their terms of reference, required to:

a) *"Supplement the social and socio-economic data collated to date by HNM, involving the collection and analysis of data in respect of socio-economic issues*

that affect communities surrounding Eskom's power stations including, but not limited to, access to:

(i) Health care services. In this regard, collect and analyse data on the health impacts of key pollutants in the region, morbidity and mortality.

(ii) Basic nutrition.

(iii) Free basic education.

(iv) Clean water and sanitation.

(v) Social assistance (access to social grants and types of grants).

(vi) Shelter.

(vii) A clean and healthy environment.

(viii) Employment.

(ix) Roads.

(x) Electricity supply.

b) Address the impact of Eskom's operations, including the shutting down thereof, on the socio-economic issues listed above.

c) Analyse the effectiveness of Eskom's offset project and propose alternatives, if any.

d) Collect data on the services provided by Eskom to the surrounding communities and analyse the impact thereof on the general socio-economic conditions in the relevant communities.

e) Analyse the economic and financial situation on a local, municipal and national level, as well as Eskom's role in this regard.

f) Analyse the level of poverty in the communities.

g) Analyse the employment trends of and skills profile of people living in communities surrounding Eskom's power stations.

h) Identify other industries, formal and informal, that employ people in the relevant communities. Where possible, determine the degree to which the surrounding companies and businesses depend on Eskom for business and survival.

i) Address any ad hoc matters related to the socio-economic situation in the Highveld Priority Area and the Waterberg-Bojanala Priority Area.

j) Draw relevant conclusions and findings from the analysed data.

k) Make relevant recommendations, including steps to mitigate any adverse effects of Eskom's power plants on communities and the economy of the country.

l) Provide an analysis of the impact of load shedding on the economy and socio-economic conditions of South Africa as well as the municipalities (district and local) where the power stations are situated.

The analysis referred to above, unless it is specified otherwise, should focus mainly on the area and communities situated in proximity to the following power stations: Majuba, Matla, Duvha, Kendal, Matimba, Tutuka, Medupi and Lethabo.

Furthermore, the National Air Quality Officer declined some of Eskom's applications in respect of decommissioning some of its power stations for its failure to submit a decommissioning plan. A draft structure on what ought to be included in a decommissioning plan has been prepared into which input should be made.

Finally, the terms of reference require the provision of a general overview of the socio-economic conditions in the Highveld and Waterberg-Bojanala Priority Areas, which may include some of the information referred to above."

In view of the above, the experts' approach and methodology involved, amongst others, a desktop analysis of various sources such as: Google Earth; data from Stats SA; reports of the AG; and other relevant studies. To place the power stations in the context of the land-uses in the areas around the power stations, and their potential contributions to air pollution (focussing on SO_2, NO_X and PM), the experts delineated 5 and 10 km zones of influence[70] around each power station. Within these delineations, the experts identified facilities and land-use activities

[70] Derived from the NEMA EIA Regulations, which are designed to safeguard protected areas from development, viz. a 10 km radius for national parks and world heritage sites, and a 5 km radius for all other protected areas.

that potentially contribute to air pollution and the social and socio-economic conditions surrounding power stations.

By way of context, the power stations under review are located in three provinces, within four district municipalities, comprising five local municipalities.

Power Station	Province	District Municipality (DM)	Local Municipality (LM)
Lethabo	Free State	Fezile Dabi	Metsimaholo
Duvha	Mpumalanga	Nkangala	Emalahleni
Matla	Mpumalanga	Nkangala	Emalahleni
Kendal	Mpumalanga	Nkangala	Emalahleni
Tutuka	Mpumalanga	Gert Sibande	Lekwa
Majuba	Mpumalanga	Gert Sibande	Dr Pixley Ka Isaka Seme
Matimba	Limpopo	Waterberg	Lephalale
Medupi	Limpopo	Waterberg	Lephalale

Table 9: Background information on the location of the power stations

The experts indicated that there were several different land-uses surrounding each power station. In addition, apart from the Eskom power stations, in some cases located close to one another, the three other primary contributors to air emissions are coal mines, dryland agricultural land/activities and people using coal and/or wood as an energy source, e.g. for cooking and heating.

In view of the above, the experts reported that,

> *". . .the usage of other sources of energy, e.g. coal, wood, paraffin, candles, etc (unspecified in the census analysis), is significant, more so in 2011 than 2022. Importantly, during the period 2011 to 2022, there has been a move away from the 'other' sources of energy, in favour of gas and electricity (which is elaborated in Section 6.9). The issue at hand is the air emissions from the burning of coal and wood, and their contribution to the emissions load in areas surrounding Eskom power stations. The emissions from burning coal are the same as those from a power station. The emissions from burning wood are a range of pollutants, most of which are harmful to human health, viz. particulates, NOX CO, volatile organic compounds (VOCs) and*

Polycyclic Aromatic Hydrocarbons (PAHs). The situation is exacerbated in the winter months on the South African Highveld when morning temperature inversion is common, trapping pollutants between the earth and the cloud base.

The proportionate contributions of domestic coal and wood burning emissions, and emissions from an Eskom power station are site- and climate-specific and unknown. However, it is important to understand these baseline data to interpret whether Eskom's current offset programmes are having the desired or any effect on the overall pollution load in the atmosphere surrounding its power stations. Therefore, for a specified radius around each Eskom power station, air quality modelling is required to establish a consolidated emissions balance. This will enable regulators to place in context the emissions from the power stations relative to other major sources of emissions, which should inform license conditions, offset requirements, etc."

They indicated that the above information demonstrates that Eskom's power stations are not the only sources of air pollution and the cumulative effects of several sources of air pollution must be addressed by all contributors. In addition, they opined that the Tutuka, Majuba, Matimba and Medupi power stations do not have significant neighbouring facilities and land-use activities contributing to SO_2, and NO_X air pollution, however, surrounding agriculture potentially contributes to dust.

Demographics

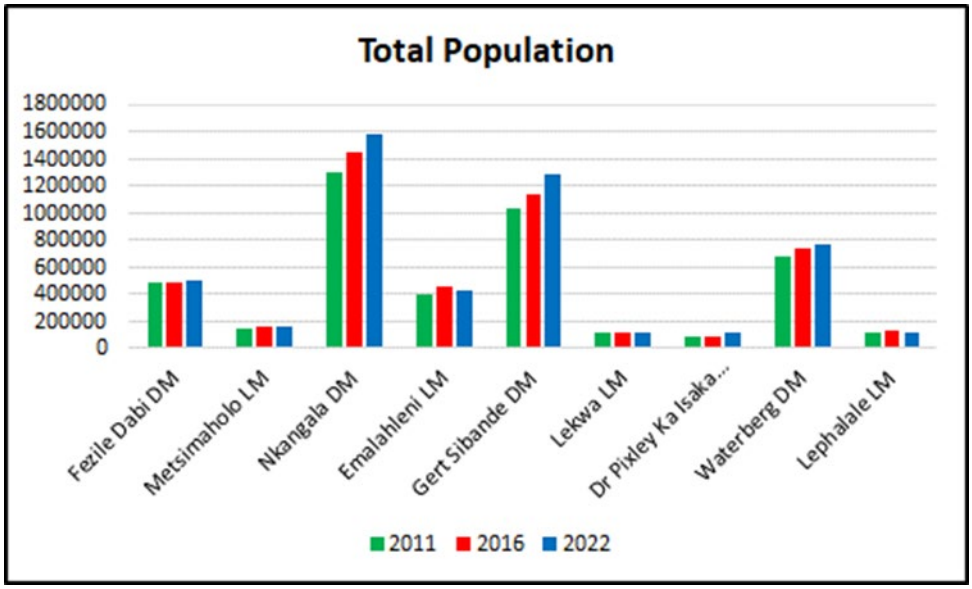

Figure 38: Population trends for the period 2011 – 2022

All of the district and local municipalities have relatively stable populations, with no significant evidence of large in- or out-migrations of people. This could be an indication that these areas are not attracting larger capital investments that would bring in people in search of employment (in-migration). Alternatively, it could be an indication that residents may not have the means to move away (out-migration).

Between 2011 and 2016, the Metsimaholo LM, Emalahleni LM, Lekwa LM, and Lephalale LM all showed growth in population, followed by a decline between 2016 and 2022. The only exception was the Dr Pixley Ka Isaka Seme LM, which showed consistent growth throughout the entire period. It is likely that the differences in population numbers are due to enumeration errors rather than indicative of a particular trend, such as limited out-migration in search of employment, or deaths from causes such as Covid-19.

Employment and unemployment

In 2021, the unemployment rate in the Fezile Dabi DM, located in the Free State, increased substantially to 36.7%, from 29.7% in 2011 (Department of Economic, Small Business

Development, Tourism, and Environmental Affairs' Annual Performance Report for Free State 2023/2024). The only other employment figure available for the Fezile Dabi DM is from 2016, where employment was recorded at 37% by Sivest.[71] It is unclear whether this figure is solely for formal employment or includes employment in the informal sector.

According to the Fezile Dabi District Municipality: District Development Model (2022), around 123,000 individuals were employed in the formal sector in the Fezile Dabi DM. For 2021, the trade sector had the highest number of employees (26,500 people, accounting for 21.5% of those formally employed) followed by community services (25,600 people, accounting for 20.8% of those formally employed). Interestingly, the electricity sector had the lowest number of employees (1,120 people, accounting for only 0.9%) followed by mining (5,570 people, accounting for 4.5%).

Readers are referred to Table 1 of annexure 29, for power stations applicable to each district municipality				
Employment by Sector (%)	District Municipality			
	Fezile Dabi (2021)	Nkangala (2019)	Gert Sibande (2019)	Waterberg* (2019)
Government	**	**	**	10
Agriculture	11.1	4	3	7.1
Community Services	20.8	16	15	12.5
Construction	6.6	8	3	5.8
Electricity	0.9	4	6	0.4
Finance	9.2	12	8	6.1
Household	11	8	--	--
Manufacturing	9.7	8	18	4.4
Mining	4.5	17	26	33
Transport	4.7	5	7	2.6
Trade	21.5	18	14	17

*Data as provided (percentages do not total 100 indicating incorrect or missing data)

**Not specified

Table 10: ***Sectoral employment for the relevant district municipalities***

[71] Sivest (2023). Bonsmara Solar PV: Environnemental Impact Assessment.

In 2019, the unemployment rate in the Nkangala DM, located in Mpumalanga, was 34.3%. In terms of employment, the trade sector recorded the highest number of employed individuals in the Nkangala DM in 2019, with a total of 63,200 individuals, accounting for 17.7% of the total employment in the district. The mining sector recorded the second-highest number of employed individuals with 61,800 people, which is 17.3% of the total employment. The electricity sector had the least number of people employed in the Nkangala DM, with only 14,400 individuals employed, which is only 4.0% of the total employment. The agriculture sector employed 16,100 individuals, which is 4.5% of the total employment in the district (Profile and Analysis, Nkangala District Development Model, 2020).

The Gert Sibande DM, by comparison, had the lowest unemployment rate among all the district municipalities in Mpumalanga, at 27.5% in 2019. In 2019, mining, manufacturing, and community services were the top three employment sectors in the Gert Sibande DM. Together, they accounted for 59% of the working population in the region. On the other hand, the electricity sector only employed 6% of the people in the Gert Sibande DM.

The Waterberg DM had a total of 203,294 employed individuals, which accounted for 15.4% of the total employment in Limpopo and 0.01% of national employment. Out of the official employment rate of 38.4%, 68% or 138,240 people were employed in the formal sector. The unemployment rate is reported as 28.8% (42,749 people) (Profile and Analysis, District Development Model, Waterberg, 2020).

Household income levels

It has been reported that data on household income levels were enumerated in 2011 during the national census, which has been used as a baseline, with the income bracket categories extrapolated by the annual inflation rate for each year from 2011 to 2023, to provide an indication of current household income levels in the ‘selected’ district and local municipalities.

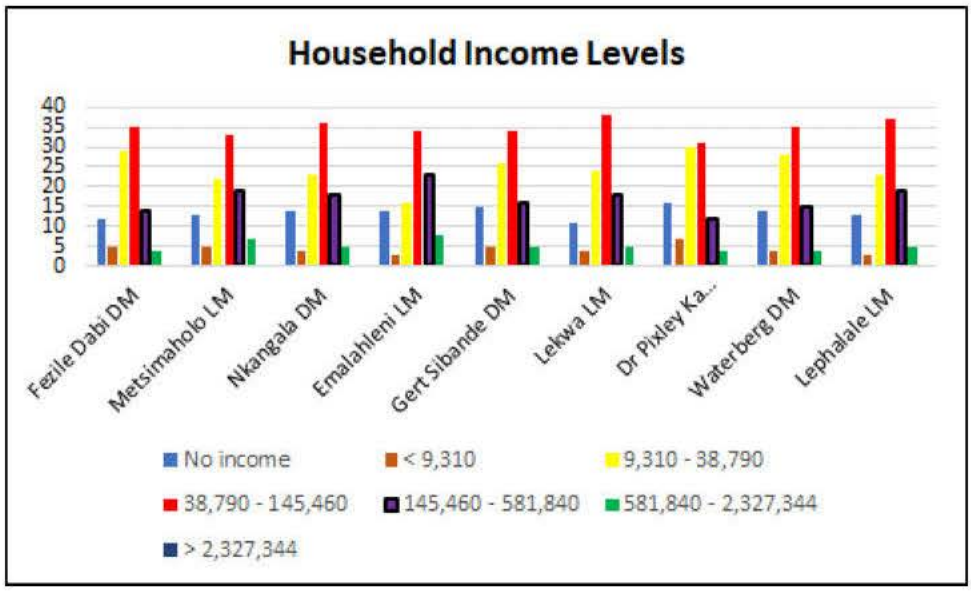

Figure 39: ***Household income levels in the municipalities under review***

It is evident from above that the majority of household incomes are within the aggregated range of R 9,310 – R 581,840 per annum. Also evident is the high number of households who report no income at all (an unweighted median of 13.6% of households).

Poverty levels

In 2023, it was estimated that around 18.2 million individuals in South Africa were living in extreme poverty, which was measured with a poverty threshold of USD 1.90 per day. This number increased by 162,859 people from the previous year. Unfortunately, the forecast is not promising. The number of people living in extreme poverty is expected to rise to more than 19.2 million by 2030, according to Statista's report in 2024.

Municipality	Percentage of People	Year
Fezile Dabi DM	57.8	2019
Metsimaholo LM (2023)	49.8	2019
Nkangala DM (2018)	45.0	2021
Emalahleni LM (2023)	34.3	2021
Gert Sibande DM (2017)	49.5	2021

Lekwa LM	44.5	2021
Dr Pixley Ka Isaka Seme LM (2017)	35.3	2021
Waterberg DM (2021)	62.2	2018
Lephalale LM (2021)	--	--

Economic Analysis (2023); Lekwa IDP 2022-27 IDP (2023/24); Pixley Ka Seme District IDP (2022-2027); Waterberg IDP 2021 -2026 (2022/23)

Table 11: ***Poverty data***[72]

According to Ms J Adam and Dr R-D Heinsohn, the poverty data is *"bleak and underline[s] the vulnerability of the communities living around Eskom power stations"* [73]

Housing[74]

It is reported that between 2011 and 2022, the number of households living in formal dwellings increased, while the number of informal dwellings decreased, with the exception of the Dr Pixley ka Isaka Seme LM. The number of traditional dwellings and other types of housing has mostly declined. It has been indicated that this trend could be attributed to various factors such

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[72] The figures include people within the three South African definitions of poverty, viz.

a) **Food poverty line** – R 760 (May 2023 prices) per person per month. This refers to the amount of money that an individual will need to afford the minimum required daily energy intake. This is also commonly referred to as the "extreme" poverty line.
b) **Lower-bound poverty line** – R 1,058 (May 2023 prices) per person per month. This refers to the food poverty line plus the average amount derived from non-food items of households whose total expenditure is equal to the food poverty line.
c) **Upper-bound poverty line** – R 1,558 (May 2023 prices) per person per month. This refers to the food poverty line plus the average amount derived from non-food items of households whose food expenditure is equal to the food poverty line (Statistics South Africa, 2023).

[73] The above should be interpreted in terms of the basic nutritional food basket for a family of four which was R 3,430 per household in 2023 (StatsSA, 2023). In some cases, this could mean that even in families where both parents are income earners, the combined incomes are insufficient to meet the nutritional needs of the families.

[74] Information on housing in the 'selected' district and local municipalities is shown in Table 14. The data are presented for 2011 and 2022 (StatsSA, 2011, 2022). Over the period 2011 to 2022.

as government initiatives aimed at eradicating informal and traditional housing. However, without further data, it is difficult to determine the exact cause of this transition.

Readers are referred to Table 1 for power stations applicable to each district and local municipality								
Municipality	2011				2022			
	Formal Dwelling	Traditional Dwelling	Informal Dwelling	Other	Formal Dwelling	Traditional Dwelling	Informal Dwelling	Other
Fezile Dabi DM	120,700	717	22,254	1,300	130,089	815	13,790	845
Metsimaholo LM	38,380	126	6,524	723	43,311	215	5,364	170
Nkangala DM	295,344	8,645	49,514	3,399	441,139	4,488	36,493	1,048
Emalahleni LM	92,595	2,721	23,138	1,419	144,874	800	18,489	409
Gert Sibande DM	197,877	27,145	45,935	2,528	332,704	13,711	30,590	1,177
Lekwa LM	22,858	570	7,414	228	34,143	602	3,669	169
Dr Pixley Ka Isaka Seme LM	15,227	3,103	1,448	59	29,589	1,389	1,935	58
Waterberg DM	156,402	2,085	22,254	1,382	227,552	1,459	18,717	798
Lephalale LM	25,016	415	4,887	312	38,294	312	4,938	296

Table 12: Housing data for 2011 and 2022

Municipality	Electricity		Gas		Other*	
	2011	2022	2011	2022	2011	2022
Fezile Dabi DM	123,670	108,474	5,299	30,750	15,705	6,081
Metsimaholo LM	38,028	31,468	2,892	14,989	4,755	2,519
Nkangala DM	261,241	316,173	6,913	113,719	88,096	52,706
Emalahleni LM	84,811	97,245	2,749	47,467	32,145	19,683
Gert Sibande DM	172,078	232,230	5,363	74,791	95,354	70,527
Lekwa LM	25,025	29,177	341	6,766	5,651	2,539
Dr Pixley Ka Isaka Seme LM	10,379	20,014	310	6,045	9,083	6,870
Waterberg DM	117,818	129,487	4,575	67,119	57,352	51,595
Lephalale LM	18,458	18,996	928	12,984	11,220	11,808

Stats SA, 2011, 2022 (Census Data) "Other" includes, inter alia, coal and wood.

Table 13: Energy sources used for cooking purposes

Ms Adam and Dr. Heinsohn contend that between 2011 and 2022, the use of other sources of energy decreased, with an increased preference for gas and electricity in all district and local municipalities. However, in the Lephalale LM, there has been an increase of 5% in the usage of other sources of energy. This increase does not seem to correlate with a decrease in the usage of electricity or gas, and the reasons behind it are unknown.

Morbidity and access to healthcare

It has been recorded that respiratory diseases make up a significant portion of the overall extent of illness in various district municipalities. Specifically, in the Fezile Dabi, Nkangala, Gert Sibande and Waterberg municipalities, these diseases account for 11.4%, 14.1%, 10.3%, and 13.4% of total morbidity, respectively. In 2018, the number of deaths from respiratory system diseases in the country was 41,237, which represents 9.1% of all deaths in that year. This suggests a correlation between poor air quality in areas surrounding power stations and associated support activities and the prevalence of respiratory diseases in these municipalities. The prevalence of respiratory diseases in these municipalities is higher than the national average.

Circulatory system diseases, such as hypertension and heart disease, are prevalent in the district municipalities under review. Stress, anxiety, poor living conditions, and bad air quality can worsen these conditions. A correlation between poor air quality and health problems may exist, but further studies are needed to confirm this.

The availability of healthcare facilities[75] in the district and local municipalities ranges from 1 facility for every 9,191 people to 1 facility for every 21,726 people. The weighted median is

[75] The availability of health-care facilities in the 'selected' district and local municipalities ranges from 1:9,191 people to 1:21,726 people. The weighted median is calculated at 1:12,315 people. These indicative (calculated) data compare reasonably favourably to the international benchmark of 1:10,000 people (www.data4impactproject.org , USAID).

calculated at 1 facility for every 12,315 people. This indicative data compares reasonably well with the international benchmark of 1 facility for every 10,000 people.

Municipality	Clinic	Community Health Centre	District Hospital	Regional Hospital	Other Hospitals	Total
Fezile Dabi DM	37	5	4	1	3	50
Metsimaholo LM (2023)	8	1	1	0	2	12
Nkangala DM (2018)	74	22	7	0	14	117
Emalahleni LM (2023)	14	5	1	0	0	20
Gert Sibande DM (2017)	66	19	8	1	6	100
Lekwa LM	8	2	1	0	1	12
Dr Pixley Ka Isaka Seme LM (2017)	6	2	2	0	0	10
Waterberg DM (2021)	61	3	7	1	11	83
Lephalale LM (2021)	7	1	2	0	0	10

Table 14: Health-care facilities in the 'selected' district and local municipalities[76]

The majority of healthcare facilities in the relevant municipalities are clinics, ranging from 63 to 74%. Although this indicates the country's emphasis on primary healthcare, it also highlights a possible shortage of advanced healthcare facilities that are necessary for treating ailments arising from poor air quality, such as respiratory disorders and cancers.

District Municipality	Health-Care Professional		
	Medical Practitioner	Professional Nurse	Pharmacist
Fezile Dabi	23.7	57.7	10.7
Nkangala	21.3	107.5	5.7
Gert Sibande	21.9	151.7	9.7
Waterberg	31.6	161.5	13.3

Table 15: Public sector service capacity and health access per 100,000 uninsured persons (March 2020)[77]

[76] Health Systems Trust, 2017.

[77] Health Systems Trust (2020).

Ms Adam and Dr. Heinsohn are of the view that *"the disparities among provinces and district municipalities significantly affect the quality and accessibility of health-care services for the country's population. This often leads people to seek better care outside their designated areas, straining certain facilities and resulting in higher out-of-pocket expenses for patients. These circumstances ultimately hinder access to quality health-care services and exacerbate existing inequalities in standards of living, and morbidity and mortality outcomes."*

Effects of loadshedding

As there is a dearth of data regarding this matter, for the particular districts and localities under examination, we have addressed this issue in a comprehensive manner for the entire country, under the reasonable assumption that the circumstances in the concerned municipalities are not dissimilar.

The energy crisis in South Africa persists, leading to frequent loadshedding due to insufficient supply of electricity to meet the demand. This situation poses a significant threat to the stability of the national power grid. Loadshedding started in late 2007 and has continued to this day, with a focus on 'loadshedding, logistics, and water crises' as key themes. The scheduled power outages are estimated to cost South Africa's businesses and industries R 1 billion per stage daily. As a result, many small and medium-sized enterprises have struggled to survive and have ultimately closed down, leading to the loss of thousands of employment positions.

Load shedding disrupts income-generation, education, healthcare, and economic productivity. It widens the wealth gap, exacerbates poverty cycles, and hinders social mobility. Recognizing its significant role is crucial for effective intervention measures to address its consequences.

As regards education, students are expected to continue their studies as usual, whether at school, college, or home. However, many students do not have alternative energy sources during load shedding. Despite this, expectations remain high. The psychological impact of these high expectations is seen in the number of dropouts before Grade 12 or tertiary education.

In terms of health, electricity is crucial for out-patients who need life-supporting machines like respirators due to respiratory problems caused by air pollution. Loadshedding can be

detrimental for these patients as it can cause stress and increase their heart rates. Unfortunately, alternative electricity supplies like standby oxygen cylinders, generators, batteries, and inverters are expensive and unaffordable for many people.

Loadshedding has a severe impact on the economy, especially on small business owners. They cannot afford alternative energy sources, which means they cannot operate during loadshedding periods, resulting in zero production or sales. Despite this, their costs remain the same, including staff costs, which must be covered by the owners. Even a two-hour loadshedding period can prevent production shifts from starting or cause businesses to remain closed for the day. The financial implications of loadshedding, such as lost production and revenue, are significant stress factors for business owners and their staff.

Services provided by Eskom to surrounding communities

The expert indicated that, *"Eskom expends money in communities via Corporate Social Investment (CSI) and Socio-economic Development (SED) initiatives and activities. These are driven by Eskom through the Eskom Development Foundation, a non-profit company wholly-owned by Eskom. For the 2022/2023 financial year, Eskom spent R 63 million, benefitting 438,094 people (in comparison to R 75.1 million benefitting 785,085 people in the 2021/2022 financial year) (Eskom, 2023). Eskom attributes the decline in social expenditure to a change from CSI to corporate social responsibility (albeit a lack of money is a more plausible explanation).*

Also, in support of local livelihoods, Eskom provides essential services, such as electricity, portable water and waste removal services, to some of the communities adjacent to its power stations.

For the 2022/2023 financial year, Eskom noted the following 'Community Development Flagship Projects':

- *Maths and Science Programme (Free State).*
- *Eskom Expo for Young Scientists.*
- *Scimathus.*
- *Energy and Sustainability Training.*
- *Mkhulu Electronic Distribution Project.*
- *Siemens Energy's donation of science kits to a local technical school in* ***Lephalale****.*

- *Kriel and **Matla** Power Stations, which donated 11 classrooms to ease overcrowding at the Bonginhlanhla Primary School.*

From the flagship projects, Matla power station's donation would have directly benefitted learners in the Emalahleni LM (Nkangala DM) while Siemen's donation would have benefitted learners in the Lephalale LM (Waterberg DM). No other linkages between Eskom CSI/SED expenditure and district and local municipalities covered in this report could be established."

All the sources Ms Adam and Dr. Heinsohn relied on are referenced in their report (Annexure 26).

11.4.3. Eskom's Offset Programme

This analysis of Eskom's Air Quality Offset Implementation Plans is based on Eskom's March 2023 Progress Report on the Offset Project, Quarterly Update Report of September 2023, a letter from Eskom to the Forum regarding its progress on the offset project dated 19 December 2023 as well as a Quarterly Update Report of January 2024. The information contained in these documents vary in certain respects and, in the event that some of the information is contradictory, the Forum has relied on the most recent document provided by Eskom.

According to Eskom, it submitted its Air Quality Offset Implementation Plans for the Nkangala District Municipality, Gert Sibande District Municipality and Sedibeng District Municipality to the NAQO and relevant AEL authorities on 28 April 2016. The updated plans were submitted in April 2021. The implementation of the offset programme is a condition stipulated in Eskom's AELs, issued in respect of some of its power stations.

Eskom's Air Quality Offset Implementation Plans are meant to address emission sources within the abovementioned districts over a period of approximately eight (8) years, starting from April 2016 until March 2025.

The Eskom Air Quality Offset Plans Progress Report of March 2023 sets out Eskom's primary goals for its Emissions Offsets Programme ("Offsets") in the applicable municipal districts.

In the districts of Nkangala and Gert Sibande, where domestic coal burning is a key contributor to poor AAQ, Eskom's offset intervention is two-pronged and entails the following:

1. The provision of a basic plus retrofit consisting of *"insulation entailing installation of a SPF ceiling system and draft proofing; electrical rewiring and issuance of [a] Certificate of Competence (CoC)"*; and

2. The replacement of household coal stoves which entails *the "provision of electricity-based energy source with LPG [liquefied petroleum gas] backup [including] a hybrid gas electric stove, LPG heater plus 2x9 kg LPG cylinders and Compact fluorescent lamp (CFL) for energy efficient lighting."*

Conversely, in the districts of Fezile Dabi and Sedibeng, where the burning of waste has adversely affected air quality, Eskom's offset intervention entails the clearing illegal waste dumps by moving waste to lawful waste disposal sites and implementing cleaning projects.

Eskom conducted the pilot project targeting domestic coal usage in KwaZamokhule, in the Nkangala District Municipality. The pilot involved the replacement of coal stoves and the installation of ceilings for 120 households between 2011 and 2013. It conducted a further pilot project in the same area involving 30 households.

Upon completion of the pilot projects, Eskom commenced the contracting phase, also known as the lead implementation phase or Baseline Phase 1, of the offset project in 2020 and it is expected that this phase will be completed in 2025. Based on its reports, Phase 1 involves installing offsets in 5800 households in Kwazamokhule in the Nkangala District Municipality, Ezamokhule in the Gert Sibande District Municipality and Sharpeville in the Sedibeng District Municipality.

Below is a summary of Eskom's reported expenditure for its Phase 1 air quality offset programme, as at the end of December 2023.

In the financial year of 2016/2017, Eskom spent a total sum of ZAR 6 957 000 (six million, nine hundred and fifty-seven thousand rands) implementing the offset pilot in 150 households at Kwazamokuhle.

In the 2017/2018 financial year, Eskom spent a further total sum of approximately ZAR 11 477 509 on the continued pilot implementation of offsets in 150 households in Kwazamokuhle, as well as conducting a baseline study in Sharpeville.

In the 2018/2019 financial year, a total sum of ZAR 3 119 535 was spent by Eskom in the continued implementation of its offsets pilot programme in 150 households in Kwazamokuhle. A portion of the amount was further allocated to awareness and communication initiatives in Sharpeville.

In the 2019/2020 financial year, Eskom spent a total of sum of ZAR 2 949 254, which was allocated to various activities in Kwazamokuhle, Ezamokuhle and Sharpeville. These activities included project planning (internal costs), the Vaal Environmental Celebration Day, a health study by the South African Medical Research Council, as well as media training.

For the 2020/2021 financial year, Eskom spent ZAR 1 483 542 of its budgetary allocation on stakeholder communication material for all the Phase 1 settlements.

In the 2021/2022 financial year, Eskom spent a further sum of ZAR 6 378 519.15 on stakeholder communication material for all the Phase 1 settlements. A portion of the amount also went towards the registration of households and procurement of stoves for Kwazamokuhle.

For the 2022/2023 financial year, total sum of ZAR 53 145 430.96 was spent on the establishment and delivery of the stove solution at Kwazamokuhle and Ezamokuhle.

In the 2023/2024 financial year, Eskom spent a total sum of ZAR 96 522 360.37 on the delivery of the stove solution at Kwazamokuhle and Ezamokuhle.

Eskom approximates its total expenditure on the offsets programme as ZAR 182 033 150.48 since 2016.

The large-scale implementation phase (Baseline Phase 2) was anticipated to commence in 2023 and to be completed in 2028. 36 000 households are expected to participate in this process. At least one settlement near each of Eskom's power stations will participate in the

process. The budget and implementation plan for Sivukile, located in the Gert Sibande District Municipality, and Phola, located in the Nkangala District Municipality, has been approved but all budgets related to the other settlements are still outstanding and have not been approved. The settlements include:

- Emzinoni located in the Nkangala District Municipality, Mpumalanga
- Thubelihle located within the Nkangala District Municipality, Mpumalanga.
- Silobela located in the wider Gert Sibande District Municipality, Mpumalanga.
- New Emerlo located in the wider Gert Sibande District Municipality, Mpumalanga.
- Grootvlei Village/Ntorwane located in the Gert Sibande District Municipality, Mpumalanga.
- Nederland located in the Gert Sibande District Municipality, Mpumalanga; and
- eMalahleni located in the Nkangala District Municipality, Mpumalanga.

The table below sets out the offset implementation plan for the Phase 2 settlements, located in the HPA.

Settlement	**No of Houses**	**Start**	**End**	**Comments**
Sivukile	1160	June 2023	December 2024	Currently in the procurement stage, where the tender for the execution was issued to the market in December 2022, however all tenderers were disqualified due to technical issues with their tender. Therefore, a re-issue to the market will be

				initiated. A delay of +7- three: months is experienced due to the non-award
Phola	6073	September 2023	October 2026	Procurement process estimated To be completed by end June 2023 Execution planned start is 01 July 2023
Emzimnoni	4300	March 2024	April 2027	Budget approval outstanding
Masakhane	1108	May 2024	Dec 2025	Budget approval outstanding
Thubelihle	2987	October 2024	March 2027	Budget approval outstanding
Silobela	2504	January 2025	July 2027	Budget approval outstanding
New Emerlo	935	April 2025	July 2026	Budget approval outstanding
Grootvlei village/Ntorwane	2000	June 2025	Sept 2027	Budget approval outstanding
Nederland	1660	June 2025	July 2027	Budget approval outstanding
eMalahleni	2000	August 2025	Nov 2027	Budget approval outstanding

Table 16: ***PHASE 2 OFFSETS IMPLEMENTATION PLAN***

11.4.3.1. Nkangala and Gert Sibande Districts

Domestic coal burning is a key contributor to poor AAQ in the Nkangala and Gert Sibande Municipal Districts. As such, Eskom's primary goal for all the settlements located near power stations in these districts is to improve the AAQ by reducing domestic coal burning through the replacement of household coal stoves with hybrid gas-electricity stoves and providing an LPG heater as well as the insulation of houses by installing ceilings.

Phase 1 Settlements

Ezamokuhle

Ezamokuhle is located in the Gert Sibande District Municipality and is in close proximity to the Majuba power station.

Eskom planned to have implemented offset interventions for 2100 households by March 2024. However, on 29 January 2024, Eskom pushed the completion date to July 2024.

The implementation of offset interventions started in December 2022, despite being scheduled to commence in April 2022. Eskom has not provided any justifications for the delay.

By February 2023, offsets had only been implemented in 30 households, the number did however increase to 941 households by the end of December 2023.

Eskom appointed two (2) contractors and five (5) subcontractors to implement the offset project in the area and has created employment for 86 individuals, the majority of whom are community members.

Eskom has also prioritized community and stakeholder engagement.

In terms of budgetary expenditure, Eskom had invested a total sum of ZAR 2 765 014 in the implementation of offsets at Ezamokuhle as of November 2022.

In the light of the above, it is clear that Eskom has made slow progress in implementing the offsets at Ezamokuhle. It is not clear how it will meet its target for the remaining 1159 households by July 2024.

KwaZamokuhle

Kwazamokuhle is located in the Nkangala District Municipality and is in close proximity to Hendrina.

The implementation of offset interventions in the area began in April 2022 and Eskom had initially aimed to have completely installed the offsets in 3700 households by July 2024.

By the end of December 2023, Eskom had completed installing offsets for 2359 households and was registering additional households. Eskom aims to complete installation in 3700 households by May 2024. Eskom is on track in this area and has done well to implement strategies to circumvent delays caused by weather changes and the lack of materials.

As of April 2022, Eskom had invested a total sum of ZAR 7 195 262 in the implementation of offsets in Kwazamokuhle.

Incidental to the offset interventions has been the employment of 76 (seventy-six) community members.

Eskom has indicated that it prioritised community and stakeholder engagement in this area, in relation to the offset project.

Phase 2 Settlements

Sivukile

Sivukile is located in the Gert Sibande District Municipality and is in close proximity to Tutuka.

Planning for the implementation of the offsets for 1160 households is underway. The procurement process for appointing service providers has been completed and implementation is expected to commence in the first quarter of 2024.

The initial expected completion date for this area was December 2024, however, as of 29 January 2024, Eskom has moved the completion date to March 2025. It is not clear why Eskom pushed the completion date, as it secured funding for this phase in the 2022/2023 financial year.

New Emerlo

New Emerlo is located in the Gert Sibande Municipal District and is in close proximity to the Camden power station.

Eskom has not confirmed funding for this project despite the revised schedule, indicating that offsets will be installed in 935 households by July 2026. Eskom has indicated that the budget for the settlement has not been approved and, as such, the expected commencement date is April 2025.

Nederland

Nederland is located in the Gert Sibande Municipal District.

Eskom has not confirmed funding for this project despite the revised schedule indicating that offsets will be installed in 1660 households by July 2027. Eskom has indicated that the budget for the settlement has not been approved and, as such, the expected commencement date is June 2025.

Silobela

Silobela is located in the Gert Sibande District Municipality and is in close proximity to the Arnot power station.

The scheduled commencement and completion dates have been revised, as such, Eskom now intends to commence the implementation of offsets for 2504 households by January 2025. The expected completion date for implementation is July 2027.

Grootvlei Village / Ntorwane

Grootvlei Village / Ntorwane is located in the Gert Sibande Municipal District and is in close proximity to the Grootvlei power station.

The scheduled commencement and completion dates have been revised, as such, Eskom now intends to commence the implementation of offsets for 2000 households by June 2025. The expected completion date for implementation is September 2027.

Emzimnoni

Emzimnoni is located in the Nkangala District Municipality and is in close proximity to Tutuka and Matla.

Eskom revised the scheduled dates and now intends to commence the implementation of offsets in the area in March 2024 for 4300 households. The expected completion date for implementation is April 2027.

Although budget approval is still pending, a health study by the South African Medical Research Council has been completed and media training has occurred.

Phola

Phola is located in the Nkangala District Municipality and is in close proximity to Kendal.

Eskom planned to implement the offset interventions for 6073 households by October 2026, with the project's scheduled commencement date being September 2023. However, as of 19 December 2023, Eskom had moved the completion date to January 2027.

Funding for the implementation of offsets in this settlement was secured in the 2022/2023 financial year. Eskom indicated that planning for the implementation of offsets for Phola has commenced. The procurement process has also commenced.

eMalahleni

eMalahleni is located in the Nkangala District Municipality and is in close proximity to Kendal, Duvha and Kusile.

Eskom plans to commence the implementation of the offset interventions for 2000 households by August 2025. The expected completion date for implementation is November 2027.

Masakhane

Masakhane is located in the Nkangala District Municipality and is in close proximity to Duvha.

Eskom plans to commence the implementation of the offset interventions for 6073 households in March 2024. It expects to complete installation by December 2025.

Thubelihle

Thubelihle is located in the Nkangala District Municipality and is in close proximity to Kriel.

The scheduled commencement and completion dates have been revised, as such, Eskom now intends to commence the implementation of offsets for 2987 households by October 2024. The expected completion date for implementation is March 2027.

11.4.3.2. Fezile Dabi / Sedibeng Municipality Districts

Phase 1

Lethabo

Lethabo is located in the VPA.

Sharpeville was selected as a Phase 1 settlement for Eskom's offset initiatives.

Eskom intends to broaden the scope of this intervention to include Tshepiso, Boipatong and Refengkgotso as Phase 2 of its offsets programme.

This initiative was scheduled to be implemented every three months *"for a period of 18 months or as and when required"*. The commencement date for this intervention was set as 27 March 2023, however Eskom only completed the first waste clean-up in July 2023, owing to delays in the commercial process. Consequently, the delay in implementing the first waste clean-up resulted in an overall delay in the implementation of the intervention (see Table 17 below for

the original schedule). In this regard, the second clean-up, which was initially scheduled to take place on 19 June 2023, was only undertaken on 3 November 2023.

Eskom aims to have completed six (6) cleaning campaigns by March 2024, when its contract with Eskom Rotek Industries, for this initiative, terminates. However, considering that the commencement of the interventions was delayed, it appears unlikely that Eskom will meet its March 2024 deadline.

Eskom indicated that planning for the third campaign is in progress, however a start date has not been announced. Further, *"discussions on a sustainable way forward for the Lethabo offsets are underway"* and *"Atmospheric Dispersion Modelling is planned*".

Notwithstanding the delays, Eskom indicated that it created employment opportunities in Sharpeville, as a result of implementing the offsets. Three (3) community liaison officers, twelve (12) general workers and two (2) supervisors have been employed.

Campaign	**Start Date**	**Finish Date**
1st Campaign	27 March 2023	31 March 2023
2nd Campaign	19 June 2023	23 June 2023
3rd Campaign	28 August 2023	01 September 2023
4th Campaign	6 November 2023	10 November 2023
5th Campaign	15 January 2024	19 January 2024
6th Campaign	25 March 2024	29 March 2024

Table 17: SHARPEVILLE ILLEGAL DUMPS CLEAN-UP CAMPAIGNS

11.4.3.3. Planning, Monitoring and Verification Activities

Eskom has contracted with a Planning, Monitoring and Verification ("PMV") company, Air Resource Management (Pty) Ltd, to monitor the effectiveness of its Phase 1 offset interventions.

The overall objective of the PMV contractor is to assist with the planning of the offset interventions so as to minimise any risk that may interfere with implementation, increase practical and scientific knowledge, and develop and refine monitoring, reporting and verification processes.

AAQ, emissions and quality of life are the variables that will be monitored before, during and after the offset interventions have been implemented. Eskom has stated that, *"Over every monitoring period, the project scenario (as it actually took place) will be compared to a credible baseline scenario (i.e. the situation that would have been the case if the project was not implemented). The principal indicator for the success of the intervention will be related to a change in the exposure to air pollution and net emissions avoided as a result of Eskom AQ [air quality] offsets interventions. This will be expressed as a reduction in the ambient concentration of particulate matter."*

As a result of the above, Eskom identified focus areas to assist it to implement the intervention plans effectively. The following activities were undertaken in Ezamokuhle, Kwazamokuhle and Sharpeville.

Activity 1:

Preliminary air assessments were conducted in Ezamokuhle to ascertain whether the community complied with the NAAQS. Even though the assessments were conducted in 2021, they provide support for Eskom's offset interventions aimed at reducing coal-based household emissions.

It was found that residential fuel burning resulted in increased levels of SO_2 and NO_X in winter and increased levels of PM in early winter and early spring. Air quality hotspots were also identified for the optimum placement of E-BAM. A need to develop a bottom-up emissions

inventory to account for non-buoyant localized ground-level sources in the airshed was identified.

Another area within Ezamokuhle, China 2, was identified as having the highest concentrations of SO_2 and NO_2 and, as such, it was recommended that the area be prioritised in the implementation of offsets to reduce the effects of coal-based household emissions.

Residential fuel burning was found to have a significant impact on ambient PM_{10} concentrations. The situation was found to be exacerbated by the *"poor air pollution dispersion" and* cold temperatures in winter.

Activity 2:

Eskom engages in a "*gathering area intelligence*" activity for the purpose of gaining a "*better understanding of the study area, including environmental and socioeconomic aspects that present threats and opportunities to the successful implementation of offsets*."

This process is continuous, and an Area Intelligence (AI) report is produced annually for the duration of Phase 1.

The AI report identifies significant attributes in relation to offsets in Ezamokuhle. These include, but are not limited to, geographic, political, historic, population, education, employment, individual income, municipal-wide employment profiles, safety and security, and human settlement and infrastructure.

In relation to human settlement and infrastructure features, Eskom indicated that, *"the type of dwelling / housing structure determines the type of offset that can be implemented in the area… it has been established in the previous Eskom pilot studies that the majority of offsets interventions cannot be implemented in informal dwelling structures or shacks"*. Despite this finding, Eskom has not indicated how it plans to address offsets for people living in informal dwelling structures.

Activity 3:

An assessment of activities resulting in emissions was undertaken and it was found that Ezamokuhle residents were exposed to agricultural, commercial, industrial and residential land use activities, occurring in close proximity to each other and resulting in air pollution. The assessment identified historic, current and potential air pollution sources in Ezamokuhle. The future emission sources include *"residential fuel burning; waste burning; and fugitive dust emissions [resulting from paved and unpaved roads as well as open sports fields]."*

The assessment provided further support for offset interventions focused on residential fuel burning. However, Eskom indicated that offset interventions targeted at *"waste burning and fugitive dust from open sports fields"* are "*low-hanging fruit opportunities*".

Other activities undertaken by Eskom in respect of the offset programme include:

- Obtaining ethical clearances (otherwise known as activity 4 and completed for all Phase 1 areas);
- Census ("activity 5");
- Community source survey ("activity 6", only completed for Ezamokuhle);
- Fuel source survey ("activity 7", only completed for Ezamokuhle);
- Household survey ("activity 8", completed for all Phase 1 areas);
- Annual house surveys ("activity 9", currently undertaken at Ezamokuhle);
- AAQ monitoring ("activity 10", currently undertaken at all the Phase 1 areas);
- Indoor air quality monitoring ("activity 11", currently undertaken at Kwazamokuhle and Ezamokuhle);
- Atmospheric dispersion modelling ("activity 12", currently undertaken at all the Phase 1 areas);

- Design of intervention (“activity 13” currently being planned for Ezamokuhle and Sharpeville);
- Development of database and reporting (“activity 14”, currently undertaken for all Phase 1 areas);
- Strategic assistance / development of an offsets methodology (“activity 15”, currently planned for all Phase 1 areas); and
- Research and development (“activity 16”, currently planned for all Phase 1 areas).

11.4.3.4. Forum’s observations

Eskom discharges its duty to implement offset interventions in the ambient environment where its coal-fired power stations are located by aiming to reduce domestic fuel burning, through the replacement of household coal stoves and installation of ceilings, as well as the reduction of the burning of waste by clearing illegal waste dumps.

Eskom has failed to meet most of its scheduled commencement and completion dates for the implementation of the offset interventions. However, in some instances, such as in the case of Kwazamokuhle, Eskom has managed to implement the offsets timeously, which resulted in the completion date moving up from July 2024 to May 2024.

Despite the shortcomings, it is evident that Eskom has invested resources, financial and otherwise in implementing the offsets, as evidenced by its budget expenditure for Kwazamokuhle, Ezamokuhle, Sharpeville and Emzimnoni.

Reliance on PMV activities demonstrates Eskom’s commitment to minimising implementation risks, increasing practical and scientific knowledge, and developing and refining monitoring, reporting and verifications processes.

Furthermore, the employment opportunities created, due the implementation of offset interventions, is a positive story and it is probable that more jobs will be created once all the offset interventions commence.

As per data from Stats SA, referenced in section 11.4.1 above, there has been a decline in the use of coal and other sources of energy such as wood and paraffin. In areas such as Fezile Dabi in the VTAPA as well as the HPA, the decline has been significant. There has been a slight decrease in the use coal and other sources in the WBPA.

The decrease in the use of coal for has resulted in significant increases in the use of electricity and gas as sources of fuel for cooking. In addition, while the decrease has not been as significant, there has been a steady decline in respect of using coal as a source for heating. In view of this and considering the slow implementation of the offset programme, it cannot be said that the decrease seen in the use of coal and increase in the use of gas is attributable to Eskom's offset programme.

However, the above evidence points to the fact that Eskom's offset programme is a step in the right direction for certain areas as more people are moving to gas as a source of fuel. Notwithstanding the positive steps taken by Eskom, exchanging coal stoves for gas-electric stoves may not be an appropriate mechanism to address air pollution in all areas.

As such, before rolling out all the offset programmes, Eskom should investigate implementing different types of offsets, ones that are fit-for-purpose. For example, the clearing of illegal waste dumps in Fezile Dabi seems appropriate as there appears to be a natural shift from coal to gas. In addition, Eskom may be in a position, while this is not its core function, to step in and assist in areas where the municipality falls short.

The Forum notes the CER's accretion that offsets should not be used as a mechanism to let Eskom off the hook, and the Forum agrees, however, the Forum is also of the view that there is no one size fits all approach that can resolve the impasse created by the various appeals. Therefore, the implementation of offsets remains a method that can address the current situation.

11.5. Achieving local emission reductions

Local air pollutants from coal plants can be reduced by:

- retrofitting the plant with appropriate abatement equipment;

- reducing the amount of coal burnt by lowering the utilisation rates of the plant and / or closing the plant early; or
- changing the sulphur content of the coal used however, this is not practical or cost-effective if coal needs to be transported from a mine further away.

The nature of the regulatory regime determines what type of air pollution reduction activities can be recognised. Concentration based MES can only be met through retrofitting a plant with abatement equipment or full plant closure. Load-based limits allow for running a plant at lower capacity rates.

This section considers the first option and the second option in section 11.6 below.

11.5.1. Retrofits to Eskom's power stations to allow for compliance with the MES regulations.

The retrofits that are required to comply with the MES are challenging because the majority of power stations were not designed to include this additional abatement equipment. Each power station has a unique layout and set of unit operations and uses a specific quality of coal, so each retrofit needs to be bespoke.

To perform a robust verification of the technologies recommended by Eskom, an independent engineering team would need to be appointed to scope the abatement retrofits for each power station and do a basic engineering design to understand how the PM, SO_X and NO_X abatement units would be incorporated into the power station. We point out that the power stations are integrated, and no space was allowed for additional abatement equipment on power stations' footprints (e.g., only the Medupi power station was designed to be FGD ready and has sufficient space in its plot plan – with the exception of Kusile, none of the other power stations are FGD ready). We estimate this verification exercise to take a number of months to complete. Unfortunately, the Forum's time and funding constraints did not permit the appointment of such experts for a detailed review of Eskom's recommended abatement solutions. As such, the Forum has considered and evaluated the available retrofit technologies per pollutant at a more general level.

11.5.1.1. Retrofits to abate PM

PM abatement can be achieved by one of two technologies: Fabric Filter Bags ("FFB") or Electrostatic Precipitators ("ESP").

At power stations that have FFB, the abatement would be enhanced by upgrading the bag houses with bags filters with a finer weave, improved pulsing and flue gas flows and/or filter-bag surface areas. At the power stations that have ESP units, ESP can be improved by SO_3 dosing, High Frequency Power Supply ("HFPS") and/or installing Dust Handling Plants ("DHP").

The proposed solutions are appropriate because it is quicker (and cheaper) to upgrade existing units than to scrap them and replace them with another technology.

It should be noted that the costs to abate SO_X and NO_X are significantly higher than primary PM abatement.

11.5.1.2. Retrofits to abate SO_X

SO_X abatement can be achieved with the installation of Wet Flue Gas Desulphurisation ("WFGD") units or semi-dry technologies, such as a Semi-Dry Spray Absorber ("SDA") or a Direct Sorbent Injection ("DSI"). These technologies were discussed in more detail in the SO_X panel report. WFGD has a higher capex and lower opex so it is preferred for power stations that have a long remaining life, while semi-dry technologies have a lower capex but higher opex, which makes them more appropriate for power stations that have a shorter remaining life.

Relative to PM and NO_X abatement, SO_X abatement is a much more difficult technology to run because they require the handling of slurries that cake, and/or solid handling of fine materials. Other challenges with FGD technologies include the fact that some require large amounts of water (WFGD) and sorbents (lime, limestone and trona), which would need to be transported from the Northern Cape, or even imported. Further, it is extremely challenging and potentially not feasible to retrofit SO_X abatement technology at power stations which were not initially designed to be 'FGD ready'. This is because of space constraints and the potential impacts of

the FGD on the down (and up) stream equipment. The Forum is not in agreement with the SO_X panel report which states that SO_X abatement retrofits are feasible or practical at Eskom's power stations. For further discussions on this, see section 10.8.2 of this report.

In the case of WFGD, there is a parasitic load, so the power stations' net output would reduce by 1-2%. This increases the power stations' CO_2 intensity and increases the amount of CO_2 emissions.

11.5.1.3. Retrofits to abate NO_X

NO_X emissions can be reduced by using Low NO_X Burners ("LNB") and/or Over-Fired Air ("OFA") systems.

NO_X abatement will result in unburnt coal in the ash, and this will reduce a power station's efficiencies in coal use and increase coal consumption by approximately 1%.

11.5.2. Complexities of retrofitting an old power station

Many of Eskom's coal-fired power stations date from the 1970s and 1980s and were designed to comply with the emission standards at the time. The layout of the power stations was optimised so it was compact and there was the best use of space. Air emission standards have since tightened and, in order for those power stations to meet the current MES, they need abatement retrofits. Unfortunately, there are space and process flow constraints, so the retrofits can be costly and negatively impact the power station's performance. Some of the impacts include:

1. Reduced capacity (MW).
2. Reduced performance, such as operating stability and ramp-up rates.
3. Operating units upstream and downstream of the retrofit will be impacted and may run sub-optimally (and may also require modifications).
4. Reduced power station or EAF availability due to a higher number of unplanned outages and longer GOs.
5. Increased maintenance costs (from the abatement equipment itself and the retrofit's impact on the upstream/downstream units).

6. Increased coal use (some unburnt coal remains in the ash).
7. Reduced thermal efficiency, which results in an increase in the power station's CO_2 emissions, which is contrary to SA's NDC commitments. This also increases the coal consumption.
8. Negative cross-media impacts (e.g. water & limestone requirements, and gypsum landfilling), particularly in the case of a FGD.

A challenge that some of Eskom's power stations face is that they do not only need to abate one pollutant, but two or three of them. Many of the challenges are intertwined, they impact one another, and the complexities increase exponentially.

If only a power station's SO_X emissions exceed the MES and need to be abated, a FGD would need to be installed. However, a FGD may require PM levels that are significantly lower than the MES, so the SO_X retrofit would also require a PM retrofit. These unintended consequences introduce complexity and each MES retrofit would need to be a bespoke design.

Policy makers, regulators, emitters, appellants, engineers, and legal experts must be prudent not to underplay the unintended consequences and complexities of these challenges.

11.5.3. Analysis of the cost of retrofits

Below is a summary of the estimated capex and time-to-implement abatement retrofits to comply with new plant standard at Eskom's 8 power stations that retire post 2030, which information was provided by Eskom.

Power station	Retirement year (ave)	Pollutant	Abatement technology	Emissions before new abatement unit (mg/Nm3)	Eskom upgrade commitment based on ERP 2022	Capex (R bn) for ERP2022 plan [2023 money]	Capex (R billion) including all SOX abatement if it was feasible [2023 money]	Earliest date the abatement equipment can be installed. Reasons why the abatement equipment cannot be installed sooner	Will the retrofit take place during the normal GO schedule? If not, how much longer would be required for the GO.
Duvha	2033	PM	Unit 4 to 6 ESP/HFPS/DHP	100	[redacted]	[redacted]	[redacted]	[redacted]	
		SOX	Semi dry FGD	2300					Preferably extending current GO durations. (Outage Duration: +150 days per unit)
		NOX	LNB	1200					Preferably extending current GO durations (Outage Duration: +120 days per unit)
Kendal	2042	PM	ESP/HFPS/DHP	100					Extending current GO durations (Outage Duration: +140 days per unit)
		SOX	Semi dry FGD	2600					Preferably extending current GO durations (Outage Duration: +150 days per unit)
		NOX	Optimisation	750					Yes
Lethabo	2039	PM	ESP/HFPS/DHP/SO3	100					Extending current GO durations (Outage Duration: +120 days per unit)
		SOX	Semi dry FGD	2500					Preferably extending current GO durations (Outage Duration: +150 days per unit)
		NOX	LNB	1300					Preferably extending current GO durations (Outage Duration: +120 days per unit)
Majuba	2049	PM	HFPS Installed	50					
		SOX	Wet FGD	3200					Preferably extending current GO durations (Outage Duration: +150 days per unit)
		NOX	LNB	1300					Preferably extending current GO durations (Outage Duration: +120 days per unit)

Power station	Retirement year (ave)	Pollutant	Abatement technology	Emissions before new abatement unit (mg/Nm3)	Eskom upgrade commitment based on ERP 2022	Capex (R bn) for ERP2022 plan [2023 money]	Capex (R billion) including all SOX abatement if it was feasible [2023 money]	Earliest date the abatement equipment can be installed. Reasons why the abatement equipment cannot be installed sooner	Will the retrofit take place during the normal GO schedule? If not, how much longer would be required for the GO.
		PM	ESP/HFPS/DHP	100					Extending current GO durations (Outage Duration: +90 days per unit)
Matimba	2040	SOX	Semi-dry FGD	4000					Preferably extending current GO durations (Outage Duration: +150 days per unit)
		NOX	Optimisation	750					Yes
		PM	ESP/HFPS/DHP	200					Extending current GO durations (Outage Duration: +120 days per unit)
Matla	2032	SOX	Semi-dry FGD	2600					Preferably extending current GO durations (Outage Duration: +150 days per unit)
		NOX	LNB (+ OFA)	1300					Preferably extending current GO durations (Outage Duration: +150 days per unit)
		PM	FFPs Installed	50					
Medupi	2068	SOX	Wet FGD	4000					Preferably extending current GO durations (Outage Duration: 90-120 days per unit)
		NOX	Optimisation	750					
		PM	ESP/HFPS/DHP/SO3	300					Extending current GO durations (Outage Duration: +150 days per unit)
Tutuka	2030	SOX	Semi-dry FGD	3400					Preferably extending current GO durations (Outage Duration: +150 days per unit)
		NOX	LNB	1300					Preferably extending current GO durations (Outage Duration: +120 days per unit)
SUB-TOTAL		PM							
		SOX							
		NOX							
TOTAL									

Table 18: Full MES abatement roll-out on Eskom's coal-fired fleet) (Source: Eskom – "Annex 1 data request costs December 2023 updated" and Eskom's December 2023 quarterly report to the DFFE.

The light blue column is the capex that would need to be invested to comply to all the MES new plant standards which includes SOX abatement at all 8 power stations. The orange column is the capex that would need to be invested as per Eskom's ERP 2022 board approved plan. The expected completion dates for the retrofits are as per Eskom's December 2023 quarterly report to the DFFE.

In order to better understand Eskom's estimated cost of abatement, the Forum has benchmarked the estimates at a high level.

The capex and opex figures for each PM, SO_X and NO_X abatement solution for each power stations were normalised and expressed on a USD/kW (for capex) and USD/kW/year (for opex). These were compared to international benchmarks, as illustrated in Table 19.

Pollutant	Abatement Technology	ESKOM capex estimates (USD / kW)	EPA capex estimates (USD / kW)
PM	ESP / HFPS / DHP / SO3 dosing	35	varies
SOX	WFGD	435	388 - 425
	Semi-dry FDG	340	385 - 420
NOX	LNB	46	24 - 61

Table 19: Eskom's abatement capex cost estimates relative to international comparables[78] [79]

The above table illustrates that Eskom's estimates appear accurate however, the accuracy of a plant's retrofit cost estimate depends largely on the extent that the plant has been scoped as

[78] EPA Base Case v.4.10

[79] Assumed exchange rate USD/ZAR = 18

illustrated in Table 18: Full MES abatement roll-out on Eskom's coal-fired fleet) (Source: Eskom – "Annex 1 data request costs December 2023 updated" and Eskom's December 2023 quarterly report to the DFFE. Based on the information the Forum has reviewed, most of Eskom's MES abatement solutions have been scoped to a point where a Class 5 cost estimate can be obtained. These Class 5 cost estimates have an accuracy of -20% to -30% on the low end, and +30% to + 100% on the high end highlighted in green in Table 20.

Internationally, a Class 2 cost estimate is typically required before a project can be sanctioned; these cost estimates have an accuracy of -5% to -15% on the low end, and +5% to +20% on the high end.

South Africa, unfortunately, has a poor track-record of project management and cost containment of capital projects, for example, Eskom's Medupi and Sasol's LCCP projects were 193% and 43% respectively overbudget, and the completion of both projects was also delayed. This is despite both projects being greenfield, with limited integration issues, and not having to work within an operating plant. The MES abatement units will be brownfield projects – this introduces more complexity and increases the risk of project cost overruns and delays.

Estimate class	Maturity level of project definition deliverables. Expressed as a % of complete definition	Methodology Typical estimating metric	Typical variation in low and high ranges with an 80% probability
Class 5	0% to 2%	Capacity factored, parametric models, judgement, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Detailed unit cost with forced detail take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Detailed unit cost with detailed take-off	L: -3% to -10% H: 3% to +15%

Table 20: Cost estimate matrix for process industries (Source: AACE recommended practices)

The Forum queried the cost estimates of Eskom's abatement projects, to which Eskom responded that[80]:

> *"The certainty with which Eskom presents costs depends on the stage of the project. Before concept release approval, costs are based on averages of published international data and benchmarks for similar technologies, and so are considered to be* ***accurate to a factor of two****. Once the conceptual designs have been done, costs are generally accurate to within 50%. Once the detailed designs are completed, costs are considered to be accurate to within 20%. Once the contracts have been placed, costs are considered to be accurate to within 10%. There is only complete certainty about the costs once the contract has been completed."*

11.5.4. Putting the cost of abatement into perspective

According to Eskom, the total estimated capex cost to retrofit all the power stations retiring post 2030 is R235 000 000 000 which, for perspective, amounts to 3.4% of South Africa's GDP[81]. This amount includes the SOX retrofit of all Eskom PSs. If Eskom's board approved ERP2022 plan is considered and only Medupi is retrofitted for SOX abatement the total capex cost reduces to R61 000 000 000. The Forum notes this very significant cost and it is thus one of several critical factors taken into consideration by the Forum.

11.5.5. Abatement retrofits during general outages ("GOs") or special shutdowns

The Forum has been advised by Eskom that online maintenance is done as far as possible so that there are no production losses however, some major maintenance and statutory inspections require the power stations to be brought offline. This is done over a ± 6-year maintenance cycle, so a typical 'six-pack' power station which consists of 6 units would have

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[80] GEM23-L107 MES panel query 6 june 23.pdf

[81] South African Reserve Bank : https://www.resbank.co.za/en/home/what-we-do/statistics/releases/economic-and-financial-data-for-south-africa ; SA's annual GDP was estimated at R6 944 billion in Q3 2023

a GO schedule of over ± 6 years, where individual units are brought offline and retrofitted in succession. As a result (if the GO schedules are adhered to), a power station's compliance with MES regulations can only be phased-in over a 6-year period, and compliance with the MES, for the full power station, will only be achieved in year 6.

The shutdown of the power stations, outside the GO schedules, to install the retrofits would be more expensive because specialised cranes and construction crews would need to be brought onsite specifically for the retrofits, while that equipment and technical crews are already onsite during a normal GO. The necessary skills and specialised cranes for the retrofits in South Africa are limited, so it might not even be feasible because the necessary skills and specialised cranes could not be available as they are used elsewhere on other projects. There will also be an increase in risk as a result of the increased complexity resulting from a special shutdown.

11.5.6. Eskom's commitment to abatement retrofits

The abatement projects which Eskom is proposing to implement were analysed and are summarised in Table 21. As can be seen, six[82] PM abatement projects are progressing at a cost [redacted]. There are three NO_X abatement projects [redacted] and there is only one SO_X abatement project, at Medupi [redacted] The cost of Eskom's outstanding committed abatement projects, in terms of Eskom's ERP2022, totals [redacted].

Over the past decade, Eskom has a poor record of taking timely and responsible action to implement MES projects. The Forum had discussions with Eskom's senior management, focusing on exploring how their power station abatement projects are being expedited. The Forum believes that Eskom is now taking the necessary action to implement the PM abatement projects as soon as possible, but this is after failing to take timely and responsible action over the past decade, when they should have been doing so.

[82] It is unclear why a PM retrofit is proposed at Matimba because as illustrated in the historical emissions, Matimba generally meets MES new plant standards.

Power station	Priority area	Retirement year (last unit)	Pollutant	Abatement technology	Emissions before new abatement unit (mg/Nm3)	Eskom upgrade commitment based on ERP 2022 and Eskom's DFFE December 2023 quarterly report	Capex (R bn) for ERP2022 plan [2023 money]	Opex (R bn/yr) [2023 money]
Duvha	HPA	2034	PM	Unit 4-6 ESP/HFPS/DHP	100	Units 4-6 complete by 2025		
Kendal	HPA	2044	PM	ESP/HFPS/DHP	100	Completed by 2025		
Lethabo	VTAPA	2041	PM	ESP/HFPS/DHP/SO3	100	Completed by 2026		
Lethabo	VTAPA	2041	NOX	LNB	1300	yes - upgrading		
Majuba	HPA	2051	NOX	LNB	1300	yes - upgrading		
Matimba	WBPA	2042	PM	ESP/HFPS/DHP	100	yes - upgrading		
Matla	HPA	2034	PM	ESP/HFPS/DHP	200	Completed by 2024		
Medupi	WBPA	2071	SOX	Wet FGD	1000	yes - upgrading		
Tutuka	HPA	2030	PM	ESP/HFPS/DHP/SO3	300	yes - upgrading		
Tutuka	HPA	2030	NOX	LNB	1300	in tendering phase		
SUB-TOTAL			PM					
			SOX					
			NOX					
TOTAL								

Table 21: Eskom's committed abatement projects: technology, timing, and cost (Source: Eskom – "Annexure 1 data requests costs dec 23 updated" and Eskom's December 2023 quarterly report to the DFFE.)

11.5.7. Eskom's progress on installation of abatement technology as at 29 January 2024

In January 2024, Eskom provided the DFFE with their quarterly update on the implementation of its MES postponement commitments, for the period ending December 2023 (attached in Annexure 27). The status of the MES abatement projects is summarized for each of the power stations below.

11.5.7.1. Duvha

PM

The ESP upgrade is completed on all three units. The HFPS Installation on unit 5 was completed previously. [redacted]. Units 4 and 6 are expected to be complete by 2025.

SO_X

The project is on hold pending the MES postponement appeal, DFFE engagements, and funding.

NO_X

No NO_X project was approved in terms of the Eskom Board decision of 31 July 2022 to comply with new plant standards. However, Eskom plans to optimize their existing burners and implement load reduction to reduce their NO_X emissions, such that Duvha complies with existing plant standards.

11.5.7.2. Kendal

PM

The HFPS project was completed on all six units. The ESP upgrade is complete on units 3, 4, 5 and 6. Planning for the remaining two units is underway. Eskom expects the retrofit to be complete by 2025.

SO_X

The project was cancelled based on the Eskom Board decision of 31 July 2022.

NOX

No update was provided regarding abatement of NO_x emissions at Kendal.

11.5.7.3. Lethabo

PM

The HFPS project is complete on five units. Execution for the remaining unit is underway and is expected to be completed by 2024.

The SO_3 refurbishment is complete on the first two units. Planning for the remaining four units is underway and are expected to be completed by 2025.

The ESP refurbishment contract was awarded in April 2022. Execution of the first unit is in progress - the planned completion date for all the units is 2026.

SO_X

The project is on hold pending the MES postponement appeal, DFFE engagements, and funding.

NO_X

Subsequent to the upgrades of the boiler in 2019, NOX emissions from the station have increased. Based on this, a NO_X project was approved by the Eskom Board in July 2022. Project planning and approval processes for the project have commenced, but the installation will not be completed before 2025.

11.5.7.4. Majuba

SO_X

The project is on hold pending the MES postponement appeal, DFFE engagements, and funding.

NO_X

The project will be restarted based on the Eskom Board decision of July 2022. [redacted] The project will be completed post 2025, and implementation dates of the units are between 2026-2032.

PM

Majuba is compliant with the MES for PM.

11.5.7.5. Matimba

SO_X

An Eskom Board decision cancelled the project, as such, Matimba will optimize its performance in terms of the existing plant limit until shutdown.

11.5.7.6. Matla

PM

The HFPS project is completed on units 2, 4 and 6. Execution for the remaining three units is underway and it expected to be completed in 2024.

ESP upgrade of the first five units of the required six units is completed. Unit 1 execution is in progress and is expected to be completed in 2024.

SO_X

Matla has not made any progress towards the installation of abatement technology for SO_X as it is awaiting the decision on the MES postponement appeal, DFFE engagements and funding.

NO_X

An Eskom Board decision cancelled the project, as such, Matla will optimise its performance in terms of the existing plant limit until shutdown[83].

11.5.7.7. Medupi

SO_X

The Eskom Board and key stakeholders approved a revised project strategy. The World Bank has approved extending the loan agreement until June 2027. [redacted] The project will not be completed by the 2025 MES deadline, with 2029 completion being likely.

The decision of whether there should be a SO_X retrofit at Medupi is important because of the large capital cost involved, cross-media impacts and the health impacts of SO_X being in the air. This is discussed in more detail in section 14.4.3 of this report.

11.5.7.8. Tutuka

PM

Dual Flue Gas Conditioning Equipment installation on the first unit is complete and testing has been initiated. The testing has been limited due to plant breakdown however, plans to make the installation semi-permanent have been developed, and installation on the first unit is complete. A basic assessment (BA) application process to obtain all necessary approvals for

[83] 20240129 Eskom MES update January 2024 rev 1 combined

the expansion of this project to all the units was completed. The Environmental Authorization was issued in May 2023.

[redacted] Based on the work done, it is now intended only to use Sulphur, hence changing from Dual Flue Gas Conditioning to Flue Gas Conditioning. [redacted]

Tutuka ESP refurbishment: The ESP contract was awarded on 28 July 2022 for the first two units. ESP installation on Unit 6 is complete. The refurbishment of the second unit is currently underway. [redacted]

Tutuka Dust Handling Plant (DHP): [redacted]

The HFPS project was completed on the first two units. Installation for unit 5 is currently underway. [redacted] The anticipated installation date for all units is March 2025 but there is a risk that the 2025 deadline will not be met for the ESP refurbishments.

MES decision limits are being appealed. On 9 November 2022, Eskom requested the suspension of limits with a revised shutdown date for Tutuka of 2030.

SO_X

The SO_X project is on hold pending the MES postponement appeal, DFFE engagements and funding.

NO_X

The project restarted based on the Eskom Board's decision of 31 July 2022. [redacted]

11.6. REDUCING THE AMOUNT OF COAL BURNT

Reducing coal burnt can be achieved by either closing the coal-fired power stations down earlier than anticipated or operating the plant more flexibly. There are many potential benefits associated with keeping a coal plant running at lower levels rather than shutting it down namely:

1) They remain available to the system to operate at higher utilisation levels;

2) The socio-economic impacts of shutting a plant down are negated; and

3) The spending of capex on new flexible forms of generation can be avoided.

Flexible running of coal-fired power stations

Coal technologies typically have less flexibility to ramp-up/down because it takes time to heat the boilers and heat exchanges before the plant can run. A coal plant is also more complex as it has several unit operations. However, globally, the coal-fired power stations are transitioning to a more flexible mode of operation whereby they can run at part-loads and cycle up/down daily depending on the electricity supply/demand balance. This is in response to the higher penetration of variable renewable energy generation. This is evident in China, where, every year, they are adding numerous new coal-fired power stations to their fleet and increasing capacity, however these power plants are increasingly being operated flexibly at part-loads. As a result, the amount of electricity generated from coal is growing at a slower pace than the growth in coal generation capacity.

Table 22 below summarises the power stations in Eskom's fleet. Almost all the power stations operate in 'baseload' mode - that is, either operating at full load or not operating at all. The load factor target would be more than 90%, and the power stations were designed to operate in baseload mode. The only power stations that have some flexibility in their design are Camden, Grootvlei and Majuba.

The power stations highlighted in red will retire on or before 2030, so, post 2030, Majuba will be the only power station that has the flexibility to run in 'mid merit' and '2-shifting' mode. The

'mid-merit' mode of operation is where the power station operates at part-loads with a load factor in the range of 15-60%, and '2-shifting' operation is where the power station is started/stopped every day to match electricity demand.

Station	Baseload	Mid Merit	Peaking	Two Shifting	Other
Arnot	X				
Camden		X			
Duvha	X				
Grootvlei		X			
Hendrina	X				
Kendal	X				
Komati	X				
Kriel	X				
Kusile	X				
Lethabo	X				
Majuba		Designed		Forced	
Matimba	X				
Matla	X				
Medupi	X				
Tutuka	X				

Table 22: Model of operation of Eskom's coal-fired PSs[84]

Majuba has a track record of operating in a flexible cycling mode. A retired Majuba employee indicated that, previously, two of Majuba's units were stopped every night and restarted the next morning, while the other four units would be cycled from maximum generation during the day to minimum generation at night.

With the increasing penetration of variable renewable energy and the retirement of Camden and Grootvlei in 2030, SA's electricity sector needs more flexible energy generation and it is desirable that more of Eskom's power stations are equipped to fulfil that purpose. This will also reduce both local and GHG emissions because less coal will be burnt.

Retrofits are normally not required to operate a coal-fired power station at part-loads of ±55% of capacity other than a modification to operational procedures and the tuning of control systems. Physical changes to the plant may be necessary to allow the power station to have the flexibility to run at high ramp rates, low-load operations and frequent start–stop actions. The challenge with the cycling of the power stations relates predominantly to regular changes

[84] Provided by Eskom in "Consistent data set Eskom generating plant2023.pdf"

in temperature resulting in thermal stresses and the condensation of water, which can cause corrosion.

Every time a power plant is turned on and off, the boiler, steam lines, turbine and auxiliary components go through unavoidably large thermal and pressure stresses. Baseload facilities are not designed for these frequent variations because they are operated at stable conditions and only experience these variations when they are shut down for a GO every few years.

Decisions on whether and when to replace parts or modify components are normally made on a case-by-case basis and can often only be made once the cycling operations have commenced and some existing equipment needs to be replaced. The changes that are required are unit specific and focus on actions that improve drainage and thermal resiliency and reduce opportunities for corrosion. Retrofits such as automated drains, dampers, additional instrumentation and/or systems to bypass steam to the condenser could be considered.

It should be noted that it is typically more challenging to retrofit a super-critical power station like Medupi or Kusile to operate in an on/off cycling mode, than to retrofit one of the other power stations in Eskom's fleet because they are sub-critical, less efficient and operate at lower temperatures.

The plant's operations will differ when the power station is operated in a flexible manner. It is therefore important that adequate operator training take place and standard operating procedures be updated. This training will reduce the wear-and-tear on the plant and make the power stations more responsive to generate the residual electricity demand required by the grid. The training would need to be done prior to beginning to run the plant in a flexible manner.

Whilst there are benefits of enabling a coal-fired plant to run more flexibly, there are also disadvantages. The operation and maintenance costs will rise because of the increased wear-and-tear from the thermal stresses and operating the plant outside its initial design of baseload operation.

While cycling-related increases in failure rates may not be noted immediately, critical components will eventually start to fail. Shorter component life expectancies will result in higher

Unplanned Capacity Loss Factor ("UCLF") rates and/or higher capital and maintenance costs to replace components at or near the end of their service lives. The increased wear and tear also reduces the power station's economic life and heightens the risk that generating plants will be unavailable when they are needed most, reducing grid reliability.

The fuel costs will also be higher because more fuel oil will be required for the frequent start/stops and the power station will also be operating at lower efficiencies because it is not run consistently at the optimal baseload design conditions.

The resulting cost of electricity (R/MWh) generated by the power station will increase because less electricity will be generated (MWh), and the operation and maintenance costs and fuel costs will increase. This increased cost of electricity will need to be recovered by Eskom. Whether this results in higher electricity costs at the system level depends on the cost of building and running alternative mid-merit capacity (most likely gas turbines), together with other systemic effects.

The emissions concentrations released by the plant, as a result of cycling, increases because of increased fuel use during start-ups, reduced plant efficiencies at less than full loads and the reduced effectiveness of pollution-control equipment at start-up and ramp-up/down.

Despite the fact that emission rates during cycling can be higher than rates during stable operation, studies such as Lew[85] et al. (2013) show that the avoided emissions from wind and solar outweigh secondary emissions impacts induced by cycling. These increases in emission concentrations at the coal power stations will need to be permitted in terms of MES regulations, and regulatory reform may be required to allow for this. On a tonnage basis, emissions will decrease due to the reduction in coal burnt.

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[85] Lew, D.; Brinkman, G.; Ibanez, E.; Florita, A.; Heaney, M.; Hodge, B.-M.; Hummon, M.; Stark, G.; King, J.; Lefton, S.A.; Kumar, N.; Agan, D.; Jordan, G.; Venkataraman, S. (2013). The Western Wind and Solar Integration Study Phase 2. NREL/TP-5500-55588. Golden, CO: National Renewable Energy Laboratory. Accessed October 7, 2013: http://www.nrel.gov/docs/fy13osti/55588.pdf.

11.7. Power plant performance and economics

This section considers the ability of Eskom's coal-fired power plants to produce power reliably and cost effectively, and for how long this can be done. The focus of the analysis is on the nine mid-life plants, together with Medupi and then Kusile, for context. An important aspect to this is the overall size of each plant, which determines the amount of electricity each has the potential to generate, and therefore each plant's relative contribution to power generation for the country.

Whilst the power system modelling takes these factors into account to provide information on power system level outputs (much of the data analysed in this section is utilised by the power system model, including the commercially sensitive coal cost data), the plant level view of these dimensions is important in its own right, when thinking about possible regulatory options.

11.7.1. Coal plant age and rated capacity

Eskom's coal plants differ in terms of age and size. An overview of Eskom's coal fleet capacity and age is presented in Table 23 below, demonstrating the different profiles of each plant. The five oldest power stations which were granted a suspension of compliance timeframes for the MES new plant standards by the NAQO are indicated in shading. These are also the smallest plants in the fleet.

	Decommissioning date	Rated capacity (MW)	% of rated capacity of coal plants considered by Forum
Matla	2034	3450	9%
Duvha	2034	2875	8%
Kendal	2044	3840	10%
Lethabo	2041	3558	10%
Matimba	2042	3690	10%
Majuba	2051	3804	10%
Medupi	2071	4320	12%
Tutuka	2030	3510	9%
Arnot	2029	2100	6%
Camden	2025	1481	4%
Grootvlei	2027	570	2%
Hendrina	2026	1098	3%
Kriel	2030	2850	8%

Table 23: Eskom's coal fleet capacity and age

Plant size is represented by Eskom's data for 'Rated Capacity', the intended full-load sustained output of a facility. Decommissioning dates and rated capacity data are based on those in Eskom's IRP 2023 submission. The year 2022 is used as the latest full year of data available

11.7.2. Plant performance

The rated capacity of a plant does not provide insight into how well the plant is able to perform against that capacity. Numerous factors influence performance, including the age of the plant, coal supply and design features, amongst many others. A metric that is widely used to describe how well a power plant is likely to perform is its Energy Availability Factor ("EAF"), which

measures the electricity that is available to be generated by the plant at a particular point in time[86].

The average EAF of Eskom's generating plants have been steadily declining over the past eight years, as demonstrated in the graph in Figure 40, analysis by the CSIR, and reflected in the current draft IRP 2023 Figure 41: Actual EAF trend from 2010 (Source, DMRE draft IRP 2023, figure 1).

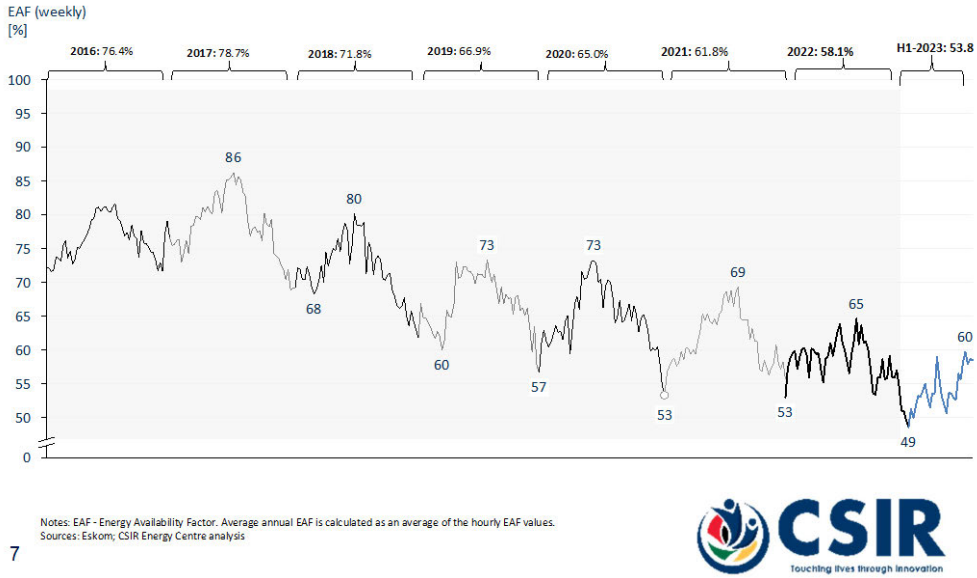


Figure 40: Declining EAF (CSIR Forum power system analysis slide deck, 2024)

[86] *This metric consists of the total theoretically possible generation capacity, less three types of generation losses due to plant downtime: Planned Capability Loss Factor (PCLF), a measure of the planned downtime; Unplanned Capability Loss Factor (UCLF) which measures the amount of time the plant had to be taken offline for unplanned reasons, and finally the Operational Capability Loss Factor (OCLF), which measures losses due to factors outside the plant managers control. (https://www.news24.com/news24/investigations/Eskomfiles/glossary-of-terms-to-assist-understanding-of-Eskom-key-performance-indicators-20211024)*

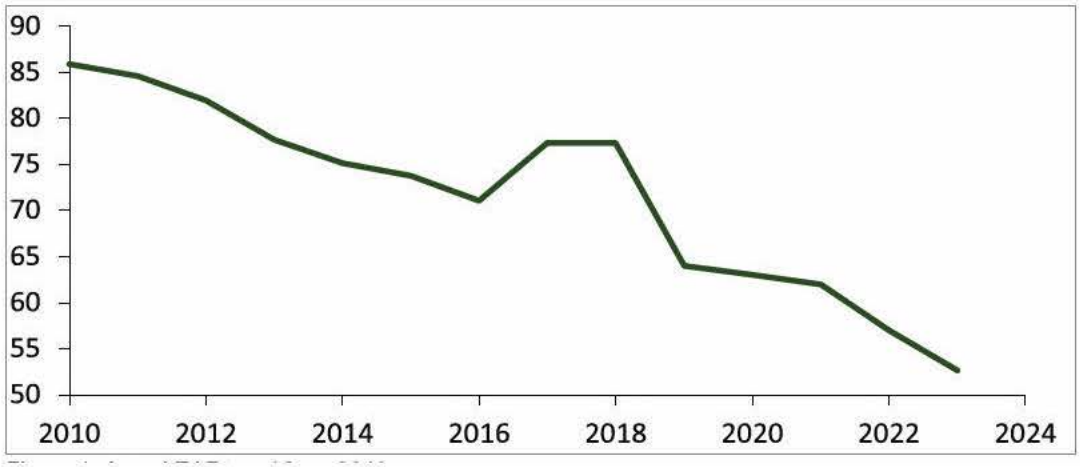


Figure 41: Actual EAF trend from 2010 (Source, DMRE draft IRP 2023, figure 1)

This decline is being driven by an increasing share of forced (unplanned) outages, shown in Figure 42.

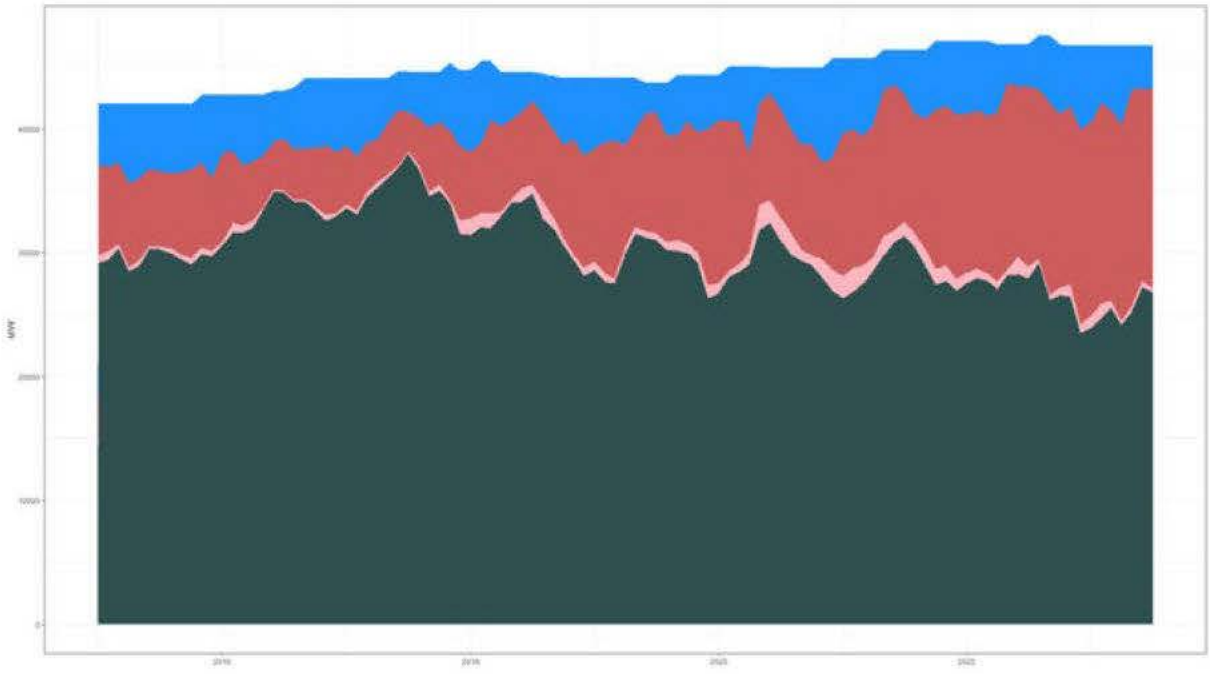


Figure 42: Eskom EAF: historic MW Available (absolute). Planned maintenance (blue), forced outages (red), other outages (pink) and MW available (dark grey)

Table 24 below is drawn from Eskom's historical EAF data (Eskom, IRP 2023), including the age of the plant for reference. As expected from their age, the five oldest plants in the fleet are amongst the worst historical performers in terms of absolute EAF levels in the most recent full year available dataset, 2022 (middle column). However, surprisingly, three of the mid-life plants perform even more poorly: Tutuka which was at 30% EAF in 2022 ranks by far the lowest, and then Duvha at 42% and Kendal at 46%.

On average, the EAF of the fleet (less Kusile, which is still under construction) has declined by 7% in 2022 from its average over the preceding five-year period (right hand column). Only two plants, Camden and Lethabo, have improved 2022 EAF figures. Perhaps surprisingly, the 2022 EAF figures of the five oldest plants have declined the least compared to the five-year average, whilst Kendal, Majuba, Medupi and Tutuka show the sharpest declines. Medupi's relatively poor EAF reflects teething problems at this very young plant. Matimba was a consistently well-performing plant over the period, and Lethabo's 2022 EAF of 80% is the highest in the fleet.

	Decommissioning date	EAF Average 2018 - 22	EAF FY 2022	Deviation of current vs 5 year average
Matla	2034	70%	66%	-4%
Duvha	2034	46%	42%	-4%
Kendal	2044	62%	46%	-16%
Lethabo	2041	75%	80%	5%
Matimba	2042	84%	75%	-9%
Majuba	2051	75%	63%	-12%
Medupi	2071	77%	63%	-14%
Tutuka	2030	49%	30%	-19%
Arnot	2029	61%	52%	-9%
Camden	2025	49%	53%	4%
Grootvlei	2027	59%	54%	-5%
Hendrina	2026	58%	51%	-7%
Kriel	2030	57%	54%	-3%
Average of plants considered		63%	56%	-7%

Table 24:Plant level EAF

Eskom projected the EAF per power plant to 2050, through the use of two scenarios (Eskom IRP, 2023): A 'corporate' and 'more optimistic' view used in their corporate planning, and a more conservative 'low' scenario that gives a downside version (B.McCourt, email dated 4 August 2023)[87]. These projections underpin the draft IRP 2023, together with an adjusted 'Gx Recovery EAF' scenario which reflects the collapse of the FGD stack at Kusile power station, amongst others. These scenarios are provided, at a fleet level, below Figure 43.

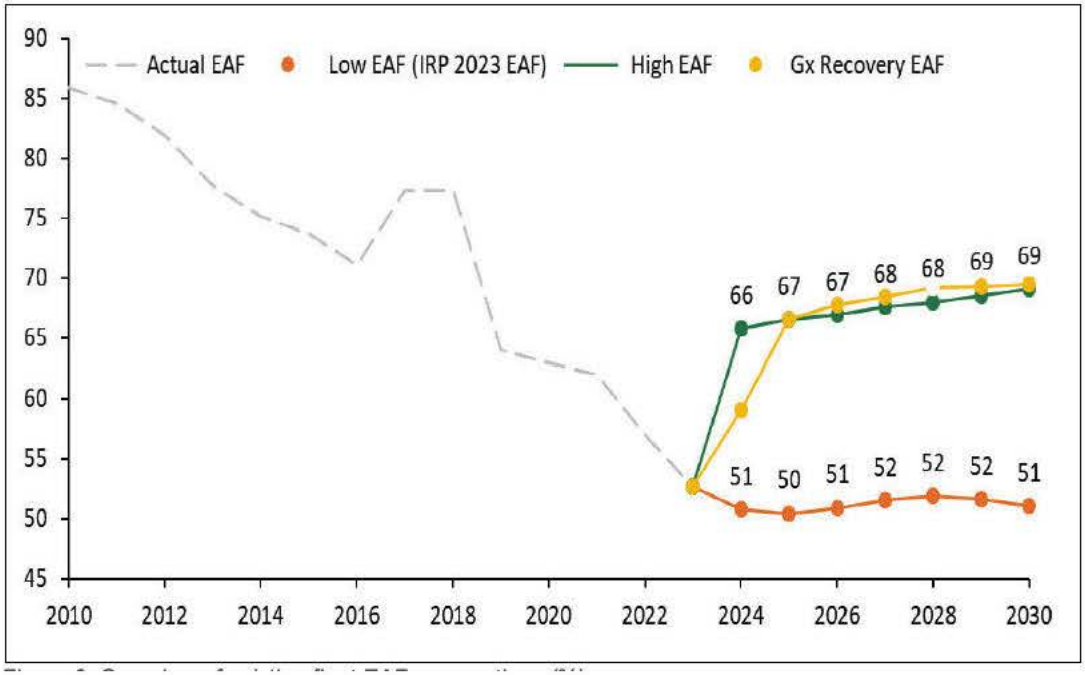
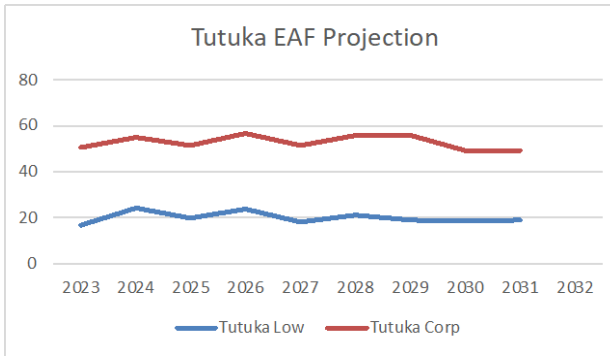


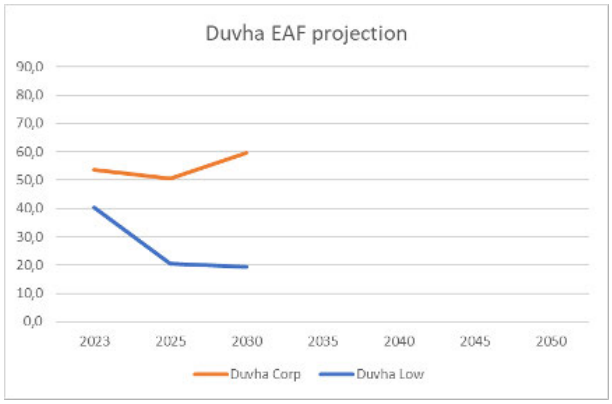
Figure 43: Overview of existing fleet EAF assumptions (%) (source IRP 2023 Figure 3)[88]

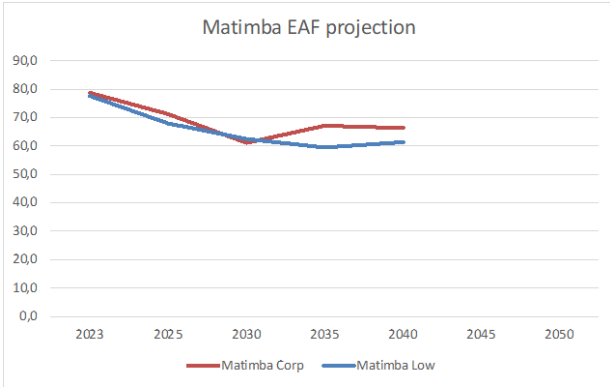
[87] *These EAF scenarios are described as including plans to upgrade local air pollution mitigation measures and plant decommissioning schedules in line with Eskom's Emission Reduction Plan 2035*

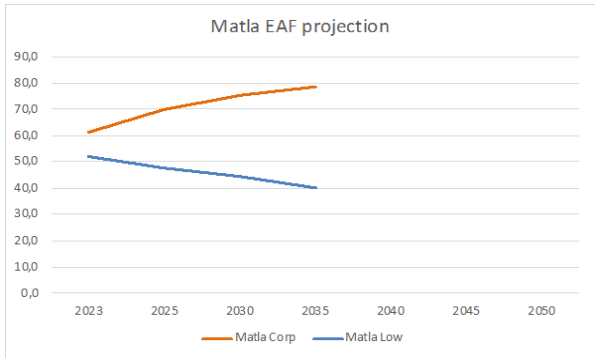
[88] *(confirmed by B.McCourt, email dated 4 August 2023). In the modelling underlying the ERP 2035 (scenario 2c), units remain on load until MES compliance projects are executed (Eskom powerpoint, Journey to 2035: Energy Planning Modelling, engagements with the NECA Panel, 18 October 2022). Therefore, minimal impact on EAF is assumed due to the MES retrofits, rendering the resulting EAF scenarios close to that of a scenario where no MES retrofits or decommissioning is required.*

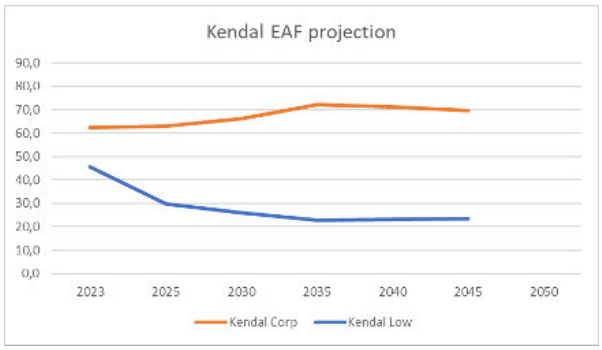
An analysis of Eskom's data for the nine youngest plants reveals both the level of anticipated performance of each plant going forward, together with how confident Eskom is that the plant will actually reach that level of performance. Eskom's 'Corporate' and 'Low' scenarios are plotted for each power plant, in Figure 44 below, providing a visual depiction of the extent of difference between the two scenarios. A timeframe to 2050 is shown for all plants except Tutuka, which is anticipated to close in 2031. The scenarios also allow something to be said about the potential for EAF improvement over time.

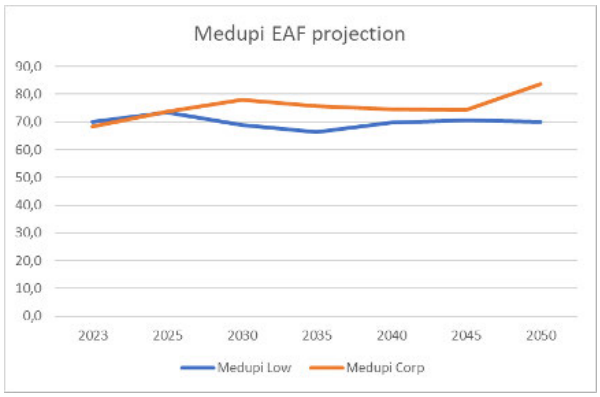


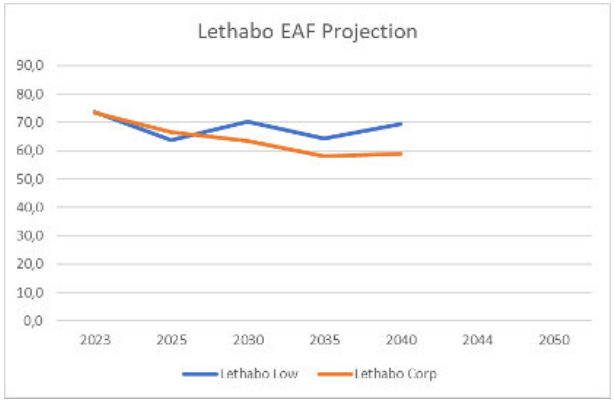












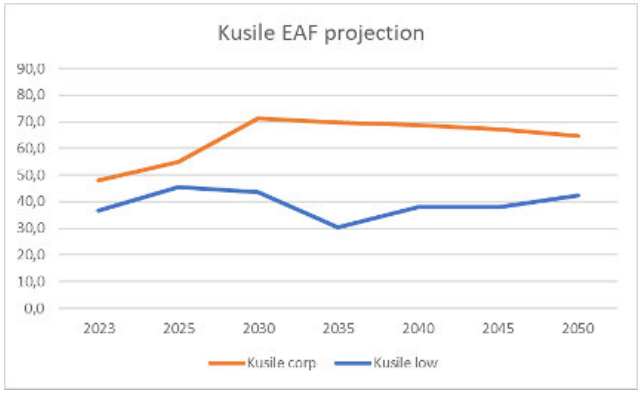
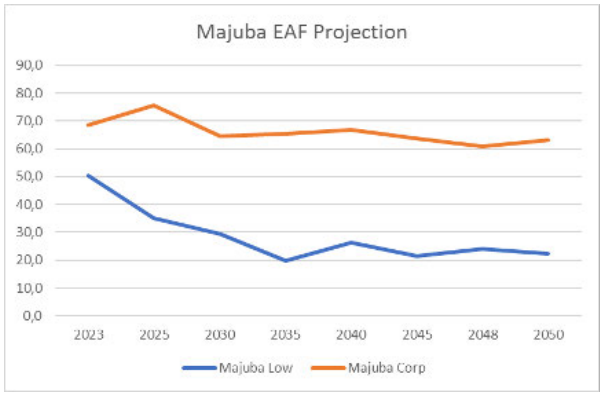


Figure 44: Eskom plant level EAF projections



Calculating the standard deviation from the mean of the average of each of Eskom's EAF scenarios at power plant level provides a crude indicator of the uncertainty of Eskom's projections per power plant. These 'uncertainty indicators' are shown in ascending order of uncertainty in **Error! Reference source not found.** below. It's clear from the table that Duvha, Matla, Kendal, Tutuka and Majuba have high future performance uncertainty. The subsequent graphs show that these plants also have a significant downside risk (reaching around 30% EAF by 2030 and declining further from there). The two scenarios for Lethabo, Matimba and Medupi – which have significantly lower uncertainty indicators ─ are much closer together and reveal EAF trajectories that are anticipated to remain strong for a longer time. Matimba declines until 2030 but then stabilizes. Kusile is included for context.

Power station	Uncertainty indicator
Matimba	2,4
Lethabo	2,8
Medupi	3,0
Matla	12,5
Kusile	13,9
Tutuka	16,3
Duvha	19,1
Majuba	19,7
Kendal	21,3

Table 25: An indication of uncertainty surrounding the future performance of each power station.

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11.7.4. Environmental levy

Eskom currently pays an Environmental Levy of 35c/MWh on all its coal plant. Whilst it also pays the South African carbon tax (which, at the time of writing, is R159/tCO2e, less exemptions). The tax is currently largely offset for the activity of electricity production, in acknowledgement of the Environmental Levy and the premium Eskom pays for renewable energy in the early Renewable Energy Independent Power Producer (REIPPP) auction rounds (Carbon Tax Act, 2019, 2019; Taxation Laws Amendment Bill, 2022). The carbon tax is considered more fully in section 11.11.2.

11.7.5. Summary

The analysis in this section shows large discrepancies in both the economics and performance of the different coal plants in Eskom's fleet, that are not correlated by plant age or location. This information is important to consider when imposing regulations that either

force a plant to retrofit costly abatement technologies, or to reduce or halt operations. A regulatory output that requires a plant with a high risk of poor performance coupled with high or uncertain coal costs to install expensive abatement equipment is unlikely to be money well spent. Conversely, forcing reduced operation or closure of a plant that is operating well and at low cost will have adverse implications for the cost of electricity. An alternative may be to reduce output or even close that plant early, concentrating abatement spend on the better performing and more economically sound plants in the fleet. This issue is discussed further in section 11.10 on electricity cost. Whilst information on coal costs and GHG emissions, together with poor past EAF performance, is captured in the Forum's power system modelling analysis (see section 12.2), the risk associated with plant performance into the future together with the risk of coal cost escalation are not. Neither are GHG emissions costed in the optimisation.

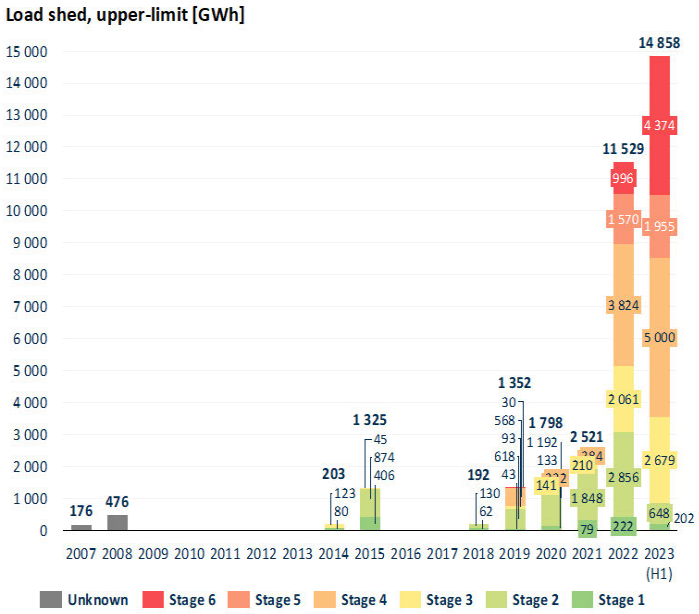
Considering the drivers of plant economics and performance per power plant serves the additional function of making these aspects explicit for the identification of possible direct or 'command-and-control' regulatory options (those involving conditions or technology specifications). These aspects are therefore captured in the Plant and PA level matrix (section 12).

11.8. Security of Electricity Supply

11.8.1. South Africa's current electricity crisis

It is common knowledge that South Africa's electricity system is not currently providing sufficient power to meet demand, thus resulting in frequent loadshedding which has been increasing in its extent. Table 27, by the CSIR, provides a summary of the incidents of loadshedding since 2007.

2023 overtook 2022 as the most intensive load shedding year on 10th May 2023. 2022 had 4.5 times more load shedding compared to 2021. Loadshedding continues to increase.



Year	Duration of outages (hours)	Energy shed (GWh)	DSR (GWh)
2007	-	176	Not available
2008	-	476	Not available
....	....	....	....
2014	121	203	Not available
2015	852	1 325	Not available
....	....	....	....
2018	127	192	392
2019	530	1 352	1 362
2020	859	1 798	1 426
2021	1 169	2 521	1 936
2022	3 773	11 529	8 301
2023-H1	3 741	14 858	10 803

Notes: Loadshedding assumed to have taken place for the full hours in which it was implemented. Practically, load shedding (and the Stage) may occassionally change/ end during a particular hour; Total GWh calculated assuming Stage 1 = 1 000 MW, Stage 2 = 2 000 MW, Stage 3 = 3 000 MW, Stage 4 = 4 000 MW, Stage 5 = 5 000 MW, Stage 6 = 6 000 MW;
Sources: Eskom Twitter account; Eskom Hld SOC Ltd FaceBook page; Eskom se Push (mobile app); Nersa; CSIR analysis

Table 27: Historical loadshedding (CSIR Forum modelling output deck, 2024)

11.8.2. Restoring adequacy of supply

This situation has multiple origins, and many factors will need to work in concert to improve it, with the coal EAF trajectories, discussed in section 11.7.2, and electricity demand being primary amongst these, given the inherent inertia in bringing new generation capacity online. Security of electricity supply is the objective of the National Energy Crisis Committee (NECOM), a multi-stakeholder committee which reports to the President. NECOM's Energy Action Plan combines immediate solutions to the energy gap, such as demand reduction and importing power, with longer-term strategies like accelerating the building of generation and storage capacity, expanding and improving infrastructure, 'fixing' Eskom and restructuring the sector, including attracting private investment. These actions are complex, involving multiple parties. It is therefore not certain how quickly they will take effect.

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- All other pathways restore security of supply from 2031 to 2

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11.8.3. Socio-economic impacts of inadequate electricity supply

The electricity crisis has been highly damaging for the South African economy and society. From an economic perspective, businesses are disrupted, output is reduced, and investment decisions are postponed or cancelled. Many estimations have been made of the cost of loadshedding to the economy, and these vary widely due to the inherent uncertainty of the calculation. Figure 48 below shows a selection, from the SARB[92] , indicating a range of

[92] *Van Rensburg, J. and Morema, K. (2023) Reflections on loadshedding and potential GDP. In SARB Occasional Bulletin of Economic Notes, June 2023. https://www.resbank.co.za/content/dam/sarb/publications/occasional-bulletin-of-economic-notes/2023/oben-2301-reflections-on-load-shedding-and-potential-gdp-june-2023.pdf*

between 0.4 – 4.2% reduction in GDP growth in 2022.

	Estimated impact on GDP growth (percentage points)	GDP lost (R million per day)	Description
PWC (2022)	Up to -3.1 in 2022		Reduction to real GDP growth, costing the economy up to 400,000 potential jobs.
Western Cape Government (2021)		500 per stage	
Eskom (Nova, 2021)	-0.4	236 in stage 1 to 942 in stage 4	Growth sensitivity to a 1% Load-shedding increase (as % of electricity sales).
Eskom (Nova, 2020)			R35 billion total cost to the economy between 2007 and 2019 in constant 2020 prices.
CSIR (2020)	-1.1 to -2.2 in 2019	700 per stage	Total cost of between 167 to 388 billion between 2007 to 2019, which is equivalent to around 0.3 to 0.7 of cumulative GDP since 2007. Costs in 2019 estimated at between 60 and 120 billion.
National Treasury (2019, Budget Review)	-0.2 in 2019		Estimated decline in GDP growth from expected decline in energy availability in 2019.
SARB (2019, April MPR)	-1.1 in 2019		Growth impact relative to baseline 2019 forecasts. Employment loss estimated by 125 000 jobs.
Morema et al (2019)	-0.3 in 2019	348 in stage 1 to 753 in stage 4	Assuming load-shedding continued throughout 2019.
Goldman Sachs (2019)	-0.9 in 2019		Estimated decline in GDP growth if load-shedding persisted throughout 2019.
RMB Morgan Stanley (2019)	-0.5		Growth sensitivity to a 10% power supply cut (annualised).
National Treasury (2015, Budget Review)	-1 in 2015		Estimated real GDP growth impact of electricity shortages in 2015.

Figure 49 Estimates of load-shedding in South Africa (Source Codera Analytics, 2022)

provides further estimates of the impacts of loadshedding, from additional studies, including on possible impacts on employment.

Institution	Methodology	Impact (%)
Absa	Ordinary Least Squares (OLS)	1.3
FNB	OLS	0.4–0.5
Investec	Working day adjustments	0.2–0.4
PWC	Input-output modelling	3.5–4.2
Intellidex	Working day adjustments	0.9–2.2
SARB (Model 1 – Morema, Rakgalakane, Alton and Mjandana (2019))	Working day adjustments	0.7
SARB (Model 2 – Mpini, Walter and Makrelov (2019))	CGE	3.2
SARB (Model 3 – SARB Quarterly Bulletin, March 2022)	OLS	2.1

Source: SARB, Absa, FNB, Investec, PWC and Intellidex

Figure 48: Expected loadshedding impact on 2022 economic growth (source SARB, 2023)

`	Estimated impact on GDP growth (percentage points)	GDP lost (R million per day)	Description
PWC (2022)	Up to -3.1 in 2022		Reduction to real GDP growth, costing the economy up to 400,000 potential jobs.
Western Cape Government (2021)		500 per stage	
Eskom (Nova, 2021)	-0.4	236 in stage 1 to 942 in stage 4	Growth sensitivity to a 1% Load-shedding increase (as % of electricity sales).
Eskom (Nova, 2020)			R35 billion total cost to the economy between 2007 and 2019 in constant 2020 prices.
CSIR (2020)	-1.1 to -2.2 in 2019	700 per stage	Total cost of between 167 to 388 billion between 2007 to 2019, which is equivalent to around 0.3 to 0.7 of cumulative GDP since 2007. Costs in 2019 estimated at between 60 and 120 billion.
National Treasury (2019, Budget Review)	-0.2 in 2019		Estimated decline in GDP growth from expected decline in energy availability in 2019.
SARB (2019, April MPR)	-1.1 in 2019		Growth impact relative to baseline 2019 forecasts. Employment loss estimated by 125 000 jobs.
Morema et al (2019)	-0.3 in 2019	348 in stage 1 to 753 in stage 4	Assuming load-shedding continued throughout 2019.
Goldman Sachs (2019)	-0.9 in 2019		Estimated decline in GDP growth if load-shedding persisted throughout 2019.
RMB Morgan Stanley (2019)	-0.5		Growth sensitivity to a 10% power supply cut (annualised).
National Treasury (2015, Budget Review)	-1 in 2015		Estimated real GDP growth impact of electricity shortages in 2015.

Figure 49 Estimates of load-shedding in South Africa (Source Codera Analytics, 2022)[93]

Whilst the uncertainty is large, so are the numbers and effects implied. The SARB publication also notes that GDP equally impacts potential economic growth, not only actual growth figures. The economic impact is felt in the short term, but also has long term implications as economic capacity is undermined, maintenance delayed and confidence reduced[94] . The impacts of this period will be felt for decades to come.

Beyond these initial studies for South Africa, there is high quality evidence from other countries to suggest that we can expect negative socio-economic effects in South Africa. A

[93] Codera Analytics, Estimations of load shedding impact in SA, May 2022. https://codera.co.za/estimates-of-load-shedding-impact-in-sa/

[94] Research by the South African Reserve Bank (2019, 2022) and Walsh et al (2021) find negative effects of loadshedding on GDP growth.

peer-reviewed academic study by Mensah (2024) [95] finds that electricity shortages are a major contributory factor to unemployment in Africa, associated with a 13.5% decrease in the probability of employment, with skilled jobs and employment in non-agricultural sectors being the most affected. Further, the study finds evidence that this is due to the negative impact on incumbent firms, constraining the expansion of the production sectors of the economy, together with outages disincentivising entrepreneurs and investors.

Whilst there has been little research into the impact of loadshedding on mortality in developing countries, there are many reasons to expect why it might have such an impact[96]. Power outages decrease the ability to regulate ambient air temperature and quality, and affects the quality of medical care. In a 2018 study by Apenteng et al[97], a positive association was found between the frequency of power outages and in-facility mortality in Ghana, with a 43% risk of mortality per day that the power was out for over two hours. Power outages cause food cold chains, sanitation, bulk water and sewerage infrastructure to become unreliable. Street and traffic light failures could lead to an increase in accidents. Lack of lighting and security could increase crime. Whilst there is substantial health literature on the effect of electricity on health outcomes, including on the impact of temperature regulation[98], especially for elderly people, direct evidence of the morbidity implications of power outages

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[95] Mensah, JT (2024). Jobs! Electricity shortages and unemployment in Africa. Published in the Journal of Development Economics, 167 (2024) 103231. https://doi.org/10.1016/j.jdeveco.2023.103231

[96] Budlender, J. 2024, doctoral thesis research work, University of Cape Town, in progress.

[97] Bettye A. Apenteng, Samuel T. Opoku, Daniel Ansong, Emmanuel A. Akowuah & Evans Afriyie-Gyawu (2018) The effect of power outages on in-facility mortality in healthcare facilities: Evidence from Ghana, Global Public Health, 13:5, 545-555, DOI: 10.1080/17441692.2016.1217031

[98] Neidell et al (2021). The unintended effects from halting nuclear power production: Evidence from Fukushima Daiichi accident. In Journal of Health Economics 79 (2021) 102507, and He and Tanaka (2023). Energy saving may kill: Evidence from the Fukushima nuclear accident. In American Economic Journal: applied economics 2023, 15(2): 377-414. https://doi.org/10.1257/app.20200505

is again limited. A study by Gehringer et al[99] finds evidence for increased paediatric hospital admissions in Cape Town, and also in Cape Town, Lawson finds evidence for increased residential fires[100].

11.8.4. MES compliance and security of supply

Whilst the power system remains insecure, conditions / regulations that enforce local air emissions mitigation will increase the risk of loadshedding quantified in section 11.8.1. There is a direct trade-off between loadshedding and air quality, whilst there is inadequate power on the system. This does not mean that energy security is sacrosanct – whilst there is insufficient clean electricity generation capacity, there will be a trade-off between full energy security and air pollution, but this trade off is one of degrees, it is not binary. It may be that some increased degree of loadshedding risk can be tolerated to improve local air quality.

The margin by which adequacy is restored is also relevant; it will take time to provide a sufficient margin of electricity supply to either start reducing coal burnt by the coal plants and / or to enable all necessary local air pollutant retrofits to be undertaken without putting energy security in jeopardy. This will require prioritisation of particular plants and therefore municipalities and regions. This process that can be assisted with reference to a multi-dimensional decision-making framework of the type developed in this report.

Decisions to either retrofit, reduce the utilisation of or close down a coal fired-power plant early require long lead times and, particularly in the case of closing down a coal plant, careful planning to ensure that communities are adequately supported. As has been demonstrated

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[99] Gehringer, C., Rode, H., and Schomaker, M. (2018). The effect of electrical load shedding on paediatric hospital admissions in South Africa. Epidemiology, 29(6):841.

[100] Lawson, K. (2022). Electricity outages and residential fires: Evidence from Cape Town, South Africa. South African Journal of Economics.

by the loadshedding projections in section 11.8.1., it is possible to anticipate the degree of loadshedding risk in a system. A composite of indicators, tracking the past quarter's power system performance, could refine these projections, indicating when and how much additional coal capacity can be taken offline permanently, or for retrofitting. This indicator basket would require careful development, but could possibly include:

- The extent of loadshedding implemented;
- The Unplanned Capability Loss Factor (UCLF) of the coal fleet; and
- Peaking plant and Risk Mitigation Independent Power Procurement Programme (RMIPPP) utilisation levels.

11.8.5. Electricity adequacy in the longer term

Over the longer term, once the current loadshedding crisis has subsided (most likely between 2027 and 2029, as per existing projections), there is no reason why the South African power system should battle with ongoing electricity security issues, assuming adequate power sector forward planning, including the establishment of market structures that enable providers of power infrastructure to respond to the quantity and type of power demand.

11.9. Longer-term dynamics in power supply

The South African power sector is in a period of disruptive transition, a defining factor for the Forum's considerations. Much power infrastructure, especially coal plants and emissions abatement technologies, have economic lives up to and beyond 50 years, and long and inflexible lead times in respect of the decision making and execution related thereto. This requires that decisions made about these in the shorter term take cognisance of longer term trends and dynamics in the power sector.

11.9.1. Decarbonisation

Foremost of the drivers of change in global power sectors is the global decarbonisation agenda. The 2015 United Nation's Paris Agreement committed the world to holding *'the*

increase in the global average temperature to well below 2°C above pre-industrial levels' and to '*pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels'*[101]. Since then, this global ambition has been strengthened following the publication of the Intergovernmental Panel on Climate Change's Special Report on Global Warming of 1.5°C, which showed that there are clear benefits and avoided harms by limiting warming to 1.5°C as opposed to 2°C[102].

This strengthening of ambition has been reflected in subsequent Conference of the Parties' ("COP") meetings and agreements, including the Glasgow Climate Pact of COP26, which recognised the need to reduce emissions by 45% by 2030 and to net zero by 2050 in order to limit warming to 1.5°C.

The first UN global stocktake (GST), which reports on the global progress made towards achieving the goals of the Paris Agreement, was presented at COP28 last year. The GST indicated that current emissions reduction pledges are insufficient for achieving the goal of limiting warming to 1.5°C. Responding to this, the UAE Consensus, agreed to at COP28, included an unprecedented reference to the need for global energy systems to transition away from fossil fuels. This was accompanied by a pledge by 123 countries (excluding South Africa) to triple the world's installed renewable energy capacity to at least 11000 GW by 2030.[103]

Together, these agreements have sent an unmistakable international market signal for a shift from fossil fuels to energy systems based on renewable energy technologies and storage, with the International Energy Agency ("IEA") projecting that global demand for coal,

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[101] UNFCCC (2015) *The Paris Agreement*. United Nations. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf (Accessed: 21 October 2020)

[102] IPCC (2018) *Summary for Policymakers SPM. Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change*.

[103] https://www.cop28.com/en/global-renewables-and-energy-efficiency-pledge

oil and gas will all peak this decade[104]. This long-term decline in demand for fossil fuels will be driven largely by significant increases in the volumes of renewable energy and storage, the prices of which have fallen dramatically over the past decade[105]. The IEA's (2023) Net Zero Roadmap update indicates that tripling global renewable energy capacity by 2030 provides the largest emissions reductions in a net zero scenario, along with the complete phase out of unabated coal based energy by 2040.

These developments are increasingly impacting the economics of electricity generation in South Africa going forward, including through technology, financing, and fuel input costs. Renewable energy and storage technology prices have plummeted in the past decade, and will continue to do so. Whilst there are integration and transition challenges to systems dominated by renewable power, these types of systems represent the least-cost way of providing power even without accounting for the cost of pollution (local air emissions, GHGs, water and waste)[106]. Power systems internationally are decentralising, digitalising and decarbonising, finding different ways, to that of fossil fuel dominated systems, of delivering reliable, affordable and adequate power.

The decarbonisation imperative and implications extend beyond the supply side of the power sector. A decarbonised power sector is also an imperative for enabling the decarbonisation of other sectors, where electrification represents the least-cost option for lowering emissions

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[104] EA (2023) *Net zero roadmap: A global pathway to keep the 1.5 °C goal in reach - 2023 update*.

[105] IRENA (2023) *Renewable Power Generation Costs in 2022*.

[106] References include IEA, World Bank, Meridian Economics, PCC, CSIR: Merven, B. *et al.* (2021) *Climate mitigation in South Africa*. SA-TIED. Available at: https://sa-tied.wider.unu.edu/article/climate-mitigation-south-africa. Energy Systems Research Group (2022) *Exploring net zero pathways for South Africa: An initial study*. University of Cape Town. Available at: https://zivahub.uct.ac.za/articles/report/Exploring_net_zero_pathways_for_South_Africa_-_An_initial_study/22189150; Meridian Economics (2023) *Achieving net-zero in South Africa's power sector*. Available at: https://meridianeconomics.co.za/our-publications/achieving-net-zero-in-south-africas-power-sector/.

– for example switching to electric mobility in transport, and moving away from coal and gas use in industry.

South Africa has the highest carbon intensity of power generation globally. Coal power generation is the most GHG intensive form of power generation, and South Africa's coal fleet is largely old and emissions intensive.

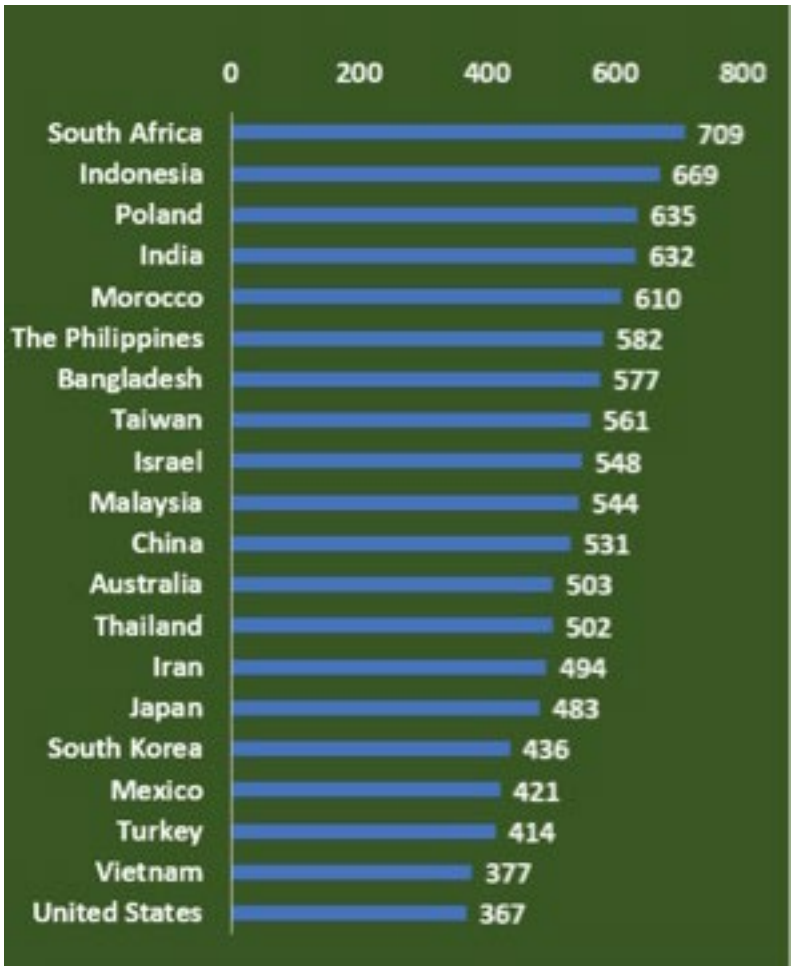

Figure 50: The relative carbon intensity of South Africa's power supply (in gCO2/KWh) (Source, Reuters, 2023)

As the world's nations strive to adhere to the Paris Agreement decarbonisation commitments, South Africa's carbon intensive power production will become increasingly economically disadvantageous. Whilst there is some room for flexibility, based on the

UNFCCC[107] principle of '*Common but Differentiated Responsibility and Respective Capabilities'*, market forces will tend towards the average level of effort, penalising economies that are more carbon intensive.

Embedded power sector emissions are relevant for South African companies, whose access to and cost of financing is increasingly being determined by carbon intensity. Further, carbon intensity is critically important for exporters. Carbon taxes on exports will start to include that of embedded electricity emissions from 2026 under the EU's Carbon Border Tax Adjustment Mechanism, attracting charges at EU Emissions Trading Scheme Allowance rates, which in the past two years have been between 60 and 100 Euros[108]. Power users will therefore increasingly require low carbon power.

Existing power system configurations are important determinants of what the transition to zero carbon power systems looks like in any one context. South Africa's overwhelming historical reliance on coal-fired power is a key feature of the country's power sector transition, technologically as well as socio-economically. An important technical aspect of the transition will be the ability of the coal plant to run more flexibly, to enable faster build out of clean variable power without locking into further fossil fuels in the form of natural gas. Eskom's coal fleet has historically been designed to run at relatively high 'stability factors', and utilisation rates. There are ways in which these stability factors and utilisation rates can be lowered through investment in the plant, enabling less coal to be burnt (with correspondingly fewer GHG and local air quality emissions), and the plant to remain playing an important role in the transitioning of the power system. This technical innovation is something other countries with sizeable existing coal power plants, such as China and Australia, are currently exploring.

As the Paris Agreement goals become increasingly internalised in domestic policies (see section 11.11) and market pricing, the Eskom coal fleet will experience both increasing policy

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[107] *UNFCCC, 1992, Article 3, paragraph 1.*

[108] https://ember-climate.org/data/data-tools/carbon-price-viewer/ Accessed 15 February 2023

and price pressure to burn less coal (achieved through lower plant utilisation rates), and pressure to close coal plants down earlier than anticipated in Eskom's ERP 2022. It will become increasingly costly for the economy to keep the coal plant running at the utilisation rates and lifetimes that the plants were designed for.

11.9.2. Decentralisation

South Africa's power sector has historically been structured as a state-owned, vertically integrated monopoly. Eskom generated, transmitted and, together with Municipalities, distributed power. However, South Africa's stated policy intention (contained in the 1998 Energy White Paper and the more recent Department of Public Enterprises 'Roadmap for Eskom in a Reformed Electricity Supply Industry', 2019) is to liberalise the sector. This process is already underway, with recent changes to licencing requirements of private generators, in particular the lifting of the licencing threshold of plant generation greater than 1MW. Further regulatory reform is due to be considered in terms of the Electricity Regulation Amendment Bill which is currently before Parliament. As such, private energy generation - both small scale residential and commercial as well as utility scale ─ is increasing exponentially, primarily with renewable energy technologies, which represent least-cost new build generation capacity. These developments are evidenced in the NECOM data in Figure 51, with the Wind, CSP and PV categories representing the Eskom procured Renewable Energy Independent Power Programme, 'Other' and 'Distributed RE', being private build (residential, commercial and industrial).

Both the decarbonisation and decentralisation drivers will have a significant impact on Eskom, historically a vertically integrated State-Owned Entity and the dominant power sector player. Power consumers will increasingly have alternative suppliers of power, and will themselves be responding to the decarbonisation agenda. GHG emissions intensive power will, however, only become more costly going forward.

11.10. Electricity cost

Because of the systemic nature of power provision, the cost of electricity supply is determined at a power system level - a reflection of the many interacting factors that contribute to producing a consistent, balanced power supply. Cost components include the capital costs of building power system capacity (generation, transmission and distribution), together with the operating costs of maintaining the infrastructure and fuel. Generation plants differ in the roles they play in the system and therefore cannot be considered in isolation.

Timeframes are also important. The cost of building a new power plant today may be different from building a plant in five years' time, given trends in technology costs. In addition, some generation plants have ongoing fuel costs to consider, others, such as renewable energy, do not.

Whilst individual consumers may choose off-grid power supply solutions, historically these have been less able to take advantage of the economies of scale and security of supply offered by grid scale solutions. This is changing but will remain true for most consumers well into the future.

Of interest to the Forum then, is the cost of supplying the country with grid power, how this could be impacted by the local air emissions reduction imperative, and who ultimately pays for this abatement.

11.10.1. Affordability of electricity

Electricity is essential for the running of a modern society and economy, and increasingly so as the world decarbonises. Electricity is an input across the economy, and a clean and safe source of energy for citizens, when compared to, for example, the use of wood, gas and paraffin. Affordable electricity is therefore a base determinant of economic activity and social well-being at a national level, which is embedded in social and economic development policies such as South Africa's Energy Policy White Paper (1998) and the National Development Plan (2013). Maintaining an affordable electricity supply is therefore key to South Africa's future socio-economic development.

The Forum's power system modelling indicates that even without any further local air quality abatement technology retrofits or improved compliance with the MES, there will be a steep rise in the price of electricity between 2020 and 2025, whereafter it is anticipated to stabilise for the longer term (see Figure 52). An analysis of the next few years therefore shows that any further increases in the price of power will be particularly difficult for society and the economy to tolerate.

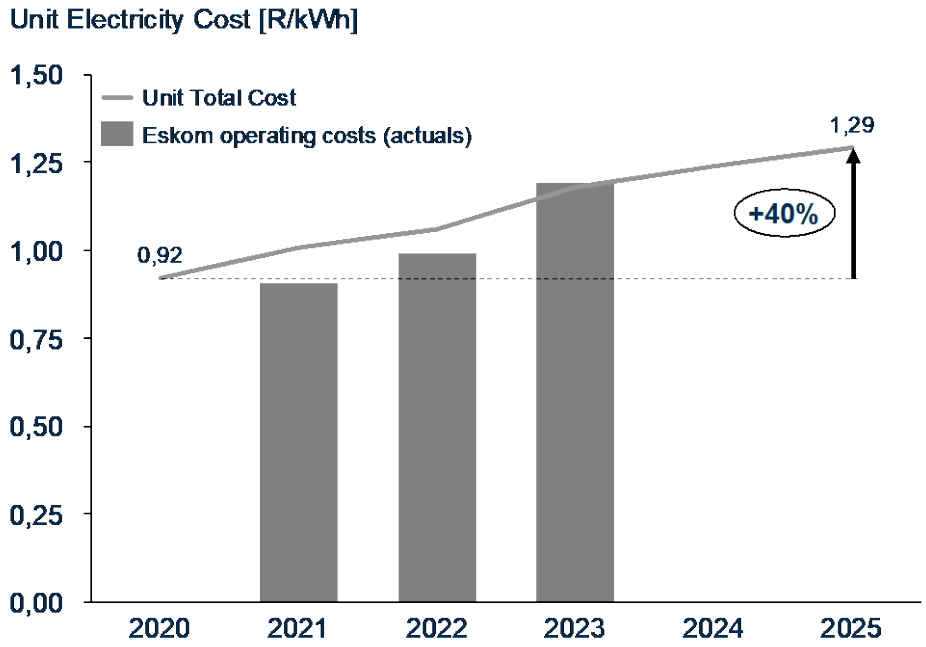

Figure 52: Electricity cost to 2025 (Source: CSIR Forum power system modelling, 2024)

11.10.2. The impact of local air emissions abatement on electricity cost

The generation of electricity causes local air pollution to the extent that electricity is produced by unabated fossil fuel power plants. As has been described in section 11.5, reducing local air pollution associated with the generation of electricity can therefore be achieved by either installing abatement technologies at emitting plants, or by reducing the contribution of these plants to the power supply. These options, or a combination thereof, at the individual plant level, will have different implications for the total cost of electricity generation to the country, depending on how they interact with the other cost drivers implicit in the power system over the longer term – the long-term perspective is particularly important given the long-term lifetimes of South Africa's power infrastructure. Whilst the cost of retrofitting different types of local air pollutant abatement technologies has been described in section 11.5, these technology costs do not translate linearly to an increase in electricity costs. Similarly, it is not possible to associate a cost (or possible saving, particularly in the long-term) to the replacement of coal-fired power with clean alternatives, as this is systemically determined.

For example, extending GOs in order to retrofit emissions abatement technologies may result in additional loadshedding or require temporary additional use of peaking plants, which are typically significantly more expensive to run than coal plants. This, together with the abatement technology costs will produce an upward pressure on electricity costs. The magnitude of this could be compared against the cost of building clean generation capacity (nuclear or renewables plus storage) to replace the coal plants before the end of its anticipated life, reducing emissions in the longer term.

These dynamics can only be considered in the context of a full power system model, as the generation constraints and characteristics of a coal plant are different from those of variable renewable energy plants, or peaking plants fired by diesel or gas. Whilst coal-fired power still currently represents the cheapest source of power on the South African grid at the margin, this situation is changing rapidly as renewable energy and storage technology costs continue to decline, and the externality costs of GHG and local air pollutants emissions are increasingly internalised both on the demand side (consumers don't want emissions intensive power), and on the supply side through pricing of GHG emissions, and the implementation of local air quality regulation.

The interaction of increased availability of renewables and other clean generation technology and the likelihood of coal attracting a carbon price (either explicitly through the South African carbon tax regime or implicitly through higher financing costs for coal mines, embedded industrial GHG emissions and international taxation on embedded GHG emissions), will impact the economic attractiveness of installing local air quality abatement technologies versus replacing coal plants with cleaner forms of power generation.

These dynamics are captured in the Forum's modelling assumptions, which has been key to exploring the implications of various abatement strategies on the cost of electricity.

11.10.3. Emissions abatement, who pays?

Given that Eskom is a regulated State-Owned Entity, any additional cost incurred from emissions abatement, either in the form of technology retrofits or reduction in coal burn will be split between the fiscus and the electricity consumer.

Electricity supply costs that Eskom is allowed to recover in the electricity tariff are determined by the National Electricity Regulator of South Africa (NERSA) through an ongoing regulatory process. What Eskom cannot recover will impact its financial viability, which impacts the cost of its current financing structures together with the cost at which the Utility can access finance going forward. In recent times, Eskom has not been allowed a full cost recovery in its tariffs, which has been a contributing factor to the State stepping in with a bail-out regime to address the Utility's ballooning debt. When the fiscus bails Eskom out in this manner, it diverts government expenditure from social and welfare budget items, and affects the government's own credit rating, making its current debt holdings and ability to access debt going forward more expensive.

Emissions abatement costs therefore impact the whole of South Africa's economy and society, and not just Eskom. The exception to this is if international funding can be sourced for forms of emissions abatement technology retrofits or a reduction in coal burnt. A very real possibility exists for this under the Just Energy Transition Partnership (JETP) between South Africa and a group of developed country partners, as part of the global climate change response (See section 11.11.1). However, because of reduced coal burn targets, international GHG reduction as well as local air quality emissions, this form of abatement is likely to be more attractive to the JETP International Partners Group.

11.11. GHG commitments

11.11.1. South Africa's International Climate Commitments

As stated above, South Africa is a signatory to the Paris Agreement and, in an effort to achieve the objectives of the Agreement, signatories are required to submit **Nationally Determined Contributions (NDCs)** outlining actions they will take to reduce their GHG emissions. South Africa's NDC (last updated in 2021) outlines a target national emissions range of between 398 and 510 Mt CO_2e by 2025 and between 350 and 420 Mt CO_2e by 2030. The upper limit of this range is proposed as being consistent with a fair contribution to the Paris Agreement's 2°C temperature rise goal while the lower limit is consistent with

the 1.5°C temperature rise goal[109]. Importantly, the Paris Agreement stipulates that NDC's must be updated every five years, with each successive iteration representing a progression that reflects each country's highest ambition. The stringency of South Africa's mitigation targets is therefore expected to increase over time, requiring more ambitious mitigation measures, including for the power sector. South Africa is next required to submit an updated NDC in early 2025, to cover the period 2030-2035.

The electricity sector has the greatest low-cost mitigation potential of all sectors in the South African economy[110]. Therefore, the power sector is the priority for decarbonisation this decade, and represents the bulk of the mitigation effort to achieve South Africa's NDC. Energy system modelling, underpinning the country's climate policy positions, suggests that the power sector should achieve below 167MT of emissions by 2030 in order for the South African economy to achieve its NDC cost effectively[111]. However, this range is not defined in policy, and will need to include policy and political considerations. The level of mitigation effort required by the power sector is contested – the draft IRP proposes a far higher range.

In addition to NDC's, signatories to the Paris Agreement are encouraged to submit long-term low GHG development strategies that place their national climate commitments within the context of long-term planning and development priorities. South Africa's **Low-Emissions Development Strategy (SA-LEDS)** aspires to a goal of reaching net-zero

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[109] The Presidency (2022) *South Africa's Just Energy Transition Investment Plan (JET IP) 2023-2027*.

[110] *Department of Environmental Affairs (2014)* South Africa's greenhouse gas (GHG) mitigation potential analysis*. Pretoria, Department of Environmental Affairs; Merven, B.* et al. *(2021)* Climate mitigation in South Africa*. SA-TIED. Available at: https://sa-tied.wider.unu.edu/article/climate-mitigation-south-africa. Energy Systems Research Group (2022)* Exploring net zero pathways for South Africa: An initial study*. University of Cape Town. Available at: https://zivahub.uct.ac.za/articles/report/Exploring_net_zero_pathways_for_South_Africa_-_An_initial_study/22189150; Meridian Economics (2023)* Achieving net-zero in South Africa's power sector*. Available at: https://meridianeconomics.co.za/our-publications/achieving-net-zero-in-south-africas-power-sector/.*

[111] The Presidency (2022) *South Africa's Just Energy Transition Investment Plan (JET IP) 2023-2027* and the World Bank South Africa Country Climate Development Report, 2022.

emissions by 2050 and sets out a vision for '*a low-carbon growth trajectory while making a fair contribution to the global effort to limit the average temperature increase, while ensuring a just transition and building of the country's resilience to climate change'*. The SA-LEDS mid-century net zero aspiration provides a domestic translation of international developments in the global energy sector, referencing both a 1.5°C emission reduction trajectory and net zero date.

An analysis conducted by the IEA (2023) shows that the electricity sectors in emerging market and developing economies will need to reach net zero before 2045 to be in line with the 1.5°C global temperature goal. None of the scenarios considered for post-2030 in the draft IRP 2023 achieve net zero by 2050, let alone 2045. Furthermore, no new unabated coal plants or new long-lead time upstream oil and gas projects are built in any country in the IEA's (2023) net zero emissions scenario. Instead, renewables capacity triples, with 40% of electricity coming from wind and solar PV in 2030.

The coal plant decommissioning schedule embedded in Eskom's 2022 board-approved Emission Reduction Plan sees all of the mid-life and younger coal stations, except Tutuka, still running after 2040, the date the IEA identifies as the limit for the operation of unabated coal-fired power stations under a global net zero scenario[112]. Although emissions from coal can be reduced by Carbon Capture Utilisation and Storage (CCUS) technologies, the high costs associated with retrofitting coal abatement technologies excludes them from least-cost electricity systems in several modelling studies[113].

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[112] The IEA 2023 target of power sector net zero by 2045 allows space for gas capacity to continue to play a peaking role.

[113] National Business Initiative (2021) Decarbonising South Africa's power system; Meridian Economics (2023) Achieving net-zero in South Africa's power sector; Presidential Climate Commission (2023) Technical report supporting the recommendations for South Africa's electricity system.

The trajectory to the net zero date matters, and this implies constraints on emissions until the net zero date, as well as the achievement of that date. How much unabated coal is burnt in Eskom's power plants on the path to net zero has direct implications for South Africa's ability to honour its international commitments.

South Africa has secured funding against its international climate commitments, including an initial $8.5 bn pledge under the **Just Energy Transition Partnership (JETP)** agreed to at COP26. In recognising South Africa's net zero aspirations, the JETP focuses on the electricity sector, and resolves to '*accelerate the decarbonisation of South Africa's electricity system to achieve the most ambitious target possible within South Africa's NDC range'*. Increasing energy efficiency, deploying renewable energy, and accelerating the retirement of coal-fired power stations are underlined as key actions in decarbonising the electricity system.

The JET Implementation Plan (JET IP), published in 2022, has been endorsed by Cabinet and the signatories to the JETP, and sets out the scale of investments needed to enable a just energy transition that diversifies the energy mix while simultaneously addressing issues of inequality, poverty and unemployment. The decommissioning of coal and the deployment of renewable energy at scale and pace are two of the key infrastructure investment priorities outlined in the JET IP for transitioning the electricity sector to a low-emissions trajectory.

These decarbonisation measures are paired with a plan to develop green industrialisation opportunities to enable the creation of quality green jobs while increasing renewable energy generation. While the conditions under which the JET IP funding may be withdrawn are unclear, misalignment with the JET IP goal of '*accelerated decarbonisation to achieve the most ambitious target possible within South Africa's NDC range'* puts this funding source at risk.

11.11.2. Domestic Climate Policies and Measures

Domestic policies and legislation are being developed in order to give effect to South Africa's international commitments. Primary amongst these are a carbon tax (remit of National Treasury) and the Climate Change Bill (remit of the DFFE).

The Climate Change Bill[114] aims to provide '*an effective climate change response and a long-term, just transition to a low-carbon and climate-resilient economy and society for South Africa in the context of sustainable development'*[115], highlighting the importance of policy alignment and the need for '*climate change considerations to be integrated into the making of decisions which may have a significant effect on the Republic's ability to mitigate or which exacerbate its vulnerability to climate change'*. The Bill makes provision for the establishment of Sectoral Emissions Targets ("SETs") as a key mitigation measure. SETs will be determined for GHG emitting sectors including electricity, establishing emissions reduction goals that are aligned with the national GHG emissions trajectory, which is currently set by the NDC. The Minister(s) responsible for electricity must then develop or amend policies and measures to ensure the achievement of the sector level SET. The Bill also makes provision for company-level carbon budgets to be made mandatory. Eskom has a voluntary carbon budget currently.

The carbon tax is based on the polluter pays principle and imposes a tax on GHG emissions to provide price signals that help shift the economy in a more sustainable direction. Currently in its first phase (2019-2025), Treasury has announced a headline tax rate of R308/tCO2e. In the second phase from 2026, that escalates to R462/tCO2e by 2030, subject to international carbon price developments[116]. As in the first phase, this rate will continue to

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[114] The Bill was passed by the National Assembly on 24 October 2023 and is currently under consideration by the National Council Of Provinces after which it will pass to the President for final approval.

[115] Department of Forestry, Fisheries and Environment (2022) Climate change bill. Available at: https://pmg.org.za/bill/1065/.

[116] National Treasury (2022). Taxation Laws Amendment Bill

be discounted through the application of various categories of exemptions, although Treasury has indicated that these will reduce[117]. The carbon tax will further align with DFFE's mitigation policy suite in the Climate Change Bill once this has passed into an Act. Most significantly, emissions above a company's carbon budget will attract a significantly increased tax rate (currently R640/tCO2 (National Treasury, 2023)) [118].

Emissions from the electricity sector are offset in the first phase, through a combination of the environmental levy (see section 11.7.4) and the premium Eskom pays for electricity from early REIPPPP projects. Whilst it is not clear to what extent these offsets will be retained into the second phase[119], Treasury has acknowledged the need to fully examine the impact of removing this concession on power users.

11.11.3. Implications across Eskom's coal plants

The impact of decarbonisation policies and pricing on the cost of coal-fired power will differ between power plants depending on their CO_2 emissions intensity. These intensities, therefore, become relevant inputs in a multi-dimensional analysis of the fleet, and are provided in descending order in Figure 53.

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[117] Budget Review, 2022

[118] The company level budgets will become mandatory on the passing of the Bill into an Act. The budgets are accompanied by a GHG management plan, currently Pollution Prevention Plans.

[119] National Treasury. (2023). Final Response Document on the 2022 Tax Bills.pdf.

	tCO2/MWh
Matla	1,19
Duvha	1,12
Kendal	1,18
Lethabo	1,08
Matimba	0,99
Majuba	1,25
Medupi	0,92
Tutuka	1,23
Arnot	1,30
Camden	1,38
Grootvlei	1,44
Hendrina	1,38
Kriel OG	1,23
Kusile	1,00

Figure 53: Carbon dioxide emissions intensity of Eskom's coal plants (Eskom, IRP data, 2023)

Due to the systemic nature of the power sector, its GHG emissions profile is determined by the particular set of technologies generating power, at any particular time, to meet demand and keep the system in balance. Therefore, whilst it is important to understand the contribution of individual power plants, GHG emissions of possible regulatory scenarios can only fully be determined at the power system level through a tool such as power system modelling. GHG emissions is one of the indicators reported in the power system modelling analysis.

Reducing coal burn through lower coal plant utilisation and closing plants early has positive indications for local air emissions, which are reduced as coal is phased down and out: closing coal plants early and / or decreasing the rate at which they are utilised has positive

impacts on both GHG emissions and local air quality. CCS or local air quality retrofits only impact one of these two environmental problems. For FGD, direct CO_2 emissions actually increase by around 1% due to the efficiency penalty associated with FGD. Retrofitting the coal plant to run at lower utilisation rates and more flexibly can both enable a reduction in coal burnt and facilitate a lower cost and faster transition to a lower carbon power system.

12. OVERVIEW OF ANALYTICAL TOOLS USED

The Forum has undertaken a multi-dimensional and multi-scalar analytical approach to explore options for achieving sustainable compliance with the MES. Because the various dimensions are impacted at different scales, we employ tools that focus on these different scales. A Plant and Priority Area (PA) Matrix tool focuses on the plant and PA scale, whilst power system modelling considers the power system scale. Finally, a multi-dimensional, multi-scalar assessment summarises the outputs of all three scales together.

12.1. Plant, Municipal and Priority Area Baseline Matrix

As discussed in section 9.2, the Plant, Municipal and PA Baseline Matrix is designed to summarise the current status, per power plant, of the various dimensions which are impacted at Municipal and PA scale, discussed in section 11 (namely socio-economic, other environment, air quality and health), in one comprehensive view. It also provides some plant-level information pertinent to abatement decision-making (on plant size and closure date, coal cost, performance and abatement technologies). This Multi-Criteria Decision Analysis thinking tool provides reference information against which to consider the various facility-level air quality regulatory options, and to guide the development of additional options.

The completed Baseline Matrix, provided in the Figure 54 below, shows the current status of all the factors considered. A traffic light system codes according to factor, with red indicating negative, orange medium and green positive. These codes are based on the evidence and discussion presented in Section 11.

The code assignment is dependent on the particular dimension and analysis, and represents an expert view. Where possible, quantitative indicators were applied. For example, the indicator '*EAF risk contained in Eskom's future projections'* was ranged 'green' if it was below 10, 'orange' if it was between 10 and 15, and above 15 was red. Details of the data and evidence used to code each dimension, together with the ranking used are provided immediately below the Figure.

Figure 54: Plant and Priority Area Matrix, completed February 2024

Factor	Factor	Coding	References
Plant specifications	Plant size	None	Eskom's IRP 2023 submission spreadsheet (confidential)
	Plant closure date	None	Inferred from Production Plan in Eskom IRP 2023 submission spreadsheet/ Fleet parameters/ date of closure of final unit.
Plant coal cost profile	Current coal cost	Green = below R500/Mt; medium = R500-700/Mt; high = > 700/Mt.	Eskom's IRP 2023 submission spreadsheet (confidential)
	Coal cost projection over plant lifetime		Eskom's IRP 2023 submission spreadsheet (confidential)
	Plant exposure to marginal coal source		APV coal data spreadsheet, 2022
Plant performance	EAF Historical average (2018-22)	Green = above 70%; Orange = 50-70%; Red = below 50%	Eskom spreadsheet: EAF update 23. Received from Eskom 18052023. (Confidential)
	EAF risk contained in Eskom's future projections	Green = below 10; Orange = 10-15; above 15 = Red	Forum calculations from Eskom IRP 2023 submission spreadsheet (Confidential). Note, future EAF predications contain MES ERP 2022 interventions
Socio-economic situation			
Other environmental impacts	Water use by plant	Green = less than 20 000 Ml/a; Orange = 20-40 000 Ml/a; Red = more than 40 000 Ml/a	Eskom Consistent data set (Confidential)
	Plant CO_2 intensity	Green = below 1,10t/MWh; Orange = 1,10 – 1,25; Red = above 1,25.	Eskom IRP 2023 submission spreadsheet (Confidential).
Abatement technologies	Difficult and duration of retrofit	Green = compliant / committed; Orange = medium; Red = difficult	Eskom spreadsheet Annex 1 data request costs (Confidential) Expert assessment
	Externalities (Sorbent, water usage)	Red = high impact, green = low impact	Eskom Consistent data set (Confidential) Expert assessment
	Cost of technology (if implemented)	Data provided	Eskom spreadsheet Annex 1 data request costs (Confidential) Expert assessment
Air quality	Plant emissions compared to average (of plant)	Green = less than average; Red = greater than average	Eskom spreadsheet Eskom PM, SO_2 NO_x daily averages Oct 2022
	PA air quality		
Health Impacts	Health Risk	Green =little health risk, Orange= medium health risk, Red=risk too health high	Highveld Health Study 2019 Department of Environmental Affairs VTAPA Health Study (2016) Clean Air J. vol.33 n.1 2023 WHO 2020 report

Figure 55: Coding and References for the Baseline Matrix

The Baseline matrix assessment demonstrates the complexity of the multi-dimensional nature of the air quality issue, as in all plants there are contradictory codings. However, some themes can be identified:

- The Waterberg power stations are both low cost, high performance plants, and are both dry-cooled.
- All the Mpumalanga plants have performance, cost and GHG emission concerns
- Most of the Mpumalanga plants, together with Lethabo, are high water consumers.
- There is a risk associated with Lethabo's coal cost, but otherwise, this is a low economic and performance risk plant.
- PM abatement retrofits have been undertaken or are committed for all plants, and is both an air quality and health risk in all three Priority Areas.
- FGD is high cost, high difficulty, high externality costs at all plants, apart from Medupi, where it is medium difficulty (but still high cost and externalities).
- NO_x is only a significant air quality and health risk in the Vaal;
- SO_x is not a significant air quality pollutant in the Waterberg, but is a significant health issue.
- SO_x is of medium air quality impact in Mpumalanga, and of significant health risk.
- Socio-economic concerns surrounding the two Waterberg plants appear the lowest. The HPA and VPA appear significantly more vulnerable.
- Population density in the Municipalities wherein Majuba, Tutuka, Matimba and Medupi are located are low, whilst density is high for the remainder of the fleet.

Whilst the Baseline matrix tool provides some insight into how possible abatement options might affect the status quo, it is not able to assess the implications for dimensions at a power system level. For this, power system modelling is required.

12.2. Power system analysis

12.2.1. Power system modelling to investigate air quality regulation in South Africa

Power system modelling is an optimisation tool that helps us understand a system as large and complex as a national power system. Being part of a system changes the profiles of component parts, such as individual coal power plants, as the system is required to constantly be in balance and respond to both a changing demand profile and changes in the many supply and storage components. Whilst the characteristics of any one plant are important, so too are their combination as a system.

Power system modelling provides insight into how this system behaves and might evolve going forward, including what might happen under particular conditions or views of the future. It can help answer questions such as: What is the most economical type of new power generation capacity to add to a power system going forward? Will the addition of various types of new generating capacity meet anticipated power demand? What happens if demand is larger or smaller than anticipated? What happens to power supply and cost of electricity if certain generation plants are taken offline for extended periods? What building plans to generate power can enable South Africa to meet its international GHG emissions commitments?

Power system modelling can therefore assist in understanding power system level dimensions relevant to the Forum's task: the cost of electricity, security of power supply, local and GHG emissions PA pollution[120]. Importantly, as used in the Forum's work, these models do not accommodate the complexity of how these emissions impact airsheds, nor

[120] Whilst the model can provide plant pollution levels over time, these are less useful findings given the way air pollution disperses and impacts health, together with the way the regulatory regime options are constructed.

human health (these dimensions require their own specialist modelling tools as described in section 11).

The Forum's task is framed in the terms of regulatory interventions – either the imposition of conditions within a regime defined by concentration limits or exploring alternative regulatory frameworks to ensure sustainable compliance with equivalent MES limits. In addition, it is a multi-dimensional task, with at least three dimensions, which may be conflicting, requiring assessment at power system level. These aspects of the Forum's task present challenges in formulating the questions that will enable a power system model to return useful information.

The first aspect relates to the issue of multi-dimensional optimisation. Whilst power system models are capable of optimising across multiple objectives, in order to do this, each dimension must be expressed in the same metric, for example, the model cannot compare tons of emissions with technology abatement costs. Monetary values are usually chosen as most amenable to this purpose, for example by assigning a price to emissions. Whilst this would enable both local air pollutants and GHG emissions to be included in the optimisation assessment, together with total power system cost, this approach introduces significant complexity which, for the Forum's purposes, outweigh the benefits: Firstly, pricing local air emissions assumes a particular framing of the regulatory environment, which is not aligned with the current MES concentration limit approach. Secondly, pricing also introduces additional assumptions, which will undermine the model's findings. Pricing GHG emissions, for example, is notoriously difficult and contentious.

The second aspect pertains to the specificities of how the particular model operates. As a tool, Plexos power system modelling has certain technical limitations with regards to exploring questions of local air quality regulation. For example, pollutant concentrations are inputs to the model, determined exogenously. Concentrations can be associated with abatement technologies (by undertaking a retrofit at a plant, the plant's emissions concentrations change), but cannot be used to constrain pollution levels in any way. Pollutant tonnage limits – representative of load-based limits ─ can however be imposed as constraints on a power plant.

These constraints can be met by reducing plant utilisation, or closing the plant. At the current level of development, the CSIR Plexos model is not able to choose between retrofitting and reducing utilisation / plant closure, although this would be a valuable model development to inform air quality regulation evolution in the future. Total tons of pollutant per year can be calculated for each modelled scenario, at the individual plant, grouping of plants, or total power system level.

The model was developed to take MES scenarios as inputs. Further development is required to have abatement technologies as model outputs (what abatement options to retrofit, which power plant to retrofit and when to do so).

There have only been two instances of power system modelling being used in relation to local air quality pollution in South Africa, of which the Forum is aware. The first is a study by the Energy Systems Research Group of the University of Cape Town (McCall et al, 2019), which considered alternative IRPs to the IRP 2019. In this study, undertaken in a full energy system modelling platform called TIMES, plants are required to comply with the MES New Plant Standards by 2025 (excluding those with suspensions to 2030), with the modelling given the binary choice of retrofitting abatement technologies at that point, or closing down. '*The results show that the least cost option is to retrofit most of the fleet with a total of 18 GW of plant retrofits across the fleet over the period to 2025. A total of 31 units are retrofitted out of a possible 42 across the fleet. All stations available for retrofitting are partially or fully retrofitted except Majuba, which the model fully decommissions by 2025 as an emissions abatement response. By 2030, renewables (wind, solar, micro-hydro, and biomass) produce 42% of electricity*' (McCall et al, 2019).

Whilst, for the Forum's purposes, this study points to the importance of building out adequate clean power generation capacity, it is too dated to shed much light on the current non-compliance situation, where there is inadequate generation capacity to meet demand. Six years have passed since the study was done, with limited new generation capacity built and a marked deterioration in the performance of the coal fleet.

The second study is work in progress commissioned by the PCC and being undertaken by the Carbon Trust and the Energy Systems Research Group of the University of Cape Town. This modelling work is primarily interested in the potential for accelerated phase-out of the

coal-fired power plant fleet, but also considers the implications of air quality compliance and just transition aspects. The study utilises a similar approach to that of the Forum – a multi-dimensional prioritisation framework plus power system modelling to develop recommendations. There are key differences in the objectives of the PCC study versus that of the Forum, together with some key modelling parameters (including coal plant utilisation rates). However, the study does lend general support to the Forum's findings[121], highlighting, in particular, the relationship between air quality and compliance with South Africa's international GHG emission commitments. The ESRG modelling underpinning the work is also a useful alternative modelling tool, to that of Plexos, with which to explore issues of air quality in South Africa in the future.

Power system modelling is not an exercise in prediction – rather, well calibrated models can assist in understanding how a power system is likely to respond under certain conditions. As with all modelling, its usefulness is dependent on the appropriateness of the model type for the questions being asked, the quality of assumptions and data, and the appropriate interpretation of the results.

The Forum's power system modelling analysis was undertaken by the Energy Centre of the CSIR, using the Plexos modelling platform, and generously funded by a grant to the CSIR by the European Climate Foundation. Plexos is used by both Eskom and the DMRE to undertake the country's Integrated Resource Plan (IRP). Further details of the modelling are provided in Annexure 29.

12.2.2. Modelling approach

The Forum utilised the power system modelling to test the real-world power system level implications of MES compliance options for Eskom's mid-life coal-fired power plants and Medupi. A base model of the power system is first developed, and a reference case established whereby nothing is done to improve air quality. Thereafter, a number of MES

[121] The Forum received a presentation by the Carbon Trust in April 2023 entitled 'Preliminary modelling and framework results discussion'.

compliance options (model scenarios), determined by the Forum, were run to assess their impact on the power system level indicators of security of supply, electricity cost, plant and regional level air pollution levels, and national GHG emission levels.

Modelling the South African power system is particularly challenging given that the system is currently in a state of crisis, lacking sufficient resources and coherent governance (including a relevant Integrated Resource Plan), and unable to meet the country's electricity needs. The coal fleet is, on average, old and maintenance has been inadequate, making it difficult to predict performance, as was discussed in Section 11.7.2.

Globally, the power sector is experiencing a phase of rapid and disruptive technological change, driven by the climate change response, which is affecting innovation, financing and markets for fuels. Taken together, these factors result in a high level of uncertainty over the future of key aspects of the South African power system, including: the future performance of certain of the coal plants; the pace at which the transmission grid can be expanded; how fast new generation capacity can be built (both utility scale and embedded); whether and when the soft systems required to wheel and efficiently transact and distribute power in a decentralised system will be developed; when and whether Koeberg will be granted a licence to extend the operating life of the plant by 20 years; the extent to which natural gas will be utilised for power; when and where peaking plants will be built; how fast the private sector will require green power; whether coal plants will be able to cost effectively operate at low utilisation rates. A set of credible assumptions are made about these factors, sense-checked and validated against other South African modelling exercises (including Eskom's Medium Term Adequacy Outlook; the draft IRP 2023; UCT ESRG; CSIR; the National Electricity Crisis Committee, NECOM).

Because of the current power system security of supply crisis (discussed further in Section 11.8), three variable input scenarios were defined in order to allow the modelling to adequately explore this issue, particularly in the period to 2030 – 'Lower loadshedding', 'Middle', and 'Higher Loadshedding'. Each scenario is a composite of a number of low, medium and high input variables for electricity demand, embedded generation, coal fleet planned maintenance, and forced outages, as per the table below. Taken together, these

scenarios map well to NECOM's loadshedding modelling undertaken by Meridian Economics (Figure 56: Loadshedding Input Scenarios).

Envelopes	Lower Loadshedding	Middle	Higher Loadshedding
Demand	Low	Med	High
Customer Resource (rooftop PV profile)	High (2,000 MW py)	Med (1,000 MW py)	Low (500 MW py)
Planned maintenance	Coal lower	Average	Coal higher
Forced outages (breakdowns)	Coal improves	Forecast	Coal worsens

Figure 56: Loadshedding Input Scenarios

Figure 57 Comparison between NECOM and CSIR unserved energy outlook (CSIR Modelling Deck, 2024)

Due to time and resource constraints, the model does not include sensitivities on factors that will be increasingly important in the longer term (2030 to 2040 and beyond). These include

build rates of new capacity, in particular utility scale RE and storage as well as fuel and GHG emissions pricing. These factors are relevant to issues of local air pollution regulation in the longer term and warrant further investigation.

Other model characteristics of particular relevance to the local air pollution issue include:

- The modelling timeframe is 2020 to 2040. Whilst this timeframe captures the anticipated closure of most of the coal plants, Kendal (2044), Majuba (2051), Medupi and Kusile (post 2070) are anticipated to close outside of the modelling timeframes in the reference case.
- Minimum utilisation rates are stipulated.
- Model granularity is plant Unit level.
- Eskom's coal fleet retirement, according to the dates provided in Eskom's spreadsheet 'Annex 10 Eskom IRP information', dated January 2023.
- Power plant / unit closure is endogenous to the model.
- No carbon constraint or carbon costs are imposed upon the model.

The 'cost of electricity', a model output, describes the total cost of generating utility-scale power by the South African electricity supply industry (transmission and distribution costs are not considered by the model). This is the same approach taken by Eskom and the DMRE in their use of Plexos for electricity planning purposes. The 'cost of electricity' output indicator therefore includes the cost of electricity generated by the REIPPP and other procurement programmes, where Eskom is the purchaser. Private sector generated and consumed power (identified in the modelling as 'customer resource') is subtracted from the demand profile, and neither is the cost of this generation, nor the energy (MWh) included in the 'unit cost of electricity' figures. The cost output, when expressed per kWh, does not equate to the price or electricity tariff. The tariff is determined by a regulatory process conducted by NERSA, which considers which costs can be passed through to the consumer. Abatement retrofit capex is amortised over the remaining life of the power plant.

Renewable energy, battery and peaking plant (utilising Liquified Natural Gas) build constraints are defined as a 'train', increasing in three stages over time (Figure 58). There is no new utility-scale capacity coming on line before 2026, given the timeframes of the currently known project pipeline.

	2026	2027	2028	2029	2030	2031…
	Single	Single	Double	Double	Double	Triple
Annual Builds MW	**2026**	**2027**	**2028**	**2029**	**2030**	**Period**
Peakers (LNG)	1,000	1,000	500			**2,500**
Wind	1,600	1,600	3,200	3,200	3,200	**12,800**
PV	1,000	1,000	2,000	2,000		**6,000**
Total	**7,200**	**5,200**	**4,900**	**3,200**	**4,400**	**21,300**
Customer Resource	*1,000*	*1,000*	*1,000*	*1,000*	*1,000*	***5,000***
Batteries	500	500	1,000	1,000	1,000	**4,000**

Figure 58: Assumptions on additional generation capacity

12.2.2.1. Defining the modelling reference case: 'Baked in Progress'

A reference case was first established, assuming no further future action is taken on local air pollution abatement. This case describes the state of local air emissions abatement technologies in Eskom's coal fleet as of November 2023, and includes all abatement projects that have been procured at this date. It does not include projects in the planning / design phase that have not yet been put out to the market[122]. No further emissions constraints or retrofit projects are included in this case, which is named 'Baked in Progress' (BIP). It

[122] Confirmed by Eskom in its review of the spreadsheet 'MES Scenarios summary 4', McCourt email, 20/12/2023

therefore can be associated with the conditions of the Baseline Matrix defined in Section 12.1.

The reference case is the counterfactual against which all alternative regulatory options are considered in the Forum's analysis. As the Forum is interested in understanding the difference between the different scenarios, in terms of their impact on the power system level dimensions, the absolute values of the modelling outputs are not significant, instead, the direction and magnitude of the difference (or delta) between each variable is what matters. The (absolute) outputs from the reference case are presented below to provide a sense of how the power system behaves against each dimension without any additional air quality interventions. All outputs and comparisons are based on the middle loadshedding impact sensitivity. Whilst the outputs are reliable indicators for the next few years, beyond this, the ultimate evolution of the power system will depend on factors such as policy direction and power system economics, all of which are subject to high levels of uncertainty.

The primary outputs of relevance to the Forum's work are:

- The tons of local air pollutants from coal-fired power plants over time at both plant and Priority Area level. The total sum of coal fleet local air pollutants is less useful, as the impact of pollutants on air quality and health occurs at the local and regional level. In some cases, however, the direction of the system total is provided as an indication of impact of the various scenarios. It is worth noting that local air emissions from other utility scale power generation sources (diesel, gas) are both significantly less than from coal, but also currently occur in different air sheds, being located predominantly at the coast. It is therefore not necessary to consider these in the fleet total for the Forum's purposes (these were modelled, but are not reported on).

- Security of power supply: This output is considered for the timeframe to 2030 only, being the time frame of particular concern, as discussed in Section 11.8. In addition, under all loadshedding sensitivities, the electricity crisis is completely, or mostly, resolved by 2030.

- Cost of electricity: This is expressed both as a unit cost (R/kWh) at any particular point in time, and as a total percentage increase in system costs over the modelled time period to 2040.

- Tons of GHG emissions per year over the modelling timeframe (expressed in CO_2). Given that these emissions have global and not local impact, the total emissions from the coal fleet is the appropriate indicator to consider.

The reference case shows a declining contribution of Eskom's coal fleet to power generation in the country. The output from the Mpumalanga region declines rapidly until 2030 as the oldest five plants come to the end of their lives. Lethabo, the only plant in the Vaal region, is anticipated to run until the end of the modelled period. The two Waterberg plants, Matimba and Medupi, also run throughout the period, with Matimba scheduled to close in 2042. The relative contribution of power from the fleet shifts during the modelled period from being dominated by Mpumalanga, to an equal split between Mpumalanga and the Waterberg plants by 2040.

In terms of PM emissions, the overwhelming volume of Eskom's coal plant emissions come from the old Mpumalanga fleet. As these plants close by 2030, the emissions of PMs in the Mpumalanga region declines significantly. Only PMs in the Waterberg area are not reduced during the period. This is because both Waterberg plants are already operating within or close to compliance with the MES New Plant Standard (Figure 59). These two plants are only scheduled to close after 2040.

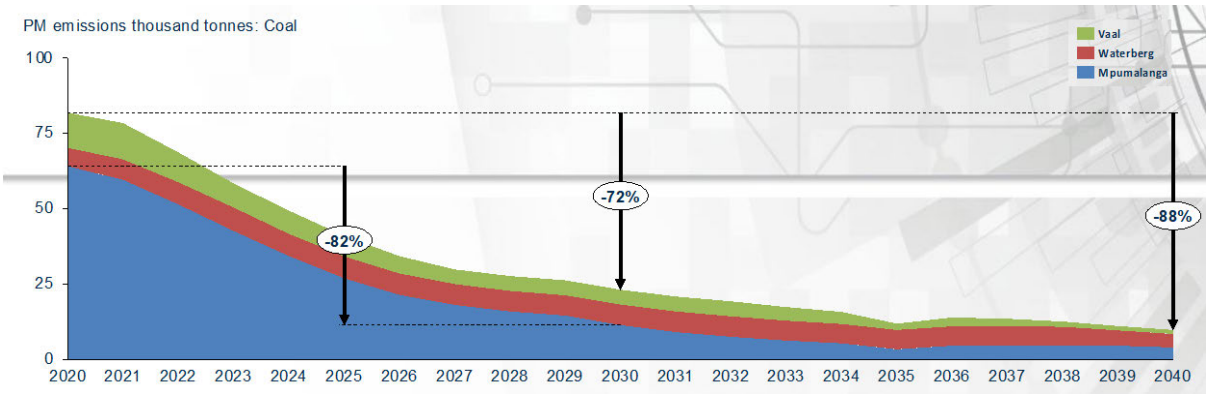

Figure 59: PM emissions in the reference case (BIP, assuming middle loadshedding sensitivity)

Total NO_x emissions across the fleet follow a similar profile to PMs, with the significant declines occurring in the Mpumalanga area, whilst the NO_x emissions in the Waterberg area, from coal-fired power stations, show very little reduction.

SO_x emissions, however, show both a smaller overall decline due to the majority of plants having no SO_x abatement technology retrofit, and a larger contribution by the Waterberg region plants, given their utilising of high sulphur content coal.

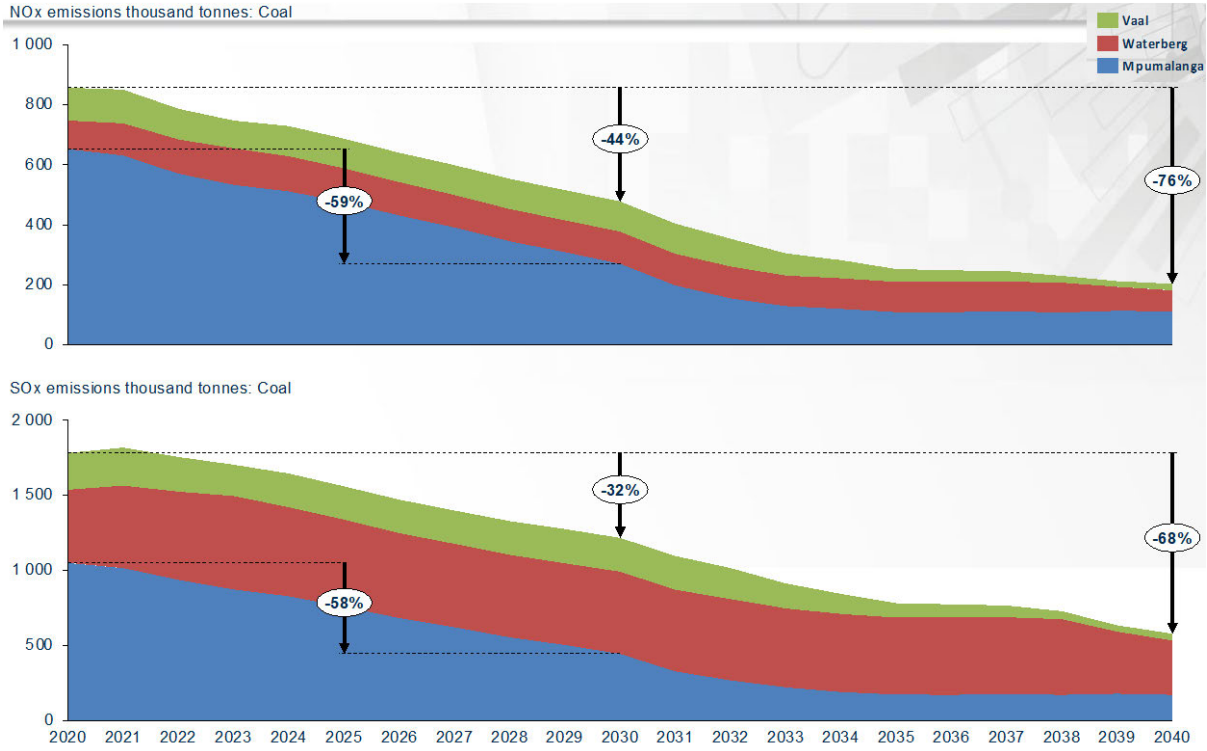

Figure 60: Nox and SOx emissions in the reference case (BIP, assuming middle loadshedding sensitivity)

CO_2 emissions from the fleet are demonstrated in Figure 61. [redacted]

[redacted]

The cost of supplying electricity until 2040 is demonstrated in Figure 62. After a steep rise until 2027, the cost is anticipated to stabilise for the remainder of the modelling period.

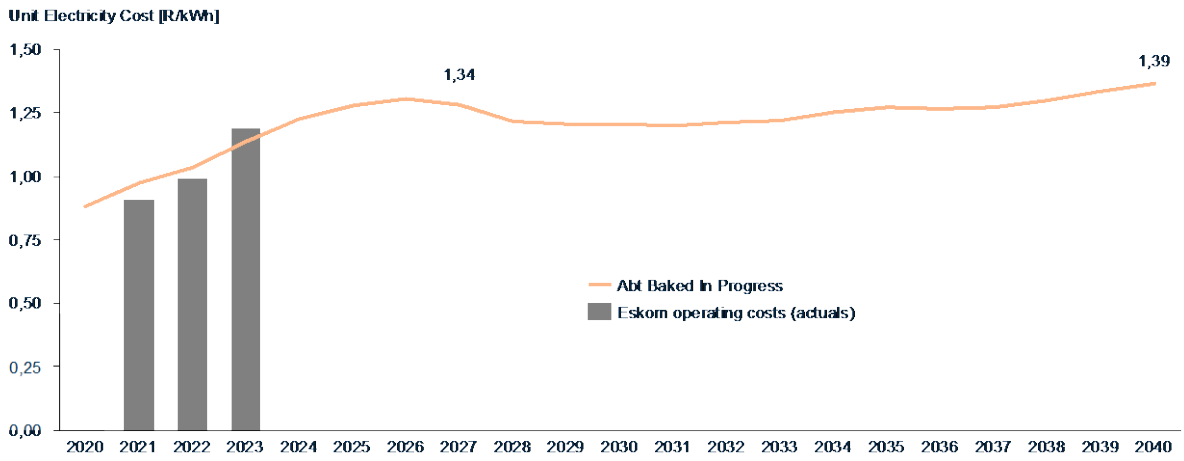

Figure 62: Cost of electricity in the reference case (BIP) (assuming middle loadshedding sensitivity, does not include cost of unserved energy)

Security of supply: The implications of the reference case for supply adequacy are only considered until 2030, given the anticipated resolution of supply insecurity this decade. The results are similar to those of NECOM, as discussed in Section 11.8.

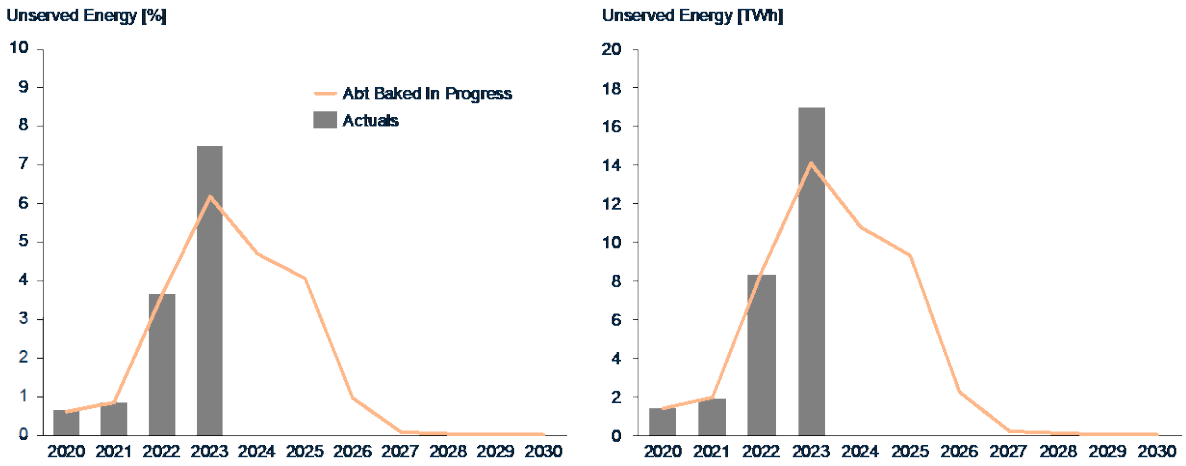

Figure 63: Security of supply in the reference case, BIP (assuming middle loadshedding sensitivity)

12.2.3. Multi-dimensional assessment of the reference case

A multi-dimensional, multi-scale matrix is used to collate and summarise the status quo, assuming no further air quality interventions, drawing on both the Plant and PA Baseline Matrix and the power system modelled outputs of the reference case 'Baked-in-progress'. This snapshot is shown in Figure 64, and provides a reference point for consideration of air quality interventions and regulation in the remainder of the report.

The matrix considers national, regional and local (municipal) level outcomes for the dimensions that the Forum was asked to consider in its TOR, noting that the number of people affected differs significantly at each scale. The regional air quality indicator provides an average view across the three Priority Areas where Eskom's power plants are located, with the municipal indicators providing an average across the municipalities where Eskom's power plants are located. If the impact is more specific, this is described in text.

Implications are considered against a counterfactual of 'policy goals', and coded using a traffic light scale indicating how well each dimension of the status quo meets the policy goals. Red indicates significantly out of alignment, orange is slightly out of alignment, grey indicates a neutral position, light green indicates going some way towards alignment and dark green indicates strong alignment. The status quo snapshot considers two timeframes: how well

the status quo meets policy goals in the short term (to 2030), and then how these goals are met in the longer term, beyond 2050. Only first order effects are captured by this view. For example, whilst the closure of a power plant will register negatively at the municipal socio-economics level, the impact of lack of security of supply on municipal socio-economics is not captured.

	National			Regional	Municipal		
	Security of Supply to 2030	**Future cost of electricity**	**International GHG commitment compliance**	**PA air quality**	**Municipal air quality**	**District Municipal health**	**Municipal socio-economics**
Counterfactual: Policy goals	Adequate supply	Affordable electricity	NDC 2030, LEDS	MES, AAQ	AAQ		
Reference BIP, short term		40% increase 2020 - 2025					
Reference BIP, long term				PM HPA	PM HPA	PM HPA	

Figure 64: Implications of the status quo (no further air quality interventions) against multi-dimensional policy goals

The status quo view suggests, unsurprisingly, that in the short term performance on security of electricity supply, cost and local air quality are falling far short of policy goals. In the short term, loadshedding unintentionally contributes towards progress on GHG reduction, although the continued operation of the full coal fleet in the 2030s reverses this in the longer term. The baked-in PM projects will have a positive impact on PM emission in the HPA, but other coal plant pollutants will continue to undermine the achievement of policy and regulation objectives.

13. ANALYSIS OF NAQO DECISIONS

13.1. Implications of NAQO Decisions

As set out in section 7 above, Eskom submitted several applications to the NAQO for the postponement of compliance timeframes and requests for alternative limits for certain pollutants in respect of most of its coal-fired power stations. The NAQO's decisions were the subject of appeals by Eskom and the CER, on behalf of its clients. In section 8.5 of this Report, the Forum presents its legal analysis of the fourteen appeals pending before the Minister.

Although the Forum does not recommend that the Minister upholds the NAQO's decisions, it is persuaded that, in respect of the following power stations, Eskom's applications do not meet the requirements for a postponement of compliance timeframes in terms of 11A of the List of Activities) and/or an alternative limit request in terms of 12A of the List of Activities:

I. Matla
II. Duvha
III. Matimba
IV. Medupi
V. Lethabo
VI. Majuba
VII. Tutuka
VIII. Kendal

The Forum has been tasked with, *inter alia*, making recommendations to the Minister on the appropriate responses to these appeals. The Forum was required to consider the appeals from a multi-disciplinary perspective and was tasked with undertaking more than a strict legal analysis which function, the Appeals directorate would be capable of fulfilling.

The reason the Forum does not recommend that the Minister uphold the NAQO's decisions, despite its view on the legal merits of these appeals, is because it would result in a situation where several of Eskom's plants would be non-compliant with the MES from 1 April 2025. In this scenario, Eskom would be faced with a choice to either operate plants in breach of their AELs, thereby running the risk of being interdicted from operating, to stop operating a

particular plant due to non-compliance and/or to retrofit a plant such that it can comply (but this would only be achievable if a retrofit for a particular pollutant is actually feasible and it requires taking the plant offline for the time required to retrofit it).

13.2. Multi-dimensional assessment of the NAQO Decisions

In order to understand the implications of the current NAQO decisions for the remaining 8 appeals, the NAQO Decisions scenario was run in the power system modelling tool. The fleet-level results of the power system modelling were then considered in conjunction with the implications of the NAQO's decisions on the plant and PA area level to derive a high-level view of the scenario's implications at all three levels.

The scenario is specified as follows, with further detail on the power system parameters provided in AppendixAnnexure 30: Power system modelling scenario specifications (Annexure 30):

- The 5 old coal plants are modelled as per the Baked-in-Progress Baseline.
- The 'middle' loadshedding sensitivity is applied.
- All of the remaining 8 plants are taken offline at 1 April 2025 because they are out of compliance with their AELs.
- Medupi undertakes an expedited FGD retrofit (taking 5 years).

Two versions of the scenario are then considered. a) Where the remaining 7 plants close permanently, as FGD is technically too difficult to retrofit, and
b) where all of the remaining plants retrofit FGD, over a five-year period, together with NO_x and PM retrofits, where required. These plants are returned to service in 2030.

The NAQO Decisions case is characterised by a drastic decline in generation and all environmental emissions in the period 2025-2030, implying a significant improvement in air quality across all three priority areas and all affected municipalities. Where all the mid-life plants return to service by 2030, NO_x and SO_x levels remain significantly reduced, PM emissions in the HPA are slightly further reduced than the Baked-in-Progress scenario (79% as opposed to 72%, as almost all plants receiving PM retrofits are included in the Baked-in-progress reference case), but GHG emissions return to the reference case levels by 2030.

In the scenario where only Medupi is returned to service, both generation and emissions from coal are obviously lower than in the case when all the mid-life plants are returned to service, but this is not a linear relationship. NO_x and SO_x levels in 2030 are predictably highest in the Baked-in-progress reference case, followed by the scenario where the mid-life plants are returned to service, and then the scenario where the least coal power generation is operational (the scenario where only Medupi is returned to service to run alongside Kusile).

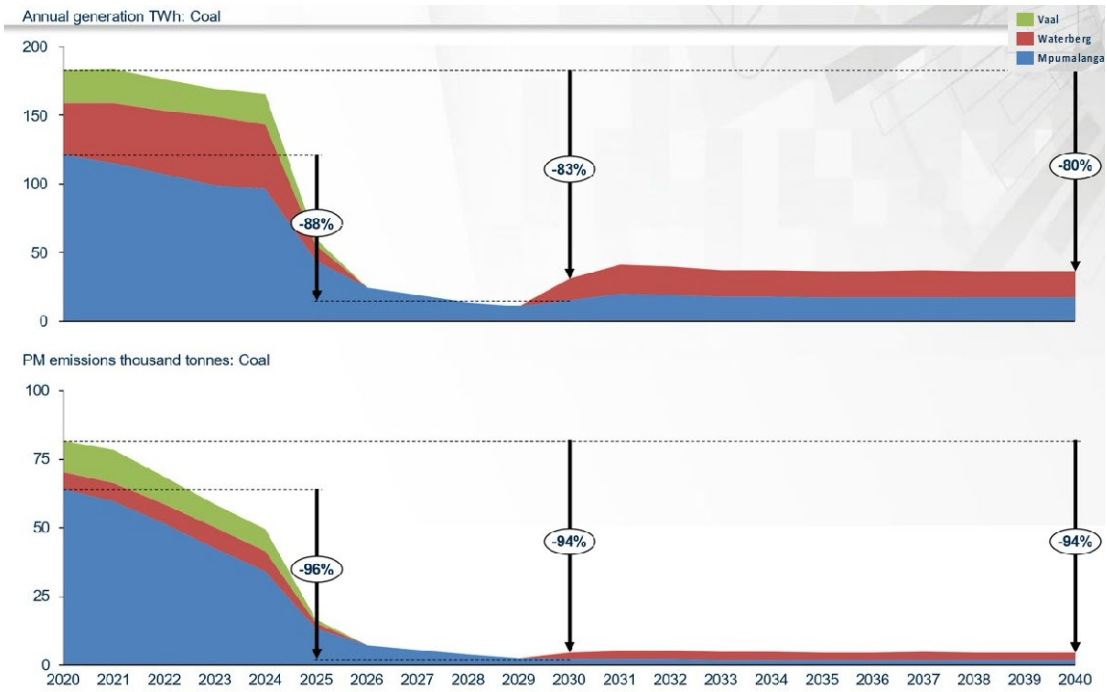

Figure 65: Generation and PMs from NAQO Decisions a) Only Medupi back, middle loadshedding sensitivity assumed.

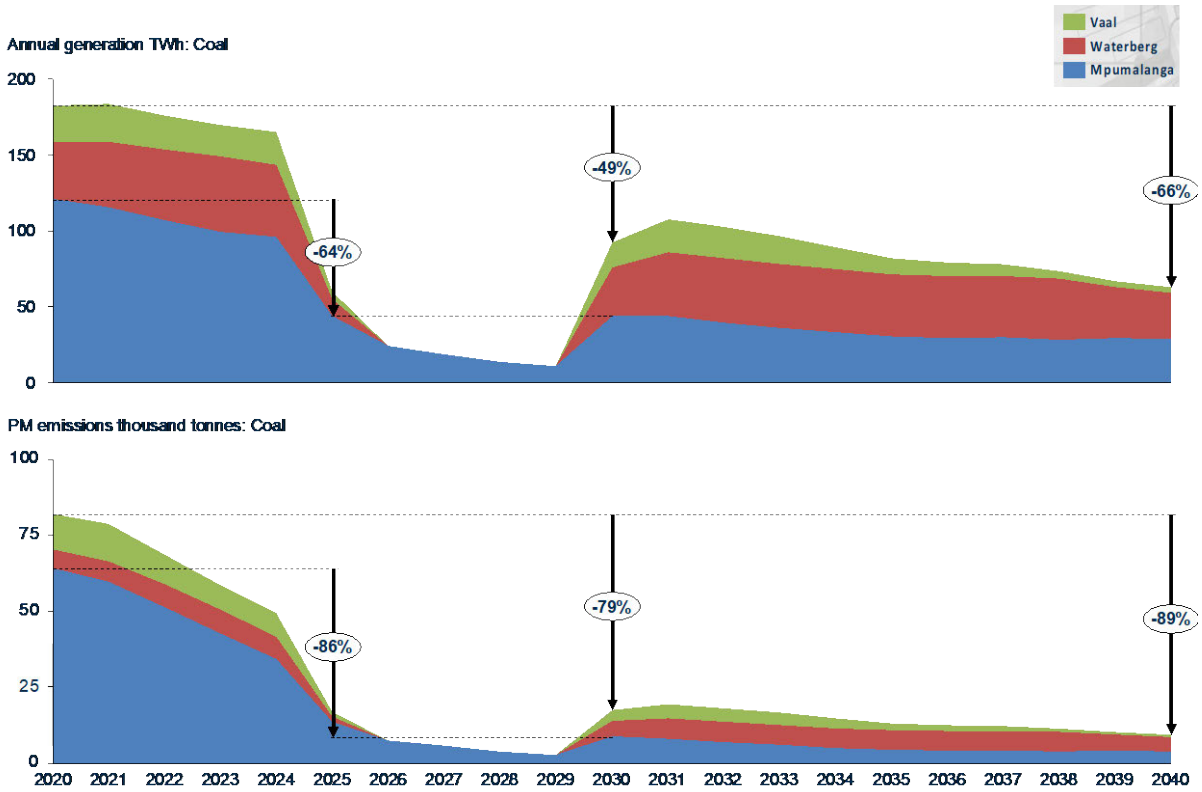

Figure 66 Generation and PM emissions from NAQO Decisions scenario (version b, all mid-life plant return)

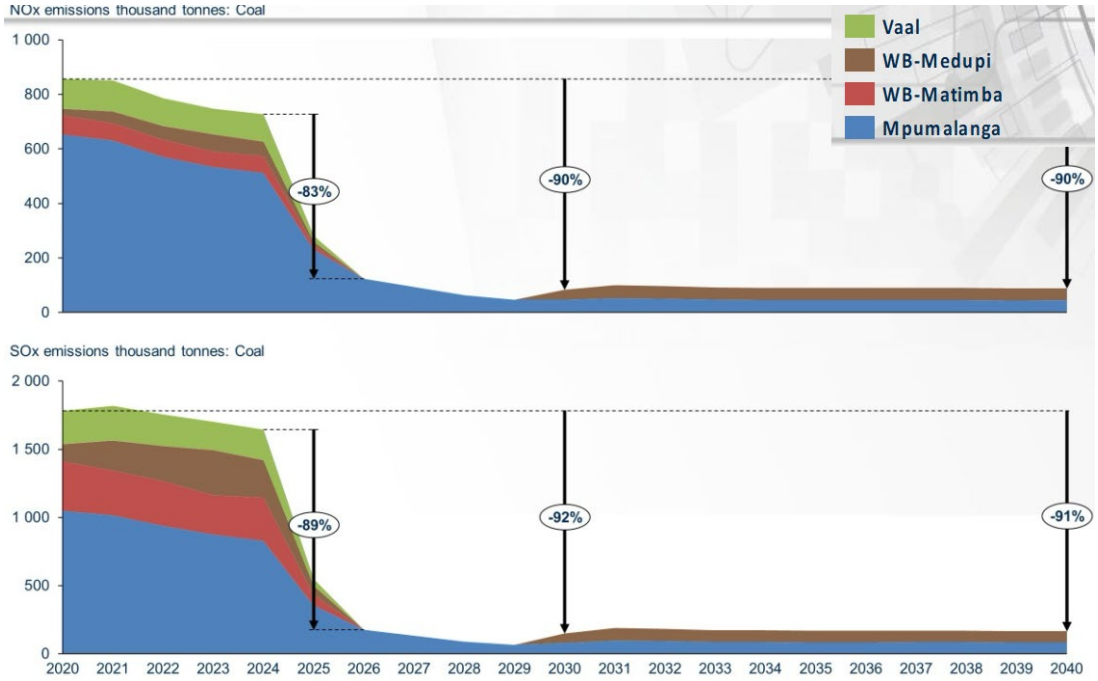

Figure 67: SOx and NOx emissions under the NAQO Decision scenario (a) (only Medupi returns)

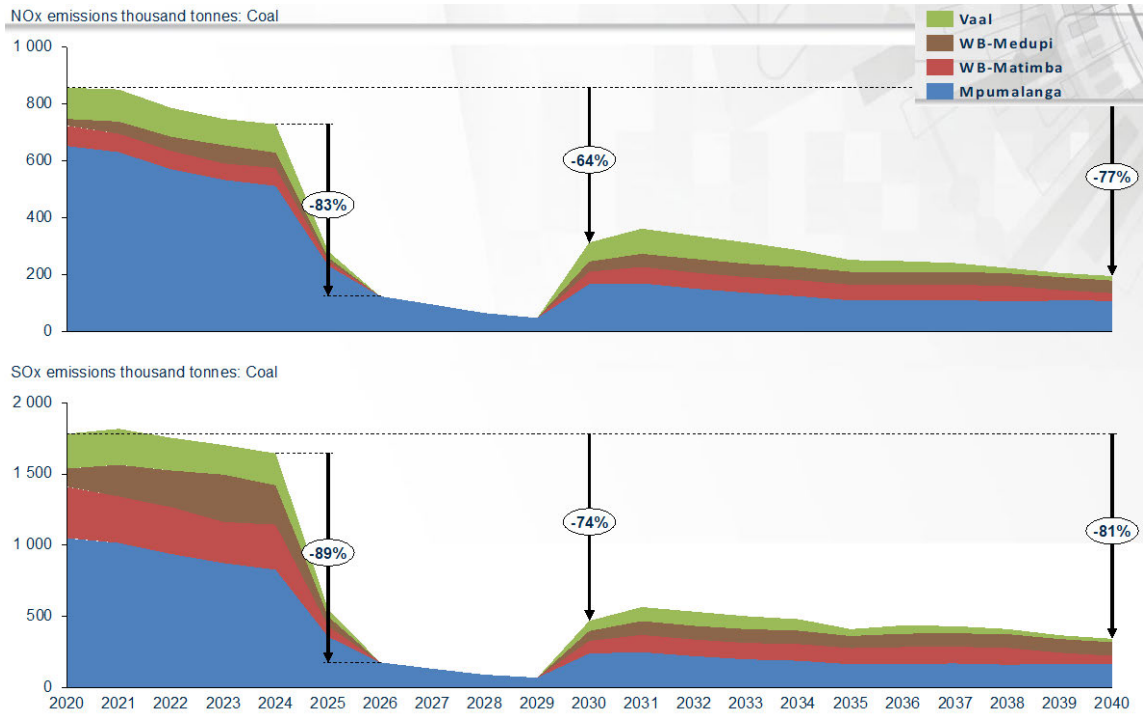

Figure 68: SOx and NOx emissions under the NAQO Decision scenarios (b)(all mid-life plant return)

CO_2 emissions from the coal fleet are demonstrated in Figure 69: CO2 emissions in the NAQO Decisions scenarios. Emissions are approximately 110/48Mt in 2030, which lie within an appropriate contribution from the coal fleet to the NDC range. The remaining CO_2 emissions from coal in 2040, even those just from Medupi and Kusile in the NAQO Decisions scenario are likely too high to achieve a 2050 economy-wide net zero aspiration as within the SA LEDS, with implications for economic competitiveness. Of relevance to GHG emissions, the NAQO Decisions scenarios are the only scenarios that see an addition of new coal (MES compliant), of 1000MW in 2030 under scenario b (the mid-life plants return) and 2000MW between 2030 and 2032 (when only Medupi returns to service).

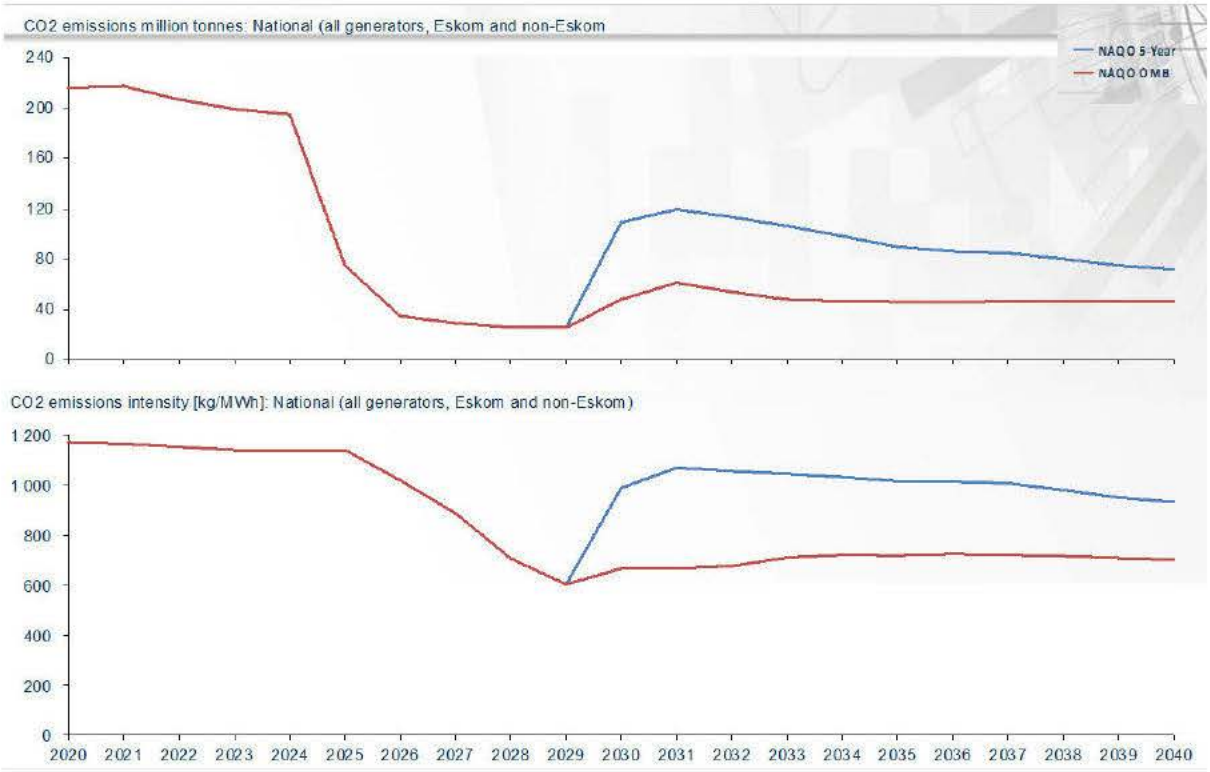

Figure 69: CO_2 emissions in the NAQO Decisions scenarios

The cost of supplying electricity under the NAQO Decisions scenarios to 2040 is demonstrated in Figure 70. The cost profiles are characterised by a significant R/kWh increase in the period when the plants are offline for retrofit, 2024 to 2030, due to the reduced electricity supply and the over-utilisation of expensive peaking plants in this period. Version

a), where just Medupi is returned to service, represents a 45% increase in the cost of generating power between 2024 and 2040. If the retrofitted mid-life plants can be brought back online, this cost differential reduces slightly, to 42%.

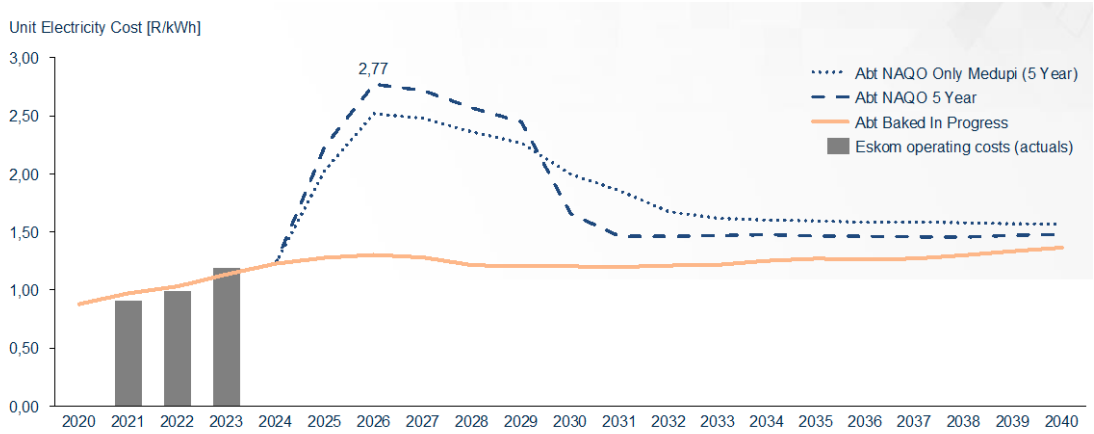

Figure 70: Cost of supply in the NAQO Decisions scenarios versus the reference case BIP (does not include cost of unserved energy)

Security of supply: The period 2024 – 2030 shows unserved energy peaking at 55%, over 120TWh, and the system only returning to adequacy in 2031.

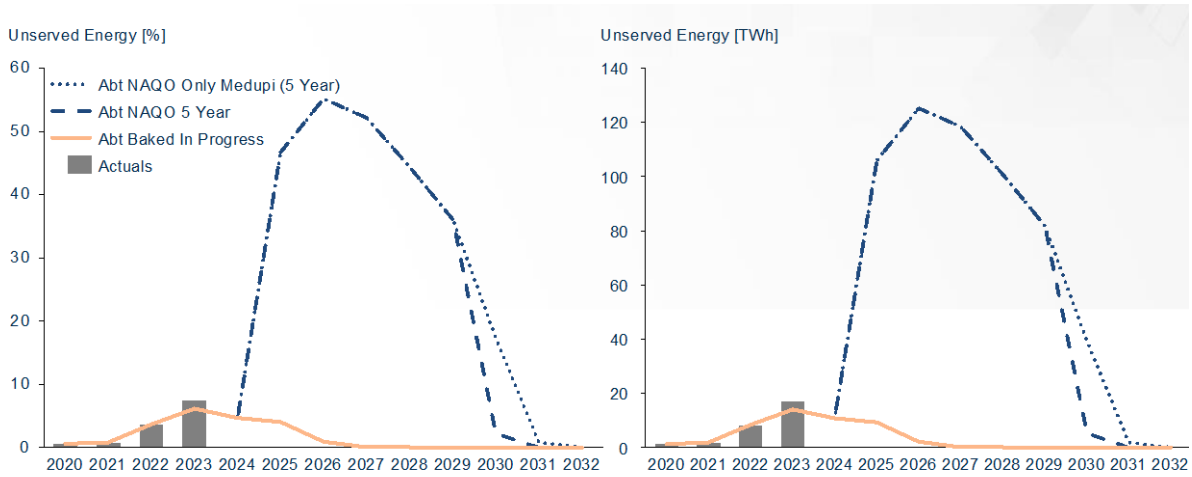

Figure 71 NAQO Decisions: Unserved energy implications

The multi-dimensional, multi-scale matrix for the NAQO Decisions compares the impact of both versions of the NAQO's decisions against the status quo depicted in Figure 72, which assumes nothing further is to be done on local air pollution.

In this version of the matrix, only a short-term view is prioritised however, significant implications for the post 2030 time period are flagged where relevant. The coding here is slightly different to the comparison of the status quo against policy goals. Here, red indicates a significant worsening from the status quo, orange a slight worsening, grey indicates a neutral position, light green a slight improvement, and dark green indicates significant improvement. Where quantitative indicators are useful and available, these are included. In all the summary matrices, only first order effects are considered.

	National			Regional	Municipal		
	Security of Supply to 2030	**Future cost of electricity**	**International GHG commitment compliance**	**PA air quality**	**Municipal air quality**	**Municipal health**	**Municipal socio-economics**
Counterfactual: Baseline / BIP			Long term compliance challenges				
NAQO decision A: Medupi back only	-2310%	45%					
NAQO decision B - All mid-life plants back	-2460%	+42%	Long term compliance challenges				

Figure 72: Multi-dimensional analysis for NAQO Decisions

Implications of the NAQO's decisions are clearly binary. The implications for national security of electricity supply and electricity cost are dire, as are municipal level socio-economics due to the closure of the plants for retrofits in the second half of the 2020's, and the remained closure of most of the plants under the 'Medupi back only case'. The implications for air emissions are strongly positive in every instance, except that of the long-term compliance with international GHG commitments due to the continued full operation of all mid-life and young plants post 2030.

14. RECOMMENDATIONS WITHIN THE CURRENT REGULATORY REGIME

It is clear to the Forum from the analysis undertaken in the preceding section that a situation where the NAQO's decisions in respect of the eight power plants is upheld, results in an untenable situation, namely the loss of approximately 16 000 MW of power, which is the equivalent of 16 stages of loadshedding. This is simply not a practical or feasible option. While Eskom's full compliance with the MES by 2025 would result in notable benefits from an air quality and health perspective, felt predominantly by communities in areas surrounding the plants, security of supply will be extremely compromised and the future cost of electricity will drastically increase.

In considering practical solutions to enable sustainable compliance with the MES, the Forum has had to look at what is possible in the short-term and what solutions are available in the long-term.

The applicable legislative framework, which is summarised at a high level below, was designed to facilitate progressive reduction of emissions by emitters to lessen the impact on air quality, the environment and the health and well-being of those who live in it. As will be addressed in the section setting out a proposed long-term solution, the Forum is of the view that the legislative framework, in its current form, does not adequately account for the reality of older plants and the limitations for compliance experienced by those plants. As explained above, in the current case, even on a broad interpretation of 12A and other legislative provisions, Eskom does not meet the requirements to obtain the requested alternative limits and has few options available to it to come into compliance. Albeit different in each case, the Forum has noted that older plants owned by other emitters face a similar challenge, in that the law with which they are required to comply does not adequately cater for the cost and complexity of doing so.

In the short-term however, the Minister is required to consider the appeals and make a decision within the confines of the existing legislative framework.

In this regard, there is the **NEMA**, which is the "parent" act and in terms of which a number of specific environmental management acts are enacted. One of these specific environmental management acts is the **NEMAQA**.

For present purposes, the following provisions of NEMA are relevant:

- Section 2, which sets out the Principles that apply to all actions of organs of state that may significantly affect the environment. These Principles serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of any statutory provision concerning the protection of the environment. The Principles must also guide the interpretation and implementation of NEMA and any other law concerned with the protection or management of the environment.

- Section 43, which applies to the present appeal process. In particular, section 43(6) which states that, "*The Minister or MEC, as the case may be, may consider such an appeal, confirm, set aside or vary the decision, provision, condition or directive or make any other appropriate decision, including a decision that the prescribed fee paid by the appellant, or any part thereof, be refunded.*"[123]

NEMAQA governs issues of air quality and the licensing of emitters. The following provisions are of importance to this section of the report:

- Section 3 imposes a general peremptory duty on the State to seek to protect and enhance the quality of air in South Africa and it must apply NEMAQA in a manner that seeks to achieve the progressive realisation of the rights contained in section 24 of the Constitution.

- Section 21 provides for the listing of activities. This is in the form of the List of Activities, which list has been updated a number of times and contains the MES per pollutant, per activity. The history of these regulations is set out in more detail in paragraph section 6 of this report.

[123] Section 43 must be read with the National Appeal Regulations.

- Section 22 prevents any person from conducting a listed activity without a either PAEL or an AEL. Chapter 5 governs the licensing of listed activities.

- When considering an application for an AEL, the licensing authority must take a number of factors into account, which are set out in section 39 and include, any applicable minimum standards set for ambient air and point source emissions that have been determined in terms of the Act (i.e. the List of Activities), the pollution being or likely to be caused by the carrying out of the listed activity applied for and the effect or likely effect of that pollution on the environment, including health, social conditions, economic conditions, cultural heritage and AAQ.

- In terms of section 40 of NEMAQA, any decision to grant an application for an AEL must be consistent with, inter alia, any minimum standards for atmospheric emissions of identified substances or mixtures or substances as contemplated in section 21(3) (i.e. the List of Activities and the MES contained therein).

- Variations to PAEL's and AEL's are permissible under certain circumstances, as provided for in section 46.

- In terms of section 59, any person may, in writing, apply to the Minister for exemption from the application of a provision of the Act. No exemption from a provision of section 9, 22 or 25 may be granted. In terms of section 59(4), the Minister may, from time to time, review any exemption granted and, on good grounds, withdraw any exemption.

The List of Activities has been amended a number of times, most recently in 2020. It is applicable to permanently operated plants with a design capacity equivalent to one of the listed activities.

- The compliance timeframes provide that "existing plant", which is all of Eskom's power stations, must comply with minimum emission standards for existing plant, as contained in the MES, by 1 April 2015, unless where specified. These existing plants must comply with the MES for new plant by April 2020, unless where specified.

- Allowance is made for the postponement of these compliance timeframes in regulations (11) to (14). In terms of (11A), a once-off postponement can be applied for but it will not be valid beyond 31 March 2025.

- In terms of (12A), an existing plant may submit an application regarding a new plant standard to the NAQO for consideration if the plant is in compliance with other emission standards but cannot comply with a particular pollutant or pollutants. An alternative emission limit or load may be granted subject to meeting the requirements in (12A).

14.1. The Forum's interpretation of certain legislative provisions

14.1.1. Regulation 12A of the List of Activities

The correct interpretation of regulation 12A of the MES is contested. Different stakeholders rely on different interpretations. In this regard, the Forum sought a legal opinion from Professor Halton Cheadle, an Emeritus Professor of Public Law at the University of Cape Town and an attorney with over 40 years' experience in areas including labour law, constitutional law and administrative law. Professor Cheadle also has extensive experience in legislative drafting and participated in the drafting of the Bill of Rights in the Constitution and several other statutes in South Africa and other jurisdictions. Professor Cheadle's opinion, insofar as it is relevant in this matter, is as follows:

> *"In terms of section 21(1) of the National Environmental Management: Air Quality Act, 39 of 2004 ("AQA"), the Minister in 2013 published by notice a list of activities together with minimum emission standards for those activities with compliance time frames (the "2013 Notice").*
>
> *Paragraph 10 of that Notice required the existing plant in those listed activities to comply with minimum emission standards for new plant ("new plant standards") by 1 April 2020.*
>
> *Paragraphs 11 to 14 of that Notice however permitted a postponement of the compliance time frames if justified and after a public participation process ("the postponement provisions").*

In 2018 the Minister amended that Notice (the "2018 Notice") in terms of section 21(2). It introduced significant restrictions in respect of the postponement applications namely that a postponement –

- *Could only be applied for once (the "once-off limitation");*
- *is restricted to a maximum period of 5 years; and*
- *cannot be extend beyond 31 March 2025.*

The 2018 Notice also inserted a new paragraph 12A. That paragraph provides for an existing plant to apply for an alternative emission limit if it is in compliance with other emission standards but cannot comply with the standards for a particular pollutant or pollutants. None of the restrictions expressly stated in the postponement provisions are included in the wording of the paragraph or by reference…

Legal context

Section 2 of AQA states that the object of the Act is to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air; the prevention of air pollution; and securing ecologically sustainable development while promoting justifiable economic and social development.

In order to achieve these objects, section 21(1) of AQA authorises the Minister, by notice in the Gazette, to publish a list of activities which result in atmospheric emissions which may have a significant detrimental effect on the environment.

The notice must establish minimum emission standards in respect of the substances resulting from the listed activity including the permissible amount, volume, emission rated that may be emitted and may contain transitional and other special arrangements.

The Minister published 2013 Notice and established the minimum emission standards for existing plant and a compliance time frame for new plant standards by

1 April 2020 including a transitional arrangement in the form of provisions to permit applications for a postponement of the time frame.

That notice was subsequently amended on several occasions, only one of which is pertinent to this opinion, namely the 2018 Notice. That notice amended paragraphs 11, 12 and 13 and, importantly for this opinion, inserted paragraphs 11A, 11B, 11C, 11D and 12A.

…

Proper approach to statutory interpretation

The correct approach to the interpretation of statutes is to be found in the principles expounded in Natal Joint Municipal Pension Fund v Endumeni Municipality 2012 (4) SA 593 (SCA) at paragraph [18].

> *"The present state of the law can be expressed as follows. Interpretation is the process of attributing meaning to the words used in a document, be it legislation, some other statutory instrument, or contract, having regard to the context provided by reading the particular provision or provisions in the light of the document as a whole and the circumstances attendant upon its coming into existence. Whatever the nature of the document, consideration must be given to the language used in the light of the ordinary rules of grammar and syntax; the context in which the provision appears; the apparent purpose to which it is directed and the material known to those responsible for its production. Where more than one meaning is possible each possibility must be weighed in the light of all these factors.The The process is objective not subjective. A sensible meaning is to be preferred to one that leads to insensible or unbusinesslike results or undermines the apparent purpose of the document. Judges must be alert to, and guard against, the temptation to substitute what they regard as reasonable, sensible or businesslike for the words actually used. To do so in regard to a statute or statutory instrument is to cross the divide between interpretation and legislation"*

In a nutshell, text, context and purpose.

Text, context and purpose

The text of paragraphs 11 to 14 contemplates two kinds of application for the temporary suspension of minimum emission standards, namely an application for postponement of the compliance time frame and an application to for an alternative emission standard if the plant is in compliance with other emission standards but cannot comply with a particular pollutant.

The applications are quite different although they may both provide for the temporary suspension of minimum emission standards. The differences are-

- *The nature of the application for a postponement under paragraph 11A is application for suspension of one or all of the new plant emission standards applicable to an existing plant during the period of the postponement. Whereas the application for an alternative emission limit under paragraph 12A is in respect of an emission for a particular pollutant in the context of the emitter complying the other applicable emission standards.*

- *the text of paragraph 11A (the application for postponement) expressly restricts postponements in three ways: it is once-off; it is restricted to a maximum period of 5 years and that no postponement may extend beyond 31 March 2025;*

- *the text of paragraph 12A (the application for an alternative emission limit) does not include any of the restrictions contained in paragraph 11A either expressly or by reference;*

- *the requirements for the application or grant of a postponement under paragraphs 12 and 13 are quite different from those required for an alternative emission limit under paragraph 12A.*

- *a postponement application under paragraph 12 requires an air pollution impact assessment, a detailed justification for the application and a public participation process.*

- *whereas the requirements for an alternative emission limit in terms of paragraph 12A are: the plant must be in compliance with the other emission standards; proof of a reduction in the emissions of the particular pollutant including proof of measures and investments towards compliance; and material compliance with the national ambient air quality standards for the pollutant or, in the absence of such a standard, an Atmospheric Impact Report that does not show a material increased health risk.*

Paragraphs 11 to 14, other than 12A, are interlocking. Paragraph 12, which sets out the requirements for a postponement application, expressly cross refers to the applications made for postponement in paragraphs 11A and 11B. Paragraph 11D, which permits only postponements in respect of new plant minimum emission standards, refers only to applications for postponement. Paragraph 13, which sets out the approval process, again cross refers to paragraphs 11A and 11B. And paragraph 14 refers back to paragraph 13.

Paragraph 12A however stands alone and includes within its terms both the application and the approval process for an alternative emission limit. It does not include any of the limitations expressly stated in paragraphs 11B of 11D.

Accordingly on purely textual analysis, other than constituting an additional mechanism to suspend the imposition of the new plant standards under paragraph 10, there is no textual basis for concluding that any of the limitations that apply to postponement applications apply to applications for an alternative emission limit or that an existing plant that has been granted a postponement under paragraph 13 cannot apply for an alternative emission limit in terms paragraph 12A.

It is evident from the statutory context summarised above that although that the principal object of imposing minimum emission standards in respect of listed activities by 1 April 2020 under both the 2013 and 2018 Notices, both Notices provide

for temporary relief for those existing plants that cannot meet the minimum emission standards in time. Accordingly, the postponement provisions and paragraph 12A have to be interpreted in the light of this purpose.

Nothing in that context or in the light of the purpose of the postponement provisions and paragraph 12A alters the textual interpretation above. The context and purpose however remain particularly important in dealing with one of the counter arguments below.

The counter arguments

The first counter argument is that because paragraph 12A is placed under the same heading and between paragraphs 12 and 13, its contents must be read together. Although placed together with other provisions under one heading (and a misleading one at that), that placement without express reference in paragraph 12A cannot textually be interpreted to subject it to the restrictions imposed by paragraph 11A.

In context, the legislative history reveals that the heading (Postponement of compliance time frames) and the paragraphs 11 to 14 dealing only with postponements preceded the amendments made in terms of the 2018 Notice. While amendments were made to the postponement provisions, paragraph 12A was also inserted but did not concern a postponement of compliance time frames but provided another form of temporary relief in the form of alternative emission limits for particular pollutants.

The best that could be said for the interpretative impact of the placement of paragraph 12A among the postponement provisions is that it constitutes another although distinct form of temporary relief for existing plant that cannot meet its minimum emission standards within the compliance time frames. In other words, it is consistent with the purpose of providing temporary relief for those emitters that cannot meet the compliance time frames.

The second counter argument is that, on its own the wording, paragraph 12A does not specify any time frames for the granting of alternative limits and that would

undermine the core purpose of AQA in securing compliance with its minimum emission standards. Accordingly, the legislative context and its placement in the group of provisions dealing with temporary relief militate that the restrictions in paragraph 11A must apply to paragraph 12A.

But that would be a misunderstanding of the discretion conferred by paragraph 12A. The courts have long held that "a power is to be implied to do that which is reasonably incidental to what has been expressly authorised" and that such an implication must be drawn if the main purpose of the statute or provision cannot be achieved without it. Although no express time limits have been specified in paragraph 12A, the paragraph cannot be interpreted to permit to the granting of alternative limits in perpetuity. It must be interpreted in the light of the fact that a principal object of AQA is to secure compliance of existing plant in listed activities with the minimum emission standards within the specified time frames. That like the applications for postponements of the compliance time frames, the purpose of applications for alternative limits (and probably why they are grouped together) is to give temporary relief to existing plants that cannot meet their minimum emission standards.

Accordingly, any grant of an alternative limit by the national air quality officer must by its very nature be temporary and the period of the grant must be determined by the circumstances of the applicant in particular the extent of the previous reduction in emissions and "the measures and direct investments implemented towards compliance with the relevant new plant standards".

In conclusion, Professor Cheadle states as follows:

- *Neither the once-off limitation or the cut off of 31 March 2025 in paragraph 11A apply to paragraph 12A. Accordingly, nothing in the current wording of paragraph 12 A prevents an existing plant applying for an alternative emission limit after the expiry of the postponement period.*
- *Since no time limit is expressly or impliedly contained in paragraph 12A, an emitter may apply for an alternative limit beyond 31 March 2025.*

- *The only manner in which such limit may be imposed in respect of 12A is by way of an amendment of the 2013 Notice.*
- *Since paragraph 11D refers specifically to postponement of compliance time frames and not to the grant of alternative emission limits, the restriction to existing plant standard in that paragraph does not apply.*
- *The text of 12A states that the application is one "regarding a new plant standard" in the context of the national air quality officer granting an "alternative emission limit" which means that it is in respect of that standard and not the minimum emission standards for existing plant standard. Accordingly, paragraph 12A can only authorise a limit that is equal to or above the minimum emission standards for existing plant referred to in paragraph 9.*
- *Although paragraph 12A does not expressly give the national air quality officer the power to grant the alternative limit on conditions (unlike paragraph 13 which does), it confers a discretion on whether to grant or not grant the alternative limit.*
- *Given that the discretion must be exercised in accordance with the purpose of the provision, namely that it is temporary in nature and aimed at securing compliance within minimum emission standards in the shortest practicable time, the national air quality officer may set terms related to time frames and measures to achieve the minimum emission standards within those time frames."*

14.1.2. Section 59 of NEMAQA

Section 59(1) of NEMAQA provides for an application for exemption from any provision of the Act excluding the provisions of sections 9, 22 or 25. The Act is defined, in section 1, as including its regulations and '*any other subordinate legislation issued in terms of the Act*' which clearly includes the MES/List of Activities. This MES notice is promulgated in terms of section 21 of NEMAQA and is accordingly not, on the face of it, excluded from the

Minister's power to grant an exemption. Accordingly, the Forum is of the view that the Minister may exempt an emitter from complying with the regulations contained in the MES/List of Activities.

If the Minister were to grant an exemption from compliance with a particular provision of the MES, it may result in the limitation of affected persons' constitutional right to an environment that is not harmful to their health and well-being.

In terms of section 36 of the Constitution, *"The rights in the Bill of Rights may be limited only in terms of law of general application to the extent that the limitation is reasonable and justifiable in an open and democratic society based on human dignity, equality and freedom, taking into account all relevant factors, including –*

(a) the nature of the right;

(b) the importance of the purpose of the limitation;

(c) the nature and extent of the limitation;

(d) the relation between the limitation and its purpose; and

(e) less restrictive means to achieve the purpose."

The section requires a balancing exercise in which the limitation is weighed against the factors listed in section 36 and other relevant factors, in order to determine whether the limitation is reasonable and justifiable. The test is essentially one of proportionality. The Constitutional Court has explained:

> *"(T)he court places the purpose, effects and importance of the infringing legislation on one side of the scales and the nature and effect of the infringement caused by*

the legislation on the other. The more substantial the inroad into fundamental rights, the more persuasive the grounds of justification must be."[124]

Any section 59 exemption application, considered by the Minister or a delegated authority, must, for the reasons set out below, be considered with reference to section 36 of the Constitution and the above factors.

14.1.3. Section 43(6) of NEMA

Section 43(6) states that:

> "*The Minister or MEC, as the case may be, may consider such an appeal, confirm, set aside or vary the decision, provision, condition or directive or make any other appropriate decision, including a decision that the prescribed fee paid by the appellant, or any part thereof, be refunded."*

For present purposes, it is important to understand what "*any other appropriate decision*" means. The term '*other*' clearly indicates that it is a power different from confirming, setting aside or varying the NAQO's decision. It is a power wider than that conferred on the NAQO, such as the refunding of the prescribed fee.

The conjunction '*or*' that precedes the phrase also indicates that the Minister does not have to make a decision to confirm, set aside or vary the decision and can limit herself to "*any other appropriate decision*". In other words, the Minister may restrict herself to making an "*appropriate decision*".

That leads to what constitutes an "*appropriate decision*". The phrase is qualified by the term '*includes*'. Such a term at the beginning of a list has long been interpreted as an open list

---

[124] *S v Bhulwana; S v Gwadiso* 1996 (1) SA 388 (CC) para 18.

limited only by the kind of matters in the list[125]. Since the only item listed is a procedural requirement for an appeal under section 43, the phrase "*appropriate order*" can be safely interpreted to include any appropriate procedural order or directive, that neither confirms, sets aside or varies the NAQO's decision and which may include a decision that provides for an interim decision followed by a final decision.

14.1.4. The Deadly Air Case

The interpretation set out above takes into consideration the precedent set by the Deadly Air Case, which is a matter that concerned the rights enshrined in section 24(a) of the Constitution, specifically the right to an environment that is not harmful to health or well-being, and NEMAQA. At the outset of the judgment, Collis J notes that *"poor air quality falls disproportionately on the shoulders of the marginalized and vulnerable communities who bear the burden of disease caused by air pollution."* This fact is undisputed by the Forum and has been borne in mind while conducting its work. Collis J also held that the principle of sustainable development requires that measures put in place to achieve economic development should not sacrifice the environment and human life and well-being and it must be that a balance should be struck.

The Court was called on to decide on a number of issues including whether in law, the right in section 24(a) of the Constitution is of such a nature that it is immediately realisable or progressively releasable, and it found that it is an immediately realisable right. In addition, Collis J declared that "*the poor air quality in the Highveld Priority Area is in breach of residents' section 24(a) constitutional right to an environment that is not harmful to their health and well-being"*.

The case has particularly informed the Forum's interpretation of section 59 of NEMAQA and is precedent to support the fact that an exemption granted in terms of this provision must be

[125] The *noscitur a sociis* canon of construction.

subject to restrictions and limitations to ensure that any resulting limitation of a person's section 24 constitutional right is in accordance with section 36 of the Constitution.

14.2. Recommended interim solution

Based on its analysis of the applicable legislative framework, the Forum has arrived at an interim solution which is lawful and that seeks to balance the competing interests which include: the impact of non-compliance with the MES on health; ambient air quality standards; the energy crisis facing South Africa; the cost of retrofitting plants; socio-economic considerations and commitments to reducing GHG emissions. In view of the fact that, for a number of its plants, Eskom does not meet the requirements to obtain an indulgence in terms of the provisions of the List of Activities, the Forum's view is that the only way for Eskom to comply is to obtain an exemption from the List of Activities or certain provisions thereof, in terms of section 59 of NEMAQA.

Relying on the above interpretation of section 43(6), it is permissible for the Minister to make a procedural order, the purpose of which would be to provide Eskom with an opportunity to apply for an exemption in terms of section 59.

Given that the granting of an exemption, in these circumstances, may temporarily infringe the constitutional right to a healthy environment, which includes the right to clean air, it is necessary to consider whether the Minister may in granting an exemption, in terms of a law which is not a law of general application, can permissibly limit the right.

Section 59 enables the Minister to grant exemptions from the provisions of NEMA and NEMAQA, which constitutes an authorisation to limit the right to a healthy environment. In exercising that discretion, she would be required to meet the requirements of section 36 of the Constitution, namely that the power granted under section 59 (the law of general application) must be exercised in accordance with the factors listed in section 36 namely –

- The nature of the right contained in section 24 of the Constitution, which is one that includes taking into account the promotion of economic and social development.
- The purpose of the limitation: which in this case is to avoid a social and economic catastrophe caused by excessive amounts of loadshedding.

- The nature and the extent of the limitation: the exemption should be granted subject to certain conditions and for a limited period of time.

- The relationship between the limitation and its purpose: the limitation will prevent the closure of plants which would otherwise have to close to comply with a potential adverse decision of the Minister and thereby, avoid additional levels of loadshedding.

- Whether there are less restrictive means: there are no less restrictive means which cannot be accommodated by the setting of conditions and the transitional nature of the exemption.

The Forum has given particular consideration to the least restrictive means by which the Minister could achieve the purpose of the potential limitation. It is recommended that if any section 59 exemption is granted, which will depend on the merits of each application, it be subject to limitations and conditions. In the following section the Forum sets out examples of conditions that could be imposed on Eskom to ensure that it is not granted an unlimited indulgence in perpetuity and which will go some way towards protecting the rights and interests of those persons most impacted by Eskom's continued air emissions. These limitations and conditions are informed by the analytical work done by the Forum.

14.3. Limitations and conditions

Whether the Minister upholds certain of the appeals and reject others or Eskom submits an application in terms of section 59 of NEMA, it is important that the Minister consider whether to impose conditions on Eskom. The NAQO and relevant licensing authorities have, in the past, imposed conditions however, Eskom failed to comply with conditions and in instances where it did, its implementation was outside the requisite time period allocated and/or was deficient.

By way of illustration, Eskom's implementation of the offset programme contained in its current AELs has been delayed. Eskom continues to revise the completion dates in each quarterly report it submits to the relevant licensing authorities, and there has been no effective consequence management for its failure to comply with its obligations.

In view of the above, it is imperative that any conditions that may be imposed on Eskom be closely monitored to ensure compliance and, in the event that it fails to comply and there are no exceptional circumstances to justify the non-compliance, Eskom's AEL must be withdrawn and the DFFE must seriously consider applying the consequence management provisions contained in NEMAQA. The relevant licencing authority therefore plays a critical role in monitoring compliance.

In considering potential mitigation steps and/or conditions that may be imposed on Eskom, the Forum was cognisant that some of the proposed conditions to address emissions fall outside the scope of Eskom's operations, but ultimately contribute to harmful AAQ in the areas within which Eskom's power stations are located. As such, the Forum has tried to balance Eskom's ability to comply with the proposed conditions against service delivery issues that fall outside of its scope.

In terms of the National Environmental Framework of 2017, there are four main sources of emissions having an adverse impact on AAQ in the HPA, VTAPA and the WBHPA, these are listed, in order of prevalence, below:

- Listed Activities contemplated in section 21 of NEMAQA;
- Burning of domestic fuel (coal/wood/paraffin);
- Vehicle emissions; and
- Mining emissions.

While there is no explicit legal obligation on Eskom to address emissions from the burning of domestic fuel (coal/wood/paraffin); vehicles; and mining activities, it has some of the largest operations in the Priority Areas. Therefore, more is required from Eskom to not only comply with section 21 of NEMAQA, but to implement further measures to address other sources of emissions that adversely affect AAQ in the areas in which it operates. In addition, the National Environmental Framework requires stakeholders to adopt a holistic approach to addressing issues related to air quality. In view of the above, Eskom must be held to a higher standard should the Minister uphold its appeals or make any other appropriate decisions.

The Forum sets out emission reduction conditions, conditions based on socio-economic, transparency and governance conditions below. These conditions are provided on a once-off basis and must be subject to specific time periods. The conditions will require regular review, underpinned by updated analyses.

14.4. Achieving emission reductions: contextual information

All of these solutions require making these plants unavailable to the power system, either temporarily, whilst abatement technologies are retrofitted, or more permanently, as units / plant operate at reduced load or are taken offline. As was very clearly demonstrated in the NAQO Decisions scenario in section 13.2, given the constraints of loadshedding for the timeframes for which conditions are being contemplated, conditions that achieve a reduction in local air emissions must be traded off against increased risk of loadshedding during the period until 2030. Once loadshedding is resolved, the options of reducing plant utilisation and taking plants offline earlier become abatement options which can be considered together with retrofits under a reformed regulatory regime.

Key differences between three local air pollutants and their abatement technologies, emerging from the discussion in section 11, have guided the Forum's consideration of abatement conditions. These are summarised in Table 28 Characteristics of local air pollutants and their abatement technologies below and underpin the remainder of the abatement conditions discussion, which proceeds separately for each pollutant. Reducing coal burnt as an abatement option is not inherently pollutant-specific and therefore is not captured in the table.

Pollutant	**Relative capital cost**	**Technical difficult to install and time required**	**Health impacts**
PM	Low	Low	High
NOx	Medium	Medium	Low

SOx	Very High	High	Medium

Table 28 Characteristics of local air pollutants and their abatement technologies

The Forum also conducted further power system and multi-dimensional analyses to better understand the implications of possible abatement conditions. The basis for this exploration was Eskom's Board Approved Emission Reduction Plan 2022 (the Eskom's ERP 2022). This Plan has been offered by Eskom as what the utility views as being possible and sensible to make progress on air pollution issues, despite its lack of ability to comply with its current AELs.

The ERP 2022 was developed by Eskom with reference to the current concentration limits based regulatory regime. Therefore, the only abatement options considered in the Plan were abatement technology retrofits and closing power plants early (Tutuka's closure date was brought forward from 2041 to 2030). Under the ERP, apart from the interventions outlined for the 5 oldest plants, (which are detailed in Annexure 30: Power system modelling scenario specifications) Eskom proposes installing FGD only at Medupi, and LNB retrofits at Lethabo, Tutuka and Majuba. Whilst Eskom has undertaken its own power system modelling as input to defining its ERP 2022, it was important for the Forum to take an independent view of this Plan, and understand its implications both from the Forum's multi-dimensional, multi-scalar perspective and within its own power system modelling environment, in order to ensure comparability with other scenarios explored. This section reports on and summarises this analysis.

The 'Eskom ERP 2022' scenario specified for power system modelling describes the abatement technologies approved by Eskom's Board in its Emission Reduction Plan (ERP) 2022 (Annexure 28), updated with progress information from Eskom's November 2023 MES Update submitted to the Forum (Annexure 30: Power system modelling scenario specifications. Eskom's ERP 2022 is compared against the reference case (Baked-in-progress), of doing nothing further on local air pollution.

The Forum's power system modelling shows that local air pollution improved under Eskom's ERP 2022 more than the improvements associated with doing nothing. Eskom's ERP 2022

achieves a slight additional PM reduction, when compared to the reference case, over the modelled period in the VPA and WHBA due to the additional PM projects undertaken in this scenario, but the impact is very slight.

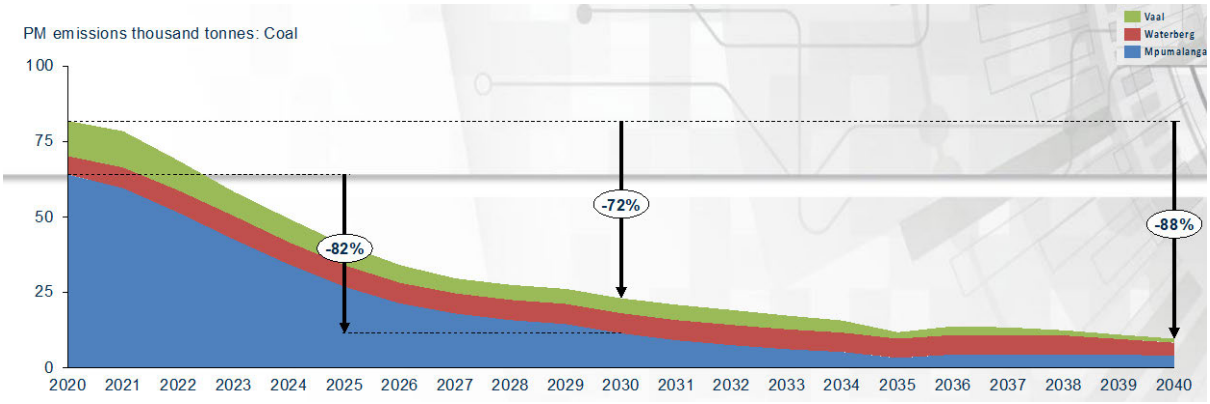

Figure 73 Coal power generation and PM emissions from Eskom's ERP 2022

The Eskom ERP 2022 also achieves a significantly improved 7% reduction in coal related NO_x emissions in the HPA and 11% in the VPA (Lethabo) compared to the reference case. On SO_x emissions, a significant 23% reduction is achieved in the WPA due to Medupi's FGD (see Figure 74).

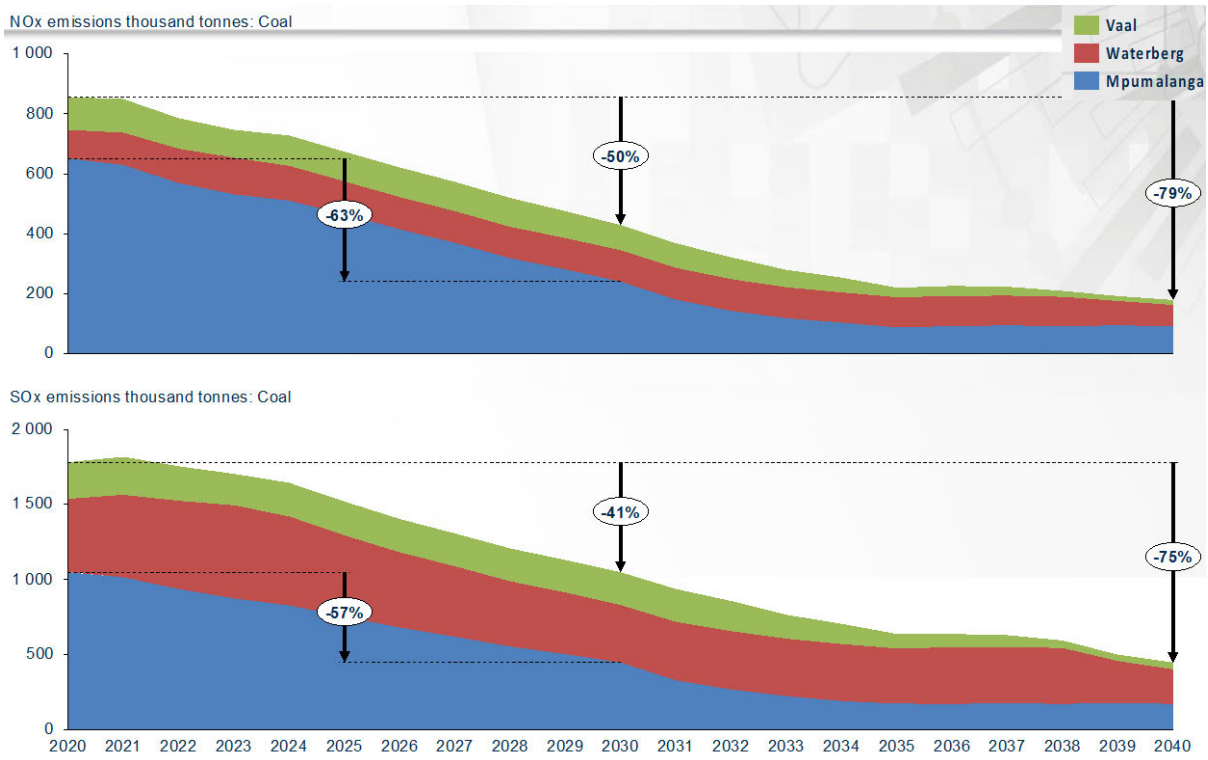

Figure 74 SOx and NOx emissions under the Eskom ERP 2022 Scenario

Eskom's ERP 2022 scenario performs less well in terms of CO_2 emissions from the fleet, which are left unchanged, compared to the Baked-in-Progress reference case, and is therefore unlikely to meet South Africa's international commitments or support green economic growth and competitiveness.

There is also a significant 2% increase in the cost of supplying electricity above that of the Baked-in-Progress scenario, due to the costs of the abatement retrofits, in particular Medupi's FGD. In terms of unserved energy, Eskom's ERP 2022 causes an increase in unserved energy of 5% of a stage applied consistently over the period until 2030 versus that of the reference case (or just under 3 extra months of Stage 1). This is due to the extension of the routine plant GOs required in order to install abatement equipment, and is demonstrated in Figure 75.

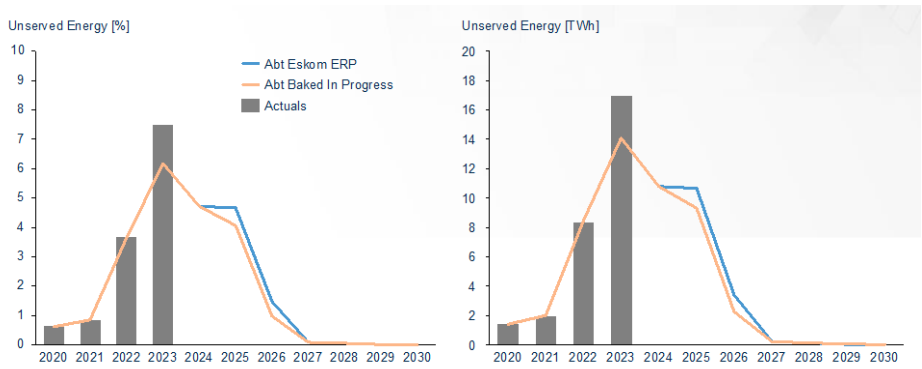

Figure 75 Eskom ERP 2022 implications for security of supply (middle loadshedding sensitivity)

The multi-dimensional, multi-scale matrix for Eskom's ERP 2022 again compares the impact of the ERP 2022 against the status quo depicted in Figure 76, where nothing further is done on local air pollution.

The ERP 2022 matrix shows an improvement in regional and local air pollution and health compared to when nothing is done, but the improvement is still falling short of what is required by policy. There is no change in long-term compliance with GHG commitments. The risk to security of power supply in the period until 2030 increases as the abatement retrofits are undertaken, and there is a not-insignificant increase to the cost of power. There is no change to municipal socio-economics.

	National			Regional	Municipal		
	Security of Supply to 2030	**Future cost of electricity**	**International GHG commitment compliance**	**PA air quality**	**Municipal air quality**	**Municipal health**	**Municipal socio-economics**
Counterfactual: Baseline / BIP			Long term compliance challenges				
Eskom ERP 2022	~ an additional stage for 3 months	+2%					

Figure 76: Multi-dimensional analysis for Eskom ERP 2022

The Forum conducted a further power system and multi-dimensional analyses to explore whether the multi-dimensional impacts of Eskom's ERP 2022 could be improved through

the imposition of abatement conditions. This analysis is discussed according to each pollutant in the sections below.

14.4.1. PM Abatement

As per Table 8, PMs are the priority pollutant from a health perspective, and the least expensive and technically challenging to address in terms of mitigation options. PM is also the pollutant for which Eskom has the most comprehensive abatement plan.

Six of the mid-life coal plants — Duvha, Kendal, Lethabo, Matla, Tutuka and Matimba – are not yet operating in compliance with the MES new plant standards for PMs. Abatement projects are planned for each of these plants to bring them into compliance, as per Eskom's Board approved ERP 2022 schedule, although not within time to meet the 31 March 2025 New Plant Standard compliance deadline.

At the Forum's request, Eskom presented on the potential to accelerate these PM projects at the online meeting of 18 January 2024 (see Annexure 31: Accelerated PM project programme).

A comparison between the ERP 2022 and the Accelerated PM Project Programme is presented below:

The impact of the accelerated PM programme was tested in the Forum's power system modelling, with results provided below. The 'Eskom ERP 2022 PM Fast Track' scenario is specified as follows:

[redacted]

The PM benefits of the Eskom ERP 2022 PM Fast-Track scenario come at the cost of worsening electricity supply adequacy. Taking the worst case of Eskom not being able to complete *any* of its accelerated PM projects within plant GOs, and a 'middle sensitivity' of loadshedding, suggests an additional 14% of a stage of loadshedding consistently applied over the six year period to 2030, or an additional stage for just under 12 months.

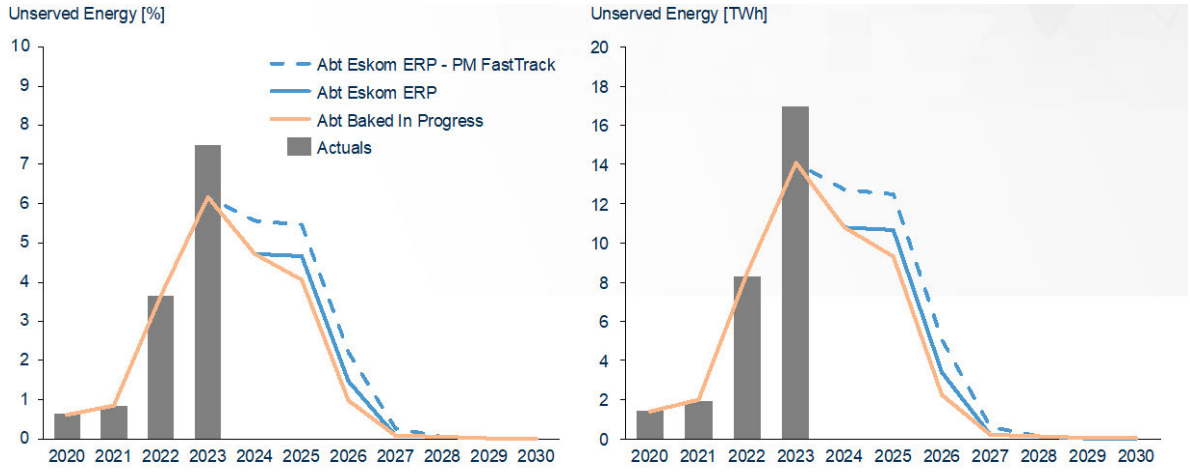

Figure 77 Eskom ERP 2022 PM Fast Track unserved energy implications

The multidimensional matrix for Eskom's PM Fast-Track scenario indicates that fast tracking the PM projects comes at a trade-off between additional loadshedding risk and a short-term improvement in PM emissions in the HPA and VPA. As PM is the most harmful of the three pollutants to health, it may be that a degree of increased loadshedding risk can be tolerated by the country in order to accelerate the PM retrofits to ensure plant compliance by the 31 March 2025 deadline.

	National			Regional	Municipal		
	Security of Supply to 2030	**Future cost of electricity**	**International GHG commitment compliance**	**PA air quality**	**District municipal air quality**	**District Municipal health**	**District municipal socio-economics**
Counterfactual: Baseline / BIP			Long term compliance challenges				
Eskom ERP 2022		Largely due to Medupi FGD					
Eskom ERP 2022 PM Fast Track	Worst case: the equivalent of an additional stage for a 12 month period.	Largely due to Medupi FGD		Short term improvement in PM in HPA and VPA	Short term improvement in PM in HPA and VPA	Short term improvement in PM inHPA and VPA	

Figure 78: Multi-dimensional analysis for Eskom ERP 2022

14.4.2. NO_x Abatement

As per Table 8, NO_x is a low health concern, LNBs are relatively inexpensive, and not unduly challenging to install. Duvha, Matla, Lethabo, Majuba, Tutuka and Matimba remain non-compliant for NO_x. Eskom's ERP 2022 anticipates only retrofitting Lethabo, Majuba and Tutuka with low NO_x burners, and undergoing an optimisation process at Matimba. Eskom does not intend to install low NO_x burners at Duvha and Matla, as these plants are identified for closure by 2034.

The Forum concurs with Eskom's ERP 2022 plan in the case of NO_x for the following reasons:

- Because NO_x is less of a health concern than PMs, installation of LNBs should not increase the risk of loadshedding whilst this remains a concern. Hence fast-tracking of LNB projects is not possible.

- LNBs are not unduly technically challenging to install, hence this should proceed as planned at Lethabo and Majuba. Tutuka's [redacted].

- Given Matla and Duvha's retirement schedule, together with the loadshedding constraint, LNB should not be made a condition at these plants so these plants would only comply with existing plant standards until retirement.

As soon as there is space identified within the margin of electricity supply adequacy beyond that required for the PM retrofit projects, consideration can be given to both accelerating the LNB projects at Lethabo and Majuba, and the retirement of Matla and Duvha. In each instance, the mitigation option of reducing output by closing non-compliant units or running these at a reduced load should explicitly be considered for both their impact on cost of electricity supply and GHG reduction.

14.4.3. SO_x Abatement [127]

As summarised in Table 8, SO_x is of medium concern from a health perspective, but abatement retrofits are relatively far more capital intensive than that for PMs or NO_x. FGD retrofits are also significantly more technically complex to install at all plants where FGD has not been incorporated in the plant design, such as Medupi and Kusile and, at most plants, there are space constraints rendering retrofitting FGD highly unlikely.

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[126] [redacted]

[127] The SO2 panel report recommended [redacted]

Therefore, the primary abatement option for SO_x for all plants, potentially with the exception of Medupi, should be reducing coal burn through reduced utilisation of the plant and / or early closure, as soon as security of supply is restored.

Moving to a primarily load-based regulatory regime in the future aligns with this view, and is discussed further in section 15. Reducing the amount of coal burnt by Eskom's coal fleet, either by running the plant at lower utilisation rates or by closing them early, aligns with strengthening drivers within the power sector globally that are penalising the operation of coal power plants from GHG, electricity cost and local air emissions perspectives. Plant upgrades and upskilling of plant-level teams will assist Eskom's fleet in complying with a progressive load-based regime as discussed in section 11.5.

Medupi's case however in particular, as has been discussed in section 11.5.7.7, warrants more detailed consideration. The main points are recalled here:

- An FGD was included in Medupi's design, and the installation of FGD remains a requirement of the World Bank loan associated with the plant.
- There is funding ring-fenced for Medupi's FGD.
- The project is included in Eskom's ERP 2022 Plan, and Eskom intends to go to market to procure the project in the first quarter of 2024.

However, when considering the multiple dimensions included in the Forum's TOR, it is not clear to the Forum that installing FGD at Medupi is the best course of action for South Africa.

There are a number of motivators for proceeding with the FGD retrofit, outlined in Section 11 and recalled here:

- Medupi is the second youngest, second largest plant in the fleet. Based on Eskom's EAF scenario planning, it is also expected to be one of the best performing over the rest of its life (along with the mid-life plants, Lethabo and Matimba). Medupi has a locked-in low priced coal long-term contract for decades to come (section 11.7).
- The coal in the Waterberg has a particularly high sulphur content, making SO_x abatement for the plant particularly effective.

However, installing FGD at Medupi does not score well on a number of other dimensions.

- FGD is an extremely expensive technology (section 11.5.7.7)
- Eskom has indicated that the FGD installation will require an extension of the plant's GOs, resulting in one of the largest and best performing plants in the fleet being offline for 80 additional days per year for 6 years during the period where load shedding risk is highest. This is, in part, reflected in the impact of the ERP 2022 power system modelling outputs of Eskom's ERP 2022[128].
- Whilst Medupi's SO_X emissions seem to negatively impact the AAQ which, together with the other pollutants, is associated with an increased risk of "*all-cause*" mortality in the surrounding communities, the effect of SO_x exposure is less of a health concern than PMs, which are directly associated with specific adverse health outcomes. In addition, the WPA is significantly less densely populated than either of the other two Priority Areas, and the power plant is situated downwind of the population, resulting in less immediate impact.
- The WBPA's AAQ is well within its compliance range (section 11.1.3).
- The operation of FGD requires a significant amount of water, which will need to be piped from the Hartbeespoort Dam, with corresponding costs (opportunity and actual) (Section 11.5.7.7).
- There are concerns over the environmental impacts of the supply, disposal and management of sorbent required for FGD. (Section 11.5.7.7).
- FGD increases GHG, NO_x and primary PM pollutants from the plant by around 1% due to the parasitic power load of the FGD plant.

[128] The Forum did not undertake modelling to specifically identify the impact of Medupi's FGD on its own.

- Operating Medupi for its full economic lifetime may not be possible given South Africa's international climate change commitments. Hence the costs of the FGD may not be able to be amortised over the full lifetime of the plant.

- FGD only addresses one air pollutant, and coal plants are problematic across additional local pollutants and GHGs. There appear to be opportunities to upgrade Eskom's coal plants to address all three local air pollutants, together with GHG emissions, suggesting it may be more cost effective to allocate available capital differently.

- Eskom has indicated that even after retrofitting Medupi with FGD it will still require indulgences to achieve compliance with concentration limits.

To further understand how installing FGD at Medupi might impact the multiple dimensions of the Forum's TOR, the Forum constructed a final power system modelling scenario to compare with Eskom's ERP 2022 (which includes Medupi's FGD) and compared the two using its multi-dimensional framework.

This final scenario is developed from the perspective of the recommended load-based regulatory regime being implemented around 2030, where the primary mechanism for reducing SO_x emissions is through a reduction in coal burnt. However, it is important to note that the power system modelling environment used for the Forum's work was not developed for the purposes of exploring alternatives to concentration-based regulation, despite this being possible in future model developments (discussed further in section 15). The current modelling environment is therefore subject to significant limitations when exploring load reduction options, primarily because the model receives the following important abatement option information as inputs:

- Plant level utilisation and ramp rates

- The decommissioning schedule of the coal plant

- Abatement retrofit technology and timing

If the coal plants can retrofit / adjust utilisation / ramp / close in response to regulatory and price pressures and the resulting system requirements, economic theory suggests that more efficient and optimal outputs will arise, including across the multiple dimensions of electricity cost, local air pollution and GHG emissions. Both in real life, and in future modelling iterations, these things are absolutely possible. Modelling considerations and developments to represent these aspects are considered further in section 15.

For its current analysis, however, the existing modelling environment constrained what could be explored. Therefore, the resulting outputs are indicative only but, importantly, are likely to be conservative in terms of what can be achieved from a multi-dimensional perspective. More flexible optimisation modelling is anticipated to reveal additional gains.

A scenario was constructed to test the implication of reducing overall coal burn rather than installing Medupi's FGD. This scenario assumes that Eskom's ERP 2022 is implemented apart from Medupi's FGD, which is not undertaken. In addition, Kendal's closure date is brought forward from 2044 to 2030. Kendal was chosen for a number of reasons:

- Kendal is a mid-size plant, currently scheduled to operate for another 20 years. Therefore, whilst representing less than Medupi's capacity and lifetime, it covers a sizeable portion of it.

- The plant performs poorly in terms of technical performance (EAF), coal cost, and local and GHG emissions factors.

- The HPA has the highest population levels and poorest AAQ compliance of the three Priority Areas where Eskom's coal plants are situated. Both SO_x and PM exceedances occur in the region.

The outputs of the ERP 2022 "no FGD Kendal off" scenario are provided below:

This scenario achieves a significant reduction in all three local air quality pollutants in the HPA region. PM's are reduced by 10%, NO_x by 7% and SO_x by 12% over the period until 2040, compared to the reference Baked-in-Progress case.

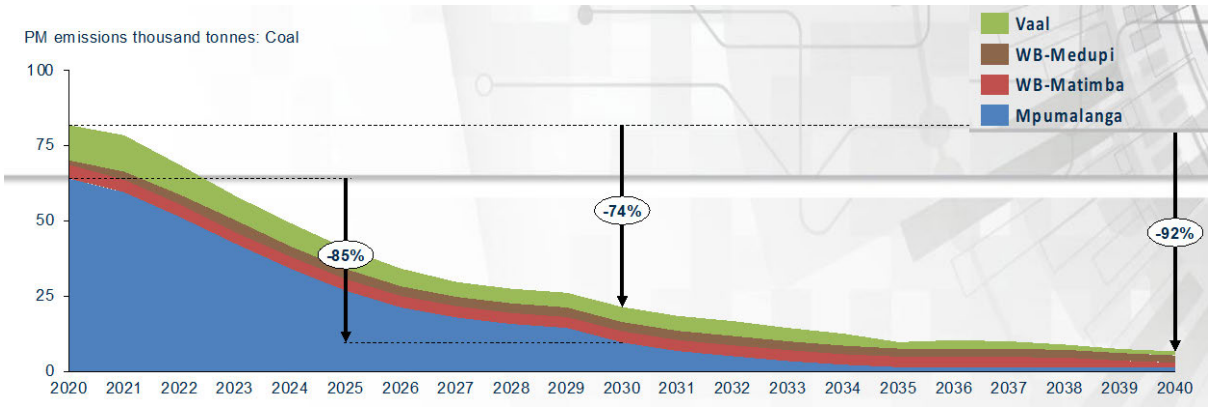

Figure 79 PM emission reductions from coal in the ERP 2022 Kendal off scenario

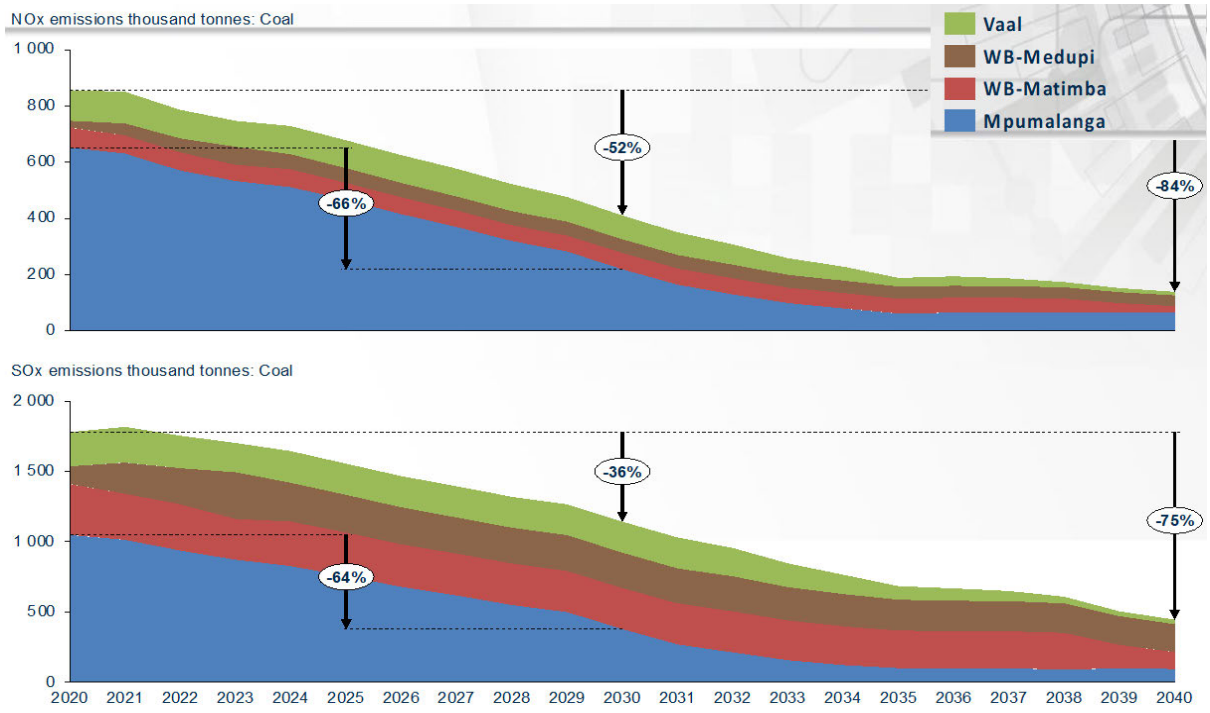

Figure 80: NOx and SOx reductions in the ERP 2022 Kendal off scenario

The ERP 2022 “Kendal off” scenario is the only one (apart from the unachievable NAQO Decision scenarios) achieving a significant reduction in GHG, of 7% over the period. Further, the removal of coal capacity causes the model to build more non-emitting generation instead, embedding the GHG reduction into the future. In addition, security of

supply is improved on the ERP 2022 (because Medupi is not taken offline for retrofitting). There is also a far smaller 0,7% increase in the cost of electricity, suggesting that there are cost gains to be had in substituting clean generating capacity above retrofitting existing plants, at least up to a point.

The multi-criteria matrix below compares Eskom's ERP 2022 and the modified "no FGD and Kendal off" scenarios. Whilst the results are not perfectly aligned on any one criteria, the differing pattern of improvements and deterioration across the different dimensions in each scenario, together with the conservativism baked into the way the "Kendal off" scenario was specified and modelled, suggests that further information and analysis is needed to first determine the value of installing FGD at Medupi and, second, to better understand how much coal use can be reduced, where and when. Interventions that support the coal plant running more flexibly will then further enhance this abatement focus.

	National			Regional	Municipal			
	Security of Supply to 2030	**Future cost of electricity**	**International GHG commitment compliance**	**PA air quality**	**District municipal air quality**	**District Municipal health**	**District municipal socio-economics**	**Local environment**
Counterfactual: Baseline / BIP			Long term compliance challenges					
Eskom ERP 2022	The equivalent of an additional stage for a 3 month period	+2%		HPA PM: - 1% HPA NOx: -7% WBPA SOx: -23%	SOx is not in exceedance in WBPA	SOx is not a priority health risk in WBPA		Medupi water supply.
Eskom ERP 2002, No FDG, close Kendal 2030	Slightly more than the BIP, but less than Eskom ERP 2022	0,7%	-7%	HPA PM: -10% HPA NOx: - 7% HPA SOx: -12%	Improvements in PM and SOx are priorities	Improvements in PM and SOx are priorities	Potential to access JET funding	

Table 30: Multi-criteria matrix below compares Eskom's ERP 2022 and the modified "no FGD and Kendal off"

In addition to the issue of Medupi's FGD, this analysis also lends support to the Forum's recommendation on regulatory reform and the value of a load-based regime focus, particularly with regards to SO_x regulation.

The Forum suggests that a multi-disciplinary panel be constituted to consider the Medupi SO_X abatement issues in 1 – 8 above and to advise the Minister and the SA government of the preferred way forward.

14.5. Power plant life extensions

Throughout its tenure, the Forum worked on the basis of Eskom's IRP 2023 submission dataset for anticipated plant closure and decommissioning dates. [redacted]

Whilst the Forum understands the context of the power supply crisis in the country, and the critical contribution of the coal fleet during the period to 2030, it notes with concern the extent of the life extensions proposed for all of the five old plant currently operating under MES suspensions. Because a clear legal resolution was available for these five older plants, the Forum has not explicitly summarized the multi-dimensional impacts of these plants in its critical factor analysis and multi-dimensional Baseline assessment. However, during the course of its work, the Forum has become aware that:

- All of these plants are located in the HPA which has regular exceedances of both PMs and SO2, and for which regulation is being developed in order to enforce improved management.
- The plants differ in terms of their anticipated performance going forward, which brings into question the blanket extension being applied.
- All of these old plants have GHG intensities above 1,3tCO2/MWh. These are the five most GHG polluting plants in the fleet.
- [redacted]

The performance of the coal fleet is the critical factor in alleviating the loadshedding crisis to 2030. Eskom's challenges in this regard are comprehensively documented in the VGBE consortium's Independent Assessment of Eskom's Operational Situation (a report which the Forum received in early March 2024, despite repeated requests for sight of the report, which

was completed in August 2023). Given the magnitude of the task at hand, it would appear that a more strategic focus on improving the performance of those plants where there are low hanging performance wins to be had, would be beneficial. Whilst the Forum acknowledges that improved coal plant performance equates to more local air emissions regardless of which plant produces the power, a focus on improving the performance of lower cost, less emitting younger plants would be advantageous from a multi-dimensional perspective.

[redacted] There is no analysis that suggests power system insecurity will persist beyond 2030. Power system modelling underpinning the draft IRP 2023, Eskom's MTSAO, that of the NECOM, and the CSIR work for the Forum, all show that the crisis should be resolved by latest 2028/29. [redacted]

All existing credible power system modelling analyses demonstrate the cost effectiveness of a renewables and storage dominated future power system for South Africa. Currently, the cost of constructing and operating solar PV contracted in the REIPPPP Bid Window 6 is lower than just the coal and operational costs of keeping [redacted]. [redacted] This can and should be explored in further analytical work.

[redacted]

[redacted] Whilst the International Partner Group has demonstrated understanding for the current security of supply conundrum, it is unlikely to tolerate a move to [redacted]

[redacted] . It is anticipated that reversing this decision may put much of the $12,5billion JETP funding at risk.

Therefore, the Forum recommends that the Minister limit Tutuka's exemption to the period where there is inadequate power supply, initially to 2027 with the potential to review additional years if this is required.

14.6. Conditions related to emission reduction

Tutuka may not be granted exemptions beyond 2030. Tutuka codes poorly in terms of costs, performance, all air pollutants and health impacts. [redacted]

Plant-specific conditions relating to all three pollutants:

14.6.1. Conditions relating to PM:

Eskom must implement PM projects according to the accelerated schedule presented in January 2024, regardless of loadshedding implications. These projects must be hard baked into a revised GO schedule.

In addition to the above, the potential for the last three ESP projects at Lethabo to be brought forward should additionally be investigated. The situation at Tutuka Units 2 and 4 should also be investigated.

The investigations contemplated above must be finalised within 60 days of any decision made by the Minister in respect of a section 59 application and the findings must be submitted to the Minister. The Minister may impose further conditions relating to the roll-out of PM projects in respect of Tutuka Units 2 and 4, and Lethabo.

If no additional loadshedding impact can be tolerated, then, at a minimum, Eskom must be required to adhere to the project completion dates in the ERP 2022 (updated 14 December 2023).

14.6.2. Conditions relating to NO_x:

Eskom needs to adhere to the MES limit they state they can achieve in their applications.

Lethabo, Majuba and Tutuka should expedite their LNB projects as fast as system adequacy allows and must report on this issue.

Once system adequacy is restored, consideration should be given to early retirement or reduced utilisation of Duvha and Matla given their lack of compliance with MES.

Kendal and Matimba must complete optimisation within the stated timeframe

14.6.3. Conditions relating to SO_x:

Eskom must achieve the concentration limit they state they can achieve in their applications.

The Forum finds that it does not yet have sufficient information to support making the installation of FGD at Medupi a condition of the plant's exemption from complying with the SO_x MES limits from 2025. Eskom must undertake an updated[129] CBA to determine the value of FGD at Medupi. This CBA must include health benefits compared to abatement costs. The outcomes of the CBA must be considered together with the benefits and costs identified in the Forum's multi-dimensional assessment.

Eskom must investigate options to upgrade its coal fleet to enable the plants to run at lower utilisation factors, and to enable the plants to ramp up and down more frequently. Eskom should undertake a detailed plant level feasibility assessment of possible upgrades, operating procedure revisions and operator training to enable operation at lower utilisation rates for each plant needing an exemption for SO_x.

[129] Whilst a number of CBAs have been undertaken historically related to the installation of FGD on Eskom's coal fleet, it is not clear whether there has been a specific CBA done for Medupi alone. If this has been done, it is not in the public domain, and may be dated.

14.7. Conditions based on socio-economic considerations

14.7.1. General interventions for/in communities

Eskom should consider investing in strategies to reduce other sources of air pollution that adversely affect AAQ, particularly those that cause and/or exacerbate pulmonary and cardiovascular diseases. In this regard, the Forum proposes the following conditions be imposed:

- One of Eskom's offset interventions in settlements near the Lethabo power station is the collection of waste and the eradication of illegal waste dumps. The scope of this intervention should be increased to cover a minimum of 2 at-risk settlements located around Eskom's power stations where illegal mining dumps have been established. This will result in the reduction of uncontrolled burning of refuse containing tyres/plastics which pollutes harmful toxins.

- In the Nkangala and Gert Sibande District Municipalities, Eskom is aiming to improve the AAQ by reducing domestic coal burning through the replacement of household coal stoves with hybrid gas-electricity stoves and an LPG heater as well as insulation of houses through the installation of ceilings. However, the scope of this intervention is narrow and slow as only 33000 households will be participating, and implementation has been slow. The implementation of these offsets must be subject to strict deadlines, and no further extensions must be approved.

- Eskom must undertake meaningful research programmes to understand offset programmes that are most appropriate and acceptable to specific communities and report on these, including how it plans to implement the said programmes, within 12 months of the issuance of the AELs. These must be the subject of a focussed planning, monitoring and verification processes to ensure that the air quality offset projects improve AAQ.

- Eskom must submit plans within 12 months of the issuance of the AEL that comprehensively address how it intends to deal with the ash dumps it has established in the various areas. These dumps contribute significantly to the emission of PM, particularly during windy conditions. Eskom must set out clear

timelines of when it will address the issues however, these timelines must fall within the time period that the AELs are in place.

- Eskom must use some of its unused land to establish green spaces, an approach that is gaining momentum, that involves planting large scale tree farms that will improve AAQ by absorbing carbon storage, which reduces the amount of carbon in the atmosphere. In areas such as Lephalale, the green spaces can also assist to minimise the heat, as these provide natural cooling of air and surfaces. Eskom can explain the benefits of this approach to get buy-in from people in the communities who can be enlisted to assist it with establishing the green spaces.

14.7.2. Health interventions

Eskom is not a health care provider however, it is common cause that emissions from its coal-fired power stations have a negative impact on the health of its employees and contractors, as well people in the surrounding communities. Therefore, it has a responsibility to ensure that it takes steps to ease the burden, where possible, on public health institutions and provide meaningful support to the health sector in the communities in which it operates.

Health interventions at the plant level – employees and contractors

Eskom conducts what it refers to as a medical surveillance and fitness assessment to its employees and fixed-term contractors. The purpose of the medical surveillance is to identify occupational diseases at an early or reversible stage and to detect adverse health effects that could possibly be related to workplace exposures. The purpose of the medical fitness assessment is to determine whether an employee meets the inherent health requirements of the job. The aim of the medical surveillance is to detect and report occupational diseases as required by legislation, whereas the aim of a fitness assessment is to determine whether the employee is fit for work and/or location.

Where its medical surveillance and fitness policy falls short, Eskom must ensure that it:

- Monitors personal air quality exposure for high-risk employees, such as 24-hour monitoring monthly with documentation and recording of exposures.

- Conducts lung health screening to include lung function testing (spirometry) including equipment, staff and training. This will develop the much-needed infrastructure to improve diagnostics of chronic lung diseases.

- Conducts cardiovascular and general health screening, blood pressure, cholesterol and blood glucose.

- Improves referral and treatment pathways to health care facilities. It must keep a record of all employees and contractors referred to health care facilities, as well as detailed reasons for such referrals.

- Compiles a comprehensive report which must contain the information referred to in the above paragraphs. This report must form part of the report pack that must be submitted to the relevant licensing authority, as per Eskom's AELs. It is important that the information provided must be provided in compliance with the Protection of Personal Information Act, therefore it should not contain information that could be used to easily identify an employee or contractor.

Health interventions at the Community level

Eskom must provide financial support to be used specifically for health-related interventions. Based on the needs and available resources in the communities, Eskom must:

- Provide facilities and resources that can be used to conduct community screening programmes biannually. The screening may be a combination of:

    - Lung health screening to include lung function testing (spirometry). This will develop the much-needed infrastructure to improve diagnostics of chronic lung diseases.

    - Cardiovascular and general health screening, blood pressure, cholesterol and blood glucose.

- Donate mobile screening clinics, which will provide first-line treatment, or revamp local health facilities as this will assist communities to access treatment pathways timeously. These facilities must serve the needs of the community, be accessible to

the community on the weekends and clinical data from these clinics (subject to POPIA requirements) should be made available to all stakeholders.

- Develop awareness programmes within 90 days of the AEL being granted. The programme must make specific reference to biannual engagements with communities as this will empower them to better understand health screening and wellness through health education programmes on early detection and accessing health care for potential air quality associated health impacts. The programme must also cater for training health care workers who will bear the responsibility to support and educate communities on health-related issues.
- Conduct detailed health risk assessments to understand the impacts of each of its plants and establish a long term (20 -30 year) cohort epidemiological study in the vicinity of each of its power stations.

14.8. Transparency and governance conditions

Eskom should install continuous emissions monitoring equipment measuring AAQ at sites around each power station and this data must be provided in real-time to all stakeholders and on the DFFE SAAQIS system.

Eskom must provide live daily emission data of each of the pollutants on Eskom's website for full disclosure to all stakeholders. This will enable all stakeholders to access information relating to Eskom's compliance with its obligations set out in its AELs.

Eskom must record the emissions data, referred to above, in its annual Sustainability Report and voice this in its Eskom's financial results /AGM.

Eskom must hold, at least, a quarterly multi-stakeholder engagement session for each power station wherein air quality issues/plans/progress on mitigation measures are discussed. Progress reports and evaluations must be made publicly available at these engagement sessions.

Eskom must consider placing an electronic messaging service in the neighbouring communities that indicates, in real time, the current state of the air quality (good/bad/unacceptable) based on AAQ monitoring data.

Public health stakeholders and academic institutions involved in researching the health implications of air pollution must be invited to participate in the process of evaluating the impacts of the postponements. A register of air pollution related health cases must be established for this purpose.

Eskom must install air filtration systems in all community and public buildings in the affected areas. This can be done through a filtration system integrated into the heating, ventilation, and air conditioning (HVAC) system or the supply and maintenance of mobile filtration devices, along with the appropriate training on their use.

Eskom must formally commit to engaging with stakeholders, community beneficiaries and appropriate state actors to formulate the establishment of a Community Grants Programme which will support, fund and manage ongoing mitigation actions. The programme must be premised on transparency, and the governance thereof must be formulated so that beneficiary representatives have meaningful oversight of the programme, as well as a say in how it is implemented.

15. RECOMMENDATIONS ON REGULATORY REFORM AND OTHER MEASURES

15.1. The need for regulatory reform

In the preceding sections, the Forum has made recommendations to the Minister which are confined to the currently applicable regulatory framework and can thus be implemented in the short term, should the Minister choose to adopt those recommendations.

The Forum however is of the view that these recommendations do not enable sustainable compliance with the MES as outlined in section 9, which section analyses the questions before the Forum. Rather, they constitute an interim solution which has been recommended to allow the Department and Minister time to implement the reforms needed to facilitate a sustainable progression towards decreased emissions of all pollutants, in particular PM and SO_x, in order to protect the health and well-being of those living close to the power plants

without compromising national-level health and well-being of citizens and impacting on the country's economy and security of electricity supply.

The Forum's ability to make recommendations to this effect was notably constrained by the applicable legislative framework. What is meant by this is that a number of practical solutions which might have been worth exploring by the Forum were not, because it was determined at the outset that they were not lawful in terms of the applicable legislation and thus would not be able to be implemented by the Minister.

In the Forum's view, the current legislation is not properly achieving its objectives for a number of reasons:

First, because there is a disconnect between what is practicable and possible from the perspective of emitters operating older facilities and what is required to be compliant in terms of the law. For example, the MES for SO_2 for Solid Fuel Combustion Installations is 1000 mg/Nm^3. This standard is achievable, but only with the installation of an FGD. As set out in section 14.4.3, at most of Eskom's power stations it is not feasible to install an FGD given space limitations and the old plant design. Absent this intervention, the Forum is convinced that plants are unable to comply with the concentration-based limits. This is a challenge faced not only by Eskom but which impacts on other industry players operating older plants. This is additional motivation for the need to review the legislative framework in order to achieve the objective of sustainable compliance.

The NAQO is aware of Eskom's difficulty with compliance and, in this regard, advised the Forum that, "*In the light of the challenges faced by Eskom to come into compliance with the MES there is a need to consider a legislative framework that will ensure continuous improvement in air quality while accommodating a new approach to emission reduction for the power generation sector, and hence Eskom.*"

Second, since the drafting of the legislation, the issue of climate change has risen up the global agenda. The resulting decarbonisation imperative has resulted in the advent of a period of disruptive change in power sector technology and pricing globally, which is driving a transition to power systems with net zero GHG emissions. This development raises the

importance of one of the abatement options less visible at the time of drafting air quality legislation – that of reducing the use of polluting fuels.

As it stands, a regulatory regime focused on concentration limits ultimately does not incentivise or align with the transition away from fossil fuels which is driving change in the power sector. In some cases, for example the retrofitting of capital intensive FGDs to old power stations, concentration solutions may actually work counter to the trends in power provision, as it may be more difficult to transition away from plants whose capital expenditure is not fully amortised over its planned life. Regulatory approaches based on restricting pollutant loads however align directly with accelerating trends in global energy systems, together with South Africa's international climate change commitments.

Third, there are further advantages to regulatory approaches based on load-restrictions in the light of significant uncertainty around the cost and performance of individual plants within the coal fleet, together with broader uncertainty around demand, alternative generation build rates, and the implications for Eskom's coal plants of the power system disruption due to decarbonisation and decentralisation.

A load-based system enables two important sources of flexibility to be introduced to the regulatory regime. The first is the concept of grouping plants together in regulatory 'bubbles'. Because air pollution is dispersed across an area far beyond the location of the plant, the impact on AAQ in this area is dependent on the cumulative emissions from all emitters located in the area. The pollutant loads of the coal plants that operate within one Priority Area can therefore be grouped, with a cumulative limit set for the area. Eskom, as owner of the coal fleet, can then decide on an ongoing basis how it meets this limit – i.e. which plants or units need to be taken off when (as the utility has the best information on individual plant conditions, performance, and costs). For example, if one unit suffers a breakdown that is very costly to repair, it may be preferable for Eskom to close this unit and achieve the load-based emission reduction than to run a better performing and cost effective unit at a lower load. A bubble approach will also enable a faster phase-in of meaningful pollution limits once security of supply is restored, due to its inherent flexibility. Upgrades to enhance the flexibility of a few plants within the bubble will further optimise cost effective pollution reduction and the resilience of the entire power system to the challenges of the energy

transition, as discussed in section 11. Clear and long-term regulatory signaling of a reducing load limit trajectory will assist in supporting and maintaining momentum on the build-out of clean power.

A second mechanism that can be introduced together with either plant level or PA level load-limits, is a levy on SO_x pollution. Similar to the introduction of the carbon tax, a levy directly internalises the cost of a pollutant and forces its inclusion in economic decision-making around a plant. This might be something National Treasury could be approached to consider. Levies generate revenue which could directly or indirectly support coal plant flexibilisation expenditure and/or socio-economic support.

The Forum acknowledges that load limits are fundamentally different to concentration limits in how they restrict pollution. However, by attending to calibration levels and safeguards such as concentration ceilings, an equivalence between the two can be achieved. There does not appear to be an a-priori reason why load-based regulation cannot achieve a similar level of health protection to that of concentration limits, and this should be the overarching objective.

Finally, in addition to concerns about compliance, misalignment with fundamental changes in global energy systems and the current state of the South African power system, there is ambiguity in the drafting of particular relevant provisions, which ambiguity has been used by different stakeholders to advance their particular case. However, the fact that there is room for different interpretations of certain provisions creates uncertainty for stakeholders, as pointed out by Anglo American Platinum in its written submissions to the Forum.

In view of the above, the Forum recommends that consideration be given to legislative reform to provide for legislation that:

1. Allows for flexibility in the way in which emitters can comply;
2. Provides legal certainty with unambiguous drafting;
3. Does not compromise on the need for continuous improvement in air quality;

4. Aligns with South Africa's international commitments and fundamental market drivers;

5. Is possible to enforce; and

6. Legislates impactful consequences for non-compliance.

15.2. Input on regulatory reform

The Forum received a number of submissions in which potential regulatory reform was proposed.

In particular, Anglo American Platinum proposed that:

- A clear application process and timelines should be legislated. For example, there should be a stipulated time period within which the NAQO must make a decision.

- Provision should be made for AELs to be amended simultaneously with a postponement decision so that a separate application does not have to be made after an applicant has received a positive outcome.

- NEMAQA should be amended to state that exemptions from the MES can be granted in terms of section 59 provided there is: good reason to do so; the exemption is supported by a cost-benefit analysis; and there are no significant environmental impacts that cannot be appropriately mitigated.

- Generally, provide greater flexibility to accommodate unique and/or changing circumstances. For example, enable flexibility on good cause shown in relation to reporting methods and averaging periods.

- Legislative changes that could stimulate the creation of innovative ways of dealing with emissions beyond the use of point source measurement.

- Consider alternatives to point source measurements because there is potential for a misalignment between concentration limits at the point source stack and air quality at the ground level where human health impacts are felt.

- The publication of regulations rather than guidelines to better recognise off-sets.

- Amend the List of Activities to include provisions addressing the cost and risk factors of compliance and ensure that these regulations align with NEMA.

- A general review of the applicable regulatory framework to identify areas of overlap and opportunities for co-ordination, harmonisation and integrated environmental management.

The Forum requested the NAQO, Dr Gwaze, to advise whether her office had any recommendations or proposals for potential regulatory reform, which may assist the licencing authorities in the administration of emissions licenses and enforcement of the MES. Dr Gwaze made a number of suggestions including:

- 12A of the List of Activities could be amended to:

    - in the short-term (until 2035), provide for facilities that are to be decommissioned by 2035 to be optimised and operated without additional investments in abatement technologies (therefore allowing facilities to operate at existing plant standards). This reform must be limited ONLY to indulgences relating to SO_2 MES;

    - in the long-term (beyond 2035), allow facilities operating beyond 2035 to commit to reasonable measures to control pollution and operate at new plant standards by 2030. This indulgence will extend compliance timeframes by another five (5) years.

- An amendment to this effect must balance environmental management and sustainable development with the principles that governed the introduction of section 21 of NEMAQA and the MES.

- The NAQO is aware of a number of risks associated with an amendment of this nature but also acknowledges the potential need for reform to address the critical energy crisis, failure by Eskom to meet the MES and the socio-economic needs of the country.

- In the NAQO's view, if such a solution were pursued, it should follow a detailed cost benefit study to rationalise the legislative amendments.

We thank the NAQO for this contribution, which was given on very short notice.

15.3. Recommended legislative reform

The Forum has given consideration to the above proposals and between its members discussed and debated potential reform.

Anglo-American Platinum's proposals are consistent with a number of recommendations made by the Forum below and to that extent are endorsed by the Forum. Although the Forum is of the view that an exemption from the MES can be granted in terms of section 59, the amendment proposed by Anglo-American Platinum to provide for further clarity, is a good one.

In the Forum's view, the short-term approach proposed by the NAQO may assist with alleviating issues of non-compliance for certain mid-life plants such as Matla, Duvha and Tutuka. In the event that this amendment is contemplated, it must drafted in the most restrictive manner to achieve the intended purpose.

However, it should be noted that extending time periods to facilitate compliance for plants closing in 2035 does not address an underlying concern which is that the manner in which the current List of Activities is drafted does not cater for emitters to implement flexible solutions which still seek to improve air quality and thus reduce negative health impacts but at least cost to the emitter and the economy.

The Forum thus recommends that consideration be given to amending the MES, which it understands is permissible in terms of section 21(1)(b) of NEMAQA, to provide for explicit load-based limits as an alternative to the currently applicable concentration-based limits. This recommendation is specifically for the SO_x limit given that it is the one which is most difficult to comply with. Where necessary, concentration limits should be used in conjunction with the primary load-based limit in order to contain the risk of exceedances. Furthermore,

it is recommended that this be accompanied by the legislating of a mechanism that would allow Eskom to make fleet level decisions in response to multiple constraints which it is argued will produce optimal outcomes. Two possible mechanisms are:

- the introduction of a “bubble approach” and
- system-wide levies which will shift the “abate or reduce load” decision away from the regulator and to the fleet operator, ensuring against unintended consequences for the plant performance and economics dimensions.

The Forum’s recommendation in this section is theoretical and requires further technical analysis. Due to time and resource constraints, the Forum was unable to model the implications of this proposal for the power system. It has, however, done some work to define what could be modelled should the Minister decide to pursue this recommendation. In this regard, and building on the discussion in section 14.4.3, power system modelling is a powerful tool that, when further specified, can provide insight into the real world, multi-dimensional impact of various regulatory regime options, but can also assist in identifying which coal plant to turn down or decommission early, and when. The modelling done within the confines of the Forum’s initial focus on concentration-based regulation, in particular the Eskom ERP “no FGD and Kendal off” scenario shows the potential of reducing generation output from coal power plants to reduce pollutants versus the retrofitting of abatement technologies. Earlier retirements and/or reduction in output and minimum stability operation limits may provide multi-dimensional gains including in respect of the cost of electricity, GHG reductions, local air pollution reductions with corresponding health gains, and improvements in local socio-economics and the environment.

In order to fully respond to the question of regulatory reform, and identify the extent of the potential in reducing generation output from the coal fleet, the following modelling developments are required:

- Abatement retrofit technologies must be decisions available to the model at the individual coal plants, not simply inputs.

- The extent to which plant stability and minimum utilisation factors can be lowered needs to be better understood, including costing of interventions to support this.

- The calibration of externality costs / prices of pollutants requires exploration and fine tuning.

- The model horizon needs to be extended to at least 2050.

16. CONCLUSION

The terms of reference of the NECA Forum and their implementation involved work that was both painstaking and complex. The public consultation process and certain of the stakeholder consultation processes, in the main, proceeded satisfactorily. There were however certain consultations and meetings which the Forum would like to have had with certain interested and affected parties and national departments, however, despite numerous efforts and invitations dispatched to those groupings, no replies were received. This was disappointing.

The work of the Forum was of national importance and sensitivity due to the fact that all options had to be considered in making its recommendations to Minister Creecy, certain of which potentially involved plunging the country into darkness with stage 16 loadshedding.

Balancing such an eventuality with other significant factors such as the deleterious impacts on the health and the wellbeing of local communities and populations situated close to Eskom power stations as a result of emissions in the Highveld Priority Area and in the Vaal Priority Area, was difficult and extremely complex.

In addition, other environmental consequences of emissions and the operation of power stations needed to be considered and assessed at a time that the country was, and is, facing extensive loadshedding with all of the terrible socio-economic consequences that such loadshedding has for our country and its people.

Ultimately, the Forum arrived at a solution which it has recommended to the Minister which avoids stage 16 loadshedding and the closure of power stations, but which places significant

constraints on the emissions of PM, NOX and SOX by Eskom power stations, and binds them to a schedule of compliance over a specific timeframe.

The interim solutions as well as the conditions are recommended based on the context and set of facts before the Forum. It cannot be implied therefore that the Forum recommends exemption for plant extensions beyond the plant lifetimes contained in Eskom's IRP 2023 submission.

The Forum would like to thank Mr Warrick Pierce of the CSIR for the exceptionally professional power system modelling under the guidance and leadership of Dr. Emily Tyler. This modelling, and the results thereof, underpinned the work and recommendations of the Forum.

We are also grateful to Mr Sherman Indhul of the European Climate Foundation who funded the power system modelling undertaken by the CSIR.

We would also like to thank Dr R-D Heinsohn and Ms J Adam who were tasked with assisting the Forum to assess the socio-economic conditions of areas close to Eskom’s power stations. They were under immense pressure to submit their report and did so professionally.

The Forum would also like to thank the DFFE, specifically Dr. Vincent Gololo who has since left the DFFE, Mr Victor Loate the Director: Atmospheric Policy, Regulations and Planning, who replaced Dr. Gololo, and Ms Nyasi Ramashia. Their assistance and hard work is deeply appreciated.

Finally, the Forum would like to thank Minister Creecy for her support and assistance the throughout the compilation of our main report dealing with the appeals relating to all Eskom power stations.

The Chairperson would like to thank the Forum members, specifically Dr. Tyler, Mr Rubbers, Mr Ramandh and Dr. Vanker for the considerable amount of time and dedication that they showed in their commitment to the work of the Forum, which work, as stated previously, was remunerated at nominal rates considerably below the professional rates at which they earn a living. Despite this, the contribution of the Forum members was immense.

Peter Harris: Chairperson

Dr. Emily Tyler

Mr Ettiene Rübbers

Dr. Aneesa Vanker

Mr Avishkar Ramandh

Ms Maphuti Kwata (resigned)

Ms Lauren Hermanus (membership withdrawn by Minister Creecy).

LIST OF Annexures

Annexure 1: NECA Forum members' comprehensive curricula vitae.

Annexure 2: NECA Forum's Terms of Reference, dated 12 May 2022.

Annexure 3: National Environmental Consultative and Advisory Forum's Amended Terms of Reference and Extension of the period for establishment of the National Environmental Consultative and Advisory Forum, dated 7 July 2023.

Annexure 4: Workplan of the NECA Forum, dated 6 September 2022.

Annexure 5: Correspondence with the National Air Quality Officer, Dr Gwaze.

Annexure 6: Eskom SOC Ltd's appeal against the NAQO's decisions, 2021.

Annexure 7: Centre for Environmental Rights ("CER") Appeal, submitted on behalf of The GroundWork Trust ("Groundwork") and Earthlife Africa.

Annexure 8: Mr Rivarola's appeal.

Annexure 9: Responding statements submitted by the CER.

Annexure 10: Responding statement submitted by the NAQO.

Annexure 11: Structure of the decommissioning plan.

Annexure 12: Stakeholder Management plan and management programme.

Annexure 13: Newspaper notifications of the public participation meetings.

Annexure 14: Report from the SMS portal indicating SMSs to I&Aps, sent between 9 and 11 November 2022.

Annexure 15: Programme and minutes of the public participation engagements.

Annexure 15A: Copy of the programme and minutes of the consultation in Witbank on 14 November 2022 in relation to the Duvha and Kendal power stations.

Annexure 15B: Copy of the programme and minutes of the consultation in Hendrina on 15 November 2022 in relation to the Hendrina, Arnot and Komati power stations.

Annexure 15C: Copy of the programme and minutes of the consultation in Kriel on 16 November 2022 in relation to the Kriel and Matla power stations.

Annexure 15D: Copy of the programme and minutes of the consultation in East London on 16 November 2022 in relation to the Port Rex power station.

Annexure 15E: Copy of the programme and minutes of the consultation in Ermelo on 17 November 2022 in relation to the Camden and Tutuka power stations.

Annexure 15F: Copy of the programme and minutes of the consultation in Amersfoort on 18 November 2022 in relation to the Majuba power station.

Annexure 15G: Copy of the programme and minutes of the consultation in Vaal on 22 November 2022 in relation to the Lethabo power station and ArcelorMittal's plant.

Annexure 15H: Copy of the programme and minutes of the consultation in Standerton on 23 November 2022 in relation to the Grootvlei and Tutuka power stations.

Annexure 15I: Copy of the programme and minutes of the consultation in Lephalale on 24 November 2022 in relation to the Matimba and Medupi power stations.

Annexure 16: Presentations made by Eskom during the public consultation meetings.

Annexure 17: Minutes of meetings with stakeholders:

Annexure 17A: DFFE;

Annexure 17B: CER;

Annexure 17C: Eskom;

Annexure 17D: Other stakeholders.

Annexure 18: Invitation and minutes of the meeting between Mr Rivarola and the NECA Forum.

Annexure 19: Mr Rivarola's submissions sent via email, dated 11 November 2022.

Annexure 20: Agenda and minutes of the meeting between the NECA Forum and the National Treasury.

Annexure 21: Submissions from the Centre for Environmental Rights on behalf of groundwork and Earthlife Africa, dated 31 January 2023.

Annexure 22: Alternative Information and Development Centre (AIDC) Submission on the Applications for Postponement/Suspension of MES Compliance Timeframes including the related appeals and the MES NECA Forum Process.

Annexure 22A: Eskom Transformed: Achieving a just energy transition for South Africa (July 2020).

Annexure 23: Solidarity Strategy Institute's Submission – Suspension and Postponement of Compliance with Minimum Emissions Standards and Issues of Provincial Emission Licenses.

Annexure 24: Submissions by SEIFSA on Load Shedding Impact Assessment on the Metals and Engineering Sector.

Annexure 24A: Response to the questions from the Presidential Climate Commission (PCC)

Annexure 24B: Submissions by Sasol Limited

Annexure 25: Eskom's history of compliance and non-compliance with the MES.

Annexure 26: Socio-economic assessment report prepared by Dr R-D Heinsohn and Ms J Adam.

Annexure 27: Eskom's quarterly update on the implementation of its MES postponement commitments, for the period ending December 2023.

Annexure 28: Eskom’s Emission Reduction Plan, 2022.

Annexure 29: Energy system modelling of South African electricity supply sector by Mr Warrick Pierce (CSIR).

Annexure 30: Power system modelling scenario specifications.

Annexure 31: Accelerated PM project programme.