



**environmental affairs**

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Department:  
Environmental Affairs  
**REPUBLIC OF SOUTH AFRICA**

# **EIA GUIDELINE FOR RENEWABLE ENERGY PROJECTS**

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## TERMS AND ABBREVIATIONS

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**In this guideline any word or expression to which a meaning has been assigned in the National Environmental Management Act No 107 of 2008 (NEMA) has that meaning, and unless the context requires otherwise-**

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Term/ Abbreviation	Explanation
BA	Basic Assessment
Bagasse	Sub-category of biomass derived from the remains of sorghum and sugarcane
Biodiversity	Variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
Bio-fuel	Fuel derived from biomass (e.g. Bio-ethanol and bio-diesel)
Biogas	Gas typically produced from the biological breakdown of organic matter
Black liquor	Spent cooking liquor from the Kraft process (e.g. produced when digesting pulpwood into paper pulp)
BX	Biodiesel type (B) and percentage (X) of biodiesel in mixture (e.g. B20- 20% biodiesel to 80% standard diesel)
Calorific value	Amount of heat released during the combustion of a material
Carbon Neutral	Having a net zero carbon footprint, may refer to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset, or buying enough carbon credits to make up the difference
CER	Certified Emissions Reduction
Cetane	A measure of the ignition value of diesel fuel
CH <sub>4</sub>	Methane
CHP	Combined Heat & Power
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CSIR	Centre for Scientific and Industrial Research
CSP	Concentrated Solar Power (also called concentrating solar power or concentrated

Term/ Abbreviation	Explanation
	solar thermal)
DEA	Department of Environmental Affairs
DNA	Designated National Authority
DNR	Direct Normal Radiation
DoE	Department of Energy
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment. Procedure which ensures that environmental consequences of projects are identified and assessed before authorisation is given (under NEMA)
EMF	Environmental Management Framework
Environmental authorisation	The Competent Authority's grant or denial of permission to undertake the proposed activity. Previously referred to as the Record of Decision (RoD)
Environmentally sustainable development	Process of social, economic, and environmental (i.e. physical) development that provides a positive outcome for the living and non-living environment
Ferrous	Relating to Iron
Fossil fuels	A hydrocarbon deposit, such as petroleum, coal, or natural gas, derived from living matter of a previous geologic time and used for fuel
GHG	Greenhouse Gas
GIS	Geographic information system
GWh	Gigawatt hour
Gwe	Gigawatt electrical
H <sub>2</sub> S	Hydrogen Sulphide
Heliostat	Sun-tracking mirrors
HFC	Hydrofluorocarbon. Organic compounds that contain only one or a few fluorine atoms. Used as refrigerants in place of the older chlorofluorocarbons
HIA	Heritage Impact Assessment
Hydropower	Power derived from the energy of falling water
I&AP	Interested & Affected Parties: Individuals, groups or organisations that may have an interest in, be affected by, or affect an initiative (i.e. project or development)
IDC	Industrial Development Corporation
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan

Term/ Abbreviation	Explanation
kW	Kilowatt
Kyoto Protocol	International treaty subsidiary to UNFCCC. Sets quantified emission limitation or reduction obligations (binding targets) for 38 industrialised countries and the European community (Annex B countries)
LDO	Land development objective
LFG	Landfill gas
Lubricity	Ability to lubricate fuel pumps and fuel injectors
M	Meter
m/s	Meters per second
Macro	Large scale
MEC	Member of the Executive Council of a province who is responsible for the designated provincial lead agency in terms of a specified Act
Micro-hydropower system	Typically produces < 100kW
Mtoe	Million Tonnes of Oil Equivalent. Unit of energy: the amount of energy released by burning one tonne of crude oil, approximately 42 GJ (note different crude oils have different calorific values)
Municipality	Metropolitan, district or local municipality established in terms of the Local Government: Municipal Structures Act, 1998 (Act No. 117 of 1998)
N <sub>2</sub> O	Nitrous Oxide
National grid	Nationwide system of electric power transmission
NEMA	National Environmental Management Act, 1998 (107 of 1998, as amended in 2014)
NEMAQA	National Environmental Management Air Quality Act (No. 39 of 2004)
NEMBA	National Environmental Management Biodiversity Act (No. 10 of 2004)
NEMWA	National Environmental Management Waste Act (No. 59 of 2008)
NFA	National Forest Act (No. 84 of 1998)
NHRA	National Heritage Resource Act (No. 25 of 1999)
NO <sub>x</sub>	Generic term for mono-nitrogen oxides NO and NO <sub>2</sub> (nitric oxide and nitrogen dioxide)

Term/ Abbreviation	Explanation
NWA	National Water Act (No. 36 of 1998)
One environmental system	Agreement between the ministers of DEA, DWS and DMR to regulate all environmental related aspects and give effect to fixed and synchronised timeframes for the consideration and issuing of the decisions
PDD	Project design document
Photovoltaic (PV)	Relates to cells made from semi-conductor materials that are able to release electrons when exposed to solar radiation (sunlight) by using the photo-electric effect.
Pico-hydropower system	Typically produces < 1kW
Policy	A proposed or adopted course or principle of action
Primary energy	Energy form found in nature that has not been subjected to any conversion or transformation process
Proponent	A person intending to submit an application for environmental authorisation and is referred to as an applicant once such application for environmental authorisation has been submitted
QUELRO	Quantified emission limitation or reduction obligations
RBS	Revised balance Scenario
Renewable energy (RE)	Energy that comes from sources that are continually replenished, such as sunlight, wind, rain, tides, waves, and geothermal heat
Role player	Party involved in a public participation process (e.g. government departments and the public)
RRDB	Renewable Resource Database (RRDB)
RSA	Republic of South Africa
S&EIR	Scoping and Environmental Impact Reporting process
SAHRA	South African Heritage Resource Authority
SDF	Spatial development framework
SEA	Strategic environmental assessment
Secondary energy requirement	Energy transformed from primary energy into more convenient forms of energy (that can directly be used by society, e.g. electric or refined fuels)
SHW	Solar Hot Water
SO <sub>2</sub>	Sulphur Dioxide
Solar power	Conversion of sunlight into electricity, either directly using photovoltaics (PV), or indirectly using concentrated solar power (CSP)

Term/ Abbreviation	Explanation
Stakeholder	Individuals, groups and organisations that may have an interest in, be affected by, or affect an initiative (i.e. project or development)
Ton	1000 kilograms
UNFCCC	United Nations Framework Convention on Climate Change
Wave energy	Any process that derives power from the movement of waves on the surface of a body of water
Wh/m <sup>2</sup>	Watt-hour per square meter (i.e. measure of expended energy over a specific area)
Wh	Unit of energy equivalent to one watt (1 W) of power expended for one hour (1 h) of time
White paper	Authoritative report or guide helping readers to understand an issue, solve a problem, or make a decision.
Wind power	Energy received from the movement of the wind across the earth

### Disclaimer

Legislation requires, Environmental Assessment Practitioners (EAPs) to take into account any guidelines published in terms of S24J of the Act applicable to the Environmental Impact Assessment (EIA) process or activity which is the subject of the application.

This document is a guideline and serves as reference and supportive text to assist Competent Authorities and applicants during the EIA process. This guideline does not supersede any regulations published by DEA and does not absolve the applicant from any legal responsibilities set out by any relevant legislation.

It is the responsibility of the applicant, or where applicable, the EAP, to apply for the specific authorisations and permits required for all relevant activities.

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## **1 INTRODUCTION**

The Department of Energy (DoE) gazetted its White Paper on Renewable Energy in 2003, and introduced it as a “policy that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy.” At that time the national target was fixed at 10 000GWh (0.8Mtoe) renewable energy contribution to final energy consumption by 2013. The White Paper proposed that this would be produced mainly from biomass, wind, solar and small-scale hydropower. It went on to recommend that this renewable energy should be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. Since the White Paper was gazetted, South Africa’s primary and secondary energy requirements have remained heavily fossil-fuel-dependant, both in terms of indigenous coal production and use, as well as the use of imported oil resources. Alongside this, the projected electricity demand of the country has led the National utility Eskom, to embark upon an intensive build programme to secure South Africa’s longer-term energy needs, together with an adequate reserve margin.

Whilst the medium-term power generation mix will continue to lean heavily on the use of fossil fuels, the Revised Balanced Scenario (RBS) of the 2010 Integrated Resource Plan (IRP) includes for a total additional supply capacity of 17.8GWe from renewable sources by 2030.

In pursuit of promoting the country’s Renewable Energy development imperatives, the Government has been actively encouraging the role of Independent Power Producers (IPPs) to feed into the national grid. Through its Renewable Energy IPPs Procurement Programme, the DoE has been engaging with the sector in order to strengthen the role of IPPs in renewable energy development. Launched during 2011, the IPPs Procurement Programme is designed so as to contribute towards a target of 3 725MW, and towards socio-economic and environmentally sustainable development, as well as to further stimulate the renewable industry in South Africa.

In order to facilitate the development of first phase IPPs procurement programme in South Africa, these guidelines have been written to assist project planning, financing, permitting, and implementation for both developers and regulators.

### **1.1 Need and desirability for this guideline**

The Renewable Energy sector has long indicated its interest and readiness to invest in renewable energy technologies. This guideline aims to ensure that all potential environmental issues pertaining to renewable energy projects are adequately and timeously assessed and addressed as necessary so as to ensure sustainable roll-out of these technologies by creating a better understanding of the environmental approval process for renewable energy projects.

## **1.2 About these guidelines**

### **1.2.1 Purpose and use of this guideline**

The purpose of this document is primarily to provide guidance on the environmental management legal framework applicable to renewable energy operations and all the role players in the sector. The guideline is principally intended for use by the following stakeholder groups:

- Public Sector Authorities (as regulator and/or competent authority);
- Joint public sector authorities and project funders, e.g., Eskom, IDC, etc.
- Private Sector Entities (as project funder/developer/consultant);
- Other interested and affected parties (as determined by the project location and/or scope).

This guideline seeks to identify activities requiring authorisation prior to commencement of that activity, and provide an interface between national EIA regulations and other legislative requirements of various authorities.

### **1.2.2 Type of projects addressed in these guidelines**

Construction, installation and/or development of the following renewable energy projects are covered in this guideline:

- Concentrating Solar Power Plant;
- Wind Farm;
- Hydropower Station; and
- Photovoltaic Power Plant.

### **1.2.3 Structure of the guideline**

The guideline has been structured in a logical and systematic way that guides the reader through the EIA process of renewable energy projects, including:

- A review of Renewable Energy technologies;
- A summary of the impacts of each technology and associated authorisation processes required;
- An overview of some good industry practice mitigation practices that may be applicable to each technology;

- A concise review of the relevant National legislation associated with project development;
- A general schematic illustrating some primary components of a typical integrated NEMA approvals process; and

The guideline is presented in four parts:

Part A: Review Technologies

This section seeks to provide a review of renewable energy technologies, limited to those identified within the 2003 Renewable Energy White Paper. Each technology is summarised in terms of its environmental impacts and the reader is referred to the relevant sections within Part B in regards to:

- Wind;
- Biomass and waste;
- Waves and ocean currents;
- Solar; and
- Small-scale Hydro.

Part B: Renewable Energy Authorisation Requirements

This section contains the necessary detail of policies and legislation related to the legislative approval process. The legislation covered includes the following:

- The Constitution of the Republic of South Africa, 1996;
- The National Environmental Management Act (Act 107 of 1998 as amended);
- The National Environmental Management: Waste Act (Act 59 of 2008 as amended);
- The National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008 as amended);
- National Environmental Management: Air Quality Act (Act 39 of 2004 as amended);
- The National Environmental Management Biodiversity Act (Act 10 of 2004);
- National Environmental Management: Protected Areas Act (Act 53 of 2003 as amended);
- The National Water Act (Act 73 of 1998 as amended);
- The Water Services Act (Act 108 of 1997);
- The Occupational Health and Safety Act (Act 85 of 1993);

- The Hazardous Substances Act (Act 15 of 1973);
- The Municipal Systems Act (Act 32 of 2000);
- Conservation of Agricultural Resources Act (No. 43 of 1983);
- Mineral and Petroleum Resource Development Act (No. 28 of 2002 as amended);
- Road Traffic Management Corporation Act (No. 20 OF 1999);
- National Roads Act (No. 93 OF 1996);
- Civil Aviation Act (No. 13 of 2009);
- Astronomy Geographic Advantage areas Act (No. 21 of 2007);
- National forest Act (No. 84 of 1998);
- Sub – division of Agricultural land (No. 70 of 2009); and
- Spatial Planning and Land Use Management Act (No. 16 of 2013).

#### Part C: Stakeholder Roles and Responsibilities

This section provides a quick-reference table for each of the stakeholder target groups, indicating what roles and responsibilities would be expected at each phase of the project development cycle. These are inclusive of mandatory requirements as well as voluntary/non-mandatory activities.

PART D: NEMA Approval Process Schematics

This section offers schematics illustrating, in general terms, the typical basic assessment and scoping & environmental impact assessment timeframes for one environmental system processes in terms of NEMA. It must be noted that the nature and location of each project will ultimately determine the requirements.

## 2 PART A: REVIEW TECHNOLOGIES

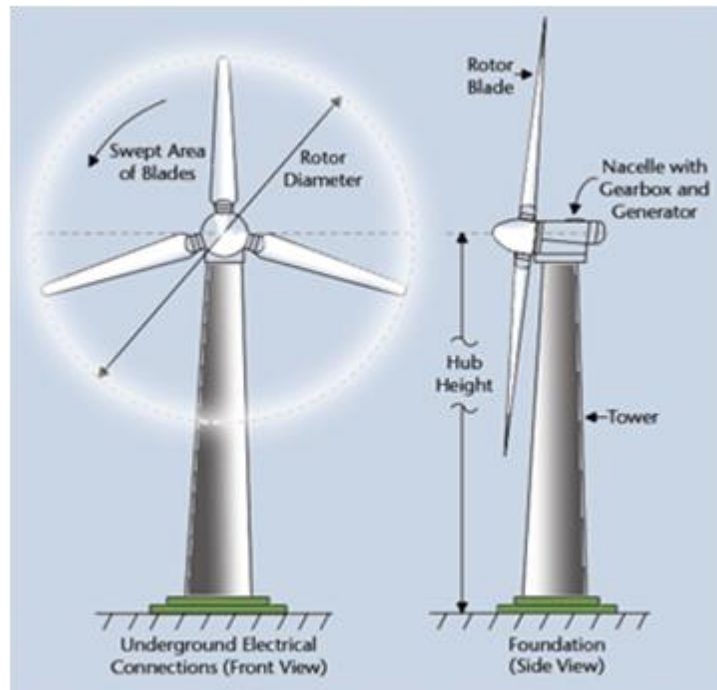
Renewable energy is energy that comes from sources that are continually replenished, such as sunlight, wind, rain, tides, waves, and geothermal heat.

Associated with each renewable energy technology discussed below, developers must consider secondary impacts of associated developments as applicable. These may include roads, transmission lines, energy storage facilities, etc. Such associated developments are not the focus of this guideline.

### 2.1 A1: Wind Energy

#### Technology Overview

Onshore wind energy technology is the most commonly used and commercially developed renewable energy technology in South Africa. Wind turbines are used to generate energy and they produce power over a wide range of wind speeds. Essentially, the turbine blades are designed to capture the kinetic energy in wind. When the turbine blades capture wind energy and start moving, they spin a shaft that leads from the hub of the rotor to a generator. The generator turns that rotational energy into electricity.



**Figure 1: Wind energy infrastructure (ESN)**



## Environmental Impacts

Wind power generates electricity without releasing toxic pollution or CO<sub>2</sub> emissions. Wind is abundant and inexhaustible.

At the same time, however, the construction and operation of wind turbines may possibly lead to unfavourable environmental impacts on biodiversity, land-use and communities in the form of noise and visual impacts. In addition to species disturbance and mortality, the issues of habitat loss and fragmentation needs to be considered for all affected living organisms inclusive of plants, invertebrates and vertebrates including birds and bats. Potential impacts from wind energy installations must therefore be assessed and mitigated when necessary.

The National Environmental Management Act (Act 107 of 1998; as amended) defines environmental impact assessment (EIA) as the procedure which ensures that impacts of projects are identified and assessed before authorisation is considered. The main objective is to avoid or minimise negative effects from the beginning of a project rather than trying to mitigate them later.

**Table 1** below indicates the potential impacts associated with wind energy and wind farm development, together with the applicable and relevant legislation and its reference location within Part B of this Guideline.

**Table 1: Potential Environmental Impacts of Wind Energy Projects**

Impact Description	Relevant Legislation	Reference (Part B)
Visual Impact	NEMA	B2
Noise Impact	NEMA, NEMBA, Health Act	B2, B3
Land Use	NEMA, NEMBA, NEMICMA, NEMPAA, NWA, NHRA	B2, B3, B5, B6, B9, B11
Impacts on Biodiversity	NEMA, NEMBA, NEMPAA, NFA	B2, B3, B6, B21
Electromagnetic Interference	NEMA, NEMBA, CAA	B2, B3, B20
Air safety	CAA	B20
Impacts on Cultural Heritage	NEMA, NHRA	B2, B11
Habitat fragmentation	SALA	B19

*NB: The constitution is couched within all South African legislation and will apply to any activity related to renewable energy (See B1 below).*

## Impacts Mitigation

Assuming an IPP project triggers the need for Basic Assessment (BA) or an Environmental Impact Assessment (EIA) under the EIA regulations, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be

informed by good industry practice and are to be included in the EMPr. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards. Potential mitigation measures associated with wind energy installations include but are not limited to:

- Minimising the project footprint by utilising existing roads and disturbed areas as much as practicable;
- Implementing adequate dust control, visual disturbance, erosion control, and noise reduction measures such as careful project siting, tarring or spraying water on dirt or gravel roads, planting trees, and constructing berms;
- Site selection outside of all relevant invertebrates, birds and bats and other animals migratory routes, nesting areas, movement and hunting corridors, as well as fog and mist-prone areas;
- Locate developments away from sensitive habitats for species, especially those that are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss ;
- Develop and implement a site specific spill management plan;
- Conduct pre-disturbance environmental and social surveys as appropriate to assess presence of sensitive resources, receptors, habitats and species;
- Bury electrical transmission infrastructure;
- Configure turbines to avoid landscape features particularly attractive to nesting raptors or other species prone to colliding with turbines;
- Minimise development lighting in order to minimise light pollution, disturbance to visible communities, and attraction of invertebrates, birds, bats and other animals at night;
- Install raptor-proof poles or similar measures on appropriate infrastructure to deter nesting, hunting, and migrating species; and
- Monitoring of relevant fauna including invertebrates, birds and bats and other animals to be undertaken during pre and post project development.

## **2.2 A2: Residual Biomass & Biofuels**

### Definitions

Residual biomass energy is generally derived from renewable sources of organic matter and can be used to provide heat, make liquid fuels (Bio-fuels) or to generate electricity. The

types of biomass include plants, residues from agriculture or forestry, and organic components in municipal and industrial wastes<sup>1</sup>.

Bio-fuels in liquid form are produced from the conversion of biomass and when correctly utilised, can be substituted for fossil-fuel derived fuel oils. Typical applications include transportation use and the generation of power via internal combustion engines. The two most commonly encountered bio-fuels are bio-ethanol and bio-diesel. Bio-ethanol is produced through a fermentation process, whereas bio-diesel is manufactured using the chemical reactions trans-esterification and esterification. The bio-diesel manufacturing process involves vegetable or animal fats and oils being reacted with short-chain alcohols (typically methanol or ethanol).

Whilst landfill gas and bio-gas may be considered to be biomass sources, these are dealt with separately within Section A7, Energy from Waste.

#### Technology Overview: Bagasse

Bagasse is a sub-category of residual biomass derived from the remains of sorghum and sugarcane, and is proven to be a good renewable alternative for producing electrical power and heat. In South Africa bagasse is extensively used within the sugar-milling industry to generate process power and heat. The mills use the sugar and juices for their products and then retain the crushed stalks which are then stored in wet conditions. Because of the decomposition of the stalks, the pile starts to dry and becomes highly combustible and ready for burning. For every 100 tonnes of sugar cane harvested and milled, 10 tonnes of sugar is produced together with some 28 tonnes of solid waste in the form of bagasse. Typically, the mill uses a portion of the bagasse in a low efficiency steam cycle to produce the electricity and steam which it needs for its own use.

With sugar mills currently generating a significant amount of power for own use and even limited export, bagasse offers some of the best potential for IPPs in South Africa using renewable resources. It is estimated that an energy conversion rate of 120kWh/ton can be achieved using conventional steam plants running at higher pressures. Using integrated combined cycle combustion technologies the yield per ton of bagasse can be increased to 200kWh/ton. Purely through increased efficiency and new technologies the potential of this resource can be increased from the current 210GWh to 1 400GWh per annum<sup>2</sup>.

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<sup>1</sup> <http://www.altenergy.org/renewables/biomass.html>

<sup>2</sup> 2003 Renewable Energy White Paper

### Technology Overview: Fuelwood, wood residues and wood pellets

Wood-derived heating and Combined Heat & Power (CHP) are essentially carbon neutral technologies, since almost all of the carbon dioxide released is reabsorbed by crops or trees that have replaced the fuel being burnt. The only net increases in carbon dioxide are caused by the energy used in building the equipment used in energy conversion and vehicle emissions during processing and transport of the fuel and during disposal of wastes. Conservatively, biomass energy systems can attain >90% carbon neutrality.

The Renewable Resource Database (RRDB) describes the following as fuelwood biomass resources:

- Commercial plantations;
- Indigenous woodlands;
- Alien vegetation;
- Deciduous fruit tree off-cuts from pruning;
- Sawmills (primary processing) mostly woodchips, sawdust and bark, as well as wood pellets; and
- Pulp mills: boiler ash, sludge, sawdust and black liquor.

The viability of wood as an energy source suitable for electricity generation lies primarily within the wood, pulp and paper industries. In these industries there is already significant heat and power generation taking place, with possible potential for upgrading and expansion. The sector consists of two main components: the production of timber and the production of wood pulp for paper and board manufacturing.

Wood pellets, made from compressed woody biomass by-products, are not widely used in RSA, but are also a viable form of biomass heating fuel. However, the combined wood residue and sludge generated at the mill are insufficient to meet the balance of energy demand, because of their low heating values resulting from high moisture and ash content. In order to enhance the boiler output, fossil fuels are co-fired with wood wastes.

Greenhouse gas (GHG) emissions from biomass burning are CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. The latter two are negligible when compared to CO<sub>2</sub> and indeed, some inventory protocols do not include them. Other important atmospheric emissions in the pulp and paper industry include SO<sub>2</sub>, H<sub>2</sub>S, NO<sub>x</sub> and CO generated in the lime kiln (furnace) and recovery boiler. Bark combustion produces SO<sub>2</sub>, NO<sub>2</sub> and CO in small quantities.

### Technology Overview: Bio-diesel

Generally speaking, biodiesel is an alternative or additive to standard diesel fuel that is made from biological ingredients instead of petroleum (or crude oil). Biodiesel is usually made

from plant oils or animal fat through a series of chemical reactions. It is both non-toxic and renewable. Because biodiesel essentially comes from plants and animals, the sources can be replenished through farming and recycling.

Biodiesel can be used in standard diesel reciprocating engines with little or no modification needed. Although biodiesel can be used in its pure form, it is usually blended with standard diesel fuel. The most common blend is B20, or 20% biodiesel to 80% standard diesel. Similarly, B100 refers to pure biodiesel.

B20 and lower-level blends generally do not require engine modifications.

B100 has a solvent effect and it can clean an engine's fuel system and release deposits accumulated from previous petroleum diesel use.

**Table 2** below indicates the potential impacts associated with biomass energy and biofuel usage, together with the applicable and relevant legislation and its reference location within Part B of this Guideline. It is stipulated that these are (under normal circumstances) the main impacts, but other impacts maybe relevant depending on project specifics.

**Table 2: Potential Environmental Impacts of Biomass Energy Projects**

Impact Description	Relevant Legislation	Reference (Part B)
Visual Impact	NEMA	B2
Noise Impact	NEMA	B2
Odour emissions	NEMA, NEMAQA, NEMWA	B2, B4
Land Use Transformation (Fuel growth and production)	NEMA, NEMBA, NEMICMA, NEMPAA, NWA, NHRA	B2, B3, B5, B6, B9, B11
Deforestation	NEMA, NEMPAA	B2, B6
Raw Materials Transportation	NEMA, NEMAQA, NEMWA, HSA	B2, B4, B7, B8
Impacts on Cultural Heritage	NEMA, NHA	B2, B11
Impacts on Water Resources	NEMA, NWA, WSA	B2, B9, B10
Industrial/Process Effluent	NEMA, NEMICMA, NEMWA, NWA, WSA	B2, B5, B7, B9, B10
Atmospheric (Combustion) Emissions	NEMA, NEMAQA	B2, B4
Hazardous Materials Storage	NEMA, NEMWA, HAS, MPRDA, SPLUMA	B2, B7, B8, B15, B17
Waste Disposal	NEMA, NEMWA	B2, B7
Habitat fragmentation	SALA	B19

*NB: The constitution is couched within all South African legislation and will apply to any activity related to renewable energy (See B1 below).*

### Impacts Mitigation

Assuming an IPP project triggers the need for Basic Assessment (BA) or a scoping environmental Impact Assessment (S&EIA) under the EIA regulations included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMPr. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards.

Potential mitigation measures associated with biomass and biofuels include but are not limited to:

- Implement measures to reduce fugitive dust emissions, sediment run-off, air pollutant release, and water discharge such as tarring or spraying roads, building berms and drainage infrastructure, capturing or limiting process emissions, and covering bare soils;
- Analyse water source use and abstraction processes to maximise efficiency (reduce required volume and recycle process water) and potentially utilise grey-water (recycled) sources;
- Appropriate biofuels species selection to maximise efficiency, minimise labour and chemical inputs, and prevent erosion and surface run-off;
- Intercrop biofuels plants with an indigenous ground cover plant to prevent bare soils, dust, and erosion;
- Site selection in existing disturbed locations for production (agricultural lands) and processing (industrial sites) rather than pristine areas;
- Utilise existing access and servitudes in order to minimise the disturbance footprint;
- Develop and implement a site-specific spill management plan;
- Conduct pre-disturbance surveys as appropriate to assess presence of sensitive resources, receptors, habitats and species;
- Fence sites as appropriate to ensure safe and authorised access; and
- Monitoring of relevant fauna including birds and bats to be undertaken during pre and post construction.

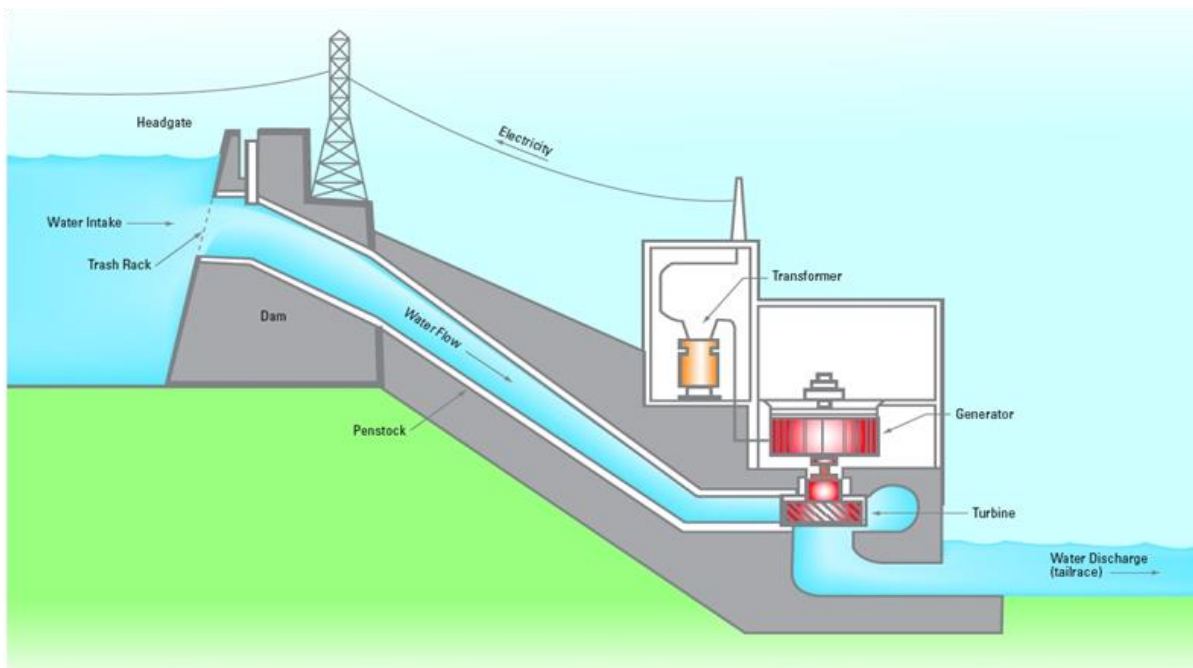
### **2.3 A3: Hydropower**

Small-scale hydropower exploits the potential of falling water, converting it into mechanical power by flowing water through a turbine and generating electrical energy by means of a generator. A micro-hydropower system is generally classified as having a generating

capacity of less than 100kW. A pico-hydropower system is generally classified as a system that has a generating capacity of less than 1kW.

Micro-hydro systems generally have the following components:

- A water turbine that converts the energy of flowing or falling water into mechanical energy that drives an electrical generator;
- A control mechanism to provide stable electrical power; and
- Electrical transmission lines and grid connection equipment to deliver the power to the user.



**Figure 2: Typical components of a hydropower scheme**

According to the 2003 Renewable Energy White Paper, there exists a significant potential for development of all categories of hydropower in the short- and medium-term in specific areas of South Africa. The Eastern Cape and KwaZulu-Natal provinces have an increased potential for the development of small hydropower plants. One of the advantages of these small hydropower plants is their flexibility in operation as either stand-alone plant or in hybrid configuration with other renewable energy sources. The Eastern Cape is potentially the most productive area for macro hydropower with particular emphasis on the Lower Orange River.

Irrespective of the size of installation, any hydropower development requires authorisation in terms of the National Water Act (DWAf, 2003). Furthermore, pressure regarding the

environmental impact and displacement of settlements by large storage dams may limit the exploitation of hydropower on a large scale.

**Table 3** below indicates the potential impacts associated with hydropower energy development, together with the applicable and relevant legislation and its reference location within Part B of this Guideline. It is stipulated that these are (under normal circumstances) the main impacts, but other impacts maybe relevant depending on project specifics.

**Table 3: Potential Impacts of Hydropower Energy Projects**

Impact Description	Relevant Legislation	Reference (Part B)
Visual Impact	NEMA	B2
Land Use Transformation (fuel growth and production)	NEMA, NEMBA, NEMICMA, NWA, NHRA	B2, B3, B5, B9, B11
Impacts on Cultural Heritage	NEMA, NHRA	B2, B11
Displacement of Communities	NEMA, NHRA, MSA	B2, B3,, B13
Impacts on Water Resource Use	NEMA, NWA, WSA	B2, B9, B10
Impacts on upstream/downstream watercourse (i.e. erosion, sediment movement)	NEMA, NEMBA, NEMICMA, NWA	B2,B3, B5 B9
Impacts on Biodiversity	NEMA, NEMBA, NEMICMA	B2, B3, B5
Damming effects to sediment movement	NWA, NEMBA	B3, B9
Damming effects to fish movement	NWA, NEMBA	B3, B9
Electromagnetic Interference and seismic activity	NEMA, MSA	B2, B13

*NB: The constitution is couched within all South African legislation and will apply to any activity related to renewable energy (See B1 below).*

### Impacts Mitigation

Assuming an IPP project triggers the need for Basic Assessment (BA) or a scoping environmental Impact Assessment (S&EIR) under the EIA regulations, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMP. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards.

Potential mitigation measures for hydropower energy projects include, but are not limited to:



- Conduct pre-disturbance surveys as appropriate to assess presence of sensitive areas, fauna ,flora and sensitive habitats;
- Protect wetlands and watercourses as applicable by avoiding or protecting them.
- Minimise erosion and sediment loading;
- Minimise stream crossings and reduce stream bank cutting to reduce erosion and reduction in aquatic habitat quality;
- Develop and implement a spill management plan;
- Plan re-vegetation with appropriate indigenous plants to prevent erosion introduction of alien species;
- Trash rack design to minimise entrapment of fish and other aquatic species at intake points;
- Fence sites as appropriate to ensure safe restricted access; and
- Ensure adequate continuous bypass flow through natural water channels.

## **2.4 A4: Solar Energy**

South Africa experiences some of the highest levels of solar radiation in the world (between 4.5 and 6.5kWh/m<sup>2</sup>) and therefore, possesses considerable solar resource potential for solar water heating applications, solar photovoltaic and concentrated solar power (CSP) generation. The potential uses and applications include:

- Active solar thermal water heating for domestic, commercial and industrial applications. This is considered a Demand Side Management intervention and is excluded from the scope of this guideline;
- Electricity (photovoltaic and solar thermal) generation, ranging from small/medium-scale stand-alone applications to large-scale grid-connected applications; and
- Solar/Heat Pump hybrid systems for water heating, space heating and cooling.

There also exists significant potential for Solar Passive building design practice for residential, commercial and industrial buildings to minimise thermal energy consumed. Furthermore, Solar Cookers have been demonstrated as an alternative to cooking with fuelwood in rural areas throughout the continent.

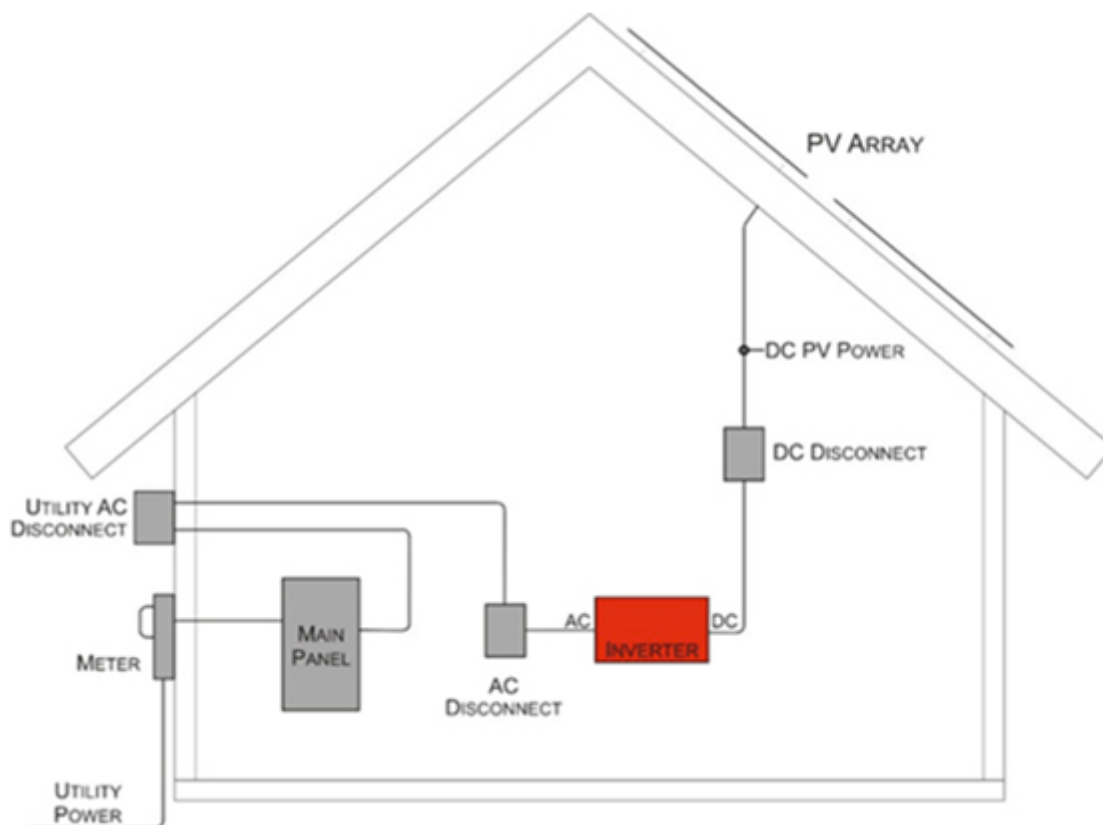
### Technology Overview: Photovoltaic Systems

Photovoltaic (PV) systems are widely applied in South Africa for powering professional niche applications such as telecommunications, microwave links, navigational aids and meteorology stations, where PV is well established as the best practical option. PV is also

applied in small-scale remote power supplies for domestic use, game farms and community water pumping schemes.

PV cells are made from semi-conductor materials that are able to release electrons when exposed to solar radiation by using the photo-electric effect. Electrons from several PV cells are gathered together through conductors to make up the generation capacity of one module and many modules can be connected together to produce power in large quantities.

Internationally, PV is the fastest-growing power generation technology and between 2000 and 2009 the installed capacity globally grew on average by 60% per year. Worldwide more than 35GW of PVs are installed and operating, and in South Africa as much as 8GW PV could potentially be installed by 2020.



**Figure 3: Schematic of a residential grid-tied PV installation**

### Technology Overview: Concentrated Solar Power

Concentrated solar power (also called concentrating solar power, concentrated solar thermal or CSP) systems use mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small area. Electrical power is produced when the concentrated light

is converted to heat, which drives a heat engine, usually a steam turbine, connected to an electrical power generator. The minimum Direct Normal Radiation (DNR) to justify a CSP plant is 1 800 kWh/m<sup>2</sup> per year. According to the South African RRDB, the area exceeding the minimum required DNR in South Africa covers approximately 194 000km<sup>2</sup>. The 2003 Renewable Energy White Paper calculates that South Africa may have a CSP potential of some 65GW, capable of providing 36 000 GWh/year.

### Environmental Impacts

The potential environmental impacts associated with solar power (land use and habitat loss, water use, and the use of hazardous materials in manufacturing) vary greatly depending on the technology to be used. In broad terms the range of potential impacts could include:

- Land use: Depending on their location, larger utility-scale solar facilities can raise concerns about land degradation and habitat loss. Total land area requirements estimates for utility-scale PV systems range from 1.5 to 4 ha per megawatt, while estimates for CSP facilities are between 0.65 and 2.7 ha per megawatt<sup>3</sup> ;
- Water use: Solar PV cells do not use water for generating electricity. However, as in all manufacturing processes, some water is used to manufacture solar PV components. CSP in common with all thermal electric plants, require water for cooling. Water use depends on the plant design, plant location, and the type of cooling system;
- Hazardous materials: The PV cell manufacturing process includes a number of hazardous materials, most of which are used to clean and purify the semiconductor surface. These chemicals (similar to those used in the general semiconductor industry) include hydrochloric acid, sulphuric acid, nitric acid, hydrogen fluoride, 1,1,1-trichloroethane, and acetone. The amount and type of chemicals used depends on the type of cell, the amount of cleaning that is needed, and the size of silicon wafer;
- Other impacts in terms of noise, visual issues, electromagnetics and aircraft interference.

**Table 4** below indicates the potential impacts associated with the full range of solar energy project development, together with the applicable and relevant legislation and its reference location within Part B of this Guideline. It is stipulated that these are (under normal circumstances) the main impacts, but other impacts maybe relevant depending on project specifics.

**Table 4: Potential Environmental Impacts of Solar Energy Projects**

Impact Description	Relevant Legislation	Reference (Part B)
Visual Impact	NEMA	B2

<sup>3</sup> www.ucsusa.org

Impact Description	Relevant Legislation	Reference (Part B)
Noise Impact (CSP)	NEMA	B2
Land Use Transformation (fuel growth and production)	NEMA, NEMPAA, NHRA	B2, B6, B11
Impacts on Cultural Heritage	NEMA, NHRA	B2, B11
Impacts on Biodiversity	NEMA, NEMBA, NEMPAA, NFA	B2, B3, B6, B21
Impacts on Water Resources	NEMA, NEMICMA, NWA, WSA	B2, B5, B9, B10
Hazardous Waste Generation (CSP and PV)	NEMA, NEMWA, HAS	B2, B7, B8
Electromagnetic Interference	NEMA	B2
Aircraft Interference	NEMA, MSA	B2, B13
Loss of agricultural land	SALA	B19
Sterilization of mineral resources	MPRDA	B15

*NB: The constitution is couched within all South African legislation and will apply to any activity related to renewable energy (See B1 below).*

### Impacts Mitigation

Assuming an IPP project triggers the need for Basic Assessment (BA) or scoping environmental Impact Assessment (S&EIA) under the EIA regulations, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMP. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards.

Potential mitigation measures for solar energy projects include but are not limited to:

- Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats;
- Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;
- Utilise existing roads and servitudes as much as possible to minimise project footprint;
- Site projects to avoid construction too near pristine natural areas and communities;

- Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;
- Fence sites as appropriate to ensure safe restricted access;
- Ensure dust abatement measures are in place during and post construction;
- Develop and implement a storm water management plan;
- Develop and implement waste management plan; and
- Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.

## **2.5 A5: Wave Energy**

### Technology Overview: Wave Energy

Wave energy refers to any process that derives power from the movement of waves on the surface of a body of water. In order to harness the power of the waves, an object must be placed in the ocean that is capable of movement as the waves pass. As each wave pounds into the object, it rises and falls in a somewhat elliptical pattern generating power in the process. The amount of power generated from wave power is determined by the height of the waves, how fast the waves move, the length of the waves, and the density of the water where the power generating objects are positioned.

Some designs incorporate parabolic reflectors as a means of increasing the wave energy at the point of capture. Once the wave energy is captured at a wave source, power must be carried to the point of use or to a connection point with the national electricity grid.

Wave energy does pose a potential impact on the marine environment. Noise pollution for example, could have negative impact if not monitored, although the noise and visible impact of each design varies greatly. Other biophysical impacts (flora and fauna, sediment regimes and water column structure and flows) of scaling up the technology are being studied. In terms of socio-economic challenges, wave farms can result in the displacement of commercial and recreational fishermen from productive fishing grounds, can change the pattern of beach sand nourishment and may represent hazards to safe navigation.

### Outlook:

The 2004 RE White Paper states the following in connection with Wave Energy potential in South Africa:

Wave potential along the Cape coastline is estimated as significant, but no exploitation is taking place to date. A mean annual power level of about 40 kW/m wave crest is typical offshore at the Cape Peninsula. An estimated total average power of 56 800 MW is

available along the entire coast. However, it is doubtful whether any of this potential energy could be realised on a large scale in the medium-term due to cost considerations (DME, DANCED, 2001). Wave technology is still at an early stage of development. Many small-scale experimental devices are being tested and several prototype devices are now producing electricity for consumption (Cavanagh et al, 1993).

The technology of Wave Energy is therefore excluded from the present version of this Guideline, with an option to include it at a later stage.

## **2.6 A6: Ocean Currents**

### Technology Overview:

Ocean currents comprise an indirect source of solar energy since they are linked to wind and surface heating processes. Harnessing the energy from open-ocean currents requires the use of turbine-driven generators anchored in place in the ocean current streams. In one concept, large turbine blades would be driven by the moving water, similar to windmill blades being moved by the wind; and the blades used to turn the generators harness the energy of the water flow. Another concept uses a barge moored in the ocean current stream fitted with a cable loop to which “parachutes” are fastened. The current acting against the open parachutes develops continuous movement of the cable which could be used to drive a generator to produce electricity.

### Outlook:

The 2004 RE White Paper states the following in connection with Ocean Current Energy potential in South Africa:

Preliminary investigation has revealed considerable potential in the Agulhas Current, one of the strongest currents in the World. The current originates in the Indian Ocean and passes down South Africa’s eastern seaboard. It is about 150 km wide and flows at 6 metres/sec, and is estimated to be able to produce some 2 000 MW. At present the technology that employs turbines for electricity production in marine environments is being utilised in several pilot sites across the World. Assessments are required to establish whether the Agulhas Current is a suitable candidate for this technology, but if so it could be regarded as a long-term prospect.

The technology of Ocean Current Energy is therefore excluded from the present version of this Guideline, with an option to include it at a later date.

## 2.7 A7: Energy from Waste

### Technology Overview: Landfill Gas

As waste in landfills decomposes, different gases are continuously produced in varying proportions. Landfill gas (LFG) comprises approximately 50% CH<sub>4</sub>, 40% CO<sub>2</sub>, small quantities of oxygen and nitrogen, and over 100 other trace gases, including CO and H<sub>2</sub>S. Whilst CO<sub>2</sub> is found in much greater quantities in the atmosphere, CH<sub>4</sub> is a potent greenhouse gas that is a key contributor to global climate change (over 21 times more potent than CO<sub>2</sub>). In addition, typical LFG if permitted to accumulate in low lying or enclosed or confined spaces (such as buildings and houses next to a landfill), may produce an atmosphere that is both explosive and hazardous to life.

The extraction of LFG can take place once landfill cells reach capacity, at which point the landfill is covered, extraction equipment and collection pipe networks set in place, and the process of extracting the LFG can begin. In addition, the installation of LFG extraction systems can be incorporated in the landfilling process, enabling the extraction of LFG much earlier and prior to the completion of individual landfill cells. LFG is converted into electricity through the following process:

- LFG is extracted from the landfill via extraction wells and a centrifugal blower;
- Gas collection pipes collect and transport the LFG from the wells to an extraction plant;
- At the extraction plant the LFG is burned. The burning of the CH<sub>4</sub> component drives a generator that produces electricity. Any surplus is flared via flare units; and
- The resulting electricity is then fed into the regional grid.

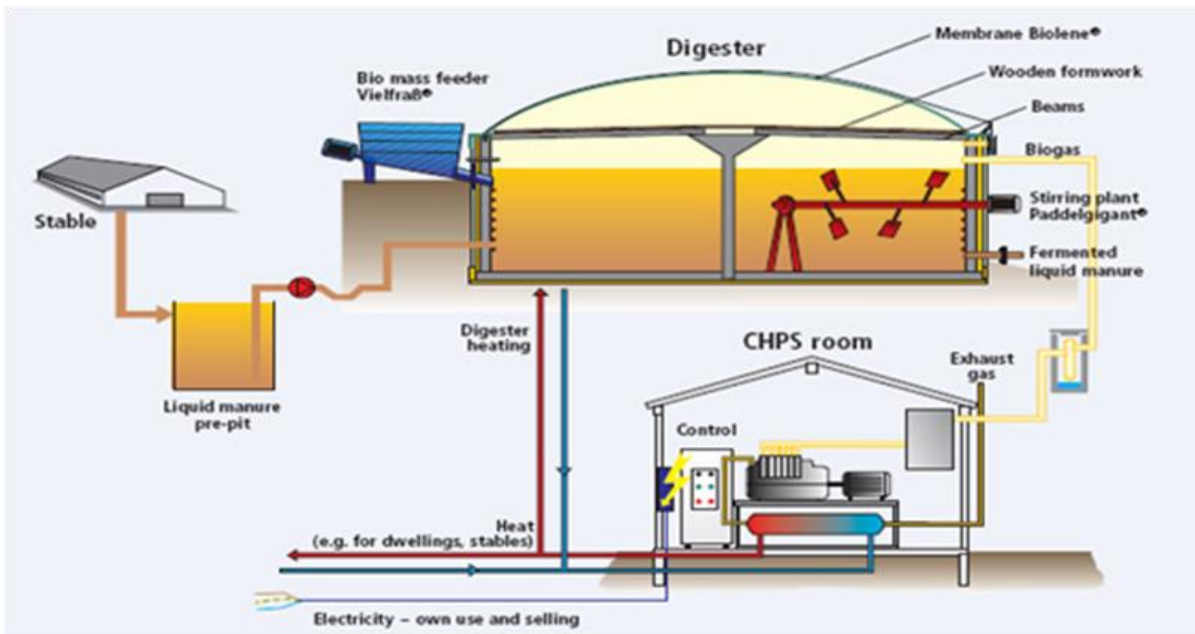
### Technology Overview: Biogas

Biogas typically refers to the gas which is produced by the biological breakdown of organic matter. Organic waste-streams such as animal manure and municipal wastewater (sewerage) can be converted into biogas using anaerobic digestion systems. Biogas consists mainly of CH<sub>4</sub> and CO<sub>2</sub>. Biogas can be used as fuel for cooking, lighting, water heating as well as being able to run biogas generators to produce electricity.

In industrialised countries, power generation is the main purpose of biogas plants where the conversion of biogas to electricity has become a standard technology. In most cases, biogas is used as a fuel for combustion engines linked to a standard power generation arrangement. Frequently the waste heat from the engine cooling system is utilised within the digester or another local heat-sink, as illustrated in **Figure 4** below.

For use within gas or diesel engines, biogas must fulfil certain requirements:

- The methane content should be as high as possible as this is the main combustible part of the gas;
- The water vapour and CO<sub>2</sub> content should be as low as possible, as they reduce calorific value of the gas; and
- The sulphur content (mainly in form of H<sub>2</sub>S) must be low as it is converted to corrosion-causing acids by condensation and combustion. The percentage of hydrogen sulphide content in the biogas can be addressed via a range of gas scrubbing methods.



**Figure 4: Biogas energy plant**

**Table 5** below indicates the potential impacts associated with LFG and biogas project development, together with the applicable and relevant legislation and its reference location within Part B of this Guideline. It is stipulated that these are (under normal circumstances) the main impacts, but other impacts maybe relevant depending on project specifics.

**Table 5: Potential Environmental Impacts of LFG and Biogas Projects**

Impact Description	Relevant Legislation	Reference (Part B)
Visual Impact	NEMA	B2
Noise Impact	NEMA	B2
Odour Emissions	NEMA, NEMAQA	B2, B4
Land Use Transformation (Fuel growth and production)	NEMA, NEMPAA, NHRA	B2, B6, B8
Impacts on Cultural Heritage	NEMA, NHRA	B2, B11
Impacts on Water Resources	NEMA, NEMICMA, NWA,	B2, B5, B9,B10



Impact Description	Relevant Legislation	Reference (Part B)
	WSA	
Hazardous Waste Storage and Generation	NEMA, NEMWA	B2, B7
Waste Transportation	NEMA, NEMWA, HSA	B2, B7, B8
Waste Disposal	NEMA, NEMWA	B2, B7
Electromagnetic Interference	NEMA, MSA	B2, B13
Sub-surface LFG Migration	NEMA, NEMWA, NWA	B2, B7, B9
Surface emissions of LFG	NEMA, NEMAQA	B2, B4
Atmospheric (Combustion) Emissions	NEMA, NEMAQA	B2, B4

*NB: The constitution is couched within all South African legislation and will apply to any activity related to renewable energy (See B1 below).*

### Impacts Mitigation

Assuming an IPP project triggers the need for Basic Assessment (BA) or a scoping environmental Impact Assessment (S&EIA) under the National Environmental Management Act (NEMA, see section B2), included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMPr. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards.

Potential mitigation measures for LFG and biogas projects include but are not limited to:

- Conduct pre-disturbance surveys as appropriate to assess presence of sensitive areas, fauna, flora and sensitive, habitats;
- Protect wetlands and watercourses as applicable;
- Plan visual and noise impact reduction measures such as natural and engineered screens and buffers;
- Plan emissions reduction or sequestration as appropriate;
- Develop and implement waste management plan;
- Develop and implement spill prevention plan;

- Develop and implement waste management plan; and
- Re-vegetation with appropriate indigenous species.

### **3 CLIMATE CHANGE AND RENEWABLE ENERGY**

Greenhouse gases (GHG), including CO<sub>2</sub> emissions are associated with the conventional provision of energy services and are a major cause of climate change. Globally, coal is the second largest primary energy source used worldwide (preceded by oil), and the first source for power generation. In terms of electricity generation or supply, South Africa is highly dependent on coal-fired power plants and therefore energy supply is carbon dioxide-intensive. Studies conducted on coal usage indicated that household coal burning contributed the largest percentage followed by industrial and commercial usage. Based on 2008 fossil-fuel CO<sub>2</sub> emissions, South Africa was rated the 13th largest emitting country in the world and the largest emitting country on the continent of Africa.

Monitoring and reporting of GHG emissions is done by defining the specific carbon footprint, expressed in carbon dioxide equivalent (CO<sub>2</sub>e) of an activity, site or operation. GHG emissions reporting is not currently mandatory in South Africa, however, industry and regulators broadly anticipate increasing implementation of regional and international carbon reporting and reduction requirements through various means, including mandatory reporting, carbon pricing, caps, taxes and trading. A growing number of energy producers today anticipate a future regulatory mandate for GHG emissions reporting by participating in voluntary corporate reporting. Many companies and cities participate in the voluntary reporting initiative, the not-for-profit Carbon Disclosure Project (CDP), the only global system to measure, disclose, manage and share vital environmental information. The CDP holds the largest collection of primary climate change, water and forest-risk information in the world, and use this information to assist industries and governments to collaboratively manage environmental risk ([www.cdproject.net](http://www.cdproject.net)). This risk can be managed in part by increasing renewable energy sources, and reducing reliance on carbon-intensive energy provision services.

Renewable energy sources play a role in providing energy services in a sustainable manner, and in particular in mitigating climate change. Eskom, South Africa's largest energy generating services has a comprehensive climate change strategy which is based on six pillars:

- Diversification of the generation mix to lower carbon emitting technologies;
- Energy efficiency measures to reduce demand and greenhouse gas and other emissions;
- Adaptation to the negative impacts of climate change;
- Innovation through research, demonstration and development;
- Investment through carbon market mechanisms; and
- Progress through advocacy, partnerships and collaboration.

Increasing the share of renewables in the energy industry is an effective way of making our energy supply more environmentally friendly, diversifying energy sources, reducing the effects of climate change as well as contributing to sustainable development.

## **4 SUSTAINABLE DEVELOPMENT**

Sustainable energy can be defined as energy which provides affordable, accessible and reliable energy services that meet economic, social and environmental needs within the overall developmental context of society, while recognising equitable distribution in meeting those needs. Sustainable energy is an element of sustainable development which is defined as development that meets the present needs and goals of the population without compromising the ability of future generations to meet theirs. On the overall sustainable development is underpinned by economic development (growth efficiency), social development (culture, heritage, poverty, and empowerment) and environmental development (pollution and natural resources).

The government of South Africa considers the use of renewable energy as a contribution to sustainable development. Most renewable energy sources are indigenous and naturally available, and the use of renewables therefore strengthens energy security because it is not subject to disruption by international crisis. Fuel wood, charcoal, coal and kerosene (paraffin) in the rural and peri-urban South Africa is the primary source of energy for cooking and heating. Sustainable development implies replacing firewood and charcoal with more modern energy sources, while at the same time introducing technological innovations to improve the efficiency and environmental problems associated with coal and kerosene. Sustainable development also implies the provision of electricity and other modern fuels to the commercial and industrial sectors to promote their economic competitiveness and future prosperity.

## **5 PART B: RENEWABLE ENERGY AUTHORISATION REQUIREMENTS**

As part of the EIA process, the content of applicable IDPs, SDFs, EMFs, SEAs and other relevant plans, frameworks, guidelines and strategies must be taken into account when analysing developments in their spatial context.

The EIA must consider the content of these tools, and the sustainable development vision, goals and objectives formulated in, and the desired spatial form and pattern of land use reflected in the area's IDP and SDF.

The assessment must determine whether a proposed activity is in line with or deviates from the plan, framework or strategy. The assessment must also consider, inter alia, the ecological, heritage, social and economic impacts that will result because of the alignment or deviation. Where a proposed activity deviates from a plan, framework or strategy, the EAP must provide information on these impacts and must indicate how the deviation might be justifiable.

A GIS can be used to identify the most suitable site for a development. By overlaying several spatial datasets (soil type, vegetation, ground and surface water, geology etc.), with specific assessment criteria for each, a map can be produced that can indicate suitable and unsuitable areas.

### **5.1 B1: Constitution of the Republic Of South Africa**

The Constitution of the Republic of South Africa is the supreme law of the country and underpins all environmental legislation. As such, any law or conduct that is inconsistent with the Constitution is invalid (Constitution, 1996). The Constitutional environmental right (section 24 of the constitution) not only affords every person the entitlement to enjoy a right to an environment which is not harmful to their health and well-being, but also places a constitutional mandate on government to protect the environment through reasonable legislative and other measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecological sustainable development and the use of natural resources while promoting justifiable economic and social development.

The constitution also gives provision in section 27(1)(b) which states that everyone has the right to have access to sufficient water and section 27(2) requires the state to take reasonable and other measures, within its available resources, to achieve the progressive realization of each of these rights.

The Constitution also requires that all spheres of Government and all organs of state within each sphere must:

- respect the constitutional status, institutions, powers and functions of government in the other spheres;
- not assume any power or function except those conferred on them in terms of the Constitution;
- exercise their powers and perform their functions in a manner that does not encroach on the geographical, functional or institutional integrity of government in another sphere; and
- co-operate with one another in mutual trust and good faith by:
  - fostering friendly relations;
  - assisting and supporting one another;
  - informing one another of, and consulting one another on, matters of common interest;
  - co-ordinating their actions and legislation with one another;
  - adhering to agreed procedures; and
  - avoiding legal proceedings against one another.

The Constitution of the Republic of South Africa forms the foundation of all environmental principles and management in the country and it is enshrined in all legislation. Such legislation is discussed below with specific reference to the environment.

## **5.2 B2: The National Environmental Management Act (No. 107 of 1998 as amended)**

The National Environmental Management Act (NEMA; No. 107 of 1998, as amended) gives effect to the Constitution of the Republic of South Africa by providing a framework for co-operative environmental governance and environmental principles that enable and facilitate decision-making on matters affecting the environment<sup>4</sup>. In summary, chapter one of the “Act” outlines national environmental management principles that must be incorporated into all decisions regarding the environment, throughout the country by all organs of state. Central to these principles is the concept of sustainability, which entails meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. Chapters two to three of the NEMA outline government and non-government institutions and their responsibilities for ensuring co-operative governance and making decisions

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<sup>4</sup> The term environment does not pertain exclusively to natural or non-human surroundings, but also includes social, economic and physical aspects of a particular location or setting

Chapter 5 of NEMA provides for integrated environmental management. The purpose of this Chapter is to promote the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities. The general objective of integrated environmental management is to:

- (a) promote the integration of the principles of environmental management set out in Section 2 of the Act into the making of all decisions which may have a significant effect on the environment;
- (b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in Section 2;
- (c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;
- (d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;
- (e) ensure the consideration of environmental attributes in management and decision making which may have a significant effect on the environment; and
- (f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.

NEMA requires that an environmental authorisation be issued by a competent authority (CA) before the commencement of a listed activity in terms of the Environmental Impact Assessment Regulations Listing Notices for Basic Assessment or scoping & Environmental Impact Assessment.

The purpose of these regulations is to avoid negative impacts on the environment or where they cannot be avoided, ensure mitigation and management of the impacts to acceptable levels, while optimising positive environmental impacts.

Examples of listed activities that require a BA or S&EIR in terms of EIA regulations 2014 are listed in

**Table 6, Table 7, and Table 8** . The competent authority (CA) in respect of the renewable energy projects and its related activities as listed in tables below is the national DEA, and the



provincial authority are the commenting authorities. It should be noted that the listed activities given below are not all inclusive.

**Table 6: Listed activities in terms of the EIA Regulations, 2014 that can possibly be triggered for RE developments: BA**

<b>Activities that require basic assessment</b>	<b>Primarily applicable to:</b>
<p><b>Activity 1:</b> The development of facilities or infrastructure for the generation of electricity from a renewable resource where – (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare;  excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar;</li> <li>• Wave;</li> <li>• Waste; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 9:</b> The development of infrastructure exceeding 1000m in length for the bulk transportation of water, or storm water – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where – (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Hydropower.</li> </ul>
<p><b>Activity 10:</b> The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve; or (b) where such development will occur within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Waste.</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p><b>Activity 11:</b> The development of facilities or infrastructure for the transmission and distribution of electricity –</p> <p>(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or</p> <p>(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar;</li> <li>• Waste;</li> <li>• Wave; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 12:</b> The development of-</p> <p>(i) canals exceeding 100 square metres in size;</p> <p>(ii) channels exceeding 100 square metres in size;</p> <p>(iii) bridges exceeding 100 square metres in size;</p> <p>(iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size;</p> <p>(v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size;</p> <p>(vi) bulk storm water outlet structures exceeding 100 square metres in size;</p> <p>(vii) marinas exceeding 100 square metres in size;</p> <p>(viii) jetties exceeding 100 square metres in size;</p> <p>(ix) slipways exceeding 100 square metres in size;</p> <p>(x) buildings exceeding 100 square metres in size;</p> <p>(xi) boardwalks exceeding 100 square metres in size; or</p> <p>(xii) infrastructure or structures with a physical footprint of 100 square metres or more;</p> <p>where such development occurs –</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; -</p> <p>excluding –</p> <p>(aa) the development of infrastructure or structures within existing</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Solar;</li> <li>• Wind; and</li> <li>• Hydropower.</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p>ports or harbours that will not increase the development footprint of the port or harbour;</p> <p>(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</p> <p>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</p> <p>(dd) where such development occurs within an urban area; or</p> <p>(ee) where such development occurs within existing roads or road reserves.</p>	
<p><b>Activity 13:</b></p> <p>The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Hydropower.</li> </ul>
<p><b>Activity 14:</b></p> <p>The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; biofuels; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 15:</b></p> <p>The development of structures in the coastal public property where the development footprint is bigger than 50 square metres, excluding –</p> <p>(i) the development of structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</p> <p>(ii) the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</p> <p>(iii) the development of temporary structures within the beach zone where such structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared; or</p> <p>(iv) activities listed in activity 14 in Listing Notice 2 of 2014, in which case that activity applies.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Wave; and</li> <li>• Ocean Currents.</li> </ul>
<p><b>Activity 17:</b></p> <p>Development-</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p>(i) in the sea;</p> <p>(ii) in an estuary;</p> <p>(iii) within the littoral active zone;</p> <p>(iv) in front of a development setback; or</p> <p>(v) if no development setback exists, within a distance of 100 metres inland of the high water mark of the sea or an estuary, whichever is the greater;</p> <p>in respect of-</p> <p>(a) fixed or floating jetties and slipways;</p> <p>(b) tidal pools;</p> <p>(c) embankments;</p> <p>(d) rock revetments or stabilising structures including stabilising walls;</p> <p>(e) buildings of 50 square metres or more; or</p> <p>(f) infrastructure with a development footprint of 50 square metres or more –</p> <p>but excluding –</p> <p>(aa) the development of infrastructure and structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</p> <p>(bb) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</p> <p>(cc) the development of temporary infrastructure or structures where such structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared; or</p> <p>(dd) where such development occurs within an urban area.</p>	<ul style="list-style-type: none"> <li>• Wave; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 18:</b></p> <p>The planting of vegetation or placing of any material on dunes or exposed sand surfaces of more than 10 square metres, within the littoral active zone, for the purpose of preventing the free movement of sand, erosion or accretion, excluding where -</p> <p>(i) the planting of vegetation or placement of material relates to restoration and maintenance of indigenous coastal vegetation undertaken in accordance with a maintenance management plan; or</p> <p>(ii) such planting of vegetation or placing of material will occur behind a development setback.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind; and</li> <li>• Wave.</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p><b>Activity 19:</b></p> <p>The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from-</p> <p>(i) a watercourse;</p> <p>(ii) the seashore; or</p> <p>(iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater –</p> <p>But excluding where such infilling, depositing, dredging, excavation, removal or moving-</p> <p>(a) will occur behind a development setback;</p> <p>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or</p> <p>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar;</li> <li>• Hydropower;</li> <li>• Wave; and</li> <li>• Ocean current.</li> </ul>
<p><b>Activity 24:</b></p> <p>The development of-</p> <p>(i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or</p> <p>(ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding-</p> <p>(a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or</p> <p>(b) roads where the entire road falls within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Hydropower;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 26:</b></p> <p>Residential, retail, recreational, tourism, commercial or institutional developments of 1000 square metres or more, on land previously used for mining or heavy industrial purposes; - excluding –</p> <p>(i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or</p> <p>(ii) where an environmental authorisation has been obtained for</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p>the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or</p> <p>(iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land.</p>	
<p><b>Activity 27:</b></p> <p>The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for –</p> <p>(i) the undertaking of a linear activity; or</p> <p>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 28:</b></p> <p>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development:</p> <p>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</p> <p>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</p> <p>excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 30:</b></p> <p>Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar;</li> <li>• Waste;</li> <li>• Wave; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 32:</b></p> <p>The continuation of any development where the environmental authorisation has lapsed and where the continuation of the development, after the date the environmental authorisation has lapsed will meet the threshold of any activity or activities listed in this Notice, Listing Notice 2 of 2014, or Listing Notice 3 or Listing</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> </ul>

Activities that require basic assessment	Primarily applicable to:
Notice 4 of 2014.	<ul style="list-style-type: none"> <li>• Solar;</li> <li>• Waste;</li> <li>• Wave; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 34:</b></p> <p>The expansion or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution, excluding-</p> <p>(i) where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or</p> <p>(ii) the expansion of or changes to existing facilities for the treatment of effluent, wastewater or sewage where the capacity will be increased by less than 15 000 cubic metres per day.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; biofuels; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 35:</b></p> <p>The expansion of residential, retail, recreational, tourism, commercial or institutional developments on land previously used for mining or heavy industrial purposes, where the increased development footprint will exceed 1000 square meters; excluding –</p> <p>(i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or</p> <p>(ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or</p> <p>(iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Hydropower;</li> <li>• Solar;</li> <li>• Biomass &amp; biofuels; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 36:</b></p> <p>The expansion of facilities or structures for the generation of electricity from a renewable resource where–</p> <p>(i) the electricity output will be increased by 10 megawatts or more, excluding where such expansion takes place on the original development footprint; or</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar;</li> <li>• Hydropower;</li> <li>• Biomass &amp; biofuels;</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p>(ii) regardless the increased output of the facility, the development footprint will be expanded by 1 hectare or more; excluding where such expansion of facilities or structures is for photovoltaic installations and occurs within an urban area.</p>	<ul style="list-style-type: none"> <li>• Waste;</li> <li>• Wave; and</li> <li>• Ocean currents</li> </ul>
<p><b>Activity 45:</b> The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure—</p> <p>(i) has an internal diameter of 0,36 metres or more; or</p> <p>(ii) has a peak throughput of 120 litres per second or more; and</p> <p>(a) where the facility or infrastructure is expanded by more than 1000 metres in length; or</p> <p>(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;</p> <p>excluding where such expansion-</p> <p>(aa) relates to transportation of water or storm water within a road reserve; or</p> <p>(bb) will occur within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Hydropower.</li> </ul>
<p><b>Activity 46:</b> The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure-</p> <p>(i) has an internal diameter of 0,36 metres or more; or</p> <p>(ii) has a peak throughput of 120 litres per second or more; and</p> <p>(a) where the facility or infrastructure is expanded by more than 1000 metres in length; or</p> <p>(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;</p> <p>excluding where such expansion-</p> <p>(aa) relates to transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve; or</p> <p>(bb) will occur within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Waste.</li> </ul>
<p><b>Activity 47:</b> The expansion of facilities or infrastructure for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar;</li> <li>• Hydropower;</li> </ul>



Activities that require basic assessment	Primarily applicable to:
	<ul style="list-style-type: none"> <li>• Biomass &amp; biofuels;</li> <li>• Waste;</li> <li>• Wave; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 48:</b> The expansion of-</p> <p>(i) canals where the canal is expanded by 100 square metres or more in size ;</p> <p>(ii) channels where the channel is expanded by 100 square metres or more in size ;</p> <p>(iii) bridges where the bridge is expanded by 100 square metres or more in size;</p> <p>(iv) dams, where the dam, including infrastructure and water surface area, is expanded by 100 square metres or more in size;</p> <p>(v) weirs, where the weir, including infrastructure and water surface area, is expanded by 100 square metres or more in size;</p> <p>(vi) bulk storm water outlet structures where the bulk storm water outlet structure is expanded by 100 square metres or more in size; or</p> <p>(vii) marinas where the marina is expanded by 100 square metres or more in size;</p> <p>where such expansion or expansion and related operation occurs-</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p>excluding –</p> <p>(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</p> <p>(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</p> <p>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</p> <p>(dd) where such expansion occurs within an urban area; or</p> <p>(ee) where such expansion occurs within existing roads or road reserves.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar; and</li> <li>• Hydropower.</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p><b>Activity 49:</b> The expansion of -</p> <ul style="list-style-type: none"> <li>(i) jetties by more than 100 square metres;</li> <li>(ii) slipways by more than 100 square metres;</li> <li>(iii) buildings by more than 100 square metres;</li> <li>(iv) boardwalks by more than 100 square metres; or</li> <li>(v) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;</li> </ul> <p>where such expansion or expansion and related operation occurs-</p> <ul style="list-style-type: none"> <li>(a) within a watercourse;</li> <li>(b) in front of a development setback; or</li> <li>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</li> </ul> <p>excluding-</p> <ul style="list-style-type: none"> <li>(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</li> <li>(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;</li> <li>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</li> <li>(dd) where such expansion occurs within an urban area; or</li> <li>(ee) where such expansion occurs within existing roads or road reserves.</li> </ul>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Wave; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 50:</b> The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Hydropower.</li> </ul>
<p><b>Activity 51:</b> The expansion of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such storage facility will be expanded by more than 80 cubic metres.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; biofuels; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 52:</b></p>	<p>Technologies of:</p>

Activities that require basic assessment	Primarily applicable to:
<p>The expansion of structures in the coastal public property where the development footprint will be increased by more than 50 square metres, excluding such expansions within existing ports or harbours where there will be no increase in the development footprint of the port or harbour and excluding activities listed in activity 23 in Listing Notice 3 of 2014, in which case that activity applies.</p>	<ul style="list-style-type: none"> <li>• Ocean currents; and</li> <li>• Wave.</li> </ul>
<p><b>Activity 54:</b>  The expansion of facilities -</p> <p>(i) in the sea;</p> <p>(ii) in an estuary;</p> <p>(iii) within the littoral active zone;</p> <p>(iv) in front of a development setback; or</p> <p>(v) if no development setback exists, within a distance of 100 metres inland of the high water mark of the sea or an estuary, whichever is the greater;</p> <p>in respect of-</p> <p>(a) fixed or floating jetties and slipways;</p> <p>(b) tidal pools;</p> <p>(c) embankments;</p> <p>(d) rock revetments or stabilising structures including stabilising walls;</p> <p>(e) buildings where the building is expanded by 50 square metres or more; or</p> <p>(f) infrastructure where the development footprint is expanded by 50 square metres or more,</p> <p>but excluding-</p> <p>(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; or</p> <p>(bb) where such expansion occurs within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar;</li> <li>• Ocean currents; and</li> <li>• Wave.</li> </ul>
<p><b>Activity 55:</b>  Expansion-</p> <p>(i) in the sea;</p> <p>(ii) in an estuary;</p> <p>(iii) within the littoral active zone;</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar;</li> <li>• Ocean currents; and</li> <li>• Wave.</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p>(iv) in front of a development setback; or</p> <p>(v) if no development setback exists, within a distance of 100 metres inland of the highwater mark of the sea or an estuary, whichever is the greater; in respect of-</p> <p>(a) facilities associated with the arrival and departure of vessels and the handling of cargo;</p> <p>(b) piers;</p> <p>(c) inter- and sub-tidal structures for entrapment of sand;</p> <p>(d) breakwater structures;</p> <p>(e) coastal marinas;</p> <p>(f) coastal harbours or ports;</p> <p>(g) tunnels; or</p> <p>(h) underwater channels;</p> <p>but excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.</p>	
<p><b>Activity 56:</b></p> <p>The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-</p> <p>(i) where the existing reserve is wider than 13,5 meters; or</p> <p>(ii) where no reserve exists, where the existing road is wider than 8 metres;</p> <p>excluding where widening or lengthening occur inside urban areas.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar;</li> <li>• Hydropower;</li> <li>• Biomass &amp; biofuels; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 65:</b></p> <p>The expansion and related operation of an island, anchored platform or any other permanent structure on or along the sea bed, where the expansion will constitute an increased development footprint, excluding expansion of facilities, infrastructure or structures for aquaculture purposes;</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 67:</b></p> <p>Phased activities for all activities</p> <p>i. listed in this Notice, which commenced on or after the effective date of this Notice; or</p> <p>ii. similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar;</li> </ul>

Activities that require basic assessment	Primarily applicable to:
<p>Notices;            where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold;            excluding the following activities listed in this Notice-</p> <p>17(i)(a-d);            17(ii)(a-d);            17(iii)(a-d);            17(iv)(a-d);            17(v)(a-d);            20;            21;            22;            24(i);            29;            30;            31;            32;            34;            54(i)(a-d);            54(ii)(a-d);            54(iii)(a-d);            54(iv)(a-d);            54(v)(a-d);            55;            61;            62;            64; and            65.</p>	<ul style="list-style-type: none"> <li>• Wave;</li> <li>• Waste; and</li> <li>• Ocean currents</li> </ul>

**Table 7: Listed activities in terms of the EIA Regulations, 2014 that can possibly be triggered for RE developments: S & EIR**

Activities that require scoping and EIR	Primarily applicable to:
<p><b>Activity 1:</b></p> <p>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar;</li> <li>• Wave;</li> <li>• Waste; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 4:</b></p> <p>The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Waste.</li> </ul>
<p><b>Activity 6:</b></p> <p>The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding –</p> <p>(i) activities which are identified and included in Listing Notice 1 of 2014; in which case the competent</p> <p>(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act responsible for mineral No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or</p> <p>(iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; biofuels; and</li> <li>• Waste .</li> </ul>
<p><b>Activity 9:</b></p> <p>The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar;</li> <li>• Wave;</li> <li>• Ocean currents; and</li> <li>• Waste.</li> </ul>

Activities that require scoping and EIR	Primarily applicable to:
<p><b>Activity 14:</b> The development and related operation of-</p> <p>(i) an island; between any combination of the following -</p> <p>(ii) anchored platform; or</p> <p>(iii) any other structure or infrastructure on, below or along the sea bed;</p> <p>excluding -</p> <p>(a) development of facilities, infrastructure or structures for aquaculture purposes; or</p> <p>(b) the development of temporary structures or infrastructure where such structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 15:</b> The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-</p> <p>(i) the undertaking of a linear activity; or</p> <p>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 23:</b> The reclamation of an island or parts of the sea.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar; and</li> <li>• Ocean currents.</li> </ul>
<p><b>Activity 24:</b> The extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils, but excluding where such extraction or removal is for the rehabilitation of wetlands in accordance with a maintenance management plan.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 26:</b> Development--</p> <p>(i) in the sea;</p> <p>(ii) in an estuary;</p> <p>(iii) within the littoral active zone;</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Solar;</li> <li>• Ocean currents; and</li> </ul>

Activities that require scoping and EIR	Primarily applicable to:
<p>(iv) in front of a development setback; or</p> <p>(v) if no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater;</p> <p>in respect of -</p> <p>(a) facilities associated with the arrival and departure of vessels and the handling of cargo;</p> <p>(b) piers;</p> <p>(c) inter- and sub-tidal structures for entrapment of sand;</p> <p>(d) breakwater structures;</p> <p>(e) coastal marinas;</p> <p>(f) coastal harbours or ports; (g) tunnels; or</p> <p>(h) underwater channels;</p> <p>but excluding the development of structures within existing ports or harbours that will not increase the development footprint of the port or harbour.</p>	<ul style="list-style-type: none"> <li>• Wave.</li> </ul>
<p><b>Activity 28:</b></p> <p>Commencing of an activity, which requires an atmospheric emission license in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004),</p> <p>excluding -</p> <p>(i) activities which are identified and included in Listing Notice 1 of 2014;</p> <p>(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or</p> <p>(iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; biofuels; and</li> <li>• Waste.</li> </ul>

**Table 8: Listed activities in terms of the EIA Regulations, 2014 that can possibly be triggered for RE developments: BA**

Activities that requires basic assessment	Primarily applicable to:
<p><b>Activity 1:</b></p> <p>The development of billboards exceeding 18 square metres in size outside urban areas, mining areas or industrial complexes.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> </ul>



	<ul style="list-style-type: none"> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 2:</b></p> <p>The development of reservoirs for bulk water supply with a capacity of more than 250 cubic meters.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Hydropower.</li> </ul>
<p><b>Activity 4:</b></p> <p>The development of a road wider than 4m with a reserve less than 13.5m.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 7:</b></p> <p>The development of aircraft landing strips and runways 1.4 kilometres and shorter.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 10:</b></p> <p>The development of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 m<sup>3</sup>.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; Biofuel; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 12:</b></p> <p>The clearance of an area of 300m<sup>2</sup> or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 14:</b></p> <p>The development of-</p>	<p>Technologies of:</p>

<p>(i) canals exceeding 10 square metres in size ;</p> <p>(ii) channels exceeding 10 square metres in size;</p> <p>(iii) bridges exceeding 10 square metres in size;</p> <p>(iv) dams, where the dam, including infrastructure and water surface area exceeds 10 square metres in size;</p> <p>(v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size;</p> <p>(vi) bulk storm water outlet structures exceeding 10 square metres in size;</p> <p>(vii) marinas exceeding 10 square metres in size;</p> <p>(viii) jetties exceeding 10 square metres in size;</p> <p>(ix) slipways exceeding 10 square metres in size;</p> <p>(x) buildings exceeding 10 square metres in size;</p> <p>(xi) boardwalks exceeding 10 square metres in size; or</p> <p>(xii) infrastructure or structures with a physical footprint of 10 square metres or more;</p> <p>where such development occurs –</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<ul style="list-style-type: none"> <li>• Wind;</li> <li>• Hydropower;</li> <li>• Ocean currents;</li> <li>• Solar; and</li> <li>• Wave.</li> </ul>
<p><b>Activity 15:</b></p> <p>The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 16:</b></p> <p>The expansion of reservoirs for bulk water supply where the capacity will be increased by more than 250 cubic metres.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Hydropower</li> </ul>
<p><b>Activity 18:</b></p>	<p>Technologies of:</p>

<p>The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste. .</li> </ul>
<p><b>Activity 19:</b></p> <p>The expansion of runways or aircraft landing strips where the expanded runways or aircraft landing strips will be longer than 1,4 kilometres in length.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 22:</b></p> <p>The expansion of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage facilities or infrastructure will be expanded by 30 cubic metres or more but no more than 80 cubic metres.</p> <p>(Provincial/geographical qualifications apply based on environmental attributes)</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; Biofuel; and</li> <li>• Waste.</li> </ul>
<p><b>Activity 23:</b></p> <p>The expansion of-</p> <p>(i) canals where the canal is expanded by 10 square metres or more in size;</p> <p>(ii) channels where the channel is expanded by 10 square metres or more in size;</p> <p>(iii) bridges where the bridge is expanded by 10 square metres or more in size;</p> <p>(iv) dams where the dam is expanded by 10 square metres or more in size;</p> <p>(v) weirs where the weir is expanded by 10 square metres or more size;</p> <p>(vi) bulk storm water outlet structures where the structure is expanded by 10 square metres or more size;</p> <p>(vii) marinas where the marina is expanded by 10 square metres or more size;</p> <p>(viii) jetties where the jetty is expanded by 10 square metres or more in size;</p> <p>(ix) slipways where the slipway is expanded by 10 square meters or more in size;</p> <p>(x) buildings where the building is expanded by 10 square metres or more in size;</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Waves; and</li> <li>• Ocean currents.</li> </ul>

<p>(xi) boardwalks where the boardwalk is expanded by 10 square metres or more in size; or</p> <p>(xii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;</p> <p>where such development occurs –</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback adopted in the prescribed manner; or</p> <p>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p>excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.</p>	
<p><b>Activity 26:</b></p> <p>Phased activities for all activities listed in this Schedule and as it applies to a specific geographical area, which commenced on or after the effective date of this notice , or</p> <p>ii. similarly listed in in any of the previous NEMA notices, and as it applies to a specific geographical area, which commenced on or after the effective date of such previous NEMA Notices –</p> <p>where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; -</p> <p>excluding the following activities listed in this Notice-7;</p> <p>8;</p> <p>11 ;</p> <p>13;</p> <p>17;</p> <p>20;</p> <p>21; and</p> <p>24</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Wind;</li> <li>• Biomass &amp; Biofuel;</li> <li>• Hydropower;</li> <li>• Solar;</li> <li>• Wave;</li> <li>• Waste; and</li> <li>• Ocean currents</li> </ul>

Environmental authorisation for an activity may only be issued by the competent authority (CA) after the developer has complied with the procedural requirements as set out in the 2014 EIA regulations of NEMA. With regard to NEMA 2014 EIA regulations, these requirements in summary entail:

- The appointment of an independent and competent Environmental Assessment Practitioner (EAP);
- EAP must determine which application process (BA or S&EIR) is applicable:
  - Regulation 16 and 19 lists the minimum requirements of a BA;
  - Regulation 16 and 21 lists the minimum requirements of a Scoping Report; and
  - Regulation 31 lists the minimum requirements of the subsequent EIA which is informed by the scoping report;
- Authorisations can be amended or suspended (Regulation 38);
- Public participation (PP) whereby interested and affected parties (I&APs) are entitled to be kept informed and involved in either the BA or the S&EIR process and have an opportunity to comment on any draft or final report before it is submitted (Regulation 39);
- Appeals need to be lodged within 20 days of the CA decision.

A responding statement must be submitted within 20 days from the date of the receipt of the appeal. Scoping is a short-term process that provides an overview of the issues involved with a proposed activity. Amongst other things, it identifies the geographical and time scales of a proposed project and provides an indication of potential positive and negative impacts associated with the project. Scoping is useful for determining the scope of a project and planning.

Public Participation (PP) is not only a legal requirement (Chapter 6), but also a vital component of any environmental authorisation process. Guidelines specify public review periods of 30 days and emphasise the importance of due process in involving previously disadvantaged communities. This is done by providing documentation in local languages and giving sufficient opportunity for rural communities to be involved in the BA or S&EIR process. The objectives of the Public Participation Process are:

- To provide stakeholders with information on the proposed project and opportunities to comment;
- To ensure that stakeholders have the opportunity to raise issues of concern and suggestions for enhanced benefits;
- To ensure that stakeholders have the opportunity to comment on the technical and public participation processes of the BA; and
- To ensure that stakeholders have the opportunity to comment on the findings of the BA or S&EIR.

An Environmental Management Programme (EMPr) is a requirement of both the BA and S&EIR processes and essentially:

- Transforms mitigation measures identified in the BA or S&EIR into legal requirements that must be carried out by specified responsible persons or parties;
- Provides goals and targets for environmental planning and regulation;
- Ensures that 'Conditions of Approval' are implemented and that there is a basis for monitoring compliance; and
- Provides a site management tool for the developer or site/ operations manager.

The NEMA 2014 EIA regulations, stipulate that where various activities require authorisation in respect of a single project, of which some require a BA and others an S& EIR; S& EIR should be conducted in respect of all activities in an integrated application process.

It is important to note that the S&EIR or BA will not only address triggered listed activities in a narrow sense, but will assess potential impacts associated with the project as a whole, including transport, water supply, etc. as well as cumulative impacts of the construction and operation over its lifetime.

**Table 6 to Table 8** are listed activities that require BA and S&EIA, which would probably or possibly require environmental authorisation before renewable energy development activities (e.g. site preparation, construction and operation) can commence. The listed activities outlined in this guideline are not exhaustive; there could be many other secondary activities that may be listed and require environmental authorisation. It is the responsibility of applicant, with the assistance of an EAP to fully investigate all activities applicable to the project.

### **5.3 B3: National Environmental Management: Biodiversity Act (Act 10 of 2004 as amended)**

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004 as amended) ("NEMBA") aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA, the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources and the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources. The Act places severe restrictions on activities that could have adverse effects on threatened or protected species.

The purpose of the NEMBA includes:

- the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998;
- the protection of species and ecosystems that warrant national protection; and

- the sustainable use of indigenous biological resources and the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources.

Chapter 3 of the NEMBA provides an overview on Biodiversity Planning and Monitoring; provides for the preparation and adoption of the National Biodiversity Framework, the determination of bioregions and the publication of bioregional plans. The NEMBA also enables the adoption, coordination and alignment of biodiversity plans and biodiversity management agreements, amongst others. Any existing statutory instruments for biodiversity protection and management which may have been adopted in terms of this chapter must be taken into account during the implementation of any development activities as well as during assessments for authorisations in terms of additional legislation such as, for instance, environmental authorisations in terms of the NEMA.

Further provision is made for protection of threatened or protected ecosystems and species as well as provisions guarding against the introduction of alien and invasive species. The Act identifies restricted activities involving listed threatened, protected or alien species. These activities include picking parts of, or cutting, chopping off, uprooting, damaging or destroying, any specimen of a listed threatened or protected species. As stipulated in Section 57 of the Act, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7. Lists of critically endangered, endangered, vulnerable and protected species in GNR 151 of 23 February 2007 and List of threatened ecosystem 2011 have been published under NEMBA. Regulations have also been promulgated on Threatened and Protected Species in GNR 324 (29 April 2014). These lists and associated restricted activities as well as the regulations need to be taken into account during the implementation of any renewable energy development activities as well as during assessments for authorisations associated with these activities in terms of other legislation.

Application may be made for a permit to engage in restricted activities, which application may be subject to various stringent requirements as set out in Section 88 of the NEMBA. The CA responsible for administrating the NEMBA is dependent on the province in which the activity is taking place.

#### **5.4 B4: National Environmental Management: Air Quality Act (Act 39 of 2004 as amended)**

The National Environment Management: Air Quality Act (NEMAQA) serves to repeal the Atmospheric Pollution Prevention Act (45 of 1965) and various other laws dealing with air pollution.

According to the Act, the DEA, the provincial environmental departments and local authorities are separately and jointly responsible for the implementation and enforcement of various aspects of the Air Quality Act. Each of these spheres of government is obliged to

appoint an air quality manager and to co-operate with each other and co-ordinate their activities through mechanisms provided for in the National Environmental Management Act.

The purpose of the Act is to set norms and standards that relate to:

- Institutional frameworks, roles and responsibilities;
- Air quality management planning;
- Air quality monitoring and information management;
- Air quality management measures;
- General compliance and enforcement.

The Act provides for the identification of priority pollutants and the setting of ambient standards with respect to these pollutants. The Act provides for the establishment of a multi-stakeholder National Air Quality Committee, which will advise the Minister on the implementation of the Act.

The Act ensures that air quality planning is integrated with existing activities. The implications of this are that plans that are required in terms of the NEMA must incorporate consideration of air quality. In addition, integrated development plans, developed by municipalities, also have to take air quality into account.

The Act describes various regulatory tools that should be developed to ensure the implementation and enforcement of air quality management plans. These include a schedule of Listed Activities which require an Atmospheric Emission license. GNR 893 (2013) Part 3 stipulates minimum emissions standards from solid biomass combustion installations as shown below in **Table 9**.

**Table 9: Minimum emissions standards for solid biomass combustion installations**

<b>Description</b>	Solid biomass fuel combustion installations used primarily for steam raising or electricity generation.		
<b>Application</b>	All installations with design capacity equal to or greater than 50 MW heat input per unit, based on the lower calorific value of the fuel used.		
<b>Substance or mixture of substances</b>		<b>Plant Status</b>	<b>Mg/Nm<sup>3</sup> under normal conditions of the 10% O<sub>2</sub>, 273 Kelvin and 101.3kPa.</b>
<b>Common name</b>	<b>Chemical Symbol</b>		
Particular matter	N/A	New	50
		Existing	100
Sulphur dioxide	SO <sub>2</sub>	New	500
		Existing	3 500
Oxides of Nitrogen	NO <sub>x</sub> expressed as	New	750
		Existing	1 100



<b>Description</b>	Solid biomass fuel combustion installations used primarily for steam raising or electricity generation.		
	NO <sub>2</sub>		

It should also be noted that GNR 893(November 2013) category 8, subcategory 8.1 stipulates minimum emission standards for thermal treatment of hazardous and general waste which should be taken into consideration.

### 5.5 B5: The National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008 as amended)

The Integrated Coastal Management Act (NEMICMA or ICMA) sets out an approach to managing the nation's coastal resources to promote social equity and make best economic use of coastal resources, whilst protecting the natural environment.

Through the ICMA, the Constitution empowers the state to manage the coast on behalf of its citizens. The NEMICMA applies specifically to South Africa's internal waters, territorial waters, exclusive economic zone, and the continental shelf, as well as the Prince Edward Islands (including Marion Island). The various spatial aspects of the Coastal Zone that the NEMICMA covers include:

- **Coastal Public Property.** Comprises coastal waters, land submerged by coastal waters, islands in coastal water, seashore, Admiralty Reserve, State land declared as coastal public property, and natural resources (Section 7 of NEMICMA)
- **Coastal protection zone.** A continuous strip of land from the high water mark to 100m inland of an Urban zone and 1000m inland of a Rural zone (Section 16 of NEMICMA).
- **Coastal access land.** Land that ensures the public has access to coastal public property (Section 18 of NEMICMA).
- **Coastal waters.** Essentially all waters influenced by tides (e.g. bays, estuaries, and harbours) and the waters extending from the shoreline of South Africa to its territorial water limit of (12 nautical miles offshore).
- **Coastal protected areas.** Any area protected under the National Environmental Management Protected Areas Act (No. 57 of 2003) or specified under section 16 of the NEMICMA; and
- **Special management areas.** Areas declared by the minister that prohibit certain activities from taking place (Section 23 of NEMICMA); and
- **Coastal set-back lines.** Lines that prohibit or restrict the construction, extension, or repair of structures that is either wholly or partly seaward of the line (Section 25 of NEMICMA). Set-back lines are ultimately the responsibility of the provincial authority.

### Assessing, avoiding and minimising adverse effects

In order to avoid negative impacts on the coastal environment, the NEMICMA applies the NEMA (section 28) to anyone who has caused or may cause significant pollution or degradation of the coastal environment.

If an activity is perceived by the minister to potentially have an adverse effect on the coastal environment, notices may be issued that include the following instructions:

- Build, maintain or demolish and works specified;
- Prohibition of the activity in question; or
- Remove the structure from the coastal zone within a certain period.

Non-compliance with these notices may result in external entities carrying out the instructions at the developers cost.

### Environmental Authorisations

The NEMICMA does not include separate environmental assessment procedures to those provided in chapter 5 of NEMA, as any activity conducted in the coastal zone will require an environmental authorisation under the NEMA. In addition to the NEMA requirements and criteria for environmental authorisations, the NEMICMA provides (in section 63) additional criteria that must be considered by the relevant competent authority when evaluating an application for an activity in the coastal zone.

### Coastal leases and concessions on coastal public property

While coastal public property is managed in the interests of the general public, the minister may grant a coastal lease or concession to allow for some activities to take place on a coastal public property. The NEMICMA specifies that no person may occupy any part of, or site, construction or erect any building, road, barrier, or structure on or in a coastal public property unless under the authority of a coastal lease or concession.

A lessee or concessionaire is still obliged to obtain any other authorisations that may be required in terms of the NEMICMA or other legislation, and comply with any other legislation.

No person may claim exclusive rights (private rights) to use any coastal resource that is part of, or derives from coastal public property, unless such a person:

- Is empowered to do so by South African legislation;
- Is authorised to do so in terms of a coastal concession awarded by the minister; or

- Is authorised to do so in terms of an authorisation issued under the Living Resource Act (No. 18 of 1998).

A coastal lease or concession may not be awarded for a period longer than 20 years is subject to case specific conditions. If a coastal lease or concession applies to land that is partially submerged by coastal waters, then the lease may allow exclusive use of the water should it be required.

### General provisions

Subject to the conditions of the Expropriation Act (No. 63 of 1975), land within the coastal zone may be temporarily occupied (i.e. material can be removed or deposited, and temporary works constructed) if it is necessary to:

- Build, maintain, or undertake repair works to implement a coastal management plan; or
- Respond to pollution or emergency incidents.

The CA responsible for administrating the NEMICMA is dependent on the province in which the activity is taking place.

## **5.6 B6: National Environmental Management: Protected Areas Act**

The objectives of the National Environmental Management: Protected Areas Act 2003 (Act 57 OF 2003) (NEMPAA) as amended by the National Environmental Management: Protected Areas Amendment Act 31 of 2004, are to:

- provide for the declaration and management of protected areas;
- provide for co-operative governance in the declaration and management of protected areas;
- effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
- provide for a representative network of protected areas on state land, private land and communal land;
- promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
- promote participation of local communities in the management of protected areas, where appropriate; and
- provide for the continued existence of South African National Parks.

The Act also provides for the maintenance and monitoring of declared protected areas. The CA responsible for administrating the NEMPAA is dependent on the province in which the activity is taking place.

### **5.7 B7: National Environmental Management: Waste Act (Act 59 of 2008 as amended)**

The National Environmental Management: Waste Act (NEMWA) came into effect on 1 July 2009. Section 19 of the NEMWA provides for listed waste management activities and states in Section 19(1) that the Minister may publish a list of waste management activities that have, or are likely to have a detrimental effect on the environment. Such a list was published in GN 921 of 29 November 2013, identifying those waste management activities that require a Waste Management Licence in terms of the Act. Activities are defined within Category A (non-hazardous) and Category B (hazardous) Category C (lower threshold in terms of waste volumes) wastes. From a renewable energy perspective, only Category A is considered here. The activities listed under Category B are equivalent to those that require an EIA process stipulated in the EIA regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

The licensing procedures in terms of the NEMWA once again makes use of the procedural provisions as set out in 2014 EIA regulations in terms of the NEMA, procedural regulations regarding environmental impact assessments. For Category A, a Basic Assessment is required, as stipulated under section 24(5) of the NEMA is required.

Before any development activities which may generate waste commence, an assessment as to the applicability of the relevant provisions of the NEMWA will need be made and if so required, any requisite waste management licenses applied for and procured prior to the commencement of any waste management activity which requires licensing. The CA responsible for administrating the NEMWA is dependent on the province in which the activity is taking place.

**Table 10** lists relevant activities which would require the Waste Management Licence application process to be undertaken before renewable energy development activities could commence.

**Table 10: Activities requiring a waste management license**

<b>NEMWA Activity Listing Category A (relevant to Renewable Energy)</b>	<b>Primarily applicable to:</b>
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<p><b>Storage of waste:</b></p> <p>3(1)The storage including the temporary storage of general waste in lagoons.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; Biofuel; and</li> <li>• Waste.</li> </ul>
<p><b>recycling and recovery:</b></p> <p>3(2)The sorting, shredding, grinding, crushing, screening or bailing of general waste at a facility that has an operational area in excess of 1000 m<sup>2</sup>.</p> <p>3(5)The recovery of waste including the refining, utilisation, or co-processing of waste in excess of 10 tons but less than 100 tons of general waste per day or excess of 500kg but less than 1 ton of hazardous waste per day, excluding recovery that takes place as an integral part of an internal manufacturing process within the same premises.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; Biofuel; and</li> <li>• Waste.</li> </ul>
<p><b>Treatment of Waste:</b></p> <p>3(6)The treatment of general waste using any form of treatment at a facility that has the capacity to process in excess of 10 tons but less than 100 tons.</p> <p>3(7)The treatment of hazardous waste using any form of treatment at the facility that has the capacity to process in excess of 500kg but less than 1 ton per day excluding the treatment of effluent, wastewater or sewage.</p>	<p>Technologies of:</p> <ul style="list-style-type: none"> <li>• Biomass &amp; Biofuel; and</li> <li>• Waste.</li> </ul>

## 5.8 B8: The Hazardous Substances Act (No. 15 of 1973)

The Hazardous Substances Act (HAS, No. 15 of 1973) was promulgated to provide for the control of substances which may cause injury, ill-health or death. Substances are defined as hazardous if their inherent nature is: toxic, corrosive, irritant; strongly sensitising, flammable and pressure generating (under certain circumstances) which may injure cause ill-health, or death in humans. HAS is administered by the department of health in consultation with other departments.

The Hazardous Substances Act also provides for matters concerning the division of such substances or products into four groups in relation to the degree of danger, the prohibition and control of the importation, manufacture, sale, use, operation, application and disposal of such substances.

- Group 1 substances include all hazardous substances (as defined above);
- Group 2 substances include mixtures of Group 1 substances;

- Group 3 substances include substances found in certain electronic products (i.e. product with an electronic circuit); and
- Group 4 substances include all radioactive substances

Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste<sup>5</sup>

Under the South African National Standards (SANS), hazardous substances are given an identification number and are classified into nine classes (**Table 11**). Minimum requirements for dealing with these substances are provided in **Table 12** below.

**Table 11: Classes of Dangerous goods as defined by DWA (2005)**

Class	Description
Class 1	<b>Explosives</b>
Class 2	<b>Gases: compressed, liquefied or dissolved under pressure</b>
2.1	Flammable Gases
2.2	Non-flammable, non-toxic gases
2.3	Toxic gases
Class 3	<b>Flammable Liquids</b>
	Low flashpoints group of liquids; flashpoints below -18°C c.c.*
3.1	Intermediate flashpoint group of liquids; flashpoint of - 18°C up to, but not including 23°C c.c.*
3.2	
3.3	High flashpoint group of liquids flashpoint of 23°C up to, and including, 61°C c.c.
Class 4	<b>Flammable Solids or substances</b>
4.1	Flammable solids
4.2	Flammable solids liable to spontaneous combustion
4.3	Flammable solids which emit flammable gases when in contact with water
Class 5	<b>Oxidising substances and organic peroxides</b>
5.1	Oxidising substances
5.2	Organic peroxides
5.3	
Class 6	<b>Toxic and infectious substances</b>
6.1	Toxic substances
6.2	Infectious material
Class 7	<b>Radioactive substances</b>
Class 8	<b>Corrosive substances</b>
Class 9	Other <b>miscellaneous dangerous substances</b> , that is any other substance which experience has shown, or may show, to be of such dangerous character

<sup>5</sup> Department of Water Affairs & Forestry (2005); *Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste*; Waste Management Series

Class	Description
	that the provisions of this Section should apply to it.

**Table 12: Minimum requirements of dealing with hazardous waste**

Subject	Minimum Requirement
Classification	In accordance with its properties and characteristics, a Hazardous Waste must be placed in a SANS 10228 class.
Unlisted compounds	Should a Hazardous Waste contain compounds NOT listed in SANS 10228, the Competent Authority must be consulted before classification is attempted.
Class 1	Direct disposal of Class 1 wastes is PROHIBITED. Class 1 wastes to be pre-treated (destroyed)
Class 2	Flammable gases to be thermally destroyed. Non-flammable gases to be released to atmosphere, unless in contravention with the National Environment Management: Air Quality Act (Act 39 of 2004) and the Montreal Protocol. Controlled destruction of poisonous gases.
Class 3	Landfilling of flammable liquids, flashpoint <61°C is prohibited. Flammable liquids to be treated to flashpoint >61°C .
Class 4	Landfilling of flammable solids is PROHIBITED Flammable solids to be treated to non-flammability.
Class 5	Landfill of Oxidising Substances and Organic Peroxides is prohibited. Treatment to neutralize oxidation potential.
Class 6	Infectious Substances to be sterilised. Residue of Infectious Substances to be Hazard Rated. Toxic Substance, Hazard Rating 3 or 4, to be disposed of at H:H or H:h sites, to have EEC multiplied factor approved by the Competent Authority. Toxic Substance, Hazard Rating 1 or 2, to be disposed at permitted H:H sites to have EEC multiplied by a factor approved by the Competent Authority.
Class 7	Radioactive Substance with specific activity < 100 Bq/g, total activity <4KBq, to be incinerated or landfilled. Disposal of Radioactive Substance with specific activity >100 Bq/g, total activity >4kBq, is PROHIBITED. Consult Department of Health.
Class 8	Disposal of Corrosive Substance, Ph <6 and/or Ph> 12, by landfill is PROHIBITED. Corrosive Substance to be treated to Ph 6-12.
Class 9	Competent Authority to be notified is a compound contains substances listed in Class 9 and written approval must be obtained before disposal. Competent Authority to be notified if a compound contains substances <b>NOT listed</b> in Class 9

### 5.9 B9: National Water Act (Act 36 of 1998 as amended)

The National Water Act (NWA) includes provisions requiring that a water use license be issued by the Department of Water & Sanitation (DWS) before a project developer engages

in any activity defined as a water use in terms of the NWA. Water use definitions considered probably or possibly relevant to Renewable Energy projects in terms of the NWA, section 21, includes:

- Taking of water from a water resource;
- Storing of water;
- Impeding or diverting the flow of water in a water course;
- Engaging in a stream flow reduction activity;
- Engaging in a controlled activity (this includes the use of water for power generation purposes);
- Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- Altering the bed, banks, course, or characteristics of a watercourse. This includes altering the course of a watercourse (previously referred to as a river diversion).

A guideline<sup>6</sup> has been produced by the DWS which provides direction and assistance to applicants and stakeholders and water users on the following:

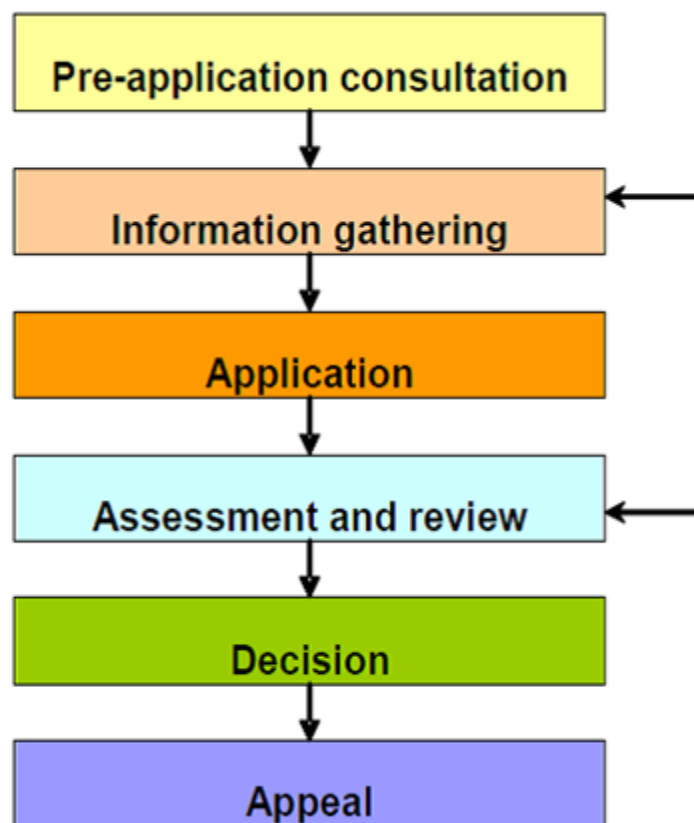
- The various water uses that require authorisation;
- Necessary consultative processes;
- The departmental requirements for the specific water uses;
- The evaluation and assessment process;
- Information on the decision-making process
- The appeal process.

The guideline covers all water use authorisation mechanisms through all stages of the authorisation process, providing an overview of the water uses, contact details of relevant official, details of the information required during the licence application process, and an overview of the process leading to the issuing of a water use authorisation (see Figure 5below). The CA responsible for administrating the NWA is the DWS regional office, dependent on the province in which the activity is taking place. Please note that the appeal process is only initiated as and when required (after the EA has been granted or denied).

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<sup>6</sup> <http://www.dwaf.gov.za/Documents/Section21/eggeneric.pdf>





**Figure 5: Water Use Authorisation Process (DWA 2007)**

Schedule 1 of the NWA outlines permissible use of water where a licence is not required. The types of activities outlined in Schedule 1 are activities that have a very small impact on the water resource. In relation to renewable energies, some of these activities (subject to the Act) include:

- Taking water directly from any water resource for reasonable domestic use in a household if the household has lawful access to that water;
- Storing and using run-off water from a roof; and
- Using water for emergencies for example for human consumption or fire-fighting.

#### **5.10 B10: The Water Services Act (No. 108 of 1998)**

The Water Services Act (WSA, No. 108 of 1998) regulates the right of access to basic water supply and basic sanitation as well as other related matters, typically at a municipal level. The WSA is different from the NWA in that the Constitution allocates the management of water resources to National Government under the NWA and the management of water and sanitation services for all citizens to municipalities (local government) under the WSA. The NWA thus deals with sources of water at a national level while the WSA deals with water services at a local level.

The Water Services Act deals mainly with water services or potable (drinkable) water and sanitation services supplied by municipalities to households and other municipal water

users. It contains rules about how municipalities should provide water supply and sanitation services. Although the WSA was enacted to deal with matters such as providing for the rights of access to basic water supply, basic sanitation, and the setting of national standards and norms for tariffs, the NWA is the primary legislation pertaining to the regulation of water in South Africa. Accordingly the NWA will typically take precedence over the WSA, and the CA responsible for administering the WSA is dependent on the municipality in which the activity is taking place.

#### **5.11 B11: National Heritage Resources Act (No. 25 of 1999)**

National Heritage Sites in South Africa are places that are of historic or cultural importance and which are for this reason declared in terms of Section 27 of the National Heritage Resources Act (NHRA). The designation was a new one that came into effect with the introduction of the Act on 1 April 2000 when all former National Monuments declared by the former National Monuments Council and its predecessors became provincial heritage sites as provided for in Section 58 of the Act.

Both national and provincial heritage sites are protected under the terms of Section 27 of the NHRA and a permit is required to work on them. National Heritage Sites are declared and administered by the national Heritage Resources Authority, SAHRA whilst provincial heritage sites fall within the domain of the various provincial heritage resources authorities. Heritage resources are protected by the Act and may not be disturbed in any way without a permit issued by the South African Heritage Resources Agency or the relevant Provincial Heritage Resources Authority. Section 38(1) of the NHRA stipulates the triggers which would require a Heritage Impact Assessment (HIA) to become part of an EIA submitted for consideration by the relevant state department.

#### **5.12 B12: Electricity Regulation 2006 (No. 4 of 2006) as amended by the ERAA in 2007)**

The Electricity Regulation Act (No 47 of 1999, as amended in 2007; RGA) provides a national regulatory framework for the electricity supply industry and makes the National Energy Regulator of South Africa the overseer and enforcer of the framework. The act requires registration and licensing of anyone wanting to generate, transmit, reticulate (i.e. network), distribute, trade, or import and export electricity. In addition, the act regulates the reticulation of electricity by municipalities<sup>7</sup>.

In order to become registered, the applicant must:

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<sup>7</sup> Compendium of South African Environmental Legislation (2010); van der Linde, M., and Feris, L., (editors); 2<sup>nd</sup> edition; Pretoria University Law Press

- Submit an application for registration accompanied by a prescribed registration fee.
- In order to obtain a license, the applicant must provide:
- A prescribed application fee;
- Description of the applicant, including vertical and horizontal relationships with other persons engaged in the operation of generation, transmission and distribution facilities, the import or export of electricity, trading or any other prescribed activity relating thereto;
- Documented evidence of the administrative, financial and technical abilities of the applicant as may be required by the Regulator;
- A description of the proposed generation, transmission or distribution facility to be constructed or operated or the proposed service in relation to electricity to be provided, including maps and diagrams where appropriate;
- A general description of the type of customer to be served and the tariff and price policies to be applied;
- The plans and the ability of the applicant to comply with applicable labour, health, safety and environmental legislation, subordinate legislation and such other requirements as may be applicable;
- A detailed specification of the services that will be rendered under the licence; and
- Evidence of compliance with any integrated resource plan applicable at that point in time or provide reasons for any deviation for the approval of the Minister.

### **5.13 B13: Municipal Systems Act (No. 32 of 2000)**

The Municipal Systems Act (No. 32 of 2000, MSA) concerns itself with the internal systems and administration of municipalities. The Act requires that the Constitution and other national level acts (e.g. NEMA) be incorporated into strategic planning at a municipal level. The CA responsible for administering the MSA is dependent on the municipality in which the activity is taking place.

Development at a local level is the primary focus as the act separates the responsibility of a service authority with that of a service provider; sets out the roles of officials and councillors, and provides for a range of requirements; including Integrated Development Plans (IDPs), performance management and tariff setting. The Act accordingly regulates municipal service delivery and provides a comprehensive range of service delivery mechanisms through which municipalities may provide municipal services. It explains the process to be applied and the criteria to be considered in reviewing and selecting municipal service delivery mechanisms.

Under the Act, every municipal council must adopt a single, inclusive and strategic plan (i.e. IDP) for the development of the municipality which amongst others:

- links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality; and
- aligns the resources and capacity of the municipality with the implementation of the plan;

At a municipal level, these plans may call for the implementation of renewable energy projects and should be referenced in applications to motivate for relevant environmental authorisations.

IPPs will need to consult with the various relevant municipal authorities and development plans as applicable to each specific project design and location.

#### **5.14 B14: Conservation and Agricultural Resources Act (Act No 43 of 1983)**

The mandate of the Conservation and Agricultural Resources Act 1983 (Act No 43 of 1983) (CARA) is to conserve “natural agricultural resources” (the soil, the water sources and the vegetation, excluding weeds and invader plants) through production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants.

Section 6 of the Act concerns the control measures which the following may be applicable to IPPs (subsections (2) (f), (g) and (o)):

- the regulating of the flow pattern of run-off water;
- the utilization and protection of the vegetation; and
- the construction, maintenance, alteration or removal of soil conservation works or other structures on land.

Regulation 8 regulating the flow pattern of run-off water states that no land user shall in any manner whatsoever divert any run-off water from a water course on his farm unit to any other water course, except on authority of a written permission by the executive officer. No land user shall effect an obstruction that will disturb the natural flow pattern of run-off water on his farm unit or permit the creation of such obstruction unless the provision for the collection, passing through and flowing away of run-off water through, around or along that obstruction is sufficient to ensure that it will not be a cause for excessive soil loss due to erosion through the action of water or the deterioration of the natural agricultural resources.

Regulations 15 and 16 under this Act, which contain problem plants (known as weeds or invaders), were amended during March 2001 and make provision for four categories of problem plants:

- Category 1: Prohibited plants which must be controlled, or eradicated where possible (except in bio-control reserves, which are areas designated for the breeding of bio-control agents)

- Category 2: Mainly commercial plantation spp. but also plants for woodlots, animal fodder, soil stabilisation etc.; allowed only in demarcated areas (by permit) under controlled conditions and in bio-control reserves
- Category 3: Mainly ornamental spp., no further planting allowed (except with special written permission), nor trade in propagative material. Existing plants may \*remain but must be prevented from spreading. (\* except those within the flood line of watercourses or wetlands or as directed by the executive officer)
- Bush encroachers: indigenous woody spp. which requires sound management practices to prevent them from becoming a problem.

CARA is administered by the National Department of Agriculture (DoA), through its Directorate: Land Use and Soil Management (D: LUSM).

#### **5.15 B15: Mineral and Petroleum Resource Development Act (MPRDA) (Act No. 28 of 2002 as amended)**

This act makes provisions for equitable access to and sustainable development of South Africa's mineral and petroleum resources.

A key definition relevant to this guideline is "Petroleum" which means any liquid, solid hydrocarbon or combustible gas existing in a natural condition in the earth's crust and includes any such liquid or solid hydrocarbon or combustible gas, which gas has in any manner been returned to such a natural condition, but does not include coal, bituminous shale or other stratified deposits from which oil can be obtained by destructive distillation or gas arising from a marsh or other surface deposits"

Section 37 (2) stipulates that Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations.

Section 38A (1) stipulates that The Minister is the responsible authority for implementing environmental provisions in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as it relates to prospecting, mining, exploration, production or activities incidental thereto on a prospecting, mining, exploration or production area.

Section 38A (2) stipulates that An environmental authorisation issued by the Minister shall be a condition prior to the issuing of a permit or the granting of a right in terms of this Act.

Section 53 of the act makes provision for use of land surface rights contrary to objects of acts

Section 53 (1) stipulates that Subject to subsection (2), any person who intends to use the surface of any land in any way which may be contrary to any object of this Act or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.

Section 53 (2) stipulates that Subsection (1) does not apply to-

- (a) fanning or any use incidental thereto; or
- (b) the use of any land which lies within an approved town-planning scheme which has applied for and obtained approval in terms of subsection (1); or
- (c) any other use which the Minister may determine by notice in the *Gazette*.

### **5.16 National Roads Act (No. 93 OF 1996)**

This Act provide for co-operative and co-ordinated strategic planning, regulation, facilitation and law enforcement in respect of road traffic matters by the national, provincial and local spheres of government. Some of the objectives of this act are as follows:

- to enhance the overall quality of road traffic service provision and, in particular, to ensure safety, security, order, discipline and mobility on the roads;
- to protect road infrastructure and the environment through the adoption of innovative practices and implementation of innovative technology;
- to phase out, where appropriate, public funding and phase in private sector investment in road traffic on a competitive basis; and
- to introduce commercial management principles to inform and guide road traffic governance and decision-making in the interest of enhanced service provision.

The National Roads Act 93 OF 1996 makes provision for regulating the transportation of dangerous goods and substances by road. Section 275 states that, no person shall operate on a public road any vehicle in or on which dangerous goods is transported, unless such dangerous goods is transported in accordance with Chapter VIII of the Act. Chapter VIII also incorporates the SABS standard specifications relating the transportation of dangerous goods and substances. Section 279 indicates the availability of an authority for classification and certification of dangerous goods should there be any doubt as to the appropriate classification of dangerous goods.

### **5.17 B17: Spatial Planning and Land Use Management Act (SPLUMA)**

SPLUMA aims to confirm and regulate the role of municipalities in land-use planning and land-use management. Two of the most relevant objectives of the SPLUMA are to ensure

that the system of spatial planning and land use management promotes social and economic inclusion and to provide for the sustainable and efficient use of land.

The Act provides that spatial planning consists of:

- Spatial development frameworks adopted at each level of government;
- Development principles, norms and standards;
- The management and facilitation of land use through land-use schemes; and
- Procedures to deal with and decide on development applications provided for in national and provincial legislation.

The Bill contains a list of development principles which apply to a municipality when it compiles its spatial development framework or zoning scheme or when it decides on an application. The Bill further instructs the national, provincial and local governments to adopt spatial development frameworks (SDFs). SDFs must 'guide planning and development decisions across all sectors'. At different levels of government the SDFs intended to guide some of the following:

- National Spatial Development Framework (NSDF) - must indicate the desired patterns of land use in South Africa;
- Provincial Spatial Development Framework (PSDF) - must provide a spatial representation of the province's land development policies, strategies and objectives and must indicate desired and intended patterns of land use and, importantly, delineate areas in which development would not be appropriate;
- Regional Spatial Development Framework (RSDF) – will be imposed if when a municipality fails to adopt or amend an MSDF the Minister may step in, declare a region and adopt an RSDF for that region and when it is 'necessary to give effect to national land-use policies or priorities' the Minister may do the same; and
- Municipal Spatial Development Framework (MSDF) - identify current and future significant structuring and restructuring elements of the spatial form of the municipality, including development corridors, activity spines and economic nodes where public and private investment will be prioritised and facilitated.

#### **5.18 B18: Astronomy Geographic Advantage areas Act (No. 21 of 2007)**

In February 2010, the Minister of Science and Technology declared all land in the Northern Cape Province situated 250km from the centre of the South African Large Telescope dome as an astronomy advantage area for optical astronomy purposes and the whole of the territory of the Northern Cape Province, excluding Kimberly, as an astronomy advantage area for radio astronomy purposes.

Furthermore, those parts of the Northern Cape which are to contain the SALT dome, the MeerKAT radio telescope and the multi-billion rand Square Kilometre Array (SKA) have been declared as core astronomy advantage areas. While all land within a 3km radius of the centre of the SALT dome falls under the Sutherland Core Astronomy Advantage Area, sections of the Kareeberg and Karoo Hoogland municipal areas, consisting of three sections of farming land, constitute the Karroo Core Astronomy Advantage Area.

The minister has also notified the public of an intention to declare portions of the established astronomy advantage areas as either central or coordinated astronomy advantage areas.

From a renewable energy perspective, one activity which may potentially be at odds with the objects of the Act is that of the use of wind turbines. There is a possibility that the power generation equipment used in harnessing wind energy may result in electromagnetic interference with radio astronomy observations. In addition, there is a possibility that the turbine blades will reflect distant radio signals from other transmitters onto the radio telescopes and act as secondary transmitters. This may result in detrimental effects to any radio astronomy facilities. The extensive power requirements of the SKA and the MeerKAT radio telescope are likely to play a prominent role in determining the extent to which the generation of electrical energy through the establishment of wind and solar power projects is to be permitted in the Northern Cape.

#### **5.19 B19: Subdivision of Agricultural Land Act (SALA) (Act no 70 of 1970) as amended**

The Subdivision of Agricultural Land Act (“Subdivision Act”) regulates the subdivision of all agricultural land in the Republic. The declared purpose of the Act is to prevent the creation of uneconomic farming units and this purpose is achieved through the requirement that the Minister of Agriculture, Forestry and Fisheries (“Minister of Agriculture”) must consent to the proposed subdivision. This purpose is to prevent the degradation of prime agricultural land in the Republic.

#### **5.20 B20: Civil Aviation Act (No.13 of 2009)**

Civil aviation in South Africa is governed by the Civil Aviation Act, 2009 (Act 13 of 2009). This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by the South African Civil Aviation Authority (SA CAA) as an agency of the Department of Transport (DoT). The SA CAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs). All proposed developments or activities in South Africa that potentially could affect civil aviation must thus be assessed by SACAA in terms of the SA



CARs and South African Civil Aviation Technical Standards (SA CATS) in order to ensure aviation safety.

The Obstacle Evaluation Committee (OEC) which consists of members from both the SA CAA and South African Air Force (SAAF) fulfils the role of streamlining and coordinating the assessment and approvals of proposed developments or activities that have the potential to affect civil aviation, military aviation, or military areas of interest. With both being national and international priorities, the OEC is responsible for facilitating the coexistence of aviation and renewable energy development, without compromising aviation safety.

### **5.21 B21 National Forests Act (No. 84 of 1998)**

The main objective of the National Forests Act, 1998 is to promote the sustainable management and development of forests and to provide protection for certain forests and trees. This said protection is provided through the protection of all natural forests (Section 7 (1), the protection of all trees declared to be protected in terms of section 12(1) of the Act, and the regulation of certain activities in a proclaimed State forest (Section 23(1)(a) – (k)).

Natural forests and woodlands form an important part of the environment and need to be conserved and developed according to the principles of sustainable management. Plantation forests play an important role in the economy. They also have an impact on the environment and need to be managed appropriately.

## **6 PART C: STAKEHOLDER ROLES AND RESPONSIBILITIES**

In relation to the assessment of an environmental impact of a listed activity or related activity (discussed above), NEMA (section 24, 4 a and v), defines I&APs as:

- any person, group of persons or organisation interested in or affected by such operation or activity; and
- any organ of state that may have jurisdiction over any aspect of the operation or activity.

Stakeholders, for the purpose of this report, are synonymous with I&APs. The outcome of an activity or initiative may affect stakeholders directly or indirectly. Directly affected stakeholders are the primary stakeholders who stand to benefit or lose from an intervention. Indirectly affected stakeholders are only incidentally interested or affected due to their expertise or interest or link to those who are directly affected.

The term Role-players refers to all parties involved in a public participation process. Role-players involved in public participation include the public, government department(s), public participation facilitators, technical specialists and the project proponent. A typical listing of role-players is shown in **Table 13** below, together with anticipated roles and level of responsibility.

**Table 13: Stakeholder Roles and Responsibilities**

	<b>Inform</b>	<b>Partner</b>	<b>Support</b>	<b>Legislate</b>
<b>C</b>	Indirect interest, or not applicable			
<b>B</b>	Secondary role/responsibility			
<b>A</b>	Primary role/engagement			
<b>Government and Public Sector</b>				
National Government Departments	C	C	C	A
Provincial Government	C	C	C	A
District Municipality Councils	B	C	C	A
Traditional Authorities	A	C	C	C
<b>Parastatal and Utility Sector</b>				
Utility Boards	B	A	B	C
Utility User Associations	B	B	A	C
Provincial development councils	B	A	B	C
Conservation bodies	A	C	C	A
Research organisations	A	B	C	C
<b>Private Sector</b>				
Individual corporations	C	A	C	C
Chamber of Commerce	B	C	A	C
Agricultural business	B	A	C	C
Farmers' associations	B	C	A	C
Forestry organisations	B	C	A	C
Mines & Industry	B	A	C	C
<b>Civil Society</b>				
NGOs	A	C	B	C
Other interest groups and associations	A	C	B	C
Affected communities and groups	A	C	B	C
Trade unions	A	C	B	C

### 6.1 C1: Public Participation Process

NEMA (section 2: 4f) requires that the participation of all interested and affected parties in environmental governance must be promoted. People must also have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation.

Certain legislation and policy oblige government to engage in public participation processes. From a renewable energy perspective the most significant of these are:

- The National Water Act (Act No. 36 of 1998);
- The White Paper on Water Policy (30 April 1997);
- The National Environmental Management Act (NEMA) (Act No. 107 of 1998);

- The Environment Conservation Act (Act No. 73 of 1989); and
- Promotion of Administration Justice Act (Act No. 3 of 2000).

A public participation process may be divided into three broad phases, comprising various aspects, as shown in **Table 14** below:

**Table 14: Generic Public Participation Phases**

Phase	Key Aspects
Planning	Decision analysis Participation planning Implementation planning
Participation	Informing stakeholders Meeting stakeholders Feedback to and from stakeholders Monitoring and Evaluation (M&E)
Exit	Ensuring that all goals have been reached Officially ending the process

## PART D: INTEGRATED ENVIRONMENTAL APPLICATION PROCESS

This section aims to illustrate how the above-mentioned licenses can be integrated into an environmental authorisation process. **Figure 6** and **Figure 7** illustrate the EIA process as a basis for one environmental system. Amendments to cater one environmental system have been made to the following legislation:

National Environmental Management Act (Act No. 107 of 1998),

Mineral & Petroleum Resources Development Act (Act No. 28 of 2002),

NEM: Air Quality Act (Act No. 39 of 2004),

NEM: Waste Act (Act No. 59 of 2004), &

National Water Act (Act No. 36 of 1998),

The date of effect to the above was the 7<sup>th</sup> December 2014. National Department of Environmental Affairs is the CA for issuing all the energy related EIA authorisation.

Other authorisations included in **Figure 6** and **Figure 7** are:

Atmospheric Emissions License (AEL) – issued by the AEL Authority located at the local/district municipality or provincial authority;

Waste License Application – issued by the National Department of Environmental Affairs (DEA) as the competent authority for hazardous waste and provincial authority for non-hazardous waste;

Water Use License (WUL) – issued by the Department of Water Affairs.

Renewable Energy projects with low impact activities are carried out through the Basic Assessment (BA) Process. The process flow diagram for a BA is shown in **Figure 6**. However, if the impacts are expected to be high then the Scoping and Environmental Impact Reporting (SR&EIR) Process is applicable. The process flow diagram for the S&EIR is shown in **Figure 7**. Both diagrams include the maximum timeframes included in the EIA regulations for the processing of applications and the minimum timeframes for public participation. It is important to note that, in practice, time frames can be extended for reasons such as delays in specialist delivery times, public holidays are excluded from the public comment period unless exceptional circumstances are provided, and if there are any appeals from I&APs.

**Figure 6** and **Figure 7** below should be read in conjunction with **Table 15** and **Table 16**.

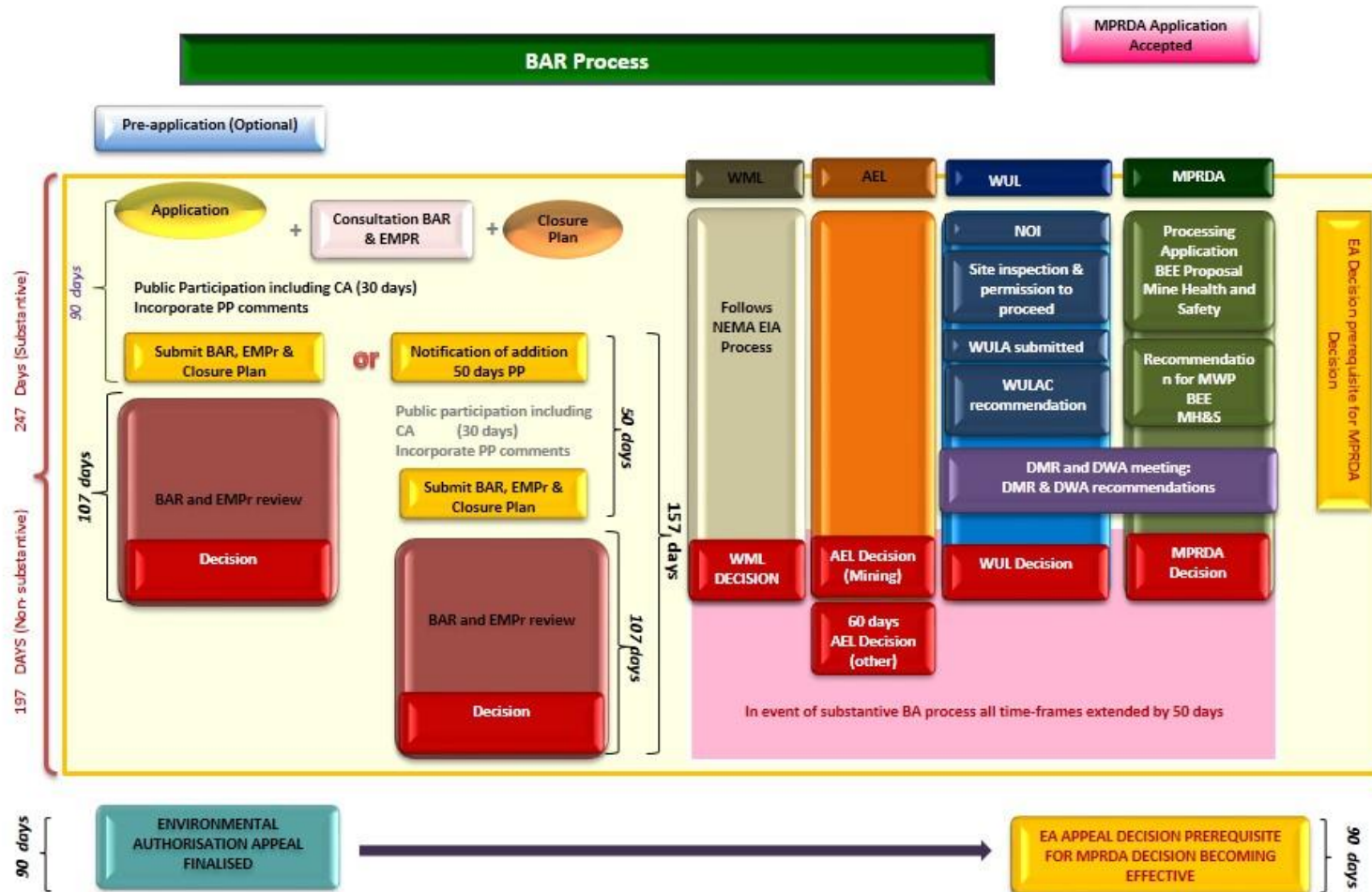
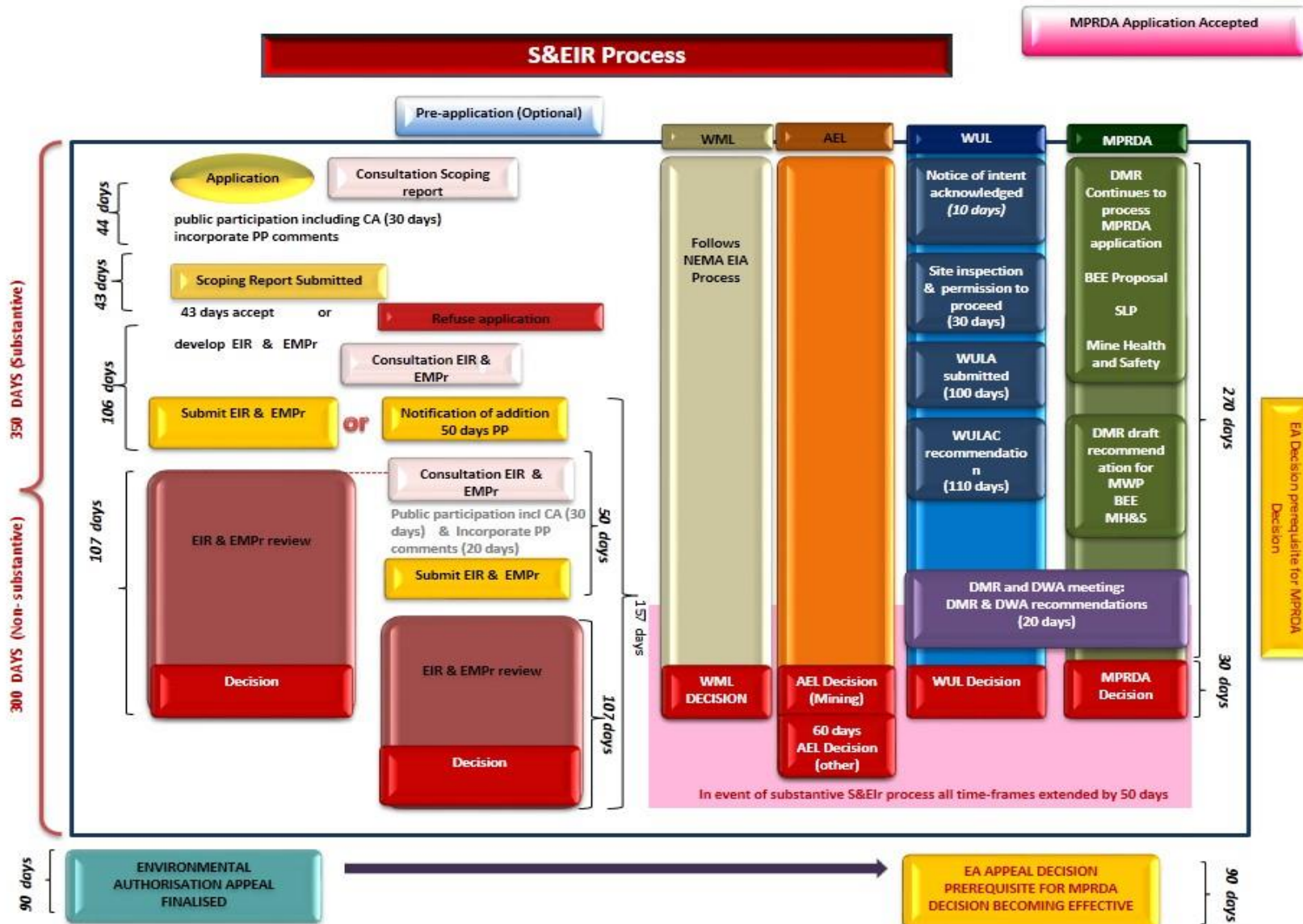


Figure 6: Integrated authorisation timeframes for Basic Assessment Process



**Figure 7: Integrated authorisation timeframes for Scoping & EIA Process**

**Table 15** below indicates the minimum requirements at different stages of the authorisation process.

**Table 15: Minimum requirements in the NEMA, NEMWA, NEM:AQA, and NWA process**

Type of authorisation	Requirements
<b>NEMA</b>	
Scoping phase	Appointment of EIA consultant
	Scoping Report
	Plan of study for Environmental Impact Report
	Identify required specialist studies
EIA Phase	Environmental Impact Assessment
	Environmental Management Plan
	Conduct Specialist Studies
<b>Waste Management License</b>	
Post NEMA authorisation	Environmental Impact Assessment Report
	Waste Management License Application Additional Information Annexure
	Specialist reports and processes
	Google Earth and Topographical maps
	Site drawn to scale
	Waste hierarchy implementation plan
	Emergency Preparedness Plan
	Security and access aspects of the site
<b>Atmospheric Emission License Application</b>	
Scoping phase	Scoping Report
	Plan of study for Environmental Impact Report
	Identify required specialist studies
Submission to AELA	Scoping Report
	Plan of Study
EIA Phase	Environmental Impact Assessment
	Environmental Management Plan
	Conduct Specialist Studies
<b>Water Use License</b>	
Prior NEMA Authorisation	Completed Application Form
	Proof of payment license application fee
	Certified copy of ID
	Certified copy of title deed
	Map
	Proof of public consultation
	EIA documentation
	Final Application Report

**Table 16** below stipulates the Legal EIA time frames. Note these timeframes represent a generic guide specific to NEMA authorisation and can vary on a project to project basis.

**Table 16: Legal EIA time frames**

<b>BASIC ASSESSMENT PROCESS</b>	<b>S&amp;EIR PROCESS</b>
Submit Application form to CA	Submit Application form to CA
CA acknowledges application form within 10 days	CA acknowledges application form within 10 days
Submit Basic Assessment Report (BAR) to CA within 90 or 140 days of receipt of the application by the CA	Submit Scoping Report (SR) to CA within 44 days receipt of the application by the CA
	The CA, within 43 days of receipt of a scoping report accept or refuse the SR
	Within 106 or 156 days of the acceptance of the scoping report submit to the CA S&EIR
If the scope of work must be expanded, which outcome could not be anticipated prior to the undertaking of the assessment, or in the event where exceptional circumstances can be demonstrated, the CA may, prior to the lapsing of the relevant prescribed timeframe, extend the relevant prescribed timeframe extension.	If the scope of work must be expanded, which outcome could not be anticipated prior to the undertaking of the assessment, or in the event where exceptional circumstances can be demonstrated, the CA may, prior to the lapsing of the relevant prescribed timeframe, extend the relevant prescribed timeframe extension
CA within 10 days acknowledges receipt of S&EIR	CA within 10 days acknowledges receipt of S&EIR
CA within 107 days of receipt of the BAR grant or refuse authorisation	CA within 107 days of receipt of the S&EIR grant or refuse authorisation
The CA must, within 05 days notify the applicant of the decision	The CA must, within 05 days notify the applicant of the decision
The applicant, within 08 days of the date of the decision, notify I&AP's of the decision and publish a notice and the applicant, within 08 days of the date of the decision, notify I&AP's of the decision and publish a notice draw the attention of all registered interested and affected parties to the fact that an appeal maybe lodged against the decision in terms of the National Appeals Regulations, if such appeal is available in the circumstances of the decision.	The applicant, within 08 days of the date of the decision, notify I&AP's of the decision and publish a notice and the applicant, within 08 days of the date of the decision, notify I&AP's of the decision and publish a notice draw the attention of all registered interested and affected parties to the fact that an appeal maybe lodged against the decision in terms of the National Appeals Regulations, if such appeal is available in the circumstances of the decision.



## 6.2 Brief descriptions of NEMA related authorisations

### Waste Management License

Waste Management Activities have two categories: A and B. Category A activities listed in the NEM:WA regulations (Section B7) are those that require a BA in terms of NEMA regulations. Category B activities, on the other hand, require a SR&EIR. RE projects that may require waste license include:

- Biomass and biogas project - would likely require waste licensing as they tend to use forms of waste as fuel inputs.
- Concentrated solar thermal projects – if they treat or dispose of wastes from wastewater from the thermal cycle or store waste heat transfer fluid on site.
- Landfill gas to energy – waste licensing required for the extraction, recovery or flaring of landfill gas.

In cases where both EIA activities as well as Waste Management Activities are involved, an application for both must be submitted. A single EIA process is then followed, but both an environmental authorisation and waste management licence is issued.

Generally, the National DEA issues a waste license and the provincial CA issues an environmental authorisation. However, for renewable energy it will be the opposite i.e. waste licenses will be issued by the provincial CA and the environmental authorisation by the National DEA. The National and provincial DEA have reached an agreement that EIA officials who receive such documents forward them to relevant waste application officials for processing and issuing of the license. It is also possible that the waste license is issued by the competent authority dealing with EIA authorisations. However, these are on a project basis.

### Atmospheric Emission License

The NEMAQA has reviewed, categorised and documented all industrial processes that have an adverse impact on ambient air quality and categorised them as Listed Activities. They are all captured in Section 21 of the NEMAQA (commonly referred to as the “Section 21 Listed Activities”).

Projects that will have some combustion emission such biogas, biomass, landfill gas and concentrated solar thermal projects will require an AEL. The metropolitan or district municipality is the Atmospheric Emission Licensing Authority (AELA) unless the municipality has delegated the licensing function to the province or the province has intervened in terms of section 139 of the Constitution.

According to the DEA (2010) there are three main principles which underpin the relationship between the EIA and AEL processes.

- Firstly, the EIA process must proceed and inform the AEL process. This is a logical sequence for various reasons:
- the EIA process considers all potential environmental impacts and this could result in the environmental authorisation being refused by the competent authority and thus no need to issue an AEL;
- the EIA process may require the submission of a specialist air quality impact assessment study which should comply with the requirements of the AQA, and will provide the AEL licensing authority with all the critical information needed when assessing the AEL application;
- the EIA process will require public participation and input which will also contribute to the understanding of public concerns and comments on the atmospheric impacts of the proposed development or activity.
- Secondly, there must only be one information gathering process for the two processes. Thus all information required for the AEL process must be gathered through the EIA process to avoid duplication of effort
- Thirdly, there should be a joint review of information related to atmospheric impacts by the EIA competent authority and the AEL licensing authority. This is a legal requirement from the National Framework for Air Quality Management, and is one which may strengthen the effectiveness of the EIA-AEL procedural relationship and may promote good cooperative governance relations

#### Permits in terms of biodiversity Act

Biodiversity specialist studies can be required to assess the impacts on biodiversity if the proposed site is a declared Protected Area , areas containing threatened or protected ecosystems or areas containing Threatened or Protected Species in terms of (NEMBA: TOPS regulations) rare or threatened ecological types.

Another form of conservation management is through what is called a “biodiversity offset” - conservation actions intended to compensate for the residual, unavoidable harm to biodiversity caused by development projects, so as to aspire to no net loss of biodiversity. Offsets should be last resorts after the developer has attempted to avoid and mitigate for impacts on biodiversity. There are no clear guidelines as yet but the Provincial Government of Western Cape, KZN and Gauteng has published the ‘Provincial Guideline on Biodiversity Offsets’ in 2006, these documents could provide possible processes that can be followed.

The need for the offset should become apparent during the scoping phase of the EIA process. Therefore the information required for this permit is largely dependent on the biodiversity specialist study conducted during the EIA process.

### Licence in terms of National Forests Act, 1998

There are at the moment 47 protected tree species in terms of the National Forests Act of 1998. In terms of the Act these trees may not be cut, destroyed, damaged or removed. Neither may the tree or their products be collected, removed, exported or donated, unless a licence has been granted by the Department of Agriculture, Forestry and Fisheries. The National Forests Act also protects live trees occurring in natural forests.

A license will be required when conducting an activity in terms of Section 7 (1), 15 (1) and 23 (1) of the National Forest Act.

Section 7(1) requires any person wishing to cut, disturb, damage or destroy any indigenous tree in a natural forest, or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any tree or any forest product derived from a natural forest to apply for a license from the Minister or any delegated institution or authority

### Water Use License (WUL)

Water use licenses will be required for renewable energy projects such as hydropower and concentrated solar thermal projects with high water requirement for the steam cycle and cooling (if evaporative cooling is being used).

The WUL process seems slightly complicated than other authorisations discussed above. It takes into consideration the following:

- water quantities available and how best to balance a scarce water resource amongst competing users including the environment itself
- water quality and the interaction between water use, discharge and water quality
- general water resource protection, such as stream-flow disturbance, river-bank maintenance and so forth

WUL application does not necessarily require NEMA authorisations therefore it can be viewed as an independent application process. However, most of the information required for the WUL is drawn from the EIA. The WUL application should be submitted prior to the submission of the EIA, but typically is not finalized until after the EIA has been approved. NWA does not appear to require a specific public consultation process, but rather a demonstration by the applicant that such a process has occurred effectively during the license application process. The comments and responses collected from the I&APs during the EIA process can be utilised if managed correctly.

## 7 REFERENCES

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