ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT SCOPING REPORT

GOURIKWA POWER STATION CONVERSION AND TRANSMISSION INTEGRATION PROJECT

WESTERN CAPE PROVINCE
(DEAT Ref Nos. 12/12/20/1141 and 12/12/20/1142)

May 2008

Prepared for

Eskom Holdings Limited
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Prepared by

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PROJECT DETAILS

DEAT Reference No.	:	12/12/20/1141 (power station conversion) 12/12/20/1142 (transmission power line)
Title	:	Environmental Impact Assessment Process Draft Scoping Report: Proposed Gourikwa Power Station Conversion and Transmission Integration Project, Western Cape Province
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Client	:	Eskom Holdings Limited (Eskom Generation Division)
Report Status	:	Draft Scoping Report for public review
Review Period	:	30 May 2008 to 30 June 2008

When used as a reference this report should be cited as: Savannah Environmental (2008) Draft Scoping Report: Proposed Gourikwa Power Station Conversion and Transmission Integration Project, Western Cape Province

PURPOSE OF THE DRAFT SCOPING REPORT

Eskom Holdings Limited (Eskom) is investigating the conversion of the five units at the existing Open Cycle Gas Turbine (OCGT) plant at Gourikwa Power Station (located near Mossel Bay in the Western Cape) to a Combined Cycle Gas Turbine (CCGT) plant. This will increase the generating capacity of this existing power station by approximately 400 MW. The proposed conversion involves the addition of Heat Recovery Steam Generators (HRSG) to generate steam, and steam turbines and generators to the existing gas turbine plant (essentially adding a steam cycle to the existing gas cycle), and will be established on the same site as the existing Gourikwa Power Station.

Eskom is also proposing the construction of a 400kV transmission power line between the Gourikwa Power Station and the existing Proteus Substation to transmit the additional power generated at Gourikwa Power Station into the national electricity grid.

Eskom has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

This Draft Scoping Report represents the outcome of the Scoping Phase of the EIA process and contains the following sections:

Chapter 1 provides background to the proposed power station conversion and transmission integration project and the environmental impact assessment process.
Chapter 2 provides the strategic context for energy planning in South Africa.
Chapter 3 describes the components of the proposed project (project scope).
Chapter 4 outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties.
Chapter 5 describes the existing biophysical and socio-economic environment.
Chapter 6 presents the evaluation of environmental impacts associated with the power station conversion.
Chapter 7 presents the evaluation of environmental impacts associated with the proposed transmission power line.
Chapter 8 presents the conclusions of the scoping evaluation.
Chapter 9 describes the Plan of Study for EIA.
Chapter 10 provides a list of references and information sources used in undertaking the studies for this Draft Scoping Report.

In accordance with the EIA Regulations, a primary purpose of the Draft Scoping Report is to provide stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study, and to raise any additional key issues for consideration. The Final Scoping Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs and Tourism (DEAT), the decision-making authority for the project.

PUBLIC REVIEW OF THE DRAFT SCOPING REPORT

The Draft Scoping Report has been made available for public review at the following public places in the project area from **30 May 2008 to 30 June 2008** at the following locations:

» Marsh Street Library
» D'Almeida Library
» Kwanonaqba Library
» Mossel Bay Environmental Partnership
» Dana Bay Conservancy
» SANCO
» PetroSA
» Mossel Bay Municipal Offices
» TNPA
» Farmers Association representing local and neighbouring farmers

The report is also available on:
» www.eskom.co.za/eia
» www.savannahSA.com

Please submit your comments to
Shawn Johnston of Sustainable Futures ZA PO Box 749, Rondebosch, Cape Town, 7701 Tel: 083 325 9965 Fax: 086 510 2537 E-mail: swjohnston@mweb.co.za
The due date for comments on the Draft Scoping Report is **30 June 2008**

Comments can be made as written submission via fax, post or e-mail.

PUBLIC MEETING

In order to facilitate comments on the draft Scoping Report, a public feedback meeting will be held during the review period. All interested and affected parties are invited to attend:

PUBLIC MEETING

DATE: Thursday, 19 June 2008
TIME: 18:00 – 20:00
VENUE: Die Skuur Dias Museum, Mossel Bay

The aim of the meeting is to provide feedback of the findings of the scoping study undertaken, and to invite comment on the proposed project.

SUMMARY

Background and Project Overview

As part of its plans for increased electricity supply options, Eskom is proposing the **conversion of the five OCGT units** installed and being installed at the existing Gourikwa Power Station to Combined Cycle Gas Turbine (CCGT) units. This conversion will increase the generating capacity of the Gourikwa Power Station by approximately 400 MW by increasing the efficiency of the gas turbine plant (i.e. more power generated and sent out, for the same amount of fuel used). Overall thermal efficiency is therefore increased from approximately 34% for the current OCGTs to approximately 50% to 55% for the proposed CCGT plant, depending on the operating regime of the plant.

Electricity cannot be readily or inexpensively stored and must be used as it is generated. It is, therefore, required that electricity must be efficiently transmitted from the point of generation to the end user. It is vital that transmission capacity keeps up with both electricity generation capacity and electricity demand.

Therefore, in order to integrate the additional power generated at the Gourikwa Power Station into the national electricity grid, the **construction of a new 400kV transmission power line** between the Gourikwa Power Station and the Proteus Substation will be required.

The Gourikwa Power Station conversion and associated transmission integration project can be seen as a third phase of the original Gourikwa OCGT power station project. The construction of the initial OCGT units (i.e. the three units now in operation) was the first phase of the project. The second phase of the project (currently under construction) involves the expansion (capacity increase) of the power station by adding another two OCGT units.

The primary components of the conversion project include the following:

» A **heat recovery steam generator** (HRSG) will be added to the gas turbine to recover waste heat, to drive the steam turbine cycle. One HRSG can be linked to two or three OCGT units.
» A **condenser** which converts exhaust steam from the steam turbine back into water through a cooling process.
» Depending on the configuration, a **bypass stack** for the CCGT, anticipated to be approximately 60 m in height will be associated with each HRSG.
» **Water treatment plant** (for treatment of potable water and production of demineralised water (for steam generation)).

- **Dry-cooled technology** consisting of a system of air-cooled condenser fans situated in fan banks approximately between 25m - 30 m above ground.
- **Additional fuel storage facilities** and associated off-loading and other related infrastructure to cater for the increased fuel requirements associated with the higher load factor (i.e. longer operating hours or a mid-merit operating regime). The CCGT units can be both liquid fuel-fired or natural gas-fired. The CCGT units would initially be diesel-fired, until such time that natural gas becomes available.
- A **water tank** with a holding volume of ~2.5 million litres (i.e. water storage for ~5 days of operation).

The nature and extent of the power station conversion and transmission integration project, as well as potential environmental impacts associated with the construction of a facility of this nature is explored in more detail in this Draft Scoping Report.

Environmental Impact Assessment

The proposed power station conversion and associated transmission integration project is subject to the requirements of the Environmental Impact Assessment Regulations (EIA Regulations) published in GN 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA, No 107 of 1998). In terms of sections 24 and 24D of NEMA, as read with GNs R385 (Regulations 27–36) and R387, a Scoping and EIA are required to be undertaken for this proposed project.

The National Department of Environmental Affairs and Tourism (DEAT) is the competent authority for this project as Eskom is a statutory body. An application for authorisation has been accepted by DEAT (under Application Reference numbers 12/12/20/1141 (power station conversion) and 12/12/20/1142 (transmission power line)). Through the decision-making process, DEAT will be supported by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP).

The scoping phase for the proposed project forms part of the EIA process and has been undertaken in accordance with the EIA Regulations. This Draft Scoping Report aimed to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving specialists with expertise relevant to the nature of the project and the study area, the project proponent, as well as a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

A comprehensive public participation process was undertaken in

accordance with Regulation 56 of Government Notice No R385 of 2006 during the Scoping phase of this EIA process. This public participation process comprised the following:

» **Notification of the EIA Process** in local, regional and national newspapers and on site, as well as through written notification to identified stakeholders and affected landowners.
» **Identification and registration** of I&APs and key stakeholders.
» Compilation and distribution of a **Background Information Document** (BID) to all identified I&APs and key stakeholders.
» **On-going consultation** with identified I&APs and stakeholders.
» Compilation and maintenance of a **register** containing the names and addresses of all identified I&APs and key stakeholders.
» Preparation of a **Comments and Response Report** detailing key issues raised by I&APs as part of the EIA Process.

Evaluation of the Proposed Power Station Conversion

Potential impacts associated with the proposed power station conversion project are expected to occur during both the construction and operational phases. In general, impacts are expected to be similar to those associated with the initial phases of the power station project. New impact sources associated with the power station conversion project would include:

» **Visual impacts** as a result of the additional infrastructure associated with the conversion project to be added onto the existing power station.
» **Air quality impacts** associated with the construction phase (dust) and the operational phase (emissions from the power station).
» **Noise impacts** associated with the existing OCGT units as well as the additional CCGT components to be added onto the existing power station.
» **Impacts on the social environment** as a result of the creation of employment opportunities, influx of workers to the area, traffic movements, and impacts on sense of place.

No environmental fatal flaws have been identified to be associated with the proposed power station conversion project at this stage of the project. In order to assess the potential impacts on the environment associated with the construction and operation of the proposed power station conversion project, detailed specialist studies to address the above issues must be undertaken within the EIA phase of the project. These studies must compare the impacts associated with the conversion project to the current situation and must assess the potential cumulative impacts associated with the project.

The proposed conversion will be on the site of the existing Gourikwa Power Station, and will not require any additional land take outside of the existing power station boundaries. Therefore, **no location alternatives** have been considered within this EIA process. The following alternatives associated with the power station operation have been nominated for consideration within the EIA Phase:

» The use of **treated water, effluent and/or stormwater** from the PetroSA facility (proposed to be piped to the power station from PetroSA via a new **~1,3 km water pipeline** proposed to be constructed parallel to the existing liquid fuel pipeline between the two facilities).
» **Dry-cooling technology** (air-cooled condensers) at the power station to reduce water requirements.
» The construction of a new dedicated **access road** to the Gourikwa Power Station directly off the N2 national road.

Evaluation and Comparison of the Proposed Transmission Power Line Alternatives

Three technically feasible alternative transmission power line alignment corridors (approximately 500 m in width) have been identified for investigation within the EIA process. Potential impacts associated with the proposed transmission power line are expected to occur during the construction and operational phases, and have been identified through this scoping process include:

» **Impacts on flora and ecology** as a result of the disturbance of habitats within the power line servitude and at tower footprints.
» **Impacts on avifauna** as a result of collisions with the earthwire, electrocution and disturbance of habitats within the power line servitude.
» **Impacts on heritage sites** as a result of disturbance or destruction, as well as due to visual impacts on heritage sites.
» **Visual impacts** on the surrounding area.
» **Impacts on the social environment** as a result of the creation of employment opportunities, influx of workers to the area, impacts on land use, and impacts on sense of place.

From the specialist studies undertaken within the Scoping Phase, **Alternative 2 or Alternative 3** are nominated as the most preferred alternative/s in terms of all aspects considered, as these alternatives would result in impacts of least significance impacts on both the social and biophysical environments. The alternative alignments have a lower impact on the overall environment as a result of consolidation of infrastructure of a similar nature and the minimisation of impacts on current and planned land use. Therefore, both Alternative 2 and Alternative 3 are nominated

for further investigation in the EIA Phase.

Alternative 1 is nominated as the least preferred alternative, and therefore this alternative is **excluded as an alternative for further investigation**.

In order to assess the potential impacts on the environment associated with the construction and operation of the proposed power line, detailed specialist studies to address the above issues must be undertaken within the EIA phase of the project.

TABLE OF CONTENTS

PAGE

APPENDICES

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Condenser: Converts exhaust steam from the steam turbine back into water through a cooling process.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Dry-cooled technology: A system of air-cooled condenser fans situated in fan banks approximately between 25-30 m above ground.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of

individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management plan: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going maintenance after implementation.

Heat recovery steam generator (HRSG): Component to be added to the gas turbine to recover waste heat, to drive the steam turbine cycle. In principle, a HRSG is associated with a gas turbine. One HRSG can be linked to 2 or 3 OCGT units.

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and Affected Party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Mid-merit capacity: Electricity capacity during the daytime from about 6 am to about 10 pm on weekdays

Peaking generation capacity: Peaking power refers to power generation technology designed to generate electricity during periods of high electricity demand, generally in the weekday mornings from 07:00 to 09:00 and weekday evenings from 18:00 to 20:00.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBOs	Community Based Organisations
CCGT	Combined Cycle Gas Turbine
CO_2	Carbon dioxide
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DEAT	National Department of Environmental Affairs and Tourism
DME	Department of Minerals and Energy
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
I&AP	Interested and Affected Party
IEP	Integrated Energy Planning
kV	Kilovolt
LUPO	Rezoning and Subdivision in terms of Land Use Planning Ordinance, Ordinance 15 of 1985
m^2	Square meters
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NGOs	Non-Governmental Organisations
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
OCGT	Open Cycle Gas Turbine
PGWC	Provincial Government of the Western Cape
SAHRA	South African Heritage Resources Agency
SIA	Social Impact Assessment

INTRODUCTION CHAPTER 1

Eskom Holdings Limited (Eskom) is investigating the conversion of the five units at the existing Open Cycle Gas Turbine (OCGT) plant at Gourikwa Power Station (located near Mossel Bay in the Western Cape) to a Combined Cycle Gas Turbine (CCGT) plant. This will increase the generating capacity of this existing power station by approximately 400 MW. The proposed conversion involves the addition of Heat Recovery Steam Generators (HRSG) to generate steam, and steam turbines and generators to the existing gas turbine plant (essentially adding a steam cycle to the existing gas cycle), and will be established on the same site as the existing Gourikwa Power Station.

Eskom is also proposing the construction of a 400kV transmission power line between the Gourikwa Power Station and the existing Proteus Substation to transmit the additional power generated at Gourikwa Power Station into the national electricity grid.

The Gourikwa Power Station conversion and associated transmission integration project can be seen as a third phase of the original Gourikwa OCGT power station project. The construction of the initial OCGT units (i.e. the three units now in operation) was the first phase of the project. The second phase of the project (currently under construction) involves the expansion of the power station by adding another two OCGT units, fuel tanks and a switchyard to the power station.

The nature and extent of the Gourikwa Power Station conversion and transmission integration project, as well as potential environmental impacts associated with the construction of a facility of this nature (as well as all associated infrastructure) is explored in more detail in this Draft Scoping Report.

1.1. The Need for the Proposed Project

Eskom contributes to its vision of “together building the powerbase for sustainable growth and development” through its core business focus on electricity generation, transportation, trading and retail. It entrenches the values of excellence, innovation, customer satisfaction and integrity across all business operations.

Achieving the vision requires in-depth planning and energetic implementation in a complex environment characterised by higher economic growth, greater demand for electricity and the heightened need for significant infrastructure expansion with attendant competition for scarce materials, funding, skills and supplier inputs. Challenges are compounded by the rising cost of primary energy and new

components, regulatory pressure, restructuring of the electricity distribution industry, expectations of better environmental performance and the growing involvement of stakeholder groups.

Considering the Government's Accelerated and Shared Growth Initiative for South Africa (ASGI-SA) targets and load growth currently being experienced, South Africa will require additional power in the next five years. To supply this additional demand in the medium term, a variety of options such as demand side management, co-generation non-Eskom generation and gas-fired plants (open cycle and combined cycle) continue to be investigated by Eskom in addition to conventional long-term supply options (such as coal and nuclear fuel plants).

As one of its increased electricity supply options, Eskom is proposing the conversion of the OCGT units at the existing Gourikwa Power Station (near Mossel Bay) as well as the Ankerlig Power Station (located near Atlantis) in the Western Cape to **Combined Cycle Gas Turbine (CCGT)** units. Due to the medium-term forecast in the demand for electricity (until approximately 2014) and constraints associated with meeting this projected demand, the conversion of these OCGT units to CCGT units is one of the few options available to Eskom to manage the projected demand in the medium-term.

The conversion of the Open Cycle Gas Turbine (OCGT) units at the Gourikwa Power Station and/or the Ankerlig Power Station will increase the generating capacity of the OCGT units within the Western Cape by approximately 400 MW. This increase in generating capacity is achieved by increasing the efficiency of the gas turbine plant (i.e. more power generated and sent out, for the same amount of fuel used at the same operating regime). Overall thermal efficiency is therefore increased from approximately 34% for the current OCGTs to approximately 50% to 55% for the proposed CCGT plant, depending on the operating regime of the plant.

This Scoping Study considers the conversion of the OCGT units at the Gourikwa Power Station to CCGT units, and considers a **maximum capacity increase of 400 MW**. Environmental studies for the conversion of the OCGT units at the Ankerlig Power Station are the subject of a separate EIA process, and Eskom have submitted a separate application for the maximum capacity increase at this power station. However, the decision around the total number of OCGT units to be converted to CCGT units, and at which power station (i.e. Ankerlig or Gourikwa) this conversion will eventually take place is still to be determined by Eskom.

As electricity cannot be readily or inexpensively stored, it is therefore required that electricity must be efficiently transmitted from the point of generation to the end user. Transmission capacity is required to keep up with both electricity

generation capacity and electricity demand. Therefore, in order to integrate the additional power generated at the Gourikwa Power Station into the national electricity grid, the construction of a new **400 kV transmission power line** between the Gourikwa Power Station and the Proteus Substation will be required.

1.2. Background to the Project

Environmental Impact Assessment (EIA) processes have previously been undertaken by Eskom for the approved OCGT units at Gourikwa (the existing three units (with a nominal capacity of 450 MW) approved in December 2005 and the additional two units (with a nominal capacity of 300 MW) approved in August 2007). The construction and commissioning of the initial three OCGT units is complete, and these units have been operational since mid-2007. Construction of the additional two OCGT units is currently underway and is expected to be complete end-2008/beginning 2009. The electricity generation capacity of the Gourikwa Power Station will assist Eskom in meeting the peaking electricity generation demands[1] in the medium-term (i.e. up to 2014).

Subsequently, considering the strategic electricity planning in place (refer to Chapter 2) and taking into account the continued growth in electricity demand, Eskom has determined that there is a need for **additional** power generation capacity in the **medium-term**. In considering the most suitable options to meet the increased electricity demand in the medium term, Eskom has concluded that it will be feasible to convert the existing Gourikwa OCGT units to CCGT units, thereby generating additional capacity for the same amount of fuel (under a similar operating regime) considering the load factors at which the units may have to operate.

1.3. Project Overview

The existing Gourikwa OCGT Power Station is located adjacent to the PetroSA Gas to Liquid (GTL) facility near Mossel Bay in the Western Cape (refer to Figure 1.1).

[1] OCGT units are best suited for peaking generation capacity (i.e. for peak periods in the morning and evenings).

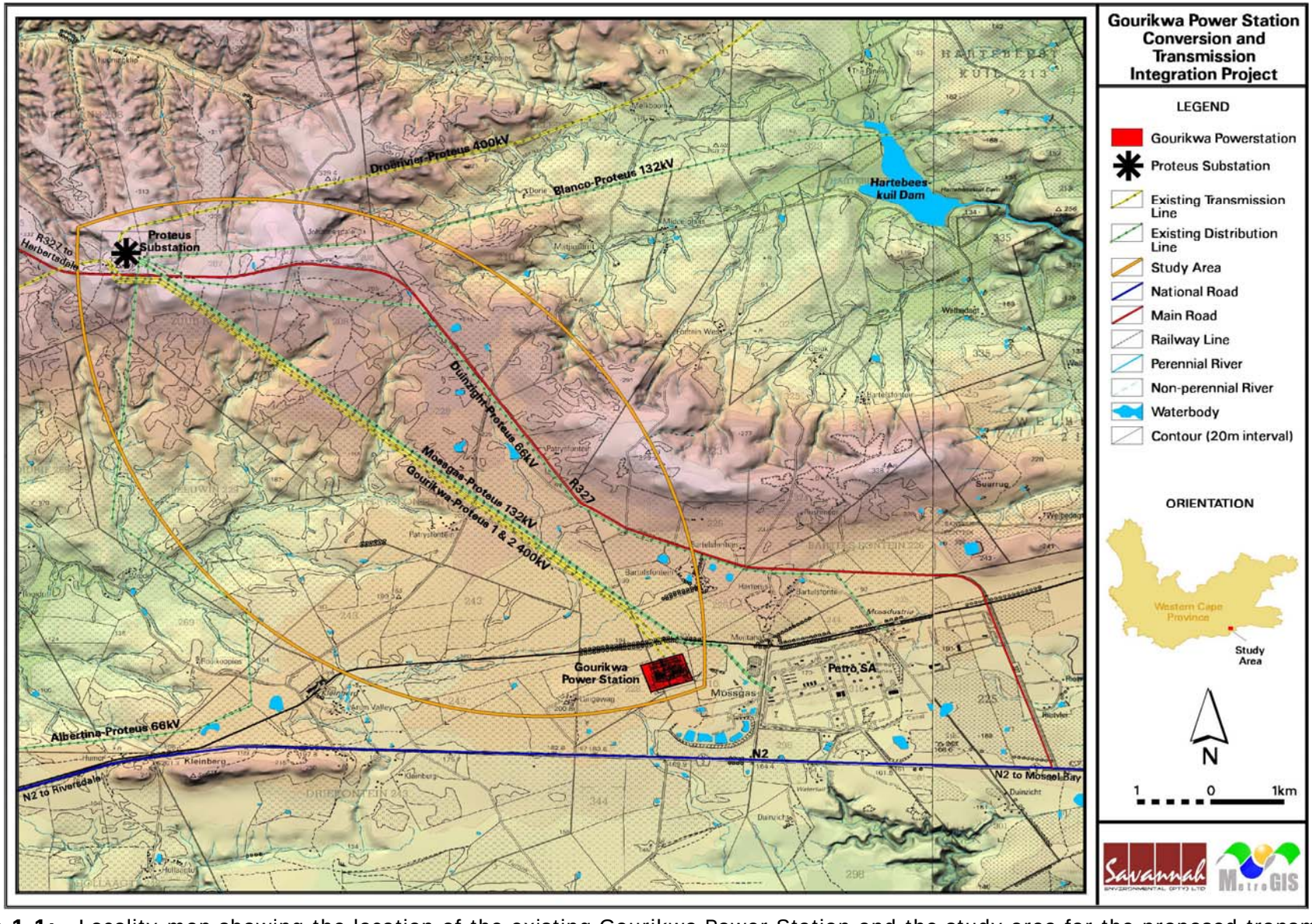


Figure 1.1: Locality map showing the location of the existing Gourikwa Power Station and the study area for the proposed transmission power line corridor alternatives between Gourikwa and Proteus Substation

1.3.1. Power Station Conversion

The Gourikwa Power Station comprises five OCGT units (i.e. 3 existing OCGT units, plus 2 additional OCGT units under construction) each with a nominal capacity of ~150 MW, resulting in a total nominal capacity of 750 MW for the power station. Each OCGT unit consists of one gas turbine driving an electric generator.

The concept of converting the OCGT units to CCGT units is to utilise the **heat energy** from the exhaust of the gas turbine to create steam in a Heat Recovery Steam Generator (HRSG) in order to drive a steam turbine, instead of this heat energy being exhausted and lost to the to the atmosphere (as is the current scenario). Conversion of the units to CCGT is therefore based on increased cycle efficiency.

Simply stated, this can be achieved through the following (and is illustrated in Figure 1.2):

» When the hot gas exits the gas turbine as exhaust gas, it has a temperature of up to 600°C. This heat energy is transferred to water in the heat recovery steam generator, instead of being exhausted to the atmosphere.
» The heat is used to generate steam (water vapour), which powers the steam turbine to produce mechanical energy.

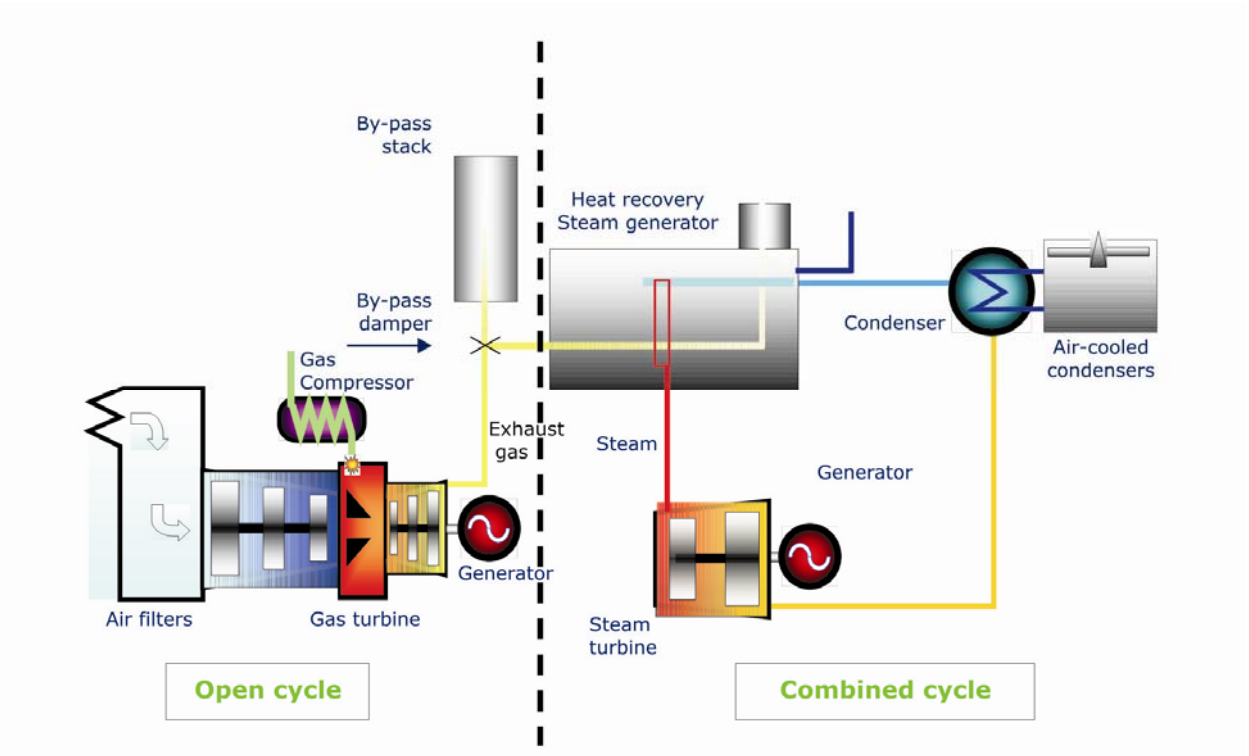


Figure 1.2: Simplified schematic illustrating the CCGT conversion process and components

» The resulting mechanical energy is transferred to a generator, where it is converted into electricity (i.e. electrical energy).
» A condenser converts exhaust steam from the steam turbine back into saturated water through a cooling process.

Conversion of the units to CCGT is undertaken to increase cycle thermal efficiency. It is estimated that each converted unit will produce approximately 80 MW additional capacity, i.e. approximately 50% more than a standard OCGT unit. Therefore, a maximum of an additional 5 x 80 MW (400 MW in total) increase in capacity is foreseen from the OCGT to CCGT conversion. The **total nominal capacity** of the Gourikwa Power Station will, therefore, be **1 150 MW**.

The primary components of the conversion project include the following:

» A **heat recovery steam generator** (HRSG) will be added to the gas turbine to recover waste heat, to drive the steam turbine cycle. One HRSG can be linked to two or three OCGT units.
» A **condenser** which converts exhaust steam from the steam turbine back into water through a cooling process.
» Depending on the configuration, a **bypass stack** for the CCGT, anticipated to be approximately 60 m in height will be associated with each HRSG.
» **Water treatment plant** (for treatment of potable water and production of demineralised water (for steam generation)).
» **Dry-cooled technology** consisting of a system of air-cooled condenser fans situated in fan banks approximately between 25m - 30 m above ground.
» **Additional fuel storage facilities** and associated off-loading and other related infrastructure to cater for the increased fuel requirements associated with the higher load factor (i.e. longer operating hours or a mid-merit operating regime[2]). The CCGT units can be both liquid fuel-fired or natural gas-fired. The CCGT units would initially be diesel-fired, until such time that natural gas becomes available.
» A **water tank** with a holding volume of ~2.5 million litres (i.e. water storage for ~5 days of operation).

The proposed conversion infrastructure will be on the site of the existing Gourikwa Power Station, and will not require any additional land take outside of the existing power station boundaries (refer to Figure 1.3).

[2] Mid-merit capacity is during the daytime from about 6 am to about 10 pm on weekdays.

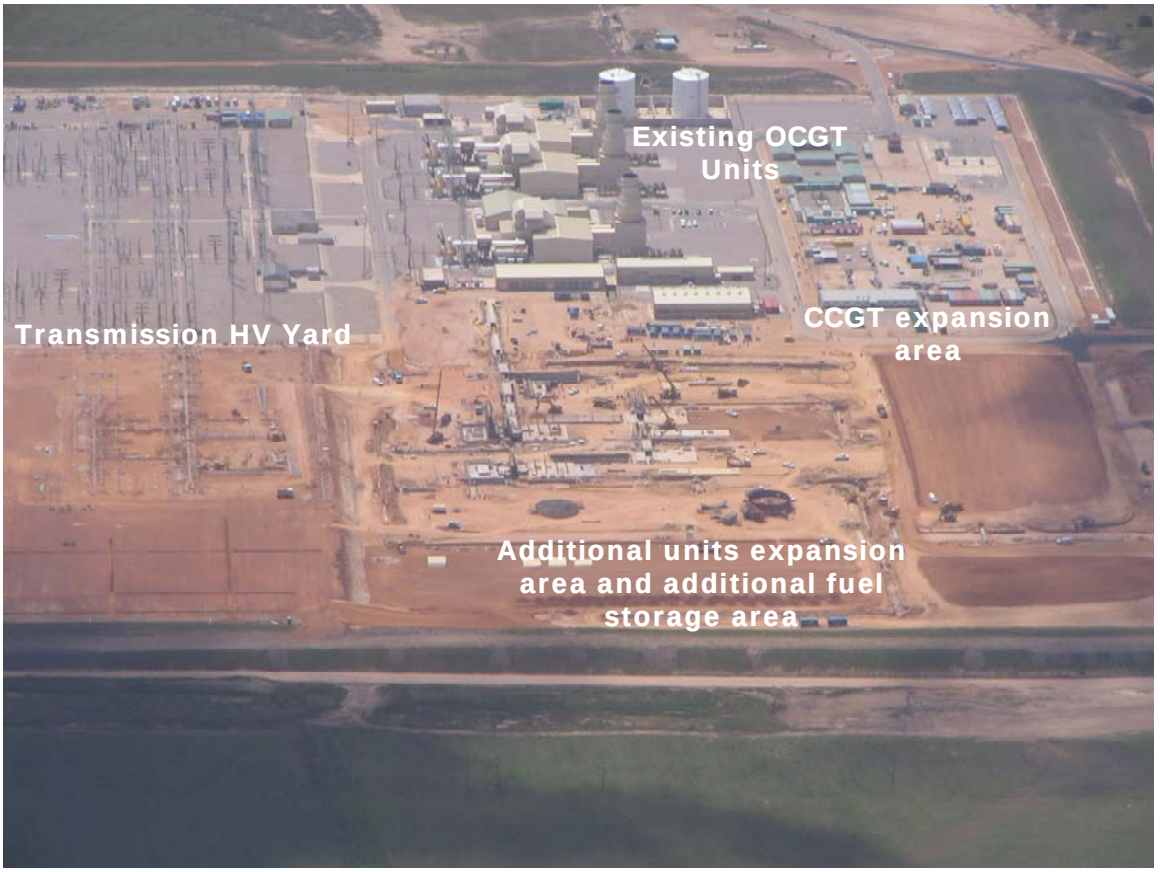


Figure 1.3: Aerial photograph of the Gourikwa Power Station site showing the existing power station infrastructure, the power station expansion site, as well as the areas for the placement of infrastructure associated with the proposed power station conversion

Water will be required for the CCGT power generation process and for cooling. The feasibility and availability of various water resource options are currently being investigated with PetroSA, including the use of treated water, effluent and/or stormwater from the PetroSA facility. A preferred option will be nominated with the agreement of PetroSA for implementation based on technical, environmental and economic constraints. The water will be piped to the power station from PetroSA via a new **water pipeline** proposed to be constructed parallel to the existing fuel pipeline between the two facilities. This water pipeline would be outside of the existing power station boundaries.

Eskom also propose the construction of a new dedicated **access road** to the Gourikwa Power Station. The power plant currently shares an access road with PetroSA. The proposed access route is directly off the N2, and would be outside of the existing power station boundaries.

1.3.2. Integration of the CCGT Power Station into the National Grid

A 400kV transmission power line is required to be constructed between the Gourikwa Power Station and the Proteus Substation (located approximately 11 km north-west of the power station) to integrate the additional power generated at this power station to the national electricity grid. The existing substation (high voltage (HV) yard) at the Gourikwa Power Station will be utilised, and no additional infrastructure or expansion of this HV yard is required to accommodate the new transmission power line.

Technically feasible alternative transmission power line **alignment corridors** (approximately 500 m in width) have been identified for investigation within the EIA process (refer to Figure 1.4). Through the EIA process, a preferred alternative power line corridor will be nominated for environmental authorisation (by the environmental authorities), provided no environmental fatal flaws are identified to be associated with the proposed project.

Transmission power lines are constructed and operated within a 55 m wide servitude that is established along the entire length of the power line. Within this servitude, Eskom has certain rights and controls that support the safe, effective operation and maintenance of the power line. The process of achieving options to acquire servitudes is referred to as the Servitude Negotiation Process. The procurement of servitudes will be through a negotiation process with each affected landowner and will be subject to the project being authorised by DEAT. The process of servitude negotiating is independent of the EIA process.

1.3.3. Summary of the Power Station Conversion and Integration Project Components

In summary, the components of this project are as follows:

1. Conversion of five OGCT units to CCGT units at Gourikwa Power Station
2. Construction of a new water pipeline between the PetroSA facility and Gourikwa Power Station
3. Construction of a new access road to Gourikwa Power Station
4. Construction of a new 400kV power line between Gourikwa Power Station and Proteus Substation

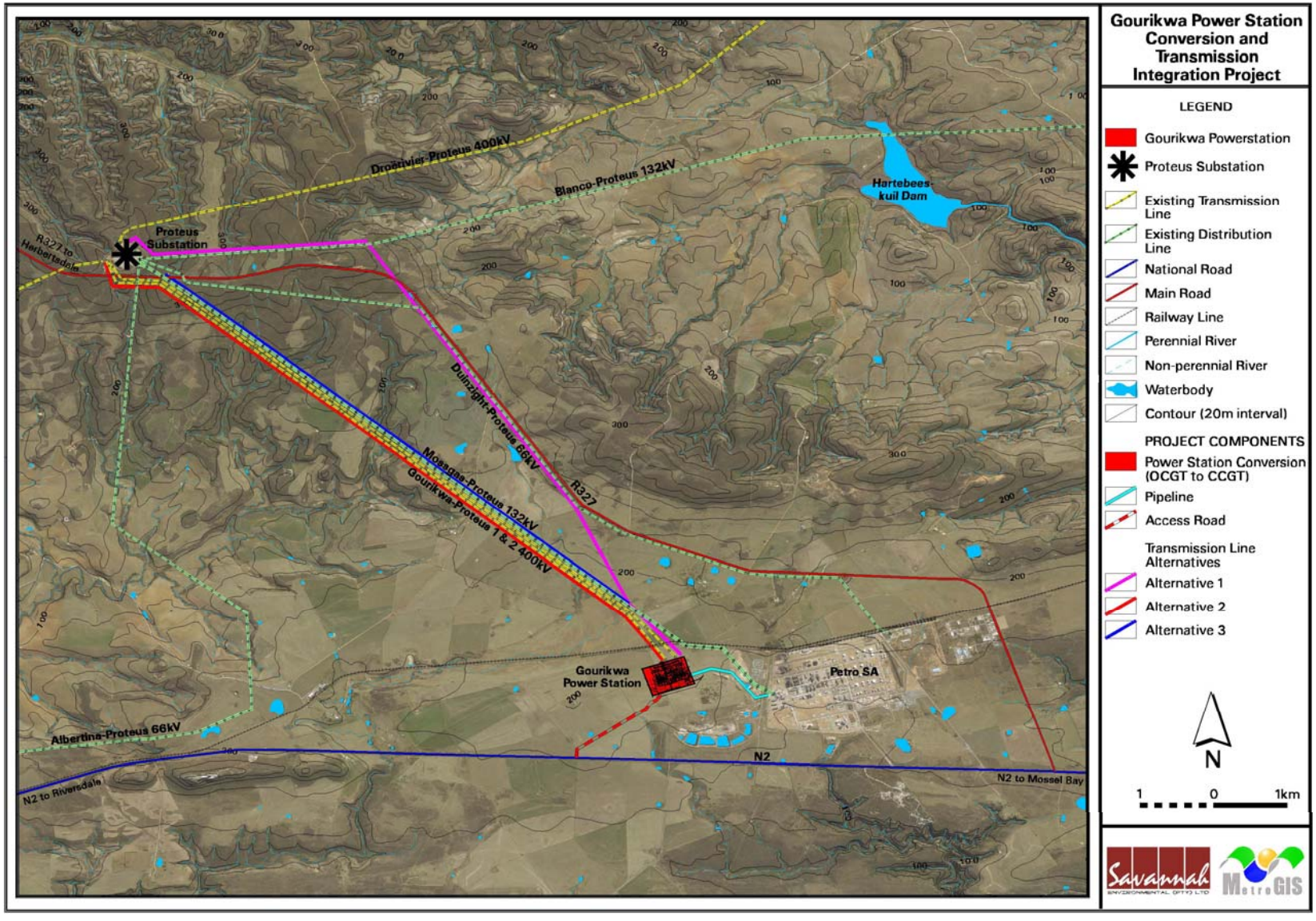


Figure 1.4: Locality map showing the project components: Gourikwa Power Station, the feasible alternative transmission power line corridor alternatives between Gourikwa and Proteus Substation, and the water pipeline and access road alignments

1.4. Requirement for an Environmental Impact Assessment Process

The proposed power station and transmission power line integration project is subject to the requirements of the Environmental Impact Assessment Regulations (EIA Regulations) published in terms of Section 24(5) of the National Environmental Management Act (NEMA, No 107 of 1998). This section provides a brief overview of EIA Regulations and their application to this project.

NEMA is national legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. The National Department of Environmental Affairs and Tourism (DEAT) is the competent authority for this project as Eskom is a statutory body. An application for authorisation has been accepted by DEAT (under Application Reference numbers 12/12/20/1141 (power station conversion) and 12/12/20/1142 (proposed transmission power line)). Through the decision-making process, DEAT will be supported by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP).

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process, and assess if environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project. Eskom appointed Savannah Environmental (Pty) Ltd to conduct the independent Environmental Impact Assessment (EIA) process for the proposed project.

An EIA is also an effective planning and decision-making tool for the project proponent. It allows the environmental consequences resulting from a technical facility during its establishment and its operation to be identified and appropriately managed. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issue(s) reported on in the Scoping and EIA reports as well as dialogue with affected parties.

In terms of sections 24 and 24D of NEMA, as read with Government Notices R385 (Regulations 27–36) and R387, a Scoping and EIA are required to be undertaken for this proposed project as it includes the following activities listed in terms of

GN R386 and R387 (GG No 28753 of 21 April 2006) relevant to the **power station conversion**:

No & date of relevant notice	Activity No (in terms of relevant Regulation / notice)	Description of listed activity
Government Notice R387 (21 April 2006)	1(a)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the generation of electricity where (i) the electricity output is 20 megawatts or more; or (ii) the elements of the facility cover a combined area in excess of 1 hectare
Government Notice R387 (21 April 2006)	1(c)	The above-ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of 1000 cubic meters or more at any one location or site including the storage of one or more dangerous goods, in a tank farm
Government Notice R387 (21 April 2006)	1(e)	Any process or activity which requires a permit or licence in terms of legislation governing the generation or release of emissions, pollution, effluent or waste and which is not identified in Government Notice No. R 386 of 2006
Government Notice R387 (21 April 2006)	1(j)	The bulk transportation of dangerous goods using pipelines, funiculars or conveyors with a throughput capacity of 50 tons or 50 cubic metres or more per day
Government Notice R387 (21 April 2006)	2	Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more
Government Notice R386 (21 April 2006)	1(k)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the bulk transportation of sewage and water, including storm water, in pipelines with - » an internal diameter of 0,36 metres or more; or » a peak throughput of 120 litres per second or more
Government Notice R386 (21 April 2006)	1(n)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the off-stream storage of water, including dams and reservoirs, with a capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of the activity listed in item 6 of Government Notice No. R. 387 of 2006

No & date of relevant notice	Activity No (in terms of relevant Regulation / notice)	Description of listed activity
Government Notice R386 (21 April 2006)	1(s)	The treatment of effluent, wastewater or sewage with an annual throughput capacity of more than 2000 cubic meters but less than 15 000 cubic meters.
Government Notice R386 (21 April 2006)	7	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.
Government Notice R386 (21 April 2006)	14	The construction of masts of any material of type and of any height, including those used for telecommunications broadcasting and radio transmission, but excluding (a) masts of 15m and lower exclusively used by (i) radio amateurs; or (ii) for lightening purposes (b) flagpoles; and (c) lightening conductor poles
Government Notice R386 (21 April 2006)	15	The construction of a road that is wider than 4 m or that has a reserve wider than 6 m, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 m long.

The following activities listed in terms of GN R386 and R387 (GG No 28753 of 21 April 2006) relevant to the **transmission power line integration**:

No & date of relevant notice	Activity No (in terms of relevant Regulation / notice)	Description of listed activity
Government Notice R387 (21 April 2006)	1(l)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more
Government Notice R386 (21 April 2006)	1(m)	any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including – a) canals; b) channels; c) bridges; d) dams; and e) weirs
Government	7	The above ground storage of a dangerous good,

No & date of relevant notice	Activity No (in terms of relevant Regulation / notice)	Description of listed activity
Notice R386 (21 April 2006)		including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.
Government Notice R386 (21 April 2006)	12	The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
Government Notice R386 (21 April 2006)	14	The construction of masts of any material of type and of any height, including those used for telecommunications broadcasting and radio transmission, but excluding (a) masts of 15m and lower exclusively used by (i) radio amateurs; or (ii) for lightening purposes (b) flagpoles; and (c) lightening conductor poles
Government Notice R386 (21 April 2006)	15	The construction of a road that is wider than 4 m or that has a reserve wider than 6 m, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 m long.

This report documents the scoping evaluation of the potential environmental impacts of the proposed construction and operation phases of the proposed power station conversion and transmission integration project. This scoping study forms part of the EIA process and was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

1.5. Objectives of the Scoping Phase

The Scoping Phase of the Environmental Impact Assessment (EIA) process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This is achieved through an evaluation of the proposed project, involving the project proponent, specialists with experience in EIAs for similar projects, and a public consultation process with key stakeholders that includes both government authorities and interested and affected parties (I&APs).

In accordance with the EIA Regulations, the main purpose of the Scoping Phase is to focus the environmental assessment in order to ensure that only potentially significant issues, and reasonable and feasible alternatives are examined in the EIA Phase. The Draft Scoping Report provides stakeholders with an opportunity to verify that the issues they have raised through the process to date have been captured and adequately considered, and provides a further opportunity for additional key issues for consideration to be raised. The Final Scoping Report will incorporate all issues and responses raised during the public review of the Draft Scoping Report prior to submission to DEAT.

The Scoping Report consists of ten sections:

Chapter 1 provides background to the proposed power station conversion and transmission integration project and the environmental impact assessment process.
Chapter 2 provides the strategic context for energy planning in South Africa.
Chapter 3 describes the components of the proposed project (project scope).
Chapter 4 outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties.
Chapter 5 describes the existing biophysical and socio-economic environment.
Chapter 6 presents the evaluation of environmental impacts associated with the power station conversion.
Chapter 7 presents the evaluation of environmental impacts associated with the proposed transmission power line.
Chapter 8 presents the conclusions of the scoping evaluation.
Chapter 9 describes the Plan of Study for EIA.
Chapter 10 provides a list of references and information sources used in undertaking the studies for this Draft Scoping Report.

1.6. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was contracted by Eskom Holdings Limited as an independent environmental assessment practitioner to undertake an Environmental Impact Assessment (EIA) for the proposed project, as required by the NEMA EIA Regulations. Neither Savannah Environmental, nor any its specialist sub-consultants on this project are subsidiaries of or affiliated to Eskom Holdings Limited. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

The Savannah Environmental project team have more than ten (10) years experience in environmental assessment and environmental management, and

have been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa. Strong competencies have been developed in project management of environmental EIA processes, as well as strategic environmental assessment and compliance advice, and the identification of environmental management solutions and mitigation/risk minimising measures.

Jo-Anne Thomas and Karen Jodas, the principal authors of this Draft Scoping Report, are both registered Professional Natural Scientists (in the practice of environmental science) with the South African Council for Natural Scientific Professions. They have gained extensive knowledge and experience on potential environmental impacts associated with electricity generation projects through their involvement in related EIA processes over the past ten (10) years. They have successfully managed and undertaken EIA processes for other power generation projects for Eskom Holdings Limited throughout South Africa. Curricula vitae for the Savannah Environmental project team consultants are included in Appendix A.

In order to adequately identify and assess potential environmental impacts, Savannah Environmental has appointed several specialist consultants to conduct specialist studies, as required. Details of these specialist studies are included in Chapter 4. The curricula vitae for the EIA specialist consultants are also included in Appendix A.

STRATEGIC CONTEXT FOR ENERGY PLANNING CHAPTER 2

Eskom contributes to its vision of "together building the powerbase for sustainable growth and development" through its core business focus on electricity generation, transportation, trading and retail. It entrenches the values of excellence, innovation, customer satisfaction and integrity across all business operations.

Achieving the vision requires in-depth planning and energetic implementation in a complex environment characterised by higher economic growth, greater demand for electricity and the heightened need for significant infrastructure expansion with attendant competition for scarce materials, funding, skills and supplier inputs. Challenges are compounded by the rising cost of primary energy and new components, regulatory pressure, restructuring of the electricity distribution industry, expectations of better environmental performance and the growing involvement of stakeholder groups.

The following four strategic objectives are key to achieving this vision:

» ***Sustaining quality and continuity of supply:***
This requires effective management of total system capacity and reliability planning, focusing on primary energy availability, maintenance, refurbishment and energy efficiency. Stretch targets that ensure quality and continuity of supply need to be set while maintaining rigorous occupational health and safety standards.

» ***Capacity expansion:***
Successful delivery on the capacity expansion programme is central to Eskom's vision and entails thorough environmental impact assessments, site selection and optimisation, procurement efficiency, project management and commitment to health and safety in the construction environment, while rigorously applying Eskom's climate change and air quality strategies. The challenge is to build new plant, on time and on budget, while running existing plant at optimal levels.

» ***Funding and resourcing:***
The build programme imposes significant funding and resourcing requirements. Appropriate skills and information management systems are also vital to ensure a sustainable business and delivery on the build programme. Other key factors include multi-year pricing determination, revenue management, efficiency initiatives and Eskom's skills acquisition and retention strategies.

» ***Leveraging business operations for developmental benefits:***
Sustainability shapes the way Eskom conducts business and provides the context for its developmental initiatives.

The magnitude of Eskom's current business procurement spend and the planned capacity expansion programme create opportunities for maximising the organisation's contribution to government's Accelerated and Shared Growth Initiative for South Africa (ASGI-SA). The mechanisms include the fostering of small and medium enterprises, black women-owned businesses and skills development, accelerated electrification and Eskom's corporate social investment spend. Local content will be a core requirement when major contracts are awarded.

Over the last decade, South Africa has experienced a steady growth in the demand for electricity on the back of healthy economic growth. The continued growth in the economy has progressively reduced Eskom electricity reserves. It is expected that the reserve margin will continue on a downward trend for the next seven years until new base-load power plant is built (2014). In spite of new capacity coming on-line, which includes bringing back mothballed power stations and commissioning Open Cycle Gas Turbine plants, the electricity demand within the country is still higher than available capacity. Eskom is stepping up the implementation of this capacity expansion programme and will invest about R150 billion over the next five years in the upgrading of South Africa's power supply infrastructure. The biggest percentage of the expenditure will go towards improving generation capacity through, among others, the construction of new power stations.

The decision to expand Eskom's electricity generation capacity is based on **national policy** and informed by on-going strategic planning undertaken by the national Department of Minerals and Energy (DME), the National Energy Regulator of South Africa (NERSA) and Eskom. Strategic decisions regarding the electricity generation options to meet energy requirements within the country are made through this strategic planning process. The acceptability of options investigated at a project-specific level from a technical, economic and environmental perspective.

The hierarchy of policy and planning documentation is illustrated in Figure 2.1.

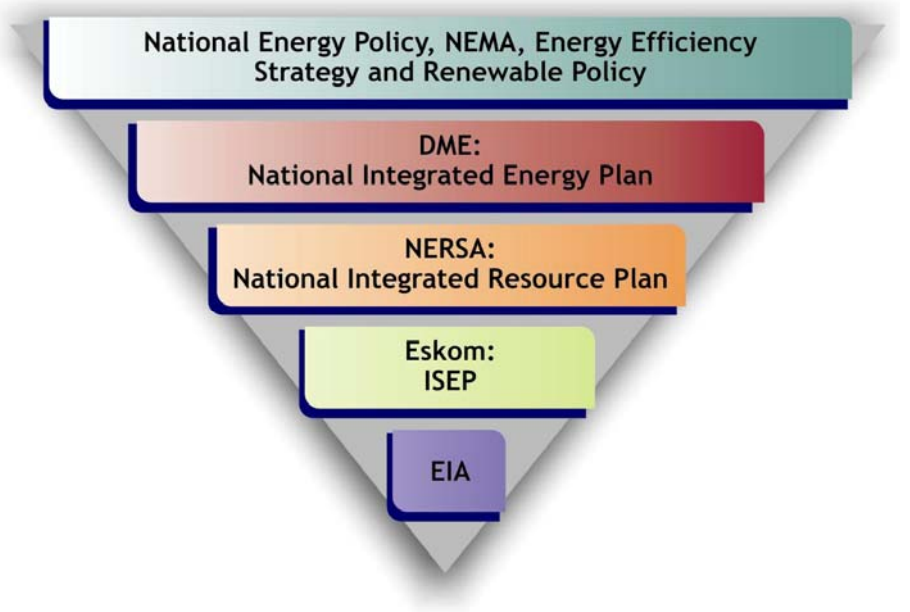


Figure 2.1: Hierarchy of electricity policy and planning documents

2.1. White Paper on the Energy Policy of the Republic of South Africa, 1998

Development within the energy sector in South Africa is governed by the White Paper on a National Energy Policy (the National Energy Policy), published by DME in 1998. This White Paper identifies five key objectives for energy supply within South Africa, that is:

» Increasing access to affordable energy services
» Improving energy sector governance
» Stimulating economic development
» Managing energy-related environmental impacts
» Securing supply through diversity.

Furthermore, the National Energy Policy identifies the need to undertake an Integrated Energy Planning (IEP) process and the adoption of a National Integrated Resource Planning (NIRP) approach. Through these processes, the most likely future electricity demand based on long-term southern African economic scenarios can be forecasted, and provide the framework for South Africa (and Eskom) to investigate a whole range of supply and demand side options.

2.2. Integrated Energy Plan (IEP) – 2003

In response to the requirements of the National Energy Policy, the DME commissioned the Integrated Energy Plan (IEP) to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a

balance between the energy demand and resource availability to provide low-cost electricity for social and economic development, while taking into account health, safety and environmental parameters.

The IEP projected that the additional demand in electricity would necessitate an increase in electricity generation capacity in South Africa by 2007. Furthermore, the IEP recognises:

- That South Africa is likely to be reliant on coal for at least the next 20 years as the predominant source of energy.
- That new electricity generation will remain predominantly coal-based, but with the potential for hydro, natural gas, and nuclear capacity.
- The need to diversify energy supply through increased use of natural gas and new and renewable energies.
- Continuing investigations into nuclear options as a future new energy source.
- The promotion of the use of energy efficiency management and technologies.
- The need to ensure environmental considerations in energy supply, transformation and end use.
- The promotion of universal access to clean and affordable energy, with the emphasis on household energy supply being co-ordinated with provincial and local integrated development programmes.
- The promotion of the use of energy efficiency management and technologies.
- The need to maximise load factors on electricity generation plants to lower levelised lifecycle costs.
- The need to lessen reliance on imported liquid fuels by exploring and developing oil and gas deposits.
- The need to increase existing oil refineries capacity where appropriate rather than greenfields development.
- The continuation of existing synfuel plants and supplement with natural gas as feedstock.
- The need to introduce policy, legislation and regulation for the promotion of renewable energy and energy efficiency measures and mandatory provision of energy data.
- The need to undertake integrated energy planning on an on-going basis

2.3. National Integrated Resource Plan (NIRP), 2003/2004

In response to the National Energy Policy's objective relating to affordable energy services, NERSA commissioned a National Integrated Resource Plan (NIRP) in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies. The planning horizon for the study was from 2003 to 2022.

The objective of the NIRP is to determine the least-cost supply options for the country, provide information on the opportunities for investment into new power generating projects, and evaluate the security of supply. The NIRP also provides an assessment of the system reliability and serves as a benchmarking tool for market performance. It also examines specific public policies, including those on security of electricity supply and risks associated with the current system.

The national electricity demand forecast took a number of factors into account. These include:

» A 2,8% average annual economic growth.
» The development and expansion of a number of large energy-intensive industrial projects.
» Electrification needs.
» A reduction in electricity-intensive industries over the 20-year planning horizon.
» A reduction in the number of electricity consumers – NIRP anticipates people switching to the direct use of natural gas.
» The supply of electricity to large mining and industrial projects in Namibia and Mozambique.
» Typical demand profiles.

Various demand-side management and supply-side options are considered in the NIRP process, prior to identifying the least cost supply options for South Africa. The outcome of the process confirmed that coal-fired options are still required over the next 20 years, and that additional base load plants will be required from 2010.

The first NIRP (NIRP1) was carried out during 2001. The second NIRP was carried out under the auspices of the NER in the period 2003-2004, and shows vast improvements to NIRP1. It provides moderate and high electricity and demand forecasts, a complete database of the cost and performance of the generation plant considered in the optimisation, detailed output results, methodology applied in the planning process and risk and sensitivity analyses.

Other important changes from NIRP1 is the inclusion of risk and sensitivity analyses and scenarios to address risk factors and uncertainties that are associated with the long-term demand forecast; performance of existing generation plants; sustainability and delivery of demand-side management (DSM) options, including interruptible load supplies and changes in the electricity demand load shape. Further, NIRP2 takes into account transmission integration costs and credits for regional location of new capacity that were not considered in the previous national resource plan.

2.4. Integrated Strategic Electricity Planning (ISEP) in Eskom

Eskom uses a modelling tool called Integrated Strategic Electricity Planning (ISEP) to plan its future capacity strategy. By analysing usage patterns and growth trends in the economy, and matching these with the performance features of various generation technologies and demand side management options, ISEP identifies the timing, quantity and type (base load or peaking) of new capacity options required in the long-term. These options include the Return-to-Service of the three mothballed coal-fired Simunye Power Stations (i.e. Camden, Komati and Grootvlei), conventional pulverised fuel power plants (i.e. coal-based power), pumped storage schemes, gas-fired power plants, nuclear plants, greenfield fluidised bed combustion technologies, renewable energy technologies (mainly wind and solar projects), and import options within the Southern African Power Pool. As the older Eskom power plants reach the end of their design life from approximately 2025 onwards, the use of all available technologies will need to be exploited to replace these in order to supply the country's growing electricity demand.

The ISEP process identifies the timing, quantity and type (e.g. base load or peaking) of new electricity generating capacity required over the next 20 years. The planning scenarios are based on an average 4% growth in demand for electricity over the 20-year period. This translates into a 6% growth in GDP. The most recently approved ISEP plan (ISEP11) identified the need for increased *peaking* electricity generating by *2007* and additional *baseload* capacity by approximately *2010*. An increase in peaking supply has since been achieved through the commissioning of new plant, including the OCGT units at the Ankerlig and Gourikwa Power Stations in the Western Cape. Figure 2.2 illustrates Eskom's "project funnel", which shows the range of supply options being considered by Eskom to meet the increasing demand for electricity in the country. There are many projects at various stages in the project funnel including research projects, transmission lines and generating options in South Africa and Southern Africa.

As is evident in Figure 2.2, the proposed Gourikwa Power Station conversion and transmission integration project is currently within the feasibility/business case phase (indicated by the yellow circle entitled 'OCGT Conversion'), i.e. this project is currently being investigated in terms of its economic, technical and environmental feasibility.

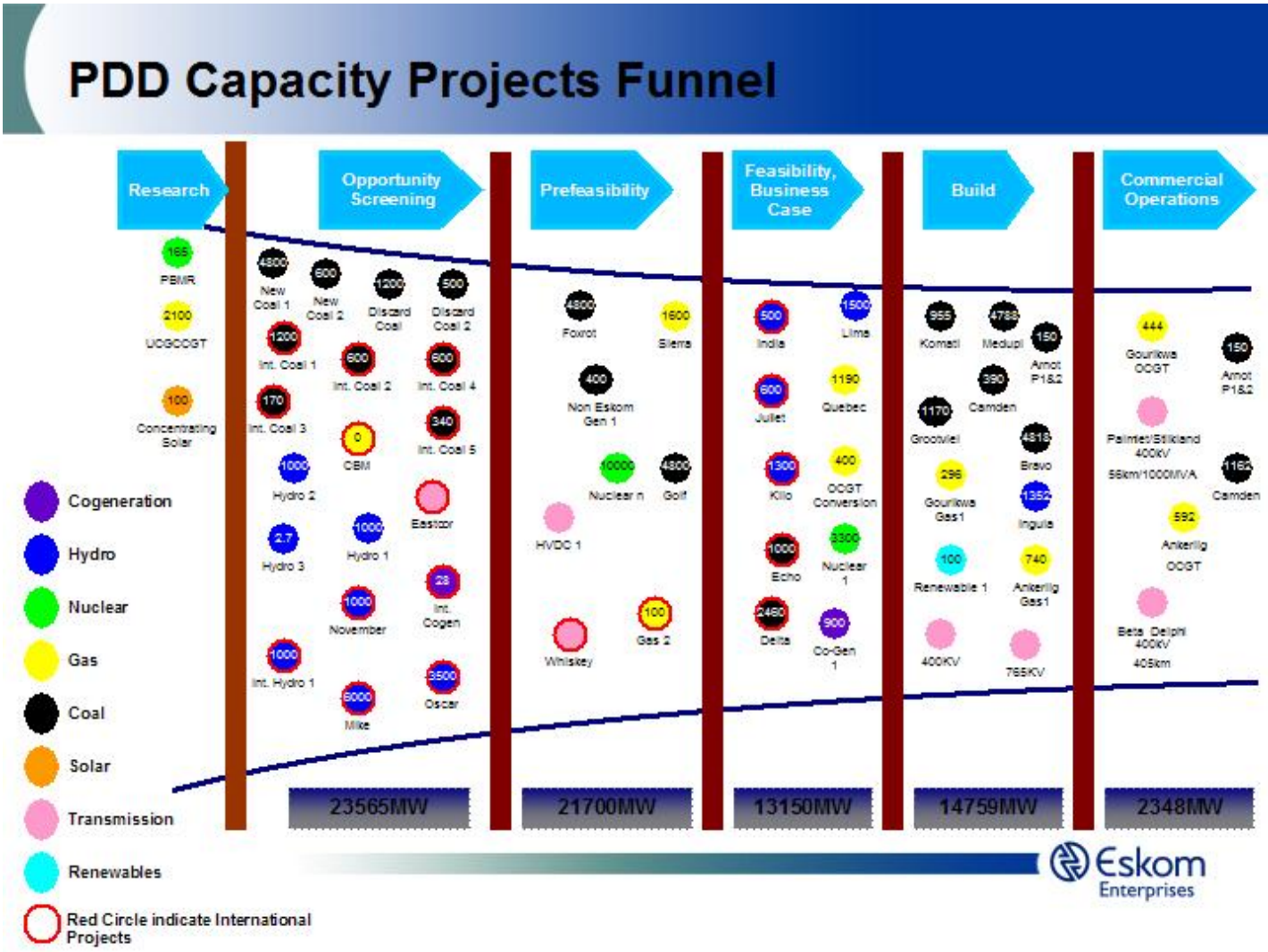


Figure 2.2: Eskom Capacity Projects Funnel illustrating the range of supply options being considered by Eskom to meet the increasing demand for electricity in the country

Eskom is currently conducting various energy-related projects in the Western Cape. The following list highlights some of the power generation and transmission projects which are currently in various stages of project development:

» Gourikwa Expansion (Gas 1) – under construction, to be completed end-2008.
» Ankerlig Expansion (Gas 1) – under construction, to be completed end-2008.
» Ankerlig Power Station conversion project – EIA process commenced in November 2007.
» Palmiet-Stikland 400 kV transmission line – Commissioned in August 2007.
» Nuclear 1 – Environmental Impact Assessment process has commenced. Draft Scoping Report has been made available for public comment.
» Nuclear 1 transmission power lines – EIA process to commence shortly.

» Wind Energy Facility in the Vredendal area – Final EIA report has been submitted to DEAT for authorisation.
» Pebble-bed Modular Reactor Demonstration facility - Final Scoping Report accepted by DEAT in March 2008.

2.5. Draft Western Cape Integrated Energy Strategy

The recent energy crisis in the Western Cape has highlighted the need to develop a plan for sustainable, secure energy provision in the Western Cape. Although various national efforts are underway to increase energy provision to the Western Cape, the Provincial Government believes that additional efforts need to be made to address the other energy challenges facing the Province, including the challenges of reducing the Province's carbon footprint and eradicating energy poverty.

The Western Cape currently relies heavily on coal-produced electricity and on petrochemicals for its energy supply. The strategy recognises that, in order to ensure that energy can be accessed from various sources in emergency situations, it is necessary to explore alternative sources of energy. The strategy lists the potential opportunities for increasing power supply to the Province. In this regard, the strategy states that the potential for gas-fired power generation is high, provided that sufficient resources of natural gas are discovered. However, supplies are currently not confirmed. Natural gas is a cleaner fossil fuel-based option than coal and can provide base load capacity.

The Strategy details various goals to which the Provincial Government of the Western Cape (PGWC) is committed and outlines a programme of action for implementation of the strategy framework (a copy of this Strategy can be obtained at http://www.capegateway.gov.za/eng/pubs/public_info/D/152704).

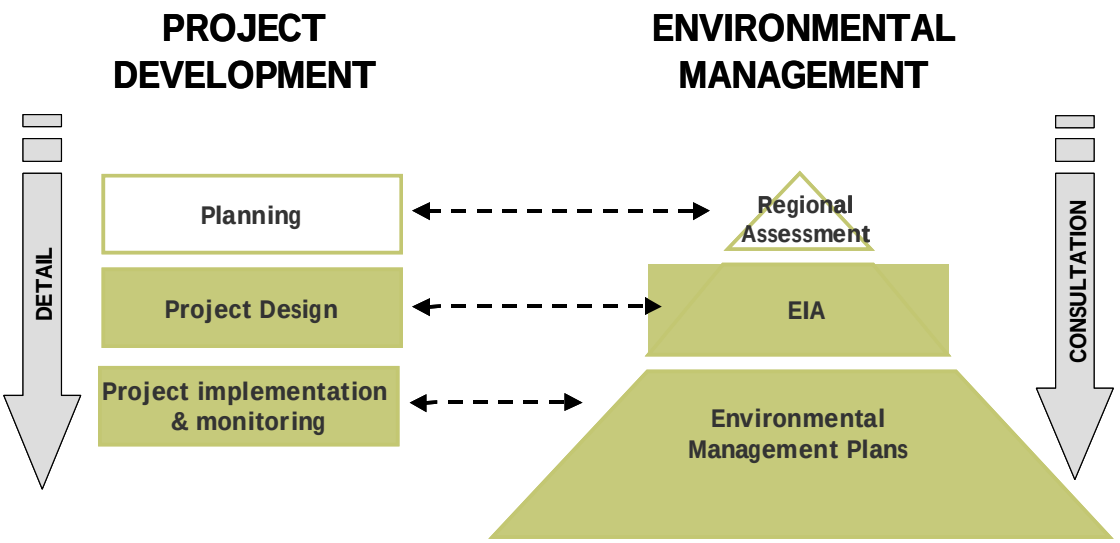
2.6. Project Planning and the site-specific Environmental Impact Assessment

Eskom Generation's planning process is based on anticipated electricity demand, rather than immediate load requirements in order to timeously supply the anticipated increased demand in the country. This is due to the long lead-time process of acquiring the necessary permissions to construct such infrastructure from DEAT and the National Energy Regulator of South Africa (NERSA), and negotiations with landowners, and power generation infrastructure purchase, delivery and ultimately construction.

In terms of the EIA Regulations under NEMA, a Scoping and EIA report (including a draft Environmental Management Plan (EMP)) are required to be compiled for this proposed project. The EIA is considered as an effective planning and decision-making tool in the planning process of a new power generation facility.

It allows the environmental consequences resulting from a technical facility during its establishment and its operation to be identified and appropriately managed through project design and implementation. The level of detail at a site-specific level is refined through the process, and allows for resolution of potential issue(s) through dialogue with affected parties.

The relationship between project development and the environmental assessment and management process is depicted in the figure below.



DESCRIPTION OF THE GOURIKWA POWER STATION & TRANSMISSION INTEGRATION PROJECT CHAPTER 3

This chapter provides details regarding the scope of the proposed Gourikwa Power Station and Transmission Integration Project, including all required elements of the project and necessary steps for the project to proceed. The scope of project includes construction and operation activities.

3.1. Power Station Conversion

The Gourikwa Power Station comprises five OCGT units (i.e. three existing OCGT units, plus two additional OCGT units under construction) each with a nominal capacity of ~150 MW, resulting in a total nominal capacity of 750 MW for the power station. Each OCGT unit consists of one gas turbine driving an electric generator.

The concept of converting the OCGT units to CCGT units is to utilise the **heat energy** from the exhaust of the gas turbine to create steam in a Heat Recovery Steam Generator (HRSG) in order to drive a steam turbine, instead of this heat energy being exhausted and lost to the atmosphere (as is the current scenario). Conversion of the units to CCGT is therefore based on increased cycle efficiency.

Simply stated, this can be achieved through the following (and is illustrated in Figure 1.2):

» When the hot gas exits the gas turbine as exhaust gas, it has a temperature of up to 600°C. This heat energy is transferred to water in the heat recovery steam generator, instead of being exhausted to the atmosphere.
» The heat is used to generate steam (water vapour), which powers the steam turbine to produce mechanical energy.
» The resulting mechanical energy is transferred to a generator, where it is converted into electricity (i.e. electrical energy).
» A condenser converts exhaust steam from the steam turbine back into saturated water through a cooling process.

Conversion of the units to CCGT is undertaken to increase cycle thermal efficiency. It is estimated that each converted unit will produce approximately 80 MW additional capacity, i.e. approximately 50% more than a standard OCGT unit. Therefore, a maximum of an additional 5 x 80 MW (400 MW in total) increase in capacity is foreseen from the OCGT to CCGT conversion. The **total nominal capacity** of the Gourikwa Power Station will, therefore, be **1 150 MW**.

The proposed conversion infrastructure will be on the site of the existing Gourikwa Power Station, and will not require any additional land take outside of the existing power station boundaries. Therefore, no location alternatives have been considered within this EIA process.

The primary components of the conversion project include the following:

- A **heat recovery steam generator** (HRSG) will be added to the gas turbine to recover waste heat, to drive the steam turbine cycle. One HRSG can be linked to two or three OCGT units. The following configuration is currently being investigated from a technical perspective:
  - A configuration of 1 x 3:1 (OCGT: HRSG units),
  - A configuration of 1 x 2:1 (OCGT: HRSG units)
- A **condenser** which converts exhaust steam from the steam turbine back into water through a cooling process.
- A **bypass stack** for the CCGT, anticipated to be approximately 60 m in height, will be associated with each HRSG. It is anticipated that two bypass stacks will be required (depending on the configuration).
- **Water treatment plant** for treatment of potable water and production of demineralised water (for steam generation).
- **Dry-cooled technology** consisting of a system of air-cooled condenser fans situated in fan banks approximately between 25 m - 30 m above ground.
- **Additional fuel storage facilities** and associated off-loading and other related infrastructure to cater for the increased fuel requirements associated with the higher load factor (i.e. longer operating hours or a mid-merit operating regime[3]). The CCGT units can be both liquid fuel-fired or natural gas-fired. The CCGT units would initially be diesel-fired, until such time that natural gas becomes available.
- A **water tank** with a holding volume of ~2.5 million litres (i.e. water storage for ~5 days of operation).

Water will be required for the CCGT power generation process and for cooling. High quality water is required for use within the CCGT power generation process. Membranes/ion exchange systems would be required for water treatment on site. A waste treatment plant for the effluent from this water treatment system will be required. All solid waste generated from this process would be disposed of off-site at a suitably licensed waste disposal facility.

The power station is to be operated as a zero liquid effluent discharge (ZLED) system, i.e. water within the power station will be recycled for re-use in the power station process. No liquid waste from the power station will therefore be discharged.

[3] Mid-merit capacity is during the daytime from about 6 am to about 10 pm on weekdays.

3.1.1. Investigation of Water Resource Options

Process water will be required for the CCGT power generation process, as well as water for cooling. It is estimated that approximately 300 m^3/day will be required for this purpose.

In order to meet this demand, the feasibility and availability of various water resource options were investigated by Eskom in terms of technical, economic and sustainability criteria. The water resource options have considered an assurance level of 98% and take into account an on-site storage of 5 days. These options included a) the use of the use of treated water, effluent and/or stormwater from the PetroSA facility adjacent to Gourikwa, b) the use of water from the Hartebeeskuil Dam situated approximately 7 km from Gourikwa, and c) the use of treated industrial effluent from the Hartenbos Sewage Works situated approximately 13 km from Gourikwa.

From the results of the preliminary investigations, the options of using treated water, effluent and/or stormwater from the PetroSA facility are considered the most practical and viable, and have been nominated as the preferred option/s in the short-term based on technical, environmental and economic constraints. These options are currently being jointly further investigated by Eskom and PetroSA (refer Appendix B). These options are been investigated to ensure their viability and sustainability. A preferred option will be nominated with the agreement of PetroSA for implementation based on technical, environmental and economic constraints.

The water will be piped to the power station from PetroSA via a new **~1,3 km water pipeline** proposed to be constructed parallel to the existing liquid fuel pipeline between the two facilities. Alternative routes for the fuel pipeline were previously investigated through an EIA process for the initial OCGT units at the power station (Ninham Shand, 2005). The fuel pipeline route constructed was considered to be the most appropriate and practical alignment from an environmental, technical and economic perspective. This alignment is now proposed to be mirrored though the construction of a parallel water pipeline. Therefore, no alternative alignments have been considered within this EIA process. This water pipeline would be outside of the existing power station boundaries. The water pipeline would be constructed above ground, and would require a servitude width of ~5 m.

3.1.2. Investigation of Cooling Technologies

A number of cooling technology options for the CCGT have been investigated by Eskom, including dry-cooled technology and wet-cooled technology. Due to financial and technical constraints, **dry-cooling technology (air-cooled condensers)** has been nominated as a preferred option for implementation. Dry-cooling technology is less water-intensive (i.e. uses significantly less water) than wet-cooled technology, and consists of a system of air-cooled condenser fans situated in fan banks approximately 25 m – 30 m above ground. In a direct dry-cooled system, the steam is condensed directly by air in a heat exchanger (air cooled condenser) and the condensate is returned to the steam cycle in a closed loop. The air flow is induced solely by mechanical draft (i.e. caused by fans) in the air cooled condensers.

A condenser converts exhaust steam from the steam turbine back into saturated water through a cooling process. This water (condensate) is then fed into a Condensate Polishing Plant (CPP), to treat/polish it to desired qualities, before it is fed back into the HRSG as part of the steam cycle. Regeneration wastes, a highly saline effluent from the CPP, will have to be disposed of. Eskom is currently investigating various disposal options (one of which could be on-site wastewater treatment).

3.1.3. Additional Fuel Storage Facilities

Conversion of the units to CCGT is based on **increased cycle thermal efficiency**. The CCGT units would utilise the **same amount of liquid fuel** (i.e. diesel) as is currently the case for the OCGT units (i.e. approximately 40 tons of diesel/unit/hour) for the same operating regime. However, in order to meet the electricity supply demand in the medium-term, the plant will have to operate for more hours per day than was anticipated for the OCGT plant (i.e. higher than anticipated load factors). Therefore, the power station will not only operate as a peaking power plant[4] as is currently the case, but will contribute to the mid-merit electricity generation supply[5].

This **higher load factor** would require **higher fuel consumption**. **Additional fuel storage facilities** will be required at the Gourikwa Power Station to cater for the increased fuel requirements associated with the higher load factor. Fuel is currently transported by pipeline to the Gourikwa Power Station site directly from the fuel supply point at PetroSA. This liquid fuel pipeline to the power station will continue to be used with the conversion project.

[4] Peaking power refers to power generation technology designed to generate electricity during periods of high electricity demand, generally in the weekday mornings from 07:00 to 09:00 and weekday evenings from 18:00 to 20:00.

[5] Mid-merit capacity is during the daytime from about 6 am to about 10 pm on weekdays.

Eskom currently has authorisation to store 10,8 million litres of fuel on the Gourikwa Power Station site (i.e. four tanks of 2 700m^3 capacity each). In order ensure supply of fuel to the CCGT units at the higher load factor, Eskom proposes the storage of an additional 32,4 million litres of fuel on the power station site (i.e. six tanks of 5 400m^3 capacity each), resulting in a total storage capacity of 43,2 million litres on site. An area to the west of the power station expansion has been earmarked for this additional fuel storage (refer to Figure 3.1). Provision would be required to be made for 6 x 5 400 m^3 fuel storage tanks, as well as associated infrastructure. Security of liquid fuel supply nationally is regulated by the Department of Minerals and Energy (DME)[6].

3.1.4. Direct Access Road to the Gourikwa Power Station site

Eskom propose the construction of a new dedicated **access road** to the Gourikwa Power Station directly off the N2 national road. The power station currently shares an access road with PetroSA, which is not considered desirable from a safety and accessibility perspective in the long-term, as both the PetroSA as well as the Gourikwa Power Station are considered to be National Key Points in their own right.

Alternative routes for access to the power station were previously investigated through an EIA process undertaken in 2005 (Ninham Shand, 2005). The route considered to be the most appropriate and practical alignment of the three alternatives considered in the previous EIA is now being re-considered through this EIA study. Therefore, no alternative alignments are being considered within this EIA process. The route was not previously constructed as it was agreed to share the use of the existing PetroSA access point.

The proposed new access road route is approximately 1,6 km in length, and would be outside of the existing power station boundaries. This route takes access from the N2 approximately 2,5 km west of PetroSA's western-most security access road (to the landfill site) and runs in a north-easterly direction along the western boundary of the PetroSA property (refer to Figure 3.2). The proposed new road follows an existing fence line for much of its length. The access road would be constructed as a single carriageway surfaced road and would require a servitude width of approximately 15 m. A new formal access point (or intersection) would be required from the N2, and will be required to be negotiated with the South African National Roads Agency (SANRAL) and designed and constructed to their specifications.

[6] Refer to Energy Security Master Plan – Liquid Fuels, published by the DME.

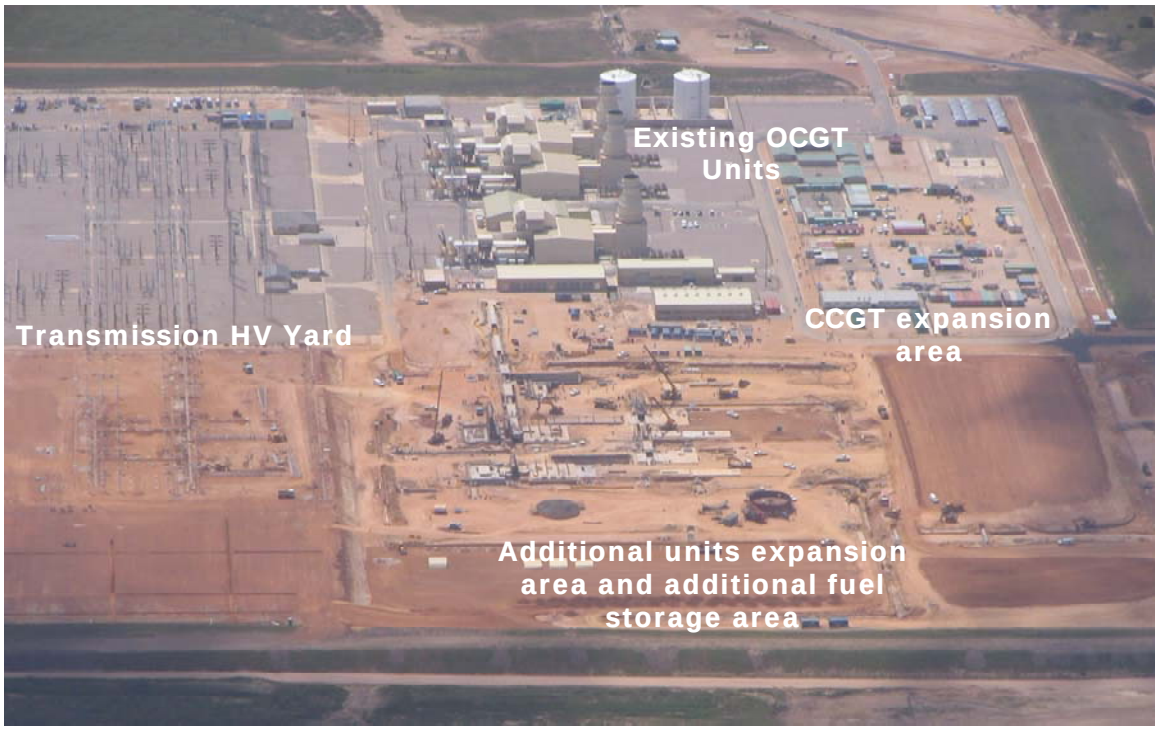


Figure 3.1: Aerial photograph of the Gourikwa Power Station site showing the existing power station infrastructure, the expansion site, as well as the areas for the placement of infrastructure associated with the proposed conversion

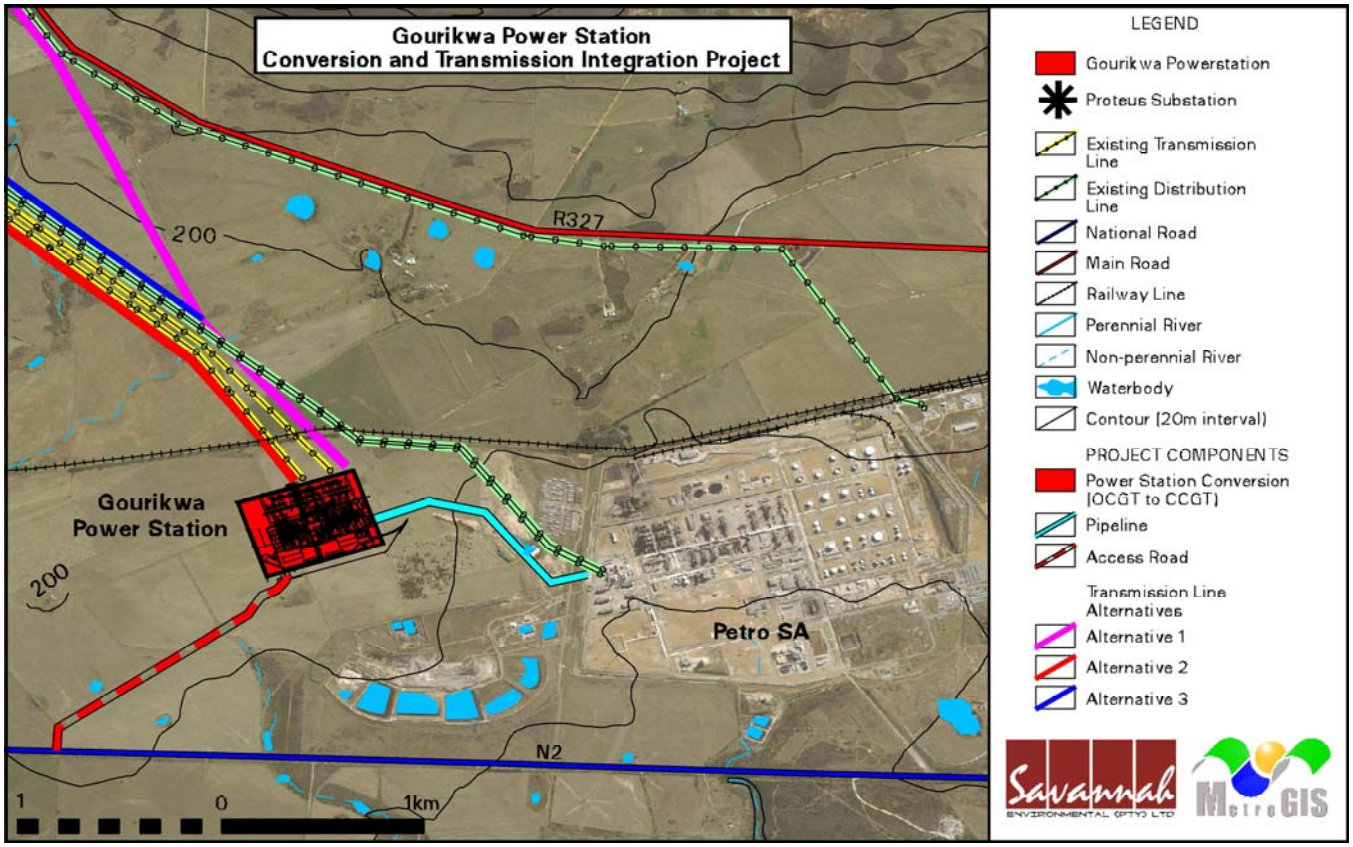


Figure 3.2: Map illustrating the proposed new access road route (~1,6 km in length) from the N2 in a north-easterly direction along the western boundary of the PetroSA property

3.1.5. Project Construction Phase

It is expected that the construction of the power station conversion would commence in 2009, and would take a maximum of 24 months to complete, with commissioning of the first unit estimated at the end of 2011. In order to meet the urgent need for additional electricity generation capacity, Eskom would aim to fast-track this construction timeframe as far as possible.

The number of construction workers required for a project of this nature is still being determined. Construction crews will constitute mainly skilled and semi-skilled workers. No employees will reside on the construction site at any time during the construction phase, and the intention is for appropriate accommodation to be sought and provided within the nearby residential area.

3.1.6. Project Operation Phase

The project is proposed to be implemented by 2011, with the commissioning of the first unit estimated at the end of 2011.

As is typical of gas turbine power stations, the expected lifespan of the power station is approximately 25 years, with the option to extend this lifespan at the end of this period through the replacement of components, should this be required. The creation of additional employment opportunities during the operational phase of the power station will be limited. It is estimated that the project will support only about 20 direct employment opportunities (operators/maintainers).

3.2. Integration of the CCGT Power Station into the National Grid

Eskom proposes the construction of a 400kV transmission power line between the Gourikwa Power Station and the existing Proteus Substation to transmit the additional power generated at this power station to the national electricity grid. Proteus Substation is situated approximately 10 km north-west of the power station adjacent to the R327 main road.

The proposed conversion project considers the addition of 400 MW of power generation at Gourikwa Power Station. Two new generator transformer bays will be required within the existing Gourikwa Substation high voltage (HV) yard to accommodate the new generation capacity and connect the new capacity into the greater 400kV network. No expansion of this HV yard outside of the power station footprint is required to accommodate the new transmission power line. Similarly, no expansion of the Proteus Substation HV yard outside of the demarcated footprint is required to accommodate the new transmission power line.

The Grid Gode requires a minimum of three lines for generation integration greater than 1000 MW (the total nominal capacity of the Gourikwa Power Station will be 1 150 MW with the conversion). Currently two 400kV transmission power lines integrate Gourikwa Power Station into the 400kV network at Proteus Substation. A third 400kV transmission power line is therefore required to be constructed as part of the proposed conversion project.

Three technically feasible alternative transmission power line alignment corridors (approximately 500 m in width) have been identified for investigation within the EIA process (refer to Figure 3.3).

Alternative 1 (indicated in pink on Figure 3.3) exits the Gourikwa Power Station in a north-westerly direction until it meets the Duinzight-Proteus 66kV distribution line. The alignment then runs parallel to the Duinzight-Proteus 66kV distribution line and the R327 main road for a distance of approximately 4 km before crossing this road, turning west and following the Blanco-Proteus 132kV distribution line into the Proteus Substation.

Alternative 2 (indicated in red on Figure 3.3) runs parallel to the two existing Gourikwa-Proteus 400kV transmission power lines (Gourikwa-Proteus 1 and 2) for the entire length of its alignment (approximately 10 km).

Alternative 3 (indicated in blue on Figure 3.3) runs parallel to the two existing Mossgas-Proteus 132kV distribution power lines (Mossgas-Proteus 1 and 2) for the entire length of its alignment (approximately 10 km).

Through the EIA process, a preferred alternative transmission power line corridor will be nominated for environmental authorisation (by the environmental authorities), provided no environmental fatal flaws are identified to be associated with the proposed project.

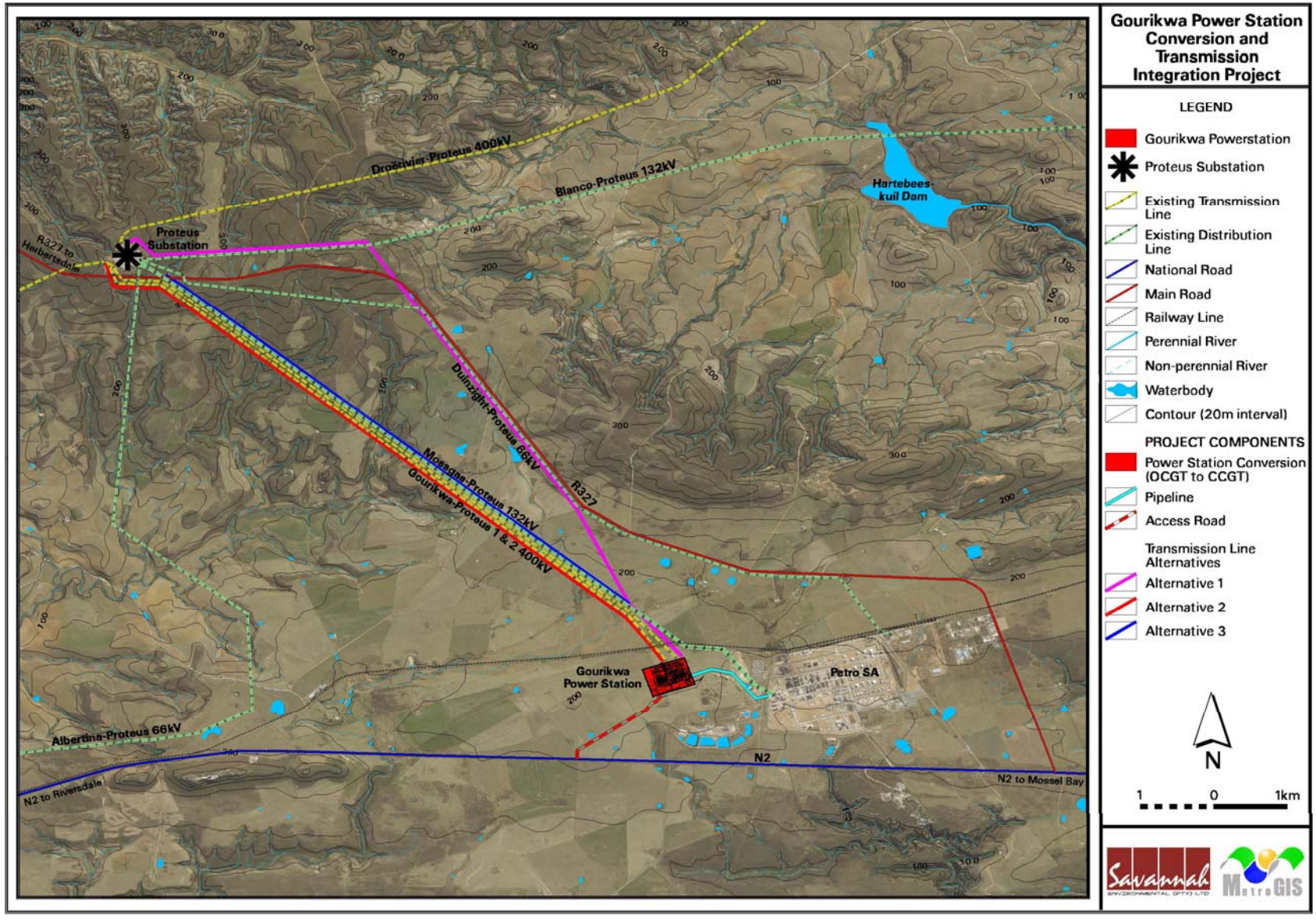


Figure 3.3: Locality map showing the feasible alternative transmission power line corridor alternatives between Gourikwa and Proteus Substation identified for investigation within the EIA process

Transmission power lines are constructed and operated within a servitude (55 m wide for 400kV lines) along the entire length of the line. Within this servitude, Eskom has certain rights and controls that support the safe and effective operation of the line. The process of achieving the servitude agreement is referred to as the Servitude Negotiation Process with each affected landowner. The negotiation process is undertaken directly by Eskom and is independent of the EIA process.

While there should be reasonable confidence in the environmental feasibility of the preferred corridor nominated, other criteria may require minor alteration to the corridor which received environmental authorisation during the land negotiation process undertaken by Eskom. These may include:

» Identification of a technical problem during the detailed design phase which will require excessive cost to resolve (e.g. unstable subsurface conditions identified by detailed geotechnical investigations).
» Request by a landowner during the course of the negotiation process that the alignment be shifted to avoid disruption of a particular activity on his property, but provide a feasible new alignment.

Provided such potential deviations to the corridor are not unreasonable, it is fair for Eskom Transmission to investigate and negotiate local adjustments within the authorised corridor alignment. This may be required at a number of points along the alignment.

3.2.1. Project Construction Phase

It is expected that the construction for transmission power line will commence in 2009, and would take approximately 9 months to complete. In order to meet the urgent need for additional electricity generation capacity, Eskom would aim to fast-track this construction timeframe as far as possible.

Construction crews will constitute mainly skilled and semi-skilled workers. No employees will reside on the construction site at any time during the construction phase.

3.2.2. Project Operation Phase

The Transmission integration would be required to be operational prior to the Gourikwa Power Station conversion being implemented in 2011.

The expected lifespan of the proposed transmission power line is between 35 and 40 years, depending on the maintenance undertaken on the power line structures. The creation of additional employment opportunities during the

operational phase of the power line will be limited, and will be restricted to skilled maintenance personnel employed by Eskom.