Bohlweki Environmental (Pty) Ltd

ENVIRONMENTAL SCOPING REPORT FOR THE PROPOSED COMBINED CYCLE GAS TURBINE (CCGT) POWER PLANT IN THE AMERSFOORT AREA, MPUMALANGA PROVINCE

(DEAT REF 12/12/20/1074)

DRAFT FOR PUBLIC REVIEW

PROJECT OF ESKOM HOLDINGS LIMITED

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EXECUTIVE SUMMARY

1. INTRODUCTION

Eskom Holdings Limited (Eskom) has appointed Bohlweki Environmental (Pty) Ltd as independent environmental consultants to conduct the Environmental Impact Assessment (EIA) process for the proposed Combined Cycle Gas Turbine (CCGT) power plant in the Amersfoort area, in terms of the EIA regulations published in Government Notice R385 to R387 of 21 April 2006 - read with Section 24(5) and Section 44,of the National Environmental Management Act, 1998 (Act No 107 of 1998, "NEMA")(as amended).

Need and Justification of the Project

Eskom has a mandate to satisfy potential customer and economic needs, which implies certain responsibilities. One of the most significant responsibilities is to find and maintain the balance between satisfying the needs of society and remaining within the capabilities of the environment. In order to achieve this, Eskom must continually re-assess its present infrastructure and take into account new developments to ensure that there is a continued supply of electricity, without significantly impacting on the environment.

Eskom is the primary supplier of electricity in South Africa, providing approximately 95% of the electricity consumed. The decision to expand Eskom's electricity generation capacity was 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. Eskom applies an Integrated Strategic Electricity Planning (ISEP) process to identify long-term options regarding both the supply and demand sides of electricity provision in South Africa.

The most recently approved ISEP (October 2005) identifies the need for increased peaking supply by about 2006/7 and base load by about 2010.

Based on the above planning processes, and in order to meet the projected increase in the demand for electricity, various projects are underway and are at various stages of implementation. These include base load technologies such as coal fired plants, combined cycle gas turbines and conventional nuclear as well as peaking technologies such as pumped storage schemes and open cycle gas turbines.

Eskom is committed to investigating and evaluating various options for the diversification of the energy mix over time (including renewable resources) and as part of an ongoing effort to assess the viability/feasibility of all supply-side options, a number of power generation technologies, not yet implemented in South Africa on a commercial basis, are being evaluated in terms of technical, socio-economic and environmental aspects. One such type of technology is Underground Coal Gasification (UCG), which has been successfully proven to be commercially viable, and Eskom plans to implement it as a fully commercially operating operation. In this current project, it is proposed that an Underground Coal Gasification-Combined Cycle Gas Turbine (UCG-CCGT) complex is constructed and operated.

The current study only focused on the **CCGT plant component** of the complex.

1.2. Overview of the Proposed Project

It is anticipated that the CCGT power plant will have approximately 2100 MW of installed capacity. The proposed project will consist of the following components:

- the CCGT power plant (comprising up to 6 units of approximately 350 MW each);
- a compressor plant;
- ignition gas plant, for unit start-up (using commercial propane);
- weather and communication mast of up to 60 meters in height and air quality monitoring station;
- high voltage yard;
- a gas pipeline from the adjacent gas cleaning plant to the CCGT;
- a water supply pipeline from the Rietpoort Balancing Dam (for construction and operational water supply);
- electricity supply for construction;
- a water treatment plant as well as ancillary works such as other associated infrastructure;
- access roads;
- sewage treatment plant;
- storage facility for hazardous materials;
- storage facility for waste; and
- borrow pits.

The CCGT plant and associated infrastructure are required to be constructed on a site that is environmentally, economically and technical feasible. A Screening Study (Site selection) encompassing a sensitivity mapping exercise was undertaken by independent consultants in order to establish the best possible sites to evaluate during the Scoping Phase of the project. The purpose of such an exercise was to identify suitable areas within the wider study area that could accommodate the CCGT plant and to pro-actively identify sensitive areas that should ideally be avoided (see Chapter 5 – Site Selection Summary).

2. DESCRIPTION OF ALTERNATIVES

In terms of the Environmental Impact Assessment (EIA) Regulations, feasible alternatives must be considered within the Environmental Scoping Study. All identified, feasible alternatives should be evaluated in terms of social, biophysical, economic and technical factors.

- ***Site alternatives***

Based upon the Screening/Site selection study, a total of ten candidate sites were identified for the possible location of the CCGT power plant and associated infrastructure.

These farms included:

- Site 1 (Portions 3 and 4 of the farm Roodekopjes 67 HS)
- Site 2
  - Site 2a (Portion 7 of the farm Bergvliet 65 HS; Portion 4 of the farm Rietpoort 83 HS; Werda 116 HS)
  - Site 2b (Portions 3 and 4 of the farm Rietpoort 83 HS and Werda 116 HS)
- Site 3 (Portions 3 and 4 of the farm Rietpoort 83 HS)
- Site 4 (Portion 1 of the farm Rietpoort 83 HS and Portions 2, 6 and 7 of the farm Welgedacht 82 HS)
- Site 5 (Portions 4, 5 and 8 of the farm Welgedacht 82 HS)
- Site 6 (Portions 1, 3 and 7 of the farm Palmietspruit 68 HS; Portion 6 of the farm Strydkraal 53 HS; Portion 1 of the farm Roodekopjes 67 HS)
- Site 7
  - Site 7a (Portions 1, 2, 6, 10 and 11 of the farm Witkoppies 81 HS)
  - Site 7b (Portions 1, 5 and 6 of the farm Witkoppies 81 HS)
  - Site 7c (Portions 4, 5, 8, 9, 12, 13 and 14 of the farm Witkoppies 81 HS)

With further input from the technical team, four sites were eliminated as they were located in the area earmarked for future UCG operations/expansion. Six alternative sites were then selected as being potentially the most viable of all the candidate sites investigated.

The following six (6) sites will, therefore, be assessed during this Scoping Study:

- Site 1 (Portions 1, 3 and 7 of the farm Palmietspruit 68 HS; Portion 6 of the farm Strydkraal 53 HS; Portion 1 of the farm Roodekopjes 67 HS)
- Site 2
  - Site 2a (Portion 7 of the farm Bergvliet 65 HS; Portion 4 of the farm Rietpoort 83 HS; Werda 116 HS)
  - Site 2b (Portions 3 and 4 of the farm Rietpoort 83 HS and Werda 116 HS)
- Site 3
  - Site 3a (Portions 1, 2, 6, 10 and 11 of the farm Witkoppies 81 HS)
  - Site 3b (Portions 1, 5 and 6 of the farm Witkoppies 81 HS)
  - Site 3c (Portions 4, 5, 8, 9, 12, 13 and 14 of the farm Witkoppies HS)

- ***Other alternatives***

Alternatives relating to the CCGT power plant layout, technology selection, pipeline corridors as well as access roads and construction village positioning will be further assessed during the EIA phase.

3. APPROACH TO THE ENVIRONMENTAL SCOPING STUDY (ESS) AND PUBLIC PARTICIPATION PROCESS

- **Environmental Scoping Study**

The ESS aims to provide a description of how the environment may be affected by the development of the proposed project. Desktop studies making use of existing information, and ground-truthing during site visits, were used to highlight and assist in the identification of potential impacts (biophysical, social and economic) associated with the proposed project.

Additional issues for consideration have been extracted from feedback obtained from the public participation process, which commenced at the beginning of the Scoping phase, and will continue throughout the duration of the project. All issues identified during this phase of the study have been documented within this issues-based Environmental Scoping Report. Thus, this Environmental Scoping Report provides a record of all issues identified, and a preliminary evaluation of the significance of the issues in order to make recommendations regarding the project and further studies required to be undertaken within the EIA phase of the proposed project.

The Scoping Study aims to address the following:

- description of the sites selected for the proposed CCGT power plant and associated infrastructure;
- identification of potential positive and negative environmental (biophysical and social) impacts, and an evaluation of their significance in terms of the project;
- optimisation of positive impacts to the benefit of the local environment and community; and
- undertaking of a fully inclusive public participation process to ensure that Interested and Affected Party (I&AP) issues and concerns are recorded and form part of the scoping process.

As the proposed project includes a number of listed activities from Government Notices R386 and R387 of April 2006, a full Environmental Impact Assessment process is being undertaken in a two-phased approach:

- *Phase 1:* Environmental Scoping Study (ESS)
- *Phase 2:* Environmental Impact Assessment and Environmental Management Plan (EMP)

A number of specialist studies were conducted in order to comprehensively identify both potential positive and negative environmental impacts (biophysical, social and economic) associated with the project. These studies are presented in Table 1 below.

Table 1 Specialist studies conducted in the Environmental Scoping Study

Specialist Study	Organisation
Hydrogeology and Hydrology	SRK Consulting
Fauna and Flora	Bathusi Environmental Consulting
Air Quality	Bohlweki Environmental
Noise	Jongens Keet Associates
Social Environment	MasterQ Research
Heritage	National Cultural History Museum
Visual aspects and aesthetics	MetroGIS
Risk	Riscom
Traffic	SSI Engineers and Environmental Consultants

- ***Approach to Scoping Study in terms of Site Preference***

The evaluation and nomination of a potential site for the CCGT power plant involves an interdisciplinary approach. The approach undertaken has involved a wide range of specialist studies (hydrogeology, hydrology, biodiversity; air quality; noise; social; visual; heritage; risk and traffic) which examined a number of different issues. In order to evaluate sites and determine a preferred site/s, the studies need to be comparative and therefore a site rating matrix was developed. The site preference rating system is applied to each discipline, and the rating of each site was conducted according to the following system:

1 = not suitable for development (impact of very high significance - negative)
2 = not preferred (impact of high significance - negative)
3 = acceptable (impact of moderate significance - negative)
4 = preferred (impact of low or negligible significance - negative)
5 = ideal site for development, or positive impact

One of the outcomes of each specialist study was to have a Site Preference Rating, how they evaluated each site varied from discipline to discipline and the description of their specific approaches are outlined in each specialist report (refer Chapters 8 and 9).

The site preference results for each site from each specialist study were entered into a matrix and added together. The site with the highest value is then considered the most preferable.

The standard matrix as described above, gives equal importance to each variable. Therefore, a weighted matrix was also used. In a weighted matrix each variable is given a different importance weighting. Input from the project team and all specialists was utilised for the allocation of weightings to the different variables. Each member of the

The project team was asked to rank each variable according to their significance:

1 – low significance
2 – medium significance
3 – high significance

Once the average weighting for each variable was obtained, it was multiplied by the Site Preference Rating (SPR) to give a weighted SPR for each variable.

Table 2 (overleaf) was obtained after the above process was completed.

Table 2 Environmental and social criteria matrix

		Unweighted						Weighted					
	Weighting	**Site 1**	**Site 2a**	**Site 2b**	**Site 3a**	**Site 3b**	**Site 3c**	**Site 1**	**Site 2a**	**Site 2b**	**Site 3a**	**Site 3b**	**Site 3c**
Biophysical Criteria													
Hydrogeology	1.7	4	3	3	4	3	3	6.8	5.1	5.1	6.8	5.1	5.1
Hydrology	2	4	3	3	3	4	3	8	6	6	6	8	6
Flora	2	4	2	2	4	5	3	8	4	4	8	10	6
Fauna	2	3	1	1	3	5	3	6	2	2	6	10	6
Social Criteria													
Noise	1.8	3	2	2	3	3	3	5.4	3.6	3.6	5.4	5.4	5.4
Social	2.2	3	3	2	4	5	3	6.6	6.6	4.4	8.8	11	6.6
Visual	1.7	5	1	1	5	5	5	8.5	1.7	1.7	8.5	8.5	8.5
Heritage	1.2	3	3	3	3	3	3	3.6	3.6	3.6	3.6	3.6	3.6
Risk	2.3	3	3	3	3	3	3	6.9	6.9	6.9	6.9	6.9	6.9
Traffic	1.6	3	3	3	3	3	3	4.8	4.8	4.8	4.8	4.8	4.8
	Total Score	**35**	**24**	**23**	**35**	**39**	**32**	**64.6**	**44.3**	**42.1**	**64.8**	**73.3**	**58.9**

- **Public Participation Process**

A public participation process has been undertaken as part of the Scoping process, and involved the consultation of individuals throughout the broader study area representing a range of sectors of society. To date, this consultation has included telephonic consultations, a Focus Group Meeting and documentation distributed via mail, background information documents and via the printed media. Issues and concerns raised during the Scoping process thus far have been recorded and captured within an Issues Trail (Appendix D).

4. CONCLUSIONS AND RECOMMENDATIONS

Based on the specialist studies, no environmental fatal flaws have been identified as a result of the proposed project on any of the sites evaluated. However, a number of potentially significant environmental impacts have been identified that requires further in-depth study.

Therefore, an EIA is to be undertaken in order to provide an assessment of these potential impacts and recommend appropriate mitigation measures, where required.

In the consideration of the environmental, social and economic criteria along with the technical criteria, the nominated sites for further study within an environmental impact assessment would be:

- **Sites 1 (Portions 1, 3 and 7 of the farm Palmietspruit 68 HS; Portion 6 of the farm Strydkraal 53 HS; Portion 1 of the farm Roodekopjes 67 HS);**
- **Site 3a (Portions 1, 2, 6, 10 and 11 of the farm Witkoppies 81 HS); and**
- **Site 3b (Portions 1, 5 and 6 of the farm Witkoppies 81 HS).**

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GLOSSARY OF TERMS

Alternatives: means different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.

Ambient sound level or **ambient noise:** means the totally encompassing sound in a given situation at a given time, and usually composed of sound from many sources, both near and far. Note that ambient noise includes the noise from the noise source under investigation. The use of the word *ambient* should however always be clearly defined (compare with *residual noise*).

Combined Cycle Gas Turbine (CCGT): In a combined cycle power plant or CCGT plant, a gas turbine generator generates electricity and the waste heat is used to make steam to generate additional electricity via a steam turbine; this last step enhances the efficiency of electricity generation.

Cumulative impact: means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Direct dry cooling: In the direct system, steam from the last stage turbine blades is channelled directly into radiator-type heat exchangers adjacent to the turbine hall of the power station (there are no cooling towers.). The heat is conducted from the steam to the metal tubes of the exchanger. Air passing through the exchanger is supplied by a number of electrically driven fans. The air removes the heat, thus condensing the steam back into water which will be used once again to produce steam in the boiler.

Do-nothing alternative: The 'do-nothing' alternative is the option of not undertaking the proposed activity.

Environmental impact assessment, 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 as defined in NEMA.

Environmental Screening Study: An exercise to identify suitable areas within the study area that could accommodate the CCGT plant and to pro-actively identify sensitive areas that should ideally be avoided.

Gas turbine: The gas turbine (also called a combustion turbine) is a rotary engine that extracts energy from a flow of combustion gas and is the first stage in the process of producing electricity through the CCGT plant.

Indirect dry cooling: Indirect dry cooling systems have a condenser and turbine exhaust system as for wet systems, with the circulating water being passed through finned tubes in a natural draught cooling tower.

Interested and affected party: any person, group of persons or organisation interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

Outflow of labourers: Locals who secure employment with the contractors might also receive training, thereby enabling them to secure more permanent employment, which in turn might cause them to move out of the area and becoming part of the migrant labour force.

Phase 1 Archaeological Survey: Walk through the entire footprint of the preferred site/s and document any/all heritage resources that exist on the site/s.

Plan of study for environmental impact assessment: means a document which forms part of a scoping report and sets out how an environmental impact assessment must be conducted.

Public participation process: means a process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters.

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 categorised as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened.

Site preference ranking: The approach involved a wide range of specialist studies examining a number of different issues. In order to evaluate sites and determine a preferred site/s, the studies needed to be comparative and therefore a site rating matrix was developed. The site preference rating system is applied to each discipline, and the rating of each site was conducted according to the following system: 1 = not suitable for development (impact of very high significance - negative); 2 = not preferred (impact of high significance - negative); 3 = acceptable (impact of moderate significance - negative); 4 = preferred (impact of low or negligible significance - negative) and 5 = ideal site for development, or positive impact.

Underground coal gasification: UCG is a process carried out on “unminable” coal seams. These are coal seams that cannot be mined by using the conventional coal mining methods e.g. open cast or underground mining. UCG involves injecting steam and air (or oxygen) into a cavity created in an underground coal seam, to form a synthetic natural gas.

Unweighted matrix: Each variable is given the same importance weighting.

Vadose zone: The portion of Earth between the land surface and zone of saturation. It extends from the top of the ground surface to the water table.

Vulnerable (vegetation): Vegetation types that have lost up to 20% of their original extent, which could result in some ecosystem function being altered.

Weighted matrix: Each variable is given a different importance weighting.

ABBREVIATIONS AND ACRONYMS

CCGT	Combined cycle gas turbine
DEAT	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
ESS	Environmental Scoping Study
FGM	Focus Group Meeting
HRSG	Heat recovery steam generator
I&AP	Interested and Affected Party
IEP	Integrated Energy Planning
IEP	Integrated Energy Planning
ISEP	Integrated Strategic Electricity Plan
KSW	Key Stakeholder Workshop
MDALA	Mpumalanga Department of Agriculture and Land Administration
NEMA	National Environmental Management Act (Act No 107 of 1998)
NERSA	National Energy Regulator of South Africa
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act (Act No 25 of 1999)
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
UCG	Underground coal gasification