AFRICAN DEVELOPMENT BANK

EXECUTIVE SUMMARY

Of

SOUTH AFRICA: ENVIRONMENTAL IMPACT ASSESSMENT FOR THE MEDUPI POWER PLANT PROJECT OF ESKOM

1 July 2009

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1. Introduction

In order to meet the objectives as set out in the South African Energy Policy as well as to meet developmental and socio-economic objectives in South Africa, the country needs to optimally use the available energy resources. Eskom is required to respond to the longer term growing electricity demand of approximately 3% per annum.

The construction of a Medupi coal-fired power station in the Lephalale (previously Ellisras) area was identified as the most favored feasible option for the first new power station, that is proposed to operate at an installed capacity of approximately 4,800 MW.

The following presents a summary of the ESIA of the MEDUPI power station project. Its contents include: i) Project Description, (ii) Policy Legal and Administrative framework, (iii) The need and justification of the Project, (iv) Project Alternatives, (v) Description of the Project Environment, (vi) Potential Impacts and Mitigation, (vii) Public Consultations and Disclosure, (viii) Environmental & Social Management and Monitoring plans (ix) Environmental Enhancement & Complementary Initiatives, (x) Conclusion and (xi) References.

2. Project Description

The Power Station is proposed to ultimately have a maximum installed capacity of up to 4800 MW (6 x 800 MW units). The power plant and associated plant (terrace area) would require an area of approximately 700 ha, and an additional estimated 500 - 1000 ha would be required for ancillary services, including ash disposal facilities (alternate ash disposal options are, however, currently being investigated).

The proposed power station will utilize a range of technologies pertaining to cooling, combustion and pollution abatement. The proposed power station will be a dry-cooled station. The use of dry-cooled technology is necessitated as a result of South Africa being a water scarce country and limited water availability in the area. The power station would be a zero liquid effluent discharge station, particulate emissions will be less than 50mg/Sm^3 and due to the relatively low sulphur content of the coal and local air quality sulfur dioxide emissions will not have a significant impact on health. The plant will be Flue Gas Desulphurization (FGD) ready, a decision and timing for retrofitting the power station with FGD will be based on ambient air quality monitoring results, South African regulations including proposed emission limits and water availability.

The power station will source coal from the local coalfields, and it would be delivered to the power station via conveyor belts. The coal to Medupi will be supplied through a brownfields expansion of Grootegeluk mine with mining from the existing opencast pit continuing at an accelerated rate. The coal beneficiation process will be handled via two new dense medium facilities (Grootegeluk 7 and Grootegeluk 8 beneficiation plants) which will be constructed at the mine. The Environmental Impact Assessment for the coal mine and transmission lines have been completed in separate EIA processes[1].

[1] The ESIA for the Transmission lines (not part of the project) is a separate process and has been completed and received the approval of the Department of Environment and Tourism (DEAT).

All Eskom's existing operational coal-fired power stations utilize pulverized fuel technology (PF). The specific technology employed in the Medupi power plant would be super critical boilers which would heat water to produce steam within a pressure and temperature range of 24-30 MPa and 538^0C – 600^0C respectively. The plant will be dry cooled and installed with low NOx burners and pulse jet fabric filters.

The proposed power station would be similar to the existing Matimba Power Station in terms of operation, design and dimensions. The power station structure would be approximately 130 m high and approximately 500 m wide. The required stacks would be approximately 220 m in height. Direct-cooling technology will be applied; hence no cooling towers will be constructed. Other related infrastructure would include a coal stockpile, conveyor belts, and an ash dump, with infrastructure such as transmission lines being planned to integrate the station into the national electricity grid. Annex 1 illustrates the plant location while Annex 2 shows the plant layout.

3. Policy, legal and administrative framework

According to AfDB environmental and social assessment procedures, this project is assigned Category 1. The ESIA conforms to the Environmental and Social Assessment Procedures (ESAP, 2001) of the African Development Bank and the World Bank 1998 Pollution Prevention and Abatement Handbook (PPAH, 1998).

In terms of the Environmental and Social Impact Assessment (ESIA) Regulations published in terms of the Environment Conservation Act (No 73 of 1989), Eskom Holdings Limited requires authorization from the National Department of Environmental Affairs and Tourism (DEAT) in consultation with the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) for the undertaking of the proposed project. In order to obtain authorization for this project, comprehensive, independent environmental studies have been undertaken in accordance with the ESIA Regulations.

An ESIA process for the proposed coal-fired power station and ancillary infrastructure has been undertaken in accordance with the requirements of all relevant South African legislation including *inter alia*, those of:

- Environment Conservation Act (No 73 of 1989);
- National Environmental Management Act (No 107 of 1998);
- National Water Act (No 36 of 1998);
- National Heritage Resources Act (No 25 of 1999);
- Occupational Health and Safety Act (No 85 of 93);
- Atmospheric Pollution Prevention Act (No 45 of 1965);
- National Environmental Management: Air Quality Act 39 of 2004;
- White Paper on Energy Policy, GN 3007, 17/12/1998;
- South Africa had its Long Term Mitigation Strategy (LTMS) on Climate Change approved by the South African cabinet in 2008;
- The March 2009 Climate Change Summit laid the foundation for a participatory process to shape the way South Africans respond to climate change following;
- The South African government has started drafting its policy framework for climate change;

• White Paper on Integrated Pollution and Waste Management for South Africa (January 2000); and
• National Waste Management Strategy documents (October 1999).

It is noted that Provisional ambient air quality limits for South Africa were published in Schedule 2 of the National Environmental Management: Air Quality Act. Draft ambient air quality standards which will replace the provisional limits were published for public comment in March 2009, and should be legislated later in 2009. South African ambient air quality limits are similar to those in the EU and the WHO Guidelines

The environmental studies (Ref 1,2, and 3)followed a two-phased approach in accordance with the ESIA Regulations published in terms of the Environment Conservation Act (No 73 of 1989) i.e.:
• Phase 1: Environmental Scoping Study
• Phase 2: Environmental Impact Assessment (EIA)

No fatal flaws were identified since the impacts can be mitigated to acceptable levels. The DEAT has granted to Eskom the Record of Decision (ROD) which is like an environmental permit.

4. The Need and Justification for the Proposed Project

Policy Considerations and Strategic Planning
The South African Energy Policy, published in December 1998 by the Department of Minerals and Energy (DME) identifies five key objectives, namely:

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

In order to meet these objectives and the developmental and socio-economic objectives in South Africa, the country needs to optimally use the available energy resources. The South African Government, through the Department of Minerals and Energy (DME), the National Electricity Regulator (NER) and Eskom are required to address what can be done to meet these electricity needs both in the short- and long-term.

Growth in electricity demand and reduction in surplus capacity
The demand for electricity in South Africa has grown, on average, at more than 4% up until 2008, with a concomitant reduction in the surplus generating capacity. The DME, NERSA and Eskom planning processes all indicate that South Africa will require an additional 5 000 MW of electricity within the next 5 years, with this consisting of both base load electricity generating capacity and peaking electricity generating capacity. The processes also indicate that new base load capacity will be required by approximately 2010. In 2004, the South African Cabinet took the decision that Eskom will build approximately 70% of the new capacity required in South Africa. The balance is expected to come from Independent Power Producers (IPPs).

For base load capacity, the selection of the preferred alternative from those being investigated is required as a matter of urgency to enable the first unit of the chosen plant to be commissioned in 2010, however the first unit of Medupi power station will only be commissioned in 2012. Eskom will be required to continue meeting the demand with very low reserve margins.

The outcomes of the Integrated Energy Planning (IEP), National Integrated Resource Planning (NIRP) and Integrated Strategic Electricity Plan (ISEP) planning processes identified that South Africa will be dependant on coal as a primary energy source for electricity generation for many years into the future. With the current production levels, coal reserves are estimated at 200 years (Chamber of Mines, 2002; cited in Eskom Research Report, 2002). The NER drew the following conclusion in their National Integrated Resource Plan (NIRP) (reference NER NIRP2 available from the NER website www.ner.org.za): *"Options for diversification are insufficient to meet all of the forecast demand for electricity over the next 20-year planning horizon. Coal-fired options are still required for expansion during this period."*

5. Project Alternatives

The 'Do Nothing' Alternative

The 'do-nothing' alternative is the option of not establishing a new coal-fired power station at a site in Lephalale, Limpopo Province. South Africa was expected to require additional peaking capacity by 2007, and base-load capacity by 2010, depending on the average growth rate. This has put pressure on the existing installed capacity to be able to meet the energy demands into the future. The 'do nothing' option will, therefore, result in these electricity demands not being met in the short-term.

Without the implementation of this project, the electricity network will not be able to function at full capacity, and the greater power supply will be compromised in the near future. This has potentially significant negative impacts on economic growth and social well-being. Therefore, the no-go option is not considered as a feasible option on this proposed project

Location Alternatives for the Establishment of a New Coal-fired

Local site alternatives

A strategic analysis was undertaken by Eskom in order to identify feasible alternative sites for the establishment of the proposed new power station (terrace) and associated infrastructure within the Lephalale area. This analysis considered technical, economic and environmental criteria. From a high-level screening study undertaken in 1998, it was concluded that there was the potential to establish a new power station in close proximity to the existing Matimba Power Station. In order to minimize the technical and environmental costs associated with the transportation of the fuel source to the power station, it was determined that the most feasible sites would be close to the existing Grootegeluk Mine.

Technology selection process and criteria

• *Sub-critical vs Super-critical*

The feasibility phase of the project considered both sub- and super-critical pulverized fuel technologies for implementation. Through the technical and financial evaluation processes followed during the feasibility phase, it emerged that the **super-critical**

option is the preferred technology solution. The term “super-critical” refers to the critical transition point of water to steam at pressures over 22 MPa. Super-critical units typically refer to main steam conditions of 24 to 30 MPa and 538 to 600ºC, with a single reheat stage at 566 to 600ºC. The super-critical boiler is a once through design which (with sliding pressure) means that heating, evaporating, and super-heating of the incoming feed water are completed within a single pass through the evaporator tubes and therefore does not require the use of a steam drum to separate and re-circulate water during normal operation. This technology provides improved cycle efficiency and hence improved environmental performance.

The benefits of super-critical technology are:

- Increased gross efficiencies. This increase in efficiency results in a reduction in coal consumption of approximately 5%.
- A reduction in emissions in the order of 5%.
- Super-critical plant performance in terms of availability indicators is comparable to that of current Eskom plant performance according to a VGB report "Availability of Thermal Power Plants" for the operation period from 1995-2004.

Other alternatives studied included the *cooling technology options, the size of the generating units, road and Conveyor belt alternatives, water supply pipeline, and ash disposal Alternatives.*

Related to ash disposal alternatives, the ESIA evaluated the impacts associated with two ash disposal options, in pit ashing into the mine and on surface disposal. The evaluation of these options recommended that on surface ashing was the preferred option. The potential impact of on surface and groundwater are evaluated further in the Integrated Water Use License (IWULA) The IWULA requires that the on surface ash dump is lined.

6. Description of Project Environment

Water Resources

Surface Water

The study area falls within the Mokolo River Catchment, which drains into the Limpopo River to the north. The Mokolo River catchment covers an area of 8,387 km2. The catchment stretches from the Waterberg Mountains though the upper reaches of the Sand River, and includes the Mokolo Dam and a number of small tributaries that join the main Mokolo River up to its confluence with the Limpopo River. The topography of the area is flat, varying between 900 and 922 meters above sea level (mamsl). The general topographical drainage system is poorly developed and drains in an easterly direction towards the Mogol River (810 mamsl).

Groundwater

The groundwater potential of the formations located in the study area is limited in their pristine state due to low permeability, storage, and transmissivity. There are no artesian boreholes located within the study area. No large-scale groundwater abstraction occurs in the study area, even along the numerous faults.

Water Users

Currently, water use in the catchment broadly comprises:

- 87% for agricultural activities.
- 13% for the industrial, mining, power generation and domestic water supply service sectors (municipalities).

According to the Internal Strategic Perspective (Report WMA 01/000/00/0304 available at www.dwaf.gov.za/documents) presently, water availability and water use in the catchment are in balance. It is anticipated that water demand will increase with new developments proposed in the Mokolo Catchment, such as new or expanded mining activities, new power stations and other developments.

Ecology and Biodiversity

Vegetation types that occur in the study area include:

- Mixed Bushveld, as is deduced from the name, represents a great variety of plant communities, with many variations and transitions. The vegetation varies from a dense, short bushveld to a rather open tree savanna.
- Sweet Bushveld occurs on fertile soils in the dry and hot valleys of the Limpopo River and the thorny, small-leaved vegetation is dominated by *Acacia* species that increase to dense, impenetrable thickets at the expense of the grass layer when over-utilised
- Waterberg Moist Mountain Bushveld (or "sour bushveld) is a typical example of moist, infertile savanna with a high proportion of unpalatable grasses, on the sandstone and quartzite of the Waterberg Mountains.

All three of the above vegetation types form part of the Savanna Biome. The Savanna Biome is the largest biome in Southern Africa, occupying over one third of the area of South Africa. A major factor delimiting the biome is the lack of sufficient rainfall which prevents the upper layer from dominating, coupled with fires and grazing, which keep the grass layer dominant.

The savanna biome is populated by a greater diversity of bird species than any other biome in South Africa. Much of the area is used for game farming and big game hunting, illustrating that utilization and conservation of an area are not mutually exclusive. The savanna biome is the core of the wildlife, ecotourism and meat-production industries. Threats include rapidly expanding development of settlements for impoverished human populations and the associated need for firewood and building materials, diminishing water supply, agriculture and overgrazing The savanna of South Africa includes numerous animal species; approximately 167 mammals (15% endemism), 532 birds (15% endemism), 161 reptiles (40% endemism), 57 amphibians (18% endemism) and an unknown number of invertebrates. Flagship species include the Starburst Horned Baboon Spider, ground Hornbill, Cape Griffon, Wild dog, Short-Eared Trident Bat and the White Rhinoceros..

Social Environment

The study area is situated approximately 20 km west of Lephalale in the Limpopo Province. The Lephalale Local Municipality covers an area of 19 605 square kilometres (km2), and consists of 11 wards. The study area comprises three wards:

- Ward 2, which has an area of 77 km2, and includes Grootegeluk Mine and the township of Maropong;

- Ward 3, a much larger ward directly to the south of Ward 2, with an area of 2 047 km2. Onverwacht, a residential area to the west of the town of Lephalale, lies in Ward 3; and
- Ward 4, which has an area of 16 km2 metres and comprises the town of Lephalale (formerly Ellisras).

Land Use

Principle land uses in the study area include:

- Agricultural land devoted mainly to game and cattle farming.
- Residential and industrial areas – i.e. Onverwacht, the town of Lephalale, and Maropong. Plans have been made to expand Maropong towards the east.
- Grootegeluk Mine, which is owned by Kumba Resources Pty Ltd.
- The existing Matimba Power Station.
- Game farms and lodges including the Ferroland Private Game Reserve.
- Sewage works on the farms Zongezien and Nelsonskop.

Population

The total population of Lephalale Local Municipality is in the order of 100 000. About 3% of this population (3000 people) live in the town of Lephalale. Ward 2 (Maropong), with a population of about 6000, accounts for 6% of the total population of the municipal area, while Ward 3 (with 10 000) people accounts for a further 10%. The average population density of Ward 3 (at 5 people per km2) is similar to that of Lephalale Local Municipality as a whole. By contrast, Ward 2 is more densely populated at about 75 people per km2, while the town of Lephalale is still more densely populated (about 180 people per km2). About 90% of the population of Lephalale Local Municipality is African, with the remainder made up almost exclusively of Whites.

Employment

• *Unemployment rates*

The unemployment rate in Lephalale Local Municipality is in the order of 20%. This figure is higher in Maropong, where roughly one-third of the workforce is unemployed. In Ward 3 the unemployment rate is about 10%, while in the town of Lephalale it is less than 5%.

• *Sectoral employment*

In Lephalale Local Municipality, agriculture is the largest source of employment, with one-third of the active labour force employed in this sector. In Maropong, mining is the largest source of employment (40%). In the town of Lephalale, the largest source of employment is the Community/Social/Personal Services sector (30%). Game farming constitutes an important economic activity on many of the farms surrounding the study area (including those in Ward 3).

Income

Limpopo Province is one of the poorest provinces in the Republic of South Africa. Poverty is also a widespread problem in Lephalale Local Municipality: roughly 20% of households report not earning any income, while an additional 45% of households earn less than R800 per month.

Housing

In Lephalale Local Municipality, 80% of households live in formal dwellings, while roughly equal proportions of the remainder live either in traditional or informal dwellings.

Services

• *Access to electricity*
Approximately 70% of households in Lephalale Local Municipality have electricity for household lighting, while the remainder use candles. In Ward 2 (Maropong), this figure is slightly higher (75%), and in Ward 3 it is still higher (85%). Virtually all households in the town of Lephalale have access to electricity.
• *Water and sanitation*
A very high percentage of communities in Limpopo Province are still below 50% of RDP standards in terms of water supply. In Lephalale Local Municipality, one-third of households do not have access to water in the dwelling or yard, but are required to make use of community standpipes. In Maropong, this figure is somewhat lower at 15% .In Ward 3 and the town of Lephalale, approximately 75% of households have access to water inside their dwelling, while 20% have a tap in the yard.

A similar pattern emerges with regard to sanitation services. In Lephalale Local Municipality, 20% of households have no access to sanitation services, 50% make use of pit latrines, while 30% have flush toilets. In Maropong and the town of Lephalale, virtually all households have flush toilets. In Ward 3, 85% of households have flush toilets, 5% make use of pit latrines, and slightly less than 10% have no access to sanitation services.

7. Potential Impacts and Mitigation Measures

Specialist studies were undertaken for environmental and social impact identification and proposal of mitigation measures.

The major environmental impacts associated with the proposed project as discussed in the ESIA include:

- Potential impacts on air quality and human health as a result of emissions from the facility.
- Potential impacts on surface and groundwater resources as a result of the proposed project.
- Potential visual impacts associated with the proposed project and associated impacts on tourism potential.
- Potential noise impacts.
- Potential impacts on heritage sites.
- Potential impacts associated with the transportation of components during construction and fuel during operation.
- Potential impacts on flora, fauna and ecology.
- Potential impacts on soils and agricultural potential
- Potential social impacts.

Ambient Air Quality Impacts and Cumulative Impacts Analysis
Primary impacts on air quality will arise from emission of Sulphur Dioxide (SO_2), Nitrous Oxide (NO and NO_2) and Particulate matters including dust (PM10). Various abatement technologies would be implemented to achieve the required control efficiencies. This plant is FGD ready and has been designed for wet FGD with control efficiencies of more than 90%.

Atmospheric dispersion modeling was undertaken for the proposed Matimba Power Station using the CALPUFF modeling suite recommended for regulatory use by the US-EPA for complex terrain environments and regional-scale modeling domains.

NO and NO_2 concentrations were predicted to be well within local and international air quality limits. Predicted PM10 concentrations were within the SA daily and annual standards but exceeded the SANS and EC limit values in the immediate vicinity of the ash dump at Zwartwater. Public exposure within this area is not expected to be significant.

Maximum monthly **dustfall** rates were typically "moderate" (i.e. 250 – 500 mg/m²/day) immediately downwind of the Zwartwater ash dump and materials handling section of the power station, with "slight" dustfalls (i.e.< 250 mg/m²/day) occurring beyond these areas.

Local and international air quality limits given for **SO_2** were predicted to be exceeded for hourly and daily averaging periods within the zone of maximum impact (i.e. southwest of the Matimba Power Station). The hourly limit value was also predicted to be exceeded infrequently within the residential area of Marapong and along the western boundaries of Onverwacht (with no excesses predicted for central Onverwacht).

All local and international air quality limit values for sulphur dioxide considered are exceeded for hourly and daily averaging periods within the maximum impact zone of the power station. This impact zone is however located to the southwest of the power station where residential settlement is currently restricted to scattered farmsteads. Within the residential areas of Marapong and Onverwacht predicted sulphur dioxide concentrations comply with UK and World Bank limits, despite exceeding EC, SA and Australian limits.

Taking into account the likelihood of exceeding SO_2 thresholds and the potential for exposure given the number of persons residing in the area, it may be concluded that little potential exists for vegetation damage, significant corrosion and health effects due to SO_2 levels. The potential for infrequent mild respiratory effects occurring in the Marapong area was classified as "moderate" given that the threshold associated with the potential for such effects was exceeded four times per year in this area which has a population of ~17000 people.

The need for and required control efficiency of abatement measures was assessed on the basis of avoiding any significant increment in non-compliance as previously defined or health risks, on the bases of ambient concentrations predicted by the dispersion model. The aim was to identify SO_2 control efficiencies at which there will be:

- No substantial changes in the magnitude, frequency or spatial extent of non-compliance; and
- No significant increment in the health risk within dense neighboring settlement areas.

The implementation of SO_2 abatement measures comprising a 80% plus for a 4800 MW station would not increase the frequency of exceedance of this health threshold above baseline levels. In the event that six units were to be installed - regardless of whether or not these units are to be phased in or not – a control efficiency in excess of 80% would be required for all six units to prevent increments in health risk potentials above baseline conditions.

Mercury Emissions

The potential for health risks associated with long-term public exposures to mercury emissions from coincident operations of the existing Matimba and proposed 4800 MW Power Station are predicted to be low even given the potential for multi-pathway exposures. The implementation of very costly mitigation measures exclusively for the reduction of mercury emissions appears unjustified given this finding. It is however noted that the implementation of certain control measures intended to reduce particulate, sulphur dioxide and nitrogen oxide emissions may control mercury emissions to some extent, thus offering additional motivation for the implementation of such measures (inline with the precautionary principle).

Groundwater Quality

No major impacts anticipated as water usage for the power plant is reduced from approximately 2.0 to approximately 0.1 – 0.2 litres per kWh of electricity sent out by using either one of two different non-evaporative cooling techniques: indirect cooling with dry-cooled heat exchangers within a conventional natural draught tower, and direct dry-cooled condensing heat exchangers installed above forced draught fans, situated just outside the power station's turbine generator hall.

A monitoring program for surface and groundwater quality and levels would be established on the site selected for development. A water use or water wastage minimization plan will be implemented. It will include:

• The Monitoring groundwater quality and water levels; and monitoring neighboring boreholes.
• Surface water controls to be installed and maintained.
• Monitoring the water quality used for irrigation.
• Monitoring groundwater levels and quality.
• Implementing a water use or water wastage minimization plan.

Fauna and Flora

Since the entire area will be developed there are few mitigation measures that can be recommended that will ameliorate potential impacts associated with the footprint of the facility. Faunal species generally move away from areas of high activity by themselves and repopulate surrounding areas of suitable habitat. General recommendations related to the fauna and flora have been developed including removing, relocation, preservation of some species, prevention of accidental fires, control of invasive plants, etc.

• remove, relocate, protect and utilize as many of the other protected tree species on site as possible, preserving existing integrity of surrounding natural vegetation;
• contain all construction and operational activities within the boundaries of the specified areas;
• utilise trees that normally grow to extensive heights for screening effects;

•contain human movement and activities within the construction camp, prevent peripheral impacts on surrounding natural habitat;
• an alien specie control and monitoring program must be developed starting during the construction phase and to be carried over into the operational phase.

Visual/Aesthetic Impacts

The vegetation cover of this region is possibly the single most sensitive element associated with the construction and operation of the Matimba B coal-fired power station, and should be seen as a critical component in the mitigation of the visual impact. The professional services of a landscape architect would be acquired in order to create a master plan for the detailed design and placement of, firstly the power station, and secondly the ancillary infrastructure. Green buffer zones should be reserved or created and maintained at critical areas surrounding the facilities. The removal and clearing of natural vegetation would be limited to the bare minimum and should not be undertaken without proper planning and delineation.

Tourism

The proposed power station development will not adversely affect the existing overall tourism industry in the area. In contrast, we have found that it could potentially increase tourism numbers to the area (albeit in the form of business tourism) as well as broadening the profile of the area as a unique ecotourism area. Specific recommendations have been made to the tourism industry including addressing the loss of land to be experienced by the Ferroland reserve and the marketing of existing ecotorourism venues in Lephalale.

Heritage sites

- Based on what was found and its evaluation, it is recommended that the proposed development can continue, on condition that cemeteries are as much as possible avoided and that archaelogical sites exposed during construction work are immediately reported to a museum for investigation and evaluation of the finds

Traffic Impacts

It is recommended that the Abnormal Load Permit for the Transport of the component parts of the proposed Power Station be scheduled for three months prior to the ordering of the components so that the best port of destination can be specified. It is recommended that the effect on pavement loading and subsequent advance of any road rehabilitation program should be mitigated after completion of construction. Such mitigation and associated costs would need to be discussed between Eskom and the provincial roads authority. Agreement would need to be reached regarding mandates and responsibility for the roads rehabilitation program for 20km of Road D1675 (Lephalale to Matimba B) and Road D2001 from D1675 to the Marapong turnoff. In the event that Flue Gas Desulphurisation is accepted as an appropriate abatement technology, it is recommended that a detailed evaluation be undertaken for the transport of Flue Gas Desulphurisation raw material supply to optimize the placement of infrastructure and minimize operations costs.

Noise Impacts

Potential noise mitigating measures for the project were assessed.

- In general operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).

- Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.
- In addition, local residents are to be notified of any potentially noisy field survey works or other works during the planning and design phases.

• *Operational Phase*

The following noise mitigating measures, which will need to be considered where appropriate, are preliminary indicators that may assist further in the selection of the best alternative site:

- The design of the new power station is to incorporate all the necessary acoustic design aspects required in order that the overall generated noise level from the new installation does not exceed a maximum equivalent continuous day/night rating level (LRdn), namely a noise level of 70dBA (just inside the *property projection plane*, namely the property boundary) as specified for industrial districts in SANS 10103. Refer to Appendix A in the ESIA report.

Soils and Agricultural Potential

Due to the fact the establishment of an ash dump and power station will involve permanent loss of the soil resource, it is recommended that the topsoil (approximately 300-400 mm) be removed and stored prior to construction. In this way, the soil will be available elsewhere at a later date for rehabilitation purposes. There is not a significant difference between the topsoil and subsoil, so if some mixing occurs, it should not be significant. Erodibility is not a problem in flat areas, such as the existing terrain, but if the stored topsoil were to be used for rehabilitation in sloping areas (for example on the sides of the ash dump), appropriate mitigation measures would be implemented to ensure that erosion does not occur.

Social Impacts and Project Benefits

Assessment of social impacts

The social impacts tentatively identified during the scoping study and earmarked for further investigation included the following:

- *Creation of employment opportunities.* It was determined that the proposed power station would lead to the creation of a number of job opportunities, both during its construction and operation.
- *Impacts on the local municipality.* It was determined during the scoping study that the power station would bring about a significant increase in the demand for housing and infrastructure in the surrounding area. This increase would have a substantial impact on the local municipality.
- *Impacts on public safety and daily movement patterns.* It was determined that the construction and operation of the power station are likely to result in an increase in traffic volumes. This could lead to damage of local roads and increased speeding through town, thereby impacting on the safety and daily movement patterns of residents in surrounding communities.
- *Social investment and infrastructural improvements.* Social investment initiatives by Eskom, as well as by Kumba Resources now named Exxaro, could have significant positive impacts on surrounding communities. Such initiatives could include upgrading of existing infrastructure such as services.
- *Impacts on owners and residents of surrounding farms.* It was determined that the power station could impact on surrounding communities' way of life and on the area's sense of place. This, in turn, could have a negative effect on

property values and on the attractiveness of the area as a destination for hunters and tourists.

- *Relocation of households.* It was determined that the construction of the power station might necessitate the relocation of certain farm residents on farms purchased by Eskom for the proposed power station.
- *Influx of job seekers.* Because of high unemployment rates in the region, it is possible that news of the proposed development could lead to an influx of job seekers into the area.
- *Possible conflict between local residents and newcomers.* If construction workers are not sourced locally, but are housed close to the site, this may give rise to conflict between local residents and newcomers. If the area experiences an influx of job seekers, competition over scarce employment opportunities may also lead to conflict with locals.
- *Impacts on the residents of Marapong.* It was determined during the scoping study that, if the proposed power station were to be located on one of the northern sites (Nelsonskop or Appelvlakte), the residents of Marapong might suffer significant negative effects in terms of changes in air quality, noise pollution and the like.

Relocation of households

The farm Naauwontkomen (the selected site for the proposed power station) was owned by Kumba Resources (Exxaro) and has been purchased by Eskom. No relocations were required as there were no people living on the farm at the time of purchase. The neighboring farm Eenzaamheid (the selected site for the ash dump) was owned by Mr J. J. Thuynsma, and there was one full-time worker residing on the farm when purchased by Eskom. it was agreed that the aforementioned farm worker will continue to be in his employ and be relocated at Mr Thuynsma's expense to one of his other properties.

The farm Kromdraai, directly to the south of Eenzaamheid, was owned by Noordgrond Eiendomme, duly represented by Mr L. Steyn, which property was purchased by Eskom. No labourers or any other occupiers resided on the farm at the time of purchase and therefore no relocations were required with respect to the property.

The ESIA indicated that, many of the negative impacts are anticipated to respond favourably to mitigation measures, whereas some of the positive impacts (e.g. maximisation of employment opportunities for members of local communities) can be optimised. Mitigation measures implemented during the project are to be informed by the suggestions made in the environmental impact report, formalised in the Environmental and Social Management Plan (ESMP) and subjected to a mitigation and monitoring process throughout the construction and operational phases.

8. Public Consultations and Disclosures

The Interested and Affected Parties (I&APs) had an opportunity at various stages throughout the ESIA process to be informed about the proposed project and to provide input into the consideration of a decision. Public participation during the Scoping Phase was comprehensive and comprised advertising in national, regional and local newspapers, subsequent notifications in regional and local newspapers,

holding several key stakeholder meetings, distributing a Background Information Document and two subsequent revisions, A series of information letters, holding two sessions of public forums at three venues in the area and capturing all the responses received in two Issues Trails. The next stage of the public participation process involved the lodging of the draft ESIA Report in public libraries, municipal offices and on the Internet, and hosting another round of public meetings. The purpose of the public meetings was to present the findings of the draft ESIA and to provide an opportunity for I&APs to comment on these findings. In general the public is highly supportive of the project with expectation of benefits from additional employment during the construction and operation phases. Below is a chronology of key events:

3 October 2005	Draft Scoping Report Issued to Public for Comment
3/10/2005 – 1/11/2005	Public Participation Process
18 November 2005	Final Scoping Report issued to DEAT
February 2006	Acceptance from DEAT issued
23 march 2006	Draft Environmental Impact Report issued to Public for Comment
23/03/2006 – 18/04/2005	Public Participation Process
22 May 2006	Final Environmental Impact Report Issued to DEAT
4 May 2007	Record of Decision Issued After Appeals Received.

During the public participation process, several of the inhabitants and owners of surrounding farms raised concerns that the proposed power station may bring about an increase in air and noise pollution, and that this may impact on their health.

The extent to which people's quality of life is affected by the new power station will depend on their proximity to it. It is assumed that the closest landowners and communities will be most affected. An additional factor to be taken into consideration is the fact that the selected farms (Naauwontkomen and Eenzaamheid) are relatively remote from other major infrastructure developments. The proposed power station and ancillary infrastructure will therefore constitute a significant change in the immediate landscape – a fact that will add to the significance of the project's impact on the landscape's sense of place.

9. Environmental and Social Management Plans and Monitoring Plans

The implementation of ESMP's for all life cycle phases (i.e. construction, operation and de-commissioning) of the proposed project will be a key in achieving the appropriate environmental management standards as detailed for this project.

The process of communication and consultation with the community representatives will be maintained as part of the ESMP process, and, in particular, during the construction phase associated with the proposed project. The issues raised regarding air quality and water use and potential pollution were considered by DWAF and DEAT in the respective application for licenses.

No environmental fatal flaws were identified through the EIA process to be associated with the operation and maintenance of the Medupi Power Station. However, a

number of potential impacts requiring management and mitigation were identified. These include:

» Impacts on air quality and human health as a result of emissions to air from the facility.
» Impacts on surface and groundwater resources as a result of the operation of the power station.
» Visual impacts.
» Noise impacts.
» Social impacts.

Mitigation measures required to be implemented in order to minimize the above identified impacts were detailed within the ESIA Report. Environmental specifications (i.e. principles of environmental management for the operation and maintenance of the Medupi Power Station) and procedures necessary for Eskom to achieve environmental compliance during the operation and maintenance of the Medupi Power Station are detailed within this section of the ESMP.

Organizational Structure and Responsibility

The Project Manager: Medupi Power Station will:

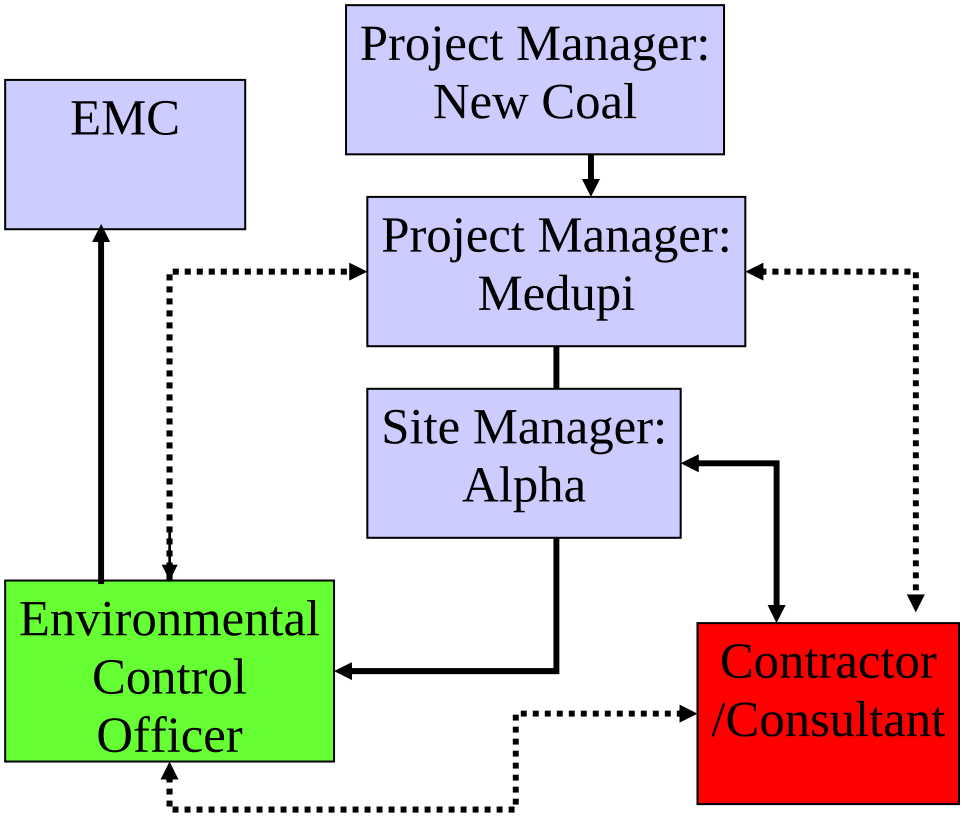
- Ensure that Eskom and the Contractor are aware of all specifications, legal constraints and Eskom standards and procedures pertaining to the project specifically with regards to the environment.
- Ensure that all stipulations within the ESMP are communicated and adhered to by Eskom and its Contractor(s).
- Monitor the implementation of the ESMP throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
    - Be fully conversant with the ESIA for the project, the conditions of the Record of Decision (ROD), and all relevant environmental legislation.

Functions and Responsibilities for the Construction Phase

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager: Site Manager: Medupi Power Station and Environmental Control Officer for the construction phase of this project are documented and communicated with all employees. The Environmental Control Officer is independent and reports to an Environmental Management Committee. The Environmental Management Committee consists of representatives of local communities, local municipality and an ecologist. There is a team of environmental

managers on site some accountable for the overall project while others are appointed by contractors to ensure compliance with the Environmental Management Plan.

The Environmental Control Officer completes monthly compliance reports which are submitted directly to DEAT. Further audits are carried out every six months by an external independent auditor. These audit reports are submitted to DEAT.



Approximate costs

The cost of monitoring and compliance is approximately R14m per annum including contractors. This cost is essentially made up of the labour component of the environmental officers and does not include any outsourced services for consultancy, monitoring services or the internal cost of building environmental facilities such as ambient monitoring station, dust monitoring, installation of bunds, drainage systems around wash bays etc.

10. Environmental Enhancement & Complimentary Initiatives

Eskom is committed to reducing greenhouse gas (GHG) emissions through a strategy that includes:

- Diversification of the generation mix to lower-carbon emitting technologies such as wind, solar, solar water heaters, electric cars, clean coal, etc
- Energy efficiency measures to reduce demand of GHG and other emissions
- Adaptation to the negative impacts of climate change, e.g using dry cooling to reduce water usage by 90% in coal power plants
- Innovation through research, demonstration and development e.g in the carbon capture and storage, integrated coal gasification combined cycle, .
- Investment through carbon market mechanism to participate in the clean development mechanism (CDM).
- Progress through advocacy, partnerships and collaboration

Furthermore, the Eskom Development Foundation has become involved in the area. The Eskom Development Foundation, is an independent Section 21 company, which incorporates and integrates Eskom's social responsibility initiatives. The Development Foundation provides grants for economic development as well as donations for social projects/programs. Its Mission is to contribute towards the improvement of the quality of life of previously disadvantaged South African citizens through integrated, efficient and effective social investment programmes.

Eskom has partnered with various other stakeholders in the region to improve the quality of life for various disadvantaged communities. These interventions are listed in the table below

Province	**Project**	**Description**	**Scope of Eskom Intervention**	**Amount**	**No. of Benefactors**
Limpopo - Lephalale	Intel/Foundation Classroom Computers	Partnership with Intel to install classmate computers in primary schools around Lephahalale	The Foundation covers the cost for the servers, teacher laptops, printers, wireless access points, hubs, cabling, classmate laptop charging trolleys, software licences for 5 years, education content training	R323 712,12	1714
Limpopo – Lephalale	Primary Schools Education Programme (NUMERACY)	Numeracy and Mathematics enhancement programme for primary schools	Numeracy and mathematics enhancement programme for primary schools	2458067.51	8000
Limpopo – Lephalale	Primary Schools Education Programme (LITERACY)	Primary school language, literacy and communication	Primary school language, literacy and communication programme in 27 primary schools - 3 years	2411943.48	8 000
Limpopo – Lephalale	School governance and Leadership	School governance & leadership programme	School governance and leadership programme	3375127	307
Limpopo – Lephalale	Limpopo (Lephalale	Contractor academy	Contractor training for 28 Medupi	2300091	28

			emerging Contractors		
Total				R 10,868,941.11	18049

Medupi is an R100b project in cost which is 4X times larger than Gautrain and South Africa's largest construction project amongst others, aimed towards building the country powerbase for sustainable growth and development. This project is expected to increase Lephalale Gross Domestic Product (GDP) by approximately 95% per annum and SA's GDP by approximately 0.35%. The impact will affect the local business, local and national infrastructure and local community.

Contribution to Greenhouse Gas Emissions

The proposed power station will contribute to the global warming: for 4800 MWe with annual coal consumption of 17,117,436 tones per annum, 29,895 kilotonnes of CO_2, 0.342 kilotonnes of N_2O with equivalent CO_2 0f 30,001 kilotonnes per annum. This emissions represents an increase in the energy sectors emissions by 9.2% and an increase in the country's contribution to global warming by 7.3%.

To mitigate the GHG effects, in addition to various renewable and energy efficiency measures under implementation, South Africa's regulator Nersa in March 2009 set renewable energy tariffs to bolster investments in the sector and to reach the country's renewable energy goal of 20% of the country's power output or 10,000 GWh by 2013. The wind power market will be driven by an increasing number of joint ventures between project developers with local knowledge and private equity investment firms, backed by the support of international wind turbine manufacturers. The new tariffs will also serve as an incentive for municipalities to become involved in power generation, he said. While only a few concentrated solar power projects are expected to be undertaken in the country due to the large capital investment and expertise required, an exponential rise in the number of landfill gas projects is expected. "If one assumes that 85% of the announced large scale renewable energy projects are executed in the country, electricity produced from renewable energy will overshoot (the 10,000 GWh) target quite substantially.

11. Conclusion

The findings of the specialist studies undertaken within this EIA provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented.

12. References

1) EIA Report for the Proposed Medupi Coal- Fired Power Station in the Leplalale Area, Limpopo Province; Final Report; May 2006

2) EIA Report for the MEDUPI-DINALEDI 400KV Transmission Lines; September 2007

3) EIA Report for the MEDUPI-MARANG 400KV Transmission Line; September 2007

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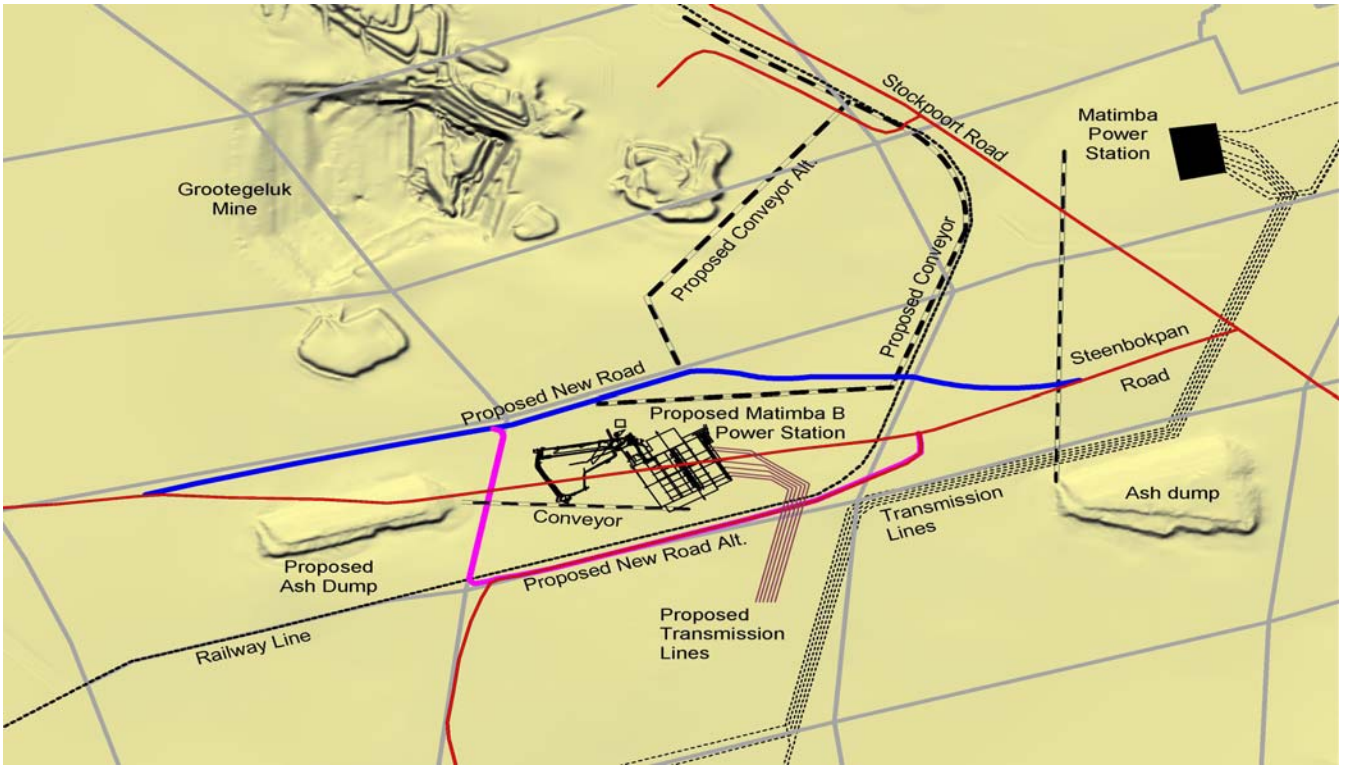
Annex 1

South Africa-Eskom Medupi Plant Location



Annex 2

South Africa- Eskom Medupi Power Plant Layout