DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE BAR

PROPOSED NDUMO GESIZA 132/22 kV
MULTI-CIRCUIT POWER LINE

Report No : 12775 – Ndumo Gezisa Basic Assessment Report

Submitted as part of the Basic Assessment Report

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16 October 2013

12775
1 INTRODUCTION

Eskom Distribution’s – KwaZulu-Natal Operation Unit is in the process of upgrading of the electricity infrastructure in the Makhathini Flats area of northern KwaZulu-Natal. The existing Makhathini 22 kV electrification network is highly constrained in terms of capacity and is unable to supply current and additional electrification in the Candover, Mbazwana and Manguzi areas. Eskom is therefore committed to establishing a new 132 kV network of powerlines and substations in the Makhathini Flats region to strengthen the existing electrification network and cater for future electrification loads.

The following electrification network upgrades or expansions are currently away, either undergoing Environmental Basic Assessment processes or are under construction:

- Nondabuya-Ndumo 132kV powerline and Ndumo 132/22kV substation – Environmental Authorisation was obtained on 29 August 2011 and both are currently under construction
- Candover-Mbazwana-Gezisa 132kV powerline and proposed 132/22kV substations at Mbazwana and Gezisa (Manguzi) – currently undergoing Basic Assessment
- Ndumo-Gezisa 22/132kV multi-circuit powerline – Currently undergoing Basic Assessment (this application)

The construction of a 22/132 kV multi-circuit powerline between the Ndumo and Gesiza Substations is part of the larger Makhathini electrification project to form a closed circuit (ring) of powerlines on the Makhathini Flats.

Eskom has appointed Zitholele Consulting as the independent Environmental Assessment Practitioner (EAP) to undertake a Basic Assessment process for the proposed new 22/132 kV multi-circuit powerline between the Ndumo and Gesiza substations in northern KwaZulu-Natal. This Impact Assessment Report has been compiled in support of the Basic Assessment process to provide the detailed information and methodology implemented to formulate the Environmental Impact Statement of the proposed development.

2 TECHNICAL DESCRIPTION OF 22/132 KV MULTI-CIRCUIT POWERLINES

The proposed Ndumo Gesiza 22/132 kV power lines will be designed and constructed according to Eskom Distribution’s Standard Specifications for overhead lines. Eskom’s engineers and surveyors will be responsible for the specific structure designs and placement of towers subsequent to the environmental authorisation of a preferred corridor and a route survey.
2.1 Power line servitudes

The width of the servitude for a 132kV power line is 36m (i.e. 18m on each side of the centre line). An 8 m wide servitude under the conductors needs to be kept clear of bush, trees and/or buildings for safe operation of the powerline. Buildings and other structures are not permitted within the 36 m servitude for safety reasons. Certain activities which may compromise the safe operation of the powerline and the safety of the activity are also not permitted to occur within the servitude. Activities such as crop cultivation of grazing may continue to occur in the servitude during the operational life of the powerline.

2.2 Powerline alignment and Bend Points

The shortest and straightest routing between two points is the optimum construction and operational alignment for a powerline. A bend point in a powerline must be achieved by using a strain tower. Deviation around any structure or sensitive environment will require a minimum three strain towers (bend points). Strain towers are generally larger in size and foundations that suspension towers and are more costly. Eskom therefore aims to minimise bends in a power line.

2.3 Tower Design

The pylons (towers) can be located approximately 300m to 400m apart on level ground, but the span length can be increased up to 1300m when crossing valleys and depending on the terrain.

A combination of the following pylons are proposed to be used:

- 253a Monopole Suspension Tower;
- 253b Monopole Angle Strain Tower
- 254c Lattice Angle Strain Tower
- 254b Lattice Angle Strain Tower

The pylon footprints for these towers range from between 4m$^2$ and 30m$^2$ depending on the structure that is used. The pylon also differs in structure to accommodate increased strain when a bend is made in the power line.

The pylons will be approximately 18 – 25 m high (which varies depending on terrain) and require a 36m wide servitude i.e. 18m either side of the centre line of the power line.

Based on the biophysical description of the proposed alternative corridors, the tower foundations could comprise of any of the following types/designs:

- reinforced concrete pads
- traditional pad and pier type
- helical screw anchor type.
Where required, cross arms will be fitted with bird diverter or anti-roosting devices to prevent birds roosting on the cross arms and inadvertently being electrocuted.

2.4 Conductor and Fittings

The powerline will consist of 3 phase conductors for each circuit and an optic fibre (OPGW) overhead earth/shield wire. The earth/shield wire will be equipped with bird flappers along spans where bird flight activity is high or sensitive i.e. (over wetlands and close to watercourses) so as to avoid collisions and associated electrical outages caused by bird collisions.

Composite (22 and 132kV) insulators will be required between the conductor and the towers along with jumpers.

3 CRITERIAL USED FOR IDENTIFYING CORRIDOR ALTERNATIVES

Several criteria were taken into consideration when identifying potential corridors suitable for the construction and operation of the proposed 22/132 kV multi-circuit power line between the Ndumo and Gesiza substations. These criteria included the following:

- **Length and alignment** – potential routes need to be as straight and as short as possible to reduce the construction and maintenance costs and improve the overall operation of the power line. Furthermore, straighter and shorter routes require less habitat modification.
- **Topography** – flat or gently sloping topography is preferred for the construction and maintenance of a power line. A gentle slope facilitates surface. Steeper slopes require modification for access and construction purposes thereby increasing the potential for negative environmental impacts during construction and maintenance.
- **Surface Water and Hydrology** – consideration is given to the proximity of potential corridors to adjacent water courses, possible river crossings and wetlands, as there may be potential impacts in terms of erosion and siltation of water courses should access roads need to be constructed over river crossings or in wetland areas. Furthermore, flooding waters may have a negative impact on the long term integrity of power line structures.
- **Geology and Soils** – consideration is given to the soil type along potential corridors whereby stable soil and founding conditions are preferable. Less stable soils, i.e. shallow, dispersive soils and soils with poor drainage present an erosion hazard if not managed correctly, and also require the use of additional, costly foundation infrastructure to ensure stability of the powerline structures.
- **Flora and fauna** – a potential powerline corridor needs to be assessed in terms of its ecological value at both a macro and micro scale i.e. within the corridor and the environment adjacent to it. Both a faunal and floral investigation may be required, with particular emphasis on ensuring the protection of endemic and red data species and their habitat, should they be present and avoidance of sensitive ecological environmental. Particular significance is placed on the potential impacts on avifauna as overhead services can cause bird-powerline collisions or electrocutions of birds on powerlines.
- **Visibility** – highly visible routes i.e. on a ridge / elevated terrain, are considered less favourable in that they have a high visual impact on the surrounding landscape. Routes that are hidden or out of sight e.g. behind a hill or amongst tall vegetation, may be considered more suitable;
• **Access** – it is preferable that potential corridors are accessible from existing roads or tracks for construction and maintenance purposes so as to avoid creating new access roads to the powerline and the associated loss of indigenous habitat.

• **Public acceptability** – public acceptance criteria relate to issues as the possible adverse impact on public health, quality of life, sense of place, loss of economic potential etc.

Applying the above criteria, initially 6 potential corridors were identified in the study area. These 6 potential corridors were assessed by specialists in the following disciplines:

- Land use and capability
- Terrestrial ecology
- Heritage protection
- Avifauna
- Surface water
- Visibility

After initial information received from the specialists, an additional two corridor sections were added. The specialist studies confirmed that 4 of the 8 potential corridors identified were considered “No Go” options and the remaining potentially suitable corridor alternatives are assessed in this report.

The figures in Appendix A of the Basic Assessment Report show the location of the initially potential corridors and the final 4 potentially suitable alternatives.

### 4 COMPARATIVE DESCRIPTION OF PROPOSED CORRIDOR ALTERNATIVES

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<tr>
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<tbody>
<tr>
<td><strong>Length</strong></td>
<td>44 km</td>
<td>47 km</td>
<td>47.5 km</td>
<td>46 km</td>
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<tr>
<td><strong>Topography</strong></td>
<td>Flat to gently undulating</td>
<td>Flat to gently undulating</td>
<td>Flat to gently undulating</td>
<td>Flat to gently undulating</td>
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<tr>
<td><strong>Geology and Soils</strong></td>
<td>Sands</td>
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<tr>
<td><strong>Access</strong></td>
<td>This alternative corridor is readily accessed via combination of district roads community tracks its entire length as it parallels first the District Road D1861 and then the Provincial Road P522. No new access roads will need to be created.</td>
<td>With the exception of the first 2.5 km where access roads will be need to be created, the corridor is readily accessed via combination of district roads community tracks its entire length as it parallels the Provincial Road P522.</td>
<td>This corridor primarily parallels the P522 for most of its length but it is located approximately 1 km to the south of this arterial road and passes around settlement areas and through mostly undisturbed and uncleared forest.</td>
<td>This corridor primarily parallels the P522 for most of its length but it is located approximately 1 km to the south and then north of this arterial road and passes around settlement areas and through mostly undisturbed and</td>
</tr>
</tbody>
</table>
## DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

<table>
<thead>
<tr>
<th>Landuse and settlement</th>
<th>Approximately 3 km off access roads will need to be created</th>
<th>Approximately 30 km of access road will need to be created.</th>
<th>uncleared forest. Approximately 30 km of access road will need to be created.</th>
</tr>
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<tbody>
<tr>
<td><strong>This corridor attempts to remain on the edge of settled areas along the D1861 and P522 but within areas that have been anthropogenically modified. The corridor diverts to the south of the Phelandaba settlement area</strong></td>
<td>This corridor attempts to remain on the edge of settled areas along the P522 but within areas that have been anthropogenically modified. The corridor passes through the Phelandaba settlement area</td>
<td>This corridor remains primarily away from settled areas and traverses largely undisturbed indigenous vegetation.</td>
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<table>
<thead>
<tr>
<th>Land ownership</th>
<th>Ndumo and Tembe Tribal Authorities and State owned land</th>
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<tr>
<td><strong>Surface Water and Wetlands</strong></td>
<td>Crosses the Pongola River at Makhane’s Drift in the west and passes through the extensive Muzi Swamp system in the east. However, the wetland areas north of the P522 are not functioning optimally due to impact of the road and transformation by anthropogenic activities and may be considered more preferable for the alignment of the powerline.</td>
<td>Crosses the Pongola River at Luwane Township adjacent to the P522 road bridge in the west and passes through the extensive Muzi Swamp system in the east. However, the wetland areas immediately adjacent to the P522 are not functioning optimally due to impact of the road and transformation by anthropogenic activities and may be considered more preferable for the alignment of the powerline.</td>
<td>Crosses the Pongola River at Makhane’s Drift in the west and passes through the extensive Muzi Swamp system in the east. Due to the location of this corridor on the periphery of human impact zones, the wetland systems are more likely to be more highly functioning than those adjacent to the P522.</td>
<td>Crosses the Pongola River at Makhane’s Drift in the west and passes through the extensive Muzi Swamp system in the east. Due to the location of this corridor on the periphery of human impact zones, the wetland systems are more likely to be more highly functioning than those adjacent to the P522.</td>
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<table>
<thead>
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<th>Visibility</th>
<th>Visible for in transit users on the Provincial Road P522 but is not considered “out of place” in this zone already impacted on</th>
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<th>Less visible to all users but will introduce an overhead visual impact in an area where none currently exists</th>
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**Ndumo and Tembe Tribal Authorities**
**State owned land**

**Crosses the Pongola River at Luwane Township adjacent to the P522 road bridge in the west and passes through the extensive Muzi Swamp system in the east. However, the wetland areas immediately adjacent to the P522 are not functioning optimally due to impact of the road and transformation by anthropogenic activities and may be considered more preferable for the alignment of the powerline.**

Due to the location of this corridor on the periphery of human impact zones, the wetland systems are more likely to be more highly functioning than those adjacent to the P522.
### Flora and Fauna
- **This corridor parallels the existing D1861 and P522 roads within 500 m of these roads and hence falls within the area of ribbon development that has largely cleared all indigenous bush.** There is less likelihood of this corridor requiring the clearing of sensitive Sand Forest communities.

### Heritage
- **This route will have no direct impact on heritage resources should the tower positions be decided upon in consultation with a Heritage Specialist.**

### NO GO ALTERNATIVE
The ‘No Go’ alternative in the context of this project implies that the power line would not be constructed. If the powerline does not go ahead, the negative environmental impacts which have been identified if it does go ahead would not occur. However, if the powerline is not constructed and commissioned, the region would be negatively affected by an inadequate and unreliable supply of electricity (basic service) which would inhibit future development in Northern Zululand and would jeopardise the success of the regions Integrated Development Plans and Spatial Development Frameworks, all of which identify the lack of electrical services as inhibitors to future development.

### IDENTIFICATION OF POTENTIAL IMPACTS
The following components were identified by site assessment and the inputs of specialists as critical components that could be impacted on negatively by the proposed development:

<table>
<thead>
<tr>
<th>Flora and Fauna</th>
<th>Impacted on by overhead and road linear servitudes</th>
<th>This corridor is set more than 1000 m from the ribbon developments along the D1861 and P522 and hence there is more likelihood that significant clearing of indigenous bush, including Sand Forest Communities will be required.</th>
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DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

- Heritage;
- Surface Water and Wetlands
- Terrestrial Ecology;
- Visual.
- Landuse
- Biodiversity
- Avifauna
- Vegetation
- Soil
- Socio-economic

7 ASSESSMENT METHODOLOGY

The potential significance of every environmental impact identified was determined by using a ranking scale, based on the following (DEAT Guideline document on EIA Regulations, April 1998):

Occurrence
- Probability of occurrence
- Duration of occurrence

Severity
- Magnitude (severity) of impact
- Scale/extent of impact

In order to assess each of these factors for each impact, the following ranking scales were used:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Duration</th>
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<tbody>
<tr>
<td>5 – Definite/don’t know</td>
<td>5 – Permanent</td>
</tr>
<tr>
<td>4 – Highly probable</td>
<td>4 – Long term (ceases with the operational life)</td>
</tr>
<tr>
<td>3 – Medium</td>
<td>3 – Medium-term (5 – 15 years)</td>
</tr>
<tr>
<td>2 – Low probability</td>
<td>2 – Short-term (0 – 5 years)</td>
</tr>
<tr>
<td>1 – Improbable</td>
<td>1 – Immediate</td>
</tr>
<tr>
<td>0 – none</td>
<td></td>
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<table>
<thead>
<tr>
<th>Scale</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 – International</td>
<td>10 – Very High/don’t know</td>
</tr>
<tr>
<td>4 – National</td>
<td>8 – High</td>
</tr>
<tr>
<td>3 – Regional (&gt;5km)</td>
<td>6 – Moderate</td>
</tr>
<tr>
<td>2 – Local (&lt;5km)</td>
<td>4 – Low</td>
</tr>
<tr>
<td>1 – Site Only</td>
<td>2 – Minor</td>
</tr>
<tr>
<td>0 – None</td>
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</table>

Once the above factors had been ranked for each impact, the environmental significance of each was assessed using the following formula:

\[ SP = (\text{magnitude} + \text{duration} + \text{scale}) \times \text{probability} \]

The maximum value is 100 significance points. Environmental effects were rated as either of high, moderate or low significance on the following basis:

- More than 60 significance points indicated high environmental significance
- Between 30 and 60 significance points indicated moderate environmental significance
- Less than 30 significance points indicated low environmental significance

The degree of certainty of the assessment was judged on the following criteria:

Definite: More than 90% sure of a particular face
Probable: Between 70 and 90% sure of a particular fact
Possible: Between 40 and 70% sure of a particular fact
Unsure: Less than 40% sure of a particular fact.
3.0 IMPACT ASSESSMENT TABLES