# IMPACT ASSESSMENT CASE STUDIES FROM SOUTHERN AFRICA

*Compiled by John Pallett (SAIEA) on behalf of EnviroDynamics*

*Client: NamPower*

**SAIEA**

*Southern African Institute for Environmental Assessment* *... working for a better Africa*

## *POWERLINES FROM THE KUDU POWER STATION TO ORANJEMUND AND OBIB*

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# POWERLINES FROM THE KUDU POWER STATION TO ORANJEMUND AND OBIB

## *Aims of the Project*

The Kudu Gas Project involved generation of electricity using gas from the offshore Kudu resource near Oranjemund, a small diamond mining town in the south-western corner of Namibia. The project encompassed three main developments:

- The development of the gas field, and the construction of a pipeline to the power plant and gas conditioning plant adjacent to the power plant;
- the construction and operation of the power plant at Uubvlei (25 km north of Oranjemund); and
- the construction of powerlines from the power station to feed into the Namibian and South African power grids.

NamPower needed to construct 4 parallel powerlines from the 800 MW Kudu Power Station at Uubvlei. For the first phase of the project, two 400kV lines were needed to feed into the Namibian and South African grids, as well as a 220kV line to connect the power station to the 220kV network at Oranjemond Substation. The second phase (another 800MW) would require an additional 400kV line to feed the South African power grid. This project did the Route Evaluation and Environmental Impact Assessment of the proposed powerlines from Uubvlei. Previous work related to the Kudu Gas development had assessed some powerline routes from the original power station site at 'Site D' near Oranjemund. Due to the high visual impact of sections of the route, sensitive habitats and the occurrence of unstable dunes, NamPower decided to reconsider the alignment of the whole route.

The rationale of the overall Kudu Gas Project was to meet the projected electricity demand of the country and to export excess power to neighbouring countries. The powerlines were needed to feed the generated power into the Namibian and South African grids.

## *Brief description of the development & alternatives considered*

The approach to the study was to conduct a short scoping exercise based on the work conducted in the previous EIAs. This included a public consultation meeting with the Oranjemund community and relevant stakeholders. Once specialist studies of the receiving environment had been completed, the consulting team carried out a comparative evaluation and environmental impact assessment of the route alternatives.

**Alternative routes considered**

The proposed powerlines would run from the proposed CCGT Power Plant at Uubvlei to Oranjemund and the Obib substation near Rosh Pinah respectively. The alternative routes considered for the powerlines are depicted in Figure 1.

The **route to Obib** via Schakalberg may follow a direct route via Dippenaarskop (Alternative 1C in Figure 1), or an indirect one along an existing 66kV line to Swartbult (Alternative 1A). The latter also has a possible detour, Alternative 1B).

From **Schakalberg, the original route to Obib**

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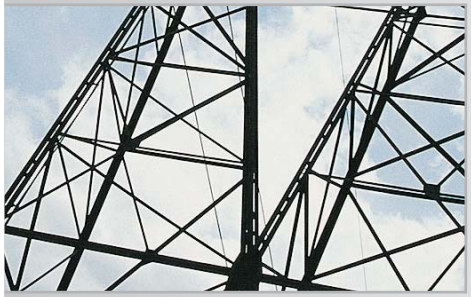

## *Brief description of the development & alternatives considered*

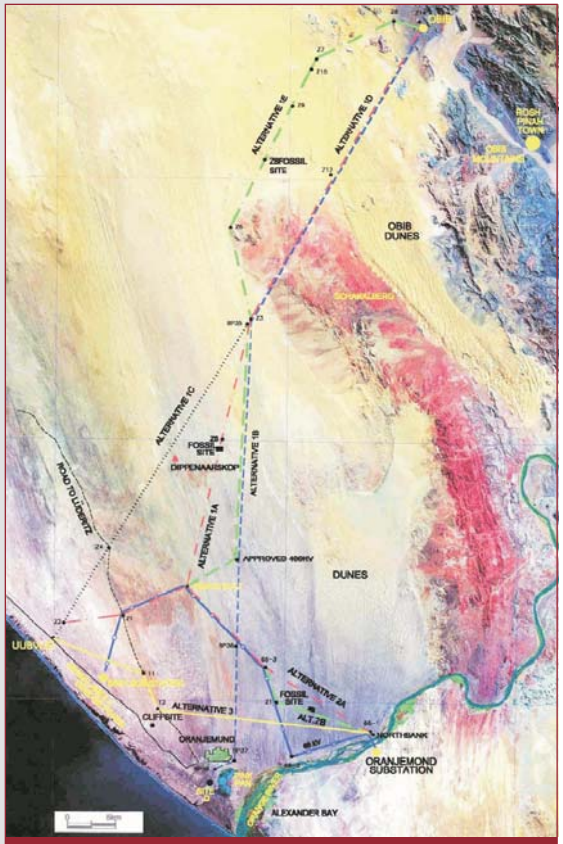


*Figure 1: Annotated satellite image of the Sperrgebiet showing the proposed powerlines and associated infrastructures.*

cuts straight across this sensitive inselberg (Alternative 1D). This straight route crosses moving sand dunes, and the Schakalberg, which harbours a rich and diverse fauna and flora population. On the initial helicopter survey of the study, NamPower, in conjunction with the Chief Ranger of the Sperrgebiet, identified a detour around the Schakalberg that followed lower ground and avoided large dunes and inselbergs (Alternative 1E). The straight route was subsequently discarded as an option, and the detour was included in this study.

The **route to South Africa** (Alternative 2A) followed the existing 66kv line from Uubvlei to a point where the latter line turns south-westwards towards the Orange River. The proposed route turns south eastwards at this point to link with the Oranjemond substation. There was a direct and indirect route along this section, presented as alternatives around the BP Pan (Alternatives 2A and 2B), a possible Namdeb diamond reserve and archaeologically sensitive area. Another alternative route (Alternative 3) to South Africa linked up with the existing road to Lüderitz, passing the northern outskirts of Oranjemund towards the Orange River crossing. This route was however discarded in the initial stages, because it posed serious corrosion problems and went very close to the aviation safety zone.

**Project Alternatives**

The study considered alternative route sections for the powerlines emanating from Uubvlei, by comparing the environmental and social pros and cons of each. An alternative to overhead powerlines would be underground cabling. NamPower rejected this alternative because it was six times more expensive than overhead powerlines, and underground cabling would lead to considerable habitat destruction to bury the lines. This option was not considered further.

The no-project alternative would rule out the opportunity to develop and export the power generated from the Kudu Gas Field to the benefit of the country and the region.

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## *Brief description of the development & alternatives considered*

**Tower design**

The conductors were to be supported on two different types of pylon: a Self-supporting Suspension and Strain Tower (Figure 2) and a Compact Cross Rope Suspension Tower (Figure 3). Strain towers would be used on bends and the other on straight sections. The 35m high towers would be spaced 400 - 500 m apart. The corridor width (the land within which no other development is allowed and cleared of tall vegetation, where the maintenance track runs) needed to accommodate the individual powerlines was 40 m for the 220 kV line and 55 m for the 400 kV line. The route running to South Africa, with three 400 kV and one 200 kV powerline running parallel to each other, would thus need a total corridor width of 205 m. The route running northwards to the Namibian grid, with only one 400 kV powerline, would have a corridor width of 55 m. The foundations of the pylons would be concrete blocks above ground.

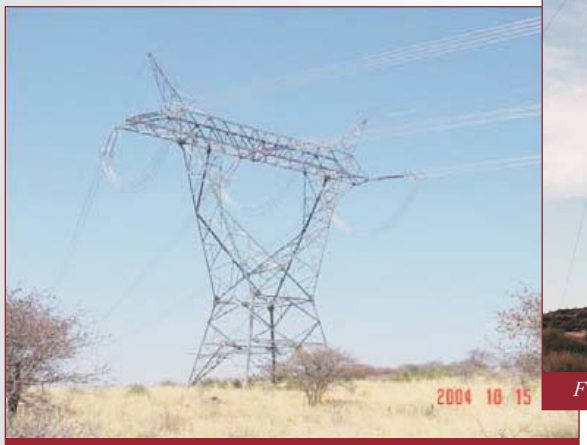


*Figure 2: A self-supporting suspension and strain tower*

*Figure 3: A compact cross rope suspension tower*

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# POWERLINES FROM THE KUDU POWER STATION TO ORANJEMUND AND OBIB

## *Environmental setting*

The most important features of the area's climate are the windy, cold and wet conditions associated with cold upwelling of the Benguela current, with associated fog. The harsh conditions at the coast cause extensive corrosion, scouring, and sand blasting of structures. Maintenance of powerline structures is particularly challenging because of these conditions.

Main topographical features are the stabilised and moving dunes, the Orange River and its valley, the Obib Mountains and the Schakalberg, an environmentally sensitive inselberg. Shifting sand dune belts needed to be avoided as they cause electrical clearance problems on powerlines and are technically difficult terrain for the erection of pylon foundations. Topographical features such as the Obib range are known for their spectacular vistas and wilderness qualities.

Namdeb extracts diamond deposits hosted in the marine terraces and paleochannels of the Orange River. The powerline route had to avoid diamondiferous reserves as they were an opportunity cost for Namdeb.

Other no-go areas included three rich fossil sites, but these could be crossed with overhead lines and tracks would be negotiated around sensitive areas. In terms of archaeology, materials from Early, Middle and Late Stone Age, covering the period from about one million years ago to the present, can readily be found in the entire Sperrgebiet. Four of the 21 sites discovered during this study are of conservation concern. They would be protected by fencing them off before construction started.

**Habitats and fauna**

The powerline routes traversed five different vegetation types. The vegetation zone surrounding Uubvlei, coastal plains and hummocks, was the most sensitive, harbouring many rare and protected plant species. It also supports a well-developed, mainly sand-living invertebrate fauna with a large but unspecified number of endemic species (Marais 1998). Some reptiles, such as the Namaqua Dwarf Adder (Bitis schneideri), are confined to the coastal vegetated hummock habitat, and are thus threatened by mining activities (Griffin 1998). All of the mammals of conservation significance that occur in this habitat have distributions that extend well beyond the project area. This habitat was being increasingly fragmented by commercial activities all along the southern Namibian coastline. The botanist's opinion was that, if construction activities were confined to single access tracks only and used limited turning points and camp sites, this would be adequate to limit impact on plants, excluding the need for plant rescue operations or rerouting.

Areas to the east of the coastal plains comprise gravely and sandy flats, low dunes and hummocks, and dunes proper. Invertebrate fauna comprises the wealth of insects, spiders and scorpions that are adapted to living in and on sand, for which the Namib is renowned. The same goes for species of reptiles and small mammals. Although the sandy substrate is not so clearly sculptured into dunes in this area as occurs further north in the central Namib sand sea, the areas are continuous with each other and there are unlikely to be any animal species with restricted geographic distributions here. Of the reptile species, three are of conservation concern: the leopard tortoise (*Geochelone pardalis*, tent tortoise (*Psammobates tentorius*) and veld leguaan (*Varanus exanthematicus*). Amongst the mammals, 8 species are of conservation concern: seven of these are

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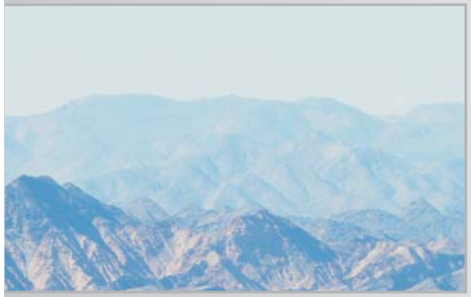

## *Environmental setting*

carnivores that are persecuted by farmers, and the last, the small grey mongoose, is probably a vagrant in this area. Persecution is not an issue in the Sperrgebiet, so the cause of their status as Vulnerable does not apply in the project area. Nevertheless, their populations should not be disturbed, as set out in the mitigatory actions suggested later in this report.

Areas of rocky outcrop occur sporadically throughout the project area. These form small rises and low hills usually flanked by accumulated sand, and the large Schakalberg Mountain is a very prominent feature of the area. The rocky outcrops, inselbergs and mountains are the most sensitive habitats in the project area, and should be avoided as much as possible.

**Birds**

The Orange River Mouth Wetland Park, including the Pink Pan is an important refuge for several Red Data bird species. Other important habitat outside the Ramsar site (between Hohenfels and the Oppenheimer Bridge) is the rocky outcrops and cliffs in the vicinity of the current 66 kV river crossing that border the river and support breeding Peregrine Falcons. Also important are the dredge ponds along the coast in the mined out areas. Flamingos use the ponds, and bird movement between these areas and the Pink Pan take place.

**The socio – economic environment**

Oranjemund is an isolated and closed mining town of less than 5,000 people situated in the south-western corner of the country. The study area is situated in Diamond Area 1 or "The Sperrgebiet", which is off limits to all but Diamond Mining Companies that have held prospecting rights for this land for over 80 years. At the time of the project the land fell under the jurisdiction of the Ministry of Mines and Energy. Mining and residential activities are the two main land uses in the area, with roads from Lüderitz, Rosh Pinah, and Alexander Bay, a 66kV powerline and two airfields in the area being the major infrastructure. The Orange River Mouth Wetland Park is a nature reserve and includes the Ramsar site. The Sperrgebiet has subsequently been proclaimed as a National Park under the Ministry of Environment and Tourism. Tourism is therefore a major component in the land use mix for the area.

## *Public consultation process & participation by civil society*

This study built on the scoping and consultation conducted in the previous EIAs of the powerlines and Power Plant at Site D. Issues raised in the previous studies were noted and shared with interested and affected parties. The Oranjemund community and Namdeb were considered the key community group and stakeholder of this project. They were consulted during a planning meeting with Namdeb and at a public meeting. The public was given the opportunity to consider issues listed previously, and to amend this list for the Uublvei alternative. All issues raised during scoping were considered during this assessment.

The Draft Route Evaluation and Environmental Impact Report was made available for public comment from 17 May until 7 June 2005. Invitations were placed in the local press and sent via e-mail to the stakeholders list. The documents were available for review on NamPower's website and at Oranjemund and Windhoek libraries.

No comments were however received on the Draft Report.

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## *Main environmental impacts & issues*

The following list of criteria was used for the route evaluation and impact assessment exercise:

1) Mining: avoid areas where diamondiferous reserves are located unless they can be mined out before construction of the powerlines.

2) Infrastructure: align powerlines along existing infrastructure corridors

3) Visual impact/tourism potential: avoid areas suitable for future tourism development and with exceptional wilderness qualities and visual quality

4) Vegetation: avoid areas that are rich in conservation worthy plant species

5) Topography: Avoid shifting sand dunes, rocky outcrops and inselbergs

6) Avoid vulnerable and important archaeological sites

7) Avoid crossings with flight paths for powerline sensitive birds and important bird habitats

8) Choose routes that are preferred by the local community

9) Construction costs: consider the distances and number of end points of route alternatives, as these aspects influence the cost of the powerlines.

Using the above criteria, the EIA considered the alternative routes. Overall, there were no fatal flaws along any of the proposed routes or their detours. As long as the "footprint" of the powerlines was reduced to the minimum through close supervision of the construction process, and fine-tuned to avoid rocky outcrops, the disturbance would affect only a thin linear strip. To achieve a limited footprint, strict control and monitoring measures would be necessary during construction.

Environmentally, the indirect route to Schakalberg via Swartbult (Alternative 1A) was preferred above the direct route via Dippenaarskop (Alternative 1C). Since construction would in any case be happening along the indirect route up to Swartbult (Alternative 1A) for the construction of the route to South Africa, it made sense to combine all construction activities and subsequent damage to one corridor. By opting for the relatively modest environmental benefits of Alternative 1A, NamPower will have to incur an additional N$ 6 million and will experience greater technical challenges to align the powerlines in one corridor. These additional costs are probably not warranted to avoid the relatively small additional environmental impact of Alternative 1C.

Along the stretch from Schakalberg to Obib (Alternative 1E), a number of small changes were recommended to avoid high ground, dunes, rocky outcrops etc. In addition, the exact route taken around the GP Pan north of the Orange River could only be determined once Namdeb had confirmed the location of diamond reserves.

Apart from avoiding outcrops and higher ground, the most important factor to avoid unnecessary damage in this pristine and sensitive desert environment was to contain and limit the footprint made along the routes during construction. The consultant stressed the importance of proper environmental management at the time of construction. This project would be implemented in a partially pristine wilderness area that was

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## *Main environmental impacts & issues*

soon be proclaimed a national park. Ecological and archaeological damage can only be limited with very strict control during construction. To achieve this goal it was required that NamPower appoints a suitable monitor to be present in the area while construction proceeds.

The EMP for the first powerlines, from Site D, recommended that no construction camps be made along the routes. Applied to this project, access would be made only from Obib or Oranjemund. Given the distance of the powerline routes, and the difficulty of accessing the project area, the practicality of the original recommendation was questioned. Identifying two camps along the route at less sensitive locations would be more practical, and having to drive to and fro along the access tracks each day to reach the construction areas was likely to cause more damage than allowing some camping along the way. These issues were to be finalised in the revised EMP.

Although bird collisions were not a concern in this project, except at the river crossing where they would be covered in a separate study to be commissioned by Eskom (South Africa), it was suggested that NamPower consider a general monitoring programme to track bird collisions in consultation with local residents. Local residents could be requested to report their concerns about the project during construction and operation. These aspects and other possible monitoring proposals were to be more fully considered in the monitoring and decommissioning plans in the EMP.

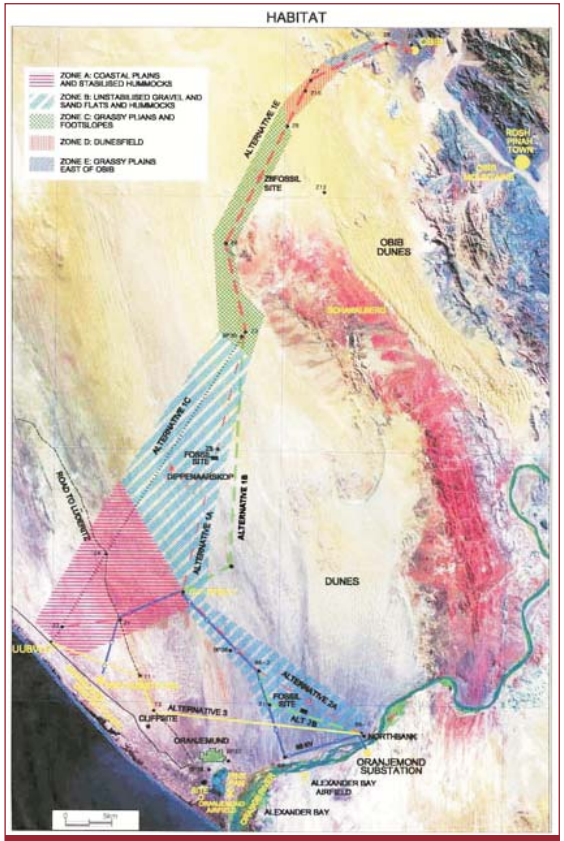


*Figure 4: Powerline routes indicating the habitats they cross.*

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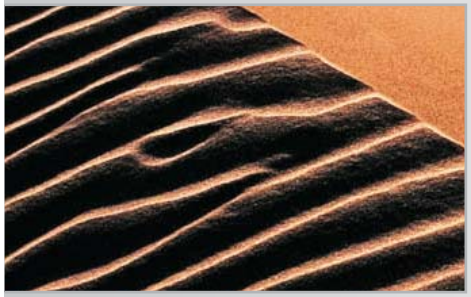

## *Decision-making process*

The EIA was favourably reviewed by the Southern African Institute for Environmental Assessment (SAIEA). It was then accepted by the Namibian Directorate of Environmental Affairs and the project received official clearance to go ahead.

NamPower accepted the EIA and its recommendations but the entire Kudu gas project was dropped shortly after completion of the work, due to higher level strategic decisions.

*Figure 5: Pristine desert landscape in the eastern Sperrgebiet, close to where the Kudu powerline would link with the Namibian grid at Obib substation.*

## *Implementation of the EMP*

The EIA stressed the need for a very good management system to make sure that the EMP would be fully adhered to. However, the project never got to the implementation phase.

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## *Main elements of excellence in this EIA*

The key issue in this study was the alignment for the line, with the previous approved alignment being unacceptable to the residents of Oranjemund, based mainly on visual criteria. It was also found to be unacceptable from an aviation safety perspective. The study thus found that option to be fatally flawed and alternatives were proposed. These options were acceptable visually and from an aviation point of view, though mitigation measures were still required to reduce impacts on birds, vegetation and archaeological sites. Another key issue regarding the routes evaluated in this EIA was the lock-up of diamonds, and the consultants recommended that further studies be done and/or negotiations be held between Nampower and Namdeb before the final route was selected.

The consultants ran a process that was transparent and professional. Interested and affected parties were given ample opportunity to be part of the process, both during the compilation of the EIA and after the draft was published for comments. Various specialist reports were commissioned, some of which were new whilst others were updates of previous reports.

Whilst the issue of waste is hardly mentioned in the report, it is accepted that the generation and disposal of waste is generally not a major concern when constructing a powerline. However, good housekeeping was emphasized so that construction crews do not litter the environment and leave behind any waste, even if buried. These issues were to be elaborated in the EMP.

The EIA provided a wide range of practical measures that were likely to help mitigating potentially negative impacts. In some cases, mitigation measures were to be spelt out more clearly in the EMP – especially on-the-ground management of the construction team. Many years of experience has proven that the grader operator is a “high level decision maker”! In the case of a powerline, the most significant type of mitigation is changing the alignment of the line. If NamPower opted for the alternative which was recommended, they would pay an estimated additional tens of millions of Namibia dollars to develop the project. This would have proven that the EIA was a serious exercise and that it influenced decision making! The project never got to that stage to test the power utility’s willingness to pay for environmental protection.

## *Lessons learnt*

An important issue in the whole Kudu gas development was the compartmentalisation of the three different EIAs (upstream, the plant and the powerlines). It is true that the three components were very different from each other, and that legal ownership of the three differed, justifying a separate EIA for each. However, I&APs became frustrated by this division and there was a strong case for integration. Nampower, if it had continued with the process, was to integrate all three once each component has been finalized.

Fortunately, the teams doing each EIA worked in close collaboration with each other, and many of the experts were involved with all three studies at the same time. To a large extent, this resulted in three compatible reports.

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