



ENVIRONMENTAL ASSESSMENT AND ENVIRONMENTAL
MANAGEMENT PLAN
FOR THE PROPOSED KUDU COMBINED CYCLE GAS TURBINE
(CCGT) POWER PLANT AT ORANJEMUND

BACKGROUND INFORMATION

This document:

- Provides a brief background and rationale of the proposed Kudu Gas CCGT Power Plant
- Lists the aims of this study
- Invites stakeholders and interested and affected parties to provide input.

Why does NamPower need to build the CCGT Power Plant?

Namibia's electrical power demand grew from 225 MW in 1992 to 378 MW in 2003, which represents a growth of over 59% in 11 years. NamPower projects that growth will continue at a rate of approximately 4%, resulting in a demand of approximately 540 MW by 2012.

Namibia has a coal fired thermal power station in Windhoek with 120 MW installed capacity, a diesel powered station at Walvis Bay of 24 MW capacity and one hydro-electric power station at Ruacana of 249 MW, giving a total installed generation capacity of 393 MW. The excessive cost of coal landed at Windhoek makes the production of electricity at the thermal power station uneconomic. The hydro-electric power station at Ruacana is therefore Namibia's main power generating source.

However, power generation at Ruacana is dependent on the highly variable water flow in the Kunene River. This has a major impact on NamPower's ability to supply the demand from its own generation facilities and the bulk of the demand has to be imported from South Africa. During the dry winter season, Namibia imports up to 50% of its energy needs from South Africa, but rising domestic demand in South Africa and Namibia might prove the continued supply of electricity to Namibia to be problematic beyond 2007. It

is therefore imperative that Namibia and NamPower does something to ensure reliability of electricity supply to the country in the future.

In addition to meeting NamPower's projected demand, electricity generated at Kudu could be exported to South Africa to fulfill that country's growing demand.

Following the drilling and testing of the Kudu-4 gas appraisal well in the last quarter of 1996, it was concluded that there were sufficient proven natural gas reserves within the Kudu Gas Field to support the development of a 750-800 MW power plant, operating for a minimum of 20 years, without the need for additional appraisal drilling. Therefore in view of the predicted shortfall in electricity supply and the presence of proven gas volumes, the Kudu Power Project is one of the preferred options to address the growth in the power demand in Namibia in the short-medium term.

What are the project components?

The Kudu Power Project encompasses three main developments: 1) 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; 2) the construction and operation of the power plant itself; and 3) the construction of power lines from the power station to feed into the Namibian and South African power grids.

Where will the project be located?

Feasibility studies were completed in 1998, which evaluated three different sites near Oranjemund, together with various cooling options and Combined Cycle Gas Turbine (CCGT) configurations, in order to determine the economic viability, the technical feasibility and the environmental acceptability of a CCGT power station. The study concluded that a power station at Site D, using seawater or saline groundwater make up for mechanical evaporative cooling purposes was the preferred technical, economic and environmental option.

The Kudu Power Project will use natural gas from the Kudu Gas Field located some 170 km offshore in Namibian territorial waters to generate electricity at a nominal 800 MW capacity, combined cycle gas fired power station at Oranjemund.. A study by Black and Veatch in 1997 identified Oranjemund as being the best position for a power plant. Oranjemund is a small diamond mining town (population: $\pm 10\ 000$) owned by Namdeb Corporation. The town is situated near the mouth of the Orange River in the south-western corner of Namibia. The Orange River forms the boundary between Namibia and South Africa (figure 1).

Site D is shown is located on mined-out land and is bounded on the east and south by the Pink Pan, which is a naturally occurring hyper-saline pan and on the west by mine workings. It currently lies within the high security mining area, but it is outside the Ramsar site at the river mouth and the proposed Orange River Mouth Wetland Park.

The Aims of this Environmental Assessment

NamPower has appointed CSIR Environmentek to conduct an Environmental Assessment and Environmental Management Plan for the proposed power plant.

The study will cover all aspects relating to the construction and operation of the plant as far as the project has been identified. It does not cover the upstream components of the development, i.e. the gas field, pipelines from the gasfield and gas conditioning plant adjacent to the power plant, nor the construction of the power lines from the power station. These components will be subject to separate EA's.

As part of the study we will:

- Consult with all interested and affected parties and stakeholders to solicit their input regarding this development, and feed this information into the EA process;
- Describe the receiving environment, including all relevant bio-physical and socio-economic components;
- Consider alternatives to the project; i.e. alternative energy supply options, based on a review of previous studies, (note that the site was selected based on the findings of the Preliminary Environmental Assessment (PEA), and alternative sites shall therefore not be considered again).
- Consider alternatives within the project, such as cooling water sources, routes for pipelines, security, housing, storage of fuel, stack heights, noise mitigation, design of the plant, etc.;
- Assess the potential impacts of the power plant on the receiving environment during all phases, and different scenarios, including construction, normal operating conditions, maintenance, decommissioning and closure
- Compile a world class EA report; and
- Compile an Environmental Management Plan for the control of the residual impacts .

Key results of the Preliminary Environmental Assessment, specifically related to Site D

Walmsley Environmental Consultants carried out a PEA on the proposed Kudu Gas power plant in 1998. The study considered the various alternative sites, and the main findings regarding the selected site were as follows.

Issues related to construction:

The main constraints hindering the construction of a power plant at Site D were found to be:

- corrosion from salt spray;
- access to site for people and materials if the fence is not moved;
- the power line route from the power plant;
- construction in the high energy surf zone if the sea water cooling option is selected.

The most significant potential impact resulting from construction at Site D, irrespective of whether the fence is moved or not, is the impact of accommodating the workforce in town on services, safety and security, housing, community facilities and social integration.

The advantages of Site D from a construction point of view are that it is further away from the proposed Orange River Mouth Wetland Park than the other sites considered, the visual impact will be lower than some of the other sites, there will be no impact on the Orange River mouth ecology, it is on degraded land and it will have low to no impact on the marine environment, depending on the cooling water source chosen.

Issues related to operation:

There are three cooling options that could be considered for Site D: once-through sea water cooling, which is unlikely due to the distance from the sea (>2 km), evaporative make-up cooling using sea water, and the use of saline ground water for evaporative cooling. Both gas-fired and diesel-fired operating scenarios were considered.

The main **constraints** at Site D are the effects of corrosion on pipe work and structures. If either of the seawater cooling options are chosen, then the maintenance of the intake and outlet structures could be problematic.

Lesser constraints will include abrasion by wind-blown sand and the high silt loads in the sea following large floods in the Orange River. The latter constraint will only occur occasionally and only if either of the sea water cooling options are considered.

The main **impact** associated with Site D is noise. The sound levels, however, can be readily mitigated with appropriate sound reduction technology.

Other issues include visual impact. Air pollution is not expected to a problem under gas-fired or diesel-fired operations because of the zero sulphur content of the natural gas as well as the excellent emission performance of combined cycle gas fired power stations.

This study shall build on and confirm the work done in the PEA.

Your role in this study

Enviro Dynamics will handle the public participation component of this study, and will consult with all people who are interested in or likely to be affected by the proposed power plant, so that the EA team has a clear idea of their concerns. Public consultation is a very important part of the EA process and it is therefore strongly encouraged.

You are therefore invited to provide your comments related to the development of the proposed Kudu Gas power plant at Oranjemund, Site D in one or more of the following ways:

- By responding via the e-mail or fax to the address below, using the attached comments form.
- By attending the public meetings as advertised
- By accessing information about this project by visiting NamPower's website, ***www.NamPower.com.na*** or by e-mailing us at any time during the EA process.

Please bear in mind that the draft EA report will be submitted on 30 July 2004, so it is important that you become involved as early as possible.

**For more information, please contact:
Ms Stephanie van Zyl, Tel 061 223336, Fax 061 240309, E-mail
envirod@africaonline.com.na**

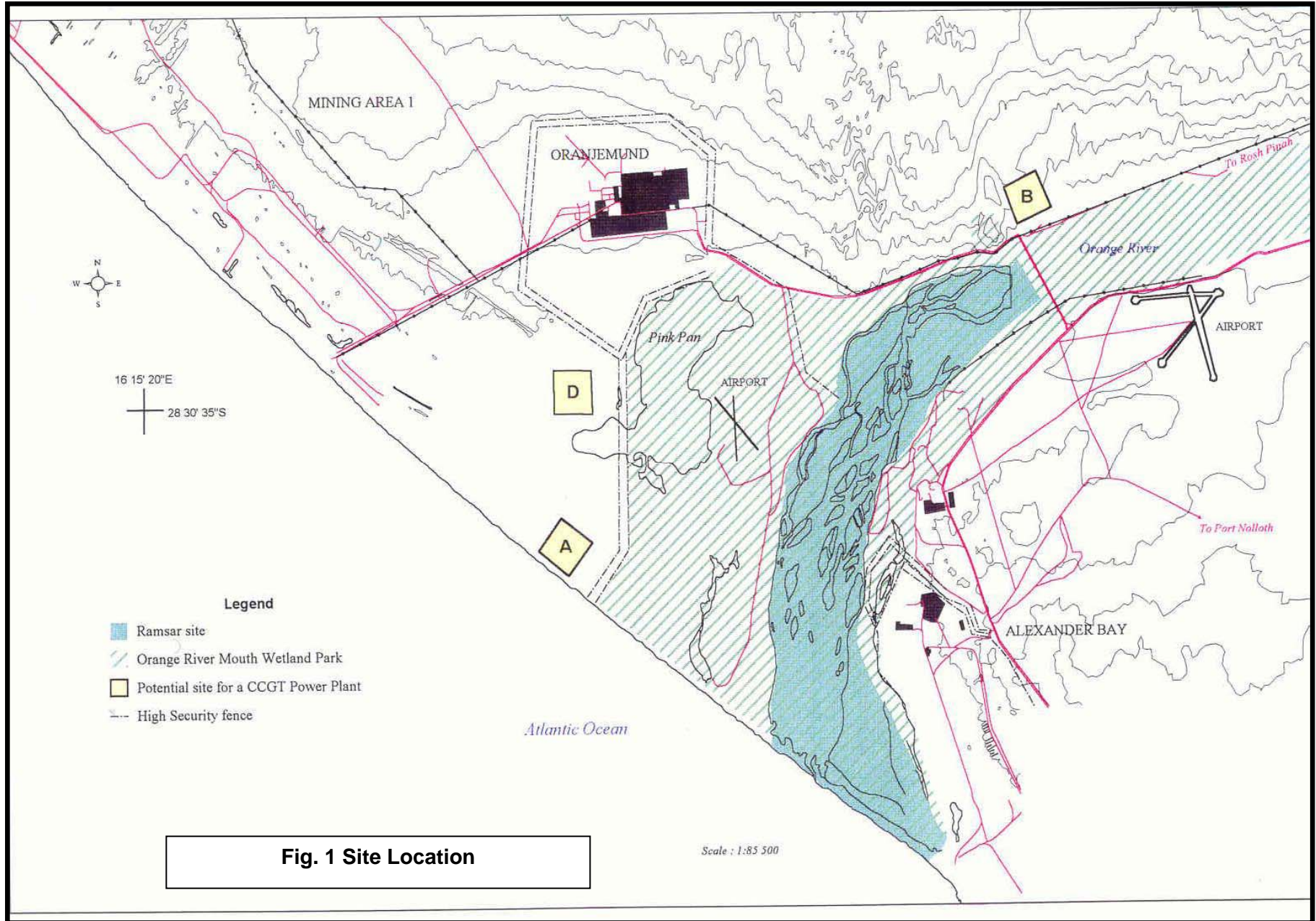


Fig. 1 Site Location

Figure 2

Examples of typical gas turbine plants



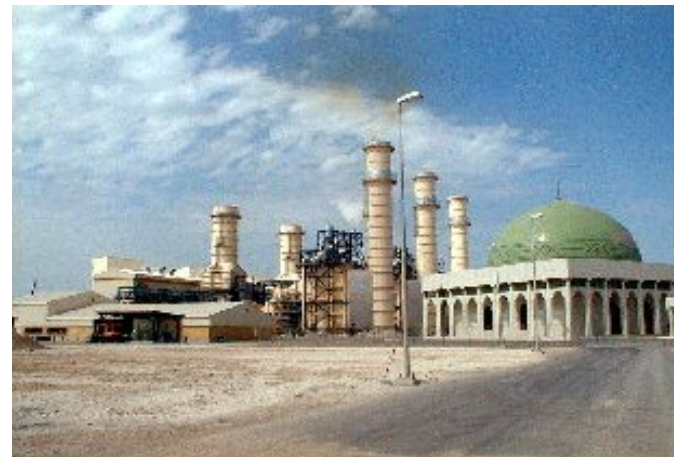
Portugal, Tapada de Oteiro



Argentina, Salta



New Zealand, Otahuhu



United Arab Emirates, Al Taweelah