



**ESKOM HOLDINGS LIMITED
GENERATION DIVISION**

**NUCLEAR 1 ENVIRONMENTAL IMPACT
ASSESSMENT AND ENVIRONMENTAL
MANAGEMENT PROGRAMME**

**SPECIALIST STUDY FOR
SCOPING REPORT**

SPECIALIST STUDY: NOISE

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JONGENS KEET ASSOCIATES
ACOUSTICAL ENGINEERING CONSULTANTS

Telephone: 021 – 7945643

Facsimile: 021 – 7945643

email: jongens@yebo.co.za

A.W.D. Jongens
8 Wingerd Avenue
7806 CONSTANTIA
Tel/Fax: 021 794 5643

D. Cosijn
207 Albert Street
0181 WATERKLOOF
Tel/Fax: 012 460 44811

Architectural Acoustics Noise & Vibration Control Environmental Noise Traffic Noise Acoustical Material Research Underwater Sound Nonlinear Acoustics

1 EXECUTIVE SUMMARY

An initial investigation was conducted into the potential impact of noise from the proposed Eskom nuclear power plant and associated infrastructure during construction and operation phases.

It is anticipated that there will be little to no noise impact beyond the site boundaries of the plant irrespective of where the plant is situated provided that noise mitigation procedures are implemented in the design and placement of the transformer oil coolers of the nuclear power plant.

The potential impact of noise during the construction phase of the plant will be investigated during the subsequent phase of the Environmental Impact Assessment once details of the construction process and details of transportation of construction and delivery vehicles is known.

2 INTRODUCTION

2.1 Description of Proposed Project

It is proposed to construct a new conventional nuclear power station at one of five potential sites along the South African coastline. These sites were previously identified during the Eskom Nuclear Site Investigation project.

2.2 Terms of Reference

The first stage of this Environmental Impact Assessment (EIA) process is to identify environmental site sensitive issues of each of the five potential sites for consideration and evaluation during the subsequent full EIA phase.

Jongens Keet Associates was commissioned to undertake a specialist study into the potential impact of noise from the proposed construction and operation of the proposed nuclear power plant.

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3 BACKGROUND AND METHODOLOGY

A noise impact study is conducted in accordance with procedures contained in South African National Standard (SANS) 10328, *Methods for environmental noise impact assessments* in terms of the National Environmental Management Act Nr 107 of 1998. A summary of the procedure is outlined hereunder.

1. Determine the land use zoning and identify all potential noise sensitive sites that could be impacted upon by activities relating to operation of the proposed nuclear power plant.
2. Determine the acceptable rating level for noise at identified noise sensitive sites.
3. Identify all noise sources relating to the activities of the proposed nuclear power plant that could potentially result in a noise impact at the identified noise sensitive sites.
4. Determine the sound emission and nature of the sound emission from each of the identified noise sources.
5. Calculate the expected rating level of sound at the identified noise sensitive sites from the combined sound power level emanating from identified noise sources.
6. Calculate the noise impact at identified noise sensitive sites.
7. Assess the noise impact at identified noise sensitive sites in terms of SANS 10103, *The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication*; the Noise Control Regulations; the World Health Organisation; the World Bank.
8. Investigate alternative noise mitigation procedures, if required.

The calculation, analysis and assessment of noise impact requires details of the plant layout and quantitative data of all sources of noise of the power plant associated with the electrical power generation process including noise emission data of each of the noise sources, their location within the plant and the material of the bounding structures. The propagation of sound from each noise source through the bounding structures and subsequent propagation through the atmosphere is calculated to predict and subsequently assess the rating levels of combined noise at identified noise sensitive sites.

The primary sources of noise are the gas turbine, electrical generator, compressors and transformer oil cooling fans. At the time of preparation of this report no details of the machinery or noise emission data was available.

4 DESCRIPTION OF THE SITE AND SURROUNDING ENVIRONMENT

The five potential sites identified were:

- Thyspunt near Cape St. Francis in the Eastern Cape
- Bantamsklip 10 km south-east of Pearly Beach in the Western Cape
- Duynefontein adjacent to the existing Koeberg Power Station north of Cape Town
- Brazil in the Kleinsee/Port Nolloth area in the Northern Cape
- Schulpfontein in the Hondeklipbaai/Kleinsee area in the Northern Cape

For nuclear safety reasons each site is located several kilometres from residential or other noise sensitive land. The nuclear power generation plant will be located on a relatively large site of the order of 30 ha with the site boundaries at considerable distances from the main plant.

5 IMPACTS AND MITIGATION MEASURES

5.1 Project Impacts and Mitigation Measures

In the absence of any information regarding the machinery to be installed at the proposed nuclear power generation plant an investigation was conducted into noise emanating from the existing Koeberg Power Station at Duynefontein [1]. The existing Koeberg nuclear power plant contains two nuclear reactors each coupled to a turbine, electrical generator and associated machinery. It was assumed that the proposed nuclear plant would be similar to the Koeberg plant in design and machinery and hence in noise emission.

Sound measurements conducted within and outside of the turbine/generator building indicated that the noise from the turbines and generators were insignificant compared to the major source of noise determined to be the transformer oil cooling fans situated outside and close to the building.

From the results of the sound measurements it was calculated that the noise emanating from a similar nuclear power plant would comply with the acceptable outdoor, night-time noise criteria contained in SANS 10103 for a suburban residential district situated 1900 m from the plant and for a rural residential district situated 2900 m from the plant. The impact of noise at these respective distances would be low to negligible. The calculations were conducted assuming unobstructed propagation of noise and of meteorological conditions most favourable for the propagation of noise from noise source to receiver. This represented a worst case scenario for any of the five alternative sites

During operation phase, therefore, it is anticipated that there would be a low to negligible noise impact beyond the site boundaries of the plant at any of the five potential sites dependent on the distance between the nuclear power generation plant and the site boundaries. Noise mitigation procedures implemented in the design and location of the oil coolers would reduce the separation distances contained in the previous paragraph. This would need to be confirmed once details and noise emission data of the proposed plant become available.

The potential impact of noise emanating from road traffic to any of the sites during operation phase will be investigated during the subsequent phase of the Environmental Impact Assessment.

The potential impact of noise emanating from any of the sites during the construction phase as well as that emanating from construction and delivery vehicles along the routes to the site will be investigated during the subsequent phase of the Environmental Impact Assessment once details of the site preparation, construction process and details of the vehicles used for transportation of equipment is known. Transportation of large, heavy equipment/machinery by slow moving, ultra-heavy-duty vehicles to site is anticipated to cause a high noise impact on noise sensitive land along the entire transportation route. This was borne out during the recent replacement of heavy machinery at the Koeberg Power Station.

Part of the Koeberg Power Station site is a nature reserve where wildlife is unaffected by the (inaudible) noise emanating from the power generation plant. The physical clearance of the site and construction of the infrastructure of the power plant is likely to have a greater impact on wildlife in the vicinity of such activities than any noise associated with such activities. During operation phase noise will have no impact on wildlife other than their natural survival instinct to be out of the immediate vicinity of people moving on the site.

5.2 Environmental Impacts and Mitigation Measures

Noise emanating from the surrounding environment will have no impact on the proposed Nuclear Power plant.

6 SITE SENSITIVITY ANALYSIS

With reference to 5.1 noise emanating from the Nuclear Power Plant during the operation phase is expected to have little to no impact beyond the boundaries of any of the five potential sites and is therefore not expected to influence the selection of any of the sites.

The potential impact of noise emanating from any of the sites during the construction phase as well as that emanating from construction and delivery vehicles along the routes to the site will be investigated during the subsequent phase of the Environmental Impact Assessment.

7 CONCLUSIONS

During the operation phase of the proposed Nuclear Power Plant and associated infrastructure it is anticipated that there will be little to no noise impact beyond the site boundaries of the plant irrespective of where the plant is situated provided that noise mitigation procedures are implemented in the design and placement of the oil coolers.

The potential impact of noise during the construction phase of the plant will be investigated during the subsequent phase of the Environmental Impact Assessment once details of the construction process and details of transportation of construction and delivery vehicles is known.

REFERENCE

- 1 Jongens Keet Associates, *Environmental noise impact study into the proposed establishment of a pebble bed modular reactor in the Western Cape*, November 2007

GLOSSARY OF TERMS

Glossary of terms used in the measurement and assessment of sound

Ambient noise

the totally encompassing sound in a given situation at a given time, and is usually composed of sound from many sources, both near and far. It includes the noise from the noise source(s) under investigation.

A-weighted sound pressure level (sound level), L_{pA}

the sound pressure level, in decibels, relative to a reference sound pressure, and incorporating an electrical filter network in the measuring instrument corresponding with the human ear's different sensitivity to sound at different frequencies.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$

A formal definition is contained in SANS 10103. The term "equivalent continuous" may be understood to mean the "average" A-weighted sound level measured continuously, or calculated, over a period of time, T.

Equivalent continuous rating level, $L_{Req,T}$

the equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$, measured or calculated during a specified time interval T, to which is added adjustments for tonal character, impulsiveness of the sound and the time of day. An adjustment of 5 dB is added for any tonal character, if present, plus a further 5 dB if the noise is also of an impulsive nature. Where neither is present, the $L_{Req,T}$ is equal to the $L_{Aeq,T}$.

Reference time interval

The time interval to which an equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$, or rating level of noise, $L_{Req,T}$, is referred. Unless otherwise indicated, the reference time interval is interpreted as follows:

- Day-time: 06:00 to 22:00hrs T=16 hours when $L_{Req,T}$ is denoted $L_{Req,d}$
- Night-time: 22:00 to 06:00hrs T=8 hours when $L_{Req,T}$ is denoted $L_{Req,n}$

Residual noise

the ambient noise that remains at a given position in a given situation when one or more specific noises (usually those under investigation) are suppressed.