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CHAPTER 1: INTRODUCTION

File name: [1] Eskom Duynefontyn SSR Chapter 1 Introduction_Rev 1a

Author declaration: I declare that appropriate diligence and quality assurance was applied in the compilation of this report. As such I am confident in the results here described and the conclusions drawn.



.....

Name: Anita Kilian Date: 2024-03-13

Peer Reviewer: I declare that this report has undergone independent peer review by myself, that comments were addressed to my satisfaction, and that as such, it is considered fit for publication.



.....

Name: Given Mabala Date: 2024-03-13

**NSS Manager
Authorisation:**

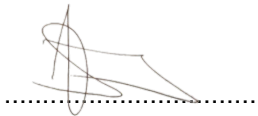


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2024-03-15

Name: Israel Sekoko Date:

Eskom Acceptance:




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2024-03-15

Name: Israel Sekoko Date:

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AMENDMENT RECORD			
Rev	Draft	Date	Description
0		4 June 2015	New chapter, replacing old KSSR Rev 0, the last authorised SSR.
1		29 September 2021	Introduction to Revision 1 of the DSSR. The chapter was updated to reflect latest developments at the site, and to align with the guidance on the format and style of SSRs (NSIP03959).
1a		13 March 2024	Chapter updated to address the NNR comments and to reflect the latest developments at the site.

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EXECUTIVE SUMMARY

This Site Safety Report (SSR) describes the Duynefontyn site and its surrounds, including the hazards associated with the site, enables an evaluation of its suitability to accommodate additional nuclear installation(s), and provides the technical input into the design of the nuclear installations currently and potentially to be located on the site. It also contains information on site suitability, emergency preparedness, and quality assurance. The Duynefontyn SSR (DSSR) will upon authorisation, replace the Koeberg Site Safety Report (KSSR Rev 0), the last authorised and approved version of the SSR.


The site includes an existing licensed nuclear installation (Koeberg Nuclear Power Station - KNPS), the Original Steam Generators Interim Storage Facility (OSGISF) located on the site of the Transient Interim Storage Facility (TISF) and the TISF. Eskom Holdings SOC Limited (hereafter referred to as Eskom) is also considering the construction of additional new nuclear installations of Pressurised Water Reactor Technology with planned capacity of up to 4 000 MWe

The site is located in the magisterial district of Malmesbury in the Western Cape. It is situated approximately 25 km north of Cape Town adjacent to the R27, bounded to the west by the Atlantic Ocean, with the site centroid having the following coordinates:

- X (m): -52727.4000;
- Y (m): -3727966.6500;
- latitude: 33° 40' 36.78" S;
- longitude: 18° 25' 53.08" E.

The licence applicant/holder is Eskom Holdings SOC Limited (Reg. No 2002/015527/06, Republic of South Africa).

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1 INTRODUCTION


This Site Safety Report (SSR) presents the site characteristics of the Duynefontyn site (hereinafter referred to as '*the site*', see **Figure 1.1**). It is an update of the Duynefontyn SSR (DSSR) Revision 1 (Eskom, 2021a), addressing NNR comments. Upon authorisation the DSSR will replace the Koeberg Site Safety Report (KSSR Rev 0), the last authorised and approved version of the Site Safety Report.

The DSSR describes the Duynefontyn site and its surrounds, including the hazards associated with the site, enables an evaluation of its suitability to accommodate additional nuclear installation(s), and provides the technical input for the design of the nuclear installations currently and potentially located on the site. It also contains information on site suitability, emergency preparedness, and quality assurance (see **Table 1.1**).

The site includes an existing licensed nuclear installation(s) (Koeberg Nuclear Power Station – KNPS). The KNPS (as per the Koeberg Nuclear Installation Licence Number NIL-01) (National Nuclear Regulator, 2024a) comprises of two three-loop pressurized water reactors (PWRs), known as Units 1 and 2, which have been operational since 1984 and 1985 respectively. The following components are recognised by NIL-01: (a) a nuclear island consisting of two reactor buildings, each housing a Nuclear Steam Supply System, two fuel buildings, a nuclear auxiliary building common to both units and connecting buildings; (b) a shared turbine building housing two turbine generators and their auxiliaries; (c) five diesel generator buildings, each housing one emergency diesel generator (two are assigned to each unit, and one can be assigned to either unit); (d) a shared electrical building; (e) one pumping station for the conventional island cooling water; (f) one pumping station for the nuclear island cooling water; (g) two condensate polishing plants and a water treatment building; (h) miscellaneous buildings for auxiliary equipment; (i) workshops and service buildings; (j) low level waste and cask storage buildings. Each unit has a nominal electrical capacity of 965 MWe (2 785 MWth). The steam generator replacement and the thermal power uprate projects will increase the core thermal output on each unit from 2 785 MWth (965 MWe) to 3 065 MWth (1 100 MWe).

Authorisation was granted for the siting, construction, operation and decommissioning of the nuclear installation known as the Transient Interim Storage Facility (TISF), and the Original Steam Generators Interim Storage

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Facility (OSGISF) located on the site of the TISF (NIL-44) (National Nuclear Regulator, 2024b) .

The TISF is located on the northern side within the KNPS owner-controlled area and includes the site earmarked for storage of spent fuel in dry storage casks and the OSGISF. The OSGISF comprises two concrete mausoleum buildings for the storage of the empty original steam generators from KNPS.

Eskom Holdings SOC Limited (hereafter referred to as Eskom) is also considering the construction of additional new nuclear installations of Pressurised Water Reactor Technology with planned capacity of up to 4 000 MWe. The design of the proposed new nuclear installation has not yet been selected and therefore priority has been given to completing this SSR for the site using a plant parameter envelope (Eskom, 2021b), while its associated enveloping liquid and gaseous source terms are given in **Chapter 7**.


1.1 Site Location

The site is located in the City of Cape Town metropolitan municipality in the Western Cape. It is situated approximately 25 km north of Cape Town adjacent to the R27, bounded to the west by the Atlantic Ocean, with the site centroid having the following coordinates (see **Figure 1.1**):

- X (m): -52727.4000;
- Y (m): -3727966.6500;
- latitude: 33° 40' 36.78" S;
- longitude: 18° 25' 53.08" E.

Eskom has adopted, with respect this revision of the SSR, the convention of referring to the site as “Duynefontyn”, as opposed to “Duynefontein”, which was used during the previous revision of the SSR. This is in recognition of, and in order to align with the official (Deeds registered) name of the greater portion of the Eskom property, which is on the farm Duynefontyn No. 1552 (see **Section 5.1**).

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**Figure 1.1
Location of the Duynefontyn Site**

1.2 Purpose of this Site Safety Report

This SSR intends to provide information about the characteristics of the site in support of KNPS periodic safety reviews and to further evaluate and demonstrate the suitability of the site to accommodate new nuclear installation(s), whilst enabling and demonstrating adherence to the relevant national nuclear safety requirements, as amongst others contained in the National Nuclear Regulator (NNR) Act (Republic of South Africa, 1999) and The Regulations on Licensing of Sites for New Nuclear Installations (Department of Energy, 2011).

The following are the specific objectives to fulfil the purpose of this SSR:

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- Provide an update of site characteristics information in support of KNPS;
- seek in advance NNR review and approval on the suitability of the site to accommodate a new additional nuclear installation(s);
- identify and evaluate potential natural and man-made hazards that could impact on the safety of the existing and proposed nuclear installation(s);
- identify physical characteristics that could pose a significant impediment to the implementation of adequate security measures associated with a nuclear installation(s) on the site;
- evaluate the possible cumulative radiological impact to the public and the environment resulting from the existing and proposed facility;
- identify physical characteristics that could pose a significant impediment to the implementation of the emergency plan; and
- demonstrate that this SSR is the result of a comprehensive, appropriately graded, quality assurance and quality control programme that was applied to the collection of data, its analyses, interpretation and reporting.


1.3 Scope of this Site Safety Report

This SSR presents the relevant characteristics of the site, where nuclear installations of maximum power output of up to 6 200 MWe¹ incorporating the final (post thermal power uprate) 2 200 MW of the KNPS, are planned to be built (following a phased approach) (see **Chapter 3** for an overview of planned activities).

The scope of the SSR is informed by Section 3 (1) of The Regulations on Licensing of Sites for New Nuclear Installations (Department of Energy, 2011), which requires that any person wishing to site a nuclear installation must lodge an application for a nuclear installation site license, addressing factors as stipulated in Section 4 of the regulations. Such an application must be supported by an SSR (Section 3.2a) addressing requirements as contained in Section 5 of the regulations. The SSR is further informed by the NNR interim guidance for the siting of nuclear facilities (RG-0011) (National

¹ KNPS + Nuclear-1 = 2 200 MWe + 4 000 MWe = 6 200 MWe

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Nuclear Regulator, 2016).

As such, this SSR contains information on the following:

- details of the licensee/applicant and the name of the site of interest in **Chapter 1**;
- motivation for choice of the site (for the purposes of new nuclear installation/s) in **Chapter 4**;
- the proposed maximum generating capacity for the site in **Chapters 1 and 3**;
- an overview of planned activities at the site in **Chapter 3**;
- the scope and extent of the investigation activities in **Chapter 4**;
- site characteristics in **Chapter 5**;
- the identification and quantification of the magnitude and occurrence probability of external events and hazards in **Chapter 6**;
- the potential radiological impact in terms of dose and risk on the public and the environment, based in part on the source term developed in **Chapter 7**;
- an evaluation of the feasibility of implementing an emergency plan in **Chapter 8**;
- a description of the quality management system used to compile this SSR in **Chapter 10**;
- measures implemented to assist with management of uncertainties;
- monitoring programmes that have been implemented and are reported on in this SSR, as well as recommendations for on-going monitoring;

The terms used in this SSR are in line with the national legislation and the Eskom Nuclear Sites Glossary of Definitions, Terms and Abbreviations (Eskom, 2020). International experience and standards were used wherever possible and relevant.

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This SSR will be updated periodically in line with the requirements as contained in the siting regulations (Department of Energy, 2011) and safety re-evaluations/re-assessments during periodic reviews.


1.4 Structure of this Site Safety Report

This document is structured in a way that allows compliance to the requirements as contained in the siting regulations. Each chapter/section has been compiled according to a technical specification (Eskom, 2022). **Table 1.1** presents a summarised description of each chapter.

Table 1.1
Structure of this Site Safety Report

Chapter	Title	Description
1	INTRODUCTION	Introduces the purpose and scope of this SSR. It also provides description on the location of the site, planned use of the site and the planned total electrical/thermal capacity at the site.
2	LEGAL AND REGULATORY BASIS	Specifies acts and regulations applicable to nuclear siting. Where there is a lack of regulatory guidance, this SSR provides alternative regulatory solutions in accordance with internationally accepted standards/recommendations for regulatory compliance, including the adoption of selected guides, codes and standards.
3	OVERVIEW OF PLANNED ACTIVITIES AT THE SITE	Describes the site development, planned site activities and generic layout for the site.
4	SITE INVESTIGATION APPROACH	Outlines the approach, rationale and process followed to select the most suitable sites. This includes strategic screening from national and regional level through ranking of many candidates sites to the selection of the most suitable sites.


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Chapter	Title	Description
5	SITE CHARACTERISTICS (DETAILED ANALYSIS)	Provides detailed information about the site specific characteristics and the surrounding environment, this includes; geography and site location, monitoring, ecology, demography, land and water use, adjacent sea use, nearby transportation, industrial and military facilities, meteorology, coastal engineering and oceanography, hydrology and hydraulics, geohydrology, water supply, geology, seismology and geotechnical characterisation. This chapter also identifies sources of potential external hazards within the site area and the surrounding environment.
6	EVALUATION OF EXTERNAL EVENTS	Presents the evaluation of potential natural and human-induced external events that are relevant for the nuclear installation(s) at the site.
7	POTENTIAL RADIOLOGICAL IMPACT ON THE PUBLIC AND THE ENVIRONMENT	Presents a preliminary dose assessment to the public during normal operations using an enveloping approach to demonstrate that the radiological consequences from normal operation and postulated events associated with the nuclear installation(s) will be acceptably low and within the regulatory limits.
8	EMERGENCY PLANNING	Identifies all physical characteristics of the site that could pose a significant impediment to the feasibility of the emergency plan for the site. The chapter will also propose Emergency Planning Zones for the site and required actions to implement protective measures at each zone.
9	PHYSICAL PROTECTION AND SECURITY	Presents the preliminary results from the assessment performed to investigate the suitability of the site from a security point of view. Specific assessments from the national security authorities and the required measures to ensure physical protection and security of the site will be submitted separately.
10	MANAGEMENT SYSTEM	Describes the management system according to which the siting and characterisation activities were performed.

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Chapter	Title	Description
11	CONCLUSIONS	Summarises the overall conclusions in terms of site suitability, regulatory compliance and management of uncertainties.

The detailed information supporting this SSR (e.g. technical reports, monitoring data, calculations and Excel sheets) are presented in appendices (in hard copy or electronic form, i.e. CDs or DVDs) attached to or referenced in the individual chapters and sections.

Measures were put in place to ensure that the SSR site investigation records are maintained during the lifecycle of the nuclear installation(s) and according to the regulatory requirements, and details are presented in **Chapter 10**.

1.5 Details of Licence Applicant

The details of the licence applicant (licence holder in the case of KNPS) are the following:

Eskom Holdings SOC Limited

Reg. No 2002/015527/06

Registered in South Africa


Physical Address of Head Office:

Eskom
Megawatt Park
Maxwell Drive
Sunninghill
Sandton 2157

Postal Address of Head Office:

Eskom
PO Box 1091
Johannesburg 2000


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5. Eskom, 2020. *Nuclear Sites Glossary of Definitions, Terms and Abbreviations*, Cape Town: Koeberg Operating Unit.
6. Eskom, 2021a. *Duynefontein Site Safety Report, Rev 1*, Cape Town: Koeberg Operating Unit.
7. Eskom, 2021b. *Plant Parameter Envelope for Nuclear Installations, Rev. 2*, Cape Town: Nuclear Engineering.
8. Eskom, 2022. *Technical Specification for Site Safety Reports*, Cape Town: Nuclear Engineering.
9. National Nuclear Regulator, 2019. *Koeberg Nuclear Power Station: NNR Directive: Storage, and Transport on-site, of Spent Fuel Dry Storage Casks, Letter: k10001392N, dated 13 March 2019*. Centurion: National Nuclear Regulator.
10. National Nuclear Regulator, 2024a. *Nuclear Installation Licence No. NIL-01 (Variation-20)*, Centurion: National Nuclear Regulator.
11. National Nuclear Regulator, 2024b. *Nuclear Instalation Licence No. NIL-44 for the Siting, Construction, Operation and Decommissioning of the Nuclear Installation Known as the Transient Interim Storage Facility and the Original Steam Generators Interim Storage Facility*. Centurion: National Nuclear Regulator.

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12. National Nuclear Regulator, 2016. *Interim Guidance for the Siting of Nuclear Facilities, RG-0011*, Centurion: National Nuclear Regulator.
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