

# 1 INTRODUCTION

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## 1.1 Project background

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In many countries, including South Africa, economic growth and social needs are resulting in substantially greater energy demands, in spite of accelerated energy efficiency advancements. As a result, the demand for power is growing at a faster rate than the rate at which new generation capacity can be installed. Eskom Holdings Limited (hereafter referred to as *Eskom*) is South Africa's primary power producer and supplier. Despite a short-term reduction in demand for electricity during the recession (Eskom's sale of electricity decreased by 4,2 % during the 2008/2009 financial year compared to a 2.9 % growth during the previous year), there is still a base-load capacity deficit in South Africa (Eskom 2009). The reserve margin (the difference between the peak demand and Eskom's generating capacity) was 5 % in January 2008, and improved to 14 % by January 2009, mainly due to the slowdown in the economy (Eskom 2009). However, even in the current recessionary conditions, this margin is still below the international norm of 15 %. Once the economy picks up again, the reserve margin will once again become critical. New power stations therefore continue to be necessary to bring the reserve margin back to an acceptable level.

According to the Accelerated and Shared Growth Initiative for South Africa (AsgiSA), government seeks a 4,5 % economic growth or higher between 2005 and 2009 and a growth rate of 6 % between 2010 and 2014 ([www.info.gov.za/asgisa/asgisa.htm](http://www.info.gov.za/asgisa/asgisa.htm) - accessed on 15 September 2009). Thus, the growth in the demand for electricity is expected to continue, despite Eskom's energy efficiency and electricity conservation programmes. It is therefore necessary to secure new base-load electricity generating capacity in South Africa.

To optimally meet the total demand for electricity, it is necessary to have both base-load<sup>1</sup> power stations and peak-load<sup>2</sup> power stations. Base load power stations provide a continuous power supply throughout the day, while peaking power stations (e.g. pumped storage schemes) can typically only supply power during the morning and afternoon peaks. Nuclear and coal-fired power stations are the only feasible options available to South Africa to supply base-load generation capacity. To keep up with the expected demand, Eskom needs to build 40 000 MegaWatt (MW) of new generation capacity by 2025, of which 9 600 MW of base load coal and 1 333 MW of pumped storage is already under construction. Further more than half of the units of the previously mothballed power stations (Komati, Camden and Grootvlei) have been returned to service. All eight units at Camden power station are commissioned and operating. Whilst South Africa's major energy source will remain coal in the foreseeable future, Eskom intends to reduce coal's current 88 % share of the energy mix to below 70 % by 2030. To achieve this, a much higher proportion of nuclear (currently 4 %) is proposed by 2030, while additional renewable energy options (about 2 % by 2030) will also be pursued (Eskom 2009). Thus, Eskom proposes to sequentially develop three nuclear power stations (NPSs), to be known as Nuclear-1, Nuclear-2 and Nuclear-3. The current application is for the first of these power stations, which may be located at one of three sites, namely Duynefontein, Bantamsklip (in the Western Cape) and Thyspunt (in the Eastern Cape). Further Nuclear-1 and the subsequent power station will have generation capacities of up to 4 000 MW.

This document is a Draft Environmental Impact Report (DEIR), which documents an Environmental Impact Assessment (EIA) process that has been undertaken to assess the environmental impacts of the proposed power station (i.e. Nuclear-1) at any one of the three alternative sites. The DEIR will be placed in the public domain for public review and comment. In terms of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) and associated EIA regulations (Government Notice Numbers R 385, 386 and 387 of 2006), listed activities included in these regulations require environmental authorisation before they can proceed.

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<sup>1</sup> Power station technology designed specifically to generate electricity continuously for all hours of the day and night

<sup>2</sup> Power station technology designed specifically to generate electricity during periods of high demand for electricity, normally on weekdays from 07:00 to 09:00 and 18:00 to 20:00

For the proposed power station the two primary listed activities in terms of Government Notice No. R 387 of 2006 are:

- (1a) *The construction of facilities or infrastructure, including associated structures or infrastructure, for the generation of electricity where the energy generation is greater than 20 Megawatts and the facility exceeds an area of one hectare; and*
- (1b) *The construction of facilities or infrastructure, including associated structures or infrastructure, for nuclear reaction including the production, enrichment, processing, reprocessing storage or disposal of nuclear fuels, radioactive products and waste.*

The EIA process was undertaken in accordance with:

- the requirements of sections 24 and 24D of the NEMA, as read with Government Notices R 385 (Regulations 27-36), R386 and R387 of the NEMA;
- the guidelines provided by the Integrated Environmental Management (IEM) Information Series; and
- Department of Environmental Affairs and Tourism<sup>3</sup> (DEAT) Guidelines for the Public Participation and the application of the EIA Regulations (DEAT 2006); and
- Various guidelines of the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP).

This DEIR documents the EIA Phase of the EIA process, which investigated the potential impacts of the proposed power station on the receiving environments.

In addition to the environmental authorisation in terms of NEMA, the proposed power station requires a number of other authorisations from various departments, such as the Department of Mineral Resources, the Department of Water Affairs (DWA), the Department of Environment Affairs (DEA), as well as the regulatory authorities such as the National Nuclear Regulator (NNR) and the National Energy Regulator of South Africa (NERSA). The processes associated with the legal requirements are documented in **Chapter 6** of this report.

The National Nuclear Regulator Act, 1999 (Act No. 47 of 1999) (NNRA) provides for the protection of persons, property and the environment against nuclear damage and mandates the NNR to exercise regulatory control related to safety. In terms of Section 20 of the NNRA, no person may site, construct, operate, decontaminate or decommission a nuclear installation, except under the authority of a nuclear installation licence. Section 21 of the NNRA makes provision for a person wishing to engage in any of these activities to apply to the Chief Executive Officer of the NNR for such a licence. However, in terms of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) ("the Constitution") and the NEMA, the DEA has a responsibility for decision-making regarding the potential impacts of the power station on the environment, even though these impacts are likely to include those relating to certain aspects of the radiological hazards associated with the facility.

In recognition of the dual but distinct responsibility with respect to the assessment of radiation issues, a co-operative agreement (**Appendix B4**) concluded between the DEA and the NNR was gazetted on 18 July 2008. One of the main purposes of this agreement is to "*prevent unnecessary and unavoidable duplication of effort*" between the NNR and DEA. The NNR authorisation process applies specifically to issues of nuclear and radiation safety related to the siting, design, construction, operation and decommissioning of nuclear installations. Furthermore, the Director General of the DEA issued a statement in January 2009 (**Appendix B4**) to further clarify the purpose of the agreement. The statement indicates that nuclear safety, radiation and radiology "*are better placed within the regulatory process of the NNRA and that consideration of the same issues in an EIA process will result in unnecessary and avoidable duplication.*"

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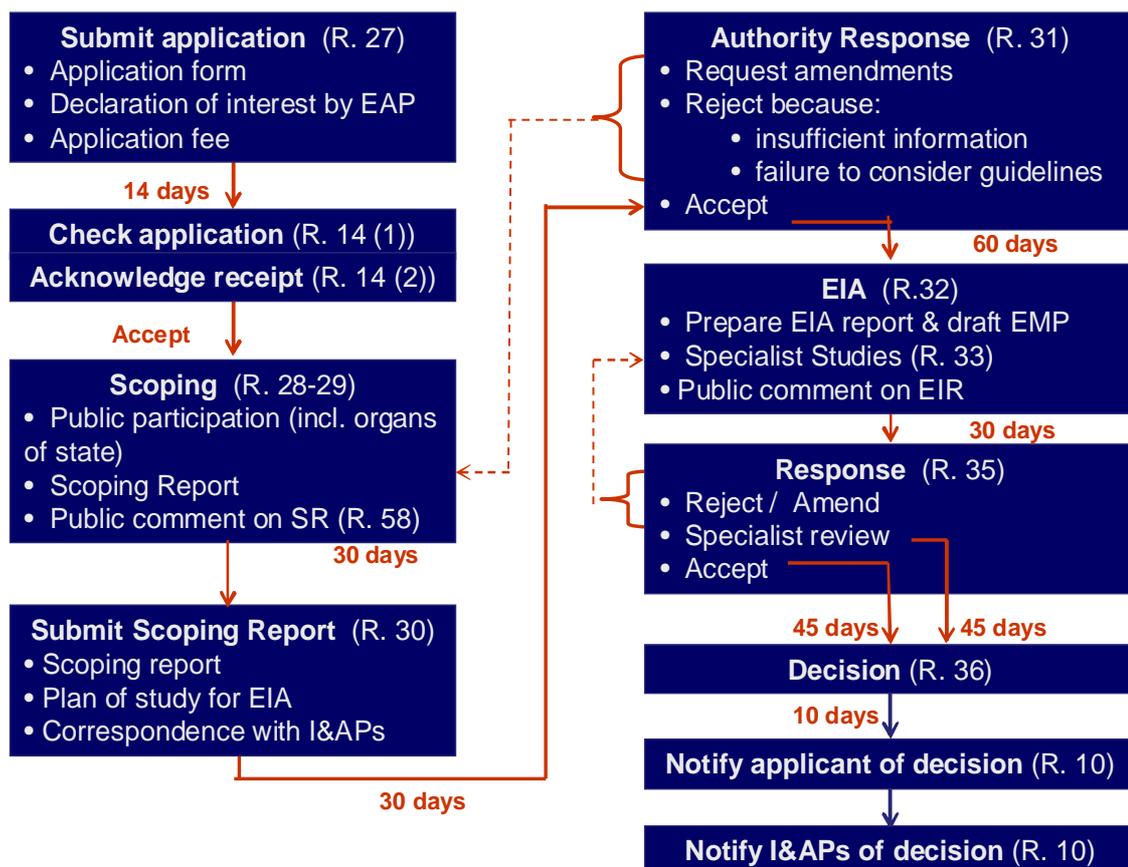
<sup>3</sup> Now Department of Environmental Affairs (DEA)

Thus, whilst “Site Safety Reports” prepared as part of the authorisation process for nuclear licensing have been included as appendices in this draft EIA Report (**Appendices E24, E26 and E27**), radiological issues will not be assessed in detail<sup>4</sup> in the DEIR and the DEA will not consider radiological impacts in decision-making.

## 1.2 Summary of the Environmental Authorisation process for the proposed NPS

Arcus GIBB (Pty) Ltd (hereafter referred to as Arcus GIBB) was appointed by Eskom to undertake the Environmental Impact Assessment (EIA) and compile a Environmental Management Plan (EMP) for the construction, operation and decommissioning of the NPS and associated infrastructure on one of five alternative sites that are located in the Northern, Eastern and Western Cape Provinces of South Africa.

The EIA process as legislated by the NEMA is indicated in **Figure 1-1**. The environmental authorisation process is the responsibility of the DEA, with the relevant provincial environmental authorities serving as commenting authorities. The Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA) and Western Cape Department of Environment Affairs and Development Planning (DEA&DP) will review the Environmental Impact Reports (EIRs) and provide comments and recommendations to the DEA.



**Figure 1-1: EIA Process as prescribed by the NEMA EIA Regulations (R refers to Regulation numbers)**

<sup>4</sup> The Emergency Response (Appendix E26) and Site Access Control Report (Appendix E27) and Human health Risk Assessment (Appendix E24), which have been prepared for the NNR nuclear licensing process, are appended to this Environmental Impact Assessment Report for information only, as their findings have no bearing on environmental impacts.

The details of the EIA process for the power station and associated infrastructure are outlined below.

### 1.2.1 Original application for a single Nuclear Power Station

The original application<sup>5</sup> submitted to the then DEAT in May 2007, and the amended application dated July 2008, was an application to commence with an EIA process for the proposed construction, operation and decommissioning of a single power station, referred to as "Nuclear-1". During the Scoping Phase of the environmental authorisation process, five sites were assessed as alternative sites and were compared in order to identify a single preferred site for the location of Nuclear-1.

The Scoping Phase of the EIA highlighted that two alternative sites i.e. Brazil and Schulpfontein, would not constitute reasonable and / or feasible site alternatives for Nuclear-1 based on, limited local demand and the lack of existing electricity transmission corridors associated with the these sites coupled with the severe time constraints associated with Nuclear-1's development. Eskom Transmission Planning Division performed high level studies of the integration into the South African electricity supply system of a large power station at each of the five coastal sites (**Appendix E28**). These studies included an assessment of the contribution to the transmission network stability, the contribution of the electricity supply to and the distance from the major load centres, the transmission infrastructure that would be required and the time required for the integration at each of the respective sites.

Thus, Brazil and Schulpfontein have been excluded from further consideration during the detailed EIA Phase<sup>6</sup> of the EIA process. However, the Scoping Report explicitly stated that the exclusion of Brazil and Schulpfontein from the EIA Phase did not preclude Brazil and Schulpfontein from the development of power stations in future.

DEAT's comments on the Final Scoping Report, received on the 19 November 2008 (**Appendix B2**), provided approval of the recommendation to exclude Brazil and Schulpfontein from further assessment during the EIA Phase of the EIA.

It has always been Eskom's intention to prepare for more than one nuclear power station. It was stated from the onset of the EIA process that all original five sites identified during the Nuclear Site Investigation Programme (NISP) will be considered for the development of power stations, as far as they are deemed feasible by the EIA process. This is part of the long-term power generation strategy for South Africa. Although the initial application for an NPS was for only a single site, during 2009 Eskom announced its intention to amend the application in order to apply for authorisation of all three sites (Duynefontein, Bantamsklip and Thyspunt). The rationale for a combined application for all three sites was based on Eskom's decision to pursue its strategy to develop a fleet of nuclear power stations on the sites identified through the Nuclear Site Investigation Programme. The intention to submit a combined application was based on the probable amendment of the EIA regulations<sup>7</sup>, which was expected to be promulgated in late 2009. However, these amendments have, at the time of writing, not yet been promulgated.

**After due consideration, Eskom decided not to pursue an application for the construction of more than one nuclear power station in this EIA. However, in line with Eskom's intention to pursue up to 20 000 MW of nuclear power generating capacity, an application for the second nuclear power station may be submitted by Eskom soon**

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<sup>5</sup> The submission of an application to the competent authority is the first step in the EIA process. The application is made in order to register the project with the competent authority and obtain permission to proceed with the EIA process.

<sup>6</sup> "EIA Phase" has been used interchangeably with "Impact Assessment Phase" throughout this document and Issues and Response Reports (IRRs).

<sup>7</sup> Section 15(2) of the proposed amendments to the EIA regulations stated: "If an applicant intends undertaking more than one activity of the same type at different locations within the area of jurisdiction of the competent authority, different applications in respect of the locations must be submitted, but the competent authority may, at the written request of the applicant, grant permission for the submission of a single application in respect of all those activities, whether or not the application is submitted on one or more applications forms."

**after the submission of the Final Environmental Impact Report for Nuclear-1. This application is therefore progressing as per the original application for authorisation of a single site.**

The potential roll out dates of the planned nuclear power stations will be based on the authorisations granted, national electricity demand forecast, availability of funding and lead times of vendors. However, indicative dates for the start of construction and commissioning of Nuclear-1 are 2012 and 2018, respectively.

## **1.2.2 Scoping Phase**

### **(a) Objectives and process**

The objectives of the Scoping Phase were to:

- Identify the important characteristics of the affected environment;
- Identify the issues and potential impacts of the project on the biophysical and socio-economic environment and associated mitigation measures;
- Ensure that feasible alternatives are identified and selected for further assessment;
- Focussing the EIA Phase on the identified feasible alternatives and significant issues;

The Scoping Report was compiled in accordance with the following content requirements:

- Details and expertise of the Environmental Assessment Practitioner (EAP) undertaking the EIA process;
- A description of the proposed locations for the activity along with all applicable alternatives;
- A baseline description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed project;
- Identification of all relevant legislation and guidelines that have been considered for the project;
- Description of the environmental issues and potential impacts, including cumulative impacts that have been identified;
- Description of the methodology to be adopted in assessing the environmental impacts, including any specialist studies that will be undertaken;
- Providing an outline of the Public Participation Process (PPP) that has been undertaken for the project; and
- Providing a Plan of Study (PoS) for EIA.

### **(b) Key environmental impacts identification**

The EIA project team, comprising Arcus GIBB (as lead consultants) and specialists, undertook site visits to each of the sites in order to obtain an overview of the potential risks and key impacts associated with the proposed power station. Risks and key impacts associated with the construction, operational and decommissioning phases were identified in consultation with the comments received from Interested and Affected Parties (I&APs), and included the following key issues:

- Geological and geotechnical suitability;
- Depth of water table and associated dewatering requirements as well as the implications for surrounding and downstream water users;
- Source of water supply for operations of the NPS;
- Disturbance and disruption of terrestrial ecological processes such as loss of habitat and associated flora and fauna.
- The disruption of faunal migration patterns between the coast and inland as well as mobile

- dunes;
- Marine ecology disturbance through requirements for cooling water, the potential for desalination and activities associated with the disposal of brine;
- Health, safety and security of the site as well as limitations on surrounding land use;
- Changes to community structures through the influx of workers and associated infrastructural requirements;
- Change in tourism activities;
- Visual disturbance;
- Loss of heritage and cultural resources;
- Loss of high potential agricultural soils;
- Wind-generated dust;
- Construction of required facilities and infrastructure associated with accessibility to the site, transport and integration of the generated power into the networks;
- Security; and
- Waste handling and management.

Potential positive impacts identified during the process included:

- Improved generation capacity in the Cape region and South Africa as a whole, which could stimulate much-needed local economic growth and reduce current power shortages;
- Potential establishment of formal conservation areas on Eskom-owned land;
- Significantly lower Green House Gas (GHG) emissions when compared with that of coal fired power stations; and
- Direct economic injection into the local economies.

The significance of the potential impacts identified during the Scoping Phase, has been assessed during the detailed assessment phase of the EIA process, and documented in Chapters 8, 9 and 10 of this DEIR.

In addition, the Scoping Phase highlighted a range of alternatives for the proposed project. These were taken forward for further consideration in the EIA Phase, as documented in Chapter 5 of this DEIR.

### **(c) Public review of the Scoping Report**

All registered I&APs were advised of the availability of the Draft Scoping Report (DSR) and were provided with an opportunity to review and submit comments on the report. An extensive set of public open days was held to enable I&APs to discuss the findings of the DSR with the Environmental Assessment Practitioners (EAPs). The Scoping Phase resulted in the exclusion of two sites, located in the Northern Cape, from further investigation during the EIA Phase.

### **(d) Finalisation and submission of the Scoping Report**

I&AP comments were integrated into an updated Issues and Response Report (IRR) and the Final Scoping Report (FSR). The FSR and Plan of Study for EIA was submitted to the DEA and the Northern, Eastern and Western Cape provincial environmental authorities for consideration. The FSR was also made available to the public for information purposes. The DEAT approved the Final Scoping Report on 19 November 2008 (**Appendix B2**) in accordance with regulation 31(1)(a) of the EIA regulations.

### **(e) Revised Plan of Study for EIA**

Section 31(1)(b) of the EIA regulations states that the competent authority must consider a Scoping Report and in writing, "*request the EAP to make such amendments to the report or the plan of study for environmental impact assessment as the competent authority may require*". Accordingly, DEA requested that the Plan of Study for EIA be revised. The Plan of Study for EIA was revised accordingly by incorporating DEA's comments. The revised Plan of

Study was placed in the public domain for a period of 30 calendar days for I&APs to review the document and provide comments.

In addition the revised Plan of Study for EIA served as a mechanism to communicate Eskom's intention to amend the original application for environmental authorisation submitted to the then DEAT in May 2007 (which application was again amended in July 2008) to apply for all three sites. As indicated in Section 1.2.1, such a combined application is no longer being pursued and the application has reverted back to an application for a single site.

### 1.2.3 Impact assessment process

The purpose of the EIA Phase of an EIA is as follows (DEAT 2005):

- Address issues that were raised during the Scoping Phase;
- Assess alternatives to the proposed activity in a comparative manner;
- Assess all identified impacts and determine the significance of each impact; and
- Formulate mitigation measures.

Comprehensive specialist studies have been undertaken during the EIA Phase of the EIA process. These specialist studies provide an in-depth understanding of the potential positive and negative impacts of the proposed development on the social, biophysical and economic facets of the environment. Terms of Reference for specialist studies were formulated taking cognisance of comments received during the public participation process to date. Specialists were required to assess and rate potential impacts in terms of a rigorous and standardised assessment methodology, in order to ensure that potential environmental impacts have been adequately investigated and that any relevant shortcomings and / or gaps can be addressed. This includes consideration of uncertainty in predicting impacts and potential cumulative effects. Specialists were also required to consider and recommend appropriate mitigation measures in the light of their likely effectiveness and practicality.

The specialist study findings have been integrated and evaluated in this Draft EIR and Draft Environmental Management Programme (EMP) (**Appendix F**). Chapter 10 provides the conclusions of the EIA process and a recommendation regarding the recommended site (of the three investigated in the detailed EIA Phase) for the proposed NPS. The recommendation takes into account environmental impacts, mitigation of impacts, transmission integration, engineering considerations, timing and socio-economic impacts.

Both the Draft EIR and EMP have been distributed for public review. A number of public interactions will be held during the comment period on the DEIR (Refer to Chapter 7). Thereafter, the report will be updated and submitted as the Final EIR to the DEA for review and decision-making. All I&APs will be notified of the availability of the Final EIR for information purposes.

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## 1.3 Scope of the Environmental Impact Report (EIR)

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The EIR is the last document to be submitted in terms of the EIA process and it is intended to provide a summary of the key findings of the EIA Phase of the EIA, including the specialist studies which were undertaken. Regulation 32 of Government Notice No. R. 385 of 2006 requires the inclusion of the following within an EIR:

- *Details of –*
  - *the EAP who compiled the report; and*
  - *the expertise of the EAP to carry out an environmental impact assessment;*
- *A detailed description of the proposed activity;*
- *A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –*

- a linear activity, a description of the route of the activity; or
  - an ocean-based activity, the coordinates where the activity is to be undertaken;
- A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;
- Details of the public participation process conducted in terms of subregulation (1), including –
  - steps undertaken in accordance with the plan of study;
  - a list of persons, organisations and organs of state that were registered as interested and affected parties;
  - a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and
  - copies of any representations, objections and comments received from registered interested and affected parties;
- A description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;
- An indication of the methodology used in determining the significance of potential environmental impacts;
- A description and comparative assessment of all alternatives identified during the environmental impact assessment process;
- A summary of the findings and recommendations of any specialist report or report on a specialised process;
- A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
- An assessment of each identified potentially significant impact, including –
  - cumulative impacts;
  - the nature of the impact;
  - the extent and duration of the impact;
  - the probability of the impact occurring;
  - the degree to which the impact can be reversed;
  - the degree to which the impact may cause irreplaceable loss of resources; and
  - the degree to which the impact can be mitigated;
- A description of any assumptions, uncertainties and gaps in knowledge;
- An opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;
- An environmental impact statement which contains –
  - a summary of the key findings of the environmental impact assessment; and
  - a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;
- A draft environmental management plan that complies with regulation 34;
- Copies of any specialist reports and reports on specialised processes complying with regulation 33; and
- Any specific information that may be required by the competent authority.

In addition, there are a number of other requirements that this EIR must address:

- The EIA Regulations Guideline Document (DEAT 2006); and
- The DEA&DP guidelines on specialist studies.

The above requirements are addressed in the relevant Chapters and Appendices of this report.

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## 1.4 Way forward

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The DEIR has been distributed for comment to all registered I&APs for a period of 66 calendar days from **19 February to 26 April 2010** (Inclusive). All comments on the document will be considered and a response thereto provided within a revised Issues and Response Report (IRR) prior to submission of the Final EIR to the DEA for consideration.

It is anticipated that the Eastern Cape and Western Cape Provincial Environmental Departments i.e. the DEDEA and the DEA&DP respectively and the National Nuclear Regulator (amongst others) would provide their review comments on the EIR to the DEA. It is, further, a DEA requirement that all relevant authorities must be consulted. DEA will consider these comments prior to making a decision on an environmental authorisation for the NPS project. Arcus GIBB will communicate DEA's decision to all I&APs.