INTRODUCTION ANDMAIN CONCLUSIONS

INTRODUCTION

At the request of the government of the Republic of South Africa, an IAEA Operational Safety Review Team (OSART) of international experts visited Koeberg Nuclear Power Plant from 21 August to 08 September 2011. The purpose of the mission was to review operating practices in the areas of Management Organization and Administration; Operations; Maintenance; Technical support; Radiation protection; Operating Experience; Chemistry; Safety culture and Severe accident management. In addition, an exchange of technical experience and knowledge took place between the experts and their plant counterparts on how the common goal of excellence in operational safety could be further pursued.

The Koeberg OSART mission was the 164th in the programme, which began in 1982. The team was composed of experts from Finland, France, Germany, Pakistan, Slovakia, Sweden, the United Kingdom, the United States of America, the IAEA staff members and observers from Bulgaria and Finland. The collective nuclear power experience of the team was approximately 372 years.

Koeberg Power Station is the only nuclear power station on the African continent. It is situated at Duynefontein, 27km north of Cape Town on the Atlantic coast. Koeberg ensures a reliable supply of electricity to the Western Cape, one of the fastest growing regions in South Africa. It has operated safely and efficiently for 25 years and has a further active life of about 15 years. The station's two reactors supply approximately 1 800MW or 5% of South Africa's electricity needs. Koeberg has produced over 269 928 100 megawatt hours (MWh) of electricity since 1984. Cooling is by means of sea water. Koeberg is a three loop, pressurised water reactor. The plant was built by a French consortium (Framatome and Alstom) in the 1970s and was based on a Westinghouse design.

Before visiting the plant, the team studied information provided by the IAEA and the Koeberg plant to familiarize themselves with the plant's main features and operating performance, staff organization and responsibilities, and important programmes and procedures. During the mission, the team reviewed many of the plant's programmes and procedures in depth, examined indicators of the plant's performance, observed work in progress, and held in-depth discussions with plant personnel.

Throughout the review, the exchange of information between the OSART experts and plant personnel was very open, professional and productive. Emphasis was placed on assessing the effectiveness of operational safety rather than simply the content of programmes. The conclusions of the OSART team were based on the plant's performance compared with good international practices.

The following report is produced to summarize the findings in the review scope, according to the OSART Guidelines document. The text reflects only those areas where the team considers that a Recommendation, a Suggestion, an Encouragement, a Good Practice or a Good Performance is appropriate. In all other areas of the review scope, where the review did not reveal further safety conclusions at the time of the review, no text is included. This is reflected in the report by the omission of some paragraph numbers where no text is required.

MAIN CONCLUSIONS

The OSART team concluded that the managers of Koeberg NPP are committed to continuously improving the operational safety and reliability of their plant. The team found good areas of performance, including the following:

- Communications is organized systematically at Koeberg to link the national stakeholder engagement and communication strategy and plan, to the Koeberg communication strategy.
- The Operating Observation and Coaching Programme.
- Corrective Action Review Committee and Maintenance Department Corrective Action Review (MCAR) process.
- Emergency Monitoring Vehicles are fitted with real time simulation software and Global Positioning System capabilities for use in Emergency Exercises.
- The laboratory information and management system (LIMS) is a powerful tool to define and adjust sampling plans.
- Establishment of the External Event Review Team (EERT) and External Events Safety Re-assessment Project as a quick response to the Fukushima accident.

A number of proposals for improvements in operational safety were offered by the team. The most significant proposals include the following:

- The plant should implement necessary systematic efforts and measures to ensure appropriate quality in the products and services obtained from all of its contractors / suppliers.
- The operating organization (Eskom) should complete the structural changes and appoint competent persons in the leadership and supervisory positions permanently, in the shortest possible time.
- The plant should analyze and improve the Operational Technical Specifications and associated procedures to ensure full control of availability of all safety related systems.
- The plant should take the necessary actions to timely solve deficiencies in the fire protection systems and strengthen the management of fire loads to ensure the robustness of the fire protection system and minimize the risk of fire.
- The plant should improve Radiation Worker practices during material transfers at contamination zone boundaries.
- The plant should improve operational and maintenance practices to avoid chemical excursions.

Steam generators are one of a number of components that require replacement during the operational life of a nuclear power plant. Koeberg currently operates with the originally installed steam generators that have tubing which is susceptible to corrosion. Due to the risks associated with tubing degradation, it has become a worldwide norm in the nuclear industry to replace these types of steam generators. Eskom has done detailed engineering analyses and developed a business case that supports the Eskom strategy to replace the steam generators at the earliest opportunity. Though currently still fully compliant with nuclear safety requirements, replacement after 2016 would have the result that Koeberg will be one of the only power stations in the world still operating this older type of steam generator. As time goes by, Koeberg faces the challenge of maintaining safe operation with ageing steam generators, exacerbated by a diminishing operating experience base from which to develop inspection and maintenance programmes. The associated risk can be mitigated by adopting an enhanced asset management strategy which includes an expanded maintenance and inspection programme, coupled with increased engineering resources. In addition, the station's operating expenditure, refuelling outage durations and radiological dose exposure would also have to be increased.

Should an in-service steam generator tubing failure occur as a result of the tubing degradation this would lead to significant production loss due to repair shutdowns lasting about six months. This would further affect the other unit and Eskom could also come under scrutiny from the nuclear regulator regarding continued operation of the plant. This could have implications for the international nuclear community as well as having an adverse impact on South Africa's nuclear programme. To counter this eventuality Eskom has embarked on a Steam Generator Replacement project in line with accepted international experience with an implementation date at the earliest opportunity.

Koeberg NPP management expressed a determination to address the areas identified for improvement and indicated a willingness to invite a follow up visit in about eighteen months.