



IAEA

International Atomic Energy Agency

**MISSION REPORT
ON
THE INTEGRATED NUCLEAR INFRASTRUCTURE
REVIEW
(INIR)**

Counterpart: Department of Energy

30 January to 8 February 2013

Johannesburg, Republic of South Africa

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1. EXECUTIVE SUMMARY

The Republic of South Africa requested the IAEA to carry out an Integrated Nuclear Infrastructure Review (INIR) mission in a letter dated 15 June 2012. A Self-Evaluation Report (SER) was subsequently provided by the Republic of South Africa.

The Terms of Reference for INIR missions are based on evaluation of the development status of the infrastructure issues described in NE Series guide “*Milestones in the Development of a National Infrastructure for Nuclear Power*” (NG-G-3.1) applying the holistic approach described in NE Series technical report “*Evaluation of the Status of National Infrastructure Development*” (NG-T-3.2) and its draft addendum prepared in January 2013. The Terms of Reference were agreed upon in the pre-INIR mission meeting held from 15 to 17 October 2012 at the Department of Energy in Pretoria, South Africa.

The IAEA implemented the INIR mission, which is a holistic coordinated peer review conducted by a team of IAEA and international experts (INIR team) who have experience in specialized nuclear infrastructure areas, from 30 January to 8 February 2013. The INIR mission was funded through a combination of support from the Government of South Africa, the Peaceful Uses Initiative and the IAEA Technical Cooperation Programme.

The INIR team acknowledges that the Republic of South Africa is the first IAEA Member State with an operating nuclear power plant to invite an INIR mission to review its nuclear power infrastructure for new build, which is a good example for other IAEA Member States with nuclear power expansion programmes.

The INIR team identified strengths in several nuclear infrastructure areas supporting both the existing and the new build programme, e.g. regulatory self-assessment, safeguards and security working level documents, management system, environmental impact assessment, grid development and stakeholder involvement.

The INIR team concluded that strong support is evident from the Government of South Africa for the nuclear power expansion programme.

However, as South Africa recognizes in its SER, it still has work to do before it will be ready to invite bids for new build.

In order to assist South Africa in making further progress in its infrastructure development, the INIR team made 10 recommendations. Based on these recommendations, the key areas for further action are summarized below:

- **Amendments to the relevant legislation, in particular to the National Nuclear Regulatory Act (NNRA), should be completed and promulgated as soon as possible**

The primary legislation governing nuclear activities in South Africa is mainly composed of the Nuclear Energy Act (NEA) Act No. 46 of 1999 and the National Nuclear Regulatory Act (NNRA) Act No. 47 of 1999. The Minister of Energy and the National Nuclear Regulator (NNR) are identified in the two Acts as having regulatory functions over nuclear activities. Considering that the Minister of Energy is also in charge of the promotion of nuclear energy and given that the Minister appoints the NNR Board and CEO, approves NNR’s budget and promulgates regulations, the INIR team is of the view that the separation between the regulatory functions and the promotional activities is not adequate, thus calling into question the effective independence of the NNR.

Although safety principles are addressed in promulgated Regulations, the Acts of Parliament do not adequately address a number of issues such as the Fundamental Safety Principles and, in particular, the prime responsibility for safety of the licence holder; decommissioning; nuclear security and some aspects of civil liability for nuclear damage.

South Africa has a clear understanding of these issues, which are to be addressed by the current legislative revision that will allow its legislative framework to be in line with the relevant international legal instruments.

- **The Regulatory Framework should be enhanced**

As South Africa is an operating nuclear power country, it has an existing regulatory framework. The NNR performed a self-assessment of its regulatory framework, using the IRRS Self-Assessment Tool and guidelines and is implementing actions to address the gaps identified. One area of the actions relates to making regulations, including management for safety, public participation in licensing and radioactive waste management. Significant progress has already been made and completion is expected by the end of March 2014.

The NEA describes the manner in which safeguards are implemented; however, there are no underlying regulations in place. Similarly there are no regulations in place for nuclear security. South Africa recognizes these deficiencies and has initiated efforts to address the regulatory framework for these areas.

- **Finalize the Contracting Strategy**

South Africa has considerable experience in the development and construction of major power projects. In addition, it has gained significant nuclear experience through the management of Koeberg nuclear power station and the recent work on suspended new nuclear build projects.

South Africa has established a National Nuclear Energy Executive Coordination Committee (NNEECC) which is managing a programme of work to implement the new nuclear build programme as defined in IRP2010. The Sub-Working Group on Financing and Procurement has been charged with developing the contracting strategy. Finalization of this strategy is needed in order to complete the bid invitation specification (BIS).

The contracting strategy should take into account its impact on the viability of financing the programme. A significant programme of work will be required to obtain the financing for the programme considering risk management, government guarantees and financial returns.

South Africa also needs to decide who will act as the procuring agency. If Eskom does not play a major role, a significant amount of work will be required to establish the arrangements for procurement.

- **An Integrated Approach to Human Resource Development is needed**

The key organizations and government departments involved in the nuclear power programme have all individually identified the human resource needs for new build. However, recent studies in South Africa have identified the need for improvements in the basic and higher education systems, the quantity of engineering and technical personnel and the facilities to develop them. A national plan needs to be developed which integrates all of these demands and identifies necessary actions to be taken to meet these demands.

Given the long lead times to educate and train nuclear professionals and specialists, coordinated intervention is needed at the national level to provide the necessary system enhancements, build capacity and ensure the necessary competent resources are available, consistent with the programme schedule.

The INIR team wishes to thank South Africa for its invitation to conduct the mission and its open and friendly cooperation during the mission.

The IAEA recommends that South Africa take the results of this mission into consideration when further developing its action plans for future activities. Such action plans should address the recommendations and suggestions, and be incorporated into South Africa's future activities for its new build programme. The IAEA stands ready to assist in the implementation of such action plans and in future reviews to evaluate the progress of South Africa's efforts.

2. INTRODUCTION

The Koeberg Nuclear Power Plant was commissioned in 1984. The plant consists of two pressurized water reactors and was built by Framatome (France). Eskom, the Government owned South African energy utility, owns and operates this nuclear power plant.

South Africa's current Nuclear Energy Policy (June 2008) was guided by the White Paper on the Energy Policy as approved by Government at the end of 1998, where nuclear energy was retained as one of the policy options for electricity generation. As part of national policy, Government also encouraged a diversity of supply sources. The main policy objectives relate to decisions regarding possible new nuclear power stations, the management of radioactive waste, safety monitoring of the nuclear industry, effectiveness and adequacy of regulatory oversight and a review of bodies associated with the nuclear industry.

The Minister of Energy and the National Nuclear Regulator (NNR) are identified in the NEA and in the NNRA as having regulatory functions over nuclear activities. The NEA assigns responsibility to the Minister of Energy for promotion of nuclear energy, but also for the implementation of the Safeguards Agreement and some aspects of the management of radioactive waste and irradiated nuclear fuel. Both, the National Energy Regulator and the National Nuclear Regulator, report to the Minister of Energy (as their Executive Authority).

The National Nuclear Regulator is the national authority responsible for exercising regulatory control over the safety of nuclear installations.

The South African Nuclear Energy Corporation (NECSA) was established as a public company in terms of the Nuclear Energy Act, 1999 (Act No. 46 of 1999) and is wholly owned by the State (represented by the Minister of Energy). The main functions of NECSA are to undertake and promote research and development in the field of nuclear energy and radiation sciences and technology; support to safeguards implementation, to process source material, special nuclear material and restricted material.

The Republic of South Africa requested the IAEA to carry out an Integrated Nuclear Infrastructure Review Mission (INIR) in a letter dated 15 June 2012. A Self-Assessment Report was subsequently provided by the Republic of South Africa.

The Terms of Reference for INIR missions are based on evaluation of the development status of the infrastructure issues described in NE Series guide "*Milestones in the Development of a National Infrastructure for Nuclear Power*" (NG-G-3.1) applying the holistic approach described in

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3. OBJECTIVES OF THE MISSION

The main objectives of the INIR mission were:

- Evaluation of the development status of the 19 infrastructure issues described in the *Milestones in the Development of a National Infrastructure for Nuclear Power*, IAEA Nuclear Energy Series No. NG-G-3.1, applying the holistic approach described in the *Evaluation of the Status of National Infrastructure Development*, IAEA Nuclear Energy Series No. NG-T-3.2. Addendum 1, draft 25 Jan 2013;
- Identification of the areas in Phase 2 needing further actions to reach respective milestones in the building of national infrastructure in South Africa; and
- To provide Recommendations and Suggestions to South Africa regarding infrastructure development which can be used in preparation of an Action Plan to address areas for further improvement in Phase 2 and the subsequent phases.

4. SCOPE OF THE MISSION

The INIR mission reviewed the status of the infrastructure conditions in South Africa covering all of the 19 infrastructure issues identified in the *Milestones* publication in a comprehensive and holistic way. The scope of the INIR mission included:

- Review of the current status of infrastructure development in South Africa;
- Discussion of outstanding recommendations/ actions from IAEA missions within the last five years;
- Recommendations to address any identified gaps in Phase 2;
- Suggestion for further improvement of the nuclear power infrastructure; and
- Identification of good practices that were observed in the nuclear power infrastructure.

5. WORK DONE

Prior to the mission, the INIR team reviewed the Self-Evaluation Report and supporting materials. Input was sought from IAEA staff members with relevant expertise. Several INIR team meetings were conducted prior to the mission, including team meetings in Vienna on 25 January 2013 and in Johannesburg on 29 January and 3 February 2013, to discuss the team's initial views on the infrastructure status.

The INIR mission was conducted from 30 January to 8 February 2013. It was coordinated for South Africa by the Department of Energy (DOE). The interviews were conducted at the Hotel Indaba, Johannesburg. The preliminary draft report was prepared and subsequently discussed with the counterparts. The mission results were presented to the representatives of the Government in an exit meeting on 8 February 2013. The preliminary draft report was delivered to the counterparts after the exit meeting.

The results of the INIR mission are summarized in Section 6 and presented, in tabular form, in Section 7 for each of the 19 infrastructure issues in Phase 2. The INIR team made observations based on the evaluation for each condition, identified areas where significant or minor actions are needed and made recommendations and suggestions (Attachment 1).

The INIR team identified many areas where good arrangements are in place to provide the infrastructure needs of South Africa's existing and new build programme. When conducting INIR missions in newcomer countries, it is common practice to identify "good practices" which could be replicated by other newcomer countries. However, it was considered inappropriate to identify "good practices" during this mission. Obviously, the experience, methods and resources available to a country with an existing nuclear power programme are not the same as those in a country developing nuclear power for the first time. It is difficult therefore to suggest that the approach used in an 'expanding' country is a good practice that a newcomer country should follow.

Nevertheless, the INIR team identified strengths in several nuclear infrastructure areas supporting both the existing and the new build programme, e.g. regulatory self-assessment, safeguards and security working level documents, management system, environmental impact assessment, grid development and stakeholder involvement.

6. MAIN CONCLUSIONS

The INIR mission was conducted in a cooperative and open atmosphere with participation from the main organizations in South Africa responsible for the nuclear power programme, in particular, the Department of Energy, Department of Mineral Resources, National Treasury, Department of Science and Technology, Department of Environmental Affairs, Department of Public Enterprises, Department of Trade and Industry, Eskom, National Nuclear Regulator and South African Nuclear Energy Corporation. A full list of participants can be found in Attachment 2.

During discussions on the individual infrastructure issues the INIR team made a number of suggestions to utilize the wide range of IAEA review services in order to support South Africa's infrastructure enhancement efforts. Since these suggestions are not based on any specific infrastructure areas needing further development, they were not individually

recorded. However, South Africa may wish to consider inviting relevant IAEA services. These services range in scope from engineering, safety, operational, and waste to regulatory matters and include: Emergency Preparedness Review Services – EPREV, International Nuclear Security Advisory Service (INSServ), International Physical Protection Advisory Service (IPPAS), Site and External Events Design Review Service (SEED), IAEA SSAC Advisory Service (ISSAS).

The INIR team identified strengths in several nuclear infrastructure areas supporting both the existing and the new build programme, e.g. regulatory self-assessment, safeguards and security working level documents, management system, environmental impact assessment, grid development and stakeholder involvement.

The INIR team concluded that strong support is evident from the Government of South Africa for the nuclear power expansion programme and it has made significant progress in establishing the necessary infrastructure.

However, as South Africa recognizes in its SER, it still has work to do before it will be ready to invite bids for new build.

In order to assist South Africa in making further progress in its infrastructure development, the INIR team made 10 recommendations. Based on these recommendations, the key areas for further action are summarized below:

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The key organisations and government departments involved in the nuclear power programme have all individually identified the human resource needs for new build. However recent studies in South Africa have identified the need for improvements in the basic and higher education systems, the quantity of engineering and technical personnel and the facilities to develop them. A national plan needs to be developed which integrates all of these demands, and identifies necessary actions to be taken to meet these demands.

Given the long lead times to educate and train nuclear professionals and specialists, coordinated intervention is needed at the national level to provide the necessary system enhancements, build capacity and ensure the necessary competent resources are available, consistent with the programme schedule.

Recommendations

R-1.2.1 South Africa should finalize its contracting strategy for new nuclear build.

R-2.1.1 In consideration of the future amendment to its nuclear legislation (See Issue 5) South Africa should explicitly address the Fundamental Safety Principles, including assigning prime responsibility for safety to the operator.

R-3.1.1 The BIS and related BIS evaluation criteria should be completed as a prerequisite for the tendering and procurement process.

R-3.2.1 The designation of the Procuring Agency should be made in the near future so that it can initiate the necessary organizational provisions, including HR development.

R-4.1.1 Once the Contracting Strategy has been finalized, South Africa should complete its financing arrangements for the new build programme.

R-5.1.1 South Africa should join the relevant international legal instrument(s) on civil liability for nuclear damage.

R-5.2.1 South Africa should complete the process of revising its legislative framework to address the independence of the regulatory body, nuclear security and civil liability for nuclear damage.

R-7.1.1 South Africa should complete regulations on nuclear security and safeguards.

R-10.1.1 South Africa should develop and implement a national human resources strategy and plan to address required improvements in: technical subjects at secondary school level; graduation rates for university engineering programmes; and training of artisans in areas relevant to nuclear industry.

R-16.1.1 South Africa should develop an integrated national Nuclear Fuel Cycle strategy, including Spent Fuel/High Level Waste disposal.

Suggestions

S-1.1.1 South Africa should consider inviting Eskom to be a member of the Nuclear Energy Working Group (NEWG).

S-2.1.1 NNR should consider formally including safety culture in its management system.

S-4.2.1 South Africa should consider finalizing its funding arrangements for expansion of NNR to undertake early licencing activities for the new nuclear power program.

S-5.1.1 South Africa should join the Amendment to the CPPNM adopted in 2005.

S-7.1.1 South Africa should continue the work to ensure timely completion of the actions identified from the NNR Self-Assessment, and consider inviting an IRRS mission.

S-11.1.1 South Africa should improve engagement with neighbouring countries on its nuclear expansion plans within a reasonably short time frame.

S-12.1.1 The owner/operator should determine the approach to licensing (site license or combined license).

S-13.1.1 South Africa should complete its planned work on the Environmental Impact Report, following national requirements and seek the approvals required for the site.

S-14.1.1 South Africa should consider including arrangements for bilateral communication with neighbouring countries in its national emergency plan.

S-14.1.2 NNR should consider activating its Emergency Control Centre during national level emergency exercises.

S-18.1.1 South Africa should define the desired extent of local industrial involvement, to be included in the BIS.

7. EVALUATION RESULTS FOR PHASE 2

For the purposes of the INIR mission results, the following definitions are used:

Significant actions needed:

The “Review observations” indicates that there is considerable effort still needed to realize the stated “Condition”, and that achievement of this “Condition” is needed in order to be able to sustain overall progress in developing an effective national nuclear power infrastructure.

Minor actions needed:

The “Review observations” indicates that there is some effort still needed to realize the stated “Condition”. However, the current status, supported by the on-going activities, mostly achieves the desired “Condition”.

No actions needed:

The available evidence indicates that the intention underlying this “Condition” has been achieved. However, as work continues on the infrastructure knowledge and implementation, care has to be taken to ensure that this status remains valid.

Recommendations:

Recommendations are proposed when aspects related to fulfilment of conditions of nuclear infrastructure development are discrepant, incomplete or inadequately implemented. Recommendations are specific, realistic and designed to result in tangible improvement. Recommendations are based on the *Milestones Approach* and, as applicable, state the relation with the specific issue. The recommendations are formulated so they are succinct and self-explanatory.

Suggestions:

Suggestions may indicate areas where concrete plans exist and are being executed, or for useful improvement of existing programmes and to point out possible better alternatives to current work. In general, suggestions stimulate the management and staff to consider new or different approaches to develop infrastructure and enhance performance. Suggestions are formulated so they are succinct and self-explanatory.

Good practices:

A good practice is identified in recognition of an outstanding organization, arrangement, programme or performance, superior to those generally observed elsewhere. A good practice is more than just the fulfilment of the conditions or expectations. It is worthy of the attention of other countries involved in the development of nuclear infrastructure as a model in the drive for excellence. Good practices also reference the bases (similar to suggestions) and are clearly documented in the mission report.

It should be noted that the results summarized in the following tables neither validate the country actions and programmes, nor certify the quality and completeness of the work done by a country.

| 1. National Position | Phase 2 | | |
|---|----------------|-------|----|
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 1.1. Government support evident | | X | |
| 1.2. Overall strategic approach for contracting with the vendor established | X | | |
| 1.3 Commitments and obligations of owner/operator organizations and regulatory body established | | | X |
| 2. Nuclear Safety | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 2.1 Safety responsibilities by all stakeholders recognized | X | | |
| 2.2 Long Term relationship with supplier established | | | X |
| 3. Management | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 3.1 Contract specifications and evaluation criteria determined | X | | |
| 3.2 Owner/operator competence to carry out nuclear procurement evident | X | | |
| 3.3 Project management organization established with adequate staff to prepare for and analyse bids available | | | X |
| 3.4 Management systems established | | | X |
| 4. Funding and Financing | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 4.1 Means of financing established and strategy for management of financial risks available | X | | |
| 4.2 Funding plan available | | X | |

| 5. Legislative Framework | Phase 2 | | |
|--|-----------------------|--------------|-----------|
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 5.1 International legal instruments governing nuclear activities in force | X | | |
| 5.2 A comprehensive nuclear law is enacted and in force | X | | |
| 5.3 All other legislation affected by the nuclear power programme developed, promulgated and in force | | | X |
| 6. Safeguards | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 6.1 Strengthening of the SSAC underway | | X | |
| 6.2 Early safeguards relevant information provided to IAEA planned | | | X |
| 7. Regulatory Framework | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 7.1 Independent regulatory body established and the necessary regulatory infrastructure developed | X | | |
| 8. Radiation Protection | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 8.1 Actions to prepare adequate radiation protection programmes undertaken, and expansion of appropriate infrastructures planned | | | X |
| 9. Electrical Grid | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 9.1 Detailed studies to determine grid expansion, upgrade or improvement undertaken | | | X |
| 9.2 Plans, funding and schedule for grid enhancement available | | | X |

| | | | |
|---|-----------------------|--------------|-----------|
| 10. Human Resources | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 10.1 Knowledge and skills needed in organizations for Phase 3 and operational phase identified and a plan to develop and maintain the human resource is developed | X | | |
| 11. Stakeholder Involvement | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 11.1 Public information and education programme developed | | X | |
| 12. Site and supporting facilities | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 12.1 Detailed site characterization completed | | X | |
| 12.2 Plans to prepare site for construction | | | X |
| 13. Environmental Protection | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 13.1 Environmental impact assessment for selected sites performed | | X | |
| 13.2 Particular environmental sensitivities included in BIS | | | X |
| 13.3 Clear and effective regulation of environmental issues established | | | X |
| 14. Emergency Planning | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 14.1 Detailed approach to emergency planning being implemented | | X | |
| 14.2 Emergency planning for existing radiation facilities and practices in place | | | X |

| | | | |
|---|-----------------------|--------------|-----------|
| 15. Security | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 15.1 Security requirements defined, plan to develop DBT established, sensitive information defined | X | | |
| 15.2 Planned nuclear security measures for siting, construction and transport | | | X |
| 15.3 Programmes for selection/qualifications of staff with access to facilities are in place | | | X |
| 15.4 Nuclear security culture development planned | | | X |
| 16. Nuclear Fuel Cycle | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 16.1 Front-end fuel cycle policy and strategy defined, and strategy for storage and ultimate disposal of spent fuel defined | X | | |
| 17. Radioactive Waste | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 17.1 Handling the burdens of low and intermediate radioactive waste considered | | | X |
| 17.2 Preliminary decommissioning plan requested | | | X |
| 18. Industrial Involvement | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 18.1 Realistic assessment of the national and local capabilities carried out, ability to meet schedule and quality requirements analysed, and plans and programs to transition to national and local suppliers in place | | X | |
| 19. Procurement | Phase 2 | | |
| Condition | Actions needed | | |
| | SIGNIFICANT | MINOR | NO |
| 19.1 Procurement programme consistent with national policy for industrial participation established | X | | |

ATTACHMENT 1: REVIEW OBSERVATIONS, RECOMMENDATIONS AND SUGGESTIONS FOR PHASE 2

| 1. National Position | Phase 2 |
|--|---|
| Condition 1.1: Government support evident | |
| Summary of the condition to be demonstrated | <p>By the end of Phase 2, regulatory and operating organizations should be in place to meet the obligations of the NPP programme. However, there is still a strong Government's role to support the development of the programme, to ensure that a policy for long term nuclear fuel cycle liabilities is established, to ensure safety, security and safeguards responsibilities are formulated and understood by all relevant organizations, and to ensure that appropriate support with emphasis on knowledge transfer from countries with experience of a nuclear programme will be available through bilateral agreements. There also needs to be a strong commitment to ensure the state fully participates in all the activities associated with the global nuclear safety and security regime.</p> <p>This role needs to be clearly established with a Government Ministry.</p> |
| Review observations | <p>The Nuclear Energy Policy (2008) serves as an embodiment of the South African Government's commitment and vision for the development of an extensive nuclear energy programme. It sets out the roles and responsibilities of government and the other key stakeholders, and defines the National Nuclear Energy Executive Coordination Committee (NNEECC) which shall ensure implementation and exercise oversight over all aspects of the nuclear energy policy. The NNEECC was established by the Cabinet in November 2011 and is chaired by the Deputy President of the Republic of South Africa. The Cabinet endorsed the terms of reference for the NNEECC in November 2012. The members of NNEECC are relevant Ministers to the nuclear power expansion programme. The NNEECC expects to meet twice a year; however there will be additional meetings as necessary. The Nuclear Energy Technical Committee (NETC), which is led by the Director General of Department of Energy, provides technical support to the NNEECC and it consists of Director Generals from relevant Departments. The NETC is supported by the Nuclear Energy Working Group (NEWG). The NEWG meets on a weekly basis to discuss the activities of the six sub-working groups under the NEWG. These are the sub-working groups on Finance and Procurement; Safety, Regulation and Legislation; Skills, Localization, Industrialization; Siting, Environment, Communication, Safeguards, Security, Physical Protection and on Fuel Cycle - Front and Back-end. These sub-working groups make recommendations on implementation and address the overall nuclear programme. Eskom is a member of all the sub-working</p> |

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| | | <p>groups and is represented by the Department of Public Enterprises at the NEWG. NEWG includes all officials who oversee key state owned entities such as Eskom. The Terms of Reference of NEWG also provide an opportunity to invite organisations such as Eskom when required.</p> <p>The Integrated Resource Plan 2010 (IRP2010), which was gazetted in May 2011, sets out a 20- year plan of electricity supply including 9.6 GWe of nuclear power. The timelines of new nuclear builds were presented. It stated that the commissioning of the 1st NPP unit would be completed by January 2024 and the total installation of 9.6 GWe by 2030.</p> <p>The Self-Evaluation Report (SER) stated that South Africa has signed bilateral agreements with vendor countries including Russian Federation, Korea, USA, France and China and is currently pursuing bilateral agreements with Japan and Canada.</p> <p>There is a long term policy for nuclear fuel cycle including waste management (Radioactive Waste Management Policy and Strategy for the Republic of South Africa 2005).</p> <p>This document is publicly available (see also Issues 16 and 17).</p> <p>South Africa is considering knowledge transfer from the vendor as a part of its contracting strategy.</p> <p>In general, Government’s support is evident for the South African Nuclear Programme through the NNEECC, Nuclear Energy Policy and IRP2010-2030.</p> |
| Areas for further action | Significant | No |
| | Minor | Eskom’s membership of NEWG |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| S-1.1.1 | | |
| South Africa should consider inviting Eskom to be a member of the NEWG | | |
| Condition 1.2: Overall strategic approach for contracting with the vendor established | | Phase 2 |
| Summary of the condition to be demonstrated | The State should have established how it wishes to contact for the NPP (e.g. ‘Build, Own, Operate, Transfer’ (BOOT), ‘Build, Own, Operate (BOO,) turnkey, multiple contracts) and should have a rationale supporting the decision. The strategy may include requesting bids for more than one option. | |
| Review observations | The SER stated that Eskom prepared the Nuclear-1 Contracting Approach, which details the contracting strategy for Nuclear-1 as well as a contracting strategy roadmap for a | |

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| | | <p>nuclear fleet. It contains a number of strategy options. The contracting strategy is not yet finalized and approved; the Sub-Working Group on Finance and Procurement is currently developing the national contracting strategy.</p> <p>The NNEECC confirmed Eskom as the owner/operator of the new Nuclear Power Plants (NPPs) in November 2012. Eskom is knowledgeable of contracting strategies including financing/funding.</p> |
| Areas for further action | Significant | Contracting strategy |
| | Minor | No |
| RECOMMENDATIONS | | |
| R-1.2.1 | | |
| South Africa should finalize its contracting strategy for new nuclear build. | | |
| SUGGESTIONS | | |
| None | | |
| Condition 1.3: Commitments and obligations of owner/operator organizations and regulatory body established | | Phase 2 |
| Summary of the condition to be demonstrated | <p>Given that the main responsibilities by the end of Phase 2 lie with the operator and the regulator, it is essential that the responsibilities of each are clearly defined and understood. It is also important that the role of any supporting organisation (e.g. a TSO) is clearly defined. If non-national organizations (e.g. vendor or other regulator) are expected to play a significant role, this should be clear in the contracting strategy. The safety and security responsibilities of each organisation should be clearly understood.</p> | |
| Review observations | <p>The National Nuclear Regulator (NNR) was established according to the National Nuclear Regulator Act, 1999 (Act No. 47, 1999).</p> <p>Article 12.3 of Nuclear Energy Policy (2008) identifies Eskom as the owner and operator of NPPs in South Africa. Eskom has over 28 years of experience as owner and operator of the existing nuclear fleet. The role of Eskom as owner and operator for new NPPs has been reconfirmed by the NNEECC in November 2012.</p> <p>The South African Nuclear Energy Corporation Limited (NECSA) was established according to the Nuclear Energy Act, 1999 (Act No. 46 of 1999) to undertake nuclear energy research, development and innovation in South Africa. NECSA provides technical support for specific subjects to Eskom and limited technical services to NNR mainly in the form analytical services through independently accredited</p> | |

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| | | laboratories. |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| 2. Nuclear Safety | | Phase 2 |
| Condition 2.1: Safety responsibilities by all stakeholders recognized | | |
| Summary of the condition to be demonstrated | <p>The Government's organization responsible for the programme should have a broad understanding of fundamental safety requirements. The operator and regulatory body should understand the fundamental safety requirements and should have begun the task of understanding the safety basis of a NPP. They should also have agreed a protocol for communication between operator, regulatory body and vendor.</p> <p>Early in Phase 2, all senior positions in the operating organization and regulatory body should have been filled and there should be evidence that the leadership of both the operating organization and the regulatory body have initiated programmes and practices to build a safety culture in their respective organizations. By the end of Phase 2, the operating organization, the regulatory body and external support organizations, as appropriate, should have the expertise to prepare for the conduct or the review of safety assessments of documentation to be supplied by the vendor.</p> | |
| Review observations | <p>South Africa is party to the Convention on Nuclear Safety (CNS). Through its participation in CNS review meetings South Africa has developed a broad understanding of fundamental safety requirements. In addition, in order to orient the members of the various organizations involved in the nuclear programme, the Sub-Working Group on Safety, Regulation and Legislation, has started organising quarterly seminars to introduce nuclear safety, safety culture, and other unique aspects of nuclear power to the key stakeholders involved in the programme. Furthermore, Eskom conducts annual nuclear safety culture awareness seminars that are open to potential suppliers.</p> <p>As a party to the CNS, South Africa has committed to the Fundamental Safety Principles; however, they are not explicitly contained within the underlying nuclear legislation. Specifically, the prime responsibility of the operator for safety is not explicitly</p> | |

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| | | <p>stated in the legislation. The Fundamental Safety Principles are however being implemented through the NNR requirements documents. This issue has been identified as part of the Self-Assessment Project that was initiated prior to and independent of the INIR process.</p> <p>As South Africa has an existing nuclear power program both, the operator and regulatory body have, developed an understanding and implementation experience of fundamental safety requirements and the two bodies have the capability to apply this knowledge to the new nuclear power program.</p> <p>The self-evaluation cites requirements documents such as RD-0034, guidance documents LG-1041 prepared by NNR and operator documents such as Eskom doc. 238-8 Nuclear Safety and Quality Manual (QM) that describes amongst others the process for review of the vendor information.</p> <p>Both, operator and regulator, provided overviews of their organizations and clarified how the organizations are set up to ensure safe operation of Koeberg NPP, as well as for future NPPs. Within this discussion, it was clear that key senior positions have been filled or responsibilities assigned for this stage of the project. The regulator has identified the additional resources necessary for the licensing of the new build. This is discussed in more detail under Issue 10 on Human Resources.</p> <p>The Protocol for communication between operator, regulatory body and vendor will be addressed within the Eskom project management manual required by NNR Licensing Guide LG-1041. The manual is currently under development. In addition, the INIR team was informed, NNR has an approved document titled “Forums between the NNR and the holders of nuclear authorizations” that addresses their interactions with Eskom, including project review meetings. The INIR team was also informed that the regulator and operator expressed the formal nature of their interactions at the various levels of the organization down to the working level.</p> <p>Regarding documentation, NNR had begun an initiative to develop its electronic document management system. Eskom identified a similar initiative. In this respect, the two organizations could work in a collaborative manner to ensure the compatibility of the systems while retaining their independent needs.</p> <p>The operator described that safety culture is promoted by the nuclear centre of excellence and covers all business units involved in the new nuclear programme. Further, Eskom invited potential suppliers to seminars as a strategy to implement safety culture within the local industry. Through discussion it was identified that NNR has implemented similar types of initiatives to ensure safety culture is being implemented throughout their organization.</p> |
| Areas for further action | Significant | Fundamental Safety Principles |
| | Minor | Safety Culture |

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| RECOMMENDATIONS | |
| R-2.1.1 | |
| In consideration of the future amendment to its nuclear legislation (See Issue 5) South Africa should explicitly address the Fundamental Safety Principles, including assigning prime responsibility for safety to the operator. | |
| SUGGESTIONS | |
| S-2.1.1 | |
| NNR should consider formally including safety culture in its management system. | |
| Condition 2.2: Long-term relationship with supplier established | |
| Phase 2 | |
| Summary of the condition to be demonstrated | Future role of the vendor in supporting safe operation should be defined by the owner/operator, for example any design authority role or support role in managing emergency situations. Training requirements from the vendor or other bodies should also be defined. |
| Review observations | Eskom identified a long term strategy as follows: join the vendor owners' group; engage the vendor country through bi-lateral cooperation and pursue long-term contracts with suppliers. This strategy includes necessary training requirements. |
| Areas for further action | Significant No |
| | Minor No |
| RECOMMENDATIONS | |
| None | |
| SUGGESTIONS | |
| None | |

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| 3. Management | |
| Condition 3.1: Contract specifications and evaluation criteria determined | |
| Phase 2 | |
| Summary of the condition to be demonstrated | <p>If competitive bidding for a NPP is being undertaken, there should be a detailed BIS available with the criteria that will be used to evaluate the bids.</p> <p>If the vendor has already been selected (e.g. by an Inter-Governmental Agreement (IGA)) the customer should have clear requirements included in the contract specification and negotiating strategy and criteria.</p> |

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| Review observations | | <p>In 2008 Eskom developed a BIS for Nuclear-1 Project. Eskom continued to work on Employers Requirements Specifications (ERS) which uses as a basis the EUR requirements, augmented with additional modifications to cover South Africa specific requirements and other relevant procurement aspects which are beyond the scope of the EUR.</p> <p>The Sub-Working Group on Finance and Procurement, of which Eskom is a member, is developing a procurement framework, which will identify the Procuring Agency and determine the contracting strategy. Following this the BIS will be developed using all existing information.</p> <p>The BIS and the related evaluation criteria is a cornerstone for the tendering and procurement process and thus it has to be completed. Furthermore the decision about the Procuring Agency and the contracting strategy is needed for the determination of required human resources.</p> |
| Areas for further action | Significant | BIS and evaluation criteria |
| | Minor | No |
| RECOMMENDATIONS | | |
| R-3.1.1 | | |
| The BIS and related BIS evaluation criteria should be completed as a prerequisite for the tendering and procurement process. | | |
| SUGGESTIONS | | |
| None | | |
| Condition 3.2: Owner/operator competence to carry out nuclear procurement evident | | Phase 2 |
| Summary of the condition to be demonstrated | <p>The owner procurement team needs to be competent to manage the procurement requirements for the type of contract. If this is not a turnkey contract (see Issue 19), a significantly greater level of competence will be required.</p> | |
| Review observations | <p>Eskom was designated as owner/operator for the new build program in November 2012; the decision as to who will act as Procuring Agency is still under discussion.</p> <p>It is stated in the SER that if Eskom will be selected as the Procuring Agency, a cross functional team of subject matter experts will be assembled drawing on experience gained from the conventional build program, previous Nuclear-1 bid experience and necessary local and international experts. This includes nuclear expertise available from Koeberg operation unit. If another organization will be selected as Procuring Agency Eskom will</p> | |

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| | | <p>support this Agency with its procurement expertise.</p> <p>Based on the long experience of Eskom in handling nuclear power there is evidence that the required procurement competence is available within the owner/operator organization.</p> <p>However, there is a need to define the Procuring Agency so that the organizations involved can define the necessary resources for the procurement activities.</p> |
| Areas for further action | Significant | Definition of Procuring Agency |
| | Minor | No |
| RECOMMENDATIONS | | |
| R-3.2.1 | | |
| The designation of the Procuring Agency should be made in the near future so that it can initiate the necessary organizational provisions, including HR development. | | |
| SUGGESTIONS | | |
| None | | |
| Condition 3.3: Procurement management organization established with adequate staff to prepare for and analyse bids available | | Phase 2 |
| Summary of the condition to be demonstrated | <p>The owner/customer of the contract(s) needs a project management team to ensure the contract requirements are fully met. This will include verification of project progress and quality requirements. This may include the appointment of an owners engineer to support the owner organization.</p> | |
| Review observations | <p>Eskom has a team of 10 professionals from its Project Development Section (part of Group Capital) to manage its early activities in the new build project. This team has access to staff in Koeberg operating unit including 134 professionals based in the nuclear client office/operational readiness and 45 professionals in nuclear engineering plus some experts for civil engineering from outside. This capability is supplemented with other Eskom expertise as necessary.</p> <p>The staffing already exists because Eskom carried out preparation work for the previous Nuclear-1 project since 2005.</p> <p>There are plans for a full project management team with about 400 staff to be set up in the Construction Management Section of Group Capital, which has about 4000 staff in total for managing large power projects.</p> <p>The INIR team observed that the number of experts available in Eskom’s organization to handle the project management seems to be sufficient. However, the project manual describing the project roles and responsibilities, interfaces with all organizations and reporting mechanisms and some more detailed aspects of the</p> | |

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| | | <p>project management are not completed and authorized.</p> <p>The proposed execution structure for the project management for this stage of the programme will be tabled at Eskom’s executive meeting in March 2013.</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |
| Condition 3.4: Management systems established | | Phase 2 |
| Summary of the condition to be demonstrated | <p>Management systems should be defined and procedures for Phase 3 in place or planned to be produced before they are required. The management systems should be consistent with IAEA safety standards and security guidelines documentation (see Relevant IAEA documents below). They should promote strong safety, safeguards and security culture and include plans for self and independent evaluation.</p> | |
| Review observations | <p>Both, operator and regulator, provided overviews of their organizations and clarified how the organizations are set up to ensure the safe operation of Koeberg NPP and to fulfil the tasks related to the expansion of the existing nuclear power program.</p> <p>Eskom, as an owner and operator of a nuclear power plant has a nuclear policy which clearly states that nuclear safety has the overriding priority in its operations. This is augmented with documented quality and safety management systems in accordance with RD0034.</p> <p>Eskom Document 238-1 describes the integrated management system.</p> <p>Eskom Document 238-8 describes the nuclear safety and quality management manual.</p> <p>Eskom Document 238-28 describes the Nuclear Safety Culture program, and</p> <p>Eskom also has a document describing its Nuclear Security Manual.</p> <p>NNR has an Integrated Management System Manual which is in line with standards such as ISO 9001. Although Rev-0 of the NNR management manual promotes a strong safety culture within the regulatory body, NNR had identified that there is a need to</p> | |

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| | | <p>optimize the content regarding nuclear safety and security culture management. This will be considered for the next revision of the manual.</p> <p>NECSA has an integrated SHEQ management system (SHEQ-INS-0001) consisting of approximately 230 documents and being expanded/reviewed on a continuous basis.</p> <p>Both, Eskom and the NNR, have initiated an update of their Management Systems Manual to cover the aspects related to the new build projects.</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| 4. Funding and financing | | Phase 2 |
| Condition 4.1: Means of financing established and strategy for management of financial risks available | | |
| Summary of the condition to be demonstrated | Available means of financing the NPP exists. Owner/operator financial team established to negotiate the levels of equity, expecting borrowing, potential investors and analysis of potential returns and any price guarantees. The financial risks are clearly identified and allocated to the party who can best manage and mitigate them. | |
| Review observations | <p>In 2011, the National Treasury led a team to explore financing options. Financial institutions were invited to give presentations. Since that time, the Sub-Working Group on Finance and Procurement has kept up to date on the availability of financing options and is exploring the full range of options.</p> <p>Whilst financing any nuclear project is very difficult, South Africa seems well informed on the issues and options. They noted that they had a viable financing option in the original 2008 discussions. Potential sources of funding and instruments that can be</p> | |

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| | | <p>employed, as well as guarantee requirements, are documented.</p> <p>Eskom has financed a number of major construction projects so this experience is also beneficial. A significant issue is the credit rating of Eskom due to the level of debt already taken to finance recent non-nuclear stations. There is a need to secure financing. The Sub-Working Group on Financing and Procurement will advise on the way forward in this regard.</p> <p>The financial consequences of the various risks, and the impact of these risks materialising, have been identified and are documented in various Eskom documents. Eskom also has a reasonable understanding of what risks vendors are willing to take from the previous bid review. Eskom previously aimed for EPC contracts for the first units and would consider multi package contracts for later units. A national position on risk management is being developed by the sub-working group.</p> <p>Eskom has a corporate process for risk management using a cross functional team. Major risks, including financial ones are addressed with mitigation actions developed and monitored.</p> <p>According to RD0034, other entities including suppliers and manufactures providing components or services important to nuclear safety in South Africa must have an IMS.</p> |
| Areas for further action | Significant | Financing arrangements |
| | Minor | No |
| RECOMMENDATIONS | | |
| R-4.1.1 | | |
| Once the Contracting Strategy has been finalized, South Africa should complete its financing arrangements for the new build programme. | | |
| SUGGESTIONS | | |
| None | | |
| Condition 4.2: Funding plan available | | Phase 2 |
| Summary of the condition to be demonstrated | The means by which costs which are not obviously included in the project financing needs to be defined (depending on the contracting model, this may include owner, education, training, research, regulatory body, waste management, decommissioning). | |
| Review observations | Government Departments and state owned entities submit an annual Medium Term Expenditure Framework. This is then used by the National Treasury when reviewing department annual submissions to understand how their requirements fit into the overall nuclear development programme. The 2011 submission was the first time that this was done so there has not yet been an opportunity for Departments and entities to review actual spend and achievement against their framework. However, for each | |

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| | | <p>department, the National Treasury has a process to review requests for budget increases, roll-over, etc. Government also provides oversight over Eskom spending to ensure accountability. Eskom also has a management process and governance structures to establish and review financial spend against proposed objectives. This is in order to comply with the Public Finance Management Act (Act No 1 of 1999).</p> <p>There are legal arrangements in place to ensure regulatory funding by way of levies on licensees and Government allocations. (The SER documents a number of references). Work to date on preparing for the new build programme has been funded through the existing budget based on Government allocations. Funding arrangements are being concluded between NNR and the potential licensee to fund preparatory work.</p> <p>Eskom may formally apply to the NNR for a site license towards the end of 2013 at which point the normal regulatory licensee funding mechanisms will apply.</p> <p>Eskom will fund the preparatory work for the new build programme and has estimated its budget requirements.</p> <p>The INIR team was informed that each licensee is required to set up a fund to make provisions for used fuel management and decommissioning. This is set out in the SSRP and the regulator checks the adequacy of provisions. There is also a 3 yearly review of the adequacy of the provisions by Eskom as required by the NNR. It is not clear that this fund makes any provision for the disposal of high level waste including spent fuel.</p> <p>Licensing requirements oblige operators to fund their own low and intermediate waste management.</p> <p>The INIR team was informed that the National Radioactive Waste Disposal Institute will be set up and will be funded inter alia by the waste generators. This will be for the management of radioactive waste, including high level waste. This organization will also carry out research into waste management issues, including ultimate high level waste disposal.</p> |
| Areas for further action | Significant | No |
| | Minor | Funding arrangement for NNR's expansion |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| S-4.2.1 | | |
| South Africa should consider finalizing its funding arrangements for expansion of NNR to undertake early licencing activities for the new nuclear power program. | | |

| 5. Legislative framework Condition 5.1: International legal instruments governing nuclear activities in force | Phase 2 |
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| Summary of the condition to be demonstrated | <p>The state should now have adhered to the following international legal instruments and should be following an action plan for their implementation:</p> <ol style="list-style-type: none"> i. Convention on Early Notification of a Nuclear Accident ii. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. iii. Convention on Nuclear Safety iv. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste management v. Convention of Physical Protection of Nuclear Materials and its Amendment vi. Vienna Convention on Civil Liability for Nuclear Damage, Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage and Convention on Supplementary Compensation for Nuclear Damage vii. Comprehensive Safeguards Agreement between the State and the IAEA viii. Revised Supplementary Agreement concerning the provision of Technical Assistance by the IAEA |
| Review observations | <p>South Africa is a party to the following international legal instruments governing nuclear activities adopted under the IAEA auspices:</p> <ul style="list-style-type: none"> - Convention on Early Notification of a Nuclear Accident (ratified in 1987), - Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (ratified in 1987), - Convention on Nuclear Safety (ratified in 1996), - Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (acceded in 2006), - Convention on the Physical Protection of Nuclear Material (CPPNM) (ratified in 2007), - Comprehensive Safeguards Agreement between South Africa and the IAEA (in force since 1991), - Additional Protocol to the Comprehensive Safeguards Agreement (in force since 2002), |

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| | | <ul style="list-style-type: none"> - Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA (in force since 2006). <p>South Africa has not yet ratified the Amendment to the CPPNM. However the INIR team was informed that steps have been taken to join the Amendment by September 2013 and that ratification was only a question of formality at this point of time.</p> <p>South Africa is not yet a party to any of the relevant international legal instrument(s) on civil liability for nuclear damage, namely the:</p> <ul style="list-style-type: none"> - 1997 Vienna Convention on Civil Liability for Nuclear Damage (the “1997 Vienna Convention”); and - Convention on Supplementary Compensation for Nuclear Damage (the “CSC”). <p>With respect to the above listed instruments, South Africa stated in its SER that “a review of suitability of various conventions on civil liability for nuclear damage was completed by the National Nuclear Regulator and the Department of Energy in 2010”. The INIR team was informed that NNR will soon submit a study on possibility to join one of the above mentioned instruments to the Sub Working Group on Safety, Regulation and Legislation. A final decision whether to join the 1997 Vienna Convention or the 1997 CSC will then be made by Cabinet on the recommendation of the NNEECC.</p> |
| Areas for further action | Significant | Nuclear liability |
| | Minor | Physical protection |
| RECOMMENDATIONS | | |
| R-5.1.1 | | |
| South Africa should join the relevant international legal instrument(s) on civil liability for nuclear damage. | | |
| SUGGESTIONS | | |
| S-5.1.1 | | |
| South Africa should join the Amendment to the CPPNM adopted in 2005. | | |
| Condition 5.2: A comprehensive nuclear law is enacted and in force | | Phase 2 |
| Summary of the condition to be demonstrated | <p>The state should have promulgated the national nuclear legislation including the following main elements:</p> <ul style="list-style-type: none"> a) establishing an effectively independent regulatory body or bodies with clear functions b) identification of responsibilities for safety, emergency response, security and safeguards c) formulation of safety principles , policies and rules (nuclear | |

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| | <p>installations, radioactive waste and spent fuel management, decommissioning, mining and milling, emergency preparedness, transport of radioactive material)</p> <ul style="list-style-type: none"> d) formulation of nuclear security principles e) giving appropriate legal authority to and definition of the responsibilities of all competent authorities establishing a regulatory control system (authorization, inspection and enforcement, review and assessment, and development of regulations and guides) f) implementing IAEA safeguards g) implementing import and export controls of nuclear and radioactive material and items h) establishing compensation mechanisms for nuclear damage. |
| <p>Review observations</p> | <p>The legislative framework governing nuclear activities in South Africa is composed of the following instruments:</p> <ul style="list-style-type: none"> 1999 Nuclear Energy Act, 1999 National Nuclear Regulator Act, 1973 Hazardous Substances as amended in 1992, 2002 National Disaster Management Act, 2008 National Radioactive Waste Disposal Institute Act. <p>The Nuclear Energy Act (NEA) is twofold. First, it establishes the South African Nuclear Energy Cooperation (NECSA) under the Minister of Energy with the aim, inter alia, to undertake and promote research and development in the field of nuclear energy. Secondly, it designates the Minister of Minerals and Energy (now the Minister of Energy) as the authority responsible for non-proliferation, safeguards and some aspects of import and export controls. In addition, it contains some provisions governing radioactive waste management and storage of irradiated nuclear fuel. The National Nuclear Regulatory Act (NNRA) establishes the National Nuclear Regulator (NNR) as the regulatory authority for the safety of nuclear installations. The Hazardous Substances Act, administered by the Department of Health, regulates radiation sources which are outside a nuclear installation and that are used for medical, scientific, agricultural, commercial or industrial purposes. Pursuant to the above, three entities can be identified as exercising regulatory functions over nuclear and radiation activities; the National Nuclear Regulator responsible for safety regulation of nuclear installations; the Minister of Energy as regards safeguards, import and export controls and radioactive waste management; the Department of Health regulates radiation sources that are outside a nuclear installation.</p> <p>The NNR is governed by a Board of Directors with the Minister of Energy as the NNR’s executive authority. According to section 8</p> |

of the NNRA, the members of the Board of Directors are appointed by the Minister and the NNR CEO is appointed by the Minister after consultation of the Board. The Board also comprises one representative each from the Department of Energy, Department of Environmental Affairs, organised labour, organised business, and affected communities. In addition, NNR funding is subject to Parliamentary approval after Minister recommendation. Finally, it is understood that NNR is responsible for developing safety regulations, and their promulgation by the Minister is a legal practice in the country.

Considering that the Minister of Energy is also in charge of the promotion of nuclear energy and, given the structure, the designation of the Board members and the process to approve the NNR's budget, the INIR team is of the view that there is no adequate separation between the regulatory functions and the promotional activities, thus calling into question the effective independence of the NNR.

The INIR team noted that the NNRA does not explicitly provide for Fundamental Safety Principles including that the prime responsibility for safety rests with the operator. It is, however, included in the Regulations 388 of 28 April 2006 on Safety Standards and Regulatory Practices. The INIR team was informed that the NNRA is being revised and will consider this issue.

As regards radioactive waste and spent fuel management, the INIR team was informed that the Department of Energy developed in 2005 a Radioactive Waste Management Policy and Strategy. In addition, the National Radioactive Waste Disposal Institute Act was adopted in 2009. Some provisions of the NEA and of the NNRA are also relevant in this area (sections 45-46 of the NEA, provisions on the nuclear installation licence of the NNRA). However, the INIR team highlighted that the general principles governing radioactive waste and spent fuel management (incorporated in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management) are not adequately reflected in the NNRA. Finally, the delineation of responsibilities of the Minister of Energy and NNR as regards the authorisation for the disposal of radioactive waste and storage of irradiated nuclear fuel is unclear. However, the INIR team was informed that the permission granted by the Minister under the NEA does not re-evaluate or consider the safety assessment, but deals specifically with the permission to dispose of waste done prior to the NNR safety assessment. The NNR is the authority for granting a safety license for disposal and storage of irradiated nuclear fuel. These two processes are independent.

While decommissioning issues are addressed in the abovementioned Regulations on Safety Standards and Regulatory Practices, the legislative framework, in particular the NNRA, does not provide for the establishment of decommissioning plans and financial arrangements.

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| | | <p>The INIR team noted that the legislative framework does not adequately cover nuclear security issues, including the physical protection of nuclear facilities and material. The NEA and the NNRA do not address nuclear security principles, do not clearly designate the responsible organisation(s) for physical protection and do not provide for criminalisation of offences in accordance with the CPPNM to which South Africa is party. The INIR team was informed that the NNRA is being amended to address these issues.</p> <p>The NEA provides for the responsibilities for the implementation and the application of the Safeguards Agreement and the Additional Protocol and the Minister of Energy acts as the national authority for the purpose of their implementation through NECSA. In this context, the INIR team was informed that the current delegated national function to NECSA will be withdrawn to ensure the independence of the safeguards function. While South Africa is a party to none of the international instruments on civil liability for nuclear damage it has included a number of provisions addressing civil liability for nuclear damage in Chapter 4 of the NNRA. However, these provisions do not fully comply with the international principles governing civil liability for nuclear damage. The INIR team was informed that the provisions of the NNRA will be revised.</p> |
| Areas for further action | Significant | Legislation: Regulatory Body independence, nuclear security, civil liability for nuclear damage. |
| | Minor | No |
| RECOMMENDATIONS | | |
| R-5.2.1 | | |
| South Africa should complete the process of revising its legislative framework to address the independence of the regulatory body, nuclear security and civil liability for nuclear damage. | | |
| SUGGESTIONS | | |
| None | | |
| Condition 5.3: All other legislation affected by the nuclear power programme developed, promulgated and in force | | Phase 2 |
| Summary of the condition to be demonstrated | <p>Laws need to be enacted and/or amended to cover:</p> <ul style="list-style-type: none"> i. environmental protection ii. emergency management iii. occupational health and safety of workers iv. protection of intellectual property v. local land use controls vi. foreign Investment | |

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| | | <ul style="list-style-type: none"> vii. taxation, fees, electricity tariffs, incentives (including long-term liabilities related to SF, radioactive waste and decommissioning) viii. roles of national government, local government, ix. stakeholders and public involvement x. international trade and customers xi. financial guarantees and any other required financial legislation xii. research and development. |
| Review observations | | <p>South Africa has adopted a number of laws also relevant to a nuclear power programme, such as:</p> <ul style="list-style-type: none"> - The National Environment Management Act, 1998, - National Disaster Management Plan, 2002, - The Intellectual Property Right Act, 2008, - Public Finance Management Act, 1999, - Promotion of Access to Information Act, 2000, - Protection of Information Act, 1982. |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| 6. Safeguards | | Phase 2 |
| Condition 6.1: Strengthening of the SSAC under way | | |
| Summary of the condition to be demonstrated | An established and technically competent State System on Accounting for and Control of Nuclear Materials (SSAC) including designation of the organization acting as the regulator, and definition of role, responsibilities and reporting methods. | |
| Review observations | <p>Based on the review of submitted documents and interviews conducted by INIR team, it is evident that the SSAC has been established and a national (State) Authority has been designated to implement safeguards with a defined role, responsibilities and reporting requirements.</p> <p>The Minister of Energy acts as the national authority for the safeguards implementation in South Africa. However, the day to day</p> | |

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| | | <p>safeguards activities are delegated to NECSA who performs the role of State Authority within South Africa’s SSAC. As such, NECSA is in charge of collecting and submitting the safeguards information to the IAEA, providing access to the IAEA inspectors and ensuring the necessary cooperation when implementing safeguards in South Africa. Section 33 of the NEA describes the manner in which the safeguards are implemented and regulated. The requirement for establishment and maintenance of SSAC is implemented mainly through the authorization for possession of nuclear material, obligations of reporting nuclear material inventories and inventory changes and inspections conducted by NECSA inspectors. In this regard, NECSA has developed numerous procedures, quality management documents and instructions on various aspects of safeguards management.</p> <p>However, no safeguards regulation is in place and, as stated in the SER, DOE recognises that NECSA undertaking the safeguards regulatory functions and also being operator is a conflict of interest and therefore the transfer of safeguards regulatory function from NECSA is under consideration. The Sub-Working Group on Safeguards, Security and Physical Protection is considering where this function should be allocated. The transfer is planned to be finalized in 2015.</p> <p>The INIR team was informed that in implementing the regulatory role of the SSAC, NECSA safeguards inspectors may, on an ‘ad hoc’ basis interact with NNR inspectors as well as inspectors appointed by the Minister of Trade and Industry in terms of relevant provisions of the Non-Proliferation Act. General aspects of such interaction are coordinated by the South African Council for the Non-Proliferation of Weapons of Mass Destruction.</p> <p>Based on its experience with implementing safeguards at existing nuclear facilities and relevant training provided to its staff, NECSA has a good understanding of the principles of safeguarding a nuclear power plant.</p> <p>Also Eskom, as the licence owner and operator of Koeberg Nuclear Power Station with long experience in ensuring transparent information exchange with the IAEA, has a good understanding of the principles of safeguarding a nuclear power plant, including the type of equipment the IAEA may install in the facility. Eskom understands the IAEA protocols and requirements and has processes in place to ensure compliance with the requirements. New build programs and processes will build on these experiences. A dedicated team within Eskom will perform the operator’s role within SSAC at the new facility.</p> | | | | | |
| | | <table border="1"> <tr> <td rowspan="2">Areas for further action</td> <td>Significant</td> <td>No</td> </tr> <tr> <td>Minor</td> <td>Independence of State Authority (see Issue 5) Safeguards regulations (see Issue 7)</td> </tr> </table> | Areas for further action | Significant | No | Minor | Independence of State Authority (see Issue 5) Safeguards regulations (see Issue 7) |
| | | Areas for further action | | Significant | No | | |
| | | | Minor | Independence of State Authority (see Issue 5) Safeguards regulations (see Issue 7) | | | |

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| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |
| Condition 6.2: Early safeguards relevant information provided to IAEA planned | | Phase 2 |
| Summary of the condition to be demonstrated | The contract specification should require early information on design to be given to IAEA for ability to suggest any design changes for safeguards reasons. | |
| Review observations | <p>The 10-year plans, including the information on the construction of the new NPP, have been submitted to the IAEA in terms of Additional Protocol Declarations (Art. 2.a.(x)) and are being regularly updated.</p> <p>The high level plan developed in the Phased Decision Making Approach includes the requirement to timely address safeguards issues in the contract specification.</p> <p>The preliminary design will be submitted to the IAEA after the selection of a specific technology.</p> | |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| 7. Regulatory framework | | Phase 2 |
| Condition 7.1: Independent nuclear regulatory body established and the necessary regulatory infrastructure developed | | |
| Summary of the condition to be demonstrated | <p>The Regulatory Framework should address all the relevant of aspects for safety, security and safeguards related to the proposed nuclear programme. The framework will ultimately need to cover all the phases of the programme (siting, design, construction, commissioning, operation, decommissioning, spent fuel and waste management, and transport) but at this stage, some aspects may be covered by future work plans.</p> <p>The regulatory body should have the legal authority, technical competence and resources to fulfil the statutory obligations, ready</p> | |

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| | <p>to licence and inspect the construction of the NPP against a clearly defined set of regulations and licensing framework. Its regulatory decisions should be free from undue political and economic influence.</p> |
| <p>Review observations</p> | <p>As South Africa is an operating nuclear power country, it has an existing regulatory framework. This regulatory framework is based on the NNRA and the NEA. Safety is explicitly contained within the NNR Act, Safeguards is governed within the NE Act, while nuclear security is not explicitly addressed in either. This is recognized and being addressed within the draft Amendment to the NNR Act. The INIR team was informed that the regulatory requirements for nuclear security are currently in draft form having been prepared by NNR. In the context of ongoing regulatory activities, the NNR performed an IRRS Self-Assessment of its regulatory framework using the IAEA Self-Assessment Tool and guidelines and is implementing action plans to address the gaps identified. The new build programme was taken into consideration during the conduct of the self-assessment and prioritizing and scheduling of the action plan. The INIR team recognized the significant amount of effort needed to not only perform the self-assessment, but also to make the progress to date on implementing the actions. Given the status of implementation of the actions, about 50% of the identified regulations will be ready for promulgation by end of March 2013 and the balance by end of March 2014.</p> <p>The Minister of Energy makes regulations and NNR issues requirements documents, licensing guides and licensing documents. The ongoing efforts not only serve to update the related requirements and guidance documents, but will also streamline the regulatory framework by elevating requirements documents to regulations and consolidating the remainder of guidance in the form of regulatory guides issued by NNR.</p> <p>The NNR Act identifies that siting, design, manufacturing, construction, operation, and eventual decommissioning falls under the regulatory control of NNR. This has been interpreted as allowing for separate applications for authorization for the various stages or combinations thereof. NNR has a suite of safety standards and regulatory practices that, as a minimum, will be applicable, as amended or replaced through ongoing enhancement project.</p> <p>The regulation for licensing of sites for new nuclear installations was issued in November 2011. In addition NNR is drafting regulations (new and revisions) as follows: Scope of regulatory control, licensing and certification, management of safety, public participation, safety assessment, radiation protection, waste management and environment protection, emergency planning, nuclear security, transport safety as well as specific regulations for nuclear installations. Regarding design, NNR had prepared NNR RD 0018, Basic Licensing requirements for PBMR, which is</p> |

generally applicable to new NPPs, the content of which will be incorporated in the revised suite of regulations. The basic regulations are contained in Government Notice R388 of 2006, the Safety Standards and Regulatory Practices. NNR has adopted a non-prescriptive regulatory approach with the regulations providing high level requirements. With regard to safeguards, Section 33 of the NEA describes the manner in which the safeguards are implemented and regulated. NECSA has developed numerous procedures, QM documents and instructions on various aspects of safeguards management which are being implemented. However, the INIR team was informed that safeguards regulations are being drafted.

The INIR team was informed of the process for issuing regulations and it was highlighted that following NNR board recommendation of regulations, the Minister of Energy is the executive authority for promulgation of the regulations to be considered as law. The draft regulation is published in the National Gazette for public comment. These comments are received by Minister of Energy but dispositioned by NNR that may involve further public consultation. Then it is submitted by the Minister of Energy to the Gazette for promulgation.

As there is an extensive effort underway to enhance the regulatory framework for the new build project, NNR has developed a series of strategy documents that are shared with industry. One of these documents, SD-003, Licensing of New Nuclear Power Plant, outlines the strategy for licensing of new plants. This document describes three partially overlapping phases: the preparatory phase following formal notification of intent; regulatory activities following an application; and NNR Board review and decision process and issuance (or not) of a nuclear authorization.

The NNR and Eskom have been in consultation on the implementation of the preparatory phase. The NNR has identified key issues to be clarified in advance of the bidding process and is developing regulatory positions on these issues. NNR performs regulatory review and assessment as directed within Government Notice R388 of 2006. NNR carries out regulatory inspections, as mandated in the NNR Act. Inspections are conducted per the annual inspection programme and plan. In addition, NNR ensures that corrective actions are implemented and takes the necessary enforcement action in the event of violations of safety requirements. The NNR Enforcement Policy and Procedure, PPD-COM-002, Compliance Assurance Policy and Procedure (PPD-COM-01), Authorisation Policy and Procedure (PPD-AUTH-01), Review and Assessment Policy and Procedure (PPD-ASS-01) have been finalized.

NNR has two main technical divisions: Standards, Authorisations, Reviews & Assessments (SARA); and Compliance Assurance & Enforcement. They have been providing oversight of Koeberg and the other nuclear facilities. In addition to the traditional

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| | | <p>organizational structure, NNR employs a matrix organization that allows broader access to technical competence within its organization. SARA also has the lead role for the regulatory framework enhancement effort. The NNR regulatory training matrix (self-assessment sub project: Regulatory Training Matrix) defines the training requirements for NNR staff for each functional area. For the new build programme, NNR has identified the additional resources needed. On completion of the Memorandum of Agreement with Eskom, NNR will begin to recruit these resources in a phased manner.</p> <p>With respect to external support, NNR uses consultants on an as needed basis. The INIR team was informed that NNR has invited proposals for possible technical support for the new build process. They noted they would need to follow South African procurement regulations, but do not anticipate challenges in obtaining the necessary support.</p> |
| Areas for further action | Significant | Nuclear Security and Safeguards Regulations |
| | Minor | On-going implementation of Action Plan from IRRS Self-Assessment |
| RECOMMENDATIONS | | |
| R-7.1.1 | | |
| South Africa should complete regulations on nuclear security and safeguards. | | |
| SUGGESTIONS | | |
| S-7.1.1 | | |
| South Africa should continue the work to ensure timely completion of the actions identified from the NNR Self-Assessment, and consider inviting an IRRS Mission. | | |

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| 8. Radiation protection | | Phase 2 |
| <p>Condition 8.1.: Actions to prepare adequate radiation protection programs undertaken and expansion of appropriate infrastructures planned</p> <p>N.B. This covers protection of workers and public on-site during planned operation. Off-site releases from planned operation are addressed in '13. Environmental Protection' and accidental releases and associated radiation protection are addressed mainly in '14. Emergency Planning'</p> | | |
| Summary of the condition to be demonstrated | <p>Plans need to be in place to develop programmes to control and monitor exposure of individuals on-site before any radioactive material arrives on the site.</p> <p>They should include staff training, procurement of equipment and services, design requirements.</p> | |

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| | | They need to be able to cope with the increased requirements during construction and commissioning. |
| Review observations | | <p>South Africa has in place well established programs on radiation protection.</p> <p>The NNR has developed a number of Safety Standards and Regulatory Practices (SSRP) documents on radiation protection. These SSRPs include Section 3 which stipulates the Principal Radiation Protection requirements and Sections 4.2 and 4.5 provide specific Radiation Protection requirements. Additional requirement documents RD-0022, RD-0018 and RD-0017 further expand on these requirements.</p> <p>Eskom has the key documents in place to manage radiation protection of the new build program. Document 238-19 is the basic Nuclear Division Radiation Protection standard describing basic principles of RP within Eskom, and document 233-93 explains the functional responsibilities for radiation protection at new nuclear power stations. Documents 233-95 and 233-96 describe the generic training program for radiation protection. Eskom’s ‘Employers Requirements Specifications (ERS)’ include requirement for both Nuclear-1 and the future fleet RP requirements from the vendor. Eskom also prepared a standard that specifies (design) requirements for radiological monitoring instruments for the protection and safety of people against ionizing radiation, taking into account the lessons learned from the Fukushima accident</p> <p>The Radiation Protection Plan for new nuclear program has not yet been finalized. It will be submitted as part of a licensing application</p> <p>NNR identified that additional staff are needed for the radiation protection area.</p> <p>Eskom considers that the radiation protection requirements apply when the fresh fuel arrives to the site. At the same time this is a regulatory hold point when all relevant RP systems and equipment should be installed and operational.</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| <p>9. Electrical grid</p> <p>Condition 9.1: Detailed studies to determine grid expansion, upgrade or improvement undertaken</p> | <p>Phase 2</p> |
| <p>Summary of the condition to be demonstrated</p> | <p>An analysis of the grid system should have been completed to identify any enhancements needed to:</p> <ul style="list-style-type: none"> • cope with the enhanced generating capacity • achieve grid stability and reliability requirements to allow safe operation (ability to reliably take the load and provide supplies to safety equipment). <p>The performance characteristics of the planned NPP have been agreed with the transmission system operator and they are compatible with the capability of NPP designs being considered.</p> |
| <p>Review observations</p> | <p>The National Energy Regulator of South Africa (NERSA) is the custodian of the South African Grid. It develops the “Grid Code”, which contains the rules for the transmission network.</p> <p>Eskom, as the licensed Transmission Network Service Provider (TNSP), plans the network according to the Grid Code and, subject to funding and other resource constraints, builds the network according to national plans.</p> <p>The transmission network covers electrical networks with voltages ranging from 220kV to 765kV and the transmission substations where these networks terminate. A few 88kV and 132kV electrical networks are included due to their strategic nature e.g. house-load supply for the NPP.</p> <p>TNSP, through NERSA, issues annually the “Network Planning” which is a forecast for the next 10 years of what measures have to be taken to ensure the reliability of the grid, considering also new generation facilities expected to come on line in this period. The latest version is for the period from 2013–2022 but no new nuclear project is considered in this report as the first nuclear unit is planned to be in commercial operation in 2023/24 (just outside of the current 10-year planning window). The Transmission Development Plan (TDP) 2013-2022 (section 6.8) indicates some requisite upgrades of the transmission network in the Thyspunt area upon confirmation of the nuclear project. However NERSA and Eskom have obviously implemented an effective methodology to prepare the grid for necessary improvement to govern any new units coming on line in the future.</p> <p>Independent from this regular NERSA forecast about the demands for grid enhancements, Eskom had initiated specific studies within the former Nuclear-1 project. The scenarios had considered all 3 potential sites, Thyspunt, Koeberg and Bantamsklip, and they had also considered the bounding scenario for the grid enhancement, that all</p> |

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| | | <p>units will be placed on one site only.</p> <p>Requirements related to the grid need to be established for the BIS. Furthermore the reliability data of the grid for the uninterrupted supply of the stations must be identified as a significant input to PRA calculations.</p> <p>Eskom had considered the EUR safety requirements related to the transmission for the new build (Vol. 2 Chapter 2.3).</p> <p>Scenarios had been evaluated on the consequences to the grid and to the nuclear power station if transmission lines are lost (usually one or two lines lost per site).</p> <p>The grid requirements will form part of the final BIS in the form of the ERS which references NERSA's grid code. Post-Fukushima studies had been performed by Eskom to identify necessary improvements related to grid.</p> <p>No need for updates had been identified for the grid requirements but improvements were identified for the internal electrical supply in case of station black out. These will be included in the safety requirements for the new build.</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |
| Condition 9.2: Plans, funding and schedule for grid enhancement available | | Phase 2 |
| Summary of the condition to be demonstrated | The plans for and funding of the identified enhancements should be available and the enhancement programme should be consistent with NPP construction programme. | |
| Review observations | <p>Eskom has costed a scheduled grid expansion to accommodate Nuclear-1 at the Thyspunt, Koeberg and Bantamsklip sites.</p> <p>The final schedule will be determined once the technology is chosen and the NPP construction schedule is agreed.</p> <p>The expected costs for the grid expansion are considered in the cost estimates for the fleet program.</p> | |
| Areas for further action | Significant | No |
| | Minor | No |

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| RECOMMENDATIONS |
| None |
| SUGGESTIONS |
| None |

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| <p>10. Human resources</p> <p>Condition 10.1.: Knowledge and skills needed in organizations for Phase 3 and operational phase are identified and a plan to develop and maintain the human resource is developed</p> <p>N.B. This issue addresses the future development of capability for phase 3 and beyond. The skills already required to be in place for phase 2 are covered under the appropriate issues (e.g. Issue 7 for the regulatory body).</p> | <p>Phase 2</p> |
| <p>Summary of the condition to be demonstrated</p> | <p>All relevant organizations should have identified an organisational structure and the staff requirements for Phase 3 and the operational phase. The intended senior staff should be in place or identified. A gap analysis should have been completed and recruitment and training plans developed. The plans of the different organisations (including research organisations and TSO's) should be considered in an integrated way so as to optimise the development programme. The programme should cover education, training and experience requirements and should also include consideration of bilateral and international training activities.</p> |
| <p>Review observations</p> | <p>The relevant Government departments, Eskom and NNR, have analyzed their needs for the new build programme and have identified the necessary resource and competence requirements.</p> <p>Eskom's project management arrangements for Phase 3 are already described under Issue 3 - Management and their operational requirements are described in the Eskom Skills Plan and the Operational Readiness manual, doc 233-1. The training requirements for new NPP personnel are described in Eskom doc 233-94, 'the training standard', based on their existing operational experience. They have a separate skills development plan for the construction and commissioning staff which includes requirements for skills development and transfer with the eventual vendor. This plan includes 18 month overseas training programs for the senior members of the project management team. In addition Eskom has recruited and commenced training nine senior instructor staff, all of whom will be trained to the level of licensed senior reactor operator.</p> <p>Eskom has also prepared two separate User Requirement Specification (URS) documents which will be part of the BIS for the vendor. One addresses operator training requirements and the other covers a range of non-operator disciplines. The second URS also</p> |

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| | | <p>includes provision for technology training for regulatory body staff. As an existing operator, Eskom staff has a good knowledge of different reactor technologies available and recently (2008) went through a bidding process for the Nuclear-1 project, although this was eventually halted. Eskom has retained many of the staff involved with the Nuclear-1 and PBMR projects and so has experienced staff available, in addition to the complement for operating the Koeberg NPP.</p> <p>NNR's strategy for managing the new build is to increase the resources within its existing organizational framework, rather than creating a new build section. NNR will initially recruit 30-35 additional staff to support the new build programme. However, recruitment for these positions is pending approval. NNR has recently commenced a skills enhancement programme for existing staff and have established a Senior Technical Experts Group to ensure the experience of the senior staff, including those recently retired, is passed on to less experienced staff.</p> <p>NNR is currently procuring technical support services (requirements listed in doc SD003) to augment its current capacity in the short term.</p> <p>Eskom and NNR both have a clear strategy and plans in place to meet their needs for the new build programme which takes into account a NIASA (nuclear industry association of SA) Educational sub-committee report, published in March 2012, which raises concerns about South Africa's ability to produce the quantity and quality of technical and professional staff required by industry as a whole. The report highlights a significant drop in the number of students applying for nuclear training programmes since the suspension of the PBMR project; it also point to the low graduation rates of students compared to entrants (around 20% in 2010). The report also refers to studies indicating a severe shortage of engineering and technical skills across various sectors and highlights particular concern concerning a lack of artisans. The need for improvements in the secondary education system, especially in the areas of maths, sciences and crafts is also identified.</p> <p>The Sub-Working Group on Skills, Localization and Industrialization indicated that it was aware of these problems and was developing a strategy to address these needs but there were no specific details available.</p> <p>NECSA and Eskom are working to assist in this area by training artisans and interns (recent science and engineering graduates).It is also recognized that more work will need to be done to secure the necessary resources for the nuclear programme, especially since it will be competing with other national projects for resources.</p> |
| Areas for further action | Significant | Secondary and Tertiary Education and craft/artisan training |
| | Minor | No |

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| RECOMMENDATIONS |
| R-10.1.1 South Africa should develop and implement a national human resources strategy and plan to address required improvements in: technical subjects at secondary school level; graduation rates for university engineering programmes; and training of artisans in areas relevant to nuclear industry. |
| SUGGESTIONS |
| None |

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| 11. Stakeholder involvement | | Phase 2 |
| Condition 11.1.: Public information and education program developed | | |
| Summary of the condition to be demonstrated | An integrated stakeholder involvement strategy and plan should be in use and updated. For each of the main organizations (government, regulator, and operator), there should be a clear statement of the role and responsibilities in proactive stakeholder involvement and each organization should have a plan covering: public, local government, industry, media, NGOs (non-government organizations), opposition groups, and neighboring countries. | |
| Review observations | <p>As a country with an existing nuclear programme, South Africa has substantial stakeholder involvement activities in place around current facilities, and is addressing the communication demands of nuclear expansion. The Communication and Stakeholder Engagement Strategy, an umbrella approach produced by the Government after consultation with Eskom, NECSA, NNR and relevant Government Departments was endorsed by the Cabinet in November 2012, and implementation has begun. Eskom and the NNR also have their own stakeholder strategies.</p> <p>The national strategy clearly sets out the challenges and main communication channels needed to reach a broad range of stakeholders on nuclear issues. It recognizes that all main nuclear-related organizations have a part to play in the stakeholder involvement process. Practical implementation plans are included in annexes to the document, which (although not intended to cover fine detail) define key messages to ensure consistency, and set out which organization should take the communication lead on each issue. These plans cover a one year period, but the INIR team was informed that the Sub-Working Group on Siting, Environment and Communication is expected to develop medium- and long-term plans.</p> <p>Most major stakeholder categories are targeted for outreach, either explicitly under the Strategy and/or in existing stakeholder engagement practice. South Africa has considerable experience of public consultation, owing to its existing nuclear programme, and a</p> | |

regulatory framework that requires public participation in various stages of licensing. That experience is now being rolled over to the new-build context.

As well as formal public hearings and Public Safety Information Forums, Eskom, NECSA and the NNR are actively involved in 'awareness' outreach with local government, communities and schools near potential future nuclear sites. There are established visitor centres at Koeberg and Pelindaba, and background information on nuclear issues is available from Eskom, NECSA, the NNR and other relevant organizations. English remains the lingua franca, but meetings are held and materials provided in other languages when appropriate. Information specific to new build is being developed, although to avoid the need for constant updating of written materials, the Government plans to use the media as a major channel for disseminating specific messages on new build. Messaging includes acknowledgement that although accidents are highly unlikely, they are not impossible.

Industry, labour unions, the media and NGOs, including those opposed to nuclear energy, are also engaged directly.

Direct engagement with neighbouring countries is not included in the short-term Strategy, but regional discussions have taken place at recent Southern African Development Community (SADC) meetings. The NNR also engages with regulators in the SADC region. South Africa acknowledges that this arrangement should be addressed. However this is planned for the medium term strategy, as it is currently giving priority to local stakeholders in affected areas.

Some opinion polls have been conducted at the national level on attitudes to nuclear power in South Africa. These have been snapshots at national level.

The DOE plans systematically to conduct repeat polls in specific communities over time, to indicate trends in opinion.

The NNR clearly states its commitment to transparency in public information. A stakeholder survey concluded, amongst others, that generally the current nuclear installations are not a safety concern but that more can be done about increasing public awareness of the role of the Regulator, especially amongst mining communities. The NNR intends to further strengthen its communication with the public and media.

Eskom has an established media training programme in place for nuclear spokespersons, and the DOE has started such training. NNR has provided training for spokespersons in the past, but does not currently have a systematic approach to this.

The DOE has hosted a seminar for journalists on nuclear issues, and plans to repeat this annually.

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| Areas for further action | Significant | No |
| | Minor | Engagement with neighbouring countries |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| S-11.1.1 | | |
| South Africa should improve engagement with neighbouring countries on its nuclear expansion plans within a reasonably short time frame. | | |

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| 12. Site and supporting facilities | | Phase 2 |
| Condition 12.1.: Detailed site characterization completed | | |
| N.B. There are also some siting related requirements under are addressed under issue 13 - environmental issues | | |
| Summary of the condition to be demonstrated | The basis for the site selection from the candidate sites available from Phase 1 should be justified against clearly defined siting criteria. These should cover safety, engineering, security, environment, social and economic aspects. The site characterization should be completed and an evaluation by the regulatory body should confirm that the site meets their siting requirements depending on the specific authorization stages defined in the Member State. Site related design basis information should be available and included in the NPP requirements. | |
| Review observations | <p>Extensive site identification and selection studies were conducted from the mid-1980's to the present time. The studies used a phased site selection process, applying more detailed criteria as the numbers of sites were reduced. Phase 1 looked at geographical areas and used broad criteria to identify possible regions. Phase 2 used criteria addressing safety, engineering, security and environment, social and economic aspects to identify a number of potential sites. Phase 3 then applied more detailed criteria again covering all aspects and resulted in the identification of five candidate sites. EIA scoping studies were then carried out and three sites identified for detailed studies.</p> <p>Presentations were made to the then Minister of Economic Coordination and Public Enterprises and to the Electricity Council for approval to proceed with land acquisition at these sites.</p> <p>A more detailed EIA study is reaching completion by the independent environmental practitioner and recommends the use of Thyspunt as the first site. The study currently covers up to 4GW on the site. A</p> | |

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| | | <p>new EIA application will be submitted for the next NPP.</p> <p>The Nuclear-1 EIR is expected to be finalised in May 2013 and submitted to DEA for review. This should take approximately 3 months.</p> <p>Detailed site investigation studies started in 2007. The site safety report (SSR) for Thyspunt is nearing completion. The SSRs for Duynefontein and Bantamsklip have commenced and are targeted for completion following the Thyspunt SSR. It is expected that the Thyspunt SSR will be submitted to the NNR before the end of 2013.</p> <p>Eskom can then follow a number of routes. They can apply for a site licence which would then require the regulator to review the submission and engage in public consultation. Review and completion of the NNR's license process including public consultation is expected to take about 2 years.</p> <p>Alternatively, Eskom can apply for a combined licence once the vendor has been selected. The best way forward is currently under consideration.</p> <p>The NNR has determined the process of public participation and is currently developing regulations in this regard.</p> <p>The NNR regulations for siting were issued in November 2011 and these have been taken into account in preparing the SSRs. The Sub-Working Group on Siting, Environment and Communication is reviewing the work done to date. South Africa hosted an IAEA workshop on siting. The INIR team suggested that South Africa might consider inviting an IAEA SEED mission.</p> <p>Many other detailed approvals are needed for the site, as per any major construction project. The requirements are clearly defined and Eskom has experience of managing these approvals from the non-nuclear construction programmes.</p> <p>The sites have the capacity to store a lifetime of fuel, initially in the spent fuel pool but later in dry storage casks. The intention is to transfer the used fuel to the NRWDI eventual site depending on the option chosen for the back end of the fuel cycle. NRWDI is yet to commission studies for back end sites.</p> |
| Areas for further action | Significant | No |
| | Minor | Licensing approach |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| S-12.1.1 | | |
| The owner/operator should determine the approach to licensing (site license or combined license) | | |

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| Condition 12.2.: Plans to prepare site for construction | | Phase 2 |
| Summary of the condition to be demonstrated | Infrastructure either exists or is planned to support construction, e.g. access, workforce housing, water and construction materials. Any outstanding work is planned in accordance with the construction requirements or included in the BIS or contract specifications. | |
| Review observations | Subject to EIA approval, Thyspunt will be the first site. Existing facilities will be described in the relevant Site safety reports and the EIR. The requirements for new facilities on the sites are clearly defined in the ERS and specific URSs for the Early Works packages. | |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| 13. Environmental protection | | Phase 2 |
| Condition 13.1.: Environmental impact assessment for selected sites performed | | |
| N.B. This covers off-site releases from planned operation and all other environmental issues. Protection of workers and public on-site during planned operation are addressed in '8. Radiation protection'. Accidental releases and radiation are addressed mainly in '14. Emergency Planning' | | |
| Summary of the condition to be demonstrated | A complete assessment of the environmental impact of the proposed NPP should be carried out in accordance with national requirements and an environmental impact assessment report submitted to the appropriate authority. | |
| Review observations | The Department of Environmental Affairs (DEA) has regulations and guidelines that clearly define the process for completing an environmental impact assessment, including carrying out public consultation and securing regulatory approval. DEA is the lead authority but they also consult with other appropriate national, regional and local authorities. In accordance with those requirements, Eskom appointed an | |

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| | | <p>independent environmental practitioner who submitted, on behalf of Eskom (the applicant), an application for the proposed project (one nuclear power plant and the associated infrastructure on one site with a maximum capacity of 4000 MWe) in 2007. That consultant carried out an initial scoping study looking at five sites; this stage included two rounds of public participation in the environs of each of the five sites respectively, as well as meetings with the relevant Local and Provincial Government authorities. The scoping study identified three sites as preferred for more detailed investigation.</p> <p>A wide range of specialist studies were then carried out on each of the three sites. These were summarized in a draft EIR and supporting documentation which is made available to the public. The draft EIR recommends Thyspunt as the preferred site. There were a series of public meetings, ranging from key stakeholders to full open public meetings to discuss the draft EIR.</p> <p>Based on the comments received, additional work on some of the specialist studies was commissioned. The draft EIR was revised and released again for public comment in 2011. Additional information was requested by the public and four studies were further updated during 2012. This second revision of the draft EIR will be the subject of further public consultation. These are expected to take place mid 2013 with the formal submission, taking into account any further comments, of the finalised EIR to DEA before the end of 2013. The EIR is a very comprehensive set of studies looking at all impacts of the proposal to recommend the optimal site. DEA reviews the proposal against all three pillars of sustainable development: environmental, economic and social. They will appoint an independent panel to review and advise on the submission. The DEA review is expected to take about three months.</p> <p>Each of the specialist reports looked at the impact, with and without mitigation measures and, based on their recommendations, the environmental practitioner has combined all these to produce an environmental management plan.</p> <p>The DEA will either decline the application or will issue an Environmental Authorisation to approve the proposal subject to a set of conditions which will ensure the implementation of the agreed environmental management plan.</p> <p>Baseline environmental data (e.g. meteorological, water movement, dunes movement) has been largely completed. The radiological baseline data has started and will be completed before submission of the EIR.</p> |
| Areas for further action | Significant | No |
| | Minor | Environmental Impact Report |
| RECOMMENDATIONS | | |
| None | | |

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| SUGGESTIONS | |
| S-13.1.1 | |
| South Africa should complete its planned work on the Environmental Impact Report, following national requirements and seek the approvals required for the site. | |
| Condition 13.2.: Particular environmental sensitivities included in BIS | |
| Phase 2 | |
| Summary of the condition to be demonstrated | Comprehensive specification of environmental site conditions, factors, characteristics and data, should be provided in the BIS or contract specifications in as much detail as possible |
| Review observations | The EIA information is publicly available. Any contract would have to commit to implementing the environmental management plan. Design requirements are implemented via the conditions to the record of decision. |
| Areas for further action | Significant No |
| | Minor No |
| RECOMMENDATIONS | |
| None | |
| SUGGESTIONS | |
| None | |
| Condition 13.3.: Clear and effective regulation of environmental issues established | |
| Phase 2 | |
| Summary of the condition to be demonstrated | The role and responsibilities of the environmental regulator for the nuclear programme should be assigned and the interface between this organisation and the nuclear regulator should be defined. |
| Review observations | The NNR Act assigns responsibility to NNR to license nuclear installations. The NNR Act includes protection of the environment against nuclear damage as one of responsibilities of the Regulator. The National Environmental Management Act assigns responsibility to Environmental Authorities (such as DEA) to protect the environment. There is thus an overlap of responsibilities between the NNR and the Environmental Authorities with respect to radiological impacts on the environment. A cooperative agreement was thus signed between the NNR and DEA to manage their respective responsibilities and avoid duplication of legislative oversight. Through the DEA, this agreement covers any potential interface |

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| | | <p>issues with other regulating agencies (e.g. water).</p> <p>DEA requires that the owner operator appoints an independent inspection agency that checks that the environmental control measures are carried out during construction. Eskom is required to report regularly to demonstrate that they are complying with the conditions.</p> <p>DEA also has its own inspectors (colloquially known as “Green Scorpions”) who carry out periodic checks that organisations are meeting their environmental commitments.</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| 14. Emergency Planning | | Phase 2 |
| Condition 14.1.: Detailed approach to emergency planning being implemented | | |
| Summary of the condition to be demonstrated | <p>The responsibilities of each of the national institutions involved should have been defined. There should be a clearly defined lead organisation responsible for the national plan. The operating organisation should be aware of its responsibilities and should have a plan to develop full capability in Phase 3. For milestone 2, implementation details do not need to be in place, but implementation of the general approach for emergency planning should have started. The gaps in existing national institutions and communication networks should have been identified and filled or included in an action plan to be implemented later in Phase 3.</p> | |
| Review observations | <p>The National Disaster Management Act, Act No 57 of 2002 makes provision for a plan to manage national emergencies, such as a nuclear disaster.</p> <p>South Africa has in place such a National Nuclear Disaster Management Plan (NNDMP). The DOE is the co-ordinating organisation required to prepare a disaster management plan in the nuclear area. It makes provision for disaster management at local, provincial and national levels. NNR Act and the SSRP (Safety Standards and Regulatory Practices) also address Emergency Planning. The SSRP is supported by NNR document RD-0014 which provides the NNR requirements for an adequate level of Emergency Preparedness. Relations and communications between neighbouring</p> | |

countries are addressed in an agreement between SADC countries and the SADC Nuclear Regulators Network (NRN) came into effect with the signing of the memorandum of cooperation. However, there is currently no requirement within the National Nuclear Disaster Management Plan to communicate with neighbouring countries. (The current and initial new build plans are a large distance from any neighbouring countries).

NNR requirements for controlling spatial developments around the Koeberg NPP are included in the Cape Town spatial development plan but there is a need to strengthen the legal basis by converting these requirements into regulations. Regulations have been developed and will be approved by the NNR Board. The Department of Energy gazetted the draft Regulations on control of development for public comment, and the NNR is resolving these comments and carrying out consultation with Cape Town Municipality.

The INIR team was informed of the decision making process and it was clear that the Joint Operations Centre (JOC), chaired by the affected local authority (municipality), has the responsibility to make and implement decisions based on expert advice from the operator in consultation with the three levels of Government (National, Provincial, Local). State entities, such as the National Disaster Management Centre, NECSA, Eskom and NNR will convene support centres whilst they have a clearly defined role to support and assist the JOC.

NNR, in accordance with its mandate, tests the effectiveness of the national emergency plan every 18 to 24 months and its inspectors review the adequacy of the demonstration. Issues are identified and corrected based on a classification system for findings and observations. The exercises include all appropriate local, provincial and national organisations as well as testing links to IAEA (RANET) and other international links e.g. EdF and WANO (through Eskom). NNR participates as umpires during these exercises. NNR does not activate its Emergency Control Centre during these exercises. It has its own “desktop” exercises to test their capability, but they don’t involve other organizations.

A Memorandum of Agreement between Eskom and the Local Authorities ensures the implementation of the requirements of the emergency plan. The Emergency Planning Steering Oversight Committee (EPSOC) provides a forum for integrated discussions between operator, regulator, national, provincial and local government, on emergency planning and reviews of issues identified in exercises. This committee is chaired by DOE.

The Integrated Koeberg Nuclear Emergency Plan clearly defines the roles and responsibilities of all players as well as the chain of command. For future sites, the “Eskom Emergency Preparedness and Response Requirements for New Eskom Nuclear Installations standard (300-872)” gives guidance. The INIR team was informed that the roles and responsibilities, and the resulting chain of command between the operator, the NNR and local, provincial and national

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| | | <p>government are stipulated in the NNDMP.</p> <p>The emergency planning framework describes the commitment and timescales required to develop the appropriate procedures and protocols for the operational phase which includes the testing and approval of the Site Emergency Plan prior to nuclear fuel arriving on site. This is in line with NNR requirements. The plan will be agreed as part of the licensing process.</p> <p>Following the Fukushima accident, NNR directed Eskom to carry out a review of lessons to be learned. Eskom looked at several issues related to emergency planning. A number of areas for potential improvement were identified, (e.g. clarifying the basis for the design of emergency response equipment, communications, additional staffing requirements, extent of planning zones). The potential areas are being reviewed for enhancement options. An initial set of actions has been agreed with NNR and an updated set of proposed actions is currently being reviewed.</p> <p>DOE recognises that the current arrangement whereby NECSA is the national contact point for early notification is not ideal given that NECSA is also an operator and could be managing an emergency at one of its sites. Consideration is being given to moving the national contact point function to NNR.</p> |
| Areas for further action | Significant | No |
| | Minor | Arrangements for communicating with neighbouring countries Emergency Control Centre |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| <p>S-14.1.1 South Africa should consider including arrangements for bilateral communication with neighbouring countries in its national emergency plan.</p> <p>S-14.1.2 NNR should consider activating its Emergency Control Centre during national level emergency exercises.</p> | | |
| Condition 14.2: Emergency planning for existing radiation facilities and practices in place | | Phase 2 |
| Summary of the condition to be demonstrated | Most countries embarking on a nuclear power programme will have emergency arrangements for radiation sources and possibly for a research reactor. Such arrangements should be demonstrated, evaluated and updated as required. | |
| Review observations | A peer review of the NNR's emergency preparedness arrangements for existing facilities from the French Nuclear Safety Authority | |

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| | | <p>(ASN) was done in 2008. A number of actions were identified (including the re-establishment of the NNRs own dedicated emergency response facility) and have been implemented.</p> <p>Self-assessments have been carried out in the past, but no formal independent assessment of the national infrastructure has been carried out.</p> <p>South Africa is looking at EPREV guidelines and said it would probably request an EPREV mission at a date to be agreed.</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

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| 15. Nuclear Security | | Phase 2 |
| Condition 15.1: Security requirements defined, plan to develop DBT established, sensitive information defined | | |
| Summary of the condition to be demonstrated | <p>The national security requirements for the design and the site should be defined. They should be included in the BIS or contract specifications. National plans to develop the nuclear security systems and measures should be defined with clear roles, responsibilities and requirements.</p> | |
| Review observations | <p>There is a plan to develop key infrastructure for nuclear security to support the roles and responsibilities of each of the key agencies involved in nuclear security. Roles and responsibilities are assigned to agencies with respect to definition of national threat assessment, and protection of national key points. As discussed in Issue 5, the roles and responsibilities of other key organizations involved in nuclear security are not clearly defined in legislation. There is a coordination mechanism in place through the Sub-Working Group on Safeguards, Security and Physical Protection.</p> <p>Eskom has nuclear security requirements defined in two documents: Standard for the security requirements for the nuclear operating unit and Standard for the Physical Security at Nuclear 1.</p> <p>There is a Design Basis Threat (DBT) document in place that was developed by the DOE. A National Security Design Basis Threat analysis has been conducted by the relevant national intelligence</p> | |

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| | | <p>agencies in coordination with other key nuclear agencies, including DOE and NNR.</p> <p>There is a Protection of Information Act 1982 that includes penalties for violation of the Act. There is a Minimum Information Security Standard that DOE uses for the protection of information. The NNR document manual includes a strategy for assurance of handling and processing of sensitive or classified documents. Eskom has a document related to Information Security that addresses confidentiality, integrity and availability of information. It includes the classification of information. It is based on the Minimum Information Security Standards.</p> <p>The INIR team was informed that South Africa is engaged in bilateral, multilateral and international arrangements that include nuclear security. South Africa has an Integrated Nuclear Security Support Plan (INSSP) in place with the IAEA.</p> |
| Areas for further action | Significant | Regulations on nuclear security (see Issue 7) |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |
| Condition 15.2: Planned nuclear security measures for siting, construction and transport | | Phase 2 |
| Summary of the condition to be demonstrated | | Appropriate nuclear security systems and measures will need to be defined for the design, siting, construction and transport of nuclear and other radioactive material. |
| Review observations | | <p>The INIR team was informed that NNR is developing regulations for nuclear security.</p> <p>The DOE has established a process, including nuclear security measures, to authorise the transport of nuclear and other radioactive material.</p> <p>The owner/operator security requirements have been finalized for inclusion in the BIS or contract specification.</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |

| SUGGESTIONS | | |
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| None | | |
| Condition 15.3: Programs for selection/qualifications of staff with access to facilities are in place | | Phase 2 |
| Summary of the condition to be demonstrated | Adequate screening programs for recruitment and selection of personnel with access to facilities and classified information. The programme should be graded so that persons with greater access undergo a more rigorous screening process. | |
| Review observations | <p>The INIR team was informed that South Africa has a national vetting system in place, based on the nature of the role and function of an individual and the classification of information to which that individual will have access. Vetting to an appropriate national security level is done once every five or ten years, depending on the level of clearance. Matters considered include extensive background checks, including whether or not an individual is considered a security risk for South Africa.</p> <p>South Africa also has a screening process in place for circumstances such as visitors to nuclear installations.</p> <p>Eskom has a Fitness for Duty Standard that covers the requirements and process for screening of personnel with access to facilities and classified documents.</p> <p>Eskom has policy and procedure documents in place in relation to selection and qualifications of its security staff.</p> | |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |
| Condition 15.4: Nuclear security culture development planned | | Phase 2 |
| Summary of the condition to be demonstrated | Evidence that all relevant organisations understand the importance of a nuclear security culture and have plans to develop a security culture among their staff. | |
| Review observations | The agencies involved in nuclear security have an understanding of nuclear security culture and have plans in place to develop appropriate nuclear security culture in every organization with a role in nuclear security. | |

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| | | Eskom and NNR have programs to promote nuclear security culture including workshops, training, policy and procedure reviews. These efforts are part of an integrated approach to safety and security culture enhancement and there is a strong interface between safety and security in order to support each discipline. |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
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| 16. Nuclear Fuel Cycle | | Phase 2 |
| Condition 16.1: Front-end fuel cycle policy and strategy defined, and strategy for storage and ultimate disposal of spent fuel defined | | |
| Summary of the condition to be demonstrated | Based on the national policy, a clear front-end fuel cycle strategy should be defined identifying how new fuel will be available in the short and long term, or which options are being pursued. A back-end fuel cycle strategy should also be defined, including plans/options for storage (at reactor and away from reactor) and for ultimate disposal. Actions and timescales should be consistent with the planned NPP construction programme. If reprocessing is considered, then the strategy should include high level waste. | |
| Review observations | <p>South Africa has strong background in nuclear fuel cycle (NFC), both in Front-end and Back-end activities. A lot of knowledge and technical expertise has been accumulated in the past. From the submitted documents, the SER and from the interviews during the INIR mission, it is evident that in the context of new build, different options of NFC have been extensively explored and the national policy on NFC has been developed.</p> <p>The documents that set the national policy framework for NFC are the Nuclear Energy Policy for the Republic of South Africa (DME, June 2008) and the Radioactive Waste Management Policy and Strategy for the Republic of South Africa (DME, 2005). Nuclear Energy Policy states that South Africa shall endeavour to implement, or obtain interests in, the complete nuclear fuel cycle from uranium mining and milling, conversion and enrichment, fuel fabrication as well as fuel reprocessing. The Radioactive Waste Management Policy and Strategy addresses fuel back-end and sets the framework for the radioactive waste governance. It relates to all waste types including</p> | |

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| | | <p>long-term management of used fuel. Disposal of waste is considered as final step of radioactive waste management (RWM).</p> <p>Front-end NFC options have been extensively studied by Eskom and NECSA. Several strategic documents related to front-end of nuclear fuel cycle exist: Nuclear Fuel Strategy of Eskom elaborates NFC from operator’s perspective and addresses nuclear fuel procurement, contracting, and used nuclear fuel strategy for the new nuclear build program in South Africa. It defines Eskom’s strategy for the full nuclear fuel cycle, for the existing NPP and the new fleet. This includes a strategy for storage of spent fuel up to when it is declared high-level waste, expected to be after 50 years of storage.</p> <p>NECSA’s proposed Nuclear Fuel Cycle Strategy of March 2012 has explored the technical viability and economic sustainability of the strategy for localization of the front-end NFC. In addition to this, prefeasibility studies for all areas of the nuclear fuel cycle have been prepared. The business plan is still pending the selection of vendor and confirmation of the fleet build programme. A proposed Uranium resource management strategy of October 2010 has also been developed by NECSA.</p> <p>The INIR team was informed that all these strategic studies are to be considered in the Sub-Working Group on NFC: Front-end and Back-end, that will integrate these strategies into a consistent national strategy on NFC. The INIR team was also informed that fuel will be procured from the vendor (three initial loads per reactor) in the short term. The localization of the complete NFC is being considered for the medium and long term only.</p> <p>For the back-end of NFC NECSA prepared several pre-feasibility studies: on spent fuel management, on geological disposal, on reprocessing and other aspects. However, NECSA has no mandate for HLW management. The National Radioactive Waste Disposal Institute (NRWDI) has been designated responsible for all activities related to disposal of spent fuel/HLW, but it is not operational yet.</p> <p>Regarding the storage of used fuel, the INIR team was informed that storage is planned in wet storage pools (10 cycles) and dry storage facilities (for additional 40 years) on each site. The requirements for these facilities will be included in the BIS. Off-site centralised storage facilities are considered in the 2005 National Radioactive Waste Management Policy.</p> <p>Timescales related to NFC actions and facilities in existing strategies are consistent with the phased decision making approach to new build.</p> |
| Areas for further action | Significant | Integrated National Strategy for NFC |
| | Minor | No |

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| RECOMMENDATIONS |
| R-16.1.1 South Africa should develop an integrated national Nuclear Fuel Cycle strategy, including spent fuel/ high level waste disposal. |
| SUGGESTIONS |
| None |

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| 17. Radioactive Waste | Phase 2 |
| Condition 17.1: Handling the burdens of low and intermediate radioactive waste considered | |
| Summary of the condition to be demonstrated | Based on the national policy, there should be a clear strategy for the processing, storage and disposal of low and intermediate radioactive waste. Requirements for facilities to be provided by the vendor should be included in the BIS or contract specifications. Plans for any national facilities or waste management organisations should be clear and consistent with the construction programme. |
| Review observations | <p>The Radioactive Waste Management Policy and Strategy, developed by the Department of Minerals and Energy, was published in 2005. The policy relates to all types of radioactive waste. Various waste endpoints are considered in the policy which includes reprocessing, vitrification and geological disposal. Disposal of waste is considered as final step of RWM. It defines the responsibilities of the Government, regulatory body, waste generators and operators of disposal facilities.</p> <p>The management of radioactive waste is the responsibility of the Minister of Energy. Currently, this responsibility is delegated to NECSA, a state owned public company, which operates the Vaalputs National Radioactive Waste Disposal Facility. Vaalputs is presently licensed to receive low and intermediate level radioactive waste (LILW) from Koeberg NPP and NECSA facilities.</p> <p>The National Radioactive Waste Disposal Institute Act from 2008 establishes the state owned Institute (NRWDI) to develop and implement disposal solutions for all types of waste, to manage and operate disposal facilities, and to investigate the need of any new disposal facility. The NRWDI is expected to be operational before the end of 2013. It will take over the operation of the Vaalputs repository. For smooth transition of operation of this facility, and other RWM responsibilities, transfer of resources (human and others) is considered within this process. The staff of Vaalputs repository as well as some staff of the Nuclear Liabilities Management unit of NECSA will be moved to the NRWDI. Funding provisions for the</p> |

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| | | <p>operation of the NRWDI are included in the Act and funds for 2013 have been allocated.</p> <p>With regard to new build, it is planned that each NPP site will have waste processing and storage facilities for LILW. The requirements for these facilities have been developed and will be included in the BIS. The conditioned waste will then be transferred to the national repository in Vaalputs. The capacity of Vaalputs site is sufficient to accommodate LILW from existing operating units as well as the new build programme.</p> <p>Gaps in Regulatory Standards relating to Waste disposal facilities have been identified in the SER. The INIR team was informed that these gaps are related to the requirements for predisposal and disposal facilities and these gaps related to predisposal facilities will be adequately addressed in March 2013 and gaps related to final disposal by March 2014 (see Issue 7).</p> |
| Areas for further action | Significant | No |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |
| Condition 17.2: Preliminary decommissioning plan requested | | Phase 2 |
| Summary of the condition to be demonstrated | | A request for a preliminary decommissioning plan from the vendor should be included in the BIS or contract specifications. Specific national criteria should be included. |
| Review observations | | <p>Section (5.1) (5.3) of NNR Regulation 388 of 2008 includes requirements for a decommissioning strategy and plan, decommissioning operations and the release of radioactively contaminated land for all license holders (a conceptual decommissioning plan is required during the planning and design phases of new facilities, RD-0026).</p> <p>The INIR team was informed that the ERS requires the vendor to demonstrate the feasibility of decommissioning including the related design features, and that these requirements will be included in the BIS.</p> |
| Areas for further action | Significant | No |
| | Minor | No |

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| RECOMMENDATIONS |
| None |
| SUGGESTIONS |
| None |

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| 18. Industrial involvement | Phase 2 |
| Condition 18.1: Realistic assessment of the national and local capabilities carried out, ability to meet schedule and quality requirements analysed, and programs to transition to national and local suppliers in place | |
| Summary of the condition to be demonstrated | A review of national capability identifying areas where national supply is available or can be developed. Based on this volume targets, or specific areas, for local or national involvement should be developed. Any plans for upgrading national capability should be defined and funded. |
| Review observations | <p>South Africa has performed various reviews to identify areas where national supply is available to support the Nuclear Power expansion programme.</p> <p>The most relevant are:</p> <ul style="list-style-type: none"> - The South African Power Project (TSAPRO) 2007 Presentations and analysis documents. - Nuclear Industry Association of South Africa (NIASA) Manufacturing Sub-Committee Reports - NIASA supplier database; Suppliers List - Independent consultant Research Study about SA Localisation Study for First Two Units of the South African Nuclear New-Build programme. <p>Furthermore Eskom has performed its own evaluations taking into consideration their experience with SA industry support for the Koeberg NPP.</p> <p>These studies indicate that a share of at least 30% local content seems to be realistic for the first installation, mainly for construction and services related to the Conventional part of the NPP. Capabilities of local suppliers for the manufacturing of class 1 components today are very limited. An expansion of local participation may be envisaged for the next phases. A higher share and an intention of manufacturing class 1 components would require some more investment.</p> <p>Suppliers within the NIASA framework are looking at what they</p> |

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| | | <p>need to do to be capable to provide more of the supply chain.</p> <p>The conclusion of the Sub-Working Group on Skills, Localization and Industrialization will outline the strategy for the national policy for industrial involvement. The decision should be made in the near future taking into consideration the project timeline for the project in particular to finalize the BIS.</p> <p>Recent global experience shows that participation of domestic suppliers had contributed in some NPP construction projects to quality issues and delays in project execution. Eskom is aware of those risks and had set up countermeasures to minimize those risks using feedback experience from NPP construction and commissioning projects. Eskom takes part in the INPO working group for OPEX in construction and commissioning.</p> <p>Furthermore there is a section in the Eskom organization dealing with the issues related to the development and qualification of suppliers (“supplier development and localization section”).</p> <p>The NNR’s approach to oversee the Supplier Qualifications includes the review of procurement processes; manufacturing documentation and instituting hold and witness points as required. Based on Eskom’s Quality Management the existing Technical Standards are reviewed on a 3-yearly basis.</p> <p>Furthermore the updating process of technical standards is part of the 10 year Periodic Safety Reviews.</p> |
| Areas for further action | Significant | No |
| | Minor | Local participation |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| S-18.1.1 South Africa should define the desired extent of local industrial involvement, to be included in the BIS. | | |

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| 19. Procurement | | Phase 2 |
| Condition 19.1: Procurement program consistent with national policy for industrial participation established | | |
| Summary of the condition to be demonstrated | Clear procurement programme included in the BIS or contract specifications that delineate the scope of supply for specific equipment and services, consistent with the national policy for national industrial involvement. | |

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| Review observations | | <p>Currently the procurement program is not finalized. Relevant input is under development but not yet decided or approved.</p> <p>Those essential elements are</p> <ul style="list-style-type: none"> • Strategy about the local industrial participation not defined • Contracting strategy and BIS not completed and approved • Procurement Agency not yet defined <p>It is expected that the implementation of the Procurement Programme will commence after the relevant decision on the procurement framework has been made.</p> |
| Areas for further action | Significant | Procurement Programme (see Issues 1, 3 and 4) |
| | Minor | No |
| RECOMMENDATIONS | | |
| None | | |
| SUGGESTIONS | | |
| None | | |

ATTACHMENT 2: LIST OF THE INIR TEAM AND COUNTERPARTS

| INIR REVIEW TEAM | |
|---------------------------|--|
| Jong Kyun PARK | Team Leader Director of the Division of Nuclear Power, Department of Nuclear Energy, IAEA |
| Pal VINCZE | Coordinator Section Head, Division of Nuclear Power Department of Nuclear Energy, IAEA |
| Abdelmadjid CHERF | Reviewer IAEA |
| Vladimir CISAR | Reviewer IAEA |
| Christelle DRILLAT | Reviewer IAEA |
| Rhonda EVANS | Reviewer IAEA |
| Eberhard GRAUF | GERMANY |
| Stephen KOENICK | Reviewer IAEA |
| Irene MELE | Reviewer IAEA |
| Brian MOLLOY | Reviewer IAEA |
| Stephen MORTIN | UNITED KINGDOM |
| Gillian TUDOR | Reviewer IAEA |

Role Assignment

| | Element | First Reviewer | Assistant Reviewer |
|---|-----------------------|-----------------------|--------------------------------------|
| 1 | National Position | Park | Mortin, Koenick, Grauf |
| 2 | Nuclear Safety | Koenick | Mortin, Grauf, Vincze |
| 3 | Management | Grauf | Mortin |
| 4 | Funding and Financing | Mortin | Grauf |
| 5 | Legislative Framework | Cherf | Drillat, Evans, Cisar, Koenick, Mele |

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| 6 | Safeguard | Cisar | Cherf, Drillat |
| 7 | Regulatory Framework | Koenick | Cherf, Evans, Drillat, Mele |
| 8 | Radiation Protection | Vincze | Koenick |
| 9 | Electrical Grid | Grauf | Vincze |
| 10 | Human Resource Development | Molloy | Koenick, all others |
| 11 | Stakeholder Involvement | Tudor | Molloy, Grauf |
| 12 | Site and Supporting Facilities | Mortin | Grauf |
| 13 | Environmental Protection | Mortin | Koenick |
| 14 | Emergency Planning | Mortin | Molloy |
| 15 | Security and Physical Protection | Evans | Cherf, Drillat, Cisar |
| 16 | Nuclear Fuel Cycle | Mele | Vincze |
| 17 | Radioactive Waste | Mele | Cherf, Mortin, Drillat |
| 18 | Industrial Involvement | Grauf | Mortin |
| 19 | Procurement | Grauf | Mortin |

| LIST OF COUNTERPARTS | |
|-----------------------------|--|
| Name | Title, Organization |
| Ms Nelisiwe Magubane | DG Department of Energy |
| Mr Zizamele Mbambo | DDG Department of Energy |
| Mr Jeetesh Keshaw | Department of Energy |
| Mr Katse Maphoto | Department of Energy |
| Ms Elsie Monale | Department of Energy |
| Mr Johannes Mahlangu | Department of Energy |
| Ms Mpho Makgale | Department of Energy |
| Mr Mogorosi Moalusi | Department of Energy |
| Mr Mpumzi Bonga | Department of Mineral Resources |
| Ms Lerato Nonyana | National Treasury |
| Mr Jeffrey Quvane | National Treasury |
| Ms Avril Halstead | National Treasury |
| Ms Anza Murovhi | Department of Science and Technology |
| Ms Deborah Ramalope | Department of Environmental Affairs |
| Mr Tshepiso Lekoma | Department of Trade and Industry |
| Ms Andretta Tsebe | Department of Public Enterprises |
| Mr Rod Speedy | Eskom |
| Mr Loyiso Tyabashe | Eskom |
| Mr Sadika Touffie | Eskom |
| Mr Antony Stott | Eskom |
| Mr Peter Bester | National Nuclear Regulator |
| Mr Orion Phillips | National Nuclear Regulator |
| Mr Umesh Natha | South African Nuclear Energy Corporation |
| Mr John Prior | South African Nuclear Energy Corporation |
| Mr Van Zyl de Villiers | South African Nuclear Energy Corporation |

ATTACHMENT 3: REFERENCES

Documents provided by South Africa

1. Self-Evaluation Report of the Status of Nuclear Power Infrastructure Development in South Africa.
2. The Nuclear Energy Act and other relevant laws, Nuclear Energy Policy for the Republic of South Africa, National Nuclear Regulatory Act and other documents as provided by South Africa (for a complete listing of all of these documents related to the nuclear power programme, please see the South Africa's Self-Evaluation Report.)

IAEA documents

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Milestones in the Development of a National Infrastructure for Nuclear Power, IAEA Nuclear Energy Series No. NG-G-3.1, Vienna (2007)
2. INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of the Status of National Infrastructure Development, IAEA Nuclear Energy Series No. NG-T-3.2, Vienna (2008)
3. Addendum to: Evaluation of the status of national infrastructure development" (Working Paper) NG-T-3.2 Addendum 1 Draft 25 Jan 2013
4. INTERNATIONAL ATOMIC ENERGY AGENCY, INIR, Integrated Nuclear Infrastructure Review Missions – Guidance on Preparing and Conducting INIR Missions. (Rev.1), Vienna (2011).
5. INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing the Safety Infrastructure for a Nuclear Power Programme", Safety Standards Series No. SSG-16, Vienna (2012)
6. INTERNATIONAL ATOMIC ENERGY AGENCY, Fundamental Safety Principles, Safety Standards No. SF-1, Vienna (2006)
7. IAEA expert Mission reports as appropriate
8. Supporting Long Term Planning of Energy Options, IAEA Mission to Support the Self-Assessment of Poland National Nuclear Infrastructure, End-of-Mission Report, Vienna, (2010)
9. Other publications as appropriate from the bibliography included in Reference 2 above