



MISSION REPORT
ON
THE INTEGRATED NUCLEAR INFRASTRUCTURE REVIEW
(INIR) – PHASE 1

Counterpart:
Ministry of Energy and Mineral Development
of the Republic of Uganda

29 November–6 December 2021
Kampala, Uganda

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EXECUTIVE SUMMARY

The East African country of the Republic of Uganda has a population of around 43 million people (2021). Over the past few decades Uganda has experienced a population growth rate of around 3%, and by the end of the century could become one of the largest in the East African region in terms of population.

Rapid urbanisation and development of infrastructure have resulted in a significant increase in energy demand. The Government of the Republic of Uganda identifies electricity as a form of modern energy to shift the country from a developing economy to an industrialized and largely urban society (Uganda Vision 2040).

Uganda's total installed power generating capacity is approximately 1268 MW(e) (December 2020), predominantly hydroelectricity (85%), with the remaining share covered by solar and thermal plants (oil and biomass). It is estimated that the demand for electricity is growing at an annual rate of 15% and will soon overtake the current total electricity supply capacity.

In 2008, Uganda enacted the Atomic Energy Act, which provides for regulation of radiation sources and includes provisions on the development of nuclear energy for power generation. The Cabinet approved the Nuclear Power Roadmap Development Strategy 2014–2016, which outlines the issues for consideration before embarking on a nuclear power programme and a plan for assessing these issues. In parallel, the Ministry of Energy and Mineral Development (MEMD) concluded multilateral and bilateral cooperation agreements to support Uganda in developing an understanding of the infrastructure issues relevant to developing a nuclear power programme.

In 2015, the Study on Integrating Nuclear Power in Generation Capacity Plan 2015–2040 envisaged a scenario that included 2000 MWe of nuclear power capacity, with 1000 MW(e) in operation in 2031 and 1000 MW(e) in 2036.

The Government of the Republic of Uganda established the Nuclear Energy Programme Implementing Organization (NEPIO) which makes use of the existing expertise within government ministries, departments and agencies. The NEPIO is comprised of:

- A Standing Cabinet Committee to support the Minister of MEMD in the implementation of the Nuclear Power Roadmap Development Strategy;
- A Steering Committee, with institutional representation similar to that of the Standing Cabinet Committee, chaired by the Permanent Secretary of MEMD and responsible for guiding the working groups;
- The MEMD Nuclear Energy Department (NED) which provides technical backstopping on nuclear related matters and is also the secretariat for the NEPIO;
- Three (3) working groups covering different infrastructure aspects.

In April 2019, the International Atomic Energy Agency (IAEA) was requested by the Government of the Republic of Uganda to conduct an Integrated Nuclear Infrastructure Review (INIR) Phase 1 mission. In anticipation of the INIR mission, Uganda developed a self-evaluation report (SER) based on the IAEA methodology described in the IAEA publication entitled *Evaluation of the Status of National Nuclear Infrastructure Development*, Nuclear Energy Series No. NG-T-3.2 (Rev. 1). The preliminary SER was sent to the IAEA in March

2021 and a virtual SER support mission / pre-INIR mission was conducted by the IAEA in June 2021. A revised SER together with 72 supporting documents were shared with the IAEA in October 2021.

The INIR Phase 1 mission was conducted from 29 November to 6 December 2021 to evaluate the status of development of the national infrastructure for nuclear power, identify areas needing further actions and provide recommendations and suggestions to the Government of the Republic of Uganda.

Hon. Okaasai Sidronius Opolot, State Minister for Energy and Mr Dohee Hahn, Director of the IAEA Division of Nuclear Power in the Department of Nuclear Energy, provided opening remarks for the INIR mission. On the Ugandan side, the mission was coordinated by Ms Sarah Nafuna, Commissioner, Nuclear Energy Department of the Ministry of Energy and Mineral Development. The INIR team was led by Mr Mehmet Ceyhan of the IAEA Nuclear Infrastructure Development Section and consisted of staff from the IAEA Departments of Nuclear Energy, Nuclear Safety and Security, and Safeguards as well as international experts recruited by the IAEA.

The INIR mission and associated activities were funded through contribution from the Republic of Uganda, the IAEA Technical Cooperation Project UGA2003 entitled *Supporting Nuclear Power Infrastructure Development in Uganda* and the IAEA's regular budget.

The INIR mission was conducted in a cooperative and open atmosphere. The INIR team concluded that the Government of the Republic of Uganda is committed to developing the required infrastructure for nuclear power in a coordinated approach. Uganda drafted an energy policy which includes nuclear power and established a NEPIO mechanism that involves a wide range of national stakeholders. The NEPIO has completed several studies on different infrastructure issues and drafted a Nuclear Power Roadmap for Uganda which includes recommendations for key decisions on the development of the required nuclear power infrastructure in the short, medium and long term. This Roadmap needs to be updated and completed by conducting further studies to be prepared to make knowledgeable decisions and commitments for the nuclear power programme.

In order to assist Uganda in making further progress in its infrastructure development, the INIR team made eleven (11) Recommendations and nine (9) Suggestions. The INIR team also identified three (3) Good Practices that may benefit other countries considering the introduction of nuclear power.

Based on the Recommendations and Suggestions, the key areas for further action are summarized below:

- **Uganda should finalize its energy policy and its roadmap for the development of nuclear power.**

Uganda is in the process of making key decisions and commitments pertaining to the safe, secure and peaceful use of nuclear power. These decisions and commitments should be documented in an approved energy policy that addresses nuclear power. The completion of the Nuclear Power Roadmap for Uganda will support the government in making a knowledgeable commitment for the nuclear power programme.

- **Uganda should strengthen its plans to join the relevant international legal instruments and to develop an adequate legal framework to support its nuclear power programme.**

Uganda intends to adhere to the relevant international legal instruments in the areas of safety, security and civil liability for nuclear damage. It should continue to develop and finalize its plan to adhere to those instruments to which it is not yet a party, and ensure that all relevant conventions on nuclear liability are assessed.

Uganda should also continue to develop and finalize its action plan with timescales for the development and enactment of its nuclear legislation and other laws that may have an impact on its nuclear power programme. In doing so, consideration should be given to the relevant international legal instruments, IAEA Safety Standards and Nuclear Security Series, as appropriate.

Uganda should develop and document a plan to rescind the Small Quantities Protocol to its Comprehensive Safeguards Agreement and continue its efforts to strengthen the State System of Accounting for and Control of Nuclear Material in preparation for the increase of activities from the nuclear power programme.

- **Uganda should continue to assess and plan for the development of the human resources necessary for the nuclear power programme.**

Uganda has analysed the human resources that will be required for the key organizations but has not yet completed an assessment of the currently available human resources or education and training capabilities. Uganda should complete this assessment and use the results to prepare an integrated plan to develop the human resources required for the nuclear power programme.

Uganda should further enhance its understanding of management systems and arrangements that will help promote a safety and security culture and develop a mechanism to ensure that the knowledge gained during Phase 1 is transferred to the future organizations.

- **Uganda should further analyse the preparedness of the electrical grid and continue work in the areas of siting, environmental protection, financing, and radiation protection.**

Uganda has completed or initiated a significant number of studies and activities. The programme would benefit from completion of additional studies and analyses, in particular in the following areas:

- Preparedness of the electrical grid for integration of a nuclear power plant;
- Identification of candidate sites;
- Suitability of the existing framework for environmental protection;
- Analysis of financing options for the nuclear power project covering risk identification and management strategies;
- Enhancement of the national radiation protection capabilities.

1. INTRODUCTION

The Government of the Republic of Uganda established the Nuclear Energy Programme Implementing Organization (NEPIO) which makes use of the existing expertise within government ministries, departments and agencies. The NEPIO is comprised of:

- A Standing Cabinet Committee to support the Minister of MEMD in the implementation of the Nuclear Power Roadmap Development Strategy;
- A Steering Committee, with institutional representation similar to that of the Standing Cabinet Committee, chaired by the Permanent Secretary of MEMD and responsible for guiding the working groups;
- The MEMD Nuclear Energy Department (NED) who provides the technical backstopping on nuclear related matters and plays the role of secretariat to the NEPIO;
- Three (3) working groups covering different infrastructure aspects.

In a letter dated 2 April 2019, the Government of the Republic of Uganda, through the MEMD, requested the International Atomic Energy Agency (IAEA) to conduct an Integrated Nuclear Infrastructure Review (INIR) Phase 1 mission. In anticipation of the INIR mission, Uganda developed a self-evaluation report (SER) based on the IAEA methodology described in the IAEA publication entitled *Evaluation of the Status of National Nuclear Infrastructure Development*, Nuclear Energy Series No. NG-T-3.2 (Rev. 1). The preliminary SER was sent to the IAEA in March 2021 and a virtual SER support mission/pre-INIR mission was conducted by the IAEA in June 2021. A revised SER together with 72 supporting documents were shared with the IAEA in October 2021.

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The INIR mission and associated activities were funded through contribution from the Republic of Uganda, the IAEA Technical Cooperation Project UGA2003 entitled *Supporting Nuclear Power Infrastructure Development in Uganda* and the IAEA's regular budget.

2. OBJECTIVES OF THE MISSION

The main objectives of the INIR mission were to:

- Evaluate the development status of the national infrastructure to support the nuclear power programme according to the IAEA’s *Milestones in the Development of a National Infrastructure for Nuclear Power*, Nuclear Energy Series NG-G-3.1 (Rev.1) and the evaluation conditions described in the IAEA publication entitled *Evaluation of the Status of National Infrastructure Development*, Nuclear Energy Series NG-T-3.2 (Rev. 1);
- Identify the areas needing further actions to reach Milestone 1: “Ready to make a knowledgeable commitment to a nuclear power programme”;
- Provide recommendations and suggestions which can be used by the Uganda and national institutions to prepare an action plan.

3. SCOPE OF THE MISSION

The INIR mission evaluated the status of the infrastructure in Uganda covering all the 19 Infrastructure Issues relative to the conditions identified in the above publications for Phase 1.

4. WORK DONE

Prior to the mission, the INIR team reviewed the Self-Evaluation Report and supporting documentation that included relevant national laws, regulations, studies and reports. The INIR team sought input from IAEA staff members with relevant expertise working with Uganda. INIR team preparatory meetings were conducted prior to the mission in Kampala from 26 to 27 November 2021.

The INIR mission was conducted from 29 November to 6 December 2021 at the Speke Resort Munyonyo in Kampala. Uganda was well prepared for the mission and managed its participation in the review effectively. During the mission, the Ugandan counterparts provided an update on the current status of infrastructure issues where progress had been made since the self-evaluation report was finalized, and provided additional supporting documentation requested by the INIR team.

The preliminary draft mission report was prepared by the INIR team and discussed with the Ugandan counterparts. The main mission results were presented to representatives of the Government of the Republic of Uganda in the exit meeting on 6 December 2021. The preliminary draft report was handed over to Rt. Hon. Rukia Nakadama Isanga, Third Deputy Prime Minister and Minister Without Portfolio during the exit meeting, attended by Hon. Okaasai Sidronius Opolot, State Minister for Energy and Ms. Irene Bateebe, Permanent Secretary of the Ministry of Energy and Mineral Development.

The results of the mission are summarized in Section 5 and presented in tabular form in Section 6 for each of the 19 Infrastructure Issues in Phase 1. Appendix 1 provides the evaluation results for each issue.

5. MAIN CONCLUSIONS

The INIR mission was conducted in a cooperative and open atmosphere. The INIR team concluded that the Government of Uganda is committed to developing the required infrastructure for nuclear power in a coordinated approach. Uganda drafted an energy policy which includes nuclear power and established a NEPIO mechanism that involves a wide range of national stakeholders. The NEPIO has completed several studies on different infrastructure issues and drafted a Nuclear Power Roadmap for Uganda which includes recommendations for key decisions on the development of the required nuclear power infrastructure in the short, medium and long term. This Roadmap needs to be updated and completed by conducting further studies to be prepared to make knowledgeable decisions and commitments for the nuclear power programme.

In order to assist Uganda in making further progress in its infrastructure development, the INIR team made eleven (11) Recommendations and nine (9) Suggestions. The INIR team also identified three (3) Good Practices that may benefit other countries considering the introduction of nuclear power.

Based on the recommendations and suggestions, the key areas for further action are summarized below:

- **Uganda should finalize its energy policy and its roadmap for the development of nuclear power.**

Uganda is in the process of making key decisions and commitments pertaining to the safe, secure and peaceful use of nuclear power. These decisions and commitments should be documented in an approved energy policy that addresses nuclear power. The completion of the Nuclear Power Roadmap for Uganda will support the government in making a knowledgeable commitment for the nuclear power programme.

- **Uganda should strengthen its plans to join the relevant international legal instruments and to develop an adequate legal framework to support its nuclear power programme.**

Uganda intends to adhere to the relevant international legal instruments in the areas of safety, security and civil liability for nuclear damage. It should continue to develop and finalize its plan to adhere to those instruments to which it is not yet a party, and ensure that all relevant conventions on nuclear liability are assessed.

Uganda should also continue to develop and finalize its action plan with timescales for the development and enactment of its nuclear legislation and other laws that may have an impact on its nuclear power programme. In doing so, consideration should be given to the relevant international legal instruments, IAEA Safety Standards and Nuclear Security Series, as appropriate.

Uganda should develop and document a plan to rescind the Small Quantities Protocol to its Comprehensive Safeguards Agreement and continue its efforts to strengthen the State System of Accounting for and Control of Nuclear Material in preparation for the increase of activities from the nuclear power programme.

- **Uganda should continue to assess and plan for the development of the human resources necessary for the nuclear power programme.**

Uganda has analysed the human resources that will be required for the key organizations but has not yet completed an assessment of the currently available human resources or education and training capabilities. Uganda should complete this assessment and use the results to prepare an integrated plan to develop the human resources required for the nuclear power programme.

Uganda should further enhance its understanding of management systems and arrangements that will help promote a safety and security culture and develop a mechanism to ensure that the knowledge gained during Phase 1 is transferred to the future organizations.

- **Uganda should further analyse the preparedness of the electrical grid and continue work in the areas of siting, environmental protection, financing, and radiation protection.**

Uganda has completed or initiated a significant number of studies and activities. The programme would benefit from completion of additional studies and analyses, in particular in the following areas:

- Preparedness of the electrical grid for integration of a nuclear power plant;
- Identification of candidate sites;
- Suitability of the existing framework for environmental protection;
- Analysis of financing options for the nuclear power project covering risk identification and management strategies;
- Enhancement of the national radiation protection capabilities.

The Recommendations, Suggestions and Good Practices identified during the mission are listed below:

Recommendations

- R-1.3.1** The NEPIO should finalize the Nuclear Power Roadmap for Uganda and submit it for the Cabinet's approval

- R-3.1.1** The NEPIO should further enhance its understanding of management systems and arrangements that promote a safety and security culture, including a mechanism to ensure the knowledge gained by the NEPIO is transferred to the future regulatory body and owner/operator respectively

- R-4.2.1** The NEPIO should update the study on options for financing the future nuclear power project, including potential financial risks and risk management strategies

- R-5.1.1** Uganda should finalize the plan to adhere to all remaining international legal instruments and carry out an analysis of the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage
- R-6.1.1** The Government should prepare a plan setting out the necessary steps to rescind the SQP in a timely manner
- R-6.2.1** The Government should develop a detailed plan to strengthen the SSAC
- R-8.1.1** The AEC and NEPIO should develop a plan to enhance the national radiation protection capabilities for the nuclear power programme
- R-9.1.1** UETCL should conduct a preliminary study of the grid system covering its capability and reliability to take the output from the future nuclear power plant (NPP), its ability to withstand loss of the NPP output, and its reliability to minimize the risk of loss of power to the NPP from the grid
- R-10.1.1** The NEPIO should complete an assessment of Uganda’s human resources and education and training infrastructure to support the nuclear power programme
- R-10.2.1** The NEPIO should prepare a national human resource development plan that addresses the needs of the three key organizations in the nuclear power programme, and identifies the required enhancements in the education and training infrastructure
- R-12.1.1** The NEPIO should complete the site survey studies to identify candidate sites.

Suggestions

- S-1.1.1** Uganda is encouraged to finalize, approve and publish its policy related to the use of nuclear energy
- S-4.1.1** The NEPIO is encouraged to further estimate the funding required for the remaining nuclear power infrastructure development activities in Phase 1 and subsequent phases
- S-5.2.1** Uganda is encouraged to formalize its plan with the actions and timescales for development and enactment of the nuclear law

- S-5.3.1** Uganda is encouraged to continue identifying other legislation that may have an impact on the nuclear power programme

- S-13.1.1** The NEPIO is encouraged to consider impacts of low-level radioactive releases associated with normal operation of the future NPP in its siting studies

- S-13.2.1** The NEPIO is encouraged to further review the suitability of the existing environmental protection framework for the nuclear power programme in a timely manner

- S-15.1.1** The AEC is encouraged to expand the current threat assessment to cover the nuclear power programme

- S-16.1.1** The NEPIO is encouraged to consider further options for spent fuel management

- S-17.1.1** The NEPIO is encouraged to continue to assess options for the management of radioactive waste and further develop the strategy

Good Practices

- GP-1.2.1** Strong governmental support for the work of the NEPIO including the provision of resources necessary to implement the nuclear power infrastructure development activities

- GP-11.1.1** Establishment of an interagency team with both communication and technical experts to support effective and informed outreach on the nuclear power programme, including early engagement with the local communities during the site survey stage

- GP-18.1.1** Early development of a comprehensive list of goods and services that could be locally supplied for the construction of the nuclear power plant as part of the National Industrial Policy

6. EVALUATION RESULTS FOR PHASE 1

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

Significant* actions needed:

The review observations indicate that important work still needs to be initiated or completed to meet the condition.

Minor* actions needed:

The review observations indicate that some additional work or steps are needed to meet the condition or that plans for the next phase need to be enhanced.

No actions needed:

The available evidence indicates that all the work to meet the condition has been completed.

*The judgment whether the actions are significant or minor is based on the importance of the work to the overall programme and/or the resources needed to complete it. The classification is done through a consensus of the INIR team and is not based solely upon the judgment of any individual team member.

Recommendations:

Recommendations are proposed when the expectations of the condition have not been met. A recommendation should:

- Emphasize ‘what’ needs to be done, not ‘how’;
- Be based on the IAEA Milestones Approach / Evaluation Methodology;
- Be succinct, self-explanatory, and achievable;
- Be supported by the Review Observation text—a ‘gap’ must be identified; already planned work can still be a recommendation if it is required to reach the milestone.

Suggestions:

Suggestions propose the consideration of new or different approaches to develop infrastructure and enhance performance, or to point out better alternatives to current work. A suggestion:

- Should be clear and self-explanatory;
- Should be supported by the Review Observation text;
- May relate to work already under consideration for the next phase.

Good practices:

A good practice is identified in recognition of an outstanding practice or arrangement, superior to those generally observed elsewhere. It is more than fulfilment of the conditions or expectation, and worthy of the attention of other countries involved in the development of nuclear infrastructure as a model in the drive for excellence.

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 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
1.1. Long term commitment made and importance of safety, security and non-proliferation recognized		X	
1.2. The Nuclear Energy Programme Implementing Organization (NEPIO) established			X
1.3. National strategy defined		X	
2. Nuclear safety	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
2.1. Key requirements of nuclear safety understood			X
2.2. Support through international cooperation initiated			X
3. Management	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
3.1. Need for appropriate leadership and management systems recognized	X		
4. Funding and financing	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
4.1. Strategies for funding established	X		
4.2. Potential strategies for financing identified	X		

5. Legal framework	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
5.1. Adherence to all relevant international legal instruments planned	X		
5.2. Plans in place for development of comprehensive national nuclear law		X	
5.3. Plans in place to enact and/or amend other legislation affecting the nuclear power programme		X	
6. Safeguards	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
6.1. Terms of international safeguards agreement in place	X		
6.2. Strengthening of the State System of Accounting for and Control of nuclear material (SSAC) planned		X	
6.3. Recommendations from any previous reviews or audits being addressed			X
7. Regulatory framework	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
7.1. Development of an adequate regulatory framework planned			X
8. Radiation protection	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
8.1. Enhancements to radiation protection programmes planned	X		

9. Electrical grid	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
9.1. Electrical grid requirements considered	X		
10. Human resource development	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
10.1. Necessary knowledge and skills identified, and gaps in current capability assessed	X		
10.2. Development of human resources planned	X		
11. Stakeholder involvement	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
11.1. Open and transparent stakeholder involvement programme initiated			X
12. Site and supporting facilities	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
12.1. General survey of potential sites conducted and candidate sites identified		X	
13. Environmental protection	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
13.1. Environmental requirements considered		X	
13.2. Framework for environment protection reviewed		X	

14. Emergency planning	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
14.1. Requirements of, and resources for, developing an emergency response capability recognized			X
14.2. Recommendations from any previous reviews or audits being addressed			X
15. Nuclear security	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
15.1. Nuclear security requirements recognized and the actions of all relevant organizations coordinated	X		
15.2. Recommendations from any previous reviews or audits being addressed			X
16. Nuclear fuel cycle	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
16.1. Options for nuclear fuel cycle (front-end and back-end) considered		X	
17. Radioactive waste management	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
17.1. The requirements for management of radioactive waste from NPP recognized		X	
17.2. Options for disposal of all radioactive waste categories understood			X

18. Industrial involvement	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
18.1. National policy developed with respect to industrial involvement			X
19. Procurement	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
19.1. Requirements for purchasing NPP services recognized			X

APPENDIX 1: REVIEW OBSERVATIONS, RECOMMENDATIONS AND SUGGESTIONS FOR PHASE 1

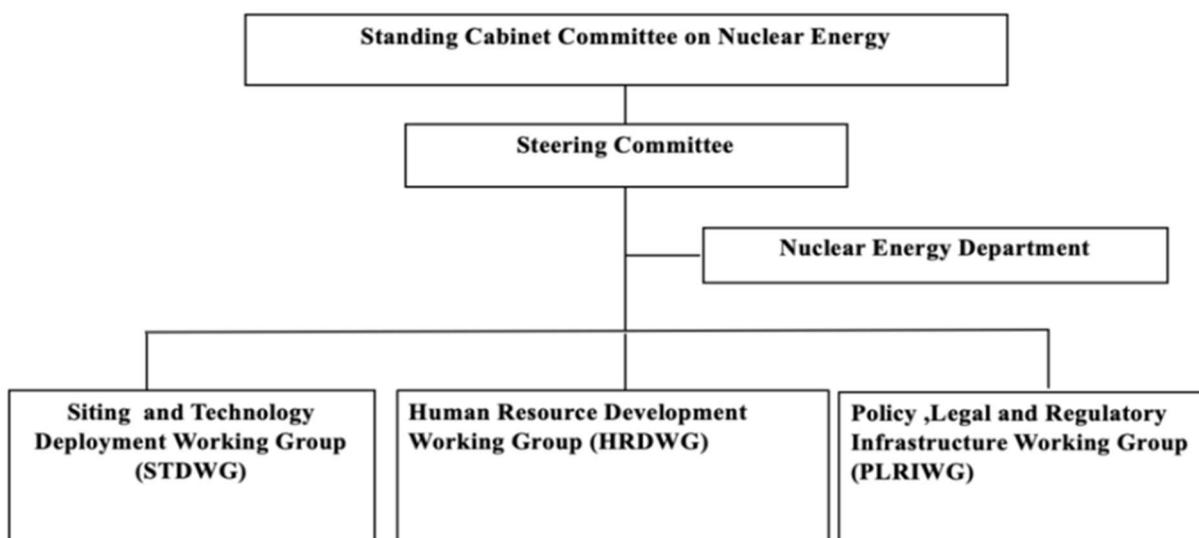
1. National Position		Phase 1
Condition 1.1: Long term commitment made, and importance of safety, security and non-proliferation recognized		
Summary of the condition to be demonstrated	A clear statement adopted by the government of its intent to develop a nuclear power programme and of its commitment to safety, security and non-proliferation, with evidence that their importance is embedded in the ongoing work programme.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A clearly stated government commitment. 2. Evidence of clear responsibilities for each issue, with government coordination of activities. 	
Observations		
<p>Energy is one of the fundamental drivers outlined in Uganda Vision 2040 to spur socio-economic transformation. Nuclear power is identified as one of the major sources of expanding the country’s electricity generation to complement the existing generation capacity that includes hydro, solar, and thermal power plants. The Energy Policy for Uganda (2002) and a new Draft National Energy Policy (2019) both emphasize the Government’s intention to promote sustainable, peaceful and safe development of nuclear power. The draft policy outlines a number of strategic steps to follow, including adhering to international legal instruments in the areas of safety, security, safeguards and nuclear liability.</p> <p>A Regulatory Impact Assessment (RIA) on Atomic Energy was undertaken and is expected to be finalised by June 2022. The RIA emphasizes the importance of strengthening the legal framework for nuclear power and identifies safety, security and safeguards among the areas that need further development in the existing national legal framework. The RIA will include recommendations related to whether a nuclear energy policy should be developed separately or embedded in the overall Energy Policy. The INIR team was informed that the policy elements for nuclear energy will be expanded to cover principles and approaches of safety, security, safeguards, and environmental protection.</p> <p>The INIR team was informed that the Energy Policy is expected to be finalized and submitted together with the RIA to the Cabinet for approval before the end of 2022.</p> <p>Uganda is already party to some relevant international legal instruments and is planning to adhere to the remaining international legal instruments in the areas of safety, security and nuclear liability.</p>		
Areas for further action	Significant	
	Minor	Energy policy/nuclear energy policy
RECOMMENDATIONS		

SUGGESTIONS
S-1.1.1 Uganda is encouraged to finalize, approve and publish its policy related to the use of nuclear energy.
GOOD PRACTICES

1. National Position		Phase 1
Condition 1.2: The NEPIO established		
Summary of the condition to be demonstrated	<p>The NEPIO:</p> <ol style="list-style-type: none"> a) Has clear terms of reference that call for a comprehensive review of all the issues relevant to making a decision to proceed with a nuclear power programme; b) Is recognized by all relevant ministries as having that role; c) Reports to a senior minister or directly to the head of government; d) Has appropriate human and financial resources; e) Involves all relevant stakeholders, including the country’s major utilities, the regulatory body for security and radiation safety, other relevant government agencies, legislative representatives and other decision makers. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. The charter establishing the NEPIO and to whom it reports. 2. Evidence that the roles and responsibilities of the NEPIO are known by all its members and by other government ministries. 3. A document defining objectives and timescales and an adequate scope of investigations. 4. A clear description of how the NEPIO operates in terms of funding, planning, reporting, scope of studies and use of consultants. 5. Evidence that the NEPIO has adequate skills to address all issues either directly or through commissioning specialist studies. 6. Evidence of relevant interactions between the head of NEPIO and appropriate ministries, such as those responsible for energy and the environment. 	
<p>Observations</p> <p>The Nuclear Power Roadmap Development Strategy 2014–2016 approved by the Cabinet in April 2015 established the Nuclear Energy Programme Implementing Organization (NEPIO) mechanism for Uganda. The NEPIO is composed of a Standing Cabinet Committee, chaired by the Minister of Energy and Mineral Development (MEMD), with membership of several other ministers, a Steering Committee and three Working Groups. The Standing Cabinet Committee is mandated to prepare policies and strategies and reports to the Cabinet. The Steering Committee provides direction to and supervises the Working Groups and is mandated to review and adopt the recommendations of the Working Groups. The Working Groups include representatives of Atomic Energy Council (AEC) and other relevant stakeholders. The INIR team was informed that the Standing Cabinet Committee and the Steering Committee meet on an ad hoc basis.</p> <p>The Nuclear Energy Unit (NEU) established by the Atomic Energy Act of 2008 under the MEMD, was upgraded to the Nuclear Energy Department (NED) in September 2019 during the organizational restructuring that was approved by the Ministry of Public Service. The INIR team was informed that the revised structure of the NED will be reflected in the future nuclear legislation.</p>		

NED provides technical backstopping on nuclear related matters and is also the secretariat for the NEPIO. It coordinates the implementation of the activities related to nuclear power and provides technical expertise to those activities where relevant competence exists in the NED. It also has the responsibility to develop a communication strategy and undertake stakeholder nuclear awareness programmes.

The NED is headed by a Commissioner and consists of three divisions: (1) Nuclear Power Infrastructure Division; (2) Nuclear Fuel and Radioactive Waste Division; and (3) Nuclear Sciences and Applications Division. The structure of the NED provides for a total of 25 technical staff with competencies in nuclear engineering, nuclear science and technology, nuclear law, environmental engineering, civil engineering, industrial chemistry, and physics. The current staffing level is 48% comprising of staff who have undertaken specialised training in nuclear related fields. The INIR team was also informed that the MEMD is planning to expand the staffing of the NED in line with the development of the nuclear power programme.



There are three Working Groups under NEPIO:

1. Policy, Legal and Regulatory Infrastructure Working Group (PLRIWG);
2. Siting and Technology Deployment Working Group (STDWG);
3. Human Resources Development Working Group (HRDWG).

Reports generated by the NED or Working Groups are submitted to the Standing Cabinet Committee through the Steering Committee when there is a need for endorsement by the Cabinet. The decisions of the Cabinet are conveyed through formal channels to the relevant Ministries for follow-up.

The INIR team was informed that the NED provides or arranges nuclear-related training for the Working Group members.

Within the Medium-Term Expenditure Framework of the Government of Uganda, MEMD initiated a Nuclear Power Infrastructure Development Project (No. 1407) which provides NED the budget to conduct the studies including the activities of the NEPIO Working Groups. The INIR team was informed that a new project will be submitted to the Ministry of Finance, Planning and Economic

Development to request additional financial resources to complete the implementation of current studies and undertake additional studies.		
Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		
GP-1.2.1 Strong governmental support for the work of the NEPIO including the provision of resources necessary to implement the nuclear power infrastructure development activities.		

1. National Position		Phase 1
Condition 1.3: National strategy defined		
Summary of the condition to be demonstrated	<p>A comprehensive report, defining and justifying the national strategy for nuclear power, including:</p> <ol style="list-style-type: none"> a) An analysis of energy demand and energy alternatives; b) An evaluation of the impacts of nuclear power on the national economy, for example gross domestic product and employment; c) A preliminary technology assessment to identify technologies that are consistent with national expectations; d) Consideration of siting possibilities and grid capacity; e) Consideration of financing options, ownership options and operator responsibilities; f) Consideration of long term costs and obligations relating to spent fuel, radioactive waste and decommissioning; g) Consideration of the human resource needs and external support needs of the regulatory body and the owner/operator; h) Recognition that there remains a non-zero possibility of a severe accident and the need to deal with the consequences of such an accident will need to be addressed; i) Consideration of the demands of each of the infrastructure issues and a plan for how they will be met in the next phase of development. <p><i>Note: Any prefeasibility study conducted during Phase 1 can provide significant input to the comprehensive report, although it is important that the report fully address all 19 infrastructure issues.</i></p>	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. List of the studies that are feeding into the report(s). 2. Current status and conclusions. 3. Contents list for the report(s). 4. Executive summary of the report(s). 5. Evidence of ministerial review of the report(s). 	
<p>Observations</p> <p>A number of pre-feasibility studies were conducted by the NED and the Working Groups, and the results are being consolidated into a Nuclear Power Roadmap for Uganda, which will help define the national strategy for nuclear power for the country:</p> <ul style="list-style-type: none"> — Site survey studies : Eight (8) nuclear power plant (NPP) potential sites have been identified; — Study on Integrating Nuclear Power in Generation Capacity Plan 2015–2040 : The study recommended 2000 MW(e) of nuclear power starting 2031, assessed preliminarily nuclear reactor technology options, nuclear fuel cycle and radioactive waste management options and funding and financing options; 		

- Assessment of human resource needs : Preliminary estimations for the number of staff and competences required for key institutions were identified;
- Study on the status of radioactive waste management in Uganda : Options for radioactive waste and spent fuel management were assessed;
- Assessment of local industrial involvement: Goods and services which could be supplied by the local industry were identified; a preliminary survey of the local cement and steel supply capabilities was conducted.

A draft communication strategy has been prepared, workshops on building awareness on nuclear energy have been conducted and a preliminary survey of knowledge and receptiveness to nuclear power has been undertaken in four (4) regions.

A Strategic Environment Assessment (SEA) for nuclear power development is ongoing to define the environmental and social impacts of the proposed nuclear power programme and their mitigation measures.

The Study on Integrating Nuclear Power in Generation Capacity Plan 2015–2040 , conducted by an international consultant, was completed in June 2015. The study includes the following topics:

- Energy planning, supply-demand forecast;
- Nuclear fuel cycle options;
- Nuclear reactor technology options;
- Radioactive waste management options;
- Financing of NPPs;
- Human resource development.

A draft Nuclear Power Roadmap of Uganda has been developed based on the direction laid out in the Nuclear Power Roadmap Development Strategy 2014–2016, approved by the Cabinet in April 2015. The draft roadmap includes recommendations and key decisions on how major nuclear power infrastructure issues will be developed in the short, medium and long term.

The draft Nuclear Power Roadmap of Uganda incorporates summaries of the results of the above listed studies and additional considerations regarding the establishment of the national legal framework and adherence to the international legal instruments in the area of safety, security, safeguards and nuclear liability. The INIR team was informed that Nuclear Power Roadmap of Uganda, once finalized, will serve as the comprehensive report to support the establishment of the national position to initiate and implement the nuclear power programme for Uganda. The INIR team noted that although many studies have been conducted, some of them may need to be reviewed and updated or supplemented with other activities such as electrical grid studies (see Condition 9.1), assessment of funds necessary to develop required infrastructure (see Condition 4.1) and macro-economic impact analysis.

The INIR team was further informed that the Nuclear Power Roadmap of Uganda is expected to be finalized and submitted to the Cabinet for approval before June 2022.

Areas for further action	Significant	
	Minor	Nuclear Power Roadmap of Uganda

RECOMMENDATIONS
R-1.3.1 The NEPIO should finalize the Nuclear Power Roadmap for Uganda and submit it for the Cabinet's approval.
SUGGESTIONS
GOOD PRACTICES

2. Nuclear Safety		Phase 1
Condition 2.1: Key elements of nuclear safety understood		
Summary of the condition to be demonstrated	The key requirements for nuclear safety, specified in the IAEA safety standards, are understood by the NEPIO and other relevant stakeholders, and their implications are recognized.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Evidence that the NEPIO has an understanding of, and commitment to, nuclear safety and the principles described in IAEA Safety Standards Series No. SF-1, Fundamental Safety Principles, and is aware of how nuclear safety requirements are taken into account in various designs of nuclear power plants (NPPs). 2. Evidence that the responsibility for nuclear safety is recognized, for example in consideration of leadership, funding and expertise. 3. Evidence that the need to develop adequate capability and skills in nuclear safety is recognized. 4. Evidence of familiarity with IAEA safety standards and other States' practices, and recognition of the need for, and commitment to, the development of national safety standards. 	
Observations		
<p>The Atomic Energy Act of 2008 includes the objective “to provide for the protection and safety of individuals, society and the environment from the dangers resulting from ionising radiation” which reflects the IAEA fundamental safety objective.</p> <p>The NEPIO through the Policy, Legal and Regulatory Infrastructure Working Group (PLRIWG) reviewed the Act against the IAEA Safety Standards. The review identified that the Act does not provide for regulation of safety for research and power reactors.</p> <p>The INIR team was informed that awareness programmes on nuclear safety and on the potential and mitigation of accidents have been conducted for the Standing Cabinet Committee, the Steering Committee, members of the Working Groups, universities, media, potential host communities, and other relevant ministries, departments and agencies.</p> <p>NED has twelve (12) technical staff who have been trained in the fields of nuclear law, nuclear safety, nuclear science and technology, and nuclear engineering. The Atomic Energy Council (AEC) is comprised of twenty-two (22) technical staff with competences in radiation safety, safeguards, radiation protection, nuclear safety, and security. High level managers have attended training in countries experienced in operating nuclear power plants. Members from different working groups are also trained. Furthermore, a national workshop on safety culture was held. INIR team was informed that there is a database of training and trained people.</p> <p>The Siting and Technology Deployment Working Group (STDWG) assessed reactor options taking into consideration nuclear safety and recommended the use of Generation III/III+ reactor types that have been licensed and are operational.</p>		

Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		

2. Nuclear Safety		Phase 1
Condition 2.2: Support through international cooperation initiated		
Summary of the condition to be demonstrated	The need for international cooperation and open exchange of information related to nuclear safety as an essential element is recognized and demonstrated.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Evidence of review of options for bilateral or regional cooperation and specific actions for selected cooperation started, especially with countries with an established nuclear power programme. 2. Implementation of a national technical cooperation programme with the IAEA and evidence of government financial support including nuclear safety aspects. 	
<p>Observations</p> <p>Uganda's participation in the IAEA Technical Cooperation Program includes activities related to nuclear safety.</p> <p>The draft Nuclear Power Roadmap for Uganda recognizes several countries for possible collaborations on certain fields of interest.</p> <p>The MEMD signed Memoranda of Understanding (MOUs) with the Russian State Atomic Energy Corporation (ROSATOM) and the China National Nuclear Corporation (CNNC) to develop frameworks for cooperation on peaceful uses of atomic energy including nuclear safety aspects. The INIR team was informed that these MOUs have only general provisions that address nuclear safety and facilitate exchange of information. Currently the implementation of these MOUs is limited to training.</p> <p>The INIR team was informed that negotiations to sign a MOU between AEC and the Chinese Nuclear Safety Authority are continuing. Furthermore, AEC is a beneficiary of a multilateral collaborative partnership with the United States Nuclear Regulatory Commission (NRC) that provides assistance for capacity building including nuclear safety.</p> <p>The INIR team was informed that, once the technology is selected, Uganda intends to establish relationships with countries that use the same technology.</p> <p>The INIR team was also informed that the AEC participates in the Forum for Nuclear Regulatory Bodies in Africa (FNRBA) meetings.</p>		
Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		

GOOD PRACTICES

3. Management		Phase 1
Condition 3.1: Need for appropriate leadership and management systems recognized		
Summary of the condition to be demonstrated	There is a commitment to leadership and management systems that will ensure success and promote a safety and security culture as well as the peaceful use of nuclear technologies. There are plans to ensure the knowledge gained by the NEPIO is transferred to the future regulatory body and the owner/operator of the programme.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Plans to ensure appointment of leaders with the appropriate training and experience to plan, procure, construct and operate an NPP as well as to ensure the leadership and management of nuclear safety, security and safeguards. 2. Evidence that the importance of nuclear safety and security culture in each of the organizations to be established is recognized. 3. Evidence that the importance of ensuring the peaceful use of nuclear technology is recognized. 4. Evidence of a clear understanding of management system requirements. 5. A plan to implement management systems in future key organizations is consistent with the appropriate standards and guidance. 	
Observations		
<p>The Uganda Public Service Standing Orders, 2021 deals with the management of the public service and issues concerning the terms and conditions of service. The Standing Order provides for the roles, obligations and conduct of a public officer, occupational safety, health and employee wellness, staff training and development in the public service, procurement and utilisation of goods and services in the public service and information and record management, among others. All activities and operations of the NEPIO are governed by the Standing Order.</p> <p>In addition, a Human Capital Management System (HCM) automates all human resource management functions in the Government and business processes end to end.</p> <p>The HCM is integrated with other systems such as Integrated Financial Management System (IFMS), Programme Budgeting System (PBS), National Identification System (NID), among others.</p> <p>The INIR team was informed that the activities of the Working Groups are documented, and that a documentation/records management system is in place that ensures retention and management of data that has been collected.</p> <p>Selected members of the NEPIO received training on nuclear law and nuclear safety, participated in workshops on leadership and safety culture, or attended scientific visits on energy planning, siting, and technology assessment. The INIR team was informed that the importance of nuclear safety, security and safeguards is understood within the Steering Committee, the NED and the Working Groups. The</p>		

INIR team was further informed that the need for leadership and management skills was identified.

The INIR team was informed that the Atomic Energy Council (AEC) has embedded safety culture in its internal organizational training activities and its regulatory practices. Safety culture is a regulatory requirement that is considered during the licensing process and inspection activities. Occupational safety is continuously reinforced through work safety briefings, the use of personal protective equipment and visits by staff to other infrastructure construction projects to show how safety is implemented.

The NEPIO does not have a specific programme to enhance nuclear safety and security culture.

The INIR team was informed that the AEC has implemented a management system.

Regarding the future owner/operator, the INIR team was informed that the ongoing rationalization process is looking to merge the generation, transmission and distribution organizations into a single organization, which could be the operator for the nuclear power plant, but this has not yet been decided.

The INIR team was informed that the NEPIO will implement ISO standards with support from the Uganda National Bureau of Standards.

The Working Groups include members from the organizations likely to be designated as the nuclear regulatory body and the owner/operator in the nuclear power programme. It is expected that on their return to the respective key organizations, these individuals would retain and transfer the knowledge gained by the NEPIO for the subsequent phases of infrastructure development.

The INIR team was informed that the MEMD has a database of the competencies and experience of staff and that retired staff could be contracted as consultants when required. The INIR team was further informed that the Human Resource Development (HRD) strategy would include an assessment of the knowledge that needs to be managed and transferred to other organizations.

Areas for further action	Significant	Management system
	Minor	

RECOMMENDATIONS

R-3.1.1 The NEPIO should further enhance its understanding of management system and arrangements that promote a safety and security culture, including a mechanism to ensure the knowledge gained by the NEPIO is transferred to the future regulatory body and owner/operator respectively.

SUGGESTIONS

GOOD PRACTICES

4. Funding and Financing		Phase 1
Condition 4.1: Strategies for funding established		
Summary of the condition to be demonstrated	<p>Mechanisms have been defined for funding a range of key activities that are specific to a nuclear power programme but may not be the fiscal responsibility of the owner/operator. The activities include:</p> <ol style="list-style-type: none"> a) Establishing the legal framework; b) Activities of the regulatory body for safety, security and safeguards; c) The government’s stakeholder involvement programme; d) Siting and environmental protection activities that are the responsibility of the government; e) Emergency preparedness and response (EPR); f) Education, training and research; g) Any required improvements to the electrical grid, if such improvements are the government’s responsibility; h) Any proposed incentives and direct government support to promote localization; i) Storage and disposal of radioactive waste, including spent fuel; j) Decommissioning of the NPP. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Clear statements of how the above areas will be funded, based on a consideration of options. 2. Evidence that the scale of the costs of each of these activities has been recognized. 	
Observations		
<p>The Nuclear Power Roadmap Development Strategy 2014–2016 includes an estimate of costs on a quarterly basis over the period 2014–2016 for implementation of the following activities:</p> <ol style="list-style-type: none"> 1. Coordination and stakeholder involvement: <ul style="list-style-type: none"> — Coordinate roadmap development activities; — Conduct awareness campaigns on nuclear energy; — Develop a communication strategy. 2. Strengthen the policy, legal and institutional framework <ul style="list-style-type: none"> — Review policy, legal and institutional framework related to nuclear energy development; — Develop a Nuclear Energy Policy for Uganda; — Develop legislation with requirements on nuclear safety, security and safeguards. 3. Siting nuclear power plants <ul style="list-style-type: none"> — Conduct preliminary site survey; — Conduct detailed site survey. 4. Nuclear power physical infrastructure studies <ul style="list-style-type: none"> — Study the integration of nuclear power in the Electricity Generation Capacity Plan 2015–2040; — Study the local industries involvement in nuclear power infrastructure development 2016– 2040. 		

5. Human resources development planning

- Conduct human resource needs assessment;
- Review the capabilities of public universities and other tertiary institutions to conduct nuclear training;
- Prepare a human resources development plan.

A financial year (FY) in Uganda covers the period from 1 July to 30 June. The Medium-Term Expenditure Framework (MTEF) is prepared and submitted to the Parliament for approval in March each year. The MTEF shows the approved budget and expenditure for the current FY, the budget proposed for approval for the next FY, and projections for the following 4 FYs.

The MTEF includes the funding of activities related to nuclear infrastructure development in the budget allocated to the Nuclear Energy Department (NED). The following outputs/activities are identified in the NED FY2020/21 budget:

- Comprehensive nuclear energy bill;
- Bilateral cooperation on nuclear energy coordinated and implemented;
- Capacity building and training through participation in short professional training courses;
- Radioactive waste management strategy;
- Strategic Environmental Assessment (SEA);
- Preliminary activities for construction of a Centre for Nuclear Science and Technology / MoU signed with the host institution;
- Awareness on nuclear energy conducted;
- Nuclear power plant site selected;
- IAEA Integrated Nuclear Infrastructure Review (INIR);
- International Atomic Energy Agency (IAEA) Technical Cooperation (TC) Programme coordinated and monitored;
- Uranium exploration and evaluation;
- Contribution to IAEA and AFRA.

Funds to support the Atomic Energy Council (AEC) and funds for upgrading the electricity transmission and distribution networks are also provided through the MTEF.

The INIR team was informed that a ‘bottom up’ approach is used to estimate the budget needs for the various activities in the different phases of infrastructure development. Expert judgment and experience from other sectors (e.g. oil and gas and mining) is used if the costing experience for a specific activity is limited. Benchmarked estimates are also obtained from engaged consultants and/or international sources. The INIR team was further informed that the mechanism of funding the infrastructure development activities through the MTEF would be retained.

The INIR team noted that the draft Nuclear Power Roadmap for Uganda (June 2021) does not include an estimation of costs for the identified infrastructure development activities. The INIR team was informed that the draft Nuclear Power Roadmap for Uganda is being updated and will include an estimation of the costs for on-going activities to be completed and additional activities to be undertaken to cover all 19 Infrastructure Issues.

Areas for further action	Significant	Funding estimate
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
S-4.1.1 The NEPIO is encouraged to further estimate the funding required for the remaining nuclear power infrastructure development activities in Phase 1 and subsequent phases.		
GOOD PRACTICES		

4. Funding and Financing		Phase 1
Condition 4.2: Potential strategies for financing identified		
Summary of the condition to be demonstrated	<p>Potential options have been identified with financial and risk management strategies, which together:</p> <ul style="list-style-type: none"> a) Create sufficient confidence for lenders and investors to support an NPP project; b) Ensure the long-term viability of the owner/operator to fulfil all its responsibilities. <p><i>Note: A large part of the government’s role in nuclear power financing, if the government is not directly a sponsor of the project, relates to financial risk reduction.</i></p>	
Examples of how the condition may be demonstrated	<p>A review of financing options and risk management strategies, considering the long term economics and risks associated with the NPP and including the extent of government funding, equity partners and borrowing, among other things.</p>	
Observations		
<p>The Study on Integrating Nuclear Power in the Generation Capacity Plan 2015–2040, identifies potential financing and investment options, including government development of the NPP; development by private sector investors; and public private partnership (PPP). The study notes that several PPP models are possible, and that internationally the most common PPP for large projects are build-operate-transfer (BOT), build-own-operate (BOO), build-own-operate-transfer (BOOT), and more recently, joint ventures with a revenue sharing. The study indicates that Uganda has experience with PPPs, for example the Bujagali hydro-power plant (250 MW) was developed on a BOOT basis, while the Nyagak III hydro-power plant (4.5 MW) was developed on a BOT basis.</p> <p>The INIR team noted that the study does not address how financial risks related to the future NPP project will be managed.</p> <p>The INIR team noted that the study only considered the United Kingdom and the United States of America experience in financing new NPPs, and not the experience of newcomer countries who had already signed contracts for the construction of their first NPP. The INIR team was informed that the experience of these newcomer countries would be reflected in the future NPP project feasibility study.</p> <p>The INIR team was informed that the final decision on the financing mechanism will depend on the potential to access lending from international financial institutions, and the potential for private investment in the nuclear programme. An analysis of potential financing models will be included in the feasibility study for the future NPP project and will include consideration of a combination of financing sources, for example equity, commercial loans and export credit agreement (ECA) loans.</p> <p>The INIR team was informed that power purchase agreements (PPA) will be considered to ensure the long-term viability of the owner/operator organization. A national nuclear energy fund is envisaged for radioactive waste management and eventual decommissioning.</p>		

Areas for further action	Significant	Financing options and management of associated risks
	Minor	
RECOMMENDATIONS		
R-4.2.1 The NEPIO should update the study on options for financing the future nuclear power project, including potential financial risks and risk management strategies.		
SUGGESTIONS		
GOOD PRACTICES		

5. Legal Framework Condition 5.1: Adherence to all relevant international legal instruments planned		Phase 1
Summary of the condition to be demonstrated	<p>There is an understanding of the requirements of the relevant international legal instruments, their implications and a commitment to adhere to them. The following instruments are covered:</p> <ul style="list-style-type: none"> a) Convention on Early Notification of a Nuclear Accident (INFCIRC/335); b) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (INFCIRC/336); c) Convention on Nuclear Safety (INFCIRC/449); d) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the ‘Joint Convention’) (INFCIRC/546); e) Convention on the Physical Protection of Nuclear Material (INFCIRC/274/Rev.1) and Amendment thereto (INFCIRC/274/Rev.1/Mod.1); f) Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/500); g) Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/566); h) Convention on Supplementary Compensation for Nuclear Damage (INFCIRC/567); i) Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (INFCIRC/402); j) Comprehensive safeguards agreement — based on The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/153 (Corrected)); k) Additional protocol — following the provisions of Model Protocol Additional to the Agreement(s) Between States(s) and the International Atomic Energy Agency for the Application of Safeguards (INFCIRC/540 (Corrected)); l) Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Plans for when each of the instruments will be adhered to. 2. Identification of the actions that will need to be undertaken and the required timescales. 3. Evidence that the resources required are understood and have been defined. 	

Observations

Uganda is a party to the Convention on the Physical Protection of Nuclear Material (CPPNM).

Uganda has concluded:

- A Comprehensive Safeguards Agreement with an amended Small Quantities Protocol (SQP) and an Additional Protocol;
- A Revised Supplementary Agreement concerning the Provision of Technical Assistance by the IAEA;

Uganda is considering becoming a party to the following international legal instruments:

- Amendment to the CPPNM;
- Convention on Early Notification of a Nuclear Accident;
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency;
- Convention on Nuclear Safety;
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management;
- Vienna Convention on Civil Liability for Nuclear Damage;
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention;
- Convention on Supplementary Compensation for Nuclear Damage.

The INIR team was informed that Uganda has undertaken some studies to identify the implications of those instruments for the country and has analysed the obligations arising therefrom. Uganda has benefitted from training opportunities in nuclear law to understand the implications of joining the relevant instruments. It is expected that by the end of FY2021/22, i.e. June 2022, the MEMD would have prepared a paper for Cabinet consideration.

While the 1997 Protocol to Amend the Convention on Civil Liability for Nuclear Damage was not covered in the draft Nuclear Power Roadmap, the INIR team was informed that adherence to this instrument is also being considered.

The INIR team was informed that in Uganda treaties are ratified by the Cabinet or by the Parliament resolution. In this context, the INIR team was also informed that there is a need for the MEMD to seek the Attorney General's approval before submitting to the Cabinet. The Attorney General determines if an international instrument can be ratified by the Cabinet or should be directed to the Parliament under certain conditions. It is foreseen that the Amendment to the CPPNM and other relevant international instruments will be ratified by the Cabinet.

The INIR team was informed that priority will be given to the Amendment to the CPPNM and the safety instruments.

The INIR team noted that consistent with the national practice, relevant provisions of the above listed international instruments will be incorporated in the future comprehensive nuclear law (see Condition 5.2).

Areas for further action	Significant	International legal instruments
	Minor	
RECOMMENDATIONS		
R-5.1.1 Uganda should finalize the plan to adhere to all remaining international legal instruments and carry out an analysis of the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage.		
SUGGESTIONS		
GOOD PRACTICES		

5. Legal Framework Condition 5.2: Plan in place for development of a comprehensive national nuclear law		Phase 1
Summary of the condition to be demonstrated	<p>There is an understanding of the requirements of the comprehensive national nuclear law that needs to be enacted, a plan with the actions and timescales for development and enactment, together with a commitment from the government to achieve the stated plan. The plan includes the need for the law to:</p> <ol style="list-style-type: none"> a) Establish an independent nuclear regulatory body with adequate human and financial resources, and a clear and comprehensive set of functions; b) Identify responsibilities for safety, security and safeguards; c) Formulate safety principles and rules (radiation protection, nuclear installations, radioactive waste and spent fuel management, decommissioning, mining and milling, EPR and the transport of radioactive material); d) Formulate nuclear security principles; e) Give appropriate legal authority to, and define the responsibilities of, the regulatory body and all competent authorities establishing a regulatory control system (authorization, inspection and enforcement, review and assessment, and development of regulations and guides); f) Implement IAEA safeguards, including a State system of accounting for and control of nuclear material (SSAC); g) Implement import and export control measures for nuclear and radioactive material and items; h) Establish compensation mechanisms for nuclear damage. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A plan on how the law will be developed and approved. 2. A summary of how each of the areas listed above will be addressed within the law. 3. Interactions with the IAEA and the other relevant organizations. 	
<p>Observations</p> <p>The current legislation (Atomic Energy Act 2008) applies mainly to radiation sources and does not provide for the regulation of nuclear power plants and other nuclear facilities, nor does it address nuclear safety, nuclear security, safeguards, spent fuel management, emergency preparedness and response and civil liability for nuclear damage.</p> <p>The Government plans to enhance the national legal framework for nuclear power. In this context, resources have been allocated in the FY2021/22 budget for preparing a comprehensive nuclear law.</p> <p>A Regulatory Impact Assessment (RIA) on Atomic Energy was conducted to assess the adequacy of the existing national legislation in relation to nuclear power development and to advise the Government</p>		

on the policy option to be undertaken. The assessment concluded that the best option for strengthening regulation of atomic energy is the revision and amendment of existing policies and laws.

In this context and in line with the practice in Uganda, the MEMD will prepare a paper including principles that will be submitted to the Cabinet to determine whether the current Atomic Energy Act will be amended, or a new law will be developed.

The INIR team was informed that the Government plans to address issues in a holistic manner by expanding the scope of the existing legislation to regulate nuclear power, and similarly the structure and functions of the current regulatory body will be revised. The future legislation will designate the Atomic Energy Council established under the Atomic Energy Act 2008 as the regulatory body for all nuclear activities including those related to a nuclear power programme. The future nuclear law will provide that the nuclear regulatory body will not report to a ministry that has responsibilities and interest in nuclear power development. The future nuclear regulatory body will have a separate budget and adequate human resources to fulfil its responsibilities.

The RIA is silent on import and export control provisions to be included in the future legislation. The INIR team was informed that specific detailed regulations will provide for such controls, and the future legislation will also include some provisions pertaining to this area.

Areas for further action	Significant	
	Minor	Formal plan for nuclear law

RECOMMENDATIONS

SUGGESTIONS

S-5.2.1 Uganda is encouraged to formalize its plan with the actions and timescales for development and enactment of the nuclear law.

GOOD PRACTICES

5. Legal Framework		Phase 1
Condition 5.3: Plans in place to enact and/or amend other legislation affecting the nuclear power programme		
Summary of the condition to be demonstrated	<p>There is an understanding of which legislation that affects the nuclear power programme needs to be enacted and/or amended, the timescales for its development and approval, together with a commitment from the government to achieve the stated plan. The legislation to be considered includes that on:</p> <ol style="list-style-type: none"> a) Environmental protection; b) EPR; c) Occupational health and safety of workers; d) Protection of intellectual property; e) Local land use controls; f) Foreign investment; g) Taxation, fees, electricity tariffs and incentives; h) Roles of national and local governments; i) Stakeholders and public involvement; j) International trade and customs; k) Financial guarantees and any other required financial legislation; l) R&D. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A plan on how the legislation will be developed and approved. 2. A summary of how each of the areas listed above will be addressed within the proposed legislation. 3. Interactions with the IAEA and the other relevant organization. 	
<p>Observations</p> <p>The Nuclear Power Roadmap Development Strategy 2014–2016 identified the following relevant laws to be reviewed, namely:</p> <ul style="list-style-type: none"> — Atomic Energy Act, 2008; — Electricity Act, 1999; — National Environment Act, 1995; — Water Act, 1997; — Mining Act, 2003; — Transport (Roads, Railway, Water) Laws; — Workers Compensation Act, 2000; — External Trade Act 1953; — Public Procurement and Disposal of Public Assets (PPDA) Act, 2003. <p>The INIR team was informed that several Acts have been reviewed, however, Uganda does not intend to amend these Acts per se, but rather include provisions in the future nuclear legislation to address the required modifications. In INIR team’s view, this will be a major challenge.</p>		

In addition to the review of the above listed acts, it was noted that there is a need to enhance implementation and enforcement of radiation protection requirements, land acquisition mechanisms, emergency preparedness and response, health, safety, and environmental guidelines on decommissioning and site remediation.

In relation to environmental protection, nuclear experts from the Ministry of Energy and Mineral Development participated in the amendment of the previous legislation that resulted in the National Environment Act, 2019. The Act includes provisions on development of nuclear related projects. The future nuclear legislation through the provisions covering the licensing process will delineate the responsibilities between the National Environment Management Authority (NEMA) and the future nuclear regulatory body.

The INIR team was informed that in addition to the above listed acts, other pieces of legislation will be reviewed to identify those that may have an impact on the nuclear power programme.

Areas for further action	Significant	
	Minor	Other legislation impacting nuclear power

RECOMMENDATIONS

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SUGGESTIONS

S-5.3.1 Uganda is encouraged to continue identifying other legislation that may have an impact on the nuclear power programme.

GOOD PRACTICES

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6. Safeguards		Phase 1
Condition 6.1: Terms of international safeguards agreement in place		
Summary of the condition to be demonstrated	<ul style="list-style-type: none"> a) The Member State has a comprehensive safeguards agreement with associated subsidiary arrangements in force with the IAEA. b) If the Member State currently has concluded a small quantities protocol to its comprehensive safeguards agreement, a plan needs to be developed setting out the necessary steps to rescind the small quantities protocol in a timely manner. c) The Member State is aware of the requirements of the additional protocol; if the Member State has made the decision to ratify the additional protocol but has not already done so, a plan is in place for the timely ratification. 	
Examples of how the condition may be demonstrated	<ul style="list-style-type: none"> 1. Plans for rescinding the small quantities protocol and/or for ratification of the additional protocol, including the actions that need to be taken, clear assignment of responsibilities and understanding of the resources and the required timescales. 2. Evidence that the need for outreach activities is recognized to ensure that all existing and future entities having to report to the State authority for safeguards are aware of their roles and obligations. 	
<p>Observations</p> <p>Uganda is party to the Non-Proliferation Treaty and has signed the African Nuclear Weapon-Free-Zone Treaty (Pelindaba Treaty). It has a Comprehensive Safeguards Agreement (INFCIRC/674) in force, as well as the amended Small Quantities Protocol (SQP) and the Additional Protocol.</p> <p>The INIR team was informed that the Atomic Energy Council (AEC) functions as the State Authority with responsibility for safeguards implementation (SRA). The future nuclear legislation will formally identify the AEC as the SRA, after which AEC plans to establish safeguards regulations to further elaborate reporting and access requirements, which will be essential for the application of safeguards in a future nuclear power plant. The future nuclear legislation will cover the implementation of all safeguards procedures, anticipating the rescission of the SQP.</p> <p>The INIR team was informed of Uganda's intent to rescind the SQP. However, formal plans are not in place yet.</p> <p>The AEC already conducts outreach to potential holders of nuclear material and is preparing a survey to gauge awareness of safeguards requirements in Uganda.</p>		
Areas for further action	Significant	Plan to rescind SQP
	Minor	

RECOMMENDATIONS
R-6.1.1 The Government should prepare a plan setting out the necessary steps to rescind the SQP in a timely manner.
SUGGESTIONS
GOOD PRACTICES

6. Safeguards		Phase 1
Condition 6.2: Strengthening of the SSAC planned		
Summary of the condition to be demonstrated	The Member State has a plan describing how the existing SSAC will be strengthened or adjusted to deal with the increase of activities and resources, as well as the need for enhancement of capabilities.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Evidence that the NEPIO includes a representative knowledgeable in the requirements of the comprehensive safeguards agreement. 2. A plan produced by the NEPIO covering the enforcement of national legislation, policies and procedures relevant to safeguards; the development of the legislation itself is covered under infrastructure issue No. 5: Legal Framework. 3. Evidence that approaches undertaken by one or more States with existing nuclear power programmes have been reviewed and the information gained has been adapted for the national context. 	
Observations		
<p>The INIR team was informed that the AEC intends to strengthen the SSAC first and foremost through developing the regulatory framework for safeguards implementation, and then through additional capacity building and human resource development. No detailed plan is established yet.</p> <p>The AEC has currently five (5) staff who are trained in safeguards. Although several inter-governmental agreements and MOUs are in place with other countries for training and capacity building, none are dedicated to safeguards capacity building. Uganda could benefit from reviewing the experience of other SQP countries who have developed (or are developing) a nuclear power programme.</p>		
Areas for further action	Significant	
	Minor	Plan to strengthen SSAC
RECOMMENDATIONS		
R-6.2.1 The Government should develop a detailed plan to strengthen the SSAC.		
SUGGESTIONS		
GOOD PRACTICES		

6. Safeguards		Phase 1
Condition 6.3: Recommendations from any previous reviews or audits being addressed		
Summary of the condition to be demonstrated	If any reviews or audits have been conducted on the existing safeguards provisions, there is evidence that the actions resulting from it are progressing.	
Examples of how the condition may be demonstrated	Action plans resulting from a review or audit with progress identified indicating the required timescales, responsibilities and resources required.	
Observations No other reviews or audits were conducted.		
Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		

7. Regulatory Framework Condition 7.1: Development of an adequate regulatory framework planned		Phase 1
Summary of the condition to be demonstrated	<p>The prospective senior managers of the regulatory body have been identified. There are plans to develop a regulatory framework for nuclear safety, nuclear security and safeguards that matches the overall plan for the NPP, and includes:</p> <ol style="list-style-type: none"> a) Designation of an effectively independent competent regulatory body with clear authority, adequate human and financial resources, and strong government support; b) Assignment of core safety, security and safeguards regulatory functions for developing regulations, review and assessment, authorization, inspection, enforcement, and public information; c) Authority and resources to obtain technical support as needed; d) A clear definition of the relationship of the regulatory body to other organizations (e.g., technical support organizations and environmental agency); e) Clearly defined responsibilities of licensees; f) Authority to implement international obligations, including IAEA safeguards; g) Authority to engage in international cooperation; h) Provisions to protect proprietary, confidential and sensitive information; i) Provisions for stakeholder involvement and communication with the public. <p>There are agreed terms of reference for each regulator and a clear definition of roles of, and interfaces with, other regulators. There is recognition of the need for integrating existing security and radiation safety regulations with new regulations for NPPs.</p> <p><i>Note: Plans to develop competence are addressed under the Infrastructure Issue No. 10: Human Resource Development.</i></p>	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Evidence of what has been done, or is planned, to develop the experience of the senior regulators. 2. Proposals on the overall approach to assessment, licensing, inspection and enforcement, among other things. 3. Plans to develop the regulatory body for safety, security, and safeguards. 4. Plans to develop the required regulations. 5. Evidence of interaction and cooperation with established regulatory organizations. 	

6. Plans to enhance or develop appropriate technical support organizations (see also Infrastructure Issue No. 10: Human Resource Development) to support the regulatory body.
7. Plans to secure support from international regulatory organizations.

Observations

The Atomic Energy Act 2008 establishes the Atomic Energy Council (AEC) as the regulator for the peaceful applications of ionising radiation in the country. However, the Act does not provide for regulation of nuclear installations. AEC currently has five Board Members including Chairperson, 22 technical staff of which five (5) are trained in nuclear power and one (1) is currently studying towards a master's degree.

The Regulatory Impact Assessment (RIA) on Atomic Energy conducted in 2021 recommends amendment of the Atomic Energy Act 2008 and identifies the need for developing regulations for several areas pertaining to nuclear power for electricity generation. The RIA also recognizes “Acquiring knowledge and skills to regulate use of atomic energy for electricity generation” as one of the actions to reach strategic objective of “establishment of facilities that use atomic energy for electricity generation”.

The Draft National Energy Policy recognizes the “inadequate legal, institutional and regulatory frameworks for nuclear energy development” as one of the issues to be addressed. It also provides a strategy to strengthen the institutional framework including the regulatory body to exercise regulatory control over power and non-power applications of nuclear energy.

AEC drafted the National Roadmap and Strategy for Regulation of Nuclear Installations in Uganda in 2019 with an objective to ensure effective regulation for the implementation of the nuclear power activities. This draft National Roadmap and Strategy document covers among other issues: the need for an independent regulatory body, provision of adequate financial and human resources, and interactions with other stakeholders including other regulatory agencies such as the National Environment Management Authority (NEMA) and the Electricity Regulation Authority (ERA). In addition, the draft National Roadmap and Strategy recommends changing the reporting lines of the regulatory body to a ministry without responsibilities for promotion of nuclear technology applications. Finally, the National Roadmap and Strategy includes an action table to address the above issues.

The future nuclear legislation is envisioned to provide for the establishment of an adequate regulatory framework covering the nuclear regulatory body, its functions and regulatory approach. The INIR team was informed that AEC will possibly be designated as the nuclear regulatory body. It will be strengthened, and its functions will be expanded to become a regulatory body for nuclear safety, security, and safeguards. The regulatory approach will be based on prescriptive regulations as well as those from the vendor country.

Furthermore, the senior managers of the nuclear regulatory body will be selected in accordance with guidelines fostering technical expertise and knowledge amongst people trained and experienced in the field of nuclear safety among others.

The INIR team was informed that the position of the future nuclear regulatory body in the Ugandan governmental system is planned to be at a higher level, reporting to at least ministerial level and it will not be placed under any promotional body.

The INIR team was informed that the current functions under AEC, such as the provision of dosimetry services or radioactive waste management, will be separated and directed to other organizations in line with development of the nuclear power programme.

The INIR team was informed that the interfaces between different regulators and relevant organizations and the nuclear regulatory body are identified and relations will be defined in the future legislation.

With regard to international cooperation, the MOUs of the MEMD with CNNC and ROSATOM make provisions for cooperation in the strengthening of the regulatory infrastructure. The INIR team was informed that the cooperation provisions under these MOUs consist of training of regulatory staff and establishment of relations with vendor country regulators and; the implemented activities under these MOUs are training of regulatory personnel.

AEC has MOUs with regulatory bodies of several countries and benefits from collaborative partnerships with the United States Nuclear Regulatory Commission (NRC), the IAEA and the Korean Institute for Nuclear Safety (KINS) in the area of capacity building. The INIR team was informed that the future nuclear regulatory body will expand its international cooperation with regulatory bodies of other countries to support its activities related to the regulation of nuclear power.

Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		

8. Radiation Protection	
Condition 8.1: Enhancements to radiation protection programmes planned	Phase 1
Summary of the condition to be demonstrated	<p>The needed enhancements to the existing radiation protection programme to address NPP operation have been identified, including consideration of transport of radioactive materials and radioactive waste management. They consider both the increase in scale and the need to cover new technical issues.</p> <p><i>Note: This issue is closely linked to the Infrastructure Issue No. 7: Regulatory Framework. In particular, the development of regulations and whether the existing regulatory body will expand its role or whether the infrastructure issues will be addressed by a separate organization.</i></p>
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Evidence of discussions with specialists from other countries. 2. Identification of the main areas requiring enhancement. 3. Recognition that additional competences will be required to review proposed designs against the requirement to control contamination and to reduce exposures to as low as reasonably achievable, also known as ALARA. 4. Recognition that the programme for dose assessment will need to be significantly expanded. 5. Plans for who will be responsible for the main elements of a radiation protection programme.
<p>Observations</p> <p>The current Atomic Energy Act of 2008 regulates the peaceful applications of ionising radiation and establishes the Atomic Energy Council (AEC) as the regulator in this area. The Atomic Energy Regulations of 2012, specify the minimum requirements for “the protection of individuals, society and environment from the dangers resulting from ionising radiation”. AEC’s current regulations are aimed at enhancing radiation protection in medical and industrial facilities. Due to the increasing scope of applications of radiation technology in the country, the AEC is reviewing these regulations. The INIR team was informed that specific regulations will be developed for nuclear power.</p> <p>The RIA report indicates the need to enhance the radiation protection requirements to support the nuclear power programme.</p> <p>The INIR team was informed that the AEC expects an increase in demand related to radiation protection to support the nuclear power programme, and therefore the need for enhancement of infrastructure and services. The AEC currently operates a dosimetry laboratory that offers external dosimetry services to over 1000 radiation workers in the medical and industrial fields and plans to develop a new dosimetry laboratory including internal dosimetry services. The INIR team was informed that separate organization(s)/institution(s) will be accredited for these services.</p> <p>The AEC is strengthening its capabilities for monitoring and control of environmental radioactivity arising from all sources of natural and artificial origin, and three AEC staff have received training in the field of environmental monitoring.</p>	

The INIR team noted that a comprehensive assessment is still to be conducted and a plan to be developed to enhance the radiation protection capabilities for the nuclear power programme.

In the framework of the IAEA Technical Cooperation Programme, Uganda is implementing regional and bilateral cooperation with other countries to enhance capacity in radiation protection.

Areas for further action	Significant	Enhancement of radiation protection capabilities
	Minor	

RECOMMENDATIONS

R-8.1.1 The AEC and NEPIO should develop a plan to enhance the national radiation protection capabilities for the nuclear power programme.

SUGGESTIONS

GOOD PRACTICES

9. Electrical Grid		Phase 1
Condition 9.1: Electrical grid requirements considered		
Summary of the condition to be demonstrated	<p>A preliminary study of the grid system has been conducted covering:</p> <ol style="list-style-type: none"> a) Capability and reliability to take the output from the NPP; b) Ability to withstand loss of the output; c) Reliability to minimize the risk of loss of power to the NPP from the grid. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. An analysis of the grid covering: <ol style="list-style-type: none"> a. The expected grid capacity; b. The historical stability and reliability of the electrical grid; c. The historical and projected variation in energy demand. 2. Evidence of consideration of: <ol style="list-style-type: none"> a. Available NPP designs to identify those with output consistent with required grid performance and reliability ('grid code'), with due consideration taken for safety aspects; b. Potential NPP sites and their impact on grid operation; c. The anticipated growth of grid capacity; d. The potential for local or regional interconnectors to improve grid characteristics. 3. Preliminary plans to enhance the grid to meet NPP requirements. 	
Observations		
<p>The Uganda Electricity Transmission Company Limited (UETCL) is the system operator of the high voltage transmission grid of Uganda. In 2017, the transmission grid consisted of 248 km of 400 kV, 150 km of 220 kV, 1443 km of 132 kV, 300 m of 132 kV (underground cable), and 35.2 km of 66 kV transmission lines, in addition to 20 substations. The recent extensions of the electric grid aimed mainly at meeting the power requirements of the country's industrial parks. The Ugandan electric grid is interconnected to neighboring networks as part of the East African Power Pool (EAPP) that involves 12 East African countries. The total installed capacity as at end of December 2020 was 1268.9 MW of which 1236.3 MW supplies the main grid, 13.9 MW is off the main grid and 18.7 MW is for own consumption which is mainly by the bagasse cogeneration plants. Hydro power plants represent around 85% of the installed generation capacity. The Uganda Vision 2040 expects the installed electric capacity to grow to 41 738 MW by 2040.</p> <p>A range of demand growth scenarios for future development of the power system are described in the Study on Integrating Nuclear Power in the Generation Capacity Plan 2015–2040 elaborated by MEMD in 2015. The 'base case' scenario: (1) provides sufficient time (around 15 years) for building the necessary national infrastructure for nuclear power, and (2) allows for introduction of 2×1000 MW nuclear generation capacity in the energy mix. Under this scenario, the first 1000 MW nuclear unit is expected to be in operation in 2031.</p> <p>UETCL developed the Grid Development Plan (GDevP) 2018–2040 (2018). The INIR team noted that the power system analyses summarized in this plan do not include necessary studies on integrating future nuclear power plants with the electrical grid.</p> <p>The INIR team was informed that the Electricity Regulatory Authority (ERA) is revising the grid code, expected to be completed in FY2022/23. The revision will reflect the planned developments in the electricity sector (mainly, the planned merging of the existing generation, transmission and distribution</p>		

companies and the projected introduction of nuclear power) as well as new heightened operational requirements related to reliability, efficiency and performance. The next update of the GDevP plan will be based on the revised version of the grid code.		
Areas for further action	Significant	Study of the grid system
	Minor	
RECOMMENDATIONS		
R-9.1.1 UETCL should conduct a preliminary study of the grid system covering its capability and reliability to take the output from the future nuclear power plant (NPP), its ability to withstand loss of the NPP output, and its reliability to minimize the risk of loss of power to the NPP from the grid.		
SUGGESTIONS		
GOOD PRACTICES		

10. Human Resources Development	
Condition 10.1: Necessary knowledge and skills identified, and gaps in current capability assessed	Phase 1
Summary of the condition to be demonstrated	<p>A broad assessment of the typical staffing needs of each of the key organizations and their technical support has been completed together with an assessment of improvements required in the current capability of the country to meet the projected need. The assessment covers the full range of scientific, technical, managerial and administrative disciplines and considers:</p> <ol style="list-style-type: none"> a) Current human resource competences and capabilities; b) Estimated required competence and capability; c) Availability of domestic and foreign capacity for education and training; d) Additional education, recruitment, training and experience that will be required (gap analysis), including specialist training in nuclear safety, nuclear security, safeguards, radiation protection, spent fuel and radioactive waste management, management systems and EPR; e) Which facilities and programmes need to be established for education, training and experience building; f) Which research capability needs to be developed; g) A senior leaders development programme.
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. An analysis identifying the competences and number of staff needed, covering all the future organizations. The analysis needs to include: <ol style="list-style-type: none"> a. Bulk workforce needs per phase; b. A breakdown by knowledge, skills and discipline per phase; c. The flow of workforce to other projects (e.g. future NPPs). 2. An analysis of existing human resource capabilities and the ability to attract experienced staff from other countries. 3. An assessment of the capability of existing education and training facilities.
<p>Observations</p> <p>In 2015, Uganda established the Human Resources Development Working Group (HRDWG) that was tasked with the following activities:</p> <ul style="list-style-type: none"> — Develop a technical paper on human resources required for a nuclear power project in Uganda; — Review the capabilities of the higher education institutions (universities and other tertiary institutions) to support nuclear education and training; and, — Prepare a national human resource development plan. 	

The HRDWG, together with NED, have assessed the human resources required for the three key organizations (NEPIO, Regulatory Body and Owner/Operator), but have not yet completed a gap analysis.

The INIR team was informed that the HRDWG will prepare Terms of Reference to guide an assessment of the current human resources available in the country, which is expected be finalized by September 2022. The outcomes of this assessment, together with the findings of the Technical Paper on Human Resources Required for a Nuclear Power Project, will enable Uganda to conduct a national human resources gap analysis and identify areas for improvement or development. As part of this assessment, the INIR team was informed that the HRDWG will also review the relevant education and training programmes that are available at universities and other higher-level institutions.

Areas for further action	Significant	National assessment of human resources
	Minor	

RECOMMENDATIONS

R-10.1.1 The NEPIO should complete an assessment of Uganda’s human resources and education and training infrastructure to support the nuclear power programme.

SUGGESTIONS

GOOD PRACTICES

10. Human Resources Development		Phase 1
Condition 10.2: Development of human resources planned		
Summary of the condition to be demonstrated	<p>Outline plans have been agreed to:</p> <ol style="list-style-type: none"> a) Enhance national education and training; b) Develop a detailed human resource development plan for each key organization; c) Integrate the plans to develop a national strategy including the development of an initial core leadership group. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Plans to develop human resources required including: <ol style="list-style-type: none"> a. Identification of national organizations that could support human resource development; b. Enhancement of education and training infrastructure; c. Development of national competences (through schools, universities, institutes and industry); d. Non-national human resources that are needed to augment national resources and how they will be secured; e. International cooperation and vendor support; f. Leadership development. 2. Strategies for the recruitment and retention of staff. 3. Recognition of the need for qualification and certification programmes for personnel. 4. Evidence that key stakeholder organizations have participated in the development and review of the plans. 	
Observations		
<p>The INIR team was informed that the NEPIO, through the HRDWG, will create a national human resource development plan following the completion of the assessment of the human resources and education and training programmes (see Condition 10.1). Once completed, this plan will identify the enhancements to the national education and training infrastructure needed to develop the human resources necessary for the key organizations involved in the nuclear power programme.</p> <p>MEMD has a training policy and plan that facilitates access to nuclear education and training, and several NED staff have participated in international education programmes and training courses on nuclear power related issues. The INIR team was informed that staff who are sent abroad for extended education and training are bonded to the organization for a period of at least three years upon their return, and that the government's national recruitment and retention policy applies to the organizations involved in the nuclear power programme.</p> <p>The INIR team was further informed that NED, with the assistance of the IAEA, is planning to conduct a feasibility study related to the establishment of a national centre for nuclear science and technology. It is expected that this centre will provide nuclear education, training, and research to support the nuclear power programme and other peaceful nuclear applications, and will also serve as a mechanism for public outreach. However, the final scope of the centre will be determined following the completion of the feasibility study and the national human resources gap analysis.</p> <p>The INIR team was informed that Uganda has initiated cooperation in the area of human resource development with the IAEA as well as with countries with operational nuclear power plants.</p>		

Areas for further action	Significant	Human resource development plans
	Minor	
RECOMMENDATIONS		
R-10.2.1 The NEPIO should prepare a national human resource development plan that addresses the needs of the three key organizations in the nuclear power programme and identifies the required enhancements in the education and training infrastructure.		
SUGGESTIONS		
GOOD PRACTICES		

11. Stakeholder Involvement		Phase 1
Condition 11.1: Open and transparent stakeholder involvement programme initiated		
Summary of the condition to be demonstrated	Stakeholder involvement strategy and plan, with the required resources and competence, implemented by the NEPIO based on transparency and openness. The public, and other relevant interested parties, receive information about the benefits and risks of nuclear power, including the non-zero potential for severe accidents.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A clear mandate for the NEPIO to engage with stakeholders. 2. Actions to disseminate information in the context of the national energy outlook, policy and needs, and pros and cons of all sources of energy, using a range of effective tools. 3. Evidence of a professional communication team available to the NEPIO, with appropriate financial resources. 4. Results of surveys to determine the public’s knowledge and receptiveness to nuclear power. 5. Approaches to address public concerns, including waste management and severe accidents. 6. Evidence of activities at the local, regional and national level. 7. A plan for ongoing interaction with the public, in particular, opinion leaders, media, local and national governmental officials and neighbouring countries. 8. Plans for regular opinion polls managed by specialist companies 9. A training programme to enable identified spokespersons to interact with stakeholders. 	
Observations		
<p>The Communications and Information Management Division (CIMD) in the Ministry of Energy and Mineral Development (MEMD) is responsible for official communication and information dissemination on energy and mineral development-related matters. CIMD, in consultation with the Nuclear Energy Department (NED) and the Atomic Energy Council (AEC), developed the Nuclear Communication Strategy for Uganda 2020–2025.</p> <p>The INIR team was informed that an interagency team, with both technical experts and communication professionals, was established with representation from CIMD, NED and AEC.</p> <p>Based on the above strategy, the team conducted the following activities:</p> <ul style="list-style-type: none"> — Development of key messages on nuclear energy that balance the risks and benefits of nuclear energy, including the role of the regulatory body; — Development of awareness materials, including booklets, documentaries; — Visits and career seminars at universities to raise awareness about the opportunities related to the nuclear power programme; — Engagement with the public through roadshows, traditional media, and social media; — Frequently Asked Questions (FAQs) to address public concerns related to the use of nuclear energy; 		

- Engagement with regional leaders and the public in the districts with potential NPP sites through workshops on the Role of Nuclear Power for Social and Economic Development;
- Engagement with Members of Parliament and civil society;
- Annual participation in a national ‘Energy Week’ events to increase the general public’s awareness on nuclear energy applications and to engage different stakeholders.

The INIR team was informed that a nuclear information centre related to the nuclear power programme is currently under development. Posters, flyers, reports and information to raise awareness on nuclear energy have already been prepared.

The INIR team was further informed that a preliminary survey on public knowledge and receptiveness was conducted in 2016 in four regions of the country. The survey showed that the public appreciated the potential benefits associated with nuclear energy but want to be assured that there is sufficient capacity for mitigation in case of an accident. Some of the concerns highlighted by the public included: management of nuclear waste, need for sufficient water, potential impact on the fishing industry, siting, emergency preparedness and response, and government capacity. A follow-up survey is planned to take place in the next financial year, with the results included in the next iteration of the National Development Plan.

The INIR team was informed that the communications team has participated in several training events and meetings hosted by the IAEA to strengthen and enhance capabilities in stakeholder involvement, communication, and information management on nuclear related matters.

The INIR team was also informed that regional communication and stakeholder engagement will be initiated through the Africa Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA), the African Commission on Nuclear Energy (AFCONE), and the Eastern African Power Pool (EAPP).

Areas for further action	Significant	
	Minor	

RECOMMENDATIONS

SUGGESTIONS

GOOD PRACTICES

GP-11.1.1 Establishment of an interagency team with both communication and technical experts to support effective and informed outreach on the nuclear power programme, including early engagement with the local communities during the site survey stage.

12. Site and Supporting Facilities Condition 12.1: General survey of potential sites conducted and candidate sites identified		Phase 1
Summary of the condition to be demonstrated	Exclusion and avoidance criteria (covering safety, security, cost, socioeconomic issues, engineering and the environment) have been identified and regional analysis to identify candidate sites has been conducted. The analysis includes the impact of external hazards on security and emergency response capability. Consultations with stakeholders have been part of the process.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A report covering: <ol style="list-style-type: none"> a. Safety and security criteria for initial NPP site selection; b. National criteria (e.g., socioeconomic, and environmental); c. Engineering and cost criteria. 2. An assessment report issued and approved identifying: <ol style="list-style-type: none"> a. Regional analysis and identification of potential sites; b. Screening of potential sites and selection of candidate sites. 3. Evidence that the resources that were used for NPP site selection are competent and have experience with NPP site selection. 4. Plans for the work that will be required in Phase 2 to select and justify the site. 5. Evidence that safety and security related activities conducted (e.g., site evaluation and environmental impact studies) are included within the framework of an effective management system. 	
<p>Observations</p> <p>Site survey studies were undertaken by the Siting and Technology Deployment Working Group (STDWG). This Working Group is composed of representatives from relevant national ministries, departments and agencies. The INIR team was informed that these representatives have competencies in fields relevant to siting (geology, statistics, geophysics, seismology, meteorology, hydrology, environment, engineering, security, physical planning, etc.) with some members having experiences in siting conventional (hydro) power plants.</p> <p>Criteria (including avoidance and exclusion criteria) for the site survey studies were developed and utilized to perform a GIS-based regional screening. This screening resulted in the identification of 20 potential areas. On-site investigations were undertaken using priority criteria which led to the identification of eight (8) potential sites located in five (5) districts.</p> <p>The criteria used in the site survey were derived from different sources (IAEA, EPRI, NEI, RAMSAR Convention). Some of these criteria are based on local expert knowledge and judgement and addressed the impact of external hazards on security and emergency planning (through exclusion of all islands and use of criterion based on a screening distance from national borders). The INIR team was informed that the above referenced sources provided guidance on quality assurance in site survey studies.</p> <p>The site survey studies were reviewed by the IAEA as part of a SEED mission conducted in 2017. The report of the SEED mission noted the systematic site survey work and the excellent awareness</p>		

programme conducted in several locations. The INIR team was informed that the stakeholder involvement process was led by MEMD and comprised meetings with relevant authorities and local populations held at regional, district, sub-county and village level. This process comprised of workshops and inception meetings and helped in addressing local concerns on several aspects including those related to nuclear safety and nuclear accidents.

The INIR team was informed that the STDWG plans to complete the remaining site survey studies and identify three (3) candidate sites by June 2022 using predefined ranking criteria.

Areas for further action	Significant	
	Minor	Identification of candidate sites

RECOMMENDATIONS

R-12.1.1 The NEPIO should complete the site survey studies to identify candidate sites.

SUGGESTIONS

GOOD PRACTICES

13. Environmental Protection		Phase 1
Condition 13.1: Environmental requirements considered		
Summary of the condition to be demonstrated	The NEPIO has considered the main environmental requirements related to the siting of an NPP, including land use, water use, water quality and the impacts of low level radioactive effluents.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Identification of key requirements for siting and during construction. 2. Evidence of discussions by specialists with States operating nuclear power. 3. Evidence that the non-radiological environmental issues, such as water use, transport of materials, disposal of hazardous waste, additional environmental monitoring requirements and construction impact, have been considered and taken into account by the NEPIO. 	
Observations		
<p>As part of the siting criteria used for the site survey studies, STDWG considered factors related to environmental protection, such as population density, environmentally protected areas, water use and protected land use.</p> <p>The INIR team noted that impacts of low-level radioactive releases associated with normal operation of the future NPP were not taken into account during the site survey studies.</p> <p>In accordance with the National Environment Act 2019, Uganda is conducting a Strategic Environmental Study (SEA) that will consider all the environmental impacts.</p>		
Areas for further action	Significant	
	Minor	Impacts of low-level radioactive releases
RECOMMENDATIONS		
SUGGESTIONS		
<p>S-13.1.1 The NEPIO is encouraged to consider impacts of low-level radioactive releases associated with normal operation of the future NPP in its siting studies.</p>		
GOOD PRACTICES		

13. Environmental Protection		Phase 1
Condition 13.2: Framework for environmental protection reviewed		
Summary of the condition to be demonstrated	The NEPIO has reviewed the suitability of the State's existing framework for environmental protection and for meeting its international obligations.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Procedures developed for the elaboration, reporting and assessment of environmental studies for nuclear and other related facilities. 2. Evidence of interactions by specialists with States operating nuclear power. 	
Observations		
<p>The Ugandan framework for environmental protection consists of the National Environment Act 2019 (NEA) and the Atomic Energy Act 2008 (AEA).</p> <p>NEA establishes the National Environment Management Authority (NEMA) as the principal agency in Uganda responsible for regulating, monitoring, supervising and coordinating all activities relating to the environment which include implementation of a nuclear power programme.</p> <p>According to NEA, NEMA, in consultation with AEC, establishes standards and guidelines for minimizing the effects of ionizing radiation and oversees SEA and EIA process with regard to nuclear power. NEA also provides the legal basis for the relationship between both organizations, NEMA and AEC, on aspects related to permits, licenses, approvals in this area.</p> <p>The INIR team was informed that the distribution of roles and responsibilities during the authorization & licensing process between NEMA and AEC is defined according to a pre-signed MOU linking the two institutions and that future legislation will further delineate responsibilities in this regard.</p> <p>Uganda is party to several international conventions on environmental protection.</p> <p>The INIR team was informed that MEMD is conducting the SEA for the nuclear power programme. One of the objectives of the SEA study is to help identify particular areas of the national environmental framework needing further enhancement and/or clarification. The INIR team was informed that the SEA will be completed by June 2022.</p>		
Areas for further action	Significant	
	Minor	Environmental protection framework
RECOMMENDATIONS		
SUGGESTIONS		
<p>S-13.2.1 The NEPIO is encouraged to further review the suitability of the existing environmental protection framework for the nuclear power programme in a timely manner.</p>		

GOOD PRACTICES

14. Emergency Planning		Phase 1
Condition 14.1: Requirements of, and resources for, developing an emergency response capability recognized		
Summary of the condition to be demonstrated	<p>a) The NEPIO is aware of the EPR arrangements and capabilities that will be required for the nuclear power programme. It has evaluated existing EPR arrangements and capabilities in the country and is aware of the major gaps that will need to be addressed.</p> <p>b) The NEPIO has identified the main organizations and resources that will need to be involved in the establishment of adequate national EPR capabilities.</p> <p>c) The lead for the execution of the action plan and the action plan coordination framework has been identified.</p> <p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. <i>The process of developing adequate EPR will be initiated in Phase 2 and will be largely carried out in Phase 3;</i> 2. <i>The requirements of the conventions on early notification and assistance are covered under the Infrastructure Issue No. 5: Legal Framework</i> 	
Examples of how the condition may be demonstrated	Report summarizing existing EPR arrangements and capabilities and identifying those to be enhanced and/or developed as well as identifying the main organizations and resources that will need to be involved in the establishment of adequate national EPR capabilities.	
Observations		
<p>The Atomic Energy Act of 2008 provides for emergency preparedness and response. The Minister of Energy and Mineral Development, in consultation with the Atomic Energy Council, established the Emergency Radiological Response Committee (ERRC).</p> <p>The ERRC is comprised of the Secretary/CEO Atomic Energy Council, and a representative from each of the following institutions:</p> <ul style="list-style-type: none"> — Ministry of Health; — Ministry of Information, Communications Technology and National Guidance; — Ministry in Charge of Disaster Preparedness and Refugees; — National Environment Management Authority; — Uganda Peoples’ Defense Forces; — Uganda Police Force; — Uganda Prisons Service; — International Committee of the Red Cross. 		

The activities of ERRC are coordinated by the Office of the Prime Minister and the AEC, and include:

- Preparing a national emergency preparedness and response plan;
- Ensuring that arrangements are in place for a timely, managed, controlled, co-ordinated and effective response at the scene and at the local, regional, national and international level, to any nuclear and radiological emergency; and
- Preparing and periodically reviewing emergency preparedness, response action levels and intervention levels.

The INIR team was informed that the current EPR arrangements are dedicated to emergencies situations involving radiation sources, and that the RIA identified the need to enhance those arrangements. The enhancements include adding considerations related to nuclear emergencies in the EPR arrangements.

The INIR team was informed that the draft National Nuclear and Radiological Emergency Response Plan (NNRERP) will include nuclear power-related emergencies originating from outside of the country. The INIR team was further informed that as Uganda progresses with the development of its nuclear power programme, the NNRERP will be updated to address internal nuclear emergencies.

The INIR team noted that the timeframe for incorporating internal nuclear emergencies into the EPR arrangements and the NNRERP is contingent on the amendment to the Atomic Energy Act, which will assign responsibilities for responding to nuclear emergencies. The INIR team was informed that self-assessments of the implementation of the EPR arrangements are conducted quarterly. As a result of these assessments, it was determined that EPR exercises should be extended to areas outside of Kampala to evaluate the ability to respond in areas with fewer local resources.

Areas for further action	Significant	
	Minor	

RECOMMENDATIONS

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SUGGESTIONS

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GOOD PRACTICES

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14. Emergency Planning		Phase 1
Condition 14.2: Recommendations from any previous reviews or audits being addressed		
Summary of the condition to be demonstrated	If any reviews or audits have been undertaken of the existing framework, there is evidence that the actions resulting from it are progressing.	
Examples of how the condition may be demonstrated	Presentation of any action plans resulting from a review or audit with progress identified.	
Observations No review or audit has been conducted.		
Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		

15. Nuclear Security Condition 15.1: Nuclear security requirements recognized and the actions of all relevant organizations coordinated		Phase 1
Summary of the condition to be demonstrated	<p>The NEPIO recognizes the importance of nuclear security, based on a national threat assessment and principles of prevention, detection and response. All competent authorities that are involved in nuclear security have been identified and there is a coordinating body or mechanism established that brings together all of the organizations that have responsibility for nuclear security.</p> <p><i>Note: The need to establish legislation and a regulatory framework is addressed under the Infrastructure Issues Nos 5 and 7: Legal Framework and Regulatory Framework, respectively.</i></p>	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Evidence of familiarity with IAEA Nuclear Security Series publications and other States’ practices 2. Clear identification of all organizations that have roles and responsibilities for nuclear security and of the work that will need to be carried out in the subsequent phases 3. Evidence that nuclear security considerations for siting have been defined and have been considered as part of the siting assessment (see infrastructure issue No. 12, site and supporting facilities) 4. Evidence that international cooperation and assistance is being used 5. Evidence that the need to address the interface with safety and safeguards is recognized. 	
<p>Observations</p> <p>The NEPIO, through the Policy Legal and Regulatory Infrastructure Working Group (PLRIWG), is responsible for reviewing the status of the existing nuclear security infrastructure, as well as coordinating the implementation of the recommendations resulting from the review. The PLRIWG is also responsible for capacity building of staff from the relevant institutions. The INIR team was informed that provisions for nuclear security will be included in the national legislation.</p> <p>The INIR team was informed that the AEC currently is the Competent Authority for nuclear security. The AEC provides support on nuclear security matters to the National Security Council, which serves as the coordinating body for nuclear security. A concept paper is under development to address the nuclear security requirements in relation to nuclear power and identify the future coordinating mechanism for nuclear security. The concept paper will be used by the National Security Council to develop a national security strategy for nuclear power. Personnel who were involved in conducting the current threat assessment will be involved in developing the concept paper.</p> <p>A national threat assessment was conducted involving several agencies in December 2019. It identified local and regional threats, potential targets for those threats, and potential consequences that could result from an attack on or misuse of those targets. The threat assessment is reviewed every two years, as new threats arise, or as deemed necessary; the next review is scheduled for the first quarter of 2022.</p>		

The 2019 assessment focused on radioactive materials, and the review planned for in 2022, will integrate nuclear material and other radioactive material; however, it will not address a future nuclear power programme.

The INIR team was informed that security-related aspects were considered in the siting criteria for potential NPP sites. However, the only security aspect mentioned in the site survey documents is that a minimum distance from the national border is required for siting. Additional security criteria, as well as further security assessments may be necessary in the final selection of the site.

Areas for further action	Significant	Threat assessment
	Minor	

RECOMMENDATIONS

SUGGESTIONS

S-15.1.1 The AEC is encouraged to expand the current threat assessment to cover the future nuclear power programme.

GOOD PRACTICES

15. Nuclear Security		Phase 1
Condition 15.2: Recommendations from any previous reviews or audits being addressed		
Summary of the condition to be demonstrated	If any reviews or audits have been undertaken of the existing framework, there is evidence that the actions resulting from it are progressing.	
Examples of how the condition may be demonstrated	Presentation of any action plans resulting from a review or audit with progress identified.	
Observations No relevant reviews or audits were identified.		
Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		

16. Nuclear Fuel Cycle		Phase 1
Condition 16.1: Options for nuclear fuel cycle (front end and back end) considered		
Summary of the condition to be demonstrated	At a strategic level, options have been considered for the front end and back end of the fuel cycle. For the front end, options for uranium sourcing and fuel manufacture and supply have been addressed. For the back end of the fuel cycle, spent fuel storage needs and capacities (on-site and off-site) and possible reprocessing have been considered.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A document: <ol style="list-style-type: none"> a. Identifying available national natural resources and capacities for individual steps in the nuclear fuel cycle; b. Identifying potential sources of supply and services; c. Assessing available options for a national fuel cycle strategy, taking into account non-proliferation issues. 2. A document clearly demonstrating that the NEPIO understands the long term commitments related to the back end of the nuclear fuel cycle and has considered the options and their implications. The document needs to address the need for adequate capacity for spent fuel storage at the reactor site, the possibility of interim storage of spent fuel at a dedicated facility and any plans for reprocessing. 3. Clear allocation of responsibilities for development of the fuel cycle policy and strategy (front end and back end) to be undertaken during Phase 2. 	
Observations		
<p>Uganda conducted a nuclear fuel cycle assessment which briefly describes the front-end and back-end options for the nuclear fuel cycle and concluded that for the front end the most cost-effective approach would be to initially utilize international suppliers and their services for the nuclear fuel cycle. The INIR team was informed that for the front end of the nuclear fuel cycle it is not yet decided if the supplier will be the NPP vendor or a different commercial supplier.</p> <p>Developing domestic services is subject for a later decision and will be based on more detailed investigations regarding the potential of uranium resources within Uganda. Uranium exploration and evaluation in Uganda already started and is intended to be further developed in detail.</p> <p>The INIR team was also informed that there is still a need to address the legal, regulatory and institutional frameworks for uranium mining, spent fuel management and financing options. All these areas will be addressed based on the RIA recommendations.</p> <p>A nuclear fuel supply strategy for the country is being developed. The inputs for the strategy will be based on the RIA recommendations and will have to be in line with the related policy. The strategy will be decided at the policy level (after RIA is finalised and approved).</p>		

For the back end of the nuclear fuel cycle, only long-term on-site storage of the spent fuel is considered. Options for spent fuel management have yet to be considered in order to determine the optimal solution for Uganda and prepare for discussions with NPP vendors.

A strategy on spent fuel and radioactive waste management is currently being developed. In the draft version the need to establish a radioactive waste management organization (WMO) with clear responsibilities regarding the spent fuel management is recognised.

Areas for further action	Significant	
	Minor	Spent fuel management options

RECOMMENDATIONS

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SUGGESTIONS

S-16.1.1 The NEPIO is encouraged to consider further options for spent fuel management

GOOD PRACTICES

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17. Radioactive Waste Management		Phase 1
Condition 17.1: The requirements for management of radioactive waste from NPPs recognized		
Summary of the condition to be demonstrated	The NEPIO understands the significantly increased requirements for the processing, storage and disposal of high, intermediate and low-level radioactive waste from a nuclear power programme, and has developed options for the management of radioactive waste, taking into account existing arrangements.	
Examples of how the condition may be demonstrated	A document addressing possible approaches to the management of radioactive waste arising from NPP operation and decommissioning, the capabilities and resources needed, and the options and technologies for its processing, handling, storage and disposal. If reprocessing is being considered, this needs to include the management of high-level waste. Regulatory framework and financing schemes are addressed under the Infrastructure Issues Nos 7 and 4: Regulatory Framework, and Funding and Financing, respectively.	
Observations		
<p>The draft report on the current status and management of the existing radioactive waste in Uganda contains the radioactive waste categorization, highlights the approach through which the current inventory is managed and identifies the processes which could be used in managing each waste category.</p> <p>The nuclear fuel cycle assessment report considered the options of management (processing, storage and disposal) of high, intermediate and low-level radioactive waste for a nuclear power programme (including several case studies from advanced programmes).</p> <p>The Nuclear Energy Department has developed a draft Spent Fuel and Radioactive Waste Management Strategy which considers pre-disposal and disposal options.</p> <p>The Strategy addresses the need to:</p> <ul style="list-style-type: none"> — Establish a centralised facility responsible for management of radioactive waste, — Build specialised human resource, — Provide mechanisms for funding and financing of radioactive waste management activities, and — Develop a comprehensive plan related to the stakeholder awareness and involvement. <p>The Strategy does not establish radwaste management routes. However, the INIR team was informed that the strategy shall be revised every five (5) years to reflect the nuclear power programme developments in line with the National Development Plan time frame.</p> <p>The INIR team was informed that the finalization of the Strategy is closely interrelated with the RIA completion which will provide the inputs for:</p> <ul style="list-style-type: none"> — Enhancing the regulatory framework; — Establishing a new organization for radwaste management (WMO); — Establishing the financing framework for the complete waste management cycle; and 		

— Considering the interfaces with and transfer of responsibilities between the foreseen future organizations (NPP operator, regulator and waste management operator).

Once these tasks are completed, the strategy will be accordingly revised.

The INIR team was informed that the responsibility for radioactive waste management will rest with the operator of the NPP, while AEC will be responsible for regulatory control.

Areas for further action	Significant	
	Minor	Options for RWM

RECOMMENDATIONS

SUGGESTIONS

S-17.1.1 The NEPIO is encouraged to continue to assess options for the management of radioactive waste and further develop the strategy.

GOOD PRACTICES

17. Radioactive Waste Management		Phase 1
Condition 17.2: Options for disposal of all radioactive waste categories understood		
Summary of the condition to be demonstrated	The NEPIO understands the options for disposal of each of the different waste categories. Although the specific routes for disposal of the different waste categories (including spent fuel if considered as waste) can be decided later, the need to select and plan for adequate options is recognized.	
Examples of how the condition may be demonstrated	A document indicating that the NEPIO understands options for disposal of different radioactive waste categories and options for funding these activities.	
Observations		
<p>The draft Spent Fuel and Radioactive Waste Management Strategy and Nuclear Fuel Cycle Assessment Report both identify the disposal options for all radioactive waste categories.</p> <p>According to the existing regulatory framework, the operator (license holder) is responsible for the complete management (including disposal) of the radioactive waste generated.</p> <p>Most of the current Uganda inventory consists of Disused Sealed Radioactive Sources (DSRS) which are stored on the user's premises or in a centralised interim storage facility under AEC authority.</p> <p>Based on case studies from countries operating NP programmes, Uganda drafted the Spent Fuel and Radioactive Waste Management Strategy which provides information on the options for disposal of radioactive waste and focuses on the short and mid-term strategic actions to be implemented: strengthening the regulatory framework in the field, establishing centralized radioactive waste management facilities, ensuring the availability of the specialised human resources, and establishing a funding mechanism for safe radioactive waste management.</p> <p>The evaluation of the feasibility of implementing the disposal options stated in the Strategy was not conducted. The INIR team was informed that: (a) the operational waste is expected to be stored on the NPP site; and (b) once the WMO will be established the technical solutions regarding the disposal of radioactive wastes and spent fuel as well as the distribution of the responsibilities will be decided.</p>		
Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		

18. Industrial Involvement		Phase 1
Condition 18.1: National policy with respect to industrial involvement developed		
Summary of the condition to be demonstrated	A policy for national involvement in the nuclear power programme has been developed, taking into account current industrial capacity and technical services, current and required quality standards, and potential investment requirements. The policy may include short term and longer term targets for industrial involvement.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A survey of companies with the potential to participate in the nuclear power programme for construction, equipment provision or support services, with a review of their ability to satisfy the requirements of a nuclear power programme 2. Meetings with, or training of, potential suppliers to explain standards and qualifications required, review feasibility of involvement, and identify required actions and funding requirements. 	
Observations		
<p>The 2014 ‘Buy Uganda Build Uganda’ (BUBU) policy is applicable to all Government programmes and hence also to the nuclear power programme. It provides policy objectives on:</p> <ul style="list-style-type: none"> — Promoting the consumption and use of locally manufactured goods and services (both through public sector procurement and the ordinary channels of commerce); — Promoting conformity to standards; — Provide capacity building programs for local suppliers of goods and services. <p>In addition, the 2020 National Industrial Policy is designed as a “framework for achieving industrialization in Uganda in order to create employment, increase value addition to local raw materials, increase export of manufactured products and increase sector contribution to GDP”. The INIR team was informed that this policy is also applicable to the nuclear power programme and that a separate policy for national involvement in the nuclear power programme is not envisaged.</p> <p>The NEPIO conducted a study on Local Industrial Involvement in the Supply of Goods and Services Required for the First Nuclear Power Project in Uganda, identifying 13 categories of goods and 25 categories of services that could be provided. The NEPIO also conducted a preliminary survey on local cement and steel industries, on the basis that these industries are established and have participated in other major projects. This was a desktop study based on a questionnaire covering topics such as annual production, experience (project participation), standards used for production, and registration status. The questionnaire was completed by four suppliers of cement products and 12 suppliers of steel products. The survey results showed that these industries produce high quality goods in accordance with ISO, East African and British Standards.</p> <p>The INIR team was informed that a more detailed survey will be conducted in 2022 on the capabilities of local industries, starting with a follow-up survey on the cement and steel industry. A national industrialisation database was launched in 2020 by the Government. It includes comprehensive information on products and suppliers and will help in the preparation for the detailed survey.</p>		

The INIR team was informed that a local content strategy will be developed for the nuclear power plant project, focused on the ‘conventional island’ and ‘balance of plant’ scopes. The INIR team was further informed that the NEPIO will benchmark the approach used in the nuclear power programme with the approach used in the oil and gas sector in Uganda. The results of the detailed survey and the benchmarking exercise will guide the development of the local content strategy and plan for the nuclear power plant project.

The INIR team noted that some members of the Siting and Technology Deployment Working Group have participated in scientific visits, technical meetings and trainings in areas of local industrial involvement in several countries with operational nuclear power plants.

The INIR team was informed that consultations with stakeholders, including trade unions, local manufacturers, the Uganda National Bureau of Standards (UNBS), and relevant ministries, departments and agencies, identified the need to provide further information about nuclear standards, as well as to consider incentives to support the local industry’s participation in the nuclear power programme.

Areas for further action	Significant	
	Minor	

RECOMMENDATIONS

SUGGESTIONS

GOOD PRACTICES

GP-18.1.1 Early development of a comprehensive list of goods and services that could be locally supplied for the construction of the nuclear power plant as part of the National Industrial Policy.

19. Procurement		Phase 1
Condition 19.1: Requirements for purchasing NPP services recognized		
Summary of the condition to be demonstrated	Recognition of the requirements associated with purchasing services.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Appropriate procurement of consulting services in Phase 1. 2. Evidence that the issues related to services for Phase 2 activities are recognized, allowing for both national and foreign suppliers. 	
<p>Observations</p> <p>The Public Procurement and Disposal of Public Asset (PPDA) Act of 2003, as amended in 2021, establishes the Public Procurement and Disposal of Public Assets Authority, and formulates the policies with respect to public procurement and disposal activities. The PPDA allows for both national and foreign participation in public procurements. The INIR team was informed that consultancy services have been procured for the nuclear power programme. NED, with support from the Procurement and Disposal Division in MEMD, prepares annual procurement plans to support activities related to the nuclear power programme.</p> <p>The INIR team was informed that, when necessary, multi-sectoral committees are established to support procurements related to the nuclear power programme. These committees include representation from NED as well as other relevant government departments and agencies. These committees support the development of the terms of reference and technical specifications for procurements, review and evaluate the bids before a contract is awarded. The INIR team was informed that quality and safety are emphasized in all procurements related to the nuclear power programme, and that bids are evaluated using weighted criteria that consider technical aspects.</p> <p>The INIR team was informed that services will be procured for the next phase of the programme in the areas of siting, preparation of bid specifications, and supporting the AEC in implementing its regulatory functions.</p>		
Areas for further action	Significant	
	Minor	
RECOMMENDATIONS		
SUGGESTIONS		
GOOD PRACTICES		

APPENDIX 2: LISTS OF THE INIR TEAM MEMBERS AND UGANDAN COUNTERPARTS

INIR MISSION REVIEW TEAM		
Mr Mehmet Ceyhan	Team Leader, IAEA/NENP-NIDS	
Mr Frédéric Bourdin	Mission Coordinator, IAEA/NENP-NIDS	
Mr Garl Bultz	IAEA/NSNS-MAFA	
Mrs Felicia Dragolici	IAEA/NEFW-WTS	
Ms Stephanie Seely	IAEA/NENP-NIDS	
Mrs Rebecca Stevens	IAEA/SG-CTR	
Mr Anthony Stott	IAEA/NENP-NIDS	
Mr Anil Bölme	International Expert, Turkey	
Mr Abdelmadjid Cherf	International Expert, Algeria	
Mr Matthew Van Sickle	International Expert, USA	
Mr Rachid Zair	International Expert, Morocco	
PARTICIPANTS FROM THE REPUBLIC OF UGANDA		
INFRASTRUCTURE ISSUE	REPRESENTATIVE	ORGANIZATION
1	National position	
	<ul style="list-style-type: none"> • Mr. Mwenyi Davis • Ms. Lugayizi Irene • Mr. Amose Olwenyi • Mr. Kandwanaho Jonan • Mr. Hannington Musimenta • Mr. Ajutu Emmanuel • Ms. Sarah Nafuna • Mr. Emmanuel Wamala • Mr. Muhindo Patrick • Mr. Denis Tusiime Tungotyo • Mr. Niwemuhwezi Anselm 	<ul style="list-style-type: none"> • Office of the President • Ministry of Justice and Constitutional Affairs • Ministry of Internal Affairs • NPA • NPA • MEMD • MEMD • MEMD • MEMD • MEMD • MEMD

2	Nuclear safety	<ul style="list-style-type: none"> • Lt.Col John Tagaswire • Mr. Nimbashabira Nazarius • Mr. Ssegane Richard • Mr. Byamukama Abdul • Mr. Sabbiti Baguma • Mr. Alex Twesigye • Mr. Anselm Niwemuhwezi 	<ul style="list-style-type: none"> • Ministry of Defence and Veteran Affairs • AEC • AEC • AEC • MEMD • MEMD • MEMD
3	Management	<ul style="list-style-type: none"> • Mr. Muwanguzi Abraham • Ms. Sarah Nafuna • Ms. Kabugo Rhita • Mr. Ouma Harrison • Mr. Nimbashabira Nazarius • Mr. Senkyazi Deo • Ms. Sheila Akankwatsa • Mr. Denis Tusiime Tungoty • Mr. Emmanuel Wamala • Mr. Derrick Cheriberi 	<ul style="list-style-type: none"> • NPA • MEMD • MEMD • MEMD • MEMD • AEC • Ministry of Foreign Affairs • MEMD • MEMD • MEMD
4	Funding and financing	<ul style="list-style-type: none"> • Ms. Namuli Monica • Mr. Benjamin Alezu • Mr. Fred Tumusiime • Mr. Muhindo Patrick • Mr. Mwesigwa Tonny • Mr. Emmanuel Wamala • Ms. Faith Rukundo 	<ul style="list-style-type: none"> • Ministry of Finance, Planning and Economic Development • Ministry of Finance, Planning and Economic Development • Ministry of Finance, Planning and Economic Development • MEMD • MEMD • MEMD • MEMD

5	Legal framework	<ul style="list-style-type: none"> • Dr. Abubakar Moki • Mr. Mwenyi Davis • Mr. Sekyanzi Deo • Ms. Ampeire Sheila Lwamafa • Ms. Sarah Nafuna • Mr. Baguma Sabbiti • Mr. Niwemuhwezi Anselm • Mr. Nimbashabira Nazarius • Mr. Byamukama Abdul 	<ul style="list-style-type: none"> • Office of the President • Office of the President • AEC • Ministry of Justice and Constitutional Affairs • MEMD • MEMD • MEMD • AEC • AEC
6	Safeguards	<ul style="list-style-type: none"> • Mr. Nimbashabira Nazarius • Ms. Asha Nabanja • Mr. Senkyazi Deo • Mr. Baguma Sabbiti • Mr. Robert Kilyowa 	<ul style="list-style-type: none"> • AEC • Ministry of Foreign Affairs • AEC • MEMD • MEMD
7	Regulatory framework	<ul style="list-style-type: none"> • Mr. Isaac V. Kinhonhi • Mr. Nimbashabira Nazarius • Mr. Richard Mugambwa • Mr. Byamukama Abdul • Mr. Baguma Sabbiti. • Mr. Tusiime Denis Tungotyo • Ms. Faith Rukundo • Mr. Derrick Cheriberi 	<ul style="list-style-type: none"> • ERA • AEC • NEMA • AEC • MEMD • MEMD • MEMD • MEMD
8	Radiation protection	<ul style="list-style-type: none"> • Dr. Jackson Amone • Mr. Byamukama Abdul • Ms. Damalie Abbo • Mr. Robert Kilyowa 	<ul style="list-style-type: none"> • Ministry of Health • AEC • MEMD • MEMD
9	Electrical grid	<ul style="list-style-type: none"> • Mr. Luyima Derrick • Mr. Namungo Mark • Mr. Nsubuga Emmanuel • Mr. Musa Mukulu • Mr. Emmanuel Wamala • Ms. Zeridah Kimanywenda • Mr. Tusiime Denis Tungotyo 	<ul style="list-style-type: none"> • UETCL • UETCL • MEMD • UEGCL • MEMD • MEMD • MEMD

10	Human resource development	<ul style="list-style-type: none"> • Hajati. Nusula • Dr. Pius Achanga • Ms. Katusabe Eva • Mr. Janja Benard • Mr. Harrison Ouma Wafula • Mr. Alex Twesigye • Ms. Zeridah Kimanywenda 	<ul style="list-style-type: none"> • Ministry of Education and Sports • Uganda National Council for Higher Education • Ministry of Gender, Labour and Social Development • National Curriculum Development Centre • MEMD • MEMD • MEMD
11	Stakeholder involvement	<ul style="list-style-type: none"> • Dr. Patricia Litho • Ms. Susan Nalwoga • Ms. Abbo Damalie • Mr. Derrick Cheriberi 	<ul style="list-style-type: none"> • MEMD, Communication and Information Management Division • MEMD • MEMD • MEMD
12	Site and supporting facilities	<ul style="list-style-type: none"> • Mr. Byamukama Abdul • Mr. Kayemba Lumama Abel • Ms. Christine Mukwaya • Eng. Jude Kidega C. • Mr. Julius Kiprop • Dr. Tugume Fred • Ms. Geraldine Paula • Mr. Kabenge Lawrence • Mr. Charles Anduma • Mr. Yafesi Batuli • Mr. Denis Tusiime Tungotyo • Ms. Zeridah Kimanywenda 	<ul style="list-style-type: none"> • AEC • Ministry of Lands, Housing and Urban Development • Ministry of Water and Environment • Ministry of Works and Transport • Uganda National Meteorological Authority • MEMD • MEMD • MEMD • Nakasongola LG • Buyende LG • MEMD • MEMD

13	Environment protection	<ul style="list-style-type: none"> • Mr. Mugambwa Richard, Environment Inspector • Mr. Kiguli Dan • Ms. Aguti Carol • Mr. Alex Twesigye • Ms. Faith Rukundo 	<ul style="list-style-type: none"> • National Environment Management Authority • National Environment Management Authority • MEMD • MEMD • MEMD
14	Emergency planning	<ul style="list-style-type: none"> • Mr. Ogwang Jimmy • Mr. Ssegane Richard • Mr. Nimbashabira Nazarius • Mr. Alex Twesigye • Mr. Anselm Niwemuhwezi • Ms. Damalie Abbo • Mr. Nimbashabira Nazarius • Mr. Byamukama Abdul • Mr. Alex Twesigye 	<ul style="list-style-type: none"> • Office of the Prime Minister • AEC • AEC • MEMD • MEMD • MEMD • AEC • AEC • MEMD
15	Nuclear security	<ul style="list-style-type: none"> • Lt.Col John Tagaswire • Lt.Col Nuwakuma Charles • Mr. Buloolo Stephen • Mr. Ssegane Richard • Ms. Benah Brenda • Mr. Alex Twesigye • Mr. Robert Kilyowa 	<ul style="list-style-type: none"> • Ministry of Defence and Veteran Affairs • Ministry of Defence and Veteran Affairs • Office of the President • AEC • Uganda Police Force • MEMD • MEMD
16	Nuclear fuel cycle	<ul style="list-style-type: none"> • Ms. Agnes Alaba • Mr. Tusiime Denis Tungotyo • Mr. Emmanuel Wamala • Mr. Ocilaje Thomas • Mr. Robert Kilyowa • Ms. Faith Rukundo 	<ul style="list-style-type: none"> • MEMD • MEMD • MEMD • MEMD • MEMD • MEMD

17	Radioactive waste management	<ul style="list-style-type: none"> • Mr. Senkyazi Deo • Ms. Ruth Asaba • Mr. Richard Mugambwa • Mr. Thomas Ocilaje • Mr. Robert Kilyowa • Ms Rukundo Faith 	<ul style="list-style-type: none"> • AEC • AEC • NEMA • MEMD • MEMD • MEMD
18	Industrial involvement	<ul style="list-style-type: none"> • Ms. Nakazzi Bena • Dr. Abdul Ndifuna • Mr. John Kyazze • Mr. David Ekou Ekanya • Mr. Mugabe Robert • Mr. Kisitu Henry • Mr. Galande Johnstone • Ms. Damalie Abbo • Mr. Derrick Cheriberi 	<ul style="list-style-type: none"> • Ministry of Trade, Industry and Cooperatives • Uganda National Bureau of Standards • Uganda National Bureau of Standards • Uganda Development Corporation • URSB • UIA • UBOS • MEMD • MEMD
19	Procurement	<ul style="list-style-type: none"> • Mr. Ssentongo Frederick • Mr. Sabitti Tom • Ms. Mbabazi Faith • Mr. Emmanuel Wamala • Mr. Derrick Cheriberi 	<ul style="list-style-type: none"> • MEMD • MEMD • Public Procurement and Disposal of Public Assets Authority (PPDA) • MEMD • MEMD

APPENDIX 3: REFERENCES

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APPENDIX 4: ABBREVIATIONS

AEC	Atomic Energy Council
AFCONE	African Commission on Nuclear Energy
AFRA	African Regional Cooperative Agreement for R&D and Training related to Nuclear Science and Technology
BOOT	Build, Own, Operate, Transfer
BOT	Build, Operate, Transfer
CIMD	Communications and Information Management Division
CNNC	China National Nuclear Corporation
CPPNM	Convention on the Physical Protection of Nuclear Material
EAPP	East African Power Pool
ECA	Export Credit Agreement
EPR	Emergency Preparedness and Response
EPRI	Electric Power Research Institute
ERA	Electricity Regulation Authority
ERRC	Emergency Radiological Response Committee
FNRBA	Forum for Nuclear Regulatory Bodies in Africa
FY	Financial Year
GDevP	Grid Development Plan
HCM	Human Capital Management
HRDWG	Human Resources Development Working Group
IAEA	International Atomic Energy Agency
INIR	Integrated Nuclear Infrastructure review
KINS	Korean Institute for Nuclear Safety
MEMD	Ministry of Energy and Mineral Development
MOU	Memorandum of Understanding
MTEF	Medium-Term Expenditure Framework

NED	Nuclear Energy Department
NEI	Nuclear Energy Institute
NEMA	National Environmental Management Authority
NEPIO	Nuclear Energy Programme Implementing Organization
NEU	Nuclear Energy Unit
NNRERP	National Nuclear and Radiological Emergency Response
NRC	US Nuclear Regulatory Commission
PLRIWG	Policy, Legal and Regulatory Infrastructure Working Group
PPA	Power Purchase Agreement
PPP	Public Private Partnership
RAMSAR	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
RIA	Regulatory Impact Assessment
ROSATOM	Russian State Atomic Energy Corporation
SER	Self-Evaluation Report
SQP	Small Quantities Protocol
SRA	State Authority with Responsibility for Safeguards Implementation
STDWG	Siting and Technology Deployment Working Group
UETCL	Uganda Electricity Transmission Company Limited
UNBS	Uganda National Bureau of Standards