



MISSION REPORT

ON

**THE INTEGRATED NUCLEAR INFRASTRUCTURE
REVIEW (INIR) — PHASE 1**

Counterpart: Ministry of Energy of the Republic of Kazakhstan

31 October – 7 November 2016

Astana, Kazakhstan

CONTENTS

EXECUTIVE SUMMARY	5
1. INTRODUCTION	8
2. OBJECTIVES OF THE MISSION.....	8
3. SCOPE OF THE MISSION.....	9
4. WORK DONE	9
5. MAIN CONCLUSIONS.....	10
6. EVALUATION RESULTS FOR PHASE 1.....	14
APPENDIX 1: REVIEW OBSERVATIONS, RECOMMENDATIONS AND SUGGESTIONS FOR PHASE 1.....	21
REFERENCES.....	83
ABBREVIATIONS.....	85

EXECUTIVE SUMMARY

More than 80% of electricity in Kazakhstan is produced from fossil fuels. Kazakhstan's demand for electricity is expected to grow as the economy develops. Due to the desire to reduce reliance on fossil fuels and diversify primary energy sources, Kazakhstan is considering the potential role for nuclear power in the country's energy mix.

The Strategy Kazakhstan 2030 that was introduced by the President of Kazakhstan in the Message of the President of the Country to the People of Kazakhstan in 1997 identified the possible use of nuclear power to support the country's development. The Prime Minister's Order No. 60-p issued on 4 May 2014 defined the priority measures and assignment of responsibilities related to the implementation of the nuclear power programme in the Republic of Kazakhstan.

Kazakhstan is the largest uranium producer in the world and is developing capabilities to implement all stages of the front end of the nuclear fuel cycle. It has a well-developed scientific research base, including three research reactors in operation and several other nuclear installations. It also has 25 years of experience operating the BN-350 fast breeder reactor which is currently under decommissioning.

Kazakhstan has in place a legal and regulatory framework covering its current nuclear activities and in January 2016 promulgated a new Law on Use of Atomic Energy. Regulatory functions for safety, security and safeguards are assigned to the Committee of Atomic and Energy Supervision and Control (CAESC), which reports to the Minister of Energy.

In 2014, the Ministry of Energy (Department of Atomic and Energy Projects Development) was assigned to coordinate the development of the infrastructure needed to support a nuclear power programme. The Ministry of Energy carried out a number of studies including a self-evaluation based on the IAEA methodology of Kazakhstan's infrastructure for nuclear power. The final self-evaluation report was sent to the IAEA in August 2016.

The International Atomic Energy Agency (IAEA) INIR Phase 1 mission was conducted from 31 October to 7 November 2016.

Mr Kanat Bozumbayev, Minister of 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. Mr. Karakozov, Director of the Department of Atomic and Energy Projects Development in the Ministry of Energy coordinated the mission in Kazakhstan. The INIR mission team was led by Mr Milko Kovachev, Head of the Nuclear Infrastructure Development Section in the IAEA Division of Nuclear Power, and consisted of staff from the IAEA Departments of Nuclear Energy, Safeguards, Technical Cooperation and the Office of Legal Affairs as well as international experts recruited by the IAEA.

The INIR mission and associated activities were funded through a combination of the IAEA national technical cooperation (TC) project entitled ‘Supporting the Development of Infrastructure for Nuclear Power Programme’ (KAZ/2/008) and an extra budgetary contribution from the United States through a Peaceful Uses Initiative (PUI) project entitled ‘Strengthening Nuclear Power Infrastructure Development in Member States’.

The INIR team found that Kazakhstan has developed a considerable base of knowledge and experience in nuclear activities. Several studies have been carried out over a number of years and Kazakhstan has an understanding of the infrastructure issues described in the IAEA Nuclear Energy Series guide entitled ‘Milestones in the Development of a National Infrastructure for Nuclear Power’.

To assist Kazakhstan in making further progress in its infrastructure development, the INIR team made 10 recommendations and 12 suggestions. The INIR team also identified 3 good practices that may benefit other countries considering the introduction of nuclear power.

Based on the recommendations and suggestions, the following key areas for further action have been identified:

- **The Ministry of Energy needs to provide the Government with a comprehensive report summarizing the assessment of all nuclear infrastructure issues.**

Kazakhstan has considerable information on the work required to develop the nuclear infrastructure. In order to assist the Government in making a knowledgeable decision and identifying the next steps in the development of the nuclear power programme, the Ministry of Energy should develop a comprehensive report. Such report should summarize the plans concerning all nuclear infrastructure issues, estimate the financial and human resources required and identify the key policy areas that need to be addressed.

Kazakhstan should formalize the responsibilities for providing overall direction and coordination of the programme and ensure that there are adequate human and financial resources.

- **Kazakhstan needs to continue assessing its legal and regulatory framework for the nuclear power programme.**

Kazakhstan has adopted the Law 442-V on Use of Atomic Energy in January 2016 that defines responsibilities for the regulation and control of its nuclear activities, including nuclear facilities, and incorporates provisions on safety, security and safeguards. In preparation for the INIR Phase 2, Kazakhstan is encouraged to continue assessing its national legislation in order to ensure its adequacy for the future nuclear power programme.

Kazakhstan is currently regulating a number of nuclear activities and facilities and has already issued several new regulations based on the Law 442-V. Kazakhstan is encouraged to further

assess the structure and staffing of the regulatory body, including technical support, to meet the needs of the nuclear power programme.

- **Kazakhstan needs to ensure that the key responsibilities and overall approach with respect to spent fuel and radioactive waste management are developed.**

Kazakhstan has considerable experience in the management of spent fuel and radioactive waste. To enable Kazakhstan to clearly define and communicate how spent fuel and radioactive waste from the nuclear power programme will be managed, Kazakhstan should consider an overall approach including assignment of responsibilities for these areas. It should also review potential mechanisms to assure adequate funding for spent fuel and radioactive waste management arising from the nuclear power programme.

- **Kazakhstan needs to develop a plan for establishing a competent owner/operator organization.**

Kazakhstan has experience in the management of nuclear facilities. It has recently established a legal entity named Kazakhstan Nuclear Power Plants as the future owner/operator. Kazakhstan should develop a phased human resource (HR) plan for the owner/operator that builds on this experience and should use opportunities for training and experience building in other countries. A phased HR plan should include specific plans for leadership development. Kazakhstan should also prepare plans for implementation of management systems consistent with best practice among nuclear power plant owner/operators.

1. INTRODUCTION

In a letter dated 22 November 2015, the Ministry of Energy requested the International Atomic Energy Agency (IAEA) to carry out an Integrated Nuclear Infrastructure Review (INIR) Phase 1 mission in Kazakhstan. The Ministry of Energy coordinated the preparation of the self-evaluation report (SER) based on the IAEA methodology. The draft SER was sent to the IAEA in January 2016. The SER support mission combined with the pre-INIR mission took place in May 2016 and the final version of the SER report including supporting documents was sent to the IAEA in August 2016. The INIR Phase 1 mission was conducted from 31 October to 7 November 2016.

Mr Kanat Bozumbayev, Minister of the Ministry of 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. Mr Batyrzhan Karakozov, Director of the Department for Atomic and Energy Projects Development in the Ministry of Energy coordinated the mission in Kazakhstan. The INIR mission team was led by Mr Milko Kovachev, Head of the Nuclear Infrastructure Development Section in the IAEA Division of Nuclear Power, and consisted of staff from the IAEA Departments of Nuclear Energy, Safeguards, Technical Cooperation and the Office of Legal Affairs as well as international experts recruited by the IAEA.

The INIR mission and associated activities were funded through a combination of the IAEA national TC project entitled Supporting the Development of Infrastructure for Nuclear Power Programme (KAZ/2/008) and an extra budgetary contribution from the United States through a Peaceful Uses Initiative (PUI) project entitled Strengthening Nuclear Power Infrastructure Development in Member States.

2. OBJECTIVES OF THE MISSION

Integrated Nuclear Infrastructure Review (INIR) missions enable the IAEA Member State representatives to have in-depth discussions with international experts about experiences and best practices in developing nuclear power infrastructure. Formulating its recommendations, the INIR mission team considers the comments made by the relevant national organizations. Implementation of any of the INIR team's recommendations is at the discretion of the Member State requesting the mission. The results of the INIR mission are expected to help the Member State to develop an action plan to fill any gaps, which in turn will help complete the development of the national nuclear infrastructure.

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 Nuclear Energy Series publication No. NG-G-3.1 (Rev.1) *Milestones in the Development of a National Infrastructure for Nuclear Power* and the evaluation conditions described in the Nuclear Series publication No. NG-T-3.2 (Rev.1) *Evaluation of the Status of National Infrastructure Development*;
- Identify the areas requiring further actions to reach respective Milestones;
- Provide recommendations and suggestions which can be used by the Kazakhstan Government and national institutions to prepare an action plan.

3. SCOPE OF THE MISSION

The INIR Phase 1 mission reviewed status of conditions in Kazakhstan covering all the 19 nuclear power programme infrastructure issues for Phase 1 as defined in the above-mentioned IAEA publications. Prior to the mission, Kazakhstan prepared the self-evaluation report (SER) covering all infrastructure issues for Phase 1 using the evaluation methodology as described in the above mentioned IAEA publication *Evaluation of the Status of National Infrastructure Development*. The SER report was delivered to the IAEA together with other relevant supporting documents.

4. WORK DONE

Prior to the mission, the INIR team reviewed the self-evaluation report and the supporting documentation that included relevant national laws, regulations, studies and reports. The INIR team sought input from the IAEA staff with relevant work experience with Kazakhstan. The INIR team meetings prior to the mission were conducted in Vienna on 28 October 2016 and in Astana, from 29 to 30 October 2016.

The INIR mission was conducted from 31 October to 7 November 2016. The meetings were held at the Ministry of Energy in Astana. The main interviews were conducted over four days. During the interviews, the Kazakhstan counterparts provided an update on the status of issues where progress had been made since the self-evaluation report was finalized and provided the additional supporting documents requested by the INIR team.

The preliminary draft report was prepared by the INIR team and discussed with the counterparts. The main mission results were presented to representatives of the Government in an exit meeting on 7 November 2016 with the preliminary draft report delivered to the counterparts during the meeting.

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 with participation from 7 organizations in Kazakhstan involved in the nuclear power programme and corresponding infrastructure. The full list of participants can be found in Appendix 2.

The INIR team found that Kazakhstan has developed considerable knowledge and experience in nuclear activities. Several studies have been carried out over a number of years and Kazakhstan has an understanding of the infrastructure issues described in the Nuclear Energy Series publication entitled *Milestones in the Development of a National Infrastructure for Nuclear Power (Rev.1)*.

To assist Kazakhstan in making further progress in its infrastructure development, the INIR team made 10 recommendations and 12 suggestions. The INIR team also identified 3 good practices that may benefit other countries considering the introduction of nuclear power.

Based on the recommendations and suggestions, the following key areas for further action have been identified:

- **The Ministry of Energy needs to provide the Government with a comprehensive report summarizing the assessment of all nuclear infrastructure issues.**

Kazakhstan has considerable knowledge on the work required to develop the nuclear infrastructure. In order to assist the Government in making a knowledgeable decision and identifying the next steps in the development of the nuclear power programme, the Ministry of Energy should develop a comprehensive report. Such report should summarize the plans concerning all nuclear infrastructure issues, estimate the financial and human resources required and identify the key policy areas that need to be addressed.

Kazakhstan should formalize the responsibilities for providing overall direction and coordination of the programme and ensure that there are adequate human and financial resources.

- **Kazakhstan needs to continue assessing its legal and regulatory framework for the nuclear power programme.**

Kazakhstan has adopted the Law 442-V on its Use of Atomic Energy that defines responsibilities for the regulation and control of nuclear activities, including nuclear facilities,

and incorporates provisions on safety, security and safeguards. In preparation for the INIR Phase 2, Kazakhstan is encouraged to continue assessing its national legislation in order to ensure its adequacy for a future nuclear power programme.

Kazakhstan is currently regulating a number of nuclear activities and facilities and has already issued several new regulations based on the Law 442-V. Kazakhstan is encouraged to further assess the structure and staffing of the regulatory body, including technical support, to meet the needs of the nuclear power programme.

- **Kazakhstan needs to ensure that key responsibilities and overall approach with respect to spent fuel and radioactive waste management are developed**

Kazakhstan has considerable experience in the management of spent fuel and radioactive waste. To enable Kazakhstan to clearly define and communicate how spent fuel and radioactive waste from a nuclear power programme will be managed, Kazakhstan should consider an overall approach including assignment of responsibilities for these areas. It should also review potential mechanisms to assure adequate funding for spent fuel and radioactive waste management arising from the nuclear power programme.

- **Kazakhstan needs to develop a plan for establishing a competent owner/operator.**

Kazakhstan has experience in the management of nuclear facilities. It has recently established a legal entity named Kazakhstan Nuclear Power Plants as the future owner/operator. Kazakhstan should develop a phased human resource (HR) plan for the owner/operator that builds on this experience and should use opportunities for training and experience building in other countries. A phased HR plan should include specific plans for leadership development. Kazakhstan should also prepare plans to implement management systems consistent with best practice among nuclear power plant owner/operators.

Recommendations

National position

R-1.2.1. Kazakhstan should improve and formalize the responsibilities with the Nuclear Energy Power Infrastructure Organization (NEPIO) and ensure it is adequately resourced to coordinate the development of the nuclear power programme.

R-1.3.1 Kazakhstan should develop a comprehensive report that includes a review and assessment of all nuclear infrastructure issues before committing significant expenditure on detailed project development.

Management

R-3.1.1 Kazakhstan should improve its understanding of the IAEA safety standards in the area of management systems and develop plans to implement appropriate management systems in the key organisations involved in the nuclear power programme.

Funding and financing

R-4.1.1 NEPIO should prepare an estimate of the funding required to develop the nuclear infrastructure to assist the Government in making a knowledgeable decision on proceeding with a nuclear power programme.

R-4.2.1 Kazakhstan should complete a preliminary study on options for financing its nuclear power plants to determine feasible options and viability before committing significant expenditure on detailed project development.

Regulatory framework

R-7.1.1 Kazakhstan should review the structure for the regulatory body in order to prepare to regulate the nuclear power programme and develop a plan for its staffing.

Human Resources

R-10.2.1 Kazakhstan should develop the human resource development (HRD) plans and a national strategy to support the nuclear power programme.

Emergency planning

R-14.1.1 CAESC should initiate a review to identify the additional items (facilities, capabilities, training, etc.) that will be needed to provide emergency response capability for the nuclear power programme.

Radioactive waste

R-17.1.1 Kazakhstan should assess the increased requirements for managing spent fuel and radioactive waste arising from a nuclear power programme, and consider an overall approach for its management, including organizational and financial resources, taking into account the radioactive waste from existing facilities.

Industrial involvement

R-18.1.1 Kazakhstan should develop a policy for industrial involvement in the nuclear power programme.

Suggestions

Nuclear safety

S-2.1.1 Kazakhstan is encouraged to ensure that the knowledge related to nuclear safety of NPPs, which is mainly in the national institutes, is transferred to all key organizations involved in the nuclear power programme.

Management

S-3.1.1 Kazakhstan is encouraged to develop a leadership programme for potential future leaders in the owner/operator organization and the regulatory body.

Funding and financing

S-4.1.1 Kazakhstan is encouraged to review the principles of how adequate funds for radioactive waste and spent fuel management and decommissioning can be assured.

Legal framework

S-5.2.1 Kazakhstan is encouraged to further assess its nuclear legislation to adequately address all aspects of a comprehensive national nuclear law that are relevant for a nuclear power programme.

S-5.3.1 Kazakhstan is encouraged to continue assessing the adequacy of national laws that may have an impact on the nuclear power programme.

Safeguards

S-6.2.1. Kazakhstan is encouraged to further enhance its safeguards regulations.

S-6.3.1 CAESC is encouraged to address the outstanding follow-up action from the International State System of Accounting for and Control of Nuclear Material Advisory Service (ISSAS) mission to acquire technical resources and means to conduct independent verification.

Regulatory framework

S-7.1.1 CAESC is encouraged to evaluate the technical support required for the licensing of an NPP.

Human Resources

S-10.1.1 Kazakhstan is encouraged to make further efforts on identification of the staffing needs of key organisations for the next phases and to identify any gaps in the national capacity (resources, education, training, etc.).

Stakeholder involvement

S-11.1.1 Kazakhstan is encouraged to develop training for nuclear spokespersons and senior managers, based on national and international experience.

Environmental protection

S-13.2.1 Kazakhstan is encouraged to review its obligations under the ESPOO and Aarhus Conventions and determine what may be required for the nuclear power programme.

Nuclear fuel cycle

S-16.1.1 Kazatomprom is encouraged to undertake more detailed studies on participation in segments of the front-end of the nuclear fuel cycle in order to prepare for negotiations with potential vendors of NPPs.

Good Practices

National position

GP-1.3.1 The early assignment of responsibilities for the development of the future owner/operator organization.

Stakeholder involvement

GP-11.1.1 The use of a non-governmental organization (NGO) to carry out stakeholder involvement activities including outreach to parliamentarians, visits to nuclear facilities and institutions in other countries and the early establishment of a nuclear information centre.

Site and supporting facilities

GP-12.1.1 Use of government commission and expert working group with representatives from all relevant institutions to review the initial site survey and to take into account lessons learned from the Fukushima Daiichi accident and select preferred regions.

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' indicates that there is considerable effort still needed to realize the stated 'Condition', and that achievement of this 'Condition' is needed to be

able to sustain overall progress in developing an effective national nuclear power infrastructure.

Minor actions needed:

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

No actions needed:

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

Recommendations:

Recommendations are proposed when fulfilment of the condition is incomplete or inadequately implemented. Recommendations are specific, realistic and designed to result in tangible improvement. Recommendations are based on the *Milestones Approach*.

Suggestions:

Suggestions propose a more effective or alternative approach to progress the infrastructure issue. They may relate to work already under consideration for the next Phase.

Good practices:

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

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 and importance of safety, security and non-proliferation recognized			X
1.2. NEPIO established and staffed	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 recognised	X	X	
4. Funding and Financing	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
4.1 Strategies for funding established	X	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 for development of comprehensive national nuclear law in place		X	
5.3. Plan to enact and/or amend other legislations affecting the nuclear power programme in place		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 SSAC planned		X	
6.3. Recommendations from any previous reviews or audits being progressed		X	
7. Regulatory Framework	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
7.1. Development of an adequate regulatory framework planned	X	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 Resources	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
10.1. Necessary knowledge and skills identified and gaps in current capabilities 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 progressed			X
15. Nuclear Security	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
15.1. Nuclear security requirements recognized and the actions of all relevant organisations coordinated			X
15.2. Recommendations from any previous reviews or audits being progressed			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	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
17.1. Requirements for management of radioactive waste from NPP recognised	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 with respect to industrial involvement developed	X		
19. Procurement	Phase 1		
Condition	Actions Needed		
	SIGNIFICANT	MINOR	NO
19.1. Requirements for purchasing NPP services recognised			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 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 co-ordination of activities. 	
Review observations		
<p>Kazakhstan has developed a hierarchy of policy documents which includes strategic guidance for the development of the nuclear sector and which are intended to ensure conditions for the development of atomic energy programme:</p> <ul style="list-style-type: none"> — The Strategy Kazakhstan 2030 that was introduced by the President of the Republic of Kazakhstan in the Message of the President of the Country to the People of Kazakhstan in 1997; — The Strategic Plan of Development of Kazakhstan till 2020 issued by the Decree of the President of the Republic of Kazakhstan on 1 February 2010; — Strategic Plan of the Ministry of Energy of the Republic of Kazakhstan for 2014–2018, as amended on 29 December 2015; — Concept for the Development of the Fuel and Energy Complex of the Republic of Kazakhstan until 2030 dated 28 June 2014. <p>Kazakhstan has adopted the Law of the Republic of Kazakhstan No. 442-V, dated 12 January 2016 on the Use of Atomic Energy recognizing the importance of nuclear safety, nuclear security and non-proliferation. It contains provisions for safety, security and safeguards.</p> <p>The Prime Minister of Kazakhstan issued the Order 60-p dated 4 May 2014 approving the priority measures and division of responsibilities related to the implementation of the nuclear power programme in the Republic of Kazakhstan. The Order was amended on 2 November 2016.</p> <p>The Charter of the Ministry of Energy describes its responsibilities in the field of nuclear energy. The Ministry of Energy is responsible for setting policy, inter alia, in the field of nuclear energy. This</p>		

function is delegated to the Department for Atomic and Energy Projects Development.		
Areas for further action	Significant	No
	Minor	No
RECOMMENDATIONS		
None		
SUGGESTIONS		
None		
GOOD PRACTICES		
None		
Condition 1.2: The NEPIO established and staffed		Phase 1
Summary of the condition to be demonstrated	<p>The nuclear energy programme implementing organization (NEPIO):</p> <ol style="list-style-type: none"> a. Has clear terms of reference which call for a comprehensive review of all the issues relevant to making a decision to proceed with a nuclear 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. Is staffed with appropriate resources (including budget for external support) and expertise; 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 who it reports to. 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, 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, environment, etc. 	

Review observations

The Ministry of Energy acts as the nuclear energy programme implementing organization (NEPIO) and performs this function through its Department of Atomic Energy Projects Development (DAEPD). The designation as the NEPIO has not been formalized by the Government's decision.

The INIR team was informed that the Charter of the Ministry and DAEPD lists the responsibilities and communication lines with other stakeholders.

The DAEPD has 15 staff members but also utilizes the resources of the institutes under its responsibility. However, the INIR team noted that the distribution of responsibilities within the NEPIO is not clearly formalized.

The Ministry of Energy has both regulatory and promotional functions. Two Committees are under the direct control of the Ministry:

- The Committee for Atomic and Energy Supervision and Control. This Committee is the regulatory body in the field of nuclear safety, security and safeguards;
- The Committee for Ecological Regulation. This Committee is the regulatory body in the field of environmental protection. There is no Ministry of Environment.

An electronic system named LOTUS governs how ministries communicate and defines deadlines for response. The INIR team was informed that this system is used by the Ministry of Energy to involve and get comments from other ministries on nuclear-related documents and decisions.

The INIR team was informed that NEPIO activities are funded through the annual budget of the Ministry of Energy.

Areas for further action	Significant	NEPIO functions
	Minor	No

RECOMMENDATIONS

R-1.2.1 Kazakhstan should formalize the responsibilities within the NEPIO and ensure it is adequately resourced to coordinate the development of the nuclear power programme.

SUGGESTIONS

None

GOOD PRACTICES

None

Condition 1.3: National strategy defined		Phase 1
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. Analysis of energy demand and energy alternatives; b. An evaluation of the impacts of nuclear power on the national economy, e.g. GDP and employment; c. A preliminary technology assessment to identify technologies that are consistent with the 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 owner/operator; h. Recognition that there remain 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>Note: Any pre-feasibility study carried out during Phase 1 can be a significant input to the comprehensive report, although it is important that the report fully address all 19 infrastructure issues.</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); current status and conclusions. 2. Contents list for the report(s). 3. Executive summary of the report(s). 4. Evidence of ministerial review of the report(s). 	
Review observations		
<p>The Prime Minister’s Order 60-p issued on 4 May 2014 and amended on 2 November 2016 defines the priority measures and division of responsibilities related to the implementation of the nuclear power programme in the Republic of Kazakhstan. The order provided for the establishment of the company that will be the future owner/operator organization for NPPs in Kazakhstan.</p> <p>Kazatomprom is responsible for developing the feasibility study (FS) for the NPPs in Kurchatov, East Kazakhstan and Ulken, Balkhash region, by 2018. The Ministry of Energy and respective stakeholders are responsible to prepare a draft Government’s decision on the construction of NPPs based on the FS results.</p> <p>On 29 July 2014 Kazakhstan Nuclear Power Plants JSC was registered within the National Wealth</p>		

Fund Samruk-Kazyna JSC. This company has recently been transferred to NAC Kazatomprom JSC. The functions and responsibilities of this company will be established by an order of the Prime Minister.

The INIR team was informed that previous studies had identified the need for the construction of nuclear power plants. These studies were based on the forecasts of demand, balanced by the existing electrical capacity in Kazakhstan, forecast of development of the electrical grid network until 2030, and additional generating capacity. Other reasons for introducing nuclear power include diversification of energy sources, environmental protection and technological development.

The INIR team noted that Kazakhstan has carried out a number of studies related to the development of nuclear infrastructure but the studies have not been brought together into a comprehensive report to assist the Government in making an informed decision.

Areas for further action	Significant	Comprehensive report
	Minor	No

RECOMMENDATIONS

R-1.3.1 Kazakhstan should develop a comprehensive report that includes a review and assessment of all nuclear infrastructure issues before committing significant expenditure on detailed project development.

SUGGESTIONS

None

GOOD PRACTICES

GP-1.3.1 The early assignment of responsibilities for the development of the future owner/operator organization.

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 recognized.

Examples of how the condition may be demonstrated

1. Evidence that the NEPIO has an understanding of and commitment to nuclear safety and the principles described in the IAEA Safety Fundamentals and is aware how nuclear safety requirements are taken into account in various designs of nuclear power plants.
2. Evidence that the prime responsibility of the licensee 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.

Review observations

Based on the IAEA recommendations and standards on safety (particularly, *Fundamental Safety Principles* IAEA Safety Standards Series No. SF-1) Kazakhstan developed in 2010 three main technical regulations, including requirements for design, commissioning, operation and decommissioning of NPP.

Several activities that show understanding of nuclear safety principles in Kazakhstan, have been performed, for example:

- In 2006, Atomic Stations Kazakhstan-Russia Company JSC conducted a feasibility study on the Construction of NPP with VBER-300 Reactor Plants in Mangistau Oblast'. This feasibility study (FS) included a safety evaluation. Most of the local experts participating in this FS work now in Kazatomprom and are potential candidates for the newly created operating company.
- In 2008, Republic State Enterprise National Nuclear Centre of the Republic of Kazakhstan (RSE NNC), with the assistance of the Japan Atomic Power Company (JAPC), carried out a pre-feasibility study for the construction of NPPs in Kazakhstan;
- In 2013, a technical study on NPP designs was prepared at the Institute of Nuclear Physics, approved by the Scientific Committee of the Ministry of Energy and published;
- Kazakhstan submitted its first national report under the Convention on Nuclear Safety (CNS), participated in the review meeting in 2014 and has submitted its report for the 2017 meeting;
- In the framework of the bilateral cooperation agreement with Japan staff from Kazakhstan`s nuclear institutions could discuss lessons learned from the Fukushima Daiichi accident with Japanese counterparts.

The need to develop adequate competence in nuclear safety in the regulatory body and the owner/operator organization is recognized but no specific actions have been taken so far. The selection and recruitment process of staff for Kazatomprom and state bodies includes requirements on knowledge of regulatory requirements, practical experience and requirements for maintaining competence. However, there are no specific requirements concerning nuclear safety or safety and security culture. The new training centre will provide training on safety culture and security for managers, supervisors and employees.

Areas for further action	Significant	No
	Minor	Knowledge transfer

RECOMMENDATIONS

None

SUGGESTIONS

S-2.1.1 Kazakhstan is encouraged to ensure that the knowledge related to nuclear safety of NPPs, which is mainly in the national institutes, is transferred to all key organizations involved in the nuclear power programme

GOOD PRACTICES

None

Condition 2.2: Support through international cooperation initiated	Phase 1
---------------------------------------------------------------------------	----------------

Summary of the condition to be demonstrated	The need for international co-operation 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"> Evidence of review of options for bilateral or regional cooperation and specific actions for the selected co-operations started, especially with countries with an established nuclear power programme. Implementation of national technical cooperation programme with IAEA and evidence of Government financial support including nuclear safety aspects.
----------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Review observations

Kazakhstan participates in the IAEA technical cooperation (TC) programme (regional for Europe and national TC projects), has projects funded through the European Commission (EC) cooperation programme and has signed about 20 bilateral agreements with countries with advanced nuclear programmes.

Kazakhstan is member of the following international organizations with the aim of building capacity in its nuclear power programme:

— Forum for Nuclear Cooperation in Asia (FNCA);

— International Framework for Nuclear Energy Cooperation (IFNEC).

Kazakhstan has participated in several international activities related to the training on nuclear safety (workshops, scientific visits, training courses, etc.).

Areas for further action	Significant	No
	Minor	No

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

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 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 ensuring 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 consistent with the appropriate IAEA standards. 	
Review observations		
<p>The existing regulatory body (Committee for Atomic and Energy Supervision and Control) has an established and experienced leadership, although it will need to be expanded to cover the nuclear power programme (see Issue 7).</p> <p>The INIR team was informed that Kazatomprom and its subsidiary companies have 25 000 staff, their own nuclear university and an institute of high technology. The HR department has developed and can offer a number of education and training programmes and has processes and procedures for the identification and appointment of senior managers. The company Kazakhstan Nuclear Power Plants JSC has recently been created as the future owner/operator. It is a wholly owned subsidiary of Kazatomprom. This new subsidiary is still awaiting an order of the head of Kazatomprom defining its functions and responsibilities; no management or staff have yet been appointed.</p> <p>Kazakhstan has benefited from training from the IAEA and other international organizations and participates in international meetings to share experience. The current national TC project KAZ/2/008 includes scientific visits for potential leaders in the nuclear power programme. For example, there was a visit of senior managers to the Czech Republic and another visit to Japan is planned.</p> <p>The Government has an academy of administration that provides training for civil servants including leadership training. A number of employees from the Ministry of Energy have attended this training.</p> <p>The INIR team was informed that at this stage there is no specific programme for leadership</p>		

development of senior managers in the owner/operator organization but this could be developed as part of the establishment of the Kazakhstan Nuclear Power Plants JSC.

The INIR team was informed that Kazatomprom has a number of subsidiary companies involved in nuclear activities related to the nuclear fuel cycle. Several of the companies have joint ownership involving foreign partners. Each of the companies is required to have a quality management system before they are granted a licence.

An international management consulting company is working with Samruk Kazyna and all its subsidiaries including Kazatomprom to carry out a complete review of the company's organization and to improve its business processes. The main transformation is expected to take place over the next three years but the work is also expected to put in place a process of ensuring continuous improvement.

The INIR team was also informed that the National Nuclear Centre carries out its activities in the framework of quality management programmes, which address quality, safety and the environment.

However, during the discussion it appeared that there was little knowledge of the IAEA safety standards in the area of management systems in either the regulatory body, the NEPIO or Kazatomprom.

Areas for further action	Significant	Management systems
	Minor	Leadership programmes

RECOMMENDATIONS

R-3.1.1 Kazakhstan should improve its understanding of the IAEA safety standards in the area of management systems and develop plans to implement appropriate management systems in the key organisations involved in the nuclear power programme.

SUGGESTIONS

S-3.1.1 Kazakhstan is encouraged to develop a leadership programme for potential future leaders in the owner/operator and the regulatory body

GOOD PRACTICES

None

4. Funding and Financing		Phase 1
Condition 4.1: Strategies for funding established		
Summary of the condition to be demonstrated	<p>Mechanisms 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 have been defined. The activities include:</p> <ol style="list-style-type: none"> a. Establishing the legal framework; b. The 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; f. Education, training and research; g. Any needed 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 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 consideration of options. 2. Evidence that the scale of the costs of each of these activities has been recognized. 	
Review observations		
<p>Kazakhstan is aware of the main elements of work that need to be funded, though they find it difficult to develop detailed estimates of costs and resources. In general, all activities that are not the responsibility of the newly formed Kazakhstan Atomic Stations Company will be funded from the annual state budget. For the regulatory body, although the numbers of staff may increase significantly the impact on the state budget may be small as staff can be transferred from other organisations. Support for development of activities may also be provided through international programmes such as IAEA, EC, etc.</p> <p>With regard to the stakeholder engagement, the INIR team was informed that there is a separate plan (with financial resources) at the State level for activities related to communication with the media and NGOs. Once the Government has made the decision concerning the nuclear power programme, some of the resources within this plan will also be allocated to activities related to communication concerning the nuclear power programme.</p> <p>The INIR team was informed that there is no significant budget required for enhancement to national education and training capability.</p> <p>For activities to be carried out by Kazakhstan Nuclear Power Plants (KNPP), funding pre-project</p>		

activities would follow the standard practice. Generally, the funding would be provided by Kazatomprom as sole shareholder of KNPP, but some additional funding may be provided by the State budget.

The INIR team was informed that the feasibility study required for the Government’s decision would address all these issues including clarification of funding requirements. The INIR team noted that not all nuclear infrastructure issues will be included in the standard terms of reference for the feasibility study.

Kazakhstan confirmed that funding for the regulatory body would continue to be provided by the State budget. In accordance with current practice the owner/operator organisation would pay licence fees to the Government.

Kazakhstan is aware of the need to establish arrangements to cover the cost of radioactive waste and spent fuel management and decommissioning. The Law on Use of Atomic Energy requires licensees to allocate funds for radioactive waste and spent fuel management and decommissioning. Kazakhstan recognizes the need to consider in more detail how the provision of adequate funds will be assured.

Areas for further action	Significant	Funding for nuclear infrastructure development
	Minor	Radioactive Waste and Spent Fuel Management and Decommissioning Costs

RECOMMENDATIONS

R-4.1.1 NEPIO should prepare an estimate of the funding required to develop the nuclear infrastructure, to assist the Government in making a knowledgeable decision on proceeding with its nuclear power programme

SUGGESTIONS

S-4.1.1 Kazakhstan is encouraged to review the principles of how adequate funds for radioactive waste and spent fuel management and decommissioning can be assured.

GOOD PRACTICES

None

4. Funding and Financing		Phase 1
Condition 4.2: Strategies for financing identified		
Summary of the condition to be demonstrated	<p>Potential options with financial and risk management strategies, which together create (1) sufficient confidence for lenders and investors to support an NPP project and (2) ensure the long term viability of the owner/operator to fulfil all its responsibilities, have been identified.</p> <p>Note: A large part of government's role in nuclear power financing, if the government is not directly a sponsor of the project, relates to financial risk reduction.</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, borrowing, etc.</p>	
Review observations		
<p>Kazakhstan is aware of the general factors related to financing but has not carried out any specific studies at this stage. Financing issues were considered in the earlier pre-feasibility study carried out 2008–2009 but this work is not directly applicable to the current plans.</p> <p>Presently, one of the possible methods of financing would be use of export credit agencies. The INIR team was informed that financial analysis will be a significant component of the feasibility study. Financing would also be addressed in the intergovernmental agreement that would precede development of contracts for NPP construction.</p>		
Areas for further action	Significant	Financing of nuclear power plants
	Minor	No
RECOMMENDATIONS		
<p>R-4.2.1 Kazakhstan should complete a preliminary study on options for financing its nuclear power plants to determine feasible options and viability before committing significant expenditure on detailed project development.</p>		
SUGGESTIONS		
None		
GOOD PRACTICES		

None

5. Legislative Framework		Phase 1
Condition 5.1: Adherence to all relevant international legal instruments planned		
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> <ol 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 of Physical Protection of Nuclear Material (INFCIRC/274) and Amendment thereto (GOV/INF/2005/10-GC(49)/INF/6); f. Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/500) ; g. Protocol to Amend the 1963 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 (INFCIRC/153 (Corrected)); k. Additional Protocol (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. 	
Review observations		
<p>Kazakhstan is already a party to the following international legal instruments adopted under the auspices of the IAEA:</p> <ul style="list-style-type: none"> — 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; — Convention of Physical Protection of Nuclear Material and Amendment thereto. 		

Kazakhstan has also concluded a Comprehensive Safeguards Agreement, an Additional Protocol and a Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA. In the area of nuclear liability, Kazakhstan is already a party to the Vienna Convention on Civil Liability for Nuclear Damage and the Protocol to Amend the Vienna Convention and is also considering adherence to the Convention on Supplementary Compensation for Nuclear Damage and to the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention.

Areas for further action	Significant	No
	Minor	No

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

Condition 5.2: Plan for development of comprehensive national nuclear law in place	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 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, emergency preparedness and response, transport of radioactive material); d. Formulate nuclear security principles; e. Give appropriate legal authority to and definition of 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);
----------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

	<ul style="list-style-type: none"> f. Implement IAEA safeguards including a State system on accounting for and control of nuclear materials (SSAC); g. Implement import and export controls of 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 of 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 IAEA and the other relevant organizations.

Review observations

Kazakhstan has enacted the Law of the Republic of Kazakhstan on Atomic Energy Use No. 442-V 3PK of 12 January 2016 ((Law 442). The Law on Radiation Safety of the Population No. 219-1 of 23 April 1998 (Law 219) is also in place.

Law 442 “shall be aimed for assurance of the nuclear non-proliferation regime, nuclear and radiation safety, and nuclear security in the use of atomic energy”. The INIR team was informed that Law 219 “regulates social relations in the area of radiation safety of the population with the aim of protection against detrimental impact of ionizing radiation” and provides, among other matters, “general requirements for an assessment of radiation safety, state and provision of radiation safety on the handling of ionizing radiation sources”.

Law 442 provides that the “designated authority in the area of use of atomic energy” shall, among other functions, exercise the State control in the area of atomic energy, licence activity in the area of use of atomic energy and develop and approve regulations (see Articles 1(7) and 6). Furthermore, Law 442 contains, among others, specific provisions on licensing (Article 9), construction of nuclear facilities and repositories (Article 12), nuclear security (Article 13), State accounting for nuclear material and sources of ionizing radiation (Article 14), export and import (Article 15), transport (Article 16), handling of radioactive waste and spent fuel (Article 17), decommissioning of facilities (Article 22), emergency preparedness and response (Article 23), safety and security reviews (Article 24) and compensation (Article 27).

While Kazakhstan has developed nuclear legislation that defines the responsibilities of the ‘designated authority’ for regulation and control of nuclear activities, including nuclear facilities, and incorporates provisions on safety, security and non-proliferation.

In preparation for Phase 2, there is a need to further assess that legal framework for a nuclear power programme, particularly for addressing aspects currently not covered by Law 442 and for ensuring consistency between the different laws applicable to the nuclear regulation of an NPP.

In particular, Law 442 does not identify the “designated authority in the area of atomic energy use”. The INIR team was informed of the process followed for the current designation of the Ministry of Energy as the ‘designated authority’ and for the creation of the Committee for Atomic and Energy Supervision and Control (CAESC). In this regard, Kazakhstan was encouraged to provide in its legislation for the establishment of an independent regulatory body with adequate financial and

human resources, as required for the effective regulation of a nuclear power programme.

In addition, there are other aspects of the legal framework that need to be enhanced, including some aspects of licensing of an NPP, nuclear security and civil liability for nuclear damage. Regarding nuclear liability, specific legal provisions should be developed, in line with the relevant international legal instruments to which the country is a party.

In connection with other applicable laws, the INIR team was informed that Law 219 was being assessed to address eventual duplications and inconsistencies between Law 442 and Law 219, both of which cover safety. Law 442 also refers to other applicable national legislation in several areas, including in connection with the core functions of authorization and inspection. In this regard, the INIR team was informed that under the national legal system, general laws exist on authorization and inspection and that the relevant provisions for the granting, renewal, suspension and revocation of licenses, the conduct of inspections, powers of inspectors and others, are contained in such laws. These laws may also need to be further reviewed to ensure their adequacy for the regulation of a NPP (see also Issue 5.3).

The INIR team was informed that CAESC is currently assessing several of the above aspects. As the nuclear power programme evolves, it would take steps to propose revisions to the nuclear legislation in the next phase.

Areas for further action	Significant	No
	Minor	Assessment of nuclear legislation

RECOMMENDATIONS

None

SUGGESTIONS

S-5.2.1 Kazakhstan is encouraged to further assess its nuclear legislation to adequately address all aspects of a comprehensive national nuclear law that are relevant for a nuclear power programme.

GOOD PRACTICES

None

Condition 5.3: Plans to enact and/or amend other legislation affecting the nuclear power programme in place	Phase 1
Summary of the condition to be demonstrated	<p>There is an understanding of what other legislation affecting the nuclear power programme needs to be established, the timescales for its development and approval, together with a commitment from government to achieve the stated plan. The other legislation to be considered includes that on:</p> <ol style="list-style-type: none"> a. Environmental protection; b. Emergency preparedness and response; 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 other any required financial legislation; l. Research and development.
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A plan of how the legislation will be developed and approved. 2. A summary of how each of the areas listed above will be addressed within proposed legislation. 3. Interactions with IAEA and the other relevant organizations.
<p>Review observations</p> <p>The INIR team was informed that, apart from the Law on Atomic Energy Use of 2016 and the Law on Radiation Safety of 1998, the main laws which identify requirements and regulations for an NPP construction are the Ecological Code and the Law on the Licensing Right and Declaration.</p> <p>In this regard, the INIR team was informed that during the process of elaboration of the new Law on Atomic Energy Use (Law 442) an assessment of relevant legislation was conducted to prevent duplications and inconsistencies, which led to some legislative amendments. Given the nature of the legal system in the country, under which some basic aspects of nuclear regulation, such as licensing and inspection procedures, are not contained in the nuclear law, but in general laws (see Issue 5.2), further assessments and reviews are expected to be conducted in this respect. In particular, there are plans to amend the Ecological Code, which contains provisions on nuclear facilities, and the Law on Insurance, to provide for compensation mechanisms for nuclear damage.</p> <p>Furthermore, the following laws have been identified as possibly having an impact in the nuclear power programme:</p> <ul style="list-style-type: none"> — Law about Civil Protection (emergency preparedness and response); — Labour Code (occupational health and safety); — Law on Copyright and Related Rights; 	

- Law on Local Government and Self-Government in the Republic of Kazakhstan;
- Enterprise Code (incorporating laws on the peasant and the farm, investments, private enterprise, competition, state control and accounting and state support of industrial innovation);
- Law on the Media (public involvement);
- Law on Regulation of Trading Activities;
- Law on Export Controls (further analysis of which may be needed to identify needed amendments — see also Issue 6);
- Law on Science.

In addition to the above laws, there is a need to continue identifying other national legislation that may have an impact on the nuclear power programme and to assess the adequacy of such laws.

Areas for further action	Significant	No
	Minor	Review of other national laws

RECOMMENDATIONS

None

SUGGESTIONS

S-5.3.1 Kazakhstan is encouraged to continue assessing the adequacy of national laws that may have an impact on the nuclear power programme.

GOOD PRACTICES

None

6. Safeguards		Phase 1
Condition 6.1: Terms of international safeguards agreement in place		
Summary of the condition to be demonstrated	<p>The Member State has a comprehensive safeguards agreement (CSA) with associated subsidiary arrangements in force with the IAEA.</p> <p>If the Member State currently has concluded a small quantities protocol (SQP) to its CSA, a plan should be developed setting out necessary steps to rescind the SQP in a timely manner.</p> <p>The Member State is aware of the requirements of the Additional Protocol (AP). If the Member State has made the decision to ratify the AP but has not already done so, a plan is in place for the timely ratification.</p>	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Plans for rescinding the SQP or/and for ratification of the AP, 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. 	
Review observations		
<p>Kazakhstan has signed a Comprehensive Safeguards Agreement (CSA) and an Additional Protocol (AP) with the IAEA (Agreement between the Republic of Kazakhstan and the International Atomic Energy Agency for the Application of Safeguards in Connection with the NPT, which entered into force on 11 August 1995 and the Additional Protocol to the Agreement between the Republic of Kazakhstan and the International Atomic Energy Agency for the Application of Safeguards in Connection with the NPT, which entered into force on 9 May 2007).</p> <p>Kazakhstan has been a member of the Nuclear Suppliers Group (NSG) and the Zangger Committee since 2002 and 2014 adopted the EU list of goods, as well as dual-use items, subject to export-import control and in acting accordingly. Kazakhstan is also reporting to the IAEA pursuant to Annex 2 of the Additional Protocol.</p> <p>The INIR team was informed that the Law on Use of Atomic Energy may need some enhancement in the area of safeguards (see Issue 5 on Legislative framework), and that more detailed regulations need to be developed.</p> <p>Kazakhstan authorities are aware of their obligations under the CSA and the AP and have ample experience in their implementation. They have an effective working relationship with all the entities involved in nuclear fuel cycle activities and also with those supporting implementation of safeguards, e.g. involved in export-import, licensing, enforcement, policy matters, etc.</p> <p>The INIR team was informed about some of the existing outreach activities and plans, including those conducted within the process of development and approval of safeguards related regulations, which go through the process of public hearing.</p>		

Areas for further action	Significant	No
	Minor	No
RECOMMENDATIONS		
None		
SUGGESTIONS		
None		
GOOD PRACTICES		
None		
Condition 6.2: Strengthening of the SSAC planned		Phase 1
Summary of the condition to be demonstrated	The Member State has a plan describing how the existing State system of accounting for and control of nuclear materials (SSAC) will be strengthened/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 CSA. 2. A plan produced by the NEPIO covering the enforcement of national legislation, policies and procedures relevant to safeguards. (N.B. The development of the legislation itself is covered under Issue 5). 3. Evidence that approaches undertaken by one or more countries with existing nuclear power programmes have been reviewed and information learned has been translated into the national context. 	
Review observations		
<p>The authority responsible for safeguards implementation is the CAESC. The SSAC functions in the CAESC are performed by the Division for Control of Material and International Safeguards.</p> <p>The INIR team noted that new and enhanced regulations for safeguards implementation have been developed, e.g.:</p> <ul style="list-style-type: none"> — Rules for State Accountancy of Nuclear Materials, Act No. 44 of 9 February 2016, and — Rules for Organization of the IAEA Inspections on the Territory of the Republic of Kazakhstan, Act No. 227 of 15 April 2016. <p>CAESC was aware that, while Rules No. 44 address several elements that were missing previously, the document may still need to be further enhanced to address aspects such as the establishment of the SSAC at facility level, the required system of records and the provision of reports and information.</p>		

CAESC also highlighted that Kazatomprom has experienced operators, competent staff and an internal system to implement the rules. In this regard, the INIR team noted that it would be useful to unify all rules, guidance and procedures in a single CAESC regulatory document.

An example of strengthening the SSAC is the new Rule No.27, where the requirements for assisting and facilitating the IAEA inspection activities are provided. The INIR team was informed that this new rule together with the estimated increase in the volume of the work arising from the possible new NPP will require an increase of staff in CAESC from 2 to 5–6 people, as well as some SSAC staff at the future NPP. CAESC will prepare a plan for increasing its competent human resources, and training of staff, including managers. (see R-7.1.1).

Areas for further action	Significant	No
	Minor	Safeguards regulations

RECOMMENDATIONS
None

SUGGESTIONS
S-6.2.1. Kazakhstan is encouraged to further enhance its safeguards regulations

GOOD PRACTICES
None

Condition 6.3: Recommendations from any previous reviews or audits being progressed	Phase 1
--------------------------------------------------------------------------------------------	----------------

Summary of the condition to be demonstrated	If any reviews or audits have been undertaken of the existing safeguards provisions, there is evidence that the actions resulting from it are being progressed.
----------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------

Examples of how the condition may be demonstrated	Action plans resulting from a review/audit with progress identified Indicating the required timescales, responsibilities and resources required.
----------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------

Review observations

The ISSAS mission to Kazakhstan was conducted in 2011 and the majority of recommendations and follow-up actions have been addressed. The INIR team was informed about progress on the outstanding issues.

In particular, the INIR team was informed that the training centre for nuclear security in Alatau is

ready to start providing training from 2017. This centre will also serve as a training hub in safeguards. Furthermore, the INIR team was informed that other follow-up actions still need to be addressed, such as acquiring, and training on using, the equipment for measuring nuclear material. This is required to provide CAESC capacity to conduct independent domestic verification inspections to assure correctness and completeness of the operators' declaration in the area of NMAC and illicit trafficking.

Areas for further action	Significant	No
	Minor	Action from ISSAS mission

RECOMMENDATIONS

None

SUGGESTIONS

S-6.3.1 CAESC is encouraged to address the outstanding follow-up action from the ISSAS mission to acquire technical resources and means to conduct independent verification.

GOOD PRACTICES

None

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. TSO, 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 of each regulator and 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 nuclear power plants.</p> <p>Note: Plans to develop competence are addressed under Issue 10.</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 etc. 3. Plans to develop the regulatory body(-ies) for safety, security and safeguards. 4. Plans to develop the regulations required. 5. Evidence of interaction and co-operation with established regulatory organizations. 6. Plans to enhance or develop appropriate technical support organizations (see also Issue 10) to the regulatory body. 7. Plans to secure support from international regulatory organizations. 	

Review observations

Kazakhstan has already a regulatory framework and a regulatory body with experience in regulating nuclear facilities. Kazakhstan has promulgated a new Law on Use of Atomic Energy Use in January 2016, which provides the functions of the ‘designated authority for atomic energy use’ for the State control in the area of atomic energy use, including functions related to safety, security and safeguards (see Issue 5 on Legal Framework). The Committee for Atomic and Energy Supervision and Control (CAESC) was established as the regulatory body by the Order of the Minister of Energy of Kazakhstan No. 42 issued on 7 October 2014.

The INIR team was informed that CAESC is “functionally independent from the Ministry of Energy” through measures such as separate decision-making on regulatory matters and separate budgeting. CAESC has currently 20 staff. It is expected that proposals for revising the organizational structure and expanding the number of staff of the regulatory body to address the needs of a nuclear power programme would be developed after the decision on NPP construction has been made. The INIR team noted however that the definition of the structure, functions and staffing of the regulatory body should be addressed in Phase 1, to adequately plan for the establishment of an effectively independent and competent regulatory body for an NPP in the areas of nuclear safety, security and safeguards (see Issues 2, 15 and 6).

The INIR team was informed that there is a plan for the development of regulations. This plan would be implemented after a decision on NPP construction has been made. There is a technical cooperation project with the IAEA (KAZ/2/008 Supporting the Development of Infrastructure for Nuclear Power Programme) that includes the development of some of these regulations, which are grouped in three broad areas: (1) site selection; (2) technical documentations for NPP construction; and (3) management of radioactive waste. Some preparatory work has already been done, and some draft regulations have been sent to stakeholders for comments.

The INIR team was informed that the radiation protection of workers and the public is regulated by the Ministry of National Economy (previously the Ministry of Health, through the sanitary and epidemiological rules) and that no decision about the future organization of the regulatory activities has been made.

The main technical support organizations are the National Nuclear Centre (1 500 staff), the Institute for Nuclear Physics (700 staff) and the Nuclear Technology Safety Centre (21 staff). The INIR team was informed that these organizations have provided support in developing regulatory documents (e.g classification of radioactive waste). They also prepared the safety analysis report for BN-350 spent fuel transportation. However, it is not clear if these organisations have all the skills and resources that will be needed in the licensing process of an NPP.

Areas for further action	Significant	Structure, functions and staffing of the regulatory body
	Minor	TSO support

RECOMMENDATIONS

R-7.1.1 Kazakhstan should review the structure for the regulatory body in order to prepare to regulate the nuclear power programme and develop a plan for its staffing.

SUGGESTIONS

S-7.1.1 CAESC is encouraged to evaluate the technical support required for the licensing of a NPP.

GOOD PRACTICES

None

8. Radiation Protection		Phase 1
Condition 8.1: Enhancements to radiation protection programmes planned		
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>Note: This issue is closely linked to Issue 7. In particular, the development of regulations and issue of whether the existing regulatory body will expand its role or whether the issues will be addressed by a separate organization is covered in Issue 7.</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 reduce exposures to as low as reasonably achievable (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. 	
Review observations		
<p>There are two laws related to radiation protection: Law on Use of Atomic Energy and Law on Radiation Protection of Population. Radiation protection (RP) requirements are covered by the Sanitary and Hygienic Rules.</p> <p>Kazakhstan has experience in radiation protection in nuclear installations (3 research reactors and the BN-350 fast breeder reactor under decommissioning).</p> <p>The current RP infrastructure covers the needs of existing facilities and activities. At national level, the licensing of activities or facilities requires availability of a defined list of RP services such as a programme of dose assessment or a system for area control. At regional level, sanitary epidemiological rules require availability of services such as dosimetry services for occupational workers control.</p> <p>For the development of the nuclear power programme in Kazakhstan, new infrastructures will be developed:</p> <ul style="list-style-type: none"> — Creation of the national Centre for complex dosimetry; — Creation of radiation monitoring system for the nuclear power plants; 		

— Improvement of current RP services.

INIR team was informed that once the nuclear power programme is approved by the Government, an international cooperation programme in this field using the existing bilateral agreements will be established.

Areas for further action	Significant	No
	Minor	No

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

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 the grid characteristics. 3. Preliminary plans to enhance the grid to meet the NPP requirements. 	
Review observations		
<p>The total available capacity of power plants in Kazakhstan is about 17 500 MW. The national electricity grid of Kazakhstan provides connections between the regions of the country and the power systems of neighbouring countries (the Russian Federation, the Kyrgyz Republic and the Republic of Uzbekistan). The national electricity grid is owned and operated by Kazakhstan Electricity Grid Operating Company (KEGOC) JSC.</p> <p>The pre-feasibility study, which was conducted in 2008-2009 with the assistance of the Japan Atomic Power Company, included forecast data on the consumption and production of electricity in Kazakhstan, and the characteristics of the electrical systems taking into account the requirements for balancing the power system in the different regions of Kazakhstan and the plans for expansion of the transmission network and the commissioning of new energy sources. The size of nuclear units that could be accommodated in the different regions of Kazakhstan was also analyzed in this study.</p> <p>The INIR team was informed that the system operator develops, subject of approval by the Ministry of Industry and New Technologies, the forecast electricity and power balance for the forthcoming seven-year period. The most recent forecast estimated that the peak demand for electricity will grow by an average of 2.5% per annum between 2016 and 2022. The required operating reserve will be maintained by the development of new generating capacity during the period.</p> <p>The INIR team was informed that a review of the electrical grid system is undertaken every 3 years. These studies consider static and dynamic characteristics of the electrical grid, taking into account the</p>		

interconnections with the systems of neighbouring countries. Regional studies have been undertaken, considering the impact of the loss of the output of a large unit on the northern grid (Kurchatov City) and the southern grid (Balkhash Lake).

The INIR team was informed that, from an electrical grid perspective, the best region for a nuclear power plant would be Kurchatov since a loss of output of a large (1 000 MW) generating unit would be compensated by the Russian electricity supply system (large thermal and hydro power stations). The current agreement with the Russian Federation makes provision for the loss of 500 MW generating capacity in the Kazakhstan electricity grid, based on the largest generating unit currently in the Kazakhstan electricity supply system. This agreement would be reviewed if the decision to construct a large nuclear power plant is taken.

The loss of output of a large generating unit in the southern electrical grid would be more difficult to manage. The INIR team was informed that current studies show that the loss of more than 600 MW in the south of the country will result in separation of the northern and southern electricity grids in order to maintain grid stability. The interconnection between the northern and southern grids has been strengthened by the construction of a second 500 kV transmission line, but further strengthening would be required, even for a 600 MW nuclear unit. There are plans to construct a third transmission line.

The INIR team was informed that the requirements regarding electrical grid stability and reliability are specified in legislation, and are based on an N-1 criterion. It was stated that N-2 criterion would probably be applied for nuclear power plants. The INIR team was informed that discussions have been held on the nuclear safety implications of connecting a nuclear power plant to the electrical grid in Kazakhstan, and there is an understanding of the implications in the system operator.

The INIR team was informed that there had been a significant improvement in the reliability of the electrical grid in Kazakhstan. A recent significant grid disturbance in the Russian Federation had no impact on the electrical grid in Kazakhstan, Also, improvements to the southern grid in recent years, have reduced the number of emergency events to 1 per annum with no separation of the northern and southern grids. Previously there were up to 10 grid separations per year.

Areas for further action	Significant	No
	Minor	No

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES
None

10. Human Resources 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 competence and capacity; b. Estimated required competence and capacity; c. Availability of domestic and foreign capacity for educating 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 emergency preparedness and response; e. What facilities and programmes need to be established for education, training and experience building; f. What 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 numbers needed, covering all the future organizations. The analysis should include: <ol style="list-style-type: none"> a) Bulk manpower needs per phase; b) Breakdown by knowledge, skills and discipline per phase; c) Flow of manpower to other projects (e.g. future NPPs). 2. An analysis of existing HR capability and the ability to attract experienced staff from other countries. 3. An assessment of the capability of existing education and training facilities. 	
<p>Review observations</p> <p>Kazakhstan has made a broad assessment of typical staffing needs and competences required for a nuclear power plant (NPP). The number of staff for future NPP operation was estimated as 600–800 persons. For the regulatory body there is an estimate that the number of staff required for licensing and attestation may increase by up to 10. Another earlier estimate suggested an increase of the regulatory body staff of up to 80 employees. Currently the regulatory body has 20 staff. There are no specific estimates of the distribution of staff by phases of the nuclear power programme development.</p> <p>The INIR team was informed that the national education system of Kazakhstan is capable of educating technical and non-technical specialists in the majority of areas of the future nuclear power programme.</p> <p>Professional training is currently performed by a number of organizations and institutes including the</p>		

National Nuclear Centre, the Institute of Nuclear Physics, the Alatau Training Centre as well as Kazatomprom subsidiaries — the Corporate Nuclear University and the Institute of High Technologies.

The INIR team was informed that the experienced operating personnel from BN-350 can be used in the nuclear power programme.

Kazakhstan also recognizes that potential partners can bring expertise to the owner/operator and noted that the vendor is expected to provide significant training, particularly for operational posts.

The most recent experience of NPP project implementation is with the JSC Kazakhstan–Russian Company Atomic Stations that was responsible for the feasibility study of an NPP with VBER-300 reactor in Mangistau Oblast (region). This can be used for the competence building of the future owner/operator JSC Kazakhstan Nuclear Power Plants. At the moment there is a plan to select CEO and appoint board of directors of this organization but there has been no analysis made on the staffing needs and associated competences for other categories of personnel.

Areas for further action	Significant	No
	Minor	Assessment of typical staffing needs for key organizations

RECOMMENDATIONS

None

SUGGESTIONS

S-10.1.1 Kazakhstan is encouraged to make further efforts on identification of the staffing needs of key organisations for the next phases and to identify any gaps in national capability (resources, education, training, etc.).

GOOD PRACTICES

None

Condition 10.2: Development of human resources planned		Phase 1
Summary of the condition to be demonstrated	Outline plans have been agreed to: <ol style="list-style-type: none"> a. Enhance national education and training; b. Develop a detailed HR development plan for each key organization; c. Integrate the plans to develop a national strategy including development of initial core leadership group. 	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Plans to develop the HR required including: <ol style="list-style-type: none"> a) Identification of national organizations which could support HR development; b) Required enhancement of education and training infrastructure; c) The development of national competence (through schools, universities, institutes, industry); d) Non-national HR 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. 	
Review observations		
<p>For key organizations involved in the nuclear power programme there are no specific human resources development (HRD) plans available at the moment and the development of these is going to be started after the Government’s decision on NPP construction is taken. There is also no overall HR strategy integrating the needs of the future organizations and addressing the key strategic issues.</p> <p>The INIR team was informed on the existing governmental programme entitled Bolashak that provides support to Kazakhstan students for overseas education in leading international universities. For example, a number of young professionals of Kazakhstan have started nuclear engineering MS programme at the National Research Nuclear University (MEPhI) in Moscow. At present, their further professional development is not specifically considered with respect to the nuclear power programme. At the moment the organization to be responsible for coordination of HRD activities in the nuclear power area at the national level has not been identified.</p>		
Areas for further action	Significant	Development of the detailed HRD plans
	Minor	No

RECOMMENDATIONS
R-10.2.1 Kazakhstan should develop the HRD plans and a national strategy to support the nuclear power programme.
SUGGESTIONS
None
GOOD PRACTICES
None

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 resource and competence, is being 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, 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 local, regional and national level. 7. A plan for ongoing interaction with the public, in particular opinion leaders, media, local and national governmental officials, neighbouring countries. 8. Plans for regular opinion polls managed by specialist companies. 9. Training programme to enable identified spokespersons to interact with stakeholders. 	
Review observations		
<p>The Ministry of Energy (the NEPIO) was tasked in 2013 to prepare a plan to promote the benefits of nuclear energy in Kazakhstan (the ‘media plan’). Other organizations and departments, such as the Ministry of Internal Affairs, the Ministry of Investment and Development, the Committee for Atomic and Energy Supervision and Control (CAESC), Kazatomprom, the National Nuclear Centre, the Institute of Nuclear Physics and the Nuclear Society of Kazakhstan Association (NSK), were involved in the development of the media plan.</p> <p>The media plan, which is updated annually, includes activities such as video clips, interviews on TV, media conferences, publication of leaflets, brochures and booklets on the use of atomic energy, articles in journals and newspapers and information on websites of the Ministry.</p> <p>The INIR team was informed that the involvement of other ministries and departments is achieved through the coordinated development of the media plan, as well as through the governance processes that require the approval of such entities for studies and documents - for example the ministerial Working Group and Special Commission that reviewed and concluded on regions and potential sites for nuclear power plants in 2013.</p> <p>The NSK manages the Information Centre on Nuclear Energy in Astana that was opened in</p>		

December 2015. The NSK also organizes technical tours to scientific and industrial organizations and nuclear power plants in other countries. The INIR team was informed that a number of events including visits to other countries have been arranged for Members of Parliament, initially at the suggestion of NSK, but subsequently at the request of the parliamentarians. For example, the Kazakhstan Members of Parliament have recently requested that a visit to Belarus is arranged, as both countries face similar issues.

The INIR team was informed that experts from the Ministry of Energy and NSK members provide experts' support for stakeholder involvement activities. Some of these experts have attended workshops and meetings on stakeholder involvement and public communications organised by the IAEA. There are no specific courses in Kazakhstan aimed at providing spokesperson training for nuclear experts. CAESC provides relevant information on its website.

The INIR team was informed that financial resources for stakeholder involvement activities are limited. The NSK has two sources of funding: membership fees from the member organizations (used to finance the main activities and events) and a low source of income from services offered to clients in accordance with the NSK charter. The Ministry of Energy does not have a specific budget for stakeholder involvement activities. The development and annual review of the media plan are financed from the State budget.

The INIR team was informed that national opinion surveys have not been conducted. Surveys were carried out during the review conducted by the Working Group and the Special Commission in 2013. To a certain extent, the results of surveys are used to adapt the communication plan. For example, the responses from the youth in the Aktau region (opinion survey) resulted in NSK increasing the number of youth-oriented informative events in the region.

Areas for further action	Significant	No
	Minor	Kazakhstan training for nuclear spokespersons

RECOMMENDATIONS

None

SUGGESTIONS

S-11.1.1 Kazakhstan is encouraged to develop training for nuclear spokespersons and senior managers, based on national and international experience.

GOOD PRACTICES

GP-11.1.1 The use of an NGO to carry out stakeholder involvement activities including outreach to parliamentarians, visits to nuclear facilities and institutions in other countries and the early establishment of a nuclear information centre.

12. Site and supporting facilities		Phase 1
Condition 12.1: General survey of potential sites conducted, and candidate sites identified		
Summary of the condition to be demonstrated	Exclusion and avoidance criteria (covering safety, security, cost, socio-economic issues, engineering and 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. socio-economic, 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 used for NPP site selection are competent and have experience in 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. 	
Review observations		
<p>The pre-feasibility study (PFS) conducted in 2008–2009 (jointly by Kazakhstan and Japan) included the assessment of potential regions for construction of a nuclear power plant. The PFS used existing (2008) forecast data on the consumption and production of electricity in Kazakhstan, and criteria related to balancing the country’s power systems and the availability of cooling water. The study also considered criteria and parameters such as external natural hazards (e.g. seismicity, geology, hydrology and flooding potential), external human-induced hazards (e.g. industrial plants and aircraft crash), radiological impacts (dispersion characteristics), social acceptance in the region, and non-safety related parameters (e.g. water availability, heavy load transport accessibility, etc.). Five regions, in the vicinity of the cities of Aktau, Kostanay, Kurchatov, Taraz and Balkhash Lake respectively, were identified as potential NPP sites.</p> <p>In 2013, the Working Group (established by the Order of the Prime Minister of Kazakhstan No. 146-r of August 2013) of professional experts from relevant ministries and organizations in Kazakhstan, evaluated the regions and potential sites recommended in the 2008–2009 PFS. The evaluation included site visits and discussions with local decision makers. The limited availability of cooling water was a criterion used to exclude two regions (Kostanay and Taraz). The Aktau site scored lowest of the remaining three sites due to factors such as lower electricity demand in the region, distance to the northern and southern grids and major load centres in Kazakhstan, and a limitation of 300 MW on the size of a unit that could be added to the grid in the region. The Working Group submitted its</p>		

recommendations to the Special Commission (established by the Decree No. 881 of August 2013), which concluded that regions near the village Ulken (Balkhash Lake) and Kurchatov in East Kazakhstan are the most preferable for the siting of nuclear power plants.

The INIR team was informed that the lessons learned from the Fukushima Daiichi accident with respect to siting were considered by the Special Commission and considered that they did not affect the choice of the two regions and potential sites. Security and emergency response considerations were taken into account, for example in terms of transport routes and accessibility to the sites and population densities in the surrounding areas.

The INIR team was informed that quality assurance requirements were in place at the time of the 2008–2009 PFS. The evaluation and conclusions of the Working Group and the Special Commission in 2013 were also subject to quality assessment (QA) requirements.

The INIR team was informed that more detailed studies of the potential sites will be undertaken in the feasibility study.

Areas for further action	Significant	No
	Minor	No

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

GP-12.1.1 Use of an expert working group and commission with representatives from all relevant institutions to review the initial site survey and to take into account lessons learned from Fukushima Daiichi accident and select preferred regions.

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 countries operating nuclear power. 3. Evidence that the non-radiological environmental issues: water use, transporting materials, disposal of hazardous waste, additional environmental monitoring requirements, construction impact, etc. have been considered and taken into account by the NEPIO. 	
Review observations		
<p>The assessment of potential regions for a nuclear power plant in Kazakhstan, undertaken as part of the 2008–2009 pre-feasibility study (PFS), included some consideration of environmental requirements.</p> <p>The INIR team was informed that the criteria used in the PFS were based on the IAEA Safety Guide on Site Survey for Nuclear Power Plants (50-SG-S9), as well as criteria used in Japan, which include the impact of a nuclear power plant on the environment — for example, air and water pollution, landscape change, ecological impacts, and cultural heritage impacts, as well as the impact on communities arising from the dispersion of radioactive material.</p> <p>The INIR team was also informed that the 2007 Environmental Code of the Republic of Kazakhstan contains detailed requirements regarding protection of the environment and also includes instructions regarding different levels of impact assessment depending on the stage of the project development, including pre-environmental impact assessment (EIA) stages.</p>		
Areas for further action	Significant	No
	Minor	No
RECOMMENDATIONS		
None		
SUGGESTIONS		
None		

GOOD PRACTICES
None

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 country'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 for the elaboration, reporting and assessment of environmental studies for nuclear and other related facilities. 2. Evidence of interactions by specialists with countries operating nuclear power. 	
Review observations		
<p>Kazakhstan has an existing framework for environmental protection. The Environmental Code of the Republic of Kazakhstan (No. 212-III dated 9 January 2007) contains extensive provisions related to environmental protection, and specifically environmental impact assessments, and international obligations.</p> <p>Instructions on assessment of environmental impacts at different stages of project development (approved by the Order of the Minister of Environmental Protection No. 204-p of 28 June 2007), establish the procedure and rules for the assessment of the impact on the environment. These instructions are also applicable to nuclear power plant projects.</p> <p>The INIR team was informed that the studies required in an environmental impact assessment (EIA) for a nuclear power plant would be undertaken by specialists in the respective areas. The EIA report would be reviewed by the Committee for Ecological Regulation and Control, which would prepare and issue a 'statement' in this regard.</p> <p>The INIR team was informed that a review of the suitability of the framework for environmental protection for a nuclear power programme has not been undertaken. However, it has been used successfully for previous nuclear energy projects.</p> <p>Kazakhstan is a party to the Convention on Environmental Impact Assessment in a Transboundary Context (ESPOO Convention), acceded to on 11 January 2001, and the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention), acceded to on 11 January 2001. The INIR team was informed that the development of a nuclear power project will comply with the obligations under these Conventions, but at this stage no assessment of what is required has been undertaken.</p>		
Areas for further action	Significant	No
	Minor	International Legal Instruments

RECOMMENDATIONS
None
SUGGESTIONS
S-13.2.1 Kazakhstan is encouraged to review its obligations under the ESPOO and Aarhus Conventions and determine what may be required for the nuclear power programme.
GOOD PRACTICES
None

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>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>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>The lead for the execution of the action plan and the action plan coordination framework has been identified.</p> <p>Notes:</p> <p>(1) The process of developing adequate EPR will be initiated in Phase 2 and will be largely carried out in Phase 3.</p> <p>(2) The requirements of the Early Notification and Assistance Conventions are covered under Issue 5.</p>	
Examples of how the condition may be demonstrated	<p>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.</p>	
Review observations		
<p>The Law on the Use of Atomic Energy establishes that the regulatory body is responsible for the development of a national plan to respond to nuclear and radiation accidents. This Law also governs entry of the national response plan into force when required and notifying the designated authority for civil defence that the plan has been activated.</p> <p>The INIR team was informed that the national response plan (NRP) for nuclear and radiation accidents was approved by the Government in August 2016. The NRP identifies roles and responsibilities of central and local authorities and actions to be taken with respect to preparedness for and response to nuclear and radiological accidents. The plan addresses all types of accidents and includes general provisions for ‘category 1’ threats. CAESC recognise that they will need to expand these provisions once the decision is taken to construct an NPP.</p> <p>The plan was developed taking account the defined role of each organisation and ensuring review and approval by all the organisations involved in the plan. Where necessary, there were special meetings arranged to review comments and find solutions. The approved plan has not yet been activated but it will be the basis for the next annual exercise. The draft plan was used for exercises and to respond to some real events involving the discovery of orphan sources.</p> <p>The INIR team was also informed that the NRP is a stand-alone plan that addresses the role of all</p>		

relevant organisations. It includes the actions for civil defence and the Emergency Situations Committee. Other events (e.g. natural disasters) requiring emergency response are covered by a separate plan.

At this stage, no analysis has been carried out to identify the need for additional facilities, capabilities, training, etc. to address the future nuclear power programme. The INIR team was informed that once the decision to construct an NPP has been taken, this work will be undertaken.

Areas for further action	Significant	Identification of needed enhancements
	Minor	No

RECOMMENDATIONS

R-14.1.1 CAESC should initiate a review to identify the additional items (facilities, capabilities, training, etc.) that will be needed to provide emergency response capability for the nuclear power programme

SUGGESTIONS

None

GOOD PRACTICES

None

Condition 14.2: Recommendations from any previous reviews or audits being progressed	Phase 1
---------------------------------------------------------------------------------------------	----------------

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 being progressed.
----------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------

Examples of how the condition may be demonstrated	Presentation of any action plans resulting from a review/audit with progress identified.
----------------------------------------------------------	------------------------------------------------------------------------------------------

Review observations

A past emergency preparedness review (EPREV) mission was conducted in September 2012 to review emergency planning and response related to the future development of the low enriched uranium fuel bank.

The EPREV mission made 16 recommendations. The INIR team was informed that Kazakhstan considers that 13 of the 16 recommendations have been addressed. 9 of them were related to the Ulba

metallurgical plant (UMP) and were addressed by implementing revisions to their documentation. Two of the remaining recommendations are discussed under Issues 7 and 8.

Areas for further action	Significant	No
	Minor	No
RECOMMENDATIONS		
None		
SUGGESTIONS		
None		
GOOD PRACTICES		
None		

15. Nuclear Security		Phase 1
Condition 15.1: Nuclear security requirements recognized and the actions of all relevant organizations coordinated		
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>Note: The need to establish legislation and a regulatory framework are addressed under Issues 5 and 7.</p>	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. Evidence of familiarity with IAEA Nuclear Security series 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 Issue 12). 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. 	
Review observations		
<p>The state system of physical protection in the Republic of Kazakhstan is based on the requirements of the Law On Use of Atomic Energy, the Convention on the Physical Protection of Nuclear Material and its Amendment, recommendations of the IAEA (INFCIRC/225/REV.5) on the physical protection of nuclear material and nuclear facilities, and regulations.</p> <p>The Regulation on the Physical Protection of Nuclear Material and Nuclear Facilities (1994) addresses the following issues:</p> <ul style="list-style-type: none"> — Organization and implementation of the physical protection of fissile nuclear materials and nuclear facilities; — Requirements for physical protection of nuclear facilities; — Requirements for physical protection of nuclear materials; — Requirements for physical protection of nuclear materials in transit. <p>The competent authority is the Commission of National Security (CNS), a body independent from the ministries. The national threat assessment is developed by the interagency commission (CNS, Security Council, Ministry of Energy, Ministry of Internal Affairs and other authorities). The first design basis threat (DBT) was developed in 2003 and is periodically updated (e.g. up dated for IAEA LEU Bank). There are no plans for developing a specific DBT to be applied to the construction of an</p>		

NPP until a nuclear project is approved.

Two new rules to enforce requirements have been approved: Physical Protection of Nuclear Materials and Nuclear Facilities and Physical Protection of Radioactive Sources”

In the field of international cooperation and assistance, Kazakhstan has agreements with the United States Department of Energy (USDOE), Japan and Germany, and is participating in the activities conducted by the IAEA’s Department of Nuclear Safety and Security (NS).

The INIR team was informed that staff from Kazakhstan institutions (regulatory body, operators, etc.) participated last year in about 20 – 25 different training courses related to nuclear security, physical protection, cyber security etc.. The training courses were both national and international.

It is expected to open officially the training centre by the beginning of 2017. Trainers have been trained and some pilot courses have been performed. Physical protection of nuclear materials and nuclear facilities, and illicit trafficking of nuclear materials will be the main topics for training courses in this centre.

Areas for further action	Significant	No
	Minor	No

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

Condition 15.2: Recommendations from any previous reviews or audits being progressed	Phase 1
---------------------------------------------------------------------------------------------	----------------

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 being progressed.
----------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------

Examples of how the condition may be demonstrated	Presentation of any action plans resulting from a review/audit with progress identified.
----------------------------------------------------------	------------------------------------------------------------------------------------------

Review observations

No reviews or audits have been undertaken.

Areas for further action

Significant

No

Minor

No

RECOMMENDATIONS

None

SUGGESTIONS

None

GOOD PRACTICES

None

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 (at-reactor and away-from-reactor) have been considered and possible reprocessing.	
Examples of how the condition may be demonstrated	<ol style="list-style-type: none"> 1. A document identifying available national natural resources and capacities for individual steps in nuclear fuel cycle, potential sources of supply and services and assessing available options for a national fuel cycle strategy taking account of 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 should 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. 	
Review observations		
<p>Kazakhstan is the largest uranium producer in the world and is interested in participating in the nuclear power programme using its own uranium resources and expanding its involvement in the front end of the nuclear fuel cycle (NFC) to all major segments. Currently, Kazakhstan already produces uranium powder and fuel pellets for nuclear fuel and is also building a fuel manufacturing plant to produce fuel assemblies for Chinese NPPs. Through the Kazakh-Russian joint venture the country has access to enrichment services (2.5 million SWU).</p> <p>Different options of participation in the NFC are considered in the Concept of Fuel and Energy Complex Development of the Republic of Kazakhstan till 2030, approved by the Government in 2014, but no detailed studies and economic analysis have been conducted. The INIR team was informed that possible options for participation in the NFC will also be discussed with the future vendor of NPPs. Currently, there is no clear strategy formulated for future negotiations with potential vendors of NPPs on fuel cycle options.</p> <p>Regarding the NFC policy the INIR team was informed that the Ministry of Energy is coordinating drafting the document while Kazatomprom will act as the implementer. Kazakhstan recognizes the importance of developing an NFC policy.</p> <p>Kazakhstan has experience in management of spent fuel (SF) from the BN-350 reactor. After the reactor was shut-down in 1998, about 3000 fuel assemblies were packed and by 2010 transported to</p>		

the Baikal-1 storage facility where they are dry stored. The National Nuclear Centre (NNC) is operating the facility. The Nuclear Technology Safety Centre studied options for the BN-350 spent fuel addressing political, non-proliferation, organizational, technical and financial aspects but the work has not been progressed to develop a national policy on spent fuel management (SFM).

The INIR team was informed that studies on SFM options and specific capacities needed for the future nuclear power programme have not yet been conducted (see Recommendation R-17.1.1). The feasibility study that is in preparation will address this issue.

Areas for further action	Significant	No
	Minor	Involvement in NFC front-end

RECOMMENDATIONS

None

SUGGESTIONS

S-16.1.1 Kazatomprom is encouraged to undertake more detailed studies on participation in segments of the front-end of the nuclear fuel cycle in order to prepare for negotiations with potential vendors of NPPs.

GOOD PRACTICES

None

17. Radioactive Waste		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 for the management of radioactive waste.	
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 should include the management of HLW arising. (Regulatory framework and financing schemes are addressed under Issue 7 and 4 respectively).	
Review observations		
<p>Kazakhstan has experience with radioactive waste management (RWM) from the BN-350 fast breeder reactor (in decommissioning), four research reactors and some other nuclear facilities. Use of radioactive sources in other applications also generates institutional radioactive waste and there exist several specialized storage facilities for this waste.</p> <p>The National Nuclear Centre (NNC) of Kazakhstan operates the storage facility for low level radioactive waste (LLW) and intermediate level radioactive waste (ILW) from the operation of the its research reactors.</p> <p>A large amount of radioactive waste (solid and liquid) is expected from the decommissioning of the BN-350 reactor in Aktau. The preparations for processing and storage of this waste are the responsibilities of Kazatomprom; these are ongoing activities. Efforts have been made to create a national radioactive waste management organization, but have not yet been successful.</p> <p>No specific studies have been conducted on the expected radioactive waste arising from the nuclear power programme, and issues regarding increased needs for managing this waste have not been taken into consideration. The INIR team was informed that information on waste types and estimated volumes from the nuclear power programme is expected to be provided by the feasibility study.</p> <p>Currently, the work on modification of the radioactive waste classification is ongoing. The feasibility study will also address technical requirements for managing the waste, the environmental impact assessment and the costs.</p>		

Areas for further action	Significant	Overall approach for radioactive waste management
	Minor	No
RECOMMENDATIONS		
R-17.1.1 Kazakhstan should assess the increased requirements for managing spent fuel and radioactive waste arising from a nuclear power programme, and consider an overall approach for its management, including organizational and financial resources, taking into account the radioactive waste from existing facilities.		
SUGGESTIONS		
None		
GOOD PRACTICES		
None		
Condition 17.2: Options for disposal of all radioactive waste categories understood		Phase 1
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.	
Review observations		
<p>The INIR team was informed that Kazakhstan has conducted some studies on disposal options for the existing radioactive waste. Several options for spent fuel disposal have been studied and three are being considered in more details (reprocessing in Russia with return of the high level waste, the disposal in underground mines in Kazakhstan and the concept of deep borehole disposal).</p> <p>Kazakhstan has also studied international experience in the area of disposal options of spent fuel, high level, intermediate level and low level radioactive waste. Some studies on geological suitability for disposal of these wastes in Kazakhstan have been undertaken.</p>		
Areas for further action	Significant	No
	Minor	No

RECOMMENDATIONS
None
SUGGESTIONS
None
GOOD PRACTICES
None

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, taking account of current industrial capability and technical services; current and required quality standards and potential investment requirements have been developed. 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. 	
Review observations		
<p>Kazakhstan has plans to increase its involvement in the nuclear fuel cycle (see Issue 16). At the moment, there is no document that can be presented as a policy for national industrial involvement in the construction of a nuclear power plant. A survey of companies with the potential to participate in the nuclear power programme for construction, supply of equipment or support services has not been conducted yet. The INIR team was informed that these activities are expected to start after the NPP vendor has been identified.</p> <p>The INIR team was informed that there was an assessment of potential industrial involvement in 2007 (when considering the VBER-300 NPP) and in 2014 (when considering siting for the NPP in East Kazakhstan).</p> <p>The INIR team was also informed that there were discussions on industrial involvement in terms of the level (percentage) of localization during negotiations with the Russian and Japanese vendor companies.</p> <p>In the Law of Procurement there is a requirement for participation of Kazakhstan organizations in international projects in Kazakhstan. The actual level will be negotiated as part of the EPC Contract. It is expected that the main equipment (reactor island and turbine island) will be supplied by the vendor. Some construction materials as well as general construction works should be procured from national suppliers. The extent of local participation will be considered in the feasibility study.</p> <p>There is a national quality certification system for industrial products and services. Consideration of the applicability of the current system and standards to potential localisation for NPP construction will be carried out after vendor selection.</p>		

Areas for further action	Significant	Policy for industrial involvement in the Nuclear Power Programme
	Minor	No
RECOMMENDATIONS		
R-18.1.1 Kazakhstan should develop a policy for industrial involvement in the nuclear power programme		
SUGGESTIONS		
None		
GOOD PRACTICES		
None		

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 for pre-project activities.	
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. 	
Review observations		
<p>Kazakhstan has significant experience in conducting studies for the various stages of major nuclear projects, including earlier feasibility studies for NPP construction, the construction of long-term storage of spent nuclear fuel and initial decommissioning of the BN-350 reactor. Almost all of these studies were conducted by Kazakhstan specialists in close cooperation with international organizations with extensive experience in the field of atomic energy use.</p> <p>The INIR team was informed that Kazakhstan Nuclear Power Plants (KNPP) company will procure the majority of the pre-project services and has access to the previous experience in both Kazatomprom and the various institutes in Kazakhstan.</p> <p>As organisations leading this work are owned by the Government, they will need to procure services using its procurement procedures. The INIR team was informed that in the past this condition made the use of international organisations particular difficult, but there have been a number of changes to procedures in recent years. Kazakhstan does not see significant difficulties in procuring future services. They are aware of a few potential issues (e.g. language to be used: Russian and Kazakh) and will consider the need for further amendment as required.</p>		
Areas for further action	Significant	No
	Minor	No
RECOMMENDATIONS		
None		
SUGGESTIONS		
None		
GOOD PRACTICES		
None		

APPENDIX 2: LIST OF THE INIR TEAM AND COUNTERPARTS

International Atomic Energy Agency (IAEA)		
1.	Milko KOVACHEV	Section Head of the Nuclear Infrastructure Development Section
2.	Jozef ZLATNANSKY	Nuclear Engineer of the Nuclear Infrastructure Development Section, Technical Officer for Kazakhstan
3.	Anthony Kenneth STOTT	Senior Nuclear Engineer of the Nuclear Infrastructure Development Section
4.	Fanny Cossette TONOS PANIAGUA	Legal Officer (Nuclear and Treaty Law Section) of the Office of Legal Affairs
5.	Kostadin DINOV	Safeguards Training Development Officer, Department of Safeguards
6.	Irena MELE	Special Advisor of the Nuclear Energy Fuel and Waste Section
7.	Stephen MORTIN	International Expert, U.K.
8.	Iva KUBANOVA	International Expert, Czech Republic
9.	Vladimir ARTISIUK	International Expert, Russian Federation
10.	Julio BARCELO VERNET	International Expert, Spain
Ministry of Energy of the Republic of Kazakhstan		
11.	Kanat Aldabergenovich BOZUMBAYEV	Minister of Energy of the Republic of Kazakhstan
12.	Bakhytzhan Mukhambetkaliyevich JAXALIYEV	Vice-Minister of Energy of the Republic of Kazakhstan

Department of the Atomic and Energy Projects Development		
13.	Batyrzhan Kumekbayevich KARAKOZOV	Director of the Department of the Atomic and Energy Projects Development of ME RK
14.	Zuriyat Sandybiyevna SAUATOVA	Deputy Director of the Department of the Atomic and Energy Projects Development of ME RK
15.	Gulvira Sagyngaliyevna ZHUBANAZAROVA	Head of the Division of Energy Projects Development
16.	Gani Aliuly MADI	Chief expert of the Division of Energy Projects Development
17.	Gaukhar Mirzhanovna ASREPOVA	Chief expert of the Division of Energy Projects Development
18.	Shyryn Shyngysbekyzy BERLESHOVA	Expert of the Division of Scientific-Technical Projects Development
Committee of Atomic and Energy Supervision and Control		
19.	Sungat Kumatovich YESSIMKHANOV	Chairman
20.	Timur Miftakhovich ZHANTIKIN	Vice-chairman
21.	Bauyrzhan Serikkaliyevich AZMAGANBETOV	Chief expert of the Division of Nuclear Security
22.	Bauyrzhan Tulkibayevich MUKHANOV	Head of Division for Control of Materials and International Safeguards
23.	Lazzat Talgatovna TOKMAGAMBETOVA	Head of the Division Licensing and Certification
24.	Abdumalik Saduakasovich YERMATOV	Head of the Division of Review and Inspection
25.	Igor Vitalyevich PANOV	Chief expert of the Division of Review and Inspection

National Nuclear Centre RSE		
26.	Shaiakhmet Bakievich SHIGANAKOV	Leading Scientist
27.	Viktor Maksimovich TSYNGAYEV	Head of the Feasibility Study Division
28.	Vitaliy Alekseevich POSPELOV	Engineer of the Nuclear Energy Development Division of the Institute of Nuclear Energy
29.	Anuar Koktemserikovich LEPSIBAYEV	Specialist
30.	Ualikhan Amirzhanovich ZHIYENBAYEV	Specialist
Institute of Nuclear Physics RSE		
31.	Murat Shakenovich TULEGENOV	Deputy Chief Engineer of the WWR-K reactor complex
National Atomic Company Kazatomprom JSC		
32.	Baurzhan Mukhtarkhanovich IBRAYEV	Chief Operations and NFC Officer
33.	Mazhit Beisembayevich SHARIPOV	Director of the Department of NFC Projects
34.	Manas Myrzashevich ISKAKOV	Chief Manager in the HSE Department
35.	Natalya Nikolayevna BOKOVAYA	Chief Manager in the Production Department, Head of the Accounting and Control Office
36.	Baglan Berdibekuly KUANOV	Specialist of the Department of HR Management
37.	Asset Kenesbekovich MAKHAMBETOV	Manager in the Department of Nuclear NFC Projects
38.	Baglan Berdibekuly KUANOV	Specialist of the Department of HR Management

KEGOC JSC		
39.	Dmitriy Konstantinovich FEKLISTOV	Head of Electrical Operational Mode Service, National Dispatch Centre of System Operator
Nuclear Society of Kazakhstan		
40.	Natalya Aleksandrovna ZHDANOVA	Executive Director

REFERENCES

Documents provided by Kazakhstan:

1. Law of the Republic of Kazakhstan on Use of Atomic Energy No. 442-V (12 January 2016).
2. Law of the Republic of Kazakhstan on the Radiation Safety of the Population, No. 219-1(23 April 1998).
3. Ecological Code of the Republic of Kazakhstan No. 212-III (9 January 2007).
4. The Strategy Kazakhstan 2030, Acts of the President, of the Republic of Kazakhstan, Message of the President of the Country to the People of Kazakhstan (1997).
5. Strategic Plan of Development of Kazakhstan till 2020 issued by the Decree of the President of the Republic of Kazakhstan (1 February 2010).
6. Strategic Plan of the Ministry of Energy of the Republic of Kazakhstan for 2014 - 2018, amended (29 December 2015).
7. Concept for the Development of the Fuel and Energy Complex of the Republic of Kazakhstan until 2030 (28 June 2014).
8. High Priority Measures Plan for the Construction of Atomic Power Stations in the Republic of Kazakhstan approved by the Order of the Prime Minister of the Republic of Kazakhstan, No. 60 (5 May 2014).
9. Decree № 146 of the Prime Minister of the Republic of Kazakhstan (29 August 2013).
10. Decree № 881 of the Prime Minister of the Republic of Kazakhstan.

IAEA documents

1. Considerations to Launch a Nuclear Power Programme, GOV/INF/2007/2/, IAEA, Vienna (2007).
2. INTERNATIONAL ATOMIC ENERGY AGENCY, Milestones in the Development of a National Infrastructure for Nuclear Power, IAEA Nuclear Energy Series No. NG-G-3.1 Rev. 1, IAEA, Vienna (2015).
3. INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of the status of national infrastructure development, IAEA Nuclear Energy Series No. NG-T-3.2, IAEA, Vienna (2008)
4. INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of the status of national infrastructure development, Working paper, IAEA (July 2015).
5. INTERNATIONAL ATOMIC ENERGY AGENCY, INIR; Integrated Nuclear Infrastructure Review Missions – Guidance on Preparing and Conducting INIR Missions. (Rev.1), IAEA, Vienna (2011).
6. INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing the Safety Infrastructure for a Nuclear Power Programme, IAEA Safety Standards Series No. SSG-16, IAEA, Vienna (2012)

7. INTERNATIONAL ATOMIC ENERGY AGENCY et al., Fundamental Safety Principles, IAEA Safety Standards Series No. SF-1, IAEA, Vienna (2006).
8. Other publications as appropriate from the bibliography included in Reference 2 above.
9. The IAEA expert Mission reports as appropriate.

ABBREVIATIONS

AP	Additional Protocol
NSK	Nuclear Society of Kazakhstan Association
BOO/BOOT	Build-Own-Operate-(Transfer)
CAESC	Committee for Atomic and Energy Supervision and Control
CER	Committee for Ecological Regulations
CIS	Commonwealth of Independent States
CSA	Comprehensive Safeguards Agreement
DAEPD	Department of Atomic and Energy Projects Development
DCID	Department of Coal Industry Development
EIA	Environmental Impact Assessment
ENU	Eurasian National University (named after L.N. Gumilyov)
FS	Feasibility Study
FNCA	Forum for Nuclear Cooperation in Asia
GoK	Government of Kazakhstan
IFNEC	International Framework for Nuclear Energy Cooperation
JAEA	Japan Atomic Energy Agency
JAPC	Japan Atomic Power Company
JSC Samruk-Kazyna	Joint Stock Company National Welfare Fund Samruk-Kazyna
JSC UMP	Joint Stock Company Ulba Metallurgical Plant
JSC KEGOC	Joint Stock Company Kazakhstan Electricity Grid Operating Company
JINR	Joint Institute for Nuclear Research
KazNU	Kazakh National University
ME RK	Ministry of Energy of the Republic of Kazakhstan
NRP	National Response Plan
NGOs	Non-Governmental Organizations
PPS	Physical Protection System
Pre-EIA	Preliminary Assessment of Environmental Impact Assessment

PFS	Pre-Feasibility Study
PTL	Power Transmission Line
RW	Radioactive Waste
RPC	Radiation-Protective Cell
RSE NNC	Republic State Enterprise National Nuclear Center
RSE INP	Republic State Enterprise Institute of Nuclear Physics
SER	Self-Evaluation Report
SNF	Spent Nuclear Fuel
SSAC	State System on Accounting for and Control of Nuclear Materials
SWU	Separative Work Units
TSO	Technical Support Organization