



MISSION REPORT

ON

THE PHASE 1 FOLLOW-UP INTEGRATED NUCLEAR INFRASTRUCTURE REVIEW (INIR)

Counterpart:

Ministry of Energy of the Republic of Kazakhstan

28-31 March 2023

Astana, Kazakhstan

DISCLAIMER

It should be noted that the findings of an INIR mission should not be taken in any way as an endorsement or confirmation of the adequacy or otherwise of the Member State's nuclear power infrastructure, nor as certification by the IAEA of the quality and completeness of the work done by the country concerned.

Although great care has been taken to maintain the accuracy of information contained in this publication, neither the IAEA nor its Member States assume any responsibility for consequences which may arise from its use.

The use of particular designations of countries or territories does not imply any judgement by the publisher, the IAEA, as to the legal status of such countries or territories, of their authorities and institutions or of the delimitation of their boundaries.

The mention of names of specific companies or products (whether or not indicated as registered) does not imply any intention to infringe proprietary rights, nor should it be construed as an endorsement or recommendation on the part of the IAEA.

CONTENTS

EXECUTIVE SUMMARY	7
1. INTRODUCTION	7
2. OBJECTIVES OF THE MISSION.....	8
3. SCOPE OF THE MISSION.....	8
4. WORK DONE	8
5. MAIN CONCLUSIONS	9
6. RESULTS OF THE FOLLOW-UP FOR PHASE 1.....	9
APPENDIX 1: EVALUATION RESULTS OF THE MISSION	15
1. National position.....	15
2. Nuclear safety	16
3. Management	17
4. Funding and financing	18
5. Legislative framework.....	19
6. Safeguards	20
7. Regulatory framework.....	21
8. Radiation protection	22
9. Electrical grid	23
10. Human resource development	23
11. Stakeholder involvement	24
12. Site and supporting facilities	24
13. Environmental protection	25
14. Emergency planning	25
15. Nuclear Security	26
16. Nuclear fuel cycle.....	26
17. Radioactive waste	27
18. Industrial involvement.....	27
19. Procurement.....	28
APPENDIX 2: LIST OF PARTICIPANTS	29
APPENDIX 3: REFERENCES	31
APPENDIX 4: ABBREVIATIONS.....	35

EXECUTIVE SUMMARY

The International Atomic Energy Agency (IAEA) conducted a Phase 1 Integrated Nuclear Infrastructure Review (INIR) mission in Kazakhstan in November 2016. In July 2022, Kazakhstan requested the IAEA to conduct a follow-up mission to review the status of implementation of the Recommendations and Suggestions from the 2016 INIR mission. Kazakhstan developed an Action Plan Progress Report on the status of implementation of the Recommendations and Suggestions from the main INIR mission and submitted it to the IAEA on 28 February 2023 together with some supporting documentation.

The Phase 1 Follow-up INIR mission was conducted from 28 to 31 March 2023. The mission was conducted by a INIR team consisting of two IAEA staff members and one international expert from the United Kingdom. Interviews were conducted over three days. During the interviews, the Kazakh counterparts provided further explanations and additional supporting documents and responded to the INIR team's questions on the content of the Action Plan Progress Report and supporting documentation.

During the main INIR mission in 2016 the INIR team made 10 Recommendations and 12 Suggestions. During the Phase 1 Follow-up INIR mission, it was concluded that:

- Kazakhstan has completely addressed four Recommendations and eight Suggestions;
- There is on-going progress in the implementation of an additional six Recommendations and four Suggestions.

The follow-up INIR team concluded that Kazakhstan has fully addressed the Recommendations in the areas of coordination of the nuclear power programme, financing of a nuclear power plant (NPP), emergency planning and radioactive waste management.

The follow-up INIR team also observed that further work is needed related to the completion of the comprehensive report, assessment of the funding needed for nuclear power infrastructure, planning for further development of the regulatory body and the owner/operator, and development of a policy for industrial involvement.

The follow-up INIR team also noted that through Kazakhstan Nuclear Power Plants Company (KNPP), Kazakhstan initiated the feasibility studies and contacts with the potential vendors.

1. INTRODUCTION

The International Atomic Energy Agency (IAEA) conducted a Phase 1 Integrated Nuclear Infrastructure Review (INIR) mission in Kazakhstan from 31 October to 7 November 2016. That mission concluded that Kazakhstan had developed a considerable base of knowledge and experience in nuclear activities. Several studies had been carried out over a number of years and Kazakhstan had an understanding of the infrastructure issues described in the IAEA Nuclear Energy Series publication entitled *Milestones in the Development of a National Infrastructure for Nuclear Power*, IAEA NE Series No. NG-G-3.1 (Rev. 1).

To assist Kazakhstan in making further progress in its infrastructure development, the INIR team made 10 Recommendations and 12 Suggestions.

In a letter dated 8 July 2022, the Ministry of Energy of the Republic of Kazakhstan requested the IAEA to conduct a Phase 1 Follow-up INIR mission in Kazakhstan. The Ministry of Energy

coordinated the preparation of an Action Plan Progress Report. This report and the supporting documents were provided to the IAEA prior to the Phase 1 Follow-up INIR mission.

Mr. Zhandos Nurmaganbetov, Vice Minister of Energy of the Republic of Kazakhstan provided opening remarks for the Phase 1 Follow-up INIR mission. On the Kazakh side, the mission was coordinated by Ms. Aidana Khamzina, Senior Expert of the Nuclear Projects Development Division, in the Department of Atomic Energy and Industry of the Ministry of Energy of the Republic of Kazakhstan. The follow-up INIR team was led by Mr. Mehmet Ceyhan of the IAEA Nuclear Infrastructure Development Section. The full list of participants is included in Appendix 2 of this report.

During the closing session, the preliminary draft Mission Report on the Phase 1 Follow-up INIR was delivered to Mr. Zhandos Nurmaganbetov, Vice Minister of Energy of the Republic of Kazakhstan.

The Follow-up INIR mission and associated activities were funded through NIDS regular budget.

2. OBJECTIVES OF THE MISSION

The main objective of the Phase 1 Follow-up INIR mission to Kazakhstan was to assess the level of implementation of the Recommendations and Suggestions of the main Phase 1 INIR mission in 2016.

3. SCOPE OF THE MISSION

The Phase 1 Follow-up INIR mission focused on how Kazakhstan has addressed the Recommendations and Suggestions given on the status of the infrastructure issues identified in the Mission Report on the Phase 1 INIR. Kazakhstan prepared the Action Plan Progress Report covering all Recommendations and Suggestions issued for Phase 1.

4. WORK DONE

Prior to the Phase 1 Follow-up INIR mission, the INIR team reviewed the Action Plan Progress Report prepared by Kazakhstan and summarizing the actions taken to address Recommendations and Suggestions as well as the supporting documentation (relevant national laws, regulations, reports and presentations, etc.).

The Phase 1 Follow-up INIR mission was conducted from 28 to 31 March 2023. The meetings were held at the Beijing Palace Soluxe Hotel in Astana. The main interviews were conducted over three days. During the interviews, the Kazakh counterparts provided further explanations and responded to the experts' questions on the content of the Action Plan Progress Report and supporting documentation.

A preliminary draft Mission Report on the Phase 1 Follow-up INIR was prepared by the INIR team and discussed with the counterparts as part of the mission. The conclusions were presented to the representatives of the Kazakh Government in an exit meeting on 31 March 2023. The preliminary draft Mission Report on the Phase 1 Follow-up INIR was delivered to the counterparts during the exit meeting.

The evaluation results for the Phase 1 Follow-up INIR mission, including a description of actions taken by Kazakhstan since the 2016 Phase 1 INIR mission for each Recommendation and Suggestion, are included in Chapter 6 of this report.

5. MAIN CONCLUSIONS

The Phase 1 Follow-up INIR mission was conducted in a cooperative and open atmosphere with participants representing eight organizations in Kazakhstan involved in the nuclear power programme and corresponding infrastructure. The full list of participants can be found in Appendix 2.

The follow-up INIR team concluded that:

- Kazakhstan has completely addressed four Recommendations and eight Suggestions;
- There is on-going progress in the implementation of an additional six Recommendations and four Suggestions.

The Follow-up INIR team concluded that Kazakhstan has fully addressed the Recommendations in the areas of coordination of the nuclear power programme, financing of the NPP, emergency planning and radioactive waste management.

The Follow-up INIR team also observed that further work is needed related to the completion of the comprehensive report, assessment of the funding needed for nuclear power infrastructure, planning for further development of the regulatory body and the owner/operator, and development of a policy for industrial involvement.

The Follow-up INIR team also noted that through Kazakhstan Nuclear Power Plants Company (KNPP), Kazakhstan initiated the feasibility studies and contacts with the potential vendors.

6. RESULTS OF THE FOLLOW-UP FOR PHASE 1

For the purposes of the follow-up INIR mission results, the following definitions are used regarding the status:

No action taken:

The recommendation or suggestion has not been taken into account or work on this issue has not started yet.

Work in progress:

Actions have been taken following the recommendation or the suggestion in the INIR report but have yet to produce their effects for the issue to be considered addressed.

Completed:

The actions taken following the recommendation of the suggestion in the INIR report have solved the issue which is considered addressed.

1. National position	Phase 1		
Recommendations	Status		
	No action taken	Work in progress	Completed
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.			X
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.		X	
2. Nuclear safety	Phase 1		
Suggestion	Status		
	No action taken	Work in progress	Completed
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.			X
3. Management	Phase 1		
Recommendation/Suggestion	Status		
	No action taken	Work in progress	Completed
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.		X	
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.		X	

4. Funding and financing	Phase 1		
Recommendations/Suggestion	Status		
	No action taken	Work in progress	Completed
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.		X	
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.			X
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.			X
5. Legal framework	Phase 1		
Suggestions	Status		
	No action taken	Work in progress	Completed
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.			X
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.		X	
6. Safeguards	Phase 1		
Suggestions	Status		
	No action taken	Work in progress	Completed
S-6.2.1 Kazakhstan is encouraged to further enhance its safeguards regulations.			X
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.			X

7. Regulatory framework	Phase 1		
Recommendation/Suggestion	Status		
	No action taken	Work in progress	Completed
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.		X	
S-7.1.1 CAESC is encouraged to evaluate the technical support required for the licensing of an NPP.		X	
8. Radiation protection	Phase 1		
There were no recommendations or suggestions in this area in the 2016 INIR Mission.			
9. Electrical grid	Phase 1		
There were no recommendations or suggestions in this area in the 2016 INIR Mission.			
10. Human resource development	Phase 1		
Recommendation/Suggestion	Status		
	No action taken	Work in progress	Completed
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.).		X	
R-10.2.1 Kazakhstan should develop the human resource development (HRD) plans and a national strategy to support the nuclear power programme.		X	
11. Stakeholder involvement	Phase 1		
Suggestion	Status		
	No action taken	Work in progress	Completed
S-11.1.1 Kazakhstan is encouraged to develop training for nuclear spokespersons and senior managers, based on national and international experience.			X
12. Site and supporting facilities	Phase 1		
There were no recommendations or suggestions in this area in the 2016 INIR Mission.			

13. Environmental protection	Phase 1		
Suggestion	Status		
	No action taken	Work in progress	Completed
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.			X
14. Emergency planning	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
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.			X
15. Nuclear security	Phase 1		
There were no recommendations or suggestions in this area in the 2016 INIR Mission.			

16. Nuclear fuel cycle	Phase 1		
Suggestion	Status		
	No action taken	Work in progress	Completed
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.			X
17. Radioactive waste management	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
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.			X
18. Industrial involvement	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
R-18.1.1 Kazakhstan should develop a policy for industrial involvement in the nuclear power programme.		X	
19. Procurement	Phase 1		
There were no recommendations or suggestions in this area in the 2016 INIR Mission.			

APPENDIX 1: EVALUATION RESULTS OF THE MISSION

1. National position

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

The Governmental Nuclear Energy Development Special Commission (Special Commission) was established in 2017 as an advisory body under the Ministry of Energy, to develop proposals to ensure the implementation of the state policy in the field of nuclear energy. The Department of Atomic Energy and Industry (DAEI) has been assigned as the working body of the Special Commission. This Special Commission met three times in 2022 to discuss a report prepared by KNPP on *Proposals on the Timing, Location and Capacity of a Nuclear Power Plant in Kazakhstan* which also includes financing schemes for the NPP.

The Department of Atomic Energy and Industry (DAEI) is responsible for the formation and implementation of the state policy in the field of the use of nuclear energy. DAEI currently has 17 staff of which 4 are working in the Nuclear Projects Development Division. The INIR team was informed that staff of other divisions such as Division for Nuclear Industry and Division for Nuclear Energy are also contributing to the activities of NEPIO in the field of nuclear power.

The Department of Atomic Energy and Industry (DAEI) has been working on building the competency to perform its assigned functions effectively. DAEI staff attended trainings provided by the IAEA and by the national nuclear institutes in Kazakhstan. The INIR team was informed that training is also provided to staff within the arrangements with other countries, e.g., in the framework of the United States of America FIRST initiative.

The Department of Atomic Energy and Industry (DAEI) has been creating ad hoc working groups upon request for a specific task from the Special Commission. A working group on siting was established when the site survey studies were conducted. A new working group has been established to consider the SMR options for Kazakhstan.

Recommendation status: Completed.

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

As part of the feasibility study, Kazakhstan developed a report entitled *Marketing Section of the Feasibility Study (FS)* on issues related to the introduction of Nuclear Power in Kazakhstan.

A brief summary has also been prepared by KNPP covering the technology selection, energy planning, site selection, financing scheme, and HR needs for an NPP.

An IAEA workshop/expert mission was organized in February 2023 to assist Kazakhstan in developing/finalizing the Comprehensive Report to help decision making for nuclear power in Kazakhstan. Following the workshop, a draft Comprehensive Report has been prepared using the information available in the *Marketing Section* of the Feasibility Study (FS) and in other reports. The draft Comprehensive Report has been reviewed by the relevant organizations. The next step will be to finalise the draft and submit it to the Special Commission for review before submission to the Government. DAEI expects that the Comprehensive Report will be approved by the Government by the end of 2023 or beginning of 2024.

The draft Comprehensive Report covers most of the 19 Infrastructure Issues. However, some of the Infrastructure Issues have not yet been introduced or adequately presented in the draft report.

Recommendation status: Work in progress.

2. Nuclear safety

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

The Institute of Nuclear Physics (INP) provides training to personnel working in the area of the application of ionizing radiation and in other areas related to the use of nuclear energy. KNPP has an agreement with INP and the Kazakh National University (KazNU) to provide training to the future personnel of KNPP in the field of nuclear power including nuclear safety, reactor technology, reactor management. INP provides internship possibilities to staff of all organizations working in the field of nuclear energy including the DAEI, the Committee on Atomic Energy Supervision and Control (CAESC) and KNPP.

In September 2022, KazNU opened a branch of the Russian National Research Nuclear University (MEPhI). Since October 2022, the branch has begun training for 63 students in Nuclear Physics and Technology (bachelor's degree). Graduates of this branch are expected to be hired by the organizations working in the nuclear field. INP also offers internship opportunities to students and graduates of this MEPhI branch.

The INIR team was informed that CAESC hired some of its staff from national institutes and organizations working in the nuclear sector.

Suggestion status: Completed

3. Management

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

In 2019, as part of its Quality Assurance Programme, KNPP developed a document entitled *Project Management of Nuclear Power Units and Plants Under Construction in the Republic of Kazakhstan - Organization and Planning of Work*. This document took into account the IAEA's guidance related to management systems, including the IAEA General Safety Requirements publication entitled *Leadership and Management for Safety*, IAEA Safety Standards Series No. GSR Part 2 and the IAEA Specific Safety Guide entitled *The Management System for Nuclear Installation*, IAEA Safety Standards Series No. GS-G-3.5.

Within the framework of the Council of Representatives of the Governing Level of Safety Regulatory Bodies in the Use of Atomic Energy of the Commonwealth of Independent States (CIS), work is underway to develop a set of measures to improve the safety culture, based on the IAEA safety standards. The work will analyze the approaches of member countries to the issues of leadership for safety and a culture of safe behavior at national levels, and the implementation of these approaches in nuclear industry organizations of the CIS member countries.

CAESC also has requirements related to management systems incorporated in its regulatory rules for licensees.

National Nuclear Center (NNC) and INP also has requirements in its documentation related to safety culture.

Recommendation status: Work in progress

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

The ongoing advanced management training programme for civil servants includes modules on *Decision Making, Project Management and Leadership*.

In addition, senior managers of organisations involved in the nuclear power programme have undertaken foreign visits for information exchange.

Kazakhstan has signed a Memorandum of Understanding (MoU) with France, the Russian Federation and the Republic of Korea. Once the technology has been selected, training for operators and engineers will be organized in the framework of activities covered by these MoUs.

KNPP has not yet considered the development of a leadership development programme.

Suggestion status: Work in progress

4. Funding and financing

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

The Ministry of Energy is developing the Nuclear Industry Development Program, for establishing a national nuclear power industry with a developed and sustainable infrastructure and staff with appropriate training and experience. It will include an action plan identifying the responsible organization, the cost of each activity and the proposed source of funding. The intention is to complete the work by the end of the year.

The INIR team noted that the IAEA publication entitled *Resource Requirements for Nuclear Power Infrastructure Development*, IAEA Nuclear Energy Series No. NG-T-3.21, is available to support DAEI in estimating resources needed for its Nuclear Power Programme.

Recommendation status: Work in progress

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

The Ministry of Energy has developed a concept for a new law *On the Management of Radioactive Waste*. The concept incorporates the *polluter pays*, principle.

The concept provides for the establishment of a special Fund for Radioactive Waste Management, held at the state level. Replenishment of this fund is envisaged by deductions from enterprises producing radioactive waste.

According to the new *Ecological Code of the Republic of Kazakhstan* dated 2 January 2021, the decommissioning of the NPP will be carried out at the expense of the operating organization. The amount of financial security is determined in accordance with the methodology approved by the environmental regulator and is subject to recalculation every seven years.

The Ministry of Energy will define the mechanisms for establishing and controlling the fund.

Suggestion status: Completed

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

A preliminary study of options for financing the construction of a nuclear power plant was conducted within the framework of the *Marketing Section* of the FS.

In October and November 2022, members of the Special Commission held two meetings to discuss the advantages and disadvantages of the mechanisms for implementing the NPP construction project. They also identified the need for more in-depth analysis of the available financing mechanisms, and discussed the risks of sanctions policy, taking into account the geopolitical situation.

Recommendation status: Completed

5. Legislative framework

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

Law No. 442 defines the roles and responsibilities of the authorized body for regulating the use of atomic energy, and the Ministry of Energy is designated as this authorized body in its founding legislation.

The Marketing Section of the Feasibility Study includes an analysis of the current legal and regulatory framework and analysis of the needs for the construction of nuclear power plants in Kazakhstan. The Ministry of Energy of the Republic of Kazakhstan, with the support of KNPP and the Nuclear Technology Safety Center (NTSC), has been assessing the legal and regulatory framework in the field of the use of atomic energy.

As a result of the review, the Law No. 442 *On Use of Atomic Energy* has been amended recently. The areas of the Amendment include addition of new categories to the list of categories of activities and facilities under regulatory control (Article 7.1) and additional provisions covering civil liability for nuclear damage (Chapter 4.1). The Amendment also includes a change in the definition of ‘nuclear installation’. Kazakhstan plans to further amend the Law No. 442 in the future especially in the area of safety, security, siting and environmental protection. The INIR team noted that this Amendment should consider provisions for the establishment of an independent regulatory body.

The INIR team also noted that during further review of the legal framework, Kazakhstan may consider seeking the IAEA’s legislative support.

Suggestion status: Completed

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

The *Marketing Section* of the Feasibility Study includes an analysis of the current legal and regulatory framework and the needs for the construction of nuclear power plants in Kazakhstan. The Ministry of Energy of the Republic of Kazakhstan, with the support of KNPP and the NTSC, has also been assessing the legal and regulatory framework in the field of the use of atomic energy.

In addition, all relevant legislation was reviewed during the site survey studies to identify if it might have impact on the selection of the site for the NPP.

The INIR team was informed that the Ministry of Energy will continue to work on assessing the legal framework for the nuclear industry. The INIR team noted that this review should be performed systematically and reported adequately.

Suggestion status: Work in progress

6. Safeguards

2016 Mission Suggestion	
S-6.2.1	Kazakhstan is encouraged to further enhance its safeguards regulations.

Action taken since the 2016 INIR mission

The Committee on Atomic Energy Supervision and Control (CAESC) is the designated authority for defining rules and regulations and implementing state-level safeguards activities. The Division for Material Control and International Safeguards of CAESC performs safeguards activities with its four staff members.

The *Rule for State Accountancy of Nuclear Materials* (Rule No. 44 of 2016) identifies the procedure of the governmental system on control of nuclear materials for assurance of the nuclear non-proliferation regime. The Rule has been amended to include additional activities and materials to be covered under the safeguards. Those areas include the mining activities and their notifications and reporting.

The International Atomic Energy Agency (IAEA) has established an integrated safeguards approach with Kazakhstan which demonstrates the country's progress in the implementation of national safeguards activities.

Kazakhstan has extensive experience in implementing safeguards activities in several different sectors including research reactors and fuel cycle facilities. Those nuclear facilities have structures for performing facility level accountancy and control for nuclear materials that they possess.

Kazakhstan recognizes that the construction of nuclear power plants will require additions to the system of nuclear materials control and safeguards, and in the number of staff and procedures. The experience with the current facilities and activities will be used as examples for the expansion of safeguards infrastructure for the NPP.

Suggestion status: Completed

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

Several actions have been taken to address the Recommendations and Suggestions of the ISSAS mission from 2011. Work is ongoing to deal with delays in the shipment of samples, reports and other submissions. The INIR team was informed that CAESC started using the State Declaration Portal to address these issues.

The Information System for Accounting for Nuclear Materials (IMMS) for the CAESC was improved. The IMMS is designed to account for nuclear materials, collect and process data on nuclear materials, and also to ensure the storage, analysis and monitoring of data. The information contained in the system is provided in the label format Code 10 to the IAEA. Since 2020, Kazakhstan has successfully installed and used a new version of the PR3 software for preparing and declaring reports under an Additional Protocol.

The INIR team was informed that CAESC has started conducting national safeguards inspections in addition to joining the IAEA inspections. The INIR team was also informed that during and after the inspections the capabilities of national institutes are being utilized for independent verification of nuclear materials.

The International Atomic Energy Agency (IAEA) has established an integrated safeguards approach with Kazakhstan which demonstrates the country's progress in the implementation of national safeguards activities.

Suggestion status: Completed

7. Regulatory framework

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

The Committee on Atomic Energy Supervision and Control (CAESC) has currently four divisions:

1. Licensing Division;
2. Nuclear and Radiation Safety Division;
3. Materials Control and International Safeguards Division; and
4. Nuclear Security and Technical Cooperation Division.

The Committee on Atomic Energy Supervision and Control (CAESC) has 20 staff in total. The Licensing Division is the main division responsible for the coordination of the licensing for any activity; all the other divisions contribute to this work.

The Marketing Section of the Feasibility Study provides an assessment of the regulatory framework including the human resources needs for the regulatory body at all stages of the development of nuclear power. As a result of this review, a new proposal for the structure of CAESC has been prepared. According to the proposal three new divisions will be created under the CAESC management to mainly deal mainly with the regulatory activities for nuclear power. The INIR team was informed that this proposed structure will be further reviewed if the decision is made by the Government to embark on nuclear power.

Recommendation status: Work in progress

2016 Mission Suggestion	
S-7.1.1	CAESC is encouraged to evaluate the technical support required for the licensing of an NPP.

Action taken since the 2016 INIR mission

The national institutes (NNC, INP and NSTC) have capabilities to conduct safety assessments due to their experience in operating research reactors. Their capabilities include conducting independent safety assessments using thermal-hydraulic and neutronic codes. The INIR team was informed that this capability could be extended to cover the nuclear power plants once the decision to embark on nuclear power is taken by the Government.

The Committee on Atomic Energy Supervision and Control (CAESC) currently reviews the practices of other countries in licensing of nuclear power plants, including several embarking countries which have already issued construction licences for their first NPP. CAESC is aware of the need to improve its own competence on licensing of NPPs and the need to gain external technical support including that from national institutes and from other countries' organizations. However, CAESC has not yet completed the evaluation of the areas where they may need external technical support. CAESC plans to complete this review if the decision to embark on nuclear power is taken by the Government.

Suggestion status: Work in progress

8. Radiation protection

There were no findings in this area in the main INIR mission

9. Electrical grid

There were no findings in this area in the main INIR mission

10. Human resource development

2016 Mission Suggestion	
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.).

Action taken since the 2016 INIR mission

Since 2017, the Ministry of Higher Education has enhanced its national educational and training capacity through a range of programmes.

The *Marketing Section* of the Feasibility Study provides assessment of the human resource needs of the regulatory body and the operating organization.

A staffing model was developed for the Regulatory Body covering the ten years after the decision has been made to embark on a nuclear power programme. This model provides details on numbers of staff to be recruited by year and by specialization but would need further assessment.

A staffing model has also been developed for KNPP. It includes details on the envisioned organization and staffing for Phase 2 to complete the feasibility studies, and numbers of positions to be fulfilled by divisions for the operational phase but does not provide details of the key competences required for managing the contract and overseeing the construction in Phase 3.

The INIR team was also informed that according to DAEI's assessment the pool of graduates and staff from nuclear and other existing industries in Kazakhstan would provide sufficient workforce for KNPP and CAESC.

The INIR team indicated that the IAEA publications *Initiating Nuclear Power Programmes: Responsibilities and Capabilities of Owners and Operators*, IAEA Nuclear Energy Series No. NG-T-3.1, *Human Resource Management for New Nuclear Power Programmes*, IAEA Nuclear Energy Series No. NG-T-3.10 (Rev.1), and the publication entitled *Managing Regulatory Body Competence*, IAEA Safety Reports Series No. 79 could be of use to CAESC and KNPP in assessing the staffing needs, including competencies, for the next phases of the nuclear power programme.

Suggestion status: Work in progress

2016 Mission Recommendation	
R-10.2.1	Kazakhstan should develop the human resource development (HRD) plans and a national strategy to support the nuclear power programme.

Action taken since the 2016 INIR mission

Based on the discussions related to the Suggestion S-10.1.1, the INIR team was informed that there are still no specific human resources development (HRD) plans available for the key organizations involved in the nuclear power programme.

The *Marketing Section* of the FS for the construction of a nuclear power plant in the Republic of Kazakhstan provides an overall assessment of the human resource needs of the regulatory body and the operating organization of the NPP.

The INIR team was informed that DAEI provided its estimated needs in terms of Human Resources to the Ministry of Higher Education, that has drafted an action plan related to its national strategy for education and takes into account the needs for the Nuclear Power Programme.

Recommendation status: Work in progress

11. Stakeholder involvement

2016 Mission Suggestion	
S-11.1.1	Kazakhstan is encouraged to develop training for nuclear spokespersons and senior managers, based on national and international experience.

Action taken since the 2016 INIR mission

Kazakhstan has a nuclear information center managed by the association Nuclear Society of Kazakhstan that organizes activities related to understanding nuclear energy addressed to the general public, as well as training for spokespersons in the nuclear field on public communication.

In December 2021, the Nuclear Society of Kazakhstan conducted a seminar on *Interaction with the Media* for managers from DAEI, KNPP and CAESC to train them on effective communication. The INIR team was informed that this training will be conducted on a regular basis to train new staff.

Suggestion status: Completed

12. Site and supporting facilities

There were no findings in this area in the main INIR mission

13. Environmental protection

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

The obligations of the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) and the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) have been included in the new Ecological Code dated 2 January 2021. Kazakhstan is planning to sign and ratify the Protocol on Strategic Environmental Assessment of the Espoo Convention, but it has already included the requirements in its Ecological Code.

In accordance with the requirements of the Aarhus Convention, the Rules for Holding Public Hearings have been developed. When conducting a Strategic Environmental Assessment (SEA) and an Environmental Impact Assessment (EIA) in Kazakhstan, public participation is provided at each of the four stages of the SEA and EIA process.

An Instruction on the Organization and Conduct of Ecological Assessment dated 30 July 2021, has been developed.

During the implementation of the nuclear power program, the obligations under the Espoo and the Aarhus Conventions will be implemented in accordance with the developed mechanisms.

The INIR team was informed that once the site of the NPP has been confirmed, the potential transboundary effects will be identified as part of stage 2 of the assessments, and communications with relevant neighbouring countries will be initiated.

Suggestion status: Completed

14. Emergency planning

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

The National Emergency Response plan for nuclear and radiation accidents has been revised and approved in 2022. The INIR team was informed that this revised plan defines roles and responsibilities for each organization and defines the communication processes. It also includes a requirement to regularly exercise the plan and train staff. It covers both national authorities (covering areas such as civil protection, regulation, health, environmental protection, transport, defense, communications, etc.) and local authorities.

An Emergency Technical Center is being built at the National Nuclear Center (NNC) with the support of the Threat Reduction Agency of the US Department of Defense.

The Ministry of Emergency Situations has a situation center to support emergency response. An additional Situation Center for Response to Nuclear and Radiation Accidents will be created at the CAESC site. As the nuclear programme develops, the role of this center for the nuclear power plant will be reviewed, taking into account the site emergency plan and any other local facilities.

In 2018, Kazakhstan ratified the Agreement on Cooperation between the CIS Member States on Preparedness in the Case of Nuclear Accident or Radiation Emergency and Mutual Assistance in Case of Elimination of their Consequences.

Recommendation status: Completed

15. Nuclear Security

There were no findings in this area in the main INIR mission

16. Nuclear fuel cycle

2016 Mission Suggestion	
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.

Action taken since the 2016 INIR mission

The rights to use the technology of refining and conversion of uranium were transferred in 2020 from the Cameco Corporation to Kazatomprom. Based on this technology, an investment project has been developed for the design and evaluation of the construction of a refining production of uranium oxide with a capacity of 6000 tons per year.

Kazatomprom already has access to the enrichment services and has the capability to manufacture fuel pellets for the French and Russian type of reactors.

Kazatomprom's Ulba-FA LLP plant for the production of fuel assemblies of the AFA 3G design for Chinese NPPs started its production activity in 2021. It has a capacity of 200 tons per year.

The INIR team was informed that Kazakhstan intends to use all its national fuel cycle front-end capabilities for its nuclear power programme. The transfer of technology to produce nuclear fuel is included in the requirements issued to potential vendors.

Suggestion status: Completed

17. Radioactive waste

2016 Mission Recommendation	
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.

Action taken since the 2016 INIR mission

Kazakhstan has a good understanding of the issues surrounding the management of spent nuclear fuel. The main criteria to be used when deciding whether to reprocess spent nuclear fuel or dispose of it are safety and economic feasibility. The decision on handling of a spent nuclear fuel will be made after the decision on the construction of a nuclear power plant.

With regard to other radioactive waste from the NPP, the Ministry of Energy is drafting a new law on *Radioactive Waste Management* that will define a national waste management organisation. It is not yet decided whether this will be a new organisation, or a responsibility added to an existing organisation. NNC is aware of the waste arisings from a nuclear power plant and the processes for its treatment, storage and disposal. The INIR team was informed that Kazakhstan already has large quantities of waste arising from historical activities, and the waste from the nuclear power programme can easily be absorbed within the programme for managing other radioactive waste.

Recommendation status: Completed

18. Industrial involvement

2016 Mission Recommendation	
R-18.1.1	Kazakhstan should develop a policy for industrial involvement in the nuclear power programme.

Action taken since the 2016 INIR mission

The *Marketing Section* of the Feasibility Study provides assessment of the industrial involvement needs for the construction of an NPP. NNC participated in this assessment and carried out a preliminary evaluation of the capacity with regards to construction. The Ministry of Industry and Infrastructural Development and the National Chamber of Entrepreneurs manage databases of national industries providing goods, works and services, and both authorities will be involved in further assessment.

Kazakhstan has an understanding of the possibilities for industrial involvement but has not yet studied the details. Because each vendor has its own approach, Kazakhstan decided to discuss with them the potential level of industrial involvement, estimated to be at least 30 to 40%. The INIR team was informed that Kazakhstan has had detailed discussions with one vendor and will also discuss further with others in the future. Kazakhstan will further study the potential for and the level of industrial involvement after determining the technology supplier.

The INIR team noted that having a clear national industrial involvement strategy, including identifying key areas for potential involvement, could benefit Kazakhstan during discussions with potential vendors, and in further developing its national industrial capabilities.

Recommendation status: Work in progress

19. Procurement

There were no findings in this area in the main INIR mission

APPENDIX 2: LIST OF PARTICIPANTS

INIR MISSION REVIEW TEAM	
Mehmet CEYHAN (NIDS)	Team Leader, IAEA
Thibaud REYSSET (NIDS)	Mission Coordinator, IAEA
Stephen MORTIN	International Expert

PARTICIPANTS FROM KAZAKHSTAN	
REPRESENTATIVE	RESPONSIBLE ORGANIZATION(S)
Zhandos NURMAGANBETOV	Vice Minister, Ministry of Energy of the Republic of Kazakhstan
Gumar SERGAZIN	Director, Department of Nuclear Energy and Industry, Ministry of Energy of the Republic of Kazakhstan
Gulmira MURSALOVA	Deputy Director, Department of Nuclear Energy and Industry, Ministry of Energy of the Republic of Kazakhstan
Kanat TUYAKBAYEV	Head of Division, Nuclear Projects Development Division, Department of Nuclear Energy and Industry, Ministry of Energy of the Republic of Kazakhstan
Alidar ZHUNISBAYEV	Head of Division, Nuclear Energy Division, Department of Nuclear Energy and Industry, Ministry of Energy of the Republic of Kazakhstan
Mussa KABIIYEV	Head of Division, Nuclear and Radiation Safety Division, Committee for Atomic and Energy Supervision and Control, Ministry of Energy of the Republic of Kazakhstan
Maksat SHARIPOV	Chief Expert, Nuclear and Radiation Safety Division, Committee for Atomic and Energy Supervision and Control, Ministry of Energy of the Republic of Kazakhstan
Albina CHUNKIBAYEVA	Chief Expert, Control of Materials and International Safeguards Division, Committee for Atomic and Energy Supervision and Control, Ministry of Energy of the Republic of Kazakhstan

REPRESENTATIVE	RESPONSIBLE ORGANIZATION(S)
Medet TARBAYEV	Acting Deputy Chairman, Committee for Atomic and Energy Supervision and Control, Ministry of Energy of the Republic of Kazakhstan
Dinara KENZHEKULOVA	Head of Division, Licensing Division, Committee for Atomic and Energy Supervision and Control, Ministry of Energy of the Republic of Kazakhstan
Nataliya DAULETIYAROVA	Deputy Director, Department of Environmental Policy and Sustainable Development, Ministry of Ecology and Natural Resources of the Republic of Kazakhstan
Zhuldys MURZABEKOVA	Head of Division, Environmental Information and Analysis Division, Department of Environmental Policy and Sustainable Development, Ministry of Ecology and Natural Resources of the Republic of Kazakhstan
Tolkyn NUGUMANOVA	Chief Expert, State Environmental Expertise and Permits Division, Committee for Environmental Regulation and Control, Ministry of Ecology and Natural Resources of the Republic of Kazakhstan
Denis ZARVA	Deputy Chief Engineer, National Nuclear Center of the Republic of Kazakhstan RSE
Vitaly POSPELOV	Section Head, Nuclear Safety and Development of Nuclear Energy Section, National Nuclear Center of the Republic of Kazakhstan RSE
Saule MUKENEVA	Senior Engineer, Technical and Economic Research Section, National Nuclear Center of the Republic of Kazakhstan RSE
Murat TULEGENOV	Advisor of the General Director, Institute of Nuclear Physics RSE
Sergey KISLISIN	Section Head, Institute of Nuclear Physics RSE
Azimbek JUMAKULOV	Chief manager, NFC Department, NAC «Kazatomprom» JSC
Rinat OKASOV	Deputy Director-General, Kazakhstan Nuclear Power Plants LLP
Kumar AUSENOV	Senior Engineer, Atomic Energy Section, Kazakhstan Nuclear Power Plants LLP
Asuan SIYABEKOV	Engineer, Atomic Energy Section, Kazakhstan Nuclear Power Plants LLP
Shaiakhmet SHIGANAKOV	Senior specialist, Nuclear Technology Safety Center

APPENDIX 3: REFERENCES

Documents provided by Kazakhstan:

1. MINISTRY OF ENERGY OF THE REPUBLIC OF KAZAKHSTAN, Action Plan Progress Report, 26 March 2023;
2. The Law of the Republic of Kazakhstan On the Use of Atomic Energy, No.442- V, 12 January 2016;
3. The Law of the Republic of Kazakhstan On Permissions and Notification, No. 202- V, 16 May 2014;
4. MINISTRY OF ECOLOGY, GEOLOGY AND NATURAL RESOURCES OF THE REPUBLIC OF KAZAKHSTAN, Ecological Code of the Republic of Kazakhstan, No.400-VI, 2 January 2021;
5. GOVERNMENT OF THE REPUBLIC OF KAZAKHSTAN, Decree On Approval of the National Plan for Response to Nuclear and Radiological Accidents, No. 467, 19 August 2016;
6. GOVERNMENT OF THE REPUBLIC OF KAZAKHSTAN, Decree On Approval of the Rules for Organizing Inspections Carried out by the International Atomic Energy Agency in the Territory of the Republic of Kazakhstan, No. 227, 15 April 2016;
7. Order of the Minister of Energy of the Republic of Kazakhstan On Approval of the Rules for State Accountancy of Nuclear Materials, No. 44, 9 February 2016;
8. Order of the Minister of Energy of the Republic of Kazakhstan On Approval of the Rules of the Organization of Collection, Storage and Burial of Radioactive Wastes and Spent Nuclear Fuel, No. 39, 8 February 2016;
9. MINISTRY OF ENERGY OF THE REPUBLIC OF KAZAKHSTAN, Order On the Establishment of the Governmental Nuclear Energy Development Special Commission of the Republic of Kazakhstan, No.389, 21 November 2017, (in Russian);
10. GOVERNMENT OF THE REPUBLIC OF KAZAKHSTAN, Resolution No. 724, Concept of Development of the Fuel and Energy Complex of the Republic of Kazakhstan 2022-2026, , 28 June 2014 (in Russian);
11. MINISTRY OF ENERGY OF THE REPUBLIC OF KAZAKHSTAN, Draft Concept of the Law of the Republic of Kazakhstan on Radioactive Waste Management, (in Russian) (Draft);
12. MINISTRY OF ENERGY OF THE REPUBLIC OF KAZAKHSTAN, Order on Rules for the Transportation of Nuclear Materials, Radioactive Substances and Radioactive Waste, No.183, 28 May 2021 (in Russian);
13. MINISTRY OF ENERGY OF THE REPUBLIC OF KAZAKHSTAN, Technical Regulations, Nuclear and Radiation Safety, No. 58, 20 February 2017 (in Russian);
14. Order of the Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, On Approval of the Instructions for the Organization and Conduct of Ecological Assessment, No. 280, 30 July 2021 (in Russian);
15. Order of the Acting Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan On Approval of the Rules of Public Hearings”, No. 286, 3 August 2021 (in Russian);

16. Order of the Minister of Energy of the Republic of Kazakhstan On Approval of the Standards for Radioactive Waste, No. 200, 16 June 2021 (in Russian);
17. Order of the Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan On Approval of the Rules for Maintaining the Register of Emissions and Transfer of Pollutants, No. 346, 31 August 2021 (in Russian);
18. MINISTRY OF HEALTHCARE OF THE REPUBLIC OF KAZAKHSTAN, Order On approval of Sanitary Rules. Sanitary and Epidemiological Requirements for Radio-Hazardous Facilities”, No. MH RK-90, 25 August 2022 (in Russian);
19. MINISTRY OF HEALTHCARE OF THE REPUBLIC OF KAZAKHSTAN, Order On Approval of Sanitary Rules. Sanitary Rules, Sanitary and Epidemiological Requirements for Ensuring Radio Safety”, No. MH RK-275/2020, 15 December 2020 (in Russian);
20. MINISTRY OF ENERGY OF THE REPUBLIC OF KAZAKHSTAN, Regulations on the Department of Atomic Energy and Industry, No.547-zh, 2 December 2021 (in Russian);
21. Order of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan On the Establishment of the Methods for Determining the Amount of Financial Security for the Fulfilment of Obligations to Eliminate the Consequences of the Operation, No.356, 6 September 2021;
22. GOVERNMENT OF THE REPUBLIC OF KAZAKHSTAN, Resolution On Approval of the National Project Quality Education *Educated Nation*, No. 726, 12 October 2021 (in Russian);
23. GOVERNMENT OF THE REPUBLIC OF KAZAKHSTAN, Resolution On Approval of the Concept of Education Development of the Republic of Kazakhstan for 2022 2026, No.941, 24 November 2022 (in Russian);
24. Minutes of the Meeting of the Expert Group of the CIS Member States on the Approval of the Draft Document 'A Set of Measures to Improve the Culture of Security and Leadership to Ensure the Security of the CIS Member States, Moscow, 7 June 2022;
25. Declaration of Intent on Cooperation in the Peaceful Use of Atomic Energy between the Ministry of Energy of the Republic of Kazakhstan and the Ministry of Energy Transition of the French Republic, 30 November 2023 (in Kazakh and French);
26. Memorandum on Personnel Training in the Nuclear Industry signed between the Ministry of Energy of the Republic of Kazakhstan and the State Atomic Energy Corporation Rosatom, 10 February 2022 (in Kazakh and Russian);
27. Memorandum of Understanding between the Ministry of Energy of the Republic of Kazakhstan and the Ministry of Culture and Innovation of Hungary on the Training and Education of Personnel in the Field of Peaceful Uses of Nuclear Energy, January 2023;
28. Additional material (printed documents or presentations) delivered during the interview sessions (in NIDS records).

IAEA documents:

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Milestones in the Development of a National Infrastructure for Nuclear Power, IAEA Nuclear Energy Series No. NG-G- 3.1, (Rev. 1) IAEA, Vienna (2016);

2. INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of the Status of National Nuclear Infrastructure Development, Rev.1, IAEA Nuclear Energy Series No. NG-T- 3.2, (Rev. 1) IAEA, Vienna (2016);
3. INTERNATIONAL ATOMIC ENERGY AGENCY, Guidelines for Preparing and Conducting an Integrated Nuclear Infrastructure Review (INIR), IAEA Services Series 34, IAEA, Vienna (2017);
4. Other publications as appropriate from the bibliography included in Reference 2 above;
5. The IAEA expert mission reports as appropriate.

APPENDIX 4: ABBREVIATIONS

BOOT	Build, Own, Operate, Transfer
CAESC	Committee on Atomic Energy Supervision and Control
CIS	Commonwealth of Independent States
CSA	Comprehensive Safeguards Agreement
DAEI	Department of Atomic Energy and Industry
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
EPR	Emergency Preparedness and Response
HRD	Human Resource Development
FS	Feasibility Study
HRD	Human Resources Development
IAEA	International Atomic Energy Agency
IMMS	Information System for Accounting for Nuclear Materials
IMS	Integrated Management System
INIR	Integrated Nuclear Infrastructure Review
INP	Institute of Nuclear Physics
ISSAS	IAEA Safeguards and SSAC Advisory Service Mission
KazNU	Al-Farabi Kazakh National University
KNPP	Kazakhstan Nuclear Power Plants Company
MEPhI	Moscow Engineering Physics Institute
MoE	Ministry of Energy
MoU	Memorandum of Understanding
NEPIO	Nuclear Energy Programme Implementing Organization
NNC	National Nuclear Center
NPHR	Nuclear Power Human Resources

NPP	Nuclear Power Plant
NTSC	Nuclear Technology Safety Center
SQP	Small Quantities Protocol
SEA	Strategic Environmental Assessment
SSAC	State's System of Accounting for and Control of Nuclear Material