THIRD NATIONAL REPORT
OF THE REPUBLIC OF KAZAKHSTAN ON COMPLIANCE WITH OBLIGATIONS SUBSEQUENT UPON THE CONVENTION ON NUCLEAR SAFETY

Nur-Sultan, 2019

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Abbreviations

BN – Fast Breeder Reactor

BO – Base Organization

CAE MINT RK – Committee of Atomic Energy of Ministry of Industry and New Technologies of Republic of Kazakhstan

CAESC ME RK – Committee of Atomic and Energy Supervision and Control of Ministry of Energy of Republic of Kazakhstan

CES RK – Committee of Emergency Situations of Republic of Kazakhstan

CIDIS MIID RK –Committee for Industrial Development and Industrial Safety of the Ministry of Industry and Infrastructural Development of the Republic of Kazakhstan

CNS RK– Committee of National Security of Republic of Kazakhstan

CPS – Control and Protection System

CQSCGS - Committee for quality and safety control of goods and services of the Ministry of Health of the Republic of Kazakhstan

EFA – Experimental Fuel Assembly

FA – Fuel Assembly

IAE NNC RK – Institute of Atomic Energy, National Nuclear Center of Republic of Kazakhstan

IAEA – International Atomic Energy Agency

INP RK – Republican State Enterprise Institute of Nuclear Physics of Republic of Kazakhstan

IRS – Ionizing Radiation source

JSC – Joint Stock Company

JSC KRC AS – JSC "Kazakhstan – Russian Company "Atomic Stations"

LRW – liquid radioactive wastes

LWSF – Liquid Waste Storage Facility

MA RK – Ministry of Agriculture of Republic of Kazakhstan

MD RK – Ministry of Defense of Republic of Kazakhstan

ME RK – Ministry of Energy of Republic of Kazakhstan

MEGNR – Ministry of Ecology, Geology and Mineral Resources of Republic of Kazakhstan

MNE RK – Ministry of National Economy of Republic of Kazakhstan

MFA RK – Ministry of Foreign Affairs of Republic of Kazakhstan

MH RK – Ministry of Health of Republic of Kazakhstan

MIA RK – Ministry of Internal Affairs of Republic of Kazakhstan

NF – Nuclear Facility

NM – Nuclear Materials

NNC RK – National Nuclear Center

NPP – Nuclear Power Plant

NREF – Nuclear, Radiation Electro physical Facility

NRS – Nuclear and Radiation Safety

OKBM – Joint Stock Company "Afrikantov Experimental Design Bureau for Mechanical Engineering"

OSART – Operational Safety Review Team

PEI – JSC “State Scientific Center of Russian Federation – Physical-Energy Institute named after A.I. Leypunskiy”

PIE – Postulated Initiating Event

RF – reactor facility

RK – Republic of Kazakhstan

RLA – Regulatory Legal Acts

RR – Research Reactor

RSC – Radiation-Shield Chamber

RSE – Republican State Enterprise

RW – Radioactive Wastes

RWDF – Radioactive Waste Disposal Facility

SAR – Safety Analysis Report

SF – Spent Fuel

SFA – Spent Fuel Assembly

SFSF – Spent Fuel Storage Facility

SPF – Sodium Processing Facility

SRINR – Scientific-Research and Development of Institute of Power Engineering

SRT – Special Rescue Team

SRW – Solid Radioactive Wastes

SRWSF – Solid Radioactive Waste Storage Facility

SSDI – JSC “State Specialized Design Institute”

SWSF – Solid Waste Storage Facility

TR – Technical Regulations

VNIPIET– OJSC “East-European Head Scientific-Research and Design Institute of Power Technologies”

Introduction

The Republic of Kazakhstan is a consistent supporter of the idea of peaceful use of atomic energy and non-proliferation of nuclear weapons. In August 1991, the Semipalatinsk nuclear test site was closed on the territory of the Republic of Kazakhstan. The Republic of Kazakhstan is a Party to the Treaty on the Non-Proliferation of Nuclear Weapons and the Comprehensive Nuclear Test Ban Treaty.

The Republic of Kazakhstan ratified the Convention on Nuclear Safety in accordance with the Law # 245-IV of the Republic of Kazakhstan on February 3, 2010. The Convention on Nuclear Safety entered into force in the Republic of Kazakhstan on June 8, 2010. Thus, the Republic of Kazakhstan has committed itself to the international community to take a number of steps for the purpose of bringing its national strategy in the field of the atomic energy use in conformity with the recommendations of IAEA.

The legal framework for the regulation of all aspects of the atomic energy use is formed in the Republic of Kazakhstan. The legal basis of activity in the sphere of atomic energy use is the Law of the Republic of Kazakhstan "On Atomic Energy Use" (new revision entered in force in 2016), which governs all the relations associated with the location, design, construction, commissioning, decommissioning of the nuclear facility and other relations in the field of atomic energy use.

The Republic of Kazakhstan at the state level makes all the necessary efforts to ensure that the fundamental principles of nuclear safety were observed at all the stages of the life cycle of existing and planned to be built nuclear facilities.

The present Third National Report of the Republic of Kazakhstan (hereinafter Report) is prepared under Article 5 of the Convention on Nuclear Safety to submit the national reports. The recommendations contained in the Convention on Nuclear Safety, the recommendations of IAEA on the preparation of Reports and the "Guidelines on national reports submitting under the Convention on Nuclear Safety" (INFCIRC/572/Rev.5) as well as IAEA comments on Second National Report were taken into account during preparation of the Report.

The Report was prepared by the Committee of Atomic and Energy Supervision and Control of the Ministry of Energy of the Republic of Kazakhstan (CAESC ME RK) with the participation of Ministry of ecology, geology and natural resources of the Republic of Kazakhstan (environmental protection functions), Committee for quality control and safety of goods and services of the Ministry of Health of the Republic of Kazakhstan (the functions of the state body in the field of sanitary and epidemiological welfare of the population), the Ministry of Internal Affairs of the Republic of Kazakhstan (issuing of permits and protection of facilities), the Committee for Industrial Development and Industrial Safety of the Ministry of Industry and Infrastructural Development of the Republic of Kazakhstan (functions of control and supervision in the field of industrial safety), Committee of emergency situations of the Ministry of Internal Affairs of the Republic of Kazakhstan (function of liquidation of industrial accidents).

Below this Report describes the clause-by-clause fulfillment of the obligations of the Republic of Kazakhstan under the provisions of the Convention and in accordance with the requirements of the Convention on Nuclear Safety.

Summary

This Report reflects the changes that have taken place in the Republic of Kazakhstan for the last period. The main changes are the enactment of new law “About Atomic Energy Use” in the beginning of 2016 and the alterations in the structure of state authorities responsible for the regulation of atomic energy use, including reformation of ministries and authorities, revisions of their responsibilities, transfer of the Regulator (state authority in the field of atomic energy use) from Ministry of Industry and New Technologies to Ministry of Energy.

The law put into effect the regulations on:

- establishing the radiation danger categories of the facilities (which allows to establish and distinguish the relevant requirements to every type of facility in accordance with degree of danger;
- attestation of personnel responsible for safety during performing the activities related to atomic energy use (to enhance safety and prevent emergencies at the atomic energy facilities);
- expert review of nuclear, and radiation safety, and nuclear security (this necessity is arisen from peculiarities of the activities, which require special knowledge and training of expert organizations and experts in the field of atomic energy use);
- revision of terminology and definitions (in order to eliminate double meaning during interpretation of legislation in the field of atomic energy use);
- requirements for insurance of personnel against radiation risks (to ensure rights and warranties for compensation of possible damage to personnel’s health).

There were defined the danger categories of radioactive sources, as well as the standards for emergency preparedness and response to nuclear and radiological accidents. Qualification requirements for the personnel of the nuclear facility were established to ensure the proper level of nuclear and radiological safety and nuclear security, emergency preparedness and response to nuclear accidents. The definitions of "nuclear security", "spent nuclear fuel", “radiation facility” and “radiation risk” were included to align national legislation with international agreements in the atomic field, which were ratified by the Republic of Kazakhstan.

The accompanying law of RK “On amendments and additions to some legislative acts of Republic of Kazakhstan on the issues of atomic energy use” introduced the amendments to Civil and Environmental Codes, the Laws RK "On Radiation Safety of Population", and "On State Secrets", and the Law of RK "On Permissions and Notifications", which replaced the Law “On Licensing”.

Environmental Code of RK was revised in a part of procedure of the import of radioactive and nuclear materials and to clarify the term "radioactive material".

The Law RK "On Radiation Safety" was revised to include the standards to harmonize the terminology with the main Law.

The Law RK "On State Secrets" was amended in paragraph 35), Article 12 in a part to adjust the list of the information considered as the state secrets of RK. This provides for accessibility of environmental information and the establishment of secrecy only with regard to information about specific systems of physical security of nuclear facilities.

The Law of RK "On Permissions and Notifications" was revised to include an amendment to increase the time for consideration of the license application, the ability of licensor to visit the

nuclear power facility to verify compliance with safety requirements, and the ability of the licensor to request additional documents on safety justification, which allows to carry out a thorough analysis of each safety aspect.

Thus, the changes in the legislation of the Republic of Kazakhstan in the field of atomic energy use allow to harmonize the system of relations' regulation, to establish and harmonize safety requirements in accordance with the international standards, to optimize the safety measures, and to minimize the cost on their implementation, and to eliminate outdated regulations and fill in the gaps.

These are the only changes important for atomic safety, which have been made in the legislation of Republic of Kazakhstan for the last period.

Article 6. Existing nuclear installations

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation.

If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

There are no nuclear installations on the territory of the Republic of Kazakhstan, which are in full compliance with the requirements of Article 2 of the Convention. Republic of Kazakhstan has the installations with nuclear material, which correspond to the criteria of a definition "nuclear installation" stated in the Amendments to the Convention on the Physical Protection of Nuclear Material and the Joint Convention on the Safety Management of Spent Nuclear Fuel and on the Safety Management of Radioactive Waste. A list of such installations is given in Table 1.

It should be noted that the legislation of the Republic of Kazakhstan related to the atomic energy establishes the unified definition "Nuclear, Radiation and Electrophysical Facility" (NREF). To comply with the terminology of the Convention on Nuclear Safety this Report will use the term "Nuclear Installation" (NI) and the rules and regulations related to the installations of this type.

Table 1. The list of nuclear installations of RK considered within the Report

#	**Name**	**Status**
1.	Nuclear power plants in the Republic of Kazakhstan	Works on selection of the site and reactor type are in progress The document “Marketing section of the feasibility study for the construction of a nuclear power plant in the Republic of Kazakhstan” was developed. The decision is expected on construction of the nuclear power plant by the Government of the Republic of Kazakhstan
2.	Reactor facility (RF) BN-350 in Aktau, Mangistau region	Reactor was shut down; the spent fuel was removed from the site and placed for storage. Work on placement into a safe state (SAFSTOR) is in progress
3.	Research reactor WWR-K, Alatau settlement, Almaty region	In operation, since September 1, 2016 transferred to low enriched fuel.

#	Name	Status
4.	Critical test facility, Alatau settlement, Almaty region	In operation, since September 1, 2016 transferred to low enriched fuel.
5.	Research reactor IGR, Kurchatov, East Kazakhstan region	In operation, the studies to reduce the reactor core enrichment are in progress
6.	Research reactor IVG.1M, Kurchatov, East Kazakhstan region	In operation, the studies to reduce the reactor core enrichment are in progress
7.	Research reactor RA, Kurchatov, East Kazakhstan region	The reactor is in a mode of durable shut down. Fuel was removed and transported to the Russian Federation.
8.	The site of long-term storage of spent nuclear fuel of RF BN-350, Kurchatov, East Kazakhstan region	In operation
9.	International Bank of Low Enriched Uranium	Preparing to start operation

Nuclear Power Plant in the Republic of Kazakhstan

Construction of new NPP in the Republic of Kazakhstan has been planned for more than 20 years. For various reasons, the decision on the construction has not been made so far. To the date, neither the type of the NPP, nor its capacity, nor the place of construction has been determined.

However, a certain path has already been traversed and there are some developments that can be used if the decision on the NPP construction is made. In the second half of 2018 and at the beginning of 2019, a document was developed in the Republic of Kazakhstan called "The Marketing Section of the Feasibility Study (FS MS) for the Construction of a Nuclear Power Plant in the Republic of Kazakhstan" (hereinafter referred to as the NPP FS MS). The purpose of development of the NPP FS MS was the selection of optimal location area (exclusion of variation) of the first nuclear power plant with an assessment of the possible range of installed power of the nuclear power plant, facilities for outputting of power and the applicability of unit capacity of the most reference units for making a decision on the FS.

Two areas were considered in the NPP FS MS for location of NPP: the area of Ulken settlement near Balkhash Lake and the area near Kurchatov City and in terms of the technical and economic comparison of options, including formation of the balance of electricity and base capacity, the construction of nuclear power plants is recommended in the Southern zone, which corresponds to the location of NPP in the area of Ulken settlement.

Based on a comparative analysis, the most promising designs are the VVER-1200 reactors and the AP-1000, ATMEA1, APR1400 and HPR-1000 reactors, the vendors of which showed interest in construcion of their plants in the Republic of Kazakhstan. VVER-1200, AP-1000, APR1400 reactors have reference blocks, which are under construction in the manufacturer countries and abroad.

The International Atomic Energy Agency has developed a number of documents that help to create on their basis a modern infrastructure for the development of a nuclear program for any of the member state of this organization. The development and introduction of

appropriate infrastructure for the successful development of nuclear power engineering and its safe, peaceful and sustainable use is an important issue for countries that intend to build and commission their first nuclear power plant.

The IAEA conducts special missions for countries wishing to embark on nuclear energy programs, i.e. construction of nuclear power plants to generate electricity. These missions, INIR (Integrated Nuclear Infrastructure Review), contribute to the early establishment of a nuclear infrastructure, taking into account the rich international experience and with the help of IAEA experts.In the Republic of Kazakhstan, the INIR mission on the stage (phase) one was conducted from October 31 to November 7, 2016. Based on the recommendations and suggestions, key areas for further action were identified.

At present, the following main documents determine the need for building of new NPP in Kazakhstan:

- Decree of the President of the Republic of Kazakhstan dated February 1, 2010 No. 922
- "On the Strategic Development Plan of the Republic of Kazakhstan until 2020".
- - Order of the Prime Minister of the Republic of Kazakhstan dated May 4, 2014 No. 60-p “On approval of “Plan of priority measures for construction of nuclear power plants in the Republic of Kazakhstan ”with amendments and additions dated November 02, 2016 No. 110-p.
- - Concept of development of the fuel and energy complex of the Republic of Kazakhstan until 2030 dated June 28, 2014.
- - The concept of the transition of the Republic of Kazakhstan to the "green economy", approved by Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577.
- - Strategic Plan of the Ministry of Energy of the Republic of Kazakhstan for 2017-2021.

Reactor Facility BN- 350

The reactor site is located near Aktau, Mangistau region. Operator – LLP MAEC-Kazatomprom. Reactor facility (RF) BN- 350 is the experimental-industrial installation of the loop type. The heat-removal circuit of RF BN-350 is three-loop. The coolant of the first and second circuits is sodium; the third circuit is steam water. The design thermal power of the reactor was 1000 MW, the equivalent electrical power – 350 MW. RF had not been operated at the maximal design parameters. For the whole time of operation the maximum thermal power was 750 MW. The reactor was in operation from 1972 to 1999.

Technical characteristics of RF BN-350

Thermal power, MW	1000
Fuel	UO_2
Load ^{235}U, kg	Fuel was removed, and transported for the long-

	term storage
Enrichment ^{235}U, %	17, 21, 26

The design lifetime of the reactor facility was 20 years. In 1992 the decision was made to upgrade the safety systems of the reactor and to conduct scientific research in order to continue the operation of the reactor for 10 years, until 2003. Several organizations located in Russia – VNIPIET – the Prime Projector, OKBM – Chief Designer, and PEI – Research Manager, developed design of the reactor facility. After the expiration of the scheduled lifetime, it was necessary to obtain an annual agreement from these organizations to extend the operation of the reactor. After the breakup of the USSR, and taking into account the financial situation in the energy sector in Kazakhstan, it was almost impossible to carry out designer's supervision over the reactor facility by Russian organizations in accordance with regulatory requirements, so this plan was not implemented in full. In 1998, in the absence of the agreed technical solutions of the given organizations, the Committee for Atomic Energy of the Republic of Kazakhstan (CAE RK) refused to issue a license for the further operation of the reactor.

The IAEA experts under OSART mission (Operational Safety Review Team) also came to the conclusion that during recent years BN-350 lacked sufficient financial and material resources to maintain the required minimum level of reactor safety. Moreover, the international community welcomed the shutdown of the reactor in terms of non-proliferation problems, as the reactor produced weapon-grade plutonium; so in 1999 the Government of the Republic of Kazakhstan adopted Decree #456 "On the decommissioning of BN-350 reactor in Aktau, Mangistau region", which provided placement of the reactor into SAFSTOR state and 50 years safe storage before the final dismantling and disposal.

During the operation of RF BN-350, the removed spent fuel of the reactor was stored under water in the storage pools, and then was transported to Russia for reprocessing. After the breakup of the USSR transportation of spent fuel was stopped and the remaining fuel continued to be stored in the storage pools. Then, with the financial and technical support from the United States, spent fuel was packed into sealed cases made of stainless steel. After that all the fuel was loaded into specially made metal-concrete containers of dual-purpose use (transportation and long-term storage) and transported to the site "Baikal- 1", located on the territory of the former Semipalatinsk nuclear test site, where it is currently located for long-term storage under IAEA safeguards. The storage facility is equipped with all the necessary physical protection systems. The estimated lifetime of the storage containers – 50 years, taking into account the certification conducted every 5 years of storage. By the time of the expiration date it is necessary to decide on the option of final treatment for the given fuel.

The safety assessment of reactor facility BN-350 at the present moment is reflected in the following documents:

- Safety Justification for the operation of reactor facility BN-350, State Science Center of the RF PEI, OKBM, VNIPIET, MAEC, 1995.
- Safety Justification for the operation of reactor facility BN-350 after complete removal of the nuclear fuel from the reactor, 2003.

Status checks of nuclear and radiation safety are conducted annually to assess the safety of reactor facility BN-350, and are documented by the relevant acts. Copies of the acts are sent to the CAESC ME RK. For all the works related to decommissioning of RF BN-350, separate

safety justification reports are developed, that are agreed with the CAESC ME RK as required.

WWR-K Reactor

The research reactor (RR) WWR-K is located in Alatau settlement near Almaty, Almaty region. Operator – RSE Institute of Nuclear Physics of ME RK. It is pool type reactor with thermal neutrons. Coolant, moderator and reflector are desalinated water. The reactor was put into operation in 1967, operated on the thermal power of 10 MW up to 1988 without deviation from the normal operation. The Research Manager of the RR WWR-K project is a Russian Research Center "Kurchatov Institute", the Chief Designer of the reactor – NIKIET, the General Designer of the WWR-K – SSDI. All of these organizations are located in the Russian Federation.

Specifications of RR WWR-K

Thermal power, MW	6
Fuel	UAl_4
Load ^{235}U, kg	4.46
Enrichment ^{235}U, %	19.7

In addition to fundamental nuclear physical and materials scientific researches and in situ tests, the reactor is used for production of medical radioisotopes and gamma-ray sources, neutron doping of silicon, and neutron activation analysis.

The reactor is equipped with hydraulic tube, pneumatic tube, universal loop facility, the installation of neutron radiography, facility for the analysis of uranium containing samples by delayed neutron technique, in-core installations for testing of construction materials for the long-term strength and creep, a chain of hot cells for work with highly active materials.

The spent fuel of WWR-K reactor was exported to Russia before the collapse of the Soviet Union, after that spent fuel was placed into at-reactor storage facility, which is equipped with the physical protection system and is under IAEA safeguards and supervision.

From 1988 to 1998 the works were conducted at WWR-K to improve security in conditions of high seismicity (calculations and studies, improvement of structures, duplication of systems responsible for the security, processing of the new documentation). By changing the configuration of the core the thermal power has been reduced to 6 MW without loss of neutron flux.

The service life of WWR-K is defined by chief designer, based on the number of 20 daily cycles of loading of pipelines and must not exceed 716 cycles since 21.10.67. So far the remaining life of the reactor is 88 loading cycles corresponding to 9 years of the reactor operation at maximum loading. To extend the service life of the WWR-K technical examination of the reactor vessel and pipelines of the primary circuit was conducted in 2015.

From 1967 to 2016 the WWR-K reactor has used the fuel assemblies of WWR-C type, UO_2 – Al with 36% enrichment. WWR-C fuel assembly contains five tube fuel elements. Conversion of WWR-K reactor was carried out in the framework of an international program on reduction of fuel enrichment of the research and test reactors (RERTR).

From 2003 to 2008 the Institute of Nuclear Physics (INP) of the Republic of Kazakhstan with the financial support of the Nuclear Threat Initiative (NTI, USA) conducted the studies on the selection of the fuel composition and the fuel assembly design for the transfer of WWR-K reactor to a low enrichment fuel. Computational studies considered uranium fuel compositions (uranium dioxide and uranium-molybdenum alloy dispersed in an aluminum matrix), as well as the fuel assemblies (FA) of various designs.

As a result of the research the FA was selected with fuel composition based on uranium dioxide dispersed in an aluminum matrix, with a uranium density of 2.8 g/cm^3 and 19.7% enrichment by uranium-235, the most optimal in terms of technical and economic indicators.

In accordance with existing regulations of the Republic of Kazakhstan before production of the fuel assemblies it is required to conduct reactor tests of an experimental batch of fuel assemblies to confirm their design characteristics. Specialists of the Institute of Nuclear Physics with the participation of experts from Argonne National Laboratory (USA) and NIKIET (RF) developed reasonable testing program for experimental fuel assemblies (EFA) and made safety justification of conducting the study tests on the reactor WWR-K, which included an analysis of possible transient processes. In agreement with the developer of EFA (NIKIET) the decision was made to conduct the tests under the modes of operation of EFA as a part of with low-enriched fuel core. The analysis of the steady state and thermo-hydraulic calculation of core was carried out. The permission was obtained from the supervision authority to carry out the tests. Novosibirsk Chemical Concentrates Plant (NCCP, Russia) manufactured three experimental fuel assemblies. In the period from March 2011 to July 2013 the resource tests were carried out in the active zone of the reactor WWR-K. There were three stages of the tests – before reaching the middle of burnout in EFA 20, 40 and 60%; at the end of each stage a visual inspection of EFA was performed.

Since 2013 to 2015 a critical test bench of WWR-K (see next Chapter) was used for the experiments on the modeling of the core of a research reactor WWR-K with low-enriched fuel. There were gained critical and operation load of the WWR-K reactor with FA of the WWR-KN type with side water reflector. Critical load consisted of 11 fuel assemblies of WWR-KN type 1 and 10 FA of WWR-KN type 2; workload consisted of 17 fuel assemblies of WWR-KN type 1 and 10 fuel assemblies of WWR-KN type 2.

On March 31, 2016, the core of a research reactor WWR-K was loaded with first FA of low enrichment fuel, which marked the beginning of work on the physical start of the reactor. During the physical start-up an operation load of the reactor core was formed, which consisted of 17 fuel assemblies of type 1 and 10 FA of type 2; the neutron-physical characteristics of the core were identified. The power start-up of the reactor took place in May of 2016. Commissioning date was September, 01, 2016. Scientific research works continue to be implemented at WWR-K IR within the framework of the republican budget programs, as well as within the contracts with international organizations and companies both in the Republic of Kazakhstan, and abroad.

As part of the training program of physical/ power startups, the safety analysis report (SAR) was developed for the WWR-K reactor with low-enriched reactor core. In 2016 SAR of research reactor was agreed and approved by CAESC ME RK. In accordance with the regulatory requirements, the research reactor SAR was adjusted in accordance with results of the power start-up and agreed by CAESC ME RK in 2018.

There is a valid passport to the reactor, which expires in August 2019. At present, the preparation of relevant documents is in a progress for sending them to CAESC to obtain a new passport. Validity of a passport in accordance with the legislation is three years.

The critical test bench of RR WWR-K

The facility is located on the site in Alatau settlement near Almaty, Almaty region. Operator – RSE Institute of Nuclear Physics of ME RK. Moderator is desalinated water. Side reflector is desalinated water or beryllium. The upper and lower end reflector is water.

Specifications of critical test bench of RR WWR-K

Thermal power, MW	100 W (limited by bioshield)
Fuel	UAl_4
Loading ^{235}U, kg	It varies depending on the experiment
Enrichment ^{235}U, %	19,7

The test facility is intended for researches on safety justification of the research reactors, testing of various reactor techniques, verification of computer codes, and safety justification of conducted dangerous nuclear experiments at the reactor WWR-K. Critical assembly of critical test bench can in some cases completely simulate the core of water-moderated reactor WWR-K.

The developer of the critical test bench is the operator – RSE Institute of Nuclear Physics of ME RK.

"Safety Analysis Report on critical test facility INP RK, 2012" was developed for the critical test facility and agreed with the CAE MINT RK (predecessor of CAESC ME RK), which is the basic document justifying the nuclear and radiation safety of critical test facility.

There is a passport issued by CAESC. In connection with the expiration of the passport, a new report on the safety analysis and a draft passport were prepared and sent to CAESC of RK for approval and issuance of a new passport.

The reactor IGR

IGR research reactor is located on the territory of the former Semipalatinsk Nuclear Test Site, "Test Field" site, near Kurchatov, East Kazakhstan region. Operator – National Nuclear Center of ME RK. Chief Designer – Federal State Unitary Enterprise " N.A. Dollezhal Scientific – Research Design Institute of Power Engineering", Research Manager – Federal State Institution Russian Research Center "Kurchatov Institute", General Designer – All-Russian Research and Design Institute for Energy Technologies – VNIPIET. All of these organizations are located in the Russian Federation.

One of the world's oldest research reactors (commissioned in 1961), the reactor IGR is a unique source of neutron and gamma radiation, which differentiates by high dynamics of power variation.

Specifications of RR IGR

Thermal power, MW	10 GW – unregulated impulse

	1 GW – regulated mode
Fuel	Graphite infiltrated with uranyl nitrate
Loading ^{235}U, kg	9,056
Enrichment ^{235}U, %	90

IGR research reactor is a thermal neutrons pulse reactor with a homogeneous uranium-graphite core of heat capacity type. The high heat capacity of graphite allowed not to have in the core a system of forced removal of heat generated during operation of the reactor. The lack of traditional coolant circuit significantly reduces the risk of a radiation accident at the reactor.

Nuclear safety of the reactor IGR is due to a significant negative coefficient of reactivity, which provided for guaranteed extinction of any physically possible power impulse initiated by the introduction of positive reactivity by removing the control rods.

The rate of accumulation of spent fuel at the complex of the research reactor IGR (CRR IGR) is determined by the amount of fuel in the experimental devices tested (irradiated) in the IGR reactor. Reactor fuel has not been unloaded since 1968. In 1967, 8 kg of uranium with enrichment of 90% dispersed in the graphite matrix weighing 2604 kg was removed from the reactor IGR for replacement.

Experimental devices with fuel tested in the IGR reactor are placed in the storage of nuclear materials in the room 0101 in Building 1 for aging for 3...5 months and then are transported to the radiation-protective chamber at CRR "Baikal-1" for the post-irradiation researches. After the research, fuel is placed for long-term storage.

For the storage of spent fuel at CRR IGR two storages are used: storage of nuclear materials in the room 0101 in building 1 and storage in the room 25 in building 20, which houses the graphite elements of the first core of the reactor IGR. Storage is equipped with a system of physical protection and is under the IAEA safeguards and supervision.

Project and design documentation for the reactor IGR does not establish the design lifetime of the reactor.

The Commission, appointed by the order of the RSE NNC RK, the composition of which shall be agreed with the CAESC ME RK, conducts technical inspection of the major systems and components of the IGR reactor. Based on the results of the technical inspection of the reactor systems and components the Commission determines possibility of further operation of the reactor and sets the deadline for the next technical inspection.

Previous technical inspection of the major systems and components of the reactor IGR was conducted in 2016.

For the first time the report on the safety analysis of RR IGR was developed and approved by the CAE MINT RK in 2001. Currently the main document defining the safety of RR IGR is the report "Pulse graphite reactor. Safety Justification. Account # E/7235 dated on 25.10.2010, agreed with the CAE MINT RK.

At present, in the frame of the contracts between the Argonne National Laboratory (USA), the Federal State Unitary Enterprise "Scientific-Research Institute of Scientific and Industrial Association "Luch", and a branch of the Institute of Atomic Energy of the Republican State Enterprise "National Nuclear Center" (IAE NNC) of the Republic of Kazakhstan, the works

are implemented to analyze technical possibility of reduction of the fuel enrichment in the research reactors IGR.

The reactor IVG.1M

IVG.1M research reactor is located on the territory of the former Semipalatinsk Nuclear Test Site, the site "Baikal -1" near Kurchatov, East Kazakhstan region. Operator - National Nuclear Center of ME RK. Chief Designer - Federal State Unitary Enterprise " N.A. Dollezhal Scientific - Research Design Institute of Power Engineering", Research Manager – Federal State Institution Russian Research Center "Kurchatov Institute", Chief Designer of fuel channels – research and industrial association "Luch". All of these organizations are located in the Russian Federation.

The water-cooled reactor IVG.1M is an upgrade of the gas-cooled reactor IVG.1, which was used for testing the fuel assemblies and the cores of high temperature gas-cooled reactors, including reactors of nuclear spacecraft propulsion and nuclear engineering power systems. IVG.1 reactor fuel was exported to Russia during its modernization into IVG.1M.

Specifications of RR IVG.1M

Thermal power	72 MW
Fuel	Uranium-zirconium alloy
Loading ^{235}U, kg	4.6 kg
Enrichment ^{235}U, %	90

IVG.1M reactor allows to conduct researches for ensuring of solution of the following tasks:

- testing of different types of fuel assemblies in the operation conditions;
- in-situ testing of construction materials of fuel assemblies ;
- refinement of the designs of fuel assemblies and their components ;
- investigation of possible emergencies and testing of measures to prevent them.

During the operation of the IVG.1M reactor (1990-2019), in 2004, one fuel assembly was unloaded from the reactor core, which was then dismantled for experiments. In 2016, two more assemblies were removed from the core, and low-enrichment assemblies were put in their place, which since 2017 have been used in experiments to convert the reactor to low-enriched fuel.

Fuel assemblies are placed for long-term storage into specially designed storage facility of the reactor IVG.1M, which has biological protection and loading mechanisms. Storage is equipped with a system of physical protection and is under the IAEA safeguards and supervision.

The design life of the reactors is not established. The period of extension of the reactor IVG.1M operation is once in every three years by the decision of the Commission for technical examination of systems and components of the reactor. Current Act on Technical Survey of the Systems and Elements of Reactor IVG.1M is dated on 03.10.2017 (the next technical inspection of reactor IVG.1M systems and elements is scheduled for 2020).

For the first time the report on the safety analysis of RR IVG.1M was developed and approved by the CAE MINT RK in 2002. Currently the main document defining the safety of RR IVG.1M is a report "Complex of the research reactors "Baikal-1". The research reactor IVG.1M is “Safety Analysis Report AK.66000.01.966, Inv. # K-51622 dated in 11.12.2013.

At present, in the framework of the contracts between the Argonne National Laboratory (USA), the Federal State Unitary Enterprise "Scientific-Research Institute of Scientific and Industrial Association "Luch" (Russia), and a branch of the Institute of Atomic Energy of the Republican State Enterprise "National Nuclear Center" (IAE NNC) of the Republic of Kazakhstan, the works are implemented to analyze technical possibility of reduction of the fuel enrichment in the research reactors IVG.1M.

RA reactor

RA research reactor is located on the territory of the former Semipalatinsk Nuclear Test Site, the site "Baikal-1" near Kurchatov, East Kazakhstan region. Operator - National Nuclear Center of ME RK. The Chief Designer of the reactor RA is "Research and Development Institute of Power Engineering" (NIKIET), Research Manager - Federal State Institution Russian Research Center "Kurchatov Institute", General Designer - All-Russian Research and Design Institute for Energy Technologies - VNIPIET. All of these organizations are located in the Russian Federation.

RA reactor was based on the design of the bench prototype of nuclear spacecraft propulsion and put into operation in 1987. Prior to 1997, various studies were conducted in justification of safety of nuclear power, to study the effects of radiation on biological objects and other works. In 1998, in accordance with intergovernmental agreements, all the fuel from the reactor was unloaded and transported to the Russian Federation.

All of the reactor systems are in working order. The resumption of operation of the reactor is not planned, but within the IAEA classification the RA reactor is considered to be functional one, since there is no developed and approved plan for its decommissioning. The design lifetime of the reactor is not established, the measures to prolong its lifetime are not conducted as its restart is not supposed.

Specifications of RR RA

Thermal power, MW	Depends on fuel
Fuel	
Loading ^{235}U, kg	No fuel since 1998
Enrichment ^{235}U, %	-

Long-term storage site of RF BN-350 spent fuel

Long-term storage of spent fuel of BN-350 reactor is located at CRR "Baikal-1" site. Transportation of spent fuel and its placement on the site for the long-term storage was completed in December 2010. The site of long-term storage of spent fuel includes two areas:

- open area site for storage, size 62.6×21 m, which allows for placement of 60 containers of spent fuel of the reactor BN-350 for storage and maintenance;

- reload area with the size 28×21 m, designed for unloading of containers from car trailers, and loading of empty protection cases on car trailer.

The storage area is a concrete site, on which the containers are placed in an upright position in four rows.

There are in total 60 dual-purpose containers (for both transportation and long-term storage) with spent nuclear fuel of RF BN-350. Containers are sealed by the IAEA inspectors and they are under their control and safeguards. The storage area of spent fuel is provided with physical protection system.

The main document substantiating the safety of operation of long-term storage of spent fuel is the report "Long-term container storage for spent nuclear fuel RF BN-350 at the complex of the research reactors "Baikal -1" and a reloading site in Kurchatov. The document was developed in 2008 and agreed with the CAE MINT RK. Containers are subject to mandatory certification every 5 years of storage with the assistance of expert organizations, operator and developer of containers JSC "KBSM", the Russian Federation and following approval by the CAESC ME RK.

Currently the certificate for storage of the containers with SNF of RF BN-350 was prorogated by the order of April 18, 2019 and will be valid until December 31, 2023.

International Bank of Low Enriched Uranium

The territory of Ulba Metallurgical Plant JSC, Ust-Kamenogorsk, was chosen by the IAEA to host the International Bank of Low-Enriched Uranium.

The official results of the tender for 90 metric tons of enriched uranium product in the form of low-enriched uranium are published on the IAEA website on November 20, 2018, delivery is planned for the end of 2019. The tender was won by NAC Kazatomprom JSC, Kazakhstan (42 tons) and Orano SA, France (48 tons).

The implementation of the project for placement of the Bank of Low Enriched Uranium (BLEU) in Kazakhstan of the IAEA continues in accordance with the Plan of specific measures adopted within the framework of the Technical Agreement between the Ministry of Energy of the Republic of Kazakhstan and the IAEA. The implementation of the Action Plan is reviewed at meetings of the Joint Coordinating Committee established in accordance with this Technical Agreement. At present, organizational and legislative measures are being taken to ensure the functioning of the LEU Bank, in particular, the resolution of taxation issues, the customs regime for temporary admission and civil liability for nuclear damage.

Article 7. Legislative and regulatory basis

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.

2. Legislative and regulatory basis provides:

i) the establishment of applicable national requirements and regulations in the field of security;

ii) the system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;

iii) the system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and terms of licenses;

iv) the enforcement of applicable regulations and terms of licenses, including suspension, modification or revocation.

7.1. Creation and Maintenance of Legislative and Regulatory Basis

General review of the legislative basis of atomic safety

The need for legislative regulation of the activity related to atomic energy use is caused by its potential danger, and the availability of facilities and dual-use technologies that can be used not only for peaceful purposes. The modern legal and regulatory basis of the Republic of Kazakhstan in the field of atomic energy use and radiation safety is presented by four levels documents:

- The first level - Decrees of the President of the Republic of Kazakhstan having the force of law, Codes and Laws of the Republic of Kazakhstan.
- The second level - the Decrees of the Government of the Republic of Kazakhstan on the atomic energy use and radiation safety.
- The third level - the Rules and Regulations specifying the issues of radiation safety while handling the radiation sources, prescribing the allowable radioactive contamination of the environment and exposure of workers and the public, which are approved by the central government authorities.
- The fourth level - the standards, guidelines, standard instructions for individual industries and enterprises of the industry.

At present nuclear and radiation safety in the Republic of Kazakhstan is regulated by the following documents, which define the basic provisions in ensuring nuclear and radiation safety:

- Law of the Republic of Kazakhstan "On Atomic Energy Use";
- Law of the Republic of Kazakhstan "On Radiation Safety of Population";
- Environmental Code of the Republic of Kazakhstan;
- Law of the Republic of Kazakhstan # 202-V "On Permissions and Notification" dated on May 16, 2014, which replaced the Law of the Republic of Kazakhstan “On Licensing”;

The Law "On Atomic Energy Use" defines the legal basis and principles for the regulation of social relations in the field of atomic energy use and aims to protect human health and safety,

environmental protection, ensuring the non-proliferation of nuclear weapons, nuclear and radiation safety in the field of the atomic energy use.

Facilities of atomic energy use on the territory of the Republic of Kazakhstan are nuclear installations, storage facilities, ionizing radiation sources above the exemption levels, organizations using the sources of ionizing radiation, including medical, educational, research, commercial, agricultural and industrial ones, mining, processing, as well as other organizations.

The subjects in the field of atomic energy use are individuals, the authorized regulatory, supervision and control body, organizations (legal entities) engaged into activities on the atomic energy use.

The law "About permissions and notifications" provides for the following main types of activities in the field of atomic energy use:

- performance of work related to the stages of the life cycle of facilities of atomic energy use;
- management of nuclear materials;
- handling of instruments and installations that generate ionizing radiation;
- provision of services in the field of atomic energy use;
- radioactive waste management;
- transportation, including transit, of nuclear materials, radioactive substances, radioisotope sources of ionizing radiation, radioactive waste within the territory of the Republic of Kazakhstan;
- activities at territories of former nuclear test sites and other territories contaminated as a result of nuclear tests conducted;
- physical protection of nuclear facilities and nuclear materials;
- special training of personnel responsible for ensuring nuclear and radiation safety.

The law "On the use of atomic energy" defines the basic rights of the authorized state bodies and officials in the field of atomic energy use, establishes the rights and responsibilities of citizens and civil society organizations in the field of atomic energy use. In accordance with the requirements of the Law the individuals and legal entities carrying out activities in the field of atomic energy use, are required to

- have a license for conducting of the activity;
- have necessary organizational, financial, material and technical resources and have qualified personnel for the safe operation and maintenance of a nuclear facility for the entire period of life cycle;
- ensure compliance of the design and operational characteristics and parameters of atomic energy use facility to the requirements of atomic and radiation safety, and nuclear security, export controls and (or) the requirements of the nuclear nonproliferation regime;
- have an organizational structure and internal documents system to ensure compliance with the requirements of nuclear and radiation safety, and nuclear security, established by the legislation of the Republic of Kazakhstan in the field of atomic energy use;

- have an organizational structure and internal documents system to ensure compliance with the requirements for the accounting and control of ionizing radiation sources and nuclear materials in accordance with the legislation of the Republic of Kazakhstan in the field of atomic energy use;
- provide for accounting and control of and control of ionizing radiation sources and nuclear materials, and to submit the reports of their availability, movement and location to the authorized body;
- inform the authorized body about any changes in the systems, equipment, documentation of a nuclear facility, which are related to ensuring the nuclear and radiation safety, and nuclear security;
- inform the authorized body about accidents and incidents related to the nuclear and radiation safety, and nuclear security;
- comply with the requirements of the nuclear and radiation safety, and nuclear security, established by the legislation of the Republic of Kazakhstan in the field of atomic energy use;
- keep a record and analysis of radiation doses of workers assigned for nuclear and radiation-hazardous work in the implementation of activities in the field of atomic energy use, and to ensure the realization of their rights to compensation;
- provide training, maintenance of qualifications and timely certification of personnel employed at the facilities of atomic energy use;
- individuals and legal entities engaged in operation of nuclear facilities, and (or) the owners of such facilities are not allowed to transfer nuclear facilities to other individuals and legal entities, if these persons do not have the license for the relevant activity in the field of atomic energy use;
- ensure the financial resources for decommissioning of nuclear facilities, closure of disposal facilities, post-utilization, disposal of radioactive waste;
- upon termination of activities to transfer radioactive waste and (or) spent radioactive sources into the storage or disposal facilities;
- carry out the works on the restoration of the environment, reclamation of territories, decontamination of equipment and buildings contaminated while implementing the terminated activities.

Separate sections of the Law are devoted to the issues of radioactive waste management. In particular, article 17 of the Law postulated that:

- radioactive waste generated in the Republic of Kazakhstan shall be disposed in such a way as to ensure the radiation protection of the population and environment for the entire period during which they can pose a potential threat;
- persons engaged in activities that lead to the formation of radioactive waste are obliged to take measures for their minimization;
- safe disposal of spent nuclear fuel and radioactive waste should be provided by design and operational documentation as a prerequisite for any kind of activity, which leads to formation of radioactive waste.

The Law "On Radiation Safety of the Population" was adopted in April 23, 1998, № 219-1 as amended.

The law regulates the social relations in the field of radiation safety of the population, in order to protect their health from the harmful effects of ionizing radiation. The law stipulates that the radiation safety is provided by:

- set of legal, organizational, engineering, sanitation, preventive, educational, general educational and informational nature measures;
- implementation by the state bodies of the Republic of Kazakhstan, associations, individuals and legal entities of measures to comply with the rules and regulations in the field of radiation safety;
- implementation of the radiation monitoring throughout the country ;
- implementation of government programs to limit the exposure of the population from the sources of ionizing radiation;
- implementation of quality programs for radiation safety at all levels of practical activities with the sources of ionizing radiation.

The law stipulates that government regulation on radiation safety is ensured and implemented by setting the standards for radiation safety, sanitary rules and hygienic standards, construction codes and regulations, occupational safety rules, guidance and other documents on radiation safety.

The Law of the Republic of Kazakhstan "On Permissions and Notifications" was adopted on May 16, 2014, with changes and amendments as of January 14, 2016.

The law regulates the public relations connected with the introduction of permission or notification practices for private businesses or other entities to conduct the separate activities or actions stipulated by this Law.

The Law defines the spheres of activities subject for licensing, including atomic energy use.

Specific conditions for issuing the license and (or) appendices to a license to conduct the activity in the field of the atomic energy use are defined by the Law of the Republic of Kazakhstan “On Atomic Energy Use”.

At that, Article 8 of the Law “On Atomic Energy Use” establishes that any activity in the field of atomic energy use, subject to licensing by the authorized bodies of state safety regulation, it is not allowed without a license for its implementation.

“The Environmental Code of the Republic of Kazakhstan” was adopted in January 9, 2007, №212 as amended.

The Environmental Code is effective since January 9, 2007, which absorbed the world experience to ensure environmental safety and production in Kazakhstan. Status of the environmental requirements and standards of the Environmental Code has a level of legislative acts of direct action.

The Code defines the basic rules and regulations for environmental and nuclear safety in the Republic of Kazakhstan and considers:

- cross-border movement of radioactive wastes and materials;
- environmental requirements for the use of radioactive materials;
- environmental requirements for storage and disposal of radioactive materials and waste;
- environmental requirements for the transportation of radioactive materials and waste;

- environmental requirements for the placement and operation of nuclear installations and facilities intended for radioactive waste management;
- organization of monitoring for the radiation situation in the residential areas, in residential and public buildings, the radiation safety of construction materials, fertilizers, fuel - energy raw materials and oil operations;
- requirements for radiation monitoring of scrap metal;
- procedure for the implementation of activities during radiation accidents;
- supervision and control in the field of radiation safety.

Along with the above-mentioned laws, the following regulatory and technical documents are currently in force in the Republic of Kazakhstan:

- Technical regulations “Nuclear and Radiation Safety”, “Nuclear and radiation safety of nuclear power plants”, “Nuclear and Radiation Safety of Nuclear Research Installations”.
- Hygienic standards “Sanitary and epidemiological requirements for radiation safety", Sanitary Rules "Sanitary and epidemiological requirements for radiation safety", Sanitary Rules "Sanitary and epidemiological requirements for radiation-hazardous objects".
- In the framework of development of by-law regulations, which are aimed for realization of the statements of the Law “On Atomic Energy Use”, the Regulations for organization, collection and disposal of RW were developed and issued on February 8, 2016, by the order of Ministry of Energy of Republic of Kazakhstan.

These documents were developed by the Republic of Kazakhstan within the framework of enhancement of national legislation in the field of atomic energy use and protection of public health. In addition, based on clause 19 of “Nuclear and Radiation Safety” Technical Regulations for a specific NRPF, the Republic of Kazakhstan has still used separate safety-related technical documents developed in USSR and in other countries, as well as the IAEA documents, which consider the issues that are not reflected in the above mentioned Technical regulations and Sanitary rules.

A complete list of legal acts effective in the Republic of Kazakhstan applicable to the regulation of issuess of atomic energy use, is shown in Appendix 1 to the present Report.

7.2 Ratification of International Conventions and Agreements Related to Atomic Safety

Nuclear safeguards are applied in the Republic of Kazakhstan in accordance with the Agreement between the Republic of Kazakhstan and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons, which entered into force in August 11, 1995.

The Republic of Kazakhstan is expanding cooperation with countries in the nuclear field. Since 1992, The Agreement on the basic principles of cooperation on the peaceful atomic energy use is effective between the countries of the CIS.

To date, the Agreement on Cooperation in the Peaceful Uses of Atomic Energy is signed with the Russian Federation (concluded in Moscow in 09.23.1993), with the United States of America (ratified by the Law of the Republic of Kazakhstan from July 13, 1999 № 420-1), with French Republic (signed in Paris, 07.27.2011), the European Atomic Energy Community (Euratom) in the field of peaceful atomic energy use, Agreement on cooperation

in the field of radiation and nuclear safety between Norway Radiation Safety Agency and Atomic Energy Committee of the Republic of Kazakhstan (Oslo, November 27, 2009), with the People's Republic of China, the Republic of Korea and other countries.

Within the framework of the ATOM-CIS cooperation, the CIS member states signed the "Agreement on the Cooperation of the CIS Member States on provision of Preparedness for a Nuclear Accident or a Radiation Emergency and Mutual Assistance in Elimination of Their Consequences". But according to the legislation of the Republic of Kazakhstan, the Agreement will enter into force after its ratification.

Republic of Kazakhstan signed and ratified international Conventions related to nuclear safety, being adopted by the following Laws of Republic of Kazakhstan:

1. Law of Republic of Kazakhstan, dated February 3, 2010, No. 243-IV "On Ratification of the Convention on Early Notification of a Nuclear Accident"
2. Law of Republic of Kazakhstan, dated February 3, 2010, No. 244-IV "On Ratification of Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency"
3. Law of Republic of Kazakhstan, dated December 22, 2004, No. 17 "On Accession of the Republic of Kazakhstan to the Convention on the Physical Protection of Nuclear Material",
4. Law of Republic of Kazakhstan, dated March 19, 2011, No. 416-IV "On Ratification of the Amendments to the Convention on the Physical Protection of Nuclear Material"
5. Law of Republic of Kazakhstan, dated October 21, 2000, No. 86-II "On Accession of the Republic of Kazakhstan to the Convention on Environmental Impact Assessment in a Transboundary Context"
6. Law of Republic of Kazakhstan, dated February 3, 2010 No. 245-IV "On Ratification of the Convention on Nuclear Safety"
7. Law of Republic of Kazakhstan, dated February 10, 2011 No. 405-IV "On Ratification of the Vienna Convention on Civil Liability for Nuclear Damage of 1997 (Consolidated text of the Vienna Convention on Civil Liability for Nuclear Damage of May 21, 1963, as amended by the Protocol of September 12, 1997)"
8. Law of Republic of Kazakhstan, dated February 3, 2010 No. 246-IV "On Ratification of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste"
9. Law of the Republic of Kazakhstan,dated October 23, 2000 No. 92-II"On Ratification of the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in issues related to the Environment"

Republic of Kazakhstan are constantly improving the legislative and regulatory framework for decision-making to ensure the safety of nuclear installations and the further development of nuclear energy, taking into account the international experience and the harmonization of safety standards.

Article 8. Regulatory Authority

1. Each Contracting Party shall establish or designate a regulatory authority entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities.

2. Each Contracting Party shall take appropriate measures to ensure the effective separation of the functions of the regulatory authority and those of any other body or organization concerned with the promotion or utilization of nuclear energy.

8.1 Powers and Responsibility of the Regulatory Authority

Functions specific to the nuclear regulator in terms of the Convention are currently assigned to the Ministry of Energy of the Republic of Kazakhstan (ME RK), which responsibilities in the field of atomic energy use were previously assigned to the Ministry of Industry and New Technologies of the Republic of Kazakhstan. Committee for Atomic and Energy Supervision and Control of ME RK (CAESC ME RK), former Atomic Energy Committee of MINT RK, is the agency carrying out control and realization functions in the field of atomic energy use within the competence of the ME RK. Hereinafter referred to as the CAESC ME RK in the performance of its tasks within the competence of the MINT RK is referred to as the "competent authority" in accordance with the legal definitions of the legislation of the Republic of Kazakhstan.

Regulatory functions in the field of atomic energy use in the Republic of Kazakhstan are also performed by Committee of Ecological Regulation and Control of Ministry of Energy RK (environmental protection), Committee for control of quality and safety of goods and services of the Ministry of Health of the Republic of Kazakhstan (functions of state authority in the field of sanitary and epidemiological welfare of the population), the Ministry of the Interior affairs (issue of authorization and protection of objects), the Committee of industrial development and industrial safety of the Ministry of Industry and Infrastructural Development of the Republic of RK (control and supervision in the field of industrial safety), the Committee for Emergency situations of the Ministry of Internal affairs of the Republic of Kazakhstan (elimination of the consequences of man-made accidents).

Safety regulatory authorities are independent from other state bodies, as well as from organizations whose activities are related to the atomic energy use.

According to the Provisions on the CAESC ME RK the main tasks of the Committee under the authority of the Ministry are:

- implementation of the state policy in the field of electric energy and atomic energy use;
- realization of other tasks within the competence of the Committee.

In accordance with its tasks the CAESC ME RK, as prescribed by the law performs the following functions:

- provides for the implementation of state policy in the field of electric energy and atomic energy use;
- carries out the regulatory, realization and control-supervision functions and participates in the implementation of the strategic functions of the central executive body within its competence;

- approves legal acts on the matters within its competence and if it has direct competence for their approval in the ministries acts, with the exception of the normative legal acts concerning human and civil rights and freedoms;
- exercise control and supervision of the activities of individuals and legal entities within its competence;
- carries out control and supervisory functions over the activities of local executive bodies on the issues relating to the responsibilities of Committee;
- implement international cooperation within its competence;
- performs a permissive control;
- conducts inspections related to the execution of its responsibilities in the field of atomic energy;
- exercises state control in the field of atomic energy use;
- 1monitors compliance with the standards and rules of radiation safety, license conditions;
- 1carries out the state control in the field of radiation safety of the population;
- exercise control over the export, import, movement, transit and placement of nuclear materials and other ionizing radiation sources;
- carries out export control in the field of atomic energy use;
- maintains the state accounting of nuclear materials;
- performs state accounting of sources of ionizing radiation;
- coordinates the issuance of a license by an authorized state body exercising state regulation in the field of export control for the export and import of nuclear and special non-nuclear materials, equipment, facilities, technologies, sources of ionizing radiation, equipment and relevant dual-use technologies (assignments), works, services related to their production;
- carries out licensing and licensing procedures within the competence stipulated by the legislation of the Republic of Kazakhstan;
- makes a decision on the state registration or removal from the state register of nuclear materials, sources of ionizing radiation;
- coordinates the calculation techniques related to ensuring nuclear, radiation and nuclear security provided by the expert organization;
- approves the design of transport packaging sets, as well as extends the validity of certificates-permits for them, approved by the authorized bodies of other countries, at territory of the Republic of Kazakhstan;
- organizes research on nuclear, radiation and nuclear security, ensuring the regime of non-proliferation of nuclear weapons and monitoring of nuclear tests;
- develops and approves methodological recommendations for individuals and legal entities carrying out activities in the field of atomic energy use regarding methods and techniques for confirming compliance of a facility using atomic energy with nuclear, radiation, and nuclear physical security requirements established by the legislation of the Republic of Kazakhstan in the field of atomic energy use;
- sets the values of the threshold activity for various radioisotopes;

- carries out the analysis and verification of the received information about the availability, location and movement of ionizing radiation sources and enters it into the register of ionizing radiation sources;;
- conducts certification of personnel employed at nuclear facilities;
- conducts accreditation of organizations carrying out expertise of nuclear, radiation and nuclear security;
- keeps a register of accredited organizations carrying out nuclear, radiation and nuclear security expertise;
- develops, coordinates and approves, within its competence, regulatory technical acts of the Republic of Kazakhstan, instructions, guidelines for the electric power industry and the use of atomic energy;
- within the competence, participates in the development and implementation of strategic and program documents, proposals to the Strategic and Operational Plans of the Ministry of Energy of the Republic of Kazakhstan;
- exercise other powers stipulated by the laws of the Republic of Kazakhstan, acts of the President of the Republic of Kazakhstan and the Government of the Republic of Kazakhstan.

CAESC ME RK realizes the state control of licensee's compliance with license conditions and in case of failure it imposes sanctions within its competence.

"Code of the Republic of Kazakhstan on Administrative Offences" provides administrative fines imposition and license denial for violation of established rules and regulations while handling the nuclear materials and radioactive substances.

Ministry of Ecology, Geology and Natural Resources (environmental protection functions) replaces the Committee of Ecological Regulations and Control of Ministry of Energy RK and provides for environmental protection functions, including the field of atomic energy use. Main goals of the Ministry:

- provides for the implementation of state policy within its competence;
- carries out the regulatory, realization and control-supervision functions and participates in the implementation of the strategic functions of the central executive body within its competence;
- approves legal acts on the matters within its competence and if it has direct competence for their approval in the ministries acts, with the exception of the normative legal acts concerning human and civil rights and freedoms;
- exercise control and supervision of the activities of individuals and legal entities within its competence;
- carries out control and supervisory functions over the activities of local executive bodies on the matters relating to the responsibilities of Committee;
- implement international cooperation within its competence;
- performs licensing and permissive procedures;
- performs a permissive control;

- carries out state environmental examination within its competence, and coordinates the implementation of environmental impact assessment in the Republic of Kazakhstan and carries out its methodological guidance;
- maintain the State Register of natural resources users and sources of environmental pollution;
- provides access to environmental information within their competence in accordance with the legislation of the Republic of Kazakhstan;
- carries out state ecological control over the observance of environmental legislation of the Republic of Kazakhstan, environmental quality standards and environmental requirements, including:
    - compliance with the environmental legislation of the Republic of Kazakhstan;
    - mitigation of consequences of environmental pollution;
    - conservation and liquidation of subsoil use facilities;
    - disposal of harmful substances, radioactive waste and discharge of waste water into the subsoil;
    - compliance with the rules of use, storage, transportation, disposal, recycling or other treatment of radioactive and other environmentally hazardous substances in terms of environmental requirements for the prevention of environmental pollution;
    - compliance with environmental requirements for sanitary-protection areas of facilities with stationary sources of emissions, discharges of pollutants and storing the production and consumption wastes;
    - radiation situation on the territory of the Republic of Kazakhstan, the implementation of design solutions for the prevention of pollution of environment by radioactive substances;
    - compliance with the requirements on the mandatory state environmental review and the implementation of its conditions;
    - performs other functions in accordance with the laws of the Republic of Kazakhstan, Acts of the President and Government of Republic of Kazakhstan.

Committee for quality control and safety of goods and services of the Ministry of Health RK (functions of state authority in the field of sanitary and epidemiological welfare of the population) replaced Committee of Public Health protection of the Ministry of Health and performs the following functions:

- issuance of the sanitary-epidemiological conclusions on the basis of check results, and other forms of control and sanitary-epidemiological examination, in accordance with the legislation of the Republic of Kazakhstan;
- inspections of vehicles within its competence on compliance with legal and regulatory documentation in the field of sanitary and epidemiological welfare of the population, which are used for the transportation of passengers, food products, food raw materials, technical and drinking water, radioactive, hazardous, chemical and toxic substances, conditions of carriage passengers and cargo;

- development of hygienic standards and sanitary regulations regulating the radiation safety of the population, the organization of sanitation and educational activities aimed at the protection of public health;
- implementation of the unified state accounting and control of individual and collective doses of the citizens of the Republic of Kazakhstan;
- implementation of state supervision and control within their competence on the territory of the State in accordance with the legislation of the Republic of Kazakhstan;
- approval of the import of X-ray equipment, devices and equipment using radioactive substances and isotopes;
- control within its competence in the form of inspections and other forms of control in accordance with the current legislation of the Republic of Kazakhstan;
- implementation of radiation monitoring in the field of sanitary and epidemiological welfare of the population on the territory of the Republic of Kazakhstan;
- the suspension of certain types of work, operation of existing, new or renovated facilities to eliminate violations of normative legal acts in the field of sanitary and epidemiological welfare of the population and hygienic standards in accordance with the legislation of the Republic of Kazakhstan on administrative violations;
- establishing and changing of the size of the sanitary protection zones.

The Committee of industrial development and industrial safety MFA RK (control and supervision in the field of industrial safety) are responsible for compliance with the statements of the Law # 188-V "On Civil Protection" dated on April 11, 2014. In accordance with Article 70 of the Law the dangerous industrial objects are the facilities, which produce, use, process, generate, store, transport, or eliminate the radioactive and (or) ionizing radiation sources.

Industrial safety is ensured by:

- establishment and implementation of the requirements of industrial safety, which are mandatory with exceptions established by the legislation of Republic of Kazakhstan;
- approval to use technology, technical devices and materials at hazardous production facilities that comply with appropriate requirements of industrial safety;
- approval for use at the territory of Republic of Kazakhstan of dangerous technical devices, which meet the industrial safety requirements;
- declaration of industrial safety of hazardous production facilities;
- state supervision, as well as industrial control in the field of industrial safety;
- examination of industrial safety;
- certification of legal entities to have a right for performing the works in the field of industrial safety;
- monitoring of industrial safety;
- service of dangerous industrial facilities by professional emergency services and formations.

8.2 Structure of the Regulatory Authority

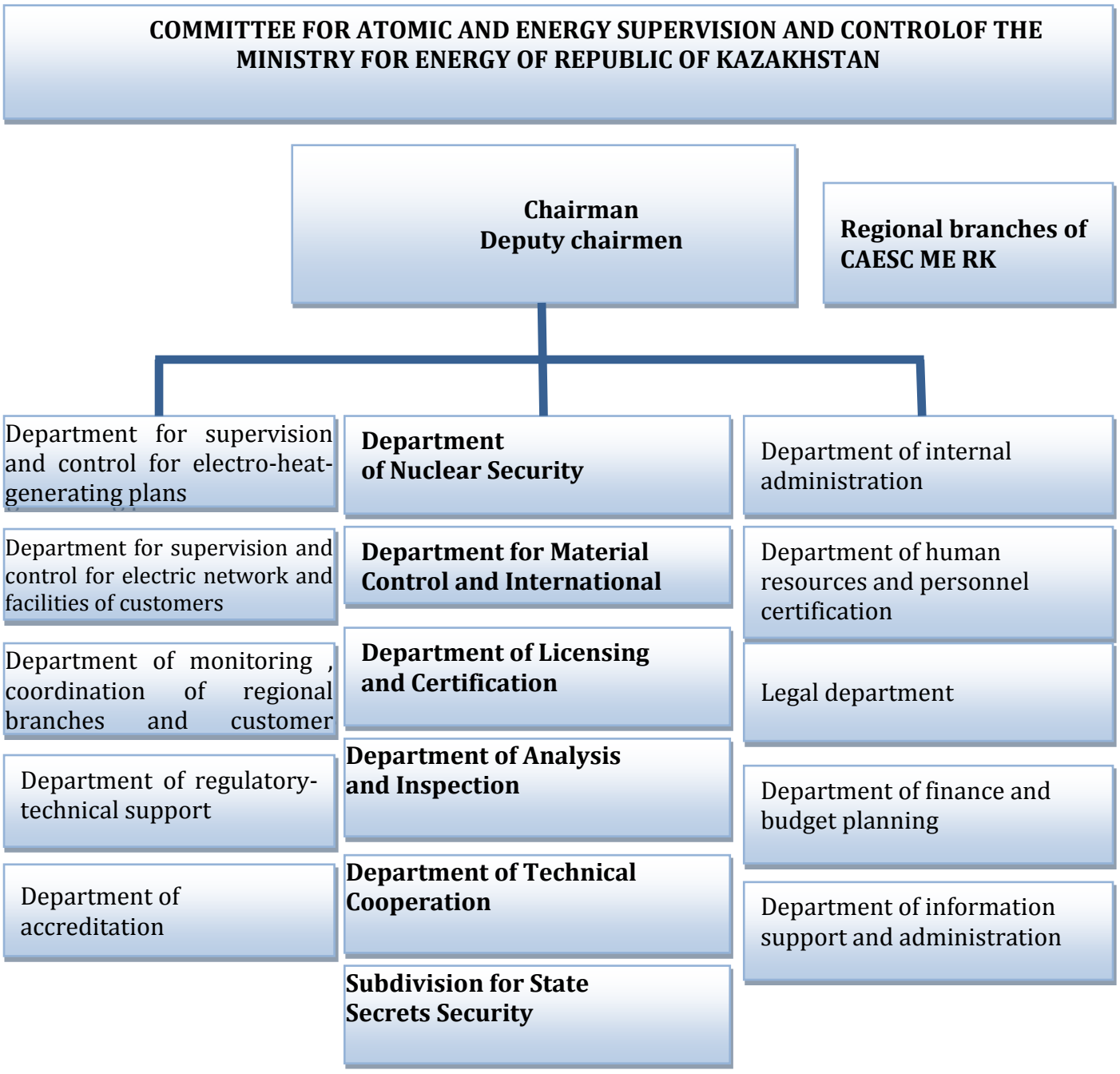
CAESC ME RK is headed by the Chairman who is appointed and dismissed by the order of the Minister of Energy RK.

The Chairman of the Committee directs and is personally responsible for the implementation of the tasks assigned to the Committee and for the performance of its functions; in the limits of the authority presents the Committee in state bodies and other organizations.

Interaction of CAESC ME RK with other state executive bodies, as well as with the organizations responsible for the atomic energy use is conducted in accordance with applicable laws and other normative legal acts of the Republic of Kazakhstan.

The authorized body of the Republic of Kazakhstan in the field of atomic energy use is provided with human, financial and technical resources to allow performing its functions.

Organizational structure of CAESC ME RK



Article 9. Licensee's responsibility

Each Contracting Party shall ensure that the main responsibility for the safety of a nuclear facility rests on the holder of the relevant license and shall take appropriate measures to ensure that each such license holder carries out his/her responsibility.

Activity associated with the atomic energy use is subject to compulsory licensing in accordance with the legislation of the Republic of Kazakhstan on licensing.

Any activity connected with the atomic energy use is provided to ensure the protection of human health and the environment, safety of natural and legal persons from the harmful effects of ionizing radiation. Nuclear and radiation safety is provided by the operating organization in accordance with established rules and regulations.

The operating organization is an organization established under the laws of the Republic of Kazakhstan and recognized capable to operate a nuclear installation, and on its own or with the assistance of other organizations to implement the activities on selection of site, design, construction, operation and decommissioning of nuclear installation, as well as activities for the treatment of nuclear materials and radioactive substances. For each of these activities the operating organization must have a license issued by the authority of the state safety regulation, documenting the conditions that must be met by the operating organization while conducting the activities in the field of atomic energy use.

The operating organization is obliged to:

- have the necessary financial, material, technical and human resources needed to ensure the safety at all stages of the atomic energy use;
- provide the measures and means to perform the works associated with the decommissioning of nuclear facilities, reclamation, disposal of radioactive waste, the elimination of the consequences of accidents, and compensation for damage to health and life of humans and the environment, as well as property of citizens and organizations.

The operating organization provides for:

- responsibility for the safety of nuclear installation, source of ionizing radiation, storage/disposal facility, which is retained even in the case of termination of the license before the transfer of the indicated objects to another operating organization or obtaining a new license;
- use of nuclear installation, source of ionizing radiation and storage/disposal facility only for the purposes for which they are intended;
- organization and coordination of the development and implementation of quality assurance programs at all phases of commissioning, operation and decommissioning of nuclear installation, source of ionizing radiation and storage/disposal facility;
- development and implementation of emergency arrangements and emergency response activities at nuclear installation, source of ionizing radiation and storage/disposal facility, as well as measures to reduce the negative consequences of accidents for workers of the objects, human population and the environment;
- accounting of individual doses of the employees of nuclear facilities and the realization of their rights to compensation;

- attestation of its personnel in the procedures prescribed by the Government of the Republic of Kazakhstan.

In accordance with Article 13 of the Law "On Atomic Energy Use" the operating organization while carrying out activities in the field of atomic energy use should ensure nuclear security.

In order to provide nuclear security, the nuclear facilities shall have the physical protection, which should ensure the following:

- protection of a nuclear facility from unauthorized removal, theft of nuclear material and unlawful taking over of nuclear facility;
- protection of nuclear facilities against sabotage;
- mitigate or minimize the radiological consequences of possible sabotage at the nuclear facilities.

Guard of nuclear facilities of 1 and 2 categories of radiation danger shall be provided by specialized security unit of internal affair authorities.

The principle of full responsibility of operational organization for the safety of nuclear installations in the Republic of Kazakhstan is set by the law, defined in the regulatory requirements and is an important organizing principle of security.

Article 10. Priority to safety

Each Contracting Party shall take appropriate measures to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that place a priory on the nuclear safety.

The goal of ensuring safety at existing nuclear installations is to limit their radiation exposure on workers, the public and the environment during normal operation, and including emergencies. This goal is achieved through the implementation of technical and organizational measures of defense in depth. Rules and regulations for the safe atomic energy use provides for a set of measures to ensure nuclear safety.

The operating organization and the competent authority shall take all the necessary measures to provide the resources for the nuclear installation, to clearly divide the duties and responsibilities, to submit to discipline, to establish a system of rewards and punishments, to develop the technological procedures, to analyze and learn from bad decisions and committed errors of employees, to qualify and train employees in psychology, which will result in security becoming a priority objective in the implementation of all activities affecting the safety of nuclear installations.

Safety culture in nuclear safety and radiation protection is determined by the characteristics of organizations and the behavior of individuals, including managers and executives, for whom the top priority in their work should be to ensure security. The safety culture should be implemented at the level of organizations, managers and executives. For all activities involving the atomic energy use, for organizations, managers and executives the basic features of safety culture are:

- responsibility, which is realized through the establishment and description of the responsibility of the organization, job responsibilities and their understanding by individuals;
- commitment, it requires a demonstration of the high priority of security at the level of managers and recognition of common security goals by individuals;
- motivation, it is formed by the methods of leadership, setting of goals and creating a system of rewards and punishments, and by forming the inner attitudes of individuals;
- supervision (control), it includes practice of inspections, audits and examinations and willingness to respond to the critical conclusions of some individuals;
- personal awareness, it defines the understanding of the importance of security;
- knowledge and competence, they are provided through training and instructions to staff, as well as its self-study.

CAESC ME RK determines compliance of nuclear installations safety level with the requirements of technical safety regulations by:

- establishing compliance of the operating organization with the established qualification requirements for the corresponding type of activity in the field of atomic energy use;
- assessments and examinations of design and use of nuclear installations;
- checking the certificates of conformity of materials, systems and components of nuclear installations;

- registration of safety-important systems and elements of nuclear installations in the authorized body;
- participation of the authorized body in the commissioning acceptance of nuclear installations after construction and installation, renovation or modernization of nuclear installations;
- conduct by the authorized body of periodic inspections of compliance with technical regulations, applicable rules, and safety standards;
- monitoring the quality assurance for safety at all stages of the life cycle of nuclear installations.

In order to ensure the necessary measures for the protection of personnel, the environment and the public from the risks associated with the operation of a nuclear installation, the operating organization carries out the following activities in accordance with the requirements of technical standards:

- an annual commission inspection of the nuclear safety of the installation;
- prompt and comprehensive checks of the status of nuclear and radiation safety of the installation by inspectors of CAESC ME RK;
- twice a year, a commission check of efficiency of fire alarm systems and physical protection of the installation;
- twice a year inventory of spent nuclear fuel.

Safety target indices during the safety analysis of NI (depending on type) at the design stage and during operation (including decommissioning) are as follows:

- estimated value of the probability of severe damage or core melt of facility with a nuclear reactor in accidents should not exceed 10-5 events per reactor per year, and formation of secondary critical mass in cases of destruction and (or) the melting of the core must be eliminated by technical means;
- estimated value of the probability of the extreme accidental release of radioactive materials for NI of I (first) radiation hazard category should not exceed 10^{-7} events per year for the installation in order to avoid the need for evacuation of the population outside the area, where protective measures are planned;
- proposed measures to manage and mitigate the consequences of accidents beyond the design basis accidents should reduce the likelihood of accidental releases of radioactivity, for which it is necessary to take immediate countermeasures outside the area of NI, not less than 10 times;
- the effective neutron multiplication factor (Keff) at storage, transportation, processing of nuclear materials, as for any piece of individual equipment, which contains nuclear materials, and for any neutron-isolated system as a whole, should not exceed 0.95 under normal operation and 0.98 for any violations of normal operation;
- limit of the individual life man-made radiation exposure of workers and the public during normal operation of nuclear installations during the year should not exceed the values of 1×10^{-3} and 5×10^{-5}, respectively.

Article 11. Financial and human resources

1. Each Contracting Party shall take appropriate measures to ensure adequate financial resources to support the safety of each nuclear installation throughout its life cycle.

2. Each Contracting Party shall take appropriate measures to ensure that for all the activities in the field of security, carried out at each nuclear installation, or in connection with the installation, throughout its life cycle there were a sufficient number of qualified staff with appropriate education, training and retraining.

11.1 The financial resources of the operating organization

The source of financing for nuclear, radiation, fire and industrial safety of nuclear installations of the Republic of Kazakhstan, including improvements in security at nuclear installations during their operation are the budgetary and extra-budgetary funds. The operating organization accumulates a necessary part of the financial resources to ensure the safe operation of nuclear facilities.

11.2 Human resources of the operating organization

To implement the research and operational activities at nuclear installations, including for the maintenance of safe operation, the personnel should be over 18 years, have relevant qualifications, have to pass medical examination and have no medical contraindications, the staff shall be certified and authorized to work independently by the order on the enterprise, they should pass briefings on professional health and safety, nuclear and radiation safety. Periodically, the staff shall have psycho-physiological examination.

The requirements for the competence of the staff are stated in appropriate job descriptions.

Selection and recruitment of specialists in required specialties is carried out by heads of departments to meet the requirements defined in the job descriptions. When hiring the level of education, their training, expertise and practical experience of professionals are taken into account.

Employees from the management of the operating organizations should pass the recertification in CAESC ME RK. The specialists of nuclear safety, as well as employees of the company conducting the nuclear-hazardous work and monitor the status of nuclear safety shall pass recertification exams in specially created commissions, both in the operating organizations, and in the CAESC ME RK.

Before admission to independent work persons of the operating personnel are trained on the job, the duration of which is determined by the administration of the reactor, depending on the type of activity. The staff that successfully completed training and passed an examination in the prescribed amount shall be allowed to work independently.

Employees of operating organizations admitted to operation and maintenance of nuclear facilities are trained in refresher courses, participate in workshops, training courses and internships organized both directly in the operating organizations themselves (using in-house expertise as teachers) and in third-party organizations of the Republic of Kazakhstan, the CIS and other foreign countries.

Maintaining the skills of workers and retraining of workers, engineers and technicians are carried out with the use of full-scale simulators and other advanced training facilities.

In accordance with the cooperation agreements with leading institutions of higher, secondary and professional educational institutions of the Republic of Kazakhstan, the CIS and other foreign countries the program of joint training of young specialists for the nuclear industry is implemented.

Article 12. Human factor

Each Contracting Party shall take appropriate measures to ensure that the capabilities and limitations of human performance were taken into account during the lifetime of a nuclear installation.

In addressing the safe operation of nuclear installations the constant work is carried out to prevent, detect and correct errors of operating personnel.

The methods of its implementation are based upon a number of reasons, including the analysis of personnel error-checking committed in the course of activity, the nature of the interaction between individual and installation and the state of feedback on operating experience.

Work to prevent, detect and correct human errors is made on the basis of the respective administrative-managerial and organizational decisions. It aims to organize and conduct training activities and the maintenance of staff qualifications at nuclear installations, the adjustment of existing documentation taking into account operation experience and development missing operational documents regulating the professional activities of the operating personnel during maintenance and repair of process equipment and systems for nuclear installations.

In the Republic of Kazakhstan at the state level, procedures and requirements are defined, on which monitoring the level of qualification of managerial, operational and other personnel of nuclear energy is organized.

Article 13. Quality assurance

Each Contracting Party shall take appropriate measures to ensure that the quality assurance programs were developed and implemented in order to create confidence in them that these requirements for all the relevant nuclear safety activities are carried out during the lifetime of a nuclear installation.

Providing the highest quality at all stages of development and operation of nuclear installations in the Republic of Kazakhstan is a priority. The priority of high quality equipment and building of nuclear power plants is reflected in the policies pursued at all levels of the atomic energy use management.

Requirements to ensure the highest quality at nuclear plants are reflected in the basic rules and regulations effective in the Republic of Kazakhstan.

In the implementation of the operation of nuclear installations, as one of the activities in the field of atomic energy use, the operating organizations and organizations carrying out work and providing services should ensure the quality of works and services at all stages of development, operation, and decommissioning of the installation through the proper implementation of quality assurance programs.

Requirements for the composition and content of the quality assurance program are identified in the regulatory document RD-MR-025-11. Quality assurance program is a mandatory requirement condition for the issuance of the license.

In accordance with the requirements of "Nuclear and Radiation Safety" technical regulation at all stages of the life cycle of nuclear installations the activities of quality management, as well as safety culture must be planned, systematically carried out, analyzed and assessed to ensure the implementation of the basic principles and criteria of safety.

Quality Management of activities shall ensure implementation of works and services in the prescribed manner, and the results should satisfy to the requirements at all stages of the life cycle of nuclear installations, including the disposal, design, construction, commissioning, operation and decommissioning, as well as the design and manufacturing of systems (components) and equipment important to safety, while handling nuclear materials, radioactive materials and radioactive waste. As a result of these activities, any error in the performance of works and provision of services should be identified and corrected, and measures should be taken to prevent the same mistakes in the future.

Activity on Quality Management in the treatment of NI is part of the quality assurance system of operating organization and the organizations carrying out work and providing services to the operating organization. Quality management activities at all stages of the life cycle of NI is regulated by common and private quality assurance programs, establishing a set of organizational and technical measures to ensure the quality.

Article 14. Assessment and verification of safety

Each Contracting Party shall take appropriate measures to ensure that:

i) prior to the start of construction and commissioning of a nuclear installation and throughout its life cycle, comprehensive and systematic safety assessments are conducted. Such estimates are reflected in detail in documents subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

ii) through the analysis, surveillance, testing and inspection of a nuclear installation is carried out in order to ensure continued compliance with its condition and how it is operated to project requirements, applicable national safety requirements, and operational limits and conditions.

14.1 Evaluation of safety by the regulatory body in the licensing

Article 9 of the Law "On the Use of Atomic Energy" establishes that activities related to the atomic energy use, subject to compulsory licensing in accordance with this Law and the legislation of the Republic of Kazakhstan about the permissions and notifications.

Law “On Permits and Notifications” dated May 16, 2014 No. 202-V, Order of the Minister of Energy of the Republic of Kazakhstan dated November 13, 2014 No. 122 “On approval of qualification requirements and list of documents confirming compliance with them for activities in the field of atomic energy use” and the order of the Minister of Energy of the Republic of Kazakhstan dated July 12, 2017 No. 238 “On the approval of standards of state services in the field of atomic energy use” regulate a wide range of issues related to licensing activities in the nuclear power industry.

Article 8 of the Law "On the Use of Atomic Energy" established that any activity in the field of atomic energy use, subject to licensing by the authorized bodies of the state safety regulation, is not permitted without a license for carrying it out.

The terms of the license issued by the safety regulatory authority establishes that the operating organization have to act appropriately to ensure that control, inspection and testing of equipment and systems important to safety are carried out in accordance with established procedures and schedules.

In the process of obtaining of licenses for one or another stage of the life cycle operating organization shall submit the documents justifying the nuclear and radiation safety of a nuclear installation.

To obtain a license for the construction or operation of a nuclear installation operating organization ensures the development and submission to the safety regulatory authority the Safety Analysis Report (SAR), in which the system of technical and organizational measures to ensure the safety of the nuclear installation should be given. As part of SAR the results of the safety analysis of the installation, accompanied by a list of initiating events for design basis accidents and beyond design basis accidents, as well as the results of the deterministic and probabilistic safety analysis of the installation should be included.

Technical Regulation “Nuclear and Radiation Safety” provides that:

- At the pre-construction stage, operating organization shall submit a preliminary SAR of NI to authorized body. The official approval of authorized body for the beginning

of the construction is a positive conclusion on the results of the review and evaluation of the preliminary SAR.

- At the stage after the completion of the construction the operating organization shall submit to the authorized body the final SAR, taking into account all the changes made in the project during the construction and commissioning of the nuclear installations. Positive conclusion on the results of the review and assessment of the final SAR is a prerequisite for issuing a license to operate NI.

The authorized body establishes composition and content of the SAR, which is applicable to the types of NI.

14.2 Safety Examination

The operating organization constantly monitors the safe operation of the nuclear installation at all stages of the life cycle, as well as the proper handling of nuclear materials and radioactive substances. Responsibility for the safety of nuclear installation, source of ionizing radiation, the storage/disposal facility is retained even in the case of termination of the license before the transfer of the stated objects to another operating organization or obtaining a new license.

The monitoring and inspections carried out by the operating organization are aimed at early detection and prevention of deficiencies in the operation of nuclear installations.

In accordance with the requirements of regulatory documents, examination of installation safety systems and other systems important for safety is carried out.

Information on the results of the control and inspection activities of the operating organization is developed in the form of reports and submitted in the prescribed order to the authorized body of the Republic of Kazakhstan.

Ongoing safety assessments and comprehensive inspections carried out systematically aimed at preventing of violations and further improving of safety of nuclear installations that meets the requirements of the Nuclear Safety Convention.

Article 15. Radiation safety

Each Contracting Party shall take appropriate measures to ensure that in all operational states the radiation exposure of workers and the public, created by the nuclear installation is kept to the lowest level reasonably achievable and that no individual received radiation doses, which exceed national prescriptions for dose limitation.

The basic principles of radiation protection in the Republic of Kazakhstan in accordance with the Law "On Radiation Safety of the Population" are:

- principle of regulation – not exceeding of permissible individual radiation doses limits of citizens from all sources of ionizing radiation;
- principle of justification – the prohibition of all kinds of activities on the use of sources of ionizing radiation in which benefit obtained for man and society does not exceed the risk of possible harm to an additional natural background radiation exposure;
- principle of optimization – keeping of individual doses and the number of exposed individuals at as low as possible and achievable level when using any source of ionizing radiation, taking into account economic and social factors;
- principle of optimization of emergency – the form, scale and duration of action in emergency situations should be optimized so that the real benefit from reducing of harm to human health could as much as possible be more than damage associated with the damage from the implementation of the intervention.

The Law of the Republic of Kazakhstan “On Radiation Safety” No. 219-I dated 23.04.1998 identifies the following responsibilities of the operating organization:

- operating organization conducts production control over the quality of radiation protection;
- order of execution of production control in the field of radiation safety for each organization is determined taking into account characteristics and conditions of its work, coordinated with the authorized state body in the sphere of sanitary and epidemiological welfare of the population and approved by the authorized state body in the field of use of nuclear energy;
- officials of operating organizations, implementing production control of radiation protection has the right to apply sanctions provided by laws of Republic of Kazakhstan in case of violations of radiation safety requirements, rules, regulations and hygienic standards, radiation safety rules, building codes, occupational safety regulations, administrative, instructional, teaching and other documents in the sphere of radiation safety in corresponding organization.

The Law of the Republic of Kazakhstan "On Radiation Safety" identifies the following requirements for assessment of radiation safety:

1. when planning and making decisions in the field of radiation safety and analyzing effectiveness of these decisions by state bodies, local executive bodies of oblasts (cities of republican status, capital), as well as by organizations working with sources of ionizing radiation, radiation safety assessment is implemented aiming to ensure the established radiation safety requirements, rules and hygienic standards in the field of radiation safety;

2. radiation safety assessment is carried out by authorized body in the field of population sanitary and epidemiological welfare, authorized body in the field of environmental protection and the authorized body in the field of nuclear energy use on the basis of:

- characteristics of the radioactive contamination of the environment;
- analysis of measures to ensure radiation safety and compliance with the rules, regulations and hygiene standards in the field of radiation safety;
- likelihood of radiation accidents and their scale;
- preparedness for effective elimination of radiation accidents and their consequences;
- analysis of the radiation doses received by different groups of the population from all sources of ionizing radiation;
- number of persons exposed to radiation beyond the limits of radiation.

3. The authorized state body in the sphere of nuclear energy use reviews and approves the results of radiation safety assessment. Organizations engaged into activities with the use of sources of ionizing radiation, shall:

- comply with the requirements of this Law and other legal acts in the field of radiation safety;
- plan and implement measures to ensure radiation safety and security of radiation sources;
- carry out work on justification of radiation safety of new (upgraded) products, materials and substances, technological processes and production, which are the sources of ionizing radiation;
- implement a systematic production control of the radiation situation in the workplace, in the premises, in the territories of organizations in controlled areas, as well as emissions and discharges of radioactive substances;
- conduct regular monitoring and recording of individual radiation doses of staff;
- provide training and certification of officers, staff, and experts of industrial radiation monitoring services as well as other persons permanently or temporarily carrying out the work with ionizing radiation sources;
- organize a preliminary (when applying for a job) and periodic medical examinations of personnel;
- regularly inform staff about the levels of ionizing radiation on their working places and on the amount individual doses received;
- promptly inform the state bodies authorized to perform state governance, supervision and control in the field of radiation safety about emergency situations and violations of technological regulations, endangering radiation safety;
- perform conclusion, regulations or instructions of officials of authorized state bodies exercising governance, supervision and control in the field of radiation safety;
- ensure the rights of citizens in the field of radiation safety.

Technical regulation "Nuclear and radiation safety" determines requirements for radiation monitoring in design work. The project should provide radiation monitoring in premises of

NI, on the site of their placement, in the sanitary protection zone, and surveillance zone. Project of radiation monitoring system should regulate:

- the types of radiation monitoring;
- facilities, subject to radiation monitoring;
- controlled parameters;
- permissible levels of controlled parameters;
- network of radiation monitoring points;
- radiation monitoring periodicity;
- contingent of persons for individual control;
- hardware and methodological support of radiation control.

Technical Regulation "Nuclear and Radiation Safety" obliges operating organization to control the volume, methods, means of radiation monitoring of dose levels, and changes of radiation situation, and to provide early detection and prediction of changes of radiation situation for all modes of nuclear installation operation, including accidents.

The volume of radiation monitoring in the sanitary protection zone shall provide the obtaining of information about radiation situation parameters during normal operation of nuclear installation and in conditions of accident.

The volume of radiation monitoring in surveillance zone shall provide obtaining of information about parameters of the radiation situation during normal operation of a nuclear facility and under accident conditions, as well as information about the levels of population exposure.

The project should provide radiation monitoring of personnel in sanitary locks, on the borders of areas with different classes of work with open sources of ionizing radiation, sanitary inspection rooms, and on the borders of a nuclear installation.

The project should provide radiation monitoring stations and equipment for decontamination of vehicles leaving nuclear facility sites.

Article 16. Emergency Preparedness

1. Each Contracting Party shall take appropriate measures to ensure that nuclear facilities were available for emergency plans on-site and off-site, that are practiced regularly and cover the activities to be carried out in case of emergency.

For any new nuclear installation, such plans shall be prepared and tested before it commences operation at above a low power level agreed by the regulatory authority.

2. Each Contracting Party shall take appropriate measures to ensure that its own population and the competent authorities of the states located near the nuclear plant are given appropriate information for emergency planning and response, since it is likely that the population of these states may be exposed to radiation as a result of an emergency

3. Contracting Parties that do not have nuclear installations in their territories, since it is likely that they will be exposed in case of a radiological emergency at a nuclear installation in the vicinity, shall take appropriate measures to ensure the preparation and testing of emergency plans that cover the activities on implementation of such an emergency case.

16.1 Plans and programs of emergency measures

A number of laws of RK and other normative-legal acts regulate protection of personnel and population in case of accidents at nuclear facilities. These documents are developed based on international experience and take into account the recommendations contained in the IAEA Safety Guides.

The staff of a nuclear installation shall be prepared to act during design basis accidents and accidents with low probability and severe consequences. Personnel actions in case of accidents with low probability and severe consequences shall be governed by special guidelines that are developed taking into account performance analyzes of these accidents.

To prepare personnel for action in emergencies trainings are periodically conducted pursuant to methods and programs agreed with the authorized bodies of supervision and control.

Nuclear facility shall be equipped with substantiated number of escape routes, with marking clear and resistant to impacts, supplied with reliable emergency lighting systems, ventilation and other facilities to ensure the safe use of these paths. Escape routes must meet specific requirements for radiation safety and fire protection, as well as the relevant requirements in relation to safety and health in the industry ensuring the physical protection of facilities.

Alarm systems and means of warning should be provided in a nuclear facility in such a way that in an emergency it could be possible to warn all persons in a nuclear facility and on-site about a danger.

External and internal emergency centers should be provided on the nuclear installation sites to manage the implementation of action plans for the protection of workers and the public in the event of an accident. The centers should be equipped with the necessary equipment, instruments and communications and maintained in constant readiness prior to putting the nuclear facility into operation.

In accordance with the Law of the RK "On Radiation Safety of the Population", organizations engaged in activities related to the use of atomic energy, must have:

- list of potential radiation accidents with the forecast of their consequences and radiation conditions agreed by the authorized state body;

- criteria for operational decision-making in the event of a radiological accident and intervention levels, agreed with the authorized state authority;
- action plan for protection of workers and the public against radiation accident and its consequences, agreed with the local executive body of region (city of republican status, capital), the authorized state bodies engaged into governing, supervision and control in the field of radiation safety;
- means for warning and elimination of consequences of radiation accidents;
- medical means to mitigate harmful radiation effects and means of providing medical care to victims of radiation accidents;
- emergency response teams that are created from the staff.

In the event of a radiological accident organization engaged into activities with the use of ionizing radiation sources, should:

- immediately inform about radiation accident authorized state bodies responsible for public administration, supervision and control in the field of radiation safety, and local executive bodies of the region (city of republican status, capital) and the population of the territories, in which increased exposure is possible;
- enforce measures together with the governmental authorities to protect workers and public from radiation accident and its consequences;
- take measures to provide medical care to victims of radiation accidents;
- take measures to localization of radioactive contamination and prevent the spread of radioactive substances into the environment;
- conduct analysis and prepare a forecast of the radiation accident development, and changes of the radiation environment in radiation accident;
- take measures on normalization of radiation situation on territory of organizations working with sources of ionizing radiation, after the elimination of radioactive accident;
- take measures on assessment of individual doses to workers and the public, and to transfer these data to health authorities and other authorized bodies.

In Accordance with the “National Plan for Responding to Nuclear and Radiation Accidents”, approved by the Government of the Republic of Kazakhstan dated August 19, 2016 No. 467, emergency planning is carried out at the state and local levels, as well as at the enterprise level.

Article 23 of the Law "On the Use of Atomic Energy" establishes that National Plan for response to nuclear and radiological accidents put into effect by the decision of the authorized body:

1. in the event of output or threat of output of impact factors of nuclear or radiological accident outside the boundaries of site of nuclear, radiation or electro physical installations;
2. in transboundary nuclear or radiological accidents that have occurred in the territory of another State, with impact or threat of the impact of which extends into the territory of the Republic of Kazakhstan.

National Plan of response to nuclear and radiological accidents specifies:

- rights and responsibilities of central and local executive bodies of the Republic of Kazakhstan, as well as individuals and legal entities in the event of a nuclear or radiation accident;
- procedures and controls for preparedness activities and response to nuclear and radiological accidents;
- coordination of activities of organizations and public authorities in the event of a nuclear or radiation accident and liquidation of its consequences.

Upon receipt of information on the respective nuclear or radiological accident, authorized body shall immediately inform authorized body in the field of civil protection about it, as well as about entrance into action of a national plan on respond to nuclear and radiological accidents.

Operating organizations develop and approve plans for emergency measures in accordance with the legislation of the Republic of Kazakhstan. The plans provide for emergency measures and procedures in the event of incidents and elimination of accidents and their consequences to minimize the potential impact on the personnel, population and the environment in accordance with the category of the radiation hazard of nuclear, radiation, or electro-physical installations.

Operating organizations at all stages of the life cycle of a nuclear facility ensure the implementation of emergency preparedness and response measures.

In the event of transboundary accidents or incidents in the field of atomic energy use, authorized body together with the authorized body in the sphere of civil protection undertake measures on warning and response in accordance with the international treaties ratified by the Republic of Kazakhstan.

Action plans developed for the protection of workers and the public should be agreed, and approved in the prescribed manner and shall be provided with the necessary resources.

Action plans for the protection of workers and the public in the event of an accident at nuclear installation shall is developed by the operating organization and provide the necessary coordination in activity of operating organization with the authorized bodies and the local authorities in accordance with the categories of potential danger of nuclear installation. Maintenance of permanent readiness and implementation of the plans rests with the administration of nuclear installation.

Action plans for the protection of workers and the public establish the levels of emergency preparedness and intervention levels, the procedure for warning about accident and beginning of implementation of these plans. The plans define necessary equipment and technical means for the protection of workers and public.

Central and local executive authorities develop their own plans for responding to radiation emergencies. Development of plans by central and local executive bodies is provided in accordance with "National Plan of response to nuclear and radiological accidents" taking into account the specifics of the main activities of regional and local features.

The plans of local executive bodies on response to possible radiation accidents shall be agreed with CES of Ministry of Internal Affairs of the Republic of Kazakhstan, KAESC ME of RK, the Committee for Quality and Safety Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, Ministy of Ecology, Geology and Mineral Resources (MEGNR) RK.

Response plans for enterprises where radiation accidents may take place, are developed and approved in accordance with applicable in the Republic of Kazakhstan rules and regulations in the field of atomic energy use. These plans should provide for immediate actions on restriction and elimination of emergency, protection of workers and the public from the consequences of accident, including procedure for notification of the off-site authorities and providing them with recommendations on protective measures and technical assistance. In particular, the following specific provisions should be reflected in the Plan:

- forecast of possible accidents and their prevention measures;
- notification procedure for responsive organizations and informing the public about accident occurrence;
- forecast the radiation situation and measures for elimination and localization of spots of emergency radioactive contamination;
- behavior of staff at the accident and providing first aid to the victims;
- organization of medical care in the case of an internal or external emergency exposure;
- procedure for elimination of accident and personnel protection measures while implementation of emergency operations;
- measures for prevention and elimination of the fire;
- training of personnel for action in case of emergency (fire);
- responsibility of administration while in activities on prevention and elimination of consequences of the accident.

Lists of beyond design basis accidents and their consequences (radiation and nuclear effects, the functional ability of safety systems, the prospects for further operation and etc.) are provided in the SAR of a nuclear installation and justified at the stage of designing.

If the analysis of the consequences of beyond design basis accidents assessing the likelihood of potential releases of radioactive material does not provide performance targets for safety, the implementation of such a project is not permitted.

In accordance with the Law of RK "On civil protection" to ensure preparedness for localization and elimination of accidents and their consequences, all organizations, having hazardous facilities (institutions engaged in the treatment of spent nuclear fuel and radioactive waste) shall:

- Develop a plan for emergency elimination, which includes:
    - operational part;
    - distribution of responsibilities between the participants involved in elimination of emergency, and sequence of actions;
    - list of officials and agencies to be notified in case of an accident and involved in its elimination.
- Provide for measures on saving people, the actions of managers and employees, emergency rescue services and/or units in emergency response plan.

Emergency response trainings is approved by the organization head and agreed with professional emergency response services of units.

Drills and emergency response trainings are held at hazardous production facilities pursuant to a plan approved by the head of the organization. Organization should inform in writing the territorial division of the authorized body in the field of industrial safety about conducting drills and emergency response trainings.

Drills and emergency response trainings are conducted by the head of the organization, together with representatives of the territorial division of the authorized body in the field of industrial safety and professional rescue services and units. The results of the drill and emergency response training are registered in formalized act. Control over the execution of the proposals set out in the Act rests with the head of the organization.

16.2 Informing public and neighboring countries

In accordance with the Plan of responding to nuclear and radiation accidents all information about the threat of radiation accidents is transferred:

- from enterprises, regardless of ownership and departmental affiliation - to territorial bodies of republican divisions of authorized body in the field of civil protection and departmental regional bodies.
- from the departmental regional bodies – to the central office of the relevant agency, to territorial divisions of the authorized body in the field of civil protection;
- from territorial divisions of the authorized body in the field of civil protection – to the Center for Control in Crisis Situations of CES MIA RK;
- from CAESC ME RK - to the central office of CES MIA RK and IAEA.

With the threat of a radiation accident or occurrence of radiation accident, regional and global scale information is transferred:

- from regional subdivisions of the authorized body in the field of civil protection – to local executive bodies of RK territorial units having administrative borders;
- from the central executive bodies – to the Center for Control in Crisis Situations of CES MIA RK about emergencies in subordinate organizations;
- from the central office of CES MIA of RK – to President Administration, Government of the Republic of Kazakhstan, CIS and foreign countries, international organizations in accordance with international treaties and agreements, central executive bodies (CAESC ME RK, Committee for quality and safety control of goods and services of the Ministry of Health of the Republic of Kazakhstan, MIA of RK, Ministry of Defense RK, Ministry of Foreign Affairs RK, Committee of Ecological Regulation and Control ME RK, the Ministry of Agriculture RK, the National Security Committee RK and other central executive bodies of the Republic of Kazakhstan).
- from CAESK ME RK - to IAEA and competent authorities of the neighboring states.

Information on radiation accident shall be transferred by electronic communication channels, and in case of their unavailability or failure – by telegraph, telephone, satellite, radio channels with following time characteristics:

- emergency information about the threat of radiation accident occurrence, - immediately;

- updated information on situation development and progress of work on localization and liquidation of consequences – within the following 30 minutes;
- clarifying data – within 2 hours intervals in course of rescue operations, unless otherwise is indicated;
- reference information – not later than 1(one) hour after the request of the latter;

Central and local executive authorities should make a decision on informing the public through the mass media or, if necessary, warning system.

Ministry of Foreign Affairs of RK (hereinafter – MFA RK) is a central executive body of the Republic of Kazakhstan, carrying out foreign policy heading the unified system of the diplomatic service of the Republic of Kazakhstan.

In accordance with its tasks and functions of the Ministry of Foreign Affairs of Kazakhstan provides for:

- assistance in the development of international cooperation in the field of emergency planning and response to radiation emergencies, rendering assistance in case of emergencies, disasters,
- notification of foreign countries about the ongoing events in the Republic of Kazakhstan on elimination of radiation accident, as well as about the threat of transboundary impact from territory of the Republic of Kazakhstan of transboundary and natural disasters,
- promotion within the framework of international assistance the rapid entry or exit visas arrangements for rescuers as well as in delivery of humanitarian supplies to the radiation accident zone.

16.3 The lessons learned from the accident at the Fukushima NPP (Japan))

The largest radiation accident at the Fukushima-1 of the maximum 7 point level according to International Nuclear Event Scale, occurred on March 11, 2011 as a result of Japanese ever strongest earthquake followed by tsunami, which led to failure of the external units of power supply and backup diesel generators and caused the loss of efficiency of all normal and emergency cooling systems, which resulted in the melting of the reactor cores at nuclear power reactors 1, 2 and 3 during the first days of the accident. Japanese nuclear engineers estimate that bringing the object into a stable, safe condition may require up to 40 years.

The Fukushima NPP accident calls for necessity of critical review of measures on prevention of the same or similar accidents and timely response to emergency situations to eliminate the consequences of arising accident that makes to take a fresh look at the state of nuclear and radiation safety in the Republic of Kazakhstan including the entire list of measures to ensure nuclear and radiation safety of nuclear facilities, starting from the stage of site selection, design, licensing, commissioning, operation, safety assessment and inspections, emergency preparedness plans and emergency response programs, procedures for warning and informing, as well as the further improvement of regulatory framework of Kazakhstan.

Since 2011 development and updating of legislation in the field of nuclear energy use in the Republic of Kazakhstan is in a progress. In April 11, 2014, President of the Republic of Kazakhstan signed the Law of Republic of Kazakhstan "On civil protection", No. 188-V ZRK. The Law “On Civil Protection” (as amended as of 08.04.2016) regulates public relations arising in the course of the activities on civil protection and it is aimed at:

prevention and elimination of natural and man-made disasters and their consequences, emergency medical and psychological assistance to populations in the emergency area, provision of fire and industrial safety, as well as determine the main tasks, organizational principles and functioning of civil defense of the Republic of Kazakhstan. The Law provides formation, storage and use of state material reserves, and organization and activities of rescue services and units. Since then the following laws are no longer in force:

- Law of the Republic of Kazakhstan "On emergency situations of natural and man-made disasters", dated July 5, 1996;
- Law of the Republic of Kazakhstan "On Fire safety", dated November 22, 1996;
- Law of the Republic of Kazakhstan "On the emergency services and the status of rescuers", dated March 27, 1997;
- Law of the Republic of Kazakhstan "On Civil Defense", dated May 7, 1997;
- Law of the Republic of Kazakhstan "On State Material Reserve", dated November 27, 2000;
- Law of the Republic of Kazakhstan "On industrial safety of hazardous production facilities", dated April 3, 2002.

Further updating of emergency preparedness plan and emergency response program for the nuclear power and research reactors is in progress.

Plan of measures for protection of personnel and public from radiation accident and its consequences should be developed pursuant to current rules and regulations in the field of nuclear energy use, which are in force in the Republic of Kazakhstan. The plan provides for immediate actions on accident mitigation, restriction and elimination, protection of personnel and public from the consequences of accident as well as procedure for warning and notification of the off-site authorities providing them with technical assistance and recommendations on protective measures.

Procedure for warning and informing is also subject to updating. The content of the notification must include:

- name of the institution, departments and time of an accident occurrence;
- characteristics of the source of ionizing radiation;
- description of accident and characteristics of technological process in which the accident occurred;
- organizational activities conducted, composition of the steering group, who organized the steering group , staffing and number of work teams;
- scale and contamination levels of territory, work surfaces, equipment, etc., the number of victims and their levels of exposure;
- information about possible consequences of accident and preventive measures.

List of organizations subject to notification for interaction in elimination of accident and its consequences:

1. Committee for atomic and energy supervision and control of ME RK;
2. Committee of Industrial Development and Industrial Safety MIID RK;

3. The Department of Emergency Situations Committee;
4. Department of Committee of quality and safety control of goods and services MH RK;
5. Department of Committee of Ecological Regulation of ME RK;
6. Akimat of the respective administrative territory.

To acquire the staff skills and abilities for independent, quick and technically correct actions in the event of process disturbances by applying technical rules of operation, and safety and maintenance instructions, operating personnel must be trained and regularly participate in emergency drills in accordance with the technical regulation "Nuclear and radiation safety", the Order of Minister of Energy RK # 58, dated February 20, 2017.

Periodicity of emergency response drills is determined by the schedule approved by enterprise director or chief engineer.

Combination of emergency and fire drills is acceptable.

Heads of enterprise and operating and maintenance personnel should take part in the emergency response trainings.

By decision of head of organization and structural unit, other employees may be involved for conduct and participation in emergency drills.

Emergency response drills are one of the mandatory forms of work with personnel.

Emergency response drills include the following tasks:

- check of staff's ability to correctly perceive and analyze information about technological violations, and based on this information make optimal solution on elimination of these violations by means of specific action or giving of specific instructions;
- provide formation of clear operational decision-making skills in any situation and in the shortest time;
- development of organizational and technical measures aimed at improving the level of professional skills of personnel and trouble-free operation of reactor.

Trainings are conducted with conventional reproduction of reactor disruptions, simulation of prompt actions at workplace to eliminate accidents and emergencies, assessment of activity of participants, and registration of permit and routing.

Head of training, the participants of training and intermediaries who perform supervisory functions are main participating persons during training.

The training effectiveness depends on the relevance of the theme, the quality of program development, training participants and the necessary means to carry out the training, the proximity of the accident simulation to real one, proper and objective assessment of the actions of participants and the training analysis.

To respond to radiation accidents and other radiological emergencies and in accordance with the Law of the Republic of Kazakhstan "On Radiation Safety of the Population" a specialized emergency rescue team (hereinafter SERT) should be established by the order of enterprise head. SERT is the enterprise division and not part of the State Emergency management system. Therefore, SERT's range of tasks is limited to the territory of sanitary and surveillance zone of enterprise. SERT's activities directed to perform work on prevention and

conduct of emergency and rescue operations during elimination of radiation accidents and other radiological emergencies.

SERT is provided with rescue equipment and outfit, radiometric, dosimetry, and other electronic devices, specialized vehicles, communications equipment, ensuring continuous communication in any conditions, the necessary computer equipment, navigation systems, and individual protective means.

SERT activities is focused on solving the following objectives:

- participation in assessment, localization and elimination of consequences of radiation accidents and other radiological emergencies;
- dosimetry control and monitoring of radiation situation at the site of emergency work and surrounding area;
- conduct of a comprehensive survey to assess the radio-ecological situation in the area of the accident;
- ensuring of radiation safety for personnel and public during the rescue operations.

General responsibilities of SERT staff to ensure the implementation of the tasks assigned:

- implement the work on the prevention of radiation accidents and other radiological emergencies;
- organize the recruitment of team with qualified personnel, to conduct regular systematic training and education of personnel;
- train personnel to observe safety rules during rescue operations;
- plan and organize equipping of team with special equipment, apparatus, tools and outfit to carry out rescue operations using means of communication, notification and transportation;
- establish and maintain a reserve of material resources for rescue operations;
- organize and provide interaction with organizations and enterprises involved in the elimination of consequences of radiation accidents and other radiological emergencies;
- carry out individual dosimetry control of personnel involved in the rescue operations;
- carry out explanatory work among the population, including through the mass media, on the issues of people life and health protection while in radiation accidents;
- carry out other functions assigned to it by the management.

Depending on the situation, the team operation is carried out in three modes:

- mode of daily activities;
- high-availability mode;
- emergency mode (emergency, accident).

Decision on the measures undertaken for protection of population is made depending on the results of comparison of the calculated doses with dose criteria. According to the analysis conducted of a particular radioactive contamination, refinement of calculated doses is carried out, comparing them with the criteria and decision is made on measures for population protection.

Deputy director of the enterprise is the person responsible for putting into effect "Plan of measures for the protection of workers and the public from radiation accident and its consequences," as well as for investigation and elimination of consequences of radiation accidents in the reactor.

Deputy director of enterprise makes a decision on implementation of "Action Plan for the protection of workers and the public from radiation accident and its consequences" based on the analysis of information received from the chief engineer and the chief of the Radiation Safety Department (or their deputies).

Article 17. Site selection

Each Contracting Party shall take appropriate measures to ensure that the appropriate procedures were established and implemented:

i) assessment of all the relevant factors relating to the cite, which could affect the safety of a nuclear installation for its projected lifetime;

ii) assess the possible impact of a proposed nuclear installation on individuals, society and the environment from the point of view of safety;

iii) re-evaluation of all relevant factors referred to in sub-paragraphs i) and ii) as necessary, in order to ensure the continued safety acceptability of the nuclear installation safety point of view;

iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, as there is a possibility that they may be affected by that facility, and provide on request the necessary information to such Contracting Parties to enable them to perform their own analysis and assessment of the possible impact of nuclear installation on its own territory.

17.1 Evaluation of the factors related to the site

The Environmental Code of the Republic of Kazakhstan established a number of requirements for the placement and operation of nuclear installations. To consider the problem of placement of a nuclear installation, the applicant shall submit the materials that must contain the rationale for building of building such an installation, as well as the alternative areas for their location. The materials should include:

- characteristics of the environment in the region of the possible location of a nuclear installation;
- assessment of the impact on human health and the environment of the planned works for the construction, commissioning, operation, decommissioning and shut-down of the nuclear installation;
- measures that reduce the negative impact on the environment;
- positive conclusion of the state ecological, sanitary-epidemiological and technical expertise with the obligatory account of the results of public hearings;
- Government of the Republic of Kazakhstan makes the decision on construction of nuclear installations after approval by the local representative bodies, in which the construction of a nuclear installation is planned;
- provision of land and subsoil for placement of nuclear facilities, carried out in the manner prescribed by the Land Code of the Republic of Kazakhstan, the legislation of the Republic of Kazakhstan on Subsoil and Subsoil Use and the Environmental Code;
- when making decisions regarding the arrangement of nuclear installations the additional measures shall be provided, aiming at the social and economic development of the region. The volume and procedure of the arrangements in each case are determined by the Government of the Republic of Kazakhstan in coordination with the local authorities on the basis of scientific and economic substantiation;
- state acceptance commission carry out acceptance of the nuclear installation in operation;

- acceptance of the nuclear installation in operation shall be carried out in conjunction with assumed in the project objects of industrial and domestic purposes;
- procedure for decommissioning of nuclear installation or facility designed for handling of radioactive waste and closure of storage facility for disposal of radioactive waste should be provided for by the design in accordance with the rules, regulations and standards in the field of use of atomic energy. Funding shall be carried out by the owner of the nuclear installation or facility designed for handling of radioactive waste;
- decision on pre-schedule decommissioning of nuclear installation is approved by the Government of the Republic of Kazakhstan and shall be brought to the attention of the operating organization or specialized enterprise not later than two years before the beginning of actions mentioned;
- sanitary protection and surveillance zones are set in the location areas of the nuclear installation;
- sizes and boundaries of the zones are defined in the design in accordance with the rules and standards in the field of use of nuclear energy. The control for radiation environment is carried out in the sanitary protection zone and the surveillance zone;
- arrangement (construction) of residential buildings, educational institutions, health care and recreation facilities, sports and fitness facilities, including the location of gardening and horticulture lands, as well as the production of agricultural products are not permitted in the sanitary protection zone regardless of its parameters and ownership;
- use of land and reservoirs located in the sanitary protective zone for agricultural purposes, is possible with mandatory radiological control of products.

17.2 The impact of installation on individuals, society in the whole and the environment

Seeing that the nuclear installations and NPP planned for construction refer to number of sources of increased danger and their activity poses a threat to health and life of population and environment, Technical regulations on safety and "The Guidelines for the choice of construction site for nuclear, radiation and electrical physical installations" establish requirements for choice of area for NI placement. In assessing the suitability of the area for placement of NI the following aspects should be considered:

- effect of natural phenomena, processes and external man-made events taking place in the region of disposal area on NI;
- characteristics of the area of disposal and the environment that may have an impact on the transfer and accumulation of radioactive products;
- medical and demographic characteristics of the area of disposal that are important for the provision of measures for protection of population.

17.3 Revaluation of factors related to the area

The area is considered suitable for nuclear installations location, if it is possible to ensure the safe operation of nuclear installations taking into account all identified facts of danger and safety of the public and the environment from radiation effects is ensured.

Characteristics of the area should be monitored throughout the life cycle of nuclear installations. The decision on disposal shall be made by taking into account:

- need for them to solve the economic problems of the Republic of Kazakhstan and its regions;
- availability of the necessary conditions for location of the stated facilities that meet standards and regulations in the field of use of nuclear energy;
- absence of the threat to nuclear installation safety, radiation source or storage facility from located nearby civilian industrial facilities;
- possible social and economic consequences of placement of mentioned facilities using the nuclear energy for industrial, agricultural, social, cultural and community development in the region.

Documents on the assessment of radiation effects on the environment together with other necessary project documents shall mandatorily undergo the state environmental review taking into account the conclusions of ecological expert review conducted by public organizations.

When selecting the areas for the new nuclear installations in the Republic of Kazakhstan will be based on the provisions of the Convention.

Article 18. Project development and construction of the installations

Each Contracting Party shall take the appropriate measures to ensure that :

i) several reliable levels and methods of protection (defense in depth) against the release of radioactive materials are provided in the project and at constructing the nuclear installation in order to prevent accidents and to mitigate their radiological effects if they occur;

ii) the technologies incorporated in the project and used at constructing the nuclear installation are proven by experience or qualified by testing or analysis;

iii) project of the nuclear installation allows conducting of reliable, stable and easily manageable operation, with specific consideration of human factors and human-machine interaction.

18.1 Implementation of the "defense in depth" concept

Project development and construction of nuclear installations is subject to licensing that is regulated by the Kazakhstani legislative and regulatory framework.

The Law of the Republic of Kazakhstan "On the use of atomic energy" defines the basic requirements to safety when choosing the areas and construction of nuclear installations and disposal/storage sites.

Defense in depth: the system of barriers intended to prevent the spread of ionizing radiation and radioactive materials into the environment, as well as the system of technical and organizational measures to protect and preserve the effectiveness of these barriers.

At all stages of the life cycle the safety of nuclear installations is ensured through the consistent realization of defense in depth principle when handling nuclear, radioactive materials and ionizing radiation, which includes:

- choice of the area, suitable for NI location;
- establishment of the sanitary protection zone and the surveillance zone around the nuclear installation;
- the development of the project of NI on the basis of conservative approach using the properties of self-protection; the use of safety related systems that are based on the principles of redundancy, diversity and independence, and the single failure and taking into account not detected failures of components leading to the violation of the limits of safe operation of nuclear installations affecting the development of the accident;
- operation of nuclear installations in accordance with the requirements of technical regulations, rules, standards and using approved technological regulations and instructions;
- selection and organization of work with personnel for actions in normal and emergency conditions, forming the culture of safety at the level of organizations, managers and executives;
- maintaining important for safety systems in good serviceable condition by providing the necessary maintenance and replacement of outdated equipment;
- timely diagnosis of defects and detection of deviations from normal operation, and measures to eliminate them;

- organizing an effective system of documenting the results of operation and control;
- development and implementation of measures for managing accidents and mitigate the consequences of accidents which could not be prevented;
- development and implementation of measures on protection of localization safety systems from destruction during beyond design-basis accidents and maintenance of their functionality;
- development and consistent implementation, if necessary, of emergency plans to protect workers and public at the area of NI and off-site;
- development and systematic realization of quality assurance programs for all types of work at the stages of the life cycle of nuclear installations.

The design of NI, in accordance with defense in depth concept should be provided with safety systems designed for:

- emergency shut down and maintenance of the installation in a safe (subcritical) state;
- emergency heat transfer from heat-generating areas;
- confinement of radioactive materials and ionizing radiation within the established boundaries.

18.2 The usage of proven technologies

Selection of the site and the construction of nuclear installations and the storage/disposal facilities should be based on rules and regulations in the field of use of atomic energy and environmental protection.

Decision on construction of nuclear installation and storage/disposal facility shall be made by the Government of the Republic of Kazakhstan with the consent of the local representatives of the corresponding administrative-territorial units with regard to:

- need for solving of economic problems of the country and its regions;
- availability of the necessary conditions that meet the standards and regulations in the field of use of nuclear energy, for placing of the specified objects;
- absence of safety threats to the specified objects from located nearby civilian and military facilities;
- environmental requirements established by the environmental legislation of the Republic of Kazakhstan;
- potential social and economic impact from placement of specified items for industrial, agricultural, social, cultural and community development in the region.

Project documents of the specified objects are subject to mandatory undergo the state environmental, sanitary and technical expert examination.

In accordance with safety requirements nuclear installation must be designed and constructed so that its radiation impact on personnel, population, and environment during normal operation, violations of normal operation, including design-basis accidents do not result in exceeding the prescribed limits of radiation exposure doses for personnel and population, the regulations on emissions and discharges of radioactive substances, the content of radioactive substances in the environment.

Requirements of rules and regulations states that the organizational and technical measures in design of nuclear installation must be carried out in view of its upcoming decommissioning (closure).

Technical and organizational solutions adopted to ensure the safety of nuclear installations should be proved by prior experience or tests, researches and experience of prototypes operation. Such approach should be applied in the design of installations, development and manufacture of equipment, construction, reconstruction and updating of their systems (components).

In case of identification at any construction stage of additional factors that lead to a decrease in the level of safety of these facilities, environmental degradation, or other adverse consequences, the construction is terminated or suspended, and further proposals for revision of the decision on construction can be adopted by public authorities, local government and public organizations (associations).

18.3 Project development for the purpose of providing the reliable, stable and manageable operation

According to the legislative regulations, the operating organization develops design for construction of a nuclear installation independently or using third party companies in accordance with the effective regulatory technical documents, and conducts consideration and coordination of the project with the ministries, departments and supervising agencies in accordance with their competence.

While in the design development all the structures, systems and components important to safety should be provided with appropriate margins of reliability against failure so that to take into account relevant mechanisms of aging and deterioration, as well as the potential degradation of characteristics due to aging, in order to ensure the ability of structures, systems or component to fulfill the required safety function throughout the whole design life cycle. The effects of aging and deterioration under should also be taken into account under normal operating conditions, during testing and maintenance, during shutdowns for routine maintenance, as well as in conditions of occurrence design initiating events and after them. The measures for the monitoring, examination, testing, sampling and inspection should be provided for the purpose to assess the mechanisms of aging, predicted at the design stage and to identify the unexpected behavior or performance degradation during operation.

Ministry of Energy, geology an natural resources RK, Ministry of Internal Affairs RK, Committee on Quality and Safety Control of Goods and Services of MH RK, Committee for Construction, Housing and Communal Services and Land Management of Ministry of National Economy RK, Headquarters of Civil Defense of the Republic of Kazakhstan carried out the examination of the design according to the established procedure on issues within their jurisdiction, and transfer materials to the Department of Atomic Energy and Industry of ME RK, which, taking into account the conclusions of these ministries and departments prepare the opinion on possibility of construction of nuclear installation and forwards it to the Cabinet of Ministers of the Republic of Kazakhstan.

Design materials can be reviewed by an independent expert commission in accordance with the procedure established by the Government of the Republic of Kazakhstan.

The head of the local administration makes the final decision on the transfer of land for construction after approval of projects for the construction.

After approval of the design of a nuclear installation the Committee for Nuclear and Energy Supervision and Control ME RK issues a permit (license) for the start of construction of a nuclear installation.

Regulation and control of compliance with requirements of the rules, safety standards and quality assurance in the manufacture of the equipment, devices and systems for nuclear installations is provided in accordance with the Law of the Republic of Kazakhstan "On Standardization and Certification" and regulations on safety in the field of use of atomic energy.

Organizations performing construction and assembly, commissioning and maintenance work on nuclear installations must have a permit (license) of CAESC ME RK for realization of these activities.

Committee on Quality and Safety Control of Goods and Services of MH RK carries out sanitary and epidemiological supervision in the field of health care for employees and their family members in the process of construction and installation work at nuclear facility and monitors implementation of foreseen nuclear installation programs provided by the design to improve the sanitary and epidemiological welfare of the region's population.

CES of Ministry of Internal Affairs RK oversees compliance with all fire safety requirements for the construction and installation of a nuclear facility.

Based on the foregoing it is clear that Republic of Kazakhstan has a regulatory framework for design and construction of nuclear installations, construction of NPPs, in line with international standards and safety requirements.

The construction of nuclear facilities is carried out only at availability of licenses (permits) issued by CAESC ME RK.

Article 19. Plant operation

Each Contracting Party shall take the appropriate measures to ensure that :

i) the initial permission to operate a nuclear installation is based on the appropriate safety analysis and the commissioning program, which show that the constructed installation complies with the requirements for project and safety;

ii) the operational limits and conditions are set and revised as needed to determine the boundaries of safe operation, specified on the basis of safety analysis, tests and operational experience;

iii) operation, maintenance, inspection and testing of the nuclear installation are conducted in accordance with approved procedures; iv procedures for responses to anticipated operational occurrences and accidents are established;

v) necessary engineering and technical support in all safety related fields is available throughout the entire life cycle of a nuclear installation;

vi) the license holder promptly reports the relevant regulatory authority on incidents significant to safety;

vii) programs to collect and analyze operating experience are developed, measures on the obtained results and conclusions are taken, and existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;

viii) production of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, as well as to any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same area as that of the nuclear installation the conditioning and disposal are taken into account..

19.1 The original resolution

All organizations operating nuclear installations have a license for operation. The CAESC ME RK carries out issuance of license only after receiving approval of environmental impact assessment and expert review of safety analysis report, and after implementation of commissioning program of installation and inspection verifying safe operation and readiness of the operating organization to the safe operation of the installation.

Available nuclear installations of RK put into operation in the USSR in accordance with the rules and regulations, which were in force at that time. Currently, operation of these facilities is conducted on the bases of the following type of licenses: "Implementation of work associated with the stages of the life cycle of nuclear facilities".

The basis for issuing of this license is fulfillment of the qualification requirements, including the availability of:

- production and technical base necessary to perform the proposed work on the basis of ownership or other legal grounds
- qualified staff with appropriate education, training, work experience and approved for implementation of the declared type and sub-activities
- licenses for construction and installation works

- test reports, acts of acceptance of systems and equipment into operation, act of acceptance of the finished facility into operation
- preliminary report on the safety analysis of the object
- preliminary decommissioning plan
- services providing operation, maintenance, inspection and testing of equipment, machinery, technological lines
- radiation safety services
- storage facilities for the storage and disposal of sources of ionizing radiation and radioactive waste on the ownership or other legal grounds
- quality assurance programs for the implementation of the proposed activities
- instructions on nuclear and radiation safety, on personnel actions in emergency situations
- an action plan to protect personnel and the public from a radiation accident and its consequences
- emergency response system for the development of personnel actions in emergency situations
- accounting and control systems for nuclear materials
- radiation situation monitoring systems at the facility, the sanitary protection zone and the observation zone in the volume necessary for all operation modes provided for by the project of the facility, as well as during design and beyond design basis accidents
- systems for monitoring and recording doses to the personnel of the applicant
- compulsory employee insurance agreement against accidents
- agreement of compulsory insurance of liability of owners of objects whose activities are related to the danger of causing harm to third parties
- compulsory environmental insurance agreement

In analysis and assessment of the safety of nuclear installations both techniques of deterministic and probabilistic analyzes are used, including consideration of postulated initiating events and factors which, individually or in the aggregate may affect the safety of nuclear installations, and which may:

- occur during NI operation;
- be caused by the actions of the staff;
- be associated with the external effects of natural and (or) man-made character.

Applicability of computer programs (computer codes), analytical methods and used models of NI used in the safety analysis, must be justified through comparative calculations and analysis of their sensitivity to changes in input parameters.

The deterministic safety analysis of nuclear installations includes:

- confirmation that the established operational limits and conditions meet the design parameters and goals of safety under the normal operating conditions of NI;
- characterization of postulated initiating events related to design and site of NI;
- analysis and evaluation of sequences of events, which are the result of postulated initiating events;

- comparison of the results of the analysis with the targets of safety and design limits;
- identification and verification of the design basis;
- confirmation that the management of the expected performance events and design basis accidents possible with automatic triggering of safety systems in combination with the prescribed actions of the operator;
- assessing the suitability of the used analytical assumptions, methods and the degree of the used conservatism.

Probabilistic safety analysis of NI includes:

- comprehensive assessment of project compliance with the general safety objectives;
- assessing the significance of particular item, design feature or operating practices for risk management;
- confirmation that the escalating of small deviations from the parameters of the NI operation in an emergency situation is prevented;
- evaluation of the probability of serious damage to the reactor core, as well as risk assessment of radioactive emissions, requiring immediate response to the off-site, in particular, in the case of emissions associated with damage to the protective coating at the early stages of the accident;
- assessment of the probability and consequences of external effects typical for the given site of NI;
- identification of systems, structures and operating procedures, change (modification) of which may reduce the probability of beyond design-basis accidents or mitigate their effects;
- assessing the adequacy of emergency procedures taken at nuclear installations.

The final decision on the adequacy of the adopted technical and organizational measures to ensure the safety of nuclear installations is made on the base of the results of a deterministic analysis.

The authorized body and other competent authorities in accordance with their authority as prescribed by law carry out state supervision and monitoring of compliance with the requirements of technical regulations of operation of nuclear installations.

The design documentation, including the updating or reconstruction, as well as operation documentation of NI, and materials justifying the choice of NI location are coordinated with state supervisory and control bodies within the procedures prescribed by regulation.

Inspections while in the process of reviewing of materials licensing are aimed to:

- assess the safety issues at the installation;
- on-site verification of reliability of the information provided;
- assess the possibilities and availability of conditions in operating organization for the conduct of the declared activity.

Pre-commissioning and adjustment work at NI, comprehensive testing of systems and NI equipment, physical and power start-up of reactor facilities and the development of capacity to the nominal rating must confirm that the NI in general, and systems and components

important to safety, in particular, related to classes 1 and 2, are implemented and operated in accordance with the design, and identified deficiencies are corrected.

The design of NI establishes sequence and volume of pre-commissioning works, physical and power start-up and acceptance criteria for equipment and systems put into operation

The documents which manage the conduct of pre-commissioning adjustment work, comprehensive testing, physical and power start-up should contain a list of potentially hazardous work and a list of measures to prevent the occurrence of accidents.

While in implementation of the commissioning program the physical characteristics of systems important to safety should be determined and documented. The list of parameters to be documented is determined by the relevant testing programs.

While in the implementation of the commissioning program the clarification of the performance characteristics of equipment and systems should be carried out, and the limits and conditions of safe operation and maintenance procedures should be clarified to ensure reflection of actual performance characteristics of systems and equipment.

The permission for comprehensive testing and implementation of the physical and power start-ups is issued to administration of NI by the authorized body after check of NI readiness to those phases of commissioning in prescribed order, provided that general emergency plan and plans to protect workers and public in the case of an accident at NI are developed in full scope.

NI or its part, with completed construction or being put into operation, must be isolated from other operated NI and from the areas where construction work is going on, so that the ongoing work and possible accidents on construction sites did not affect the safety of NI being entered into service, and in the event of possible accidents on the operating NI, the safety should be provided on construction sites and sites being subject to put into operation.

While in commissioning as well as during reconstruction (upgrading), which may affect the design basis of nuclear installations, the authorized body periodically (at least 1 time in 3 years) carries out the independent inspections to monitor the compliance with the requirements of technical regulations, safety regulations and standards.

19.2 The operational limits and conditions

In accordance with the requirements of technical regulations in the field of nuclear and radiation safety, operational limits, conditions and limits of safe operation of NI should be identified and justified in the NI design. The technological regulation is the document that determines the rules and the basic methods of safe operation, limits and conditions of safe operation, the general order of performing operation procedures, that affect the safety of NPP.

Technological regulation ensures the safety of operations of particular NI, by setting the limits and allowable design modes for safe operation. The limits of safe operation are also reflected in the safety analysis report for current NI. The operational limits and conditions of safe operation are reviewed, and adjusted in process of redevelopment of technological regulations NI, and updating of NI systems.

Authorized body performs the final approval of changes in limits and conditions of safe operation.

In accordance with existing regulations and standards during normal operation and violations of normal operation and design-basis, accidents (including blackout mode) the control and

management system should be provided with reliable power supply in the volume justified in the project of NI.

In both sanitary protection and surveillance zones NI administration should organize on a regular basis measurements of ionizing radiation dose rates, wind speed and other meteorological parameters, as well as periodic measurements of radioactive fallout density for assessing and predicting of radiation situation in the surrounding area during normal operation of NI in design and beyond design basis accidents.

It is necessary to provide strict control of radiation levels of NI personnel and personnel from other organizations engaged into the maintenance and repair, to develop and implement measures to reduce the exposure of personnel to reasonably achievable level.

It is necessary to ensure strict accounting of amounts of movements and locations of all fissile and radioactive materials, fresh and spent fuel, radioactive waste and other sources of ionizing radiation at the NI.

Operation of NI should be stopped if the limits and conditions of safe operation set for it cannot be kept.

In order to maintain the ability of systems having an impact on NI safety, to meet design requirements, regular maintenance, repair and testing should be carried out during the life cycle.

Performing of repairs and maintenance, replacement of failed equipment, handling of nuclear and radioactive materials, and nuclear fuel, should be conducted in accordance with the documentation, developed on the basis of NI project. Specific requirements for repair and maintenance work must be stated in a special section of the project of NI.

Maintenance and repairs during operation should be carried out under the conditions and safe operation limits established in the Safety Analysis Report and technological regulation.

Operation, maintenance, and repair must be carried out in compliance with the conditions and limits of safe operation, set out in safety analysis report and technological regulations.

Periodicity and time allowed for maintenance and inspections must comply with design requirements.

Maintenance, repair, testing, monitoring of state of the basic metal and welded joints of NI systems and components important to safety shall be carried out in accordance with instructions, programs and schedules developed by the NI administration, based on design requirements and technological regulations, and must be carefully documented.

Administration of NI should provide for organizational arrangements, which exclude the possibility of unauthorized changes in the technological, electrical, electronic circuitries, as well as hardware and algorithms for initiating systems of security.

Systems and equipment after maintenance and should be checked for performance characteristics and compliance with design characteristics with the documentation of test results.

Tests and other works at NI, which are not provided for by technological regulations and operating instructions should be carried out on the basis of technical solutions, according to programs and procedures for containing measures to ensure the safety of these tests.

Technical solutions, programs and techniques of such tests should be agreed with the authorized body and approved by NI administration.

In the case of revealing of operation dangerous for NI reactions of control and management systems in the process, NI has to shut down, the necessary technical measures on their remove should be initiated and the appropriate changes to the project of NI should be inserted in the prescribed order.

At all stages of the life cycle of NI, the activity on quality management and safety culture must be planned, systematically carried out, analyzed and evaluated to ensure the implementation of the basic principles and criteria to ensure safety.

19.3 Regulations of operation, maintenance, inspection and testing

In accordance with the requirements of the Law of RK "On the Use of Atomic Energy" constant monitoring of the safe operation of the nuclear installation is carried out by the operational organization at all stages of its life cycle.

The main document, according to which the operation of NI should be carried out, is a technological regulation of operation of NI containing the rules and the basic techniques of safe operation, the general order of operations affecting the safety of nuclear installations, as well as the limits and conditions of safe operation.

The technological regulation of operation of NI is developed by the designer of NI, coordinated by the authorized body and approved by the NI administration before the beginning of pre-commissioning and adjustment work.

Changes introduced to the technological regulation should be agreed in the prescribed order with the organizations involved in its development, coordination and approval.

Before the pre-commissioning work administration of NI on the basis of approved technological regulations and operational documentation of both NI designer and equipment developers should provide the development of the necessary instructions for operation.

Instructions for operation of equipment and systems shall contain specific instructions to operational staff on how to carry out works in normal operation and emergency situations.

Technological regulations and instructions for operation of systems and equipment should be adjusted in accordance with results of the commissioning program of NI.

The monitoring and inspections system provided by the operating organization is aimed at early detection and prevention of deficiencies in the operation of the installation and their timely removal. In accordance with the requirements of relevant regulations, performance check of NI safety systems and other systems important to safety is periodically conducted.

Operating organization provides comprehensive and specific checks of safe operation of the installation, and fulfillment of conditions of licenses issued.

Periodically (at least 1 time per year) the internal commission is appointed by order of administration of NI to verify the status of nuclear and (or) radiation safety in NI. Act of the Commission is compiled and approved based on the inspection results. One copy of the approved act is sent to the authorized body not later than February 1 of year following the reporting one.

While in NI operation design functioning of monitoring systems for registration of the processes and phenomena of natural and man-made origin included into the design basis, as well as for monitoring of the slow geological and engineering-geological processes, including seismic should be provided.

While in NI operation, control of NI protection against external influences should be provided by:

- observations of foundation conditions;
- observations of the behavior of buildings, constructions, including rolls and precipitation, monitoring and diagnostics of structural connections important to safety;
- periodic inspections of conditions of protective equipment (seismic isolation, damping devices, etc.), as well as their test;
- control of the good serviceability of apparatus for measuring, recording, and transmitting of information used for the prevention and protection against external effects;
- control of availability of individual and collective protection measures of personnel directly involved into control of NI;
- analysis of safety barriers condition (in accordance with the results of regular and periodic data on the status of facility).

Based on data recorded on the impact and response of systems and components, expert comparative analysis of design data about the impacts and responses to structures should be conducted.

If changes of the design parameters are fixed resulted from of the control in the operation of the facility, then the effects of these changes should be evaluated and, if necessary, decisions on the development of protective measures should be made.

Operating organization provides continuous monitoring and inspection of equipment condition by conducting of technical inspection of equipment. After expiry of NI design lifetime operating organization must confirm the availability of the residual operational resource of NI.

Administration of NI develops and approves schedules for maintenance and repairs for all types of NI equipment and systems. The work is performed in accordance with the existing on NI instructions for operation, maintenance, and repair of systems important to safety and schedule is approved by NI administration. Maintenance of equipment and reactor systems are mainly carried out by reactor staff and covers monitoring of changes in operating parameters of the equipment for early elimination of the deviations, implementation of preventive measures and specified tests of the equipment, instruments, systems.

Planned repair at NI is performed regardless of the actual technical condition of equipment to the moment of start of repair with periodicity and in the amount established by the regulations on maintenance and repair. Periodicity and scope of planned maintenance and repair of equipment and systems are determined by necessity to maintain the reliability of systems and equipment in accordance with the terms of safe operation and operational limits established by the NI design.

The need to perform unplanned maintenance and repair of equipment and systems is determined by the results of the monitoring of their condition. Technical regulations on nuclear and radiation safety govern the work of inspection and testing of systems important to safety.

System of NI inspection by supervisory body and operating organization is realized based on annual schedules of planned inspections. The results of inspections and audits carried out by

the operating organization are formalized with relevant documents containing the identified deficiencies and comments, as well as measures to eliminate them.

19.4 The regulations defining the response in case of expected occurrences of events and accidents while in operation

Prior to commissioning of NI the ready-to-run action plans are developed for protection of personnel and population in case of an accident at NI, taking into account the radiation effects of accidents. Plans are developed based on the design characteristics and parameters of NI, and criteria for decision-making for measures on protection of personnel and population in case of an accident, taking into account the category of potential danger of NI, economic, environmental, and other characteristics and features.

The action plans on the protection of personnel and population, in case of an accident at NI, are developed by the operator, and they should provide for the necessary coordination of the operator's actions with authorized bodies and local authorities in accordance with the category of potential danger of NI. Maintaining a constant readiness and implementation of plans is responsibilities of NI administration.

The action plans on the protection of personnel and population set the levels of emergency preparedness and intervention levels, determine the emergency-alert procedure and the beginning of realization of plans. The action plans specify the necessary equipment and facilities to protect personnel and population.

NI personnel must be prepared to act in design basis accidents and accidents with low probability and severe consequences. Personnel actions in case of accidents with low probability and severe consequences, must be governed by special guidelines that are developed by taking into account implementation of analyzes of these accidents.

To prepare personnel to actions in emergency conditions the emergency response drills are conducted periodically in accordance with methods and programs of their preparation and implementation agreed with the authorized bodies of supervisory and control.

In the event of accidents and pre-emergency situations occurrence at NI operational personnel guided by the requirements of the emergency documentation – instructions for personnel actions in emergency situations at NI and the action plan for protection of personnel and the population against radiation accident at NI.

In the event of pre-emergency signs identification or occurrence of the accident at the reactor, shift supervisor immediately reports to NI management, which, in turn, notifies the appropriate organizations and officials in accordance with the action plan for protection of personnel and population against radiation accident.

19.5 Engineering and technical support

Throughout the life cycle of NI tracking of work on its maintenance and upgrading is carried out with the involvement of the organizations that participated in its design development and construction, as well as expert organizations.

In accordance with the requirements of technical regulations in the field of nuclear and radiation safety, safety is ensured at all stages of NI life cycle through the implementation of a system of organizational and engineering measures, part of which are as follows:

- maintenance of systems important to safety in serviceable condition by performing necessary maintenance and the replacement of outdated equipment;
- timely diagnosis of defects and identification of deviations from normal operation, and adoption of measures to address them;
- organization of an effective system for documenting the results of operation and control;
- development and consistent implementation of quality assurance programs for all kinds of work for all stages of NI life cycle.

Types and forms of engineering and technical support at different stages of NI construction, commissioning and operation vary depending on the tasks of the operating organization. Involved are specialized research, design, repair, adjustment and other organizations, companies, manufacturers of equipment such as RK, and other countries with experience of services and work in the sphere of use of atomic energy.

19.6 Reporting on incidents important for safety

Documented information on control of limits and conditions of safe operation should be stored at nuclear installation for two years or two campaigns between reactor core refueling. Before elimination of records the indicated results should be included into periodic reports issued by the administration of NI and sent to the authorized body.

Collection, processing, analysis and storage of information about the equipment failure and human errors during operation should be provided at NI.

Administration of NI in the order, prescribed by the authorized body, investigates, keeps records and informs the authorized body about all cases of violations of the design limits and conditions of safe operation of nuclear installation.

Emergency situations and accidents that occurred on NI should be investigated by commissions in the order prescribed by the authorized body, in accordance with the requirements of Technical regulations on safety and "The Guidelines on informing, investigation and recording of operational disruption of nuclear installations".

Informing of supervising body during normal operation:

- weekly emails about the security status of NI and radiation safety of prescribed form;
- periodically (at least once an year) approved act of commission check on status of nuclear and (or) radiation safety at the plant shall be submitted to the supervisory body.

Informing of supervisory body in case of violation of the NI operation:

- prompt report on violation;
- additional report on violation;
- report or act on investigated violation.

Depending on features and consequences of violations related to nuclear and radiation processes, and their impact on safety, they are divided into the following categories:

- accident (radiation);
- incident (radiation, non-radiation).

Category of violation is assigned depending on features, reasons and consequences of violations. Guidelines for informing, investigation accounting of violations in operation of NI defines ratio of categories of violations with other estimates of the level of disturbance (according to the scale emergencies and the International Nuclear Event Scale).

Enterprise carry out the collection, processing, analysis and storage of information on all violations (equipment failure, erroneous actions of personnel) that have occurred on NI, and their account.

19.7 Account of operating experience

Design materials of NI, executive documentation for the construction of nuclear installation, test reports and executive documentation on the maintenance and repair of safety systems (components) and the elements that affect safety must be stored at nuclear installations throughout their life cycle.

By Decision of the Council of CIS Heads of Government, the State Scientific Center of the Russian Federation – Research Institute of Atomic Reactors (hereinafter - NIIAR) was assigned the status of Base Organization (BO) of states – participants of the CIS on information exchange in the area of safety research of nuclear installations. Together with members of BO the work is organized on the collection of information on the experience of operation of research reactors in the Base Organization and electronic information system is created and implemented for the exchange of experience and information.

Research reactors of RK are BO participants. In accordance with the guidelines all enterprises involved organized the work on the collection and provision of information to BO on violations and status of operated research reactors at enterprises. To obtain information on violations and status of research reactors of other companies – participants of this information system, the staff, which is in charge of safety issues is given the appropriate access.

19.8 Management of spent fuel and radioactive waste at the site

Storage of nuclear materials, radioactive materials, fresh and spent nuclear fuel and radioactive waste shall be provided for by the NI design. Storage capacity of storage facilities must be substantiated by the project.

Ability to achieve criticality in the storage facility of nuclear and radioactive materials, fresh and spent nuclear fuel during their placement and movement shall be physically eliminated by providing the relevant characteristics of the storage facility.

Design of storage facility of spent nuclear fuel and radioactive waste should provide for the reliable decay heat removal system and corresponding chemical composition of the heat-eliminating medium to prevent interaction, resulted in output of radioactive materials to NI premises or the environment beyond the limits set by design.

Design of NI should provide for transportation and handling operations and special equipment and facilities for the transport of nuclear and radioactive materials, fresh and spent nuclear fuel and radioactive waste inside and outside NI.

NI should be equipped with technical means for proper control of emissions of liquid radioactive substances into the environment, so that levels of emissions and concentrations were maintained within the prescribed limits of sanitary norms and standards.

Design of installation should provide for the necessary systems for the processing of liquid and gaseous radioactive waste in order to maintain the quantity and concentration of radioactive discharges and emissions within the prescribed limits of sanitary and health standards.

Design of installation should contain an analysis of the composition and quantity of solid, liquid and gaseous radioactive wastes generated during normal operation and evaluation of their quantities for design-basis accidents.

Design of installation should provide for methods and tools of preliminary processing, packaging and, if necessary, processing of radioactive waste, as well as the places and ways of their temporary storage and disposal.

Management of spent fuel

Nuclear power plant BN-350

The only power reactor in the territory of the Republic of Kazakhstan - the fast breeder reactor as integral part of RF BN-350 – was in operation since 1973 until 1999, is currently out of service. During operation, the spent fuel was regularly transported for processing to Russian Federation. After disintegration of Soviet Union in 1991, spent fuel remaining in the reactor, was stored in the reactor spent fuel storage facility of pool type.

In December 1998, the work started on the packaging of the BN-350 reactor spent fuel in sealed canisters, filled with inert gas. The purpose of this work was packaging BN-350 reactor spent fuel stored in cooling ponds, and then placement of this material for a long-term dry storage.

Upon completion of work on packaging of spent fuel of BN-350 reactor it was stored in storage pools. Then sealed canisters with spent fuel were overloaded in metal-concrete containers of dual use (transportation and long-term storage). Containers were transported by railway road and placed on a specially constructed platform of long-term container storage of spent nuclear fuel to KIR "Baikal-1" of National Nuclear Center of Kazakhstan located in the eastern part of Kazakhstan. Reliable storage of spent fuel for 50 years is ensured.

Spent fuel of research reactors

There are four research reactors in Republic of Kazakhstan owned to branch IAE RSE NNC RK (RA reactors, IVG.1M and IGR) and RSE INP RK (WWR-K), three of which are on territory of the former Semipalatinsk test site near Kurchatov, and one – near Alatau village (Almaty). Spent fuel management for research reactors currently includes unloading from the reactor, transportation to nearby store facility and long-term controlled storage.

WWR-K reactor

Since December 2008 to May 2009, the rail transport exported spent nuclear fuel from the WWR-K INP research reactor from the territory of the Republic of Kazakhstan for reprocessing to the Russian Federation. 278 fuel assemblies of type WWR-C were removed.

In December 2014, 127 fuel assemblies of the WWR-C type were transported by air transport to the Russian Federation.

Since July to August 2017, 153 fuel assemblies of the VVR-C type were transported to the Russian Federation by air transport, which contain the total mass of all uranium isotopes after irradiation - 47.3165 kg.

Received radioactive waste from the reprocessing of spent nuclear fuel will be returned to the Republic of Kazakhstan in 20 years. Instead of shipped uranium, new nuclear fuel in the form of fuel assemblies was supplied to Kazakhstan.

IGR reactor

The rate of spent fuel generation at KIR IGR is determined by the amount of fuel in the experimental devices tested (irradiated) in IGR reactor. Unloading of spent fuel is not conducted since 1968.

Experimental devices with fuel tested in IGR reactor are placed into storage facility of nuclear materials located in premise 0101 of building 1 for aging (3 to 5 months) followed by transportation to radiation-protective chamber (RPC) to KIR "Baikal-1" for post-irradiation examination. After investigation, fuel is placed for long-term storage. The amount of spent fuel accumulated in 19 experimental devices of IGR reactor made 81.2 kg of uranium. Two storage facilities are used for storage of spent nuclear fuel at KIR IGR – storage facility of nuclear materials located in room 0101 of building 1, and storage facility in room 25 of building 20, in which graphite elements of the first IGR reactor core are stored.

IVG.1M reactor

During the operation of the IVG.1M reactor (1990-2019), in 2004, one fuel assembly was unloaded from the reactor core, which was then dismantled for experiments. In 2016, two more assemblies were removed from the core, and low-enrichment experimental assemblies were put in instead. Fuel assemblies are placed for long-term storage into specially designed storage facility of the reactor IVG.1M, which has biological protection and loading mechanisms. Storage is equipped with a system of physical protection and is under the IAEA safeguards and supervision.

RA Reactor

In 1998, in accordance with intergovernmental agreements fuel from the reactor was unloaded and transported to Russia.

Radioactive waste management at

NPP BN-350 site

Power reactor BN-350 in Aktau is currently shut down and being decommissioned. The following facilities are available for radioactive waste management at the site of BN-350 (Aktau):

- Facility (SRWSF) for collection and storage of low-level and intermediate-level SRW (in accordance with internal enterprise design classification SRW with dose rates, respectively, from 0.1 to 30 mrem/h (0,001-0.3 mSv/h) and from 30 to 1000 mrem/h (0.3-10 mSv/h) and for high-level waste from the dose rates of more than 1000 mrem/h (10 mSv/h). Low- and intermediate-level waste is placed in structure 156, representing two parallel arranged trenches with volume capacity of 4590 m^3 and 3910 m^3. After filling the trench backfilled with fill ground with a layer thickness of

not less than 0.5 meter and covered with concrete (asphalt) Currently, both trenches are 100% filled and covered with layers of soil, concrete and asphalt. HTRO holds about 6418 tons of low-level and about 642 tons of intermediate level waste with total activity of about 4.4×10^4 GBq. High activity SRW (in accordance with internal classification of enterprise) representing elements of equipment and spent sealed sources are stored under structure 158, in reinforced concrete vault consisting of the hopper with twelve loading hatches. The total volume of the vault makes 351 m^3. The total weight of high-level radioactive waste is about 169.37 tons and activity is about 4.7×10^5 GBq.

- Storage facility for ageing of reactor equipment, premise 510, containing reactor internals, microadsorber with total weight of 11.294 tons with total activity of 19.2 GBq.
- Radioactive non-nuclear materials, canisters, water purification module, baskets, radiation sources with a total weight of 135.7 tons and a total activity of 5.05×10^4 GBq, located in cooling pools, are housed in dry storage in containers at the former temporary storage facility of spent fuel.
- So called repository vault of BN-350 hot cell, premise 010. In the period from the beginning of the hot cell operation since 1973 till September 1, 1999 complete cutting of 50 spent fuel assemblies, 20 control rods and one antimony-beryllium neutron source was performed in the hot chamber. In the repository vault, located under the hot cell (premise 010), different parts of cut irradiated products were, at the same time, placed for storage. Thus, 205 fuel assembly tails, 32 fuel assembly heads, 72 "sets" of fuel assembly internal parts, and 14 radiation sources are stored in burial vault. Total amount of accumulated radioactive waste in burial vault makes 2.504 tons with a total activity of about 7.17×10^5 GBq.
- Facility for collection and storage of LRW of BN-350. Storage facility LRWSF is located in building 157 of BN-350 and consists of 10 tanks for long-term storage of liquid radioactive waste. Currently 6 tanks are in operation, containing 3220.7 m^3 of LRW with total activity of $3{,}56\times10^5$ GBq). The LRW Backup Storage Facility has been built and is in the state of commissioning.
- Radioactive sodium processing unit (SPF). The SPF unit is an integral part of the technological complex for handling liquid metal coolant (LMT) and is designed to process sodium into a hydroxide solution with a concentration of 35 to 70%. In addition, the installation should provide processing and Na-K alloy (22% sodium and 78% potassium), located in the cooling circuit of cold filter traps. In total, about 610 m^3 of primary sodium and about 20 m^3 of sodium-potassium alloy need to be processed at the BN-350 reactor. The plant has been upgraded to allow sodium to be processed into hydroxide with a concentration of up to 90%. SPF was upgraded and commissioned. A trial batch of non-radioactive sodium of the secondary circuit of the BN-350 reactor has been processed

WWR-K reactor

Generation of radioactive wastes in WWR-K reactor of INP RGP RK INP makes at the average: liquid radioactive waste (LRW) from 6.2 m^3 per year with activity to 1.26 GBq, solid radioactive waste (TPO) from 601 kg per year, the activity of 2.2 GBq. There is a facility for the simultaneous cementing of LRW and SRW at WWR-K reactor. Overall

activity of liquid and solid waste buried since 1988 until nowadays at INP disposal facility is 328.011 TBq.

Currently, work is underway to design a regional repository for ampoule sources of silo type at territory of the INP, which will be used for storing of some sources from the old storage facility, as well as for receiving spent sources from the region.

IGR, IVG.1M and RA reactors

The average rate of generation of radioactive waste at the reactor complexes IGR, IVG.1M and RA makes:

- solid waste - 300 ... 400 kg/year;
- liquid waste - 2.0 ... 3.0 m3/year.

Radioactive waste generated at KIR "Baikal-1 is transported in the prescribed manner to the long-term storage of KIR "Baikal-1".

The amount of solid radioactive waste at KIR "Baikal-1" referred to private enterprise savings, makes 182 692.79 kg with a total activity of 5094.05 GBq.

Total amount of radioactive waste placed for long-term storage at KIR "Baikal-1" with regard to radioactive waste received by the branch IAE RSE NNC RK from outside (enterprises, organizations, and lost sealed sources) makes 2 819 435.76 kg with a total activity of 7560.51 GBq.

Appendix 1. List of Main Regulatory and Legal Acts of the Republic of Kazakhstan in the Field of Nuclear and Radiation Safety

1. Constitution of the Republic of Kazakhstan (adopted by the Republican Referendum on 30th August, 1995) as subsequently amended as of February 2, 2011

Principal International Agreements of the Republic of Kazakhstan

2. Law of Republic of Kazakhstan dated on February 3, 2010, No. 243-IV "On Ratification of the Convention on Early Notification of a Nuclear Accident"

3. Law of Republic of Kazakhstan dated on February 3, 2010, No. 244-IV "On Ratification of Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency"

4. Law of Republic of Kazakhstan dated on December 22, 2004, No. 17-III "On Accession of the Republic of Kazakhstan to the Convention on the Physical Protection of Nuclear Material", Law of Republic of Kazakhstan dated on March 19, 2011, No. 416-IV "On Ratification of the Amendments to the Convention on the Physical Protection of Nuclear Material"

5. Law of Republic of Kazakhstan dated on October 21, 2000, No. 86-II "On Accession of the Republic of Kazakhstan to the Convention on Environmental Impact Assessment in a Transboundary Context"

6. Law of Republic of Kazakhstan on February 3, 2010 No. 245-IV "On Ratification of the Convention on Nuclear Safety"

7. Law of Republic of Kazakhstan on February 10, 2011 No. 405-IV "On Ratification of the Vienna Convention on Civil Liability for Nuclear Damage of 1997 (Consolidated text of the Vienna Convention on Civil Liability for Nuclear Damage of May 21, 1963, as amended by the Protocol of September 12, 1997)"

8. Law of Republic of Kazakhstan on February 3, 2010 No. 246-IV "On Ratification of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste"

9. Law of the Republic of Kazakhstan on October 23, 2000 No. 92-II "On Ratification of the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in issues related to the Environment"

10. Draft Law on the ratification of the Agreement on the Cooperation of the CIS Member States on Preparedness for a Nuclear Accident or a Radiation Emergency and Mutual Assistance in Elimination of Their Consequences

Main Codes of the Republic of Kazakhstan

11. The Code of the Republic of Kazakhstan dated October 29, 2015 № 375-V LRK «Entrepreneurial Code of the Republic of Kazakhstan"

12. Code of the Republic of Kazakhstan dated on July 9, 2003, No. 481 "Water Code of the Republic of Kazakhstan"

13. Code of the Republic of Kazakhstan dated on June 20, 2003, No. 442 "Land Code of the Republic of Kazakhstan"

14. Code of the Republic of Kazakhstan dated on December 10, 2008, No. 99-IV “About Taxes and Other Obligatory Payments to Budget (Tax Code)”

15. Code Of the Republic of Kazakhstan dated on January 9, 2007, No. 212 “Environmental Code of the Republic of Kazakhstan”

16. Code Of the Republic of Kazakhstan dated on September 18, 2009 No. 193-IV “On Public Health and Health Care System

17. Code Of the Republic of Kazakhstan “on July 5, 2014 No. 235-V “On Administrative Offenses”

18. The Code of the Republic of Kazakhstan dated December 27, 2017 No. 125-VI ЗРК "On subsoil and subsoil use"

Main Laws of the Republic of Kazakhstan

19. Law of Republic of Kazakhstan dated on November 9, 2004 No. 603 “On Technical Regulation”

20. Law of Republic of Kazakhstan dated on May 16, 2014 No. 202-V “On Permissions and Notifications”

21. Law of Republic of Kazakhstan dated on October 19, 2000 No. 85 “On Security Activities”

22. Law of Republic of Kazakhstan dated on April 11, 2014 No. 188-V “On Civil Protection”

23. Law of Republic of Kazakhstan dated on January 12, 2016 No. 442-V “On Atomic Energy Use”

24. Law of Republic of Kazakhstan dated on April 23, 1998 No. 219 “On Radiation Safety of Population»

25. Law of Republic of Kazakhstan dated on July 13, 1999 No. 416 “On Counteracting Terrorism”

26. Law of Republic of Kazakhstan dated on July 21, 2007 “On Export Control”

Principal Decrees of the Government of Republic of Kazakhstan

27. Decree of the Government of Republic of Kazakhstan on August 13, 1996, No. 1002 “On Additional Measures to Ensure the Activities of the National Nuclear Center of Kazakhstan, as well as Nuclear Radiation Safety at Its Sites”

28. Decree of the Government of Republic of Kazakhstan on April 23, 2015 No. 274 “On Determination of Licensor in Sphere of Atomic Energy Use”

29. Decree of the Government of Republic of Kazakhstan on February 24, 1998 No. 130 “On Some Issues of Regulation of Export of Uranium Products”

30. Decree of the Government of Republic of Kazakhstan on June 29, 2011 No. 728 “On Approval of Program of Nuclear Industry Development in the Republic of Kazakhstan for 2011-2014 with the Prospects of up to 2020”

31. Decree of the Government of Republic of Kazakhstan dated on August 28, 2013 № 876 “On Approval of List of Units of Republic of Kazakhstan Vulnerable against Terrorism”

Orders of Ministries and Authorities

32. Order of Minister of Environment Protection of Republic of Kazakhstan dated on May 21 2012 № 164-ө "On Approval of Form of Report on Dangerous Wastes and Instruction on Filling the" Registered in Ministry of Justice of Republic of Kazakhstan on June 25, 2012 № 7746

33. Order of acting Minister of Investment and Development of Republic of Kazakhstan dated on December 26, 2014 № 297 "On approval of Rules for Ensuring Industrial Safety while Geological Exploration, Mining and Processing of Uranium". Registered in Ministry of Justice of Republic of Kazakhstan on February5, 2015 № 10187

34. Order of acting Minister of Investment and Development of Republic of Kazakhstan dated on December 26, 2014 № 301 « On approval of Rules for Ensuring Industrial Safety while Handling Ionizing Radiation Sources". Registered in Ministry of Justice of Republic of Kazakhstan on February 11, 2015 № 10225

35. Order of Minister of Energy Of Republic of Kazakhstan dated on February 8, 2016 № 39 "On approval of Rules for Organization of Collection, Storage and Disposal of Radioactive Sources and Nuclear Spent Fuel". Registered in Ministry of Justice of Republic of Kazakhstan on March 28, 2016 № 13537

36. Order of Minister of Energy Of Republic of Kazakhstan dated on January 20, 2016 № 12. "On Approval of Attestation of the Personnel of Atomic Energy Use Facilities". Registered in Ministry of Justice of Republic of Kazakhstan on March 15, 2016 № 13468

37. Order of Minister of Transport and Communications Of Republic of Kazakhstan dated on February 18, 2011 № 79. "On Approval of List of Dangerous Goods Transported by Civil Aircraft". Registered in Ministry of Justice of Republic of Kazakhstan dated on March 14, 2011 № 6805

38. Order of Minister of Energy Of Republic of Kazakhstan dated on January 21, 2015 № 26. "On Approval of List of Pollutants and Waste Types, for which Emissions Standards are Set. Registered in Ministry of Justice of Republic of Kazakhstan on February 20, 2015 № 10302

39. Order of Minister of Energy Of Republic of Kazakhstan dated on February 9 2016 № 44. "On Approval of the Rules for State Accounting of Nuclear Material". Registered in Ministry of Justice of Republic of Kazakhstan on March 15, 2016 № 13470

40. Order of Minister of Energy Of the Republic of Kazakhstan dated on November 13, 2014 № 123. "On Approval of Rules for State Register of Disposal of Hazardous Substances, Radioactive Waste and Sewage Discharge into the Subsoil". Registered in Ministry of Justice of Republic of Kazakhstan on December 24, 2014 № 9996

41. Order of the Minister of Energy of the Republic of Kazakhstan dated February 20, 2017 No. 58 "On approval of the technical regulation" Nuclear and Radiation Safety ". Registered in the Ministry of Justice of the Republic of Kazakhstan on April 11, 2017 No. 15005

42. Order of the Minister of Energy of the Republic of Kazakhstan dated February 20, 2017 No. 59 "On approval of the technical regulation" Nuclear and Radiation Safety of Research Nuclear Installations ". Registered in the Ministry of Justice of the Republic of Kazakhstan on April 11, 2017 No. 15006

43. Order of the Minister of Energy of the Republic of Kazakhstan of February 20, 2017 No. 60 “On approval of the technical regulations“ Nuclear and Radiation Safety of Nuclear Power Plants ”. Registered in the Ministry of Justice of the Republic of Kazakhstan on April 11, 2017 No. 15007

44. Order of Minister of National Economy Of Republic of Kazakhstan dated on February 27, 2015 № 155. «On Approval of Hygienic standards “Sanitary requirements for radiation safety”. Registered in Ministry of Justice of Republic of Kazakhstan on April 10, 2015 № 10671

45. Order of acting Minister of National Economy Of Republic of Kazakhstan dated on March 27, 2015 № 261. «On Approval of Sanitary Rules "Sanitary-epidemiological requirements for ensuring radiation safety”. Registered in Ministry of Justice of Republic of Kazakhstan on May 27, 2015 № 11205

46. Order of Minister of Investment and Development Of Republic of Kazakhstan dated on April 30, 2015 № 548. «On Approval of Regulations for Transportation of Dangerous Goods”. Registered in Ministry of Justice of Republic of Kazakhstan on August 11, 2015 № 11857

47. Order of acting Minister of National Economy Of Republic of Kazakhstan dated on March 27, 2015 № 259 “On Approval of Regulations for Control and Accounting of Individual Doses of Persons during Work with Ionizing Radiation Sources, Medical X-ray Procedures, as well as Obtained due to artificial radiation background”. Registered in Ministry of Justice of Republic of Kazakhstan on May 5, 2015 № 10943.

Regulations and Requirements

48. “Fire safety regulations. The design of nuclear power plants”, VSN-01-87

49. SP-AS-88/93 ((5.01.021-99) “Sanitary rules for design and operation of nuclear power plants”

50. “Safety requirements for collecting, processing and storage of radioactive waste” TBSPH-2003

51. RD-06-03-22-04 “Requirements for accounting of ionizing radiation sources for the licensees of the Atomic Energy Committee”

52. RD-09-02-01-99 “Requirements for quality assurance programs of radiation safety of the activities related to the use of atomic energy”

53. RD-05-02-29-05 Requirements for the composition and content of the documents for substantiation of operation of dry storage of spent fuel”

54. RD-08-02-28-04 “Safety Requirements for processing of radioactive sodium (TBPRN-2004)”

Methodical instructions

55. Methodical guidelines for notification, investigation and registration of the violations when working with radioactive substances and radioactive waste (approved by Order of the Chairman of the Atomic Energy Ministry of Energy and Mineral Resources of the Republic of Kazakhstan on November 5, 2008 No. 88-pr)

56. Methodical guidelines for notification, investigation and registration of the violations in operation of the research nuclear facilities (approved by Order of the Chairman of the Atomic Energy Ministry of Energy and Mineral Resources Of the Republic of Kazakhstan on November 5, 2008 No. 88-pr)

57. Methodical guidelines for notification, investigation and registration of the violations in operation of the nuclear fuel cycle facilities (approved by Order of the Chairman of the Atomic Energy Ministry of Energy and Mineral Resources Of the Republic of Kazakhstan on November 5, 2008 No. 88-pr)

58. RD-RU-007-08 "Guidelines for safety of the near-surface disposal of radioactive waste"

59. RD-TS-006-08 “Typical contents of a safety analysis report of spent fuel storage facility”