3rd National Report of the Republic of Armenia

under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

as referred to in Article 32 of the Convention

October 2020

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SECTION A. INTRODUCTION

A1. General introductory remarks

The Parliament of the Republic of Armenia ratified the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (hereinafter referred to as "the Joint Convention") on 21 March 2013.

This is the 3rd National Report (hereinafter referred to as "the report") of the Republic of Armenia developed pursuant to Article 32 of the Joint Convention for the review and discussion of Contracting Parties as set out in Article 30 of the Joint Convention.

Armenian Nuclear Power Plant (hereinafter referred to as "ANPP") is the only generator of spent fuel and the main generator of radioactive waste in Armenia. It consists of two units, of which the Unit № 1 is in long-term shut down regime and the Unit № 2 is operated in accordance with the license granted by the Armenian Nuclear Regulatory Authority (hereinafter referred to as ANRA) on April 1, 2011. Additionally, institutional radioactive wastes are generated from certain applications in medicine, industry, research and other practices and are managed by the "Rendering Harmless of Radioactive Waste" CJSC in accordance with the license granted by ANRA on August 26, 2009. The license was renewed in August 2019 for additional 10 years, according to the RA legislation.

During the reporting period, the "Strategy on Safe Management of Radioactive Waste and Spent Fuel in RA" was approved under the RA Government protocol decision № 42 on October 05, 2017.

Then the RA Government on January 10, 2019 adopted the Decree № 3-L on approval of 2019-2026 action plan–schedule on implementation of provisions stipulated in strategy on safe management of radioactive waste and spent nuclear fuel in the Republic of Armenia

The establishment of the National Operator, which will be responsible organization for long-term management of radioactive waste generated in Armenia, is under the review. For implementation of the activities stipulated in the Action Plan, the Ministry of Territorial Administration and Infrastructure of Armenia, which is the state competent authority, empowered with the radioactive waste management related issues has established a "Working group".

A2. The main themes and safety issues of the report

The Report is developed in compliance with the Guidelines Regarding the Form and Structure of National Reports, INFCIRC/604/Rev.3 and addresses the developments in the period from October 2017 to September 2020, and presents amendments to the national legislation, recent developments in the system of spent fuel and radioactive waste management, as well as demonstrates the efforts put to improve the safety by enhancing the national arrangements and developing the international cooperation to meet the obligations under the Joint Convention. Due consideration has been given to the questions raised during the previous review process by other contracting parties to include appropriate information in the current report.

The policies and practices of Armenia related to the management of spent fuel and radioactive waste are described in Section B in conformity with the requirements of paragraph 1 of Article 32 of the Joint Convention. The Section C of the report states the position of Armenia with regard to the scope of application as required by the Article 3 of the Joint Convention. The Section D of the report provides data on the location, main purpose and essential features of facilities for the management of spent fuel and radioactive waste, as well as the inventories of spent fuel and radioactive waste as provided in the paragraph 2 of Article 32 of the Joint Convention. The issues related to the safety of spent fuel and radioactive waste management are discussed in the Sections E through J and the Section K provides the summary of safety issues and challenges identified in the previous review process and of actions taken to address those issues and challenges, as well as the future actions planned to enhance the safety of spent fuel and radioactive waste management in Armenia. The Section K summarizes international peer review missions hosted by Armenia and of the actions taken to enhance openness and transparency in the fulfillment the obligations under the Joint

Convention.

In compliance with the Articles 7 and 38 of INFCIRC/604/Rev.3, the Section L includes Annexes with lists, inventories, references and other material relevant to the scope of application of the Joint Convention.

A3. Overview Matrix of the Republic of Armenia

The Overview Matrix is prepared in pursuance of Article 11 of the Joint Convention Guidelines regarding the Form and Structure of National Reports (INFCIRC/604/Rev.3) and is provided below:

Table 1. Overview Matrix of the Republic of Armenia

Type of Liability	Long-Term Management Policy	Funding of Liabilities	Current Practice / Facilities	Planned Facilities
Spent Fuel	Dry storage	ANPP	Storage in DSFSF (NUHOMS-56 type) at ANPP site	Expansion of dry storage capacities
Nuclear Fuel Cycle Wastes	Conceptual endpoints for RW classes are (according to the Strategy): - VLLW, LLW, SL ILW- disposal of in near surface repository, - LL ILW and HLW - disposal of in geological repository.	- Operational RW -ANPP - Decommissioning RW - Decommissioning Fund	- Liquid RW - treatment by DEF and storage - Solid RW - pretreatment and storage	- L&ILW processing facility - VLLW storage facility - Storage facility for processed L&ILW
Application Wastes	See above	State budget	Storage at near surface institutional RW management facility.	The final decision will be made after the establishment of National Operator for RW long-term management.
Decommissioning	ANPP – based on approved Decommissioning Strategy.	Decommissioning Fund	No nuclear facility is in decommissioning. ANPP Decommissioning Strategy, Initial DP and the preliminary cost estimate are developed.	- Unit № 1 - Unit № 2 after LTE
Disused Sealed Sources	Final decision will be made after the establishment of National Operator for RW long-term management and the approval of its Statute.	DSS from NPP - ANPP DSS from other applications - State budget	- DSS from NPP are stored at NPP site - DSS from other applications are stored at near surface institutional RW management facility	To be specified by the National Operator for RW long-term management after its establishment.

SECTION B. POLICIES AND PRACTICES (Article 32, paragraph 1)

Each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:
B1. Spent fuel management policy; B2. Spent fuel management practices;
B3. Radioactive waste management policy; B4. Radioactive waste management practices;
B5. Definition, categorization and classification of radioactive waste.

B1., B3. Spent fuel and radioactive waste management policy

The objectives of the National Policy for safe management of spent fuel and radioactive waste in the RA are described in the Concept on safe management of radioactive waste and spent fuel in Armenia approved under the ordinance № 7 issued by the of the RA President on January 19, 2017.

During the reporting period, the "Strategy on Safe Management of Radioactive Waste and Spent Fuel in RA" was approved under the RA Government Protocol Decision №42 as of October 5, 2017, which identifies the strategic issues of upgrading RW and SF management system in Armenia and describes the approaches for their implementation.

The strategy was developed based on the recommendations on strategic routes for RW and SF management provided to Armenia in frame of EC Development and Cooperation (DEVCO) Programme. It follows the "two level strategy" formulation approach based on the considerations of the IAEA Nuclear Energy Series № NW-G-1.1 "Policies and strategies for radioactive waste management" (i.e. national strategy sets key issues in general terms and its detailed implementation is delegated to strategies of spent fuel and radioactive waste managing companies).

The draft was posted in the corresponding web page of the RA Ministry of Justice (i.e., www.e-draft.am), as well as shared with interested parties for public information, review and comments as prescribed by the existing RA legislation and in accordance with the Aarhus Convention.

The strategy covers the period of 2018-2088 and establishes provisions for:

- Expanding existing DSFS facility (dry horizontal storage technology);
- Constructing DSFS facility (vertical storage technology of dual purpose casks);
- Establishing the National Operator, a state entity under the Ministry of Territorial Administration and Infrastructures, responsible for radioactive waste long term management;
- Introducing "polluter pays" principle and establishment of special "off budget" account;
- Enhancing measures for controlling the radioactive waste generation;
- Implementing activities for disposal of VLLW, LLW and ILW (short-lived waste) in a near surface formations (site selection, design, construction, operation) considering the opportunity of expansion of disposal capacity after the decommissioning of ANPP;
- Implementing R&D on feasibility of radioactive waste disposal in geological formations in Armenia (the need for international support is highlighted therein);
- Enhancing the radioactive waste processing and storage capabilities;
- Implementing measures for personnel recruitment/training;
- Establishing electronic database for radioactive waste accounting and control;
- Developing and submitting the action plan for implementation of strategic goals for the RA Government's approval.

For achieving the strategic goals and for the implementation of provisions stipulated in the strategy, the RA Government approved the Decree N 3-L as of January 10, 2019. It identifies the responsible authorities/entities, timeframes, funding for activities included therein and as well the supervision of implementation/control mechanisms and, inter alia, incorporates ANPP activities on enhancement of

spent fuel and radioactive waste management specified in the corresponding programs.

For implementation of provisions stipulated in the Action Plan, on July 19, 2020 under the order of the Minister of Territorial Administration and Infrastructures, a working group was established, which is composed of specialists from different entities in the field of RW management.

B2. Spent fuel management practices

The spent fuel management practice in ANPP consists of:

- The unloading of fuel assemblies from the reactor core upon considering them as spent fuel, their testing for leak tightness and in case it is tight, a spent fuel assembly is placed in the storage pool of Unit № 2 for 3-5 years. When failed assemblies are detected they are placed in tight casings and then stored in the storage pool of Unit № 2 without further relocation;
- The relocation of spent fuel assemblies from the storage pool of Unit № 2 to the spent fuel storage pool of Unit № 1 and storage of spent fuel assemblies till their compliance with the criteria established in the SAR for NUHOMS Storage Facility. The total storage time of the spent fuel assembly shall meet at least the required value (not less than 5 years for the designed nuclear fuel and at least 10-12 years, for the profiled nuclear fuel with the initial enrichment 3.82% by U-235);
- The transfer of spent fuel assemblies to Dry Spent Fuel Storage Facility (DSFSF).

At ANPP site there are two Dry Spent Fuel Storage Facilities of NUHOMS-56 type, DSFSF-1 and DSFSF-2 that are operated in accordance with the operational licenses granted by ANRA in 2000 and in 2008, respectively.

B4. Radioactive waste management practices

The description of practice of radioactive waste management in the Republic of Armenia includes the management of nuclear waste generated from the operation of ANPP and of institutional waste generated from certain applications in medicine, industry, research and other practices.

Nuclear Waste Management practice

All liquids from ANPP controlled area are collected and evaporated continuously and the generated evaporator concentrate, that is intermediate level liquid radioactive waste based on the current RW classification, subsequently undergoes treatment at deep evaporation facility (DEF) and the resulted alloy ("salt cake") is packed in metal containers, where it is solidified and placed for storage in the DEF containers temporary storage module. The temporary storage module is currently full, and the solid intermediate level waste storage facility is used as an interim solution for disposition of the DEF containers.

Solid radioactive wastes at ANPP undergo pre-treatment before transportation to the appropriate storage facility. Currently no treatment or conditioning technologies for solid radioactive wastes processing are implemented at ANPP.

There is no gaseous radioactive waste accumulated at ANPP due to the continuous purification of technological blow-off through the special gas purification system.

Institutional Waste Management Practice

A certain amount of radioactive waste, mainly disused sealed sources and radioactive waste from non-nuclear fuel cycle facilities is generated in the RA, but the volume of such waste is much less than the radioactive waste generated at ANPP.

Institutional wastes, upon request from the waste generator and with ANRA's permission, are packed and transported by a specially equipped vehicle to the institutional waste management facility (Radon type). The transportation is arranged by the licensed operator of the facility, the "Rendering Harmless of Radioactive Waste" CJSC, on the basis of separate transportation license granted by ANRA in 2013.

B5. Definition, categorization and classification of radioactive waste

The definition of radioactive waste is provided for in the Law on Safe Utilization of Atomic Energy for Peaceful Purposes: the Article 3 stipulates, "Radioactive waste is a radioactive material or a surface contaminated radioactive material for which no further use is foreseen and which is subject to isolation from the environment".

The definitions of the different types of radioactive waste regarding its aggregate state are set in the RA Government Decree № 1489 as of 18.08.2006 on approval of Radiation Safety Rules and are as follow:

- Solid radioactive wastes are the radioisotope sources not intended for further use, contaminated solid materials, equipment, biological objects, soil, as well as solidified liquid radioactive wastes, in which activity concentration of radionuclides of artificial origin is equal to or exceeds the clearance levels stipulated in the Table 27 of Radiation Safety Norms adopted by the RA Government Decree № 1219-N as of 18.08.2006.
- Liquid radioactive wastes are organic and non-organic liquids, pulps and sludge for which no further use is foreseen and the activity concentration of radionuclides in case of interaction with water exceed the intervention levels specified by the Radiation Safety Norms for more than 10 times.
- Gaseous radioactive waste are radioactive gases and aerosols generated during industrial processes the activity concentration of which equals to or exceeds the permissible levels specified in the Radiation Safety Norms.

The criteria for RW categorization and classification are specified in the RA Government Decree № 1489 as of August 18, 2006 on approval of Radiation Safety Rules.

The categorization of radioactive waste is based on the following criteria:

- Waste class;
- Aggregate state;
- Half-life of radionuclides contained in it;
- Physical and chemical properties;
- Processing method.

The existing classification specified in the Radiation Safety Rules are in line with the IAEA General Safety Guide GSG-1 "Classification of Radioactive Waste". The existing RW classification is provided in Annex I of Section L of this report.

In accordance with the Requirement 8 of the IAEA General Safety Requirements Part 3, the Radiation Safety Norms approved under the RA Government Decree № 1219 as of August 18, 2006 identifies the practices or sources within practices subject to exemption from the requirements of Radiation Safety Norms and as well the moderate and bulk amount of materials within the authorized practice that may be cleared from the regulatory control. The activity concentration levels for exemption and clearance are established therein and are identical with the ones specified in the IAEA General Safety Requirements Part 3.

Also, the Radiation Safety Rules identify the cases for conditional clearance of materials and stipulate:

- Materials containing a small number of radionuclides can be used in any area. The decision making criteria for possible use of materials containing a small number of radionuclides is the expected annual effective dose which in its planned use shall not exceed 10μSv.
- There is no limitation on those used in practice solid materials containing radionuclides the activity concentration of which does not exceed 0.3Bq/g.
- The regulatory authority may specify higher levels of activity concentrations for certain beta

radionuclides contained in valuable materials for unrestricted use of those materials.

- Under authorization of the regulatory authority materials containing radionuclides with beta activity concentration of 0.3-100Bq/g or alpha activity concentration of 0.3-10Bq/g or transuranium radionuclides with the gamma activity concentration of 0.3–1.0Bq/g may be used in limited amounts purposes. These materials are subject to the mandatory radiation control.

The conditions for exemption of and clearance of radioactive material containing more than one radionuclide specified in the Radiation Safety Rules are identical with the ones set in the paragraphs I.7 and I.14 of the IAEA General Safety Requirements Part 3, respectively.

SECTION C. SCOPE OF APPLICATION (Article 3)

1. This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.

In the Republic of Armenia there is no spent fuel other than one generated from the operation of civilian nuclear reactors. No service on spent fuel processing has been rendered to the Republic of Armenia.

2. This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.

Any waste that contains only naturally occurring radioactive material and does not originate from the nuclear fuel cycle has not been declared as radioactive waste for the purposes of the Joint Convention.

3. This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defense programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.

Any radioactive waste within military service or defense programs has not been declared as a radioactive waste for the purpose of the Joint Convention.

SECTION D. INVENTORIES AND LISTS (Article 32, paragraph 2)

2. Each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall also include:

D1. List of spent fuel facilities

(i) A list of spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

There are following facilities for the management of spent fuel at ANPP:

- Storage pool of the Unit №1;
- Storage pool of the Unit №2;
- Dry Spent Fuel Storage Facilities DSFSF-1 and DSFSF-2.

Spent fuel assemblies are originated at ANPP as a result of irradiation in the reactor core. After burn-up resource is exhausted, the spent fuel assemblies are unloaded from the reactor core and placed in the storage pool of ANPP Unit №2. The spent fuel assemblies are stored in the storage pool in an upright position in the cells of the fixed shelves.

The spent fuel storage pools of ANPP Unit №1 and Unit №2 are identical in construction. Each storage pool consists of assembly and container compartments. The assembly compartment is intended for storage of SF assemblies irradiated in the reactor. In accordance with the design, the assembly compartment of each storage pool consists of:

- 310 hexagonal cells designed for storage of SF assemblies;
- 60 round cells designed to house hermetic cases for storing damaged fuel assemblies.

Container compartment is designed for placing and withdrawal of various containers (on-site transfer cask, transport container/DSC, etc.), for storage, change of place and transfer of fuel assemblies.

The on-site transfer cask is designed to move fresh fuel assemblies from the fresh fuel storage facility to the storage pool for subsequent loading into the reactor core.

Transport container/DSC is a loading container with a dry shield canister inside, intended for moving and transporting spent fuel assemblies during their transportation to DSFSF or during their transfer from one storage pool to another.

In case of planned or emergency discharge of the reactor core, the upper rack of the shelves is used to place spent fuel assemblies. At ANPP there is only one set of the upper rack of shelves. It can be placed either in the storage pool of the Unit № 1, or in the storage pool of the Unit № 2. It consists of three separate sections (351 cells):

- Left section (from the reactor side) – 110 cells;
- Central section – 126 cells;
- Right section – 115 cells.

The spent fuel assemblies, present at the ANPP can be conditionally divided into three groups:

- Spent fuel assemblies with the initial enrichment by uranium-235 to 3.6% and the burn-up depth to 42.0 mW*day/kg U, (group 1);
- Spent fuel assemblies with the initial enrichment by uranium-235 to 3.6% and the burn-in depth over 42.0 mW *day/kg U, but less than 45.7 mW/kg U, (group 2);
- Spent fuel assemblies with the initial enrichment for uranium-235 to 3.82% and the burn-up depth to 45.7 mW*day/kg U, (group 3).

The retention time necessary for transfer from one storage pool to another and for transfer to the DSFSF is determined and justified for each group of spent fuel assemblies.

After preliminary retention (to reduce the level of residual heat and radioactivity) spent fuel assemblies are transferred to the storage pool of the Unit №1. After the necessary retention in the storage pool of the Unit №1, the spent fuel assemblies are transported to DSFSF.

DSFSF is designed and built in accordance with the standard NUHOMS-56 system intended for storage of spent fuel assemblies of WWER-440 reactors.

Spent fuel assemblies are placed in DSC, which is filled with high purity nuclear-grade helium with the retained high pressure. Protection and insulation of DSC are provided by a single reinforced concrete horizontal storage module (HSM). Residual heat release of radioactive decay in DSC and HSM is removed through the ventilation system, the operation of which is based on passive natural convection.

The main design characteristics of DSFSF are:

- *Storage of SF assemblies in a hermetical welded containment enclosure inside a protective concrete module.*

  It ensures the efficiency of a highly efficient multi-barrier protection system that guarantees the safe storage of SF assemblies.

- *Transportation of the DSC in horizontal position in DSFSF and back.*

  Optimum means provide with the biological protection and passive storage of SF assemblies that does not require special maintenance. Another option is to withdraw DSC and then transport it outside the NPP in the same licensed transport container.

- *Transportation of DSC in a transport container from the technological transport corridor of the reactor hall to DSFSF.*

  It provides radiation protection of personnel and integrity of DSC during transportation, while supporting the possibility of passive heat removal from the TC/DSC into the atmosphere.

- *Protective end plugs.*

  It provides contact manipulation and control from the upper and lower parts of the DSC located in a transport container or HSM.

- *Passive cooling with natural air circulation.*

  The fuel claddings temperature is kept below the maximum permissible limit, and therefore their damage is prevented during long-term storage.

- *Helium storage medium.*

  It provides with effective heat removal and prevents oxidation of cladding of the SF assemblies and fuel elements. Welding of the DSC cladding with a double root joint ensures the preservation of the helium environment.

DSC subcriticality of is provided and justified for loading 56 fresh fuel assemblies and filling with non-borated water.

There are two dry spent fuel storage facilities in operation (separate licence for each of them as a single nuclear installation), which are located at the ANPP site and consist of 3 horizontal storage modules of NUHOMS-56 type, specifically:

- DSFSF-1 commissioned in 2000, consisting of 11 HSM (616 spent fuel assemblies);
- First module of DSFSF-2 commissioned in 2008, consisting of 12 HSM (672 spent fuel assemblies);
- Second module of DSFSF-2 commissioned in 2015, consisting of 12 HSM (9 HSM are filled by 504 spent fuel assemblies, 3 HSM are free).

The total number of filled HSM is 32 and of SF assemblies stored in DSFSF is 1792.

A list of spent fuel management facilities subject to the Joint Convention, their location and main purpose is provided in Annex A of Section L of this report.

D2. An inventory of spent fuel

(ii) An inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

Inventory of spent fuel that is subject to the Joint Convention is provided in Annex D of Section L of this report.

D3. List of radioactive waste management facilities

(iii) A list of radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

There are two radioactive waste management facilities in the Republic of Armenia:

ANPP for nuclear waste management;

Institutional waste management facility (Radon type) for management of waste from non- nuclear facilities.

The description of the radioactive waste management systems available at ANPP is provided below:

- **Storage system for solid low level radioactive waste**

The storage facility for solid low level radioactive waste is located at the ANPP site. The storage facility consists of two compartments of solid concrete. The dimensions of each compartment are 27×36×8.9 m. The total capacity of the compartments is 17051m^3. The bottom and walls are made of reinforced concrete of 0.6m thickness and have a three-layer waterproofing. The compartments are closed with the reinforced concrete slabs with openings through which solid radioactive waste is loaded for storage. The dimensions of the openings are 0.75×0.75m. There are 108 openings in all.

- **Storage system for solid intermediate level radioactive waste**

The storage system solid intermediate level radioactive waste is located in the Auxiliary building of ANPP, in separate compartments, closed with the reinforced concrete covers. The total storage capacity is 1001m^3. The DEF containers are also placed in the storage facility. Due to insufficient storage capacity, a fenced area for temporary storage of DEF containers was constructed on the roof of the Auxiliary Building. The useful capacity of the storage facility is no more than 3000 DEF containers, with a working area of 655m^2.

- **Storage system for solid high level radioactive waste**

The storage facility for solid high level radioactive waste is located in the Central Hall of the Reactor Building of ANPP and consists of 380 cells with a diameter of 0.18m, a length of 8.9m, and is closed with the stoppers with a height of 0.72m. The cell is a metal pipe with walls of 6mm thick and with a welded bottom.

- **Storage system for liquid radioactive waste**

The capacities for storage of liquid radioactive waste, located in the Auxiliary Building of ANPP, are as follows:

- Six tanks for evaporator concentrate (ECT). Tanks are made of stainless steel with a net volume of 470m^3 each; the total volume of six tanks is 2820m^3.
- Two tanks designed for storage of high-level sorbents (HLST). Tanks are made of stainless steel, with a net volume of 350 m3 each; the total storage capacity is 700 m3. These tanks were originally designed for storage of high-level sorbents; however, since high-level liquid wastes are not generated at ANPP, these tanks are used for storage of intermediate level waste. Spent ion exchange resins (sorbents) are stored in one of these tanks, HLST-2 and HLST-1 is used to store

evaporator concentrate.

- **Deep evaporation facility**

The deep evaporation facility (DEF-200) is designed for processing of evaporator concentrate stored in the ECTs to a solid monolith fireproof product with a density of 1.7-1.8kg/l. The DEF- 200 is located in the Auxiliary Building of ANPP. It consists of a supply tank and dosing pumps, evaporators, cyclone-evaporators, heat exchangers, fans, valves, pipelines, I&C.

The main parameters of DEF-200 are as follows:

- Temperature of the initial solution (evaporator concentrate) - 20°C;
- Temperature in the cyclone - 118-130°C;
- System performance - 200 l/h;
- Temperature of heating steam - 170°C;
- Steam pressure - from 4 to 7.8 kg/cm^2;
- Pressure on the pump head – 3-3,5 kg/cm^2;
- Condensate vapor pressure - 3.7- 4.2 kg/cm^2.

The activity concentration of the product obtained ("salt cake") is about 1.1×10^6-9×10^6 Bq/kg, with a humidity of 18-25%.

The description of the institutional waste management facility, its location, main purpose and essential features are provided below:

The institutional waste management facility is located in the ANPP supervised area at a distance of 0.3 km north of the ANPP Unit №2. The facility had been designed as near surface disposal facility for solid and liquid radioactive waste generated by institutional RW generators and consists of 3 identical buildings with the total volume of 2250m^3. Each building has seven double-layer underground concrete vaults covered with a concrete slab. Two boreholes with helical tubular devices, according to the design of disposal facility, were provided for high-level disused sealed sources but had never been operated due to deficiencies of mechanical manipulators.

This facility was commissioned in 1980 replacing the old one constructed in 1950ies at the Sovetashen site where the threat of landslip of the territory was faced. All radioactive waste from the Sovetashen site were retrieved and transported to the new disposal facility and the vaults №1&2 in of the disposal facility 1st building were immediately filled with the retrieved waste.

In the disposal facility the radioactive wastes were grouted into standard drums (200 liters) bringing them to a suitable safety condition for their disposal, place them into reinforced concrete vault and once the first layer is full the empty space between drums was filled with grouting. This process was repeated for the second layer.

In 2009, according to the legislation in force, the operating organization applied to obtain a licence for operation of institutional RW disposal facility. ANRA made decision to grant a licence for operation of L&ILW-SL institutional waste storage facility and, since 2009, the institutional waste are collected, transported and stored in the relevant building of the storage facility. There were no provisions specified in the licence for possible retrieval of disposed waste. The provisions for retrieval of disposed waste will be considered from RW long-term management prospective upon availability of national up-to-date capacities for disposal of radioactive waste.

D4. Inventory of radioactive waste

(a) an inventory of radioactive waste that is being held in storage at radioactive waste management and nuclear fuel cycle facilities

Inventory of radioactive waste generated and accumulated at ANPP

By January 1, 2020, 7748m^3 of solid radioactive waste and 2349m^3 of liquid radioactive waste were

accumulated at ANPP. The main radionuclides present are Cs-134, Cs-137, Co-58, Co-60, Mn-54, Ag-110^{m}. In the period 2017-2019, 438m^3 of solid radioactive wastes were generated at ANPP, of which:

- 386,6 m^3 (88 % of the entire volume of generated SRW) are of LLW class with activity concentration of $1{,}1\times10^2 \div 9{,}7\times10^2$ kBq/kg;
- 49 m^3 of solid ILW, of which 23,6 m^3 is "salt cake" from DEF with activity concentration of $1{,}1\times10^6$ -$1{,}4\times10^7$ Bq/kg and the activity concentration of other solid ILW was $1{,}1\times10^3$-$1{,}3\times10^4$ Bq/kg;
- 1,6 m^3 of solid HLW.

In the period 2017-2019, 155,6m^3 of liquid radioactive wastes were generated at ANPP, of which:

- 145m^3 of evaporator concentrate;
- 10,6 m^3 of spent ion exchange resins.

Inventory of institutional waste accumulated at institutional waste management facility

By January 1, 2020, 267 m^3 of solid radioactive waste were accumulated at the institutional waste management facility. Total activity of accumulated wastes is $5{,}1\times10^{13}$ Bq. The main radionuclides present are C-14, Ni-63, Pu-238, Pu-239, Ra-226, Th-232, U-236, U-238, Ba-133, Cd-109, Cl-36, Cs-137, Co-60, Eu-152, Fe-55, H-3, Na-22, Pm-147, Sr-90, Tc-99, Am-241, Ir-192, Pu-Be (neutron source).

The inventory list of radioactive waste accumulated at the institutional waste management facility is provided in Table 9 of Annex E of Section L of this report.

(b) an inventory of radioactive waste that has been disposed of

There is no repository for disposal of radioactive waste in the Republic of Armenia.

(c) an inventory of radioactive waste that has resulted from past practices

The inventory of radioactive waste accumulated at ANPP from 1979 to January 1, 2020 and as well at the institutional waste management facility is provided in Tables 8 and 9 of Annex E of Section L of this report.

(d) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities

There are no nuclear facilities in the process of decommissioning in the Republic of Armenia.

SECTION E. LEGISLATIVE AND REGULATORY SYSTEM

E1. Implementing measures (Article 18)

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligation under this Convention.

A constitutional referendum was held in Armenia on December 6, 2015. Its amendments to the constitution put the country on a course from having a semi-presidential system to being a parliamentary government.

The Constitution of the RA has the highest legal force and its provisions are directly applied. Laws that should comply with the constitutional laws and laws and belong to the first level of legislative framework on the nuclear safety regulation.

Decrees of the RA Government and the RA Prime Minister belong to the second level of the legislative framework.

Regulations approved by ANRA Chairman, registered by the Ministry of Justice of the RA and named "subordinate acts" belong to the third level of the legislative framework.

Guides, methodologies, industrial standards and so on belong to the forth level of the legislative framework.

The intentional treaties of the RA are integral part of the legislative framework and also belong to the first level. If the international treaties ratified by the National Assembly of the RA stipulate provisions other than the ones stipulated in the laws, the provisions of the ratified international treaties are applied.

During the reporting period, in November 2017, the Republic of Armenia has signed the Comprehensive and Enhanced Partnership Agreement (CEPA) between the European Union and Armenia. ANRA has undertaken responsibility to bring the legal regulatory infrastructure for nuclear and radiation safety in conformity with the following 5 EU directives, within 4-5 years after the entry into force of CEPA:

- COUNCIL DIRECTIVE 2006/117/EURATOM of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel;
- COUNCIL DIRECTIVE 2009/71/EURATOM of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations;
- COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste;
- COUNCIL DIRECTIVE 2013/51/EURATOM of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption;
- COUNCIL DIRECTIVE 2013/59/EURATOM of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

The list of international treaties ratified by the RA is provided in Annex F of Section L of this report.

E2. Legislative and regulatory framework (Article 19)

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.
2. This legislative and regulatory framework shall provide for:
(i) the establishment of applicable national safety requirements and regulations for radiation safety;
(ii) a system of licensing of spent fuel and radioactive waste management activities;
(iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence;

(iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;
(v) the enforcement of applicable regulations and of the terms of the licences;
(vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.

E2.1 National safety requirements and regulations

The following laws directly pertain to the safety of spent fuel management and to the safety of radioactive waste management:

- The Law on Safe Utilization of Atomic Energy for Peaceful Purposes, adopted on March 01, 1999 by the National Assembly (Parliament) of the Republic of Armenia, is the basic legal document for settling relations in the field of the atomic energy utilization and is called to ensure fulfillment of obligations of the RA under the international treaties in the field of atomic energy utilization. The Law establishes provisions on accounting for and control of nuclear materials, radioactive waste and ionizing radiation sources, and as well sets the requirements to accounting of nuclear materials at the nuclear facilities and locations outside the facilities on the levels of state and operator, exemption and termination of safeguards, submission of accounting reports and other issues related to the safeguards implementation.
- The Law on Licensing as of May 30, 2001 establishes types of practices subject to licensing in the atomic energy utilization field and settles relations related to licensing.
- The Law of the RA on Environmental Impact Expertise as of July 22, 2014 specifies the activities that are subject to environmental impact assessment and expertise in the atomic energy utilization field and also establishes requirements on public notification and discussions of the environmental impact assessment and expertise processes.
- The Law of the RA on organization and conduct of inspections adopted on May 17, 2000 settles relations concerned with organization and conduct of inspections and examinations of practices of entities as well as of individual entrepreneurs.
- The Code of the RA on Administrative Offenses, as amended in 1996. The amendments empower ANRA to impose sanctions (fines) to offender of the legislation in the field of atomic energy utilization.
- The Law of the RA on Population Protection in Emergencies adopted on December 02,1998 establishes organization of population protection in emergency situations, rights and responsibilities of the state and local authorities, entities, officials and citizens involved in the national emergency response system.
- The Criminal Code of the RA adopted on April 18, 2003 specifies the types of crimes and liabilities in the field of atomic energy utilization.

The list of legal acts belonging to the first level of the legislative framework is provided in Annex F of Section L of this report.

Decrees of the RA Government and the Prime Minister, which belong to the second level of the legislative framework, are specifically oriented and settle specific relations, for instance:

- RA Government Decree № 631-N as of June 04, 2009 on approval of Procedure on Radioactive Waste Management specifies requirements to radioactive waste management, designates the Ministry of Energy Infrastructures and Natural Resources as the state competent authority empowered with radioactive waste management related issues and settles the functions of authorities involved in the management of radioactive waste.
- RA Government Decree № 1219-N as of August 18, 2006 on approval of Radiation Safety Norms applies to planned, emergency and existing exposure situations and specifies the practices or sources within practices subject to exemption from the requirements of Radiation Safety Norms and as well the moderate and bulk amount of materials within authorized practice that are subject to clearance

or to conditional clearance from regulatory control.

- RA Government Decree № 1489-N as of August 18, 2006 on approval of the Radiation Safety Rules defines safety rules for protection from sources of ionizing radiation with characteristics equal to or exceeding the exemption levels stipulated in the Radiation Safety Norms and applies to occupational, public and medical exposure categories. The Radiation Safety Rules set the classification of radioactive wastes and requirements on the radiation safety of radioactive waste.
- RA Government Decree №1263-N as of December 24, 2001 on approval of Special Rules on Transportation of Nuclear and Radioactive Materials stipulates safety norms to all types of transportation in the territory of the Republic of Armenia and the transportation comprises of all operations and conditions related to the transfer of nuclear and radioactive materials, in particular the design, manufacture, maintenance and repairs of the packaging, as well as the preparation, loading, delivery, transportation of packages with nuclear and radioactive materials, including transit, unloading and their acceptance at the final destination.
- RA Government Decree № 931-N as of June 27, 2002 on approval of the procedure for safe transport of nuclear and radioactive materials stipulates relations regulating the safe transportation of nuclear and radioactive materials with the characteristics subject to regulation in the Republic of Armenia are regulated to ensure the protection of people and the environment against the harmful impact of ionizing radiation.
- Government Protocol Decree №53 as of December 18, 2014 on approval of Strategy for Environmental Radiation Monitoring and Surveillance in the Republic of Armenia identifies the steps for the establishment and development of capacities appropriate to modern international approaches in environmental radiation monitoring and surveillance and settles relations related to establishment and functionality of environmental radiation monitoring system.

The list of legally binding acts belonging to the second level of the legislative framework is provided in Annex F of Section L of this report.

The following law has been adopted by the Republic of Armenia in the reporting period:

- The Law of the RA on safe utilization of atomic energy for peaceful purposes has been amended (as approved on March 20, 2020 under № HO-136-N) with the propose to ensure the compliance of the Law on Licensing and the Law on the Safe Use of Atomic Energy for Peaceful Purposes and to entrench the right of the regulatory authority to adopt subordinate normative legal acts and to conclude international treaties.

The RA Government has approved the following decrees in the reporting period:

- RA Government Protocol Decision № 42 as of October 05, 2017 an approval of strategy on safe management of radioactive waste and spent fuel in RA. It represents the strategic issues for upgrading RW and SF management system in RA and gives the approaches for their implementation (e.g. establishment of National Operator for RW management; establishment of special "off-budget account" for RW and SF management activities and introducing the "polluter pays" principle; measures for capacity building; establishment of RW accounting electronic database; etc.).
- RA Government Decree № 1329-N as of October 19, 2017 on amendments and supplements to the RA Government Decree № 553-N as of May 03, 2007 on approval of procedure on detection and isolation of radioactive materials. The decree clarified the functions of authorities dealing with detection and isolation of radioactive materials, as well as to ensure the compliance of the decree with the IAEA safety standards;
- RA Government Decree № 751-N as of June 06, 2018 on amendments to the RA Government Decree № 2013-N as of November 21, 2002 on approval of the requirements to form and contents of the Safety Analysis Report of ANPP Unit №2. The decree establishes new, strict requirements for the NPP site characteristics and their analysis, analysis of safety and safety systems and elements, format and content of information submitted in relation to safety analysis and operating experience.

The adoption of the decree allows ANPP operational safety assessment to be implemented in line with modern requirements, taking into consideration the best international practice in the field and lessons learned from the Fukushima accident and the results of ANPP Unit №2 operation lifetime extension;

- RA Government Decree 3-L as of January 10, 2019 on approval of 2019-2026 action plan –schedule on implementation of provisions stipulated in strategy on safe management of radioactive waste and spent nuclear fuel in the Republic of Armenia. It identifies responsible authorities/entities, timeframes, funding mechanisms for activities included therein and as well the supervision of implementation/control mechanisms and, inter alia, incorporates ANPP activities on enhancement of spent fuel and radioactive waste management specified in the corresponding programs.
- RA Government Decree № 61-N as of January 31, 2019 on amendments to the RA Government Decree № 1791-N as of February 09, 2005 on approval of the licensing procedure and licence form for transport of radioactive materials or equipment containing radioactive materials. The decree establishes the requirements to radiation protection during transport of radioactive materials in accordance with the requirements of the IAEA "Regulations for the Safe Transport of Radioactive Material" SSR-6 and the "Security of Radioactive Sources" NSS 11.The RA Government Decree №967-N as of August 01, 2019 on amendments to the RA Government Decree № 1085-N as of August 23, 2012 on approval of the requirements to design lifetime extension for ANPP Unit №2 operation.
- The decree established requirements to submission of periodical reports by the operating organization for justification the safe and reliable operation of the NPP beyond designed operation lifetime.
- RA Government Decree №975-N as of August 01, 2019 on amendments to the RA Government Decree № 400-N as of March 24, 2005 on approval of the licensing procedure and licence form for operation of nuclear installations. Through amendments a relevant reference was made to the subordinate normative legal acts, which define the relations associated with the extension operation license of the nuclear installation, i.e. the nuclear power plant, in accordance with the requirements of Articles 30 and 31 of the Law on Licensing.

Legally binding acts, that are approved by the Chairman of Armenian Nuclear Regulatory Authority and registered by the Ministry of Justice of the RA, are adopted in accordance with the legal acts of higher legal force. These legal acts belong to the third level of the legislative framework and settle specific issues, for instance:

- The requirements to format and content of operation procedure of radiation monitoring system of atomic energy utilization object were approved under the order of ANRA Chairman and registered in the Ministry of Justice of the RA under №12512230 as of March 27, 2007.
- The requirements to format and content of decommissioning programme of atomic energy utilization object were approved under the order of ANRA Chairman and registered in the Ministry of Justice of the RA under №12511432 as of September 27, 2011.
- ANRA order №323-L as of December 28, 2018 on approval of the procedure for authorization of implementation of safety important measures during NPP operation.

The list of subordinate (ministerial) normative legal acts is provided in Annex F of Section L of this report.

The relations concerned with development, agreement and approval of legal acts are settled by the Law of the RA on Legal Acts and the Ordinance of the RA President.

E2.2 System of licensing and of the prohibition of operation of nuclear facility without a licence

Licensing related relations are settled under the Law of the RA on Licensing, the Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes and the relevant licensing procedures approved by the RA Government.

The following practices in atomic energy utilization field are subject to licensing:

- Siting, design, construction, operation, and decommissioning of nuclear installation, radioactive waste storage facilities, radioactive waste disposal facilities;
- Processing and storage of radioactive waste;
- Use, transport and storage of nuclear materials;
- Physical protection of nuclear installations and nuclear materials;
- Expertise of designs and other documents of nuclear installations,
- Physical persons implementing practices and holding positions important to safety in atomic energy field and other.

The licensing is implemented subject to the complex procedure: licensing of specific type of practice is specified in respective licensing procedures (approved under the RA Government Decrees). For instance, the RA Government Decree № 702-N as of May 19, 2005 on approval of licensing procedure and licence form for operation of radioactive waste storage facilities specifies the requirements to licensing of radioactive waste storage facility operation, the list of application supporting documents, the requirements mandatory for obtaining a licence, the provisions related to review of application supporting documents, to control over implementation of licence conditions and other issues.

ANRA reviews application for obtaining a licence on siting, designing, construction, operation and decommissioning (or closure in case of RW repositories) of nuclear installations, radioactive waste storage facilities, radioactive waste disposal facilities, as well as for processing and storage activities of radioactive wastes, within 30 days after receiving all documents as required by the Law on licensing, and grants or rejects licence within 180 days after all required documents are submitted. This timeline is taken from the international experience and it is mandatory for ANRA to follow it as it established in the RA legislation. During the review of submittals the regulatory authority can require additional safety justifications, design documentations, results on R&D activities and other documents necessary for safety assessment. In this case the timeline is counted from the date the last document was submitted.

Licences for siting, designing, construction, operation and decommissioning (or closure in case of RW repositories) of nuclear installations, radioactive waste storage facilities, radioactive waste disposal facilities, as well as for processing and storage activities of radioactive wastes are separate licences and are reviewed respectively in accordance with the relevant licensing procedures adopted by the RA Government. The Law of the RA on Licensing specifies also provisions for extension of licence validity period.

ANRA establishes a licensing commission to make conclusions on granting, termination or revocation of licence; the statute of licensing commission is approved by ANRA.

Provisions related to public involvement and awareness of atomic energy utilization object construction are specified in the Law of the RA on Environmental Impact Expertise (Articles 12, 13, 16), the Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes (Article 10).

In accordance with the Code of the RA on Administrative Offences a legal entity has no right to implement the practices subject to licensing without a licence, otherwise administrative or criminal liabilities shall be applied. In accordance with the Article 169 of the Code of the RA on Administrative Offences the implementation of a practice without licence is subject to fine at the

rates specified in the legislation. The Article 188 of the Criminal Code of the RA stipulates provisions related to implementation of activities without special permit (licence), causing losses to the citizens or commercial organizations and other as well as enforcement actions to be imposed for each offence.

The right of ANRA to impose enforcement actions is established in the Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes, the Law of the RA on Licensing and the Code of the RA on Administrative Offences.

ANRA has developed a strategic plan that provides a realistic and balanced approach for improving the functioning of the regulatory body in all aspects which are part of its mission and identifies the managerial, technical and administrative issues that are typically applicable by the regulatory body.

E2.3 System of regulatory inspection and of enforcement

The inspection is one of the major functions of ANRA to satisfy itself that ANPP, that is spent fuel and nuclear waste management facility, and the "Rendering Harmless of Radioactive Waste" CJSC, that is institutional waste management facility operator, fulfill the terms and conditions set out in the authorizations and ANRA requirements. ANRA`s inspections are organized and conducted in accordance with the Law on Safe Utilization of Atomic Energy for Peaceful Purposes, ANRA statute and the Instruction on organization and conduct of inspections.

ANRA organizes inspections based on the 3-years baseline inspection program. Annual inspection plan is organized based on the mentioned program. There are planned and reactive inspections, that it its turn can be announced and unannounced. Reactive inspections are conducted as appropriate. In case of announced inspections the operating organization is notified in advance. Unannounced inspections can be conducted without prior notification. By the content of subject inspected, inspections can be complex, special and routine. Inspection consists of three stages:

- Preparations to conduct an inspection;
- Conduct of inspection;
- Recording of inspection results.

ANRA Chairman issues order on appointment of an inspection team to conduct the inspection. Specialists of ANRA TSO can be involved in inspections.

An inspection program and plan are developed prior to inspection. The inspection program includes:

- Objective of inspection;
- Issues to be inspected;
- Structural divisions of facility to be inspected;
- Inspection periods.

The inspection program is approved by ANRA Chairman.

The inspection team collects the following information prior to an inspection:

- Safety norms and rules related to the inspected subject;
- Documents related to the organizational structure of the operating organization, quality assurance program for practices implemented by the licence holder and related to the inspected subject;
- Terms and conditions of licences/permits issued by ANRA to the operating organization;
- Enforcement actions imposed by ANRA earlier and information on their implementation;
- And also reporting documents developed based on results of earlier conducted inspections.

The inspection program and plan are transmitted to the licence holder not later than in 10 working days before inspection.

Visit to industrial areas, workplaces, observation of systems and elements important to safety are implemented in the order established at the operating organization.

Deficiencies detected during inspections are recorded and discussed at the final meeting with the management and responsible officials of the operating organization.

Inspection results are recorded in the form of reports if violations of safety requirements are not detected or act-enforcement if a non-compliance with the safety requirements is detected. The following is indicated in the act-enforcement:

1. Fact of non-compliance with safety requirement;
2. Points of articles with indication of legal acts, norms and rules in atomic energy utilization field non-complied with;
3. Requirements to eliminate deficiency detected;
4. Deadline for elimination of deficiency.

Report and act-enforcement are signed by the inspection team leader, all members of the inspection team and transmitted for signature to the manager of operating organization.

Routine inspections of ANPP are conducted by the resident inspector. When detecting non-compliances with the safety requirements the resident inspector issues enforcement to the NPP director and informs ANRA about it.

ANRA controls over fulfillment of its act-enforcements and enforcements through:

1. Receiving and review of information on fulfillment of requirements of act - enforcements and enforcements and control over timeliness of its submission;
2. Verification of fulfillment of act-enforcements and enforcements.

The right of ANRA to impose enforcement actions is established in the Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes, the Law of the RA on Licensing and the Code of the RA on Administrative Offences.

The Articles 36 and 37 of the Law of the RA on Licensing specify the cases for suspension and termination when ANRA has right to suspend and terminate a licence.

The Code of the RA on Administrative Offences (Articles 97-97[6]) specifies the types of administrative offences in the atomic energy utilization field and the types of enforcement actions (fines) applied by ANRA. The process of application of enforcement actions starts with drawing up a protocol on administrative offence. The protocol should indicate date and place, name and surname of person drawing up the protocol, information on person committed an offence, time and place where the offence was committed, subject-matter of offence, the normative document which establishes liability for the present offence, explanatory note of the offender, other information related to the case. The protocol is signed by the person drawn up the protocol and by the person committed the offence (offender).

If the offender refuses to sign the protocol, the indication on that should be appropriately made. The offender has right to give explanations and comments to the protocol content which are to be attached to the protocol, as well as to express in writing reasons of his refusal to sign the protocol. While drawing a protocol the offender is notified of his rights and responsibilities and this is relevantly indicated in the protocol. The protocol is the basis for investigation of a case with offence. Authority (official) investigating the case when detecting causes and conditions resulting in administrative offence, makes relevant proposals on undertaking measures intended to eliminate those causes and conditions.

Having investigated the case on administrative offences the official makes one of the following decisions:

- Impose administrative penalty;

- Withdraw the case.

Decision on administrative offence is mandatory for implementation by state and public authorities, entities, officials and citizens. Decision on the case on administrative offence can be appealed in court by person to whom it was applied as well as by aggrieved party.

Thus, the RA has established and maintains the legislative and regulatory framework for Atomic Energy Utilization Object safety that includes:

- Establishment of relevant national requirements and regulations on safety;
- System for licensing of nuclear installations and nuclear facilities and prohibiting to operate them without licence;
- System of regulatory inspections and assessment to confirm the compliance with the requirements specified in the regulations and licence terms;
- Enforcement of requirements specified in the applied regulations and licence terms, including suspension, modification and termination of licence.

E2.4 Allocation of responsibilities of the bodies involved in the SF and RW management

In accordance with the requirement 2 of IAEA Safety Standards Series No. GSR Part 1 "Governmental, Legal and Regulatory Framework for Safety", the Law of the Republic of Armenia on Safe Utilization of Atomic Energy for Peaceful Purposes establishes framework for safety and defines the jurisdictions of authorities in the field of atomic energy utilization, specifically:

- Article 7 of the Law stipulates the jurisdiction of the Government of the Republic of Armenia in the field of atomic energy utilization;
- Article 8 of the Law specifies the jurisdiction of the Republican State Authorities in the field of atomic energy utilization;
- Article 9 of the Law outlines the jurisdiction of the Regional State Authorities in the field of atomic energy utilization;
- Article 10 of the Law defines the jurisdiction of Local Authorities in the field of atomic energy utilization;
- Article 15 of the Law stipulates the jurisdiction of the State Regulatory Authority in the field of atomic energy utilization and the Article 17 the jurisdiction of state inspectors of the regulatory authority;
- Article 20 of the Law states the jurisdiction of the Operating Organization of the nuclear facility.

The RA Government Decree № 631 as of June 04, 2009 on approval of Procedure on Radioactive Waste Management designates the Ministry of Energy Infrastructures and Natural Resources as the state competent authority empowered with radioactive waste management issues and also the ordinance of the RA President № 7 as of 19 January 2017 authorizes the Ministry of Energy Infrastructures and Natural Resources with spent fuel management issues.

The detailed information on the liabilities of Armenian Nuclear Regulatory Authority and as well on provisions to ensure the effective independence of the regulatory functions is provided in Section E3.

E3. Regulatory body (Article 20)

1. ***Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities.***
2. ***Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure an effective independence of regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.***

E3.1 Establishment of the Regulatory Body

ANRA was established under the RA Government Decree № 573 as of November 16, 1993 as a state authority under the RA Government empowered to regulate the nuclear and radiation safety in the atomic energy utilization field. In the period 2002-2008 ANRA functioned within the Ministry for Nature Protection of the RA in the status of the inspectorate; in May 2008 under the Ordinance issued by the RA President the inspectorate was reorganized into the State Committee under the Government of the RA on Nuclear Safety Regulation (it was decided to retain the acronym "ANRA"). The statute and the organizational chart of ANRA were approved under the RA Government Decree № 866 as of June 17, 2008. A constitutional referendum was held in Armenia on December 6, 2015. Its amendments to the constitution put the country on a course from having a semi-presidential system to being a parliamentary republic. After the new elections in December 2018, the decision was made to reduce the number of ministries. On May 8, 2019, the RA Law on Amendments and Supplements to the RA Law on "The Structure and Functioning of the Government" (LO-31-N) was adopted, with 12 ministries included in the structure of the government instead of the former 17. The status of ANRA within the government structure has not been changed and it remains reporting to the government and the prime minister and its statute was approved on July 11, 2018 under the Prime Minister Decree №747-L. The change in RA government structure did not affect ANRA's implementation of its statutory and regulatory functions. ANRA's position within the RA Government Structure is provided in Figure 3 of Annex J.

ANRA is the State administration body implementing the state regulation of the atomic energy utilization field aimed to ensure the safety of population and personnel, environmental safety and to defend safety interests of the Republic of Armenia. ANRA Chairman is appointed and dismissed by the RA Prime Minister. ANRA Chairman reports to the RA President, RA Government and RA Prime Minister. ANRA does not report to any other authority or ministry.

ANRA is independent from the agencies responsible for promotion of nuclear energy, has its independent budget (is directly financed from the state budget); ANRA's jurisdictions are established in the Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes (Articles 17, 17^{1}) and its Statute.

In accordance with the above mentioned legal acts ANRA's jurisdictions are:

1) Organization of development, development and submission of drafts of safety norms and rules, legal acts related to the atomic energy utilization field to the RA Government in accordance with the established procedure;
2) Licensing of practices and physical persons entities implementing practices and holding positions important in terms of safety in the atomic energy utilization field;
3) Suspension or termination of licence in accordance with the requirements of the international treaties and the RA legislation when non-compliance by a licence holder with licence terms and conditions is detected;
4) Safety assessment, organization and conduct of expertise of practices, installations and equipment in the atomic energy utilization field;
5) Organization and conduct of researches for safety strengthening purposes in the atomic energy utilization field;
6) Control over compliance with requirements of the RA laws related to the atomic energy utilization field as well as terms and conditions of issued licences by legal entities and physical persons;
7) Verification of QA programs of contractors implementing safety important activities and rendering services to licence holders in the atomic energy utilization field;
8) Control on preparedness of licence holders to possible emergency situations;
9) In case of emergencies, assessment of situation and on the basis of prognosis on its possible

changes submission of proposals on implementation of necessary protective actions to the state authority of the RA empowered with the responsibility for emergency situation related issues;

10) Jointly with the authority empowered with responsibilities for foreign affairs within its jurisdictions control over fulfillment of the RA of commitments undertaken under the international treaties of the RA in the atomic energy utilization field;

11) Control on safeguards implementation;

12) Imposing sanctions to licence holders binding for implementation when non-compliance with requirements specified in the RA legislation related to the atomic energy utilization field and with terms and conditions of issued licences is detected, and issuing order for termination of activities being implemented in case of threat to the human health and the environment;

13) The right to stop immediately ANPP operation rests with the Chairman, his relevant deputy and the site inspector;

14) In accordance with the RA legislation, imposing administrative offences to licence holders breaching the RA laws related to the atomic energy utilization field, safety norms and rules; requirements of sanctions imposed, and in the order established in the law, transmission of the materials related to breach to the law enforcement authorities;

15) With the purpose to determine the condition of nuclear and radiation safety, inspection of atomic energy utilization objects and of activities carried out there freely, using the necessary measurement and registration instruments, including audio and video recorders, entering industrial sites of atomic energy utilization objects freely, taking needed samples and obtaining data, installing necessary devices;

16) Involving in the established order specialists from the RA ministries, other state authorities, organizations as well as international organizations in inspection practices;

17) Assessment of investigations conducted by operating organization in relation to nuclear and radiological emergencies taken place during operation of atomic energy utilization installations and implementation of additional investigation, as necessary, in accordance with the procedure established by the RA Government and development of database of deficiencies;

18) State registration of nuclear materials, ionizing radiation sources and radioactive waste;

19) Providing information to state and local authorities, physical persons and mass media on nuclear and radiation safety in accordance with the procedure established in the RA legislation;

20) Cooperation with international and foreign competent organizations on safety regulation related issues;

21) Coordination of the RA national and regional projects in frame of technical cooperation with the IAEA;

22) Making early international notification on an emergency, in accordance with to the provisions of the Convention on Early Notification in case emergencies at the atomic energy utilization installation or in activities implementing there;

23) Once a year submitting a report to the RA Government on nuclear and radiation safety situation in the RA, its separate regions or separate atomic energy utilization installations;

24) State regulation (within its jurisdictions) of physical protection of nuclear and radioactive materials and atomic energy utilization objects jointly with the RA police and state authority empowered with national security related issues;

25) Obtaining information necessary for nuclear and radiation safety assessment from state authorities and organizations in accordance with the procedure established in the RA legislation;

26) Adopting subordinate (ministerial) acts;

27) Monitoring and controlling exposure to environmental radiation.

The organizational structure of ANRA is presented on Figure 1 in Annex J of Section L of this report.

According to the personnel list ANRA employs 43 specialists as of September 2020, (two positions of internal auditors were reduced under the RA Government decree in all state authorities, including in the regulatory authority), from which 27 specialists have university degrees, 5 specialists have PhDs, 17 specialists have work experience in the nuclear energy field of more than 15 years, and 7 specialists have more than 10 years' work experience at ANPP. The dynamics of ANRA staffing is show on Figure 2 in Annex J of Section L of this report.

ANRA organizes training of new personnel in accordance with the individual programs consisting of theoretical (on the jog self-training) and practical trainings. The resources of the IAEA, US NRC and EC cooperation programs are used for implementation of separate tasks concerned with training, improvement and maintaining of the personnel qualification.

ANRA is financed from the State Budget of the RA and the information on ANRA budget for years 2018-2020 is provided in the Table 2.

Table 2. ANRA budget for 2018-2020

	ANRA's annual budget (according to the Central Bank of the RA exchange rate as of 13.01.2020 is 1USD equals to 489.65 AMD)	Contractual allocations to NRSC from ANRA's budget (according to the Central Bank of the RA exchange rate as of 13.01.2020 is 1USD equals to 489.65 AMD)
2018	278,412,700AMD/568,595,3 USD	67,275,900AMD /137,395,8 USD
2019	323,048,400 AMD / 659,753,7USD	67,272,600 AMD /137,389,1 USD
2020	314,667,000AMD /642,636,5 USD	67,252,500AMD /137348,1 USD

To function effectively and to continually improve the regulatory performance ANRA has established a process oriented quality management system. ANRA QMS is represented in the management handbook. ANRA QMS is a set of interrelated or interacting processes that establish policies and objectives and which enables those objectives to be achieved in safe, efficient and effective manner. ANRA QMS has been revised and brought in compliance with the IAEA GS-R-3 in accordance with the recommendations of the IRRS mission. ANRA plans to make another revision of its QMS for bringing in compliance with the GSR part 2.

To improve safety and physical protection of nuclear facilities and nuclear materials, to promote non-proliferation and to prevent illicit trafficking of nuclear materials ANRA cooperates with the international organizations and regulatory authorities of other countries to harmonize the policy of the Republic of Armenia in the atomic energy utilization field.

ANRA has cooperation agreements with the following regulatory authorities:

- United States Nuclear Regulatory Commission (US NRC) in frame of the Arrangement between the Nuclear Regulatory Authority of the Republic of Armenia and The United States Nuclear Regulatory Commission on the Exchange of Technical Information and Cooperation in Nuclear Safety Matters (signed on 27 March 2017);
- Rostekhnadzor in frame of the Agreement between the Federal Authority of Russia on Nuclear and Radiation Safety and the State Authority of Armenia on Nuclear and Radiation Safety (23 May 1994);
- Department of Nuclear and Radiation Safety of the Ministry of Emergency Situations of the Belarus Republic in frame of the agreement between the Government of the Republic of Armenia and the Government of the Republic of Belarus on cooperation for exchange of information and on nuclear safety and radiation protection (signed in May 2012);

- State Nuclear Regulatory Inspectorate of Ukraine and Armenian Nuclear Regulatory Authority in frame of the agreement between on cooperation in the fields of nuclear safety and radiation protection (signed on 26 October 2016).

In frame of EC INSC, IAEA technical cooperation projects ANRA cooperates with:

- Bel V, (a subsidiary of the Federal Agency for Nuclear Control), Belgium;
- Bulgarian Nuclear Regulatory Authority (BNRA), Bulgaria;
- Gesellschaft für Anlagen- und Reaktorsicherheit (GRS), Germany;
- Institut de Radioprotection et de Sûreté Nucléaire (IRSN), France;
- Nuclear Research Institute Řež plc (NRI Řež), Czech Republic;
- Radiation and Nuclear Safety Authority of Finland (STUK);
- Slovak Nuclear Regulatory Authority (UJD SR);
- State Office for Nuclear Safety (SUJB), Czech Republic.
- and other.

ANRA has no advisory committees. The Nuclear Energy Safety Council under the RA Prime Minister (former the Nuclear Energy Safety Council under the RA President) in accordance with its statute approved under the RA Prime Minister decree №1164-A as of September 3, 2018:

- Makes proposals on safety and safety improvement in the nuclear energy field;
- Makes analysis and proposals on measures aimed to improve the safety and reliability of ANPP operation.

The Council implements its activities through meetings organized once a year or once in a year and a half is composed of world authorities in nuclear science and engineering.

The state republican authorities are the ministries of the RA, state authorities under the RA Government. The RA Government structure and position of ANRA within the structure is presented on Figure 3 in Annex J of Section L of this report.

In accordance with the Article 17 of the Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes and its statute ANRA submits annual report to the RA Government on nuclear and radiation safety of the RA, its certain territories and nuclear installations.

ANRA follows the principle transparency and openness in its regulatory practice which creates credibility for the regulatory decisions. Thus, ANRA's reports, annual plans are regularly published and updated on ANRA's web page. At the end of each year ANRA publishes information on implementation of the regulatory activities included in the RA Government annual work plan.

As the state authority empowered with regulation of nuclear and radiation safety issues ANRA establishes legal acts that before approval of the RA Government are published on its web page for public information and opinion.

ANRA participates in various international activities and projects and regularly publishes information on events organized in frame of cooperation projects with IAEA, EU, USA: the relevant information on expert missions hosted, workshops organized is posed on ANRA's web page.

There is also a dedicated hot-line intended for licence holders and for public to obtain information on nuclear and radiation safety situation, on licensing process as well as other information that might be of interest for public and also different state authorities and entities.

In case of events in other countries concerned with operation of NPP, radioactive sources, nuclear and radioactive materials and other, ANRA organizes press conferences for mass media to provide more details and explanations to form unbiased opinion and avoid misunderstanding.

Thus ANRA, the state authority for nuclear safety regulation has been established at the RA; it is provided with relevant jurisdictions, human and financial resources and there is an effective separation between the functions of ANRA from the agencies responsible for promotion of nuclear energy.

In implementation its functions ANRA receives technical support from the NRSC which was established under the Government Decree № 342 as of April 25, 2001. NRSC is a research company which provides expertise in the field of nuclear and radiation safety and security of nuclear facilities. NRSC has developed an organizational structure which is commensurate with the nature of its activities. NRSC activities cover two main fields – nuclear safety and radiation safety. These fields are subdivided into several groups that are responsible for various activities within NRSC and contribute to achieving its mission.

NRSC personnel includes nuclear physicists, chemists, experts on nuclear and radiation safety, engineers, IT specialists, administrative and management personnel. Most of experts hold PhD in the field. NRSC's organizational chart is provided in the Figure 4 of Annex J of Section L of this report.

NRSC provides technical and expert support to ANRA in the following areas:

- Nuclear safety, including:
    - Reactor core physics and thermal hydraulic analysis with application of state-of-art computational tools and multiphysics simulation;
    - Neutronics and nuclear fuel safety analysis;
    - Probabilistic safety assessment of complex systems and NPP;
    - Assessment of seismic safety of nuclear facilities, etc.
- Radiation safety and security, including:
    - Radiation safety and protection assessment of facilities and practices;
    - Security of radioactive and nuclear materials;
    - Safety assessment of radioactive waste management facilities and practices, etc.
- IT support and software development for regulatory purposes.

Following its main mission to provide technical support to ANRA, since its establishment NRSC is actively involved in the activities related to review and development of national regulations in the field of nuclear and radiation safety and providing support to licensing the ANPP modifications. Among the examples of implemented activities are:

- Review and assessment of safety related submittals from ANPP, institutional waste management facility, and other stakeholders using/storing nuclear materials and radioactive sources;
- Implementation of verification calculations to check design specifications and safety criteria;
- Development of regulatory requirements and guides in the field of nuclear and radiation safety, security and radioactive waste management;
- Participation in regulatory inspections;
- Training of newcomers for ANRA;
- Participation in development of emergency response infrastructure. Recent activities performed for the regulatory authority include:
- Review and independent verification analysis of ANPP safety submittals within ANPP LTE and ongoing safety upgrade program;
- Review of the Emergency Operating procedures of ANPP;
- Review of the report on the safe management of the spent fuel within extended operation period of

ANPP;

- Feasibility study on re-racking of the ANPP spent fuel storage pool;
- Review of the safety analysis on the safe transport of the spent fuel assemblies form Unit №2 storage pool into Unit №1 storage pool;
- Participation in ANPP spent fuel pool PSA level-1 analysis;
- Technical support at licensing of ionizing radiation sources;
- Technical support of the inspection activities of nuclear facilities, ionizing radiation sources;
- Review of implementation of Stress Test National Action Plan.

NRSC pays much attention to work quality and is focused to implement a process-oriented quality management system in line with the requirements of ISO 9001:2015 standard. It ensures customers satisfaction and the adherence of working results to the specified standards and company objectives.

SECTION F. OTHER GENERAL SAFETY PROVISIONS

F1. Responsibilities of licence holders (Article 21)

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

2. If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

In accordance with the para. 2 of Article 19 of the Law of the RA on safe Utilization of Atomic Energy for Peaceful Purposes the operating organization bears the overall responsibility for safe operation of the objects important in terms of safety.

In 2015 ANPP management adopted a Declaration on safety and quality policy, which asserts absolute priority of safety with the following statement:

“The highest priority of our activity, predominating even the factor of production itself, is the ANPP and personnel safety, and also minimization of environmental impact”.

With the aim of safety culture development ANPP performs periodic self-assessment of “Safety culture and safety management system”. Such self-assessments are performed once per three years in compliance with the approved Guideline on self-assessment. The Guideline establishes the procedure of organization and conduct of self-assessments, and their frequency. The Guideline includes description of assessment templates and indicators/criteria to be used for assessment. The Guideline is complemented with the methodologies for performing self-assessments in which the self-assessment team members are trained prior to self-assessment.

Taking into account the technology development ANPP management takes relevant measures on ensuring valid physical security conditions against the existing risks by means of periodic assessment and update of physical protection systems aimed at equipping it with up-to-date technical means, personnel and required procedures which provide sufficient efficiency. In particular, the system of the personnel access to radioactive waste storage facilities is strengthened.

ANPP personnel exposure dose is regularly accounted. ANPP subdivisions are monthly provided with exposure dose statements for each worker.

ANPP carries out control and accounting of radioactive waste generated during ANPP operation and stored in the radioactive waste storage facilities. The Regulatory Authority is provided with quarterly and annual reports on radioactive waste at the ANPP. Besides, quarterly reports on radioactive waste are submitted to WANO.

An event data base is developed and implemented at ANPP. The event database is installed in the

plant intranet and it allows users to report on-line about events, receiving all information on the occurred events, on investigation status, corrective measures, etc.

ANPP developed a "Response plan to nuclear and/or radiation emergencies (ANPP on-site plan)" describing duties and responsibilities of all persons involved in emergency response, and ensuring clear planning of all emergency activities.

With the purpose of fire protection, ANPP developed a "Fire Protection Plan of ANPP" and procedures on fire safety activities both for the ANPP and individual subdivisions. A "Procedure on arrangement and implementation of activities on fire extinguishing and mitigation of emergency situations under ionizing irradiation conditions in the ANPP buildings and production premises" was developed.

Annually ANPP develops plans for the personnel training, retraining, and advanced training. The ANPP personnel pass annual mandatory medical examination.

F.2. Human and financial resources (Article 22)

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

(i) qualified personnel are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

(ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

(iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

F2.1 Management of recruitment, training and qualification maintenance of the personnel at ANPP

The personnel for the nuclear energy field is trained in two main higher education institutions of Armenia:

- National Polytechnic University of Armenia;
- Yerevan State University.

Since 2004 an international regional center of nuclear safety is functioning at the National Polytechnic University of Armenia, based on which international workshops and trainings are carried out. The international regional center of nuclear safety was established with support of the US DOE.

A Training Center is functioning at ANPP both for training of newly hired personnel and retraining of existing personnel.

Armenia, as a country which uses nuclear energy, considers ensuring of ANPP safety and reliability as especially important issue to a large extent depending on the personnel qualification and competence. The competence of operating and maintenance personnel is the most important component in the defence in depth strategy to ensure ANPP safety and population protection.

The main document on management of personnel development at ANPP is the Program of Administrative Management – Personnel Development.

The policy of ANPP management on ensuring ANPP safe operation is reflected in corresponding Declarations, including the Declarations on personnel and radiation safety policy.

General management of the personnel development at ANPP is entrusted to the General Director of ANPP, and organization of personnel development is entrusted to the Chief Engineer, Deputies of the General Director and Deputies of the Chief Engineer, with distribution of duties.

The main forms of personnel development at the ANPP are:

- Personnel recruitment;

- Training for position;
- Qualification maintaining;
- Qualification improvement;
- Examination;
- Qualification for job relevance;
- Production and administrative work with personnel;
- Work with human resources.

Personnel recruitment

The work on organization of personnel recruitment and selection for filling of vacant positions is performed in compliance with the requirements of the below mentioned guidelines:

- Procedure of human resources identification;
- Procedure of recruitment;
- Organization of recruitment;

Qualification requirements to personnel are established in job descriptions in compliance with the requirements of the following documents:

- Qualification profile of the workers of nuclear utilities;
- Unified qualification reference book of manager, specialist, and office worker jobs;
- Unified tariff and qualification reference book of worker activities and professions.

Organization of personnel training

Training of newly recruited personnel is performed in compliance with requirements of the guideline "Organization of ANPP personnel development".

ANPP personnel training system foresees the following types of training:

- General training;
- Briefings;
- Initial (primary) training;
- Qualification improvement;
- Periodical training (qualification maintaining).

Only the workers whose qualification corresponds to the requirements established in standard documentation and who have no medical and physiological contradictions for the work on the mentioned position are admitted for the job training.

The personnel training is performed according to the training programs based on group or individual training method at the ANPP Training Centre, and also directly at the ANPP structural divisions.

Availability of lists of positions for which model training programs shall be developed

ANPP approved a list of positions for which the access to unsupervised work is allowed upon passing the formalized training. The formalized training of ANPP personnel is carried out in compliance with the established programs of job training.

The programs specify step-by-step procedure of training, including:

- Theoretical training;
- Unsupervised training;

- On-job training;
- Simulator training (in case such training is foreseen for the given position).

Procedure of personnel training and probation

Access to training is formalized with ANPP administrative document:

For workers from operating personnel – by Chief Engineer's order;

- For managers and specialists - by Chief Engineer's order;
- For other workers to be trained – by order of the relevant department manager;
- For the personnel accepted to probation from other NPPs or organizations – under ANPP Director's order.

The administrative document on training indicates:

- Name, surname, patronymic, and position of the worker to be trained;
- Start of training;
- Start of probation at working place;
- Working place for probation;
- Name, surname, patronymic, and position of the workers responsible for theoretical, simulator training, and probation.

In the course of probation a worker shall:

- Get acquainted with his working place, location of the maintained equipment, special features of the work implementation;
- Learn the rules, codes and procedures, including the procedures on labor protection, fire, radiation, nuclear, industrial safety and their practical application at the working place;
- Study diagrams and process procedures the knowledge of which is mandatory for the given position (profession);
- Practice clear orientation at own working place;
- Acquire required skills on process operation on inactive equipment;
- Learn the methods and conditions of failure-safe, safe, and effective operation, and (or) maintenance of serviced equipment.

During probation the worker shall master the work methods envisaged in the probation topical plan only under supervision of a responsible instructor (tutor).

Examination

Examination of ANPP personnel knowledge of codes, standards and procedures in nuclear energy use is performed in compliance with the requirements of the guideline "Examination of the ANPP personnel". This document covers organizational issues related to examination. The composition of the ANPP examination commission is established in the ANPP order.

Access of operating personnel, managers and specialists to unsupervised work

To perform examinations, the examination commissions are established by the Director's Order. The composition and functions of the commissions are reflected in the guideline "Examination of ANPP personnel". The access for workers who need a permit to work in the nuclear energy field and nuclear safety workers is recorded in ANPP Director's Order. The access to unsupervised work for other ANPP workers is formalized with the administrative document:

- For Chief Engineer, Deputies of the Director and Deputies of the Chief Engineer, Chief Inspector,

Accountant General and his Deputies – by the Director's Order;

- For Heads of departments and their deputies - by the Director's Order;
- For other managers and specialists – by the Order of Chief Engineer, Deputy Chief Engineer, Deputy Director by subordination (train the units);
- For other category workers – by instruction of the relevant department head.

Maintaining the personnel qualification

The ANPP personnel qualification is maintained at the plant training department and directly at the structural units in compliance with approved schedules and programs. The programs of qualification maintaining include the following topics on nuclear fuel and radioactive waste management:

- Radiation safety;
- Procedure of radiation-hazardous work implementation;
- Technical and administrative means for overexposure prevention;
- ALARA principle;
- Management of radioactive waste;
- Main criteria and principles of NPP safety;
- Prevention of dissemination of radioactive materials and substances at the ANPP;
- Management of radioactive waste, minimization of radioactive waste.

Annually special training on safety during transportation and technological operations with spent fuel is carried out for personnel of relevant ANPP departments.

For 2014-2017, 7 specialists from the ANPP participated in the regional workshops on RW and SF management.

The quality control of the NPP personnel training and qualification maintaining is performed in compliance with the guideline "Control of the personnel training process". The quality assurance criteria are established in that document.

Organization of examination of the NPP personnel for knowledge of standards and rules in the nuclear energy field

Examination is organized in accordance with annual schedules of examinations for workers, specialists, and heads of departments approved in an established order and included in the "Annual schedules of the departments' personnel development".

The workers to be examined shall be familiar with the schedule at least 15 days prior to the date of examination.

Organization of granting permit to the NPP employees to implement activity in the area of nuclear energy use

ANRA initially and periodically licenses the ANPP physical persons who occupy positions important in terms of safety in the nuclear energy field. The licences are issued in compliance with the Government Decree №1858-N as of December 14, 2006 "On approval of the licensing procedure for activity, check of, licence and application forms and qualification check of individuals implementing practices and holding positions important for safety of atomic energy utilization field".

Emergency exercises of operating personnel

The frequency and topics of emergency exercises are specified in the "Schedule of the plant emergency and fire, unit emergency, departmental emergency exercises of the ANPP operating

personnel" and the "List of plant and Unit exercises of operating personnel" included in the "Annual schedule of personnel development". Each operations department shall develop its own lists of emergency exercises topics to be approved by the department head.

The schedule of the ANPP personnel emergency and fire exercises on emergency response, and the list of plant and unit exercises topics is approved by the ANPP Chief Engineer.

The programs of the plant and Unit emergency exercises are developed in the Training Center, and the programs of the departmental emergency exercises are developed by the department specialists in compliance with the Regulation "Training and implementation of the ANPP personnel emergency exercises".

The following is considered while developing the emergency exercises programs:

- Failures of normal operation conditions specified in the design and operational documentation;
- Results of reconstruction and modernization, tests, studies and checks of the NPP systems and NPP operating experience, including human error analysis;
- Needs in exercises on mitigation of NPP operational failures caused by fire or leading to fire;
- Meteorological conditions and seasonal phenomena which are the most specific for the give n geographical region (rainfall, ice slick, strong wind, etc.);
- Administrative documents of ANPP;
- Recommendations of the State Safety Regulation authorities.

Procedure of the NPP personnel training to act during design basis and beyond-the-design basis accidents

Training of operating personnel in mitigation of design basis accidents and management of beyond-the-design basis accidents is performed in the following forms:

- Unsupervised on-job training (study of NPP event reports, study of failure reports, etc);
- Audit training at the Training Centre (unsupervised study of operating experience, lectures on event analysis, analysis of human actions during accidents under an instructor supervision);
- Simulator training at the Training Centre;
- On-job emergency exercises;
- Training Centre simulator emergency exercises.

F2.2 Management of recruitment, training and qualification maintenance of the personnel at the institutional waste management facility

The personnel of "Rendering Harmless of Radioactive Waste" CJSC is trained to be competent so as to assure quality of the implemented activities. Provision with adequate personnel qualification for implementation of activities is implemented through management of their recruitment, training, qualification maintaining and improvement, and examination and qualification.

Periodical examination of personnel of "Rendering Harmless of Radioactive Waste" CJSC is performed once per year according to the RA legal acts pertaining to RW management, radiation safety and transportation of radioactive materials. The examination is performed by a commission headed by the General Director. The commission consists of the Chief Engineer and a specialist on RW management. The knowledge examination results are recorded in the log-book of examination and scores are assigned.

Periodically, a theoretical examination of personnel in compliance with job descriptions and practical training on safe management of RW is performed and the results are entered in the briefings log-book.

Newly adopted employees are admitted to unsupervised work upon passing a special theoretical

training and exams at the extent which corresponds to their job descriptions. The workers who have a break in work from two weeks to two months shall get familiar with all changes made in the period of their absence. In case of breaks from two months to six months a health physicist shall, in addition to familiarization with changes, pass an extra briefing with a record in the briefings log-book.

F2.3 Financial resources for SF and RW management

In order to ensure safe management of the RW generated at the ANPP the electricity tariff foresees relevant financial means. Also, the tariff foresees means for SF management.

In compliance with the requirements of the Law of the RA on Safe Utilization of Atomic Energy in Peaceful Purposes (Article 19) and the Law of the RA on Energy (Chapter 4, Article 2-1, subpoint f) ANPP as an operating organization forms financial means aimed at development and ensuring the plant functioning throughout all stages of its lifetime: siting, design, construction, commissioning, decommissioning, and also other functions of the operating organizations.

The source for financial means is constituted by revenues from electricity (power) sale in compliance with the tariff approved by the Commission on Public Services Regulation.

In compliance with Article 19.1 of the Law of the RA on Safe Utilization of Atomic Energy in Peaceful Purposes ANPP provides financing of the following expenses from the power sale:

- Nuclear, radiation, technical, and fire safety;
- Physical protection, control and accounting of nuclear materials;
- Development of the NPP (scientific and technical support).

The safety upgrades are financed both from power sale revenue and under EC, RF Government, and US DOE assistance programs.

Government Decree №1653-N as of December 11, 2003 on "Determination of the price for radioactive waste transport, neutralization and storage services" establishes a zero AMD price for the mentioned activities and, accordingly, the State covers all expenses connected with institutional waste management.

F2.4 Financial arrangements for institutional control and monitoring following the closure of a disposal facility

There is no RW disposal facility in the Republic of Armenia.

F.3. Quality assurance (Article 23)

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.

In compliance with Article 20 of the Law of the RA on Safe Utilization of Atomic Energy in Peaceful Purposes the operating organization shall develop a quality assurance program for all stages of a nuclear facility (siting, designing, construction, operation, decommissioning) and ensure its implementation.

Thus, while implementing an activity on management of RW and SF the operating organization and the technical support organizations assure quality of activities and services at all stages of establishment, operation and decommissioning of the facility through proper implementation of quality assurance programs.

The availability of quality assurance program is mandatory for obtaining a licence and implementation of licence terms and conditions for implementation of a practice in the nuclear energy field. The quality assurance issues are considered also during inspections performed by the regulatory authority of organizations implementing activities in the nuclear energy field.

The requirements to the content and structure of a quality assurance program are specified in the

national and international documents in force at the operating organization and the international standards.

The goal of the quality assurance program implemented by the operating organization and its technical support organizations is to document activities related to quality assurance aimed at implementation of main safety criteria and principles including management of spent fuel and radioactive waste.

The Declaration of the management of the operating organization on safety and quality being an integral part of the quality assurance program states that the highest priority is the ANPP and personnel safety, and also minimization of environmental impact.

The operating organization implements activity on quality assurance and arranges the development of quality assurance programs for all stages of the NPP lifetime, and also supervises the contractors' activities. All quality assurance programs are subject to mandatory review, in an established order, and to modifications and amendments.

The following quality assurance programs (QAP) are developed and implemented at the ANPP:

- QAP "Operation of ANPP";
- QAP "Management of radioactive waste";
- QAP "Operation of radioactive waste storage facilities";
- QAP "Operation of the DSFSF";
- QAP "Operation of the solid radioactive wastes storage";
- QAP "Use of equipment containing radioactive material";
- QAP "Use of radioactive materials";
- QAP "Use of nuclear materials".

The quality assurance programs specify duties and responsibilities of the ANPP departments and individual officials in implementation of the regulated activity.

The quality assurance programs regulate management of resources (human, material resources, logistics, and infrastructure), and also planning of activity on RW storage facilities and DSFSF lifetime processes.

The QAP specifies the analysis and improvement methods in management of RW, identifies inconsistencies and weak points, development and implementation of corrective actions based on results of audits and self-assessments.

For the "Rendering Harmless of Radioactive Waste" CJSC administrative management, the main objective is to ensure the quality of operation and to improve the quality assurance system. In this regard a quality assurance program was developed and implemented which defines quality indicators and methods of their assessment.

The general quality indicators of the "Rendering Harmless of Radioactive Waste" CJSC activity are:

- Collective exposure dose of personnel;
- RW volume;
- Availability of safety systems.

Common performance indicators of quality system functioning are:

- Extent of personnel involvement in the quality assurance activity;
- Compliance of the implemented activity with safety standards and quality criteria;

- Timely identification of inconsistencies and implementation of adequate corrective actions;
- Efficiency of administrative and working documents; and
- Other indicators accepted for assessment of safety culture and safety management system efficiency.

For each direction of activity and specific process (work), in compliance with graded approach, specific quality indicators are defined which are mentioned in relevant administrative, technical, and working documents.

F.4. Radiation protection during operation (Article 24)

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:
(i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;
(ii) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and
(iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.
2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:
(i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and
(ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.
3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

The Radiation Safety Norms approved by the Government Decree № 1219 as of August 18, 2006 stipulates the dose limits for workers and public, specifically:

1. The dose limit for occupational exposure of workers of category "A" as:
    - An effective dose up to 20mSv per year averaged over five consecutive years (100mSv in 5 years), but not exceeding 50mSv in any single year (consecutive 12 months);
    - An equivalent dose to the lens of the eye up to 20mSv per year averaged over five consecutive years, but not exceeding 50mSv in any single year (consecutive 12 months);
    - An equivalent dose to the extremities (hands and feet) or to the skin up to 500mSv in a year (consecutive 12 months).
2. The dose limit for occupational exposure of workers of category "B" equals to ¼ of dose limit established for workers of category "A".

According to the RA Government Decree №1489 on approval of "Radiation Safety Rules" the population exposure within the supervised area of atomic energy utilization objects of categories 1 and 2 in normal operating conditions shall be limited to the dose constrain specified for the given facility. The dose constrain of the atomic energy utilization objects of category 1 and 2 in operation shall not exceed 250μSv, and the dose constrain of new constructed ones shall not exceed 100μSv.

According to the RA Government Decree №1489 on approval of "Radiation Safety Rules" the population exposure within the supervised area of atomic energy utilization objects of categories 1 and 2 in normal operating conditions shall be limited to the dose constrain specified for the given facility. The dose constrain of the atomic energy utilization objects of category 1 and 2 in operation shall not exceed 250μSv, and the dose constrain of new constructed ones shall not exceed 100μSv.

The RF "Safety Rules for NPP Design and Operation-2003", which in force in RA, stipulates: when

optimizing the radiation protection of the population in the normal operation of the NPP, the value of the dose constrain is considered as the upper boundary of the possible exposure of the population from radiation factors (liquid and gaseous discharges) and as the lower boundary of the population exposure from a single radiation factor a minimum dose of 10μSv per year is taken.

The values of the dose constrain to population are used to calculate the maximum permissible gaseous and liquid discharges from the NPP to the environment and are as presented in the Table 3. The annual limits for permissible gaseous discharges are provided in Table 4.

Table 3 The dose constrain to population due to ANPP operation in μSv constitutes:

Radiation factor	NPP	
	Operating	Under construction or design
Gaseous and airborne releases	200	50
Liquid releases	50	50
Total	250	100

Table 4: Annual limits of permissible gaseous discharge

Radionuclide	WWER NPP
Noble gases [TBq]	690
^{131}I [GBq] (gas and airborne)	18
60Co [GBq]	7.4
134Cs [GBq]	0.9
137Cs [GBq]	2.0

F4.1 Justification, norm setting and optimization of personnel exposure dose, observation of main ALARA principles

The management of the ANPP adheres to the policy of safety absolute priority over any other interests and regards the principles of dose optimization as the most important tool for decrease of the personnel exposure working under ionizing radiation conditions, this fact being stated in the "Declaration of the ANPP on radiation safety policy".

The goals, criteria, procedures, and administrative limitations in regard to radiation safety are established considering:

- Requirements of standard documentation;
- International practice in the area of radiation safety;
- Existing operating experience of the ANPP and other nuclear plants;
- Need in maximum possible decrease of the NPP impact on the environment.

Efficiency of the ANPP radiation safety is measured with the following indicators:

- Maximum individual dose;
- Collective dose;
- Amount of gaseous radioactive releases;
- Amount of aqueous radioactive effluents;
- Number of personnel contamination cases;
- Number of radioactive incidents subject to plant recording.

In evaluation of radiation safety efficiency the ratio of the above mentioned indicators and relevant standards, dynamics of indicators, their comparison with similar values specifying the status of radiation safety at other similar NPPs is considered.

With the aim of practical optimization of radiation safety the ALARA Committee is established along with the ALARA engineering group at the ANPP. The ALARA Committee and the engineering group act on a regular basis in close contact with all ANPP units, which are involved in activities with ionizing radiation sources and implement activity on the ANPP radiation safety optimization in compliance with the requirements of the Program "Optimization of the ANPP radiation safety management by ALARA principle".

Based on the results of the ALARA Committee activity the annual reports are developed constituting a part of the ANPP annual productive activity report.

With the aim of further implementation of ALARA principle the ANPP developed a "Program of the ANPP radiation safety" for each year which sets the goals and objectives of radiation impact minimization and efficient radiation protection of the ANPP personnel. The Program was aimed at maintaining the personnel annual collective dose as low as reasonably achievable.

The following objectives were set:

- Non-exceedance of personnel annual collective dose above defined value;
- Non-exceedance of personnel collective dose in the outage period above defined value;
- Non-exceedance of personnel individual annual dose above defined value;
- Maintaining amount of gaseous radioactive releases below the administrative levels for:
  - Nobel radioactive gases, long-lived nuclides, iodine vapor;
  - Maintaining amount of aqueous radioactive effluents below the administrative levels;
  - Decrease of number of contaminated persons.

F4.2 Observation of Exposure Dose Limits

The individual monitoring of personnel external exposure is performed by thermoluminescent dosimeters (TLD) (main dosimeter) with a frequency of once a month.

For operational (shift-time) monitoring of exposure doses, in addition to the main TLD dosimeter, the personnel is provided with electronic dosimeters having a threshold warning system set both for the dose rate and for the accumulated dose. The system allows the personnel to enter the controlled area only when both dosimeters are available. If the dose limits established at the ANPP are reached, if the Radiation Protection Test is not passed, if the findings of the medical examination are negative, the system automatically bans the entrance of the given worker into the controlled area. Within the period of outage in 2017, 2018 and 2019 the ANPP personnel operational doses were accordingly 824,635 man-mSv, 619,41 man-mSv and 843.934 man-mSv. The ANPP personnel collective doses for 2017, 2018 and 2019 were accordingly 1058,235 man-mSv, 854,269 man-mSv and 979,45 man-mSv. The maximum individual doses for 2017, 2018 and 2019 of external exposure were accordingly 17,337 mSv, 12,127 mSv, 20,927mSv.

The ANPP personnel collective dose for 1994-2019 is shown in Figure 5 in Annex J of Section L of this report.

According to the order of the Director of "Rendering Harmless of Radioactive Waste" CJSC 10 workers belong to the category "A" for whom individual dose monitoring is performed. The quarterly readings are recorded in the log of individual doses; the annual readings are recorded in the employee's individual record sheet.

A worker's individual exposure dose, assuming that he is involved in all the operations, is equal to 13.2mSv/year. This calculation is based on the fact that the radiation exposure of all the received loads is 0.1mSv/hour at a distance of 1m from the source. The calculated exposure dose of

13.2mSv/year is a maximum value based on the highest dose rate of a container that could be received. It is obvious that the exposure rate of a medium load is lower and therefore the workers' exposure dose is significantly lower than the maximum value.

To ensure compliance with the main point of ALARA principle at the "Rendering Harmless of Radioactive Waste" CJSC dose constrain (10mSv/year) and action level (5mSv/year) are established for the personnel that may be exposed to radiation when handling the sources.

To protect the personnel when handling the sources/wastes, the remote holders and personnel protective means are used.

F4.3 Effectiveness of the radiation protection of the public and the environment

The Radiation Safety Norms approved under the Government Decree № 1219 as of August 18, 2006 establishes the dose limit for public as:

- An effective dose up to 1mSv in a year;
- If the implementation of activities (e.g. decontamination of contaminated area) causes the increase of public exposure dose, a higher value of effective dose in a single year could be applied, provided that the average effective dose over five consecutive 60 months (5 years) does not exceed 1mSv per year;
- An equivalent dose to the lens of the eye up to 15mSv in a year (consecutive 12 months);
- An equivalent dose to the skin up to 50mSv in a year (consecutive 12 months).

Throughout the year, according to the "Regulations of the ANPP Radiation Monitoring System", emissions and discharges were monitored, as well as monitoring of the radiation situation in the environment within a ten-kilometer supervision zone is performed.

In compliance with the "Regulations on the ANPP radiation monitoring system" the monitoring of releases and effluents, and also the monitoring of environment radiation monitoring in 10 km. supervision area was carried out in the course of the year.

The data on radiation monitoring in the supervision area provided in Annex K of Section L.

Daily radiation monitoring at the institutional waste management facility site is performed by using of different portable dosimetric systems. Besides, the storage facilities are equipped with sensors for twenty-four-hour radiation monitoring.

The calculation of exposure doses for the population critical group were performed in Metsamor town, which is located at a distance of 5 km from the ANPP on the downwind side, and the population of Metsamor town was selected as a critical population group. The calculations were performed using the RD software (version 1), developed by the VUJE Institute in the framework of a joint project with the IAEA. Summary results of calculations are provided below.

Analysis of the calculated data for 2017, 2018 and 2019 shows that the population exposure dose caused by the impact of the ANPP is approximately for 5 orders of magnitude lower than the dose limit (1 mSv per year) set in the Government Decree № 1219-N as of August 18,2006 on approval of Radiation Safety Norms.

F.5. Emergency Preparedness (Article 25)

1. Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.

2. Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

F5.1 Emergency preparedness at ANPP

The National Plan on Population Protection in case of a nuclear and radiological emergencies at ANPP

provides with the detailed assessment of organizational measures and allocation of the functions and responsibilities of the operator and the national and local authorities implementing response measures in case emergencies at the ANPP (Government Decree № 2328-N as of December 22, 2005, amended in 2008 and 2010 respectively). This plan had been developed with account taken to requirements of the IAEA GS-R-2, GS-G-2.1 and EPR-METHOD-2003.

The plan revised based on GSR part 7, GSG-2 taken into account new radiological intervention criteria established in GSR Part 3. The revised version of plane enforced under the RA Government Decree № 248-N on March 1, 2018.

The following activities for emergency preparedness are implemented at the ANPP:

- Identification of the organizational structure of the emergency response system (ERS);
- Establishing interrelations with response organizations;
- Coordination of emergency response;
- Development of plans and procedures;
- Logistics and facilities;
- Personnel training, exercises and exercises;
- Quality assurance.

F5.2 Identification of the Organizational Structure of ERS

To ensure an adequate level of preparedness and response to nuclear and radiation accidents a system of prevention and actions in emergencies - emergency response system (ERS) has been established and functions at the ANPP. The emergency response system existing at the ANPP is intended for prevention of emergency situations, prevention, limitation and mitigation of the effects of radiation releases, localization and timely mitigation of accident consequences.

The emergency response at ANPP is implemented by the emergency personnel in the framework of a specially established organizational structure of the emergency response system.

F5.3 The organizational structure of ERS functions within the overall organizational structure of the ANPP.

The existing emergency response system at ANPP is designed for prevention of emergency situations, prevention or limitation, mitigation of radioactive release impact, localization and timely mitigation of accident consequences.

The ANPP emergency response is implemented by the emergency personnel in the frame of a specially established organizational structure of the emergency response system (ERS). ERS management structure is a part of the general management structure of ANPP.

The manager of emergency activities, i.e. the ANPP General Director, is in charge of the ERS.

ANPP ERS includes the following functional units:

- Manager of emergency activities;
- Committee on Emergency Situations of ANPP;
- ANPP operating personnel;
- Headquarters of Civil Defense & Emergency Situations;
- Coordinator of public and media relations;
- ERS structural units;
- Personnel of the physical protection department;
- RA Police military unit;

- Specialized brigade for ANPP fire protection.

ANPP emergency response system is coordinated by the Committee on Emergency Situations (CES). The chairperson of the CES is the ANPP Chief Engineer. CES activity is implemented under the direction of the manager of emergency activities, i.e. the ANPP General Director.

The headquarter, the ANPP Civil Defense and Emergency Situations Service, is the executive authority of the CES.

Besides the national organizations 8 ANPP cooperates with WANO MC Regional Crisis Center for WWER type reactors on the basis of "ROSENERGOATOM" OJSC Crisis Center. Interaction with the RCC of WANO-MC is regulated by the requirements of the following documents:

- Regulations on the Regional Crisis Center of the NPP with the WWER reactor of the Moscow Center of WANO, registration number R16-2012;
- Regulations for information exchange between the participants of the Regional Crisis Center of NPPs with the WWER reactor of the Moscow Center of WANO, registration number R15-2013;
- Regulations for the operation of the Regional Crisis Center for Nuclear Power Plants with WWER reactor of the Moscow Center of WANO, registration number R21-2016.

To ensure proper response, ANPP ERS is provided with the required material and technical means and support, and also with the emergency equipment and special premises.

The special premises are assigned which could be used at various stages of emergency response, such as:

- Emergency control board for the MCR operating personnel;
- Crisis center;
- Reserve crisis center;
- Shelters;
- ERS property warehouse.

There are special systems and channels of emergency and regular communication and notification developed and implemented at ANPP.

F5.4 Establishing Interrelations with Response Organizations

In case of emergencies at ANPP the RA key organizations are:

- ANPP;
- Armenian Nuclear Regulatory Authority (ANRA);
- RA Ministry of Emergency Situations (RA MES).

The functional responsibilities of the organizations involved in emergencies at the ANPP are established in the RA legislation in the area of civil defence and emergency situations, "National population protection plan in case of nuclear and (or) radiation accidents at the ANPP (Off-site plan)" (approved by the RA Government Decree №2328-N as of 22 December, 2005). In addition, each organization has its own emergency plan with a detailed description of functional responsibilities and protective measures, as well as of forces and resources required for their implementation.

Besides republican organizations, the ANPP cooperates with the WANO MC Regional Crisis Centre (RCC) for NPPs with WWER reactor facilities on the basis of the "Rosenergoatom" PC Crisis Centre. The cooperation with the WANO MC RCC is regulated by the requirements of the following documents:

- Regulations for the WANO MC Regional Crisis Centre for NPPs with WWER reactors;
- Regulations for information exchange between members of the WANO MC Regional Crisis Centre

for NPPs with WWER reactors;

- Regulations for functioning of the WANO MC Regional Crisis Centre for NPPs with WWER reactors.

F5.5 Coordination of Emergency Response

According to the National Plan on Population Protection (the off-site plan):

- ANPP is responsible for classification of emergency situation at NPP, prompt notification on emergency situation, bringing the reactor in safe condition and NPP personnel protection;
- Ministry of Emergency Situations of the Republic of Armenia (MES) is responsible for warning of national response organizations and population, coordination of population protection measures, organization of emergency radiological monitoring and performing rescue actions in emergency situations. From 2008 the Armenian Rescue Service (ARS) functions within the MES. The Rescue Service of Armenia functions as the national coordinator in organization and implementation of population protection measures. To cope with this task there was established the Crisis Management Centre of the MES equipped with new equipment and communication means. The MES is the competent authority and the contact point under the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency. The Ministry for Emergency Situation transmits radiation monitoring data in area where emergency took place and in adjacent to its territories to the ANRA ERC;
- ANRA is the national advisor in organization of response and also the National Warning Point under the Convention on Early Notification about Nuclear Accident. In case of threat to population ANRA notifies Ministry for Emergency Situations on emerged situation, provides with information on situation in the area where emergency took place;
- Hydrometeorological Service provides ANRA ERC and Ministry for Emergency Situations with the information on meteorological situation in the area where emergency took place and the meteorological prognosis;
- Ministry of Foreign Affairs of the RA is responsible for providing information received from ANRA ERC on emergency to the embassies, foreign representative offices and RA Embassies in other countries;
- Ministry of Health of the RA is responsible for provision of medical aid to the affected population, coordination of evacuation of injured persons from contaminated area and participation in organization of decontamination of evacuees;
- Ministry of Defense of the RA is responsible for conducting emergency radiological monitoring, deployment of forces and resources necessary for rescue operations and deployment of decontamination and special treatment units;
- Police of the RA is responsible for warning and notification of the population, protection of property and assets of the settlements in the contaminated area and maintaining public order in settlements, organizations, evacuation points, and transportation routes;

The responsibilities of the local authorities on the regional and local levels in the territory included in PAZ or UPZ are indicated in the off-site emergency plan of ANPP. The local authorities perform the displacement, reception and the distribution of the displaced people, sheltering and provision of individual protection for the population.

The organizational chart of the population protection planning system will updated with regard to recent changes in the RA government structure.

F5.6 Development of Plans and Procedures

The ANPP as an organization responding to emergencies occurred at the ANPP bears full responsibility for development and implementation of ERS documentation for various situations

including radiation and non-radiation accidents.

- Concept of emergency response;
- Response plan;
- Geographical maps and plans;
- Administrative and technical documentation;
- Procedures for emergency response critical tasks;
- Regulations for structural divisions;
- Procedures for operation and maintenance of engineering systems;
- Emergency actions sheets;
- Methodologies of evaluating the situations and anticipating their development;
- Forms for making records.

The response activities are performed following the classification of accidents. To assess the disturbances (events) in normal operation, the nuclear or radiation accidents the Guidance "Classification of emergency situations at ANPP" was developed at ANPP. The "Guidance" addresses different types of man-made accidents, natural disasters and human errors that may lead to a nuclear or radiation accident.

A special revision of the "Guidance" is planned following the development and approval of the emergency operating procedures.

The person responsible for accident classification is the ANPP shift supervisor. If there is a threat or there are indications of an accident ANPP shift supervisor classifies the accident within 15 minutes. In the course of the accident the classification is repeated not less than once an hour or immediately if additional initiating events occur or indications of ANPP condition change are identified.

ANPP response plan to nuclear and/or radiation accidents" (ANPP on-site plan) briefly describes the procedure of fulfilling critical response tasks following the accident classifications.

The administrative and technical documents of the ERS provide a full description of the ANPP ERS tasks and functions, as well as assignment of duties and responsibilities for ensuring ERS reliable functioning.

The procedures for critical tasks contain a detailed description of measures required for adequate fulfillment of a specific critical task of emergency response.

The regulations for committees and structural divisions contain a clear assignment of tasks, functions, duties and responsibilities, subordination and interrelation diagrams, as well as lists of procurement of emergency equipment, other resources and documents.

The procedures for operation and maintenance of engineering systems contain requirements and relevant procedures for operation and maintenance of the life support systems and of the emergency equipment that ensures their continuous preparedness and adequate performance.

The emergency actions sheets contain actions of officials who occupy key positions in the ERS and take responsible decisions given in the relevant order.

The methodologies of evaluating the situations and prognosis of their further development contain description of analytical tools and computer codes used during accidents.

35 standard training programs and 6 training courses for the personnel involved in the ANPP ERS have been developed and approved. Some standard training programs, training aids and drill programs are under development.

F5.7 Logistic support and objects

To ensure adequate response of the ERS, ANPP is provided with logistic means and support also with emergency equipment and special rooms.

Special rooms are assigned which can be used at different stages of emergency response, such as:

- Remote shutdown panel for MCR personnel;
- Crises center;
- Reserve crises center (technical requirement is developed);
- Shelters;
- Warehouse of ERS inventory.

There are special systems and channels of emergency and regular communication and warning systems.

More detailed description of system operation and of means is given in the Procedure on organization of notification and communication in case of emergency situations at ANPP.

In accordance with the lists of logistic means, given in the provisions on commissions and units of ERS, the following means and equipment are provided.

- Devices to perform measurements and analyses;
- Tools for emergency brigade;
- Office equipment, accessories and consumables for CC;
- Hardware;
- Maps, plans and documentation (including operational procedures);
- Medical means;
- Individual protection means;
- Transportation means;
- Overalls for the personnel of the units.

Measures on inventory accounting and emergency systematic resupply are foreseen.

F5.8 Personnel training and exercises

ANPP organizes systematic training under the relevant programs and in accordance with the approved schedules.

The topics of the emergency preparedness and response are annually included into the topical plans of the initial briefings for the personnel of structural units.

The issues of the emergency preparedness and response are included in the examination questionnaires of ANPP personnel.

The skills on appropriate accident response are maintained through periodical exercises and drills which follow specially prepared scenario and involve all officials who are responsible for critical emergency response objectives.

The exercises and drills are systematically assessed, and based on the results a plan of correcting measures is developed. Their timely and proper implementation is followed-up.

F5.9 Quality assurance

According to the approved schedule, or, if necessary, extraordinarily, analyses of the ERS documentation quality is performed, corresponding changes are made (telephone numbers, addresses

of emergency personnel is specified). After trainings and exercises, if necessary, the documentation is corrected. According to the approved schedule the means of communication and notification, CC and shelters life support systems are reviewed.

The review of individual protection tools, ERS systems and means test and technical support is performed according to the schedule. To improve the emergency preparedness condition, scheduled audits are conducted by the Quality Assurance Department. Peer reviews and missions are performed by the International Organizations.

As a result of analyses of exercises, audits, peer reviews and missions a plan of corrective measures is developed and their corresponding and timely performance is followed-up.

At ANPP site the following radiation-dangerous facilities are operated:

- Reactor;
- Spent fuel storage pools - SFSP1, SFSP2;
- Dry spent fuel storage facility;
- High level solid waste storage facility;
- Intermediate level solid waste storage facility;
- Low level solid waste storage facility;
- Liquid radioactive waste storage facility.

Emergency preparedness provides the performance of emergency response actions at the above mentioned radiation–dangerous facilities:

- Identification, notification and activation of emergency response system;
- Taking mitigation measures;
- Taking urgent protective measures;
- Issuing instructions and recommendations on personnel protection;
- Protection of emergency workers and helping people;
- Medical aid;
- Maintaining awareness of the population;
- Radioactive waste management;
- Mitigation of non-radiological consequences
- Help request from outer organizations;
- Implementation of recovery operations and resumption of social and economic activities;
- Analysis of accident and response process.

In connection with the fact that the institutional waste management facility is a potentially dangerous facility it is necessary to ensure emergency preparedness in case of radiation accident due to technological, anthropogenic causes or natural disasters. With this purpose activities are performed to ensure emergency preparedness, and measures on timely response and accident mitigation are foreseen in cooperation with the relevant state authorities for personnel and population protection.

F.6. Decommissioning (Article 26)

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:
(i) qualified personnel and adequate financial resources are available;
(ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;
(iii) the provisions of Article 25 with respect to emergency preparedness are applied; and
(iv) records of information important to decommissioning are kept.

The RA Government Decree №707-N as of June 01, 2005 stipulates that for nuclear installations which design does not provide for the decommissioning process, the operating organization at least 5 years before the start of decommissioning process shall apply for the decommissioning licence. The Decommissioning Plan (DP) is one of the most important documents which is submitted to the regulatory authority. Along with DP, the set of documents submitted for obtaining the decommissioning licence includes also Safety Analyses Report (SAR) during decommissioning, Decommissioning Environmental Impact Report and other documents. The ANPP Decommissioning Preliminary Plan (DPP) was developed within the framework of the EU assistance in cooperation with the British company Babcock (2010). It is based on the selected strategy of ANPP decommissioning. The main objective of DPP is the development of "living" document that will be revised/updated through periodic reviews while the ANPP operation lifetime expires. Taking into consideration Unit № 2 lifetime extension the ANPP decommissioning strategy and DPP will be revised/updated.

The ANPP together with Babcock prepared a list of activities aimed at improving the areas in which the DPP doesn`t fully correspond to the IAEA requirements (IAEA expert mission conclusions). It was decided that in updated revision of the DPP specific attention should be given to the following issues as far as they are of fundamental importance:

1. Development of detailed concept of decommissioning strategy implementation;
2. Development of detailed structure of work breakdown (WBS) "from bottom to top";
3. Detailed cost estimate for the ANPP decommissioning;
4. Development of information system with data base on decommissioning works software;
5. Development of waste management program.

In the framework of the EU INSC on-site assistance (Instrument for Nuclear Safety Cooperation) project A1.01/09CD "Implementation of activities related to decommissioning at the ANPP: Decommissioning Concept and documents on licensing of decommissioning at the ANPP and performance of the ANPP Unit №1 pilot decommissioning" the following activities have been performed:

1. Detailed concept on decommissioning of ANPP based on the approved strategy of ANPP decommissioning and the preliminary plan on decommissioning. The task included development of:
   - Decommissioning process maps;
   - Decommissioning process models.
2. Assessment of costs for ANPP decommissioning was performed in frame of the project of "On-site Assistance to ANPP" by the Slovak subcontractor (NS & Decom Company). "Report on costs-estimation for ANPP Decommissioning " was issued in November 2013.

The objective of this cost estimate report is to define the principles for performing the decommissioning cost estimate, as well as to present the cost estimated of ANPP decommissioning, in accordance with the decommissioning strategy and the decommissioning schedule. The cost estimate for ANPP decommissioning provided in this report is "preliminary" as it is based on the preliminary decommissioning plan. The calculation should be updated periodically to improve accuracy and to

reflect additional information, knowledge and experience gained. The costing approach is in line with the IAEA recommendations below.

The costing approach and costing model are based on ISDC and the international experience in performing decommissioning cost estimates.

Decommissioning costs and planning include all activities ranging from decommissioning planning, post-operational phase (from shutdown to decommissioning), decontamination and dismantling and management of the generated waste to final site remediation. The calculation includes all associated costs, payments, services and other cost items.

The waste management system for decommissioning reflects the waste types defined in the ISDC. The costs of recycling and final disposal of waste from decommissioning are estimated and included in the cost estimate. operational waste management costs are estimated separately in accordance with ISDC definitions. All other activities related to planning, shutdown, safekeeping, management and implementation of activities are presented based on ISDC definitions in order to comply with international practice on decommissioning. In the work performed, a sensitivity analysis was also performed for the number of personnel involved in the activities.

In frame of the project A1.01/09CD, the "Program for radioactive waste management" and "Technical specifications for equipment for decommissioning, packaging forms and control equipment for releasing materials from regulatory control have been developed:

- Based on practical experience in the field of NPP decommissioning, a program for radioactive waste management during the ANPP planned decommissioning has been developed, which includes an assessment of the types, categories and physical/radiation characteristics of waste, as well as waste control and processing. The waste management program contains an assessment of the total amount of waste, taking into account their categorization (nuclear and hazardous) and materials that are returned for re-use.
- Technical specifications have been developed for equipment used in decontamination and dismantling, waste packaging and radiation monitoring equipment to release waste from regulatory control.

The results of the above mentioned work performed will be included in the updated versions of the preliminary plan on decommissioning.

For the first 3 phases of decommissioning (post-operation, preparation to safe enclosure and safe enclosure) the SAR and Environmental impact Assessment Report are developed and approved.

F6.1 Availability of qualified personnel and adequate financial recourses

Financial Provision of ANPP Decommissioning and evaluation of expenses for decommissioning

In accordance with the RA Government Decree №1637-N as of October 16, 2006 on opening a special account for decommissioning of ANPP a special fund was created to provide implementation of decommissioning work, which is managed by the Ministry of Finances. It is prohibited to use financial recourses accumulated in this fund for other purposes.

The ANPP decommissioning expenses within the framework of the EC project "ANPP on-site assistance" were evaluated in 2013 with the participation of Slovak subcontractor (NS и Decom Company). The evaluation is a so-called "budget" estimate of expenses on the level corresponding to the level of DPP with the accuracy of + 30%, -15%. Calculation methodology and model are based on the International Structure of Nuclear Facility Decommissioning Expenses Evaluation (ISDS). Based on the scope of the work to be performed the quantity of the necessary personnel is also evaluated.

Total cost of the ANPP decommissioning with the optimized cost of post-operational period (from the point of view of the personnel) is 545 million Euros. Financial resources, accumulated in this fund, have not increased significantly and are not enough for implementation of decommissioning in accordance with the implemented evaluation of expenses. Based on this, to implement

decommissioning, financial support of International Organizations and funding from other sources will be required.

Availability of qualified personnel

In accordance with the DPP decommissioning activities will be performed by the ANPP personnel. Within the framework of the EC INSC Project the needs for ANPP personnel retraining and engagement of new specialists have been determined based on the characteristics of the work to be performed at different stages of decommissioning according to the previously developed programmes both in ANPP Training Centre and in other organizations having decommissioning experience.

F6.2 Radiation protection, discharges and unplanned and uncontrolled emissions

The entire legislative and regulatory framework, including requirements and limitations which are applied to all operated installations, is also applicable to the ANPP in the stage of decommissioning. When performing dismantling activities, decontamination and other activities specific for different decommissioning stages, as well as for the stage of operation, radiation environment monitoring will be carried out both within and outside the ANPP, monitoring of personnel exposure, as well as discharges and releases into the environment will be performed. Radiation safety issues during decommissioning are considered in SAR on decommissioning based on the nature of works at different stages of decommissioning.

F6.3 Emergency preparedness

The entire legislative and regulatory framework referring to emergency preparedness at the stage of operation is also applicable to ANPP decommissioning stage. In order to get a Decommissioning Licence the ANPP must submit an emergency plan to the regulatory authority for consideration in which activities for personnel and population protection should be described in case of radiological accidents due to external and internal initiating events while performing ANPP decommissioning. The existing action plan on personnel and population protection during ANPP operation in case of accidents during decommissioning will be updated taking into consideration the specifics of ANPP decommissioning.

Emergency preparedness during decommissioning will be maintained by:

- Updating the existing emergency plans (taking into consideration the specifics of different stages of ANPP decommissioning and the nature of possible events during decommissioning);
- Maintaining emergency preparedness level (equipment and materials, emergency duty, etc.);
- Response to accidents and emergencies;
- Emergency exercises.

F6.4 Maintaining information important for decommissioning

The scope of information, important for ANPP decommissioning, includes all design documentation with corresponding design changes related to operational modernization and reconstruction, as well as all operational documentation which could affect the ANPP decommissioning (information on operational history, implemented engineering and radiation surveys, results of analyses, etc.).

An Information System on Decommissioning with a Database (DISDB) has been established at ANPP and is at the stage of pilot operation within the framework of the above EC project.
DISDB system is a modular software product. It consists of a number of functional blocks. Each module covers the specific requirements of the NPP decommissioning process. All modules are integrated into a single system, which provides access to the functions of all modules.

- Module of General Administration;
- Module of Documentation Management;
- Module of Inventory and Radiation Data;

- Module of Dismantling Planning and Realization;
- Module of Decommissioning Project Management;
- Module of Material and Waste Management.

The DISDB includes an extensive database intended for all ANPP data collection and use of all data related to decommissioning (strategic and short-term work planning with the evaluation of required recourses, preparation for work implementation, physical and radiation parameters of systems/equipment/component by inventory and radiation survey, dismantling activities, RW and materials management, etc.). At present measures are implemented at ANPP to fill in the database.

SECTION G. SAFETY OF SPENT FUEL MANAGEMENT

G1. General Safety Requirements (Article 4)

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards. In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;

(ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;

(iii) take into account interdependencies among the different steps in spent fuel management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

The following national regulations are used for the SF safe management:

- The Law on Safe Utilization of Atomic Energy for Peaceful Purposes;
- The Law of the RA on Environmental Impact Expertise.

The RA Government Decrees are as follows:

- Government Decree № 609-N as of May 12, 2005 on approval of the Licensing Procedure and Licence Form for Site Selection of Nuclear Installations;
- RA Government Decree № 1546-N as of December 13, 2012 on approval of Method on Seismic Hazard Assessment for New Nuclear Unit Site;
- RA Government Decree № 708-N as of July 04, 2013 on approval of the Site Safety Requirements to New NPP Unit(s);
- Government Decree № 608-N as of May 12, 2005 on approval of the licensing procedure and licence form for designing of nuclear installations;
- Government Decree № 649-N as of May 12, 2005 on approval of the licensing procedure and licence form for construction of nuclear installations;
- Government Decree № 400-N as of March 24, 2005 on approval of the licensing procedure and licence form for operation of nuclear installations;
- Government Decree № 2013-N as of November 21, 2002 on approval of the requirements to form and contents of the Safety Analysis Report of ANPP Unit №2;
- RA Government Decree № 762-N as of June 09, 2005 on approval of the licensing procedure and licence form for use of nuclear materials;
- RA Government Decree № 745-N as of June 09, 2005 on approval of the licensing procedure and licence form for storage of nuclear materials;
- RA Government Decree № 746-N as of June 09, 2005 on approval of the licensing procedure and licence form for transport of nuclear materials;
- RA Government Decree № 1263-N as of December 24, 2001 on approval of the special rules on

transport of nuclear and radioactive materials;

- RA Government Decree № 931-N as of June 27, 2002 on approval of the procedure for safe transport of nuclear and radioactive materials.

In addition, the following international regulations are used for the safe management of spent fuel:

- USA 10 CFR 72;
- NUREG-1567 Standard Review Plan for Spent Fuel Dry Storage Facilities;
- NP-001-97. General regulations for nuclear power plants safety. OPB–88/97, (PNAE G-01- 011-97);
- NP-082-07. Nuclear Safety Rules for Reactor Installations of Nuclear Power Plants;
- NP-060-05. Siting of Storage Facilities for Nuclear and Radioactive Materials. Basic Criteria and Safety Requirements;
- NP-061-05. Safety Rules for Storage and Transportation of Nuclear Fuel at the Sites of Nuclear Facilities;
- NP-035-02. Dry Storage Facilities for Spent fuel. Safety Requirements.

In accordance with the Article 6 of the Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes the spent fuel and radioactive wastes generated in nuclear facilities located on the territory of the Republic of Armenia are the properties of the Republic of Armenia.

G1.1 Sub-criticality and removal of residual heat

In accordance with the Safety Rules for Storage and Transportation of Nuclear Fuel at the Sites of Nuclear Facilities (NP-061-05) the spacing of FAs arrangement in shrouds, racks, and packages, as well as mutual arrangement of shrouds, racks, stacks and tubes, shall be chosen so that during nuclear fuel storage and transportation the effective neutron multiplication factor would not exceed 0.95 in normal operation and operational events, including design basis accidents.

The same Rule establishes requirements for residual heat removal systems: storage pools of spent fuel shall be equipped, at minimum, with the following systems necessary for safety:

- Heat removal from the cooling medium (except for the cases, for which it is proved that the design temperature values of the cooling medium are not exceeded when the cooling medium heat removal system is unavailable);
- Monitoring of specific activity of the cooling medium.

Subcriticality during storage of SF in the storage pools is provided by positioning the cells of the racks (225 mm) and using a homogeneous absorber (boric acid solution). However, in the criticality safety analysis, boron acid presence in the cooling pool coolant conservatively was not taken into account.

Subcriticality during the storage of SF in the DSFSF is provided by location of the cells of the DSC and the use of cells from boron-containing steel.

Residual heat removal in the storage pool is provided by a coolant (an aqueous solution of boric acid). During storage of SF in the storage pools, the coolant level and temperature, as well as its chemical and radiochemical composition, are controlled.

Residual heat removal of spent fuel stored in the DSFSF is provided by air circulation through the intake and exhaust ventilation ducts, due to natural convection. The process of removing residual heat is controlled by measuring the temperature of intake and exhaust air, determining their difference and comparing it with design characteristics.

G1.2 Generation of radioactive waste associated with spent fuel management

Generation of radioactive waste associated with spent fuel management is kept to the practicable minimum in accordance with the established policy on use of nuclear fuel. In order to achieve this goal, steps are undertaken:

- To improve the quality of nuclear fuel (fuel manufacturer agrees all changes with the ANPP and ANRA, there is possibility to perform inspections at the fuel manufacturing factory by ANPP);
- To optimize spent fuel management technologies;
- To increase the nuclear fuel burn up.

G1.3 Interdependencies among the different steps in spent fuel management

Licence in the atomic energy utilization field (for the SF management also) is granted in accordance with the complex licence procedure and the licensing procedures established under the RA Government decrees that specify mandatory requirements and conditions (a set of documents).

G1.4 Effective protection of individuals, society and the environment, by applying at the national level suitable protective methods

The requirements to limit the impact of nuclear facilities to people and the environment are established in the RA Government Decree № 1219-N as of August 18, 2006 on approval of radiation safety norms and in the RA Government Decree № 1489-N as of August 18, 2006 on approval of radiation safety rules that have been brought to conformity with the IAEA's GSR Part 3 standard.

In 1998, the US CFR 10 and the corresponding NUREGs were applied by the FRAMATOM to the US NUHOMS-type dry spent fuel storage facility. The French IRSN has prepared a detailed expert conclusion on design of the storage facility, where the assessment of impact of the storage facility on the population in both natural and emergency situations was performed as well as the assessment of the organizational measures and technical measures to be used by the NPP to limit the impact.

As prescribed in the operating licence of spent fuel management facilities, all radioactive discharges must be monitored, quantified and documented. The licence holder must report the relevant data on discharges and radiological exposure to the regulatory authority. The licence holder is required to set up and maintain an adequate off-site monitoring program. This program normally includes measurements of radiological exposures and possible contamination of grass and milk in the vicinity of the installation. The results are reported to and regularly checked by the regulatory authority. Detailed description of the radiation protection systems in the Republic of Armenia is provided in Section F4 of this report.

G1.5 Consideration of biological, chemical and other hazards that may be associated with spent fuel management

All hazards that may be associated with spent fuel management are taken into account in the safety analysis and assessment of spent fuel management facilities. The scope of the hazards is based on the requirements of “Standard format and content for the safety analysis report of an independent spent fuel storage installation (dry storage)”, US NRC Regulatory guide 3.48 and “Requirements on format and content of the ANPP Unit №2”.

G1.6 Avoiding actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation

Protection of future generations is assured through the fulfillment of requirements applied to the evaluation of projected radiation impacts produced on future generations and resulting from SF management; these impacts shall not exceed the acceptable public exposure levels as established by the existing regulations and is considered in the safety analysis reports for SF management facilities.

G1.7 Reduction of burdens on future generations

The policy intended to reduce imposing undue burdens on future generations is achieved in three

directions:

- Reducing the risk associated with nuclear energy through development and implementation of safety improvement measures at associated facilities in compliance with the Law of the Republic of Armenia on Safe Utilization of Atomic Energy for Peaceful Purposes;
- Review the Spent Fuel Management in the frame of Long Term Operation and Justification of Safely Spent Fuel Management during the additional Life Time;
- Reducing the burdens on future generation related to decommissioning through establishment and collection of the decommissioning and RW management funds.

G2. Existing facilities (Article 5)

Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

There are 3 nuclear facilities in the Republic of Armenia holding license for spent fuel management:

1. ANPP with two spent fuel storage pools - one in the Unit № 1 and the other in the Unit № 2;
2. Module 1 of DSFSF;
3. Module 2 of DSFSF.

ANPP Unit № 2 is operated in accordance with the licence issued by the Armenian Nuclear Regulatory Authority (ANRA) on April 1, 2011.

Dry spent fuel storage facilities DSFSF-1 and DSFSF-2 are operated in accordance with the licences issued by the Armenian Nuclear Regulatory Authority (ANRA) on August 1, 2000 and on August 16 2008, respectively.

Dry spent fuel storage facilities consist of horizontal storage modules of NUHOMS-56 type. According to the scheme of spent fuel assemblies management adopted at the ANPP the following activities are performed:

- Storage of spent fuel assemblies in the storage pool of the Unit № 2;
- Storage of spent fuel assemblies in the storage pool of the Unit № 1;
- Transfer of the spent fuel assemblies from the storage pool of the Unit №2 to the storage pool of the Unit №1;
- Transfer of spent fuel assemblies in the storage pool of the Unit №1 to the DSFSF and storage in the DSFSF.

G2.1 Spent fuel storage pools

After the operation of fuel assemblies in the Unit №2 reactor core, they are unloaded from the reactor into the Unit №2 storage pool. After the preliminary storage in the Unit №2 pool, the spent fuel assemblies are transferred to the pool of the Unit№ 1 for additional storage. After additional storage, the spent fuel assemblies from the Unit №1 pool are transferred to the DSFSF. The total storage time of the spent fuel assemblies should meet DSFSF design acceptance criteria on decay heat and neutron/gamma irradiation dose rates.

The storage pool is equipped with ventilation system which creates air screen above the pool surface preventing radioactive material release. During normal operating mode the storage pools shall be covered with plates. Residual heat removal is ensured with the required temperature (below 70°C) coolant of the storage pool. The storage pool has the systems of filling and cooling. Also, the coolant quality is controlled (chemical composition and content of radioactive isotopes).

G2.2 SF Management at NPP

The spent fuel assemblies are originated during the operation of the ANPP Unit №2. After the end of

the service life during the fuel loading, they are unloaded from the reactor core and placed in the cell of the Unit № 2 storage pool. The fuel is reloaded once a year, when the reactor shutdown, pressure relief and cooling are performed. After unloading from the reactor, the spent fuel assemblies are tested for leaktightness. In the event of leakage, SF is placed in the cell of the storage pool. In the case of damage to the fuel assembly, it is placed in a hermetic case and stored in it.

The safety of storage of spent fuel assemblies in the storage pools is justified in the report "Technical justification for the safe operation of vibro-resistant, profiled assemblies with medium-enrichment 3.82% at the ANPP Unit №2", 270-Pr-024 (OKB "GIDROPRESS", RF).

The procedure for the safe storage of spent fuel assemblies in the storage pools is defined in the following documents:

- Manual on "Storage of nuclear fuel";
- Instruction on "Storage of spent fuel assemblies in storage pools 1 and 2".
- Instruction on "Storage of assemblies with leaky fuel claddings in hermetic canisters".

During storage of spent fuel assemblies in the storage pools, periodic monitoring is carried out for:

- Coolant level;
- Coolant temperature;
- Coolant quality (chemical and radiochemical composition).

The safe transfer of spent fuel assemblies from the Unit №2 storage pool to the Unit №1 storage pool is justified in the documents listed in Section G2.1 of this report.

The procedure of transfer of spent fuel assemblies from the Unit №2 storage pool to the Unit № 1 storage pool is defined in the Instruction on "Transfer of spent fuel assemblies from 2BV to 1BV".

Transfer of the spent fuel assemblies from the Unit №2 storage pool to the Unit №1 storage pool is carried out using transport containers OSTC (On-Site Transport Container). For each transfer, the following documents are developed:

- Transfer program;
- Working schedule for loading and unloading of spent fuel assemblies to/from DSC;
- DSC loading map;
- Characteristics (dates of loading into the reactor and 2BV, amount of nuclear material, burn- up depth, residual heat release) of spent fuel assemblies loaded into the DSC;
- Control and working maps of loading of the storage pools and DSC before and after the completion of work.

The correctness of the working schedule is checked by periodic comparison of control and working maps of loading the DSC and the storage pool.

When moving TC/DSC/SFA from the Unit №2 to the Unit №1, the temperature of the DSC external wall and gamma radiation power are controlled.

Safety assessment of spent fuel management facilities is presented in the section G.2.1.

G2.3 ANPP Dry Spent Fuel Storage Facility

Following the required storage in the storage pools the SNF assemblies shall be stored in the DSFSF which was designed and constructed in compliance with the standard NUHOMS-56 system designed for storage of WWER-440 SNF assemblies.

The safe transfer and storage of spent fuel assemblies in the DSFSF is based on the following documents:

- *Analytical safety report for NUHOMS system on the territory of ANPP,* NVPF XX 97 0539 TFR/BEQ, June 1997, (for the first module of the DSFSF);
- *Analytical safety report for NUHOMS system on the territory of ANPP***,** DOS-06-00029988, October 2006 (for the second module of DSFSF);
- *Documents listed in G2.1.*

The SNF assemblies shall be installed in the DSC which is filled with nuclear category helium withheld high pressure. The DSC protection and safety is ensured with monolith reinforced concrete storage horizontal module (HSM). The residual heat of radioactive decay in the DSC and HSM is removed with ventilation system operated based on natural convection.

The main design features of the DSFSF are:

- *Storage of SNF assemblies in hermetic welded protective case inside a protective concrete module.* It ensures availability of high efficiency multi-barrier protective system for safety of the SNF assemblies' storage;
- *Transportation of DSC in horizontal position to the DSFSF and back.* Optimal means ensure biological protection and passive storage which does not require a special maintenance. Another potential is a withdrawal of DSC and their further transportation outside the plant in the same licensed transport container.
- *Transportation of DSC in the transport container from technological transport gallery of RD to the DSFSF*. It ensures radiation protection of personnel and integrity of the DSC during transportation, at the same time maintaining a potential for passive heat removal from the TC/DSC to the atmosphere;
- *Protective end plugs*. Ensuring contact manipulation and control from the upper and lower parts of DSC located in the transport container or HSM.
- *Passive cooling with use of natural air circulation.* The temperature of fuel claddings is maintained below maximum allowable limit and thus, their damage is prevented during long-term storage.
- *Helium storage medium*. Ensuring efficient heat removal and prevention of SNF and fuel rod cladding oxidization. Welding of SNF cladding with use of double root weld ensuring integrity of helium fluid.

The DSC subcriticality is ensured and justified for loading of 56 fresh fuel assemblies and filling with non-borated water.

Currently the following facilities are operated:

- The first set of DSFSF commissioned in 2000 and consisting of 11 HSM (616 SNF assemblies);
- The first part of the second set of DSFSF commissioned in 2008 and consisting of 12 HSM (672 SNF assemblies);
- The second part of the second set of DSFSF commissioned in 2015 and consisting of 12 HSM (9 HSM, 504 SNF assemblies are filled, 3 HSM are empty);

Total number of filled HSMs is 32; the number of SNF assemblies stored in the DSFSF are 1792.

Transfer and storage of spent fuel assemblies from the storage pool 1 to the DSFSF is organized in accordance with the "Instruction on operation of DSFSF".

The following documents are developed for each shipment:

- Program on shipment;
- Working schedule on loading of SF assemblies from the storage pool 1 to DSC;
- DSC loading map;
- Characteristics of spent fuel assemblies loaded into the DSC;

- Control and working maps of loading of the storage pools and DSC before and after the completion of works.

The following is controlled during transfer of spent fuel assemblies from the Unit №1storage pool to the DSFSF:

- Temperature on the side walls and on the cover of TC/DSC/SF;
- The dose rate of gamma radiation on the side walls and on the cover of OSTC (1m);
- Degree of vaacumisation of DSC;
- The quality of welding of the DSC covers;
- The following is controlled during storage of spent fuel assemblies to the DSFSF:
- Temperature of air entering into the HSM;
- Temperature of air leaving from HSM;
- The gamma/neutron radiation dose rate on the roof and on the doors of the HSM.

After placing DSC to the HSM daily control is performed until the DSC is reached to the stationary temperature regime. After the stationary temperature regime is in place in the HSM, the parameters characterizing the operational safety condition of the DSFSF are controlled twice a month, according to the schedule approved by ANPP the chief engineer.

The "Instructions for the DSFSF operation" also provides for walkdown along the territory and observation of the DSFSF building. During walkdowns, the cleanliness of the site, the condition of the mesh fence, the openness of the ventilation ducts of the HSM, the state of the IAEA safeguards seals are checked. Visits are conducted twice a week.

Periodic assessments of the operational safety condition are carried out in accordance with the terms of licence №01-00 for the operation of the first module of the DSFSF granted by ANRA on August 1, 2000 and the terms of licence №MTSH-001-2008 for the operation of the second module of the DSFSF granted by ANRA on August 16, 2008.

The assessment of the operational safety of the DSFSF is performed according to the results of:

- Measurements of the temperature values incoming and outgoing air in the HMS;
- Measurements of the dose rate of gamma radiation on the roof and on the door of the HSM;
- Determination of the state of building structures of the DSFSF buildings;
- Inspection of the condition of the DSFSF fence;
- Determination of the state of the DSFSF lighting system.

Checks are performed twice a month. Based on the results of the checks, quarterly reports on the assessment of the operational safety of the DSFSF are developed and submitted to ANRA.

G3. Siting of Proposed Facilities (Article 6)

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

Siting for nuclear installation is performed according to t h e RA Government Decree № 609- N as of May 12, 2005 on approval of the licensing procedure and licence form for site selection of nuclear installations.

The abovementioned document defines mandatory requirements and documentation required for licensing of site selection. The submitted documents shall include:

- The general description of the design of nuclear installation to be constructed on the given site;
- The QA program on site selection of nuclear installation ;
- The pubic hearing results on site selection of the nuclear installations from local authorities and the affected community population;
- The list of organizations involved in site selection, copies of their statutes and information on professional qualification of personnel necessary for site selection and documents confirming availability of technical and software means to the applicant and those organizations.

G3.1 Evaluation of all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime

The main regulatory documents and areas of the regulatory review of siting licence application are listed below:

- RA Government Decree № 1546-N as of December 13, 2012 on approval of Method on Seismic Hazard Assessment for New Nuclear Unit Site;
- RA Government Decree № 708-N as of July 04, 2013 on approval of the Site Safety Requirements to New NPP Unit(s);
    - Evaluating a proposed site to ensure that the site related phenomena and characteristics are adequately taken into account;
    - Analyzing the characteristics of the population of the region and the capability of implementing emergency plans over the projected lifetime of the plant;
    - Defining site related hazards;
    - Defining the extent of information on a site to be presented by the applicant.

The assessment of all site-related factors that affect safety throughout the service life is a part of the documentation required for licensing of site selection.

The selection of the construction site of the DSFSF was made in 1997 on the basis of the results of:

- Engineering and geological studies of the construction site of the DSFSF (Institute of Armhydroenergoproekt, 1997);
- Assessment of the natural background of the terrain;
- Environmental impact assessment;
- Public hearings.

The following characteristics were taken into account when selecting a site for the DSFSF construction:

- Location of the facility;
- Demographic data;
- Use of land and water near the DSFSF;
- Nearby industrial enterprises and transport communications;
- Meteorological data;

- Relief;
- Surface water hydrology;
- Groundwater hydrology;
- Geological and seismological data.

The description and assessment of the safety of the DSFSF site are provided in the SAR for the NUHOMS.

G3.2 Assessment of environmental impact of such facility on safety of people, society and the environment

Such an assessment is made in the Chapter 7 of SAR for DSFSF, where it is justified that during the lifetime, all design accidents at the facility will not have a significant impact on the safety of people, society and the environment. The following are considered as design basis accidents:

- Tornado and wind loads;
- Design flood;
- Seismic impacts;
- Snow and ice loads;
- Airplane crash;
- Accumulation of dust.

G3.3 Informing public about safety of such a facility

The existing legislation stipulates holding the public hearings related to use of atomic energy and radiation safety. The main goal of the public hearings on use of atomic energy and radiation safety consists in observance of the public members and their groups rights on participation in discussion of issues like siting, design, construction, commissioning and decommissioning of nuclear facilities.

Before the start of the DSFSF construction on 26.01.2007, public hearings were organized in the city of Metsamor. The members of the city hall of Metsamor, representatives of public organizations and the television company "Noy" participated in the public hearings. The answers to the questions were given by the management and competent experts of ANPP. The design was approved as a result of the hearings. The proceedings are formalized in the protocol №1 as of 26.01.2007.

Public hearings on the DSFSF design were organized in Yerevan, in the Ministry of Energy on February 27, 2007. The hearing was attended by representatives of the Ministry of Energy, ANPP, "Environmental expertise" SNCO, representative of TN International. As a result of the hearings, a positive attitude of state organizations and the public to the proposed design was expressed. The results of the hearings were formalized in the protocol as of 27.02.2007.

G4. Design and Construction of Facilities (Article 7)

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

(i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;

(iii) the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

Design and construction of nuclear facilities is performed according to the procedures mentioned below:

Licensing of Designing and Construction of nuclear installation is performed according to:

- RA Government Decree №608-N as of May 12, 2005 on approval of the licensing procedure and licence form for designing of nuclear installations;
- RA Government Decree №649-N as of May 12, 2005 on approval the licensing procedure and licence form for construction of nuclear installations.

The abovementioned documents define mandatory requirements and documentation required for licensing of site selection. The submitted documents obligatory include:

1) Nuclear installation master plan;
2) Nuclear installation construction schedule;
3) Design of nuclear installation to be constructed;
4) The description of the applicant's organization structure, information on the availability of scientific and technical support, description of capabilities on organization and control of nuclear installation construction;
5) The assessment of quantity and properties of radioactive wastes and spent fuel generated during operation of nuclear installation;
6) Description of physical protection of nuclear installations and nuclear materials, safeguards application and design solution;
7) Information on decommissioning of nuclear installations and organization of radioactive wastes and spent fuel management and financial management;
8) Preliminary safety analysis report on nuclear installation;
9) Probabilistic safety analysis report on nuclear installation;
10) Quality assurance program on nuclear installation construction;
11) For operating organization of nuclear installations - copies of documents confirming professional qualification of persons important to safety in the atomic energy utilization field;
12) The expertise of documents specified in the 3^{th}, 6^{th}, 8^{th}, 9^{th} and 10^{th} sub points of this point;
13) The results of public hearing of local authorities and public of the region where the nuclear installation to be constructed.

Main areas of the regulatory review of licence application for Nuclear Installations Designing and Construction are listed below:

- The assessment of quantity and properties of radioactive wastes and spent fuel generated during operation of nuclear installation;
- Description of physical protection of nuclear installations and nuclear materials, safeguards application and design solution;
- Information on organization and financial management of nuclear installations construction decommissioning, radioactive wastes and spent fuel management;
- Preliminary safety analysis report on nuclear installation;
- Probabilistic safety analysis report on nuclear installation;
- Quality assurance program on nuclear installation construction.

G4.1 Limitation of possible radiation impacts on public and the environment

In order to limit the possible radiation impact on individuals, the public and the environment, the safety principles adopted in international practice are built-in in the DSFSF design: the defence in

depth principle, based on the application of a system of physical barriers to the dissemination of radioactive materials and ionizing radiation to work areas and the environment, and the application of a system of technical and organizational measures to ensure the integrity and effectiveness of barriers. ALARA principle adopted and incorporated in the design of DSFSF. Features of the DSFSF system design that are directed toward ensuring ALARA are:

- Thick concrete walls and roof on the HSM to minimize the on-site and off-site dose contribution from the ISFSI.
- A thick shield plug on each end of the DSC to reduce the dose to plant workers performing drying and sealing operations, and during transfer and storage of the DSC in the HSM.
- Use of a heavy shielded transfer cask for DSC handling and transfer operations to ensure that the dose to plant and ISFSI workers is minimized.
- Fuel loading procedures which follow accepted practice and build on existing experience.
- A recess in the HSM access opening to dock and secure the transfer cask during DSC transfer so as to reduce direct and scattered radiation exposure.
- Double seal welds on each end of DSC to provide redundant containment of radioactive material.
- Placement of demineralized water in the transfer cask/DSC annulus, then sealing the annulus to minimize contamination of the DSC exterior and the transfer cask interior surfaces during loading and unloading operations in the fuel pool.
- Use of a heavy shielded door for the HSM to minimize direct and scattered radiation exposure.
- Use of a passive system design for long term storage that requires minimal maintenance.
- Use of proven procedures and experience to control contamination during canister handing and transfer operations.
- Use of water in the DSC cavity during placement of the DSC inner seal weld to minimize direct and scattered radiation exposure.
- Use of water in the transfer cask/DSC annulus during DSC closure operations to reduce radiation streaming through the annulus.
- Use of temporary shielding during DSC draining, drying, inerting and closure operations as necessary to further reduce the direct and scattered dose.

G4.2 Conceptual plans and technical prerequisites for decommissioning of SF management facilities

Conceptual aspects of dry spent fuel storage facility decommissioning are provided in the Chapter

3.5 “Decommissioning considerations” of the Safety Analysis Report of Dry spent fuel storage facility. Decommissioning of the spent fuel storage pools of Unit №1 and Unit №2 is foreseen within decommissioning of the respective Units of the ANPP. It should be mentioned that while dry storage technology is in use at ANPP, spent fuel storage pools with their relevant infrastructure (reloading machine, cranes etc.) shall be kept functional to serve dry storage needs (loading of the cask to be shipped to dry storage, emergency unloading of the casks to the spent fuel etc.).

G4.3 Support of technologies incorporated in the design by experience, testing or analysis

According to OPB section 1.2.5 ANRA requires that technical and administrative decisions made for ensuring NPP safety shall be well proven by the previous experience or tests, investigations, operating experience of prototypes and shall meet requirements of regulatory documents. Such approach shall be applied not only in development of equipment and design of the NPP but also in manufacture of equipment, construction and operation of the NPP, its backfitting and reconditioning of its systems (elements).

Technologies incorporated in the design of the ANPP DSFSF represent adaptation of the technology

for SF storage in casks NUHOMS-56 used in US NPPs. These technologies incorporate operational experience of appropriate storage facilities in the USA and are supported by the analysis provided in the SAR for the storage facility.

G5. Assessment of Safety of Facilities (Article 8)

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

(i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

G5.1 Safety assessment and environmental impact examination

The safety of storage of spent fuel assemblies in the storage pools is analyzed and proved in the report "Technical justification for the safe operation of vibro-resistant, profiled assemblies with medium-enrichment 3.82% at the ANPP Unit №2", 270-Pr-024 (OKB "GIDROPRESS", RF). Spent fuel storage safety assessment results also incorporated in the SAR of ANPP. The procedure for the safe storage of spent fuel assemblies in the storage pools is defined in the following documents:

- Manual on "Storage of nuclear fuel";
- Instruction on "Storage of spent fuel assemblies in storage pools 1 and 2".

The ability to safely transfer spent fuel assemblies from the Unit №2 storage pool to the Unit №1 storage pool and transfer of fuel assemblies from the Unit №1 storage pool to the DSFSF is justified in the following documents:

- "Criticality Safety Analysis of ANPP NUHOMS Type dry Storage Transport Cask", NRSC- RT-ANPP-001/16-001;
- "Analysis of the sources of residual heat release, neutron and gamma radiation of the spent fuel of ANPP with WWER-440 reactor", NRSC-RT-ANPP-001/16-002;
- "Analysis of the dose of the spent fuel transport container of the ANPP", NRSC-RT-ANPP-000/16-004;
- "Thermohydraulic analysis for determination of TC/DSC parameters in the process of transfer of spent fuel from Unit № 2 SF storage pool to Unit № 1 SF storage pool", NRSC- RT-ANPP-001/16-003;
- "Analysis of the sources of residual heat release, neutron and gamma radiation of spent fuel of the VVER-440 ANPP reactor", NRSC-RT-ANPP-002/17-001;
- "Analysis of the dose of the spent fuel transport container of the ANPP", NRSC-RT-ANPP-002/17-003;
- "Thermohydraulic analysis to determine the parameters of the TC/DSC during transfer of spent fuel from 2BV to 1BV", NRSC-RT-ANPP-002/17-002.

The required cooling time for spent fuel assemblies in the storage pool for their transfer to the DSFSF is 5-12 years depending on the initial enrichment and discharge burnup of fuel assemblies.

In accordance with the RA Government Decree № 1085-N as of 23.08.2012 on approval of the requirements to extension of design lifetime for ANPP Unit №2 operation for the design life time extension for the unit operation, the SF management at ANPP was analyzed.

In the reporting period in frame of LTE project a comprehensive assessment of SF management system was performed including instrumental inspection of spent nuclear storage pool.

At the request of ANRA, licensing of the ANPP DSFSF was performed in accordance with the

requirements of the US 10 CFR 72 regulatory guide. According to this document ANPP has submitted the following licensing documents:

- Preliminary Safety Report;
- Final safety report;
- Application for operation licence;
- Statement of accumulation of funds;
- The emergency plan;
- Quality assurance plan;
- Operation instructions;
- Canister loading maps;
- Information on physical protection;
- Personnel training program, qualification certificate.

ANRA reviewed the safety report based on NUREG-1567 Standard Review Plan for Spent Fuel Dry Storage Facilities and applied the same acceptance criteria mentioned in the document.

DSFSF SAR passed independent expertise of the Institute of physical protection and nuclear safety (IRSN, France).

G5.2 SAR re-assessment in construction and commissioning

Following a review of the preliminary version of SAR the regulatory authority made comments and suggestions. As a result, the process of accumulation of dust on the external surface of DSC and associated degradation of heat removal from the surface of DSC was investigated. The report "ANPP Spent fuel dry storage. Thermal analysis of a dusty DSC rested in the HSM. SB24-002.00021" contains a proof that impact of dust with 5 mm thickness on the temperature of the fuel assemblies cladding and on the temperature of the DSFSF component is very low.

In the preliminary version of SAR it was supposed to place 56 cells from stainless steel in the DSC. The subcriticality of DSC did not meet the requirements. For that, additional calculations were performed and the need to place cells made of boron containing stainless steel was justified in the document "ANPP spent fuel storage criticality analysis report" TF/JN/DC/0751 revision A. Results of this review have been included in the renewed SAR, and 24 cells made of boron containing stainless steel were placed in DSC basket.

G6. Operation of facilities (Article 9)

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

(i) the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

(v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vi) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

G6.1 Licences for operation of facilities

RA Government Decree №400-N as of March 24,2005 on approval of operation licensing procedure and licence form for operation of nuclear installations defines mandatory requirements and documentation required for licensing of site selection. The submitted documents shall obligatory include:

- Information on quantity and physical, chemical and neutronic characteristics of nuclear materials used and stored during operation of nuclear facilities, as well as the program on accounting and control of nuclear materials;
- The description of the organizational structure of the operating organization, which includes:
  - The management program of the operating organization and distribution of the safety functions among the structural divisions;
  - System on training, retraining and qualification check of persons holding positions important to safety in the atomic energy utilization field;
  - Job descriptions of persons holding positions important to safety in the atomic energy utilization field;
- Safety Analysis Report (in case of operating NPP - in accordance with the RA Government Decree № 2013-N as of 21.11.2002 on approval of the requirements to form and contents of the Safety Analysis Report of ANPP Unit №2, and in case of DSFSF – in accordance with the NUREG-1567 Standard Review Plan for Spent Fuel Dry Storage Facilities);
- PSA report;
- Classification of safety important SSC;
- QA program on operation of nuclear facilities;
- Technological specification on operation of nuclear facilities;
- On-site emergency response plan;
- Plan on fire safety measures;
- Technical instructions developed jointly with designers and dedicated organizations, which specify limits and conditions of technological processes important to safety during different conditions of NPP operation;
- Program on periodical checks of safety important systems;
- Program on maintenance, testing and periodical checks of SSC important to safety of nuclear installations;
- Program on reactor loading with nuclear fuel. Instructions on nuclear fuel loading, use, unloading and testing in the core;
- Expert conclusion on environmental monitoring and environmental monitoring program for territories adjacent to nuclear facilities;
- Copies of the following licences:
- Use and storage of nuclear materials;
- Use and storage of radioactive materials or devises containing radioactive materials or radiation generators;
- Physical protection of nuclear installations and nuclear materials.

Instructions on management of design and beyond design accidents of nuclear installations. The list of submissions which are mandatory subject of independent expertise includes:

- Safety Analysis Report;
- PSA report;
- Classification of safety important SSC;
- Technological specification on operation of nuclear facilities;
- On-site emergency response plan;
- Program on reactor loading with nuclear fuel;
- Instructions on nuclear fuel loading, use, unloading and testing in the core.

After the safety review and assessment in 2011 the operational licence was granted by ANRA for operation ANPP Unit № 2. The licence is supported by the relevant terms and conditions.

After the safety review and assessment in 2008 the operational licence was granted by ANRA for operation of the DSFSF-2. The licence is supported by the relevant terms and conditions.

DSFSF-1 was licensed in 2000. The licence is supported by the relevant terms and conditions.

G6.2 Definition and revision of operational limits and conditions

In compliance with the "Basic Requirements to NPP Safety", the design of every nuclear installation incorporates the NPP safe operation limits – designed process parameters whose deviations can cause an accident – and safe operation conditions – designed minimal conditions of the quantity, characteristics, operability and maintenance of safety-significant systems (components) intended to maintain the safe operation limits and/or safety criteria. According to the terms of issued licences, the operating organization shall reassess the safety of operating nuclear facilities (DSFSF) and submit associated reports to ANRA every 10 years. The reassessment constitutes the basis for defining and revising operational limits and conditions of the facility.

Operational limits and conditions for DSFSF are set and justified in the Chapter "Operational controls and limits" of SAR of DSFSF.

G6.3 Operating procedures

DSFSF is operated in accordance with the "Instructions for DSFSF Operations". It determines the procedure on organization of transfer of spent fuel assemblies to the DSFSF, safety measures, employees, responsible for the safety of operations, personnel actions in case of unforeseen situations. This instruction also defines the procedure, frequency, and scope of walkdowns and measurement parameters of DSFSF.

The periodic inspection of the transport and technological equipment is performed according to the schedules, approved by the ANPP Chief Engineer and before the beginning of activities on transfer of SF assemblies to the DSFSF.

Spent fuel handling within ANPP is carried out by ANPP technical specifications and internal operating procedures.

G6.4 Engineering and technical support in operation

In conformity with the "Basic Requirements to NPP Safety" the operating organization is responsible for establishing an organizational structure required for safe operation of a nuclear facility as a whole and for its engineering support in particular. To fulfill this condition the operating organization develops and implements relevant programs and takes required actions. In Armenia the main technical support organization for the ANPP is the "Armatom" CJSC.

G6.5 Reporting on incidents significant to safety to ANRA

In accordance with the Article 20 of the Law of the RA on Safe Utilization of Atomic Energy for Peaceful

Purposes the operating organization should investigate accidents and incidents occurred during operation of nuclear installations. In accordance with the Basic requirements to NPP safety the operating organization should provide ANRA with information on operational events in the established order. Criteria of selection of events to be reported to the regulatory body, are described in the RA Government Decree № 418-N as of 05.04.2012 on approval of procedure on investigation of NPP operational events. The procedure establishes:

- Categories of operational events;
- Procedure of accounting and notification of events;
- Procedure on investigation of events.

The investigation commission should be established within 24 hours upon detection of event and investigation should be conducted not later than within 15 days upon its detection.

During the investigation of incidents, the commission should:

- Determine the class of incident;
- Assess the incident according to the International Atomic Energy Agency (IAEA) International Nuclear Events Scale (INES);
- Determine the sequence and deviations of the events that occurred before and during the incident;
- Determine the direct and root causes of the incident;
- Evaluate the importance of the incident from the point of view of its impact on safety;
- Analyze the effectiveness of preventive measures implemented during previous similar incidents;
- Elaborate measures to prevent recurrence of such incident.

The information on all the operational events, emergencies and accidents occurred at nuclear facilities is investigated in compliance with the document "Ensuring investigation and recording events occurred during the ANPP operation" and is reported to ANRA and other relevant organizations.

If required, the representatives of ANRA and their experts participate in the investigation of the operational events occurred at the facility.

G6.6 Analysis of relevant operating experience

ANRA receives information on events in other States through the dedicated IAEA information systems and performs analysis of that information. ANRA is also involved in a number of other IAEA information systems (USIE, NEWS, NUSEC, REGNET, INIS, etc.).

To take taken into account the technological advances, research and development work, relevant operational lessons learned, and institutional knowledge in the review and revision of the regulations and guides, ANRA has established special procedure "Knowledge management" in its QMS (collects and analyze all relevant information, including information from IAEA CRPs, Technical Meetings, Fellowships, Scientific Visits, Workshops, INES, IRS, US NRC information dissemination systems). Furthermore, by the order of ANRA, NRSC (TSO of ANRA) carries out special research and development work that is used in the review and revision as well as in the development of the regulations and guides.

In compliance with the "Basic Requirements to NPP Safety", the operating organization is responsible for the completeness and quality of investigation, development and implementation of measures to prevent further operational events and accidents, submission of truthful and timely investigation reports to ANRA.

The operating organization receives information from WANO on operating experience which is analyzed for further improvement and implementation of the safe operation program.

The operating organization exercises constant monitoring of all activities significant to safety of nuclear facilities. The operating organization submits findings of safety inspections of the facility and periodical reports on current safety level to ANRA. In compliance with the "General Provisions of Nuclear Power Plant Safety Assurance", information on violations of limits and conditions of safe operation shall be included in periodic reports on current safety level. Requirements on annual safety reports are established in the document "Requirements on Annual Safety Reports for WWER NPPs".

In accordance with the ANPP procedures, all of the events, which have impact on the safety, are investigated relative to their significance (the chief engineer is the chairman of the commission), reports on events (with all attachments) are obligatorily submitted to ANRA.

Quality control of the developed reports is made by the QA department with application of the specific QA criteria for the reporting.

ANPP, as operating organization is responsible for the completeness and quality of investigation made, the technical inspection continuously controls the implementation of all the corrective measures approved according event investigation reports and periodically submit information on the control results to ANRA.

During operation DSFSF (2000-2020) showed itself as a solid and safe system for storage of spent fuel. All parameters, characteristic of operational safety of DSFSF, have been established in the SAR and design documentation.

There have been no unforeseen or accident situations.

G7. Disposal of Spent Fuel (Article 10)

If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

Spent fuel is not considered as radioactive waste in the Republic of Armenia and is not designated for disposal.

SECTION H. RADIOACTIVE WASTE SAFE MANAGEMENT

H1. General Safety Requirements (Article 11)

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards. In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;

(ii) ensure that the generation of radioactive waste is kept to the minimum practicable;

(iii) take into account interdependencies among the different steps in radioactive waste management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

H1.1 Criticality and removal of residual heat generated during radioactive waste management

The Article 2 of Law on Safe Utilization of Atomic Energy for Peaceful Purposes stipulates that the Government and state authorities of the Republic of Armenia within the normative legal regulation process implemented in atomic energy utilization field shall ensure the compliance of legal acts related to atomic energy utilization field with requirements of international treaties of the RA and safety standards of the International Atomic Energy Agency.

Detailed information on the national safety requirements and regulations directly pertaining to the management of radioactive waste is provided in Section E2.1 of this report.

H1.2 Minimization of radioactive waste generation

The paragraph 17 of the RA Government Decree № 631-N as of June 04, 2009 on approval of Procedure on Radioactive Waste Management stipulates that the generation of radioactive wastes should be kept on the level as low as reasonably achievable.

One of the main tasks stipulated in the "Strategy on Safe Management of Radioactive Waste and Spent Fuel in RA", approved under the RA Government Protocol Decision №42 as of October 5, 2017 and its implementation Action Plan is reducing generation of RW of different classes by introducing different technical solutions, by application of the principle "polluter pays", etc.

One of the RW related terms and conditions to the licence issued by ANRA in 2011 for operation of nuclear facility (ANPP) is the minimization of radioactive waste generation.

Implicitly, the legislation in force considers the concept of radioactive waste minimisation by establishing clearance levels in the RA Government Decree № 1219-N as of August 18, 2006 on approval of Radiation Safety Norms.

A number of activities are performed to ensure the minimization of radioactive waste generation at ANPP, for instance:

- The standard committee is established to analyze quarterly the generation of radioactive waste and, if necessary (in excess of the expected level of waste generation), to develop corrective measures;
- Daily monitoring of the volume of generated radioactive liquids is performed versus the rates established;
- Appropriate documents are issued, e.g. "Program on minimization of solid radioactive waste",

"Guidance on minimization of solid RW at the ANPP";

- Before entering the controlled area equipment are withdrawn transport packaging and are removed from lubricants;
- The radioactive waste management issues are incorporated in ANPP personnel training programs, etc.

The ratio of projected and actual annual SRW streams at ANPP during the reporting period (from 2017 to 2019) with the result of actions undertaken to minimize waste streams is provided on the Figure 7 of Annex J of Section L of this report.

H1.3. Interdependencies among the different steps in radioactive waste management

The paragraph 18 of the RA Government Decree № 631-N as of June 04, 2009 on approval of Procedure on Radioactive Waste Management stipulates that all stages of radioactive waste generation and its further management should be interconnected.

Pursuant to the recommendation of IAEA IRRS mission hosted in June 2015 to ensure integrated consideration of effectiveness of RW predisposal management, the elaboration of requirements for development of preliminary waste acceptance criteria for the storage and the disposal of radioactive waste packages is ongoing on the basis of conservative evaluation of experience and operational practice gained in analogical circumstances (i.e. application of verified world practice).

H1.4 Radiation protection of personnel, population and the environment

The RA Government Decree № 1219-N as of August 18, 2006 on approval of Radiation Safety Norms applies to planned, emergency and existing exposure situations and specifies the dose limits to workers and public.

The RA Government Decree № 1489-N as of August 18, 2006 on approval of the Radiation Safety Rules defines safety rules for protection from sources of ionizing radiation with characteristics equal to or exceeding the exemption levels stipulated in the Radiation Safety Norms and applies to occupational, public and medical exposure categories.

Detailed information on this issue is provided in the Section F4 of this report.

H1.5 Biological, chemical and other hazards that may be associated with radioactive waste management

The requirements on due consideration and control of hazards other than radioactivity in the management of radioactive waste are stipulated in the Section XII of the RA Government Decree

№ 1489-N as of August 18, 2006 on approval of the Radiation Safety Rules. For an example, the para. 148 of Radiation Safety Rules sets that the storage periods of radioactive waste containing large amounts of organic materials (e.g. corps of animals used for biological tests, samples, vegetation and other) shall not exceed 5 days, if their cooling or storing in relevant solutions is not arranged; the paragraph 149 establishes that flammable and explosive radioactive wastes shall be brought in safe condition before transfer to storage or disposal facility.

Chemical, explosive, toxic hazards associated with radioactive waste management are considered in the Safety Analysis Report for ANPP operation based on existing regulations and the operating procedures for waste management.

H1.6 Impacts on future generations

The RA Government Decree № 1219-N as of August 18,2006 on approval of Radiation Safety Norms is the document that establishes the standards ensuring the minimum risk from the harmful effects of ionizing radiation to present and future generations. This document is revised and harmonized with the IAEA Safety Standards Series GSR Part 3 Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards. More details are described further, in H1.7.

H1.7 Reduction of burdens on future generations

The para. 3 of ordinance of the RA President № 7 as of 19 January 2017 on approval of Concept on safe management of spent fuel and radioactive waste in RA stipulates that the Secretary of the National Security Council under the RA President shall quarterly present to the President of the Republic of Armenia a summary information on the implementation of programmes that ensure application of provisions set in the Concept on safe management of spent fuel and radioactive waste in RA.

The para 1-5) of article 2 of the "Strategy on Safe Management of Radioactive Waste and Spent Fuel in RA" stipulates that current and future generations, as well as the environment, must be protected from the risk of ionizing radiation.

As described in H1.6 of the report, the Radiation Safety Norms also gives requirements towards ensuring the minimum risk from the harmful effects of ionizing radiation to present and future generations.

All these provisions described above are to provide for the reduction of burdens on future generation.

H.2. Existing facilities and past practices (Article 12)

Each Contracting Party shall in due course take the appropriate steps to review:

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

There are two radioactive waste management facilities in the Republic of Armenia:

- ANPP for nuclear waste management;
- Institutional waste management facility (Radon type facility) for management of waste from non-nuclear facilities.

The detailed description of the radioactive waste management systems available at ANPP is provided in the Section D3 of this report. The information on the efforts on RWM safety improvement is provided in the Section K of this report.

Systematic radiation monitoring is performed in the premises where the storage systems for high and intermediate level liquid wastes and deep evaporation facility are located. Radiation monitoring is performed also on the territory of low-level solid radioactive waste storage system. The frequency of radiation monitoring is specified in the "Technological specification on radioactive monitoring". The measurements of level and activity concentration of ground waters (if present) in the control boreholes is made. Ground waters in the control boreholes were not detected in the reporting period. Observation on the physical condition of storage facilities is regularly made.

Frequency of observations is specified in the annually developed schedules. In the reporting period no violation in the physical condition of the radioactive waste storage systems was detected. In 2015 in accordance with the approved programs activities on retrieval, sorting and repackaging of solid intermediate level radioactive wastes stored in the compartment OS-109 of the storage facility were performed. At that, a part of waste was segregated as low level solid radioactive waste and transferred to the storage facility for solid low level radioactive waste; the other part was placed in the compartment OS-109 of solid intermediate level radioactive waste storage facility.

To prevent unauthorized access the number of persons having access to the radioactive waste storage facility is limited. The solid low level radioactive waste storage facility is guarded by the police troops of RA.

Near surface institutional radioactive waste management facility

The design capacity of the near-surface radioactive waste storage facility is 2268 m^3. It consists of three separate storages, each with a capacity of 756 m^3, with seven two-layer underground concrete chambers, closed by concrete slabs. The detailed description of the institutional waste management facility, its location, main purpose and essential features are provided in the Section D3 of this report.

H3. Siting of proposed facilities (Article 13).

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.

No activities on siting for radioactive waste management facilities were performed in the reporting period.

H4. Design and construction of facilities (Article 14)

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

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

(iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;

(iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

No activities on designing and construction of radioactive waste management facilities were performed in the reporting period.

H5. Assessment of safety of facilities (Article 15).

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

(i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;

(iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

The RA Government Decree № 416-N as of March 31, 2005 on approval of the licensing procedure and licence form for construction of radioactive waste storage facility set provisions for submission of radioactive waste storage facility preliminary safety analysis report and of environmental impact assessment report in support to the licence application for construction of radioactive waste storage facility.

The RA Government Decree № 702-N as of May 19, 2005 on approval of the licensing procedure and licence form for operation of RW storage facility set provisions for submission of radioactive waste storage facility safety analysis report and of environmental impact assessment report in support to the licence application for operation of radioactive waste storage facility.

All RW storage systems at ANPP are included in the ANPP design. And subsequently all issues related to safety assessment are provided for in the SAR for the ANPP Unit №2.

In collaboration with Russian Federation specialists a survey was performed at ANPP in the reporting period. The survey objective was to assess the technical condition of radioactive waste management facilities available at ANPP and to provide appropriate solutions for processing and storing of radioactive waste that are accumulated at ANPP and to be generated during the extended lifetime of ANPP Unit №2.

On the basis of performed activities, the reports with analysis of the results of work and the appropriate recommendations were prepared. Consequently, the Concept was developed on the management of radioactive waste at ANPP for an extended operation lifetime of the ANPP Unit

№2 taking into consideration the up-to-date safety requirements. The aforementioned Concept was agreed with ANRA and in terms of agreed Concept the detailed Programme, including work breakdowns and time schedule was developed in June, 2018 for the period from 2018-2023 More details about the content of the program are given further, in section K, under Article 34 of the report.

The safety assessment of institutional waste management facility was accomplished in the frame of preparation of licensing submittals. The licence granted by ANRA for operation of institutional waste storage facility was renewed in August 2019 for additional 10 years, according to the RA legislation.

H.6. Operation of Facilities (Article 16)

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

(i) the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

(v) procedures for characterization and segregation of radioactive waste are applied;

(vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vii) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;

(ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information

obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

H6.1 The licence to operate a radioactive waste management facility

The radioactive waste management facilities existing at ANPP site are included in the ANPP design and are covered by licence granted by ANRA in 2011 for operation of ANPP Unit № 2.

Institutional waste management facility is operated by the "Rendering Harmless of Radioactive Waste" CJSC in accordance with the licence granted by ANRA in 2009. As was mentioned before, the license was renewed for additional 10 years according to RA legislation, in August, 2019.

H6.2 Definition of operational limits and conditions and their revision

Operational limits and conditions of radioactive waste management facilities are established in their design and corresponding operational procedures. Relevant operational documents pertaining to radioactive waste management have been elaborated and are in force at the ANPP, for instance:

- The procedures on operation of RW management systems and equipment, where the rules and basic techniques of safe operation, order of performing operations, instructions on safe operation rules are described.
- Liquid RW generation rates during the ANPP operation;
- Programmes on implementation of specific RW management activities.

The operational documentation is regularly reviewed.

H6.3 Operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility and availability of engineering and technical support

Scheduled maintenances are regularly performed at ANPP for the equipment of RW management facilities. Maintenance plans and schedules for ANPP systems are developed on the basis of "Administrative Management Program, Maintenance and Repair" UR.ATD13.OPR-001, which was developed in accordance to the requirements of «Maintenance and Repair Organization Rules for NPP Systems and Equipment» RD EO 0069-97, «Maintenance System of NPP equipment. Standard Documents on Equipment Maintenance and Scheduled Repair. Types and Forms of the Documents. Rules for Preparing and Drawing up» RD 53.025.010-89 and the rules and norms for safety in nuclear field, design documentation for the ANPP systems, operational and repair documentation for the equipment of company-developer/manufacturer.

The responsibility for organizing maintenance current planning and implementation of non-scheduled maintenance rests with the ANPP Chief Engineer on maintenance.

The Maintenance Planning and Implementation Department, jointly with the owner departments, prepares annual outage master plans for the ANPP basic facilities and systems, submits to the Chief Engineer, Deputy Chief Engineer on operation, Deputy Chief Engineer on maintenance, Deputy Chief Engineer on safety, Deputy Chief Engineer on modernization to be agreed, and to ANPP Director General to be approved within 8 months prior to the start of the scheduled year. Once the schedules are agreed on and approved, all the ANPP departments and Contractor organizations-maintenance executors are provided with them not later than within 2 months prior to the start of the scheduled year.

The annual maintenance master plans for the equipment of NPP main facilities include major overhauls, intermediate, current maintenances of the main facilities, as well as activities on modernization and reconstruction, if at the moment of the plan development the approved technical documentation for those activities, the means for material resources are available, contracts with suppliers have been concluded, where hardware delivery dates are within 15 days prior to the start of the outage.

All the annual maintenance schedules for the auxiliary and the plant equipment are developed by the Maintenance Planning and Implementation Department jointly with the equipment owner departments, are agreed with maintenance executors, approved by the ANPP Chief Engineer, and

are submitted to the equipment owners and the work executors within 10 days prior to the start of the scheduled period. The schedules are prepared in view of combining maintenance for all the items belonging to a system or assembly, including heat mechanical, electrical parts, I &C equipment.

On the basis of annual maintenance schedules of the plant auxiliary equipment and the actual corrections to the maintenance dates for the main and the auxiliary equipment, monthly maintenance schedules and exact dates of the scheduled activities are prepared by the Maintenance Planning and Implementation Department, agreed with the equipment owner departments, with the work executors and by the 25th date of the month preceding the scheduled one, is approved by the ANPP Depu

ty Chief Engineer on maintenance. The approved monthly schedules prior to the start of the scheduled month are provided to the work executors and the equipment owner departments.

The checks/inspections of the ANPP systems operability is performed on the basis of annual schedule. The person in charge of developing the annual schedule for periodic checks of operability of the systems important to safety (SIS) is Head of the Operation Support Technical Department. The person in charge of developing the annual schedule for periodic tests of the normal operation system (NOS) is Head of equipment owner department. The requirements to the schedule and the order of SIS and NOS tests are set in Guideline "The Order of Performing Checks and Tests of the ANPP Equipment and Systems".

Maintenance programs are being developed, for which equipment maintenance schedules are annually developed and approved. Based on the results of the equipment condition control, a decision is taken to perform unscheduled equipment maintenance.

H6.4 Procedures for characterization and segregation of radioactive waste

The radioactive waste characterization and sorting is performed in accordance with the corresponding procedures established at the ANPP. The SRW sorting is performed at the place of collection and on the basis of RW classification. With this, the SRW are placed into paper or polyethylene bags, and then into collection containers, corresponding to SRW activity category. The SRW sorting, like all the other operations carried out with SRW, are implemented under radiation monitoring. The monitoring is ensured by the Radiation Safety Department of ANPP.

The collection, sorting, packaging and placement into SRW collection containers are implemented in accordance with the following pattern of responsibilities allocation:

- The responsible person at whose workplace RW has been generated as a result of work performance:
  - submits an application on RW generation to the Shift Supervisor (duty health physicist) of the Radiation Safety Department to arrange for their activity measurement;
  - under the supervision of the duty health physicist, he arranges for SRW packaging into polyethylene or multi-layer paper bags;
  - arranges for the placement of the bags containing SRW into the collection containers complying with their classification.
- The responsible person from Decontamination and RW Management Department in the controlled area (Senior Foreman of the Decontamination and RW Management Department):
  - monitors activities on SRW collection, sorting, transportation within the controlled area;
  - indicates the collection containers, where the SRW should be placed;
  - supervises SRW placement into the collection containers;
- The Radiation Safety Department Shift Supervisor (duty health physicist):
  - On the basis of the responsible person's application, at whose workplace the RW has been generated as a result of work performance;

- In the absence of the responsible person from Decontamination and RW Management; Department he supervises during the evening and night shifts, as well as on weekends and holidays the SRW packaging into bags, their further transportation and placing into corresponding collection containers.

The liquid RW management system at the ANPP envisages for their collection and processing on special process facilities, as a result of which the LRW is divided into:

- Unbalanced waters, which once they are purified and radiation-monitored, may be discharged into domestic sewage;
- Liquid radioactive media subject to reuse in industrial purposes;
- Active sorbents and evaporation concentrate subject to being stored in liquid RW storages;
- Solidified liquid waste to be stored in SRW intermediate level storage.

H6.5 Investigation of deviations and events important to safety

Deviations in operation are investigated in compliance with the order established at the ANPP. The order of event investigation at the ANPP is regulated in Guideline "Organization and Conduct of Event Investigation at the ANPP". The process of organization of event investigation is provided in Figure 6 in Annex J of Section L of this report.

To investigate events important to safety, by the Director's order a Central Commission chaired by the ANPP Chief Engineer is established. The Commission investigates the event and prepares a report.

The Chairs of the Commission on the level of Technical Commission Investigation and Departments Investigation are assigned by the Chief Engineer. Commissions are organized to consist of not less than three people. The Commission members are assigned by the Chairman. The specialists of Operational Experience Department are members of commissions of all levels.

The investigation conduct is aimed at identifying event circumstances:

- What has happened? (sequence of events, initial failure or inadequate actions);
- Where did it happen? (area, within which the event occurred);
- When did it happen? (time of the event occurrence, including its chronology)
- How did it happen? (stages of event progress and /or personnel's actions);
- Why did it happen? (causes of the event);
- Who is involved in the event? (the personnel, having relation to the event).

The selection from event database is also carried out for obtaining information on similar events in order to identify whether the corrective measures taken earlier were aimed at preventing event recurrence and why they proved to be inefficient.

Once the direct and root causes of the event are identified, the commission develops corrective measures aimed at:

- Elimination of event consequences;
- Elimination of direct, root causes and contributors;
- Elimination of faults in other areas, identified in the course of investigation.

Corrective measures are developed in view of the fact that they should be:

- Specific and practical, intended for preventing recurrence of each abnormal case of event;
- Agreed in terms of dates and scopes with the executors that are responsible for their execution;
- Timely and prioritized;

- Short-term (urgent), to eliminate the direct causes prior to implementation of long-term corrective measures;
- Feasible (sufficiency of resources to perform a task);
- Aimed at fulfilling the absolute requirements of the Standard Technical Documentation.

In view of the peculiarity of a specific event, in order to eliminate its consequences/causes, short-term (urgent) measures, aimed at elimination of direct causes prior to long-term corrective measures implementation, may be taken.

The efficiency of the suggested corrective measures is determined by the answer to the following questions with subsequent questions "Why?":

- Will the implementation of a particular corrective measure not lead to negative consequences?
- What impact does the corrective measure implementation have on the personnel?
- Is the corrective measure implementation feasible within the specified dates?
- Are the corrective measures clear to be successfully implemented?
- Do the particular corrective measures eliminate all the direct and root causes?
- Will the particular corrective measures enable to prevent the event recurrence?
- Will the implementation of a particular corrective measure be economically feasible?
- What are the consequences of not-implementing a particular corrective measure?

H.6.6 Availability of programmes to collect and analyze relevant operating experience

The collection, analysis, systemization and storage of information related to operating experience of radioactive waste management facilities are implemented by the Operational Experience Department of ANPP. For the reported period no deviations have been recorded in operation of RW management facilities.

H6.7 Availability of decommissioning plans for a radioactive waste management facility

The radioactive waste management facilities existing at ANPP site are included in the ANPP design and their decommissioning is not considered separately from the ANPP decommissioning. Detailed information on this issue is provided in Section F6 of this report.

Decommissioning plan is not available for the institutional waste management facility.

H6.8 Plans for the closure of a disposal facility

There is no radioactive waste disposal facility in the Republic of Armenia.

H7. Institutional Measures after Closure (Article 17).

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

(i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

(ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

(iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

There is no RW disposal facility in the Republic of Armenia.

SECTION I. TRANSBOUNDARY MOVEMENT (Article 27)

1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

In so doing:

(i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

(ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

(iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

(iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.

3. Nothing in this Convention prejudices or affects:

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

There is no transboundary movement of spent fuel and radioactive waste through or for the Republic Armenia. All SF and RW generated in Armenia are stored in Armenia.

The Article 22 of the Law on Safe Utilization of Atomic Energy for Peaceful Purposes stipulates that the import of radioactive waste into the Republic of Armenia from other states is prohibited except where the waste was generated by the other state as a result of rendering a certain service to the Republic of Armenia and their import into the Republic of Armenia is foreseen under the international treaties of the Republic of Armenia, to the extent that the quantity and general activity of the radioactive waste correspond to the current technological conditions.

SECTION J. DISUSED SEALED SOURCES (Article 28).

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

2. A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

The RA Government Decree № 1479-N as of December 17, 2015 on amendments and supplements to the Government Decree № 1790-N as of 09.12.2004 on approval of procedure on licensing of import to and export from the Republic of Armenia of ionizing generators, radioactive materials and equipment containing radioactive materials set provisions for return of imported 1st, 2nd and 3rd classes radioactive materials or equipment containing radioactive materials to the manufacturer after their service life expires and requires to provide the copy of the contract for return with the licence application for import.

For the management of DSS in the RA the Government Decree № 1489 as of August 18, 2006 on approval of Radiation Safety Rules specifies that radioisotope sources not intended for further use are considered a solid radioactive waste.

SECTION K. GENERAL EFFORTS TO IMPROVE SAFETY

Article 34 of INFCIRC/604/Rev.3.

This section provides an opportunity to give a summary of safety issues of concern identified earlier and of planned future actions to address those issues, including, where appropriate, measures of international co-operation.

On October 5, 2017 the "Strategy on Safe Management of Radioactive Waste and Spent Fuel in RA" was approved under the RA Government Protocol Decision №42. It represents the strategic issues of upgrading RW and SF management system in Armenia and gives the approaches for their implementation.

Then, for achieving the strategic goals and for the implementation of provisions stipulated in the strategy, on January 10, 2019 the Government Decree N 3-L was approved, which identifies the responsible authorities/entities, timeframes, funding routes and as well the supervision of implementation/control mechanisms. It incorporates also ANPP activities on enhancement of spent fuel and radioactive waste management specified in their corresponding programs.

More details on strategy provisions and activities stipulated for their implementation are described in Section B of the current report.

The examination of the SSCs related to spent fuel safe management has being implemented in the frame of ANPP Unit 2 lifetime extension activities aimed to extend the period of their operation. Besides, the analysis of deviations of the design of ANPP Unit №2 from the requirements of the existing regulations has being performed.

The list of documents that has been analyzed for deviations related to safe management of spent fuel includes:

- General provisions for the safety of nuclear power plants. OPB-88/97, PNAE G-01-011-97 (NP-001-97);
- Nuclear Safety Rules for NPP reactors, NP-082-07;
- Safety rules for the storage and transportation of nuclear fuel at NPPs, NP-061-05.

As a part of activities related to the ANPP lifetime extension, the "Concept for management of RW at ANPP for an extended operation lifetime of the Unit №2" taking into consideration the up-to-date safety requirements, has been developed. The document was developed on the basis of results of survey accomplished in collaboration with Russian Federation specialists, and purposely to assess the technical condition of radioactive waste management facilities available at ANPP and to provide appropriate solutions for processing and storing of radioactive waste that are accumulated at ANPP and to be generated during the extended lifetime of ANPP Unit №2. The document foresees the upgrade of existing RW management system at ANPP by implementation certain projects, e.g.:

Based on that, the Program of activities for management of the radioactive waste existing at the ANPP and generated during the additional period of operation of the ANPP Unit 2 was developed and approved at ANPP in 2018.

The ultimate objective of the program is to bring the system of RW handling at the ANPP in accordance with the up-to-date safety requirements.

The program consists of 4 projects:

- Project 1. Development and implementation of RW accounting and control system;
- Project 2. Modernization of the system of liquid radioactive waste processing;
- Project 3. Modernization of the system of solid radioactive waste processing;
- Project 4. Establishment of capacities for storage of conditioned RW.

The implementation of the Program activities will ensure safe handling of the radioactive waste accumulated at the ANPP and generated within the additional period of operation of the ANPP Unit №2.

Article 35 of INFCIRC/604/Rev.3.

This section should also summarize

(a) measures taken to address suggestions and challenges identified at previous Review Meetings.

The challenges identified during the 6th Review Meeting and the measures taken by the Republic of Armenia to address them are followings:

1. Improvement of the RW management practice in compliance with the up-to-date safety requirements.

In terms of "Concept for management of RW at ANPP for an extended operation lifetime of the Unit №2", developed by ANPP and agreed with ANRA, the detailed Programme, including work breakdowns and time schedule was developed by ANPP in June, 2018 for the period from 2018-2023. The activities prescribed in the Programme are continuously performed and periodic reports are sent to ANRA, as prescribed in ANPP License Terms and Conditions, point 2.45.

2. Extension of the storage capacity for SF management.

Based on document "Conception of ANPP on SF management approaches, generating in the LTE period of Unit №2", the current DSFSF capacities are enough to safe operation to 2024, and new DSFSF should be constructed to 2024 and first loading is planned on 2024.

3. Decommissioning is linked to the SF management. While dry storage technology is in use at ANPP, SF storage pools with their relevant infrastructure shall be kept functional to serve dry storage needs.

Some of SSC of ANPP Unit 1 and Unit 2 are using for operation ANPP Unit 2 and should be need for safe decommissioning ANPP Unit 1 and Unit 2, as well as for operation DSFSFs. This concept is taken in to account during evaluation of SSC and justification of residual lifetime in frame of LTE project.

According to the ANPP Spent Fuel management approach it is planned to introduce vertical dual purpose casks to get rid of dependence of the availability of ANPP spent fuel pools.

4. Establish sufficient financial resources to implement decommissioning. Financial support of International Organizations and funding from other sources will be required.

In accordance with the RA Government Decree №1637 as of October 16, 2006 on opening a special account for decommissioning of ANPP a special fund was created to provide implementation of decommissioning work. It is prohibited to use financial recourses accumulated in this fund for other purposes. Financial resources, accumulated in this fund are not enough for implementation of decommissioning in accordance with the implemented evaluation of expenses. RA Government inquiries into the matter of the current topic. RA Government initiated the discussion to increase the decommissioning found. ANRA has suggested to review DPP and increase monthly payments.

(b) strong features in its current practices, possible areas for improvement, major challenges that the Contracting Party has identified for itself and how the Contracting Party plans to address these issues.

1. The RA signed the Comprehensive and Enhanced Partnership Agreement (CEPA) in November 2017. The roadmap has been developed to harmonize the national legislation with the EU directives. The first challenge is recognized is the harmonize the national legislation with the EU directives, including COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.
2. The second challenge recognized is the implementation of "new" requirements adopted after the harmonization of RA legislation with the EU Directives.
3. The third challenge for RA is slow process of development of ANPP Decommissioning program

and the update of the DPP.

4. The fourth challenge is the insufficient financial resources to implement the decommissioning programme.

Article 36 of INFCIRC/604/Rev.3.

This section should:

- For those countries hosting, having hosted, or planning to host international peer review missions and follow-up missions, include a description of policies, plans and schedules for such peer review missions;

- Include the measures taken by the Contracting Party to voluntarily make public the reports on their international peer review missions.

International cooperation activities to enhance the management of spent fuel and radioactive waste are implemented by the Republic of Armenia in frame of EC INSC projects, IAEA Technical Cooperation program and other instruments.

Armenia hosted the IAEA IRRS follow-up mission from 10 to 17 June 2019. The objective of the mission was to review the implementation of recommendations and suggestions made during the initial IRRS mission in 2015. The team found that since 2015, Armenia has taken key steps for radioactive waste by adopting a strategy for spent fuel and radioactive waste management, and by intensifying inspections related to emergency preparedness and response. Armenia is still addressing some other recommendations and suggestions from the 2015 mission, in part because the country is undertaking a comprehensive legislative review process. The IRRS follow-up report to Armenia is published on ANRA website.

Armenia hosted the EU Stress Test Peer Review Follow-up Mission in the period of 25-29 November 2019. The team reviewed the adequacy of the NAcP structure and content and discussed the timescales for implementation of the specified improvements. The EU Stress Test Peer Review Follow-up Mission team recognized that significant efforts were undertaken since 2016 and good progress has been made to protect the installations from external hazards. The "EU Peer Review Report on Implementation of Armenian Stress Test National Action Plan" is published in ENSREG website.

The following projects have been implemented in frame of EC INSC:

- INSC Project A4.01/09 "Development of Radioactive Waste and Spent Fuel Management Strategy for Armenia" (2013-2015);
- INSC ARRA07 project "Enhancement of ANRA and NRSC capabilities for safety review and assessment of radioactive waste management facilities and activities" (2016-2018).

The objective of the project was:

- To improve of the radioactive waste management safety in the Republic of Armenia and contribute to strengthening of the national infrastructure of radioactive waste management in Armenia,
- To strengthen ANRA and NRSC capabilities in review, assessment and associated decision making on safety of the radioactive waste management.

Article 37 of INFCIRC/604/Rev.3.

This section should include information on the actions taken to enhance openness and transparency in the implementation of the obligations under the Convention.

Armenia undertakes measures to fulfill the obligations under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Activities resulted from implementation of the Joint Convention are included in the Government Annual Plan and in ANRA annual workplan. The national reports under the Joint Convention are posed on ANRA web page.

ANRA organizes press conferences for mass media as well as updates regularly its web page to

communicate on issues related to regulation of nuclear and radiation safety in the nuclear facilities.

SECTION L. ANNEXES

Annex A. List of spent fuel management facilities (as of 1 January 2020).

Table 5. List of SF management facilities at ANPP

Name of facility	Location	Main purpose	Comment
Storage pools of ANPP Unit №1 and №2	Reactor Building, ANPP	Retention of SF to reduce the level of residual heat	In operation
Dry Spent fuel Storage Facilities № 1 and № 2	ANPP site	Storage	In operation

Annex B. List of radioactive waste management facilities (as of 1 January 2020).

Table 6. List of RWM facilities at ANPP

№	Name of facility	Location	Main purpose
1	Solid LLW storage facility	ANPP site	Storage of solid low level radioactive waste
2	Solid ILLW storage facility	Auxiliary Building, ANPP	Storage of solid intermediate level radioactive waste
3	DEF containers temporary storage site	Auxiliary Building, ANPP	Storage of DEF containers with “salt cake”
4	Solid HLLW storage facility	Reactor Building, ANPP	Storage of solid high level radioactive waste
5	Liquid RW storage facilities (ECTs and HLST-1)	Auxiliary Building, ANPP	Storage of evaporator concentrates
6	Liquid RW storage facility (HLST-2)	Auxiliary Building, ANPP	Storage of ion exchange sorbents
7	Deep Evaporation Facility	Auxiliary Building, ANPP	Treatment of evaporator concentrates

Annex C. List of nuclear facilities in the process of being decommissioned

There is no nuclear facility in the process of being decommissioned in the Republic of Armenia.

Annex D. Inventory of spent fuel (as of 1 January 2020).

Table 7. Inventory of spent fuel stored at ANPP

№ п/п	Name of facility	Quantity of SNF assemblies, items	Quantity of DSC, items
1	Storage pool of Unit № 1	299	---
2	Storage pool of Unit № 2	121	---
	In total	**420**	---
3	DSFS-1	616	11
4	DSFS-2-1	672	12
5	DSFS-2-2	504	9
	In total	**1792**	**32**

Annex E. Inventory of radioactive waste (as of 1 January 2020).

Table 8. Inventory of radioactive waste stored at ANPP

№	Name of facility	Location	Design capacity, m^3	Accumulated RW, m^3	Note
1	Solid LLW storage facility	ANPP site	17051	6795	
2	Solid ILLW storage facility	Auxiliary Building,	1001	480	Including 372 $м^3$(1716 DEF containers)
3	DEF containers temporary storage site	Auxiliary Building,	No more than 3000 containers	435 (1978 containers)	
4	Solid HLW storage facility	Reactor Building,	78	38	
5	Liquid RW storage facilities (6 ECTs and HLST-1)	Auxiliary Building,	3170	2349	
6	Liquid RW storage facility (HLST-2)	Auxiliary Building,	350	203	

* storage facilities for solid VLLW are not available at the ANPP

Table 9. Inventory of radioactive waste stored at institutional waste management facility

Name of facility	Storage capacity, m^3	Accumulated RW, m^3	Total activity, [TBq]
Institutional waste storage facility	2268	267	51

Annex F. References to national laws, regulations, requirements, guides

The international treaties ratified by the Republic of Armenia

- Convention on Nuclear Safety ratified on 24.09.1997
- Convention on Early Notification about Nuclear Accident ratified on 22.06.1993
- Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency ratified on 22.06.1993
- Vienna Convention on Civil Liability for Nuclear Damage ratified on 22.06.1993
- Convention on Physical Protection of a Nuclear Material ratified on 22.06.1993
- Amendment to the Convention on Physical Protection of Nuclear Material signed on 8 July 2005 adopted by the National Assembly as of 18.03.2013
- CTBT Comprehensive Nuclear-Test-Ban Treaty ratified on 21.12.1993
- Treaty on the Non-Proliferation of Nuclear Weapons ratified on 24.09.1991
- Agreement between the Republic Armenia and the International Atomic Energy Agency for the Application of Safeguards in connection with Treaty on the Non-Proliferation of Nuclear Weapon signed on 23.09.1993
- Protocol Additional to the Agreement between the Republic Armenia and the International Atomic Energy Agency for "The Application of Safeguards in connection with Treaty on the Non-Proliferation of Nuclear Weapon ratified on 28.06 2004
- Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the International Atomic Energy Agency to the Government of the Republic of Armenia ratified on 04.06 2003
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ratified on 21.03.2013.

Laws Adopted in Atomic Energy Utilization Field

- Law on Safe Utilization of Atomic Energy for Peaceful Purposes with amendments and supplements
- Law of the RA on Licensing
- Code of the RA on Administrative Offences
- Law of the RA on Normative Legal Acts (21.03.2018 HO-180-N)
- Law of the RA on Civil Service (27.12.2001 HO-272)
- Law of the RA on Population Protection in case of Emergencies (02.12.1998 HO-265)
- Law of the RA on Organization and Conduct of Inspections (17.05.2000 HO-172)
- Criminal Code of the RA (18.04.2003)
- Law of the RA on Administration Principles and Procedure (18.02.2004 HO-41N)
- Law of the RA on Energy (07.03.2001 HO-148)
- The Law of the RA on Environmental Impact Expertise (22.07.2014).

Government Decrees Adopted in Atomic Energy Utilization Field

- Government Decree № 573-N as of 13.11.1993 on establishment of the state authority under the government of the RA on regulation of nuclear and radiation safety for atomic energy utilization (ANRA)

- Government Decree № 768-N as of 22.12.1999 on approval of the list positions important in terms of safety in atomic energy utilization field
- Government Decree № 342-N as of 25.04.2001 on establishment of the scientific and technical center on nuclear and radiation safety
- Government Decree № 640-N as of 12.07.2001 on approval of the procedure for organization and conduct of safety expertise in the atomic energy utilization field
- Government Decree № 2013-N as of 21.11.2002 on approval of the requirements to form and contents of the Safety Analysis Report of ANPP Unit №2
- Government Decree № 1953-N as of 30.10.2004 on preparedness to response to nuclear and radiation emergencies in the RA
- Government Decree № 1792-N as of 09.12. 2004 on approval of the procedure licensing and form of licence for storage of radioactive materials, devices containing radioactive materials, or radiation generators
- Government Decree № 257-N as of 10.02. 2005 on approval of the licensing procedure and licence form for designing of systems, structures and components important to safety of atomic energy utilization object
- Government Decree № 258-N as of 10.02. 2005 on approval of the licensing procedure and licence form for manufacture of systems, structures and components important to safety of atomic energy utilization object
- Government Decree № 345-N as of 24.03.2005 on approval of the licensing procedure and licence form for expertise of atomic energy utilization objects, their designs and other documents
- Government Decree № 400-N as of 24.03. 2005 on approval of the licensing procedure and licence form for operation of nuclear installations
- Government Decree № 608-N as of 12.05. 2005 on approval of the licensing procedure and licence form for designing of nuclear installations
- Government Decree № 609-N as of 12.05. 2005 on approval of the licensing procedure and licence form for site selection of nuclear installations
- Government Decree № 649-N as of 12.05. 2005 on approval of the licensing procedure and licence form for construction of nuclear installations
- Government Decree № 707-N as of 01.06. 2005 on approval of the licensing procedure and licence form for decommissioning of nuclear installations
- Government Decree № 781-N as of 16.06. 2005 on approval of the licensing procedure and licence form for services and practices not foreseen in the original design implemented during site selection, designing, construction, commissioning, operation and decommissioning of nuclear installations
- Government Decree № 1858-N as of 14.12.2006 on approval of the licensing procedure and licence and application form and procedure for qualification check of physical persons holding positions important for safety in atomic energy utilization field
- Government Decree № 1489-N as of 18.08. 2005 on approval of radiation safety rules
- Government Decree № 1219-N as of 18.08. 2005 on approval of radiation safety norms
- Government Decree № 1637-N as of 16.10.2006 on opening a special account for decommissioning of ANPP
- Government Decree № 532-A as of 03.05.2007 on approval of composition of a commission on management of special account for decommissioning of ANPP

- Government decree № 866-N as of 17.07.2008 on establishment of the State Committee under the Government of the RA on Nuclear Safety Regulation, approval of the statute and organizational structure, content and size of property of the State Committee under the Government of the RA on Nuclear Safety Regulation
- Government Decree № 602-N as of 29.05.2009 on amendments to the licensing procedures of the atomic energy utilization field
- Government Decree № 631-N as of 04.06.2009 on approval of the procedure on radioactive waste management
- Government Decree № 418-N as of 05.04.2012 on approval of procedure on investigation of NPP operational events
- Government Decree № 709-N as of 04.07.2013 on approval of List of Internal Legal Acts Applied in Atomic Energy Utilization Field in Russian and in English
- Government protocol decree №43 as of 4 November 2010 on approval of Concept on safe management of radioactive waste and spent fuel in RA
- Government Decree № 1263-N as of 24.12.2001 on approval of Special rules on transportation of nuclear and radioactive materials
- Government Decree № 1653-N as of 11.12.2003 on Determination of the price for radioactive waste transport, neutralization and storage services
- Government Decree № 2141-N as of 01.12.2005 on approval of the licensing procedure and licence form for decommissioning of radioactive waste storage and for closure of disposal facilities
- Government Decree № 931-N as of 27.06.2002 on approval of Procedure for safe transport of nuclear and radioactive materials
- Government Decree № 1231-N as of 11.09.2003 on approval of Concept of physical protection and security of ANPP and nuclear materials and rules on physical protection of nuclear installations and nuclear materials
- Government Decree № 1597-N as of 26.10.2004 on fulfillment of obligations undertaken under the Protocol Additional to the Agreement between the Republic of Armenia and the International Atomic Energy Agency for the Application of Safeguards in Connection with Treaty on the Non-Proliferation of Nuclear Weapons
- Government Decree № 1953-N as of 30.10.2004 on preparedness to response to nuclear and radiation emergencies in the RA
- Government Decree № 1751-N as of 09.12.2004 on approval of licensing procedure and licence form for use of radioactive materials, devices containing radioactive materials, or radiation generators
- Government Decree № 1790-N as of 09.12.2004 on approval of licensing procedure and application form for import and export of radioactive materials, devices containing radioactive materials, or radiation generators
- Government Decree № 346-N as of 24.03.2005 on approval of licensing procedure and licence form for import and export of nuclear materials
- Government Decree № 375-N as of 24.03.2005 on approval of licensing procedure and licence form for import and export of radioactive wastes
- Government Decree № 376-N as of 24.03.2005 on approval of licensing procedure and licence form for import and export of special materials, equipment and technologies in the RA
- Government Decree № 401-N as of 31.03.2005 on approval of licensing procedure and licence form for implementation of physical protection of nuclear installations and nuclear materials

- Government Decree № 416-N as of 31.03.2005 on approval of licensing procedure and licence form for construction of radioactive waste storage facility
- Government Decree № 417-N as of 31.03.2005 on approval of licensing procedure and licence form for construction of radioactive waste disposal facility
- Government Decree № 647-N as of 05.05.2005 on approval of licensing procedure and licence form for storage of radioactive wastes
- Government Decree № 652-N as of 19.05.2005 on approval of licensing procedure and licence form for operation of radioactive waste disposal facility
- Government Decree № 660-N as of 05.05.2005 on approval of licensing procedure and licence form for transport of radioactive waste
- Government Decree № 702-N as of 19.05.2005 on approval of licensing procedure and licence form for operation of radioactive waste storage facility
- Government Decree № 703-N as of 19.05.2005 on approval of licensing procedure and licence form for processing of radioactive wastes
- Government Decree № 745-N as of 09.06.2005 on approval of licensing procedure and licence form for storage of nuclear materials
- Government Decree № 746-N as of 09.06.2005 on approval of licensing procedure and licence form for transport of nuclear materials
- Government Decree № 762-N as of 09.06.2005 on approval of licensing procedure and licence form for use of nuclear materials
- Government Decree № 985-N as of 07.07.2005 on approval of licensing procedure and licence form for designing of radioactive waste storage facility
- Government Decree № 986-N as of 07.07.2005 on approval of licensing procedure and licence form for designing of radioactive waste disposal facility
- Government Decree № 1203-N as of 11.08.2005 on approval of licensing procedure and licence form for site selection of radioactive waste storage facility
- Government Decree № 1204-N as of 11.08.2005 on approval of licensing procedure and licence form for site selection of radioactive waste disposal facility
- Government Decree № 2129-N as of 01.12.2005 on approval of licensing procedure and licence form for closure of radioactive waste disposal facility
- Government Decree № 2140-N as of 01.12.2005 on approval of licensing procedure and licence form for manufacture of radioactive materials, equipment containing radioactive materials, or radiation generators
- Government Decree № 2141-N as of 01.12.2005 on approval of licensing procedure and licence form for decommissioning of radioactive waste storage facility
- RA Government Decree № 943-N as of 18.08.2015 on approval of the procedure on implementation of rescue activities in the radioactive contaminated areas
- RA Government Protocol Decision № 53 as of 18.12.2014 on approval of the Strategy for Environmental Radiation Monitoring in the Republic of Armenia
- RA Government Protocol Decision № 8 as of 03.03.2016 on approval of national plan of protection of the population in the case of radiation and nuclear accident in the territory of the Republic of Armenia
- RA Government Protocol Decision №42 as of 05.10.2017 on approval of strategy on safe management of radioactive waste and spent fuel in Republic of Armenia

- RA Government Decree 3-L as of 10.01.2019 on approval of 2019-2026 action plan –schedule on implementation of provisions stipulated in strategy on safe management of radioactive waste and spent nuclear fuel in the Republic of Armenia
- RA Government Decree №11-N adopted on 14.01.2016 on approval of rules on physical protection of radioactive materials and devices containing radioactive materials
- RA Prime Minister decree №747-L as of 11.06.2018 on approval of ANRA statute.

Subordinate Acts Adopted in Atomic Energy Utilization Field

- Requirements to format and content of conclusion on safety expertise in atomic energy utilization field (Registered by the Ministry of Justice of RA. Registration № 10503349 as of 12.11.2003)
- Establishment of ANPP emergency planning zones (Registered by the Ministry of Justice of RA. Registration № 12506129 as of 04.05.2006)
- Statute and procedure on formation of commission on qualification check of physical persons holding positions and implementing practices important to safety in atomic energy utilization field (Registered by the Ministry of Justice of RA. Registration № 12507398 as of 21.11.2007)
- Requirements to content and form of program on decommissioning of nuclear installations (registered by the Ministry of Justice of RA. Registration № 12511432 as of 27.09.2011)
- Requirements to format and content of environmental radiation monitoring system of nuclear energy utilization installation (registered by the Ministry of Justice of RA. Registration № 12512230 as of 31.05.2012)
- Requirements to format and content of occupational exposure personal cards (registered by the Ministry of Justice of RA on 25 March 2013 under the state registration № 12513109)
- Requirements on accounting of radioisotopic and ionizing radiation sources at atomic energy utilization installations (Registered by the Ministry of Justice of RA. Registration № 12512188 as of 11.04.2012)
- Requirements to format and content of occupational exposure personal cards (Registered by the Ministry of Justice of RA. Registration № 12513109 as of 25.05.2013)
- Requirements to content and form of the complex survey report approved under the order № 19-N as of 19.01.2016 (Registered by the Ministry of Justice of RA. Registration № 12516039 as of 04.02.2016)
- Methodology on analysis of deviations at NPP Unit from the requirements of the existing regulations approved under the order № 98-A as of 22.06.2016
- Requirements to probabilistic safety assessment approved under the order № 226-A as of 14.10.2016

Annex G. References to official national and international reports related to safety

- Report of Integrated Regulatory Review Service (IRRS) Follow-Up Mission to Armenia Yerevan, Armenia 11 to 17 June 2019;
- EU Peer Review Report Implementation of Armenian Stress Test National Action Plan November 2019;
- National Report of the Republic of Armenia under the Convention On Nuclear Safety, September 2019.

Annex H. References to reports on international review missions performed at the request of a Contracting Party

- Integrated Regulatory Review Service (IRRS) Follow-Up Mission to Armenia Yerevan, Armenia 11 to 17 June 2019;
- EC Peer review of the Armenian Stress Test National Action Plan, 25-29 November 2019.

Annex I. Radioactive waste classification

Table 10. Classification of radioactive wastes by activity concentration

Class of Waste	Activity concentration kBq/kg		
	Beta emitting radionuclides	Alfa emitting radionuclides (except transuranium radionulides)	Transuranium radionulides
Very low level solid wastes [a)]	Up to 10^2	Up to 10	Up to 1
Low level waste	From 10^2 to 10^3	From 10 to 10^2	From 1 to 10
Intermediate level waste	From 10^3 to 10^7	From 10^2 to 10^6	From 10 to 10^5
High level waste	More than 10^7	More than 10^6	More than 10^5

a) If the radionuclide composition of solid radioactive waste is known, the very low level waste shall satisfy the following condition:

$$1 \leq \sum_{i=1}^{n} \frac{A_{mi}}{A^{c}_{mi}} \leq 100$$

Where A_{mi} is activity concentration of "i" radionuclide, A^{c}_{mi}- is the clearance level of "i" radioisotope by the activity concentration, "n" is the number of radionuclides in waste.

Table 11. RW classification by half-life of radionuclides

Class of waste	Half-life of radionuclides prevailing in waste
Very short lived waste	Less than 100 days[a)]
Short lived waste	From 100 days to 30 years
Long lived waste	More than 30 years

a) The half-life of radionuclides prevailing in radioactive waste can be more than 100 days, however, if the activity concentration of waste within a period of time not exceeding 3 years can drop below the clearance level, then such waste will also be considered sa very short lived one.

Table 12. RW classification by gamma radiation dose rate

For sorting solid radioactive waste the following values of gamma radiation dose rate at 0.1 m from the surface of waste can be used as a classification criterion:

Class of waste	Dose rate
Very low level waste	Less than 1 μSv/h
Low level waste	More than 1 μSv/h, however, does not exceed 0.3mSv/h
Intermediate level waste	More than 0.3 mSv/h, however, does not exceed 10 mSv/h
High level waste	Exceeds 10 mSv/h

Table 13. Radioactive waste classification by surface contamination level

Class of waste	Surface radioactive contamination level (count/cm^2 x min)		
	Beta emitting radionuclides	Alpha emitting radionuclides (except transuranium radionuclides)	Transuranum radionuclides
Very low level	Up to $5x10^2$	Up to $5x10^1$	Up to 5
Low level	From $5x10^2$ to $1x10^4$	From $5x10^1$ to $1x10^3$	From 5 to $1x10^2$
Intermediate level	From $1x10^4$ to $1x10^7$	From $1x10^3$ to $1x10^6$	From $1x10^2$ to $1x10^5$
High level	More than $1x10^7$	More than $1x10^6$	More than $1x10^5$

Annex J. Figures

Figure 1: The organizational structure of ANRA

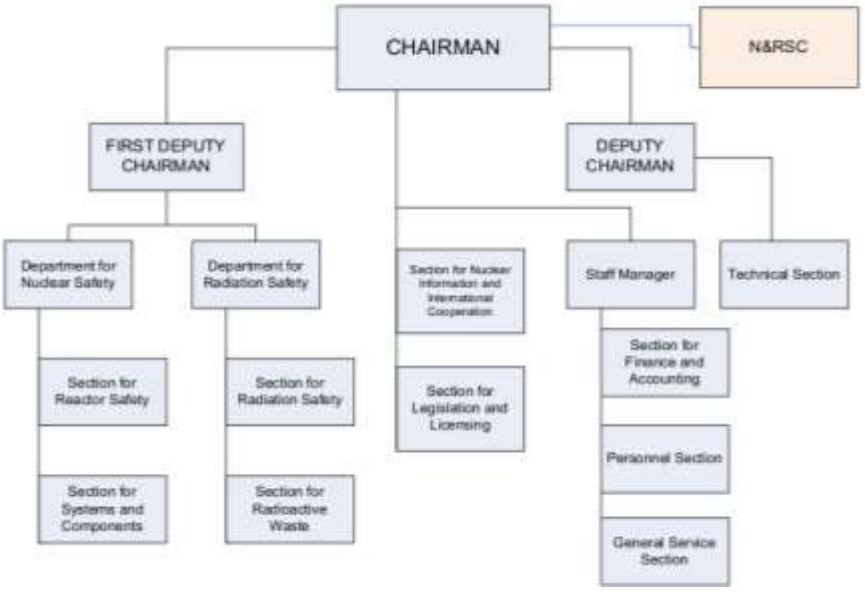


Figure 2: Dynamics of ANRA staffing

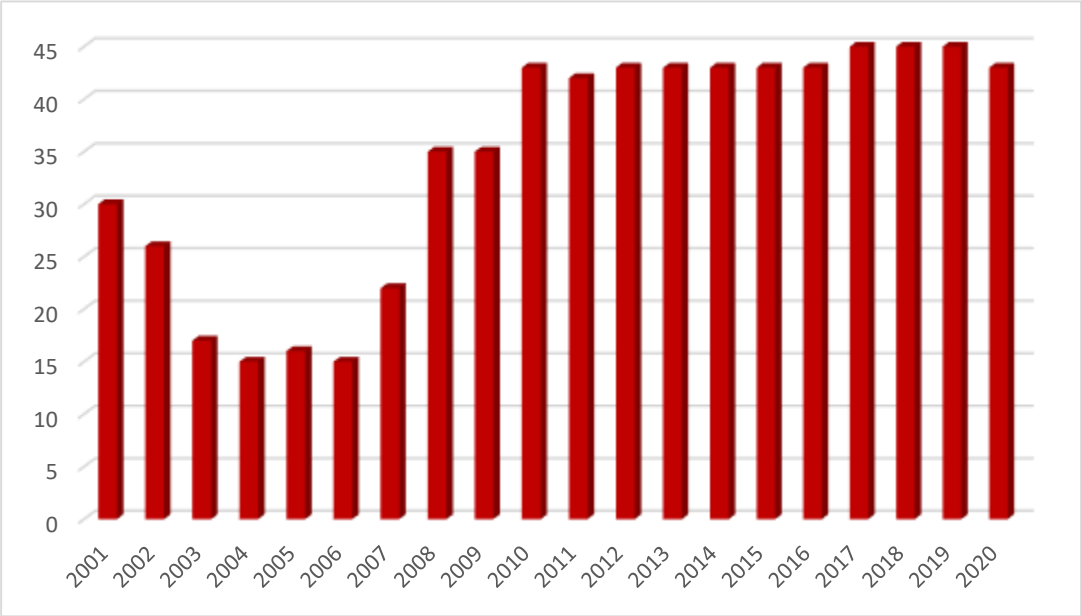


Figure 3: RA Government structure and position of ANRA within the structure

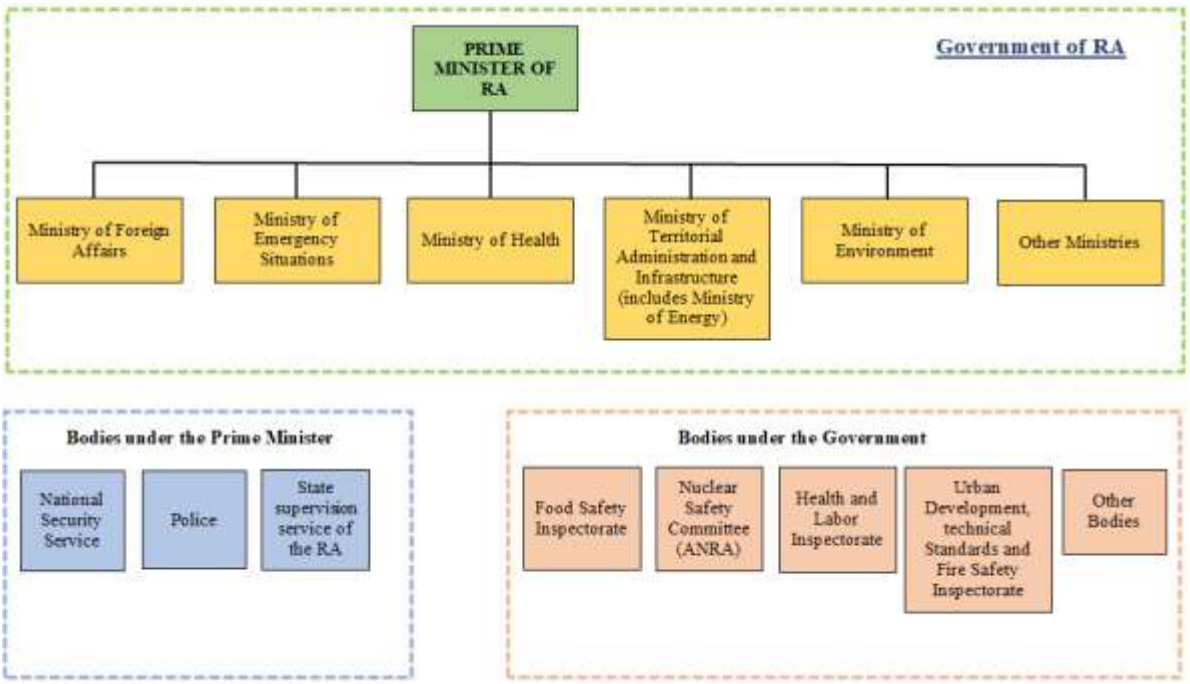


Figure 4. NRSC organizational chart

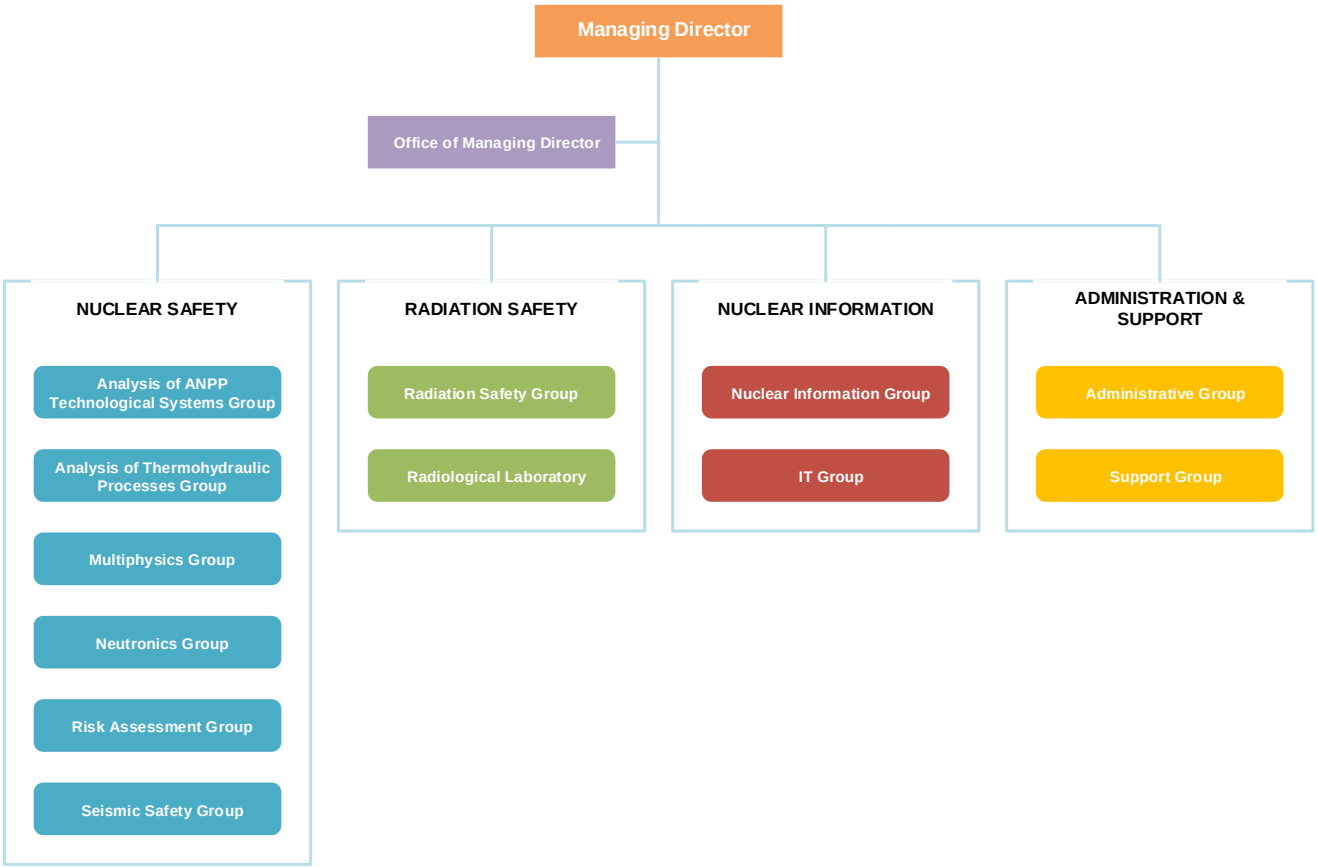


Figure 5. ANPP personnel collective exposure dose for up to 2019.

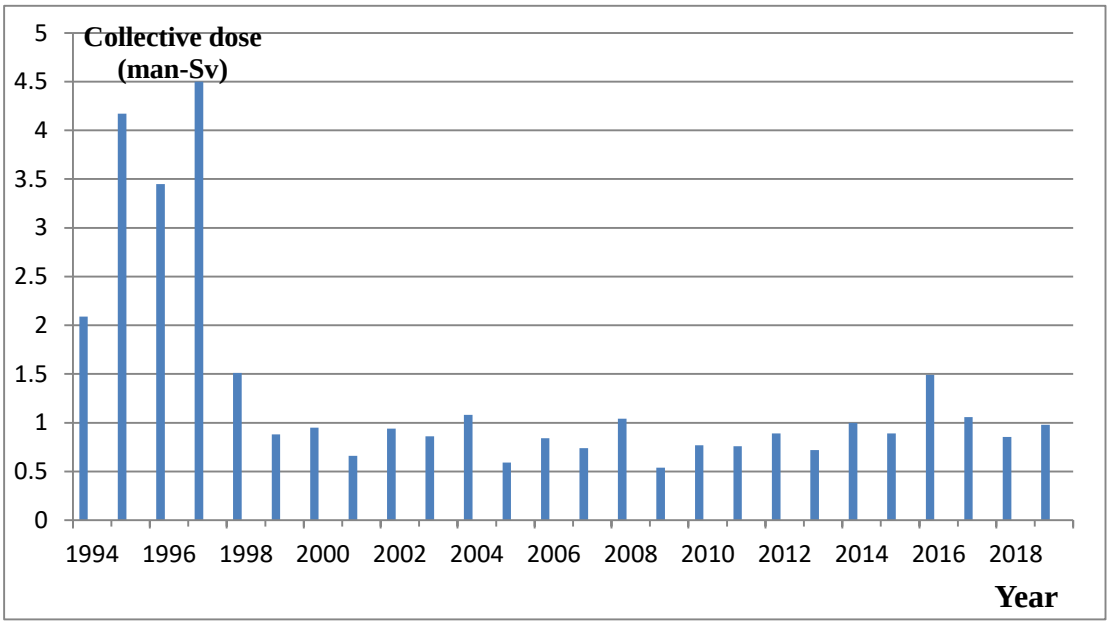


Figure 6. Organization of Event Investigation Process

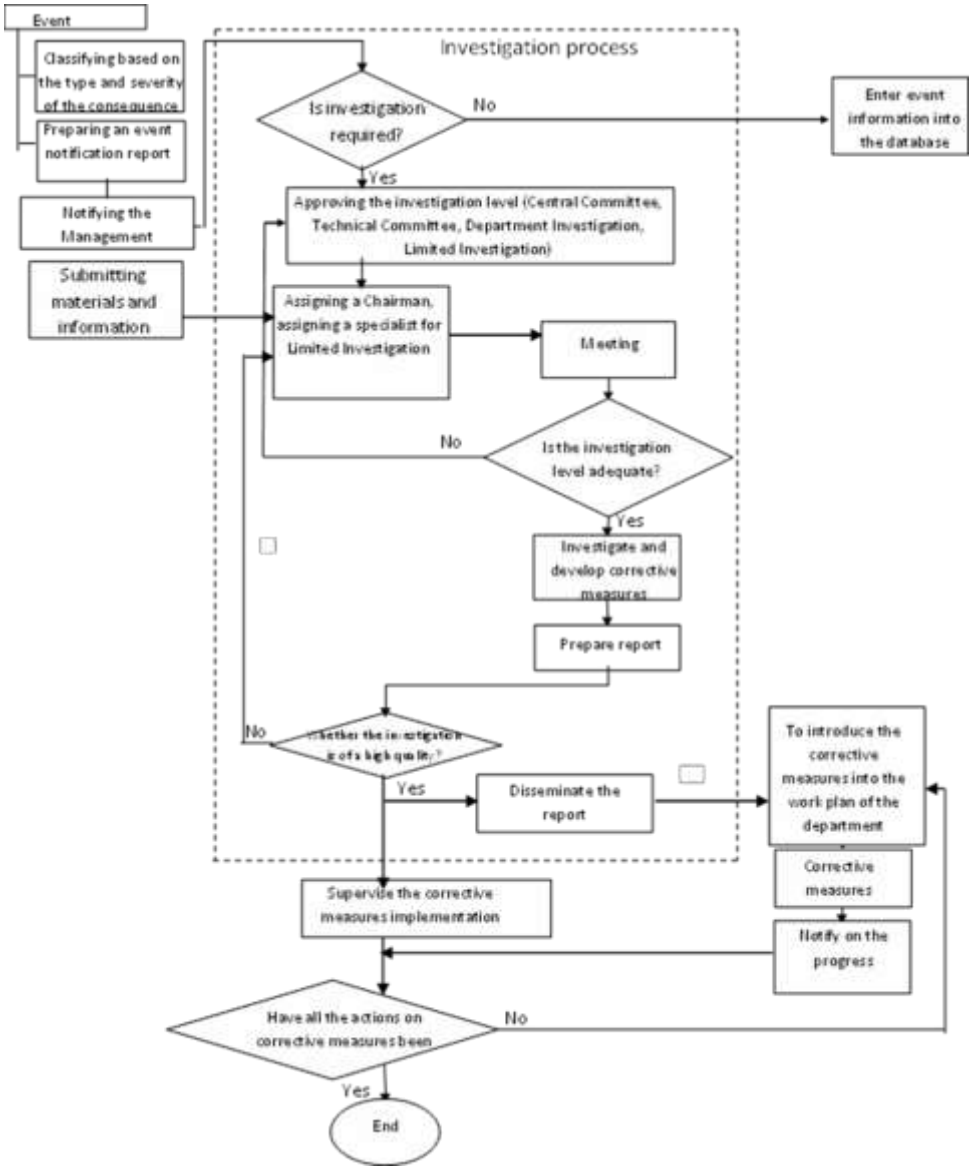
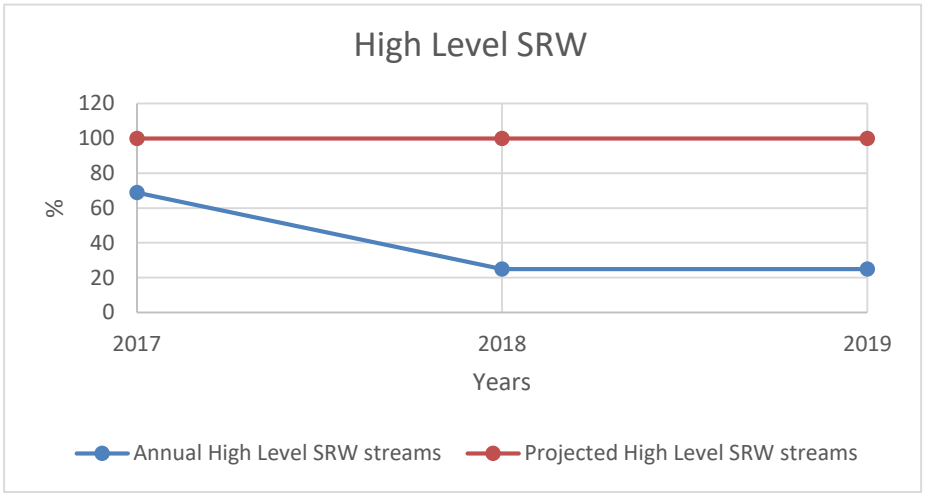
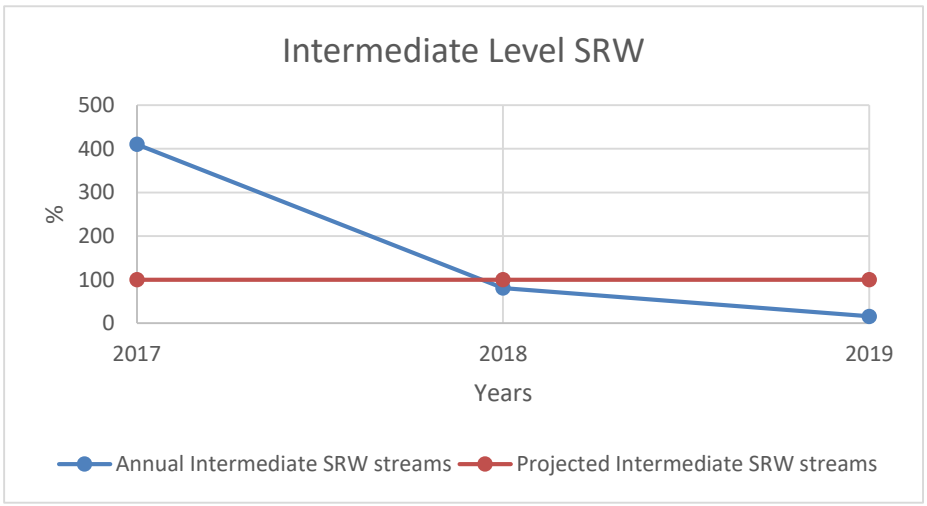
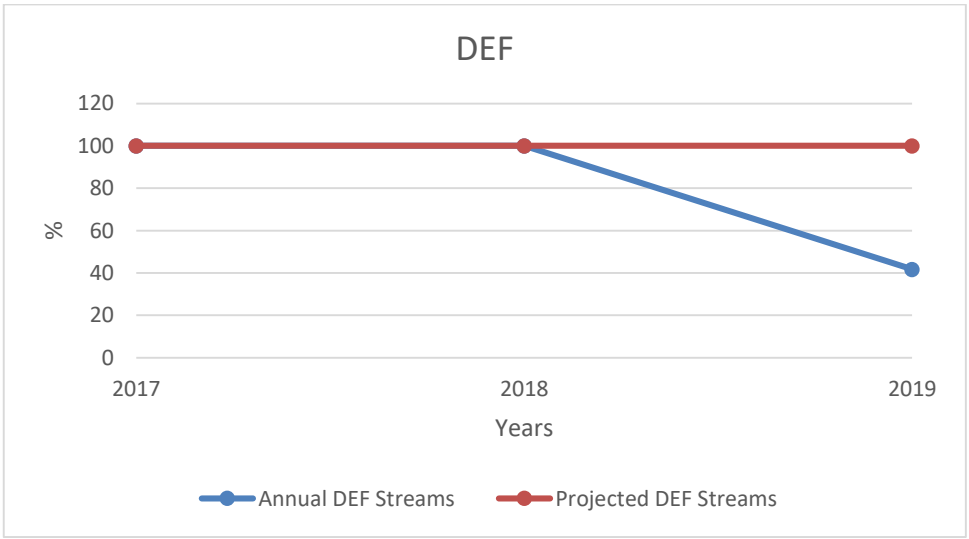


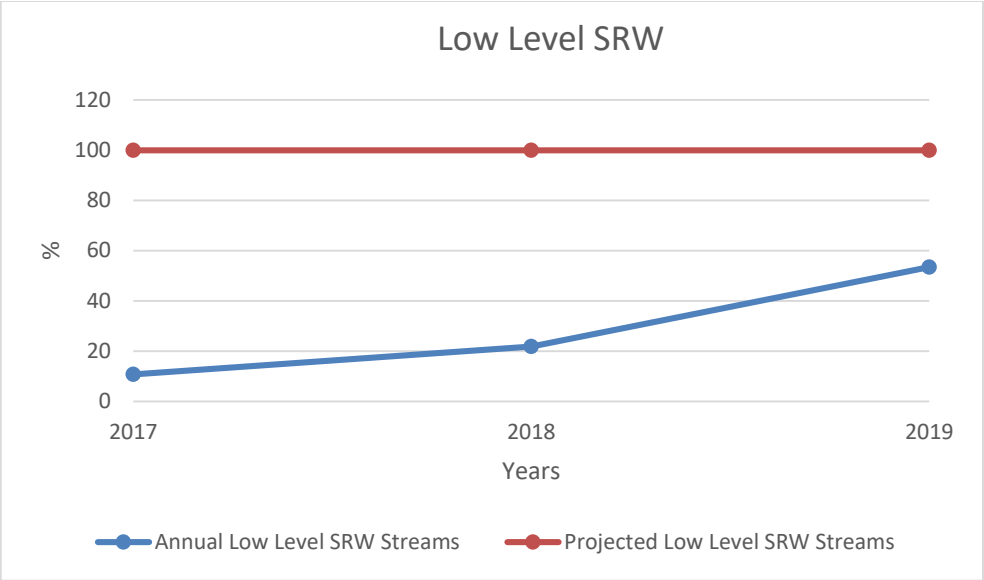
Figure 7. Projected and annual SRW streams at ANPP (from 2017 to 2019)





* In frame of LTE actions additional activites had been implemented in 2017, which leads to the increase of projected ILW streams.




Low Level SRW
120
100
80
60
40
20
0
%
2017
2018
2019
Years
Annual Low Level SRW Streams
Projected Low Level SRW Streams

Annex K. Environmental monitoring data

Table 14. The average amount of LLN, I-131 atmospheric releases and total beta activity during 2017-2019 (10^6 Bq/month)

Radionuclide	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
^{137}Cs	0.03	0.19	0.14	0.07	0.04	0.19	0.19	0.21	0.20	0.13	0.64	0.17
^{134}Cs	bse	bse	bse	0.04	bse	0.05	bse	bse	0.06	0.03	bse	bse
^{131}I	0.63	0.56	0.68	0.56	0.56	0.76	0.56	0.53	0.32	0.52	0.57	0.60
^{110m}Ag	0.03	0.19	0.13	0.10	3.15	3.74	2.25	2.28	0.28	0.21	0.41	0.11
^{106}Ru	bse	bse	0.17	bse	2.08	bse	bse	0.40	bse	bse	bse	bse
^{103}Ru	bse	bse	bse	bse	bse	bse	bse	bse	bse	bse	bse	bse
^{95}Zr	bse	bse	bse	bse	bse	bse	bse	bse	bse	bse	bse	bse
^{95}Nb	bse	bse	bse	bse	bse	0.04	bse	0.02	bse	bse	bse	bse
^{90}Sr	bse	bse	0.05	bse	bse	0.03	bse	bse	0.03	bse	bse	0.03
^{60}Co	0.20	0.48	0.33	0.07	0.94	1.04	1.09	1.11	0.42	0.30	1.21	0.47
^{58}Co	bse	bse	0.05	0.06	0.00	0.05	0.09	0.09	bse	bse	bse	bse
^{54}Mn	bse	bse	bse	bse	0.21	0.10	bse	0.07	bse	bse	bse	0.03
^{51}Cr	bse	bse	bse	0.34	bse	bse	bse	bse	bse	bse	bse	bse
Σ-ß.ac	3.14	2.64	3.04	3.27	3.53	4.06	4.51	4.91	4.15	4.21	5.09	5.12
noble gases	107.87	99.37	108.80	103.60	104.87	94.00	101.27	99.47	100.53	104.63	102.00	109.17

The concentration of Sr-90 is determined once per quarter.
bse – below sensitivity of equipment

Table 15. The averaged specific activity of the ANPP effluents during 2017-2019 (Bq/l)

Radionuclide	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
HSS												
^{137}Cs	0.07	0.07	0.08	0.03	0.01	0.04	0.02	0.02	0.04	0.03	0.04	0.03
^{90}Sr	0.02	0.02	0.05	0.02	bse	0.01	0.01	0.05	0.04	bse	bse	bse
Σß-act	0.14	0.11	0.40	0.17	0.11	0.13	0.10	0.11	0.10	0.15	0.11	0.11
IRWS												
^{137}Cs	0.10	0.07	0.09	0.03	0.02	0.05	0.05	0.04	0.03	0.03	0.03	0.04
^{90}Sr	0.07	0.09	0.15	0.18	0.11	0.08	0.06	0.07	0.05	0.11	0.12	0.11
Σß-act	0.07	0.07	0.40	0.38	0.15	0.09	0.13	0.11	0.16	0.15	0.13	0.13

Table 16. The averaged dose rate at the checkpoints of the ANPP supervision area during 2017-2019 (μSv/hour)

№	2017	2018	2019
Metsamor	0.09	0.09	0.09
Aknalich	0.09	0.09	0.09
Aeration device of ANPP	0.09	0.09	0.09
Armavir	0.1	0.1	0.1
Ejmiatsin	0.09	0.1	0.1
Aygeshat	0.1	0.1	0.1
Pond	0.09	0.09	0.09
Mugan	0.09	0.09	0.09
Yerevan	0.1	0.1	0.1
Nairi	0.1	0.1	0.1

ANPP site	0.1	0.1	0.1
Road from the ANPP to the LLW storage facility	0.1	0.1	0.1
Road from Metsamor to ANPP	0.09	0.09	0.09
Bypass road	0.09	0.1	0.1
Road to Institutional waste management facility	0.09	0.09	0.09

Table 17. The average volumetric β -activity in atmosphere in the ANPP supervision area during 2017-2019 (10^{-4}Bq/m^3)

№	2017	2018	2019
ANPP	0.69	0.27	0.5
1 radius	1.34	0.22	1.3
2 radius	1.18	0.49	0.9
3 radius	0.83	0.35	Not measured

Table 18. The average concentration of radionuclides in the atmosphere of ANPP supervision area during 2017-2019 (10^{-4} Bq/m^3)

Years	Radionuclide	Sampling points			
		ANPP 0.5 km	Metsamor 5 km	Pond 11km	Yerevan 25km
2017	137Cs	0.05	0.04	0.04	0.05
	90Sr	0.09	0.01	0.007	0.03
	7Be	4.6	6.2	6.4	5.1
2018	137Cs	0.03	0.03	0.03	0.008
	90Sr	0.004	0.02	0.007	0.003
	7Be	5.34	2.45	4.62	4.74
2019	137Cs	0.001	0.003	0.004	Not measured
	90Sr	0.001	0.001	0.005	
	7Be	4.7	6.26	3.37	

Table 19. Total β-activity of radioactive fallout from atmosphere during 2017-2019 (10^6 Bq/ km^2 month)

№	2017	2018	2019
ANPP	368	53.66	81.35
1 radius	276.1	54.4	82.22
2 radius	286	33.1	46.45
3 radius	275	37.8	57.6

Table 20. Concentration of radionuclides in the air outflows during 2017-2019 (10^7Bq/km^2 quarter)

Years	Radionuclide	Sampling points			
		ANPP	1 radius	2 radius	3 radius
2017	137Cs	0.33	0.44	0.29	0.29
	90Sr	0.18	0.12	0.18	0.07
	7Be	18.3	11.6	12.7	10.8
2018	137Cs	0.54	1.05	1.29	0.83
	90Sr	0.18	0.16	0.19	0.21
	7Be	6.63	12.64	8.92	2.3

2019	137Cs	0.295	0.340	0.125	0.377
	90Sr	0.074	0.082	0.05	0.085
	7Be	10.7	17	2	0.86

Table 21. Total β-activity in soil for 2017-2019 (Bq/kg)

№	2017	2018	2019
Metsamor	260	290	274
Aknalich	269	378	488
Aeration device of NPP	264	309	296
Pond	325	315	268
Ejmiatsin	303	291	290
Aygeshat	275	420	422
Mugan	253	298	311
Nairi	206	346	323
Yerevan	285	290	426
ANPP site	276	320	279

Table 22. Average specific activity of radionuclides in soil and vegetation for 2017-2019 (Bq/kg)

№	Average specific activity of radionuclides in soil					
	2017		2018		2019	
	137Cs	90Sr	137Cs	90Sr	137Cs	90Sr
ANPP	12	1.93	44.6	1.32	51.2	2.57
1 radius	12.2	1.42	8.91	2	8.3	0.42
2 radius	8.9	1.1	10.25	1.27	2.2	0.16
3 radius	9.3	0.91	8.9	1.43	3.3	0.11
№	**Average specific activity of radionuclides in vegetation**					
	2017		**2018**		**2019**	
	137Cs	90Sr	137Cs	90Sr	137Cs	90Sr
ANPP	7.55	1.25	4.6	0.6	43.8	0.9
1 radius	8.51	1.65	6.7	0.5	12.7	0.7
2 radius	9.1	1.9	4.5	0.8	3.3	0.5
3 radius	7	1.55	9.4	0.4	12.2	0.4

Table 23. Averaged specific β-activity of vegetation for 2017-2019 (Bq/kg of dry weight)

№	2017	2018	2019
Metsamor	168	383	334
Aknalich	173	181	290
Aeration device of nuclear power plant	174	210	260
Pond	174	295	333
Ejmiatsin	190	340	306
Aygeshat	161	193	250
Mughan	155	282	430
Nairi	129	340	290
Yerevan	194	371	340
ANPP site	235	388	183

Table 24. Specific β-activity of bottom sediments and concentration of radionuclides in them for 2017-2019 (Bq/kg)

№	Concentration of radionuclides in bottom sediments					
	2017		2018		2019	
	137Cs	90Sr	137Cs	90Sr	137Cs	90Sr
Lake Aknalich	6.2	2.2	5.7	2.1	1.8	0.1
Fisheries	5.1	2.5	4.8	1.7	2.1	0.7
Pumping of technical water supply	6.5	0	4.9	2.0	2.5	0.9
Potable water diversion for Metsamor town	4.2	0	5.2	1.8	2.8	0.7
Water diversion for pumping station	6.7	1.8	6.0	2.4	4.2	1.0
Potable water diversion for Armavir town	5.1	2.0	5.8	1.9	2.1	0.8
Reset point to HSS	5.9	1.6	7.1	3.0	5.5	1.2
Reset point to IRWS	6.1	2.4	7.7	3.4	3.7	0.9

	Specific β-activity of bottom sediments		
	2017	2018	2019
Lake Aknalich	483	625	480
Fisheries	562	450	410
Pumping of technical water supply	390	382	460
Potable water diversion for Metsamor town	328	562	350
Water diversion for pumping station	410	352	320
Potable water diversion for Armavir town	306	593	410
Reset point to HSS	540	408	440
Reset point to IRWS	489	389	360

Table 25. Specific β-activity of algae and the concentration of radionuclides in them for 2017-2019 (Bq/kg)

№	Concentration of radionuclides in algae					
	2017		2018		2019	
	137Cs	90Sr	137Cs	90Sr	137Cs	90Sr
Lake Aknalich	4.0	1.0	5.2	0.9	2.2	0.5
Fisheries	3.1	2.1	4.1	1.2	3.4	0.3
Pumping of technical water supply	4.2	1.4	3.9	1.7	2.4	0.7
Potable water diversion for Metsamor town	4.9	1.1	6.2	0.7	2.9	0.5
Water diversion for pumping station	5.1	1.0	4.8	1.2	1.8	0.9
Potable water diversion for Armavir town	2.8	1.3	5.1	1.5	3.2	0.8
Reset point to HSS	4.2	1.5	4.2	1.7	2.1	0.7
Reset point to IRWS	4.7	1.1	4.7	0.9	1.2	0.69
	Specific β-activity of algae					
	2017		2018		2019	
Lake Aknalich	304		246		187	
Fisheries	298		223		204	
Pumping of technical water supply	368		387		240	
Potable water diversion for Metsamor town	205		221		160	
Water diversion for pumping station	190		432		170	
Potable water diversion for Armavir town	268		288		125	
Reset point to HSS	286		369		190	
Reset point to IRWS	268		379		210	

Table 26. Data of observations of deep-water wells of the sanitary protection area and NPP supervision area. averaged β-activity concentration of water from wells for 2017-2019 (Bq/l)

Number of well	Σ β-activity		
	2017	2018	2019
1	0.16	0.13	0.12
9	0.5	0.12	0.11
10	0.1	0.07	0.1
25	0.11	0.08	0.08
27	0.19	0.12	0.13

Table 27. Total β-activity of the waters of open reservoirs for 2017-2019 (Bq/l)

№	2017	2018	2019
Lake Aknalich	0.09	0.55	0.4
Fisheries	0.1	0.4	0.4
Pumping of technical water supply	0.09	0.6	0.25
Potable water diversion for Metsamor town	0.09	0.26	0.27
Water diversion for pumping station	0.1	1.3	1
Potable water diversion for Armavir town	0.12	1.3	1
Reset point to HSS	0.05	1.15	0.9
Reset point to IRWS	0.07	1.15	0.8
Large Irrigation Canal	0.08	No water	No water

Table 28. Averaged concentration of radionuclides in the water of open reservoirs for 2017-2019, Cs-137 and Sr-90 (Bq/l)

№	2017		2018		2019	
	137Cs	90Sr	137Cs	90Sr	137Cs	90Sr
Lake Aknalich	0.05	0	0.07	0.02	0.11	0
Fisheries	0.05	0.01	0.09	0.03	0.13	0.01
Pumping of technical water supply	0.05	0.01	0.08	0.01	0.1	0.01
Potable water diversion for Metsamor town	0.05	0	0.06	0.03	0.1	0
Water diversion for pumping station	0.05	0.01	0.08	0.04	0.1	0.01
Potable water diversion for Armavir town	0.05	0.01	0.07	0.05	0.07	0.06
Reset point to HSS	0.06	0	0.09	0.06	0.08	0.06
Reset point to IRWS	0.06	0.01	0.07	0.05	0.08	0
Large Irrigation Canal	0.08	0.01	No water	No water	No water	No water

Table 29. Averaged specific β-activity of agricultural products cultivated in the supervision area and the concentration of Cs-137 and Sr-90 in them for 2017-2019 (Bq/kg)

№	Concentration of radionuclides in agricultural products					
	2017		2018		2019	
	137Cs	90Sr	137Cs	90Sr	137Cs	90Sr
Tomatoes	2.1	0	2.7	0.05	0.5	0
Eggplant	2.6	0	3.5	0.07	0.6	0
Cucumbers	1.9	0	3.1	0.08	0.2	0
Grapes	2.7	0	2.1	0.06	0.8	0
Apricots	1.8	0	2.5	0.01	0.9	0
Peppers	1.4	0.03	3.8	0.08	1.1	0
Potatoes	1.6	0	2.4	0.09	0.7	0
Fish	1.9	0.03	1.9	0.07	0.6	0
Milk	2.3	0.09	2.1	0.08	0.3	0
Food greens	3.4	0.12	2.8	0.09	1.3	0.06
Cereals	2.8	0	2.7	0.07	0.9	0
	Specific β-activity of agricultural products					
	2017		2018		2019	
Tomatoes	158		11		35	
Eggplant	136		19		42	
Cucumbers	98		14		28	
Grapes	59		11		65	
Apricots	120		12		82	
Peppers	98		15		59	
Potatoes	110		17		37	
Fish	188		35		45	
Milk	180		35		45	
Food greens	240		20		86	
Cereals	264		15		35	

Table 30. The average value of the individual effective dose of the population by all radionuclides for the critical population group [10^{-10} Sv]

Age	0-1 year	1-2 years	2-7 years	7-12 years	12-17 years	Adults
2017	190	210	250	210	200	210
2018	180	205	238	198	195	203
2019	210	230	245	206	200	210

Location of sampling points

1. Location of fixed aeration device in the supervision area:
   - the first - 500 m from the NPP;
   - the second – Metsamor town;
   - the third - 7 km from the NPP;
   - the fourth- Yerevan city.

2. Location of ditches in the supervision area:
   - ANPP industrial site - 4 ditches;
   - 1st radius: Metsamor town, village of Aknalich; aeration device. NPP;

- 2nd radius: town of Armavir, Ejmiatsin town, village of Aygeshat, Prud
- 3rd radius: village of Mugan, Yerevan city, village of Nairi.

The dose rate of gamma radiation on the ground is measured at the observation points, where the ditches are located. Samples of soil and vegetation are selected at the observation points where the ditches are located.

List of Abbreviations

ATD	Administrative technical documentation
ANPP	Armenian Nuclear Power Plant
ANRA	Armenian Nuclear Regulatory Authority
CC	Crisis Centre
DEF	Deep evaporation facility
DISDB	Decommissioning information system with database
DPP	Decommissioning preliminary plan
DSC	Dry shielded canister
DSFSF	Dry spent fuel storage facility
ECT	Evaporator concentrate tank
ERS	Emergency response system
ESC	Emergency situations committee
HLST	High level sorbent tank
HLW	High level waste
HSM	Horizontal storage module
HSS	Household sewerage system
I&C	Instrumentation and control
ILW	Intermediate level waste
LL	Long lived
LLN	Long lived nuclide
LLW	Low level waste
INSC	Instrument for Nuclear Safety Cooperation
IRWS	Industrial and rainfall water sewage system
MES	Ministry of Emergency Situations
NPP	Nuclear Power Plant
NRSC	Nuclear and Radiation Safety Center
QAP	Quality assurance program
RA	Republic of Armenia
RCC	Regional Crisis Centre
R&D	Research and development
RW	Radioactive waste
RWM	Radioactive waste management
SAR	Safety Analysis Report
SF	Spent fuel

SFSP	Spent fuel storage pool
SL	Short lived
SRW	Solid radioactive waste
SSC	Systems, structures and components
TC	Transport container
TSO	Technical support organization
VLLW	Very low level waste
WANO	World Association of Nuclear Operators
WWER	Water Cooled Water moderated Energy Reactor