



**REPUBLIC OF TÜRKİYE**

# **Convention on Nuclear Safety**

## **Turkish National Report for the Joint 8<sup>th</sup> and 9<sup>th</sup> Review Meeting**

**August 2022**



**NUCLEAR REGULATORY AUTHORITY**

**REPUBLIC OF TÜRKİYE**



**Turkish National Report  
on Compliance with the Obligations of the  
Convention on Nuclear Safety**

**August 2022**



**NUCLEAR REGULATORY AUTHORITY**

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## LIST OF ABBREVIATIONS

<b>AFAD</b>	Disaster and Emergency Management Authority
<b>Akkuyu NPP</b>	Akkuyu Nuclear Power Plant
<b>Akkuyu Nuclear JSC</b>	Akkuyu Nuclear Power Plant Electricity Generation Joint-Stock Company
<b>ALARA</b>	As Low As Reasonably Achievable
<b>BOO</b>	Build-Own-Operate
<b>CBRN</b>	Chemical, Biological, Radiological or Nuclear
<b>ÇNAEM</b>	Çekmece Nuclear Research and Training Center
<b>CNS</b>	Convention on Nuclear Safety
<b>ÇŞİDB</b>	Ministry of Environment, Urbanisation and Climate Change
<b>DBEE</b>	Design Basis External Event
<b>DI</b>	Department of Inspection
<b>DNI</b>	Department of Nuclear Installations
<b>EAL</b>	Emergency Action Levels
<b>EARMS</b>	Environmental Automated Radiological Monitoring System
<b>EC</b>	European Commission
<b>EIA</b>	Environmental Impact Assessment
<b>ENSREG</b>	European Nuclear Safety Regulators Group
<b>EPDK</b>	Energy Market Regulatory Authority
<b>EPREV</b>	Emergency Preparedness Review
<b>ERML</b>	Environment Radiation Monitoring Laboratory
<b>ETKB</b>	Ministry of Energy and Natural Resources
<b>EU</b>	European Union
<b>EÜAŞ</b>	Electricity Generation Corporation
<b>EURDEP</b>	European Radiological Data Exchange Platform
<b>FSAR</b>	Final Safety Analysis Report
<b>GNAT</b>	Grand National Assembly of Türkiye
<b>HMB</b>	Ministry of Treasury and Finance
<b>IAEA</b>	International Atomic Energy Agency
<b>IGA</b>	Intergovernmental Agreement
<b>IKAS</b>	Integrated Warning and Alarm System
<b>IMS</b>	Integrated Management System
<b>INIR</b>	Integrated Nuclear Infrastructure Review
<b>INSC</b>	Instrument for Nuclear Safety Cooperation
<b>IPA</b>	Pre-accession Assistance
<b>ISO</b>	International Organization for Standardization
<b>İTÜ</b>	İstanbul Technical University
<b>MS</b>	Management System
<b>NDK</b>	Nuclear Regulatory Authority
<b>NDRP</b>	National Disaster Response Plan
<b>NEIPGM</b>	General Directorate of Nuclear Energy and International Projects

<b>NREP</b>	National Radiation Emergency Plan
<b>NUTED</b>	National Nuclear Technical Support Organization
<b>OJT</b>	On-the-job Training
<b>Paris Convention</b>	Convention on Third Party Liability in the Field of Nuclear Energy
<b>PIC</b>	Public Information Center
<b>PSA</b>	Probabilistic Safety Assessment
<b>PSAR</b>	Preliminary Safety Analysis Report
<b>QAP</b>	Quality Assurance Program
<b>QMS</b>	Quality Management System
<b>RESA</b>	Radiation Monitoring and Early Warning System
<b>SAR</b>	Safety Analysis Report
<b>SARCoN</b>	Systematic Assessment of Regulatory Competence Needs
<b>SPR</b>	Site Parameters Report
<b>SSHAC</b>	Senior Seismic Hazard Committee
<b>TAEK</b>	Turkish Atomic Energy Authority
<b>TENMAK</b>	Turkish Energy, Nuclear and Mineral Research Agency
<b>TETAŞ</b>	Turkish Electricity Trading and Contracting Company
<b>TSE</b>	Turkish Standards Institution
<b>TSO</b>	Technical Support Organization
<b>USR</b>	Updated Site Report
<b>VDNS</b>	Vienna Declaration on Nuclear Safety
<b>VVER</b>	Water-Water Energetic Reactor

## INTRODUCTION

On September 24, 1994 Türkiye signed the Convention on Nuclear Safety (CNS) which was adopted on 17 June 1994 in the Vienna Diplomatic Conference. After the ratification of the CNS by the Turkish Parliament and officially becoming a Contracting Party on January 14, 1995, Türkiye presented its national reports in accordance with the provisions of Article 5 of the CNS review the implementation of the CNS. This report is the Turkish National Report for the Joint 8<sup>th</sup> and 9<sup>th</sup> Review Meeting in March 2023.

Türkiye took an active and positive role in attending meetings and reviewing national reports during all review meetings and intends to continue the same manner in the upcoming Review Meetings of the Parties to the CNS.

Türkiye is currently constructing all four Units of the Akkuyu Nuclear Power Plant (Akkuyu NPP). Other nuclear power project is the Sinop Nuclear Power Plant (NPP).

The Joint 8<sup>th</sup> and 9<sup>th</sup> National Report of Türkiye has been developed in full compliance with the requirements of the “Convention on Nuclear Safety and Guidelines Regarding National Reports under the Convention on Nuclear Safety (INFCIRC/572/Rev.6)” and also by using “Template to support the drafting of National Reports, International Atomic Energy Agency (IAEA)”.

The National report was prepared to reflect the latest developments in nuclear power programme in Türkiye. For this reason, the chapters related to the establishing nuclear infrastructure and siting have been prepared in detail to inform contracting parties of the CNS.

Also, the report contains an overview in the “Summary” section facilitating discussion on the actions taken to reflect the principles in the Vienna Declaration on Nuclear Safety (VDNS) for the implementation of the objective of the CNS to prevent accidents and mitigate radiological consequences.

## SUMMARY

### CURRENT SITUATION

With the strong growth in energy demand in Türkiye, initiatives to build a nuclear power plant were given a new boost in the past decade. Currently, Türkiye has four-unit Akkuyu NPP under construction.

Negotiations on building an NPP on the Mediterranean coast of Türkiye in Mersin province resulted in the signing of an intergovernmental agreement (IGA), the “Agreement between the Government of the Russian Federation and the Government of the Republic of Türkiye on cooperation in relation to the construction and operation of a nuclear power plant at the Akkuyu site in the Republic of Türkiye” (Akkuyu Project Agreement), with Russian Federation in Ankara on May 12, 2010. The Akkuyu Project Agreement is based on a Build-Own-Operate (BOO) model, the first of its kind in the world, and according to the agreement, the technology and financing for the project is being provided by the Russian Federation.

“Akkuyu Nuclear Power Plant Electricity Generation Joint-Stock Company (Akkuyu Nuclear JSC)” was incorporated pursuant to the terms of the Akkuyu Project Agreement to implement the Akkuyu NPP Project under the Turkish jurisdiction on December 13, 2010. Akkuyu Nuclear JSC is responsible for the construction and operation of four units of Water-Water Energetic Reactor (VVER) each with the capacity of 1200 MWe power. The predecessor of the Nuclear Regulatory Authority of the Republic of Türkiye (NDK), Turkish Atomic Energy Authority (TAEK), recognized the Akkuyu Nuclear JSC as the “owner” of the Akkuyu NPP Project on February 7, 2011.

In accordance with the Akkuyu Project Agreement, Russian Federation has undertaken not only to finance the construction of the NPP, but also to ensure the production of electricity

and to guarantee the supply of nuclear fuel for the NPP's lifespan.

Although the Akkuyu Site was granted a site license for building an NPP in 1976 and allocated to the Akkuyu Nuclear JSC in 2011, Akkuyu Nuclear JSC re-performed the detailed site investigations in Akkuyu site for updating the site characteristics and parameters. The Updated Site Report (USR) and the site related project parameters were approved by TAEK on March 2015 and on February, 2017, respectively.

March 2, 2017 Akkuyu Nuclear JSC applied for construction license of Akkuyu NPP Unit 1. Based on this application, a limited work permit was issued by TAEK for Akkuyu NPP Unit 1 on October 19, 2017, allowing Akkuyu Nuclear JSC to proceed with the installation of structural foundations of reactor and environmental safety related buildings and facilities and construction of other structures, systems and components. Based on the same application, the construction license is granted for Akkuyu NPP Unit 1 on April 2, 2018, allowing the Akkuyu Nuclear JSC to build all Unit 1 structures.

All limited work permits and construction licenses for four Units were obtained on the following dates:

- For Unit 1: Limited Work Permit was obtained on 20.10.2017 and Construction License was obtained on 02.04.2018
- For Unit 2: Limited Work Permit was obtained on 30.11.2018 and Construction License was obtained on 26.08.2019.
- For Unit 3: Limited Work Permit was obtained on 23.07.2020 and Construction License was obtained on 13.11.2020.

- For Unit 4: Limited Work Permit was obtained on 30.06.2021 and Construction License was obtained on 28.10.2021.

The second NPP is the Sinop NPP Project on the Black Sea coast, based on "The Agreement Between the Government of the Republic of Türkiye and the Government of Japan on Cooperation for Development of Nuclear Power Plants and the Nuclear Power Industry in the Republic of Türkiye" (Sinop Project Agreement) signed with Japan on May 3, 2013. The Sinop Project Agreement covers the construction and operation of an NPP comprising of four ATMEA-1 reactors in Sinop site. Currently, the recognized "owner" for the Sinop NPP Project is the Electricity Generation Corporation (EÜAŞ). Based on the results and evaluation of the feasibility study prepared by the Japanese-led consortium to build the Sinop NPP project, the Turkish Government decided not to continue with Japan on this project. Currently, site related activities to license the Sinop NPP site without the Japanese Consortium are completed and a site report has been prepared for site license application to NDK.

Moreover, in line with the needs of NDK, a variety of tools including IAEA Technical Cooperation Programme and European Commission (EC) Instrument for Nuclear Safety Cooperation (INSC) were used. There are three Technical Cooperation Projects (TUR Projects) carried out with the IAEA: the activities for the 2020-2022 period have been completed, the implementation of the activities for the 2022-2024 period has been started, and preliminary negotiations on activities planned for the 2024-2026 period continue. INSC Project which was started with TAEK in 2018 was taken over by NDK upon its establishment. Activities within the scope of INSC Project were completed in 2021.

In addition, NDK benefits from the missions of the IAEA to further develop the country's nuclear infrastructure needed to support the

nuclear power programme in Türkiye. The Integrated Nuclear Infrastructure Review (INIR) Mission was conducted from 4 to 14 November 2013 and the Ministry of Energy and Natural Resources (ETKB), TAEK, EÜAŞ and other related organizations got involved in building the national nuclear infrastructure.

The preparatory meeting of the Integrated Regulatory Review Service (IRRS) was held on 5-6 May 2022 in Ankara, the Advance Reference Material was provided to IAEA on 4 June 2022 and IRRS Mission will take place on 4-16 September 2022.

The Emergency Preparedness Review (EPREV) Mission has been requested and a protocol was signed between Disaster and Emergency Management Authority (AFAD) and NDK on March 2022 since the EPREV Mission will be implemented in coordination with AFAD. The EPREV Mission is planned to be held in Q3 2023. The full-scale exercise for Akkuyu NPP is planned to take place in the Q4 2022 or Q1 2023.

After the accident at the Fukushima Daiichi NPP, for the purpose of safety and risk assessment studies, an undertaking has been initiated by the EC to allow participation of neighbouring countries to the stress tests. Türkiye is among the countries that signed the Joint Declaration on comprehensive risk and safety assessments of nuclear plants, also called Stress Tests. As an outcome of the Joint Declaration, TAEK has requested applicable Stress Test evaluations for the Akkuyu NPP Project from the Akkuyu Nuclear JSC.

Akkuyu Nuclear JSC prepared the applicable stress test evaluations for the Akkuyu NPP Project and submitted to TAEK. The Stress Tests National Report of Türkiye, which included evaluations of the regulatory body was finished in May 2012 and opened for comments of the ETKB and Ministry of Foreign Affairs. The finalized report was sent to the EC on June, 2012. As a result of comments received, updated version of "Stress Tests National

Report of Türkiye” was issued on December 2018.

On mid-2021, discussions on organisation of the peer review started with European Nuclear Safety Regulators Group (ENSREG). Questions of Peer review team were sent to NDK on December 16th, 2021 and answers were prepared and sent to ENSREG on March 15<sup>th</sup>, 2022.

First step of the peer review of Akkuyu NPP was held from 16 to 18 of May in Ankara, NDK Headquarters. As the result of discussions for clarification on the questions and national report, findings of the peer review team are expected. The second step of the peer review team visit is planned on June, 2022 to Akkuyu site.

#### CHANGES SINCE THE 7<sup>TH</sup> REVIEW MEETING OF CONVENTION ON NUCLEAR SAFETY

Since the 7<sup>th</sup> Review Meeting of CNS, Türkiye has continued to update its nuclear regulatory infrastructure and developed its nuclear energy programme. This subchapter of Summary presents developments and changes that have arisen since the previous National Report.

Türkiye established its first nuclear regulatory body (the Atomic Energy Commission, AEC) on 27 August 1956 with Law No. 6821 and pursued this effort to benefit from international experience in the area and become one of the founding members of IAEA in 1957. The AEC was replaced by the TAEK in 1982 under Law No. 2690. In July 2018, with a referendum amending the constitution, parliamentary system of government in Türkiye was replaced with a presidential governmental system. Consequentially, all governmental institutions had been modified to adapt with the new system.

To improve the regulatory system in Türkiye and achieve full compliance with international requirements and expectations in the nuclear area, a draft Nuclear Energy Law was prepared by TAEK in coordination with ETKB. This

draft law has been enacted with Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Various Laws No. 702 (DL No. 702) and with Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations No. 4 (PD No. 4).

NDK was established by DL No. 702 which was a comprehensive nuclear law regulating radiation protection, safety of nuclear, radiation, waste and transport facilities and activities, security facilities and activities, and safeguards.

Following the entry into force of DL No. 702, the Turkish Constitutional Court annulled DL No. 702 on 9 March 2021 due to procedural reasons. The Turkish Constitutional Court defined one-year period for the date of effect of the decision allowing the government to reregulate. In this period, to replace DL No. 702, Nuclear Regulatory Law No. 7381 (Law No. 7381) was prepared and entered into force on 8 March 2022.

Law No. 7381 contains provisions and requirements on general principles of

- nuclear safety, nuclear security, nuclear safeguards and radiation protection;
- authorizations and inspections;
- administrative and criminal sanctions;
- coordination of activities between different governmental bodies regarding interfaces between them while regulating nuclear and radiation facilities and activities;
- principles of decommissioning and treating and handling of spent fuel and radioactive waste;
- establishment of independent nuclear regulatory body, NDK
- and establishment of the National Nuclear Technical Support Organization (NUTED).

In addition to Law No. 7381, Presidential Decree on the Organization and Duties of the Nuclear Regulatory Authority No. 95 (PD No. 95) entered into force on 8 March 2022 which lays out the functions and organizational structure of the NDK. Therefore, the provisions regarding the NDK in PD No. 4 have been replaced by PD No. 95.

Former nuclear regulatory body, TAEK, was responsible not only for developing nuclear regulations and safety measures, but also for operating Türkiye's research reactors. With the establishment of NDK, TAEK was transformed to become a research and development organization and also given the responsibility of management of all national radioactive waste including the final disposal activities.

With PD No. 57, Turkish Energy, Nuclear and Mineral Research Agency (TENMAK) was established. TAEK, National Boron Research Institute (BOREN) and Rare Earth Element Research Institute (NATEN) will be gathered under the umbrella of TENMAK.

ETKB is the main body of the Turkish energy sector. It is responsible for the preparation and implementation of energy policies, plans and programmes, in coordination with its dependent and related institutions and with other public and private entities. "Presidential Decree on the Organization of Presidency" of 10 July 2018, Presidential Decree No. 1 (PD No. 1) defines the organizational structure of the ETKB. The General Directorate of Nuclear Energy and International Projects (NEIPGM) under the ETKB was established by PD No. 1. NEIPGM has the responsibility of coordination of activities between ministries, public institutions and organizations, universities, non-governmental organizations and private sector companies regarding the implementation of NPP projects in line with the IAEA Milestones Approach. Furthermore, informing the public regarding nuclear energy is also under the responsibility of NEIPGM.

The legislations and regulations issued since the 7<sup>th</sup> Review Meeting are:

- Regulation on Construction Inspection of the Nuclear Power Plants (2017),
- Regulation on Operating Organization, Operating Personnel Qualifications and Training and Operating Personnel Licenses (2017),
- Regulation on Authorization Regarding Radiation Facilities and Radiation Practices (2020),
- Regulation on Management of the Radiation Emergencies (2020),
- Regulation on Inspections Regarding Nuclear Energy and Ionizing Radiation (2021),
- Regulation on Administrative Sanctions (2021),
- Regulation on Working Procedures and Principles of Nuclear Regulatory Board (2022),
- Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities (2022).

Türkiye has also signed some arrangements and Memorandum of Understandings to receive support from experienced Regulatory Bodies. These agreements are:

- Arrangement Between Turkish Atomic Energy Authority (TAEK) and The National Nuclear Safety Administration of The People's Republic of China in the Field of Nuclear Safety (September, 2016)
- Arrangement between the Turkish Atomic Energy Authority (TAEK) and the United States Nuclear Regulatory Commission for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters (September, 2017)
- Memorandum of Understanding between the Department for Nuclear and Radiation Safety of the Ministry

for Emergency Situations of the Republic of Belarus and Nuclear Regulatory Authority (NDK) of Türkiye (August 2020),

- Memorandum of Understanding between the State Office for Nuclear Safety (SUJB) and Nuclear Regulatory Authority (NDK) of Türkiye (February 2022).

#### ACTIONS TAKEN TO REFLECT THE PRINCIPLES IN THE VIENNA DECLARATION ON NUCLEAR SAFETY (VDNS)

This subsection contains summary discussion on the actions taken to reflect the principles in the VDNS for the implementation of the objective of the CNS to prevent accidents and mitigate radiological consequences.

#### VDNS PRINCIPLE 1

VDNS Principle 1 states that “New nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off-site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions.”

Issues of this principle were addressed during the approval of site related design parameters of Akkuyu and review and assessment of Preliminary Safety Analysis Report (PSAR) for limited work permit and construction license for the Unit 1, 2, 3 and 4 of Akkuyu NPP. Further details were given in sections 3, 13, 14 and 15.

#### VDNS PRINCIPLE 2

VDNS Principle 2 states that “Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are to be implemented in a timely manner.”

Although this principle addresses the existing reactors, it was considered in review and assessment of Safety Analysis Report (SAR) for construction license of Unit 1, 2, 3 and 4 of Akkuyu NPP. Some safety improvements are under further investigations of Akkuyu Nuclear JSC and NDK. Further information can be found in sections 3 and 15 of this report.

#### VDNS PRINCIPLE 3

VDNS Principle 3 states that “National requirements and regulations for addressing this objective throughout the lifetime of nuclear power plants are to take into account the relevant IAEA Safety Standards and, as appropriate, other good practices as identified inter alia in the Review Meetings of the CNS.”

The new legislative framework is established, the regulatory framework needs an upgrading to comply with the legislations. This opportunity has been utilized by NDK as upgrading safety regulations to ensure full compliance with IAEA safety requirements and to be in line with the VDNS principles. Further information can be found in section 4 of this report.

## 6 EXISTING NUCLEAR INSTALLATIONS (ARTICLE 6)

*Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.*

Negotiations to build an NPP at Akkuyu site in Türkiye has been started with the Russian Federation on February 2010 and concluded on May 12<sup>th</sup>, 2010 with the “Agreement between the Government of the Russian Federation and the Government of the Republic of Türkiye on cooperation in relation to the construction and operation of a nuclear power plant at the Akkuyu site in the Republic of Türkiye” (Akkuyu Project Agreement) based on a BOO model.

According to the Akkuyu Project Agreement, a Project Company named Akkuyu Nuclear JSC was incorporated to implement the Akkuyu NPP Project under the Turkish jurisdiction on December 13<sup>th</sup>, 2010, which was later renamed as Akkuyu Nuclear JSC. This company is responsible for the construction and operation of four VVER reactors with a total capacity of 4800 MW. The former nuclear regulatory body of Türkiye, TAEK, recognized Akkuyu Nuclear JSC as the “Owner” of the Akkuyu NPP Project on February 7, 2011.

The Akkuyu Site on the Mediterranean coast was granted a site license for building an NPP in 1976 and this site was allocated to Akkuyu Nuclear JSC in 2011 as specified in the Akkuyu Project Agreement. Akkuyu Nuclear JSC finished the site investigations in Akkuyu for updating the site characteristics and parameters according to “Decree on Licensing of Nuclear Installations, 1983” and other related legislation. Updated information on the characteristics of the site was included in the USR and the report was approved by TAEK in March 2015. Upon completion of updating the

information on the characteristics and parameters of the site, Site Parameters Report (SPR) was submitted to TAEK for approval of site related design parameters in December 2015. SPR also includes the results of detailed site investigations performed at the NPP site and the precise values of the project parameters. On February 9, 2017, the project parameters were approved by TAEK in accordance with the relevant articles of the Decree.

On March 2, 2017, Akkuyu Nuclear JSC applied for the construction license of Akkuyu NPP Unit 1. As the result of review and assessment of the application, the limited work permit was given to Akkuyu Nuclear JSC for Akkuyu NPP Unit 1 at the 146<sup>th</sup> meeting of Atomic Energy Commission on October 19, 2017.

With the limited work permit, Akkuyu Nuclear JSC is allowed to start the construction of non-nuclear buildings, preparing the structural foundations of buildings and facilities related to nuclear and environmental safety, as well as the construction or manufacturing of structures, systems and components not related to nuclear and environmental safety in accordance with the Decree.

On April 2, 2018, the construction license was granted for the Akkuyu NPP Unit 1 based on the application of the Akkuyu Nuclear JSC by the decision number 148/2 of the AEC on March 30, 2018, in accordance with the Law on TAEK and related regulations.

According to the Decree on Licensing of Nuclear Installations, operation and

construction licenses for nuclear facilities can be issued based on general and specific conditions. So, there are also general and specific conditions as an integral part of the

construction license of Akkuyu NPP Unit 1. The license conditions are mainly related to the detailed design of the plant issues to be finalized until the operation license phase.

**Table 1. Licences and Permits Granted for the Akkuyu NPP Project by August 2022**

LICENCE/PERMIT	DATE	PURPOSE
<b>Site Licence</b>	1976	Suitability of the site to host an NPP
<b>Approval of Updated Site Report</b>	2013	Updating site studies based on developments after the site license issued in 1976 including changes in the site environment, changes in the regulatory requirements, the proposed NPP project and the lessons learned from the Fukushima Daiichi accident
<b>Approval of EIA report</b>	2014	To ensure environmental safety
<b>Approval of Site Parameters</b>	2017	Approval of the site parameters to be used in the design of NPP
<b>Limited Work Permit for Unit 1</b>	2017	Commencement of manufacturing and non-safety related construction.
<b>Construction License for Unit 1</b>	2018	Commencement of nuclear safety related construction and installation of systems and equipment
<b>Limited Work Permit for Unit 2</b>	2018	Commencement of manufacturing and non-safety related construction.
<b>Construction License for Unit 2</b>	2019	Commencement of nuclear safety related construction and installation of systems and equipment
<b>Limited Work Permit for Unit 3</b>	2020	Commencement of manufacturing and non-safety related construction
<b>Construction License for Unit 3</b>	2020	Commencement of nuclear safety related construction and installation of systems and equipment
<b>Limited Work Permit for Unit 4</b>	2021	Commencement of manufacturing and non-safety related construction
<b>Construction License for Unit 4</b>	2021	Commencement of nuclear safety related construction and installation of systems and equipment

On June 22, 2018, Akkuyu Nuclear JSC applied for the construction license of Akkuyu NPP Unit 2. As the results of review and assessment of the application, the limited work permit was

given to Applicant for Akkuyu NPP Unit 2 at the 149<sup>th</sup> meeting of AEC on November 30, 2018. The construction license was granted for the Akkuyu NPP Unit 2 by the decision number

2019-44/1-1 of Nuclear Regulatory Board on August 26, 2019, in accordance with the DL No. 702 and related regulations.

On March 28, 2019, Akkuyu Nuclear JSC applied for the construction license of Akkuyu NPP Unit 3. As the result of review and assessment of the application, the limited work permit was granted for Akkuyu NPP Unit 3 on July 23, 2020. The construction license was granted for the Akkuyu NPP Unit 3 by the decision number 2020-71/2-1 of Nuclear Regulatory Board on November 13, 2020, in accordance with the DL No. 702 and related regulations.

On May 12, 2020, Akkuyu Nuclear JSC applied for the construction license of Akkuyu NPP Unit 4. As the result of review and assessment of the application, the limited work permit was granted on June 30, 2021. The construction license was granted for by the decision number 2021-51/3-1 of Nuclear Regulatory Board on October 28, 2021, in accordance with the DL No. 702 and related regulations. Licenses and permits granted for the Akkuyu NPP Project by August 2022 are listed in Table 1.

While performing the review and assessment of the site reports and submissions for the construction license, special attention has been given to lessons learned from the Fukushima

Daiichi accident and the principles of the VDNS. While certain measures have already been taken, such as being very conservative in estimating the potential tsunami wave height for the site, increasing the capacity of hydro accumulators from 24 to 72 hours, adding mobile diesel generators in case of exceeding 72 hours design extension conditions or severe accidents, and including a core catcher in the design, some further issues are still under investigation of the regulatory body to ensure that the principles of the VDNS are met to the fullest.

The Sinop NPP is the second NPP project in Türkiye. Within this context, “Agreement between the Government of Republic of Türkiye and the Government of Japan on Cooperation for Development of Nuclear Power Plants and the Nuclear Power Industry in the Republic of Türkiye” was signed on May 3, 2013, aiming the construction and operation of an NPP. Based on the results and evaluation of the feasibility study prepared by the Japanese-led consortium to build the Sinop NPP project, the Turkish Government decided not to continue with Japan on this project.

In addition to the Akkuyu and Sinop NPP Projects, the ETKB predicts a third NPP project.



**Figure 2. TR-2 Research Reactor**

Türkiye has two research reactors. These facilities are outside the context of CNS. The

Çekmece Nuclear Research and Training Centre (ÇNAEM), which is one of the three

affiliated institutions of TAEK, co-operates with universities and other scientific and research institutes for the development and application of nuclear science and technology for peaceful uses of atomic energy. ÇNAEM commissioned a 1 MW research reactor (TR-1) in 1962 for both research and production of isotopes for industrial and medical purposes. It was operational from 1962 to 1977 and has been dismantled. A pool type 5 MW TR-2 reactor was later built in the same building and operated at 5 MW between 1984 and 1994 for irradiation purposes and operated at low power levels between 1995 and 2009 due to the fact that an update of conducting seismic evaluation studies of the reactor building are required. In 2013, the project on strengthening the reactor building was completed and an updated SAR

was prepared. After review and assessment of updated SAR, fuel loading and pre-operational test permit was kept on hold for the ÇNAEM TR-2 regarding the plans for decommissioning. Figure 1 shows control room and reactor pool of the TR-2 reactor

The second research reactor in Türkiye, İTÜ (İstanbul Technical University) TRIGA Mark II reached its first criticality on March 11, 1979. It is a pool-type, light water cooled and graphite-reflected reactor. İTÜ TRIGA Mark II Reactor is capable of steady-state operation at power levels up to 250 kW or pulsing mode operation where powers as high as 1200 MW are achieved for about 10 msec. Figure 2 shows some pictures of the İTÜ TRIGA Mark II.



**Figure 3. İTÜ TRIGA Mark II Research Reactor**

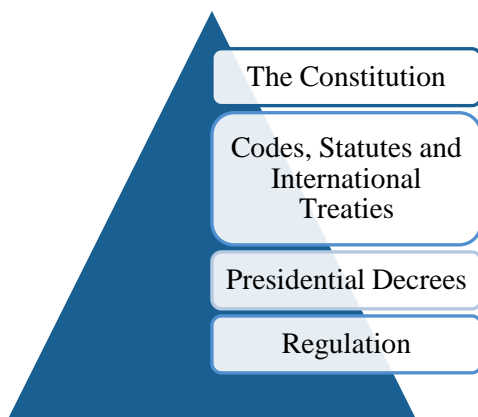
## 7 LEGISLATIVE AND REGULATORY FRAMEWORK (ARTICLE 7)

1. *Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.*
2. *The legislative and regulatory framework shall provide for:*
  - i. *the establishment of applicable national safety requirements and regulations;*
  - ii. *a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence;*
  - iii. *a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;*
  - iv. *the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.*

### 7.1 ESTABLISHING AND MAINTAINING A LEGISLATIVE AND REGULATORY FRAMEWORK

#### 7.1.1 LEGISLATIVE FRAMEWORK

Türkiye has a civil law system based on codified laws. As can be seen in Figure 3, the main domestic sources of law in hierarchical order can be listed as follows: The Constitution, codes and statutes, international treaties, Presidential decrees, and regulations. Once the international treaties ratified by the Grand National Assembly of Türkiye (GNAT), they have the same legal effect as codes and statutes.



**Figure 4. Hierarchy of Norms in Türkiye**

Türkiye established its first nuclear regulatory body, AEC, on 27 August 1956 with Law No. 6821 and pursued this effort to benefit from

international experience in the area and become one of the founding members of IAEA in 1957. The AEC was replaced by the TAEK in 1982 under Law No. 2690. In July 2018, with a referendum amending the constitution, parliamentary system of government in Türkiye was replaced with a presidential governmental system. Consequentially, all governmental institutions had been modified to adapt with the new system.

To improve the regulatory system in Türkiye and achieve full compliance with international requirements and expectations in the area, a draft Nuclear Energy Law was prepared by TAEK in coordination with ETKB. This draft law has been enacted with The Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Various Laws No. 702 (DL No. 702) and with Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations No. 4 (PD No. 4).

NDK was established by DL No. 702 which was a comprehensive nuclear law regulating nuclear safety, nuclear security, nuclear safeguards, radiation safety, radiation protection, and other related subjects on this topic.

Following the entry into force of DL No. 702, the Turkish Constitutional Court annulled DL

No. 702 on 9 March 2021 due to procedural reasons. The Turkish Constitutional Court defined one-year period for the date of effect of the decision allowing the government to reregulate. In this period, to replace DL No. 702, Nuclear Regulatory Law No. 7381 was prepared and entered into force on 8 March 2022.

Law No. 7381 contains provisions and requirements on general principles of radiation protection, safety, security, and safeguards; authorizations and inspections; administrative and criminal sanctions; coordination of activities between different governmental bodies regarding interfaces between them while regulating nuclear and radiation facilities and activities; roles and responsibilities of decommissioning and treating and handling of spent fuel and radioactive waste; establishment of independent nuclear regulatory body, NDK, and establishment of NUTED.

In addition to Law No. 7381, Presidential Decree on the Organization and Duties of the Nuclear Regulatory Authority No. 95 (PD No. 95) entered into force on 8 March 2022 and it regulates the functions and organizational structure of the NDK. Therefore, the provisions regarding the NDK in PD No. 4 have been regulated by PD No. 95.

Former nuclear regulatory body, TAEK, was transformed to become a research and development organization and also given the responsibility of management of all national radioactive waste including the final disposal activities.

With PD No. 57, TENMAK was established. TAEK, National Boron Research Institute (BOREN) and Rare Earth Element Research Institute (NATEN) will be gathered under the umbrella of TENMAK.

Other important legislation affecting the nuclear installations consists of the Environment Law No. 2874 which regulates environmental impact of nuclear facilities and gives the regulatory responsibilities and authorities to the Ministry of Environment Urbanisation and Climate Change (ÇŞİDB) and the Electricity Market Law No. 6446 which regulates electricity production licenses and gives regulatory authority to the Energy Market Regulatory Authority (EPDK). Furthermore, the “Penal Code” defines some of nuclear and radiological related crimes and penalties. However, for full compliance with the international instruments’ provisions some crimes and administrative penalties are defined in Law No. 7381. There are several other regulatory bodies indirectly regulating NPPs for some other general issues such as Ministry of Transportation and Infrastructure, Ministry of Health, municipalities etc.

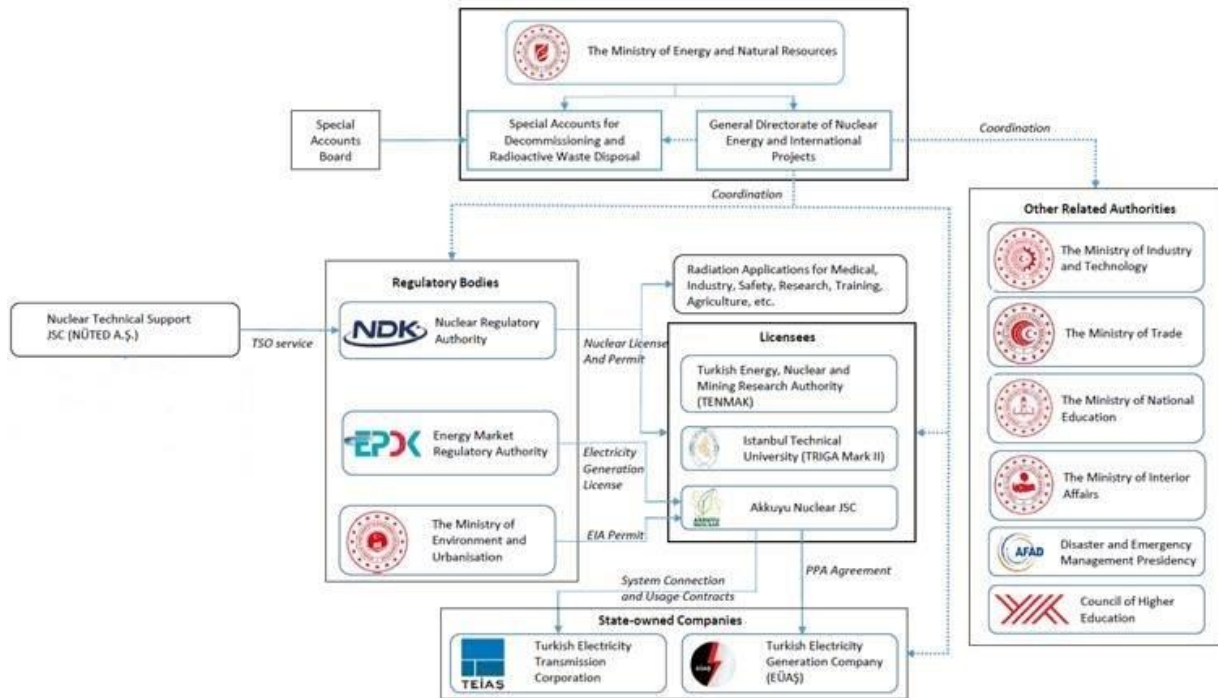
In the field of nuclear liability, Türkiye is a party to the Paris Convention on Third Party Liability in the Field of Nuclear Energy (The Paris Convention) of 29 July 1960. Its 1964, 1982 and 2004 additional protocols are ratified and currently in force in Türkiye. Provisions regarding nuclear liability, which are included in the fifth Section of Law No. 7381, are in full compliance with the Paris Convention.

**Table 2. International Agreements Signed/Ratified by Türkiye**

<b>AGREEMENT</b>	<b>SIGNED ON</b>	<b>RATIFICATION</b>
<b>Convention on Early Notification of a Nuclear Accident</b>	26.09.1986	03.01.1991
<b>Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency</b>	26.09.1986	03.01.1991
<b>Convention on Nuclear Safety</b>	20.09.1994	08.03.1995
<b>Convention on Physical Protection of Nuclear Materials</b>	23.08.1983	08.02.1987
<b>Amendment to the Convention on Physical Protection of Nuclear Materials</b>	08.07.2015	08.05.2016
<b>Convention on Third Party Liability in the Field of Nuclear Energy (the Paris Convention)</b>	29.07.1960	13.05.1961
<b>1964 Protocol to Amend the Paris Convention</b>	28.01.1964	13.06.1967
<b>1982 Protocol to Amend the Paris Convention</b>	16.11.1982	23.05.1986
<b>2004 Protocol to Amend the Paris Convention</b>		09.12.2021
<b>Joint Protocol Relating to the Application of the Vienna and the Paris Conventions</b>	21.09.1988	26.03.2007
<b>Treaty on the Non-Proliferation of Nuclear Weapons</b>	28.01.1969	17.04.1980
<b>Application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons</b>	30.06.1981	01.09.1981
<b>International Convention for the Suppression of Acts of Nuclear Terrorism</b>	14.09.2005	24.09.2012
<b>Protocol Additional to the Agreement between the Government of the Republic of Türkiye and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons</b>	06.07.2000	17.07.2001
<b>Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management</b>	06.10.2021	21.07.2022

The Law proposal for the accession to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was ratified by the GNAT on 6 October 2021. It is approved by the President in 2022.

On the other hand, “The Draft Regulation on Radioactive Waste Management Fund, Decommissioning Fund and Board of Accounts” is already prepared and it is in the approval process. It is expected to be enacted by the end of the year 2022.



**Figure 5. Governmental and Organizational Infrastructure Taking Part in Turkish Nuclear Energy Program**

### 7.1.2 RELATED GOVERNMENTAL BODIES WITH REGULATORY FUNCTIONS ON NUCLEAR ACTIVITIES

There are a number of organizations who directly or indirectly involved in the implementation of the nuclear power programme in Türkiye (Figure 4). The responsibilities of the Governmental bodies with regulatory functions are given in the following subchapters.

#### 7.1.2.1 MINISTRY OF ENERGY AND NATURAL RESOURCES (ETKB)

The ETKB is the major competent authority in the national energy sector. It is responsible for the preparation and implementation of energy policies, plans and programs in co-ordination with its subsidiaries, related institutions and other public and private entities.

“Presidential Decree on the Organization of Presidency” of 10 July 2018, Presidential Decree No. 1 (PD No. 1) defines the organizational structure of ETKB. NEIPGM is established by PD 1. NEIPGM has the responsibility of coordination of activities between ministries, public institutions and organizations, universities, non-governmental organizations and private sector companies regarding nuclear power plant projects and related activities. Furthermore, informing the public regarding nuclear energy is also under the responsibility of NEIPGM.

TENMAK and EÜAŞ are related with ETKB while the regulatory bodies, NDK and EPDK, are associated with the ETKB. Under the Turkish legal system Ministries have no administrative authority over associated organizations nor is there any hierarchical relation. Association only serves the purpose of integrity of administration and facilitation of coordination.

### 7.1.2.2 MINISTRY OF ENVIRONMENT, URBANISATION AND CLIMATE CHANGE (ÇŞİDB)

ÇŞİDB establishes principles of national policy, related plans and programs for protection and improvement of the environment, and the prevention of environmental pollution and struggling with climate change. In concrete terms, the ÇŞİDB responsibilities include ensuring the most proper and effective use and protection of land, the protection and improvement of the natural plant and animal habitat and the prevention of environmental pollution. These responsibilities are being carried out by the ÇŞİDB in the frame of the Regulation on Environmental Impact Assessment (EIA), 2014. According to this Regulation, the owner of the project has to prepare an EIA Report at the planning stage which should be submitted to the ÇŞİDB. The ÇŞİDB evaluates the report for the feasibility and environmental aspects of the proposed installation, and grants permission to the owner to carry out its project if the report is found satisfactory. Nuclear Installations fall into the category of facilities which require this authorization as NPPs are listed in Art. 2(b) of the EIA Regulation. NPPs should obtain an affirmative decision on EIA from the ÇŞİDB as a prerequisite to any license. According to PD No. 95, ÇŞİDB defines the format of EIA report's chapter regarding radiological effects with NDK's assent. These chapters are reviewed and assessed by NDK.

### 7.1.2.3 NUCLEAR REGULATORY AUTHORITY (NDK)

NDK is established as the independent nuclear regulatory body by Law No. 7381. NDK regulates all activities regarding to nuclear facilities, radiation facilities, radioactive waste facilities, nuclear materials, radiation sources, radioactive waste, export control with the aim of non-proliferation of nuclear weapons, radiation emergency management, qualification and training of personnel through

issuing regulations and guides, reviewing and assessing the submitted documents, issuing authorizations, and conducting inspections and enforcements.

### 7.1.2.4 TURKISH ENERGY, NUCLEAR AND MINERAL RESEARCH AGENCY (TENMAK)

Although established as the nuclear regulatory body by the Law No. 2690 of 1982, TAEK has been stripped of its regulatory duties during the transition to new governmental system in July 2019 and transformed into a research and development organization in nuclear and radiation field.

TENMAK was established by the PD No. 57. TENMAK consists of a central organization headquartered in Ankara and many service units directly connected to the headquarters.

The institutes within TENMAK body are:

- Nuclear Energy Research Institute,
- BOREN,
- NATEN,
- Energy Research Institute
- Clean Energy Research Institute.

TENMAK is given the lead role, authority and responsibility on research and development in science and technology related to energy, minerals, ionizing radiation, particle accelerators, nuclear, radioactive waste, boron and rare earth elements. TENMAK's responsibility on determining the strategies regarding radioactive waste and taking necessary actions as the national radioactive waste management organization leads the establishments of a Radioactive Waste Management Department under TENMAK.

### 7.1.2.5 THE ENERGY MARKET REGULATORY AUTHORITY (EPDK)

EPDK is the independent regulatory body for Turkish energy markets. EPDK is responsible and entitled to grant and renew licenses defining the rights and liabilities of the legal persons pertaining to their authorized activities;

prepare the existing contracts within the scope of the transfer of operational rights; establish performance standards by monitoring the market performances; prepare, improve and execute the secondary legislation, audit the licensees, prepare, modify and execute regulated tariffs and to ensure that the market activities are in compliance with the Electricity Market Law No. 6446. In this capacity EPDK grants the electricity production license to nuclear installations.

#### 7.1.2.6 THE ELECTRICITY GENERATION COMPANY (EÜAŞ)

EÜAŞ is a state-owned company and the largest electricity generation company in Türkiye. The responsibility of EÜAŞ is to operate the existing hydraulic and thermal power plants under its jurisdiction, running the newly built hydraulic power plants maintenance, repair and rehabilitation of the power plants under operation.

EÜAŞ has also been given the role as state electricity generation entity for nuclear power plants in case the nuclear power plant will be owned and operated by the state (as whole owner or shareholder). An application was made by EÜAŞ to TAEK and EÜAŞ was recognised as an owner of Sinop NPP in August 2012.

An integrated management system (IMS) was established which covers the central and provincial organizations of EÜAŞ as of the date of 11.06.2019 and is still effectively used. ISO 9001:2015 Quality Management System (QMS), ISO 14001:2015 Environmental Management System and ISO 45001:2018 Occupational Health and Safety Management Systems and ISO/IEC 27001:2013 Information Security Management System are used within the scope of the IMS.

During transition to the new governmental system in 2018, Turkish Electricity Trading and Contracting Company (TETAŞ) was merged with EÜAŞ. TETAŞ had the responsibility to

purchase part of the electricity from the Akkuyu NPP.

## 7.2 NATIONAL SAFETY REQUIREMENTS AND REGULATIONS

Prior to July 2018, TAEK had the responsibility and authorization to issue decrees and regulations in the field of nuclear energy. Law No. 2690, the “Decree on Licensing of Nuclear Installations, 1983”, the “Directive on Determination of Licensing Basis Regulations, Guides and Standards and Reference Plant for Nuclear Power Plants, 2012” and the regulations issued by TAEK constituted the basis of the regulatory framework of nuclear safety for nuclear installations in Türkiye.

Regulations related to nuclear safety were being developed by Department of Nuclear Safety of TAEK in accordance with the Directive on Preparation of Secondary Legislation. This Directive defined detailed procedures for planning, drafting, consulting with stakeholders, reviewing and issuing the regulations, guides and other regulatory documents.

Rules and procedures related to the licensing of nuclear installations were laid out in the “Decree on Licensing of Nuclear Installations”, which entered into force in 1983. The Decree defines permits and licenses to be obtained, requirements for applications to these permits and licenses, including lists and contents of documents to be submitted, review and assessment procedures, the authorizing entities within TAEK for each authorization, approval mechanisms for modifications during construction and operation, and authorizes TAEK for inspecting the installations throughout their lifetime and enforcing penalties such as limiting, suspending and revoking the licenses.

Although TAEK issued some regulations and guides prior to nuclear programme regarding the safety and security of nuclear facilities, the variety of technology choices and lack of a

technology selection at the early phases of nuclear programme hindered the formation of a complete set of regulatory requirements. TAEK developed mostly technology neutral regulations by adopting IAEA requirements. Türkiye's rapid growth and Government's ambition to include nuclear energy in the energy mix led to a very aggressive schedule for the implementation of the nuclear programme. Engaging with two different vendors for two different projects raised difficulties to develop the regulatory basis. To be able to apply most recent requirements in the area of nuclear safety, TAEK developed a licensing approach in parallel with the methods suggested in INSAG-26 document utilizing applicable IAEA, vendor country and third-party requirements to fill the gaps in current Turkish regulations. Furthermore, this licensing approach included the utilization of a reference plant to facilitate the licensing process. TAEK issued the Directive on Determination of Licensing Basis Regulations, Guides and Standards and Reference Plant for Nuclear Power Plants defining the licensing approach in 2011 and revised it in 2012. This Directive defines a Licensing Basis List which consists of applicable Turkish legislation, IAEA requirements, vendor country requirements, and third-party requirements where necessary. The list is prepared by an applicant through

negotiations with TAEK and approved by the Atomic Energy Commission establishing the Licensing Basis for the project. Directive also had provisions for the selection and approval of a reference plant representing the NPP units to be installed. In accordance with the provisions of Law No. 7381, all these regulations and directives issued at the time of TAEK are currently carried out by the NDK and remain valid unless the relevant regulation is rearranged by the NDK. Current secondary regulations defining the Turkish nuclear safety and security requirements are given on Table 2. These regulations are under revision for adapting the system with new legislative structure. This opportunity is also utilized for upgrading national regulations to comply with new editions of IAEA safety requirements and incorporating safety objectives into the system to be in line with the IAEA fundamentals and requirements as well as the VDNS principles to the extent possible.

NDK issued "Regulation on Working Procedures and Principles of Nuclear Regulatory Board" in 2022. This regulation defines Nuclear Regulatory Board of NDK's working procedures and principles.

PD No. 95 defines the activities, topics and areas to be regulated by the NDK and the duties of its service units.

**Table 3. Secondary Legislation in The Field of Nuclear Safety**

<b>DECREE/REGULATION</b>	<b>ISSUE DATE</b>	<b>SCOPE</b>
<b>Decree on Licensing of Nuclear Installations</b>	1983	Establishes the licensing system, defines rules and procedures for licensing, inspections and enforcements
<b>Regulation on Nuclear and Radiological National Emergency Preparedness</b>	2000	Defines responsibilities and interfaces between responsible organizations regarding a nuclear and radiological emergency and regulates the activities regarding the emergency.
<b>Regulation on Safe Transport of Radioactive Material</b>	2005	Defines measures for stages of loading, transportation, unloading, temporary storage as well as delivery to recipient of the packages containing radioactive materials including its design and preparation, for transportation by road, railways, air or sea.
<b>Regulation on Specific Principles for Safety of Nuclear Power Plants</b>	2008	Determines the safety principles to be complied to achieve the nuclear safety objectives defined by the Authority in site assessment, design, construction, commissioning, operation and decommissioning phases; as well as principles related with the emergency and accident management.
<b>Regulation on Design Principles for Safety of Nuclear Power Plants</b>	2008	Establishes safety principles to be followed during the design of nuclear power plants to achieve nuclear safety objectives defined by the Authority.
<b>Regulation on Site of a Nuclear Power Plant</b>	2009	Establishes the nuclear safety requirements for siting of nuclear power plants.
<b>Regulation on Protection of Outside Workers in Controlled Areas from the Risks of Ionizing Radiation</b>	2011	Defines the requirements for radiation protection of outside workers performing nuclear and ionizing radiation activities in controlled areas
<b>Regulation on Physical Protection of Nuclear Materials and Nuclear Facilities (revision of Reg-1979)</b>	2012	Defines national aspects of physical protection of nuclear materials in compliance with INFCIRC 225/Rev.4 and some provisions of INFCIRC 225/Rev5.
<b>Regulation on Clearance in Nuclear Facilities and Release of Site from Regulatory Control</b>	2013	Determines the methods and principles related to clearance of radioactive material and waste which arise during operation and decommissioning of nuclear facilities and to release of site from regulatory control
<b>Regulation Regarding Equipment Procurement Process and Approval of Manufacturers for Nuclear Facilities</b>	2015	Defines rules and procedures for the procurement and manufacturing of all equipment used in nuclear facilities; defines required permits and approvals for procurement and manufacture; defines inspections and enforcements regarding procurement and manufacturing
<b>Regulation on Construction Inspection of the Nuclear Power Plants</b>	2017	Defines the scope of the inspections which will be performed by the Owner for the purpose of constructing nuclear plants in compliance with

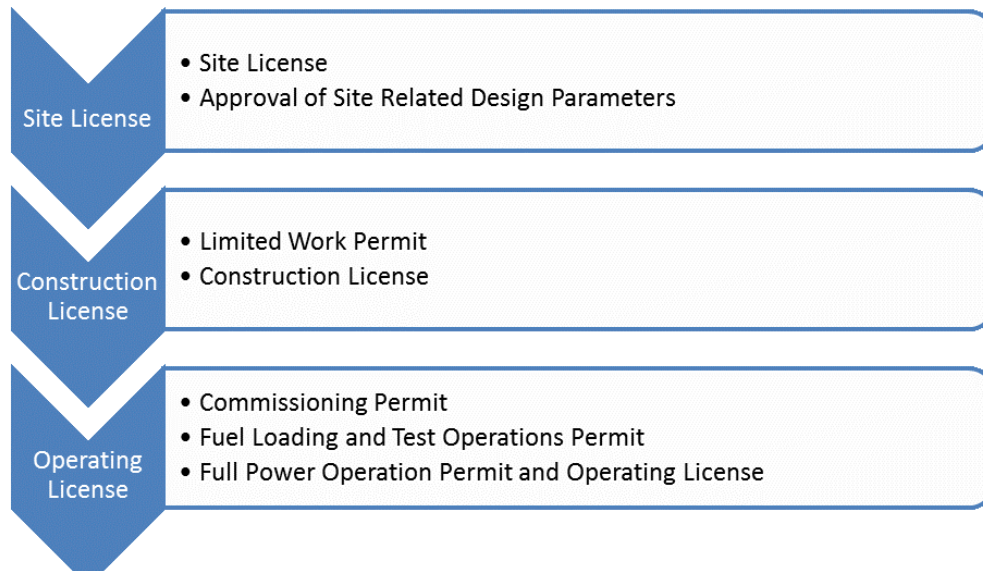
		nuclear safety principles and related legislation and standards; defines the methods and principles regarding the authorization of nuclear construction inspection organizations; defines the duties and responsibilities of relevant parties; and defines the scope of the contract of service that will be concluded between nuclear construction inspection organization and the Owner.
<b>Regulation on Operating Organization, Operating Personnel Qualifications and Training and Operating Personnel Licenses</b>	2017	Defines rules and procedures for operating organization, qualification and training of operating personnel, and operating personnel licenses.
<b>Regulation on Radiation Protection in Nuclear Installations</b>	2018	Defines rules and procedures for radiation protection in all phases during the lifetime of nuclear installations radiation facilities and radioactive waste facilities, radiation facilities and radioactive waste facilities.
<b>Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities</b>	2022	Defines the basic requirements for establishing, maintaining and continuously improving a management system that gives priority to safety, develops leadership skills at all levels of management and supports a strong safety culture in Organization that constructs, operates, decommissions or closes a nuclear installation.

### 7.3 SYSTEM OF LICENSING

Prior to July 2018, licensing of nuclear installations was under the responsibility of TAEK regarding nuclear safety, security and radiation protection issues in accordance with the process which is defined in the Decree on Licensing of Nuclear Installations, 1983. According to the Decree, licensing procedure was initiated by the applicant to be recognized as the “Owner”. Licensing process for an NPP comprised of three main stages in succession: Site License, Construction License and Operating License (Figure 5). There were several permits functioning as hold points during the licensing process. These are limited work permit, commissioning permit, permit to bring fuel to site, fuel loading and test

operations permit for operating license. For each authorization, documents required for review and assessment of TAEK were defined in the Decree.

Licensing approach of TAEK was defined in the “Directive on Determination of Licensing Basis Regulations, Guides and Standards and Reference Plant for Nuclear Power Plants, 2012”, which laid out the rules for establishing a licensing basis for NPPs. This Directive is being implemented for the Akkuyu and Sinop NPP Projects. A list of applicable regulations, guides and standards has been determined by the Akkuyu Nuclear JSC for the Akkuyu NPP Project and by EÜAŞ (with the assistance of future project partners of Japanese Consortium) for the Sinop NPP Project.



**Figure 6. Old Licensing System**

The Atomic Energy Commission of TAEK approved the “List of Licensing Basis for Akkuyu NPP” on 2 November 2012 and its revision (Rev.2) on 14 November 2014. Akkuyu NPP licensing basis list is mainly composed of Turkish regulations, IAEA Safety Fundamentals and Requirements and Russian Federation Regulations. Relevant standards and guides of Türkiye and Russian Federation are also included in the List. Novovoronezh-II NPP in Russian Federation was approved as the reference plant for the Akkuyu NPP Project by Atomic Energy Commission of TAEK on 16 August 2012.

Regarding the Sinop NPP Project, the Atomic Energy Commission of TAEK approved the “List of Licensing Basis for the Sinop Nuclear Power Plant” on 24 January 2018. The Sinop NPP List is mainly composed of Turkish regulations, IAEA Safety Fundamentals and Requirements and American (USA) Regulations. Standards and guides of Türkiye and USA are also included in the List. On 24 January 2018, the Atomic Energy Commission of TAEK approved EPR type Flamanville-III NPP in France as the reference plant for Sinop NPP noting that the NPP is not the same but most similar technology to the proposed ATMEA-1. ATMEA-1 is a first of a kind

reactor and does not have a proper reference plant.

The licensing includes review and assessment of a set of documents for each license application. These documents include:

- Preliminary or Final Safety Analysis Report (FSAR),
- Probabilistic Safety Assessment (PSA) Reports for Level 1 and 2,
- Physical Protection Programme documentation,
- Nuclear Material Accountancy and Control System documentation,
- Emergency Management Plan,
- Management System (MS) documents,
- Other documents.

Turkish licensing system included “3S” approach. During the evaluation of license application submitted reports and programmes related to the safety, security and safeguards were reviewed by the regulatory body. The approval of physical protection programme and the nuclear material accountancy and control system of the NPP was a pre-requisite before granting permission to bring nuclear material to the site. The final information regarding the emergency management would have been reviewed before the permit for fuel loading.

A new regulation will be developed to outline the licensing process in accordance with the provisions of Law No. 7381. Until this regulation is issued, the Decree on Licensing of Nuclear Installations will be in force.

Law No. 7381 Art. 4 para. 1 states that; “Activities within the scope of this Law shall not be implemented without authorization from the Authority. The natural or legal persons who want to carry out an activity are obliged to apply to the Authority. The Authority determines the activities that require notification or authorization on the basis of safety and security principles.” Also, Art 4 par 2. states that; “It is obligatory to obtain a license from the Authority to operate a nuclear facility, radiation facility, radioactive waste facility and to carry out radiation applications. Only the citizens of the Republic of Türkiye or legal persons established in accordance with the legislation of Republic of Türkiye may obtain licenses from the Authority.”

The activities requiring permission from NDK are defined in Law No. 7381 Art. 4 para. 3:

- Preparation of the site for the nuclear facility, manufacturing the equipment determined by the Authority, constructing the facility, commissioning, decommissioning, re-start of operation, and modifications related to safety and security of the installation,
- Commissioning and decommissioning of radiation facility and modifications related to safety and security of the facility,
- Construction, commissioning, decommissioning, closure of the radioactive waste facility, and making changes concerning safety and security in the facility,
- Export, import, transportation, transit of radioactive materials,
- Within the scope of nuclear safeguards, the export of substances, materials, equipment, systems, components and

related technology and nuclear dual-use substances, materials, equipment, systems, components and related technology specially designed or prepared for use in the nuclear field,

- Import of substances, materials, equipment, systems, components or related technology determined by the Authority within the scope of nuclear safeguards,
- Other activities determined by the Authority taking into account safety security, and nuclear safeguards.

The activities within the scope of this Law that require certificate from the Authority are as follows;

- Legal persons that provide training on radiation protection to the personnel who will take part in the activities,
- Persons who will provide services for radiation protection,
- Personnel to take part in the activities,
- Persons manufacturing equipment,
- Companies performing third party surveillance.

Furthermore, Law No. 7381 also defines sanctions regarding misconduct of authorized activities. Criminal and administrative sanctions are determined for operation of a nuclear installation without a valid license and for abandoning an authorized activity before legal responsibilities properly ended.

#### 7.4 SYSTEM OF REGULATORY INSPECTION AND ENFORCEMENT

Regulatory inspection and enforcement activities cover all areas throughout the lifetime of a nuclear installation. The main philosophy for the regulatory inspection is “Trust and Verify”. However, until trust is established this is achieved by planning the overall approach in scope and content of the inspection to be conducted, not only limited to the authorized organization but also to include its contractor and supplier chains.

Until April 2019, TAEK conducted inspections to ensure that the authorized organization complies with the conditions set out in the authorization and applicable regulations. Enforcement actions were taken, when deemed necessary by TAEK in the event of deviations from, or non-compliance with conditions and requirements. The methods of inspection include examination and evaluation of all records and documentation, and surveillance, monitoring, auditing and interviewing of personnel and management, as well as performing of actual tests and measurements in all phases of the installation. In addition to TAEK staff outside technical support have also been utilized when necessary.

“Regulation Regarding Equipment Procurement Process and Approval of Manufacturers for Nuclear Facilities, 2015” established the provisions for the procurement process of all equipment used in nuclear facilities including the permits necessary to be obtained by the Owner to initiate the procurement process and issues regarding approval of manufacturers taking part in the procurement process of equipment important to safety as well as regulatory inspections and sanctions to be implemented in the procurement process. According to this regulation, items important to safety could only be produced by approved manufacturers. TAEK also conducted inspections to the manufacturers who applied for being approved manufacturers.

“Regulation on Construction Inspection of the Nuclear Power Plants” defined requirements for the independent organization to perform the manufacturing and construction inspections for the Owner. According to this regulation it is mandatory for the Owner to hire an independent inspection organization certified by TAEK.

To improve the inspection capabilities, TAEK used external consultants from the universities during site studies. In 2015, to procure external support, TAEK signed a protocol with Turkish Standards Institution (TSE) who has experience in industrial inspections. TAEK also sought

support of experienced EU regulators and inspection organizations through EU projects to improve its inspection system with their experience. Technology Department of TAEK has given the duty to improve the in-house inspection capacity and human resources in the area. Technology Department supported the Department of Nuclear Safety during construction and manufacturing inspections.

After April 2019, when NDK became operational with transfer of regulatory personnel from TAEK, regulatory inspection activities are also transferred to the NDK’s Department of Inspections (DI). Former regulations regarding inspections issued by TAEK are in the process of update to be re-issued by NDK.

In accordance with PD No. 95, DI of NDK have the following responsibilities:

- To inspect or examine on-site of the activities and authorized persons before or after the authorization,
- To prepare annual inspection programs regarding inspection activities in coordination with the relevant departments,
- To carry out the works and procedures related to the implementation of administrative sanctions in matters falling within its scope of duty and authority, in coordination with the relevant service units.
- To carry out the works and procedures related to administrative sanctions in matters that do not require coordination with the relevant service units, in coordination with the Department of Legal Services,
- To receive technical support services from specialized public institutions and organizations, private law legal entities and real persons, within the scope of the inspection and on-site examination, in order to conduct the examination, research, determination and reporting

in a way that will not be binding on the Authority in terms of results,

- To inform the authorized person about the findings determined as a result of the inspection activities, to follow up the works and procedures of the authorized person regarding the findings, to report the findings that are not closed positively to the relevant service units and to carry out the works and procedures stipulated in the relevant legislation in coordination,
- To carry out the works and procedures for the authorization of the inspector of the Authority,
- To perform other duties assigned by the President.

#### 7.5 ENFORCEMENT OF APPLICABLE REGULATIONS AND TERMS OF LICENSES

Law No. 7381 provides provisions for enforcement of applicable regulations and terms of licenses. As a general principle it is stated in Art. 3 para. 3; activities related to nuclear energy and radiation and persons, facilities, devices and materials related to these activities are subject to regulatory control in terms of safety, security and nuclear

safeguards. The exemptions to be granted regarding regulatory control and the limits and conditions of these exemptions are determined by the regulation by the Authority on the basis of the graded approach, so as to meet the safety and security requirements.

For the enforcement of applicable regulations and terms of licenses, administrative sanctions defined in Law No. 7381. Art. 25 defines these sanctions in detail. Law No. 7381 Art. 25 para. 2 states that in addition to the administrative fines applied pursuant to the first paragraph, an appropriate time is given to the person concerned by NDK to rectify the violations. If the violations are not remedied within the given time, administrative fines are applied in the amount of twice the previous penalty each time. If it is determined that the false document, misleading information or the change in the authorization conditions are the basis for the authorization and it is determined that it is not possible to correct it, the authorization is suspended, restricted or cancelled in addition to the administrative fine.

For the implementation of administrative sanctions, a new regulation has been issued to clarify the procedural issues, Regulation on Administrative Sanctions, 2021.

## 8 REGULATORY BODY (ARTICLE 8)

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 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

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

### 8.1 ESTABLISHMENT OF THE REGULATORY BODY

Türkiye established its first nuclear regulatory body, the AEC, on 27 August 1956 with Law No. 6821. The AEC was replaced by the TAEK in 1982 under Law No. 2690. Türkiye's transition to a presidential governmental system in 2018 through a constitutional referendum brought along the modification of the governmental institutions. In this context, to improve the regulatory system in Türkiye and to comply with international regulations, NDK was established by DL No. 702 as explained in more detail in 4.1.1.

Due to procedural reasons, the Turkish Constitutional Court annulled DL No. 702 and defined one-year period for the date of effect of the decision. In this period, in line with the need for replacement of DL No. 702 and entered into force on 8 March 2022.

Law No. 7381 contains provisions and requirements on general principles of nuclear safety, security, safeguards and radiation protection; authorizations and inspections; administrative and criminal sanctions; coordination of activities between different governmental bodies regarding interfaces between them while regulating nuclear and radiation facilities and activities; principles of decommissioning and treating and handling of spent fuel and radioactive waste; establishment of independent nuclear regulatory body, NDK and establishment of a national nuclear TSO, NUTED.

In addition to Law No. 7381, PD No. 95 entered into force on 8 March 2022 and it lays out the functions and organizational structure of the NDK.

#### 8.1.1 LEGAL FOUNDATIONS AND STATUTE OF THE REGULATORY BODY

The duties and responsibilities of NDK are defined on 8 March 2022 under PD No. 95.

NDK is composed of a Nuclear Regulatory Board and Presidency. NDK is independent regarding regulatory decisions and the decision-making organ in NDK is the Nuclear Regulatory Board.

Nuclear Regulatory Board consists of five members including the President, who also chairs the Board, and Second Chairperson. All Board members are assigned by the President of the Republic of Türkiye. NDK issued "Regulation on Working Procedures and Principles of Nuclear Regulatory Board" in 2022 in order to define the working procedures of the Nuclear Regulatory Board.

#### 8.1.2 MANDATE, MISSION AND TASKS

The aim and scope of Law No. 7381 defined in Art. 1. This Article also defines the general mandate of NDK as regulatory control of activities regarding utilization of nuclear energy and ionizing radiation as follows;

"The objective of this Law is to determine, based on the peaceful use principle, the

fundamental principles and rules to be applied for the protection of workers, public, environment and future generations from possible harmful effects of radiation during activities regarding utilization of nuclear energy and ionizing radiation; and to determine the responsibilities of the parties; and to define the organization, duties and authorities of the NDK having regulatory control over these activities; and to define the principles regarding personal rights of the personnel of NDK.”

NDK’s responsibilities, duties and authorities are defined in Art. 4 and Art. 5 of PD No. 95. The Authority shall regulate the following activities, topics and areas:

- a) Radiation protection of workers, public, environment and future generations
- b) Safety, security and nuclear safeguards in the activities regarding nuclear energy and radiation,
- c) All activities related to the building, operation, decommissioning and closure of nuclear installations, radiation facilities and radioactive waste facilities.
- d) Extraction, production, transportation, storage, export, import, trade, possession, transfer, processing, reprocessing and use of nuclear materials,
- e) Production, transportation, storage, export, import, trade, possession, transfer, use, installation, modification, dismantling, maintenance and repair of radiation sources.
- f) The possession, transfer, processing, transportation, storage, export, import and disposal of radioactive wastes.
- g) Export and import of substances, materials, equipment, systems, components or related technology determined by the Authority within the scope of nuclear safeguards.
- h) Radiation emergency management.
- i) The qualifications and training of the personnel related to the activities within the scope of its duties and authorities.
- j) Other issues, areas and activities that fall under the scope of its duties and authorities and to be determined by the Board.

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### 8.1.3 AUTHORITIES AND RESPONSIBILITIES

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PD No. 95 determines activities, topics and areas to be regulated by the NDK and its duties and authorities. The duties and authorities of the NDK are as follows:

- a) To determine the strategy, target and working principles of the Authority.
- b) To carry out regulatory operations regarding issues within the scope of its duties and authorities.
- c) To grant authorizations; to define and modify the technical, legal, administrative and financial scope and conditions of the authorizations; to restrict, suspend, end, revoke the granted authorizations; to determine and modify the term of the authorizations; to review and evaluate the information and documents submitted to the Authority for or after the authorization; to define and modify the conditions of the granted authorization in view of the concluded evaluations.
- d) To inspect or examine on-site of the activities or authorized persons before and after the authorization
- e) To request and evaluate all kinds of required information and documents from the persons who apply to the Authority for authorization and are authorized, to use this information and documents in compliance with the confidentiality requirements,
- f) To determine the issues that require approval within the scope of safety, security, nuclear safeguards and radiation protection, to give approval and to bring compliance criteria when necessary,
- g) To request the authorized person to carry out an assessment on safety, security, and nuclear safeguards and to request from the authorized person, under the condition of having financial responsibility and legal

- liability, to take additional measures according to the results of the assessment,
- h) To carry out works and procedures related to administrative sanctions within the scope of Law No. 7381,
  - i) To determine whether the authorized persons have fulfilled their obligations related to the insurance or financial guarantee for nuclear liability and related to the special accounts of radioactive waste and decommissioning,
  - j) To establish and operate the national radiation sources recording system, national dose registry system, national nuclear material accounting and control system,
  - k) To conduct the national radiation monitoring activity or to have it conducted,
  - l) To cooperate with the institutions and organizations of other countries and international organizations, to participate in joint activities or to coordinate the activities carried out with these organizations within the scope of its duties and authorities,
  - m) To inform relevant national or international organizations about extraordinary events,
  - n) To have carried out research and development activities in the field of safety and security necessary to support its regulatory activities,
  - o) To exchange information, cooperate and communicate directly with public and private institutions and organizations, non-governmental organizations and the public,
  - p) To determine regulatory activities, decisions and opinions to be sent to national and international institutions and organizations, and to be disclosed to the public,
  - q) To request all kinds of necessary information and documents related to a subject from all natural and legal persons including public institutions and organizations and/or to examine them,

- r) To determine the training programs for radiation protection for the personnel who take part in the activities of the authorized persons and determined by the Authority, to ensure that training is given, to carry out the works and procedures related to examination and certification,
- s) To cooperate with AFAD and relevant institutions and organizations in the management of radiation emergencies that may occur as a result of activities not under regulatory control.

PD No. 95 Art. 5 para. 2 also states that “The Authority cooperates with other authorized institutions and organizations in terms of emergency planning and response, the health of the public and employees, protection of the environment, legal responsibility in the nuclear field, water use and food consumption, land use and planning, transportation of dangerous goods and other areas of which it is a stakeholder, in terms of safety and security, and gives advice to institutions and organizations.”

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#### 8.1.4 ORGANIZATIONAL STRUCTURE OF THE REGULATORY BODY

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NDK is composed of a Nuclear Regulatory Board and Presidency. The decision-making organ of the NDK is the Nuclear Regulatory Board. Nuclear Regulatory Board consists of five members including the President of NDK (who also chairs the Board) and a Second Chairperson. All Board members are assigned by the President of the Republic. President of the Republic also appoints President of NDK and Second Chairperson. On 5 February 2019 the President of NDK and the Board Members are appointed by a Presidential Decree. The Regulation on Working Procedures and Principles of Nuclear Regulatory Board was issued in 2022.

The Presidency consists of the President of NDK, two vice presidents, and service units.

NDK’s main organization consists of five technical and six administrative units.

Technical units are:

- Department of Nuclear Installations (DNI) (regulatory activities in nuclear safety),
- Department of Radiation Applications (regulatory activities in radiation applications and radiation facilities),
- Department of Security and Safeguards (regulatory activities in nuclear security and safeguards and transportation and import/export of radioactive materials),
- Department of Radiation Protection (regulatory activities in radiation protection and radioactive waste management safety),
- Department of Inspection (nuclear and radiation safety inspections).

Administrative units are:

- Department of External Relations (national and international coordination of all kinds of activities within the scope of duties and responsibilities of NDK).
- Department of Legal Services,
- Department of Strategy Development (administrative and financial activities of NDK).
- Department of Support Services (human resources and other supporting services),
- Press and Public Relations Consultancy,
- Directorate of Board Services (conducting secretarial work and operations of the Nuclear Regulatory Board).

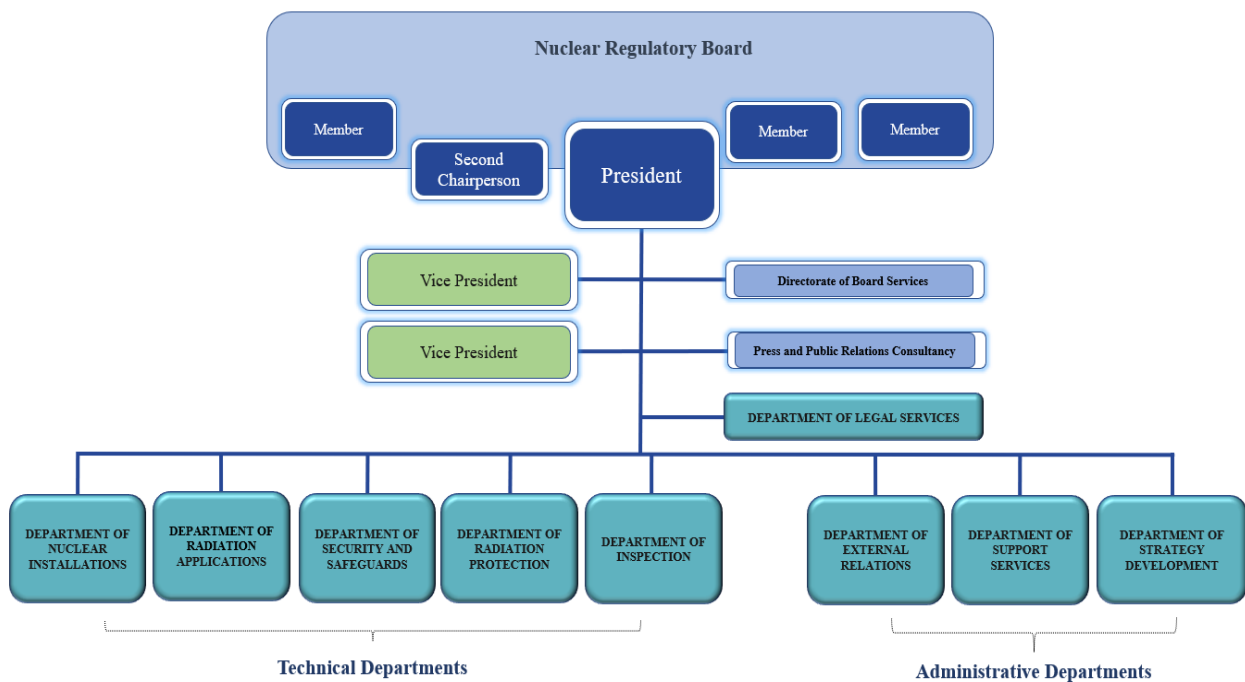


Figure 7. Organizational Structure of NDK

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### 8.1.5 COMPETENCE OF THE REGULATORY BODY

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NDK recruits its staff through Public Personnel Selection Examination which is a central exam to employ public personnel arranged by Measurement Selection and Placement Centre. NDK has been implementing the rules for hiring its staff through central governmental hiring mechanisms. Since 2011, regulatory body has also implemented its own selection procedures for personnel.

International organizations, technical support organizations (TSOs), EU projects, regulatory bodies of the vendor countries and regulatory bodies of other countries through bilateral agreements are also being utilized to augment in house training capabilities for its personnel.

A study was initiated following an IAEA Expert Mission conducted in February 2013 to develop a systematic competency management framework based on IAEA's Systematic Assessment of Regulatory Competence Needs (SARCON) model.

Also, two projects were implemented with support from European Commission: a Pre-accession Assistance (IPA) twinning project with TÜV-SÜD and INSC Project with Risk Audit. The aim is to improve the competency of TAEK by gaining EU experience in the fields of development and enforcement of regulatory framework (acts, regulations, technical guides, etc), enhancing regulatory capacity in review and assessment of safety documentation and inspection of nuclear facilities and activities, and improving TAEK's self-sustainability in drawing up regulatory training programs.

For successful licensing process of Akkuyu NPP, Türkiye has plans under implementation for extending its human resources who will be employed for the licensing and inspection activities of the nuclear power plant.

Although DNI has got experience with regulating research reactors, it also utilizes the support from IAEA (peer reviews) and

contracts with competent foreign Technical Support Organisations (TSOs) in the field of regulating nuclear power plants. NDK has continuing intention to use TSOs for eliminating the competency gaps when needed.

TAEK awarded a contract to UJV Rez a.s. from Czech Republic to support the review and assessment of the construction license application documents for the Akkuyu NPP Unit 1 including the PSAR and other supporting documents. For Akkuyu Project Unit 2, TÜV SÜD has been selected as the TSO and an agreement was signed between NDK and TÜV SÜD in 2019. TÜV SÜD performed review and assessment during licensing of Akkuyu NPP Unit 2.

NUTED was established at the same time with NDK as a government owned company for helping to run the services that the NDK needs during the execution of its duties, such as authorization, review and assessment, analyses, inspections, and trainings. provide technical support while performing its duties. After its establishment, NUTED started providing technical and scientific support to the DI. Main activities carried out by NUTED till to date was surveillance and supporting inspection activities of NDK. These services are still provided by NUTED. In addition to these services, review, assessment and consultation services has provided to DNI, on different stages of authorisation of the Akkuyu NPP.

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### 8.1.6 FINANCIAL STATUS OF THE REGULATORY BODY

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According PD No. 95 Art. 28, the incomes of the NDK are composed of:

- a) Service and operation fees,
- b) Incomes from publications and other similar items,
- c) Donations and grants,
- d) Incomes from estates and assets of NDK,
- e) Treasury aids from general budget.

PD No. 95 states that it is essential that NDK's incomes should cover its expenditures. The Authority cannot accept donations in any way from persons subject to regulatory control.

### 8.1.7 MANAGEMENT SYSTEM IN REGULATORY BODY

Before the establishment of NDK, former regulatory body, TAEK, has started to develop its own QMS for its main departments which are relevant to nuclear and radiation safety, nuclear security and licensing of nuclear installations. The QMS of TAEK has been established in 2014 in accordance with ISO 9001:2008 standard. After the publishing of ISO 9001:2015, TAEK adapted its QMS to this version. In 2017, TAEK QMS was certified by the TSE.

In addition, the project called "Support to the Regulatory Authority of Türkiye" has been started at the beginning of 2018 within the scope of INSC with Risk Audit. The overall objective of the project is to further developing the managerial and technical capabilities of the regulatory body. After the establishment of NDK, it undertook the abovementioned project and worked together with local consultants on developing QMS. Activities within the scope of the project were finalized in 2021. As a consequence of these efforts, NDK established its own MS in order to ensure that its assigned responsibilities are properly fulfilled, maintain and improve its performance, foster and support a safety culture. In April 2021, the MS of NDK was certified in terms of ISO 9001 QMS and ISO 45001:2018 Occupational Health and Safety Management System by TSE.

### 8.1.8 OPENNESS AND TRANSPARENCY OF REGULATORY ACTIVITIES

According to PD No. 95 Art. 5, NDK has the following duties:

- To cooperate with the institutions and organizations of other countries and

international organizations, to participate in joint activities or to coordinate the activities carried out with these organizations, in the scope of its field of responsibility.

- To inform relevant national or international organizations about extraordinary events.
- To exchange information, cooperate and communicate directly with public and private institutions and organizations, non-governmental organizations and the public.

NDK is transparent to the public in regulatory decisions through its website (<https://www.ndk.org.tr>). For some events, NDK produces press releases with detailed information for a better public understanding.

Public participation and consultation are valued as processes of the Regulation on EIA.

### 8.2 STATUS OF THE REGULATORY BODY

NDK is intended to be an independent nuclear regulator and in order to protect the independence of NDK and enable it to make regulatory decisions without undue pressure or constraints, PD No. 95 regulates that no authority or organization has right to give orders to NDK.

PD No. 95 states that "The Authority independently fulfils and uses the duties and powers given to it by Law No. 7381, this PD and other relevant legislation. Authority decisions must not be subject to expediency control. No organ, authority or person can give orders or instructions to influence the decisions of the Authority". The NDK independently implements its duties and uses authorities assigned to it by this PD. Decisions taken by NDK cannot be subject to propriety audit. NDK shall not be given any responsibilities which shall weaken its regulatory activities, conflict with these activities or prevent NDK from conducting its activities effectively. The property and assets of NDK shall be deemed as

State property. The property, assets, rights and receivables of the Authority cannot be seized and cannot be pledged. The Authority may

establish units affiliated with the headquarters where deemed necessary for the activities in the scope of this PD.

## 9 RESPONSIBILITY OF THE LICENSE HOLDER (ARTICLE 9)

*Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.*

Prime responsibility for the safety of a nuclear installation is on the holder of the relevant license. This responsibility is stated in Law No. 7381.

Law No. 7381, Art. 5, para. 3 states that “The authorized person has the prime responsibility to ensure safety and security in an activity or at a facility. To comply with the terms and conditions of a granted authorization and related legislation or to be under regulatory control or delegation or contracting to outsource its responsibilities, shall not reduce or remove the responsibility of the authorized person.”

Law No. 7381, Art. 5, para. 1 related clauses state that:

“Authorized legal persons shall, within the framework of the conditions of the authorization granted and bearing all responsibilities;

- a) Provide radiation protection, safety and security during the activity,
- b) Ensure that the activity is carried out by sufficient number of competent personnel with a culture of safety and security,
- c) Provide the necessary organizational structure, equipment and financial resources to carry out the activity in a safe and secure manner,
- d) Ensure that the necessary training is given to the personnel,
- e) Perform safety and security assessments at the frequency determined by the Authority,
- f) Carry out its activities with an appropriate MS,
- g) Keep the records, make notifications and reporting as defined in legislation and MS,
- h) Submit to the Authority all information and documents required by the Authority in the required form, content and scope,

i) Conduct research and investigation required by the Authority regarding safety and security or have them conducted,

j) Fulfil its obligations concerning nuclear safeguards,

k) Within the scope of inspections conducted by the Authority, perform required corrective and preventive activities within the period of time,

l) Carry out on-site management of radiation emergencies, cooperates with AFAD and other relevant institutions and organizations in the management of off-site emergencies,

m) As a result of the assessments, fulfil additional obligations related to safety, security and nuclear safeguards as determined by the Authority,

n) Ensure the conditions for releasing from regulatory control.”

The Law No. 7381, Art. 5, para. 6 states that “The authorized person's responsibilities end with the release from regulatory control. Dismissal of the authorized person, restriction, suspension or cancellation of his/her authority and similar situations shall not relieve him/her of his/her responsibility. In such cases, if the Authority evaluates that there is a weakness in terms of security, safety and nuclear safeguards, all kinds of measures to ensure security, safety and nuclear safeguards may be taken by the Authority, provided that the legal and financial responsibility belongs to the authorized person.”

Law No 7381, Art. 5, para. 4 states that “The authorized person must not abandon the place of operation or facility, nuclear material, radioactive source or radioactive waste unless their obligations related to the activity ends.”

Law No 7381, Art. 5, para. 5 states that “The authorized person must fulfil the financial obligations under this Law.”

Law No. 7381, Art. 7, para. 1 states that “The activities and authorized persons within the scope of this Law are subject to the inspection of the Authority. Within the scope of the authorization, the Authority may also inspect the activities of the contractors, subcontractors, suppliers and sub-suppliers of the authorized persons. Inspections may be conducted, scheduled or unscheduled, announced or unannounced, at any day of the year and at any time of the day, including public holidays.

Law No. 7381, Art. 7, para. 4 states that “In addition to the supervision of the Authority; authorized legal entities receive services from authorized companies for third party surveillance of activities determined by the Authority, including the inspection of structures related to nuclear facility or radioactive waste facility. The activities, authorities and responsibilities of these companies and the procedures and principles regarding service procurement are determined by the Authority by regulation.”.

Law No. 7381, Art. 7, para. 7 states that “Authorized persons pay the fees determined by the Authority for the inspections of the Authority.”.

Law No. 7381, Art. 7, para. 5 states that “The persons, who are subject to inspections shall be obliged to provide all necessary conditions and take all safety measures in order for the inspectors of the Authority and the persons appointed by the Authority to perform their duties freely and on time.”.

Law No. 7381, Art. 7, para. 6 states that “Those subject to nuclear safeguards inspections, shall comply with their obligations indicated in the relevant legislation during the inspections performed under the international obligations related to nuclear safeguards inspections by the inspectors of IAEA, who are approved by the Republic of Türkiye. These inspections are accompanied by the Authority representative.”.

Law No. 7381, Art. 5, para. 6 states that “The authorized person's responsibilities end with the release from regulatory control. Dismissal

of the authorized person, restriction, suspension or cancellation of his/her authority and similar situations shall not relieve him/her of his/her responsibility. In such cases, if the Authority evaluates that there is a weakness in terms of security, safety and nuclear safeguards, all kinds of measures to ensure security, safety and nuclear safeguards may be taken by the Authority, provided that the legal and financial responsibility belongs to the authorized person”.

Related provisions, which indicates the responsibilities of the operator on the Paris Convention are also embedded to Law No. 7381.

Law No. 7381, Art. 14, para. 1 states that Operators shall be obliged to take out an insurance or provide another guarantee for each nuclear facility or transport activity in the amount of the upper limit determined in Art. 13, at the time and in accordance with the conditions determined by the Authority.

Within the scope of this Article, Akkuyu Nuclear JSC will have insurance for Akkuyu NPP.

“Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” determines the safety principles to be complied by the authorized person in nuclear power plants to achieve the nuclear safety objectives defined by the Authority.

The license holder arranges his organization and distribution of responsibilities according to the Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities. This regulation covers all the stages during the lifetime of a nuclear installation.

The public relations for the Akkuyu NPP Project are carried out by Akkuyu Nuclear JSC. Information exchange with public is provided by the information centers. The project includes measures of public relations at the EIA stage - public discussions, etc. The public relations activities of the project will continue during the

construction and operation phases. In this regard, in addition to local newspapers, television and radio, the newspapers, television and radio broadcasted on a national scale will also be utilized within the scope of the public relations activities.

Akkuyu Nuclear JSC established a Public Information Center (PIC) for communication with public in Mersin in 2012 under the cooperation of the Russian Federation and the Republic of Türkiye in relation to the design and construction of the first NPP on territory of Türkiye, the Akkuyu NPP. The PIC is a versatile communication platform and provides excursion programs for the population in Mersin Province, in neighbouring provinces and in other regions. Among the visitors there are children, students, representatives of authorities and mass media, tourists and many others. This center lets the visitors get detailed and updated information about the Akkuyu NPP Project, safety systems of the plant, its interference with the environment and importance of the nuclear energy development for the Republic of Türkiye by specialists.

The PIC of Akkuyu NPP is a platform for the trust-based and open dialogue of the citizens of the Republic of Türkiye to raise public

awareness of the nuclear power and the safety of nuclear technologies.

All activities of the PIC of the Akkuyu NPP are pro bono ones. All visits are free of charge. Akkuyu Nuclear JSC arranges education and training of the students in universities of the Russian Federation, technical training of specialists at training centers of the Russian Federation and in the operating NPPs.

At present, 271 Turkish students have graduated from Russian Universities, 51 students continue their studies. Of these 51 students, 25 students will graduate from their master's programs in July this year and 26 students will graduate from universities in 2023.

Akkuyu Nuclear JSC will also establish a training center for the Akkuyu NPP. The Training Center of Akkuyu NPP will aim at performing job training and maintaining the qualifications of the operation-related personnel (operating personnel, maintenance and repair personnel, engineering support personnel), including theoretical training and practical training with the use of training hardware (simulators, training sites, specialized training classes).

## 10 PRIORITY TO SAFETY (ARTICLE 10)

*Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.*

The fundamentals of national safety policy have been established under Law No. 7381 which determines the fundamental principles and rules to be applied for the protection of workers, public, environment and future generations from the possible harmful effects of radiation during the conduct of activities related to nuclear energy and radiation.

The principle of priority to safety is clearly stated in the Art. 3 para. 4 of Law No. 7381 as “For the activities within the scope of this Law, prioritising the provision of safety and security is essential”.

NDK achieves regulatory control over nuclear installations in accordance with its duties and authorities defined in Law No. 7381 and in the PD No. 95 through a comprehensive authorization system, which is defined in Art. 4 of Law No. 7381, in order to assure that nuclear installations are utilized with proper consideration for nuclear safety. The authorization system of NDK guarantees that proper measures to protect workers, public, environment and future generations and to ensure nuclear safety are taken during the use of nuclear installations. The holder of the license to use the relevant authority assumes the primary liability for the safety of a nuclear installation.

Processes regarding authorizations, authorization conditions, application, scope and validity periods of authorizations, as well as issues regarding renewal, restriction, suspension, cancellation or authorization of another person for a previously authorized activity are determined by regulations issued by the NDK. For issues not covered by national regulations, NDK follows IAEA safety requirements.

The aforementioned NDK regulations in which the responsibilities of license holders are defined in detail, require license holders to adopt an organisation ensuring that the safety is prioritized in activities for design, construction, commissioning, operation and decommissioning of nuclear installations.

The detailed regulatory requirements and obligations related to the process-oriented MS to be created, maintained and continuously improved by the license holders in which safety is prioritized and safety culture is supported are defined in Law No. 7381 and in the Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities.

NDK fulfils its mission and duties as a regulatory authority with the understanding of

- ensuring a high level of nuclear safety continuously;
- ensuring that a safety and security culture understanding, which shows that nuclear safety issues are given the highest importance, is adopted by all NDK employees and is reflected in NDK's activities;
- ensuring that regulatory activities and decisions are carried out and taken independently without being influenced;
- having and maintaining the necessary competence by constantly increasing the knowledge, experience and culture of NDK employees so that regulatory decisions can be made in a timely and accurate manner;
- continuously improving the effectiveness of regulatory activities by applying MS tools.

In accordance with IGA, Akkuyu Nuclear JSC is held liable for the design, construction, commissioning, operation, and decommissioning of the Akkuyu NPP. As Akkuyu Nuclear JSC states in the Safety Policy, the assurance of safety, occupational health and environment protection is Akkuyu Nuclear JSC's top-priority task and vitally important need during the performance of all and any activities of the Akkuyu Nuclear JSC. At the same time, Akkuyu Nuclear JSC consistently, persistently and steadily performs the obligations stipulated in the CNS and follows requirements and recommendations of IAEA in terms of safety assurance, and strives to continuously improve the activities aimed at ensuring safety, occupational health and environment protection at all stages of the nuclear power plant life cycle.

The top-priority objectives of the safety policy of Akkuyu Nuclear JSC are:

- maintaining the highest attainable level of safety at all stages of the NPP life cycle based on the commitment to flawless performance of all and any safety-affecting actions in accordance with requirements of the applicable laws and standards in the field of nuclear energy uses, putting safety above the Akkuyu Nuclear JSC's production activity issues;
- creating and maintaining effective means of protection against potential radiation hazard to protect particular persons, the public as a whole and the environment against hazardous effects of the ionizing radiation;
- preventing the events that may cause adverse effects on the workers, the public and the environment during construction, normal operation, normal operation violations and accidents at Akkuyu NPP;
- mitigating adverse effects of the NPP on the workers, the public and the environment during construction, normal operation, normal operation

violations and accidents, and taking effective emergency-readiness and emergency-response actions;

- achieving and maintaining a high level of (robust) safety culture;
- using accumulated experience in construction and operation of a nuclear power plant in Rosatom State Corporation during construction of Akkuyu NPP;
- using the lessons learned and good international practices in the field of safety assurance at all stages of the nuclear power plant life cycle, and implementing corrective actions.

For the purpose of achieving the pre-set objectives and further developing and improving the Safety Policy, Akkuyu Nuclear JSC:

- implements the unified engineering, economic and energy policy with unconditional priority given to safety assurance;
- performs all and any types of activities important to safety based on requirements of the regulatory documents in the field of nuclear energy uses;
- ensures maintaining an effective organizational structure, clear allocation of obligations and liability, proper qualification and executive discipline of the personnel of Akkuyu Nuclear JSC;
- performs the activities aimed at fostering the commitment among the personnel of the Akkuyu Nuclear JSC and supporting specialized organizations to the safety culture principles during activities at all stages of the nuclear power plant life cycle, arranges inspection and self-assessment of the safety level;
- ensures quality at all stages of the nuclear power plant life cycle through development and implementation of

common Quality Assurance Programs of Akkuyu Nuclear JSC, Quality Assurance Programs for stages of the nuclear power plant life cycle (Quality Plans) during performance of the licensable type of activity in the field of nuclear energy uses, as well as quality assurance control in regard to the products being delivered to Akkuyu Nuclear JSC, the works being performed, and services being rendered;

- creates an effective system of internal safety and quality control to ensure safety at all stages of the nuclear power plant life cycle;
- monitor activities of the organizations performing works or rendering services for the Akkuyu Nuclear JSC at all stages of the nuclear power plant life cycle;
- makes decisions based on risk analysis, proven good practice, completeness and feasibility, subject to compliance with the safety principles;
- regularly review safety issues over the whole life cycle of the nuclear power plant;
- take measures to make sure that radiation effects on the personnel and the public are kept at reasonably achievable low level in all and any operating states;

- develop the Action Plan for protecting personnel in case of accident at the nuclear power plant and conduct emergency exercises where required actions and skills of emergency units are trained for an emergency situation;
- conduct analysis of and use international experience in operation of nuclear power plants;
- creates financial and tangible resources to ensure safety;
- develops and implements the bonus-and-reward system to encourage safe operation and development of the safety culture principles;
- provides the personnel with an opportunity to make proposals on safety issues; creates the conditions and arranges notification of the personnel of the Akkuyu Nuclear JSC's management's Safety Assurance Policy;
- conducts a constructive dialogue and interaction with government authorities and national safety regulation authorities in the field of nuclear energy uses;
- maintains relations with the public and local government authorities; arranges provision to the mass media of reliable information on the nuclear power plant operation.

## 11 FINANCIAL AND HUMAN RESOURCES (ARTICLE 11)

*i. Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.*

*ii. Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.*

### 11.1 FINANCIAL RESOURCES

#### 11.1.1 FINANCING OF SAFETY IMPROVEMENTS

In accordance with Law No. 7381 Art. 5.1.c the authorized person is responsible for provision of necessary organizational structure, equipment and financial resources for safety and security of the licensed activity. Furthermore, according to Art. 5.1.g, authorized person is responsible for conducting necessary research and surveys regarding safety and security. The NDK may also request the authorized person to conduct these research and surveys. After conducted assessments, the NDK may bring additional obligations in accordance with Art. 5.1.j to improve safety, security and safeguards.

Akkuyu Nuclear JSC, as the NPP operator, will be responsible to ensure the necessary financial provisions for safety improvements to the nuclear installation over its operational lifetime. Planned maintenance expenses are considered in the operational costs of the plant. Future investments needed to ensure safety during the plant operation (for example as a result of equipment aging/wearing/obsolescence or additional international requirements in the future, innovative design solutions, etc.) will be financed, in general, through the Akkuyu Nuclear JSC revenue, which will be accumulated through electricity sales.

In addition, annual payments to an Akkuyu Nuclear JSC's internal account for safety will be made during the plant operation. This is a special account for safety in which Akkuyu

Nuclear JSC will accumulate amounts on annual basis, and the accumulated funds will be spent on modernization programs, related to safety. As mentioned above, these could, for example, be modernizations needed to replace aged or obsolete equipment, to comply with future international safety requirements, to apply innovative design solutions, etc.

The following main principles will apply:

- Priority will be given to financial resources necessary to ensure the safety of the nuclear installation throughout its operational lifetime, including measures to comply with the actual safety requirements,
- An adequate organizational structure and procedures will be put in place to support the proper planning of necessary measures, as well as ensuring respective financial resources required for their implementation,
- Attention will be paid, both on sufficiency and on timely provision of such financial resources,
- While in general, financing for safety during the plant operational lifetime will be ensured through electricity sales' revenue, the following specific sources could be used:
  - Akkuyu Nuclear JSC cash balance;
  - Akkuyu Nuclear JSC special safety account;
  - Credits.

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### 11.1.2 FINANCIAL PROVISIONS FOR DECOMMISSIONING, SPENT FUEL AND RADIOACTIVE WASTE

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IGA signed between the Turkish and Russian party for construction and operation of the Akkuyu NPP stipulates that Akkuyu Nuclear JSC, which owns and operates the plant, will be responsible for decommissioning and waste management of the NPP (Art. 12, para. 4). The Akkuyu Nuclear JSC is obliged by the IGA to make the necessary payments to relevant funds stipulated by the Turkish laws and regulations. The following amounts shall be paid by the Akkuyu Nuclear JSC for the electricity, purchased by EÜAŞ (IGA, Art. 10, para. 9):

- 0.15 US dollar cents per kWh to the account for spent fuel and radioactive waste management, and
- 0.15 US dollar cents per kWh to the account for decommissioning.

With regards to the electricity to be sold outside the Power Purchase Agreement, the necessary payments to the funds shall be in accordance with the Turkish laws and regulations.

According to the new legislative system established, the NPP operators and radioactive waste producers shall pay an annual fee to decommissioning and/or radioactive waste accounts in the amount determined annually by the Fund Management. Both accounts shall be constituted by an arrangement formed by the ETKB and the Ministry of Treasury and Finance (HMB). The operations of the accounts will all be exempted from taxation. The procedures and principles regarding the establishment, creation and management of the Decommissioning and Radioactive Waste Management accounts shall be prepared jointly by the ETKB and the HMB. The revenue collected in the name of the Decommissioning and Radioactive Waste Account may only be used within its purpose.

At the end of the operational period, the plant operator (enterprise – company which produces

and sells electricity), is obliged to decommission the plant under the criteria to be issued by the NDK. The decommissioning costs will be covered by the Decommissioning Account. On the other hand, “The Draft Regulation on Radioactive Waste Management Fund, Decommissioning Fund and Board of Accounts” is already prepared which will establish the accounts and will stipulate the main principles of their management and operation and is waiting for approval process. It is expected to be enacted by the end of the year 2022.

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### 11.1.3 ADEQUACY OF FINANCIAL PROVISIONS

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In accordance with Law No. 7381 Art. 5.5, the authorized person shall fulfil the financial obligations defined under this Law.

Decree on Licensing of Nuclear Installations stipulates in Art. 6 that the applicant for construction and operation license of a nuclear installation has to submit within the application a description of his technical and financial abilities. Financial capabilities of the company, applying to construct and operate a NPP, shall be demonstrated in front of the relevant authorities in order to obtain a license.

In accordance with Art. 10.2 of Law No. 7381, the Accounts Management Board determines the contributions to be paid to special accounts for nuclear power plants per unit of electricity produced (kilowatt hour), and the amount of guarantees per installed power (megawatt). For other facilities and applications, the contributions to be paid to special accounts and the amount of guarantees; are determined by the Accounts Management Board, taking into account the type of facility and application, the class, amount and activity of the waste. Contributions to be paid to special accounts and the amount of guarantees are reviewed every year and updated to cover the foreseen expenses.

Art. 10.7 of Law No. 7381 states that: “In case the amount in the special account for

radioactive waste and decommissioning is insufficient due to expenses that may be incurred during decommissioning or related to radioactive waste management, or due to early decommissioning of the facility, the costs shall be covered by the guarantee provided by the authorized person. If the guarantee is insufficient, the remaining amount is collected from the authorized person. Taking into account the amount accumulated in the special account, the amount of financial guarantee in question is determined again upon the request of the authorized person.” Law No. 7381 includes provisions to regulate nuclear liability in accordance with the Paris Convention. The Operator has to obtain an insurance or guarantee to cover up to 700 million euros of nuclear damage.

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#### 11.1.4 PROCESSES FOR THE ASSESSMENT OF THE FINANCIAL PROVISIONS

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Modernization programs will be developed for 6-years periods. They shall be based on the design requirements, actual plant status, international safety cases, development etc. Programs will include financial resources needed for their implementation.

Repair and maintenance planning shall be made annually, based on the design requirements, equipment maintenance instructions, equipment status, as well as experience in operation of NPPs. Annual planning will include financial resources needed for implementation of the maintenance.

Contributions to be paid to special accounts of decommissioning and radioactive waste management and the amount of guarantees are reviewed every year by the Accounts Management Board and updated to cover the foreseen expenses.

### 11.2 HUMAN RESOURCES

According to Art. 5.1 of Law No. 7381, licensee is responsible for ensuring the activity being carried out by sufficient number of

competent personnel and they receive the necessary training.

Procedures and rules for operating organization, qualifications and training of operating personnel, and licenses of operating personnel in NPPs are defined under “Regulation on the Operating Organization, Qualifications and Training of Operating Personnel, and Licenses of Operating Personnel in Nuclear Power Plants”.

The Akkuyu NPP have been designed, manufactured and being built by the Akkuyu Nuclear JSC. The commissioning and operation of the Akkuyu NPP will be done by the Akkuyu Nuclear JSC (as owner and operator) which was established according to Turkish laws and is financed by Russian Federation. However, this does not imply that all of the personal will be Russian. At the beginning of 2022, Turkish citizens working in the Akkuyu Nuclear JSC is about 28 per cent of the total workforce. According to Turkish legislation, the formal language of communication is in Turkish.

IGA, Art. 6, para. 5 stipulated that Turkish citizens shall be trained and widely employed for the purpose of operating needs of the NPP. Such training shall include but not limited to, the establishment of an on-site full scope simulator.

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#### 11.2.1 NPP PERSONNEL TRAINING

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Regulation on the Operating Organization, Qualifications and Training of Operating Personnel, and Licenses of Operating Personnel in Nuclear Power Plants stipulates the training requirements for NPPs. According to the Regulation, the operating organization is responsible for training of the operating personnel and ensuring these persons meet the requirements of the position they are assigned to. Following requirements about training are set in Art. 20 of the Regulation:

- (2) For this purpose, the licence is responsible for,

a) Preparation, development, updating and implementation of a program and related procedures regarding personnel training and competence within the scope of the management system, based on the training policy and long-term needs and targets of the plant,

b) Training of the operating personnel taking office in the operating organization in accordance with the position-specific training programs,

c) Ensuring that the personnel have completed the necessary training successfully before taking up office or before the permissions that the personnel is required to receive and/or before license applications,

ç) Consideration of efficiency of the personnel training and competency program, and reviewing and updating of this program periodically by taking into consideration the existing and future needs of the plant and acquisitions acquired from operating experience,

d) Constitution of the relevant unit within the operating organization to implement the personnel training and competency program, and allocation of all the necessary sources and training environment to this unit,

e) Training of the trainers who are responsible for training of personnel,

f) Evaluating the performance of the trainees and trainers at different steps of the training.

(3) Personnel training is carried out by taking into consideration the systematic approach containing the analysis, design, development, implementation and evaluation steps.

(4) In case it deems necessary, the Authority may audit the training carried out in the plant with or without notice, or participate in the training as an observer.”

It is foreseen that for the construction and commissioning of the four units of Akkuyu NPP more than 20,000 persons will be involved, and then about 4000 will be constantly needed during the 60 years of plant operation.

In order to develop a pipeline between the technical high schools near plant site and nuclear training centre at plant site to be established for construction works, a protocol was signed between the ETKB, Ministry of National Education, EPC contractor and owner and operator of Akkuyu NPP. Within the scope of this protocol, “Introduction to Nuclear Energy” course and course book was developed for high school students. After graduation, student will be received on-the-job training (OJT) in nuclear training centre to be constructed at Akkuyu site. After the training, they can work at NPP construction activities.

The Russian party will provide support and assistance in training of professional staff for nuclear power development in Türkiye. The selection of Turkish students to undertake nuclear energy learning had begun in 2011. In May 2022, there are 271 Turkish students who graduated from Russian Nuclear Universities, 51 people continue their studies. Of these 51 people, 25 people graduate from the master's degree in July 2022, 26 people graduate from the university in 2023. A total of 322 people will be trained by 2023. The Akkuyu Nuclear JSC provides support and assistance in training of professional staff for NPP consideration in Türkiye. Akkuyu Nuclear JSC is seeking for the new opportunities to develop its own educational and training capabilities to better assure the long-term availability of the human resources and to provide opportunities to the local citizens.

The Akkuyu Nuclear JSC is able to provide the training of future operating personnel using NPP training simulators or similar operating units. Elimination of the language barrier is provided by arrangement of language courses.

The Akkuyu Nuclear JSC is also intended to use Systematic Approach for Training for attaining and maintaining the competencies of personnel as the aforementioned approach is entirely compatible with the MS as it is also a process based, result oriented, and systematic approach. Through the analysis and design phases, training will be focused on certain necessary job specific competencies. Evaluation of the training programme's effectiveness and continual improvements will ensure maintaining of the personnel competence and training programmes up to date, and significantly contribute to the safe performance.

Akkuyu Nuclear JSC has developed the Akkuyu NPP personnel training manual that describes the main principles and requirements for initial training and continuing training or retraining.

The training programme for emergencies will be established to train Akkuyu Nuclear JSC staff to ensure the effectiveness of the response. Emergency preparedness exercises will be designed before commencing the operation to ensure that NPP staff and staff from other participating organizations possess the required knowledge, skills and attitudes.

In addition to human resources of Akkuyu Nuclear JSC, NUTED is also continuing building capabilities on new work areas and increasing capacity for ongoing work areas. For the time being, for surveillance/inspection, works provided by NUTED in Türkiye and abroad by Turkish personnel of NUTED (about %70).

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### 11.2.2 QUALIFICATION MAINTENANCE

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In accordance with the provisions of Regulation on the Operating Organization, Qualifications and Training of Operating Personnel, and Licenses of Operating Personnel in Nuclear Power Plants, maintenance of qualification of NPP personnel should be ensured in accordance with personnel training and qualification

programme of the Operating Organization. The positions that are subject to periodic and re-training for maintaining personnel competence, the scope, period, methods and tools of these trainings, and success measurement and evaluation methods should be determined by the Organization.

The NPP personnel shall have the diploma or certificate on education and specialization in order to work on the nuclear installation. The NPP personnel qualification will be maintained in the Training Center, NPP divisions and other educational institutions on an annual basis.

Annual duration of NPP personnel training, in compliance with qualification maintenance programs, shall be as follows:

- NPP Main Control Room operators – at least 80 hours, including 36 hours of practical training on the simulators;
- Other categories of NPP personnel – at least 20 hours.

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### 11.2.3 IMPROVEMENTS TO TRAINING PROGRAMS

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Regulation on the Operating Organization, Qualifications and Training of Operating Personnel, and Licenses of Operating Personnel in Nuclear Power Plants has provisions for the improvement of training programmes. Art. 20.2. gives responsibility to the Licensee for:

- a) Preparation, development, updating and implementation of a program and related procedures regarding personnel training and competence within the scope of the management system, based on the training policy and long-term needs and targets of the plant,

And for:

- ç) Consideration of efficiency of the personnel training and competency program, and reviewing and updating of this program periodically by taking into consideration the existing and future needs

of the plant and acquisitions acquired from operating experience,

Akkuyu Nuclear JSC will arrange the assessment and improvement of the training programmes periodically.

The training methods and practices will be put in place for the timely modification and updating of the training facilities, computer models, simulators and materials to ensure that they adequately reflect current plant conditions and operating policy, and that any differences are justified.

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#### 11.2.4 ASSESSMENT OF THE SUFFICIENCY AND THE QUALIFICATION OF THE NPP STAFF

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Requirements for organizational structure and qualifications of operating personnel and required authorizations and licenses are defined under Regulation on the Operating Organization, Qualifications and Training of Operating Personnel, and Licenses of Operating Personnel in Nuclear Power Plants.

In accordance with the laws and regulatory documents, qualification requirements are determined for those professionals, who, depending on the type of activities have to obtain license to carry out work in the field of nuclear energy.

The NPP Chief Inspector arrange preliminary (at employment commencement) and regular (during employment) medical examination of employees, working with harmful substances or dealing with dangerous or adverse factors of the working environment.

NPP specialists, who, depending on the functions performed, must receive permit for work in the field of nuclear power use, shall undergo preliminary and annual medical and psychological examination.

Professional training opportunities are provided for young specialists, for new employees, for staff transferred to new positions, etc., in

accordance with the specific needs and requirements of the related jobs.

The NPP personnel shall have the diploma or certificate on education and specialization in order to work on the nuclear installation.

NPP personnel qualification shall be maintained on an annual basis, in the following forms:

- Off-the job training, intended to retain professional knowledge and skills obtained during training courses and in other educational institutions,
- OJT in the Training Centre and NPP divisions,
- Repeated, off-schedule and special-purpose briefings,
- Accident mitigation, fire protection and emergency drills,
- Training of NPP operational personnel on the simulators, including activities related to power unit start up/shutdown and operations preceding power unit scheduled start up/shutdown,
- Fellowships, including in specialized companies, participation in seminars and workshops,
- Training and regular licensing of NPP employees, working on facilities or performing works under the authority of official supervision or regulatory bodies and other agencies in compliance with procedures, approved by the corresponding authorities,
- Self-study of professional related issues.

The NPP personnel qualification shall be maintained in compliance with qualification maintenance programs. The programs, as above, shall be elaborated according to the requirements established by the Akkuyu Nuclear JSC.

Akkuyu Nuclear JSC plans to use the own personnel and inviting personnel from other NPP, as additional staff required for the severe accident managements.

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### 11.2.5 REGULATORY REVIEW AND CONTROL ACTIVITIES

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Responsibilities of the authorized persons are defined in Art. 5 of Law No. 7381. According to Law, authorized legal persons shall, within the framework of the conditions of the authorization granted and bearing all responsibilities, ensure that the activity is carried out by sufficient number of competent personnel with a culture of safety and security, provide the necessary organizational structure, equipment and financial resources to carry out the activity in a safe and secure manner and ensure that the necessary training is given to the personnel.

The detailed procedures and rules regarding operating organization, qualifications and training of operating personnel, and authorization of operating personnel in nuclear power plants are set with "Regulation on Operation Organization in Nuclear Power Plants, Qualifications and Training of Operating Personnel, and Operator Personnel Licenses". Similar requirements for research reactors are regulated by the Regulation on Operating Organization, Personnel Qualification and Operating Personnel Licensing for Research Reactors.

According to this Regulation, the authorized person is primarily responsible for the safe and secure operation of the installation in compliance with license terms, regulatory requirements and relevant legislation. The authorized person within the framework of this responsibility creates nuclear safety and security policies and targets that will ensure the operation of the installation within the framework of safety and security culture, and provides and allocates financial and human resources in a timely manner in line with these targets.

Also, some general requirements are set with the "Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008" about operator responsibilities, human resource

management issues, and training of operating personnel.

In addition to the above regulations, IAEA and vendor country requirements are also used by authorized persons when necessary.

Information and documents showing that the requirements are met are submitted to the Authority with authorization applications such as construction license or operating license. Application documents are subject to review and assessment in accordance with the relevant requirements during the evaluation phase of applications. In addition, audits can be carried out when necessary.

In addition to the authorization process of the installation, separate processes regarding the authorization of the operating personnel are carried out. These are issued to specific individuals for the right to carry out specific activities. For example, direct operation of a reactor. Within the scope of this authorization, training programs and applications are reviewed and authorization exams are held.

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### 11.2.6 COMPETENCY MANAGEMENT ACTIVITIES FOR REGULATORY BODY STAFF

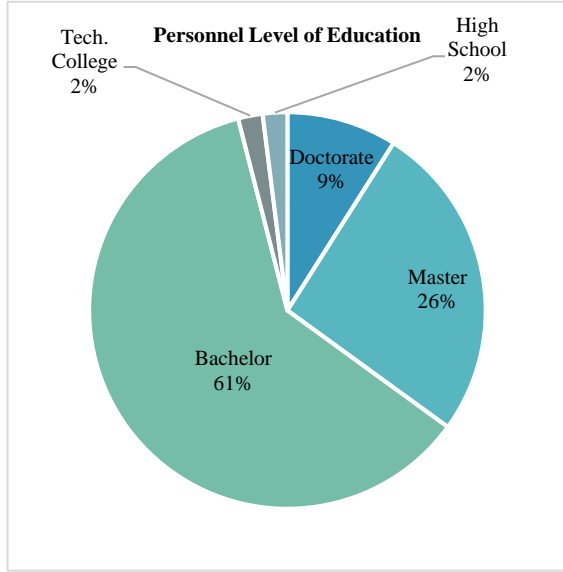
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NDK improves its human resources for the licensing and inspection activities of the nuclear power plant. NDK also uses TSOs for eliminating the competency gaps when needed. A human resource development plan is prepared annually to maintain the competence of the NDK.

As a governmental organization the NDK has to hire civil servants coming through a central governmental selection exam. However, it can apply its own selection procedures through written and oral exams to the applicants who passed central governmental exam.

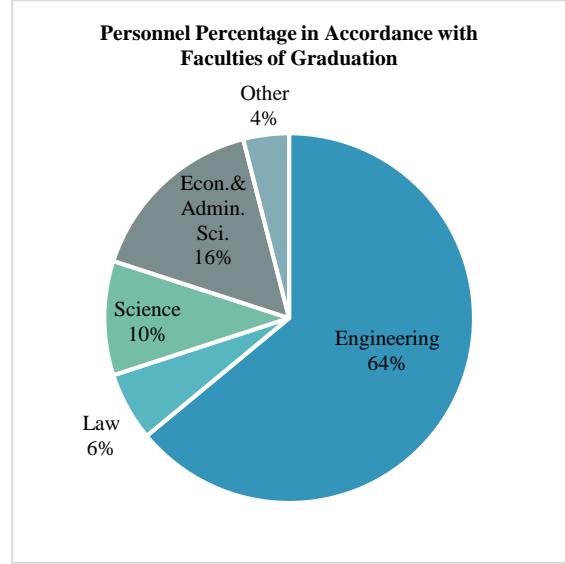
By the end of May 2022 NDK had 218 personnel of which 64% with an engineering

degree and 10% with a science degree (**Hata! Başvuru kaynağı bulunamadı.8**). 96% of the NDK personnel has a university degree of



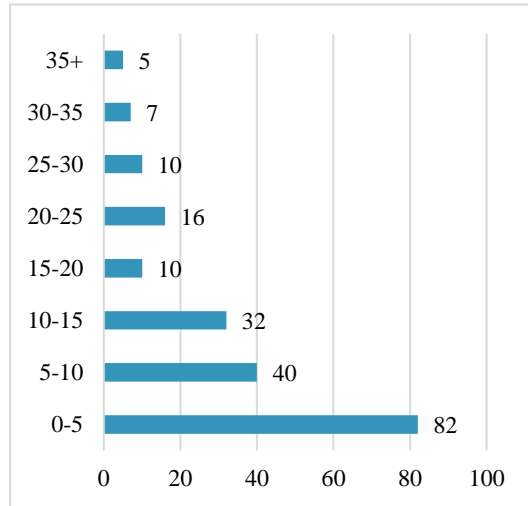
**Figure 9. Education Levels of the NDK Personnel as of August 2022**

which 9% has a doctorate degree and 26% has master degree (**Hata! Başvuru kaynağı bulunamadı.7**).



**Figure 8. Personnel Percentage in Accordance with Faculties of Graduation as of August 2022**

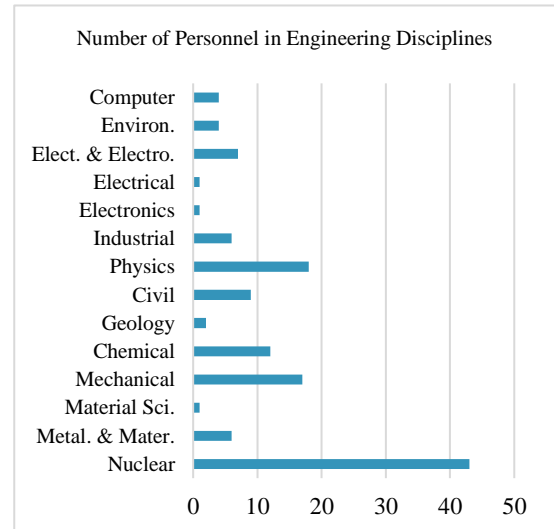
Number of personnel in different engineering disciplines are given in **Hata! Başvuru**



**kaynağı bulunamadı.10**. NDK employs mainly young personnel. NDK is a young

**Figure 11. NDK Personnel Experience Levels in Years as of August 2022**

organization with average age of 38 years and the average experience level of the NDK



personnel is 11 years (**Hata! Başvuru kaynağı bulunamadı.9**).

**Figure 10. Number of Personnel in Engineering Disciplines as of August 2022**

An important source for employees for the NDK is the students sent abroad for graduation studies. By the end of May 2022, 134 students were sent abroad for attending graduate schools in various countries with special assignments from the NDK. These students get scholarship from the Ministry of National Education in exchange of obligatory service in the NDK. 27 of these students concluded their studies and returned home to work in the NDK.

Law No. 7381 amends the Public Procurement Law No. 4734 to give NDK an exemption for the procurement of goods and services and consultancies regarding regulatory and inspection activities and for the procurement of services and consultancies regarding site and feasibility studies for NPP projects. This amendment facilitates NDK's procurement of TSO services.

NDK has established a TS EN ISO 9001:2015 and TS EN ISO 45001:2018 based IMS. The Management of competence is an integral part of the overall management of the NDK. The main objective is to ensure having the right number of staffs with the right and enough competences at the right time.

#### 11.2.7 TRAINING PROGRAMME FOR REGULATORY BODY

NDK has been trying to increase its capability for the conducting of each function of the regulatory body. Training of staff concentrates on the regulatory process used for reactor oversight and on the special technical functions that a regulator must perform and the results of competency gap analysis are using for the establishment of the training program.

Regulatory processes include enactment and development of regulations, licensing, and inspection activities. Training in these processes will be gained through rotational assignment in countries with mature regulatory programmes by NDK or through the IAEA. Trainings will be concentrated on review and assessment of PSAR and inspection.

NDK performs training programme as below:

1. Internal trainings
  - Entry level training for new staff provided by NDK experienced staff,
  - The Internal Training Programme is prepared contains 44 subjects including technical, administrative and personal development topics and it targets 948 trainings for the year 2022 approximately. Previous year the number of trainings performed was 1148.
2. Domestic trainings
  - Academic units in Türkiye,
  - Other organizations experienced in specific subjects.
3. International trainings
  - IAEA,
  - EC,
  - Bilateral agreements with other regulatory organizations,
  - TSO,
  - Others.

The aim of training of NDK staff is to provide knowledge and experience that result in confidence that staff is qualified to perform the essential functions of regulatory body. Within this context variety of tools are being used including IAEA instruments. NDK has a specific TC project named IAEA TC TUR/9/023 "Strengthening the Nuclear Regulatory Authority's Regulatory Capabilities on Safety and Security" for this purpose and provided its own financial resources for the project. IAEA TC TUR/9/023 project is fully funded by NDK.

Improving NDK staff's knowledge in the field of review and assessment of PSAR and inspection are some of the main purposes of this project. The main tools in the project are scientific visits, training courses, workshops

and expert missions. The expected outcomes of the project are:

- Staff trained on evaluation of submittals of siting, construction and operation of NPPs; and on manufacturing and construction inspections,

Established procedure/documentations on evaluation of submittals of siting, construction and operation of NPPs; and on manufacturing and operation inspections.

EC projects are also utilized for the development of Human Resources infrastructure of the regulatory body. For this purpose, EC IPA twinning project with TÜV-SÜD” and an “INSC Project with Risk Audit” were implemented. The aim is to improve the competency of the Turkish Regulatory Body (first TAEK and then the NDK) by gaining EU experience in the fields of development and enforcement of regulatory framework (acts, regulations, technical guides, etc), enhancing regulatory capacity in review and assessment of safety documentation and inspection of nuclear facilities and activities, and improving regulatory body’s self-sustainability in drawing up regulatory training programs.

The EC launched the Twinning Project under the IPA. This project was awarded to the German TÜV SÜD Industrie Service GmbH and started in the summer of 2017. The project, entitled “Improvement of Nuclear Safety Regulatory Infrastructure of Türkiye” (TR13 IPA NS 01 16 R), has a budget of EUR 1.5 million and an indicative duration of 21 months.

The Twinning project comprises the following main components:

- Transposition of the EU nuclear safety and security acquis,
- Development and implementation of review and assessment procedures for licensing and permission activities,

- Improving regulatory inspection capabilities, and

- Human resource management.

The IPA project has been successfully completed in early 2019, achieving more than 95 % implementation of activities.

The EC INSC Project titled “Support to the Regulatory Authority of Türkiye (TR3.01/16)” is implemented in cooperation with the Risk Audit (IRSN (France) / GRS (Germany)) with a budget of EUR 2.500.000. Upon the completion of INSC Project in 2021, the dissemination meeting was held on February 2022.

The purpose is to enhance competence and capabilities within Turkish Nuclear Regulatory Authority in regulating the safety of nuclear power plants in deterministic and probabilistic safety analyses, manufacturing and construction inspections, and MS of the regulatory body

The INSC support to the NDK is primarily directed at transferring EU regulatory methodologies, including the formulation of legislation and development of regulatory documents.

The INSC Project (TR3.01/16) fits into the above described context in Türkiye in that the three technical tasks as defined in the terms of reference have been identified as key areas for capacity development in the regulatory process, i.e. enhancing regulatory body’s capabilities for assessing deterministic and probabilistic safety analyses, improving regulatory body’s manufacturing and construction inspection capacity and capabilities and improving the MS of the regulatory body.

The Ministry of Education grants scholarships to graduate students for attending Master of Science and doctorate studies abroad in fields determined by regulatory body. These students have the obligation to return to Türkiye and work to pay back their scholarships.

NDK has also self-sustainability in drawing up regulatory training programs. The main activities of this project are:

- Project management,
- Review and improvement of national nuclear regulatory infrastructure,
- Assistance in the development of national nuclear regulatory infrastructure,
- Development of methodologies for review and assessment of licensing documents,
- Establishment of the technical support system for independent safety assessment,
- Development of methodologies for regulatory inspections,
- Training of personnel of regulatory organization.

#### 11.2.8 THE ROLE OF TSO IN REGULATORY ACTIVITIES

Hiring new staff and training them for NDK's needs would not provide enough technical resources with proper competency in timely manner. As an important adjunct to the regulatory staff, TSOs have the role to supply the NDK with specialized technical skills. For this purpose, the NDK is planning to use TSOS and consultancy services whenever it needs in order to accomplish its regulatory functions.

National consultants are used for their specific expertise to support the licensing process (**Hata! Başvuru kaynağı bulunamadı.4**):

**Table 4. National Consultants Worked for the Akkuyu and Sinop NPP Licensing Projects**

Title of National Consultants	Institution of National Consultants	Speciality of National Consultants
Professor	Middle East Tech. Uni. (Ankara)	Geotechnics and Earthquake
Professor	Middle East Tech. Uni. (Ankara)	Geology
Professor	Istanbul Tech. Uni. (Istanbul)	Meteorology
Professor	Hacettepe Uni. (Ankara)	Hydrology, Hydrogeology
Professor	Middle East Tech. Uni. (Ankara)	Seismology
Professor	Middle East Tech. Uni. (Ankara)	Structural Design
Professor	Hacettepe Uni. (Ankara)	Strength Analysis
Professor	Istanbul Tech. Uni. (Istanbul)	Nuclear Materials

Furthermore, to improve the competency of NDK, a TSO, NUTED has been established by Law No. 7381 as a government owned company. At least 51% of its shares will be owned by NDK. NUTED has the responsibility

to provide all necessary TSO services to NDK. Hiring staff and capacity building for NUTED will be implemented in parallel to the needs of NDK.

*Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account through-out the life of a nuclear installation.*

### 12.1 REGULATORY REQUIREMENTS

“Regulation on Design Principles for Safety of Nuclear Power Plants, 2008” and “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” defines safety principles, including human factors to be followed during the design of nuclear power plants to achieve nuclear safety objectives.

To avoid human errors Art. 20 and 21 of “Regulation on Design Principles for Safety of Nuclear Power Plants, 2008” includes the following requirements to NPP design:

- Parameters to be monitored in the control room are selected, and their displays are arranged, to ensure clear and unambiguous indications of the status of plant conditions important for safety, especially for the purpose of identifying and diagnosing the automatic actuation and operation of a safety system or the degradation of defence-in-depth,
- Control room is provided with a display of the information on plant variables needed to ascertain the status in normal operation, to detect and diagnose off-normal conditions, and to observe the effect of corrective responses by control and safety systems,
- The control room is designed to remain habitable under normal operating conditions, anticipated abnormal occurrences and accidents considered in the design,
- The environment in the control room is protected against abnormal conditions that might compromise the operators’ effectiveness or jeopardize their health.

The following provision is included in Art. 31, para. 2 of the Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008. According to the provision, instrumentation shall be available to assist operators, who may at some time be faced with the need to control the course and consequences of an accident beyond the design basis:

“Instrumentation that can be read from the control room or points, work in all conditions and provide the necessary information to recognize abnormal conditions and monitor the effects of interventions is provided, especially to assist in heavy accidents.”

Requirements for qualification of operating personnel as part of human factor are also covered as following in Turkish and Russian legislative and normative documents.

According to Art. 4, sub-para. c of para. 4 of Law No. 7381, it is obligatory to obtain authorization certificate from the NDK for “personnel to take part in the activities determined by the NDK regarding the activities within the scope of this Law”

The regulations deal with human factors and some organizational aspects, as well as the authorization of operating personnel are “Regulation on the Operating Organization, Qualifications and Training of Operating Personnel and Licenses of Operating Personnel in Nuclear Power Plants” and “Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities”. Main provisions concerning leadership for safety, human factors and safety culture are presented in the Art. 6 and 7 of the Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities.

In the Akkuyu Project Agreement training of the staff is mentioned as “the parties shall

cooperate in regard to: training and retraining of operating personnel of the NPP, the development and use of technical training facilities, including simulators, for training of personnel of the NPP”.

The approved “List of Licensing Basis for Akkuyu NPP” is mainly composed of Turkish regulations, IAEA Safety Fundamentals and Requirements, Safety Guides and Russian Federation Regulations. Some of the IAEA general safety requirements and guides that are on the list and contain relevant provisions are given in the following:

“Governmental, Legal and Regulatory Framework for Safety, GSR Part 1 (Rev. 1)”, “Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, GSR Part 3”, “Safety Assessment for Facilities and Activities, GSR Part 4”, “GS-G-3.1, Application of the Management System for Facilities and Activities, 2006”, “The Management System for Nuclear Installations, GS-G-3.5”.

The list also includes Russian Federations regulations and guides regarding the MS and quality assurance for nuclear power plants.

Licensing Basis for Akkuyu NPP are used for review and assessment in case of lacking provisions in NDK requirements and guidelines.

## 12.2 METHODS AND PROGRAMMES OF THE LICENCE HOLDER

Russian normative documents and standards require human factor to be accounted for during NPP lifetime, including design stage. One of the Russian norms and rules, which is also among the Licensing Basis for Akkuyu is “General regulations on ensuring safety of nuclear power plants, NP-001-15”.

Relevant provisions are given in the following:

- The design shall provide for the possibility to exclude personnel single errors and mitigate their consequences,

- In the design of NPP and reactor plant systems (elements) priority shall be given to systems (elements) design of which has been based on the passive principle of action and inherent safety features (self-control, thermal inertia and other natural processes), as well as on the safe failure principle,
- In the design of the control rooms problems of man-machine interface shall be solved. The NPP parameters to be controlled shall be so selected and displayed as to provide personnel with unambiguous information indicating that NPP safe operating limits and conditions are observed, and identification and diagnostics of automatic response and functioning of safety systems are possible,
- NPP shall be staffed with personnel having the necessary qualification and admitted to independent work in the established order prior to delivery of nuclear fuel to the plant. Simulators have to be used for operation personal training before commence of unit operation. Professional training of the NPP personnel for exercising. practical actions of the NPP operation shall involve technical means including simulators of various types, permitted for application in training NPP personnel. Particular attention shall be paid to exercising actions on probable disturbances, including accidents, in NPP operation and consideration of operating experience.

## 12.3 SELF-ASSESSMENT OF MANAGERIAL AND ORGANIZATIONAL ISSUES BY THE OPERATOR

The systematic self-assessment of senior managers and management at all other levels in the Akkuyu Nuclear JSC are integral part of the monitoring and review system in order to identify achievements and address any degradation in the safety performance.

In addition, regarding human factors and safety culture, in the PSAR (Article 17 - Siting), it is stated that Akkuyu Nuclear JSC management carries out various functions aimed at systematic information distribution to all personnel and promotion of relevant values and attitudes as well as at conduct of well-timed training and briefings to provide for unified understanding of safety culture concept/meaning and provision of strict compliance with safety requirements. Also, for continuous safety culture enhancement and well-timed identification of any negative tendencies, the Akkuyu Nuclear JSC management will carry out continuous safety culture monitoring and periodical self-assessment within the organization over the entire life cycle of NPP.

#### 12.4 ARRANGEMENTS FOR THE FEEDBACK OF EXPERIENCE

Arrangements for the feedback of experience in relation to human factors and organizational issues are discussed in Article 19 of the present National Report.

#### 12.5 REGULATORY REVIEW AND CONTROL ACTIVITIES

In terms of regulatory oversight of the human factors, some of the relevant regulations of the

NDK are focused on the design of nuclear power plants. Also, NDK's regulatory control is applied in authorization process according to regulations and requirements specific to the relevant authorization with regard to human factors. Authorization activities include: Authorization of Nuclear Facilities, Approval of Manufacturers of Equipment Important to Nuclear Safety for Nuclear Facilities, Authorization of Nuclear Construction Inspection Organizations, Authorization of Operating Personnel in Nuclear Facilities. Regulatory control activities related to human factors and safety culture can also be carried out during the review and assessment or on-site examination stages of the aforementioned authorizations. Relevant review and assessment procedures or checklists are used in these activities.

Legislative update studies on the subject are also continuing. There is a draft regulation called "The Regulation on Organizational Structure and Personnel in Nuclear Installations". Human factors and organizational issues are regulated in relevant articles such as organizational structure, NPP personnel, responsibilities of managers, personnel subject to notification, personnel training, and authorization of operating personnel.

*Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.*

### 13.1 REGULATORY REQUIREMENTS FOR QUALITY MANAGEMENT

NDK gives highest priority to safety during the licensing of all nuclear facilities. NDK's regulatory activities are in parallel with IAEA directives, requirements, guides and principles. In accordance with the para. 1 of the Art. 5 of Law No. 7381, authorized legal persons shall, within the framework of the conditions of the authorization granted and bearing all responsibilities, carry out its activities with an appropriate MS and keep the records, make notifications and reporting as defined in legislation and MS. Also, according to "Decree on Licensing of Nuclear Installations, 1983" the license holders or applicants should have quality assurance programs for different stages of the implementation of nuclear power plant projects and submit those programs to NDK. NDK, then, reviews and assesses quality assurance programs when implementing licensing process.

Detailed regulatory requirements and responsibilities of license holders related to MS and to provide a highest nuclear safety and safety culture in nuclear facilities and activities, with the purpose of incorporating lessons learned from former experiences, a new regulation, Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, was published which is aspiring to establish an IMS, in parallel to new IAEA document on this issue, GSR Part 2 – Leadership and Management for Nuclear Safety.

Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities includes basic principles and specific requirements such as responsibilities of

the organization and top management, leadership for safety, safety culture, MS, managerial processes, safety-related processes, quality assurance and management This Regulations also defines the minimum documents which should be included in the MS of a nuclear facility.

With this Regulation, requirements have been set for implementation, maintaining, evaluating and continuously improving of a MS for Organizations that construct, operate, decommission or close a nuclear facility. The Organization is obliged to establish a MS to carry out all its activities that prioritizes safety and supports safety culture. The Organization's MS has to integrate safety, security, environment, health and quality elements and individual, social and economic factors without compromising safety. In addition, the Regulation sets out requirements for issues such as quality assurance, configuration management and supply management.

According to Directive on Determination of Licensing Basis Regulations, Guides and Standards and Reference Plant for Nuclear Power Plants, 2012, a list of regulatory documents is defined for licensing of nuclear power plants in Türkiye. The approved "List of Licensing Basis for Akkuyu NPP" is mainly composed of Turkish regulations, IAEA Safety Fundamentals and Requirements and Russian Federation Regulations. The list includes "Leadership and Management for Safety, Series No. GS-R Part 2, 2016" and "GS-G-3.1, Application of the Management System for Facilities and Activities, 2006" documents of the IAEA in addition to this Regulation. The list also includes Russian Federations regulations and guides regarding the MS and quality assurance for nuclear power plants.

### 13.2 QUALITY MANAGEMENT SYSTEM OF REGULATORY BODY

Before the establishment of NDK, former regulatory body, TAEK, has started to develop its own QMS for its main departments which are relevant to nuclear and radiation safety, nuclear security and licensing of nuclear installations. The QMS of TAEK has been established in 2014 in accordance with ISO 9001:2008 standard. After the publishing of ISO 9001:2015, TAEK adapted its QMS to this version. In 2017, TAEK QMS was certified by the TSE. Additionally, the project "Support to the Regulatory Authority of Türkiye" has been started at the beginning of 2018 within the scope of INSC with Risk Audit. The overall objective of the project is to further developing the managerial and technical capabilities of the regulatory body in the following areas:

- Deterministic and probabilistic safety analysis,
- Manufacturing and construction inspections,
- MS of the regulatory body.

Improving a MS based on International Organization for Standardization (ISO) and IAEA requirements was a component of this project. After the establishment of NDK, it undertook the above-mentioned project and worked together with local consultants on developing QMS. Activities within the scope of the project were finalized in 2021. As a consequence of these efforts, NDK established its own MS in order to ensure that its assigned responsibilities are properly fulfilled, maintain and improve its performance, foster and support a safety culture. NDK has a MS build around national and international requirements. Main tools of the MS are as follows:

- Defining NDK's vision, core values and policy to provide a perspective on its activities,
- Strategic goals and annual targets on the basis of five-year strategic plan,

- An organizational manual, procedures and guides regarding all activities within NDK,
- Risk-based process approach for considering all possible issues about its activities,
- Performance indicators for measuring the effectiveness of them,
- Annual internal and external audits to confirm that all activities are performed in an effective manner, and to find areas for improvement,
- Annual management review of the MS with the aim of continuous improvement of its operation.

In April 2021, the MS of NDK was certified in terms of ISO 9001 QMS and ISO 45001:2018 Occupational Health and Safety Management System by TSE.

### 13.3 INTEGRATED MANAGEMENT SYSTEM OF THE AKKUYU NPP

Akkuyu Nuclear JSC has established an IMS in order to carry out activities for construction and operation of the Akkuyu NPP in a system focused on safety and quality, and also applies, maintains, evaluates and continuously improves the IMS.

The following Akkuyu Nuclear JSC MSs are integrated into the IMS: QMS, Environmental Management System and Occupational Health and Safety Management System.

The IMS has been developed in accordance with requirements of IAEA, international standards ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and Guidelines for Management System at Nuclear Facilities of the Türkiye. The IMS covers all processes, systems and elements, documentation, activities and services that affect safety of the Akkuyu NPP and quality of services, goods and activities provided.

The purpose of establishing, implementing, functioning and developing the IMS is to ensure effective functioning of processes, their continuous improvement and creation of

opportunities to increase customer satisfaction, taking into account applicable legislative and regulatory requirements.

Safety is the fundamental principle on which the IMS is based.

The IMS ensures maintaining and improvement of safety by planning and monitoring of the processes functioning, activities related to safety and affecting safety, as well as monitoring functioning of processes and activities at all stages of Akkuyu NPP life cycle.

The Akkuyu Nuclear JSC's IMS contributes to:

- the formation and maintaining of a strong safety culture;
- continuous improvement of the Akkuyu Nuclear JSC's processes and activities;
- management of development and changes;
- improving the efficiency and effectiveness of the Akkuyu Nuclear JSC's activities;
- creation, maintenance and development of effective internal and external communications as well as effective and efficient management of the Akkuyu Nuclear JSC.

The Akkuyu Nuclear JSC's QMS ensures implementation of the Quality Policy and is aimed at achieving the Akkuyu Nuclear JSC's goals, taking into account assuring the required level of quality at all stages of Akkuyu NPP life cycle.

Environmental Management System assures implementation of the Environmental Protection Policy and is aimed at achieving the Akkuyu Nuclear JSC's goals to reduce impact to the Akkuyu Nuclear JSC's activities and contractors involved in the construction of the Akkuyu NPP on environment, improving the environmental safety of the Akkuyu NPP at all stages of its life cycle, protection from emergencies in accordance with the requirements of legal acts as well as regulatory

documents and recommendations of international organizations.

Occupational Health and Safety Management System ensures implementation of the Occupational Health and Safety Policy and is aimed at reducing impact of hazardous and harmful production factors and associated risks at workers' workplaces, and improving safety culture of production. In 2020, the international certification body for MSs, BUREAU VERITAS recognized that the Akkuyu Nuclear JSC's IMS meets the requirements of ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 standards and issued the Akkuyu Nuclear JSC Certificates of Conformity with a validity period until the end of 2023.

In accordance with requirements of the NDK and ISO standards, the Akkuyu Nuclear JSC has developed and put into effect the "IMS Manual", which defines the Vision, Mission and Values of the Akkuyu Nuclear JSC, describes goals, principles and specific approaches for organization and functioning of IMS, a decision-making mechanism that provides priority of safety and achievement of the Akkuyu Nuclear JSC's goals, organizational and managerial measures aimed at ensuring safety, quality and a high safety culture at all stages of the Akkuyu NPP life cycle.

Based on process approach, the IMS Manual defines a set of interrelated and manageable IMS processes, consisting of the main processes, security processes, management processes and supporting processes. In addition to this, the owners of the processes, their responsibilities, as well as the requirements of stakeholders, are also defined.

To coordinate activities on functioning and development of the IMS, including nuclear safety and quality assurance issues, First Deputy Director General/Director of the NPP under construction has been appointed as a Senior Management Representative on IMS. The functions, responsibilities, duties and powers of a Senior Management Representative

on the IMS are defined in Regulation on a Senior Management Representative.

To ensure a high level of safety and quality, the principle of using a differentiated approach is laid down in the IMS, in which the application of safety requirements to processes and activities, products and services is established in accordance with the degree, probability and scale of possible radiation effects from the process, type of activity, service provided.

Decision-making on the functioning and development of the IMS and its individual elements and processes is based on use of a risk-based approach, principle of responsibility and leadership of the Akkuyu Nuclear JSC's management, which provides a strong safety culture in the Akkuyu Nuclear JSC.

The formation and maintaining of a strong safety culture are carried out by:

- ensuring priority of safety at all activities and processes of the Akkuyu Nuclear JSC when making any decisions;
- ensuring a common understanding of safety culture principles by all employees and managers, as well as suppliers and contractors;
- awareness of all employees about dangers and radiation risks of their activities;
- ensuring such conditions under which employees safely perform official functions, taking into account interaction of human, technological, organizational factors;
- ensuring an atmosphere of trust and the principle of "not accusations" at all levels of management;
- understanding by each manager and employee of the inadmissibility of hiding mistakes in their activity, the need to identify and eliminate the causes of their occurrence;
- full regulation of all activities.

The effectiveness of the IMS is ensured by the order of relations between interacting elements of the IMS, which is determined by the

organizational chart and becomes the most important regulator of their behaviour.

The organizational chart includes formulation of goals and objectives, definition of composition and location of departments, their resource provision (including the number of employees), development of regulatory procedures, documents, regulations that consolidate and regulate the forms, methods and processes that are carried out in the IMS.

Development and improvement of the IMG is ensured by a continuous analysis of the organizational chart functioning in order to make timely changes and adjustments to the organizational structure of the Akkuyu Nuclear JSC. Improving the organizational chart includes clarifying the functions of departments, defining the rights and responsibilities of managers and employees in Regulations and Job Descriptions and matrices of authority, eliminating multi-stages, duplication of functions and information flows.

To determine and separate areas of responsibility when monitoring activity and assessing the compliance of activity performed with established criteria, the IMS uses the principle of activities split (by functional characteristics and management levels), determining and accounting for the ratio of responsibility and authority, delegation of authority, centralization and decentralization of management, responsibility and supervision.

The Akkuyu Nuclear JSC provides systematic identification of indicators, monitoring and evaluation of the IMS to confirm its effectiveness and efficiency, as well as to identify areas requiring improvement. For these purposes, the following various types of monitoring and evaluation are used:

- monitoring the activities of managers, monitoring /measuring processes, including self-assessment and independent evaluation;
- internal and external audits, as well as conducting an analysis based on the results of

assessments. The corresponding processes are defined in the IMS for these actions.

Procedures have been developed and implemented to define requirements for planning and conducting audits and self-assessment. The Akkuyu Nuclear JSC conducts internal audits of the IMS to assess the effectiveness of processes and the IMS in overall.

The overall purpose of internal audits is to analyse the current state of the IMS, determine need for improvements and develop corrective actions if necessary.

Internal audit of processes is carried out on the basis of relevant approved schedule and audit plans.

The IMS defines processes to ensure safety and reliability. The processes are designed to manage various aspects of safety, including nuclear, radiation, technical and industrial, fire, information, environmental, physical safety, as well as health and labour safety.

Monitoring of physical configuration compliance with Akkuyu NPP Project requirements and the content of the Project, as well as establishing and maintaining of the Akkuyu NPP Project framework throughout the life cycle of the Akkuyu NPP, ensuring unified approach to decision-making, and assessing impact of these decisions on future Akkuyu NPP Project changes and safety, is carried out in accordance with the configuration management activities. For these actions, the IMS defines the "Configuration Management" process, main purpose of which is to provide timely information that reflects the actual physical and operational characteristics of Akkuyu NPP, and contributes to the adoption of safe, competent and cost-effective decisions taking into account safety.

The documentation of the IMS establishes general approaches, requirements, principles of the Akkuyu Nuclear JSC's processes and activities, and measures to ensure safety and quality. To manage the Akkuyu Nuclear JSC's

documentation, ensure the quality and relevance of the documents used, "Documentation Support" process functions. The documentation of the IMS is structured according to a hierarchical principle. During operation of the IMS, numerous records are made recording results of the Akkuyu Nuclear JSC's activities and functioning of the IMS. Document flow control and keeping of documents for the Akkuyu Nuclear JSC's activities and processes, functioning of the IMS, as well as the establishing of general requirements for inspecting, accounting, keeping, identification, withdrawal from circulation of records is carried out in accordance with procedures approved by the management of the Akkuyu Nuclear JSC.

The IMS defines principles of the relationship between various participants of the Akkuyu NPP construction Project, namely:

- All activities on the Akkuyu NPP Project are carried out on the basis of contracts, which clearly indicate the scope of activities, responsibilities, and quality requirements;
- Each participant of the Akkuyu NPP Project should develop and implement its own QMS;
- The Akkuyu Nuclear JSC develops General Quality Assurance Program (hereinafter referred to as the QAP (G), in which it establishes set of organizational and technical quality assurance measures affecting safety of Akkuyu NPP;
- Each Akkuyu NPP Project participant develops an individual Quality Assurance Program based on the QAP (G), which ensures Akkuyu NPP management confidence that all participants performing activities and providing services to the Akkuyu Nuclear JSC ensure safety and quality, taking into account differentiated approach that takes into account classification of systems (elements), buildings and structures of the Akkuyu NPP according to degree of their impact on security.

Sufficiency of guarantees to assure proper quality of supplied equipment and services is confirmed by external audits.

Following QAP (G), the Akkuyu Nuclear JSC provides systematic measurement and monitoring of suppliers and contractors QMSs in order to determine ability of the suppliers and contractors to deliver processes, products and services that meet the requirements of regulatory documents the Akkuyu Nuclear JSC and the terms of contracts.

When conducting external audits, the Akkuyu Nuclear JSC verifies compliance of suppliers and contractors with the Akkuyu Nuclear JSC's requirements set out in contracts and quality assurance programs.

Evaluation and selection of suppliers and contractors is carried out on a competitive basis, taking into account objective evidence of their ability to fulfil their contractual obligations, including compliance with quality management requirements, in accordance with the Akkuyu Nuclear JSC's procurement MS.

The Akkuyu Nuclear JSC has a procurement committee designated to evaluate contracts and technical information submitted to tender and to make decisions. Additionally, there is a special procedure for preliminary evaluation of potential suppliers.

For continuous improvement and development of the IMS, systematic monitoring of its functioning and evaluation of effectiveness is carried out. To monitor and evaluate the effectiveness of processes, process indicators are defined for each process.

In order to continuously improve and develop the IMS, identify areas for improvement and develop measures for improvement, an annual analysis of the IMS functioning is carried out.

One of the methods of the IMS effectiveness general analysis is self-assessment method. Self-assessment involves an assessment of the entire IMS and, first of all, an assessment of ensuring safety and quality, achieving and maintaining a high safety culture. The results of

self-assessment are documented, kept and used as input data for analysis by the Akkuyu Nuclear JSC's Top Management in order to continuously improving of the IMS.

To determine effectiveness of the IMS, regular independent assessments are carried out, including an audit at all levels, the functions performed at each level and the determination of the effectiveness of processes.

To assess the compliance of the IMS functioning and its individual processes with requirements and to assess its effectiveness and efficiency, periodic audits of the IMS are implemented.

In order to maintain the required level of activities quality and ensure safety in the Akkuyu Nuclear JSC, according to the results of inspecting, analysing of non-conformities revealed, the non-conformities are managed and corrective actions are implemented for elimination and prevention of non-conformities. All identified non-conformities are evaluated in terms of their impact on safety, and actions are taken to eliminate non-conformities and causes of non-conformities repetition in the future. When investigating non-conformities, the causes of their occurrence are determined. Investigation materials are used as input data for development of corrective actions.

In order to implement principle of continuous improvement of the IMS functioning in the Akkuyu Nuclear JSC, corrective and preventive actions are managed in accordance with documented procedures.

In order to implement principle of the Akkuyu Nuclear JSC's IMS functioning continuous improvement, corrective and preventive actions are managed in accordance with documented procedures.

Management of non-conformities, corrective and preventive actions is carried out using an automated quality management information system.

The top management of the Akkuyu Nuclear JSC annually conducts Overall analysis of the IMS in order to ensure its continued suitability, adequacy, effectiveness and consistency with the strategic direction for implementation of the Akkuyu Nuclear JSC's Policies and goals, as well as the application of lessons learned from internal and external experience to improve the functioning of the IMS.

All activities related to the assessment, self-assessment, audits and analysis of the IMS are regulated in the IMS documentation and approved by the Akkuyu Nuclear JSC's management.

#### 13.4 QUALITY MANAGEMENT SYSTEM OF SINOP NPP

EÜAŞ and EÜAŞ International ICC conduct their activities in accordance with the MS, which is in compliance with the NDK regulation, "Regulation on Management System in Nuclear Installations, 30032 numbered 08/04/2017 dated" (superseded by the Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities). Sinop MS for siting stage was reviewed and approved by TAEK. A specific quality manual and quality plan, which are in compliance with the entity's own QMS, were prepared by the contractors for each site studies and submitted to the Owner and Regulatory Body. Owner and Regulatory Body made several audits during the course of the activities. All the records and MS documentation are a part of the Quality Management Program section of Sinop Site Report and will be provided to NDK. During the field works, owner's representative was available at site and the contractor followed daily and monthly reporting system to the Owner. Owner has performed self-assessments as a part of its MS to maintain the continuous improvement of the system.

#### 13.5 REGULATORY REVIEW AND CONTROL

According to Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, the MS is documented in a systematic manner in accordance with the provisions of the Regulation. MS documents are prepared in a useful and legible manner, checked and approved by the authorities of the Organization in accordance with the relevant procedure. The organization puts the MS documents into practice after passing through the internal approval process.

The MS to be established and implemented by the Organizations, MS documents and important changes in terms of safety to be made in the system are subject to the NDK's review and assessment and inspections. Provisions in the relevant regulation of NDK are applied in matters related to inspections on MS of Organizations.

The Organization submits the documents showing the compliance of the MS it has approved with the provisions of the Regulation to the NDK. Additionally, the results of the self-assessments, independent assessments and management reviews regarding the MS of the organizations are submitted to the NDK within three months following the realization of these activities.

In order to ensure safety in activities related to the facility, systematic measures applied in activities affecting safety and institutional and technical arrangements are recorded with general quality assurance document and activity-specific quality assurance documents such as siting, manufacturing, construction, commissioning, operation and decommissioning or shutdown. The general quality assurance document includes measures and regulations applicable to all activities.

The Organization corrects the any deficiencies determined in the MS documents based on the

NDK's reviews and assessments, within the period deemed appropriate by the NDK.

Administrative sanctions are imposed if it is determined that there is a violation of the relevant legislation or authorization conditions, the decisions and instructions of the NDK.

In addition to the oversight of applicants/licensees over their vendors, NDK's regulatory control is also applied to those

vendors. The manufacturers of equipment important to nuclear safety for nuclear facilities to be built in Türkiye subject to authorization and inspections of NDK according to Regulation Regarding Equipment Procurement Process and Approval of Manufacturers for Nuclear Facilities issued in 2015. During the authorization process for manufacturers, NDK seeks for established QMS in the manufacturers' organization and facilities.

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

- i. comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;*
- ii. verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.*

New regulatory framework has been established in 2018 together with transition to new governmental system and this framework has been also updated in 2022 in the level of law. Law No. 7381 defines NDK as the new regulatory authority and makes authorization for any activities within the scope of this Law obligatory and states that license from the NDK is needed to operate any nuclear facility. In this context, the applicants for authorization are obliged to provide all the information and documents in the required format and content requested by the NDK.

Because of the fact that transition period has not been finished yet in all levels of legislation, some old Decrees and regulations are still in effect until the new regulations are issued in line with the provisions of Law No. 7381.

One of the most important laws still in force is “Decree on Licensing of Nuclear Installations, 1983”. This Decree defines the main steps of licensing with minimum level of required format & content for regulatory review.

According to the Decree, licensing procedure is initiated by the application of the owner to be recognized as such. Licensing process for an NPP comprises three main stages in succession: Site License, Construction License and Operating License.

There are also several permits functioning as hold points during the licensing process, such as limited work permit, commissioning permit, permit to bring fuel to site, fuel loading and test operations permit for operating license, etc.

The general procedures for review and assessment of regulatory body are laid out in the Decree. According to this general process, regulatory body may request further information related to safety for review and assessment at any stage whenever it deemed necessary. The application documents are reviewed and assessed by NDK.

The purpose of the review and assessment by NDK is to determine whether if the applicant has demonstrated that the safety in all stages of facility’s lifetime such as the design and operation meeting the related safety requirements by the proposed design in its reports. Details of the licensing process and review and assessment activity are regulated by internal guidelines. Main internal document in this subject is the “Directive on Establishment and Implementation of Licensing Projects”. This directive provides provisions on the mechanism to establish and implement licensing activities for nuclear installations under project management approach. The directive envisages two main processes to follow: Review and Assessment, and Inspections. Both topics are also regulated by two internal guidelines.

According to directive on review and assessment process for nuclear installations are performed in different levels:

1. Level 1 R&A is implemented mainly to check the adequacy of the application; and format and content of the documents submitted with the application,

2. Level 2 R&A is broad review and assessment and implemented mainly to check the suitability of the information provided in the documents for independent assessment; consistency of the information provided; and compliance with the regulations,
3. Level 3 R&A is detailed review and assessment and implemented mainly to check if the structures, systems and components are classified adequately in terms of safety and quality classes; if their technical specifications, their environmental qualification and their safety functions are properly addressed and in conformity with the relevant codes and standards; and to check if the accident analyses are performed using adequate method and tools; if assumptions and inputs are suitable; if the results are in conformity with the regulations and acceptance criteria. Also, this level includes independent verification of some of the accident analyses if deemed necessary.

The review and assessment process are always supported by regulatory inspections and enforcement activities at any stage of licensing and throughout the lifespan of a nuclear installation.

#### 14.1 SITE LICENSE PROCESS

In site license process (Article 17 - Siting explains this process in detail), a site report containing information on a potential site for a nuclear installation submitted by the owner is reviewed and assessed for compliance with national regulation and IAEA guidelines to grant the Site License. After having studied the results of the inspections performed by the NDK at the proposed site, DNI prepares site evaluations report and submits Nuclear Regulatory Board for decision.

An affirmative notification is called site license. The conditions of the license are given to the applicant as an appendix to the license.

Following the receipts of the site license, the applicant may proceed with the work related to site preparation, potable water and electricity supply, road and harbour construction etc. and buildings other than the nuclear reactor facility itself. Then the applicant may perform the detailed site investigations and submit their results and the final values of the site related design parameters to NDK for approval prior to the application for construction license.

#### 14.2 CONSTRUCTION LICENSE PROCESS

To obtain a construction license, the applicant must have obtained a site license and has to apply to the NDK enclosing the PSAR and PSA to his application. According to Decree, the PSAR must include the following information:

1. New information related to site and its environment acquired after the issuance of site report,
2. Safety Principles, criteria and standards to be applied for the design construction, quality assurance, commissioning, operating and decommissioning of the facility,
3. General characteristics of the facility and layout and design bases for structures, systems and components,
4. List giving seismic safety and quality classifications of structures, systems and components,
5. Information related to the design of the process and safety systems of the facility,
6. Design and layout provisions for radiation protection and radioactive waste management in-service inspection maintenance during operation and decommissioning,
7. Safety analysis of the facility during normal operation, anticipated operational occurrences and accident conditions,

8. Quality assurance program comprising information on its objectives, description, organization and implementation,
9. Information on technical capability, know-how, experience and organizational structure for the applicant and vendors related to the project,
10. Preliminary information on commissioning,
11. Other additional information which may be requested in the light of developments and new practices in nuclear safety.

PSAR and PSA of the installation and several other supportive documents are reviewed and assessed to verify the safety of design as a prerequisite to Construction License. Following the assessment of the PSAR, the DNI prepares a limited work permit evaluation report and submits Nuclear Regulatory Board for decision.

Board may decide to grant a limited work permit. The decision is released to the applicant by the NDK. An affirmative notification is called limited work permit. The applicant, who has obtained a limited work permit, may proceed with the installation of structural foundations of reactor and environmental safety related buildings and facilities and construction of other structures, systems and components.

Following the granting of the limited work permit, the evaluation of the PSAR, in connection with the construction license, proceeds. After having observed the carried out at the reactor site by its inspectors the DNI prepares a construction license evaluation report and submits Nuclear Regulatory Board for decision.

The final decision comprising the subjects to be added to the FSAR, is released to the applicant by the NDK. The construction license authorized the applicants to start with the constructions of all structures and the erection of all the systems of nuclear reactor facility. During construction, regulatory inspections are

used to ensure that the installation is built as designed.

### 14.3 OPERATING LICENSE PROCESS

The review and assessment of the FSAR together with supportive documents listed in the Decree to verify safe operation of installation is the basis for issuing the Operating License. The Operating License is granted in three steps:

1. Commissioning Permit,
2. Fuel Loading and Pre-Operational Test Permit,
3. Full Power Operating Permit and Operating License.

For Commissioning Permit following documents have to be enclosed with these applications:

1. The final design of the components and systems,
2. Documents related to quality assurance and control of said components and systems,
3. Commissioning program,
4. Pre-service examination,
5. Documents related to the adequacy and organization of commissioning personnel,
6. Preliminary information on operational limits and conditions,
7. Operating instructions and procedures for the components and systems,
8. Other additional information which may be requested in the light of developments and new practices in nuclear safety.

Following the evaluation of documents listed below and reports of inspections, tests carried out during the construction by DNI, Board may grant the commissioning permit. It is not allowed to transport to the reactor site the nuclear fuel and heavy water with nuclear fuel for heavy water reactors before the documents pertaining to the physical protection program of

the nuclear reactor facility, nuclear material accounting and control, and procurement, transportation, storage, accounting and control of heavy water for heavy water type reactors have been presented to the NDK and its approval is obtained.

In order to obtain Fuel Loading and Pre-Operational Tests permit applicant must apply to the NDK enclosing the documents listed below and the FSAR:

1. Information related to results and evaluations of tests carried out during the commissioning of the nuclear and environmental safety related components and systems,
2. Quality assurance documents of the facility and quality assurance program for operation,
3. Document affirming competence and organization of the operating personnel,
4. Program of fuel loading, criticality and pre-operational tests,
5. Preliminary information on operating limits and conditions,
6. Operating instructions and procedures for the nuclear reactor facility,
7. Radiation protection program,
8. Emergency plans,
9. Other additional information which may be required in the light of development and new practices in the nuclear safety.

After having evaluated the documents required above and the inspection reports pertaining to the testing during the commissioning period of the components and systems by the DNI, Board grants the fuel loading and preoperational test permit.

To obtain a full power operating permit and operating license the applicant has to apply to the NDK enclosing the documents listed below:

1. Results and evaluation of fuel loading, criticality, and pre-operational tests,

2. Final information regarding operational limits and conditions,
3. Instructions and procedures pertaining to the final status of matters,
4. Other additional information which may be requested in the light of developments and new practices in nuclear safety.

After having reviewed and assessed the documents requested and reports pertaining to the inspections, DNI prepares an evaluation report for full power permit and operating license and then submits the report Nuclear Regulatory Board for decision. The decision of the Board is released to the applicant by the NDK. An affirmative notification is called a full power permit and operating license.

Safety assessment by NDK are conducted continuously in all lifetime of the facilities. According to Law No. 7381, any authorized person should perform safety assessments at the frequency determined by NDK. It is foreseen by NDK in the draft regulation periodic safety reviews will be conducted in defined periods for different facilities using graded approaches.

Throughout the operation of the nuclear power plant, the regulatory body should keep the power plant under control with in-service inspections. In-service inspection is an important measure to ensure equipment integrity and prevent failures, and is therefore an essential tool in the management of nuclear plant safety and lifetime. With these inspections, the regulatory body should ensure that all activities of the structures, systems and components that are particularly important for safety are carried out properly.

Akkuyu NPP design has been reviewed and assessed based on licensing pyramid which includes Turkish legislation, IAEA safety requirements and vendor country regulations, standards and codes. In parallel to review and assessment of the NDK, the design has been also reviewed by the UJV Rez a.s. from Czech Republic and TÜV SÜD of Germany with

respect to these regulations and IAEA safety requirements.

#### 14.4 IMPLEMENTATION OF VDNS PRINCIPLES

Although there is no operating nuclear power plant in Türkiye currently, the regulatory body used the opportunity of licensing activities for the Akkuyu NPP to implement lessons learned after the Fukushima Daiichi Accident such as the VDNS principles. During the review and assessment for site related design parameters

approval, limited work permit and the construction license for the Unit 1 of Akkuyu NPP, the items mentioned in first principle of VDNS are among the main focus of review and assessment. Measures taken by the designer are carefully investigated to comply with this principle. In this context, dry-site concept has been adopted for the Akkuyu Site in the siting stage and provisions for station blackout, provisions for station blackout, early release frequency is still among the issues discussed with the Akkuyu Nuclear JSC for complying with the VDNS.

## 15 RADIATION PROTECTION (ARTICLE 15)

*Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.*

### 15.1 REGULATORY REQUIREMENTS

Regulation on Radiation Protection in Nuclear Facilities dated 2018, is the main regulation which governs the radiation protection aspects in NPPs. This regulation covers the requirements for the protection of the workers, the public and the environment from the harmful effects of ionizing radiation during the nuclear facilities' site assessment, design, construction, commissioning, operation, decommissioning and release of the site from regulatory control phases and during the emergencies in nuclear facilities.

The regulation states that the effective dose caused to a worker shall not exceed an average of 20 milliSieverts (mSv) per year in any five years period, nor 50 mSv in any single year. The limit for the annual dose of an individual in the population, arising from the normal operation of a nuclear power plant, is 1 mSv. The guidance values for restricting exposure of emergency workers are also given in the regulation.

Basic obligations of the licensee of a nuclear power plant related to the radiation protection, the content of the radiation protection program which should be prepared by the licensee, the basic responsibilities of the radiation protection officers and radiation workers which are working in nuclear power plants, classification of workplaces as controlled and supervised areas and the rules that should be followed in these areas, radiological monitoring, emergency and existing exposure situations are the main topics that are covered in this regulation.

ALARA (as low as reasonably achievable) requirements related to all these topics are specified in the Regulation on Radiation Protection in Nuclear Facilities. According to this regulation the licensee should take all measures related to the safety and security of the radiation sources in nuclear power plants and the activities related to these sources are licensed according to the legislations on radiation safety.

The recently issued Law No. 7381 states that all the activities related to nuclear facilities should be authorized by NDK. The authorization procedure and the contents of the documents that should be submitted during authorization process are described in the Decree on Licensing of Nuclear Installations dated 1983. According to this decree, the applicant must have obtained a site license from regulatory body prior to the application to obtain a construction license. The applicant also has to apply to regulatory body for construction license by enclosing the PSAR and PSA to the application.

The decree defines the information to be provided in the PSAR. According to the decree, the PSAR shall include design and layout provisions for radiation protection, radioactive waste management, in-service inspection, maintenance during operation and decommissioning.

The PSAR shall include a chapter defining the organization for radiation protection, measures for radiation protection taken in plant design, the roles and responsibilities of personnel with respect to radiation protection and safety as well as the means and provisions to implement the respective actions.

The decree also stipulates that the final radiation protection program should be submitted during the application for fuel loading permit. The content of the radiation protection program is described in the Regulation on Radiation Protection in Nuclear Facilities. According to this regulation radiation protection program of a nuclear power plant should at least include the information and procedures related to the following topics:

- Organization related to the radiation protection
- Responsibilities of the radiation workers and outside workers
- Classification of workplaces
- Classification of radiation workers
- Radiation work permits
- Personal protective equipment
- Medical surveillance
- Radiological monitoring of workplaces
- Personal radiological monitoring
- Monitoring of releases
- Calibration and maintenance of monitoring equipment
- Trainings related to radiation protection

Public dose constraints for each nuclear power plant are determined by regulatory body and dose constraints for workers are determined, monitored and controlled by the licensee according to the Regulation on Radiation Protection in Nuclear Facilities and Regulation on Radioactive Waste Management.

Release and discharge limits shall be determined by the authorized person for gaseous and liquid wastes separately, based on optimization of radiation protection as well as dose constraints which are determined by the regulatory body for the public on the bases of plant conditions. Release limits in nuclear facilities should be presented to regulatory body during the authorization application for construction and operation. In the authorization phases sufficiency of these limits are evaluated by regulatory body.

Final values are considered within the scope of operating limits and conditions of the plant.

Environmental monitoring program shall be carried out in the facilities which yearly maximum doses received by critical groups exceed 10  $\mu\text{Sv}$  in the operation conditions. The authorized person is obliged to ensure; monitoring and recording of dose rates in the environment continuously; and monitoring and recording activity concentrations in air, water, soil and various food samples in regular intervals.

The environmental radiological monitoring activity for the NPPs which are not located in the border of Republic of Türkiye but may have radiological impacts on the territory of Türkiye, i.e. in Province of Iğdır due to Metsamor NPP, is performed by NDK. The samples within the scope of environmental radiological monitoring activity are taken regularly and related measurements and analyses are realized. The radioactivity levels in various environmental medias such as soil, air, water, food, vegetation, precipitation, deposition, bioindicators etc. are followed. Besides, instantaneous gamma dose rates in air and three-month cumulative ambient air doses are also monitored. If any increase is detected above the investigation levels and operational intervention levels, the related investigation and intervention activities are performed by NDK. It should also be noted that the regulations related to radiation protection and as well as other regulations are under renewal process to meet the new requirements stipulated in the recently issued Law No. 7381 and PD No. 95.

## 15.2 OPERATIONAL CONTROL AND RADIATION PROTECTION PLAN FOR AKKUYU NPP

The agreement on the Akkuyu Project defines the scope of responsibilities of the Akkuyu Nuclear JSC for the project. The means and provisions for radiation protection are included within the scope of the Akkuyu Nuclear JSC's responsibilities.

The measurements to estimate the existing natural radiation background have been performed and documented in the framework of Engineering Studies Program of the siting work. Background radiation and the doses which are to be incurred from the background radiation were presented in the EIA Report. Affirmative decision was made for the EIA Report at the end of 2014. This information is also given in the SPR of the Akkuyu NPP which was approved in 2017.

In April 2018 construction license of Akkuyu NPP Unit 1 was issued. Moreover, construction licenses of Unit 2 in August 2019, Unit 3 in November 2020 and Unit 4 in October 2021 were issued. A description of the radiation protection systems and relevant basic equipment is presented in the PSARs of these units of the Akkuyu NPP.

According to the PSAR, radiation protection is provided by the implementation of following provisions:

- The shielding for radiation protection at the plant will mainly be provided by radiation shielding for the reactor and through concrete walls and floors,
- In the event of an accident, measures to prevent the dispersion of radioactive substances into the environment (such as double containment) will be considered in the design,
- The fact that radioactive substances are generally located in closed loops will prevent the spread of these substances into the facility and the environment,
- Radioactive leakages from the equipment will be detected through the monitoring using the sampling methods,
- Ventilation systems will be used to provide the necessary air exchange rate to keep the radioactivity concentration in the workplaces within the limits determined by the regulatory legislation,
- Gas and aerosols will be passed through the air purification system and released to the atmosphere,

- Radioactive waste MSs will be used,
- Classification of workplaces will be performed,
- On-site and off-site radiation monitoring will be performed.

In addition to this, in accordance with the ALARA Principle, the related measures to be taken in order to minimize the personnel radiation doses to the lowest possible level are provided in PSAR.

During the operation of the Akkuyu NPP Units, radiation monitoring of the units and the environment will be performed by the operating organization. The monitoring program will include source, environmental, individual monitoring and dose assessment as follows:

- Monitoring in the premises of the NPP (on-line monitoring, and radiation dose rate monitoring, control of releases, contamination control, dosimetry control); monitoring of the physical barriers,
- Monitoring of gaseous releases and liquid discharges from the plant using the Automated System of Radiation Monitoring on site (source monitoring),
- Environmental monitoring of the impact area during normal operation and accident (Environmental Automated Radiological Monitoring System, EARMS and Environment radiation monitoring laboratory, ERML); environmental sampling for specific activity of radionuclides in contaminated air, soil, water, local ecosystems, foodstuffs and other possible pathways of public exposure.

The monitored values by EARMS are also provided.

The activities that should be performed by radiation protection officers who have the main responsibility to carry out the activities related to the radiation protection are given in the Regulation on Radiation Protection in Nuclear Facilities.

In addition to this, the main administrative responsibilities of the radiation protection officers are stated in the PSAR.

The Akkuyu Nuclear JSC is responsible for establishing a radiation protection program, which includes procedures aimed at systematically meeting the corresponding regulatory documents on radiation protection. The radiation protection program will be submitted together with the FSAR which will be submitted for fuel loading permit according to the Decree on Licensing of Nuclear Installations.

NPP management will carry out administrative activities such as ensuring adequate and competent manpower, implementing appropriate administrative management,

establishing appropriate working procedures, and periodically updating the documents related to these activities.

Radiological impacts of the Sinop NPP for normal operating conditions and reference accident scenario were analysed and incorporated in the EIA Report. This impact will also be considered in the Site report. The design of radiation protection systems and the detailed analysis will be provided in PSAR and FSAR implementing ALARA Principle in accordance with the Turkish and International requirements.

## 16 EMERGENCY PREPAREDNESS (ARTICLE 16)

- 1. Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency. For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.*
- 2. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.*
- 3. Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.*

### 16.1 EMERGENCY PLANS AND PROGRAMMES

Basic legislative documents on emergency preparedness and response are listed below:

- Regulation on Disaster and Emergency Management Centers (2011),
- National Disaster Response Plan (NDRP) (2014),
- Regulation on Radiation Protection in Nuclear Facilities (2018),
- National Radiation Emergency Plan (NREP) (2019),
- Regulation on Tasks Regarding Chemical, Biological, Radiological and Nuclear Threats and Hazards (2020),
- Regulation on Management of Radiation Emergencies (2020),
- Regulation on Disaster and Emergency Response Services (2022).
- Nuclear Regulatory Law (Law No. 7381) (2022),
- Presidential Decree on Organization and Duties of Nuclear Regulatory Authority (PD No. 95) (2022).

The authority to regulate on-site emergency preparedness and response (EPR) of operating organizations of regulated facilities or activities that could necessitate emergency response actions is given to the NDK by PD No. 95.

According to PD No. 95, the on-site EPR activities of the facilities and activities that are within the scope of the Law No. 7381 are regulated by the NDK, the off-site EPR activities are regulated by AFAD. Besides, PD No. 95 states that NDK regulates the management of radiation emergencies.

#### 16.1.1 NATIONAL COORDINATING AUTHORITY FOR EMERGENCY PREPAREDNESS AND RESPONSE

AFAD is the coordinating authority assigned for all kinds of disasters and emergencies at all levels including large scale nuclear and radiological emergencies. AFAD is recognized as the competent authority by IAEA according to Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Also, provincial Disaster and Emergency Directorates, affiliated with AFAD, are established within the body of governorship in all 81 provinces.

AFAD and other related stakeholders have specific centers for disaster and emergency management that have roles in emergency response according to the related regulations. Also, provincial Disaster and Emergency Directorates, affiliated with AFAD, are established within the body of governorship in

all 81 provinces. All the responsible authorities take part in the Presidential AFAD Center to provide effective response, coordination, and collaboration when a national-level response is required for the management of disasters and emergencies.

Disaster and Emergency Council has been established in 2020 with PD No. 67 and the Council meetings are chaired by the Minister of Internal Affairs. It consists of the vice ministers of following ministries: Ministry of Family, Labour and Social Services, ÇŞİDB, ETKB, HMB, Ministry of Health, Ministry of Agriculture and Forestry and Ministry of Transportation and Infrastructure, and representatives of the following institutions and organizations: Türkiye Red Crescent, Boğaziçi University Kandilli Observatory and Earthquake Research Institute. If the Minister of Internal Affairs considers it necessary, representatives of other ministries, public institutions and organizations, universities, and non-governmental organizations and experts could be invited to the Council's meetings.

The Council gathers at least twice a year. In case of need, the Board may hold extraordinary meetings upon the call of the Minister of Interior.

Provincial Disaster and Emergency Directorates, which are affiliated with the AFAD, were established within the body of governorships in all 81 provinces.

### 16.1.2 NATIONAL REGULATORY BODY

NDK's mission as a regulatory body is to undertake regulatory and inspectorial activities. NDK is recognized as the "national warning point" and the "competent authority" by IAEA according to Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

NDK provides technical consultancy in case of major radiation emergencies within the

Presidential AFAD Center within the new preparedness and response infrastructure which was established with the foundation of AFAD. In this framework, NDK is one of the support solution partners of the Disaster Search and Rescue Working Group which has been established within the frame of NDRP.

Radiation monitoring and early warning system (RESA) network throughout the country was established by NDK after Chernobyl accident. Monitoring stations are densely deployed at locations close to national borders and around sites (Mersin and Sinop) where the nuclear power plants are to be constructed. The number of the stations has currently reached to 211 (**Hata! Başvuru kaynağı bulunamadı.**11).

Atmospheric dispersion calculation capabilities are also present (HySplit) in NDK and studies for adaptation of the decision support system JRODOS to Türkiye are in progress.

The responsibilities of NDK are:

- To establish measures to be taken during radiation emergencies, to establish the general criteria about limitation of contaminated food consumption, and establish operational intervention levels,
- To establish the necessities for the reporting and classification of radiation emergencies,
- To establish the acceptable dose levels of radiation workers during emergencies,
- To evaluate the nuclear, radiation, and waste facilities, to estimate the doses, to give the necessary advice to the provincial Disaster and Emergency Directorates and provincial Emergency Management Centers,
- To support the analysis of national CBRN risk, to give the necessary knowledge, documentation to the governorships,
- To establish or ensure the establishment of radiation early warning systems, monitoring of early warning systems, and evaluate the data,
- To evaluate the notifications and reports related to radiological and/or nuclear threats and hazards; and if the event occurs to

- inform the relevant governorship, ministries etc.,
- To supply informative support to the first responders related to radiological emergencies,

- To ensure the contact point function related to radiological emergencies within the concept of international agreements and organizations; to notify the relevant organizations for necessary precautions and coordinate information exchange.



**Figure 12. Measuring Stations of the National Radiation Monitoring Network**

### 16.1.3 NATIONAL EMERGENCY PLANNING FRAMEWORK

In terms of emergency/disaster response, the roles and responsibilities of ministries, related institutions, and governorships are defined in related legislation and in NDRP which was issued in 2014. The NDRP is the highest-level overarching plan and can be executed for all types of emergencies and disasters.

The objectives of NDRP are as follows:

- To save lives,
- To return the interrupted life and activities to normal as soon as possible,
- To carry out the intervention works quickly and in a planned manner,
- To protect and maintain public health,
- To protect property, environment and cultural heritage,
- To reduce economic and social losses,
- To prevent secondary disasters or to reduce their effects,
- To ensure the effective use of resources.

25 working groups are defined in NDRP and each working group is dedicated to a specific service which may be required in case of emergencies. The roles and responsibilities of the working groups are defined in NDRP and each working group has a main solution partner (which are generally ministries or AFAD) and supporting solution partners (ministries, governmental institutions, non-governmental organizations).

In terms of emergency/disaster response, the roles and responsibilities of ministries, related institutions and governorships are defined in related legislation and in NDRP. The organization of the working groups that have role in emergency preparedness and response are determined in the NDRP which corresponds to the highest-level all-hazards plan. The integrated planning infrastructure has been established in NDRP. According to this infrastructure, there are national working groups' plans (such as Disaster Search and Rescue Working Group and Health Working Group) under the NDRP. The provincial

disaster response plans and local working groups' operation plans are also present in this framework. The specific types of hazards and threats such as radiation emergencies are planned within the framework of national and local event-type plans.

NREP is an event-type plan according to the NDRP.

NREP was prepared by NDK in collaboration with AFAD based upon the Regulation on Disaster and Emergency Response Services, Regulation on Tasks Regarding Chemical, Biological, Radiological and Nuclear Threats and Hazards, and NDRP. The roles of ministries, institutions and working groups set forth in the legislation are elaborated in NREP in terms of radiation emergencies. The emergency plans to be taken into consideration in case of radiation emergencies are given in NREP by taking into account the integrated planning structure present in NDRP (**Hata! Başvuru kaynağı bulunamadı.**12).

The most recent approach of the IAEA on emergency preparedness and response was adopted, and lessons learned from the Fukushima Daiichi accident and international practices were taken into account to comply with the principle on mitigation of the possible releases of Vienna Declaration during the preparation of NREP.

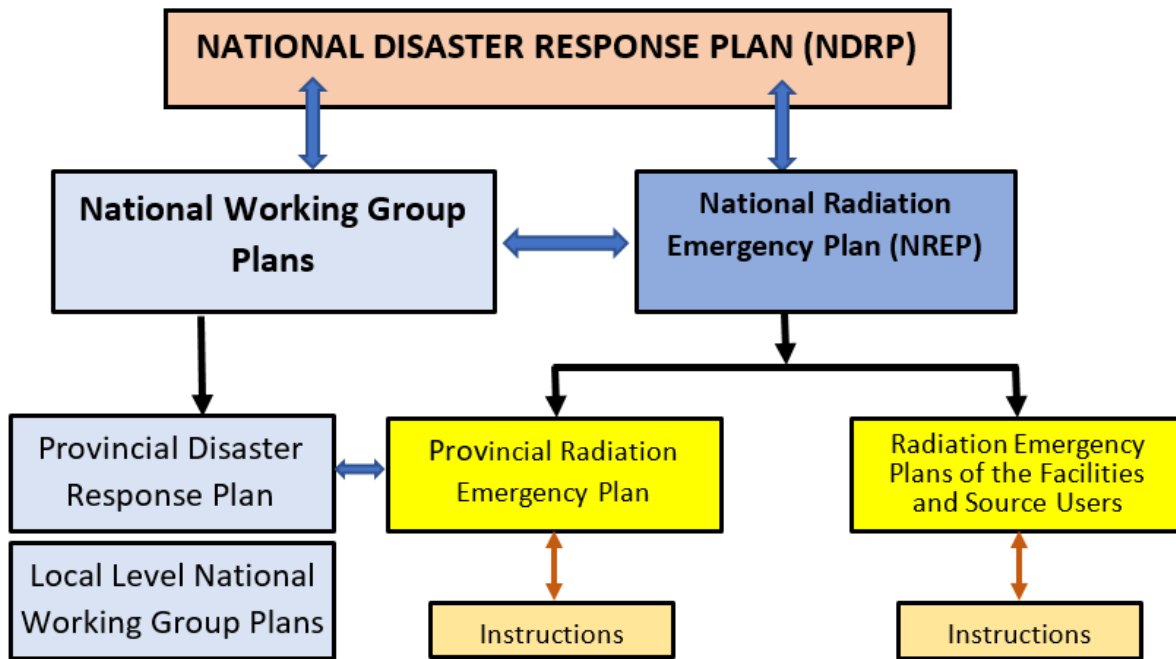
Command and control system at national and local levels for emergency response under the all-hazards approach has been established in NDRP. The local emergency management organization is established in NDRP and its interfaces with the national emergency management organization is explained in NDRP.

The emergency facilities and their locations suggested by the IAEA, and related provisions, are also adopted in the NREP. The organization for management of radiation emergencies and the transition of responsibilities during a

radiation emergency is described in the NREP. The stakeholders assigned for response to radiation emergencies are in place. The national and local radiation emergency management organizations are established in NREP as a subset of the emergency management organizations defined in NDRP. Emergency response organization for radiation emergencies is also based on the emergency management organization provided in NDRP. The same response services are used and command and control system are explained by taking into consideration the emergency classes in NREP.

NREP covers;

- Terminology specific to radiation emergencies,
- Legal bases,
- The ministries, institutions and working groups that will take part in response in radiation emergencies,
- Planning bases (hazard assessment and emergency preparedness categories),
- Responsibilities of related parties;
- Response organization,
- On- and off-site emergency management centers and locations,
- Occupational concepts (ideal responses);
- Training, drills and exercises;
- International authorities and conventions,
- Technical guidelines:
  - Hazard assessment,
  - Generic criteria,
  - Operational intervention levels,
  - Guidance values for restricting exposure of emergency workers,
  - Use of thyroid blocking agents,
  - Response time objectives,
  - Dangerous sources.
- Emergency planning zones, emergency planning distances and areas to be cordoned,
- Teams and facilities required for response.



**Figure 13. The National Emergency Planning Framework**

#### 16.1.4 CLASSIFICATION OF EMERGENCIES

The emergencies that may take place in NPPs shall be classified by the operating organization of authorized facilities taking the Emergency Action Levels (EALs) into consideration according to Regulation on Management of Radiation Emergencies. The guidance on the derivation of EALs for NPPs is included in NREP. The EALs will be derived specific to each plant type by the license holders and reviewed by the NDK.

Reactor parameters such as temperature, pressure, flow rate, specific events related to the plant safety, radioactive material releases, radiological measurement results, or other parameters related to extraordinary conditions based on different observable indications in the plant, operational criteria (EALs), as determined during the licensing or preparation phase, should be used for rapid and accurate identification and classification of the emergency situation. The main purpose of the emergency classification system established by using EALs is to create a reference approach that can be used for all light water reactor

designs. This system should take into consideration the features of the existing design when adapting to a particular design or construction.

The classification system is based on the possibility of causing a major release from the primary reactor building or reactor vessel or damage to the reactor core or critical safety systems in order to detect high radiation doses on-site. Emergency classes are associated with increased risk of damage to the reactor core or increased probability of high radiation doses occurring off-site. The use of such a classification system will ensure that appropriate conditions are established and sufficient time is available for the on-site emergency response organization to be able to mitigate the situation and for the off-site emergency response organization to implement effective protective actions. EAL are predetermined variables that can be measured or threshold values for each observable case which were predetermined for each emergency class during the emergency preparedness phase.

NREP and Regulation on Management of Radiation Emergencies suggests the following

emergency classes related to possible off-site consequences due to nuclear facilities:

General emergency is an accident with actual or significant risk of radioactive release or radiation exposure which presupposes off-site emergency response activities. When this class of emergency is declared, measures for mitigation of consequences and protection of people must be taken urgently on-site and off-site;

Site area emergency is a significant deterioration of protection level for people on site or near the NPP. When this class of emergency is declared, remedial actions and measures for on-site protection of people must be taken urgently, and arrangements shall be made to take the off-site protective measures if necessary;

Facility emergency is a significant deterioration of protection level for people on site. When this class of emergency is declared, remedial actions and measures for on-site protection of people must be taken urgently;

Alert is an accident with an indefinite or significant deterioration of protection level for the public or people on site. When this class of emergency is declared, measures for evaluation and mitigation of consequences and enhancement of preparedness of on-site and off-site responsible organizations shall be taken urgently

Based on the classification, the Operator shall notify and continue providing updated information to the off-site decision makers responsible for the respective protective actions.

According to the Regulation on Management of Radiation Emergencies, within the scope of requesting technical support from off-site, important parameters of the NPP (safety parameters) that will be transferred to the NDK, provincial Disaster and Emergency Management Centre and TSOs outside the facility (such as supplier of the NPP) are regulated.

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#### 16.1.5 ON- AND OFF-SITE PLANS FOR THE NUCLEAR POWER PLANTS

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Akkuyu Nuclear JSC is responsible for developing the on-site emergency plan for the Akkuyu NPP which determines the required actions for mitigation of the accident consequences whilst respective governmental organizations (Mersin Governorship which is supported by AFAD and NDK) prepare the off-site radiation emergency plan (provincial radiation emergency plan).

The national protection strategy which is defined in NREP is adapted to local conditions via preparation of the provincial radiation emergency plans. The provincial radiation emergency plans are also event-type sub-plans of provincial disaster response plans. These provincial radiation emergency plans are prepared by each governorship according to a template which is prepared by NDK and AFAD. This template is mainly based on content of NREP. The roles of local institutions and working groups set forth in the legislation are elaborated in provincial radiation emergency plans in accordance with the local level working groups' plans.

The provincial radiation emergency plan determines zones and distances of emergency planning and defines actions to be taken by authorized local and state authorities to protect the public, property and the environment in the event of an emergency. The public and the environment are protected by implementing radiation emergency plans developed for local authorities (Mersin Province), companies and the facility (NPP) involved in the local response that are associated with the NREP and NDRP.

The topics that should be covered for on-site radiation emergency plan are given in the Regulation on Management of Radiation Emergencies.

Radiation emergency plan implementation instructions and other necessary documents, the on-site emergency plan will provide clear and

straight forward interface with the off-site decision makers. The necessary procedures will be identified, developed and agreed with the responsible officials prior the commissioning of the Akkuyu NPP. The on-site emergency plan of Akkuyu Nuclear JSC, “The Plan of Measures on Personnel Protection in Case of an Accident at the Akkuyu NPP”, is currently in phase of actualization and approval. After the on-site emergency plan is developed, it will be submitted to the NDK for review and approval prior to the fuel loading to the first reactor at the site. Regulatory body NDK will evaluate the on-site plan and consistency of on-site plan with the provincial radiation emergency plan and NREP according to the related regulations. The full-scale exercise for each NPP should be conducted before the fresh nuclear fuel is brought to site and will be repeated at least every three years.

The preparations for the full-scale exercise for Akkuyu NPP, which is currently planned to be held in November 2022, are continuing with the contributions of all relevant institutions and organizations on the national scale.

The on-site emergency plan shall be revised and updated periodically and also if specific circumstances require these changes.

The analysis related to emergency planning and the applicability of the emergency planning to the Sinop NPP site are to be evaluated in Sinop NPP Site Report being a part of the assessment for site suitability. The detailed on-site and provincial radiation emergency plan and NREP for emergency conditions will be prepared in accordance with the Turkish and international requirements and the on-site emergency plan of Sinop NPP will be submitted to NDK during commissioning license stage.

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#### 16.1.6 TRAININGS AND EXERCISES

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Regulation on Tasks Regarding Chemical, Biological, Radiological and Nuclear Threats and Hazards has the following provisions about CBRN threats and hazards including radiation emergencies:

- The training of the personnel who will be assigned within the scope of this regulation is given by AFAD and its local subordinates. Special CBRN trainings related to the duties of institutions and organizations are provided by their own institutions.
- Ministries, relevant institutions and organizations and governorships organize CBRN exercises in cooperation with AFAD for the training of teams and personnel and participate in the exercises held in this field.
- Except for military training, in case national and international CBRN trainings are organized by institutions and organizations in our country, AFAD is informed and a result report is sent.

The provisions about the trainings of the off-site emergency response organization are given in NREP.

Moreover, the table-top, partial and full-scale, and field exercises that will be performed for radiation emergencies are also specified in NREP.

Provincial radiation emergency plans also include dedicated sections about trainings, drills and exercises.

The trainings, drills and exercises that will be performed by operating organizations are in accordance with the Regulation on Management of Radiation Emergencies.

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#### 16.1.7 THE EMERGENCY MANAGEMENT FACILITIES AND LOCATIONS

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The emergency facilities and locations suggested by the IAEA and related provisions are adopted in the NREP. The Akkuyu Nuclear JSC and NDK have reached a common understanding regarding the on-site and off-site emergency facilities and locations.

NREP defines both on-site and off-site emergency management centers and points that will be used during radiation emergencies, their specifications, functions, activation times and possible locations. The off-site emergency management centers and points are as follows:

- Reference hospital,
- Provincial AFAD center,
- Emergency response management point,
- Designated hospital,
- Radioactivity analysis laboratory,
- Notification point,
- Public information center,
- Radiological monitoring and evaluation center,
- Reception center,
- Supply and storage place.

The steps for establishing and building a proper off-site emergency management center or point are given in NREP.

The locations and the specification of all these centers and points are also given in the provincial radiation emergency plan of Mersin.

The on-site emergency management centers and rooms according to NREP are as follows:

- Control room,
- Back-up control room,
- On-site emergency center,
- Operation support center,
- Technical support center.

The on-site emergency facilities except the backup control room can be collocated under the same roof.

The process of establishing a mobile crisis center for Akkuyu NPP in addition to the planned off-site emergency center (this center will be the back-up of the on-site emergency center) is currently ongoing. The on-site emergency facilities that should be built-up to satisfy the related requirements and to perform the related functions are given in the Regulation on Management of Radiation Emergencies.

The Akkuyu JSC will establish a backup off-site emergency management center located beyond the emergency planning zones in a way that can provide the functions specified for the on-site emergency management center. The location of the center is determined by taking the opinion of the governorship of Mersin Province where the facility is located, AFAD

and NDK. In case of radiation emergencies, the center can also be used by off-site authorities if it is deemed necessary by the governorship of Mersin Province, within the scope of a protocol to be signed between Akkuyu JSC and the governorship.

## 16.2 INFORMATION TO THE PUBLIC AND NEIGHBOURING STATES

Türkiye is a party to the Early Notification and Assistance Conventions. The infrastructure for communication channels such as phone lines, facsimile facilities, computer and internet facilities which are to be used for communication with IAEA and other parties, are in place. NDK is recognized as the national warning point and the competent authority for communication with IAEA.

Türkiye has bilateral agreements with Bulgaria, Romania, Ukraine, and Russian Federation on early notification in case of nuclear emergencies.

Provision regarding public information, including the public information center and responsible authorities are included in the NREP.

The general information about the radiation emergencies together with the protective actions and other response actions are given to the public who are residing, in the provinces where national NPPs are located and in provinces which are within the emergency planning zones of neighbourhood countries' NPPs, are given through public information meetings and the distribution of the brochures about the possible radiation emergencies.

One type of these brochures has general information which is in compliance with the NREP and other types of these brochures include the information about the abovementioned topics by taking into local conditions such as brochures for Iğdır Province cover the information about the local settlements within the emergency preparedness zone which is determined for Metsamor NPP

within the scope of provincial radiation emergency plan of Iğdır. Same type of brochures will be prepared for Mersin Province also where the Akkuyu NPP is located.

The coordinating authority and regulatory body (AFAD and NDK) also provide the public with information about the radiation emergencies via their web sites.

The public will be warned by AFAD about the radiation emergencies through the Integrated Warning and Alarm System (IKAS). IKAS; against air attacks, CBRN threats and hazards, the warning and alarm news to be received from the Air Force Command and the disaster and emergency news to be received from the institutions that are the source of danger news will be sent to the Provincial AFAD Centers. It has been prepared in order to warn the people in the regions that may be under threat by being transmitted as on-line. With the system, it is aimed to modernize the existing system in accordance with today's technology, and to support the siren warnings with audible warnings, cellular and social messages. IKAS consists of 3 sub-components working on the Uninterrupted and Secure Communication System as Information Reception and Dissemination System, Warning and Alarm (Siren) System and Message Alert System.

According to Regulation on Management of Radiation Emergencies, in case of radiation emergencies, regular information is provided to the public and the media by AFAD during radiation emergencies in the general emergency class, and by NDK in cases falling under the radiation emergency classes other than this. These public information activities will be performed under the roof of the public information center which will be established according to NREP.

The draft press releases for NPP emergencies are prepared by NDK and AFAD which are present in the provincial radiation emergency plans of Iğdır and Mersin Provinces.

The embassies in other states are to be provided with information and advice by the Ministry of

Foreign Affairs in collaboration with AFAD and NDK according to NREP. The radiological monitoring results acquired from the RESA stations are published on publicly available website and shared with the European countries via the European Radiological Data Exchange Platform (EURDEP) voluntarily. Moreover, NDK is registered as the data provider to IRMIS of IAEA.

Due to the fact that the Metsamor NPP is close to the eastern border of Türkiye, some areas in the region are considered as critical locations, vulnerable to possible radiological consequences, where urgent protective measures shall be taken in case of an accident.

The following activities are performed in Iğdır Province in terms of informing public at the preparedness stage of radiation emergencies:

- With the cooperation of NDK and AFAD, a regional workshop and desktop exercise, in which the emergency scenario originating from the Metsamor NPP was discussed, was held in Iğdır Governorate on 8-10 August 2016. In addition, on August 11, 2016, information was given to the village headmen and councils of elders of the villages that were considered to be within the PAZ of the Metsamor NPP in Iğdır. On the same date, another information meeting was held in Iğdır Province Culture and Congress Center, with the participation of the Iğdır Governor and Deputy Governors, the other provincial protocol and the public, which lasted approximately three hours.
- NDK, AFAD and Iğdır Governorship personnel went to the villages within the PAZ of the Metsamor NPP in Iğdır Province between 7-11 August 2017 and carried out iodine tablet distribution and public information activities (distribution of the brochures).

A workshop about the nuclear emergency preparedness and response was performed in Iğdır Province in April 2019 before the full scope exercise. The full-scale exercise with the participation of national and local authorities

was performed in Iğdır Province which is the closest city to the NPP located in a neighbouring country in June 2019. A full-scale exercise for the Akkuyu NPP is also going to be conducted before the nuclear fuel arrives at the field according to NREP. Therefore, preparations for a full-scale field exercise has been ongoing within coordination of AFAD. As soon as the full-scale exercises for the Akkuyu NPP is conducted before the nuclear fuel arrives at the field, this exercise is going to be repeated once every three years. When a full-scale exercise is not conducted, a table top exercise is going to be carried out instead.

### 16.3 EMERGENCY PREPAREDNESS FOR CONTRACTING PARTIES WITHOUT NUCLEAR INSTALLATIONS

The governorship of Iğdır Province which is the closest city to the NPP located in a neighbouring country is being supported by NDK and AFAD for ensuring necessary preparedness. The provincial radiation emergency plan for Iğdır Province was prepared by Iğdır governorship in collaboration with NDK and AFAD. The governorship and provincial Disaster and Emergency Management Directorate were informed about the necessary resources, tasks to be performed and exercises. Preparation studies for conduction of a full-scope exercise in Iğdır Province were performed and the exercise was conducted in June 2019.

## 17 SITING (ARTICLE 17)

*Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:*

- i. for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;*
- ii. for evaluating the likely safety impact of a pro-posed nuclear installation on individuals, society and the environment;*
- iii. for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;*
- iv. for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.*

### 17.1 EVALUATION OF SITE RELATED FACTORS

#### 17.1.1 SITE SELECTION AND RANKING METHODOLOGY

The site selection methodology in Türkiye is formed in accordance with national regulations and international practices. The methodology is based on screening of candidate sites. Sites are evaluated considering 43 siting criteria grouped into four major categories: Economic, Engineering, Environmental and Sociological. A ranking is assigned from 0 to 5, for each criterion with the quantitative ranking metrics in evaluation process.

The siting process for an NPP generally consists of an investigation of a large area to select one or more candidate sites and finally identifying preferred site or sites. The site survey process commonly begins with delineating the region of interest and proceeds through first three steps. Later on, those candidate sites are investigated in detail. Last step belongs to the site selection process.

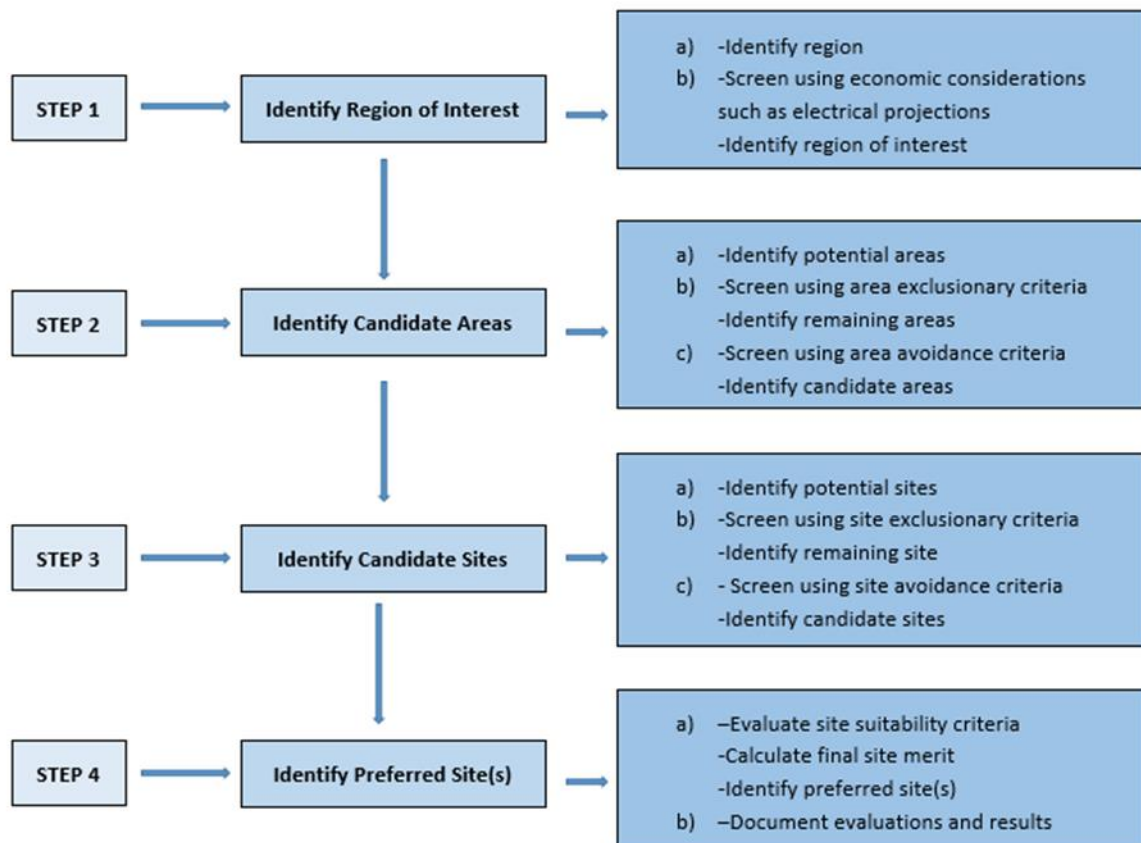
In order to determine the interested area(s), some site characteristics are considered with the aim of rejecting unacceptable areas or sites. Most generally, the experts of the utility can easily decide about the interested areas. In this phase some near regional characteristics may

play a certain role to determine the area(s). For instance, Türkiye is a country having active seismic zones. Therefore, the earthquake is the main factor in the selection of NPP sites. Thus, if the candidate site is on a seismically active region, those areas on that region it shall not be considered. According to regulations; nuclear power plants shall not be located on sites directly situated on active faults. No aircraft shall enter into the airspace designated by 6500 ft altitude from the sea level and 2 km lateral distance from controlled access area perimeter located inside the site boundaries and encompassing all nuclear safety structures. This airspace shall not be violated by air corridors or airport approach, landing and take-off operations. Free-field ground motion level cannot be used less than 0.15 g. All events identified as design basis external events (DBEE), should be rigorously examined, analysed and the parameters on which the plant's design will be based should be definitely established. Despite the use of engineering safety features in the design and strengthening of the plant structures to reduce the intensity and probability of events, if the risks associated with DBEE in terms of plant safety are not acceptable the site shall be deemed unsuitable.

Likewise, cooling water source of the nuclear reactor is also inevitable major factor for the site selection from the both safety and economical point of view. If the cooling water

is insufficient for the once through cooling, cooling towers should be used that will affect the reactor cost. The basic methodology for the siting is given in Figure 13. According to the Regulation on EIA, owner of the Project has to prepare and submit to the ÇŞİDB an EIA Report at the planning stage. The environmental aspects of the proposed installation which cover alternative sites are

evaluated by the ÇŞİDB. Within the framework of the duties and responsibilities of the Ministry, the activities have to be carried out considering the locations of the institutions, settlements, industrial facilities, transportation routes, schools, hospitals, etc., noise and air pollution at the site selected, possible effects of these works and compliance with the provisions of the relevant legislation.



**Figure 14. Basic Methodology for The Siting**

### 17.1.2 REGULATIONS ON SITE STAGES

Licensing decree has a main role for licensing of NPPs as it defines all licensing stages and the application sequence. Furthermore, the “Regulation on Nuclear Power Plant Sites”, “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” and the draft “Regulation on Nuclear Installation Safety” stipulate that the site of a nuclear installation is determined by considering the site’s effect to

the NPP, the NPP’s effect to the site and the applicability of the emergency plans. Applicability of emergency plans is also evaluated and planning zones are determined accordingly. Details are given in the “Regulation on Nuclear Power Plant Sites”. The fundamental issues in this Regulation are based on IAEA Safety Requirement SSR-1. Guideline on Format & Content of NPP Site Report provides guidance for developing the site report.

### 17.1.3 LICENSING OF SITES

In order to construct an NPP, it is compulsory to obtain a license from NDK. The NPP licensing process is carried out in accordance with the Decree on Licensing of Nuclear Installations. The licensing process for a nuclear installation is being conducted in three phases; site license, construction license and operating license.

Owner notifies NDK before site investigations, after beginning of site investigations NDK performs inspections on site. Application document for site license is site report and a special format is given to the applicant to facilitate preparation of site report. The site report shall cover:

- Information regarding the purpose of the nuclear reactor facility, its power and the type of reactor,
- Information regarding the technical capability of applicant and institutions carrying out site studies on behalf of the applicant,
- Regional map clearly indicating the geography of the proposed site,
- Information and studies regarding topographical, geological, geotechnical hydrological, seismological and meteorological characteristics of the selected site,
- Layout alternatives for the reactor types considered,
- Information about the site evaluation with respect to natural phenomena such as earthquakes, floods and storms,
- Information about the site evaluation with respect to man-made external events such as aircraft crashes, fires, explosions and failure of dams, etc,
- Information regarding the adequacy of water sources to be used for cooling purposes,

- QA program for detailed site investigations,
- Information regarding the national electrical grid connection and reliability of the off-site electrical power,
- Preliminary studies on radiation exposure of the public due to liquid and gaseous radioactive effluents during normal operations, anticipated operational occurrences and accident conditions,
- Information regarding effects of ecology to the NPP such as measures against biological fouling, etc,
- Other additional information which may be requested based on the developments and new practices on nuclear safety.

With this report, it has to be shown that any site characteristic shall not preclude technologically the construction of a safe NPP at the proposed site, and those site parameters significant to safety must be within acceptable limits from the latest technological applications.

Following the submission of site report, review and assessment is conducted by DNI in NDK.

Technical support is taken generally from universities as Consultants and IAEA Missions as an independent review. Following the receipt of all reports, a Site Evaluation Report (SER) is prepared by DNI and site license conditions are identified. This report is submitted to Nuclear Regulatory Board for decision. As the site license is granted then applicant may start following activities;

- Site preparation, water and electricity supply, road and harbour construction etc,
- Construction of buildings and installations other than nuclear reactor facility itself.

EIA affirmative decision is prerequisite before the site license. ÇŞİDB is the responsible body for EIA process. A public participation meeting is organized by the owner of the project, at the place where the project is

planned to be realized, on a date to be determined by agreement with the Ministry, to inform investors and to obtain their views and suggestions. The opinions of the public, relevant public institutions and organizations are reflected in the EIA report. In the EIA process, NDK contributes on radiological part of EIA report and relevant issues.

Upon acquiring site license, detailed site investigation results and exact values of site

related project parameters are submitted for approval of NDK by licensee. After this approval owner can apply for construction license with PSAR.

#### 17.1.4 NPP SITES

Türkiye has two identified NPP sites. One is Akkuyu and the other is Sinop. Locations of both sites can be seen in Figure 14.



Figure 15. NPP Site Locations

##### 17.1.4.1 THE AKKUYU SITE

Akkuyu Site license had been issued to Turkish Electric Company in 1976. The site license is still valid and transferred to Akkuyu Nuclear JSC, in accordance with the Akkuyu Project Agreement. However, TAEK requested Akkuyu Nuclear JSC to update site related studies and prepare an USR since current project is different than the project which was supposed to be built in 1976 as well as site characteristics and parameters were determined in 1970s. Akkuyu Nuclear JSC is recognized as the Owner on February 7<sup>th</sup>, 2011. The Akkuyu Site on the Mediterranean coast was allocated to Akkuyu Nuclear JSC in 2011 as specified in the Akkuyu Project Agreement. Although the

site license has already been granted in 1976 an update of the site report was required both because of the regulatory framework and international practice evolved and also because of the need to incorporate the site data gathered after 1976. Akkuyu Nuclear JSC started site investigations in Akkuyu for updating the site characteristics and parameters according to the Decree on Licensing of Nuclear Installations, 1983 and other related legislation.

The USR that addresses the site license validity was prepared by Akkuyu Nuclear JSC and submitted to TAEK in May 2012. Review and assessment conducted by Site Group with the support of Advisory Committee on Nuclear Safety of TAEK and IAEA and positive decision for USR was given in December 2013.

SPR was submitted in November 2014 and approved in February 2017.

Within the framework of implemented studies all the siting requirements and the necessary characterization studies have been addressed;

- a) Integration to the grid- The site has been evaluated for connection to the national 154 kV and 380 kV transmission distribution systems. EÜAŞ has been assigned the project to design and construct the transmission lines from the terminations of the NPP switchyard to a selected and construction of the NPP switchyard is part of the scope of the project under Akkuyu Nuclear JSC responsibility,
- b) Geology and Tectonics – The geology and tectonics of the site has been investigated in compliance with TAEK regulations and also the IAEA Safety Guide SSG-9. In particular the four-scale approach (regional, near regional, site vicinity and site area) has been used to identify all relevant geological and tectonic structures. Using the criteria recommended in SSG-9, it has been demonstrated that there is no potential for fault displacement hazard at the site which can jeopardize the safety of the NPP structures, systems and components. Seismology - The seismological database included paleoseismology, archeo-seismology, historical seismology, instrumental seismology and the monitoring of earthquakes in the near region and site vicinity. Requirements of TAEK regulations and recommendations of the IAEA Safety Guide SSG-9 have been followed. The complete methodology and approach were included in the USR. The results which include the seismic design bases for the NPP are reported in the Site Parameters Approval Report,
- c) Heat removal capability – The Mediterranean Sea will be the main source of cooling including the Ultimate Heat Sink. Subjects related with plant efficiency

and sea water temperature have been studied. Furthermore, the potential for low water during extreme oceanographic events (such as tsunamis) have been evaluated. The final design bases for the NPP are provided in the Site Parameters Report,

- d) Hydrology - This topic includes potential hydrological hazards and also the availability of fresh water for construction and plant use during operation. It also includes dispersion of effluents in aquatic media. The studies confirmed that the nearby creeks and streams do not pose a hazard for flooding the NPP site. Comprehensive coastal flooding investigations were conducted (including tsunamis, seiches, storm surges, tides, waves and sea level rise due to global warming). “Dry site” concept will be used for protection from coastal flooding as recommended in IAEA Safety Guide SSG-18. The methods used were reported in the USR. The final design bases for the NPP are provided in the Site Parameters Report. Dispersion of effluents (including radioactive and non-radioactive substances and thermal effects) in aquatic media/environment is discussed in the USR, SPR and also the EIA Report. The availability of fresh water for construction and operation of the plant was being studied as part of preparatory site and engineering works,
- e) Demography – The demographic situation of the site was discussed in reports and emphasis was given to the feasibility of emergency planning given the present and projected population near the site,
- f) Meteorology - This topic includes potential meteorological hazards and the dispersion of effluents in atmospheric media. The extreme meteorological hazards at Akkuyu include storms, heavy precipitation (impacting hydrological events), extreme heat (air and water), lightning and small tornadoes and waterspouts. All these

hazards have been evaluated using the IAEA Safety Guide SSG-18. The methods used were reported in the USR. The final design bases for the NPP are provided in the Site Parameters Approval Report. Dispersion of effluents in atmospheric media was discussed in reports,

- g) Environmental Issues – Akkuyu Nuclear JSC has submitted an Application Dossier to ÇŞİDB in 2011. On the basis of this Dossier, the ÇŞİDB selected a panel of experts who prepared a detailed Table of Contents for the EIA Report. This Table of Content includes the evaluation of all (radiological and non-radiological) impacts. It also includes all external hazards that could affect the safety of the installation. The EIA Report has been submitted to ÇŞİDB in July 2013 and affirmative decision was given in December 2014,
- h) External Hazards – Natural external hazards were already addressed under subject matter items (b, c, e, g). Human induced hazards have been evaluated using the recommendations of the IAEA Safety Guide NS-G-3.1. The sources of potential hazards include airplane crash and explosion of oil/gas tankers in the Mediterranean Sea. There are no acceptability issues related to these hazards,
- i) Local Infrastructure - The Project Site is located in the south of Türkiye in the Akkuyu Bay, which is located in the Büyükeceli Neighbourhood of Gülnar District of Mediterranean Sea Region Mersin Province. It is at approximately 37 km southwest from the center of the Gülnar District; 140 km westward from the city center of Mersin Province. The area

within a 50 km radius of the site is a low population area with the primary industries being agriculture and tourism. Akkuyu Nuclear JSC has developed plans to establish on the site the necessary wharfs for the receipt of equipment and materials by sea and for fabrication and construction facilities. Akkuyu Nuclear JSC has developed plans for a permanent residence facility near the project site for the housing of personnel that will operate and maintain the Akkuyu units and also has provision for developing on the project site a large-scale temporary housing complex for the construction workforce. Layout of Akkuyu NPP is given in the Figure 15.

- j) Access - Large-tonnage cargoes will be unloaded and processed in the local port intended in Akkuyu site. The site is connected to the major Adana-Antalya highway (E-90 highway) via a 4.5 km road,
- k) Legal Issues – Akkuyu Project was formally approved by the parliaments of both counties and established the legal framework for the implementation of the Akkuyu NPP project. The Akkuyu Project Agreement also requires that the project be implemented in accordance with all Turkish national laws and regulations, including all license requirements,
- l) Nuclear Security – Akkuyu Project Agreement establishes that there shall be joint cooperation specifically for the physical protection of the NPP. Protection of the site is the responsibility of Akkuyu Nuclear JSC. Both the Republic of Türkiye and the Russian Federation are signatories of the Convention of the Physical Protection of Nuclear Materials and the Treaty on the Non-Proliferation of Nuclear Weapons.



**Figure 16. Layout of the Akkuyu NPP Site**

Considering these investigations, review and assessment of SPR was carried out. As it may be seen above, site characterization studies, as well as the review and assessment performed by TAEK, considered the relevant items of VDNS, particularly focused on grid reliability and tsunami issues for the site.

TAEK also utilized IAEA support in the review of this report and an IAEA mission and its follow-up on SPR were carried out in February 2015 and in July 2017, respectively. Upon completion of the review and assessment, site related design parameters of Akkuyu has been approved by TAEK on February 9, 2017.

In accordance with the provisions of Limited Work Permit granted for the first unit of Akkuyu NPP, Akkuyu Nuclear JSC has already started the Site Parameters Monitoring Program which ensures that any new information

obtained shall be re-considered throughout the lifetime of the plant.

#### 17.1.4.2 THE SINOP SITE

The Sinop site is located on the Black Sea coast in the province of Sinop. The site is situated approximately 16 km west-northwest of Sinop. An “owner” application was made to TAEK by EÜAŞ and EÜAŞ was recognised as the owner of the proposed Sinop NPP in August 2012.

IGA has been signed between Türkiye and Japan on the 3<sup>rd</sup> May 2013 for the construction of four units of ATMEA1 Reactor (1100 MWe per reactor). Based on the results and evaluation of the feasibility study prepared by the Japanese-led consortium to build the Sinop NPP project, the Turkish Government decided not to continue with Japan on this project.

Collective work related to site issues was carried out. Site feasibility studies were

performed prior to this work by the Japanese-led consortium.

With the owner EÜAŞ; the project sponsors Mitsubishi Heavy Industries, ITOCHU Corporation and ENGIE were the parties of the Sinop NPP consortium partners.

Site related activities have been proceeded by EÜAŞ International ICC to license the Sinop NPP site without the Japanese Consortium. Based on all conducted site investigations, onshore and offshore site characterization studies, a site report has been prepared for the application to the site license.

Regulatory review and control activities have been carried out by informative meetings and site inspections. As mentioned in GSR Part 1 (Rev. 1) - Requirement 25: TAEK reviewed and assessed relevant information submitted by the vendor to determine whether activities comply with regulatory requirements and the conditions specified in the authorization.

The site characterization phase has been completed in 2021. Details for determining site properties, in scope of the works about site licensing by EÜAŞ is given below:

During the preparation of the site report, many baseline studies have been used and the following studies were performed; LIDAR, bathymetry, onshore geophysical and geotechnical surveys, and site parameters survey. Offshore geophysical and geomorphological studies, seismic hazard analysis studies, hydrographic and oceanographic surveys, natural external events hazards analysis such as tsunami, earthquakes, floods, storms, and external human-induced hazard analysis studies were also conducted. The baseline environmental and radiological studies, the hydrogeological and meteorological studies were performed as well. Moreover, emergency planning and socio-economic characteristics such as land use, population, and industrial installations were analysed.

A protocol was signed in September 2012 with The Scientific And Technological Research Council Of Türkiye - Marmara Research Center (TÜBİTAK-MAM) for evaluating studies both on land and off shore about the fields; geology, oceanography, geophysics, seismology, geotechnical, geodesy.

Japanese Atomic Project Company (JAPC) and Dokuz Eylül University (İzmir/Türkiye) performed Offshore Studies in 2013, for identification and characterization of potential seismogenic features in the near region in order to make an assessment of their contribution to the seismic hazard.

JAPC has performed Onshore Surveys in 2014 and 2015, for Identification and characterization of potential seismogenic features in the near region in order to make an assessment of their contribution to the seismic hazard at the Sinop NPP site. These surveys contain Boring, Seismic Reflections, PS Logging, Microtremor works.

Within these site studies, it is fundamental to assess seismic hazards. Therefore, a Senior Seismic Hazard Committee (SSHAC) has been established by project sponsor companies so as to evaluate seismicity in accordance with US Guide - NUREG/CR-6372 (Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts)

SSHAC approach will allow considering uncertainties related to random and epistemic uncertainties, as recommended by the IAEA guideline SSG-9.

Marine Flora and Fauna, Bathymetry, Geomorphology, Lidar and Meteorology are other subjects of under the scope of site studies.

As an outcome of the extensive site investigations, preparation of the Sinop Site Report was commenced in 2017 and the report was completed in 2021. The site license application is in near future. The Report is composed of 13 Chapters including Geography and Demography, Industrial Installations, Meteorology, Hydrology, Geology,

Geophysics and Seismology, Ecological Impacts, Human Induced External Events, Radiological Impact, Emergency Planning, Electrical Systems, Physical Protection and Quality Management.

Within the scope of site investigations, site characterization studies were commenced in 2017 and were completed in 2021. The results of this study will be the site parameters that constituting the bases of the plant design. According to the current NDK regulations, the Sinop SPR will be finalized and planned to be submitted to NDK after granting the Site License. All the site studies given above are under regulatory control by regulatory inspections. Throughout these inspections TAEK experts, and outsourced Consultants from various universities haven taken in charge.

## 17.2 IMPACT OF THE INSTALLATION ON INDIVIDUALS, SOCIETY AND ENVIRONMENT

The characteristics of the natural environment, population and individuals in the region that may be affected by potential radiological impacts in operational states and accident conditions through all possible transport routes are investigated and assessed. Applicability of emergency plans is also evaluated and planning zones are determined accordingly. All these characteristics are monitored throughout the lifetime of the plant. In accordance with requirements and criteria of the authority, an adequate quality assurance programme shall be established and applied to conduct and control the effectiveness of the site investigations and assessments.

“Regulation on Nuclear Power Plant Sites”, “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” and the draft “Regulation on Nuclear Installation Safety” require the effects of the NPP to the site and the applicability of the emergency plans. The feasibility of the implementation of the emergency measures in the emergency

planning zone within the projections in the population during lifetime of the plant is demonstrated. Details are given in these regulations.

ÇŞİDB defines some requirements to the environmental studies and the radiological and non-radiological impact of the plant. EIA Report consists of assessment of main impacts any nuclear power plant during construction, operation (normal operation, design and beyond design basis accidents) and decommissioning process on aquatic and terrestrial ecosystems, the personal of the plant and the public:

- Thermal impact, related to operation of cooling systems of the plant’ equipment (warm water release),
- Environmental impact, due to usage of chemicals in plant process, cleaning and water treatment systems, prevention of bio growth on the equipment and cooling sea water supply lines, emissions in air of combustion products of fossil fuels, etc.,
- Radiological impact,
- Electromagnetic impact, sources of which could be gridlines, high voltage equipment on the site,
- Noise impact,
- Impacts on the protected areas.

### 17.2.1 THE AKKUYU NPP SITE

Within the USR and SPR there is a preliminary assessment of the radiological impact of the plant. The assessment takes into account severe accidents and normal operation releases based on up to date meteorological data to estimate the atmospheric dispersion factors for Akkuyu NPP site. In addition, ground surface contamination and public exposure doses have been determined for gaseous releases as well as evaluation of the liquid discharges to the environment. The analyses comply with the relevant Russian standards in the field and have been based on data for the reference plant since

the final dispersion factors relevant to the actual design is provided in the PSAR.

EIA Report consists of assessment of main impacts of Akkuyu NPP during construction, operation (normal operation, design and beyond design basis accidents) and decommissioning on aquatic and terrestrial ecosystems, the personal of the plant and the public. On the other hand, monitoring program on this subject is ongoing.

### 17.2.2 THE SINOP NPP SITE

One of the exclusionary criteria for site screening is the impact of the project on the environment. A Positive Decision of the EIA is a prerequisite for the approval of Site Report. A comprehensive set of analysis were conducted through the EIA study. In order to evaluate the possible environmental impacts due to project realization and operation, baseline environmental data of the region were collected and non-radiological and radiological studies were performed. Human & socioeconomic aspects are also considered. The EIA process started with the submittal of EIA application file to the ÇŞİDB on December 27, 2017. The Public participation meeting was held on February 06, 2018 in Sinop. ÇŞİDB has established the Examining & Evaluation Commission of 40 members (composed of related public institutions, universities) and the standardized special format of the EIA report for the Sinop NPP Project was provided to EÜAŞ International ICC on March 19, 2018. The EIA Affirmative Decision was given on September 11, 2020 regarding the Sinop NPP project and as such, the EIA process was completed.

### 17.3 CONSULTATION WITH OTHER CONTRACTING PARTIES LIKELY TO BE AFFECTED BY INSTALLATION

Türkiye's legislative and regulatory framework ensures that nuclear materials and facilities are utilized and nuclear activities are performed

with proper consideration for health- safety, security and protection of the people and the environment. In this respect, Türkiye signed and/or approved international agreements and conventions.

Four bilateral agreements for Early Notification of Nuclear Accidents are in force between Türkiye and Bulgaria, Romania, Ukraine and Russia. No new agreements or conventions are signed after the Fukushima Daiichi accident.

After the accident at the Fukushima Daiichi NPP, a number of studies have been implemented by ENSREG to review and improve the nuclear facilities of the EU nations. In this context, safety and risk assessment studies have been initiated within the scope of stress tests.

An undertaking has been initiated by the EC to allow participation of neighbouring countries to the stress tests. Türkiye is among the countries that signed the Joint Declaration on comprehensive risk and safety assessments of nuclear plants, also called Stress Tests and Türkiye observes these studies and supports the decisions reached by consensus. As an outcome of the Joint Declaration, TAEK, former regulatory body of Türkiye, has requested applicable stress test evaluations for the Akkuyu project from the Akkuyu Nuclear JSC. Akkuyu Nuclear JSC developed the applicable stress test evaluations for the Akkuyu project and submitted to TAEK.

The Stress Tests National Report of Türkiye, which included evaluations of the regulatory body was finished in May 2012 and opened for comments of the relevant bodies (ETKB and Ministry of Foreign Affairs). The finalized report was sent to the EC on June, 2012.

At the end of December 2018, updated version of “Stress Tests National Report of Türkiye” was prepared taking into consideration the comments of ETKB and the Ministry of Foreign Affairs.

On mid-2021, discussions on organisation of the peer review started with ENSREG.

Peer review team questions were sent to NDK on December 16th, 2021. Answers to peer review team questions were prepared and sent to ENSREG on March 15th, 2022.

First step of the peer review of Akkuyu NPP was held on 16th to 18th of May in Ankara,

NDK Headquarters. As the result of discussions for clarification on the questions and national report, findings of the peer review team is expected. The second step of the peer review team visit is planned on June, 2022 to Akkuyu site.

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

- i. the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;*
- ii. the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;*
- iii. the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.*

### 18.1 IMPLEMENTATION OF DEFENCE IN DEPTH

Implementation of defence in depth in design and construction phase is ensured by regulations and regulatory control. The “Regulation on Design Principles for Safety of Nuclear Power Plants, 2008” focuses on design issues for ensuring safety of nuclear power plants. Similarly, “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” addresses principles on design and construction for nuclear power plants.

According to these regulations, nuclear power plant is designed so as not to deviate from safety objectives under normal operation, anticipated operational occurrences and accident conditions. For the construction of nuclear power plants, safety evaluation of design and achievement of quality during manufacturing and construction are the main principles addressed in the “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”. These regulations take into account general requirements related to defence in depth such as physical barriers, redundancy, diversity, physical separation, conservative design and high quality in construction, accident management and emergency response measures.

“Guide on Specific Design Principles”, which is issued in 2012 defines specific principles to

be applied during the design stage of a nuclear power plant. Among the principles which are defined in the Guide are levels of defence in depth, plant states and objectives, earthquake and aircraft crash.

NDK also follows IAEA’s Safety Standards that provide requirements to ensure nuclear safety.

New legislative framework and documents related to design and construction of nuclear power plants are also under development. All requirements are revised and updated according to new developments and lessons learnt. Nuclear safety objectives (including protection from possible radiological damage from nuclear facilities), defence in depth and new approaches to defence in depth and nuclear safety are defined in the draft regulations.

### 18.2 INCORPORATION OF PROVEN TECHNOLOGIES

“Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” mentions the use of proven technologies in design. It 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 back fitting and reconditioning of its systems (elements).

Technologies proven by experience and testing are used in the design of the reference NPP. Where an unproven feature is introduced, safety is demonstrated to be adequate by appropriate supporting research programs and by prototype testing.

Physical and mathematical models used in the design are verified by experiments, operational tests and data analyses. In the safety analysis of the plant, conservative data and models are used. Realistic data and models are used only when their validity and suitability are proven.

Another provision for use of a proven power plant design is the reference plant approach which is defined in “Directive on Determination of Licensing Basis Regulations, Guides and Standards and Reference Plant for Nuclear Power Plants, 2012”. The approach defined in the Directive is in parallel to the IAEA INSAG-26 document on “Licensing of the First Nuclear Power Plant”. According to the Directive, “the Owner must propose a nuclear power plant in operation as reference plant that represents the plant, for which the license application has been made. If there is no such plant in operation, a plant of the same technology that has been licensed upon a comprehensive nuclear safety assessment by a competent nuclear regulatory body and is under construction may be proposed”.

Novovoronezh-II NPP in Russian Federation is approved as the reference plant for Akkuyu NPP by Atomic Energy Commission of TAEK.

Proven engineering practices is also taken into account in the draft regulations. Draft regulations require the organization to ensure, through analysis, evaluation or testing, that the equipment can perform its safety function within the specified design framework.

### 18.3 DESIGN FOR RELIABLE, STABLE AND MANAGEABLE OPERATION

“Regulation on Design Principles for Safety of Nuclear Power Plants, 2008” and Russian safety rules provide requirements to ensure reliable, stable and manageable operation.

In-service inspection and maintenance features are taken into consideration in design to control the primary coolant system integrity during the operational lifetime of the plant in accordance with “Regulation on Design Principles for Safety of Nuclear Power Plants, 2008”.

Regulation also requires organizations to provide automatic systems that would maintain three safety functions which includes safely shut down of the reactor, maintaining it in a cold state and limiting any release of fission products that might possibly ensue, if operating conditions were to exceed predetermined set points. It is requested to ensure at the design stage that provisions to control the accidents stays within the design basis, including specification of information and instrumentation needed by the staff for following and intervening in the course of accidents are made. In case of any deviation, systems shall be automatically actuated to provide the operating staff with sufficient time to assess systems, review possibilities and decide on a subsequent course of action.

It is also requested the organization that parameters to be monitored in the control room are selected and their displays are arranged during the design stage to ensure clear and unambiguous indications of the status of plant conditions, especially for the purpose of identifying and diagnosing the automatic actuation and operation of a safety system or the degradation of defence in depth. Independent monitoring and essential capability for control needed to maintain ultimate shutdown, cooling and confinement shall be provided by one of more remote control points separate from the main control room for

circumstances in which the main control room may be uninhabitable or damaged.

Human factor is also taken into account in the draft regulations. It is mentioned in draft regulations that the organization shall ensure that potential human errors and the effects of

human-machine interfaces are taken into account in all activities, including the design, that may affect the safety of the nuclear facility, and shall establish mechanisms to prevent, identify, correct or compensate for such errors and mitigate their consequences.

## 19 OPERATION (ARTICLE 19)

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

- i. the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;*
- ii. operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;*
- iii. operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;*
- iv. procedures are established for responding to anticipated operational occurrences and to accidents;*
- v. necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;*
- vi. incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;*
- vii. programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;*
- viii. the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.*

### 19.1 INITIAL AUTHORIZATION

Commissioning of an NPP requires permit from regulatory body as it was stated both in the “Decree on Licensing of Nuclear Installations, 1983” and Law No. 7381. Details of requirements are laid out in the “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”. In addition, information on the documents subject to regulatory control (to be reviewed and evaluated) during the evaluation process based on the commissioning permit is included in the draft “Regulation on Authorizations for Nuclear Facilities”.

Safety aspects of commissioning and operation of nuclear power plants are included in “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”. During the commissioning program phase, the operational settings are made in accordance with the design and safety analysis. A commissioning program is established and implemented to verify that

the plant's important elements, especially for safety and radiation protection, have been constructed in accordance with the design and are functioning as intended. The commissioning program includes checks of the physical and functional characteristics of the structure, system and components for verification.

### 19.2 OPERATIONAL LIMITS AND CONDITIONS

Safety limits for important system variables, safety system limit settings and limit conditions for operation are determined according to the “Regulation on Design Principles for Safety of Nuclear Power Plants”.

According to the “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”, the plant is operated within the operating limits and conditions that determine the safe operating limits. Except as permitted by the procedures approved by the NDK, the

operating limits and conditions cannot be deliberately exceeded.

According to the “Decree on Licensing of Nuclear Installations, 1983” any changes to operational limits and conditions are subject to approval of the NDK.

### 19.3 PROCEDURES FOR OPERATION, MAINTENANCE, INSPECTION AND TESTING

The regulatory requirements regarding the procedures for the inspection and testing of a nuclear installation are included in the "Regulation on Inspections Regarding Nuclear Energy and Ionizing Radiation Regulations, 2021". The provisions for maintenance, repair, test and inspections are stated in “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” which include that the installation is to be operated according to approved hierarchical procedures which need to be updated regularly. The activities are performed in the framework of a program, which is supported by a QMS and subject to approval of regulatory body.

According to the provision about modification management in the “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”, any modifications regarding to operational procedures can only be implemented after they are approved in accordance with the rules set by the NDK. In Art. 18 of “Management System Regulation in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, 2022”, it is stated that mechanisms for the approval of the modifications to be made by the licensee in its activities and documents related to these activities are established by considering the relevant regulations of the NDK.

According to Art. 8 of “Management System Regulation in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, 2022”, the MS documents are prepared for the nuclear installation staff and access to these documents by them is ensured. In terms of

incorporation of operational procedures into the MS of the nuclear installations, provisions stating that the process documents determine the activities and acceptance criteria applicable to the works that make up the processes, the inspection, testing, verification and validation, and the responsibilities for the fulfilment of these activities are included in Art. 13 of this Regulation.

### 19.4 PROCEDURES FOR RESPONDING TO OPERATIONAL OCCURRENCES AND ACCIDENTS

Art. 5 of Law No. 7381 and Art. 5 of Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities include the responsibility of the licensee for taking appropriate and adequate measures for preparation and response to radiation emergencies.

According to the “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”, which includes the requirements for anticipated operational events, accidents and emergency management, in case of possible severe accidents, accident management planning is made based on the results of the analyses made to determine the behaviour of the plant and accident management procedures are developed. For an emergency at the plant, an emergency plan approved by the NDK is created for accidents that may cause a significant release of radioactive material into or out of the site, and drills are carried out periodically to ensure the applicability of this plan.

Regulations regarding the on-site management of radiation emergencies for facilities and applications subject to regulatory control, in which activities related to nuclear energy and ionizing radiation are carried out in the “Regulation on Radiation Emergencies Management, 2020”, are given in the title named as “Article 16 - Emergency Preparedness” of this report.

## 19.5 ENGINEERING AND TECHNICAL SUPPORT

The “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” requires the operator to have an engineering and technical support team, competent in all disciplines important for safety, is available during modifications, repairs and special tests to assist itself for safe operation and throughout the lifetime of the plant.

The continuing safe operation of a plant requires the support of an engineering organization, which can be called on as required to assist with plant modifications, repairs and special tests, and to provide analytical support as necessary for the safety of the plant. It is the responsibility of the plant management to ensure that the resources required are available.

According to Art. 7 of Law No. 7381, the NDK may receive technical support services within the scope of inspection and on-site examination in a way that is not binding for the NDK in terms of its results. In order to provide technical support services such as all kinds of analysis, consultancy, surveillance, examination, research, inspection, testing, control, training and certification that NDK may need while performing its duties, NUTED has been established within Law No. 7381 as mentioned above.

## 19.6 REPORTING OF INCIDENTS SIGNIFICANT TO SAFETY

The requirement for keeping records, making notifications and reports defined in the legislation and the MS is specified in the Art. 5 of Law No. 7381. In the “Decree on Licensing of Nuclear Installations, 1983” and “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”, there are requirements for the licensee to promptly inform the regulatory body about abnormal events, which include incidents significant to safety, to prepare operating reports, to provide information about

events, and to the method to be followed in the transition to operation after the event.

The necessity of having a safety culture that ensures timely reporting of problems related to technical, human and organizational factors and any deficiencies in the structure, system and components in order to prevent safety weakness is mentioned in the Art. 7 of Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities. There are activities in terms of evaluating the effectiveness of the MS such as keeping records of events and emerging safety problems, examining and reporting possible results to determine their importance and causes, determining and implementing corrective actions to prevent recurrence of incidents, reflecting the lessons learned in the risk records, evaluating and reporting the effectiveness of corrective actions is mentioned in Art. 11 of the mentioned regulation.

In the draft regulation titled "Regulation on Recording, Notification and Reporting in Nuclear Facilities", there are records to be kept throughout the plant life, all reports including event reports submitted by the licensee to the regulatory body, and situations requiring notification. This draft will identify reporting criteria and methods, together with the use of the INES scale for all events, including low-level and near-miss incidents, and documentation of the reported events.

## 19.7 OPERATIONAL EXPERIENCE FEEDBACK

Analysing the causes and effects of the events, preventing the recurrence of the events and implementing necessary modifications in line with the experiences are addressed in the Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008. In Art. 7 and 8 of Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, it is mentioned that the use of international good practice examples to improve safety culture and the identification of risks that may affect safety related to activities

and including regulations for timely measures in the MS.

The responsibilities regarding the periodic review and updating of the personnel training and competency program, considering the current and future needs of the facility and lessons learned from operating experiences, are included in the “Regulation on Operation Organization, Qualifications and Training of Operation Personnel and Operator Personnel Licenses in Nuclear Power Plants”. International Reporting System whose national coordination is carried out by the NDK, is actively used as international information database on operating experience for safety assessments due to the information it contains for event analysis.

#### 19.8 MANAGEMENT OF SPENT FUEL AND RADIOACTIVE WASTE ON THE SITE

The requirements and responsible parties regarding the on-site management of

radioactive wastes and spent fuels are specified in Art. 5 and 9 of Law No. 7381 and “Regulation on Radioactive Waste Management, 2013”. According to these requirements, radioactive waste and spent fuel management including on-site storage of spent fuels is carried out within the framework of a program and in accordance with the defence-in-depth principle.

The requirement to keep the amount of radioactive waste that will be generated during operation as low as reasonably achievable is mentioned in "Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008". For on-site spent nuclear fuel storage, provisions of "Regulation on Design Principles for Safety of Nuclear Power Plants, 2008" will be applied.

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4. Nuclear Regulatory Law No. 7381, 2022
5. Presidential Decree on the Organization and Duties of the Nuclear Regulatory Authority No. 95, 2022

**Decrees**

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2. Decree on Radiation Safety, 1985 (to be replaced)

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8. Regulation on Design Principles for Safety of Nuclear Power Plants, 2008
9. Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008
10. Regulation on Nuclear Power Plant Sites, 2009
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**NUCLEAR REGULATORY AUTHORITY**