



REPUBLIC of TURKEY

**A FULL REPORT
TO
THE 8TH REVIEW MEETING
OF
CONVENTION ON NUCLEAR SAFETY**

August 2019



NUCLEAR REGULATORY AUTHORITY



REPUBLIC OF TURKEY

A FULL REPORT TO THE 8TH REVIEW MEETING OF CONVENTION ON NUCLEAR SAFETY

August 2019

REPUBLIC OF TURKEY NUCLEAR REGULATORY AUTHORITY

TABLE OF CONTENTS

LIST OF FIGURES	iv
LIST OF TABLES	V
LIST OF ABBREVIATIONS	vi
1 INTRODUCTION	1
2 SUMMARY	2
2.1 CURRENT SITUATION	2
2.2 CHANGES SINCE THE 7 TH REVIEW MEETING OF CONVENTION ON NUCLEAR SAFETY	3
2.3 ACTIONS TAKEN TO REFLECT THE PRINCIPLES IN THE VIENNA DECLARATION ON NUCLEAR SAFETY (VDNS) ..	4
2.3.1 VDNS Principle 1.....	4
2.3.2 VDNS Principle 2.....	5
2.3.3 VDNS Principle 3.....	5
3 EXISTING NUCLEAR INSTALLATIONS (ARTICLE 6)	9
4 LEGISLATIVE AND REGULATORY FRAMEWORK (ARTICLE 7)	10
4.1 ESTABLISHING AND MAINTAINING A LEGISLATIVE AND REGULATORY FRAMEWORK	10
4.1.1 Legislative Framework	10
4.1.2 Related Governmental Bodies with Regulatory Functions on Nuclear Activities	13
4.2 NATIONAL SAFETY REQUIREMENTS AND REGULATIONS	14
4.3 SYSTEM OF LICENSING.....	17
4.4 SYSTEM OF REGULATORY INSPECTION AND ENFORCEMENT	20
4.5 ENFORCEMENT OF APPLICABLE REGULATIONS AND TERMS OF LICENSES.....	21
5 REGULATORY BODY (ARTICLE 8)	22
5.1 ESTABLISHMENT OF THE REGULATORY BODY	22
5.1.1 Legal Foundations and Statute of the Regulatory Body	22
5.1.2 Mandate, Mission and Tasks	23
5.1.3 Authorities and Responsibilities	24
5.1.4 Organizational Structure of the Regulatory Body	25
5.1.5 Competence of the Regulatory Body	26
5.1.6 Financial Status of the Regulatory Body	27
5.1.7 Management System in Regulatory Body.....	27
5.1.8 Openness and Transparency of Regulatory Activities.....	27
5.2 STATUS OF THE REGULATORY BODY	28
6 RESPONSIBILITY OF THE LICENSE HOLDER (ARTICLE 9)	29
7 PRIORITY TO SAFETY (ARTICLE 10)	32
8 FINANCIAL AND HUMAN RESOURCES (ARTICLE 11)	34
8.1 FINANCIAL RESOURCES.....	34
8.1.1 Financing of Safety Improvements	34
8.1.2 Financial Provisions for Decommissioning, Spent Fuel and Radioactive Waste.....	34
8.1.3 Adequacy of Financial Provisions.....	35
8.1.4 Processes for the Assessment of the Financial Provisions.....	36

8.2	HUMAN RESOURCES.....	36
8.2.1	<i>NPP Personnel Training.....</i>	36
8.2.2	<i>Qualification Maintenance</i>	37
8.2.3	<i>Improvements to Training Programmes.....</i>	37
8.2.4	<i>Assessment of the Sufficiency and the Qualification of the NPP Staff.....</i>	37
8.2.5	<i>Regulatory Review and Control Activities</i>	38
8.2.6	<i>Competency Management Activities for Regulatory Body Staff.....</i>	39
8.2.7	<i>Training Programme for Regulatory Body</i>	40
8.2.8	<i>The Role of TSO in Regulatory Activities</i>	41
9	HUMAN FACTORS (ARTICLE 12).....	38
10	QUALITY ASSURANCE (ARTICLE 13)	40
10.1	REGULATORY REQUIREMENTS FOR QUALITY MANAGEMENT	40
10.2	QUALITY MANAGEMENT SYSTEM OF REGULATORY BODY	40
10.3	QUALITY MANAGEMENT SYSTEM OF AKKUYU NPP.....	41
10.4	QUALITY MANAGEMENT SYSTEM OF SINOP NPP	44
10.5	REGULATORY REVIEW AND CONTROL	44
11	ASSESSMENT AND VERIFICATION OF SAFETY (ARTICLE 14).....	46
11.1	SITE LICENSE PROCESS	47
11.2	CONSTRUCTION LICENSE PROCESS	47
11.3	OPERATING LICENSE PROCESS	48
11.4	IMPLEMENTATION OF VNDS PRINCIPLES	49
12	RADIATION PROTECTION (ARTICLE 15).....	50
12.1	REGULATORY REQUIREMENTS	50
12.2	OPERATIONAL CONTROL AND RADIATION PROTECTION PLAN FOR AKKUYU NPP	51
13	EMERGENCY PREPAREDNESS (ARTICLE 16).....	55
13.1	EMERGENCY PLANS AND PROGRAMMES	55
13.1.1	<i>National Coordinating Authority for Emergency Preparedness and Response.....</i>	55
13.1.2	<i>National Regulatory Body.....</i>	56
13.1.3	<i>National Emergency Planning Framework</i>	57
13.1.4	<i>Classification of Emergencies.....</i>	58
13.1.5	<i>On- and off-site Plans for Akkuyu NPP.....</i>	59
13.1.6	<i>The Emergency Management Facilities and Locations.....</i>	60
13.2	INFORMATION TO THE PUBLIC AND NEIGHBOURING STATES	61
13.3	EMERGENCY PREPAREDNESS FOR CONTRACTING PARTIES WITHOUT NUCLEAR INSTALLATIONS.....	62
14	SITING (ARTICLE 17).....	63
14.1	EVALUATION OF SITE RELATED FACTORS	63
14.1.1	<i>Site Selection and Ranking Methodology</i>	63
14.1.2	<i>Regulations on Site Stages.....</i>	64
14.1.3	<i>Licensing of Sites.....</i>	64
14.1.4	<i>NPP Sites</i>	66
14.2	IMPACT OF THE INSTALLATION ON INDIVIDUALS, SOCIETY AND ENVIRONMENT	71
14.2.1	<i>Akkuyu NPP site</i>	71
14.2.2	<i>Sinop NPP Site.....</i>	71

14.3	CONSULTATION WITH OTHER CONTRACTING PARTIES LIKELY TO BE AFFECTED BY INSTALLATION	72
15	DESIGN AND CONSTRUCTION (ARTICLE 18)	73
15.1	IMPLEMENTATION OF DEFENCE IN DEPTH	73
15.2	INCORPORATION OF PROVEN TECHNOLOGIES.....	73
15.3	DESIGN FOR RELIABLE, STABLE AND MANAGEABLE OPERATION	74
16	OPERATION (ARTICLE 19)	75
17	REFERENCES	76
ANNEX I	77
ANNEX II	79

LIST OF FIGURES

FIGURE 1 TR-2 RESEARCH REACTOR	9
FIGURE 2 İTÜ TRIGA MARK II RESEARCH REACTOR.....	9
FIGURE 3 HIERARCHY OF LEGAL DOCUMENTS IN TURKISH LAW.....	10
FIGURE 4 ORGANIZATIONS TAKING PART IN TURKISH NUCLEAR ENERGY PROGRAM.....	12
FIGURE 5 LICENSING SYSTEM UNDER LAW NO. 2690 (OBSOLETE).....	18
FIGURE 6 ORGANIZATIONAL STRUCTURE OF NDK	26
FIGURE 7 MEASURING STATIONS OF THE NATIONAL RADIATION MONITORING NETWORK	56
FIGURE 8 THE NATIONAL EMERGENCY PLANNING FRAMEWORK.....	58
FIGURE 9 BASIC METHODOLOGY FOR THE SITING.....	64
FIGURE 10 NPP SITE LOCATIONS	66
FIGURE 11 LAYOUT OF AKKUYU NPP SITE.....	69

LIST OF TABLES

TABLE 1 LICENSES AND PERMITS GRANTED FOR AKKUYU NPP PROJECT BY JULY 2019	8
TABLE 2 SECONDARY LEGISLATION IN THE FIELD OF NUCLEAR SAFETY ISSUED UNDER LAW NO. 2690 (OBSOLETE).....	16

LIST OF ABBREVIATIONS

- AFAD:** Disaster and Emergency Management Presidency of Prime Ministry (DEMP)
- Akkuyu NPP:** Akkuyu Nuclear Power Plant
- Akkuyu Nuclear JSC:** Akkuyu Nuclear Power Plant Electricity Generation Joint-Stock Company
- BOO:** Build-Own-Operate
- CBRN:** Chemical, Biological, Radiological or Nuclear
- CMS:** Configuration Management System
- CNS:** Convention on Nuclear Safety
- CMS:** Configuration Management System
- ÇNAEM:** Çekmece Nuclear Research and Training Center
- ÇŞB:** Ministry of Environment and Urbanisation
- DBEE:** Design Basis External Event
- DEMC:** Disaster and Emergency Management Centre
- DNI:** Department of Nuclear Installations
- EC:** European Commission
- EIA:** Environmental Impact Assessment
- EPDK:** Energy Market Regulatory Authority
- ETKB:** Ministry of Energy and Natural Resources
- EU:** European Union
- EÜAŞ:** Electricity Generation Company
- FSAR:** Final Safety Analysis Report
- IAEA:** International Atomic Energy Agency
- IGA:** Intergovernmental Agreement
- INSC:** Instrument for Nuclear Safety Cooperation
- IPA:** Pre-accession Assistance
- ISO:** International Organization for Standardization
- İTÜ:** İstanbul Technical University
- MS:** Management System
- NEIPGM:** General Directorate of Nuclear Energy and International Projects
- NDK:** Nuclear Regulatory Authority
- NREP:** National Radiation Emergency Plan
- NÜTED:** National Nuclear Technical Support Organization
- QMS:** Quality Management System
- PSAR:** Preliminary Safety Analysis Report
- RESA:** The Early Warning Environmental Radiation Monitoring System
- RAW:** Radioactive Waste

SAR: Safety Analysis Report

SARCoN: Systematic Assessment of Regulatory Competence Needs

SPR: Site Parameters Report

TAEK: Turkish Atomic Energy Authority

TETAŞ: Turkish Electricity Trading and Contracting Company

TSO: Technical Support Organization

USR: Updated Site Report

VDNS: Vienna Declaration on Nuclear Safety

WWER: Water-Water Energetic Reactor

1 INTRODUCTION

On September 24, 1994 Turkey signed the Convention on Nuclear Safety (CNS). After the ratification of the CNS by Turkish Parliament and officially becoming a Contracting Party on January 14, 1995, Turkey presented its national reports in accordance with the provisions of Article 5 of the CNS in the previous review meetings that were organized to review the implementation of the CNS.

Turkey 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.

Turkey is currently constructing the unit 1 of the Akkuyu Nuclear Power Plant (Akkuyu NPP). Other nuclear power project is Sinop NPP.

This 8th National Report 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, IAEA".

The National report was prepared to reflect the latest developments in nuclear power programme in Turkey. 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.

2 SUMMARY

2.1 CURRENT SITUATION

Turkey has currently one nuclear power plant under construction, Akkuyu Nuclear Power Plant (Akkuyu NPP).

Negotiations to build an NPP at a site named Akkuyu in Turkey started with the Russian Federation in February 2010 and concluded on May 12th, 2010 with the "Agreement between the Government of the Russian Federation and the Government of the Republic of Turkey on cooperation in relation to the construction and operation of a nuclear power plant at the Akkuyu site in the Republic of Turkey" (Akkuyu Project Agreement) based on a Build-Own-Operate (BOO) model.

In accordance with the Akkuyu Project Agreement, Akkuyu Nuclear JSC implements the project, responsible for the construction and operation of four units of Water-Water Energetic Reactor (WWER) each with the capacity of 1200 MWe power.

The Akkuyu Site on the Mediterranean coast of Turkey was granted a site license for building an NPP in 1976 and allocated to Akkuyu Nuclear JSC in 2011 as specified in the Akkuyu Project Agreement. Akkuyu Nuclear JSC re-performed the detailed site investigations in Akkuyu for updating the site characteristics and parameters. The Updated Site Report was approved by TAEK in March 2015. On February 9, 2017, the site related project parameters are approved by TAEK.

On 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 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.

On June 22, 2018, Akkuyu Nuclear JSC applied for construction license of Akkuyu NPP Unit 2. As the results of review and assessment of the application, limited work permit was granted on November 30, 2018. Decision for the construction license was yet to be taken for the unit 2 at the time of this report.

Akkuyu Nuclear JSC applied for construction license of Akkuyu NPP Unit 3 in March 2019.

As the second NPP project, "The Agreement Between the Government of the Republic of Turkey and the Government of Japan on Cooperation for Development of Nuclear Power Plants and the Nuclear Power Industry in the Republic of Turkey" was signed on 3rd of May 2013, aiming the construction and operation of an NPP comprising of four units of ATMEA-1 design in Sinop site. Currently, the recognized "Owner" for Sinop NPP project is the Electricity Generation Company (EÜAŞ), who will be a partner to the Project Company with a share of up to 49%. After the establishment of Project Company, EÜAŞ is expected to relinquish its owner status so that the Project Company would take over and commence on the implementation of the Sinop NPP project.

Turkey is a party to the relevant international legal instruments for safe and secure use of nuclear energy and has adhered to their provisions, with the exception of the International Convention for the Suppression of Acts of Nuclear Terrorism and the Comprehensive Nuclear Test Ban Treaty, which

have been ratified but are not yet in force in the state.

On the other hand, In July 2018 the Council of Ministers enacted Decree - Law no. 702. This new law, which supersedes Law No. 2690 of 1982, establishes a new Nuclear Regulatory Authority, namely Nükleer Düzenleme Kurumu (NDK), ending the former regulatory role of the Turkish Atomic Energy Authority (TAEK). The new law is intended to improve the regulatory system in Turkey and achieve full compliance with international requirements.

Consequently, the existing regulatory system need to be modified to reflect the new governmental structure meaning the replacement and modification of all decrees, regulations and guides that were based on Law. No. 2690.

The new law has been enacted after TAEK has issued a construction licence for the first unit at the Akkuyu site and an orderly transfer of staff and responsibilities from TAEK to the new authority still continues.

2.2 CHANGES SINCE THE 7TH REVIEW MEETING OF CONVENTION ON NUCLEAR SAFETY

Since the 7th Review Meeting of Convention on Nuclear Safety, Turkey 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.

In July 2018, with a referendum amending the constitution, governmental system of Turkey has been decided to transform into a presidential republic. Consequentially, all governmental institutions were modified to adapt with the new system.

Meanwhile, Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Certain Laws”, Decree-Law

No. 702 (DL 702) were issued by the cabinet on 9 July 2018 as one of the transition decree laws. DL 702 is a comprehensive nuclear law regulating the nuclear safety, security, safeguards and radiation protection and other related subjects. Furthermore, it establishes a new independent nuclear regulatory authority NDK. The duties and responsibilities of NDK are defined on 15 July 2018 under “Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations”, Presidential Decree No:4 (PD 4). Former nuclear regulator Turkish Atomic Energy Authority (TAEK) was transformed to become a research and development organization and also given the responsibility of management of all national radioactive waste including final disposal activities.

DL 702 contains provisions and requirements on general principles of 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, establishment of a national nuclear technical support organization, NÜTED and it also contains provisions for transition from former government system and regulatory structure to the new one.

“Presidential Decree on the Organization of Presidency” of 10 July 2018, Presidential Decree No. 1 (PD 1) defines the organizational structure of ETKB. A General Directorate of Nuclear Energy and International Projects (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.

During transition to new governmental system the “Decree Law on Amendments to Certain Laws and Decree Laws for Adaptation to the Amendments to the Constitution” of 9 July 2018, Decree-Law No.703 (DL 703) annulled the legal basis provision of Law No: 2690 making all current decrees and regulations obsolete. A transition article in DL 702 made these decrees and regulations effective until the new regulations are issued in line with the provisions of the new nuclear law supersedes them.

The legislations and regulations Issued since the 7th National Report of CNS 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 Management System for Nuclear Installations (revision of Reg-2007), 2017
- Regulation on Radiation Protection in Nuclear Installations, 2018
- “Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Certain Laws”, Decree-Law No. 702, 2018
- “Decree Law on Amendments to Certain Laws and Decree Laws for Adaptation to the Amendments to the Constitution” of 9 July 2018, Decree-Law No.703, 2018

- “Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations”, Presidential Decree No:4, 2018
- Regulation on Working Procedures and Principles of Nuclear Regulatory Board, 2019
- The Regulation on Organisation of Nuclear Regulatory Authority, 2019

Turkey has also signed some agreements to receive support from experienced Regulatory Bodies. These agreements are:

- Arrangement Between Turkish Atomic Energy Authority 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 and the United States Nuclear Regulatory Commission for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters (September, 2017)

2.3 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 Vienna Declaration on Nuclear Safety (VDNS) for the implementation of the objective of the CNS to prevent accidents and mitigate radiological consequences.

2.3.1 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 PSAR for limited work permit and construction license for the unit 1 of Akkuyu NPP. Further details were given in sections 3, 13, 14 and 15.

2.3.2 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 SAR for construction license of unit 1 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.

2.3.3 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.

3 EXISTING NUCLEAR INSTALLATIONS (ARTICLE 6)

Turkey has currently one nuclear power plant under construction named Akkuyu Nuclear Power Plant (Akkuyu NPP).

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

According to the Akkuyu Project Agreement, a Project Company named “Akkuyu Nuclear Power Plant Electricity Generation Joint-Stock Company (APC: Akkuyu Project Company)” was established under the Turkish jurisdiction on December 13th, 2010, which was later renamed as Akkuyu Nuclear JSC. This company is responsible for the construction and operation of four units of Water-Water Energetic Reactor (WWER) each with the capacity of 1200 MWe power. The former nuclear regulatory body of Turkey, Turkish Atomic Energy Authority (TAEK), recognized Akkuyu Nuclear JSC as the “Owner” of the Akkuyu 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 Updated Site Report 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 submitted to TAEK for approval of site related design parameters in the December 2015. Site Parameters Report 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 project parameters are approved by TAEK in accordance with the relevant articles of the Decree.

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

With the limiting work permit, Akkuyu Nuclear JSC is allowed 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 in accordance with the Decree.

On April 2, 2018, construction license is granted for the Akkuyu NPP Unit 1 based on the application of the Akkuyu Nuclear JSC by the decision number 148/2 of the Atomic Energy Commission on March 30, 2018, in accordance with the Law on Turkish Atomic Energy Authority 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 integral part of the construction license of Akkuyu NPP Unit 1. The

Table 1 Licenses and Permits Granted for Akkuyu NPP Project by July 2019

Licence/Permit	Date	Purpose
Site Licence	1976	Suitability of the site to host an NPP
Approval of Updated Site Report	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
Approval of EIA report	2014	To ensure environmental safety
Approval of Site Parameters	2017	Approval of the site parameters to be used in the design of NPP
Limited Work Permit for Unit 1	2017	Commencement of manufacturing and non-safety related construction.
Construction License for Unit 1	2018	Commencement of nuclear safety related construction and installation of systems and equipment
Limited Work Permit for Unit 2	2018	Commencement of manufacturing and non-safety related construction.

license conditions are mainly related to the detailed design of the plant issues to be finalized until the operation license phase.

On June 22, 2018, Akkuyu Nuclear JSC applied for construction license of Akkuyu NPP Unit 2. As the results of review and assessment of the application, limited work permit was given to Applicant for Akkuyu NPP Unit 2 at the 149th meeting of Atomic Energy Commission on November 30, 2018. The construction license for the unit 2 of Akkuyu NPP is still under consideration of the current regulatory body of Turkey, NDK. Akkuyu Nuclear JSC applied for construction license of Akkuyu NPP Unit 3 in March 2019. Licenses and permits granted for Akkuyu NPP project by July 2019 are given in Table 1.

While performing the review and assessment of the site reports and of submissions for the construction license, the special attention was given to lessons learned from the Fukushima Daiichi accident and 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 or 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 nuclear power plant project in Turkey. Within this context, “Agreement between the Government of Republic of Turkey and the Government of Japan on Cooperation for Development of Nuclear Power Plants and the Nuclear Power Industry in the Republic of Turkey” was signed on May 3rd, 2013, aiming the construction and operation of an NPP comprising of four units of ATMEA-1 design in Sinop site. Based on this agreement a Project Company will be established and further details of the project will be determined by Host Government Agreement, which will be signed between the SPC and the Turkish Government in later stage.

Turkey 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

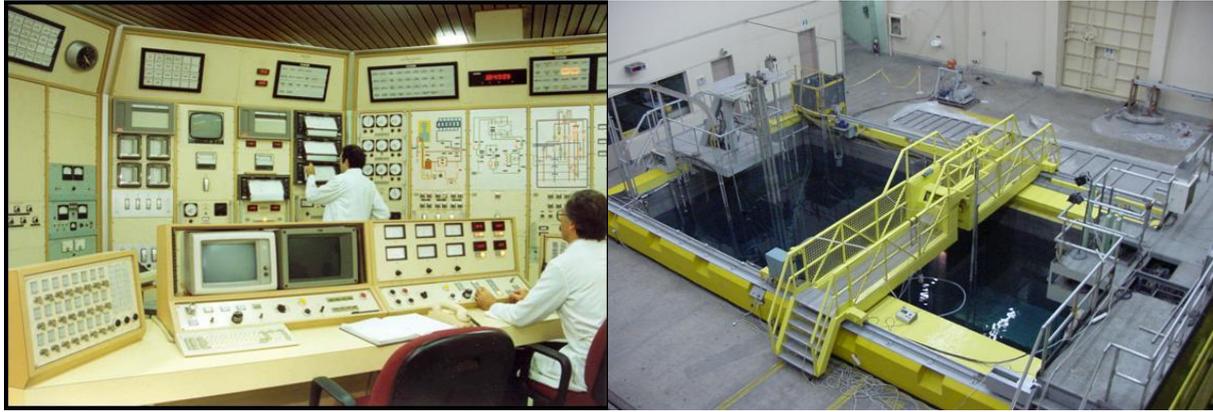


Figure 1 TR-2 Research Reactor

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 now been dismantled. A pool type 5 MW TR-2 reactor was later built in the same building and has been 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 is completed an updated safety analysis report (SAR) is prepared. After review and assessment of updated SAR, Fuel loading and

Pre-Operational Test Permit granted for the ÇNAEM TR-2. Figure 1 shows control room and reactor pool of the TR-2 reactor

The second research reactor in Turkey, İTÜ 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. The review and assesment process regarding modification permission application for the control console changing of İTÜ TRIGA Mark II still continues.



Figure 2 İTÜ TRIGA Mark II Research Reactor

4 LEGISLATIVE AND REGULATORY FRAMEWORK (ARTICLE 7)

4.1 ESTABLISHING AND MAINTAINING A LEGISLATIVE AND REGULATORY FRAMEWORK

4.1.1 LEGISLATIVE FRAMEWORK

Turkey has a civil law system based on codified laws. Turkish legal system consists of constitution, laws, decree-laws, presidential decrees, decrees and regulations (Figure 3). International instruments duly approved and enacted by the legislature is also deemed to be part of the legal system.

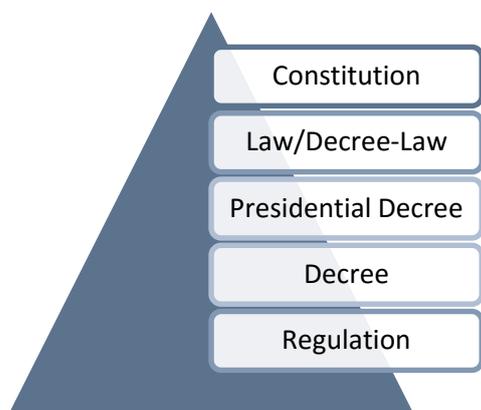


Figure 3 Hierarchy of Legal Documents in Turkish Law

In July 2018, with a referendum amending the constitution, government system of Turkey had been transformed into a presidential republic. Consequentially, all governmental institutions had been modified to adapt with the new system.

During this transition, “Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Certain Laws”, Decree-Law No. 702 (DL 702) were issued by the cabinet on 9 July 2018. DL 702 is a comprehensive nuclear law regulating the safety, security, safeguards and radiation protection and other related subjects. Furthermore, it establishes a new independent

nuclear regulatory authority, namely “Nükleer Düzenleme Kurumu (NDK).” The duties and responsibilities of NDK are defined on 15 July 2018 with the “Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations”, Presidential Decree No:4 (PD 4). Former nuclear regulator Turkish Atomic Energy Authority (TAEK) was transformed to become a research and development organization and also given the responsibility of management of all national radioactive waste including final disposal activities.

DL 702 contains provisions and requirements on general principles of 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, the NDK; establishment of a national nuclear technical support organization, NÜTED; and it also contains provisions for transition from former governmental system and regulatory structure to the new one.

Other important legislation affecting the nuclear installations consists of the “Environmental Law” which regulates environmental impact of nuclear facilities and giving the regulatory responsibilities and authorities to Ministry of Environment and Urbanisation and the “Law on Electricity Market” which regulates electricity production licenses and giving regulatory authority to Energy Market Regulatory Authority (EPDK).

Furthermore, the "Penal Law" defines some of nuclear and radiological crimes and penalties. However, for full compliance with the international instruments' provisions some crimes and penalties are defined in the Decree-Law No. 702. 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, Turkey is a party to the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960. Its 1964, and 1982 additional protocols are ratified and currently in force in Turkey. A national law on nuclear liability has been drafted in full compliance with Paris Conventions 2004 Protocol but has not been enacted yet.

International instruments duly approved and enacted by the legislature is also deemed to be part of the legal system. Turkey is a party to the following international legal instruments for safe, secure and responsible use of nuclear energy and has adhered to their provisions:

a) Convention on Early Notification of a Nuclear Accident signed on 28 September 1986 published on 3 September 1990 in Official Gazette No: 20624 (entry into force 3 February 1991) with reservation: [3 January 1991] "Turkey hereby declares that in accordance with paragraph 3 of the article 11 of the Convention on Early Notification of a Nuclear Accident, it does not consider itself bound by the provisions of paragraph 2 of article 11, thereof."

b) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. 28 September 1986 published on 3 September 1990 in Official Gazette No: 20624 (Entry into force 3 February 1991) with reservation: [3 January 1991] "In conformity with the article 8 paragraph 9 of the Convention on Assistance in

the Case of a Nuclear Accident or Radiological Emergency, Turkey does not consider itself bound by article 8 paragraph 2(a) with regard to the immunity from civil proceedings, by paragraph 2(b) concerning exception from taxation, duties or other charges for personnel of the assisting party. "Turkey hereby declares that in accordance with article 10, paragraph 5 of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, it does not consider itself bound by the provisions of paragraph 2 article 10." Turkey hereby declares that in accordance with paragraph 3 of the article 13 of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, it does not consider itself bound by the provisions of paragraph 2 of article 13, thereof."

c) Convention on Nuclear Safety 24 September 1994 published on 14 January 1995 in Official Gazette No: 22171 (entry into force 24 October 1986).

d) Convention on Physical Protection of Nuclear Materials signed on 23 August 1983 entered into force 8 February 1987 (with reservation: [23 August 1983] "Turkey, in accordance with Article 17, Paragraph 3, of the Convention does not consider itself bound by Article 17, Paragraph 2 of the Convention." Turkish internal legal procedure is continuing for the ratification of the Amendment.

e) Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982 signed on 29 July 1960.

f) The Agreement between Turkey and the IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons signed on 30 June 1981 entered into force 1 September 1981.

g) Protocol Additional to The Agreement between Turkey and the IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons signed on 6 July 2000 entered into force 17 July 2001.

h) Revised Supplementary Agreement concerning the provision of Technical Assistance by the IAEA signed and entered into force on 11 November 1980.

i) Treaty on the Non-Proliferation of Nuclear Weapons signed on 28 January 1969 ratified on 17 April 1980.

j) Amendment to the Convention on the Physical Protection of Nuclear Material, ratified on 10 February 2015 (entry into force 8 July 2015) (with reservation: "It is the understanding of the Republic of Turkey that the term international humanitarian law in paragraphs (a) and (b) of article 2(4) of Convention on the Physical Protection of

Nuclear Material, refers to the legal instruments to which Turkey is already party. The article should not be interpreted as giving a different status to the armed forces and groups other than the armed forces of a state as currently understood and applied in international law and thereby creating new obligations for Turkey."

According to the Decision on Turkey's National Programme for the Adoption of the EU Acquis Implementation, Coordination and Monitoring, enacted by the Council of Ministers' decision dated 11 October 2008 and numbered 2008/14481, Participation in the Joint Convention on Spent Fuel and Radioactive Waste Management Safety was indicated. 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 passed through the sub-committees and in the Agenda of Turkish Grand National Assembly.

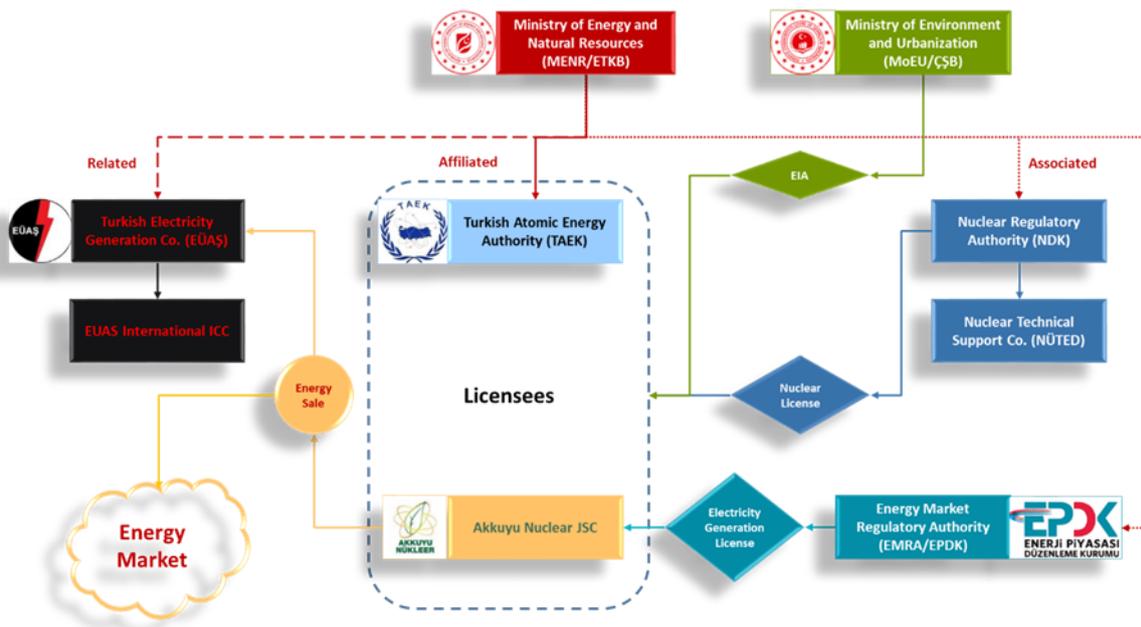


Figure 4 Organizations Taking Part in Turkish Nuclear Energy Program

4.1.2 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 Turkey (Figure 4).The responsibilities of the Governmental bodies with regulatory functions are given in the following subchapters.

4.1.2.1 MINISTRY OF ENERGY AND NATURAL RESOURCES (ETKB)

This ministry 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 1) defines the organizational structure of ETKB. A General Directorate of Nuclear Energy and International Projects (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.

TAEK is affiliated and EÜAŞ is 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.

4.1.2.2 MINISTRY OF ENVIRONMENT AND URBANISATION (ÇŞB)

ÇŞB establishes principles of national policy, related plans and programs for protection and improvement of the environment, and the prevention of environmental pollution. In concrete terms, the ÇŞB’s 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 ÇŞB in the frame of the Regulation on Environmental Impact Assessment, 2014. According to this Regulation, the owner of the project has to prepare an Environmental Impact Assessment (EIA) Report at the planning stage which should be submitted to the ÇŞB. The ÇŞB 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. NPPs should obtain an affirmative decision on EIA from the ÇŞB as a prerequisite to any license. According to DL 702, ÇŞB defines the format of environmental impact assessment report’s chapter regarding radiological effects with NDK’s assent. These chapters are reviewed and assessed by NDK.

4.1.2.3 NUCLEAR REGULATORY AUTHORITY (NDK)

NDK is established as the independent nuclear regulatory body by the DL 702. 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, review and assessment of documents, issuing authorizations, conducting inspections and enforcements.

4.1.2.4 TURKISH ATOMIC ENERGY AUTHORITY (TAEK)

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. Another important responsibility given to the TAEK is to determine the policies and strategies regarding radioactive waste and to take necessary actions as the national radioactive waste management organization.

4.1.2.5 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. In this capacity EPDK grants the electricity production license to nuclear installations

4.1.2.6 THE ELECTRICITY GENERATION COMPANY (EÜAŞ)

EÜAŞ is a state-owned company and the largest electricity generation company in

Turkey. 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.

During transition to the new government system Turkish Electricity Trading and Contracting Company (TETAŞ) is merged with EÜAŞ. TETAŞ had the responsibility to buy part of the electricity from Akkuyu NPP.

4.2 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 Turkey.

Regulations related to nuclear safety were being developed by Department of Nuclear Safety in accordance with the Directive on Preparation of Secondary Legislation. This Directive defined detailed procedures for planning, drafting, consulting with stake holders, 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”, entered into force in 1983. The decree defined 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. Turkey’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 brought more 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 patch 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 was being prepared by an applicant through negotiations with TAEK and approved by 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.

Current 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 utilised 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” on 11 April 2019 (O.G. No. 30742). This regulation defines Nuclear Regulatory Board of NDK’s working procedures and principles.

Presidency of the Republic was issued “Regulation on Organization of Nuclear Regulatory Authority” on 25 April 2019. This regulation defines the organizational structure of NDK and duties and responsibilities of its service units.

Table 2 Secondary Legislation in the Field of Nuclear Safety issued under Law No. 2690 (obsolete)

Decree/Regulation	Issue Date	Scope
Decree on Licensing of Nuclear Installations	1983	Establishes the licensing system, defines rules and procedures for licensing, inspections and enforcements
Decree on Radiation Safety	1985	Defines general rules for radiation safety regarding keeping, using, producing, importing and exporting, acquiring, selling, transportation and storage of the ionizing radiation sources
Regulation on Radiation Safety	2000	Defines measures to be taken against dangers of radiation during activities utilizing radiation sources
Regulation on Nuclear and Radiological National Emergency Preparedness	2000	Defines responsibilities and interfaces between responsible organizations regarding a nuclear and radiological emergency and regulates the activities regarding the emergency.
Regulation on Safe Transport of Radioactive Material	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.
Regulation on Nuclear Safety Inspections and Enforcement	2007	Defines procedures and rules of the inspections to be carried out for the confirmation of nuclear safety and determines enforcements to be applied in case of non-conformances.
Regulation on Specific Principles for Safety of Nuclear Power Plants	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.
Regulation on Design Principles for Safety of Nuclear Power Plants	2008	Establishes safety principles to be followed during the design of nuclear power plants to achieve nuclear safety objectives defined by the Authority.
Regulation on Site of a Nuclear Power Plant	2009	Establishes the nuclear safety requirements for siting of nuclear power plants.
Regulation on Protection of Outside Workers in Controlled Areas from the Risks of Ionizing Radiation	2011	Defines the requirements for radiation protection of outside workers performing nuclear and ionizing radiation activities in controlled areas
Regulation on Physical Protection of Nuclear Materials and Nuclear Facilities (revision of Reg-1979)	2012	Defines national aspects of physical protection of nuclear materials in compliance with INFCIRC 225/Rev.4 and some provisions of INFCIRC 225/Rev5.
Regulation on Nuclear Material Accounting and Control (revision of Reg-1997)	2012	Defines rules and procedures for accounting for and control of nuclear materials in compliance with the requirements of the Safeguards Agreement with the IAEA and its Additional Protocol.
Regulation on Radioactive Waste Management	2013	Defines rules and procedures for the safe management of radioactive wastes which may arise during the use of nuclear energy as well as sources of ionizing radiation.
Regulation on Clearance in Nuclear Facilities and Release of Site from Regulatory Control	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

Decree/Regulation	Issue Date	Scope
Regulation Regarding Equipment Procurement Process and Approval of Manufacturers for Nuclear Facilities	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
Regulation on Construction Inspection of the Nuclear Power Plants	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.
Regulation on Operating Organization, Operating Personnel Qualifications and Training and Operating Personnel Licenses	2017	Defines rules and procedures for operating organization, qualification and training of operating personnel, and operating personnel licenses.
Regulation on Management System for Nuclear Installations (revision of Reg-2007)	2017	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.
Regulation on Radiation Protection in Nuclear Installations	2018	Defines rules and procedures for radiation protection in all phases during the lifetime of a nuclear installation.

4.3 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 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 Sinop NPP Project.



Figure 5 Licensing System under Law No. 2690 (obsolete)

Atomic Energy Commission of TAEK approved the “List of Licensing Basis for Akkuyu Nuclear Power Plant” 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 Turkey and Russian Federation are also included in the List. Novovoronezh-II NPP in Russian Federation was approved as the reference plant for Akkuyu NPP by Atomic Energy Commission of TAEK on 16 August 2012.

Regarding the Sinop NPP project Atomic Energy Commission of TAEK approved the “List of Licensing Basis for Sinop Nuclear Power Plant” on 24 January 2018. Sinop NPP List is mainly composed of Turkish regulations, IAEA Safety Fundamentals and Requirements and USA Regulations. Standards and guides of Turkey and USA are also included in the List. Atomic Energy Commission of TAEK approved on 24 January 2018 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 Safety Analysis Report (PSAR) or Final Safety Analysis Report (FSAR)
- Physical Protection Programme documentation
- Nuclear Material Accountancy and Control System documentation
- Emergency Management Plan
- Management System 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 the new nuclear law. Until this regulation is issued, the Decree on Licensing of Nuclear Installations will be in force.

DL 702 Art.4 par.1 states that; activities in the scope of the DL 702 shall not be implemented without getting proper authorization from the NDK. Any real or legal person who wanted to implement such an activity is obligated to apply to the NDK to acquire a proper authorization. However, the NDK may exempt some activities which are in the scope of DL 702 from authorization obligation and define a notification obligation for those activities instead. The activities requiring authorization from regulatory body are defined in PD 4. The items subject to either certification or approval by the NDK are;

- The site for a nuclear facility, a radiation facility or a radioactive waste facility,
- Design of the radiation facility or the design of the place where certain radiation application activities, determined by NDK, shall be implemented,
- Clearance from regulatory control and release of radioactive material,
- Manufacturers and manufacturing of the certain items determined by NDK,
- Nuclear inspection organizations,
- Organizations transporting radioactive materials,

- Certain activities, systems and methods and organizations or laboratories serving for radiation protection to be determined by NDK,
- Personnel who will work on certain positions to be determined by NDK in the activities under the scope of DL 702, and
- Other issues to be determined by NDK regarding radioactive materials.

The activities subject to permit granted by the NDK are;

- For nuclear installations; preparation of the site, commencement of procurement, limited work before construction, construction, commissioning, decommissioning, restart of operation and modifications affecting safety,
- For radioactive waste facilities; preparation of the site, commencement of procurement, construction, decommissioning, closure and modifications affecting safety,
- For radiation facilities; commissioning, decommissioning and modifications affecting safety,
- Export of all substances, material, equipment, system, component or related technologies subject to control with the aim of non-proliferation of nuclear weapons, and
- Export or import, transport and transit of radioactive materials.

The activities subject to a license granted by the NDK are;

- Operation of nuclear installations, radiation facilities and radioactive waste facilities, and
- Conducting radiation applications.

Furthermore, DL 702 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.

4.4 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 is in compliance with the conditions set out in the authorization and applicable regulations, based on the “Regulation on Nuclear Safety Inspections and Enforcement, 2007”. 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 Institute 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. Former regulations regarding inspections issued by TAEK are in the process of update to be re-issued by NDK.

Department of Inspections of NDK have the following responsibilities:

- Conducting inspections before and after the authorizations,
- Preparation of annual inspection programs
- Preparation of draft regulations and guides on inspections
- Procurement of technical support services to be used in inspections
- Notification of relevant NDK departments on the findings of inspections for determination of incompliances
- Authorization of NDK inspectors
- Determination of incompliances in accordance with the inspection findings
- Determination of administrative sanctions and coordination of their implementations
- Training of its personnel

4.5 ENFORCEMENT OF APPLICABLE REGULATIONS AND TERMS OF LICENSES

DL 702 provides provisions for enforcement of applicable regulations and terms of licenses. As a general principle it is stated in Art. 3 par. 3; activities in the scope of DL 702 and facilities and locations where these activities implemented are subject to NDK's regulatory control regards to safety, security and safeguards.

DL 702 Art. 4 par. 4 provides NDK the authority to define terms for the authorizations including conditions and requirements to be satisfied regarding safety and security for the authorized activities.

For the enforcement of applicable regulations and terms of licenses administrative sanctions defined in DL 702. Art. 4 par. 2 c) of DL 702 states that administrative penalties shall be applied in case of detection of violation of requirements of secondary legislation or terms of authorization or violation of Authorities' decisions or directives or in case of exceed of limits. The amount of penalties are determined as TRY 750.000-1.500.000 (~USD 130.000-265.000) for nuclear installations, TRY 75.000-350.000 (~USD 13.000-60.000) for radioactive waste facilities or radiation facilities and TRY 2.000-15.000 (~USD 350-2650) for other activities. Furthermore, DL 702 Art. 4 par. 3 states that if the violation stated in par. 2 causes a harm creating a threat to public or environmental health and safety the amount of penalty may be increased up to double. And it gives authorization to NDK to limit, suspend or revoke the license or permit until the risk is disappeared.

Furthermore, PD 4 Art. 785 par. 3 c) gives authority to NDK for limiting, suspending, ending or revoking authorizations.

5 REGULATORY BODY (ARTICLE 8)

5.1 ESTABLISHMENT OF THE REGULATORY BODY

Turkey established the first nuclear regulatory body back in 27 August 1956 with Law no. 6821 as the Atomic Energy Commission and to benefit from the international experience in the area become one of the founding members of IAEA in 1957. Atomic Energy Commission was replaced with the Turkish Atomic Energy Authority in 1982 with the Law no.2690. Regulation of all the activities in the field of peaceful uses of nuclear energy including, issuing regulations, making safety reviews and assessments, granting permissions and licenses, conducting inspections and applying enforcement actions were among the authorities and responsibilities of TAEK. However, TAEK had also some promotional responsibilities and been the operator of some facilities requiring regulatory control.

In July 2018, with a referendum amending the constitution, government system of Turkey transformed into a presidential republic. Consequentially, all governmental institutions modified to adapt with the new system.

To improve the regulatory system in Turkey and to achieve full compliance with the international requirements and expectations in the area a draft Nuclear Energy Law had been prepared by TAEK under Ministry of Energy and Natural Resources coordination. This draft law has been enacted with Decree-law no. 702 and with Presidential Decree no.4.

Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Various Laws”, Decree-Law No. 702 (DL 702) were issued by the cabinet on 9 July 2018 as one of the transition decree laws. DL 702 is a comprehensive nuclear law regulating the nuclear safety, security and

radiation protection and other related subjects. Furthermore, it established a new independent nuclear regulatory authority NDK.

5.1.1 LEGAL FOUNDATIONS AND STATUTE OF THE REGULATORY BODY

The duties and responsibilities of NDK are defined on 15 July 2018 under “Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations”, Presidential Decree No:4 (PD 4).

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

NDK consists of a board (Nükleer Düzenleme Kurulu – Nuclear Regulatory Board) which is the decision making organ and a presidency. 5 members of the Board including Chairman, who is also the President of the NDK, and Second Chairman were appointed by the President of the Republic with Decision No. 2019/40 issued on O.G. No. 30677 on 5 February 2019.

NDK issued “Regulation on Working Procedures and Principles of Nuclear Regulatory Board” on 11 April 2019 (O.G. No. 30742). This regulation defines Nuclear Regulatory Board of NDK’s working procedures and principles.

Presidency of the Republic was issued “Regulation on Organization of Nuclear Regulatory Authority” on 25 April 2019. This

regulation defines the organizational structure of NDK and duties and responsibilities of its units.

5.1.2 MANDATE, MISSION AND TASKS

The aim and scope of DL 702 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 purpose of this Decree-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 Nuclear Regulatory Authority having regulatory control over these activities; and to define the principles regarding personal rights of its personnel.”

NDK has been established by DL 702 Art. 7 as follows:

“Nuclear Regulatory Authority, having public legal personality and administrative and financial autonomy and abbreviation of its name as “NDK”, and associated with the ministry that would be determined by President of the Republic, has been established to implement the duties and to use the authorities given by this Decree-Law and other related legislation. Its headquarters is in Ankara. The Authority consists of the Board and the Presidency. Decision making body of the Authority is the Board. The Authority independently implements the duties and use authorities assigned to it by this Decree-Law. Decisions of the Authority cannot be subject to propriety audit. No organs, authorities, or persons may issue orders or directives to

influence the decisions of the Authority. The Authority shall not be given any responsibilities which shall weaken its regulatory activities, conflict with these activities or prevent the Authority from conducting its activities effectively. The property and assets of the Authority 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 Decree-Law.”

In accordance with this article NDK is associated with Ministry of Energy and Natural Resources by the Presidential Circular 2018/1 on 15 July 2018

Furthermore, Presidential Decree No.14 amended PD 4 on 24 July 2018 to define activities, topics and areas to be regulated by NDK in the scope of DL 702 as follows;

- a) Protection of the employees, the public, the environment and future generations from radiation.
- b) Safety, security and safeguards in the activities regarding nuclear energy and ionizing radiation.
- c) Site assessment, design, construction, commissioning, operation, decommissioning and closure of nuclear installations, radiation facilities and radioactive waste facilities.
- d) Mining, production, transportation, storage, export, import, trade, possession, transfer, accounting and control, processing, reprocessing and use of nuclear materials.
- e) Production, transportation, storage, export, import, trade, possession, transfer, use, installation, dismantling, manufacture, maintenance and repair of radiation sources.

- f) The possession, transfer, processing, transportation, storage, export, import, trade and disposal of radioactive wastes.
- g) Exports of all kinds of substances, materials, equipment, systems, components or related technology subject to control with the aim of non-proliferation of nuclear weapons.
- h) Radiation emergency management.
- i) The qualifications and training of the personnel regarding the activities within the scope of the DL 702.
- j) Other issues, areas and activities within the scope of the DL 702 and which are to be determined by the Board.

5.1.3 AUTHORITIES AND RESPONSIBILITIES

DL 702 Art. 7 para 2 authorizes President of the Republic to determine activities, topics and areas to be regulated by the NDK and its duties and authorities. The duties and authorities of the NDK are determined by President of the Republic with PD 4 on 15 July 2018 and amended with PD 14 on 24 July 2018. The duties and authorities of the NDK are as follows:

- a) To determine the strategy, target and working principles of the Authority.
- b) To issue regulatory requirements and decisions in the areas 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, terminate, revoke the granted authorizations; to determine and change the duration of the authorizations; to review and assess the information and documents submitted to the Authority for or after authorization; to define and modify the conditions of the granted

- authorization as a result of the safety assessments.
- d) To inspect or investigate the activities or places within the scope of its duties or authorities or have them inspected or investigated before and after the authorization; to make measurements, analysis, examinations, tests within the scope of inspections or investigations or have them made; to request and retain all kinds of documents and records; to make visual, auditory or written records.
- e) To request and evaluate all the required information and documents from the applicants and authorized persons, to use these information and documents in compliance with the confidentiality requirements.
- f) To request the authorized person to carry out a safety assessment for the activity when deemed necessary; 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.
- g) 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.
- h) To establish and operate the national radiation sources recording system, national central dose recording system, national nuclear material accounting and control system.
- i) To conduct the national radiation monitoring activity or to have it conducted.
- j) 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.

- k) To inform relevant national or international organizations about extraordinary events.
- l) To have research and development activities in the field of safety and security necessary to support its regulatory activities carried out
- m) To exchange information, cooperate and communicate directly with public and private institutions and organizations, non-governmental organizations and the public.
- n) To determine regulatory activities, decisions and opinions to be sent to national and international institutions and organizations, and to be disclosed to the public.
- o) To request all kinds of necessary information and documents related to a subject from all real and legal persons including public institutions and organizations and/or to examine them on site.
- p) To cooperate with the Disaster and Emergency Management Presidency and relevant institutions and organizations in the management of radiation emergencies that may occur as a result of activities not under regulatory control.

5.1.4 ORGANIZATIONAL STRUCTURE OF THE REGULATORY BODY

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 5 people including the President of NDK (who also chairs the Board) and a Second Chairman. All Board members are assigned by the President of the Republic. President of the Republic also appoints President of NDK and Second Chairman. 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 on 11 April 2019.

The Presidency consists of the President of NDK, two vice presidents, and service units. The organisational structure of the Presidency will be determined by a regulation to be issued by the President of the Republic.

NDK's main organization consists of six technical and five administrative units. Technical units are:

- Department of Nuclear Installations (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).
- Department of External Affairs (national and international coordination of all kinds of activities within the scope of duties and responsibilities of NDK).

Administrative units are:

- 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).

The Law no. 702 makes provision for transfer of current regulatory personnel employed

within TAEK in the departments of Nuclear Safety, radiation Health and Safety, and Technology to NDK.

Figure 6 shows the organizational structure of NDK:

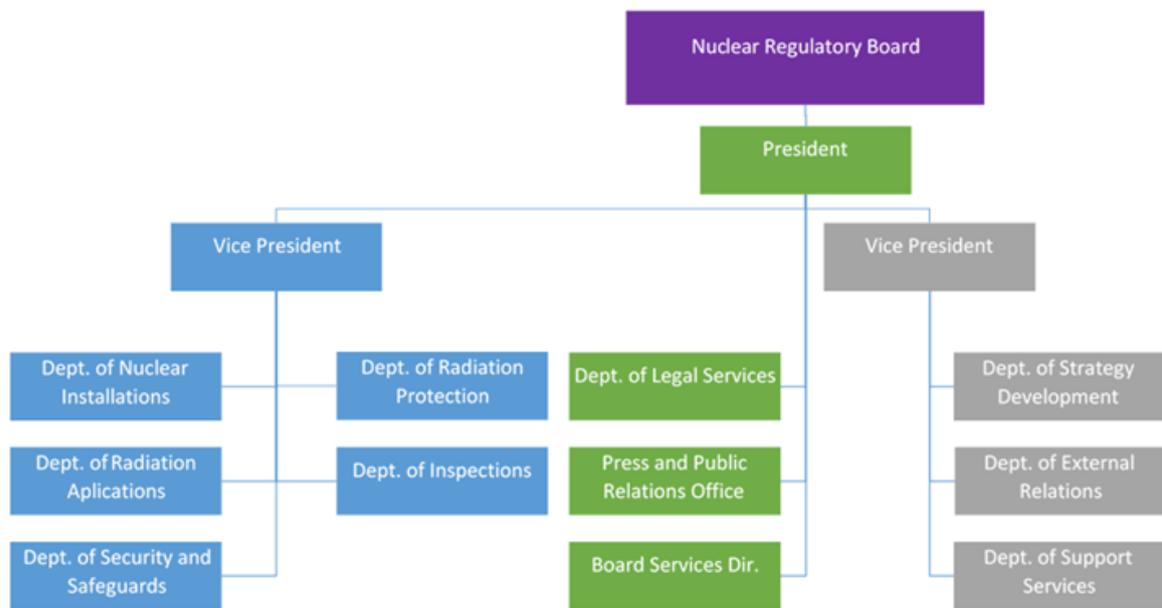


Figure 6 Organizational Structure of NDK

5.1.5 COMPETENCE OF THE REGULATORY BODY

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, 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 SARCON model.

Also, two projects are implemented with support from European Commission: a Pre-accession Assistance (EC IPA) twinning project with TÜV-SÜD and an INSC Project with Risk Audit. The aim is to improve the competency of TAEK by gaining European Union 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, Turkey 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 Department of Nuclear Installations (DNI) has got experience with regulating research reactors, it also utilizes the support from IAEA (peer reviews) and contracts with competent foreign Technical Safety 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 (UJV) Company 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.

5.1.6 FINANCIAL STATUS OF THE REGULATORY BODY

According to new nuclear law NDK's incomes are composed of:

- a) Service and operation fees
- b) Incomes from publications and other similar items
- c) Donations and grants
- d) 80% of the administrative fines applied by NDK
- e) Incomes from estates and assets of NDK
- f) Treasury aids from general budget

Law no.702 states that it is essential that NDK's incomes should cover its expenditures. If this is not possible the difference will be covered from the special budget item reserved in the Budget of Ministry of Energy and Natural Resources for this purpose. If the income is higher than the expenditure, then surpassing amount will be transferred to next year's budget. NDK will issue a regulation regarding the determination of its service and operation fees.

5.1.7 MANAGEMENT SYSTEM IN REGULATORY BODY

Previously, TAEK had a quality management system in the frame of applicable requirements for Turkish central government organizations. TAEK was also working on development of an ISO 9001 based quality management system to satisfy the requirements of a safety focused integrated management system. Establishment of a management system was a component of the European Council Instrument for Nuclear Safety Cooperation (INSC) Project initiated in 2018 for the strengthening of the regulatory body in Turkey. It is expected that these studies will form the basis for the establishment of the integrated management system of the new regulatory body, the NDK.

5.1.8 OPENNESS AND TRANSPARENCY OF REGULATORY ACTIVITIES

"Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations", Presidential Decree No: 4, 2018, Article 785, paragraph 3, related clauses state that 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.

Nuclear Regulatory Authority (NDK) is transparent to the public in regulatory decisions. They are made available with supporting documents on the internet. 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 Environmental Impact Assessment (EIA).

5.2 STATUS OF THE REGULATORY BODY

The nuclear regulatory authority (NDK) is intended to be an independent nuclear regulator and there are clear provisions in new nuclear law stating no authority or organization has a right to give orders to NDK.

NDK has been established by DL 702 Art. 7 as follows:

“Nuclear Regulatory Authority, having public legal personality and administrative and financial autonomy and abbreviation of its name as “NDK”, and associated with the ministry that would be determined by President of the Republic, has been established to implement the duties and to use the authorities given by this Decree-Law and other related legislation.

The Authority independently implements its duties and uses authorities assigned to it by this Decree-Law. Decisions of the Authority cannot be subject to propriety audit. No organs, authorities, or persons may issue orders or directives to influence the decisions of the Authority. The Authority shall not be given any responsibilities which shall weaken its regulatory activities, conflict with these activities or prevent the Authority from conducting its activities effectively. The property and assets of the Authority 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 Decree-Law.”

In accordance with this article NDK is associated with Ministry of Energy and Natural Resources by the Presidential Circular 2018/1 on 15 July 2018.

6 RESPONSIBILITY OF THE LICENSE HOLDER (ARTICLE 9)

Prime responsibility for the safety of a nuclear installation is on the holder of the relevant license. This responsibility is implied in the Decree on Licensing of Nuclear Installations, 1983 and explicitly stated in the Law no 702.

DL 702, Article 3, para. 6 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.”

DL 702, Article 4, para. 8 states that “The applicants for authorization are obliged to provide all the information and documents requested by the Authority for authorization in the required format and content and pay the fees determined by the Authority to be registered as revenue in the Authority's budget”.

DL 702, Article 4, para. 9 states that “Authorized legal persons shall also receive, within the scope of procedures and principles determined by the Authority, inspection services from the private legal entities authorized by the Authority for the inspection of the construction, manufacturing and installation processes of the structures, systems and components which constitute the facility. The responsibilities of the authorized person within the scope of this paragraph in relation to the inspection activities and inspectors shall be determined by the Authority with a regulation”.

DL 702, Article 4, para. 10 related clauses state that:

“The legal persons authorized by the Authority 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 personnel and the organization have safety and security culture,

c) Carry out the activity safely and securely by employing sufficient number of qualified personnel, with necessary financial resources, and with required organizational structure,

d) Perform safety and security assessments at the frequency determined by the Authority,

e) Carry out its activities with the management system with the assent of the Authority,

f) Submit to the Authority all information and documents required by the Authority in the required form, content and scope,

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

h) Keep the records, make notifications and reporting as defined in legislation and management system,

i) Fulfil its obligations concerning safeguards,

j) Provide the required conditions to remove the activity from the regulatory control after end of the activity,

k) Within the scope of inspections conducted by the Authority, perform required corrective and preventive activities, actions and acts,

l) Fulfil additional obligations related to safety, security and safeguards as determined by the Authority within the limits of nuclear safety principles”.

DL 702, Article 4, para. 11 states that “Authorized natural persons shall perform the

authorized activity in accordance with the legislation and authorization conditions, giving utmost importance and priority to safety and security”.

DL 702, Article 4, para. 12 states that “The authorized person must not leave the place of operation or facility, nuclear material, radioactive source or radioactive waste as unattended unless their obligations related to the activity ends”.

DL 702, Article 4, para. 13 states that “Authorized persons are subject to the inspection of the Authority. The Authority may also inspect contractors, subcontractors, suppliers and sub-suppliers. 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. Rules and principles regarding acts and actions to be taken in the scope of this article and qualifications of inspector, method and scope of inspection, shall be determined by the Authority with a regulation”.

DL 702, Article 4, para. 16 states that “Persons authorized to carry out an activity within the scope of this Decree- Law are obliged to pay the amount determined by the Authority to be registered as revenue in the Authorities’ budget for the inspections of the Authority”.

DL 702, Article 4, para. 17 states that “The authorized person must fulfil the financial obligations under this Decree Law”.

DL 702, Article 4, para. 18 states that “The persons, who are subject to inspections within the scope of this Decree-Law, and their authorized personnel, 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”.

DL 702, Article 4, para. 19 states that “The persons, who are subject to inspection within the scope of this Decree-Law, and their authorized personnel shall comply with their obligations indicated in the relevant legislation during the inspections performed under the international obligations related to safeguards inspections by the inspectors of International Atomic Energy Agency, who are approved by the Republic of Turkey”.

DL 702, Article 3, para. 8 states that “The responsibilities of the authorized person within the scope of this Decree- Law shall be terminated if the Authority determines that the conditions specified in the authorization are met. Cease of business operations, bankruptcy or any similar situations shall not relieve the authorized person of responsibility”.

“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 Basic Requirements on Quality Management for the Safety of Nuclear Installations, 2007”. This regulation covers all the stages during the lifetime of a nuclear installation.

It is stated in the Akkuyu Project Agreement that the Akkuyu NPP will be licensed and inspected in accordance with the regulations of Turkey in terms of nuclear safety and radiation protection.

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 updated site report 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 has been recognized as the Owner on February 7th, 2011. The Akkuyu Site on the Mediterranean coast was allocated to Akkuyu Nuclear JSC in 2011 as specified in the Akkuyu Project Agreement. 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 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, besides using the 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 for communication with public in Mersin in 2012 under the cooperation of the Russian Federation and the Republic of Turkey in relation to the design and construction of the first nuclear power plant on territory of Turkey, Akkuyu NPP. The Public Information Center is a versatile

communication platform and provides excursion programs both for the population in Mersin Province, in neighbouring provinces and other regions. Among the visitors there are children, students, representatives of authorities and mass media, tourists and many others. The visitors may get information about the history and development of the nuclear industry, use of achievements in physics, prospects of the energy development and about the social and economic development of the Republic of Turkey which is related to construction of the nuclear industry enterprises and accompanying infrastructure.

The Public Information Center of Akkuyu NPP in Mersin is a platform for the trust-based, open and interesting dialogue of the citizens of the Republic of Turkey on the nuclear energy topic.

All activities of the Public Information Center of 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.

294 Turkish students related to the Akkuyu NPP were being educated in Russian Universities by February 2016.

Akkuyu Nuclear JSC will also establish a training center for Akkuyu NPP.

7 PRIORITY TO SAFETY (ARTICLE 10)

The main mission of NDK, the regulatory body is to ensure that the use of nuclear energy in Turkey does not pose undue risk to human health and the environment. Basic tools for realization of this mission are the national regulations and international instruments, guides and standards. The national regulations are mainly based on IAEA safety requirements, standards and guides and international experiences, giving high priority to the safety. For issues not covered by national regulations NDK uses IAEA safety requirements.

NDK's licensing regulations establishes safety principles to be followed during the design, construction, commissioning, operation and decommissioning of nuclear power plants to achieve nuclear safety objectives.

NDK achieves regulatory control of nuclear facilities and nuclear materials through a comprehensive licensing system. NDK's licensing system assures that nuclear facilities and nuclear items are utilized with proper consideration for the protection of workers, public and the environment and nuclear security. Prime responsibility for the safety of a nuclear installation is on the holder of the relevant license.

Detailed regulatory requirements and responsibilities of license holders related to management system are defined in the "The Regulation on Management System in Nuclear Installations No: 30032 Date: April 8th, 2017". The Regulation includes many topics such as main characteristics of the management system, responsibilities, and relations with the authority and safety culture.

The new Nuclear Law (DL 702) has provisions on the responsibilities and obligations of license holders and regulatory organization.

According to the Inter-Governmental Agreement, Akkuyu Nuclear JSC is responsible for the design, construction, commissioning, operation, and decommissioning of the Akkuyu NPP. In the statement of quality policy, Akkuyu Nuclear JSC states that the highest priority of activity is the safety of "Akkuyu" NPP and the personnel, as well as minimizing impact on population and environment. Unconditional priority will be given to NPP safety requirements in review of any design, engineering and technological developments and alternative solutions, as well as in selection of contractors and subcontractors, producing and controlling work schedules.

In implementation of the quality policy, Akkuyu Nuclear JSC adhere to the following principles:

- Commitment to "safety culture" concept and maintaining an environment where safety oriented thinking of the personnel is established forming questioning attitude, excluding complacency and fostering excellence, development of ownership and dedication in safety issues,
- Graded application of safety requirements in implementation of all types of activities influencing on company safe and effective performance,
- Systematic planning, clear definition of safety priorities and timely provision of the required resources including human, financial and material,
- Ensuring rigorous and precise implementation of all tasks and activities in accordance with the applicable regulatory safety

requirements, approved procedures and best international practice,

- Application of a process approach in quality management and performance,
- Implementation of works and performance of activities by personnel

having suitable knowledge, skills and qualification,

- Commitment to “no blame” policy and creating an environment allowing for personnel involvement in open discussion and solution of safety related issues.

8 FINANCIAL AND HUMAN RESOURCES (ARTICLE 11)

8.1 FINANCIAL RESOURCES

8.1.1 FINANCING OF SAFETY IMPROVEMENTS

Akkuyu Nuclear JSC, as the plant 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 approach is in compliance with the Russian legislation (Federal Law No 317 – Φ3 dated December 1st, 2007), which requires such funds to be collected by the state corporation "Rosatom".

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.

8.1.2 FINANCIAL PROVISIONS FOR DECOMMISSIONING, SPENT FUEL AND RADIOACTIVE WASTE

Intergovernmental Agreement (IGA) signed between the Turkish and Russian party for construction and operation of the Akkuyu NPP stipulates that Akkuyu Nuclear JSC, that the Project Company, which will own and operate the plant, will be responsible for decommissioning and waste management of the NPP (Article 12, par. 4). The Project Company 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 Project Company for the electricity, purchased by EÜAŞ (IGA, Article 10, par. 9):

- 0.15 US dollar cents per kWh to the account for spent fuel and RAW 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 (PPA), 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 Treasury. 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 Treasury. 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 TAEK. The decommissioning costs will be covered by the Decommissioning Account. Should recourses of the account prove to be insufficient; the Treasury will cover an amount of up to 25% of the accounts collected in the Decommissioning account. Should this prove to be insufficient, the enterprise (plant operator) shall cover the excess cost. Further elaboration of the Turkish legislation in regards to the decommissioning and Radioactive Waste accounts is expected; this will establish the accounts and will

stipulate the main principles of their management and operation.

8.1.3 ADEQUACY OF FINANCIAL PROVISIONS

Decree on licensing of nuclear installations (published in the Official Gazette Number 18256 dated 19.12.1983) stipulates in Article 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 nuclear power plant, shall be demonstrated in front of the relevant authorities in order to obtain a license.

Annual payments to the Decommissioning and Radioactive Waste Management accounts shall be determined by the fund management in accordance with current legislation based on the actual information on decommissioning and Radioactive Waste Management costs and the estimates of the electricity production. The similar recommendations are contained in the Directives Council Directive 2011/70/EURATOM of July 19th, 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. However, during the entire plant operational lifetime, periodic review of the amounts accumulated in the accounts shall be made and shall be assessed versus the updated information on the Decommissioning and Radioactive Waste management costs.

According to the Turkish legislation and IGA, Article 16 on nuclear responsibility, the Akkuyu Nuclear JSC will be ensuring the necessary financial resources in the event of the radiological emergency.

8.1.4 PROCESSES FOR THE ASSESSMENT OF THE FINANCIAL PROVISIONS

Modernization programs will be developed for 6-years periods. They shall be based on the design requirements, actual plant status, international safety cases and 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 nuclear power plants. Annual planning will include financial resources needed for implementation of the maintenance.

Decommissioning and Radioactive Waste management costs shall be reassessed every 5 years, based on the updated information, plant status, operational records, etc.

8.2 HUMAN RESOURCES

The Akkuyu NPP have been designed, manufactured and will be constructed commissioned, and operated by Akkuyu Nuclear JSC (owner and operator) established according to Turkish laws and financed by Russia. However, this does not imply that the all personal will always be Russian. At the beginning of 2019 Turkish citizens working in the Project Company is about 32 per cent of the total workforce. . According to Turkish legislation, the formal language of communication is in Turkish.

IGA, Article 6, Par.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.

8.2.1 NPP PERSONNEL TRAINING

It is foreseen that for the construction and commissioning of the four units of Akkuyu NPP more than 10,000 persons will be involved, and then about 4000 will be constantly needed during the 60 years of plant operation.

The Russian party will provide support and assistance in training of professional staff for nuclear power development in Turkey. The selection of Turkish students to undertake nuclear energy learning had been began in 2011. Until month of May 2019, 156 students were having education in the Russian Nuclear Universities.

The Akkuyu Nuclear JSC provides support and assistance in training of professional staff for NPP consideration in Turkey. 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 resource and to provide opportunities to the local citizens.

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 will be provided by arrangement of language courses.

Akkuyu Nuclear JSC is also intended to use Systematic Approach for Training (SAT) for attaining and maintaining the competencies of personnel as the mentioned approach is entirely compatible with the management system 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.

8.2.2 QUALIFICATION MAINTENANCE

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.

8.2.3 IMPROVEMENTS TO TRAINING PROGRAMMES

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

The training methods and practices will be put in place for the 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.

8.2.4 ASSESSMENT OF THE SUFFICIENCY AND THE QUALIFICATION OF THE NPP STAFF

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 Director shall 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 will be 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,
- On-the-job-training 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 startup/shutdown and operations preceding power unit scheduled startup/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.

8.2.5 REGULATORY REVIEW AND CONTROL ACTIVITIES

Operator responsibilities, human resource management issues, and training of operating personnel are detailed in the “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008”. According to the regulation, the Licensee has the prime responsibility for ensuring that employees are qualified and have the necessary authority and skill set to perform their assigned tasks. The Licensee shall employ an adequate number of competent and experienced personnel

throughout the entire life of the plant in order to ensure safe operation.

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 Director shall 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.

Akkuyu Nuclear JSC specifies the requirements related to competence of the employees of all the levels and ensures staffing and proper staff training consistent with IAEA Safety Standards Series No. NS-G-2.8, Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Vienna, 2002, other international guidelines and Russian national requirements in the nuclear field. The requirements are presented in detail for each position in the respective job descriptions.

“Regulation on the Operating Organization, Qualifications and Training of Operating Personnel, and Licences of Operating Personnel in Nuclear Power Plants” entered into force on 27th April 2017. The Regulation is to determine the procedures and principles for operating organization, qualifications and training of operating personnel, and licenses of operating personnel in nuclear power plants.

8.2.6 COMPETENCY MANAGEMENT ACTIVITIES FOR REGULATORY BODY STAFF

NDK continues to extending its human resources who will be employed for the licensing and inspection activities of the nuclear power plant. NDK also continue to use technical support organizations (TSO) for eliminating the competency gaps when needed.

Former regulatory body TAEK utilized services of external experts and organizations before and during the licensing studies for Akkuyu and Sinop NPP projects. Academicians and domestic experts were used to support regulatory activities regarding the siting where significant domestic expertise is available. Technical support from foreign organizations with adequate qualification is planned to be used as it is needed.

TAEK awarded a contract to UJV Rez a.s. (UJV) Company 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.

TAEK also signed a protocol to get external support for inspection activities with Turkish Standards Institute who has experience in industrial inspections.

Law no. 702 amends the Public Procurement Law 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.

Also, to improve the competency of NDK, a TSO, NÜTED (Nuclear Technical Support Joint Stock Company), has been established by the new nuclear law as a government owned company. At least 51% of its shares will be owned by NDK. NÜTED has the responsibility to provide all necessary TSO services to NDK. Hiring staff and capacity building for NÜTED will be implemented in parallel to the needs of NDK.

Since the transitional article 2 of the new nuclear law transfer all contracts regarding nuclear safety and security to NDK. All TSO and consultancy contracts done by TAEK will also be transferred to NDK.

NDK is aiming to establish an effective and efficient management system for the organization and performance of its activities. The management of competence is a part of this and needs to be integral part with the overall management of the NDK. The main objective is to ensure having the right number of staff with the right and enough competences at the right time.

NDK also continues to improve its capacity, knowledge and experience in the following areas: Project management, Legal issues, Earth Sciences, Radiation protection and Emergency Planning, Nuclear Physics, Nuclear Engineering, Dosimetry, Probabilistic Safety Assessment, Accident Analysis, Quality Management, Electrical Engineering, Mechanical Engineering, Material Engineering, Civil Engineering, Chemical Engineering, Instrumentation and Control Engineering, Fire Protection, Nuclear Security and Physical Protection.

8.2.7 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
2. Domestic trainings
 - Academic units in Turkey
 - Other organizations experienced in specific subjects
3. International trainings
 - IAEA
 - European Commission
 - Bilateral agreements with other regulatory organizations
 - Technical support organization
 - 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. TAEK has a specific TC project named IAEA TC TUR/9/021 for this purpose and provided its own financial resources for the project. IAEA TC TUR/9/021 project is fully funded by Turkey and transferred to NDK with its establishment.

Improving NDK staff's knowledge in the field of review and assessment of PSAR and inspection are the main purposes of this project. The main tools in the project are On the Job Trainings, workshops, training courses and expert missions' tools. 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.

The other two projects with the support from European Commission are a "Pre-accession Assistance (EC IPA) twinning project with TÜV-SÜD" and an "INSC Project with Risk Audit". The aim is to improve the competency of TAEK by gaining European Union 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 INSC Project at hand is governed by the regulation, establishing an Instrument for Nuclear Safety Cooperation (INSC). The objective of the INSC is to support the promotion of an effective nuclear safety culture in line with the EU framework,

governing nuclear safety, radiation protection and the safety of radioactive waste management, the international legal framework and best practices in the field of nuclear energy. The INSC support to the NDK is primarily directed at transferring EU regulatory methodologies, including the formulation of legislation and development of regulatory documents.

INSC project TR3.01/16 fits into the above described context in Turkey 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 management system of the regulatory body.

In parallel to this project, the EC launched the Twinning Project under the Instrument for Pre-accession Assistance (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 Turkey" (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, while activities on INSC project is still being implemented.

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 Turkey 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.

8.2.8 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 continue have the role to supply the TAEK with specialized technical skills. For this purpose TAEK is planning to use TSO whenever it needs in order to accomplish its regulatory functions internally or outside the country. TAEK awarded a contract to UJV

Rez (UJV) Company 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.

9 HUMAN FACTORS (ARTICLE 12)

“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 “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.

Requirements for qualification of operating personnel as part of human factor are also

covered in Turkish and Russian legislative and normative documents.

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 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.

Russian normative documents and standards require human factor to be accounted for during NPP lifetime, including design stage. Russian safety rules “General regulations on ensuring safety of nuclear power plants” NP-001-15 state that:

- 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,
- In the design of the control rooms problems of man-machine interface shall be solved. 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 met, 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.

10 QUALITY ASSURANCE (ARTICLE 13)

10.1 REGULATORY REQUIREMENTS FOR QUALITY MANAGEMENT

Nuclear Regulatory Authority (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. According to Decree-law numbered 702 dated 9/7/2018 the license holders or applicants should carry out its activities with the management system deemed appropriate by the Authority. Also according to "Decree on Licensing of Nuclear Installations, 1983" the license holders or applicants should have quality assurance programmes for different stages of the implementation of nuclear power plant projects and submit those programmes to NDK. NDK, then, reviews and assesses quality assurance programmes when implementing licensing process.

Detailed regulatory requirements and responsibilities of license holders related to management system 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 titled "Regulation on Management System in Nuclear Installations (RMSNI) 30032 numbered 8/4/2017 dated was published which is aspiring to establish an integrated management system, in parallel to new IAEA document on this issue, GSR Part 2 – Leadership and Management for Nuclear Safety.

RMSNI includes basic principles and specific requirements such as responsibility, leadership, safety culture, process approach and graded approach and assessment of management system manual and management plans. RMSNI also defines the

documents which should be included in the management system of a nuclear facility.

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 Turkey. The approved "List of Licensing Basis for Akkuyu Nuclear Power Plant" 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 RMSNI. The list also includes Russian Federations regulations and guides regarding the management systems and quality assurance for nuclear power plants.

10.2 QUALITY MANAGEMENT SYSTEM OF REGULATORY BODY

Nuclear Regulatory Authority has been established with the decree-law numbered 702 and the regulation on organizational structure has been issued in April 2019.

Before establishment of NDK, former regulatory body TAEK has started to establish its own internal 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 2015 version of ISO 9001 published, TAEK QMS has adapted to this version. In 2017 TAEK QMS was certified by Turkish Standards Institution (TSE).

TAEK QMS includes: processes for overall management of the organization; processes

for main regulatory functions; and processes for supporting activities. TAEK QMS self-assessment and external audit for evaluating the performance of the management system and improving it to enhance the effectiveness of the organization.

After establishment of NDK, the previously carried out quality practices have been continued with the below approaches and values:

- Priority to safety and security,
- Safety and security culture,
- Graded approach,
- Independence and competence,
- Objectiveness and trustfulness,
- Openness and accountability,
- Quality and effectiveness,
- Continuous improvement.

NDK utilizes external technical support services in implementing its regulatory activities including review and assessment and inspections when it deems necessary. Hiring those services are implemented in accordance with the national procurement rules and regulations and based on commercial contracts. NDK always seeks proper quality management system in its contractors for main service providers. There is a formal internal procedure to oversee the activities of contractors for such technical support services in NDK QMS.

Additionally, the project "Support to the Regulatory Authority of Turkey" has been started in the beginning of 2018 within scope of Instrument for Nuclear Safety Cooperation Program of the European Union Nuclear Safety Cooperation Instrument (INSC). The overall objective of the project is to strengthen the managerial and technical capabilities of the regulatory body and one of the tasks is the

improving the management system. Works are ongoing within the scope of the project.

10.3 QUALITY MANAGEMENT SYSTEM OF AKKUYU NPP

Regulations and practices in the area of quality management in nuclear developments in Turkey have significantly increased during the last years. Akkuyu Nuclear JSC has started the implementation of its MS directed to provide for arrangements and ensure safety in activities performed in a most coherent way. The system established integrates the safety, health, environmental, security, quality and economic issues plus other considerations such as social responsibility in an integrated framework. The management system identifies and integrates the requirements contained within the applicable codes, standards, statutory and regulatory requirements. The management system is designed to promote and support a strong safety culture.

A General QMS Manual has been developed in accordance with the requirements of BQMR Regulation (the regulation on QMS before 2017), IAEA Safety Standards (GS-R-3) and ISO 9001:2008 and implemented. The MS covers all management activities and processes, services and items influencing on safety, reliability and effectiveness during the all NPP throughout the lifetime.

Akkuyu NPP's General QMS Manual describes specific approaches, and organizational and management measures, aimed to ensure quality and strong safety culture at all stages of the NPP.

Additionally, a Configuration Management System (CMS) manual has been developed and its system to be established as per the requirements of ISO 10007:2003 Quality Management Systems - Guidelines for Configuration Management Standard. These

QMS and CMS have been developed and approved by Akkuyu Nuclear JSC and approved by TAEK.

According to QMS the configuration management process is performed to guarantee that changes made to enhance the efficiency and economic effectiveness do not compromise the safety. Akkuyu Nuclear JSC defines requirements to procedure of preparation of proposals, substantiation and incorporation of different changes.

The main principal used as a basis to establish an organizational structure was to meet the general requirements for nuclear safety of the NPP, taking into consideration the particular stage of the plant life cycle. Besides, account was taken of which functions should be performed at the NPP site and off the site. The QMS describes the project activities and the processes of the organization. The supporting information is provided in the guidelines that comprise the second level of QMS documentation that are presented in Management System Procedures and are planned to develop according to the Schedule of development of the Company Management System documentation.

Akkuyu Nuclear JSC ensures the systematic measurement, monitoring and assessment of the management system in order to ensure that the system is effective and to define areas requiring improvement. Various monitoring and assessment types are applied with the purpose: control/oversight of activities by managers and monitoring/measuring of the processes, including self-assessment' and independent assessment. The QMS defines a separate process for these activities.

The QMS defines a separate process for ensuring safety and reliability. The process is dedicated to manage different aspects of safety, such as nuclear, radiation, industrial, fire, environmental and seismic. It sets priority

and specifies the requirements to ensure of safety, risk management, health and environment protection.

The QMS declares that the management system implemented is used to facilitate and support strong Safety Culture by means of:

- Ensuring common understanding of key aspects of Safety Culture by the personnel of the organizations and suppliers,
- Ensuring the required resources and infrastructure to provide conditions where the employees can perform their tasks in a safe and successful manner considering human-technology-organization interface,
- Encouraging constructive and questioning attitude at all levels of organization and suppliers,
- Providing resources aimed at continuous development and enhancement of Safety Culture.

The QMS defines a particular process for monitoring measurement and assessment of the Company performance. Specific procedures defining requirements for planning carrying out audits and self-assessments are developed and implemented.

The management system is aimed to develop of such values, behaviour and basic assumptions that will ensure sustainable development and reinforcement of the most important attributes/features for healthy and strong Safety Culture.

Akkuyu Nuclear JSC aims to implement different activities for systematic communication to all personnel and dissemination of appropriate values and behaviour, and provide training and briefing in order to ensure common understanding of Safety Culture and ensure strict adherence to safety requirements.

Detailed principles of relationships between different project participants were stipulated in the QMS. The following main rules are applied as far as concerned to different contractors and subcontractors of the Akkuyu Nuclear JSC:

- All activities on the project are performed based on Contracts, which shall clearly specify the scope of works and responsibilities,
- Each project participant shall develop and implement its own quality management system, providing that it is coordinated with the Akkuyu Nuclear JSC or respective employer,
- Each QMS shall ensure meeting the requirements of applicable codes and standards, efficient application at all the stages of activities, possibility for the Akkuyu Nuclear JSC to access the necessary documents that confirm quality of the activities performed, necessary measures to be taken on non-conformances detected to the products, equipment and services being supplied, persons involved in the project should be properly qualified for the assigned tasks,
- Sufficiency of guarantees to assure proper quality of the equipment and services being supplied is confirmed by external audits on behalf of the Company.

Subcontractors are evaluated and selected based on objective evidence on their capability to perform the contractual obligations, including quality management requirements.

A purchasing committee has been established that is especially dedicated for evaluation of the submitted contract and technical information and decision making. In addition, a special procedure for preliminary evaluation of the possible subcontractors has been developed and implemented.

The QMS defines a particular process for monitoring measurement and assessment. Specific procedure has been developed and implemented on requirements for external audits.

The QMS of Akkuyu Nuclear JSC has been upgraded to MS as required by the regulatory body in 2019.

Akkuyu Nuclear JSC is currently creating portfolio of Turkish companies with capabilities to participate in the plant construction works, in providing construction materials, equipment and machinery, as well as handling maintenance and repair services. All the above principles and requirements are applying.

The general QAP manual of Akkuyu Nuclear JSC defines a particular process for monitoring measurement and assessment. Specific procedure such as Standards of Company, Audit Programmes has been developed and implemented on requirements for internal audits.

In accordance with General QAP manual the Akkuyu Nuclear JSC insures systematic measurement and monitoring of QMS so as to define the system's ability to achieve the expected results in the area of activities to be improved. Various types of monitoring are performed for this purpose: control/supervision of operation by top managers and monitoring/measurement of processes. To ensure monitoring and Verification internal Audits are carried out by the Akkuyu Nuclear JSC permitting it to assess the efficiency of QMS.

The general purpose of internal Audit is the Analysis of the current of QMS, determination of the need for improvements and development of Corrective Actions in collaboration with audited division.

Internal Audit of each unit shall be carried out once a year based on the relevant approved schedule and program.

In accordance of General QAP the Akkuyu Nuclear JSC provides systematic measurement and monitoring of the Suppliers' QMS in order to define the system's ability to achieve the expected results in the area of activities carried out in the course of implementation of Akkuyu NPP project. For this purpose the Akkuyu Nuclear JSC performs different types of QMS monitoring confirming compliance with established requirements to the Supplier Company's activities with help of objective evidence. Audit performance by the Akkuyu Nuclear JSC is one of the QMS Efficiency Assessment methods on the approved program.

10.4 QUALITY MANAGEMENT SYSTEM OF SINOP NPP

EÜAŞ and EÜAŞ International ICC conduct all the activities in accordance with the Management System (MS) which is in compliance with NDK Regulation "Regulation on Management System in Nuclear Installations", dated 08/04/2017. 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 quality management system, 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 management system 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 management

system to maintain the continuous improvement of the system.

10.5 REGULATORY REVIEW AND CONTROL

According to RMSNI, the management system manual together with related procedures to the NDK. Also the management plans with related procedures are submitted for assessment at times determined by the NDK. Those manual and plans are subject to review and assessment of NDK. All related MS documentation is to be submitted for review and assessment. NDK reviews and assesses the compliance of MS documentation with the requirements by means of audits, monitoring, surveillance and inspections.

The grading approach related to safety, health, environment, security, quality and economic factors have to be submitted together with the management system manual. The applicant has to make a commitment in the relevant chapter of the safety analysis report regarding its full compliance with RMSNI regulation and IAEA GSR Part 2 Safety Standard Requirements document and has to demonstrate that the requirements are fulfilled.

During the regulatory quality inspections, if any non-conformances or deviations are determined, the works may be stopped by NDK unless corrective and preventive actions are taken by the licensee who carries out the quality management activities for the related stage of the nuclear facility.

In addition to the oversight of applicants/licensees over their vendors, NDK's regulatory control is also applied those vendors according to the RMSNI requirements. In order to implement regulatory control over major equipment manufacturers for nuclear power plants to be built in Turkey, a regulation (Regulation Regarding Equipment Procurement Process and Approval of Manufacturers for Nuclear Facilities) has been

issued in 2015. According to this regulation, manufacturers of equipment which are important to safety has to be approved by NDK and subject to NDK's inspections. During the

approval process for manufacturers, NDK seeks for established Quality Management System in the manufacturers' organization and facilities.

11 ASSESSMENT AND VERIFICATION OF SAFETY (ARTICLE 14)

During transition to new governmental system the Decree Law on Amendments to Certain Laws and Decree Laws for Adaptation to the Amendments to the Constitution” of 9 July 2018, Decree-Law No.703 (DL 703) annulled the legal basis provision of Law No: 2690 making all decrees and regulations obsolete. Due to the transition article in DL 702 they are temporarily applicable until replaced by new regulations to be issued by NDK. Decrees and regulations will be effective until the new regulations are issued in line with the provisions of the new nuclear law.

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 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 regulatory body.

The purpose of the review and assessment work by regulatory body is to determine if the applicant has demonstrated that the safety goals and criteria are met 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.

1. According to directive on review and assessment process for nuclear installations are performed in different levels: 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 repeat of some of the accident analyses if deemed necessary,

The review and assessment process is always supported by regulatory inspection and enforcement activities at any stage of licensing and throughout the lifetime of a nuclear installation.

11.1 SITE LICENSE PROCESS

In site license process (Chapter 14 "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.

The decision-making organ of the NDK is the Nuclear Regulatory Board. This Board consists of 5 people including the President of NDK (who also chairs the Board) and a Second Chairman. All Board members are assigned by the President of the Republic. President of the Republic also appoints President of NDK and Second Chairman.

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.

11.2 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 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 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.

11.3 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 be 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 studied 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.

11.4 IMPLEMENTATION OF VNDNS PRINCIPLES

Although there is no operating nuclear power plants in Turkey, TAEK and then NDK used the opportunity of licensing activities for Akkuyu NPP to implement the VNDNS principles. During the review and assessment for site related design parameters approval, limited work permit and the construction license for the first unit of Akkuyu NPP, the items mentioned in first principle of VNDNS are among the main focus of review and assessment. Measures taken by the designer are carefully investigated to comply with this principle.

Estimation of tsunami wave, provisions for station blackout, early release frequency were among the issues discussed with the Akkuyu Nuclear JSC for complying with the VNDNS.

12 RADIATION PROTECTION (ARTICLE 15)

12.1 REGULATORY REQUIREMENTS

Regulation on Radiation Protection in Nuclear Facilities dated 2018, is the main regulation which governs the radiation protection aspects in nuclear power plants. 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 exemption 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 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 decree-law on Organization and Duties of Nuclear Regulatory Authority dated 2018 states that all the activities related to nuclear facilities should be authorized by Nuclear Regulatory Authority. 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 Preliminary Safety Analysis Report (PSAR) 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 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 μSv 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.

Finally, 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 decree-law on Organization and Duties of Nuclear Regulatory Authority dated 2018.

12.2 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 APC'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 Environmental Impact Assessment Report (EIAR). Affirmative decision was made for the EIAR at the end of 2014. These information are also given in the Site Parameters Report of the Akkuyu NPP which was approved in 2017.

In March 2018 construction license of Akkuyu NPP Unit 1 was issued. Moreover, in November 2018 limited work permit for Akkuyu NPP Unit 2 was issued. A description of the radiation

protection systems and relevant basic equipment is presented in the PSARs of these units of 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 management systems 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, it is stated that the following measures will be taken in order to minimize the personnel radiation doses to the lowest possible level:

- Reducing the accumulation of corrosion products in the equipment with

appropriate material selection (for reduction of the gamma radiation dose rate at the work stations of the maintenance personnel)

- Decontamination of primary loop equipment will be performed
- Mechanization and automation of the work to be carried out in the controlled access area will be carried out in a way that restricts the staff's time to be exposed to ionizing radiation.
- Remote control systems will be used for the maintenance and repair of equipment in the nuclear power plant
- Camera systems and protective shielding equipment will be used for work to be carried out in controlled access areas
- Trainings in model systems and simulators will be given to personnel who will work in high radiation areas
- The equipment and components to be used to reduce the exposure of personnel to radiation are accessible and ready for use as needed
- The layout of structures and rooms is designed to facilitate access to the equipment during operation, maintenance, repair and replacement, and to limit the possibility of personnel exposure to radiation and contamination
- The layout of the controlled access areas in accordance with the requirements of legislation and previous operating experience is arranged to prevent personnel from entering areas with low radiation areas by passing through areas of higher radiation level or contamination
- The control room is not directly connected to other areas. The control room is protected from environmental effects by the pressure difference created by its own independent ventilation system and by special filter systems

- Fuel management operations will be performed under a protective water layer to ensure that it is applied at an acceptable level of radiation
- Transport of radioactive materials and wastes will be performed with protective transport containers
- Personal dosimeter monitoring systems, including electronic dosimeters, to be used to determine the dose to be exposed to personnel during work on controlled access areas
- There will be signs indicating the exit routes for the evacuation of personnel in emergency situations on the corridor and stair walls of controlled access areas

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); 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 will be as follows:

- Radionuclide volumetric activity in lowest atmospheric layer, Bq/m³;
- Atmospheric radionuclide fallout density, Bq/m² per day;
- Surface radionuclide activity in soil, Bq/m²;
- Specific radionuclide activity in surface and drinking water, Bq/kg;
- Specific radionuclide activity in bottom sediments, Bq/kg;
- Specific (volumetric) radionuclide activity in food products, fodder and vegetation, Bq/kg (Bq/m³);
- Specific (volumetric) gross α and β -activity of samples, Bq/kg (Bq/m³);
- Ambient equivalent dose rate (μ Sv/h) and annual gamma-radiation dose on the ground (μ Sv)

According to the Regulation on Radiation Protection in Nuclear Facilities, the following activities should be performed by radiation protection officers who have the main responsibility to carry out the activities related to the radiation protection:

- To inform the radiation workers about the radiation protection program, to give the necessary training and to implement the program
- To check the health surveillance of the radiation workers
- To collect the data about the radiation doses of the outside workers
- To keep records of the visitors who enter the workplaces in the facility
- To make the personal dose assessments of radiation workers regularly and to take additional measures if necessary
- To keep the records of the personal monitoring of the category A workers and outside workers
- To take the necessary measures by taking into account the risks related to workplaces and inform the employees about the doses to be taken

- Taking measures related to the safety of radioactive sources
- To carry out workplace monitoring program, control radiation level and radioactive contamination in controlled areas and take preventive measures
- To determine the investigation levels and the methods to be followed if these levels are exceeded
- Carry out decontamination in case of radioactive contamination

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

- To collect information which is necessary for the implementation radiation protection measures from the managers and operators of other units of the NPP
- To carry out necessary inspection activities related to radiation protection in the facility
- To give written instructions for cases of violation of radiation safety requirements and corrective actions to be followed and to request reports that they have been carried out
- To inform NPP management about the sanctions to be applied to the employees who act against the requirements of radiation safety
- To terminate the use of equipment and other related activities and to inform the NPP management if they do not comply

with the requirements of the regulatory documents on radiation safety

- Suspend the authorization of staff that do not perform their duties in accordance with the requirements of the regulatory documents on radiation safety

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 and ALARA principle. The radiation protection program is to be a part of Final Safety Analysis Report (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 impact of the Sinop NPP is analysed and incorporated in the Sinop Site Report and EIA 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.

13 EMERGENCY PREPAREDNESS (ARTICLE 16)

13.1 EMERGENCY PLANS AND PROGRAMMES

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

- Presidential Decree on Organization of Affiliated, Related, Associated Institutions and Organizations with Ministries and Other Institutions and Organizations (2018),
- Regulation on National Implementation for Nuclear and Radiological Hazard Situations (2000),
- Regulation on Disaster and Emergency Management Centers (2011),
- Regulation on Tasks Regarding Chemical, Biological, Radiological and Nuclear Hazards (2012),
- Regulation on Disaster and Emergency Response Services (2013),
- National Disaster Response Plan (2014),
- National Radiation Emergency Plan,
- Draft Regulation on Management of the Nuclear and Radiological Emergencies.

13.1.1 NATIONAL COORDINATING AUTHORITY FOR EMERGENCY PREPAREDNESS AND RESPONSE

Disaster and Emergency Management Authority (AFAD) is the coordinating agency assigned for all kinds of disasters and emergencies at all levels including large scale nuclear and radiological emergencies. AFAD has its own Disaster and Emergency Management Center (DEMC) like all the stakeholders which have role in emergency response according to the related regulation. AFAD-DEMC is operated on a 24/7 basis.

All the responsible authorities take part in AFAD-DEMC, related to particular emergency when effective response, coordination and

collaboration in national level are required for management of emergencies.

Disaster and Emergency Advisory Board has been established in 2018 and the Board meetings are chaired by the President or the Vice-President of AFAD. It consists of the representative of following institutions and organizations: Ministry of Foreign Affairs, Ministry of Interior, Boğaziçi University Kandilli Observatory, Earthquake Research Institute, General Directorate of Mineral Research and Exploration, Turkey Scientific and Technological Research Council of Turkey, Turkey Red Crescent, and designated university lecturers.

The Board is responsible for protecting against disasters and emergencies, reducing the risks of disasters and emergencies, providing suggestions on the activities that will be carried out after disaster and emergencies, and determining the policies and priorities. The Council gathers at least twice a year. In case of need, the Council may hold extraordinary meetings upon the call of the President of AFAD

Provincial Disaster and Emergency Directorates, which are affiliated with AFAD, were established within the body of governorships in provinces. Their duties related to disaster and emergency management are;

- To determine disaster hazards and risks of the province (hazard assessment),
- To prepare and implement provincial disaster and emergency plans in collaboration and coordination with local administrations and public institutions and organizations,
- To manage provincial disaster and emergency management centers (Provincial-DEMC),

- To determine damages and losses suffered in the case of disasters and emergencies,
- To establish and manage warehouses for storing necessary search and rescue materials, food, tools, equipment and materials to be used for satisfying the needs of public for sheltering, nutrition and health services in cases of disasters and emergencies,
- To perform the duties related with mobilization and civil defence services in the province according to the relevant legislation,
- To manage services for determining, identifying and decontaminating chemical, biological, radiological and nuclear agents, and providing collaboration and coordination among relevant organizations.

13.1.2 NATIONAL REGULATORY BODY

The mission of the regulatory body (Nuclear Regulatory Authority) is to lead the way for ensuring that Turkey benefits from nuclear technology and to undertake regulatory and inspectorial activities.

Regulatory body is recognized as the “warning point” and the “competent authority” by the 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.

Nuclear Regulatory Authority will provide technical consultancy in case of major radiation emergencies within the AFAD-DEMCC within the new preparedness and response infrastructure which was established with the foundation of AFAD. In this new framework Nuclear Regulatory Authority is one of the support solution partners of the CBRN service group which has been established within the frame of National Disaster Response Plan (NDRP).

Environmental radiation monitoring system network (RESA) throughout the country was established 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 (Figure 7).

Atmospheric dispersion calculation capabilities are also present and studies for adaptation of the decision support system JRODOS to Turkey are in progress.



Figure 7 Measuring Stations of the National Radiation Monitoring Network

13.1.3 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 the National Disaster Response Plan (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. 28 service groups are designed in the NDRP for national level response. Each service group is dedicated to a specific service which may be required in case of emergency/disaster.

Based upon the Regulation on Disaster and Emergency Response Services and National Disaster Response Plan (Figure 8), National Radiation Emergency Plan (NREP) was prepared by regulatory body in collaboration with AFAD. The preparation process was carried out transparently and the comments of and inputs from the related stakeholders were taken into consideration. NREP is ratified by the Presidency of the Republic of Turkey on April 4, 2019.

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.

NREP is an event-type plan according to the National Disaster Response Plan. The roles of

ministries, institutions and service groups set forth in the legislation are elaborated in the plan.

The emergency command and control system and the transition of responsibilities during an emergency is specified in the NREP. The plan covers;

- Terminology specific to radiation emergencies,
- Legal bases,
- The ministries, institutions and service 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.

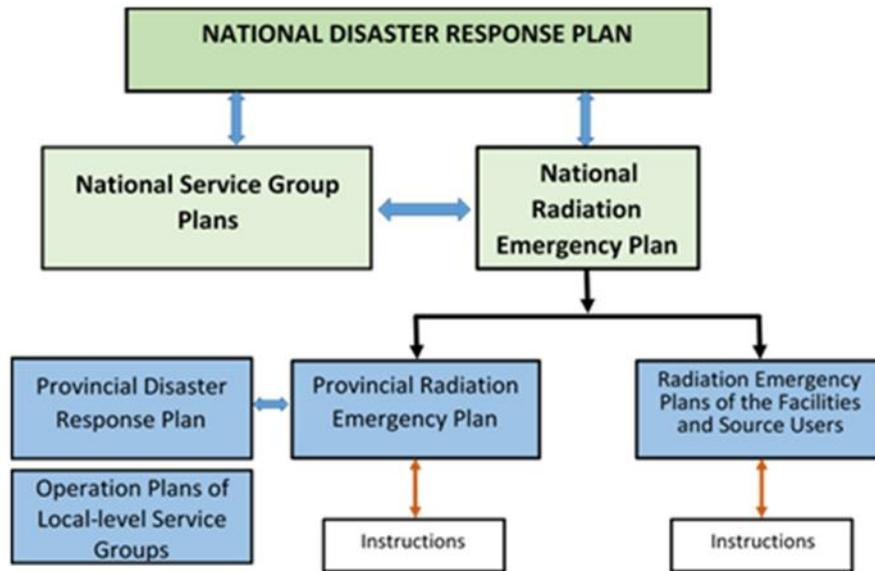


Figure 8 the National Emergency Planning Framework

13.1.4 CLASSIFICATION OF EMERGENCIES

The emergencies that may take place in NPPs shall be classified by the operating organization taking the Emergency Action Levels (EALs) into consideration. The EALs will be derived specific to each plant type by the license holders and reviewed by regulatory body.

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 (Emergency Action Levels), 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 EAL 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 suggests the following emergency classes related to possible off site consequences due to nuclear power plants:

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 Draft Regulation on Management of the Nuclear and Radiological Emergencies, within the scope of requesting technical support from off-site, important parameters of the NPP (safety parameters) will

be transferred to the regulatory body, off-site emergency management center and technical support resources outside the facility (such as supplier of nuclear installation). In case of emergency, the parameters to be transferred from the site must include at least the following headings:

- Significant reactor core parameters and primary and secondary cycle parameters
- Back-up water sources and emergency cooling system parameters
- Residual heat cooling system parameters
- Key containment parameters
- The most important electrical system parameters
- Information on the radiation situation in the facility and on-site
- Information on the radiation situation near the site
- Meteorological data

13.1.5 ON- AND OFF-SITE PLANS FOR AKKUYU NPP

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

According to the Draft Regulation on Management of the Nuclear and Radiological Emergencies the on-site emergency plan should generally include at least the following topics:

- Classification of the emergency and the identification of the underlying events and plant parameters when this classification is made
- Formation of on-site emergency response organization and determination of responsibilities
- Principles of response activities to be carried out on-site and preparations for response activities
- Arrangements for alarms, notifications and communication
- Emergency management and realization of the situation assessment
- Emergency worker's safety and protection from radiation
- Radiological monitoring to be carried out in the facility, on-site and near the site during emergency situations
- Information to be provided for off-site emergency response organization to inform the public about the emergency situation
- Centers and points to be used during emergency response, equipment and other additional units
- Termination of the emergency and remedial actions
- Implementation instructions of the emergency response organization

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.

After the on-site emergency plan is developed it shall be submitted to regulatory body for review and approval prior to the fuel loading to

the first reactor at the site. Regulatory body will evaluate the on-site plan and consistency of on-site plan with the off-site plan according to the related regulations. The full-scale exercise for each NPP should be conducted before the fuel loading and pre-operational tests.

The 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 site are evaluated in Sinop Site Report being a part of the assessment for site suitability. The detailed on-site and off-site plans for emergency conditions will be prepared in accordance with the Turkish and International requirements and the Emergency Plan of Sinop NPP will be submitted with FSAR before fuel loading.

13.1.6 THE EMERGENCY MANAGEMENT FACILITIES AND LOCATIONS

The emergency facilities and locations suggested by the IAEA and related provisions are adopted in the NREP. The Akkuyu Nuclear JSC and regulatory body have reached a common understanding regarding the on- and off-site emergency facilities and locations. The off-site center (Provincial Disaster and Emergency Management Center) is planned to be established as a township disaster and emergency management center and integrated to the national framework.

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

According to the Draft Regulation on Management of the Nuclear and Radiological Emergencies the on-site emergency facilities should be built-up to satisfy the following requirements and to perform the following functions:

- To support the management and control arrangements that allow the fulfilment of the emergency management functions needed to control and mitigate the foreseen accident conditions
- To be operable during the whole response period during emergencies
- To be operable in case the infrastructure is damaged
- To ensure the radiological monitoring of the personnel entering the center
- To ensure the contamination control within the center
- To ensure communication with off-site centers in case of damage to infrastructure or overload of communication lines
- To be protected against earthquakes and other natural hazards
- To ensure the road transport in emergency conditions
- To meet the humanitarian needs if the center is isolated from the environment for a long time during emergency
- To ensure the protection of the workers from the center for the radiological and other dangerous conditions foreseen in the emergency situation
- To provide the required data close to real time from reliable information sources
- To have access to design and safety analysis information

- To be able to move to a back-up center located off-site depending on the radiological and other conditions

13.2 INFORMATION TO THE PUBLIC AND NEIGHBOURING STATES

Turkey 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. Regulatory body is recognized as the competent authority for communication with IAEA.

Turkey 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 radiological monitoring results acquired from the RESA stations are published on publicly available website and shared with the European countries via European Radiological Data Exchange Platform.

Due to the fact that the Armenian NPP is close to the eastern border of Turkey, 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.

A full-scope exercise with the participation of national and local authorities was performed in Iğdır province which is the closest city to a NPP located in a neighboring country in June 2019.

13.3 EMERGENCY PREPAREDNESS FOR CONTRACTING PARTIES WITHOUT NUCLEAR INSTALLATIONS

The governorship of Iğdır province which is the closest city to a NPP located in a neighbouring country is being supported by regulatory body and AFAD for ensuring necessary preparedness. The template for provincial radiation emergency plan for Iğdır province was prepared by Iğdır governorship in

collaboration with regulatory body 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 has been performed and the exercise was conducted in June 2019.

14 SITING (ARTICLE 17)

14.1 EVALUATION OF SITE RELATED FACTORS

14.1.1 SITE SELECTION AND RANKING METHODOLOGY

The site selection methodology in Turkey 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 region characteristics may play a certain role to determine the area(s). For instance, Turkey is a country having active seismic zones. Therefore, the earthquake is the main factor in the selection of NPP sites. Thus, if the probable site is on a seismically active region, those areas on that region shall not be considered. According to

regulations; nuclear power plants shall not be located on sites directly situated on active faults. No airport shall be located within an area of 10 km radius centred at the installation. No take-off, landing or holding airspaces shall be located over the same area. No air traffic corridor shall pass over an area of 5 km radius centred at the installation. Ground motion level under free soil surface acceleration can not be used no less than 0.15 g. All events identified as design basis external events (DBEE), should be examined and analysed in detail and their parameters which will be based in the design of the plant should be definitely established. Despite the reduction of the intensity and probability of the events, use of engineering safety features in the design and strengthening of the plant structures, 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 not enough 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 9. According to the Regulation on Environmental Impact Assessment, owner of the Project has to prepare and submit to the Ministry of Environment and Urbanization (ÇŞB) an Environmental Impact Assessment report (EIA) at the planning stage. The environmental aspects of the proposed installation which cover alternative sites are evaluated by this Ministry.

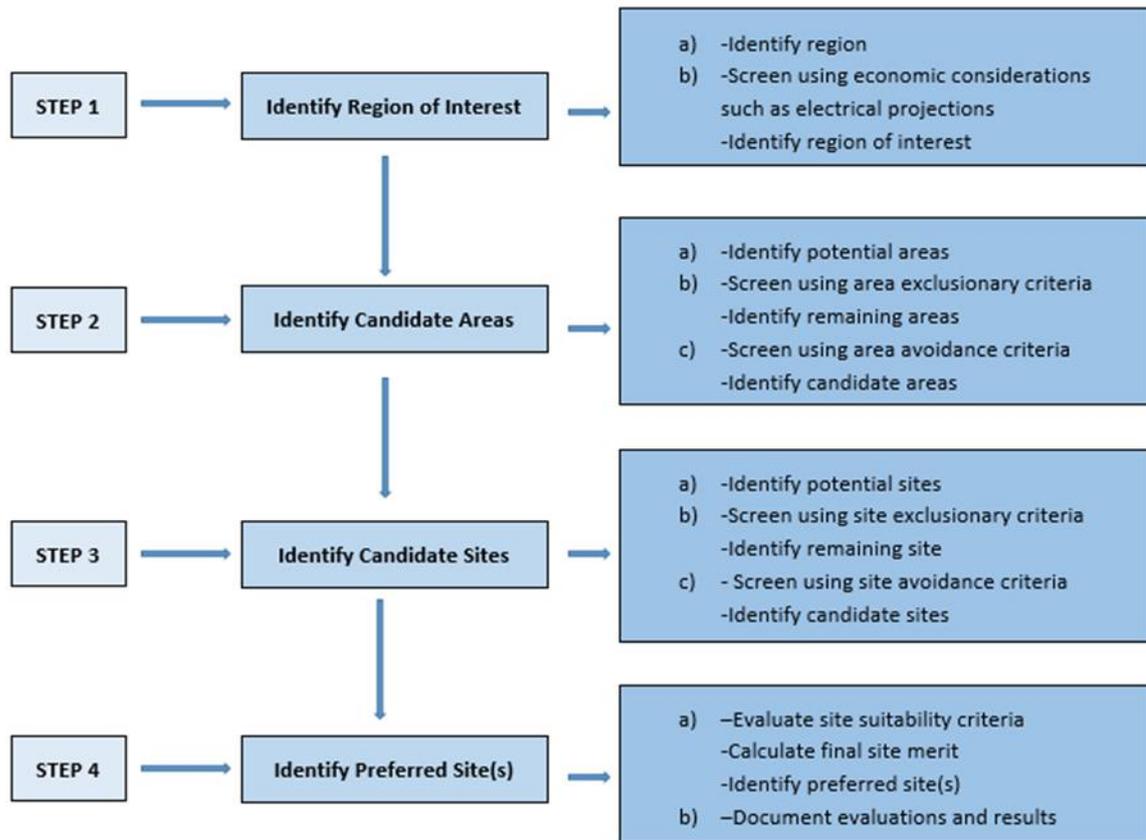


Figure 9 Basic Methodology for the Siting

14.1.2 REGULATIONS ON SITE STAGES

Licensing decree has a main role for licensing of NPPs as it defines all licensing stages and the application sequence. In addition 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” require that the site of a nuclear installation is determined by taking into account the effect of the site to the NPP, the effect of the NPP 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”. In this Regulation the fundamental issues are based on IAEA Safety Requirement NS-R-3. Guideline on Format & Content of NPP Site

Report provides guidance for developing the site report.

14.1.3 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 Pertaining to Issue of Licences for 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. According to tentative schedule, period up to site license application is two years. 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, this period is approximately six months.

Review and assessment is conducted by Site Group in DNI. Technical support is taken generally from universities as Consultants and IAEA Missions as an independent review. After all reports taken, 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 site license. ÇŞB 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, in order to inform people of the investment and to obtain their views and suggestions. 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.

14.1.4 NPP SITES

Turkey has two identified NPP sites. One is Akkuyu and the other is Sinop. Locations of both sites can be seen in Figure 10.



Figure 10 NPP Site Locations

14.1.4.1 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 updated site report 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 7th, 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 Updated Site Report 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, Advisory Committee on Nuclear Safety of TAEK and IAEA and positive decision for USR was given in December 2013. Site Parameters Report (SPR) submitted in November 2014. The Updated SPR (Rev 4) was approved in February 2017.

Within the framework 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 substation. Design 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 was included in the Updated Site Report. 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). The principle of a “dry site” will be used for protection from coastal flooding as recommended in IAEA Safety Guide SSG-18. The methods used were reported in the Updated Site Report. 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 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 Updated Site Report. 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 ÇŞB in 2011. On the basis of this Dossier, the ÇŞB selected a panel of experts who prepared a detailed Table of Contents (TOC) for the EIA Report. This TOC 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 ÇŞB 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 Turkey 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 11.

- 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 Turkey 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.

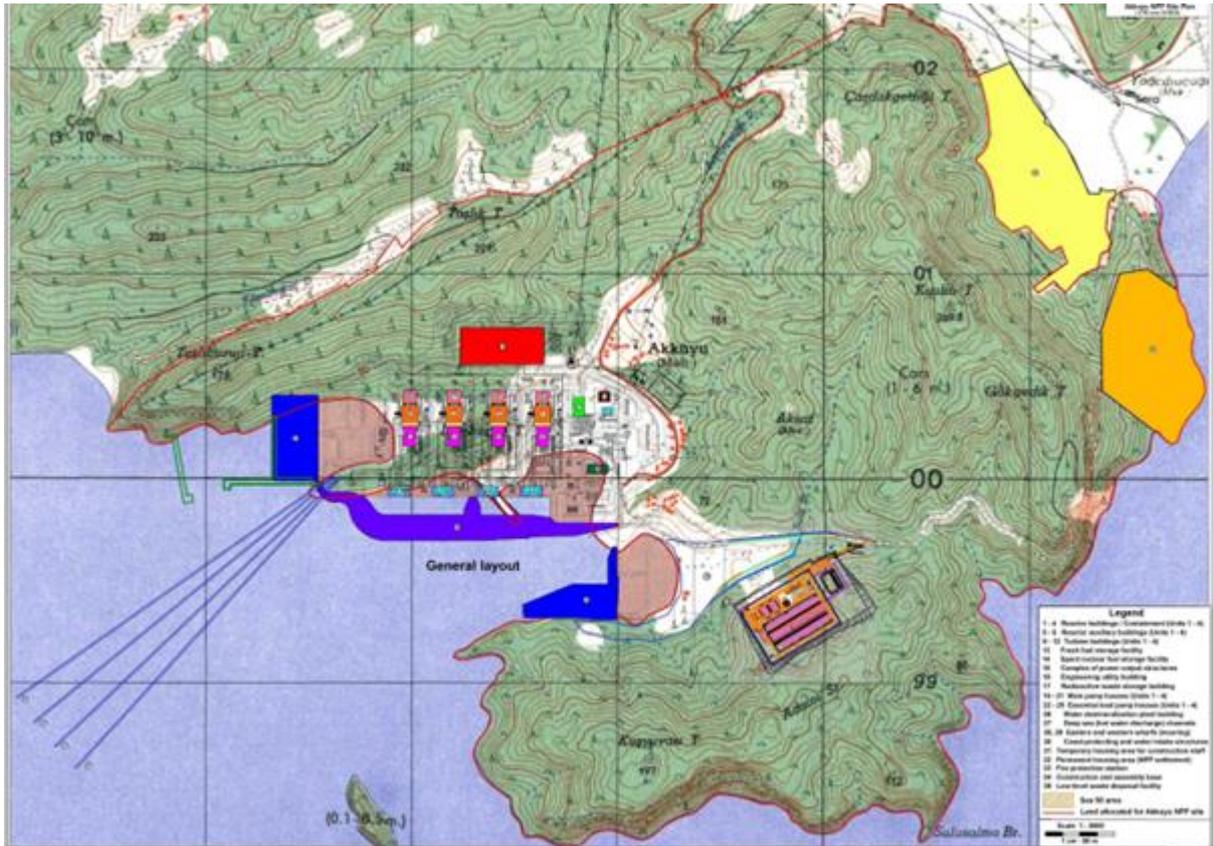


Figure 11 Layout of Akkuyu NPP Site

Considering these investigations, review and assessment of Site Parameters Report was carried out. As it may be seen above, site characterisation 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 use the IAEA support in reviewing 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.

14.1.4.2 SINOP SITE

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 by Turkish Electricity Generation Company (EÜAŞ) to TAEK and EÜAŞ was recognised as an owner of Sinop NPP in August 2012.

An Inter-Governmental Agreement (IGA) has been signed between Turkey and Japan on the 3rd May 2013 for the construction of four units of ATMEA1 Reactor (1100 MWe per reactor).

A collective work will be performed related to site issues by a project company which will be established after the Host Governmental Agreement. Until this time a consortium of project sponsor companies will perform site feasibility works.

With the owner EÜAŞ; the project sponsors Mitsubishi Heavy Industries, ITOCHU Corporation and ENGIE are the parties of the

Sinop Nuclear Power Plant consortium partners.

At this stage of the project, the project sponsors are evaluating the suitability of the site and the viability of the project.

Regulatory review and control activities have been carried out by informative meetings and site inspections during this stage. As mentioned in GSR Part 1-R 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.

Site characterization phase is in progress. Details for determining site properties, in scope of the works about site licensing by EÜAŞ is given below:

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

JAPC (Japanese Atomic Project Company) and Dokuz Eylül University (İzmir/Turkey) 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 (Japanese Atomic Project Company) have 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)

Senior Seismic Hazard Committee (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 Sinop Site Report was commenced in 2017 and planned to be submitted to NDK in 2019. 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. The results of this study will be the site parameters that constitute the bases of the plant design. According to the current TAEK/NDK regulations, Sinop Site Parameters Report 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.

14.2 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 pathways 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.

ÇŞB 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 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),

- Chemical impact, due to usage of chemicals in plant process, cleaning and water treatment systems, prevention of biogrowth 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.

14.2.1 AKKUYU NPP SITE

Within the Updated Site Report and Site Parameters Report 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.

14.2.2 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 Environmental Impact Assessment (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 Ministry of Environment and Urbanization (ÇŞB) on December 27, 2017. The Public participation meeting was held on February 06, 2018 in Sinop. ÇŞB has established Examining & Evaluation Commission of 40 members (composed of related public institutions, universities) and the standardized special format of EIA report for Sinop NPP Project was provided to EÜAŞ International ICC on March 19, 2018. The EIA Report is planned to be submitted to ÇŞB in 2019 to get EIA Positive Decision.

14.3 CONSULTATION WITH OTHER CONTRACTING PARTIES LIKELY TO BE AFFECTED BY INSTALLATION

Turkey'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,

Turkey signed and/or approved international agreements and conventions.

Four bilateral agreements for Early Notification of Nuclear Accidents are in force between Turkey 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 European Nuclear Safety Regulators Group (ENSREG) to review and improve the nuclear facilities of the European Union 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 European Commission to allow participation of neighbouring countries to the stress tests. Turkey is among the countries that signed the Joint Declaration on comprehensive risk and safety assessments of nuclear plants, also called stress tests and observes these studies and supports the decisions reached by consensus. As an outcome of the Joint Declaration, TAEK, former regulatory body of Turkey 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.

15 DESIGN AND CONSTRUCTION (ARTICLE 18)

15.1 IMPLEMENTATION OF DEFENCE IN DEPTH

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 construction issues for nuclear power plants.

“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.

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”. The Regulation also mentions the use of proven technologies in design.

Another arrangement 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.

Flamanville-3 plant in France is approved as the reference plant for Sinop NPP by regulatory body.

15.2 INCORPORATION OF PROVEN TECHNOLOGIES

The TAEK “Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008” and Russian safety rules require 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.

15.3 DESIGN FOR RELIABLE, STABLE AND MANAGEABLE OPERATION

“Regulation on Design Principles for Safety of Nuclear Power Plants, 2008” and Russian safety rules provide requirements on the management of technological processes. To ensure reliable, stable and manageable operation, technical design of the reference NPP includes the required measures.

Akkuyu NPP design has been reviewed and assessed mainly based on these regulations, in addition to IAEA safety requirements and VDNS principles. In addition to review and assessment performed by TAEK, and NDK experts after July 2018, the design has been reviewed by the UJV Rez a.s. of Check Republic

and TÜV SÜD of Germany with respect to these regulations and IAEA safety requirements.

Additional attention was given to principles of VDNS during the review and assessment of plant layout and design to ensure that the design includes necessary provisions for preventing accidents, and should they occur mitigating the possible releases and avoiding early large releases.

Main measures taken in the design to address such issues are passive heat removal systems, hydro-accumulators with extended capacity, and core catcher. Some further measure are still under investigation to enhance safe operation of the plant.

16 OPERATION (ARTICLE 19)

Safety aspects of commissioning and operation of nuclear power plants are handled in "Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008". Commissioning of an NPP requires permit from regulatory body as it was stated in the "Decree on Licensing of Nuclear Installations, 1983". Details of requirements are laid out in the "Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008". According to the "Decree on Licensing of Nuclear Installations, 1983" any changes to operational limits and conditions are subject to approval of regulatory body.

The "Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008" states that the installation is to be operated according to approved hierarchical procedures which need to be updated regularly. Regulatory requirements for operation, maintenance, inspection and testing of a nuclear installation are also specified in this regulation. The activities are performed in the framework of a program, which is supported by a Quality Management System and subject to approval of regulatory body.

On the other hand, principles and rules of conduct for operational procedures, their implementation, periodic review, modification, approval and documentation are stated in the "Regulation on Basic Requirements on Quality Management for the Safety of Nuclear Installations, 2007".

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 throughout the lifetime of the plant.

The continuing safe operation of a nuclear power 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.

Abnormal events, which include incidents significant to safety, are notified to regulatory body according to the "Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008". A draft regulation is planned for notification and reporting procedures for NPP.

The "Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008" requires the operator to have a technical team for necessary engineering and technical support during modifications, repairs and special tests to assist itself for safe operation. This regulation also requires the operator to compile and analyse the operational experience and share and make use of the lessons-learned within the framework of a program.

Safe management of radioactive waste has been addressed as a requirement in the "Regulation on Radioactive Waste Management", putting an emphasis on keeping the radioactivity and volume of waste produced as low as reasonably achievable within the framework of a program. For on-site spent nuclear fuel storage, provisions of "Regulation on Design Principles for Safety of Nuclear Power Plants, 2008" will be applied.

17 REFERENCES

- [1] Akkuyu Site License, 1976.
- [2] Determination of Candidate Sites for NPP, Ankara, 2005 (unpublished)
- [3] Guide on Format and Content of Site Report for Nuclear Power Plants, 2009
- [4] Republic of Turkey, National Report for the Convention on Nuclear Safety, Report No:5, September 2010
- [5] Agreement between the Government of the Russian Federation and the Government of the Republic of Turkey on cooperation in the construction and operation of NPP at the Akkuyu Site, 2010.
- [6] Republic of Turkey, National Report for the Second Extraordinary Meeting of Convention on Nuclear Safety, May 2011
- [7] Akkuyu Updated Site Report (Rev 0), 2012.
- [8] Akkuyu Updated Site Report (Revision 1) March 2013.
- [9] Republic of Turkey, National Report for the Convention on Nuclear Safety, Report No:6, August 2013
- [10] Regulation on Environmental Impact Assessment, Official Gazette No: 29186, November 2014
- [11] Republic of Turkey, National Report for the Convention on Nuclear Safety, Report No:7, August 2016
- [12] Akkuyu NPP Stress Tests Report, Worley Parsons Energy Services JSC, 2018
- [13] Guidelines Regarding National Reports under the Convention on Nuclear Safety (INFCIRC/572/Rev.6), 2018
- [14] Supporting Information to the Turkish National Report on Convention on Nuclear Safety, Akkuyu NPP Electricity Generation Joint-Stock Company, 2018

Multilateral Conventions, Treaties and Bilateral Agreements of Turkey

1. Paris Convention on Third Party Liability in the Field of Nuclear Energy (July 29th, 1960), 1961
 - a. Protocol to Amend the Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960 (January 28th, 1964), 1967
 - b. Protocol to Amend the Convention on Third Party Liability in the Field of Nuclear Energy of July 29th, 1960, as Amended by the Additional Protocol of January 28th, 1964 (November 16th, 1982), 1984
2. Treaty on the Non Proliferation of Nuclear Weapons (NPT), 1979
3. Agreement Between the Government of the Republic of Turkey and the IAEA for the Application of Safeguards in Connection with NPT, 1981
 - a. Protocol Additional to the Agreement Between the Government of the Republic of Turkey and the IAEA for the Application of Safeguards in Connection with NPT, 2001
4. Convention on the Physical Protection of Nuclear Material, 1986
5. Convention on Early Notification of a Nuclear Accident, 1990
6. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, 1990
7. Convention on Nuclear Safety, 1994
8. Comprehensive Test Ban Treaty, 1999
9. Agreement Between the Government of Canada and the Government of the Republic of Turkey for Co-operation in the Peaceful Uses of Nuclear Energy, 1986
10. Agreement Between the Government of the Republic of Turkey and the Government of Argentine Republic for Co-operation in the Peaceful Uses of Nuclear Energy, 1992
11. Agreement Between the Government of the Republic of Turkey and the Government of the Republic of Bulgaria on Early Notification of a Nuclear Accident and on Exchange of Information on Nuclear Facilities, 1997
12. Agreement Between the Government of Korea and the Government of the Republic of Turkey for Co-operation in the Peaceful Uses of Nuclear Energy, 1999
13. Agreement Between the Government of the Republic of Turkey and the Cabinet of Ministers of Ukraine on Early Notification of a Nuclear Accident and Exchange of Information on Nuclear Facilities, 2001
14. Agreement Between the Government of French Republic and the Government of the Republic of Turkey for Co-operation in the Peaceful Uses of Nuclear Energy, 2004
15. Agreement for Cooperation Between the Republic of Turkey and the United States of America Concerning Peaceful Uses of Nuclear Energy, 2006

16. Memorandum of Understanding for Technical Cooperation and Exchange of Information in Nuclear Regulatory Matters Between Turkish Atomic Energy Authority and the State Nuclear Regulatory Committee of Ukraine, 2008
17. Agreement Between the Government of the Republic of Turkey and the Government of Romania on Early Notification of a Nuclear Accident, 2008
18. Agreement Between the Government of the Republic of Turkey and the Government of the Russian Federation for Cooperation in the Use of Nuclear Energy for Peaceful Purposes, 2009
19. Agreement Between the Government of the Republic of Turkey and the Government of the Russian Federation on Early Notification of a Nuclear Accident and Exchange of Information on Nuclear Facilities, 2009
20. Agreement Between the Turkish Atomic Energy Authority (the Republic of Turkey) and the Federal Environmental, Industrial and Nuclear Supervision Service (the Russian Federation) for Cooperation in the Field of Nuclear Licensing and Supervision, 2010
21. Agreement Between the Turkish Atomic Energy Authority and the United States Nuclear Regulatory Commission for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters, 2012
22. Arrangement Between Turkish Atomic Energy Authority and The National Nuclear Safety Administration of The People's Republic of China in the Field of Nuclear Safety, 2016
23. Arrangement between the Turkish Atomic Energy Authority and the United States Nuclear Regulatory Commission for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters, 2017

Laws, Decrees, Regulations and Guides Concerning the Safety of Nuclear Installations

Laws

1. “Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Certain Laws”, Decree-Law No. 702, 2018
2. “Decree-Law on Amendments to Certain Laws and Decree Laws for Adaptation to the Amendments to the Constitution” of 9 July 2018, Decree-Law No.703, 2018
3. “Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations”, Presidential Decree No:4, 2018

Decrees

1. Decree on Licensing of Nuclear Installations, 1983 (obsolete)
2. Decree on Radiation Safety, 1985 (obsolete)

Regulations

1. Regulation on Radiation Safety, 2000
2. Regulation on Nuclear and Radiological National Emergency Preparedness, 2000
3. Regulation on Safe Transport of Radioactive Material, 2005
4. Regulation on Basic Requirements on Quality Management for the Safety of Nuclear Installations, 2007
5. Regulation on Nuclear Safety Inspections and Enforcement, 2007
6. Regulation on Issuing Document Base to Export Permission for Nuclear and Nuclear Dual Use Items, 2007
7. Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008
8. Regulation on Design Principles for Safety of Nuclear Power Plants, 2008
9. Regulation on Site of a Nuclear Power Plant, 2009
10. Regulation on Protection of Outside Workers in Controlled Areas from the Risks of Ionizing Radiation, 2011
11. Regulation on Physical Protection of Nuclear Materials and Nuclear Facilities, 2012
12. Regulation on Nuclear Material Accounting and Control, 2012
13. Regulation on Radioactive Waste Management, 2013
14. Regulation on Clearance in Nuclear Facilities and Release of Site from Regulatory Control, 2013.
15. Regulation Regarding Equipment Procurement Process and Approval of Manufacturers for Nuclear Facilities, 2015
16. Regulation on Management System in Nuclear Installations, 2017
17. Regulation on Construction Inspection of Nuclear Power Plants, 2017

18. Regulation on Operating Organization, Operating Personnel Qualification and Education and Licensing of Operators in Nuclear Power Plants, 2017
19. Regulation on Official Duties Related to Chemical, Biological, Radiological and Nuclear Hazards, 2012
20. Regulation on Disaster and Emergency Response Services, 2013
21. Regulation on Radiation Protection in Nuclear Facilities, 2018
22. Regulation on Working Procedures and Principles of Nuclear Regulatory Board, 2019
23. Regulation on Organisation of Nuclear Regulatory Authority, 2019

Documents and Guides

1. A Guide on Format and Content of Site Report for Nuclear Power Plants, 2009
2. A Guide on Specific Design Principles, 2012
3. Directive on Determination of Licensing Basis Regulations, Guides and Standards and Reference Plant for Nuclear Power Plants, 2012
4. A Guide on Owner and Authorization Application for Nuclear Installations, 2014
5. Guide on the Construction Activities in Nuclear Installations that are Authorized as per the Authorization Stages, 2016



NUCLEAR REGULATORY AUTHORITY