REPUBLIC OF TÜRKİYE

JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Turkish National Report for the Eighth Review Meeting

August 2024

NDK
NUCLEAR REGULATORY AUTHORITY

JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

NUCLEAR REGULATORY AUTHORITY

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LIST OF ACRONYMS

AEC	Atomic Energy Commission
AFAD	Ministry of Interior, Disaster and Emergency Management Presidency
Akkuyu NPP	Akkuyu Nuclear Power Plant
Akkuyu Nuclear JSC	Akkuyu Nuclear Power Plant Electricity Generation Joint-Stock Company
ALARA	As Low as Reasonably Achievable
DBL	Regulatory Documents List
DDF	Deep Disposal Facility
DL No. 702	Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Various Laws No. 702
EARMS	Environmental Automated Radiological Monitoring System
EC	European Commission
EIA	Environmental Impact Assessment
ENSREG	European Nuclear Safety Regulators Group
EPC	Emergency Preparedness Categories
EPREV	Emergency Preparedness Review
ERML	Environment Radiation Monitoring Laboratory
ETKB	Ministry of Energy and Natural Resources
EU	European Union
GRW	Gaseous Radioactive Waste
HEU	High Enriched Uranium
HLW	High Level Radioactive Waste
HYK	The Accounts Management Board
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IGA	Agreement Between the Government of the Republic of Türkiye and the Government of the Russian Federation on Cooperation in Relation to the Construction and Operation of an NPP at the Akkuyu Site, May 12, 2010
INIR	Integrated Nuclear Infrastructure Review
INSC	Instrument for International Nuclear Safety Cooperation
IPPAS	International Physical Protection Advisory Service
IRRS	Integrated Regulatory Review Service
ISSAS	International SSAC Advisory Service
İTÜ	İstanbul Technical University
İTÜ TM-II	İstanbul Technical University TRIGA MARK-II Training and Research Reactor
Joint Convention	The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
Law No. 7381	Nuclear Regulatory Law No. 7381
LEU	Low Enriched Uranium
LIL	Low and Intermediate Level
LRW	Liquid Radioactive Waste
MEB	The Ministry of National Education
NDK	Nuclear Regulatory Authority

NEUPGM	General Directorate of Nuclear Energy and International Projects
NORM	Naturally Occurring Radioactive Material
NPP	Nuclear Power Plant
NRWMP	National Radioactive Waste Management Plan
NSDF	Near Surface Disposal Facility
NÜTED A.Ş.	Nuclear Technical Support Joint Stock Company
OECD/NEA	Organization for Economic Co-operation and Development/Nuclear Energy Agency
OLC	Operational Limits and Conditions
PD No. 1	Presidential Decree on the Organization of Presidency, Presidential Decree No. 1
PD No. 4	Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations No. 4
PD No. 95	Presidential Decree on the Organization and Duties of the Nuclear Regulatory Authority No. 95
PPA	Power Purchase Agreement
PPM	Public Participation Meeting
RADİSA	The Radiation Monitoring and Warning System Network
SAR	Safety Analysis Report
SEED	Site and External Events Design Review Service
SF	Spent Fuel
Sinop NPP	Sinop Nuclear Power Plant
SRW	Solid Radioactive Waste
TAMP	National Disaster Response Plan
TBMM	Grand National Assembly of Türkiye
TENMAK	Turkish Energy, Nuclear, and Mineral Research Agency
TENORM	Technologically Enhanced Naturally Occurring Radioactive Material
TLD	Thermoluminescent Dosimeter
TR-1	TR-1 Research Reactor
TRIGA	Training Research Isotope Production General Atomic
TSE	Turkish Standards Institution
TSO	Technical Support Organization
TÜNAŞ	Türkiye Nuclear Energy Company
URAP	National Radiation Emergency Plan
USA	United States of America
VLL	Very Low-Level
VSL	Very Short-Lived
YLSY	The MEB Selection and Placement of Candidates Sent Abroad for Postgraduate Education

MAIN DEFINITIONS

Authorized person: a natural or legal person who has been granted license, permit, or certificate by the NDK for the conduction of an activity within the scope of Law No. 7381.

Clearance: Removal of radioactive material from regulatory control as a result of its radioactivity being below or falling below the clearance limits.

Clearance limits: The values determined by the NDK for the clearance of radioactive materials, in terms of dose, activity concentration, and radioactive contamination levels.

Closure: A set of activities, including final engineering works or also other works that will make the disposal facility safe in the long term, aimed at closing the facility so that radioactive wastes cannot be accessed after operational activities are completed.

Decommissioning: The set of activities aimed at removing all or a part of a facility from regulatory control with the decision not to operate them again.

Disposal: The final storage of radioactive waste with no intention of retrieval.

Disposal facility: The facility where radioactive waste is disposed of without the intention of retrieval.

Facility: A nuclear facility, radiation facility, or radioactive waste facility.

Nuclear facility: A facility to be established or being operated for the purpose of extracting, producing, processing, using, possessing, reprocessing, or storing nuclear material.

Orphan radioactive material: Radioactive material determined by NDK either as it has never been under regulatory control due to any reason or as it has been out of regulatory control due to reasons such as abandonment, theft, loss, or transfer without proper authorization.

Radioactive contamination: The undesired accumulation of radioactive materials in the environment, within the body, or on the surface of any material.

Radioactive material: Isotopes or material containing isotopes whose nuclei emit radiation by spontaneous decay, including also nuclear material, radioactive sources, and radioactive wastes.

Radioactive source: Unsealed or sealed sources produced using their radioactive material content in order to be used for radiation applications.

Radioactive waste: Radioactive materials for which no further use is foreseen and which have radioactivity above the clearance and release limits determined by the NDK, including contaminated materials.

Radioactive waste facility: A facility where radioactive waste is processed, stored, or disposed of.

Radioactive waste management: Administrative and technical activities regarding the collection, handling, processing, on-site transportation, storage, or disposal of radioactive waste.

Radioactive waste package: Total of radioactive waste resulting from conditioning, its container, and the labeling.

Release: The planned and controlled discharge of radioactive material in gaseous and liquid form, whose radioactivity or activity concentration does not exceed the release limits, into the atmosphere, surface or groundwater, or sewerage.

Release limits: Values in terms of radioactivity or activity concentration determined by the NDK for the release of radioactive gases or liquids into the environment during normal operation of facilities and, during the conduct of radiation applications or other activities.

Spent fuel: Irradiated fuel that has been removed from the reactor and cannot be used as fuel again in its current form.

SECTION A INTRODUCTION

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) was adopted on September 5, 1997, during the Vienna Diplomatic Conference. The Joint Convention officially entered into force on May 21, 2023 in Türkiye to ensure spent fuel and radioactive waste management in a safe, secure and sustainable manner in accordance with internationally recognized principles and good practices related to nuclear and radiation safety. After the ratification of the Joint Convention and officially becoming a Contracting Party, Türkiye presents its first national report, in accordance with the provisions set out in Article 32 of the Joint Convention, for the 8th Review Meeting of the Joint Convention to be held in March 2025. This national report describes the legislative, regulatory, and administrative measures, along with additional initiatives, undertaken by Türkiye to fulfil its commitments as a Contracting Party to the Joint Convention.

Türkiye's plans for three nuclear power plant (NPP) projects include the ongoing construction of the Akkuyu NPP Project, a granted site approval for Sinop NPP Project, and ongoing preliminary site selection studies for the third one. The Akkuyu NPP project, Türkiye's first step into nuclear power generation, consists of four units of VVER-1200 reactors. The first unit of Akkuyu NPP was granted a commissioning permit on December 12, 2023 and the construction of other three units is ongoing. The other ongoing nuclear power project is the Sinop NPP, which received site approval on April 3, 2024.

In 1962, Türkiye's first research reactor, TR-1, was commissioned with 1 MW power for research and production of isotopes for industrial and medical purposes in İstanbul. It was operational from 1962 to 1977 and has since been dismantled. The second research reactor of Türkiye is the Turkish Energy, Nuclear and Mineral Research Agency (TENMAK) TR-2 Research Reactor (TENMAK TR-2) with 5 MW power which is located at the TENMAK Küçükçekmece Campus. The third research reactor of Türkiye is the İstanbul Technical University TRIGA MARK-II Training and Research Reactor (İTÜ TM-II), situated at İstanbul Technical University (İTÜ) Ayazağa Campus with 250 kW power. It is operational since 1979 and supports a wide range of academic and research activities. These reactors have played and are still playing a vital role in nuclear research and training, contributing to advancements in reactor technology, material science, and nuclear medicine, and ensuring the country's alignment with international standards in nuclear research and safety.

Moreover, the TENMAK Radioactive Waste Processing and Storage Facility (TENMAK RWPSF) was established in 1986 in İstanbul and has a crucial role for the management of radioactive waste in Türkiye. This facility is designed for the processing and storage of very low level (VLL) radioactive waste and low and intermediate level (LIL) radioactive waste resulting from activities conducted in the country. Türkiye has initiated efforts to establish a near surface disposal facility (NSDF) to meet the disposal needs expected in the meantime, especially with the start of the nuclear power programme. The NSDF Project is in the site selection stage.

Additionally, a rare earth mining and thorium storage project is being planned in Eskişehir. The Eskişehir-Beylikova Complex Ore (Barite, Fluorite, Rare Earth Elements, Thorium) Quarry, Ore Preparation and Enrichment and Storage Facility received an affirmative environmental impact assessment (EIA) decision in 2020, marking a significant step in the

development of the rare earth mining and thorium storage project. Nuclear Regulatory Authority (NDK) granted a limited work permit and construction license to the facility in January 2023.

The historical development of nuclear regulatory bodies in Türkiye has seen significant changes since the establishment of the Atomic Energy Commission (AEC) in 1956 under Law No. 6821. In 1982, Law No. 2690 reorganized the AEC into the Turkish Atomic Energy Authority (TAEK). TAEK was tasked with regulating and promoting the peaceful use of nuclear energy, ensuring nuclear safety and security, and overseeing radiation protection. In 2018, the Turkish government restructured the nuclear regulatory framework. NDK was established as an independent regulatory body under Decree-Law on Organization and Duties of Nuclear Regulatory Authority and Amendments to Various Laws No. 702 (DL No. 702) and took over the regulatory functions of TAEK. Following the establishment of NDK, TAEK's role was redefined and it continued to focus on research, development, and promotion of nuclear technology.

Recognizing the critical importance of managing radioactive waste and spent fuel for Türkiye, the process of acceding to the Joint Convention is successfully completed. This significant step underscores Türkiye's commitment to upholding the highest standards of safety in these areas. As part of this process, the Turkish National Report for the Eighth Review Meeting has been prepared.

This report is structured in accordance with the "Guidelines regarding the Form and Structure of National Reports, INFCIRC/604/Rev.4" and the outcomes of the Fifth Extraordinary Meeting of the Joint Convention held in March 2024. Each article of the Joint Convention is addressed in a distinct section, with the relevant article referenced at the beginning of each section.

- Section B: Policy and practices regarding spent fuel and radioactive waste (Article 32)
- Section C: Scope of application (Article 3)
- Section D: The inventories of spent fuel and radioactive waste and the list of facilities (Article 32)
- Section E: The legislative and regulatory system in force (Articles 18 to 20)
- Section F: The general safety provisions (Articles 21 to 26)
- Section G: The safety of spent fuel management (Articles 4 to 10)
- Section H: The safety of radioactive waste management (Articles 11 to 17)
- Section I: Transboundary movements (Article 27)
- Section J: Disused sealed sources (Article 28)
- Section K: General efforts to improve safety
- Section L: Annexes to the report (the list of spent fuel management facilities, the list of radioactive waste management facilities, the inventory of radioactive waste, the reference to national law, regulations, requirements and guides, the reference to international agreements and review missions and the past practices)

Some terms defined in the Turkish legislative system regarding the management of spent fuel and radioactive waste are presented in “main definitions” section for purpose of clarity.

As agreed upon by the contracting parties at the Fifth Extraordinary Meeting of the Joint Convention, the overview matrix is presented in Table 1 and the challenges, areas of good performance, and proposed good practices are presented in Section K.

This national report was developed by NDK, with the cooperation of the following concerned parties:

1. Ministry of Energy and Natural Resources (ETKB)
2. TENMAK
3. Ministry of Interior, Disaster and Emergency Management Presidency (AFAD)
4. İTÜ
5. Türkiye Nuclear Energy Company (TÜNAŞ)
6. Akkuyu Nuclear Power Plant Electricity Generation Joint-Stock Company (Akkuyu Nuclear JSC)

Table 1 *Overview matrix*

Type of Liability	Long-Term Management Policy	Funding of Liabilities	Current Practice/ Facilities	Planned Facilities
Spent Fuel	For NPPs: - preferred alternative – direct disposal in planned Deep Disposal Facility (DDF) but reprocessing is not excluded For research reactors: - return to country of origin or disposal in planned DDF	radioactive waste management special account (guarantee, if special account is not sufficient)	- Unit 1 of Akkuyu NPP is in commissioning (no SF) - TENMAK TR-2 is in extended-shutdown (no SF, all SF returned to the United States of America (USA)) - İTÜ TM-II (in operation, no SF) - TR-1 (decommissioned, no SF, all SF returned to the USA)	DDF
Nuclear Fuel Cycle Wastes	Disposal in planned NSDF or DDF	radioactive waste management special account (guarantee, if special account is not sufficient)	Storage in TENMAK RWPSF	NSDF and DDF
Application Wastes	Disposal in planned NSDF or DDF	radioactive waste management special account (guarantee, if special account is not sufficient)	Storage in TENMAK RWPSF	NSDF and DDF
Decommissioning	Immediate dismantling	decommissioning special account (guarantee, if special account is not sufficient)	No decommissioning activity	NSDF and DDF
Disused Sealed Sources	Return to country of origin or disposal in planned NSDF or DDF	- radioactive waste management special account (guarantee, if special account is not sufficient) - for orphan radioactive materials: state budget	Storage in TENMAK RWPSF	NSDF and DDF

SECTION B POLICIES AND PRACTICES

Article 32. Reporting

1.In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

(i) spent fuel management policy;
(ii)spent fuel management practices;
(iii)radioactive waste management policy;
(iv)radioactive waste management practices;
(v)criteria used to define and categorize radioactive waste.

B.1 National spent fuel and radioactive waste management policy

The spent fuel and radioactive waste management policy, defined in Nuclear Regulatory Law No. 7381 (Law No. 7381), sets out the goals and objectives for the safe and secure management of spent fuel and radioactive waste in Türkiye. Developed in alignment with relevant international agreements and national legislation, this policy outlines the roles and responsibilities of institutions and organizations involved in spent fuel and radioactive waste management in Türkiye.

The objective of Law No. 7381 is to establish the fundamental principles and rules for protecting workers, the public, the environment and future generations from possible harmful effects of radiation during activities regarding utilization of nuclear energy and ionizing radiation, based on the principle of peaceful use. This Law determines the responsibilities of the parties involved and defines the organization, duties and authorities of the NDK having regulatory control over these activities.

B.1.1 Policy regarding the safety of spent fuel and radioactive waste

- Spent fuel and radioactive waste must be managed in a safe, secure, sustainable and responsible manner within the framework of intergovernmental agreements and widely accepted standards.
- Necessary precautions shall be taken to ensure that the effects of spent fuels and radioactive wastes on workers, the public, the environment and future generations do not exceed acceptable levels. In activities related to spent fuel and radioactive waste management, relevant legislative requirements shall be applied in matters regarding the protection of workers, the public and the environment from radiation.
- Non-radiological hazards and occupational health and safety issues shall be also considered in the management of spent fuel and radioactive waste.
- In the management of spent fuel and radioactive waste, the possible effects of spent fuel and radioactive waste on the public and the environment beyond the country’s borders shall be considered.
- It is prohibited to import radioactive waste generated from activities conducted outside the jurisdiction area of the Republic of Türkiye. This requirement does not apply to radiation sources produced within Türkiye's borders that are exported under the condition of being returned when their usage period expires, nor to the transit passage of radioactive

wastes or the imports of materials contaminated with naturally occurring radioactive materials.

- Disused sealed sources shall be returned to the country of origin or, if that is not possible, to a radioactive waste facility.
- Radioactive waste shall not be released or left to the environment.
- The authorized person that generate radioactive waste shall take the necessary measures to keep the waste at the lowest possible and reasonable levels in terms of quantity, volume and radioactivity.
- The spent fuel generated in NPPs shall be stored at the NPP site throughout the operational lifetime of the NPP.

B.1.2 Policy regarding the responsibilities related to spent fuel and radioactive waste management

- NDK is responsible for establishing regulations concerning the safe management of spent fuel and radioactive waste, the release and the clearance of radioactive materials, and the orphan radioactive materials.
- TENMAK is responsible for the disposal of radioactive waste generated as a result of activities carried out in the sovereignty area of the Republic of Türkiye and the management of orphan radioactive materials.
- TENMAK must prepare the draft National Radioactive Waste Management Plan (NRWMP) as a basis for establishing the national radioactive waste policy and strategy for the management of radioactive waste and spent fuel. The draft NRWMP shall be approved by the ETKB, considering the comments of the NDK, and shall be updated every five years.
- The Ministry of Environment, Urbanization and Climate Change (ÇŞİDB), in collaboration with the NDK, is responsible for conducting remediation activities in contaminated areas resulting from activities not covered by Law No. 7381. The management of radioactive waste generated in these areas shall be conducted by TENMAK and any expenses associated with waste management activities shall be borne by the organization responsible for the contamination.
- All responsibility for the management of the spent fuel or radioactive waste, excluding their disposal, belongs to the person authorized for the activity.
- Authorized person who produces spent fuel or radioactive waste is responsible for all transportation within or outside the facility.
- All kinds of responsibility for the radioactive waste arising during decommissioning activities belong to the authorized person.

B.1.3 Policy regarding the funding of the spent fuel and radioactive waste management

- The ETKB is responsible for establishing the radioactive waste management special account and the decommissioning special account. These accounts must be opened with the central accounting unit of the ETKB. Any revenue collected for these special accounts must be used solely for the intended purpose.
- The Accounts Management Board (HYK) is responsible for determining the contributions to the special accounts. For NPPs, the contributions shall be based on the electricity produced per kilowatt hour and the guarantees shall be based on per megawatt of installed power. For other facilities, contributions and guarantees shall be set according to the facility type, application, and waste characteristics. These contributions and guarantees shall be reviewed annually and updated by the HYK to cover anticipated expenses.

- Authorized persons who generate radioactive waste during activities subject to authorization are responsible for making a contribution payment to the radioactive waste management special account in the amount determined by the HYK in accordance with relevant legislation.
- Persons authorized to operate nuclear facilities, radiation facilities, and radioactive waste facilities are responsible for making a contribution payment to the decommissioning special account in the amount determined by the HYK in accordance with relevant legislation.
- Revenues of radioactive waste management special account and decommissioning special account consist of contributions and guarantees to be paid, revenues obtained from the evaluation of special account revenues, donations and other revenues.
- Payments shall be made to TENMAK from the radioactive waste management special account for:
  i) Determination of areas for establishing a radioactive waste disposal facility and related siting studies.
  ii) Design, authorization, construction, operation, maintenance, closure, and release of the radioactive waste disposal facility from regulatory control.
  iii) Research and development activities for the specified purposes.
- Payments shall be made to authorized person from the decommissioning special account for:
  i) Decommissioning of nuclear facilities, radiation facilities and radioactive waste facilities, including the costs of disposal of radioactive wastes generated during decommissioning,
  ii) Remediation of the site compatible with the conditions for the end state of the facility site
- It is a condition of authorization for the operation of a facility that the HYK shall report to the NDK that the guarantee is adequate to cover the necessary costs for radioactive waste management and decommissioning in the event of early decommissioning of the facility.
- If the balance in the special accounts for radioactive waste and decommissioning proves insufficient to cover expenses associated with decommissioning or radioactive waste management, including early decommissioning, the costs shall be covered by the guarantee provided by the authorized person. In the event that the guarantee is deemed inadequate, the authorized person is responsible for covering the remaining amount.
- Persons applying for authorization to operate the facilities are required to submit a cost plan for decommissioning and radioactive waste to the ETKB. Each facility shall have its own decommissioning special account.

B.1.4 Status of spent fuel from NPPs and research reactors

Currently, there is no spent fuel in the inventory of Türkiye.

As stated in the intergovernmental agreement, Agreement Between the Government of the Republic of Türkiye and the Government of the Russian Federation on Cooperation in Relation to the Construction and Operation of an NPP at the Akkuyu Site, signed on May 12, 2010 (IGA) spent fuel of Russian origin may be reprocessed in the Russian Federation through a separate agreement to be negotiated between the parties. Negotiations on spent fuel

reprocessing are currently ongoing between the parties and no agreement has been signed yet. Therefore, in the absence of an intergovernmental agreement between the parties for the reprocessing of spent fuel of the Akkuyu NPP, the spent fuel of the Akkuyu NPP will be stored on site for the lifetime of the Akkuyu NPP and then transferred to TENMAK for disposal, in accordance with Law No. 7381.

For research reactors, the operator is responsible for the management of spent fuel. This responsibility may be fulfilled by shipping the spent fuel to the country of origin or transferring it to TENMAK for disposal at the end of the research reactor's operating life.

B.1.5 Transparency and public participation

As it is stated at Law No. 7381, it is essential to inform the people who may be affected by the risk regarding all kinds of activities that will cause the risk of radiation exposure to the workers, the public, the environment and the future generations.

NDK, as a regulatory body, has a press and public relations consultancy, as outlined in Presidential Decree on the Organization and Duties of the Nuclear Regulatory Authority No. 95 (PD No. 95), to inform the public about matters related to the NDK's activities. NDK provides information on spent fuel and radioactive waste management through its official website and press releases. Furthermore, the NDK official website allows the public to view and provide feedback on draft regulations and guidelines on spent fuel and radioactive waste management. The NDK takes suggestions and opinions from the public into consideration when developing the regulations and guidelines. According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, NDK may request that an authorized person disclose to the public any information or documents related to the management of spent fuel and radioactive waste, without prejudice to the protection of trade secrets or intellectual property rights.

The procedure for organizing public information and public participation meetings for investment projects subject to EIA is described in the Regulation on Environmental Impact Assessment, 2022. According to this regulation, the ÇŞİDB, together with qualified institutions and the project owner, must hold a meeting to inform the public and collect their feedback. It also requires a stakeholder participation plan to be included in the EIA application. The ÇŞİDB may also require additional public engagement measures, such as brochures, surveys, or a website.

TENMAK informs the public about the management of radioactive wastes through its official website and organized trainings, in accordance with the task assigned to it.

Akkuyu Nuclear JSC actively participates in the social life of the NPP construction region by implementing educational and environmental initiatives, cultural, social and charitable projects to support local residents. The Akkuyu Nuclear JSC regularly organizes career guidance activities for children, lectures in schools and field trips to the Akkuyu NPP construction site. Additionally, Akkuyu Nuclear JSC holds seminars for teachers to improve their qualifications and foster dialogue between teachers and parents, with participation from experts in pedagogical and psychological sciences.

According to Law on the Right to Information No. 4982 and Law on the Exercise of the Right to Petition No. 3071 people have the right to obtain information about spent fuel and radioactive waste management by applying to relevant institutions in Türkiye. The purpose of these laws is to regulate the principles and procedures regarding the right of individuals to use

their right to obtain information in accordance with the principles of equality, impartiality and openness, which are the requirements of democratic and transparent governance.

B.2 National spent fuel and radioactive waste management strategy

National spent fuel and radioactive waste management strategies set out technical measures and other issues for the management of spent fuel and radioactive waste in Türkiye, in alignment with the national policy and relevant legislation.

The main elements of the national spent fuel and radioactive waste management strategies, as defined by Law No. 7381 and the NRWMP, are as follows:

- Radioactive waste generated as a result of activities carried out within the sovereignty area of the Republic of Türkiye will be disposed of by TENMAK.
- Radioactive waste management special account and decommissioning special account were established within the ETKB to guarantee the costs for the disposal of radioactive waste and the decommissioning of facilities. Waste producers are required to contribute to these special accounts in accordance with relevant legislation and provide the necessary guarantees.
- The HYK will manage the revenues and expenditures of both the radioactive waste management special account and the decommissioning special account.
- The HYK approves the adequacy of the guarantee submitted to the special accounts that the necessary costs for radioactive waste management and decommissioning can be covered in case of early decommissioning of the facility and notifies NDK.
- The costs of activities carried out by TENMAK for the disposal of radioactive waste are covered by the radioactive waste management special account.
- National radioactive waste and spent fuel inventory is kept by TENMAK, including current amount and future estimates based on the NRWMP studies and records from facilities and activities authorized by the NDK.
- If an orphan radioactive material is identified, TENMAK shall cooperate with the relevant institutions and organizations to take the necessary measures and carry out the necessary measures, including disposal.
- TENMAK shall establish and operate a system suitable for the characterization, storage and treatment of radioactive waste.
- TENMAK constitutes a waste characterization system within the scope of the relevant legislation and improves and implements appropriate approaches and solutions for the management of radioactive waste, particularly focusing on disposal.
- Institutions and organizations that generate radioactive waste shall carry out their radioactive waste management activities in accordance with the relevant legislation and the national radioactive waste policy and strategy.
- VLL radioactive waste and LIL radioactive waste generated as a result of operation of Akkuyu NPP will be processed and stored at the facility site and the waste will be delivered to TENMAK for disposal after the commissioning of the NSDF.
- The decommissioning strategy for nuclear facilities, radiation facilities and radioactive waste processing and storage facilities is immediate dismantling.

B.2.1 National radioactive waste management plan

According to Law No. 7381, the NRWMP draft has been prepared by TENMAK and determined by ETKB by taking the opinion of NDK for the period of 2021-2025 as a basis for

establishing the national policy and strategy for the management of radioactive waste and spent fuel.

The NRWMP serves as a reference document outlining the comprehensive approach to be followed in the management of radioactive waste and spent fuel generated in Türkiye, as well as the decommissioning of nuclear facilities, radiation facilities, and radioactive waste facilities. It details the strategies to be implemented and the steps to be taken in these areas, addressing issues such as the generation of radioactive waste, general waste management activities, costs, and funding mechanisms. Projects and activities to be carried out by institutions and organizations with duties and responsibilities in this field will be coordinated nationally on the basis of the NRWMP.

According to the NRWMP, the construction of an NSDF will proceed in two phases. The first phase includes conceptual design studies, determining waste acceptance criteria, and site screening and site selection. The facility's capacity and design will be based on the national waste inventory and allow for future expansion.

Once the NSDF is operational, TENMAK RWPSF will be decommissioned, and its radioactive wastes will be transferred to the NSDF.

The NRWMP outlines the coordination of radioactive waste management activities, including TENMAK RWPSF, the planned Akkuyu NPP's radioactive waste management and spent fuel storage facilities, and the planned NSDF and DDF. Estimated timelines for commissioning, operation, and decommissioning of these facilities are provided in the plan, as shown in Figure 1.

The NRWMP will be updated every five years in accordance with Law No. 7381.

B.3 Spent fuel management practices

Currently, Türkiye does not have spent fuel and high-level waste (HLW) in its inventory. However, with the future operation of research reactors and NPPs, it is anticipated that both spent fuel and HLW will be generated.

The design of the Akkuyu NPP, with four VVER-1200 reactor units, includes the entire infrastructure, including transportation and process equipment, to support the fuel cycle of the reactor and to manage the spent fuel after irradiation in the reactor core. In the design, the spent fuel assemblies are unloaded from the reactor core by a reloading machine and placed in the cells of the rack of the at-reactor spent fuel pool, ensuring residual heat removal and radioactivity decay in a safe manner. The capacity of the at-reactor spent fuel pool located in the reactor hall is sufficient to store spent fuel to be discharged for each reactor unit over a ten-year operational period. Once the spent fuel pool reaches capacity, the spent fuel assemblies are loaded into dual-purpose casks and transferred to a separate dry cask storage facility on-site. The dry cask storage facility allows for an additional 7-8 years of spent fuel storage on-site before any need to remove the spent fuel from the NPP site. Currently, preliminary design work is underway for an additional spent fuel storage facility on-site, considering the spent fuel accumulated over the entire sixty-year operating life of 4 units of the Akkuyu NPP. In the absence of an IGA between the parties for the reprocessing of spent fuel from the Akkuyu NPP, the spent fuel will be stored in the additional on-site spent fuel storage facility for the plant's lifetime, in accordance with Law No. 7381. The design details of the at-reactor spent fuel pool, dry cask storage facility is presented in section A.1 of Annex 1.

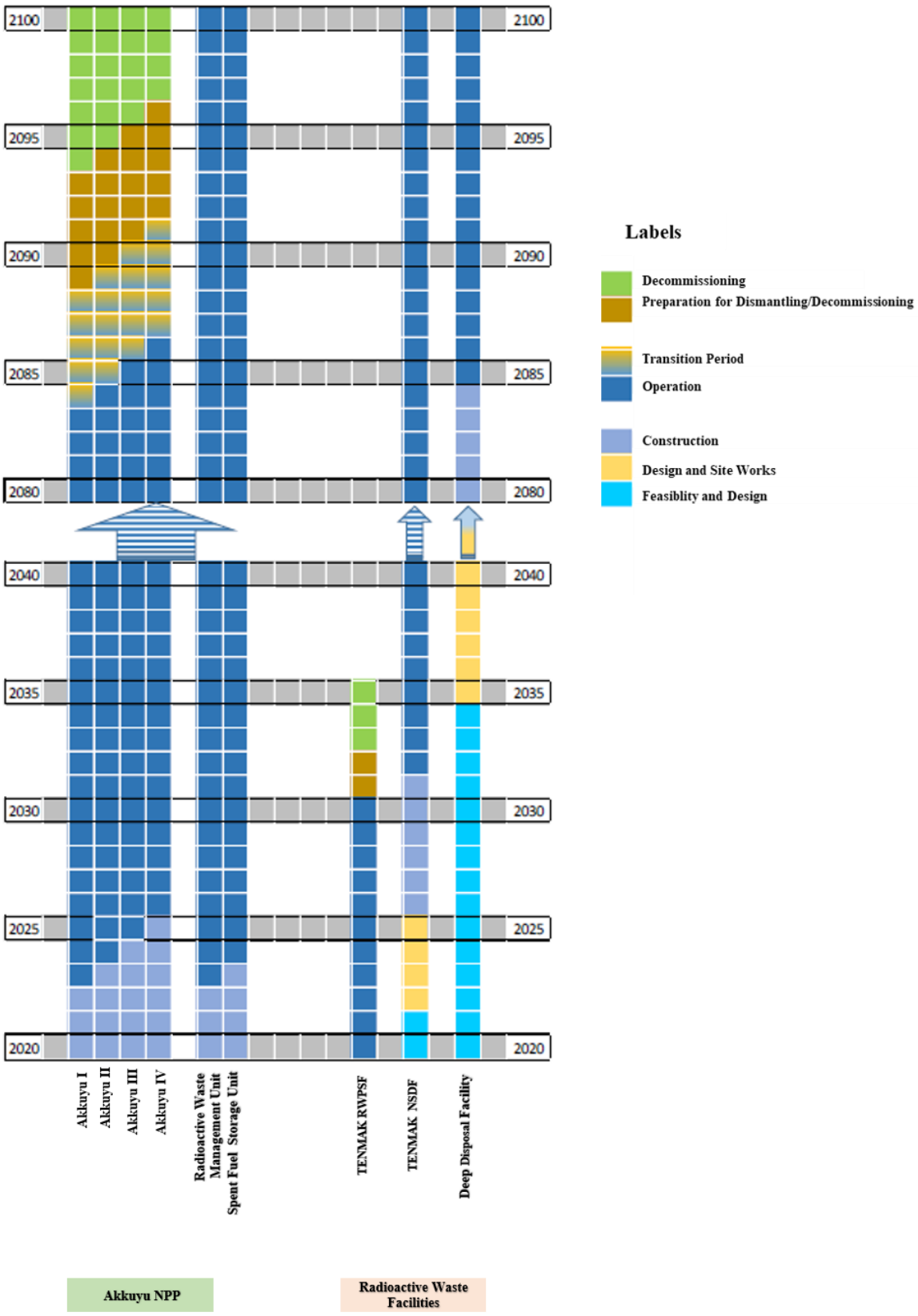

Figure 1 *General schedule presented in the first NRWMP*

The TENMAK TR-2 received fresh low-enriched uranium (LEU) fuel elements in 2009, following the shipment of high-enriched uranium (HEU) to the USA. Currently, the TENMAK TR-2 is in an extended-shutdown period and these fuel elements have not been irradiated. Three partially irradiated fuel elements are being stored in the reactor pool, which are not classified as spent fuel. The research reactor's storage capacity can accommodate spent fuel until it is either shipped back to the country of origin or transferred to TENMAK for disposal.

The İTÜ TM-II is operational, but currently does not have any spent fuel. The wet interim storage area inside the reactor building has a capacity of 10 fuel elements with a storage pit. At present, no fuel elements are present in the storage pit. The facility can store spent fuel from the research reactor until it is either shipped back to the country of origin or transferred to TENMAK for disposal.

B.4 Radioactive waste management practices

In Türkiye, radioactive wastes generated from mining and scrap recycling and various applications in industry, medicine, research and calibration are stored in TENMAK RWPSF in İstanbul. This facility also receives radioactive wastes produced during the operation of research reactors.

The TENMAK RWPSF inventory includes:

- Very Short-Lived (VSL) Waste: generally compressible waste and sealed sources containing short-lived radionuclides.
- VLL Waste: consist of Naturally Occurring Radioactive Materials (NORM) and Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) as well as contaminated materials.
- LIL Waste: includes sealed source devices such as moisture and density meters, industrial instrumentation, and teletherapy equipment containing sealed radioactive sources.

The national radioactive waste inventory of Türkiye as of June 2024 is presented in Annex 3.

In Türkiye, there is no disposal facility for radioactive waste. Efforts are underway to establish a NSDF to meet the future disposal needs, especially with the start of the nuclear power program.

Once operational, the NSDF will accept VLL and LIL radioactive waste in accordance with established waste acceptance criteria.

B.4.1 Management of Radioactive Waste from NPPs and Research Reactors

Currently, the Akkuyu NPP is not operational, therefore, there is no radioactive waste from this facility. Akkuyu Nuclear JSC is responsible for the predisposal management of radioactive waste generated during the operation and decommissioning of four reactor units. The predisposal management of radioactive waste includes collection, segregation, and treatment in order to reduce the volume, as well as packaging and storage of solid radioactive waste and solidified liquid radioactive waste during the operation of the Akkuyu NPP. The design details of predisposal management of solid, liquid and gaseous radioactive waste at the Akkuyu NPP are presented in section A.1 of Annex 1.

For the TENMAK TR-2 and İTÜ TM-II research reactors, VLL and LIL radioactive waste, such as contaminated water from the water treatment system, active resins and sludge, are delivered to the TENMAK RWPSF. These radioactive wastes are treated, packaged and stored at the facility.

B.4.2 Management of Institutional Radioactive Waste

The management of institutional radioactive waste at the TENMAK RWPSF is described in detail in section A.1 of Annex 2.

B.4.3 Management of Orphan Radioactive Material

According to Law No. 7381, in the event that an orphan radioactive material is identified, TENMAK shall cooperate with relevant institutions and organizations and take the necessary measures and carry out the necessary works, including disposal. Consequently, orphan radioactive materials are being transferred to the TENMAK RWPSF.

B.4.4 Management of Other Radioactive Waste

Following the Chernobyl accident in 1986, 58,070 tons of Cs-137 contaminated tea were disposed of in 36 landfills in 5 provinces. Detailed information is presented in Annex 6.

In 2008, Eu-152 contaminated scrap metal was detected at a private scrap metal processing facility, which was not subject to regulatory control, in the Gaziemir district of İzmir province. After various environmental remediation activities at the facility site, 260 tons of radioactive-contaminated scrap metal were transferred to the TENMAK RWPSF. Currently, some mixed waste, comprising both radioactive and chemical waste, remains on the facility site and will be transferred to the TENMAK RWPSF upon completion of the remediation activities. Further details are presented in Annex 6.

B.5 Criteria used to categorize the radioactive waste

In Türkiye, the radioactive waste classification scheme is defined in the Regulation on Radioactive Waste and Spent Fuel Management (2023). This scheme is aligned with the IAEA General Safety Guide on Classification of Radioactive Waste (GSG-1) with minor differences.

According to the regulation, radioactive waste is classified based on its radioactivity concentration and the half-lives of the radionuclides into the following categories: VSL radioactive waste, VLL radioactive waste, LIL radioactive waste, and HLW. For each category of waste, the regulation also specifies the final disposal route.

Clearance limits are also used for the classification of radioactive waste and are defined in the Regulation on Clearance and Release of Radioactive Materials, 2023.

The radioactive waste classification scheme in Türkiye is as follows:

VSL Radioactive Waste: This category includes radioactive waste containing radionuclides with a half-life of less than about 100 days. Such waste is expected to decay to levels below the clearance or release limits, making it suitable for clearance or release.

VLL Radioactive Waste: This category includes radioactive waste that is not classified as VSL radioactive waste, but has radioactivity concentrations below 100 times the clearance limits. Disposal of VLL radioactive waste can be carried out in near surface, intermediate depth or deep disposal facilities.

LIL Radioactive Waste: This category includes radioactive waste whose level of radioactivity is higher than that of VLL radioactive waste, but is not classified as HLW. LIL radioactive waste containing radionuclides with half-lives less than 31 years may be disposed of in near surface, intermediate depth or deep disposal facilities.

The regulation sets limits for long lived radionuclides as follows:

i. For long lived alpha emitting radionuclides: 400 Bq/g on average for all radioactive waste packages and 4,000 Bq/g for individual packages,
ii. For long lived beta and gamma emitting radionuclides: radioactivity concentration of approximately 10 kBq/g

Depending on these limits, the final disposal path for LIL waste is determined. If the radioactivity concentration is below these limits, disposal options include near-surface, intermediate-depth, or DDFs. If above these limits, only intermediate-depth or DDFs are suitable.

HLW: This category includes spent fuels that have been recognized as radioactive waste, radioactive waste resulting from reprocessing and containing fission products and actinides with a total radioactivity concentration of more than about 10^8 Bq/g, and other radioactive waste containing the same levels of radioactivity. HLW is only disposed of in deep disposal facilities.

In comparison to IAEA GSG-1, low level radioactive waste and intermediate level radioactive waste classes are combined into a single category as LIL radioactive waste in Türkiye. In addition, the Regulation on Radioactive Waste and Spent Fuel Management, 2023, does not define exempt waste, but the exemption and clearance limits for radioactive materials are defined in other regulations.

The radioactive waste classification scheme and the final route are summarized in Table 2.

Table 2 *Radioactive waste classification scheme in Türkiye*

Radioactive Waste Class	Limits on Half-life or Radioactivity Concentration	Final Route
VSL Radioactive Waste	Half-life of less than about 100 days	Clearance or release
VLL Radioactive Waste	Radioactivity concentrations below one hundred times the clearance limits and not classified as very short-lived radioactive waste	Near surface, intermediate depth or deep disposal facility
LIL Radioactive Waste	• Radionuclides with half-lives less than 31 years • For long lived alpha emitting radionuclides: Radioactivity concentration below 400 Bq/g on average for all radioactive waste packages and below 4,000 Bq/g for individual packages, • For long lived beta and gamma emitting radionuclides: Radioactivity concentration below approximately 10 kBq/g	Near surface, intermediate depth or deep disposal facility
	• For long lived alpha emitting radionuclides: Radioactivity concentration above 400 Bq/g on average for all radioactive waste packages and above 4,000 Bq/g for individual packages, • For long lived beta and gamma emitting radionuclides: Radioactivity concentration above 10 kBq/g	Intermediate depth or deep disposal facility
HLW	• Spent fuels that have been recognized as radioactive waste • Radioactive waste resulting from reprocessing and containing fission products and actinides with a total radioactivity concentration of more than about 10^8 Bq/g • Radioactive waste containing around 10^8 Bq/g of radioactivity concentration	Deep disposal facility

SECTION C SCOPE OF APPLICATIONS

Article 3. Scope of Application

1.This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.
2.This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.
3.This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.
4.This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.

C.1 Reprocessing of spent fuel

There is no spent fuel reprocessing facility in Türkiye. As described in Section B, reprocessing of spent fuel of the Akkuyu NPP in the Russian Federation is an option that has not yet been decided.

C.2 Naturally occurring radioactive material

Any waste that contains NORM as a result of activities such as oil exploration, water treatment etc. is declared as radioactive waste and falls within the scope of the Joint Convention in Türkiye.

C.3 Spent fuel and radioactive waste within military or defense programmes

Türkiye has been a party to the Treaty on the Non-Proliferation of Nuclear Weapons since 1979 and is committed to the peaceful use of nuclear energy. Hence, there is no spent fuel and radioactive waste from military or defense programmes in Türkiye.

C.4 Discharges

The term “discharge” is defined as “release” in the legislation on radioactive waste management in Türkiye and is used in the same context in this report. The information on discharges is provided in the respective chapters referring to Articles 4, 7, 11, 14, 24 and 26 of the Joint Convention.

SECTION D INVENTORIES AND LISTS

Article 32. Reporting

2.This report shall also include:

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

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

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

(iv)an inventory of radioactive waste that is subject to this Convention that:

a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;

b) has been disposed of; or

c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

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

D.1 Spent fuel management facilities and inventory of spent fuel

In Türkiye, there is no spent fuel or HLW in the inventory. The list and detailed information of spent fuel facilities in Türkiye is presented in Annex 1. The spent fuel facilities, locations, current status and inventories are summarized in Table 3.

The spent fuel management practices in Türkiye are summarized in Section B.

D.2 Radioactive Waste Management Facilities and Inventory of Radioactive Waste

The list and detailed information of radioactive waste management facilities in Türkiye are presented in Annex 2.

In Türkiye, radioactive wastes generated during mining, scrap metal recycling, the application of radiation in industry, medicine, research and calibration are being stored in TENMAK RWPSF in İstanbul. Radioactive wastes generated during the operation phase of the research reactors are also sent to this facility.

The radioactive waste management facilities, locations, current status and inventories are summarized in Table 4.

The radioactive waste management practices in Türkiye are summarized in Section B.

Table 3 *The spent fuel management facilities in Türkiye*

Spent Fuel Management Facility	Location	Current Status	Inventory of Spent Fuel
Akkuyu NPP Units 1-4 (spent fuel pool and dry storage building within NPP)	Mersin	Commissioning (Unit 1) Under Construction (Unit 2-4)	-
Sinop NPP	Sinop	Site Approval	-
TR-1	İstanbul	Decommissioned	- (returned to USA in 1977)
TENMAK TR-2	İstanbul	Extended shut-down	- (returned to USA in 2009)
İTÜ TM-II	İstanbul	Operational	-

Table 4 *The radioactive waste management facilities in Türkiye*

Radioactive Waste Management Facility	Location	Current Status	Inventory of Radioactive Waste
TENMAK RWPSF	İstanbul	Operational	See Annex 3
TENMAK NSDF	-	Site Selection	-
Eskişehir-Beylikova Complex Ore Quarry, Ore Preparation and Enrichment and Storage Facility	Eskişehir	Under Construction	-
Akkuyu NPP Units 1-4 (radioactive waste conditioning and storage buildings)	Mersin	Commissioning (Unit 1) Under Construction (Unit 2-4)	-
Sinop NPP	Sinop	Site Approval	-
TENMAK TR-2	İstanbul	Extended shut-down	-
İTÜ TM-II	İstanbul	Operational	-

D.3 Radioactive waste resulted from past practices

Following the Chernobyl accident in 1986, 58,070 tons of tea contaminated with Cs-137 were disposed of in 36 landfills located in 5 provinces. Detailed information is provided in Annex 6.

In 2008, Eu-152 contaminated scrap metal was detected at a private scrap metal processing facility, which was not subject to regulatory control, in the Gaziemir district of İzmir province. Following various environmental remediation activities, 260 tons of radioactive-contaminated scrap metal were transferred to the TENMAK RWPSF. Currently, some mixed waste, both radioactive and chemical, remains on-site, and will be moved to the TENMAK RWPSF once the remediation activities at the facility site are completed. Detailed information is provided in Annex 6.

D.4 Decommissioning of nuclear facilities

At present, there is no nuclear facility under decommissioning in Türkiye. The TR-1 was decommissioned in 1977 (see section A.3.1 of Annex 1 for details) and the TENMAK TR-2 is in extended-shutdown (see section A.3.2 of Annex 1 for details), but the decommissioning of the TENMAK TR-2 has not yet been decided.

SECTION E LEGISLATIVE AND REGULATORY SYSTEM

Article 18. Implementing Measures

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

The necessary legislative, regulatory and administrative measures to fulfil the obligations under the Convention have been taken and are discussed in this report.

Article 19. Legislative and Regulatory Framework

1.Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.
2.This legislative and regulatory framework shall provide for:
(i)the establishment of applicable national safety requirements and regulations for radiation safety;
(ii)a system of licensing of spent fuel and radioactive waste management activities;
(iii)a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence;
(iv)a system of appropriate institutional control, regulatory inspection and documentation and reporting;
(v)the enforcement of applicable regulations and of the terms of the licences;
(vi)a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.
3.When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.

E.1 Legislative and regulatory framework

The Republic of Türkiye has a legal system based on codified laws. As illustrated in Figure 2, the primary domestic sources of law in hierarchical order can be listed as follows: The Constitution, laws, international treaties, presidential decrees and regulations. Once ratified by the Grand National Assembly of Türkiye (TBMM), international treaties have the same rank as codes and statues.

Türkiye established its first nuclear regulatory body, AEC, on August 27, 1956, with Law No. 6821, aiming to leverage international expertise in the field. Türkiye became one of the founding members of IAEA in 1957. Subsequently, nuclear research and education centers were established in İstanbul and Ankara, significantly contributing to studies in nuclear energy and radiation applications, including the safe management of the radioactive waste.

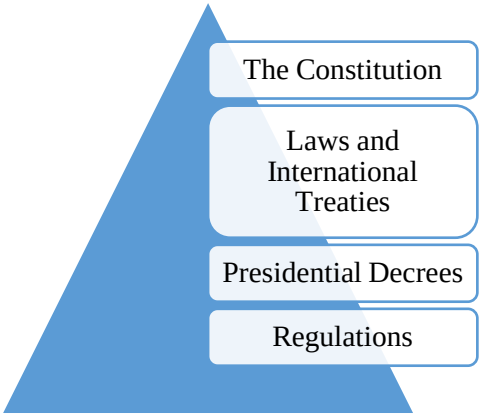

Figure 2 *Hierarchy of Norms in Türkiye*

In 1982, the AEC was replaced by the TAEK under Law No. 2690, along with its research centers and facilities. To address the management needs of radioactive waste at TAEK's İstanbul Küçükçekmece Campus the Radioactive Waste Management Facility was established in 1986 as a part of IAEA project and commissioned in 1989.

Until July 2018, TAEK conducted both regulatory and research and development activities in the field of nuclear energy and radiation applications. Following a constitutional amendment referendum in July 2018, the parliamentary system of government in Türkiye was replaced with a presidential system of government, resulting in the restructuring of all government institutions to align with the new system.

To enhance the regulatory framework and ensure full compliance with international requirements and expectations in nuclear area, a draft nuclear energy law was prepared by TAEK in coordination with ETKB. This draft law was enacted as DL No. 702 and Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations No. 4 (PD No. 4).

Former nuclear regulatory body, TAEK, retained its research and development functions and was assigned the responsibility of management of all national radioactive waste, including the disposal activities. In 2020, with the enactment of PD No. 4, TENMAK was established, incorporating TAEK, the National Boron Research Institute and the Rare Earth Element Research Institute. TENMAK is the responsible body developing solutions and ensuring safe disposal of radioactive wastes.

DL No. 702, which established NDK, was a comprehensive nuclear law covering nuclear safety, nuclear security, nuclear safeguards, radiation safety, and related topics. However, on 9 March 2021, the Turkish Constitutional Court annulled DL No. 702 for procedural reasons, providing a one-year period for the government to re-regulate. During this period, Law No. 7381 and PD No. 95 were prepared and entered into force on March 8, 2022, replacing DL No. 702. With the establishment of the NDK, regulatory and supervisory duties and practicing activities were separated. The NDK is structured as an independent body that performs only regulatory and supervisory functions regarding nuclear energy and ionizing radiation.

Law No. 7381 contains provisions and requirements on general principles of radiation protection, safety, security and safeguards; authorizations and inspections; administrative and criminal sanctions; coordination of activities between different governmental bodies regarding

interfaces between them while regulating nuclear and radiation facilities and activities; roles and responsibilities of decommissioning and management of spent fuel and radioactive waste; third-party liability for nuclear damage arising from nuclear incidents; establishment of independent nuclear regulatory body, NDK, and establishment of Nuclear Technical Support Joint Stock Company (NÜTED A.Ş.), the technical support organization for NDK.

In addition to Law No. 7381, PD No. 95 regulates functions and organizational structure of the NDK.

Other significant legislation affecting the radioactive waste and spent fuel management facilities consists of the Environment Law No. 2872, which regulates environmental impact of these facilities and gives the regulatory responsibilities and authorities to the ÇŞİDB. Furthermore, the Turkish Criminal Law No. 5237 defines certain nuclear and radiological related crimes and penalties. For full compliance with the international provisions, additional crimes, penalties and administrative sanctions are defined in Law No. 7381. Several other regulatory bodies, such as Ministry of Transportation and Infrastructure and municipalities, indirectly regulate radioactive waste and spent fuel management facilities for some other general issues. This report discusses the roles of these related governmental bodies in regulating nuclear activities. Although other institutions or organizations may have the authority to regulate in the relevant areas; according to Art. 3, Para.'s 6 and 7 of Law No. 7381, administrative actions and measures by other organizations that regulate or oversee activities outside the scope of Law No. 7381 in the field of nuclear energy and radiation cannot compromise safety, security, and nuclear safeguards. Additionally, provisions of other regulations that do not meet the requirements for safety, security, and nuclear safeguards will not apply to activities within the scope of Law No. 7381. In such cases, the NDK has the authority to make additional regulations to ensure safety, security, and nuclear safeguards.

International Agreements signed by Türkiye and in force are presented in Annex 5. Law for the accession to the Joint Convention was ratified by the TBMM on October 6, 2021, and entered into force on July 2022.

E.2 National safety requirements and regulations

Prior to July 2018, TAEK was responsible for issuing regulations related to nuclear energy. The regulatory framework for the safety of nuclear facilities and radioactive waste facilities in Türkiye was primarily based on Law No. 2690, the Decree on Licensing of Nuclear Installations, 1983, the Decree on Radiation Safety, 1985, and various regulations issued by TAEK.

TAEK developed regulations and guides aligned with IAEA requirements, addressing the safety and security of nuclear facilities and radioactive waste facilities. The Decree on Licensing of Nuclear Installations, 1983, established rules and procedures for obtaining permits and licenses, including application requirements, document submissions, review and assessment processes, authorizing entities within TAEK, and mechanisms for approving modifications during construction and operation. It also granted TAEK the authority to inspect facilities throughout their lifetime and enforce penalties such as limiting, suspending, or revoking licenses. This Decree was revoked in 2023. Following the revocation of the Decree, the Regulation on Authorizations Regarding Nuclear Facilities, 2023, was enacted to establish the procedures and principles for authorizing activities related to nuclear facilities to ensure that

these activities are conducted within the framework of radiation protection, safety, and security principles.

The Decree on Radiation Safety, 1985, outlined general radiation safety rules for the keep, use, production, importation, exportation, acquisition, sale, transportation, and storage of ionizing radiation sources. It also included provisions related to radioactive waste, subjecting such activities to authorization and supervision of regulatory authority. This Decree was also revoked in 2023. Following the revocation of the Decree, the Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices, 2023, was enacted to establish the procedures and principles for authorizing activities related to nuclear facilities to regulate the procedures and principles regarding the authorization of activities in order to determine and confirm that the activities related to radiation facilities and radiation practices are carried out within the framework of radiation protection, safety and security principles.

TENMAK RWPSF was previously authorized under the repealed Regulation on Radiation Safety to ensure radiation protection during its the operation, including radioactive wastes containing activity or activity concentration above the exemption limits specified in the revoked Decree on Radiation Safety. Following the establishment of the new regulatory infrastructure in Türkiye in 2018, this facility was defined as a radioactive waste facility under Law No. 7381. Consequently, the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, was enacted and the Nuclear Regulatory Board Decision on Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and Other Processes for Radioactive Waste Facilities were issued regarding the authorization of radioactive waste facilities. Regulation on Radioactive Waste and Spent Fuel Management, 2023, was enacted to define the procedures and principles regarding the safe management of radioactive waste and spent fuels. According to the provisional article of the regulation, the previous authorization of the facility remained valid until March 2023 when the current authorization period requiring TENMAK to apply to the NDK for facility authorization under the new regulation. Detailed information regarding the authorization of the TENMAK RWPSF according to aforementioned legislation is provided in Article 12 of Section H of this report.

In accordance with the paragraph 2 of provisional Art. 1 of Law No. 7381, all these regulations issued by TAEK are currently carried out by the NDK and remain valid unless the relevant regulation is rearranged and promulgated by the NDK. Current secondary regulations defining the Turkish nuclear safety, radiation safety, spent fuel and radioactive waste safety and security requirements are listed on Table 5. Some of these regulations are under revision to align with the new legislative structure and to update national standards in accordance with the latest IAEA safety requirements and the Vienna Declaration on Nuclear Safety principles. Further details on national safety requirements and regulations for radiation safety are explained in the Article 24 of Section F of this report.

Table 5 *Secondary legislation of the NDK*

DECREE/REGULATION	DATE of ISSUE	SCOPE
Decree on Licensing of Nuclear Installations (was revoked in 2023)	1983	Establishes the licensing system, defines rules and procedures for licensing, inspections and enforcements
Decree on Radiation Safety (was revoked in 2023)	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 general rules to ensure the radiation safety of people and the environment against ionizing radiation.
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 Specific Principles for the Safety of Nuclear Power Plants	2008	Determines the safety principles to be complied to achieve the nuclear safety objectives defined by the NDK 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 NDK.
Regulation on Recording and Reporting in Research Reactors	2009	Defines the records to be kept regularly during the operation of research reactors and the reports to be submitted to the NDK.
Regulation on Notification and Reporting of Unusual Event for Research Reactors	2009	Defines the principles and procedures regarding notification and reporting of unusual events which occur in research reactors.
Regulation on Specific Principles for the Safety of Research Reactors	2009	Determines the safety principles for the research reactors to achieve nuclear safety objectives defined by the NDK.
Regulation on Nuclear Power Plant Sites	2009	Establishes the nuclear safety requirements for siting of nuclear power plants.
Regulation on Special Principles for the Safety of Nuclear Fuel Cycle Facilities	2010	Determines the safety principles for the nuclear fuel cycle facilities to achieve nuclear safety objectives defined by the NDK.
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 in Transport of Nuclear Materials	2012	Defines national aspects of physical protection in the transport of nuclear materials in compliance with INFCIRC 225/Rev.4 and some provisions of INFCIRC 225/Rev5.
Regulation on Radiation Protection in Nuclear Facilities	2018	Defines rules and procedures for radiation protection in all phases during the lifetime of nuclear installations radiation facilities and radioactive waste facilities, radiation facilities and radioactive waste facilities.
Regulation on Nuclear Export Control	2020	Establishes the procedures and principles for the export of items specifically designed or prepared for use in the nuclear field and nuclear dual-use items in order to prevent the proliferation of nuclear weapons in compliance with INFCIRC/254 Part 1 and INFCIRC/254, Part 2
Regulation on Nuclear Safeguards	2022	Regulates the issues related to the notification, detection and follow-up of the inventory of nuclear materials used for peaceful purposes and the equipment and materials specially designed or prepared for the nuclear fuel cycle within the borders of the Republic of Türkiye, and to prevent unauthorized use of these equipment and materials, and their conversion into nuclear weapons or other nuclear explosive devices to determine the procedures and principles to be followed within the framework of the national nuclear material counting and control system established by the NDK to ensure prevention and timely detection of initiatives in this direction
Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities	2022	Defines the basic requirements for establishing, maintaining and continuously improving a management system that gives priority to safety, develops leadership skills at all levels of management and supports a strong safety culture in Organization that constructs, operates, decommissions or closes a nuclear installation.
Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities	2022	Defines the procedures and principles regarding the authorization of activities in the radioactive waste facilities in order to determine and confirm that the activities are carried out within the framework of radiation protection, safety and security principles and security principles that must be followed in these facilities.
Regulation on the Authorization of Environmental Remediation Activities of Radioactively Contaminated Areas	2022	Defines the procedures and principles regarding the authorization of environmental remediation activities to be carried out in areas exposed to radioactive contamination.

Regulation on Organizational Structure and Personnel in Nuclear Facilities	2022	Defines the procedures and rules for operating organization, qualifications and training of operating personnel, and licenses of operating personnel in nuclear plants.
Regulation on National Radiation Monitoring and Radiation Control	2022	Determines the principles, procedures, and responsibilities of individuals, institutions, and organizations regarding the conduct of national radiation monitoring and radiation control activities directed towards ionizing radiation
Nuclear Regulatory Authority Administrative Sanctions Regulation	2023	Defines the administrative sanctions to be applied by the NDK and the procedures and principles regarding their implementation.
Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices	2023	Defines the procedures and principles regarding the authorization of activities in order to determine and confirm that the activities related to radiation facilities and radiation practices are carried out within the framework of radiation protection, safety and security principles
Regulation on Authorizations Regarding Nuclear Facilities	2023	Defines the procedures and principles regarding the authorization of activities in order to determine and confirm that the activities related to nuclear facilities are carried out within the framework of radiation protection, safety and security principles.
Regulation on Fire Safety in Nuclear Facilities	2023	Defines the basic principles and the duties and responsibilities of the organization regarding ensuring fire safety in nuclear facilities.
Regulation on Management of Radiation Emergencies	2023	Defines the procedures and principles regarding the management of radiation emergencies that may occur during the execution of activities subject to regulatory control regarding nuclear energy and ionizing radiation, and determines the duties and responsibilities of the authorized persons.
Regulation on Inspections and On-site Examinations Regarding Nuclear Energy and Ionizing Radiation	2023	Defines the works and procedures regarding the inspections and on-site examinations conducted by the NDK for activities related to nuclear energy and ionizing radiation and authorized persons, the type and scope of inspections and issues related to inspectors.
Regulation on Clearance and Release of Radioactive Materials	2023	Defines the principles and procedures regarding the release of radioactive materials generated during the activities related to nuclear energy and ionizing radiation.
Regulation on Liability Insurance and Guarantee Regarding Nuclear Risks	2023	Defines the procedures and principles regarding the insurance or the guarantee that the operator must provide, due to the legal responsibilities of the operator concerning nuclear damages arising from nuclear incidents in accordance with Law No. 7381 and The Paris Convention on Third Party Liability in

		the Field of Nuclear Energy of July 29, 1960, as amended by the additional protocols to which the Republic of Türkiye is a party.
Regulation on Radioactive Waste and Spent Fuel Management	2023	Defines the procedures and principles regarding the safe management of radioactive waste and spent fuels.
Regulation on Security of Nuclear Facilities and Nuclear Materials	2024	Defines the principles governing the security measures to be taken during the execution of activities subject to regulatory control regarding nuclear facilities and nuclear materials.
Regulation on the Supply Chain in Nuclear Facilities	2024	Defines the duties and responsibilities of the Organization regarding the supply chain of nuclear facilities, the qualifications of suppliers subject to notification and authorization, and the procedures and principles related to notification and authorization.
Regulation on Independent Oversight Activities in Nuclear Facilities	2024	Defines the duties and responsibilities of the Organization and the companies that will provide independent oversight services, as well as the procedures and principles related to the authorization of these companies, in order to ensure the conduct of independent oversight activities related to nuclear facilities.

E.3 System of licensing

The licensing system of nuclear facilities before 2018 is briefly summarized in the Türkiye's national report for the Joint 8th and 9th Review Meeting of Convention on Nuclear Safety.

Currently, according to Law No. 7381, activities covered by the law shall not be carried out without authorization from the NDK. Natural or legal persons seeking to carry out such activities shall apply to the NDK for authorization. The NDK shall determine which activities require notification or authorization based on safety and security principles. Additionally, it is obligatory to obtain a license from the NDK to operate a nuclear facility, radiation facility, radioactive waste facility and to carry out radiation applications. Only the citizens of the Republic of Türkiye or legal persons established in accordance with the legislation of Republic of Türkiye may obtain licenses from the NDK.

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

- Preparation of the site for a nuclear facility, manufacturing the equipment determined by the NDK, construction, commissioning, decommissioning, re-start of operation, and modifications related to safety and security of the facility,
- Commissioning and decommissioning of a radiation facility and modifications related to safety and security of the facility,
- Construction, commissioning, decommissioning, closure of a radioactive waste facility, and modifications related to safety and security in the facility,
- Export, import, transportation, transit of radioactive materials,

- Within the scope of nuclear safeguards, the export of substances, materials, equipment, systems, components and related technology and nuclear dual-use substances, materials, equipment, systems, components and related technology specially designed or prepared for use in the nuclear field,
- Import of substances, materials, equipment, systems, components or related technology determined by the NDK within the scope of nuclear safeguards,
- Other activities determined by the NDK taking into account safety, security and nuclear safeguards.

According to Art. 4, Para. 4 of Law No. 7381, obtaining an authorization certificate from NDK is mandatory for the following activities within the scope of this Law:

- Legal persons providing radiation protection training to personnel involved in the activities,
- Persons providing radiation protection services,
- Personnel involved in the activities,
- Persons engaged in equipment manufacturing,
- Companies performing third party surveillance.

The NDK may impose an obligation on authorized persons to obtain certificates for services to be provided by other persons or for other activities that may affect safety, security, and nuclear safeguards.

The following regulations and board decisions outline the authorization process for radioactive waste facilities, nuclear facilities and radiation facilities in accordance with the provisions of Law No. 7381:

- Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022.
- Nuclear Regulatory Board Decision titled “Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and other Processes for Radioactive Waste Facilities”, 2022.
- Regulation on Authorizations Regarding Nuclear Facilities, 2023.
- Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices, 2023.

E.3.1 Authorization of nuclear facilities

According to Law No. 7381, nuclear facilities are defined as the facilities being established or operating for extraction, production, processing, use, possession and storage of nuclear material. Regulation on Authorizations Regarding Nuclear Facilities, 2023, includes provisions for the authorization of NPPs, research reactors, nuclear fuel production and reprocessing facilities, and nuclear material processing facilities. The site of any nuclear facility must be approved by the NDK. The regulation specifies that the following activities require authorization from the NDK:

- Site preparation,
- Equipment manufacturing,
- Construction,
- Commissioning,
- Operation,

- Re-starting operation,
- Modifications affecting safety and security at the facility,
- Decommissioning.

The regulation adopts a graded approach to authorization procedures and application documents. For instance, the site preparation permit for research reactors and nuclear fuel fabrication and reprocessing facilities, includes site approval, while the construction permit covers the commissioning process. For nuclear material processing facilities, the construction permit encompasses site approval, site preparation, equipment manufacturing, and commissioning.

According to the regulation, in order to establish a nuclear facility, an organization must initially submit a notice of intent to the NDK. This notice of intent should include detailed information about the organization, the proposed facility, including contact information, administrative structure, management system certifications, technical experience, and a project schedule. The NDK registers the organization and prepares the regulatory documents list (DBL), which includes national and international standards and guidelines. The DBL is periodically reviewed and updated as necessary to ensure compliance with safety and regulatory requirements.

The proposed site for an NPP must be approved by the NDK. After site approval, the authorization process continues with the issuance of the site preparation permit. Equipment manufacturing, as determined by the NDK, also requires a permit. The construction permit application must include the construction schedule, system descriptions, quality assurance documentation, and relevant plans and programs.

Once the construction permit is obtained, the subsequent authorizations are the commissioning permit and the operating license. The application for the operating license must include updated documents reflecting the plant's as-built status, such as a safety analysis report (SAR), operational organization and staff information, emergency plans, and updated procedures for operational and accident conditions. After obtaining an operating license, the organization must comply with safety and security regulations, conduct periodic reviews and obtain permit for any significant modifications. Finally, the decommissioning process requires a separate permit to ensure that all activities meet regulatory standards until the site is released from regulatory control.

E.3.2 Authorization of radioactive waste facilities

According to Law No. 7381, radioactive waste facilities are defined as the facilities where radioactive waste is processed, stored, or disposed of. Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, includes provisions for authorization of radioactive waste processing, storage and disposal facilities. Law No. 7381 mandates that any radioactive waste facility site must receive approval from the NDK. It specifies that the following activities require authorization from the NDK:

- Construction,
- Commissioning,
- Operation,
- Modifications affecting safety and security at the facility,
- Decommissioning or closure.

According to the regulation, the organization shall apply the graded approach principle according to the type and nature of the facility in the activities carried out within the scope of ensuring radiation protection, safety and security at the radioactive waste facility. Similarly, the NDK shall apply the graded approach principle according to the type and nature of the facility in the review and assessment processes of authorization applications for radioactive waste facilities.

To establish a radioactive waste facility, the organization must first submit a notice of intent to the NDK. This notice of intent should contain detailed information about the organization and the proposed facility, including contact details, administrative structure, management system certificates, technical experience and an anticipated project schedule. The NDK then registers the organization and initiates the preparation of the DBL, which serves as the basis for licensing and includes national and international standards and guidelines. The DBL is periodically reviewed and updated as necessary to ensure compliance with safety and regulatory requirements.

For radioactive waste facilities, first, a site approval must be obtained from the NDK, which involves submitting a comprehensive site report and conducting detailed site studies to ensure that the site is suitable. The organization must then apply for a construction permit by submitting SAR and environmental monitoring programmes. Once construction is complete, the organization must obtain a commissioning permit, which involves testing and verifying that the facility operates as designed.

Following the commissioning permit, the organization must apply for an operating license. After obtaining an operating license, the organization must comply with safety and security regulations, conduct periodic reviews and obtain permit for any significant modifications. Finally, the decommissioning process requires a separate permit to ensure that all activities meet regulatory standards until the site is released from regulatory control.

For disposal facilities, active and passive safety measures on and around the site shall be implemented during the post-closure control periods. The results of radiological environmental monitoring and maintenance and repair activities shall be reported to the NDK annually from the date of the closure permit during the post-closure active control period until release from regulatory control.

Disposal facilities will be released from regulatory control after the post-closure active control period and only under the condition of restricted use of the site. During the post-closure active control period, monitoring and control activities shall be carried out to monitor the integrity of the barriers. The site of disposal facilities released from regulatory control shall be marked by the organization during the passive control period. The conditions for restricted use shall be ensured and annual reports shall be submitted to the NDK demonstrating that these conditions are fulfilled. The organization shall also prepare a historical report of the facility and shall submit it to the relevant institutions and organizations.

Approval and authorization steps for nuclear facilities and radioactive waste facilities are summarized in Table 6.

Table 6 *Approval and authorization steps for nuclear facilities and radioactive waste facilities*

	Regulation on Authorizations Regarding Nuclear Facilities			**Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities**	
Approval and Authorization Steps for Facilities	**NPPs**	**Research Reactors**	**Nuclear Raw Material Processing Facilities**	**Radioactive Waste Processing and Storage Facilities**	**Radioactive Waste Disposal Facilities**
Site Approval	×	–	–	×	×
Manufacturing Permit	×	×	–	–	–
Site Preparation Permit	×	×	–	–	–
Construction Permit	×	×	×	×	×
Commissioning Permit	×	–	–	×	×
Operating License	×	×	×	×	×
Permit for Re-starting Operation	×	×	×	–	–
Modification Permit	×	×	×	×	×
Decommissioning Permit	×	×	×	×	–
Closure Permit	–	–	–	–	×
Release from Regulatory Control	×	×	×	×	×

E.4 Prohibited operation without a license

The utilization of nuclear energy and ionizing radiation without a license is prohibited by Law No. 7381. This Law establishes sanctions for violations of authorized activities, including criminal and administrative sanctions for facilities operating without a valid license and for those abandoning an authorized activity before the proper termination of legal responsibilities.

E.5 System of regulatory inspection, documentation and reporting

Until the establishment of NDK, TAEK conducted inspections to ensure that the authorized organization complies with the conditions set out in the authorization and applicable regulations. TAEK took enforcement actions when deviations or non-compliance with conditions and requirements were identified. 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 facilities. In addition to TAEK inspectors, external technical

support has also been utilized when necessary. To improve the inspection capabilities, TAEK received external consultancy services from academicians. In 2015, TAEK signed a protocol with Turkish Standards Institution (TSE), which has experience in industrial inspections, to procure external support. Additionally, TAEK sought assistance from experienced European Union (EU) regulators and inspection organizations through EU projects to improve its inspection system.

After the NDK became operational with transfer of personnel from the regulatory divisions of TAEK, regulatory inspection activities were also transferred to the NDK. Former regulations regarding inspections issued by TAEK are being updated by NDK. Recently, Regulation on Inspections and On-site Examinations Regarding Nuclear Energy and Ionizing Radiation, 2023 was published. This regulation outlines the inspection process in accordance with the provisions of Law No. 7381.

Under PD No. 95, NDK has the following responsibilities regarding inspection:

- To inspect or examine on-site of the activities and authorized persons before or after the authorization,
- To prepare annual inspection programs regarding inspection activities in coordination with the relevant departments,
- To carry out the works and procedures related to the implementation of administrative sanctions in matters falling within its scope of duty and authority, in coordination with the relevant service units.
- To receive technical support services from specialized public institutions and organizations, private law legal entities and real persons, within the scope of the inspection and on-site examination, in order to conduct the examination, research, determination and reporting in a way that will not be binding on the NDK in terms of results,
- To inform the authorized person about the findings determined as a result of the inspection activities, to follow up the works and procedures of the authorized person regarding the findings, to report the findings that are not closed positively to the relevant service units and to carry out the works and procedures stipulated in the relevant legislation in coordination,

Additionally, inspectors of the NDK and other NDK personnel assigned to accompany the inspection, has the authority to enter relevant places or facilities for inspection purposes; to supervise the activities and inspect them on the spot; to meet with the people they deem necessary and to conduct examinations, research and investigations on the issues they deem necessary; requesting, examining, retaining or taking copies of all kinds of information, documents and records; to take, remove, retain, properly dispose of or have any material or sample; to make or have measurement, analysis, inspection and testing using any device; to keep visual, audio or written records.

Law No. 7381 assigns the responsibility for documentation and reporting to the authorized person, requiring them to keep records, make notifications, and submit reports as defined in the legislation and its management system. Additionally, the Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, 2022, includes requirements for record-keeping and reporting in accordance with the facilities' management systems.

For radioactive waste and spent fuel management, the Regulation on Radioactive Waste and Spent Fuel Management, 2023, provides detailed guidelines on record-keeping and reporting obligations.

Art. 27 of the Regulation on Radioactive Waste and Spent Fuel Management, 2023, states that the authorized person must record detailed information about radioactive waste and spent fuel based on the type of activity. These records include the classification, quantity, radioactivity, radionuclide content, physical, chemical, and thermal properties, as well as the location and activity of the waste. Information about the packaging, such as type, volume, weight, number, radionuclide content, total radioactivity, surface contamination, dose rate, and identification number, must also be documented. Additional records include data on reusable or recoverable radioactive materials, disused sealed sources, spent fuel details, and any radioactive waste generated during emergencies. These records must be periodically updated and retained until the facility or site is no longer under regulatory control.

Art. 28 of the Regulation on Radioactive Waste and Spent Fuel Management, 2023, states that the authorized person must submit an annual radioactive waste and spent fuel management report to the NDK, starting from the date an operating license is granted until the facility is no longer under regulatory control. For disposal facilities, this reporting requirement continues until a closure permit is issued. The annual report should include the records specified in Art. 27. Additionally, the authorized person must report any information required by the NDK, based on the graded approach principle, regarding radioactive waste management for radiation facilities, radiation applications, and other activities.

There are currently two specific regulations in force for research reactors regarding records and reporting; Regulation on Recording and Reporting in Research Reactors, 2009 and Regulation on Notification and Reporting of Unusual Events for Research Reactors, 2009. On the other hand, Regulation on Record, Notification and Reporting in Nuclear Facilities is currently in draft form and expected to be entered into force by the end of 2024. Once this new regulation is enacted, it is planned to revoke the two existing regulations for research reactors.

Furthermore, Art. 13 of the Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, 2022, stipulates that the authorized persons for nuclear facilities, radiation facilities and radioactive waste facilities shall structure their activities as interacting processes, and they shall record, execute, monitor, evaluate, continuously improve and manage these processes. According to this regulation, each process shall be recorded with documents that are compatible and consistent with the other documents of the facility, including its objectives, introduction, owner, responsible persons, scope of work, main inputs and outputs, monitoring methods and indicators, other processes with which it interacts, records to be kept, requirements to be met and implementation procedures. This regulation also includes general provisions regarding documentation of procurement management, document management and modification management.

E.6 Enforcement of applicable regulations and terms of licenses

Law No. 7381 provides the legal framework for enforcement of applicable regulations and terms of licenses. According to Art. 3 para. 3, activities related to nuclear energy and radiation and persons, facilities, devices and materials related to these activities are subject to regulatory control in terms of safety, security and nuclear safeguards.

According to Law No. 7381 nuclear enforcement system consist of criminal sanctions and administrative sanctions. Art. 24 regulates criminal sanctions, implementation of these sanctions is not part of the regulatory functions of NDK. It falls within the jurisdiction of the criminal courts. Art. 25 regulates administrative sanctions which comprises cancellation, suspension, restriction of authorization and administrative fines. The Nuclear Regulatory Board is authorized to decide on administrative sanctions.

NDK could apply administrative sanctions together or separately. In cases where safety or security is endangered or may be compromised NDK may decide suspension or restriction of authorization in addition to the administrative fine.

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

Administrative sanctions to be applied by the NDK; are determined with a graded approach. This approach is based on the type and characteristics of the activity, the risk of exposure, the magnitude of the radiation exposed, together with the presence and magnitude of the damage.

For the implementation of administrative sanctions, a regulation has been issued to clarify the procedural issues, the Regulation on Administrative Sanctions of Nuclear Regulatory Authority, 2021. This regulation was re-issued and published in 2023 with some revisions. The enforcement process begins with the identification of violation. Violations are graded depending on the consequences of the violations. And there is a calculation table and formula which is prepared to determine the influence of the criteria presented in the Regulation on the administrative sanction to be applied.

E.7 Related governmental bodies with regulatory functions on spent fuel and radioactive waste management

As seen in Figure 3, numerous organizations are directly or indirectly involved in the spent fuel and radioactive waste management in Türkiye. The responsibilities of the Governmental bodies with regulatory functions are given in the following subchapters.

E.7.1 Ministry of Energy and Natural Resources (ETKB)

The ETKB is the main supervising authority in the national energy sector, responsible for preparing and implementing energy policies, plans and programs in co-ordination with its subsidiaries, related institutions and other public and private entities.

ETKB has several critical responsibilities regarding spent fuel and radioactive waste management in Türkiye. The Ministry is the policy maker for management of spent fuel and radioactive waste and manages the special accounts for radioactive waste management and decommissioning, ensuring that necessary funds are available for these purposes. Additionally, ETKB supervises the TENMAK, which ensures safe final disposal of radioactive waste.

ETKB also approves the NRWMP prepared by TENMAK, incorporating feedback from the NDK, and ensures that this plan is updated every five years. Through these responsibilities, ETKB plays a pivotal role in maintaining the safety, security, and environmental integrity of spent fuel and radioactive waste management in Türkiye.

E.7.2 Ministry of Environment, Urbanization and Climate Change (ÇŞİDB)

ÇŞİDB establishes principles of national policy, related plans and programs for protection and improvement of the environment, and the prevention of environmental pollution and addressing climate change. In concrete terms, the ÇŞİDB responsibilities include ensuring the most proper and effective use and protection of land, the protection and improvement of the natural plant and animal habitat and the prevention of environmental pollution.

The Regulation on Environmental Impact Assessment, 2022, stipulates the projects that require the preparation of an EIA report, and according to Annex-1 of the regulation, radioactive waste and spent fuel management facilities are among these projects. Project owners must prepare and submit an EIA report during the planning stage and ÇŞİDB ensures that the environmental impacts of proposed radioactive waste and spent fuel management facilities are thoroughly evaluated and grants affirmative EIA decision if the report is satisfactory. According to PD No. 95, the format of the sections of the EIA report related to radiological effects is determined by the ÇŞİDB, with the approval of the NDK. Radioactive waste and spent fuel management facilities should obtain an affirmative decision on EIA from the ÇŞİDB as a prerequisite to any license.

E.7.3 Nuclear Regulatory Authority (NDK)

NDK is established as an independent nuclear regulatory body. NDK regulates all activities regarding to nuclear facilities, radiation facilities, radioactive waste facilities, nuclear materials, radiation sources, radioactive waste, export control with the aim of non-proliferation of nuclear weapons, radiation emergency management, qualification and training of personnel through issuing regulations and guides, reviewing and assessing the submitted documents, issuing authorizations, and conducting inspections and enforcements. More detailed information about NDK is presented in Article 20 of this section.

E.7.4 The Accounts Management Board (HYK)

According to Law No. 7381 Art. 10 radioactive waste management special account and decommissioning special account were established. Waste producers will contribute to these special accounts in accordance with the relevant legislation and provide the necessary guarantees.

The HYK will manage the revenues and expenditures of the radioactive waste management special account and the decommissioning special account. The HYK approves the adequacy of the guarantee submitted to the special accounts that the necessary costs for radioactive waste management and decommissioning can be covered in case of early decommissioning of the facility and notifies NDK.

E.7.5 Turkish Energy, Nuclear and Mineral Research Agency (TENMAK)

TENMAK was established with a special budget in 2020 as an affiliated organization of the ETKB. The institutes within TENMAK are:

- Nuclear Energy Research Institute,
- Boron Research Institute,

- Rare Earth Elements Research Institute,
- Energy Research Institute,
- Clean Energy Research Institute.

TENMAK is tasked with several critical responsibilities regarding spent fuel and radioactive waste management in Türkiye. It is responsible for preparing the draft NRWM. This plan outlines the national strategy and policy for managing radioactive waste and spent fuel, which is subject to approval by the ETKB. TENMAK's responsibility on determining the strategies regarding radioactive waste and taking necessary actions as the national radioactive waste management organization leads the establishments of a Radioactive Waste Management Department under TENMAK.

TENMAK oversees the disposal of radioactive waste generated within Türkiye's jurisdiction. This includes managing orphan radioactive materials and ensuring safe and compliant disposal practices. TENMAK leads research and development efforts in areas related to radioactive waste management. This includes advancing technologies and methodologies for the safe handling, treatment, and disposal of radioactive materials.

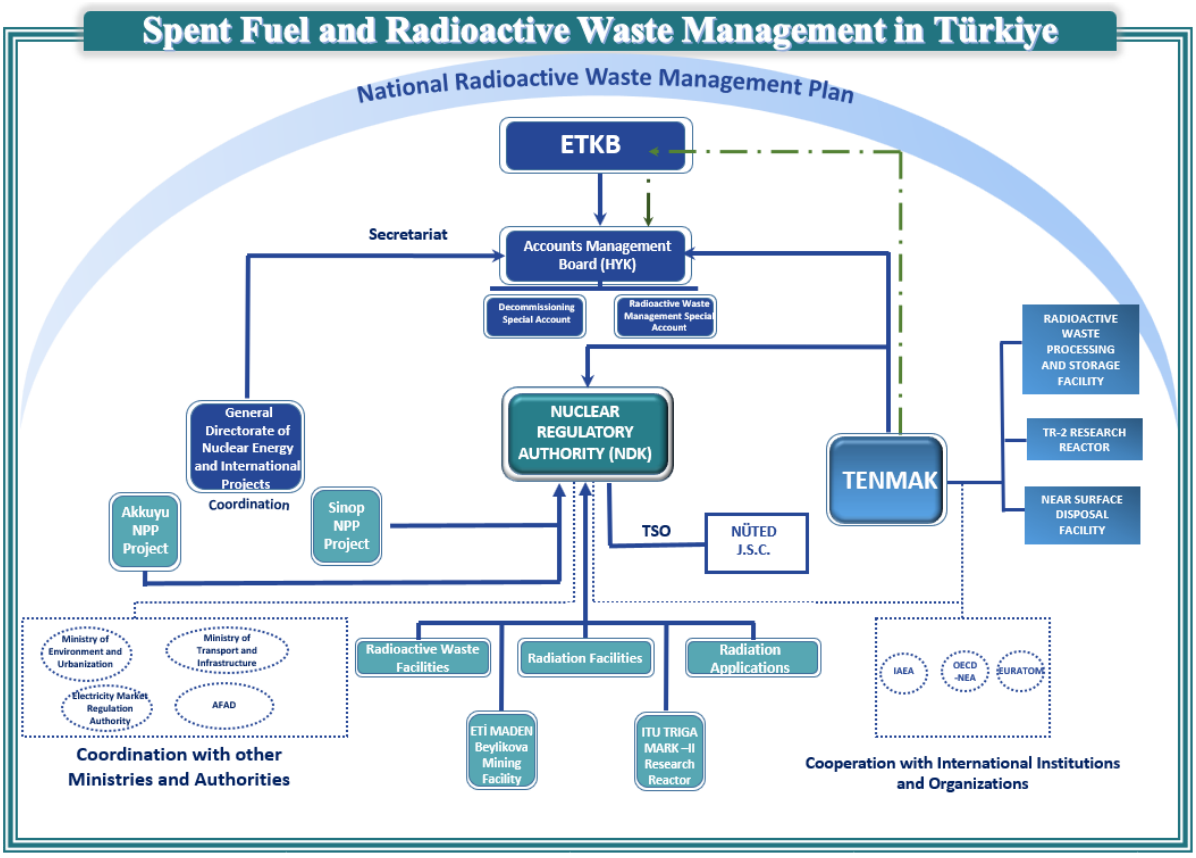

Figure 3 *Governmental and organizational infrastructure*

Article 20. Regulatory Body

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

E.8 Establishment of the regulatory body

Information regarding the establishment of the regulatory body, NDK, is given in E.1 of this section.

E.9 Legal foundations and statute of the regulatory body

The legal foundations and statute of the NDK are primarily established by Law No. 7381 and PD No. 95. Law No. 7381 sets forth comprehensive provisions and requirements for nuclear safety, security, safeguards, and radiation protection, including authorizations, inspections, sanctions, and coordination between governmental bodies. PD No. 95 details the organizational structure and functions of the NDK.

E.10 Mandate, mission and tasks

NDK has been established with the mission to ensure the safe and peaceful use of nuclear energy and ionizing radiation for individuals, the public, the environment, and future generations through competent and effective regulatory control.

Law No. 7381 outlines its aim and scope in Art. 1, which also establishes the general mandate of the NDK for regulating activities involving the use of nuclear energy and ionizing radiation. The objective of the law is to set fundamental principles and rules to protect workers, the public, the environment, and future generations from potential harmful radiation effects. It specifies the responsibilities of involved parties, defines the organization, duties, and authorities of the NDK, and details the principles concerning the personal rights of NDK personnel. This framework ensures that all activities related to nuclear energy and ionizing radiation adhere to the principle of peaceful use.

According to Art. 4 of PD No. 95, NDK regulates the following activities, topics and areas:

a. Radiation protection of workers, public, environment and future generations
b. Safety, security and nuclear safeguards in the activities regarding nuclear energy and radiation,
c. All activities related to the construction, operation, decommissioning and closure of nuclear installations, radiation facilities and radioactive waste facilities.
d. Extraction, production, transportation, storage, export, import, trade, possession, transfer, processing, reprocessing and use of nuclear materials,
e. Production, transportation, storage, export, import, trade, possession, transfer, use, installation, modification, dismantling, maintenance and repair of radiation sources.

f. The possession, transfer, processing, transportation, storage, export, import and disposal of radioactive wastes.
g. Export and import of substances, materials, equipment, systems, components or related technology determined by the NDK within the scope of nuclear safeguards.
h. Radiation emergency management.
i. The qualifications and training of the personnel related to the activities within the scope of its duties and authorities.
j. Other issues, areas and activities that fall under the scope of its duties and authorities and to be determined by the Board.

E.11 Authorities and responsibilities

According to Art. 5 of PD No. 95, the duties and authorities of the NDK are as follows:

a. To determine the strategy, goals and working principles of the NDK.
b. To carry out regulatory operations regarding issues within the scope of its duties and authorities.
c. To grant authorizations; to define and modify the technical, legal, administrative and financial scope and conditions of the authorizations; to restrict, suspend, end, revoke the granted authorizations; to determine and modify the term of the authorizations; to review and evaluate the information and documents submitted to the NDK for or after the authorization; to define and modify the conditions of the granted authorization in view of the concluded evaluations.
d. To inspect or examine on-site of the activities or authorized persons before and after the authorization
e. To request and evaluate all kinds of required information and documents from the persons who apply to the NDK for authorization and are authorized, to use this information and documents in compliance with the confidentiality requirements,
f. To determine the issues that require approval within the scope of safety, security, nuclear safeguards and radiation protection, to give approval and to bring compliance criteria when necessary,
g. To request the authorized person to carry out an assessment on safety, security, and nuclear safeguards and to request from the authorized person, under the condition of having financial responsibility and legal liability, to take additional measures according to the results of the assessment,
h. To carry out works and procedures related to administrative sanctions within the scope of Law No. 7381,
i. To determine whether the authorized persons have fulfilled their obligations related to the insurance or financial guarantee for nuclear liability and related to the special accounts of radioactive waste and decommissioning,
j. To establish and operate the national radiation sources recording system, national dose registry system, national nuclear material accounting and control system,
k. To conduct the national radiation monitoring activity or to have it conducted,
l. To cooperate with the institutions and organizations of other countries and international organizations, to participate in joint activities or to coordinate the

activities carried out with these organizations within the scope of its duties and authorities,

m. To inform relevant national or international organizations about extraordinary events,
n. To have carried out research and development activities in the field of safety and security necessary to support its regulatory activities,
o. To exchange information, cooperate and communicate directly with public and private institutions and organizations, non-governmental organizations and the public,
p. To determine regulatory activities, decisions and opinions to be sent to national and international institutions and organizations, and to be disclosed to the public,
q. To request all kinds of necessary information and documents related to a subject from all natural and legal persons including public institutions and organizations and/or to examine them,
r. To determine the training programs for radiation protection for the personnel who take part in the activities of the authorized persons and determined by the Authority, to ensure that training is given, to carry out the works and procedures related to examination and certification,
s. To cooperate with relevant institutions and organizations in the management of radiation emergencies that may occur as a result of activities not under regulatory control.

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

E.12 Organizational structure of the regulatory body

PD No. 95 delineates the organizational structure of the NDK, which is comprised of a Nuclear Regulatory Board and a Presidency.

The Nuclear Regulatory Board is the decision-making body of the NDK, comprised of five members including the President of the NDK (who also chairs the Nuclear Regulatory Board) and a Second Chairperson. All members of the Nuclear Regulatory Board, including the President and the Second Chairperson, are appointed by the President of the Republic of Türkiye. In addition, the Regulation on Working Procedures and Principles of the Nuclear Regulatory Board was issued in 2022.

The Presidency of NDK includes the President, two Vice Presidents, five technical and six administrative service 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).

Administrative units are:

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

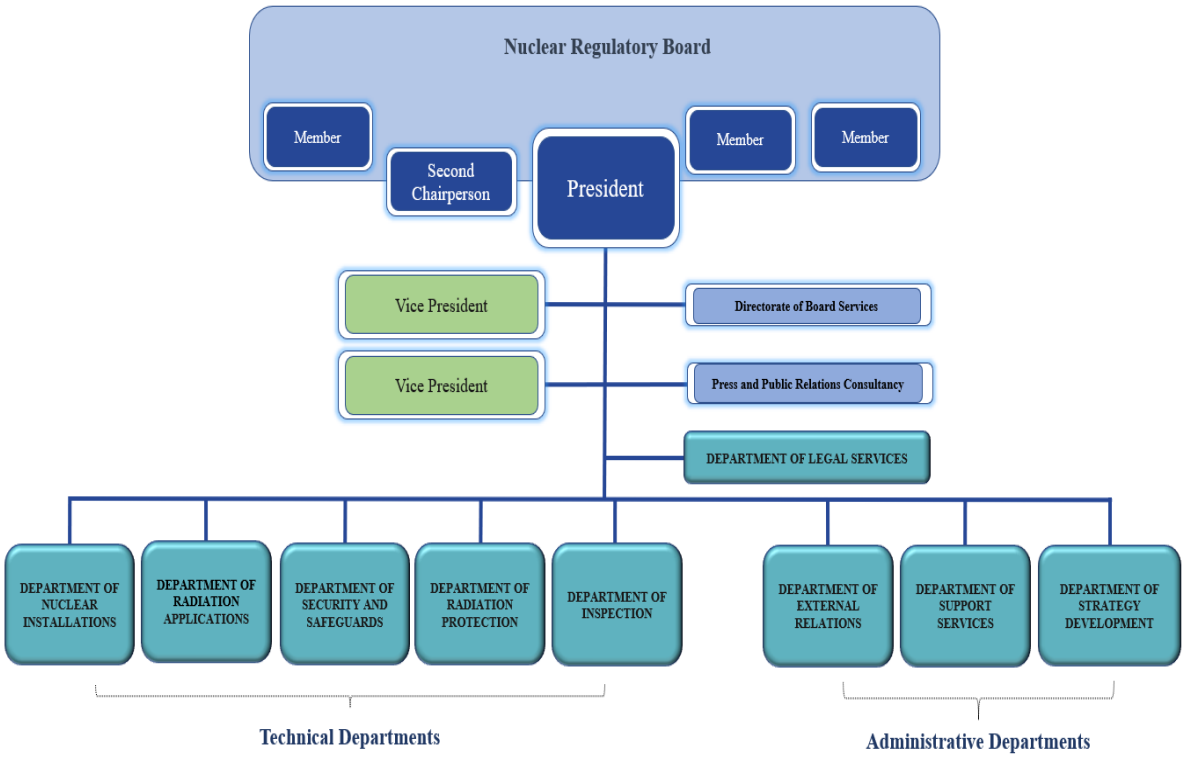

Figure 4 Organizational Structure of the NDK

E.13 Competence of the regulatory body

Upon its establishment, the NDK took over the regulatory functions previously carried out by TAEK. This transfer included moving staff members from TAEK's regulatory divisions to the newly formed NDK.

Currently, NDK recruits its staff through Public Personnel Selection Examination, a central exam to employ public personnel arranged by Measurement Selection and Placement Centre. The NDK has adhered to these central hiring protocols while also implementing its own internal selection procedures.

To enhance its training capabilities, the NDK collaborates with international organizations, technical support organizations (TSOs), and regulatory bodies from vendor and other countries through bilateral agreements.

Following an IAEA Expert Mission in February 2013, a study was initiated to develop a systematic competency management framework based on IAEA's Systematic Assessment of Regulatory Competence Needs, SARCON, model. In addition, two projects were implemented with support from European Commission (EC): a Pre-accession Assistance, IPA, twinning project with TÜV-SÜD and Instrument for International Nuclear Safety Cooperation (INSC) Project with Risk Audit. These initiatives aim to to enhance the competency of TAEK by leveraging EU expertise in regulatory framework development, enforcement, and training program design. The projects focused on advancing regulatory body's technical proficiency in critical areas such as radiation protection and waste management, boosting its manufacturing and construction inspection abilities, and refining its overall management system.

NÜTED A.Ş., a government-owned entity, was established alongside the NDK to provide essential technical support services, including authorization, review, assessment, analysis, inspections, and training.

E.14 Financial status of the regulatory body

Established under Law No. 7381 and PD No. 95, NDK operates with financial autonomy, allowing it to utilize its allocated budget without external interference. Its financial resources are allocated and managed according to procedures and principles outlined in relevant legislation, ensuring that funds are used effectively to support its regulatory activities.

According PD No. 95 Art. 28, the revenues of the NDK are as follows:

a. Process and service fees,
b. Publication and other similar revenues,
c. Donations to be submitted to NDK,
d. Revenues of movable or immovable properties of of NDK,
e. Treasury grants from general budget.

According to PD No. 95, it is essential for the NDK's revenues to cover its expenses. Also, the NDK is not permitted to accept donations in any way from persons subject to regulatory control.

E.15 Management system in regulatory body

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

Additionally, the project titled "Support to the Regulatory Authority of Türkiye" has been started at the beginning of 2018 within the scope of INSC with Risk Audit. The overall objective of the project is to further develop the managerial and technical capabilities of the regulatory body. After the establishment of NDK, it undertook the abovementioned project and collaborated with local consultants on developing quality management system. Activities within the scope of the project were finalized in 2021. As a consequence of these efforts, NDK

established its own MS in order to ensure that its assigned responsibilities are properly fulfilled, maintain and improve its performance, foster and support a safety culture. In April 2021, the MS of NDK was certified in terms of ISO 9001 QMS and ISO 45001:2018 Occupational Health and Safety Management System by TSE.

E.16 Openness and transparency of regulatory activities

According to Art. 5 of PD No. 95, the NDK is tasked with collaborating with institutions and organizations from other countries and international bodies. It participates in joint activities and coordinates efforts within its area of responsibility. In addition, NDK must inform relevant national and international organizations about any extraordinary events that occur and it is responsible for exchanging information and cooperating directly with public and private institutions, non-governmental organizations, and the general public.

NDK maintains transparency in regulatory decisions through its official website (https://www.ndk.org.tr/en-US) and produces press releases to provide detailed information on specific events, enhancing public understanding.

E.17 Status of the regulatory body

NDK is designed to function as an independent nuclear regulatory body and in order to protect its independence and enable it to make regulatory decisions without undue pressure or constraints, PD No. 95 stipulates that no authority or organization has right to give orders to NDK.

PD No. 95 states that the NDK will independently execute its duties and powers as granted by Law No. 7381, this PD and other relevant legislation. NDK's decisions are not be subject to expediency control or propriety audit. The NDK independently implements its duties and uses authorities assigned to it by this PD. NDK shall not be given any responsibilities which shall weaken its regulatory activities, conflict with these activities or prevent NDK from conducting its activities effectively. The property and assets of NDK shall be deemed as State property. The property, assets, rights and receivables of the NDK cannot be seized or pledged. The NDK is allowed to establish units affiliated with the headquarters where deemed necessary for the activities in the scope of PD No. 95.

NDK operates as a public entity with legal, institutional, and political independence, alongside substantial financial flexibility. Law No. 7381 and PD No. 95 constitute governmental, legal and regulatory framework that underpins independency of NDK. NDK is associated with the ETKB because in Türkiye, all regulatory bodies need to be associated with a ministry to be represented in the Parliament. This association does not imply a reporting structure but rather aligns with the country's governmental framework. According to the report of IRSS Mission, which was held in 2022, the legal system of Türkiye adequately stipulates the requirements for the establishment of a regulatory body and its independence.

E.18 Human resources

Currently, NDK carries out the duties and authorities assigned to it by legislation through a total of 292 personnel.

The Ministry of National Education (MEB) of Türkiye provides a fully supported scholarship program for studying abroad, known as the MEB Selection and Placement of Candidates Sent Abroad for Postgraduate Education (YLSY). Established under Law No. 1416,

this program has been facilitating the international education of students since 1929, aiming to address the need for expert personnel in universities and public institutions.

A total of 85 scholarship students studied on behalf of NDK from 2017 to 2023. Among them, 12 were sent abroad to receive Ph.D. education, while the others were sent abroad to receive M.Sc. education. 79 of these students who successfully completed their education abroad in 2022 were appointed to positions as Nuclear Regulatory Assistant Specialist at NDK.

SECTION F OTHER GENERAL SAFETY PROVISIONS

Article 21. Responsibility of The License Holder

1.Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.
2.If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

F.1 Responsibilities of the authorized person

The responsibilities of the authorized person for the safety of spent fuel or radioactive waste management are prescribed in Law No. 7381 and the Regulation on Radioactive Waste and Spent Fuel Management, 2023.

Pursuant to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, the authorized person for the activity shall bear full responsibility for the effective and efficient management of radioactive waste and spent fuel within the site, or alternatively, for the management of radioactive wastes at designated locations where radiation application or other related activities are being conducted. Furthermore, 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.

All responsibility for the management of spent fuel or radioactive waste, excluding its disposal, rests with the person authorized to carry out the activity. In addition, all responsibility for radioactive waste generated during decommissioning activities rests with the authorized person. According to Law No. 7381, TENMAK is responsible for the disposal of radioactive waste generated as a result of the activities carried out in the sovereignty area of the Republic of Türkiye.

With regard to the financial responsibility of the authorized person, the person authorized for the activity generating the radioactive waste and spent fuel shall bear full financial responsibility for all costs associated with the management of radioactive waste and spent fuel. As per Law No. 7381 and Regulation on Radioactive Waste Management Special Account and Decommissioning Special Account and the Accounts Management Board, 2023, persons authorized to operate NPPs or facilities other than NPPs shall make their contribution payments to radioactive waste management special account and decommissioning special account separately. Persons who apply for authorization to operate NPPs or facilities other than NPPs make their guarantee payments separately to the special accounts before the authorization is made. The detailed information regarding the financial responsibility of the authorized person is given in Article 22 of this report.

In addition to the aforementioned responsibilities, according to Law No. 7381, the authorized person must not abandon the place of operation or facility, nuclear material, radioactive source or radioactive waste unless their obligations related to the activity terminates.

On the other part, it is the responsibility of NDK to verify that the authorized persons fulfil their responsibilities set in the legislation. This verification is carried out through safety reviews and assessments as well as inspections. In addition to the inspection of NDK; authorized legal entities receive services from authorized companies for third-party surveillance of activities determined by NDK, including the inspection of structures related to nuclear facilities or radioactive waste facilities. Additionally, NDK may engage specialized public institutions, private legal entities, and individuals with expertise to conduct examinations, investigations, assessments, and reporting within the framework of inspections and on-site examinations.

F.2 Termination of responsibilities of the authorized person

The termination of responsibility of the authorized person for the safety of spent fuel or radioactive waste management is prescribed in Law No. 7381 and the Regulation on Radioactive Waste and Spent Fuel Management, 2023.

The authorized person's responsibility regarding the radioactive waste under Law No. 7381 terminates when the authorized person exports radioactive waste or delivers it to another authorized person for processing, storage or disposal or when the radioactivity of the radioactive waste falls below the clearance or release limits, in accordance with the relevant legislation.

The responsibilities of the authorized person terminate with the release from regulatory control. Termination, limitation, suspension or revocation of the relevant authorization or similar situations shall not reduce the responsibilities of the authorized person. In such cases, if NDK determines that there is a weakness in safety, security and nuclear safeguards, NDK may take all kinds of measures to ensure safety, security and nuclear safeguards, provided that the legal and financial responsibility rests with the authorized person.

F.3 Orphan radioactive materials

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, radioactive material that is not under regulatory control for any reason, or that is out of regulatory control for reasons such as abandonment, theft, loss, or transfer without compliance with licensing requirements, is defined as orphan radioactive material. Moreover, according to Law No. 7381 management of orphan radioactive material is the responsibility of TENMAK.

The detailed information regarding the management of orphan radioactive materials and responsibilities are presented in Section J.

Article 22. Human and Financial Resources

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

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

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

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

F.4 Human resources

According to Law No. 7381 and the Regulation on Authorizations Regarding Nuclear Facilities, 2023, and the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, the authorized person is obligated to ensure that activities are conducted by a sufficient number of competent personnel who embody a safety and security culture. This involves providing necessary training to personnel and developing nuclear safety and security policies and targets. The authorized person must allocate human and financial resources in a timely manner to achieve these goals, ensuring the organizational structure, equipment, and financial resources are adequate for safe and secure operations.

Furthermore, the competence, training, and qualifications of personnel working in nuclear facilities are detailed in the Regulation on Organizational Structure and Personnel in Nuclear Facilities, 2022. According to this regulation, the organization must structure itself to possess the necessary competence to conduct facility-related activities safely and securely. Additionally, managerial and safety-critical duties must be performed exclusively by personnel who have successfully completed facility-specific training and possess the required competence. The regulation further stipulates requirements for personnel training emphasizing the importance of safety and security in activities and the responsibilities of personnel in radiation protection and emergencies. The organization is tasked with developing and implementing an employee training program that ensures personnel maintain competencies necessary for their roles, through regular or individualized training sessions aligned with the security significance of their duties.

F.4.1 Human resources in the Akkuyu NPP

According to the Regulation on the Organizational Structure and Personnel in Nuclear Facilities, 2022, Akkuyu Nuclear JSC is required to develop and implement comprehensive training programs for its personnel. These training programs focus on educating employees about their responsibilities in nuclear safety, security, radiation protection, and emergency preparedness and response, specifically tailored to the management of radioactive waste and spent nuclear fuel.

Moreover, employee training for a position is conducted in accordance with their individual training program, except for exempted employees by authorization approval. Generally, preparation for a position includes a combination of theoretical and practical training, along with on-the-job training.

According to the requirements of the Regulation on Radiation Protection at Nuclear Facilities, 2018, in order to ensure the radiation safety at NPPs, personnel working under conditions of radiation exposure must undergo a mandatory training course.

Throughout their work activities, personnel are obligated to maintain their qualification by updating, developing, and enhancing previously acquired professional knowledge, practical skills, abilities, and competencies essential for their job duties. Furthermore, personnel training at NPPs takes place in training centers, including those situated at the Russian NPP sites and organizations within Russian Federation, following the guidelines of the IGA. According to the IGA, Turkish citizens shall be trained and widely employed for the purpose of operating needs of the Akkuyu NPP.

In order to develop a pipeline between the technical high schools near plant site and nuclear training center at plant site to be established for construction works, a protocol was signed between the ETKB, MEB, and Akkuyu NPP.

Finally, the Russian party is providing support and assistance in training of professional staff for nuclear power development in Türkiye. In this regard, between 2011 and 2023, 322 Turkish citizens were educated at Russian Universities for both undergraduate and graduate studies.

F.4.2 Human resources in TENMAK

YLSY scholarship holders, graduated from nuclear related subjects including radioactive waste management at universities ranked among the top five hundred in the world as Master's degree, have been working at TENMAK. In addition to that, employees of TENMAK are of various professions and are regularly further educated to upgrade specific knowledge in the field of safe radioactive waste management and radiation protection. The education is mostly carried out through IAEA technical cooperation projects, as well as IAEA and other trainings, meetings, workshops, and fellowships, but also in direct cooperation with universities, institutes, expert radioactive waste management organizations, institutions, and groups in other countries.

F.4.3 Human resources in TÜNAŞ

Within the framework of the "Cooperation Agreement on the Peaceful Uses of Nuclear Energy" signed between the Republic of Türkiye and the People's Republic of China on April 6, 2012, the "International Master's Program in Nuclear Energy Engineering and Management" was established in partnership with Tsinghua University to develop human resources in the field of nuclear energy in Türkiye. Students are trained in various fields of nuclear technologies, including power plant engineering and management, as well as radioactive waste management.

The program has awarded Chinese government scholarships to students and arranged internships in various sectors of the Chinese nuclear industry. Since 2017, students have participated in programs in China, with organization, coordination, and management overseen by TÜNAŞ. Similar processes have also been carried out with Harbin University. Additionally, individuals graduated from YLSY programmes on nuclear related subjects, including radioactive waste management and disposal have also been hired by TÜNAŞ.

Apart from the master's programs, scholarships, and waste management internships, personnel at TÜNAŞ have consistently participated in technical meetings, workshops, and training sessions organized by various international organizations such as IAEA, Nuclear

Regulatory Commission of USA and World Association of Nuclear Operators, WANO. As part of TÜNAŞ's competency development strategy, internal trainings related to NPP owner's requirements and national and international regulations, guides and requirements have been organized. During these training sessions, topics such as spent fuel management and radioactive waste management strategy including waste characterization, treatment and conditioning, transportation, disposal options are covered.

F.4.4 Human resources in İstanbul Technical University

İTÜ employs a sufficient number of competent managers and staff, as required by its human resources policy, and, those with the required qualification certificates, in compliance with NDK requirements for all personnel.

F.5 Financial resources

F.5.1 Financing of radioactive waste management and the decommissioning

The financing of radioactive waste management and decommissioning in Türkiye is determined by intergovernmental agreements, Law No. 7381 and regulations. The policy regarding the funding of the spent fuel and radioactive waste management is presented in Section B of this report.

The IGA signed between Republic of Türkiye and the Russian Federation for the construction and operation of the Akkuyu NPP stipulates that Akkuyu Nuclear JSC, which owns and operates the plant, will be responsible for the waste management and the decommissioning of the Akkuyu NPP.

In IGA, a power purchase agreement is defined between the Akkuyu NPP and the Turkish side. For the electricity purchased by the Turkish side according to the power purchase agreement, Akkuyu Nuclear JSC shall pay a separate amount of 0.15 US dollar cent per kWh to the radioactive waste management special account and 0.15 US dollar cent per kWh to the decommissioning special account. Regarding the electricity sold outside the framework of the power purchase agreement, Akkuyu Nuclear JSC shall make payments to these special accounts in accordance with the amounts stipulated by the HYK.

As stated in Law No. 7381, incomes of special accounts consist of contributions and guarantees to be paid, revenues obtained from the evaluation of special accounts, donations and other revenues.

In addition, the payment is made from the radioactive waste management special account to TENMAK to cover the expenses related to the activities including determination of areas for establishing a radioactive waste disposal facility and related siting studies, design, authorization, construction, operation, maintenance, closure, and release of the radioactive waste disposal facility from regulatory control, and research and development activities for the specified purposes.

Also, the payment is made to the authorized person from the decommissioning special account to cover the expenses related to the activities including decommissioning procedures, covering the costs of the disposal of radioactive wastes generated during the decommissioning of facilities and making the site compatible with the conditions for the end state of the facility site.

Contributions collected for the special accounts will be evaluated through the applications stated in the Regulation on Radioactive Waste Management Special Account and Decommissioning Special Account and the Accounts Management Board, 2023. In compliance with Law No. 7381 and the regulation, persons authorized to operate facilities make their contribution payments to radioactive waste management special account and decommissioning special account separately. Persons who apply for authorization to operate facilities make their guarantee payments separately to the special accounts before the authorization is made. In this regard, radioactive waste management special account and decommissioning special account were opened at ETKB Central Accounting Unit.

According to the abovementioned regulation, persons authorized to operate NPPs shall make contribution payments monthly to special accounts separately. The obligation to make contribution payment to the special accounts by persons authorized to operate an NPP starts with the commercial operation of NPP and ends when the relevant nuclear power plant ceases electricity generation.

F.5.2 The HYK

Within the scope of Law No. 738, the HYK is established, and the HYK consists of two representatives each from ETKB and the Ministry of Treasury and Finance, a representative from TENMAK and a representative of legal entities operating NPPs within the borders of the Republic of Türkiye, not exceeding three of these institutions and one member representing other facilities and applications.

The HYK determines the contributions to be paid to special accounts for NPPs per unit of electricity generated (kilowatt hour), and the amount of guarantees per installed power (megawatt). For other facilities and applications, the contributions to be paid to special accounts and the amount of guarantees; are determined by the HYK, taking into account the type of facility and application, the class, amount and activity of the waste.

The HYK approves the adequacy of the guarantee submitted to the special accounts that the costs necessary for radioactive waste management and decommissioning could be covered in case of early decommissioning of the facility and notifies the NDK, which is a condition for the operating license of a facility.

F.5.3 Cost of radioactive waste management and the decommissioning

According to the Regulation on Radioactive Waste Management Special Account and Decommissioning Special Account and the Accounts Management Board, 2023, the radioactive waste management cost plan and the decommissioning cost plan are defined.

The radioactive waste management cost plan shall be prepared by TENMAK and submitted to the ETKB. The radioactive waste management cost plan shall include; the project schedule, disposal method, characteristics of the disposal facility, expenses related to the activities and all expenses related to the disposal of radioactive wastes, including all expenses related to the disposal of radioactive wastes, the calculation method of the expenses and detailed cost and risk analyzes.

The decommissioning cost plan shall be prepared by authorized persons after the application to obtain an operating license for facilities and submitted to the ETKB. The decommissioning cost plan includes the project schedule, dismantling method, methods of making the facility site compatible for re-use conditions, the expenses related to the activities,

including all expenses related to decommissioning, the calculation method regarding the expenses and detailed cost and risk analyzes including early decommissioning.

Article 23. Quality Assurance

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

F.6 Management system in NDK

Management system in NDK is described in Article 20 of Section E.

F.7 Quality assurance and plan in the processes for nuclear facilities, radiation facilities and radioactive waste facilities

The Regulation on the Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, 2022, requires that authorized legal persons maintain an appropriate management system. This system must include record keeping, notification and reporting as required by the legislation and the organization's management framework. The regulation outlines detailed requirements and responsibilities for organizations and top management, emphasizing leadership for safety, safety culture and quality assurance in these facilities. Also, the regulation establishes requirements for the implementation, maintenance, evaluation and continuous improvement of management systems in all phases of the life cycle of facilities - from construction to operation, decommissioning or closure.

F.8 Quality plans in the processes for nuclear facilities including for NPPs, research reactors and mining facilities

As stated in the Regulation on Authorizations Regarding Nuclear Facilities, 2023, the Organization shall carry out all its activities within the scope of the management system established in accordance with the relevant legislation until it is removed from regulatory control.

According to abovementioned Regulation, a legal person wishing to establish a nuclear facility first submits a notice of intent to NDK. The management system certificates are one of the documents that this legal person shall submit to NDK along with the notice of intent. It is essential that the works within the scope of activities related to nuclear facilities shall be carried out in accordance with the quality plans and implementation projects prepared and approved by the Organization and that these plans and projects shall be kept at the place where the work is carried out.

The authorization of activities related to nuclear facilities are considered with a graded approach according to the type and qualifications of the facility. In this regard, as part of the other authorization applications for NPPs and research reactors, such as manufacturing permit, site preparation permit, construction permit, and commissioning permit applications, quality management system documents shall be submitted to NDK. As for mining facilities, the quality documents shall be submitted to NDK as part of the construction permit application.

F.9 Quality assurance in the Akkuyu NPP

A quality assurance program for the management of radioactive waste has been developed and applied in Akkuyu NPP that includes a set of responsibilities, authorities and interrelation,

process methods and necessary resources to implement management functions, ensuring the quality and safety of operation of equipment for collection, transportation, processing, including compaction and packaging, certification and storage of radioactive materials, as well as control and process control systems.

In this context, to enhance safety of Akkuyu NPP, Akkuyu Nuclear JSC initiated integrated management systems that have been certificated to comply with international standards ISO 9001, ISO 19443, ISO 14001, ISO 45001.

F.10 Quality assurance and plan in the processes for RWFs

According to the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, all activities pertaining to the radioactive waste facility shall be conducted by the Organization in accordance with the quality plans and implementation projects. Furthermore, it is required that mentioned plans and projects shall be maintained both on site and in the facility. Following its authorization, the Organization prepares the quality plans for the activities to be undertaken within the scope of its authorization in accordance with the relevant legislation. These plans and projects shall be kept until the radioactive waste facility and site are removed from regulatory control.

In accordance with the abovementioned regulation, after the organization has made a notification of intent and NDK has registered it; the organization shall prepare the quality assurance document and subsequently submit it to NDK.

As part of the authorization applications, quality assurance documents related with the specific application, shall be included in application documents.

F.11 Quality assurance in TENMAK

The management system of TENMAK includes a description of the radioactive waste management organization, the responsibilities of the hierarchy system, training, quality assurance, and the establishment of procedures. The management system includes a planned and systematic set of procedures for carrying out and documenting the various steps in the safety case development process providing confidence that the input data, models and results have sufficient quality. The management system also monitors and controls staff competence to ensure that a continuous and integrated safety programme is in place and a sound safety culture has been developed.

An Integrated Management System has been established and is currently being implemented within TENMAK, taking into account the requirements stipulated by the TS EN ISO 9001 Quality Management System standard. In this context, Management System was established for the NSDF Project and TENMAK RWPSF in accordance with the requirements of the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, and the Regulation on Management System in Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, 2022.

Article 24. Operational Radiation Protection

1.Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

(i)the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;

(ii)no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and

(iii)measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

2.Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:

(i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and

(ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

3.Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

F.12 Legislation regarding the radiation protection

As mentioned above, Law No. 7381 Art. 1 states that the objective of the 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. Art. 3 Para. 2 regulates that the fundamental radiation protection principles shall apply to any activity involving the risk of radiation exposure of workers, public, environment and future generations. These principles are:

a) The activity shall be beneficial for the individuals or the society,

b) Radiation doses that may be exposed to due to the activity shall be kept at as low as reasonably achievable levels,

c) Radiation doses that may be exposed to due to the activity shall not exceed the dose limits established by the NDK.

In this manner, the regulations related to radiation protection as well as other regulations are under renewal process to meet the new requirements stipulated in Law No. 7381 and PD No. 95. The draft Regulation on Radiation Protection is expected to be published within the year 2025. Its scope covers nuclear facilities, radioactive waste facilities, radiation facilities, radiation applications and natural radiation and other related activities that require taking precautions for radiation protection. The purpose of the draft Regulation is to determine the principles and principles to be applied and the duties and responsibilities of the parties to protect employees, the public, the environment and future generations from the possible harmful effects of ionizing radiation. It includes articles related to measures to be taken for radiation protection

at the design stage by considering optimization, waste minimization principles and keeping the releases below the defined limits.

F.13 Radiation protection for nuclear facilities

The Regulation on Radiation Protection in Nuclear Facilities, 2018, is the main regulation which governs the radiation protection aspects in NPPs. This regulation covers the requirements for the protection of the workers, the public and the environment from the harmful effects of ionizing radiation during the nuclear facilities' authorization stages and during the emergencies.

The regulation states that for occupational exposure of workers the effective dose shall not exceed 20 mSv per year averaged over five consecutive years nor 50 mSv in any single year. The limit for the annual dose of an individual in the population is 1 mSv. Annual effective dose limit is 6 mSv for interns and students aged between 16 and 18. The guidance values for restricting exposure of emergency workers are also given in the regulation. Basic obligations of the authorized person of a NPP related to the radiation protection, the content of the radiation protection program which should be prepared by the authorized person, the basic responsibilities of the radiation protection officers and radiation workers which are working in NPPs, 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.

As low as reasonably achievable (ALARA) requirements related to all these topics are specified in the Regulation on Radiation Protection in Nuclear Facilities, 2018. According to this regulation, the authorized person should take all measures related to the safety and security of the radiation sources in NPPs and the activities related to these sources are licensed according to the legislations on radiation safety. In addition, the detailed content of the radiation protection program to be submitted with relevant authorization applications is described in the Regulation on Radiation Protection in Nuclear Facilities.

On the other hand, dose constraints for public exposure for each NPP are determined by regulatory body and dose constraints for occupational exposures are determined, monitored and controlled by the authorized person according to the Regulation on Radiation Protection in Nuclear Facilities, 2018. Also, the release and clearance 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.

According to the Regulation on Radiation Protection in Nuclear Facilities, 2018, all the releases of radioactive materials shall be monitored by the authorized person during normal operation and accidental conditions with the permanent measuring systems continuously. In case of failure of any monitoring system, no releases shall be given to the environment. Moreover, radionuclides resulted from the releases of the NPPs shall be given to the environment by decreasing their activities with the use of appropriate treatment methods. According to the Regulation on Clearance and Release of Radioactive Materials, 2023, for nuclear facilities the type, amount, radioactivity, ways of releasing to the environment, timing and methods, doses received by representative person, measures taken to control releases and release limits shall be submitted to the NDK at the construction permit and operation license stages within the scope of the SAR.

Moreover, the authorized person is obliged to ensure monitoring and recording of dose rates in the environment continuously and monitoring and recording activity concentrations in air, water, soil and various food samples in regular intervals. The environmental radiological monitoring activity for the NPPs which are not located in the border of the Republic of Türkiye but may have radiological impacts on the territory of Türkiye, i.e. in Province of Iğdır due to Metsamor NPP, is performed by NDK.

In accordance with the aforementioned issues, SAR submitted for Akkuyu NPP includes radiation protection provisions including but not limited to shielding, measures to prevent the dispersion of radioactive substances in an accident event, detection of leakages, ventilation and air purification systems, classification of workplaces and on-site and off-site radiation monitoring.

In addition to this, in accordance with the ALARA principle, the related measures to be taken in order to minimize the personnel radiation doses to the lowest possible level will be taken in Akkuyu NPP. 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.

On the other hand, radiological impacts of the Sinop NPP for normal operating conditions and reference accident scenario were analyzed and incorporated in the EIA Report and also considered in the site report. The design of radiation protection systems and the detailed analysis is provided in SAR implementing ALARA Principle in accordance with the Turkish and International requirements. Also, the radiation protection program of Sinop NPP will be submitted to the NDK during commissioning permit according to the Regulation on Authorizations Regarding Nuclear Facilities, 2018.

F.14 Radiation protection for radioactive waste facilities

Before 2018, TENMAK RWPSF was considered a radiation facility within the framework of the provisions of the Regulation on Radiation Safety, 2000, and was authorized within the framework of the provisions of this regulation. Basic principles applied in the radiation protection system, dose limits for workers, interns, pregnant workers and the public, classification of workers and radiation areas, individual monitoring and monitoring of radiation areas, medical surveillance, personal protective equipment, control and monitoring of radioactive substances released into the environment, emergency response plan and responsibilities were evaluated within the scope of the Regulation on Radiation Safety, 2000, and in compliance with IAEA basic safety standards.

However, after the establishment of NDK, the authorization perspective was changed and the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, was published. Also, for the protection of employees, public, environment and future generations, the Regulation on Radioactive Waste and Spent Fuel Management, 2023, states that radioactive waste cannot be left or released to the environment and necessary precautions shall be taken by the authorized person to ensure that the effects of radioactive waste and spent fuel on employees, the public, the environment and future generations do not exceed acceptable levels. Para. 3 says that in activities related to spent fuel and radioactive waste management; relevant legislative provisions shall be applied in matters regarding the protection of employees, the public and the environment from harmful effects of radiation. Additionally, Para. 5 states that in the management of spent fuel and radioactive waste, the possible effects of spent fuel

and radioactive waste on the public and the environment beyond the country's borders shall be taken into account. According to the Regulation on Clearance and Release of Radioactive Materials, 2023, for radioactive waste facilities the type, amount, radioactivity, ways of releasing to the environment, timing and methods, doses received by representative person, measures taken to control releases and release limits shall be submitted to the NDK at the construction permit and operation license stages within the scope of the SAR.

Besides issues regarding radiation protection in radioactive waste facilities have been determined in detail in the draft Regulation on Radiation Protection, and the preparation work for the draft regulation is still ongoing. In addition to the basic principles of the radiation protection system to be applied in radioactive waste facilities, this draft regulation also includes dose limits, dose restrictions and dose criteria, radiation protection program and responsibilities.

On the other hand, occupational exposure of workers shall not exceed 20 mSv per year averaged over five consecutive years nor 50 mSv in any single year according to IAEA GSR Part-3 Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards and IAEA GSG-7 Occupational Radiation Protection.

Within the scope of the authorization documents submitted by TENMAK to NDK for the operation of TENMAK RWPSF, the radiation protection program includes the monitoring of workers both with thermoluminescent dosimeters (TLD) and electronic dosimeters. Monitoring with TLDs are carried out continuously in two-months period. Passive dosimeter results are also kept in the National Dose Registry System operated by NDK. Individual dose results are regularly monitored by NDK, and if the dose values specified in the legislation are exceeded, the facility is subjected to the inspection program. Moreover, the personnel working at TENMAK RWPSF are also subject to a medical surveillance program, and their health examinations are carried out before starting work and at least once a year.

In addition, in case of an accident, these workers are also subjected to chromosomal aberration tests.

As a result of these follow-ups, the average dose values received by employees at TENMAK RWPSF in the last 5 years have been found to be below 1 mSv. Doses received by TENMAK RWPSF workers for the years 2020 and 2021 are given in Table 7. Records of TLD and blood aberration results are archived according to Turkish regulations.

Table 7 *Doses received by TENMAK RWPSF workers*

Year	Number of workers	Dose Interval[1] (mSv)
2020	11	0.01-0.23
2021	10	0.02-0.17

[1] Minimum dose – maximum dose

More information regarding the radiation safety measures at the TENMAK RWPSF, including personnel training, use of protective equipment, controlled and supervised areas are presented in section A.1 of Annex 2.

Article 25. Emergency Preparedness

1.Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.
2.Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

F.15 Regulatory framework

Basic legislative documents and plans which set up the emergency management system of Türkiye for all hazards are listed below:

- Law No. 7381,
- PD No. 95,
- Regulation on Disaster and Emergency Management Centers, 2011,
- Regulation on Disaster and Emergency Response Services, 2013,
- Regulation on Tasks Regarding Chemical, Biological, Radiological and Nuclear Threats and Hazards, 2020,
- Regulation on Management of Radiation Emergencies, 2023,
- National Disaster Response Plan (TAMP), 2014,
- National Radiation Emergency Plan (URAP), 2019,
- Provincial Radiation Emergency Plans.

Emergency management system was established based on the abovementioned legislative documents and emergency plans. Within the overall emergency management system for all hazards, the roles and responsibilities of ministries, related institutions and governorships are defined in these documents and plans.

According to the PD No. 4, it is within the scope of the duties and responsibilities of the AFAD to determine the measures to be taken and activities to be carried out against the dangers posed by chemical, biological, radiological and nuclear substances and to ensure coordination among the relevant ministries, public and private institutions and organizations.

In order to prevent or minimize the damage to human health and the environment against chemical, biological, radiological and nuclear threats and hazards that may occur at home or abroad and affect our country, the duties and responsibilities of the relevant institutions and organizations and the Turkish Armed Forces before, during and after the incident within the framework of civil military cooperation, and the principles of the necessary cooperation and coordination are set out in the Regulation on Duties Regarding Chemical, Biological, Radiological, Nuclear Threats and Hazards, 2020. According to the legislation, AFAD has the duty to ensure coordination in all kinds of disasters and emergencies, including radiological and nuclear emergencies, and to carry out response activities together with relevant institutions and organizations. AFAD carries out response activities and coordination at local level through 81 Provincial Disaster and Emergency Directorates.

Furthermore, TAMP has been prepared for all disasters that may occur in our country, including radiological and nuclear disasters. All types of disasters are responded to in line with TAMP and event type plans prepared in line with TAMP and national and local level disaster plans under TAMP. Also, URAP is an event type plan connected to the TAMP, defines the hazards and the response actions. Also, the roles and responsibilities of related institutions are defined in the URAP.

On the other hand, Provincial Radiation Emergency Plans, which are an annex to the Provincial Disaster Response Plan for the provinces containing facilities and areas in emergency preparedness categories (EPC) I, II and V, the format and content of which will be determined by AFAD in co-operation with NDK, are prepared by the Governorships with the approval of NDK. Accordingly, Provincial Radiation Emergency Plans for Mersin and Iğdır provinces were prepared under the coordination of AFAD, approved and put into force.

According to Law No. 7381, the authorized person is responsible for managing the radiation emergencies on site for facilities and applications and collaborating with AFAD and other related institutions during the management of off-site emergency response. The on-site radiation emergency plans of the authorized facilities and applications in all emergency preparedness categories shall be prepared in accordance with the Regulation on Management of Radiation Emergencies, 2023.

In this regard, radiation emergency plan covers the topics including but not limited to general information about the facility and application, on-site emergency response organization, duties and responsibilities, radiation emergency classification and operational emergency criteria, the principles of the response to be carried out on-site, preparations for alerts, radiation emergency notifications and communications, and for the safety and radiation protection of workers, radiological monitoring and analysis activities, information on off-site emergency response organization, information on characteristics and locations of emergency equipment, and information on the termination of the response, decontamination and the management of waste.

For NPPs and radioactive waste management facilities, the radiation emergency plan is submitted within the scope of the commissioning permit. If an update is made to the radiation emergency plan after the commissioning permit, the revised plan is evaluated within the scope of the operating license.

F.16 International treaties and agreements

Türkiye signed the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency in 1986. Also, bilateral agreements covering early notification of a nuclear accident were signed with Bulgaria, Romania, Russian Federation and Ukraine.

F.17 Emergency preparedness and response

F.17.1 Hazard assessment

Hazard assessment is performed according to the criteria set forth in the URAP and in the Regulation on Management of Radiation Emergencies, 2023, which are in line with the IAEA's approach. There are five categories (Categories I to V) in URAP, that the authorized person will use to determine the preparedness, planning and response activities for radiation emergencies. Considering the EPC, the facilities and practices in the country are as follows;

- EPC I: Akkuyu NPP, Sinop NPP, Nuclear powered aircraft carriers visiting national ports;
- EPC II**:** TENMAK TR-2, Nuclear powered submarines visiting the national ports;
- EPC III: İTÜ TM-II, industrial irradiation facilities, accelerator facilities, medical practices;
- EPC IV: Other related activities such as transportation, mobile sources, uncontrolled dangerous sources etc.;
- EPC V: Areas within the urgent protective action planning zone, extended planning distance and ingestion and commodities planning distance of the Metsamor NPP which lie within the national borders.

F.17.2 Radiation emergency classifications

The emergency action levels are to be used to identify and classify the radiation emergencies as the general emergency, site emergency, facility emergency, alarm situation, and other emergencies, whose definitions are given in the Regulation on Management of Radiation Emergencies, 2023, and in URAP.

F.17.3 Management of radiation emergency

The organization for management of radiation emergencies and the transition of responsibilities during a radiation emergency is described in the URAP. The stakeholders assigned for response to radiation emergencies are in place. The national and local radiation emergency management organizations are established in URAP as a sub-set of the emergency management organizations defined in TAMP.

F.17.4 Monitoring

Türkiye began establishing its own early warning environmental radiation monitoring system network throughout the country after the Chernobyl accident. The Radiation Monitoring and Warning System Network (RADİSA) is operated by the NDK. Data acquired from the network are received and evaluated in the NDK Emergency Management Center. RADİSA monitoring stations using Geiger-Müller detectors were placed to measure ambient gamma radiation dose rate throughout Türkiye (see Figure 5).

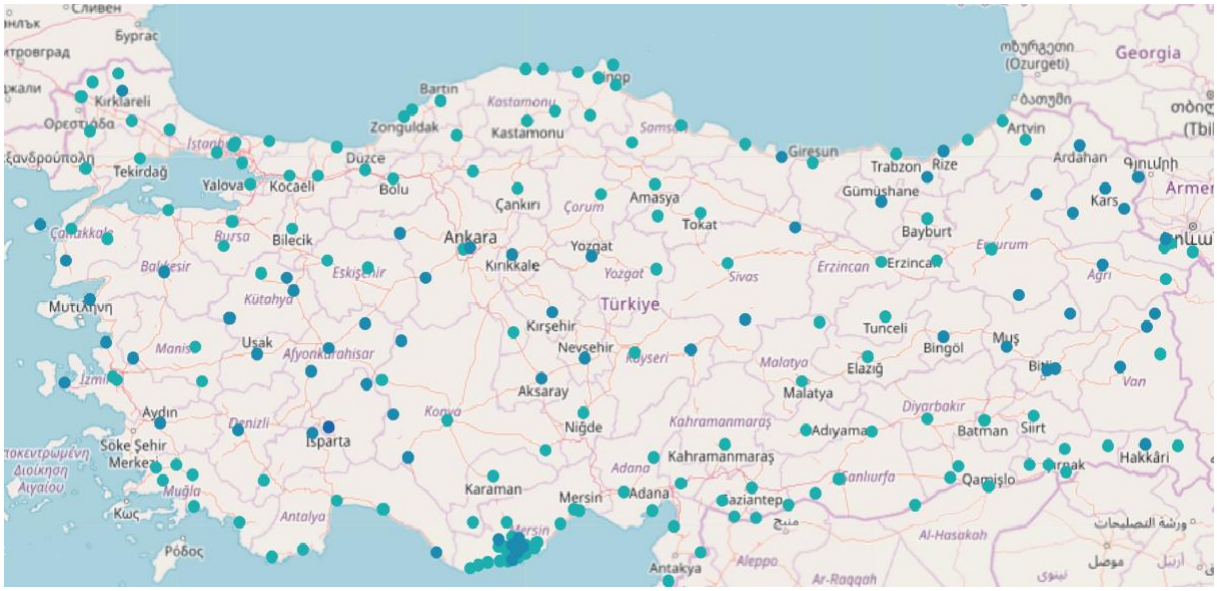

Figure 5 *The RADİSA stations in Türkiye*

Monitoring stations are densely deployed at locations close to national borders, in proximity to the Metsamor NPP and around sites where the NPPs are planned to be constructed. The number of the stations has currently reached 240. These data are available on the NDK website and are also voluntarily shared with the European Radiological Data Exchange Platform, EURDEP, and the International Radiation Monitoring Information System, IRMIS.

Additionally, environmental radiological monitoring activities carried out in our country are coordinated by the NDK. Within the scope of agreement signed between the NDK and the TENMAK, environmental radiological monitoring activities in Iğdır have been carried out by the NDK since 2021 since the Metsamor NPP's urgent protective action planning zone, extended planning distance and ingestion and commodities planning distance lie within the national borders of Türkiye. On the other hand, an environmental radiological monitoring activity has been established by the authorized person for Akkuyu NPP, and an environmental radiological monitoring activity will be initiated by NDK prior to the commissioning of the power plant.

F.17.5 Exercises

The exercises that will be performed for radiation emergencies are also specified in URAP as follows:

Table-top exercises: Table-top exercises are carried out in the form of discussion/evaluation where all participants are in the same room or building. In general, table-top exercises are not carried out in real time. Table-top exercises mainly focus on decision making, evaluation, policy of communication with the public and media.

Partial and full-scale exercises: Partial and full-scale exercises are exercises during which the organizations/stakeholders who will take part in the emergency response will act in coordination and interact with each other. These exercises focus on coordination and cooperation.

Field exercises: Field exercises focus on the tasks and coordination of the resources to be used in the field (the people or teams that will serve on or in the vicinity of an emergency scene). Field exercises are carried out in order to evaluate the integrated performance of the teams such as radiological monitoring teams, police, medical response teams and fire brigade. Where it is deemed necessary, a part of the community is included in field exercises (as in the case of evacuation exercises).

In this content, a full-scale exercise in which a severe accident in Metsamor NPP was fictionalized and conducted in Ankara and Iğdır provinces in 2019. The detailed exercise scenario and exercise handbook were prepared by NDK and AFAD accordingly.

According to the Regulation on Management of Radiation Emergencies, 2023, a full-scale exercise shall be performed before the fresh nuclear fuel delivery to NPP. In this regard, a full-scale exercise was performed in December 2022 in Mersin province, with the participation of all stakeholders.

F.18 Radiation emergency plans

F.18.1 Akkuyu NPP

Akkuyu Nuclear JSC, as the operator of Akkuyu NPP, has issued methods and programs of emergency trainings to practice personnel actions in case of accidents and ensures periodic

conducting of these trainings taking into account the current activities at the site of NPP construction. In order to ensure the preparedness of personnel for actions in case of design basis and beyond design basis accidents, the corresponding instructions and guidelines have been developed, defining the first priority actions of personnel to minimize possible accidents and eliminate their consequences.

Moreover, in order to establish the principles of planning, response and management of nuclear and radiation emergencies at the Akkuyu NPP facility and the site, the emergency plan in case of accident at Akkuyu NPP has been developed. The emergency plan takes into account URAP, TAMP, Provincial Radiation Emergency Response Plan and Disaster Risk Reduction Plan.

F.18.2 Research reactors

The emergency plan for the TENMAK TR-2 was prepared and submitted to NDK in 2017 during application for authorization.

Regarding İTÜ TM-II, the on-site emergency plan and conducting of emergency exercises for the İTÜ TM-II was prepared according to the Regulation on Radiation Protection in Nuclear Facilities, 2018. Moreover, the on-site emergency plan is scheduled for an update in 2024 and shall undergo regular reviews annually. Specifically, the on-site emergency plan of İTÜ TM-II is an appendix of the SAR of the facility and includes emergency procedures related to fuel elements and radioactive waste.

F.18.3 TENMAK RWPSF

Among the documents prepared within the scope of authorization submission according to the Regulation on Authorizations for Radioactive Waste Facilities and Safety Principles, 2022, a radiation emergency program was submitted to NDK. The purpose of this program is to plan the work to be conducted to minimize the harmful effects of a nuclear or radiological accidents that may occur in the TENMAK RWPSF and to determine the duties and responsibilities thereof.

Article 26. Decommissioning

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

(i)qualified staff and adequate financial resources are available;

(ii)the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;

(iii)the provisions of Article 25 with respect to emergency preparedness are applied; and

(iv)records of information important to decommissioning are kept.

F.19 Qualified staff and adequate financial resources

In Article 22 of Section F of this report, information is provided on the availability of qualified staff and adequate financial resources to ensure the safety of the decommissioning of the nuclear facility by the authorized person.

F.20 Operational radiation protection, discharges and unplanned and uncontrolled releases during decommissioning of a nuclear facility

The Regulation on Radiation Protection in Nuclear Facilities, 2018, is the main regulation which governs the radiation protection aspects in nuclear facilities. This regulation covers the requirements for the protection of the workers, the public and the environment from the harmful effects of ionizing radiation during all authorization stages of nuclear facilities including decommissioning.

The detailed information on operational radiation protection, discharges and unplanned and uncontrolled releases is given in Article 24 of Section F of this report. The requirements related to radiation protection and all releases also apply to decommissioning. Moreover, the draft Regulation on Radiation Protection specifies the effective dose values for the representative person following decommissioning of the facility and release of site from regulatory control.

F.21 Decommissioning regarding emergency preparedness

In accordance the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, and the Regulation on Authorization Regarding Nuclear Facilities, 2023, in the assessment of emergency preparedness for decommissioning, an emergency plan shall be submitted by the authorized person according to emergency preparedness categories at the decommissioning permit stage for NPPs and radioactive waste management facilities. The detailed information about emergency preparedness is given in Article 25 of Section F of this report.

F.22 Decommissioning activities

In accordance with Law No. 7381, authorized person carries out the necessary decommissioning works without delay in order to release the nuclear facility, radiation facility and radioactive waste processing and storage facility sites from regulatory control in accordance with the re-use conditions. Radioactive waste disposal facilities are closed after safety and security measures are taken and shall not be released from regulatory control except for restricted use of the site. For this, an authorization application shall be made to NDK including a report covering the issues such as detailed information and plans, approaches, processes and technologies to be used in decommissioning of the facility.

The radioactive wastes that will be generated as a result of decommissioning activities will be delivered to the NSDF for disposal.

F.22.1 Decommissioning in Akkuyu NPP

Currently, there is no separate decommissioning plan for radioactive waste and spent fuel management facilities of the Akkuyu NPP. Therefore, their decommissioning is planned together with the decommissioning of Akkuyu NPP power units after the end of the 60-year design life. Decommissioning activities will begin with comprehensive engineering and radiation surveys and the preparation of a decommissioning plan that will be submitted to NDK, after the reactors have been shut down and spent fuel removed.

The immediate dismantling strategy shall be applied according to Law No 7381. In the dismantling process, activities regarding dismantling of systems, assemblies and equipment constituting the reactor units and the management of the generated radioactive waste shall be conducted.

F.22.2 Decommissioning in research reactors

Decommissioning of nuclear facilities is subject to a permit from the NDK. The Regulation on Radiation Protection in Nuclear Facilities stipulates that a radiation protection plan shall be included in the decommissioning permit application.

Considering the TENMAK TR-2, a preliminary decommissioning programme for TENMAK TR-2 was prepared and submitted in 2017. The status of TENMAK TR-2 is extended-shutdown since 2009 and there has been no decommissioning decision yet. For İTÜ TM-II, it has no decommissioning programme. A decommissioning programme for the operation is planned to be prepared in accordance with the regulations in effect.

SECTION G SAFETY OF SPENT FUEL MANAGEMENT

Article 4. General Safety Requirements

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

In so doing, each Contracting Party shall take the appropriate steps to:

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

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

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

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

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

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

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

According to Law No. 7381, a nuclear facility is a facility under construction or in operation for the purpose of extracting, producing, processing, using, holding, reprocessing or storing nuclear material. Spent fuel storage facility of NPPs and research reactors is a part of the facility and covered by the authorizations, including operation license, described in the Regulation on Authorizations Regarding Nuclear Facilities, 2023, if the facility is not a separate facility. Also, according to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, spent fuel can only be disposed of in deep disposal facilities.

The Regulation on Design Principles for Safety of Nuclear Power Plants, 2008, focuses on design issues for ensuring safety of NPPs. Similarly, the Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008, addresses principles on design, construction and operation of NPPs. These regulations establish safety principles to be followed during the design of NPPs to achieve nuclear safety objectives in site assessment, design, construction, commissioning, operation and decommissioning phases, as well as principles related to the emergency and accident management. Also, the Regulation on Specific Principles for the Safety of Research Reactors, 2009, determines the safety principles for the research reactors to achieve nuclear safety objectives during design, construction, operation, commissioning and decommissioning activities.

The Regulation on Radioactive Waste and Spent Fuel Management, 2023, defines general safety requirements for the safe management of radioactive waste and spent fuel in accordance with the IAEA recommendations, at both nuclear facilities and radioactive waste facilities. Rules and procedures for authorizations regarding these facilities are given in the aforementioned regulations.

The requirements and responsible parties regarding the on-site management of radioactive waste and spent fuel are specified in Law No. 7381 and the Regulation on Radioactive Waste and Spent Fuel Management, 2023. According to these requirements, radioactive waste and spent fuel management, including on-site storage of spent fuel, is carried out within the framework of a radioactive waste management program and in accordance with the defense-in-depth principle.

According to Law No. 7381, spent fuel generated in NPPs shall be stored at the NPP site throughout its operational life, and all responsibility for the management of the spent fuel or radioactive waste, excluding their disposal, belongs to the authorized person. Spent fuel management is under the responsibility of the authorized person until spent fuel is taken over by TENMAK for disposal. The current policy and status of spent fuel is described in Section B Policies and Practices of this report.

G.1 Criticality and removal of residual heat

Possibility of criticality and production of residual heat shall be taken into account by the authorized person in the characterization, processing and storage of spent fuel. In facilities where spent fuel is stored; shielding, cooling and similar measures shall be applied by authorized person to maintain the subcritical state, to remove residual heat, to confine radioactive materials and to minimize irradiation in accordance with the Regulation on Radioactive Waste and Spent Fuel Management, 2023.

According to the Regulation on Design Principles for Safety of Nuclear Power Plants, 2008, on-site storage units shall keep spent fuel in a safe and subcritical array under all anticipated storage conditions. The design of the units and fuel racks shall take into account external loads and forces. Since the spent fuel contains a significant inventory of fission products, shielding from radiation and safe means of loading the assemblies into shipping casks shall be provided. The integrity of spent fuel cladding shall be preserved by redundant and reliable means of removing decay heat.

The safety criteria of the spent fuel storage system at the Akkuyu NPP dictates that the regulatory limits of criticality during normal operation and in case of design basis accidents shall not be exceeded.

G.2 Generation of radioactive waste

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, in order to ensure that the generation of radioactive waste is kept as low as possible and at a reasonable level in terms of quantity, volume and radioactivity; necessary measures, including reuse and recovery, shall be taken by the authorized person to conduct the activities that result in the generation of radioactive waste or its management, including the waste associated with spent fuel management.

G.3 Interdependencies among different steps

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, in the management of spent fuel, interdependencies among the processes involved shall be clearly and comprehensively defined and taken into account by the authorized person.

G.4 Radiation protection

The issues regarding the protection of workers, the public and the environment from the harmful effects of ionizing radiation during the site evaluation, design, construction, commissioning, operation, decommissioning and release of the site from regulatory control phases of nuclear facilities and in emergencies are covered in the Regulation on Radiation Protection in Nuclear Facilities, 2018. The authorized person is required to implement measures and control throughout the facility's lifetime, considering economic and social factors, to minimize and maintain radiation doses at a reasonable level. While the dose limits for the public during normal operation are set by NDK, radiation dose constrains for radiation workers are determined by the authorized person and assessed by NDK. Also, an environmental radiological monitoring program shall be prepared to adequately evaluate the public dose during operating conditions and accidents and shall be submitted to NDK as part of the construction permit application. In addition, as mentioned in Article 24 of Section F, all the releases of radioactive materials shall be monitored by the authorized person during normal operation and accidental conditions with the permanent monitoring systems continuously. In case of failure of any monitoring systems, radioactive materials shall not be released to the environment. Moreover, before the release of radioactive materials from the NPPs, appropriate treatment methods should be applied in order to decrease the activities. In accordance with the Regulation on Clearance and Release of Radioactive Materials, 2023, the doses to be received by representative persons from radioactive releases shall not exceed the dose constraints specified in radiation protection legislation. Also, for nuclear facilities, the authorized person shall determine the release limits separately for gaseous and liquid releases based on the dose constraints set by the NDK for the public and all operating conditions of the facility within the framework of the principle of optimization of radiation protection.

Türkiye established an early warning environmental monitoring system network throughout the country after Chernobyl accident. Recently, studies have been carried out to increase the number of radiation monitoring stations around the Akkuyu NPP, which is being constructed in Türkiye. Emergency preparedness plans and environmental monitoring program are given in Section F Other General Safety Provisions under Article 24.

In the design of NPPs, as stated in the Regulation on Design Principles for the Safety of Nuclear Power Plants, 2008, the design is required to keep radioactive waste releases below the limits set by NDK and to take necessary measures to protect operating staff from radiation and radioactive contamination.

G.5 Biological, chemical and other hazards

The physical, chemical and biological risks of the waste expected to arise during radioactive waste and spent fuel management shall be taken into account at every stage of radioactive waste management, particularly for characterization, waste processing, packaging and storage, according to the Regulation on Radioactive Waste and Spent Fuel Management, 2023. It is required that radioactive waste and spent fuel packages maintain their integrity under operational and accident conditions during handling, transportation and storage or until

disposal. In order to ensure compliance, the authorized person shall conduct modelling calculations and/or tests to verify the physical and chemical stability of unpackaged radioactive waste. The authorized person shall ensure quality control of packages through the control of records pertaining to radioactive waste management, conducting pre-conditioning tests, and controlling the processing of waste.

During the storage process, the radionuclide content, half-lives, activity concentration and physical, chemical, and biological features of radioactive waste and spent fuel to be stored are taken into consideration. The authorized person shall take required measures to guarantee the physical and chemical stability of radioactive waste and spent fuel intended for storage and to prevent any deterioration of their material properties throughout the anticipated storage period. The application of additional shielding to the radioactive waste or spent fuel packages for storage shall be mandated when deemed necessary. The storage of radioactive waste and spent fuel packages shall be required within a secure and safeguarded structure that exhibits resilience against environmental degradation.

G.6 Avoiding undue burdens on future generations

Türkiye has initiated a comprehensive strategy to ensure the safe management of spent fuel and radioactive waste, with a strong focus on the development of essential infrastructure and the establishment of financial mechanisms. This strategy is intended to avoid placing an undue burden on future generations. The NRWMP reflects Türkiye's commitment to protecting public and environment while complying with international standards and regulatory obligations, and outlines strategies for both near-surface and deep geological disposal facilities. Policies and strategies regarding the safe management of spent fuel and radioactive waste are given in Section B of this report.

According to Regulation on Radioactive Waste and Spent Fuel Management, 2023, and other relevant regulations, radioactive waste and spent fuel shall be managed in a manner that will not impose undue burdens on future generations. Necessary measures shall be taken by the authorized person to ensure that the effects of radioactive waste and spent fuel on the workers, the public, the environment and future generations do not exceed acceptable levels. These issues are also given in Article 24 of Section F. The authorized person establishes the administrative, financial and technical structure to ensure the protection of current and future generations from harmful effects of radiation throughout the life of the facility, including decommissioning, to fulfill its responsibilities and to take the necessary precautions. Facility design is made to facilitate activities such as maintenance, repairs, periodic tests and decommissioning.

The radioactive waste management special account has been established within the ETKB. Authorized persons that produce radioactive waste shall make a contribution payment to the radioactive waste management special account. The authorized persons that operate a nuclear facility, radiation facility or radioactive waste facility shall also make a contribution payment to the decommissioning special account. Revenues collected on behalf of special accounts shall not be used for any other purpose. The fund makes a payment to TENMAK to cover the expenses for the radioactive waste disposal facility and makes a payment to the authorized person for decommissioning. Thus, the future generations are adequately protected, and any other undue burdens will not be imposed on them.

The policy and financial measures to avoid undue burden on future generations are detailed in section B and in Article 22 of Section F, respectively.

Article 5. Existing Facilities

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

G.7 The policy, status and periodic safety review of spent fuel management facilities

The national spent fuel management policy is described in Section B of this report.

The list of spent fuel management facilities and their status are provided in Table 3. There is no spent fuel inventory when the first national report is submitted.

The periodic safety assessment is stated in the Regulation on Authorizations Regarding Nuclear Facilities, 2023. After the operating license is issued, the authorized person shall conduct a periodic safety assessment of the structures, systems and components of the facility. This safety assessment might also be carried out upon the request of NDK due to changes in national or international safety approaches. In this scope, if improvements are required in terms of safety as a result of the assessment made by NDK, authorized person shall specify the necessary measures and implementation schedule, submit them to obtain approval of NDK and implements them if deemed appropriate.

G.8 Improvements related to safety of spent fuel management facilities

G.8.1 TENMAK TR-2 structural strengthening project and ageing management activities

The TENMAK TR-2 was operated at low power levels between 1995 and 2009 in accordance with the regulatory requirements of the TAEK. In 2009, the reactor was shut down to convert the reactor core from mixed HEU and LEU core to fully LEU core. Fresh fuel assemblies were delivered, but have never been irradiated and remain stored within the reactor facility as specified in A.3 of Annex 1.

Following a structural strengthening project for the reactor building completed in 2013 to improve structural integrity and meet updated safety standards, an updated safety analysis report and ageing management program were prepared and submitted to the regulatory authority in order to obtain a fuel loading permit in 2017. Despite these efforts, the TENMAK TR-2 has been on extended shutdown since 2009.

Article 6. Siting of Proposed Facilities

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

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

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

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

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

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

G.9 Relevant site-related factors

There is no policy for a centralized spent fuel storage facility in Türkiye. Therefore, the only facilities that have a spent fuel management function are NPPs and research reactors. The site selection methodology in Türkiye is formed in accordance with national regulations and international practices. The methodology is based on screening of candidate sites. Sites are evaluated considering 43 siting criteria grouped into four major categories: economic, engineering, environmental and sociological. All authorization stages and the application procedures for authorizations of nuclear facilities are described in the Regulation on Authorizations Regarding Nuclear Facilities, 2023. Furthermore, the Regulation on Nuclear Power Plant Sites, 2009, the Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008, the Regulation on Specific Principles for the Safety of Research Reactors, 2009, and the Regulation on Special Principles for the Safety of Nuclear Fuel Cycle Facilities, 2010 describe the nuclear safety principles for the nuclear facilities to achieve during design, construction, operation, commissioning and decommissioning activities.

A legal person intending to establish a nuclear facility shall first submit a notice of intent to NDK. Following this, the legal person may commence the siting process, which includes site investigations for site approval and site preparation permit. Within the siting process, site research and infrastructure development activities could be conducted on site and temporary structures could be built to be used during field surveys and/or upcoming constructions, and NDK shall be notified of these works.

The site survey process commonly begins with delineating the region of interest. Later on, the candidate sites are investigated in detail. The last step is the site selection process.

In order to determine the candidate sites, some site characteristics are considered with the aim of rejecting unacceptable areas or sites. In this phase some near regional characteristics may play a certain role to determine the site. Application document for site approval is a site report. The Guidance on the Format and Content of the Site Report for Nuclear Power Plants describes in detail the requirements and expected findings for the report to be submitted to the

NDK for the site. The site report is subject to review and assessment by NDK. This review and assessment focus on the feasibility of implementing necessary safety and security measures against both site-specific human-induced and natural external events including applicability of radiation emergency measures and the potential transport of radioactive materials released from the facility into the surrounding environment.

The site preparation permit needs to be issued to the authorized person prior to the commencement of site preparation activities. For this, an application for the site preparation permit shall be made, with submission of the section of the SAR regarding the site, site characteristics, plant layout and the classification of structures, systems and components and of the site preparation program.

Application for site preparation permit for research reactors shall be made before the start of site preparation activities. For such facilities, site preparation permit also covers site approval.

G.10 Safety impact of a proposed spent fuel facility on individuals, society and the environment

According to the Regulation on Environmental Impact Assessment, 2022, owner of the Project shall prepare and submit to the ÇŞİDB an EIA report at the planning stage. The environmental aspects, including radiological and non-radiological impacts, of the proposed facility which cover alternative sites are evaluated by the ÇŞİDB.

According to Annex-1 of the Regulation on Environmental Impact Assessment, 2022, the list of projects to which environmental impact assessment must be applied is as follows:

- In the construction or dismantling of NPPs or other nuclear facilities,
- Facilities that involve the processing of waste containing radiation above the limit value,
- Facilities where final disposal of radioactive waste is carried out,
- Facilities for spent fuels planned to be stored for more than 10 years or radioactive waste planned to be stored in a location other than where it was produced.

Regarding the Akkuyu NPP Project, after submission of the EIA application in accordance with Annex-III of the Regulation on Environmental Impact Assessment, 2022, a public participation meeting was held in Mersin on March 29, 2012.

During the management of the spent fuel, the potential impact of the spent fuel on the population and the environment beyond the national borders shall be taken into account. The authorized person shall undertake necessary measures to ensure that the impact of spent fuel on workers, the public, the environment, and future generations shall not surpass the acceptable limits. In addition, during the course of the site studies, an examination shall be conducted on the hydrological, hydrogeological, geological, and meteorological features of the site, as well as the radiological impact of the spent fuel facility, human-induced and natural external events, and the effects of climate change. The applicability of emergency plans is also evaluated and planning zones are determined accordingly. All these characteristics are monitored throughout the lifetime of the facility. In accordance with the requirements and criteria of NDK, an adequate quality assurance programme shall be established and applied to conduct and control the effectiveness of the site investigations and assessments. More information could be found in Article 24 of Section F.

G.11 Sharing of the information with the public

The Regulation on Radioactive Waste and Spent Fuel Management, 2023 states that NDK may require the authorized person to share information and documents on radioactive waste and spent fuel management with the public, subject to protection of trade secrets or intellectual property. This provision emphasizes the necessity of informing the public and stakeholders about institutions and organizations radioactive waste management activities.

More information regarding transparency and sharing information with public is given in Section B.

G.12 Sharing of the information with the concerning parties

An undertaking was signed by the EC to allow participation of neighboring countries to the stress tests. Türkiye is among the countries that signed the Joint Declaration on comprehensive risk and safety assessments of nuclear plants, also called Stress Tests, and Türkiye observes these studies and supports the decisions reached by consensus. As an outcome of the Joint Declaration, TAEK, 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. In this context, in cooperation with the European Union (EU), a meeting was held on June 23, 2011 with the participation member of the EC, Deputy Ministers of Energy, senior representatives of the ETKB and representatives of Belarus, Armenia, Croatia, Switzerland, Russia and Türkiye in charge of nuclear energy:

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

At the end of December 2018, updated version of "Stress Tests National Report of Türkiye" was prepared taking into consideration the comments of ETKB and the Ministry of Foreign Affairs. The report was published by NDK official website for public.

After the accident at the Fukushima Daiichi NPP, a number of studies were organized by European Nuclear Safety Regulators Group (ENSREG) to review and improve the nuclear facilities of the EU nations. In this context, safety and risk assessment studies were initiated within the scope of stress tests. On mid-2021, discussions on organization of the peer review started with ENSREG. Peer review team questions were sent to NDK on December 16th, 2021. Answers to peer review team questions were prepared and sent to ENSREG on March 15th, 2022. First step of the peer review of Akkuyu NPP was held on 16th to 18th of May in Ankara, NDK Headquarters. As the result of discussions for clarification on the questions and national report, findings of the peer review team were sent to NDK. The peer review team also visited the Akkuyu site in May 2024. ENSREG is in the process of finalizing its review of the national report. Annex 5 gives a list of international review missions performed and official national and international reports, related to those aforementioned issues.

As explained in this report, Türkiye is committed to international nuclear safety and security requirements. In this regard, Türkiye has signed/ratified international agreements and conventions. In addition, Türkiye has signed bilateral agreements with several countries for cooperation in the peaceful uses of nuclear energy and the exchange of information. The

international agreements and conventions signed/ratified by Türkiye and the bilateral agreements to which Türkiye is a party are listed in Annex 5.

Article 7. Design and Construction of Facilities

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

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

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

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

G.13 Possible radiological impacts on individuals, society and the environment during the design and construction of a spent fuel management facility

The Regulation on Design Principles for Safety of Nuclear Power Plants, 2008, the Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008, and the Regulation on Specific Principles for the Safety of Research Reactors, 2009, define that a spent fuel management facility shall be designed so as not to deviate from safety objectives under normal operation, anticipated operational occurrences and accident conditions.

The Regulation on Clearance and Release of Radioactive Materials, 2023, defines clearance and release of radioactive materials including the clearance and release limits during the conduct of activities regarding nuclear energy and ionizing radiation.

Radiation dose criteria including discharges and controlled and uncontrolled releases are determined quantitatively in the Regulation on Radiation Protection in Nuclear Facilities, 2018. The essential radiation protection requirements for the authorized person throughout all phases of nuclear facilities, in parallel with the IAEA requirements, are set out in the same regulation.

As per the Regulation on Radioactive Waste and Spent Fuel Management, 2023, in facilities where spent fuel is stored, it is required that structures, systems and components with safety functions be designed in an independent and complementary manner.

More information regarding radiation protection for spent fuel management facilities could be found in Article 24 of Section F.

G.14 Taking into account decommissioning of a spent fuel management facility at the design stage

According to the Regulation on Design Principles for the Safety of Nuclear Power Plants, 2008, the Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008, and the Regulation on Specific Principles for Safety of Research Reactors, 2009, design of nuclear facilities shall facilitate activities such as maintenance, repairs, periodic tests and decommissioning. Also, plant design provides for transport, handling and storage of spent fuel in such a way as to ensure protection of workers and to prevent the release of radioactive material. Consideration is given in design and plant operations to facilitate eventual decommissioning and waste management.

For research reactors, design limits for all relevant parameters are specified, evaluating all event scenarios, including experiments. Design limits of these parameters are determined in such a way that the reactor core will not be damaged significantly and the radiation dose as a result of radioactive release is kept within the limits defined by NDK in normal operating and within design basis accident conditions. A decommissioning plan is prepared to ensure safety throughout the decommissioning process.

G.15 Experience, testing and analysis during the design and construction of a spent fuel management facility

NDK regulations for nuclear facilities require the use of proven technologies in design. It is required that technical and administrative decisions made to ensure safety shall be well proven by previous experience or tests, investigations, operating experience of prototypes and shall meet the requirements of regulatory documents. Such approach shall be applied not only in design and development of equipment, but also in manufacture of equipment, construction and operation, back-fitting and reconditioning of systems and their components.

Article 8. Assessment of Safety of Facilities

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

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

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

In accordance with the Regulation on Authorizations regarding Nuclear Facilities, 2023, construction of a nuclear facility is subject to a permit from NDK.

The construction permit application for NPPs and research reactors must include SAR, probabilistic safety assessment reports, the construction programme, the management system documents, independent assessment report, staff training programme and environmental monitoring programme.

According to the regulation, authorization applications are subject to a thorough review and assessment by the NDK, which employs a graded approach tailored to the type and qualifications of the facility. The NDK then compiles a safety assessment report that details the review findings, inspection results and on-site examination outcomes. The report also includes recommendations for authorization conditions. Based on this report, an authorization decision is given by the NDK. A positive decision results in issuing an authorization document with specific conditions, while a negative decision is accompanied by reasons for the denial. Additionally, the NDK communicates its findings to the applicant, which shall update and resubmit relevant documents accordingly.

Regulation on Authorizations regarding Nuclear Facilities, 2023, contains provisions on the criteria for review and assessment of submitted reports, programmes and documents. In this manner, NDK reviews and assesses the submitted documents in accordance with the provisions of this regulation in a systematic way.

Before construction of an NPP and a research reactor, environmental safety is assessed by review of environmental monitoring programme and the relevant chapters of SAR by the NDK, with a graded approach mentioned above. Regarding the radioactive releases, the SAR shall cover details including release form, amount, radioactivity, methods of release, timing, doses received by the representative person, release limits and the control measures, in accordance with the Regulation on Clearance and Release of Radioactive Materials, 2023.

Also, the Regulation on Authorizations regarding Nuclear Facilities, 2023, stipulates that the applicant shall promptly inform the NDK of any changes related to safety and security in the submitted application documents. If deemed necessary by the NDK, the applicant shall provide the updated documents to the NDK. It is essential that any issues for which additional information is requested during the review and assessment procedure shall be resolved in a manner deemed acceptable by the NDK before authorization is granted. For commissioning permit and operating license applications, the regulation requires that the applicant shall submit updated versions of the plans, programs, and documents.

In order to assure that the safety of the nuclear facility is maintained during the operating lifetime of the facility, the authorized person shall conduct a periodic safety assessment of the structures, systems and components of the nuclear facility, and shall report the results to the NDK, according to the Regulation on Authorizations Regarding Nuclear Facilities, 2023. In addition, this safety assessment may also be carried out at the request of NDK due to the modifications in national or international safety approaches. In this context, starting from the date of issuance of the operating license, the period between reporting the results of two sequential periodic assessments to NDK shall not exceed ten years.

Article 9. Operation of Facilities

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

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

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

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

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

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

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

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

According to the Regulation on Authorizations Regarding Nuclear Facilities, 2023, a permit for commissioning is required for NPPs after the construction permit. For research reactors, construction permit covers commissioning activities. As per the regulation, the commissioning process for a nuclear facility is crucial for ensuring the facility's safe and effective operation before it begins using nuclear materials. This process starts with rigorous testing and verification of the facilities' structure, systems, and equipment. These tests are designed to confirm that operation is conducted according to the design specifications and in accordance with safety standards. This thorough examination is essential to identify and rectify any issues before nuclear materials are introduced into the facility.

As a requirement of the Regulation on Authorizations Regarding Nuclear Facilities, 2023, independent oversight organizations shall involve to the commissioning process. These organizations, separate from the designers, manufacturers, and constructors, provide impartial monitoring of the commissioning activities. They ensure that all procedures and tests are conducted according to approved protocols and regulatory requirements. Their role is to provide an additional layer of assurance that the facility is being built and tested correctly. Finally, the procedures and programs used during commissioning must be formally approved. This ensures that all testing and verification activities adhere to regulatory standards and that the facility will be safe and operational when it becomes operational.

The application for an operating license for NPPs shall include a SAR specifying the current status of the facility, operating and accident procedures, documents on the management of major accidents, monitoring and control plans or programs for the operation process, and updated plans, programs, procedures or reports. The NDK may request additional documents according to the characteristics of the facility and will review the submitted SAR and other

documents and evaluate them for sufficiency and suitability for the purpose. In addition, the results of commissioning tests shall also be considered in the review of the operating license. The operating license application for research reactors should also include a SAR including issues aforementioned with graded approach.

G.16 Commissioning programme

In accordance with the Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008, a commissioning programme shall be established and implemented to verify that the components of the NPP important to safety and radiation protection are constructed in accordance with the design and operated in accordance with their intended purpose, and to remedy any deficiencies. This programme includes checks of the physical and functional characteristics of the system, structure and components. During the implementation of the commissioning programme, operational settings shall be made in accordance with the design and safety analyses.

For research reactors, in order to ensure that the research reactor is constructed in accordance with the design, the authorized person shall establish a detailed organization with clear and detailed tasks, authorities and responsibilities, according to the Regulation on Specific Principles for the Safety of Research Reactors, 2009. The authorized person shall implement a commissioning programme that demonstrates that the structure, systems and components are installed in accordance with the design objectives and meet the performance criteria.

G.17 Operational limits and conditions

During the commissioning process of NPPs, the authorized person shall finalize the operational limits and conditions based on the results of the commissioning tests. Then, these limits and conditions shall be submitted to the NDK for review. Once approved, the authorized person begins operations in accordance with the updated license conditions set by the NDK. In addition, according to the Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008, the NPP shall be operated within the operational limits and conditions. These limits shall be determined for all normal operation states of the NPP, such as start-up, hot or cold stand-by, power operation, stopping, shutdown, maintenance-repair, testing and refueling.

For research reactors, the safety analysis report of the plant shall be updated during the construction and commissioning processes, considering all parameters that deviate from the design values. The operational limits and conditions of a research reactor shall be established based on safety analyses to ensure the protection of public, workers, and the environment, according to the Regulation on Specific Principles for the Safety of Research Reactors, 2009.

G.18 Procedures for operation, maintenance, monitoring, inspection and testing

NPPs shall be operated in accordance with detailed operating procedures that have been reviewed and approved by the NDK, according to the Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008. In addition, in order to ensure that structures, systems, and components important to safety meet design requirements throughout the NPP lifecycle, protective and preventive maintenance, inspections, testing, and repairs shall be carried out regularly according to detailed, verified, and approved procedures supported by a quality assurance program. Also, the maintenance, testing, and inspection program shall be updated as needed based on operational experiences.

According to the Regulation on Specific Principles for the Safety of Research Reactors, 2009, procedures shall be established for the review and updating of operational procedures for research reactors. Also, all maintenance, repairs, tests, and inspections shall be conducted according to written procedures, at regular intervals, and by qualified personnel.

G.19 Engineering and technical support

The authorized person shall provide the necessary engineering and technical support throughout the life of the NPP to ensure the safe operation of the NPP. For research reactors, the authorized person shall provide all necessary technical, administrative, and financial resources required for safe operation, including the necessary engineering and technical support.

G.20 Reporting of events

The Regulation on Specific Principles for the Safety of Nuclear Power Plants, 2008 mandates that the authorized person shall ensure that events important to safety are identified, reviewed, and necessary corrective measures are taken, and shall notify the NDK in accordance with the relevant procedures.

The Regulation on Notification and Reporting of Unusual Events in Research Reactors, 2009 determines the procedures and principles regarding the notification and reporting of events occurred important to safety in research reactors.

G.21 Operating experience

According to the Regulation on Authorizations Regarding Nuclear Facilities, 2023, a programme of operating experience shall be submitted to the NDK during construction permit application for both NPPs and research reactors. This operating experience programme is subject to review by the NDK and shall be updated by the authorized person during the operation of the facility accordingly.

G.22 Decommissioning

The decommissioning process for a nuclear facility includes activities such as dismantling, decontamination and environmental remediation.

The decommissioning chapter of the SAR submitted with construction permit is deemed as initial decommissioning program and subject to review and assessment by the NDK. The authorized person shall grant a decommissioning permit from the NDK in order to carry out decommissioning activities. The decommissioning permit application shall include the safety report, program for decommissioning process, management system documents, radiation emergency plan, and plans or programs related to environmental radiological monitoring, fire safety, radiation protection, radioactive waste management, security and safeguards. The initial decommissioning program along with other plans or programs shall be updated with periodic safety assessments and operating experience and shall be used throughout the decommissioning phase.

G.23 Radioactive waste and spent fuel management plan

For NPPs and research reactors, a radioactive waste and spent fuel management plan shall be submitted to the NDK during relevant authorization applications. According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, the plan shall comply with the NRWMP.

Also, the plan shall detail the mechanisms of radioactive waste generation and the organizational structure responsible for managing radioactive waste and spent fuel. It shall also include principles and measures to minimize the amount, volume, and radioactivity of the radioactive waste. The plan shall provide inventories of both radioactive waste and spent fuel, specifying their properties, types, reactivities, and generation rates.

Additionally, the plan shall describe methods for handling, processing, storing, and transporting radioactive waste, as well as packaging for storage and transportation. It shall ensure compliance with the waste acceptance criteria of the disposal facility and address the management of disused sealed sources.

Article10. Disposal of Spent Fuel

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

According to Law No. 7381 and the Regulation on Radioactive Waste and Spent Fuel Management, 2023, radioactive waste and spent fuel management, including on-site storage of spent fuel, is carried out within the framework of a program and in accordance with the defense-in-depth principle. Furthermore, information on the national policy and strategy for the fuel cycle back-end is provided in Section B. Spent fuel, which is accepted as radioactive waste, is considered high-level radioactive waste and shall be disposed of in deep disposal facilities, according to the Regulation on Radioactive Waste and Spent Fuel Management, 2023.

The Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, sets out principles and procedures pertaining to the authorization of activities and the safety principles for radioactive waste management facilities including deep disposal facilities for spent fuel in accordance with the principles of radiation protection, nuclear safety and security. Detailed information about authorization of radioactive waste facilities is given in Section H.

SECTION H SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Article 11. General Safety Requirements

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

In so doing, each Contracting Party shall take the appropriate steps to:

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

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

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

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

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

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

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

In this report, NPPs and research reactors are considered as both spent fuel and radioactive waste facilities. In this section of the report, the issues related to the safety of spent fuel from NPPs and research reactors, which are presented in Section G and which also apply to the management of radioactive waste from these facilities, are not repeated here.

The legislative and regulatory framework to ensure that individuals, society and the environment are adequately protected against radiological and other hazards at all stages of radioactive waste management is given in Article 19 of Section E.

H.1 Criticality and removal of residual heat

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, criticality and residual heat, among other characteristics, shall be taken into account during radioactive waste management.

Also, for radioactive waste facilities, the SAR of the facility shall include the design measures to prevent the criticality in accordance with the Board Decision titled “Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and other Processes for Radioactive Waste Facilities”.

Currently, radioactive waste being stored in TENMAK RWPSF does not require any special measures related to heat removal or criticality.

H.2 Generation of radioactive waste

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, in order to ensure that the generation of radioactive waste is kept as low as possible and at a reasonable level in terms of quantity, volume and radioactivity; necessary measures, including reuse and recovery, shall be taken by the authorized person to conduct the activities that result in the generation of radioactive waste or its management.

Also, pursuant to the Regulation on Clearance and Release of Radioactive Materials, 2023, in order to reduce the amount of radioactive waste, methods such as decontamination and radioactive decay shall be implemented.

H.3 Interdependencies among different steps

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, in the management of radioactive waste, interdependencies among the processes involved shall be clearly and comprehensively defined and taken into account by the authorized person.

H.4 Radiation protection

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, the primary responsibility for ensuring that the objectives and principles of safety and security and the protection of workers, the public, the environment and future generations from radiation are met in the activities related to the siting, construction, commissioning, operation, decommissioning or closure of radioactive waste facilities and their release from regulatory control rests with the authorized person.

Additionally, the radioactive waste facilities shall be designed for safe operation, decommissioning or closure under operational and accident conditions to ensure the protection of workers, the public, the environment and future generations from radiation.

Detailed information on radiation protection is given in Article 24 of Section F.

H.5 Biological, chemical and other hazards

In the Regulation on Radioactive Waste and Spent Fuel Management, 2023, it is stated that in addition to radiological risks, biological, chemical and physical risks shall also be taken into account in radioactive waste management processes of characterization, processing, packaging and storage.

H.6 Avoiding undue burdens on future generations

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, and other relevant regulations, radioactive waste and shall be managed in a manner that will not impose undue burdens on future generations. Also, the authorized person shall establish the administrative, financial and technical structure to ensure the protection of current and future generations from radiation throughout the life of the facility, including decommissioning.

The radioactive waste management special account has been established within the ETKB. Authorized persons that produce radioactive waste shall make a contribution payment to the radioactive waste management special account. The authorized persons that operate a nuclear facility, radiation facility or radioactive waste facility shall also make a contribution payment to the decommissioning special account. Revenues collected on behalf of special

accounts shall not be used for any other purpose. The HYK shall make payment to TENMAK to cover the expenses for the radioactive waste disposal facility and make payment to the authorized person for decommissioning. Thus, the future generations are adequately protected, and any other undue burdens will not be imposed on them.

The policy and financial measures to avoid undue burden on future generations are detailed in section B and in Article 22 of Section F, respectively.

H.7 Practices to maintain general safety requirements

In Akkuyu, the design of the radioactive waste management system is based on ensuring the reduction of radioactive waste volumes and their non-spread outside the NPP. The basic principles established for the design of radioactive waste management systems are to ensure radiation safety during normal operation and to reduce radiation exposure to the personnel and to the public in accidents. As well as to maintain at the lowest possible and achievable level both individual and collective radiation doses, considering social and economic factors.

Also, TENMAK RWPSF conducts an environmental radioactivity monitoring program to protect employees, the public, and the environment. The construction of a NSDF is planned to prevent burdens on future generations and the environment.

Article 12. Existing Facilities and Past Practices

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

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

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

The list of radioactive waste management facilities in Türkiye is given in Annex 2.

In Türkiye, radioactive wastes generated during mining, scrap metal recycling, the application of radiation in industry, medicine, research and calibration are being stored in TENMAK RWPSF in İstanbul. Radioactive wastes generated during the operation of the research reactors are also sent to this facility.

The radioactive waste management facilities, locations, current status and inventories are summarized in Section D of this report.

H.8 Improvements related to safety of radioactive waste management facilities

H.8.1 Improvements in legislation and safety case

As it is explained in Section E of this report, in July 2018, Türkiye transitioned from a parliamentary to a presidential system through a constitutional referendum. This led to the adaptation of all governmental institutions and to enhance regulatory standards, a comprehensive nuclear energy law was prepared and enacted.

With the enactment of nuclear energy law, the term “radioactive waste facility” was defined and a regulation regarding authorization of radioactive waste facilities, the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, was published in 2022.

TENMAK RWPSF was previously authorized in accordance with the Regulation on Radiation Safety, 2000. With the enactment of Law No. 7381, the definition of “facility” has been expanded to include radioactive waste facilities. Consequently, TENMAK RWPSF has been licensed as a radioactive waste facility (see A.1 of Annex 2 for further details).

H.8.2 TENMAK RWPSF

The radioactive waste acceptance criteria of the TENMAK RWPSF have been updated to include the requirement that ISO containers and packages containing NORM-TENORM radioactive waste to be accepted at the facility must be unused and undamaged.

The containers, which were previously on the soil, have been moved to a sealed concrete floor to maintain the integrity of the containers containing NORM and TENORM for a longer period of time (see A.1 of Annex 2).

As part of the waste acceptance criteria, the surface dose rate at any point of the package containing the radioactive waste to be delivered to the facility was specified in order to minimize the dose received by personnel working at the facility in accordance with the ALARA principle.

In addition, due to the degradation of some of the drums used in the past for solidification after processing liquid radioactive waste, these drums were overpacked with stainless steel drums (see A.1 of Annex 2).

H.9 Past practices

H.9.1 The site contaminated with Eu-152 in Izmir

Following the Chernobyl accident in 1986, 58,070 tons of Cs-137 contaminated tea were disposed of in 36 landfills in 5 provinces. Detailed information is given in Annex 6.

H.9.2 Radioactive tea landfills

In 2008, Eu-152 contaminated scrap metal was detected at a private scrap metal processing facility, which was not subject to regulatory control, in the Gaziemir district of İzmir province. After various environmental remediation activities at the facility site, 260 tons of radioactive-contaminated scrap metal were transferred to the TENMAK RWPSF. Currently, some mixed waste (radioactive and chemical waste) remains on the facility site, and these mixed wastes will be transferred to the TENMAK RWPSF once the remediation activities at the facility site are completed. Detailed information is given in Annex 6.

Article 13. Siting of Proposed Facilities

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

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

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

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

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

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

According to Law No. 7381, the site of nuclear facilities and radioactive waste facilities are subject to the approval of the NDK.

Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, include the requirements to be followed during the siting process of radioactive waste facilities. The legal person wishing to establish a radioactive waste facility shall first submit a notice of intent to the NDK. After the notice of intent is registered, the Organization shall; implement the management system, prepare and submit to the NDK the program for siting works based on the content of the site report prior to commencing any work on site. The organization shall apply for site approval by preparing the site report after conducting detailed site studies in order to ascertain that the site does not have any characteristics that would prevent the establishment of the proposed radioactive waste facility.

In accordance with the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, the entire life of the facility shall be considered in site studies, until the post-closure control periods are completed for disposal facilities and until the facility and site are released from regulatory control for other radioactive waste facilities.

H.10 Relevant site-related factors

According to the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, the site approval application file shall include the site report and the site parameters monitoring programme, the contents of which are specified by the Board Decision titled “Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and other Processes for Radioactive Waste Facilities”.

The site report shall contain information on the location, environmental impacts and safety of the planned radioactive waste facility. The report shall also cover site description, location, population distribution, land and water use, other facilities in the region, meteorology, hydrology, hydrogeology, geology, radiological impact, waste transportation and design

parameters. It shall describe the geographical, demographic and environmental characteristics of the site in detail and shall identify the important parameters necessary for the safe operation of the radioactive waste facility.

The site parameters monitoring program encompasses data on systems, methods, frequency and equipment for monitoring geological, hydrological, hydrogeological and meteorological parameters at the radioactive waste facility site, as well as information on land and water use, settlement and population parameters in the surrounding area of the site.

The organization which has received site approval shall implement the site parameters monitoring program and shall submit annual reports detailing the activities carried out under this program to the NDK. According to the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, the validity of site approval is for a period of ten years.

As mentioned in Section B, establishment of an NSDF is planned for the disposal of VLL and LIL radioactive waste in Türkiye. In this context, a site selection report, the details of which are given in Section A.2 of Annex 2, was prepared by TAEK. In the report, suitable areas in Türkiye were evaluated in terms of population, seismic, topography, geology, hydrogeology, hydrology, agriculture, animal husbandry and protected areas. This report was shared with relevant institutions and organizations and the sites were examined in detail. Studies are being carried out on candidate sites that stand out as a result of the comments received.

The site where the planned NSDF will be located is subject to approval in accordance with Law No. 7381 and the requirements of associated regulations. According to the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, the principles regarding the site process, the scope and conditions for the site approval application and evaluation are determined. Additionally, safety and security principles are also included in the same regulation.

In all processes of NSDF, starting with the initial phase of site selection, a safety policy has been adopted that evaluates the factors that may affect the safety of individuals, society and the environment (dose limits, barriers, etc.) and also takes into account factors related to site safety in the long term. The criteria used in all processes in the establishment of this facility will be within the scope of the technical reports, recommendations, and national legislation specified in IAEA and Organization for Economic Co-operation and Development/Nuclear Energy Agency (OECD/NEA). All studies will be carried out by taking into account the technical requirements of international organizations such as IAEA and OECD/NEA, experiences, and good practices of other countries.

H.11 Safety impact of a proposed radioactive waste facility on individuals, society and the environment

During the management of the radioactive waste, the potential impact of the radioactive waste on the population and the environment beyond the national borders shall be taken into account. The authorized person shall undertake necessary measures to ensure that the impact of radioactive waste on workers, the public, the environment, and future generations shall not surpass the acceptable limits. In addition, during the course of the site studies, an examination shall be conducted on the hydrological, hydrogeological, geological, and meteorological features of the site, as well as the radiological impact of the radioactive facility, human-induced

and natural external events, and the effects of climate change. The applicability of emergency plans is also evaluated and planning zones are determined accordingly. All these characteristics are monitored throughout the lifetime of the facility. In accordance with the requirements and criteria of NDK, an adequate quality assurance programme shall be established and applied to conduct and control the effectiveness of the site investigations and assessments. More information could be found in Article 24 of Section F.

The disposal of radioactive waste is included in the list of projects to be subjected to EIA within the scope of the Regulation on Environmental Impact Assessment, 2022. In addition, these facilities are subject to the EIA preparation process in order to take into account and evaluate biological, chemical and other risks that may be related to radioactive waste management

H.12 Sharing of the information with the public

The Regulation on Radioactive Waste and Spent Fuel Management, 2023 states that NDK may require the authorized person to share information and documents on radioactive waste and spent fuel management with the public, subject to protection of trade secrets or intellectual property. This provision emphasizes the necessity of informing the public and stakeholders about institutions and organizations radioactive waste management activities.

More information regarding transparency and sharing information with public is given in Section B.

H.13 Sharing of the information with the concerning parties

As explained in this report, Türkiye is committed to international nuclear safety and security requirements. In this regard, Türkiye has signed/ratified international agreements and conventions. In addition, Türkiye has signed bilateral agreements with several countries for cooperation in the peaceful uses of nuclear energy and the exchange of information. The international agreements and conventions signed/ratified by Türkiye and the bilateral agreements to which Türkiye is a party are listed in Annex 5.

Article 14. Design And Construction of Facilities

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

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

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

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

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

H.14 Possible radiological impacts on individuals, society and the environment during the design and construction of a radioactive waste facility

According to the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, radioactive waste facilities shall be designed for safe operation, decommissioning or closure under operational and accident conditions to ensure the protection of workers, the public, the environment and future generations from radiation.

In accordance with the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, the structures, systems and components of radioactive waste facilities shall be classified according to their functions and their importance in terms of safety and seismicity and shall be designed in accordance with the relevant legislation and standards. It shall be ensured in the design that no damage is caused to safety-critical structures, systems and components during operating conditions. Safety systems shall be included in the design to prevent accidents and mitigate their consequences. Additionally, systems such as ventilation, monitoring and filtration shall be included in the design of radioactive waste facilities. In the design, measures against the alteration and degradation of the structure of the waste or barriers and other structures, systems and components due to radiological, thermal and chemical effects and measures such as shielding and impermeability shall be taken into consideration. The structures, systems and components of the facility shall be designed and positioned to reduce the likelihood and effects of impacts that may occur due to external events and hazards such as fire and explosion.

Also, pursuant to the same regulation, the radioactive waste facilities shall be constructed in accordance with the design and constructed in such a way that the safety functions of natural barriers are maintained. The structures, systems and components included in the design shall be manufactured and constructed using proven and accepted materials, technical methods and procedures, also taking into account their safety and seismic class.

In accordance with the Regulation on Clearance and Release of Radioactive Materials, 2023, the doses to be received by representative persons from radioactive releases shall not exceed the dose constraints specified in radiation protection legislation. Also, for radioactive waste facilities, the authorized person shall determine the release limits separately for gaseous and liquid releases based on the dose constraints set by the NDK for the public and all operating

conditions of the facility within the framework of the principle of optimization of radiation protection.

During the construction permit application, the SAR of radioactive waste facilities shall cover details including release form, amount, radioactivity, methods of release, timing, estimated doses received by the representative person, release limits and the control measures, in accordance with the Regulation on Clearance and Release of Radioactive Materials, 2023.

The disposal facilities shall be designed to ensure that the potential radiological effects of radioactive wastes remain within the limits determined in the legislation regarding radiation protection throughout the post-closure control periods. The design of disposal facilities shall include multiple active and passive barriers to ensure the effective confinement and isolation of radionuclides from the surrounding environment.

H.15 Taking into account decommissioning/closure of a radioactive waste facility/disposal facility at the design stage

Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, mandates that the decommissioning and closure processes in radioactive waste facilities shall be taken into account when designing the facility.

According to the regulation, the disposal facilities shall be designed in a way that minimizes the need for ongoing active safety measures, such as control, maintenance, and monitoring, during the post-closure period. Passive safety measures, including barriers, site marking, restriction of site use, and record keeping, must be sufficient to ensure safety. Furthermore, the disposal facilities must be designed to account for the specific characteristics of the site, with the objective of reducing the likelihood of human, plant, and animal interaction, controlling the dispersion of radionuclides in the geosphere and biosphere in the event of an incident that could compromise the facility's integrity, and ensuring the isolation of radioactive waste.

H.16 Experience, testing and analysis during the design and construction of a spent fuel management facility

NDK regulations for nuclear facilities require the use of proven technologies in design. It is required that technical and administrative decisions made to ensure safety shall be well proven by previous experience or tests, investigations, operating experience of prototypes and shall meet the requirements of regulatory documents. Such approach shall be applied not only in design and development of equipment, but also in manufacture of equipment, construction and operation, back-fitting and reconditioning of systems and their components.

Article 15. Assessment of Safety of Facilities

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

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

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

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

In accordance with the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022, construction of a radioactive waste facility is subject to a permit from NDK.

The construction permit application for radioactive waste facilities must include SAR, the independent assessment report, management system documents and environmental monitoring programme.

According to the regulation, authorization applications are subject to a thorough review and assessment by the NDK, which employs a graded approach tailored to the type and qualifications of the facility. The NDK assesses the submitted documents for their adequacy and compliance with the requirements of the DBL and makes the authorization decision by taking into account the inspection reports, if any. If the decision is positive, the permit or license document including the conditions of authorization determined as a result of the assessment is sent to the organization. If the decision is negative, the decision is notified to the organization together with the reasons for the decision.

Before construction of a radioactive waste facility, including a disposal facility, environmental safety is assessed by review of environmental monitoring programme and the relevant chapters of SAR by the NDK, with a graded approach. Regarding the radioactive releases, the SAR shall cover details including release form, amount, radioactivity, methods of release, timing, doses received by the representative person, release limits and the control measures, in accordance with the Regulation on Clearance and Release of Radioactive Materials, 2023.

Also, the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022, stipulates that the applicant shall promptly inform the NDK of any changes related to safety and security in the submitted application documents. If deemed necessary by the NDK, the applicant shall provide the updated documents to the NDK. It is essential that any issues for which additional information is requested during the review and assessment procedure shall be resolved in a manner deemed acceptable by the NDK before authorization is granted. For commissioning permit and operating license applications, the

regulation requires that the applicant shall submit updated versions of the plans, programs, and documents.

In order to assure that the safety of the radioactive waste facility is maintained during the operating lifetime of the facility, the authorized person shall conduct a periodic safety assessment of the structures, systems and components of the radioactive waste facility, and reports the results to the NDK, according to the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022. In addition, this safety assessment may also be carried out at the request of NDK due to the modifications in national or international safety approaches. In this context, starting from the date of issuance of the operating license, the period between reporting the results of two sequential periodic assessments to NDK shall not exceed ten years.

The information regarding EIA is given in Article 6 in Section G of this Report is also valid for radioactive waste facilities, including disposal facilities.

Article 16. Operation of Facilities

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

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

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

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

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

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

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

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

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

(ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

According to the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022, a permit for commissioning is required for radioactive waste facilities after the construction permit. As per the regulation, the commissioning process for a radioactive waste facility is crucial for ensuring the facility's safe and effective operation before the acceptance of radioactive waste into the facility. This process starts with rigorous testing and verification of the facilities' structure, systems, and equipment. These tests are designed to confirm that operation is conducted according to the design specifications and in accordance with safety standards. This thorough examination is essential to identify and rectify any issues before the acceptance of radioactive waste into the facility.

H.17 Commissioning programme

Pursuant to the regulation, prior to the start of operation of the radioactive waste facility, the authorized person shall verify through testing that the structure, systems and components are functioning in accordance with their design objectives, that they are constructed in accordance with their design objectives, that they are functioning as intended and that deficiencies have been identified and corrected in accordance with the commissioning

programme. The commissioning programme shall also include testing of all operating procedures.

Commissioning programme shall be submitted during the commissioning permit application and it is subject to review and assessment of the NDK.

H.18 Operational limits and conditions

The requirements for operational limits and conditions for radioactive waste facilities are covered in the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022.

According to the regulation, the authorized person shall operate the radioactive waste facility safely within the operational limits and conditions and in accordance with the documents in the DBL. Also, the operating limits and conditions, including waste acceptance criteria, which provide the framework for the safe operation of the radioactive waste facility shall be established by the authorized person and submitted to the NDK for approval.

In addition, compliance of the structures, systems and components of the radioactive waste facility with the operational limits and conditions shall be monitored by the authorized person during operation and it shall be ensured that they continue to meet the design requirements.

Finally, any changes to the operational limits and conditions as a result of the commissioning tests shall be specified by the authorized person in the application for an operating license. After an operating license is issued, any changes in radioactive waste facilities that may affect safety, such as changes in operational limits and conditions, are subject to approval by the NDK.

H.19 Procedures for operation, maintenance, monitoring, inspection and testing

According to the Nuclear Regulatory Board Decision of Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and Other Processes for Radioactive Waste Facilities, the commissioning programme shall include the procedures for operation and the equipment safety programme shall include the procedures for maintenance, monitoring, inspection and testing. In addition, the procedures for operation, maintenance, monitoring, inspection and testing shall be introduced during the authorization applications as a part of SAR.

These procedures are subject to review and assessment of the NDK in accordance with the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022.

For disposal facilities, active and passive safety measures on and around the site shall be implemented during the post-closure control periods. The results of radiological environmental monitoring and maintenance and repair activities shall be reported to the NDK annually from the date of the closure permit during the post-closure active control period until release from regulatory control.

H.20 Engineering and technical support

According to the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022, the authorized person shall ensures that all activities are carried out in accordance with the relevant legislation, by a sufficient number of competent

personnel with a safety and security culture, and shall provide the necessary organizational structure, equipment and financial resources to carry out the activities in a safe and secure manner, including the necessary engineering and technical support.

H.21 Procedures for characterization and segregation

According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, the radioactive waste and spent fuel management plan shall cover procedures for the management of radioactive waste and spent fuel, including characterization and segregation of radioactive waste. The radioactive waste and spent fuel management plan is reviewed and assessed by the NDK during relevant authorization applications.

H.22 Reporting of events

According to the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022, the authorized person shall carry out the activities related to radiation emergencies that may occur at the radioactive waste facility in accordance with the relevant legislation (see Article 25 of Section F).

Pursuant to the regulation, the report prepared after the intervention regarding the radiation emergency is terminated shall be submitted to the NDK. If the radiation emergency requires the cessation of operation of the radioactive waste facility, the authorized person shall notify the NDK within the scope of the report. The NDK shall review and assess the report and decide on the re-operation of the radioactive waste facility.

H.23 Operating experience

According to the Nuclear Regulatory Board Decision of Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and Other Processes for Radioactive Waste Facilities, the experience gained as a result of the operation of the radioactive waste facilities shall be indicated in the periodic safety assessment reports, in line with the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022.

H.24 Decommissioning and closure

The decommissioning or closure chapter of the SAR submitted with construction permit is deemed as initial decommissioning or closure program and subject to review and assessment by the NDK. The authorized person shall grant a decommissioning or closure permit from the NDK in order to carry out decommissioning or closure activities. The decommissioning or closure permit application shall include the SAR, management system documents, radiation emergency plan, environmental monitoring programme, fire safety, radiation protection programme and security plan. The initial decommissioning or closure programme along with other plans or programmes shall be updated with periodic safety assessments and operating experience and shall be used throughout the decommissioning and closure phase.

The details of the SAR regarding decommissioning and closure shall be in line with the Nuclear Regulatory Board Decision of Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and Other Processes for Radioactive Waste Facilities.

According to the Regulation on Authorizations and Safety Principles regarding Radioactive Waste Facilities, 2022, reports, plans and programs for decommissioning activities shall be prepared and implemented during the decommissioning process of radioactive waste

processing and storage facilities. Also, for disposal facilities, reports, plans and programs including active and passive security measures to be taken by the authorized person after closure and active and passive control periods shall be defined, implemented and updated when necessary.

H.25 Radioactive waste and spent fuel management plan

For radioactive waste facilities, a radioactive waste and spent fuel management plan shall be submitted to the NDK during relevant authorization applications. According to the Regulation on Radioactive Waste and Spent Fuel Management, 2023, the plan shall comply with the NRWMP.

Also, the plan shall detail the mechanisms of radioactive waste generation and the organizational structure responsible for managing radioactive waste and spent fuel. It shall also include principles and measures to minimize the amount, volume, and radioactivity of the radioactive waste. The plan shall provide inventories of both radioactive waste and spent fuel, specifying their properties, types, reactivities, and generation rates.

Additionally, the plan shall describe methods for handling, processing, storing, and transporting radioactive waste, as well as packaging for storage and transportation. It shall ensure compliance with the waste acceptance criteria of the disposal facility and address the management of disused sealed sources.

Article 17. Institutional Measures After Closure

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

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

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

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

According to the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, active and passive safety measures on and around the site of a disposal facility shall be implemented during the control periods after closure. In addition to that, the authorized person shall report the results of environmental monitoring activities and maintenance and repair activities to the NDK every year, starting from the date of the closure permit, during the active control period after closure, until it is released from regulatory control. The authorized person shall immediately notify the NDK of any unusual events and shall report the measures planned to be taken.

The regulation mandates that the disposal facilities shall be removed from regulatory control after the post-closure active control period and only on condition of restricted use of the site. During the post-closure active control period, monitoring and control activities shall be carried out to monitor the integrity of the barriers. Also, the sites of disposal facilities shall be marked by the authorized person during the passive control period, conditions for restricted use

shall be ensured, and annual reports showing that these conditions are met shall be submitted to the NDK.

The authorized person shall also prepare a historical report of the facility, the content of which will be determined by the NDK, the authorized person and other relevant institutions and organizations, after it is released from regulatory control, and shall submit the historical report of the facility to the relevant institutions and organizations.

SECTION I TRANSBOUNDARY MOVEMENT

Article 27 Transboundary Movement

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

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

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

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

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

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.

3. Nothing in this Convention prejudices or affects:

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation
rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

By Law No. 7381 and the PD No. 95; transportation, storage, export, import, possession and use of radioactive materials containing radioactive sources, nuclear materials and

radioactive wastes are regulated by NDK and the NDK has a regulatory control on these activities.

By Law No. 7381, it is mandatory to get permission from NDK for the export, import, transport, transit of radioactive material. Getting license from the NDK is also obligatory to transport, storage, export, import, possession and use of radioactive sources.

Bringing radioactive waste generated by an activity implemented outside the area of jurisdiction of the Republic of Türkiye into the territory of the Republic of Türkiye is forbidden by Law No. 7381 except for; the radiation sources produced within the borders of the Republic of Türkiye and exported with the condition of being returned to the country of origin when their usage period expires and the transit passage of radioactive wastes and the importation of materials contaminated with natural radioactive materials.

Türkiye has made political commitment about the implementing of the IAEA's "Code of Conduct on The Safety and Security of Radioactive Sources" and its "Guidance on The Import and Export of Radioactive Sources". Current national regulations are also in line with IAEA's documents/regulations.

Main regulations that regulates the import, export and transport of radioactive material are:

- Regulation on Nuclear Export Control, 2020,
- Regulation on Nuclear Safeguards, 2022,
- Regulation on Authorizations Regarding Nuclear Facilities, 2023,
- Regulation on Safe Transportation of Radioactive Materials, 2005,
- Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices, 2023
- Regulation on Security of Nuclear Facilities and Nuclear Materials, 2024,
- Regulation on Physical Protection in Transport of Nuclear Materials, 2012, (changed, 2024),
- Rules and Principles on Authorization of Entry, Exit, Transit Pass and Transport Activities of Radiation Sources
- Rules and Principles on Security of Radioactive Sources

As an importer country; both importer and end user of the radioactive material are required to have related authorizations issued by NDK according to above mentioned regulations. During the importation, NDK's authorization is also sought by the Ministry of Trade according to the Communiqué on the Import of Radioactive Materials and Devices Using Them.

As an exporter country; both exporter is required to have related authorizations issued by NDK and scope and the aim of the exportations should be in the line with the nuclear export control and safeguard policy regulated by above mentioned regulations. In terms of radioactive source, exportations occur only for repatriation purposes.

For the importation/exportation of Category 1 and Category 2 radioactive sources (as identified in Table 1, Annex 1 of the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources), related prior notification and consent are done in the line with the "Guidance on The Import and Export of Radioactive Sources".

While transportation and transit passage of radioactive materials is subjected to NDK's permit and organizations carrying out transportation of radioactive sources are needed to take license from NDK, as being a dangerous goods, transportation of radioactive material is also subjected to regulatory control of Ministry of Transport and Infrastructure and national dangerous goods regulations which aim the implementation of international agreements that Republic of Türkiye is a party are executed by the Ministry of Transport and Infrastructure.

By the PD No.95 it is also regulated that safety and security issues are regulated by the NDK, and other issues are regulated by the Ministry of Transport and Infrastructure, with the approval of the NDK.

In this scope, the main regulations and international agreements related with the transport of radioactive materials are:

- Regulation on Safe Transportation of Radioactive Materials, 2005, which is executed by NDK and based upon IAEA's Regulations for the Safe Transport of Radioactive Material, 1996 Edition (As Amended 2003), No. TS-R-1.
- Regulation on Transport of Dangerous Goods by Road, 2022, which is executed by the Ministry of Transport and Infrastructure and compatible with The Agreement concerning the International Carriage of Dangerous Goods by Road
- Regulation on Transport of Dangerous Goods by Airway, 2018, which is enforced by the Ministry of Transport and Infrastructure and compatible with Civil Aviation Organization Technical Instructions
- Regulation on Transport of Dangerous Goods by Sea, 2015, which is executed by the Ministry of Transport and Infrastructure and compatible with International Maritime Dangerous Goods Code
- Regulation on Transport of Dangerous Goods by Rail, 2015, which is executed by the Ministry of Transport and Infrastructure and compatible with Regulations concerning the International Carriage of Dangerous Goods by Rail, 2021.

In accordance with the Joint Convention, Türkiye does not make authorization for the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal. It should be noted that Türkiye has been the party of Antarctic Treaty since 1995.

SECTION J DISUSED SEALED SOURCES

Article 28 Disused Sealed Sources

1.Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

2.A Contracting Party shall allow for re-entry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

J.1 Radioactive sources and disused sealed sources

All activities regarding radioactive sources including the use, manufacture and possession are subject to obtaining a license from the NDK. According to Law No. 7381 the operations to be carried out at all stages from the manufacture or supply of the sealed radioactive source to its export, return to the origin, delivery to the radioactive waste facility, sale or transfer shall be carried out by the authorized persons.

Authorization stages, the application procedure, radiation protection, safety and security principles for radiation facilities and radiation practices, which cover the use, manufacture and possession of radioactive sources are described in the Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices, 2023. According to the regulation, activities must be justified on the basis of societal benefits and must comply with dose limits specified by NDK. Licenses are not transferable, and authorized persons must comply with the conditions of the license. Responsibilities of the authorized person include maintaining safety, security and nuclear safeguards, with the NDK empowered to take measures to ensure these aspects even if the authorization is revoked. The primary responsibility for radiation protection of workers, the public, the environment, and future generations rests with the authorized person. Management systems, nuclear safeguards, and radioactive waste management shall be conducted in accordance with the relevant regulations.

According to the Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices, 2023:

- Authorized person must regularly review the radioactive source inventory to identify disused sealed sources and ensure their continuous safety and security.
- The appropriate one of the following actions shall be taken by the authorized person with respect to the disused sealed sources:
  i. In case of a request for reuse of disused sealed sources for another purpose, the NDK shall be notified with the necessary information and documents. Disused sealed sources may be reused only with the consent of the NDK and within the scope of the provisions of this Regulation.
  ii. In the event that it is requested to transfer the disused sealed sources, the transfer of the disused sealed source shall be conducted only if the authorized person notifies

the NDK and the license application made by the transferee is approved by the NDK.

iii. In the event that disused sealed sources are not reused or transferred the disused sealed sources shall be returned to the country of origin or, if that is not possible, shall be delivered to the radioactive waste facility operated by TENMAK.

- Disused sealed sources cannot be left in the environment or stored indefinitely by the authorized person.

Currently, disused sealed sources, that are not returned to the country of origin, are being processed and stored at the TENMAK RWPSF. If TENMAK determines that the radioactive materials delivered to the facility as radioactive waste can be reused within the framework of the principle of minimization of radioactive waste, the TENMAK shall notify the NDK of the information regarding the removal of such radioactive materials from the status of radioactive waste and the reuse of such radioactive materials. The radioactive materials may be reused only with the approval of the NDK and within the scope of the provisions of the relevant legislation, in accordance with the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022.

J.2 Re-entry of disused sealed sources into the Republic of Türkiye

Bringing radioactive waste generated by an activity implemented outside the area of jurisdiction of the Republic of Türkiye into the territory of the Republic of Türkiye is forbidden by Law No. 7381 except for; the radiation sources produced within the borders of the Republic of Türkiye and exported with the condition of being returned to the country of origin when their usage period expires and the transit passage of radioactive wastes and the importation of materials contaminated with natural radioactive materials.

Requirements for transboundary movement of radioactive materials are discussed in Section I.

J.3 Orphan radioactive materials

Within the scope of the policy and strategy to be followed by the authorized person regarding spent fuel and radioactive waste management, responsibilities and management of orphan radioactive materials is provided in Section B of this report.

In accordance with the Regulation on Radioactive Waste Management and Spent Fuel Management, 2023, TENMAK shall designate the required procedures for the control of orphan radioactive materials, take or have taken the necessary measures in cooperation with the relevant institutions and organizations when necessary, and carry out the necessary works and procedures including disposal. Costs that may arise due to orphan sources shall be compensated by the last owner, if any, as identified by NDK.

In order to minimize the harmful effects of orphan radioactive materials, radiation measurements systems including fixed-portal detectors have been installed at the entrances of facilities importing scrap metal, ports and customs. These radiation measurement systems are regulated according to Procedures and Principles for Radiation Measurement System Conformity Assessment.

If the scrap metal to be imported into the country is submitted with a document indicating that the scrap metal does not contain radioactivity, issued as a result of the radiation control carried out by authorized person prior to loading onto the ship or land transport vehicle in the

country of origin, but radioactivity is detected by the radioactive measurement system; NDK may deem the scrap metal as orphan radioactive material. If so, the detected radioactive materials by the radiation measurement systems are sent to TENMAK. In these cases, the costs related to the radioactive waste management and transportation of metal scrap containing radioactive material shall be compensated by the importer of scrap metal. In the absence of a document stating that such radiation control has been carried out, the entrance of the scrap metal that contains radioactive material into the country is prohibited.

In addition to the national radiation monitoring programme described in Article 25 of Section F, radiation monitoring systems shall be installed at customs, chemical waste processing facilities and necessary situations such as monitoring of radioactively contaminated lands, visits of nuclear-powered ships and submarines to Turkish territorial waters and ports, in coordination with the Ministry of Trade and the ÇŞİDB. The monitoring activities of radioactive materials at national level are described in the Regulation on National Radiation Monitoring and Radiation Control, 2022.

In order to avoid the orphan radioactive materials, Law No. 7381 states that the persons who leave the place or facility where the activity is carried out, nuclear material, radioactive source or radioactive waste unattended before the termination of the obligations related to the activity shall be sentenced to imprisonment from three to eight years and a judicial fine of five thousand days.

SECTION K GENERAL EFFORTS TO IMPROVE SAFETY

Republic of Türkiye signed the Joint Convention on October 6, 2021, and it entered into force on May 21, 2023. The NDK serves as the national contact point for this Joint Convention. This is the first national report prepared for the Republic of Türkiye under the obligations of the Joint Convention.

The nuclear programme, nuclear facilities, radioactive waste facilities, spent fuel management facilities, past practices and environmental remediation activities are presented in various sections of this report.

K.1 Improvements in legislative and regulatory framework and development of infrastructure

A comprehensive nuclear energy law was enacted in July 2018 to strengthen the regulatory standards and infrastructure of Türkiye. With the enactment of the nuclear energy law, the main policy regarding the safe management of radioactive waste and spent fuel are defined. An independent regulatory authority, NDK, the HYK and the national radioactive waste management organization, TENMAK, are established. The first NRWMP was prepared by TENMAK, covering the period 2021-2025, and shall be updated every five years.

Detailed information on legislative and regulatory framework and infrastructure development can be found in Section E of this report.

K.2 International projects, international agreements and review missions

Türkiye engages in close collaboration with the IAEA, the EU, OECD-NEA, and EURATOM. This collaborative effort aims to develop Türkiye's infrastructure and enhance its technical capacity for the safe management of radioactive waste and spent fuel.

The INSC project titled “Support to the Regulatory Authority of Türkiye (TR3.01/16)” was launched in 2018 aiming to increase the technical knowledge and experience of the NDK personnel in regulatory activities related to nuclear safety and completed as of 2022 successfully. Another INSC project, titled “Further Strengthening the Nuclear Safety and Radioprotection Regulator in Türkiye” covering the years 2023-2026, is currently being carried out. One task under this project focuses on adopting European standards for near-surface disposal of radioactive waste in Türkiye. It involves reviewing Türkiye's regulatory framework, assessing implementation capabilities, and improving safety analysis review methods. The goal of this task is to strengthen regulations and enhance the capabilities of NDK for safe management of radioactive waste.

Under the IAEA's Technical Cooperation Programme, project activities such as TUR9026 entitled "Strengthening the Implementation of the National Radioactive Waste Disposal Programme" was initiated under the coordination of TENMAK. In addition, TENMAK has ongoing efforts within the INSC to initiate projects that will contribute to the safe management of spent fuel and radioactive waste in Türkiye in line with EU and international standards. These projects focus on improving safety culture, awareness and expertise at all stages, including site planning and design, in line with the schedule stated in NRWMP.

As a new Contracting Party, the Republic of Türkiye requested the assistance of IAEA in the preparation of its first national report to the Joint Convention. In this context, IAEA organized a workshop in Türkiye from 20 to 24 May 2024 with the participation of IAEA experts. The workshop was attended by representatives from the NDK, ETKB, AFAD, TENMAK, TÜNAŞ and Akkuyu Nuclear JSC.

The international agreements that Republic of Türkiye is party to in the field of nuclear energy, bilateral agreements with other countries and organizations, and the review missions Türkiye has received, are provided in Annex 5.

K.3 Challenges, areas of good performance and proposed good practices

K.3.1 Challenges:

1. Having a complete and up to date set of legislation (for instance, regulation on radiation protection, regulation on decommissioning of facilities and regulation on transport of radioactive materials are in draft, relevant guidelines for decommissioning, spent fuel and radioactive waste management needs to be established)
2. The majority of the newly recruited staff of NDK and other related institutions (ETKB, TENMAK and TÜNAŞ) are young and have lack of experience and qualifications in spent fuel and radioactive waste management.
3. Current status of the TENMAK TR-2 is extended shut down. It is still unclear when/if it will be decommissioned.
4. Establishment of NSDF in the proposed timeline which will affect the radioactive waste management of Akkuyu NPP, planned NPPs and research reactors including potential decommissioning of TENMAK TR-2.

K.3.2 Areas of good performance:

1. Development and improvement of spent fuel and radioactive waste management infrastructure prior to operation of the first NPP:
   - The policy and strategy for spent fuel and radioactive waste management are established,
   - An independent regulatory body (NDK) and its TSO (NÜTED A.Ş.) are established,
   - The national radioactive waste management organization (TENMAK) is established with responsibility for radioactive waste disposal,
   - The HYK and the funding mechanism for spent fuel and radioactive waste management is established,
   - As a basis for establishing the national radioactive waste policy and strategy for the management of spent fuel and radioactive waste the first NRWMP is established.
2. As it is described in Section H Article 12 of this report, authorization of TENMAK RWPSF according to the updated legislation.

K.3.3 Proposed good practices:

1. During the drafting of regulations concerning spent fuel and radioactive waste management, NDK fully considered the articles of the Joint Convention and recent publications of the IAEA, other international standards and the outcomes of IRRS mission conducted in 2022. This ensures that regulations align with international standards, promoting clear and effective oversight of safe management of spent fuel and radioactive waste in Türkiye.

2. The scholarship program detailed in Article 20 of Section E and Article 22 and Section F of this report, which is known as YLSY, ensures that graduates specializing in nuclear-related subjects, such as spent fuel and radioactive waste management, from globally recognized universities, contribute their expertise to organizations like NDK, ETKB, TENMAK, and TÜNAŞ upon completion of their studies.

SECTION L ANNEXES

ANNEX 1 List of Spent Fuel Management Facilities

A.1 Akkuyu NPP

On May 12, 2010, the Russian Federation and the Government of the Republic of Türkiye signed an IGA in Ankara to construct Türkiye's first NPP on the Mediterranean coast of Türkiye within the boundaries of Gülnar district of Mersin province. The IGA represents a world-first in terms of the Build-Own-Operate model, with the Russian Federation providing technology and financing for the construction of the Akkuyu NPP.

On December 13, 2010, Akkuyu Nuclear JSC was established under Turkish jurisdiction to execute the Akkuyu NPP Project. Akkuyu Nuclear JSC is responsible for the construction and operation of four 1200 MWe power units of the Water-Water Energetic Reactor (VVER) type that is one of the evolutionary reactor design.

On February 7, 2011, TAEK, recognized Akkuyu Nuclear JSC as the project's owner. In line with the IGA, Akkuyu Nuclear JSC receives financing and technology from the Russian Federation. This ensures not only NPP construction but also electricity production and a guaranteed supply of nuclear fuel throughout the NPP's lifetime.

In November 2014, Akkuyu Nuclear JSC presented the Site Parameters Report to TAEK, which included a comprehensive assessment of the Akkuyu site. TAEK approved the fourth version of the Site Parameters Report, the Updated Site Report, in March 2015 and the related project parameters in February 2017. Additionally, the first batch of nuclear fuel was delivered to the Akkuyu NPP site with NDK approval on April 27, 2023. On December 12, 2023, NDK issued the commissioning permit for Power Unit No. 1 of the Akkuyu NPP. All permits and licenses for the Akkuyu NPP are listed in Table 8.

Table 8 *Permits and licenses issued to Akkuyu NPP*

Power Unit	Limited Work Permit	Construction License	Commissioning Permit
Unit 1	19.10.2017	02.04.2018	12.12.2023
Unit 2	30.11.2018	26.08.2019	-
Unit 3	23.07.2020	13.11.2020	-
Unit 4	30.06.2021	28.10.2021	-

Safety in handling SF at the Akkuyu NPP is ensured through a combination of design solutions. According to the Akkuyu NPP radioactive waste management plan, the SFs resulting from the operation of Akkuyu NPP will be stored at spent fuel pool at the reactor for a certain period of time and then will be transported to the interim dry cask storage building within the NPP site.

A1.1 Spent nuclear fuel management in Akkuyu NPP

A1.1.1 SF at-reactor storage facility

The SF at-reactor storage facility is designed to safely manage spent fuel assemblies unloaded from the reactor, minimizing their activity and residual energy release to acceptable levels, enabling their safe transportation for further storage.

Following the reactor unloading process, SF is transported to SF at-reactor storage facility. This facility, located adjacent to the reactor within the containment, serves as a spent fuel pool equipped with necessary systems and equipment for management of SF. The SF at reactor storage system includes the water pool in which racks are located, consisting of cells for placing of SFA, also the cask water compartment to ensure shipment of cask with loaded SFAs from at reactor water pool of the reactor building to the separate dry cask storage facility on the NPP site.

The SF at-reactor storage facility system serves several crucial roles as follows:

- Placing SF unloaded during reactor refueling, including emergency unloading of core fuel,
- Storing SF before its removal from the reactor building,
- Reducing the activity and residual heat from SF to values acceptable for their transportation,
- Providing the biological protection for personnel from the stored fuel in spent fuel pool.

In accordance with the EUR requirements, the capacity of the spent fuel pool is designed to accommodate spent fuel assemblies that are accumulated over 10 years of NPP operation, together with control rod protection system absorber rods (CPS AR) and all fuel assemblies from the reactor core at any time during operation.

The safety of the SF at-reactor storage system shall be ensured by the implementation of the following principles and requirements:

- the effective neutron multiplication factor shall not exceed 0.95 under normal operating conditions and during design basis accidents,
- any need to move loads over SF shall be excluded if they are not parts of lifting and management equipment,
- the design of the racks in the spent fuel pool shall ensure their stability under normal operation conditions and in the case of the maximum estimated seismicity,
- the design of spent fuel assembly management equipment shall ensure nuclear safety mainly by placing fuel assemblies with the specific grid spacing,
- the spent fuel pool includes systems on water supply, cleaning, water cooling, monitoring the radioactivity, temperature, water level and chemical conditions of water,
- the design includes technical facilities for the detection of leakages and defects on FAs,
- the neutron absorbing additives shall be incorporated into the structural materials of the spent fuel pool racks for nuclear safety purposes. The racks shall be designed and manufactured to ensure that the absorption capacity is not reduced by mechanical, chemical and radiation effects during normal operation and design basis accidents,
- the use of non-recoverable heterogeneous or homogeneous absorbers and control over their absorption capacity or absorber concentration,

- the redundancy in the spent fuel pool cooling system,
- the equipment of the spent fuel pool with a water make-up system of the required quality,
- establishing the defense-in-depth concept from the entering and exiting the reactor building that against potentially hazardous radioactive material contained in fuel, based on the application of a barrier system and technical and organizational protection measurement system.

Unloaded SF is transported from the at-reactor storage facility using dual-purpose casks, utilizing a road train to transfer them to a designated spent fuel storage facility within the NPP site. This storage facility is designed for the interim storage of SF in the cask.

The leak-tight bottles containing the damaged spent fuel assemblies, if any, are to be stored in the racks of the spent fuel pool until the unit is decommissioned.

A1.1.2 SF interim dry cask storage facility (SFSF)

According to the classification of NPP systems and components, the SFSF is a normal operation system, also according to its safety significance; it is a safety-related system. The SFSF is a general plant facility that is a separate building with vehicular enter/exit. The main functions of the SFSF are following:

- reception of cask with SF from the reactor buildings,
- storage of the cask in the SFSF,
- shipment of cask with SF from the SFSF to the geological disposal facility or reprocessing facility.

The capacity of the SFSF provides for storage up to 40 casks. The service life of SFSF is not less than 60 years. SF are stored in the dry dual-purpose casks.

The safety of the SF storage system in the SFSF is ensured by the implementation of the following requirements:

- the effective neutron multiplication factor should not exceed 0.95 under normal operating conditions and during design basis accidents,
- eliminated the need to movement the loads over the SF casks, if they are not part of the lifting and reloading devices,
- the design of the cask for transporting and storage of SF shall ensure nuclear safety due to the location of the spent fuel assemblies with a certain grid spacing of the cask using by placing spent fuel assemblies at a specific grid spacing in the cases,
- the management equipment shall prevent any possibility of a cask falling during normal operation, as well as such damage on the cask and fuel assemblies that could lead to an accident in the initial events causing the packages to fall,
- the technical means are provided to prevent uncontrolled, spontaneous movements of the nuclear fuel management equipment,
- the complex of SF storage and management systems performs its functions under the natural and man-made external influences adopted in the project.

Monitoring system on the SF in the SFSF

During SF storage in the SFSF, each cask is equipped with a monitoring system according to the design with following purpose:

- monitoring and storing the received data from the pressure sensors in the inner-cover of the cask and temperature sensors of in the outer surface of the cask,
- indication of current values of pressure and temperature in the online regime on the operator's automated workstation (AWS),
- generation of personnel alert signals in the event of a pressure drop in the inner-cover cavity that are below the permissible limits and/or an increase in the temperature of the outer surfaces of the TPS above the permissible limits,
- transmission of monitoring data to the common station network.

The condition monitoring system of cask during storage provides the following functions:

- monitoring the supply voltage to the system, control cabinet and sensors,
- providing power supply and temperature sensors and signal convertors,
- conversion of analogue signals from sensors into digital signals,
- visualization of the current pressure and temperature values based on the installed sensors on the operator's workstation monitor,
- storage (logging) of readings of cask inter-roof pressure monitoring sensors and cask outer surface temperature monitoring sensors with reference to time and date of recording,
- notification of personnel (generating signals) in the case of monitored parameter values exceeding permissible limits.

The monitoring system provides the following functions:

- AWS of the operator-technologist - AWS (personal computer with monitor, keyboard and mouse),
- control cabinet (data recording) of the pressure monitoring system on the inner-cover of cask and the temperature monitoring system on the outer surface of cask, including power supplies, field controllers, information input/output devices, local monitor with control panel, communication devices for connecting to the general plant network,
- communication and sensor power cables laid in cable channels.

In order to measure the pressure of the cask between the covers used the pressure sensor that is installed between the cask vessel and outer cover.

In order to measure the temperature of the outer surface of cask used the sensor that is installed the cask vessel.

The sensors for measuring temperature and pressure are included with the delivery of each cask.

The console (panel) for recording data from the cask condition monitoring system is located in the SFSF building in the separate room.

Room accommodates the following monitoring system equipment:

- counter (control cabinet) for data collection equipment, alarm signals generation and information transmission equipment,
- process operator's AWS,

Currently, the cask condition monitoring system is in the design phase.

A1.2 Radioactive waste management of Akkuyu NPP

Radioactive wastes that will be generated during power generation at Akkuyu NPP, is divided into three categories: SRW, LRW and GRW.

The main purposes of gaseous radioactive waste management systems (radioactive blowdown purification system and hydrogen combustion system from radioactive process blowdowns) are:

- ensuring non-exceedance of radionuclide concentrations in the air of the premises defined by regulatory documentation;
- reduction of radionuclide release into the environment at the level and below the permissible values defined by the normative documentation;
- ensuring that radiation doses to the critical group of population living around the NPP are not exceeded.

LRW management systems are designed to ensure safe management of LRW generated during technological processes, including collection, classification, temporary storage, processing and conditioning of LRW. Liquid radioactive media and LRW management systems include the following systems:

- building special sewerage system;
- system of trap water processing;
- system of intermediate storage of liquid radioactive waste;
- concentration systems;
- cementing systems;
- system for pyrolysis of spent ion exchange resins, sorbents and sludge.

The solid radioactive waste processing systems are divided into the following categories by their functional purposes:

- collection and transportation of SRW;
- reception and segregation of SRW;
- decontamination of metallic SRW;
- pre-pressing of SRW;
- high-pressure pressing;
- incineration of combustible SRW;
- cementing of briquettes with SRW after pressing;
- storage of SRW.

LRW is collected in specialized containers, depending on their activity and type (trap water, spent ion exchange resins and sludge), after holding for decay of short-lived radionuclides that is sent for concentration by evaporation method, and the obtained vat residue is to be conditioned in the cementation system. Spent ion exchange resins and sludge are sent for processing to the pyrolysis system that is located in the radioactive waste processing and

storage building, and the obtained waste coke residue is conditioned in the cementation system. Solidified liquid radioactive waste by cementation method is sent for long-term storage.

Gaseous radioactive waste is collected by ventilation and purification systems for radioactive blowdown and, after filtration to levels authorized for release, is discharged through a ventilation stack into the atmosphere.

Within the scope of Akkuyu NPP radioactive waste management, it is envisaged to collect, process and store solid, liquid and gaseous radioactive waste within the NPP site. As part of the liquid radioactive waste management, that is classified by radioactivity as low-level and intermediate-level radioactive waste and collected depending on their specific activities and types (as trap water, spent ion exchange resins and sludge). Liquid radioactive waste as trap water is processed in the trap water treatment and concentration systems by evaporation method, and spent ion exchange resins and sludge are sent for processing to the pyrolysis system (that is located in the radioactive waste processing and storage building), the received waste (cube residue concentrate and coke residue) is conditioned in the cementation system. The solidified liquid radioactive waste that is generated during the processing of radioactive waste is classified as low and intermediate-level radioactive waste and is sent for storage to the radioactive waste processing and storage building.

Solid radioactive waste that is generated at Akkuyu NPP facilities, is classified according to their radioactivity level as very low-level, low and intermediate-level and high-level. The segregated waste by classes is received for processing and/or storage based on its type after segregation of solid radioactive waste at their generation points and collection points.

Segregated solid radioactive waste at the organized collection points as very low-level solid radioactive waste is sent to very low-level storage building. On the other hand, the segregated solid radioactive waste as low and intermediate-level solid radioactive waste is sent to the radioactive waste processing and storage building.

The low and intermediate level solid radioactive waste is divided into recyclable low and intermediate-level solid radioactive waste and non-recyclable low and intermediate-level solid radioactive waste, including solidified radioactive waste, is sent for processing and storage to the radioactive waste processing and storage building.

The low and intermediate-level solid radioactive waste having dose rates that do not exceed 1 mSv/h, shall be processed in the incineration, compression, and cementing systems at Akkuyu NPP.

The processed solid radioactive waste is cemented and sent for storage in 0.2 m^3 drums to the storage part of the radioactive waste processing and storage building.

The non-processed solid radioactive waste, having dose rate more than 1 mSv/h, shall be stored in 0.2 m^3 drums without pre-treatment.

Solid radioactive waste that is classified as very low-level radioactive waste is stored in 0.2 m^3 volume drums for 10 years at the Akkuyu NPP site, without processing in the storage building for very low-level radioactive waste. The storage building for very low-level radioactive waste is provided the possibility to remove the solid radioactive waste packages (drums) at the end of the designated storage period and to transfer these packages (drums) for

disposal to a disposal facility that is planned to be constructed in the territory of the Republic of Türkiye, according to the NRWMP in 2036.

In case of unavailability of the NSDF that is indicated in the NRWMP to accomplish the compensatory measures, an area is reserved in the Akkuyu NPP site layout to store of the very low-level radioactive waste drums for additional 50 years, i.e. until the end of NPP operation.

In order to manage the low and intermediate level solid radioactive waste in the radioactive waste processing and storage building is equipped with the collection and segregation system, metal solid radioactive waste decontamination system, solid radioactive waste incineration system, solid radioactive waste pressing system and cementation system. The low and intermediate level solid radioactive waste that is generated during the whole life-time of Akkuyu NPP, shall be stored at the Akkuyu NPP site, i.e. in the radioactive waste processing and storage building after processing and compliance until their transfer to facilities of TENMAK for disposal.

The storage part of the radioactive waste processing and storage building is designed for collection and interim storage of solid and solidified low and intermediate-level radioactive waste that is generated during ten years of operation of four power units (with the possibility of subsequent expansion of storage volume for additional 50 years of NPP operation. As well as high-level radioactive waste that is generated during 60 years of operation of four power units.)

The processed solid radioactive waste and solidified liquid radioactive waste are classified as low and intermediate-level radioactive waste that is stored in 0.2 m^3 drums. Solid radioactive waste that is generated from the reactor plants, is classified as high-level radioactive waste and is stored in special capsules at the radioactive waste processing and storage building.

In Akkuyu NPP, RW collection and segregation is a mandatory stage of waste preparation for processing, storage, conditioning and ensures exclusion of radionuclides from the environment. RW segregation at NPPs is performed directly at the places of its generation by categories separately from production and consumption waste taking into account:

- aggregate state of RW (solid, liquid);
- level of radioactive contamination and gamma radiation dose rate;
- RW category;
- quantity of RW;
- physical and chemical characteristics of RW;
- nature of RW (organic and inorganic);
- explosion and fire hazard of RW;
- methods of further RW management.

Solid radioactive waste generated in the controlled access zone is collected in containers placed in specially equipped locations., which measure gamma radiation dose rate, Then, solid radioactive waste is classified into categories based on dose rate levels measured as very low level radioactive waste (less than 0.001 mSv/h), un-processible low and intermediate level waste (from 0.001 mSv/h to 1 mSv/h) and processible low and intermediate level waste (dose rate more than 1 mSv/h).

Following this first procedure, segregated waste classified initially as VLL radioactive waste undergoes certification procedure either confirming its classification or exclusion from

very low-level waste for decontamination. Characteristics of the categorized waste as un-processible low and intermediate level waste are determined based on the certification procedure results of radioactive waste packages that shall be stored in. On the other hand, the characteristics of the categorized waste as processible low and intermediate level waste are established based on the certification procedure results of packages containing conditioning waste after the processing procedure.

A.2 Sinop NPP

The Sinop NPP, planned to be the Türkiye's second NPP, will be located on the Turkish Black Sea coast, within the provincial borders of Sinop. The EIA Affirmative Certificate of the Sinop NPP Project was granted by the ÇŞİDB on 11.09.2020 with the Decision No: 6006. On 31.12.2022, TÜNAŞ submitted an application to NDK to be the owner of the Sinop Site and NDK recognized the application on 20.01.2023. On 30.05.2023, an official application for site approval for Sinop NPP was submitted. Pursuant to the site approval application, NDK granted site approval in accordance with Law No. 7381 and the relevant legislation with the Nuclear Regulatory Board's decision dated 03.04.2024.

For Sinop NPP, technology providers have not been decided yet but negotiations are currently underway under the responsibility of the ETKB.

A.3 Research Reactors

A.3.1 TR-1

In 1962, Türkiye's first research reactor, TR-1, was commissioned with 1 MW power for research and production of isotopes for industrial and medical purposes in İstanbul. It was operational from 1962 to 1977 and has since been dismantled. In 1977, TR-1's fuels were returned to the country of origin (USA). The extensions of the irradiation tubes in the pool were removed and closed. The structural parts such as the "bridge" and "diving board" are still present.

A.3.2 TENMAK TR-2

In 1981, a pool type 5 MW reactor was built in the same building of TR-1 in order to carry out basic research and development studies to ensure the development of nuclear technology in Türkiye, to carry out research on the production and production techniques of radioisotopes used in medicine and industry, and to train personnel to work in the nuclear field.

TENMAK TR-2 (see Figure 6, https://nuken.tenmak.gov.tr/tr/tesisler/arastirma-reaktoru.html) operated at 5 MW between 1984 and 1994. Due to seismic evaluation studies of the reactor building, it operated at low power levels between 1995 and 2009, as required by the regulatory authority. In 2009, the reactor was shut down to convert the reactor core from mixed HEU and LEU core to fully LEU core. After the shipment of HEU fuel elements to country of origin (USA), fresh LEU fuel elements have been supplied but they have never been irradiated and being stored in the research reactor. Three irradiated fuel elements, which are not classified as spent fuel, are being stored in the reactor pool. In 2013, the project on strengthening of the reactor building was completed. An updated safety analysis report and other related documents were prepared and submitted to the regulatory authority to obtain fuel loading permit. TENMAK TR-2's current status is extended-shutdown since 2009.

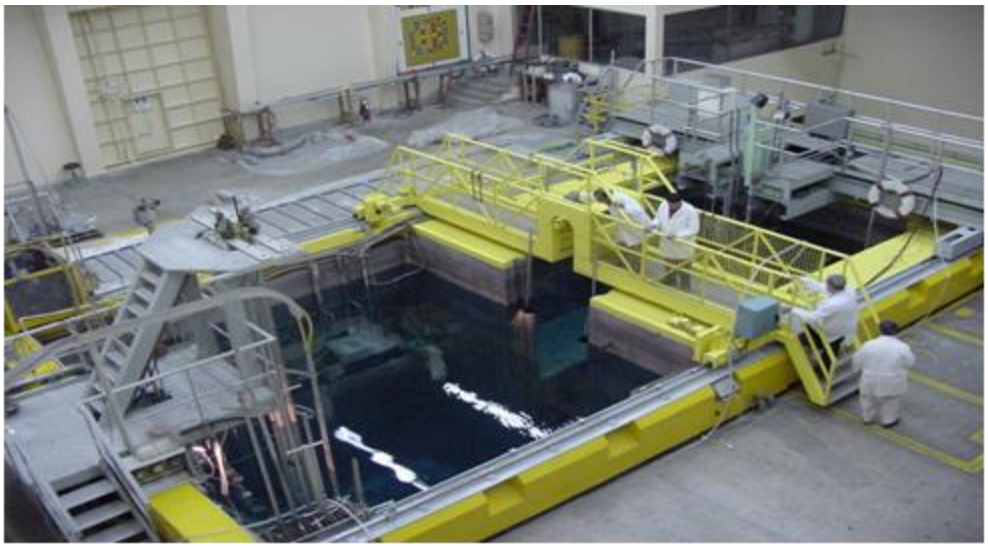

Figure 6 *TENMAK TR-2*

A.3.3 İTÜ TRIGA MARK-II research reactor (İTÜ TM-II)

İTÜ TM-II was put into operation on March 11, 1979 in order to support nuclear training, research and development activities and to provide irradiation, testing and analysis services in İTÜ Ayazağa Campus İstanbul. İTÜ TM-II is an open tank type reactor that works with solid fuel elements, which is formed by homogeneous mixing of light water coolant, graphite reflector and 20% enriched uranium fuel with zirconium hydride retarder. It can be operated in a continuous or pulsed regime. It can go up to 250 kW in continuous operation and 1200 MW in pulsed operation for a very short time interval. İTÜ TM-II is in operation.

There are 69 standard fuel elements within the reactor tank. In this initial report period, no spent fuel elements are currently stored at the İTÜ TM-II. In line with global practices for TRIGA reactors, spent fuel elements are typically stored within the reactor hall, falling under the safety and security management of the reactor building. At the İTÜ TM-II, the storage racks are placed directly in the reactor tank, suspended along the tank wall underwater, and four storage pits in the reactor hall floor are utilized. The wet storage capacity is 10 fuel elements for each fuel storage pit in the reactor hall floor.

ANNEX 2 List of Radioactive Waste Management Facilities

A.1 TENMAK RWPSF

Türkiye Energy, Nuclear and Mineral Research Agency (TENMAK), Radioactive Waste Processing and Storage Facility was established in 1986 on Nakkaştepe, 30 km away from the city center in the west of İstanbul in the Marmara Region, with an average altitude of 58 meters above the sea level. This facility is located in the same residential area as TENMAK Nuclear Energy Research Institute - İstanbul Campus. The facility continues its activities under the Radioactive Waste Management Department - Radioactive Waste Processing and Storage Unit with the establishment of the TENMAK and has been the only centralized radioactive waste management facility in Türkiye since its establishment.

TENMAK RWPSF was licensed in accordance with the provisions of the repealed Regulation on Radiation Safety to ensure radiation protection during the operation of the facility where radioactive wastes containing activity or activity concentration above the exemption limits specified in the revoked Decree on Radiation Safety. With the establishment of the new regulatory infrastructure in Türkiye in 2018, this facility was defined as a radioactive waste facility under Law No. 7381. Consequently, the Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022, and Nuclear Regulatory Board Decision on Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and Other Processes for Radioactive Waste Facilities were issued regarding authorization of radioactive waste facilities. According to the provisional article of the regulation, the current license of the facility remained valid until March 2023, and it is stipulated that TENMAK must apply to the NDK under this regulation by this date.

In this context, TENMAK applied to NDK in February 2023 to obtain an operating license for the facility in accordance with the new legislation. Following the review and assessment of the safety case, including the requested supplementary reports, the facility was granted a license to operate in April 2024, with conditions.

TENMAK RWPSF operates all the administrative and technical activities related to the acceptance, classification, conditioning and storage activities, and inventory keeping of the radioactive waste generated as a result of different applications. TENMAK RWPSF ensures that radioactive wastes that may arise during the use of ionizing radiation sources is managed safely in a way that does not harm employees, society, environment, and future generations.

TENMAK RWPSF consists of one office building, the processing building, approximately 30 thousand square meters of open space and four closed warehouses. There are multiple containers containing radioactively contaminated scrap materials are kept in the container stocking area in the open field. In the facility, there are four storage buildings as RAY-D-1, RAY-D-2, RAY-D-3, and RAY-D-4, where the radioactive wastes are safely stored and protected based on their properties. Two warehouses, RAY-D-1 and RAY-D-4 have a reinforced concrete structure, while RAY-D-2 and RAY-D-3 have a steel construction. There are also some ISO 20 feet containers to store devices, which contain sealed radioactive sources.

In this facility, the collection, treatment and storage of low and intermediate level radioactive wastes that have been generated as a result of various activities in Türkiye are carried out. By fulfilling these responsibilities, it ensures the protection of the public, the environment and future generations from radioactive wastes resulting from the use of radioactive materials and the possible harmful effects of other radioactive wastes. It is expected that radioactive waste will be stored at this site until the NSDF mentioned in the National Radioactive Waste Management Plan is established.

A.1.1 Management of institutional radioactive waste

Management of very short-lived radioactive wastes

For industrial and medical very short-lived radioactive waste contaminated by radionuclides with a half-life of 100 days or less, the radioactive waste must be placed in durable bags and stored for ten half-lives of the longest-lived radionuclide. After clearance, the authorized person shall deliver the medical waste to a medical waste processing facility or the industrial waste to a waste processing facility authorized by the ÇŞİDB.

Radioactive liquid wastes can be released into the sewerage system only after their radioactivity falls below specified limits. The radioactivity of each radionuclide must not exceed exemption limits at one time. For liquids containing multiple radionuclides, the sum of the ratios of each radionuclide's radioactivity to its exemption value must not exceed 1 at any time and 10 in monthly releases. Hospitals administering radionuclides for inpatient treatment must use a liquid waste tank system, and the wastes can only be released after meeting specific radioactivity concentration limits and time requirements defined in the Regulation on the Clearance and Release of Radioactive Materials, 2023.

Management of radioactive waste from radiation facilities and radiation applications

Most of the radioactive sources from gamma irradiation facilities, radioisotope production facilities, and radiopharmaceutical production facilities, as well as radioactive sources from radiation applications such as industry, medicine, research, and calibration, have been returned to the country of origin. Those that were not returned are currently being stored in the TENMAK RWPSF.

Management of radioactive waste from petroleum exploration and scrap metal trading activities

Activities such as oil exploration and scrap metal processing in Türkiye generate various substances that are considered as radioactive waste. These radioactive wastes are delivered to TENMAK RWPSF for interim storage.

Management of consumer products containing radioactive sources

Consumer products such as lightning rods and smoke detectors that contain radioactive sources are transferred to TENMAK RWPSF for appropriate radioactive waste management operations at the end of their lifetime.

A.1.2 Radiation safety in the facility

At all stages of radioactive waste management, it is essential that all employees comply with the relevant procedures and take safety precautions. All personnel in the organization take basic safety measures to protect people and the environment from the harmful effects of ionizing radiation.

All radiation protection officers working in the facility have a complete radiation protection training and success certificates, and the basic principles of radiation protection are

applied and some personal protective equipment is used to protect the radiation workers from ionizing radiation.

Controlled area

Working areas where radiation officers may be exposed to radiation doses more than 3/10 of the average annual dose limit of 20 mSv within five consecutive years due to their duties are considered as controlled areas. Working areas in TENMAK RWPSF that are likely to exceed this value are evaluated as Warehouses, Storage Area, Radioactive Waste Processing Facility, Temporary Storage Building.

The following radiation warning signs are placed in these areas;

- Basic radiation symbols indicating a radiation field
- Signs carrying the necessary information, symbols and colors to clearly indicate the magnitude and characteristics of the danger of radiation exposure.

Calculation of the time to be spent in controlled areas where there is a risk of radiation exposure and contamination and which protective clothing and tools should be used are determined by the radiation protection officer before each work in these areas.

Radiation supervised area

Working areas where radiation officers may be exposed to radiation doses more than 1/20 of the annual dose limits, and 3/10 of the annual dose limits are not expected to be exceeded and do not require individual monitoring but require monitoring of environmental radiation. The Office Building has been designated as supervised areas in TENMAK RWPSF.

Locations of the radiation warning signs in controlled and supervised areas are as follows:

- In the access control area from the offices to the Facility,
- At the entrance of the waste processing facility,
- In warehouses,
- Approximately 10 m intervals in the wire fences bordering the facility,
- Radiation hazard warning signs appear on radioactive waste packages.

Radiation dose and contamination control

In order to determine the radiological effects of the activities carried out by TENMAK RWPSF, the offices, processing facility, radioactive waste site, warehouses, the environment of the waste site and the entrance to the facility, dose rate measurements and contamination controlling activities are carried out every month at pre-determined and marked points. The location information is recorded to maintain accuracy.

A.1.3 Equipment

TENMAK RWPSF has devices and equipment used to carry out radioactive waste processing and storage activities in a safe and secure manner. An effective and consistent equipment security program is implemented to ensure that these devices are kept ready for every need, that they can be used safely to perform the work expected of them, that their performance does not to decrease due to ageing and that do not create new unforeseen radiation risks for the facility, environment and employees. Another equipment security program is carried out for tools, devices and equipment that are not used directly for the processing of radioactive waste in the facility, but are involved in the management of equipment that plays an auxiliary role in these activities. All of the devices are checked, calibrated and controlled in a timely manner.

In the Processing Building, there are one hot cell, a compactor for compactable radioactive wastes, table and hand tools used to process consumer products, lifting and transportation systems for radioactive waste processing, conditioning and packaging processes, a compressor, and electrical/mechanical hand tools that have been used in various applications in radioactive waste processing activities.

Table 9 *Radioactive waste storage buildings in TENMAK RWPSF*

Building Name	Content
Container Stocking Area	Containers with contaminated scrap
RAY - D- 1	Waste containing nuclear material
RAY - D- 2	Storage of conditioned radioactive waste packages
RAY - D- 3	Pre-processing radioactive waste storage
RAY - D- 4	Storage of conditioned and re-packaged drums containing nuclear material

There is also a system based on chemical precipitation in TENMAK RWPSF for the processing of liquid wastes, which was provided by the IAEA during the establishment of the Processing Building. It was used in the processing activities of liquid wastes, especially during the periods when the TR-2 research reactor was in operation. However, Liquid Waste Processing System is no longer in operation and currently, there are no liquid waste processing activities carried out in TENMAK RWPSF.

The applications that have been carried out in TENMAK RWPSF can be detailed further as follows.

A.1.4 Radioactive waste acceptance

Radioactive wastes brought to TENMAK RWPSF by other transportation companies licensed by NDK, are accepted according to the TENMAK RWPSF's waste acceptance criteria and related waste acceptance procedures which are listed in the TENMAK's web-page (https://www.tenmak.gov.tr/index.php?option=com_content&view=article&id=2575:rayk-atik-kabul-kosullari).

A.1.5 Radioactive waste processing and conditioning

Since its early years, TENMAK RWPSF has gained significant experience in the processing and conditioning activities of radioactive sources that are generally classified as very low-level and low- intermediate -level radioactive wastes, which are included in Categories 3, 4 and 5 of the IAEA categorization of the radioactive sources based on the activity ratio (A/D). However, in TENMAK RWPSF there are currently no processing or conditioning activities except for compressible radioactive wastes, Technetium generators and consumer products

such as smoking detectors and lighting rods. All types of radioactive wastes other than the mentioned above are stored in a safely manner according to the relevant procedures.

In the past, processing activities of sealed radioactive sources were carried out in a hot cell. The hot cell was built by the facility personnel in 2014, in accordance with IAEA Safety Standards and NDK regulations and its maintenance and controls are carried out according to the principles of the relevant equipment safety programs. In addition, auxiliary equipment was used in conditioning processes such as cranes, hand tools, radiation measurement systems are also subject to maintenance, control and calibration management according to relevant management plan. All these activities were carried out in accordance with the relevant standard instructions, following international technical guides. After processing, sources were put in the stainless-steel capsules and then in a lead shielded container. This shielded container then put inside a cemented 200 l drums and labelled-stored according to the relevant procedures.

Table 10 *Activity limits for hot cell applications*

Radioisotope	Activity limit inside the cell (Ci)
Cs-137	150
Co-60	1
Ir-92	1000
Se-75	1000
Ra-226	1.5

Compactable radioactive waste processing

Compactable radioactive wastes are wastes that occur in laboratories, facilities, research institutions and TENMAK RWPSF. Examples of these wastes include overshoes, gloves, disposable overalls-aprons, paper towels, etc. decontamination materials, soft filters, metallic or plastic foils and various laboratory consumables. TENMAK RWPSF generally receives such wastes from TENMAK corporate research laboratories, radiochemistry laboratories of universities and radiopharmaceutical production facilities in our country. These compactable solid radioactive wastes are collected in yellow plastic bags. These yellow bags are put into the compactor within 200 l drum to be pressed. This process is targeted to reduce the volume.

Liquid radioactive waste processing

Liquid wastes delivered to TENMAK RWPSF are generally laboratory wastes resulting from TENMAK research activities, TENMAK TR-2 pool water filtering wastes and wastes resulting from research activities conducted by some other public research laboratories. Among these, TENMAK TR-2 delivered the most liquid radioactive waste by volume. There is a system based on chemical precipitation in TENMAK RWPSF for the processing of liquid wastes. The system, which aims to separate the water and radionuclides in the liquid by combining the radionuclides contained in the liquid wastes with the addition of suitable precipitating chemicals, was provided by the IAEA during the establishment of the facility. It was used in the processing of liquid wastes received from the above-mentioned facilities, especially during the periods when the TENMAK TR-2 was in operation. The wastes processed with this chemical precipitation method are conditioned in 200 l drums using the cementation method. These drums are labeled and stored in the relevant storage. However, liquid waste processing

is no longer carried out in TENMAK RWPSF and this system is not in use. Liquids accepted to the facility are stored in barrels in the liquid waste storage.

A.1.6 Radioactive waste packaging

The storage and subsequent disposal of radioactive wastes can only be achieved with packaging that complies with the waste acceptance criteria of the relevant waste facilities where both applications are carried out, provides long-term safety, and sufficiently prevents the waste from harming the environment and humans. The qualities sought in the packages may vary depending on the radiological properties, physical properties, chemical properties, packaging conditions, processing and conditioning types, and storage facility conditions of the wastes. TENMAK RWPSF both receives packaged waste (devices with original shielding as packaging) and performs packaging after processing and conditioning activities. The procedures for carrying out the packaging processes are stated in the relevant instructions. These standard working instructions include packaging and labeling information related to each type of wastes.

A.1.7 Radioactive waste storage

TENMAK RWPSF's storage and field capacity are flexible. It is also suitable for capacity increase depending on the radioactive waste generation. There are different managements for different purposes in storage activities, which can be evaluated as follows:

1. **Interim storage (ISO Containers):** Storage service for radioactive waste packages (ISO containers) containing Norm contaminated scrap materials in the container stocking area. There are also some ISO 20 feet containers to store devices which contains sealed radioactive sources such as density measurement devices.
2. **Interim storage (Warehouses):** In TENMAK RWPSF, there are currently no processing or conditioning activities except for compressible radioactive wastes and consumer products (smoking detectors and lighting rods). All types of radioactive wastes other than those mentioned above are stored in a safely manner according to the relevant procedures. In these types of devices, those containing nuclear materials are stored in the RAY-D-1 warehouse, other devices containing sealed radioactive sources are stored in the RAY-D-3 warehouse. The radioactive waste packages previously conditioned by TENMAK RWPSF are stored in the RAY-D-2 storage, and the liquid wastes from TR-2 research reactor, which was conditioned and re-packaged, are stored in the RAY-D-4 storage.

A.1.8 Conducted activities to improve safety at the facility

The containers, which were previously on the ground, have been moved to a sealed concrete floor to maintain the integrity of the containers as seen on Figure 7.

Figure 7 *The containers in TENMAK RWPSF*

Due to the degradation of some of the 200-litre drums used for storage of solidified liquid radioactive waste, these drums were overpacked with stainless steel drums as seen on Figure 8.

Figure 8 *Degraded drums (left), after overpacking with steel drums (right)*

A.1.9 Registry system

For the registration of the radioactive waste accepted to the radioactive waste processing and storage facility, information such as brand, model, serial number, source serial number, activity production date and isotope, quantity (volume for liquid waste, weight for solid

compressible waste) are recorded for inventory keeping and this information is shared with NDK.

For clearance, swab/dirt samples are taken from the materials to be cleared and sent to TENMAK's accredited laboratories for alpha, beta and gamma analyses. In addition, on-site measurement service is received from the relevant unit of TENMAK. These analysis and measurement results are recorded. The clearance procedure is applied to materials whose results are below the limits specified in the relevant regulation as a result of the swab samples/analyses performed and all this information are shared with NDK.

A.1.10 Research and development

The primary objectives of research and development activities in the field of radioactive waste management can be summarized as follows:

- To support the development and optimization of the disposal facility design, including the selection and definition of the engineering barrier system,
- To create data, models and concepts to be used in various evaluations such as business and post-operational safety and environmental impacts,
- To ensure reliability, which is important in safety assessments of disposal facilities, especially in terms of public acceptance.

TENMAK develops its collaborations with institutions and organizations working in this field, the IAEA and OCED/NEA and institutions and organizations of other countries.

A.1.11 Management system of TENMAK RWPSF

An Integrated Management System has been established and is currently available within TENMAK, taking into account the conditions stipulated by the TS EN ISO 9001:2008 Quality Management System standard. Under this framework and scope, the TENMAK RWPSF Management System has been established for TENMAK RWPSF in accordance with the requirements of the Regulation on Authorizations and Security Principles for Radioactive Waste Facilities, 2022 and the Management System Regulation for Nuclear Facilities, Radiation Facilities and Radioactive Waste Facilities, 2022.

TENMAK RWPSF Management System Mission; to offer a radioactive waste management that processes and stores the radioactive wastes generated in our country in a safe and environmentally friendly manner, by attaching importance to safety culture, in accordance with international standards and by adopting the best international practices.

<u>Safety policy</u>

By effectively promoting safety culture and nuclear safety culture, Radioactive Waste Management Department integrates safety, security, environment, health and quality elements and individual, social and economic factors in the processing and storage of radioactive waste in all activities of the Facility without compromising safety;

- Carrying out all activities in a safe manner and taking into account the protection of future generations from the harmful effects of radiation,
- Maintain its services in accordance with the provisions of applicable safety and nuclear safety legislation and other requirements,
- To ensure that human resources are managed with safety in mind and to provide the necessary training opportunities for the establishment of a safety culture,

- A shared understanding and commitment to safety and safety culture within the facility to support efforts for the continuous improvement of these elements, watch over it.

Quality policy

Within the framework of TENMAK Quality Policy, all activities of TENMAK are undertaken:

- To be carried out in accordance with national and international guidelines and standards,
- Develop a national innovation ecosystem and value chain,
- Innovations that will meet Türkiye's technology needs and reduce foreign dependency
- to carry out localization studies,
- In the products and services, it offers by taking into account the needs and expectations of all stakeholders increase satisfaction,
- Products and services in accordance with the provisions of the legislation in force and other conditions to keep going,
- By identifying strengths, weaknesses, risks and opportunities to increase institutional capacity, monitor the effectiveness of practices, measure performance and continuously improve processes,
- Provide the necessary training opportunities to ensure the development of human resources and ensure quality perspective, it is committed to pursuing sustainability goals and sensitivity to environmental issues.

TENMAK also ensures that all of radioactive waste processing and storage facility's activities:

- To carry out all its activities in an effective, efficient and fast manner, prioritizing safety culture, nuclear safety culture, human health and environmental factors,
- Continuous improvement of management system of radioactive waste processing and storage facility by using qualified personnel and technology infrastructure.

A.2 TENMAK Near Surface Disposal Facility (NSDF)

TAEK conducted desktop studies across the country to identify potential sites for the NSDF. A total of 21 sites in 6 regions were evaluated based on specified criteria below, including international and national site selection standards.

The sites were evaluated based on factors such as population density, distance to protected areas, slope, and geological and hydrological suitability. To begin with, initial observations were made to assess if the sites have natural barriers for radioactive waste, and to understand the current status of surface and groundwater movement. Additionally, tests were conducted to determine if the tectonic/seismotectonic and geotechnical properties of the sites meet the necessary conditions. When selecting the areas, the first step was to confirm if they were public land. The following criteria were used in the site selection process:

- Areas within nature reserves and natural protected areas were not considered.
- Sites within 5 km of active fault lines were excluded.
- Urban and densely populated areas were avoided.
- Steep, difficult-to-build-on terrain, and narrow areas were not considered.
- Locations without access to transportation were disregarded due to the high cost of road construction.
- Areas with intensive agricultural and animal husbandry activities were avoided.

Preliminary site selection has been made for NSDF, but efforts to implement EIA procedures, obtain the EIA Positive Certificate, and obtain a document showing ownership or usage rights on the site for project planning are continuing.

A.2.1 Research and development

Research and development activities in the field of radioactive waste management are planned to focus on the disposal of radioactive waste. In this context, in order to support the NSDF planned to be established in the medium term and the deep geological disposal facility to be established in the long-term research and development activities in the following areas will be required in the context of site selection, design, licensing and long-term operational performance:

- Radioactive waste inventory for disposal facilities
- Engineering barriers for the disposal of radioactive waste
- The role of natural barriers in the disposal of radioactive waste
- Transport and storage of radionuclides in the earth and biosphere
- Transport / release of waste from geological formations in disposal facilities
- Laboratories and experimental setups for simulating disposal conditions
- Underground rock laboratories and natural environments representing disposal conditions
- Model, system and database development

A.2.2 Management system of NSDF project

Safety policy

TENMAK, as an organization that provides services by effectively promoting safety culture and integrating safety, security, environment, health and quality elements and individual, social and economic factors in the disposal of radioactive waste at all stages of the radioactive waste facility without compromising safety;

- To ensure that all activities are carried out safely and taking into account the protection of future generations from the harmful effects of radiation,
- To maintain its services in accordance with the provisions of applicable safety legislation and other conditions,
- To ensure that human resources are managed with safety in mind and to provide the necessary training opportunities for the establishment of a safety culture,
- To support efforts to continuously improve these elements by ensuring a common understanding and commitment to safety and safety culture within the facility,

undertakes.

Quality policy

During the location, design, construction, commissioning, operation and shutdown phases of the NSDF Project, the highest level of importance is given to quality and safety culture in order to ensure radiation safety, reliability and achievement of the objectives in an effective and efficient way within the framework of the relevant legislation.

TENMAK ensures that all activities within the framework of the NSDF Project;

- To be carried out in accordance with national and international guidelines and standards,
- To be carried out effectively, efficiently and quickly by prioritizing safety culture, human health and environmental factors,
- Continuous improvement of the Management System by using qualified personnel and technological infrastructure,

undertakes.

A.3 Eskişehir-Beylikova Complex Ore (Barite, Fluorite, Rare Earth Elements, Thorium) Quarry, Ore Preparation and Enrichment and Storage Facility

The General Directorate of Eti Mining Operations plans to carry out mining activities in the district of Kızılcaören, within the scope of Beylikova Fluorite, Barite, and Rare Earth Elements Operation Directorate, located in Sivrihisar and Beylikova Districts of Eskişehir Province.

The extraction of identified ore in this field is intended to be conducted through open-pit mining, followed by ore enrichment and hydrometallurgical processes to produce Rare Earth Elements, barite, fluorite, and thorium as a by-product.

The long-term storage facility for radioactive process wastes and thorium compounds to be generated during production is within the scope of the activity.

The resulting thorium compound falls within the scope of nuclear material. Authorization procedures for mines are carried out within the scope of the Regulation on Authorizations Regarding Nuclear Facilities, 2023. Limited work permit and construction license have been issued for the Eskişehir-Beylikova Complex Ore (Barite, Fluorite, Rare Earth Elements, Thorium) Mine, Ore Preparation and Enrichment, and Storage Facility, by the decision number 2023-8/5-1 of Nuclear Regulatory Board on January 2023.

ANNEX 3 Inventory of Radioactive Waste

TENMAK RWPSF is the only facility that is responsible for the management of all types of radioactive waste that have been produced in Türkiye.

The national radioactive waste inventory is the most important data that constitutes the basis for the determination of safe and secure effective radioactive waste management methods, the development of technologies and implementation-oriented planning to ensure the high level of protection of the public and the environment in Türkiye.

The national radioactive waste inventory also encourages the fulfillment of international reporting obligations, the determination of policies and strategies, the planning of radioactive waste management activities, the establishment of necessary radioactive waste facilities, and the participation of stakeholders in waste management processes.

The national radioactive waste inventory includes the category of waste, the amount of current waste, the physical and the radioactivity content and their origins.

The national radioactive waste inventory does not include:

- Liquid and gaseous wastes containing very low concentrations of radioactivity that are routinely released into the environment in accordance with the legislation, and radioactive wastes with very short half-lives that are sent to other waste disposal facilities.
- NORM that accumulate in the field during gas or oil extraction processes,
- If there is no separation or treatment plan approved by the authorized institutions in the areas contaminated with radioactivity, the substances in these areas are not considered as waste in the context of inventory frame.
- Contaminated teas are not included in the national radioactive waste inventory.

In Türkiye, radioactive wastes are generated from:

- TENMAK TR-2 (water treatment system contaminated water, active resins and sludge),
- Nuclear research laboratories (compactable materials, contaminated liquids),
- Nuclear medicine (radiotherapy, brachytherapy sources and blood irradiation sources; except the exempted material),
- Industrial sources (density, level, thickness, weight, and humidity measurements, gauges),
- Radioisotope and radiopharmacy laboratories,
- Gammagraphy sources and shields,
- NORM and TENORM, contaminated stainless steel, contaminated slag and contaminated scrap metals,
- Consumer products (lightning rods, smoke detectors, etc.),
- Calibration sets.

Radiation facilities such as gamma irradiation, radioisotope and radiopharmaceutical production, and the implementations of radiation in industry, medicine, research, and

calibration applications have been used widely in Türkiye for a long time and their use is becoming more and more widespread.

In consumer products such as smoke detectors and lightning rods, the use of radiation sources is decreasing and alternative technologies that have been developed are preferred.

In general, some of the radioactive resources used in radiation applications are returned to their origin and the rest are sent to TENMAK RWPSF to be treated as radioactive waste. Especially the radioactive sources that are mostly used in industrial and medical applications are delivered to TENMAK RWPSF.

TENMAK RWPSF keeps the records of the radioactive waste, as the basis for the national radioactive waste inventory of Türkiye.

Table 11 illustrates the inventory of radioactive waste as of June, 2024.

Table 11 *National radioactive waste inventory of Türkiye as of June 2024*

No	Waste Classification	Location	Main Radionuclides	Waste Origin	Volume (m^3)	Total Activity (TBq)*
1	**VSL RW**	TENMAK Radioactive Waste Processing and Storage Facility	Not Determined	Industrial and Medical Applications, consumer products	Unprocessed: 28.40 Processed: 13.60 **TOTAL: 42.00**	-
2	**VLL RW**	TENMAK Radioactive Waste Processing and Storage Facility	(NORM-TENORM)	Not Determined	**2,846.70**	2
3	**LIL RW**	TENMAK Radioactive Waste Processing and Storage Facility	Cs-137, Co-60, Am-241, Ra-226, Sr-90, Ir-192, Cf-252	Industrial and Medical Applications, consumer products	Unprocessed: 105.20 Processed: 27.00 **TOTAL: 132.20**	5,460
4	**HL RW**	-	-	-	-	-

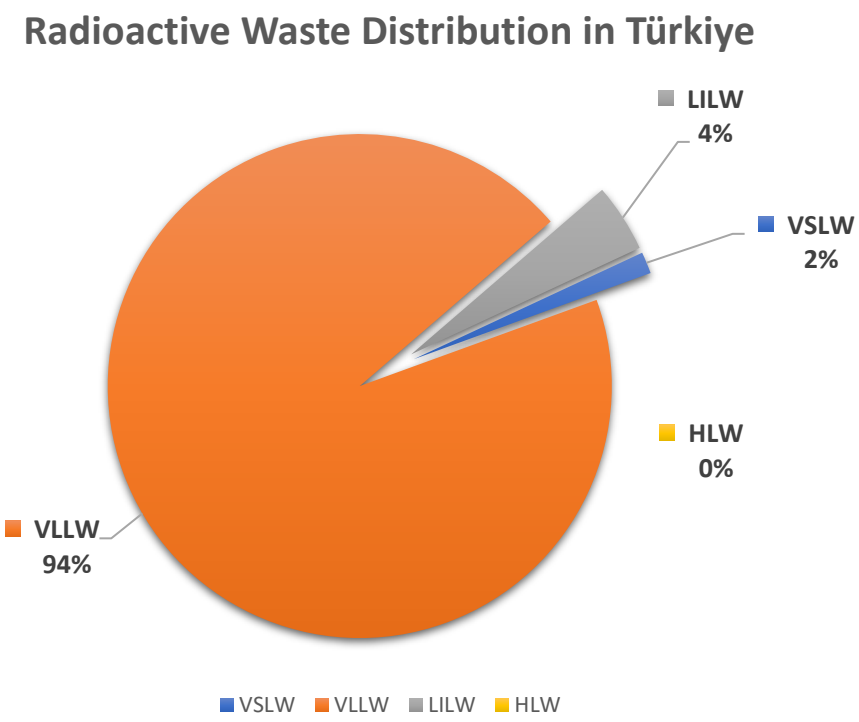

Figure 9 *The distribution of radioactive waste in Türkiye*

It can be seen from Figure 1 that the vast majority of the national radioactive waste inventory consists of VLL radioactive waste with a rate of 94%. Also, it is clearly stated that there is no HLW in the national inventory.

ANNEX 4 References to National Laws, Regulations, Requirements and Guides

Law

1. Nuclear Regulatory Law No. 7381, 2022
2. Environmental Law No. 2872, 1983 (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=2872&MevzuatTur=1&MevzuatTertip=5)

Presidential Decrees

1. Presidential Decree on the Organization of Presidency, No. 1, 2018
2. Presidential Decree on Organization of Institutions and Organizations Related, Affiliated and Associated with Ministries and Other Institutions and Organizations, No. 4, 2018
3. Presidential Decree on Organization and Duties of The Nuclear Regulatory Authority, No. 95, 2022

Regulations

1. Regulation on the Safe Transport of Radioactive Material, 2005
2. Regulation on Specific Principles for Safety of Nuclear Power Plants, 2008
3. Regulation on Design Principles for Safety of Nuclear Power Plants, 2008
4. Regulation on Recording and Reporting in Research Reactors, 2009
5. Regulation on Notification and Reporting of Unusual Events in Research Reactors, 2009
6. Regulation on Specific Principles for the Safety of Research Reactors, 2009
7. Regulation on Nuclear Power Plant Sites, 2009
8. Regulation on Special Principles for the Safety of Nuclear Fuel Cycle Facilities, 2010
9. Regulation on Protection of Outside Workers in Controlled Areas from the Risks of Ionizing Radiation, 2011
10. Regulation on Physical Protection in Transport of Nuclear Materials, 2012 (changed, 2024)
11. Regulation on Usage of Personal Protective Equipment in Workplace, 2013 **(Enforced by the Ministry of Labour and Social Security)** (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=18540&MevzuatTur=7&MevzuatTertip=5)
12. Regulation on Transport of Dangerous Goods by Sea, 2015 (**Enforced by Ministry of Transport and Infrastructure**) (https://www.resmigazete.gov.tr/eskiler/2015/03/20150303-6.htm)
13. Regulation on Transport of Dangerous Goods by Rail, 2015 (**Enforced by Ministry of Transport and Infrastructure**) (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=20934&MevzuatTur=7&MevzuatTertip=5)
14. Regulation on Radiation Protection in Nuclear Facilities, 2018

15. Regulation on Transport of Dangerous Goods by Airway, 2018 (**Enforced by Ministry of Transport and Infrastructure**) (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=24512&MevzuatTur=7&MevzuatTertip=5)
16. Regulation on Nuclear Export Control, 2020
17. Regulation on Duties Regarding Chemical, Biological, Radiological, Nuclear Threats and Hazards, 2020 (**Enforced by AFAD**).
18. Regulation on National Radiation Monitoring and Radiation Control, 2022
19. Regulation on Authorizations Regarding Environmental Remediation Activities of Contaminated Areas, 2022
20. Regulation on Management System for Nuclear, Radiation and Radioactive Waste Facilities, 2022
21. Regulation on Authorizations and Safety Principles Regarding Radioactive Waste Facilities, 2022
22. Regulation on Nuclear Safeguards, 2022
23. Regulation on Organizational Structure and Personnel in Nuclear Facilities, 2022
24. Regulation on Environmental Impact Assessment, 2022 (**Enforced by ÇŞİDB**) (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=39647&MevzuatTur=7&MevzuatTertip=5)
25. Regulation on Transport of Dangerous Goods by Road, 2022 (**Enforced by Ministry of Transport and Infrastructure**) (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=39586&MevzuatTur=7&MevzuatTertip=5)
26. Regulation on Administrative Sanctions of Nuclear Regulatory Authority, 2023
27. Regulation on Fire Safety in Nuclear Facilities, 2023
28. Regulation on Liability Insurance and Guarantee Regarding Nuclear Risks, 2023
29. Regulation on Authorizations Regarding Nuclear Facilities, 2023
30. Regulation on Management of Radiation Emergencies, 2023
31. Regulation on Inspections and On-Site Examinations Regarding Nuclear Energy and Ionizing Radiation, 2023
32. Regulation on Clearance and Release of Radioactive Materials, 2023
33. Regulation on Radioactive Waste and Spent Fuel Management, 2023
34. Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices, 2023.
35. Regulation on Radioactive Waste Management Special Account and Decommissioning Special Account and the Accounts Management Board, 2023 (**Enforced by ETKB**) (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=40077&MevzuatTur=7&MevzuatTertip=5)
36. Regulation on Authorizations Regarding Radiation Facilities and Radiation Practices, 2023
37. Regulation on National Radiation Monitoring and Radiation Control, 2023
38. Regulation on Security of Nuclear Facilities and Nuclear Materials, 2024
39. Regulation on the Supply Chain in Nuclear Facilities, 2024
40. Regulation on Independent Oversight Activities in Nuclear Facilities, 2024

Board Decision

1. Nuclear Regulatory Board Decision of Content of Documents to be Submitted to the Nuclear Regulatory Authority Regarding Authorization Applications and Other Processes for Radioactive Waste Facilities, 2022

Rules and Principles

1. Rules and Principles on Authorization of Entry, Exit, Transit Pass and Transport Activities of Radiation Sources
2. Rules and Principles on Security of Radioactive Sources

Documents and Guides

2. Guidelines for the Safe Transport of Radioactive Materials
3. Guidelines for Authorization Applications for Nuclear Facilities
4. Guidelines on the Format and Content of the Site Report for Nuclear Power Plants
5. Safety Analysis Report on Research Reactors
6. Guide on Special Design Principles
7. Guide on Classification of Radiation Incident or Accidents
8. Guide on Radiation Warning Signs
9. Guide on General Procedures to be Used for the Evaluation of and Response to Radiological Emergencies
10. Guide on Dosimetric Quantities
11. Guide on Radiation Protective Equipment
12. Guide on Personal Dosimeter Use
13. Guide on Classification of Radiation Areas
14. Guide on Classification of Sealed Radioactive Sources
15. Guide on Monitoring of Radiation Areas
16. National Radioactive Waste Management Plan (NRWMP) (**not publicly available**)
17. National Radiation Emergency Plan (URAP), (**Enforced by AFAD**) (https://www.afad.gov.tr/kurumlar/afad.gov.tr/e_Kutuphane/Planlar/ULUSAL_RADYASYON_ACIL_DURUM_PLANI__URAP__2019-_2_.pdf)

The above-mentioned NDK regulations, board decisions, rules and principles, and documents and guides can be accessed in Turkish from the website: https://www.ndk.org.tr/mevzuat

ANNEX 5 Reference to International Agreements and Review Missions

A.1 International agreements, conventions and bilateral agreements signed by the Republic of Türkiye in the field of nuclear energy

Table 12 *International agreements and conventions signed by Republic of Türkiye*

No.	AGREEMENT	SIGNED ON	IN FORCE
1	Convention on Third Party Liability in the Field of Nuclear Energy (the Paris Convention)	28.10.1960	01.04.1968
2	1964 Protocol to Amend the Paris Convention	28.01.1964	05.04.1968
3	1982 Protocol to Amend the Paris Convention	16.11.1982	07.10.1988
4	2004 Protocol to Amend the Paris Convention	12.02.2004	04.01.2022
5	Treaty on the Non-Proliferation of Nuclear Weapons	28.01.1969	17.04.1980
6	Application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons	30.06.1981	01.09.1981
7	Protocol Additional to the Agreement between the Government of the Republic of Türkiye and the IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons	06.07.2000	17.07.2001
8	Convention on the Physical Protection of Nuclear Material	23.08.1983	08.02.1987
9	Amendment to the Convention on the Physical Protection of Nuclear Material	24.04.2015	08.05.2016
10	Convention on Early Notification of a Nuclear Accident	26.09.1986	03.02.1991
11	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	26.09.1986	03.02.1991
12	Convention on Nuclear Safety	20.09.1994	24.10.1996
13	Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention	21.09.1988	26.06.2007

14	International Convention for the Suppression of Acts of Nuclear Terrorism	14.09.2005	24.09.2012
15	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	06.10.2021	21.05.2023

Table 13 *Bilateral agreements signed/approved by the Republic of Türkiye in the field of nuclear energy*

No.	AGREEMENT	SIGNATURE	RATIFICATION
1	Agreement Between the Government of Canada and the Government of the Republic of Türkiye for Cooperation in the Peaceful Uses of Nuclear Energy	18.06.1985	29.06.1986
2	Agreement Between the Government of the Republic of Türkiye and the Government of the Argentine Republic for Cooperation in the Peaceful Uses of Nuclear Energy	03.05.1988	08.02.1992
3	Agreement Between the Government of the Republic of Türkiye and the Government of the Republic of Bulgaria on Early Notification of a Nuclear Accident and on Exchange of Information on Nuclear Facilities	28.07.1997	11.09.1997
4	Agreement Between the Government of the Federal Republic of Germany and the Government of the Republic of Türkiye for Cooperation in the Peaceful Uses of Nuclear Energy	14.01.1998	—
5	Agreement Between the Government of the Republic of Türkiye and the Government of the Republic of Korea For Cooperation in the Peaceful Uses of Nuclear Energy	26.10.1998	12.04.1999
6	Agreement Between the Government of the Republic of Türkiye and the Cabinet of Ministers of Ukraine on Early Notification of a Nuclear Accident and Exchange of Information on Nuclear Facilities	23.11.2000	02.05.2001
7	Agreement Between the Government of the Republic of Türkiye and the United States of America for Cooperation in the Peaceful Uses of Nuclear Energy	26.07.2000	09.07.2006
8	Agreement Between the Government of the Republic of Türkiye and the Government of Romania on Early Notification of a Nuclear Accident	03.03.2008	16.05.2008

9	Agreement Between the Government of the Republic of Türkiye and the Russian Federation on Cooperation in Relation to the Construction and Operation of a Nuclear Power Plant at the Akkuyu Site in the Republic of Türkiye	12.05.2010	06.10.2010
10	Agreement Between the Government of the Republic of Türkiye and the Government of the Russian Federation for Cooperation in the Use of Nuclear Energy for Peaceful Purposes	06.08.2009	12.02.2011
11	Agreement Between the Government of the Republic of Türkiye and the Government of the Russian Federation on Early Notification of a Nuclear Accident and Exchange of Information on Nuclear Facilities	06.08.2009	12.02.2011
12	Agreement Between the Government of the Republic of Türkiye and the Government of the French Republic for Cooperation on the Peaceful Uses of Nuclear Energy	21.09.1999	25.02.2011
13	Agreement Between the Turkish Atomic Energy Authority (the Republic of Türkiye) and the Federal Environmental, Industrial and Nuclear Supervision Service (the Russian Federation) for Cooperation in the Field of Nuclear Licensing and Supervision	08.06.2010	-
14	Agreement Between the Government of the Republic of Türkiye and the Government of Japan for Cooperation in the Use of Nuclear Energy for Peaceful Purposes	03.05.2013	22.04.2014
15	Agreement Between the Government of the Republic of Türkiye and the Government of the Hashemite Kingdom of Jordan for Cooperation in the Use of Nuclear Energy for Peaceful Purposes	17.02.2011	05.06.2015
16	Agreement Between the Government of the Republic of Türkiye and the Government of the People's Republic of China for Cooperation in the Peaceful Uses of Nuclear Energy	09.04.2012	02.09.2016
17	Agreement Between the Government of the Republic of Türkiye and the Government of the Republic of Belarus on Cooperation in the Use of Nuclear Energy for Peaceful Purposes	11.11.2016	—

A.2 International review missions

Republic of Türkiye and Nuclear Regulatory Authority of Republic of Türkiye (NDK) have received Integrated Nuclear Infrastructure Review (INIR), Site and External Events Design Review Service (SEED), International Physical Protection Advisory Service (IPPAS), Integrated Regulatory Review Service (IRRS), and International SSAC Advisory Service (ISSAS) services so far, and the work of Emergency Preparedness Review (EPREV) missions

continues. In addition, Republic of Türkiye supports the IAEA by participating at an expert level in various missions carried out in other countries through NDK experts.

Integrated Nuclear Infrastructure Review (INIR) in 2013

The Nuclear Energy Project Application Department of the Ministry of Energy and Natural Resources organized a study in Ankara between 04-14 November 2013 for IAEA experts to review the self-assessment report. As a result of this study, the experts prepared a Mission Report including the recommendations and suggestions they determined for Türkiye and submitted it to the Ministry of Energy and Natural Resources. Turkish Atomic Energy Authority also contributed to this mission as a stakeholder organization.

Site and External Events Design Review Service (SEED) in 2017

SEED Mission was held by the TAEK in 2017. Follow-up mission was carried out in May 2021.

International Physical Protection Advisory Service (IPPAS) in 2021

The IPPAS mission includes a review of the legal and regulatory framework at national level and a comparison of the existing national nuclear safety regime and nuclear safety-related systems and practices with relevant international instruments and IAEA nuclear safety guidance documents. The mission, which is within the scope of the Department of Security and Safeguards, and was carried out on Q4 in 2021.

Integrated Regulatory Review Service (IRRS) in 2022

Integrated Regulatory Review Service (IRRS) Mission to Türkiye Mission was held on 4-16 September 2022 in NDK Headquarters in Ankara. The findings from the mission are reported by IAEA with the report named IAEA-NS-IRRS-2022/07 and the purpose of this peer review was to review the governmental, legal and regulatory framework of Türkiye for nuclear and radiation safety. The IRRS team carried out the review in the following areas: responsibilities and functions of the government; the global nuclear safety regime; responsibilities and functions of the regulatory body; the management system of the regulatory body; the activities of the regulatory body including the authorization, review and assessment, inspection and enforcement processes; development and content of regulations and guides; emergency preparedness and response; occupational radiation protection, control of medical exposure, control of public exposure, transport of radioactive material, waste management and decommissioning.

NDK applied to receive the IRRS mission and the planning and implementation process has been completed. The IAEA team was formed for the IRRS Türkiye mission, and the team carried on their works. In parallel with this process, a self-assessment process was carried out and completed by NDK experts in terms of compliance with IAEA safety standards. Studies for the analysis of self-evaluation findings and the preparation of an action plan to eliminate the differences with the SWOT approach were completed.

According to the IRRS Türkiye implementation calendar, preliminary findings were discussed at the preliminary meeting held in May 2022 with the IRRS Team leader, deputy team leader, coordinator and deputy coordinator. In June, our national report was finalized and it was sent to the IRRS team. The IRRS team finalized its findings with the meetings held in Republic of Türkiye in the first half of September 2022 and prepared the IRRS country report.

The IRRS country report, which was completed through the meticulous work of both teams and includes the good practices of the NDK and recommendations for areas for improvement.

Related with TENMAK waste processing and storage facility the recommendation (R15) is given as "NDK should ensure during the relicensing of the TENMAK waste processing and storage facility that the highest priority is given to personnel safety and safety of radioactive waste and installations and that in the short term an appropriate plan is developed by TENMAK with focus on enhancement of processing and storage of the radioactive wastes and safety of the facility in general". Additionally, for radioactive waste facilities, the recommendation (R26) is given as "NDK should establish requirements for nuclear and radioactive waste facilities to periodically review and revise emergency plans." Moreover, (R20) is given as NDK should extend the scope of the Regulation on Clearance in Nuclear Facilities and Release of Site from Regulatory Control to make it applicable to all activities and facilities.

An Action Plan is prepared by NDK regarding the improvement of Recommendations and Suggestions. Related with the recommendation R15, as of 18th April, 2024; operating license is issued to TENMAK RWPSF with conditions by the Nuclear Regulatory Board Decision No. 2024-28/2. By this scope TENMAK has submitted a work schedule for improving the safety analysis report. On the other hand, related to recommendation R20, the Regulation on Clearance and Release of Radioactive Materials, 2023, is published. The scope of this regulation is clearance and release of radioactive materials occurring during the conduct of activities regarding nuclear energy and ionizing radiation and it can be said that in accordance with the recommendation R20, the scope is resolved.

Regarding recommendation R26 issue was resolved through issuance of Regulation on the Management of Radiation Emergency Situations on June 16, 2023, with the provision that the radiation emergency plan shall be reviewed at least once a year by the authorized person, and updated and resubmitted to the NDK.

International SSAC Advisory Service (ISSAS) in 2023

The ISSAS mission was carried out between 9-17 October 2023 with the IAEA experts and representatives of relevant institutions and organizations. During the mission, the current situation was reviewed by comparing Türkiye's national nuclear safeguards practices, legal and regulatory framework for nuclear safeguards, systems and practices for nuclear safeguards practices with the relevant international agreements and IAEA Nuclear Safeguards Guidance documents.

Emergency Preparedness Review (EPREV)

At that time of the report, Republic of Türkiye has requested an EPREV mission. Negotiations are currently underway to determine the mission date.

ANNEX 6 Past Practices

A.1 Radioactive tea landfills

Following the Chernobyl Accident in 1986, TAEK conducted radioactivity measurements and analysis of radioactivity in environmental samples, food samples and tea products around Türkiye.

According to the radiological assessments of the results of analysis of the first, second and third fresh tealeaf of 1986 products and processed tea and measurements performed at different tea gardens, consumption of tea produced in 1986 having activity concentration greater than 12,500 Bq/kg has not been allowed by TAEK. After the 1987 tea products have been came onto the market, this particular activity concentration level has been decreased to 3,000 Bq/kg beginning from November 1987, and 58,070 tons of tea products having radioactivity above this level have been stored at the factories of General Directorate of Tea Enterprises, ÇAYKUR, under the supervision and control of TAEK.

As a result of the decision of Council of Ministers numbered 88/12495 and 88/12958, all the radioactive contaminated tea was disposed of as radioactive waste at 36 landfills in 5 provinces. The landfills are located at the factories owned by General Directorate of Tea Enterprises, ÇAYKUR, at Black Sea Region of Türkiye and Ankara; and premises of TAEK in İstanbul and Ankara.

In order to ensure the safety of public and environment, NDK signed a contract with TENMAK to prepare and conduct a radiological environmental monitoring program for the contaminated tea landfills. According to the radiological environmental monitoring program, the general radiological status of the landfills are periodically monitored by taking samples from the determined receiving environments, as well as on-site examinations and measurements done by TENMAK experts.

These environmental radioactivity monitoring studies, which basically aim to determine the radiation level in the environment which is needed to understand how much radiation that public could be exposed to and detect significant changes in radiation dose rates in environment, were carried out in five provinces. At the end of the studies, three final reports were prepared in the years 2010 and 2016 by TAEK and 2024 by TENMAK. When the results of the latest study are examined, it is seen that the drinking water measurement results are below the limit value determined in the Regulation on Waters for Human Consumption Purposes, 2005 published by the Ministry of Health of Türkiye. In addition, the results of measurements for Cs-137 activity in samples of drinking water, sediment, soil, agricultural food and terrestrial plant species are below the exemption limit specified in the draft regulation on radiation protection. Also, the dose rate values measured above the surface in order to see the radiation from external exposure, are similar to the background radiation dose rate values. Therefore, it has been observed that the probability of the public being directly or indirectly exposed to ionizing radiation due to tea landfill sites is low.

According to the reference scenario for national radioactive waste management plan, contaminated teas disposed of in the landfills will continue to be preserved at the landfills unless an environmental remediation activity will be carried out. If an environmental remediation activity is planned to be carried out for these landfills, a permit from the NDK should be

obtained according to the Regulation on the Authorization of Environmental Remediation Activities of Radioactively Contaminated Areas, 2022.

A.2 The site contaminated with Eu-152 in İzmir

On April 16, 2007, an alarm was triggered at the fixed radiation detectors at the entrance of the İZAYDAŞ Chemical Waste Disposal Facility in İzmit, during the acceptance of chemical waste at the facility.

TAEK intervened in the case and the analysis revealed the presence of Europium-152 and traces of Europium-154 radioisotopes in the scrap metal.

The owner of the contaminated scrap metal was identified as a private scrap metal processing company, Aslan Avcı Foundry Industry and Trade Inc., located in the Gaziemir district of İzmir. Aslan Avcı Foundry Industry and Trade Inc., was established in the year 1940, operated its facilities for the production of lead ingots through chemical and physical recovery processes from waste accumulators and scrap lead residues until the year 2011. Further investigation revealed that chemical waste was being illegally disposed of at the facility site, with Eu-152 contaminated scrap metal being scattered haphazardly across the site. In order to ensure the safety of the public and prevent the spread of the contamination, the facility site was promptly enclosed with wire fencing and fixed radiation detectors were installed at the entrance of the facility site by TAEK.

TAEK conducted environmental remediation activities, resulting in 260 tons of Eu-152-contaminated scrap metal, contained in 125 containers, being sent to the radioactive waste processing and storage facility operated by TAEK. Today, some mixed waste (radioactive and chemical waste) still remains on the facility site.

Pursuant to Art. 9 para. 8 of Law No. 7381, the works and procedures regarding the environmental remediation of areas exposed to radioactive contamination shall be carried out by the ÇŞİDB in cooperation with the NDK; and the management of radioactive wastes generated as a result of environmental remediation activities carried out in these areas shall be carried out by the TENMAK. According to the Regulation on Authorization of Environmental Remediation Activities of Radioactively Contaminated Areas, 2022, the environmental remediation activities for the areas exposed to radioactive contamination are subject to a permit from the NDK.

In 2022, EKOVAR Environment Group Recycling, Waste Storage, Construction, Contracting, Industry and Trade Joint Stock Company (EKOVAR JSC) applied to NDK for the purpose of carrying out environmental remediation activities at the site and the removal of radioactive waste from the site in accordance with the Regulation on Authorization of Environmental Remediation Activities of Radioactively Contaminated Areas, 2022. The EKOVAR JSC prepared a technical report on the remediation of radioactive contamination, including methods, equipment, radioactive waste management, radiation protection and emergency procedures, and submitted it to the NDK. As a result of the review, the EKOVAR JSC was authorized to carry out environmental remediation activities by the Nuclear Regulatory Board Decision 2023-15/4 dated 8.3.2023.

Following completion of environmental remediation activities, the EKOVAR JSC will apply to the NDK to remove the area from the regulatory control. Attached to the application, a report on the environmental remediation activities carried out and a radiological

characterization report, the content of which is determined by the NDK, showing that the necessary conditions for removal of the area from regulatory control are met, must be submitted according to the Regulation on the Authorization of Environmental Remediation Activities of Radioactively Contaminated Areas, 2022.

REPUBLIC OF TÜRKİYE

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NUCLEAR REGULATORY AUTHORITY