TURKEY

A. National Framework for management of radioactive waste and spent fuel

Roles and Responsibilities of Stakeholders:

Turkish Atomic Energy Authority (TAEK) is the nuclear regulatory body in Turkey. TAEK has regulatory activities in radioactive waste and spent fuel management, and decommissioning. There is a processing and storage unit for low-intermediate level radioactive wastes arising from industrial and medical usage, and research reactors in ÇNAEM/İstanbul.

The producers of radioactive waste are responsible for safe management of their radioactive waste. A national waste management organisation responsible for off-site management of rad-waste and spent fuel is planned to be established by the Draft Nuclear Energy Law.

Policies and Strategies:

Turkey has initiated nuclear power programme in order to support its energy supply. Two nuclear power projects have been started by signing intergovernmental agreements (IGA) with Russian Federation and Japan for building and operating two nuclear power plants in Akkuyu and Sinop sites. Site studies of Akkuyu and Sinop NPP projects are ongoing.

Radioactive waste and spent fuel management policy has been elaborated by TAEK and Ministry of Energy and Natural Resources. The policy related issues have been decided to take place in Draft Nuclear Energy Law. The planned waste management organisation is foreseen to develop the strategy. According to the provisions of the policy, the waste producers are responsible for safe management of their radioactive wastes, import of radioactive wastes for processing, storage or disposal purposes is forbidden should they be produced outside of Turkey. There are provisions in the draft law for establishing two separate accounts: one for radioactive waste management and one for decommissioning. The nuclear power plant operators have to make payments to both accounts.

Though the policy will be part of Draft Nuclear Energy Law, there are some policy related articles in IGA for Akkuyu NPP and Radioactive Waste Management Regulation. According to them, NPP operator has the prime responsibility on rad-waste and spent fuel management and decommissioning including bearing their costs.

According to the undertaking given by Akkuyu NPP Operator in EIA Report, the plant has the lifetime storage capacity of the spent fuels and radioactive wastes, if there is no any centralised storage/disposal facility at that time.

B. National legal and regulatory framework

Regulatory Body:

TAEK is regulatory body for radioactive waste and spent fuel management, and decommissioning.

Laws & Regulations on Rad-Waste Management:

a. Intergovernmental Agreement Between Republic of Turkey and Government of the Russian Federation on Cooperation In Relation to the Construction and Operation of a NPP at the Akkuyu Site in the Republic of Turkey (IGA) (12.05.2010)
b. Radioactive Waste Management Regulation (OG:09.03.2013, 28582)
c. Clearance in Nuclear Facilities and Release of Site From Regulatory Control (OG:09.03.2013, 28582)
d. Regulation on Wastes Originated From Radioactive Materials (OG: 02.09.2004, 25571)
e. Draft Nuclear Energy Law
f. Joint Convention (will be ratified by Parliament)

C. Radioactive waste management, decommissioning and spent fuel strategy and current practices & technologies

Waste and Spent Fuel Management Activities:

ÇNAEM operates a processing and storage facility for low-intermediate level radioactive wastes arising from medical and industrial usage, and research reactors in Turkey. All the spent fuels of TR-2 research reactor were sent to US Savannah River Site in December 2009, there have been no any other spent nuclear fuels in that reactor since then, because it has not been operating, for resistance of the reactor building against earthquake has to be improved. In TRIGA research reactors there is no any spent fuel, since all the fuels in the core are still being used. There is no any radioactive waste disposed of or disposal facility for any type of radioactive waste in Turkey. Sinop and Akkuyu NPP projects are ongoing. On-site radioactive waste management strategy of Akkuyu NPP is determined by the operator. For Akkuyu NPP, processing methods for LILW will be evaporation, concentration and cementation for liquid LILW, and decontamination for metal LILW, and compaction, incineration and cementation for other solid LILW. The plant will have the storage capacity for all radioactive wastes arising during the operation. For ÇNAEM LILW processing and storage facility, processing methods applied are

decontamination for metal radioactive wastes, and compaction for compactible solid ones, chemical precipitation and cementation for liquid wastes.

Overview of Research and Development Programs:

High Level Radioactive Waste Management Unit (HLRWM), now operating under Radioactive Waste Management Department in ÇNAEM, is aim to perform research & development studies on design, site selection and acceptance criteria of new radioactive waste facilities, and package design of radioactive wastes with respect to their classes for their subsequent storage & disposal. HLRWM unit is now working on mechanical, chemical waste processing methods with regard to waste classes in the present facility. HLRWM works in the following projects of IAEA;

- Introducing and Harmonizing Standardized Quality Control Procedures for Radiation Technologies (RER/1/011)
- Strengthening Radioactive Waste Management Capabilities (RER/9/107)
- Supporting Decommissioning Implementation for Facilities Using Radioactive Material (RER/9/120)

Overview of Financing of Waste and Spent Fuel Management:

In accordance with IGA for Akkuyu NPP, Project Company shall pay separate amount of 0.15 Dollar cent per kWh to the account for spent fuel and radioactive waste management and 0.15 Dollar cent per kWh to the account for decommissioning for electricity purchased by TETAŞ within the framework of power purchased agreement which is for 15 yrs. With regards to the electricity sold outside the framework of the PPA, Project Company will make the necessary payments to the relevant funds stipulated by the applicable Turkish laws and regulations. Detailed funding regulation is planned to be developed.

D. Radioactive waste classification, waste and spent fuel quantities (inventory) (including disused sources that are declared radioactive waste)

National radioactive waste classification is based on Radioactive Waste Management Regulation (OG:09.03.2013, 28582) and for disposal purposes.

Table 1. National Radioactive Waste Classification System

Waste class	Activity/Half life	Disposal method
Very short	Their activities are above exemption levels and after	No need to dispose (decay

lived rad-waste	a storage period of a few years at most they will be thus appropriate for clearance.	storage is the preferred option)
Very low level rad-waste	They are not classified as very short lived wastes and they have activity concentrations below approximately a hundred times of the clearance limits.	Surface disposal
Low and intermediate level rad-waste	(a) After conditioning, alpha emitting radionuclide concentrations are below 400 Bq/g for the average of whole package and below 4000 Bq/g for an individual waste package.	Near surface disposal (<30 m)
	(b) After conditioning, alpha emitting radionuclide concentrations are above 400 Bq/g for the average of whole package and above 4000 Bq/g for an individual waste package	Intermediate level depth disposal (30-100 m)
High level waste	They are spent fuels declared as radioactive waste, radioactive wastes which are products of reprocessing and may include fission products and actinides, and other radioactive wastes with comparable activity levels with those above.	Deep geological repository (~few 100 meters or deeper)

Provisions of this Regulation applies to nuclear and radioactive materials as well as structures, systems, components, materials become radioactive or contaminated with radioactive materials having activity levels above clearance levels and with no intention of reuse. High level radioactive wastes shall only be disposed of in deep disposal facilities. Small volumes of low and intermediate level radioactive wastes can be disposed of in borehole disposal facilities. Radioactive wastes arising from mining activities are disposed of in surface disposal facilities on the mining site due to their large volumes.

Table 2. Radioactive Waste in Storage (including spent fuel that is considered waste)

Route	Processed	Total	Estimated	Distribution (%)	Planned

Waste Class	(type)/ Unprocessed	Current Volume (m^3)	Disposal Volume (m^3)	RO	FFE	RP	NA	DF	DC/ RE	ND	Disposal Route (if known)*
All Classes	Processed	47,8									
All Classes	Unprocessed	1584,2									
VSLW	Processed	10,8					100				
VSLW	Unprocessed	1,2					100				
VLLW	Processed	20					100				
VLLW	Unprocessed	1500					68		32		
LLW	Processed	0					100				
LLW	Unprocessed	60					100				
ILW	Processed	17		59			41				
ILW	Unprocessed	23					100				

Turkey does not have any disposal facility for any type of radioactive waste. There is not much radioactive waste of LILW class to consider disposal at the moment in ÇNAEM RWM facility. It is matter of volume that when the amount of waste exceeds 5000 m^3 in that facility then disposal will come into consideration.

Table 3. Example of a Translation Matrix (From NEWMDB) That Can Be Used For Transition from a National Classification System to IAEA Classification

National Waste Classification Name	VLLW	LILW-SL	LILW-LL	HLW
LILW-SL	10%	90%	0	0
LILW-LL	0	0	100%	0
HLW	0	0	0	100%

E. Tabulation of processing, storage and disposal facilities for waste and spent fuel, including their capacities and status

Table 4. Waste Management Facilities

Type	Planned	Construction	Commissioning	In Operation	Shutdown	Decomm.	Other	Total
Spent Fuel Storage	*							

Type	Planned	Construction	Commissioning	In Operation	Shutdown	Decomm.	Other	Total
Spent Fuel Reprocessing and Recycling								
Spent Fuel Conditioning								
Spent Fuel disposal								
Waste processing	*(LILW)			1 (LILW)				1
Waste storage:	*(LILW and HLW)			1 (LILW)				1
Waste disposal:								

*In NPPs there will be onsite storage facility for spent fuels, and processing and storage facility for radioactive waste.

Table 5. Summary of Major Sources of Waste (from IAEA PRIS, INFCIS & RRDB databases)

Type	Planned	Construction	Commissioning	In Operation	Shutdown	Decomm.	Other	Total
Research reactors				1	1	1		3
Nuclear Power reactors	2 NPPs (8 units)							
Spent Fuel Reprocessing and Recycling								
Other							Nuclear applications (medical, research, industrial)	

F. Sources of data, assumptions (especially for future waste forecasts) and references

1. Akkuyu NPP- Final EIA Report, 2014
2. Radioactive Waste Management Regulation (OG:09.03.2013, 28582)
3. Classification of Radioactive Waste IAEA, GSG-1, 2009.
4. Categorization of Radioactive Sources IAEA, RS-G1.9

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