TÜRKİYE ATOM ENERJİSİ KURUMU

RADIOACTIVE WASTE MANAGEMENT IN TURKEY

ÖZKAN YILMAZ

TAEK-RADIOACTIVE WASTE MANAGEMENT DEPARTMENT

NDK - II.NUCLEAR SAFETY FORUM-12.11.2019, Ankara-TURKEY

CONTENT

- Structure of TAEK
- Structure of Radioactive Waste Management Department
- National Policy and Regulations
- RWMD Facility : Waste Management Division
- The Future of RWMD

Top left TAEK Presidency in Ankara,
top right: CNRTC, down right SNRTC

STRUCTURE OF TAEK

TURKISH ATOMIC ENERGY AUTHORITY

Top left TR-1 opening ceremony(1961), top right TR-2(1984)
Middle left TR-2 building today, middle right Tr-2 control room,
Down: Proton Accelerator in Ankara

STRUCTURE OF TAEK-A SHORT HISTORY

- 1956: Established as Atomic Energy Commission
- 1960: CNRTC established
- 1962: TR-1 Research reactor
- 1967: ANRTC established
- 1982: Re-organized as Turkish Atomic Energy Authority
- 1984: TR-2 Research reactor
- 1986: Radioactive Waste Management Facility established in CNRTC.
- 1999: SNRTC established
- 2006: Radioactive Waste Management Unit established
- 2012: Radioactive Waste Management Division established with two units (LL-RWMU & HL-RWMU)
- 2018: Re-organized without regulatory functions
- 2018: Nuclear Regulatory Authority (NDK) established with separation from TAEK
- 2018: TAEK's main functions declared as radioactive waste management and research
- 2018: Radioactive Waste Management Departments established

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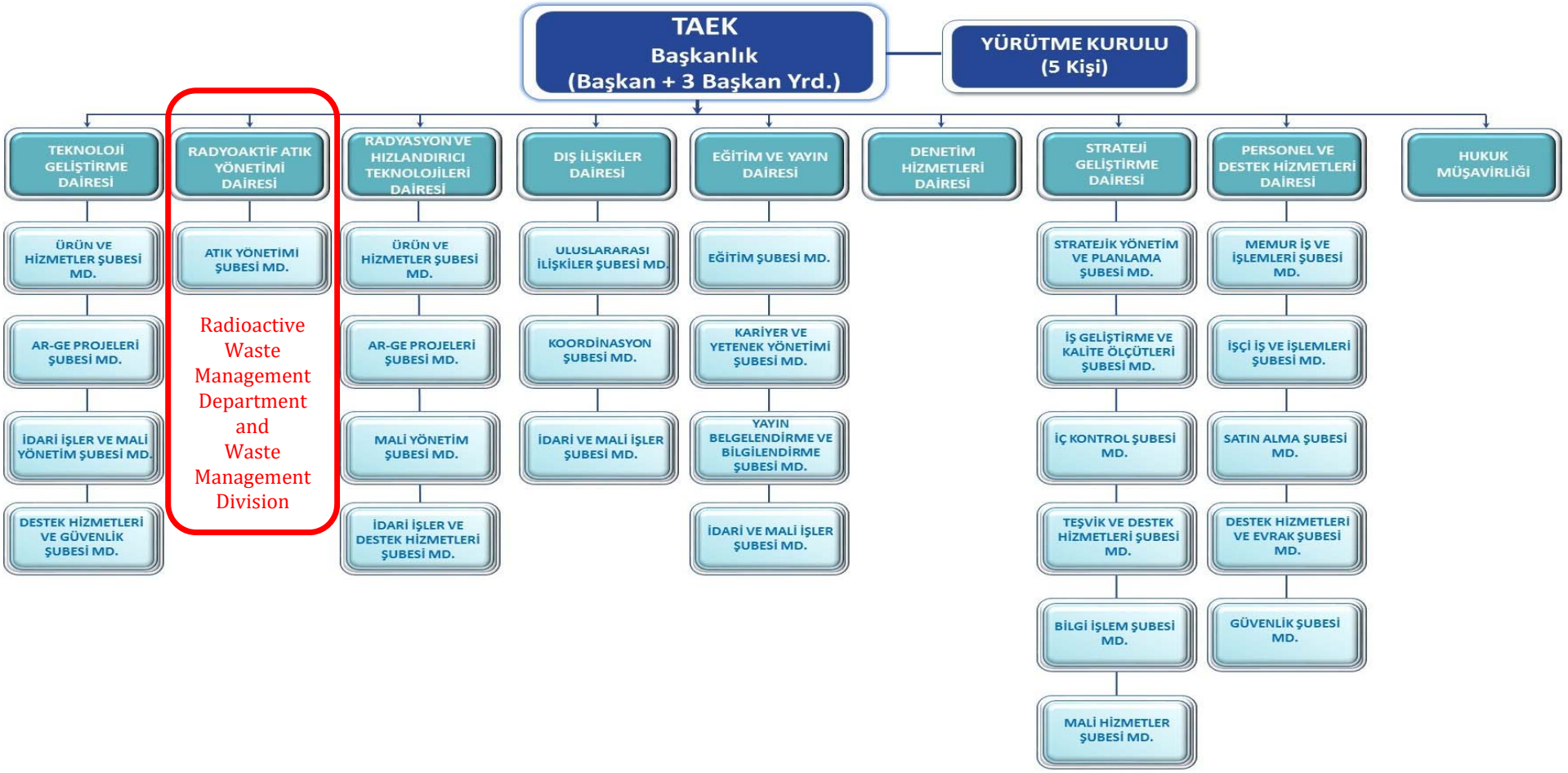
STRUCTURE OF TAEK



STRUCTURE OF RWMD

RADIOACTIVE WASTE MANAGEMENT DEPARTMENT

STRUCTURE OF RWMD:A SHORT HISTORY

- Radioactive Waste Management Facility(1986)
- Waste Management Controlled Zone(2006)
- New Storage Sites(2006)
- Radioactive Waste Management Unit (2006)
- Radioactive Waste Management Division (2012)
- LL-RWMU & HL-RWMU (2012)
- Implementation License(2013)
- Radioactive Material Transport License(2013)
- Radioactive Waste Management Department and Division (2018)

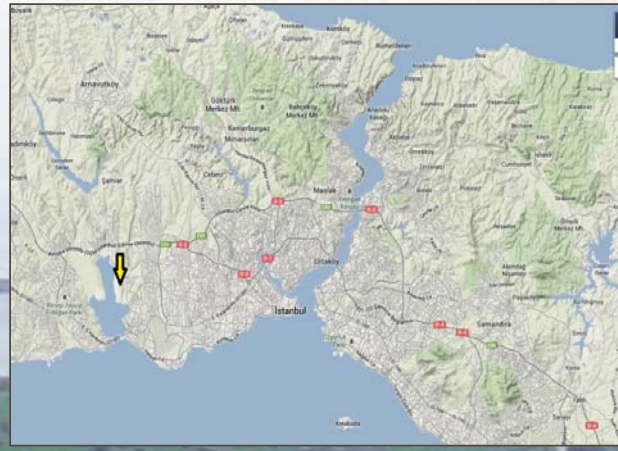
Radioactive Waste Processing and Storage Facility established in 1986 under an IAEA TC Project.

This facility designed for low and intermediate level radioactive waste operations. All radioactive waste arised in Turkey is received by this facility.

STRUCTURE OF RWMD: LOCATION

RWMD is located in Kucukcekmece-Istanbul beside Kucukcekmece Lake

- **RWMD Team :**
- 1 Head of Department
- 1 Head of Division
- 1 Group Coordinator
- 2 Engineer
- 1 Physicst
- 2 Chemist
- 2 Technicians
- 3 Radiation Workers



Radioactive Waste Management Department

STRUCTURE OF RWMD:LICENCES

TÜRKİYE ATOM ENERJİSİ KURUMU

LİSANS BELGESİ

RADYOAKTİF ATIK YÖNETİMİ DAİRESİ BAŞKANLIĞI
ATIK YÖNETİMİ ŞUBESİ MÜDÜRLÜĞÜ
DÜŞÜK DÜZEYLİ RADYOAKTİF ATIK YÖNETİMİ GRUP BAŞKANLIĞI
BİRİMİ

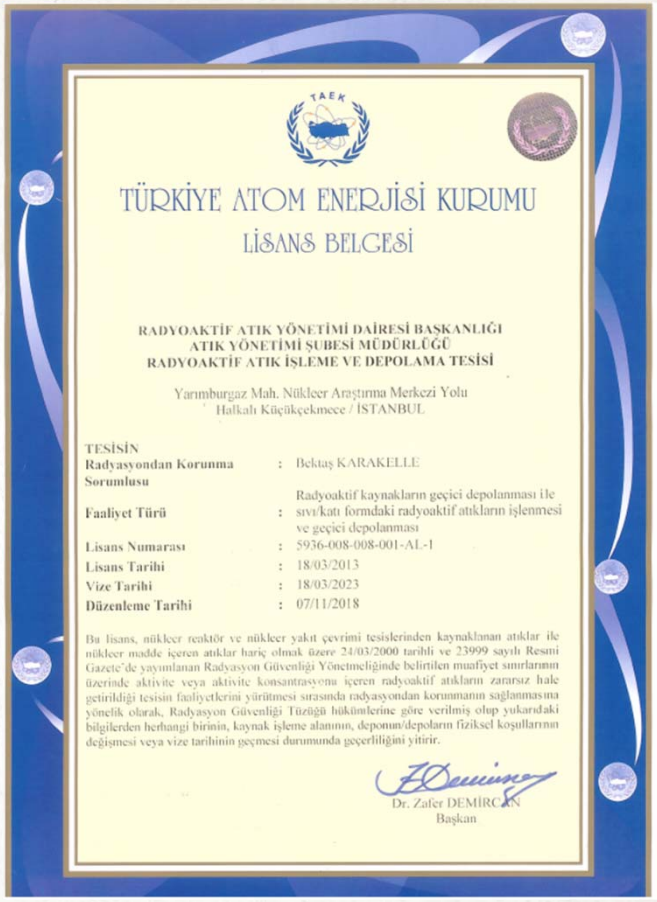
YARIMBURGAZ MAHALLESİ NÜKLEER ARAŞTIRMA MERKEZİ YOLU
KÜÇÜKÇEKMECE/İSTANBUL

Radyasyondan Korunma Sorumlusu	: BURHAN DOĞAN
Faaliyet Türü	: Kullanılmayacak Kapalı Radyoaktif Kaynak İçeren Cihaz veya Mahfazanın Sökümü, Paketlemesi, Taşınması ve Radyoaktif Atık Tesisine Teslimi
Lisans Numarası	: 5936-008 -KS-1-L
Lisans Tarihi	: 07-11-2013
Vize Tarihi	: 07-11-2023
Düzenleme Tarihi	: 19-10-2018

Bu lisans, radyasyondan korunmanın sağlanmasına yönelik olarak Radyasyon Güvenliği Tüzüğü ve Radyasyon Güvenliği Yönetmeliği hükümlerine göre verilmiş olup, yukarıdaki bilgilerden herhangi birinin değişmesi ya da vize tarihinin geçmesi durumunda geçerliliğini yitirir.

Osman ALTUNKAL
Başkan a.
Radyasyon Sağlığı ve Güvenliği
Dairesi Başkanı V.

Radioactive Materials Transport License of RWMD



TÜRKİYE ATOM ENERJİSİ KURUMU

LİSANS BELGESİ

RADYOAKTİF ATIK YÖNETİMİ DAİRESİ BAŞKANLIĞI
ATIK YÖNETİMİ ŞUBESİ MÜDÜRLÜĞÜ
RADYOAKTİF ATIK İŞLEME VE DEPOLAMA TESİSİ

Yarımburgaz Mah. Nükleer Araştırma Merkezi Yolu
Halkalı Küçükçekmece / İSTANBUL

TESİSİN

Radyasyondan Korunma Sorumlusu	: Bektaş KARAKELLE
Faaliyet Türü	: Radyoaktif kaynakların geçici depolanması ile sıvı/katı formdaki radyoaktif atıkların işlenmesi ve geçici depolanması
Lisans Numarası	: 5936-008-008-001-AL-1
Lisans Tarihi	: 18/03/2013
Vize Tarihi	: 18/03/2023
Düzenleme Tarihi	: 07/11/2018

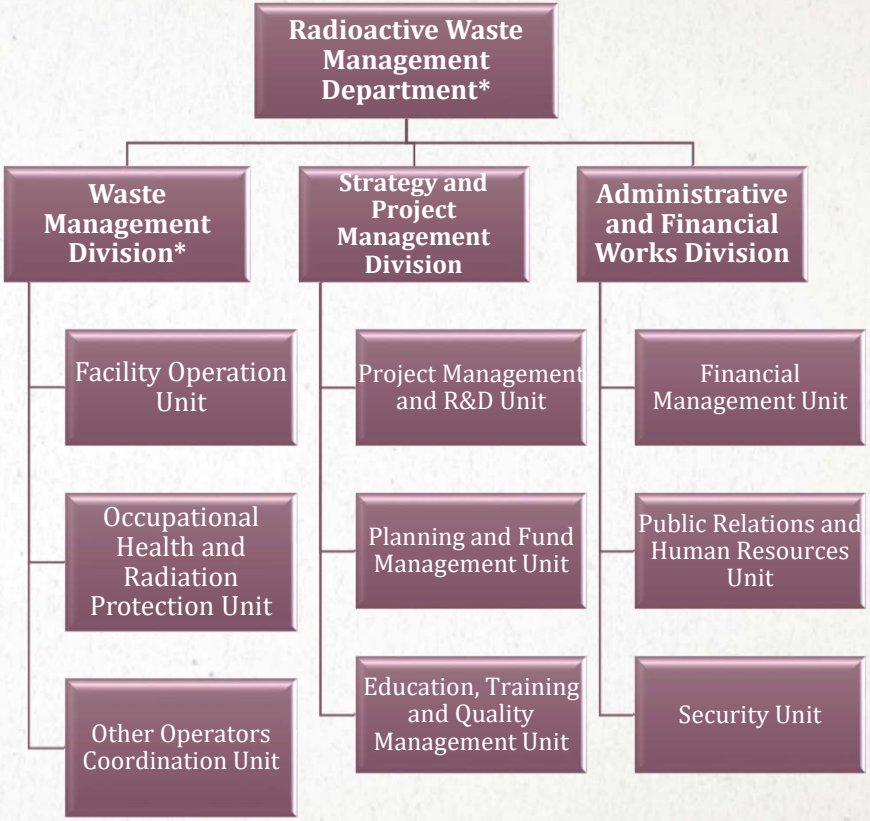
Bu lisans, nükleer reaktör ve nükleer yakıt çevrimi tesislerinden kaynaklanan atıklar ile nükleer madde içeren atıklar hariç olmak üzere 24/03/2000 tarihli ve 23999 sayılı Resmi Gazete'de yayımlanan Radyasyon Güvenliği Yönetmeliğinde belirtilen muafiyet sınırlarının üzerinde aktivite veya aktivite konsantrasyonu içeren radyoaktif atıkların zararsız hale getirildiği tesisin faaliyetlerini yürütmesi sırasında radyasyondan korunmanın sağlanmasına yönelik olarak, Radyasyon Güvenliği Tüzüğü hükümlerine göre verilmiş olup yukarıdaki bilgilerden herhangi birinin, kaynak işleme alanının, deponun/depoların fiziksel koşullarının değişmesi veya vize tarihinin geçmesi durumunda geçerliliğini yitirir.

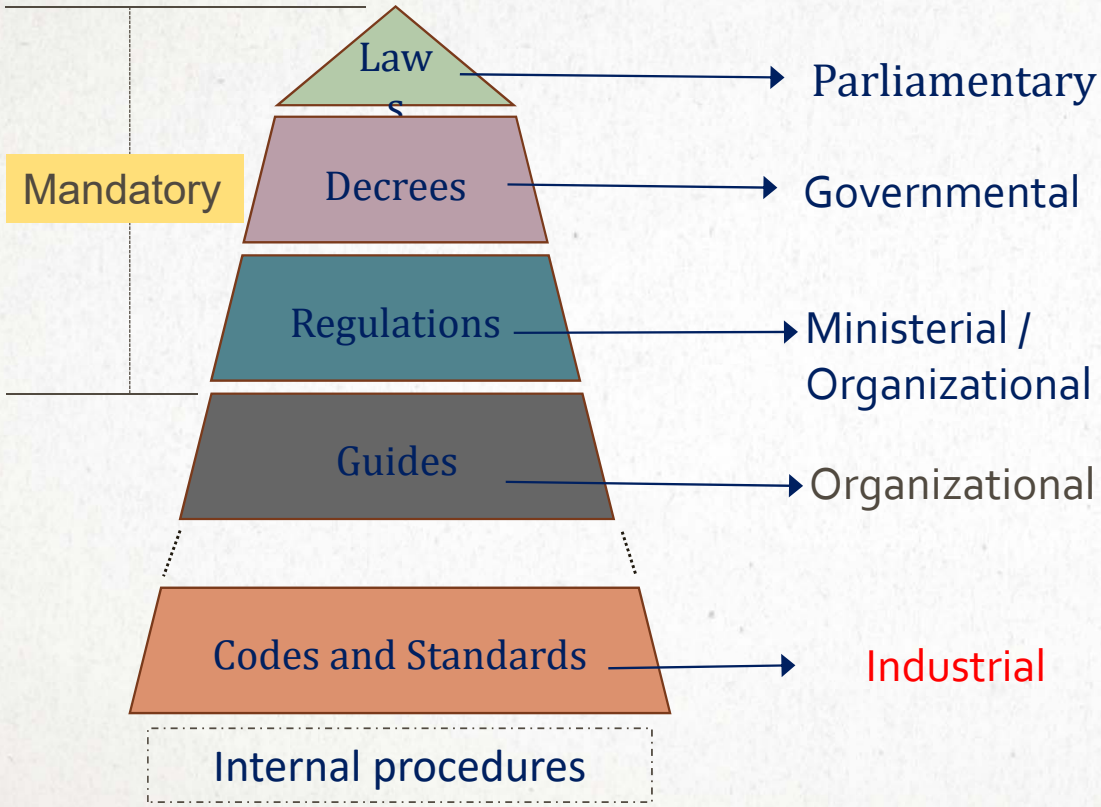
Dr. Zafer DEMİRCAN
Başkan

Radioactive Waste Conditioning and Storage License of RWMD

RWMD NEW PROPOSAL STRUCTURE

- Currently Radioactive Waste Management Department has one division called Radioactive Waste Management Division for the current duties and responsibilities.
- According to new responsibilities loaded by new laws, re-establishment of RWMD is on progress.
- First proposal for close future is shown at the right scheme. (the * marks are currently established parts)





NATIONAL POLICY AND REGULATIONS

in relation with radioactive waste management.

NATIONAL POLICY & REGULATIONS ON RADIOACTIVE WASTE MANAGEMENT

- **Presidential Decree No:4 , 2018** is changing law 2690 and defining new roles of **TAEK** as an **operator**, **research** and **technology development** organization.
- According to presidential decree, **RWMD is established** with the duty and responsibilities;
  - ✓ Preparing the National Radioactive Waste Management Plan
  - ✓ Conducting and coordinating all kinds of activities related to radioactive waste management such as collection, treatment, processing, transportation, storage and **disposal** of radioactive wastes
  - ✓ To carry out the tasks related to the participation of the Authority(TAEK) in the Accounts Management Board.
  - ✓ Establishing, installing, operating and make operatable radioactive waste facilities and for this purpose to establish economic enterprises
  - ✓ To carry out research and development activities related to radioactive waste management; establish, to be established, install, to be installed, operate, to be operated, decommission research-oriented laboratories, technology transfer offices, research and development centers
  - ✓ Carry out training activities related to radioactive waste management
  - ✓ To perform other duties given by the President.

NATIONAL POLICY & REGULATIONS ON RADIOACTIVE WASTE MANAGEMENT

- **Decree with power of law No:702: Decree with power of law on Organization and Duties of Nuclear Regulatory Authority and Changing in Some Laws,2018** establish **nuclear regulatory authority (NDK)** and define its responsibilities. Meanwhile **radioactive waste national policy** defined in this decree with the power of law.
- The activities within the scope of this decree with power of law cannot be executed without permission from Authority(NDK). Natural or legal persons wishing to carry out an activity within the scope of this decree are obliged to apply to the Authority to obtain the necessary authorization for the activity. However, the Authority may determine the activities that do not require authorization and may impose notification for them.
- The radioactive waste generated by the activities carried out in the Republic of Turkey's area of dominance is disposed by **TAEK** *(means TAEK-RWMD is the disposal operator)*
- In the central accounting unit of the Ministry special account of radioactive waste management and special account of decommissioning will be opened.
- A Board of Accounts is established to manage the revenues of special accounts and to approve payments from special accounts.

RWMD FACILITY:WASTE MANAGEMENT DIVISION

Since 1986, only facility for radioactive waste treatment and storage for Turkey.

TÜRKİYE ATOM ENERJİSİ KURUMU

RWMD FACILITY:WASTE MANAGEMENT DIVISION

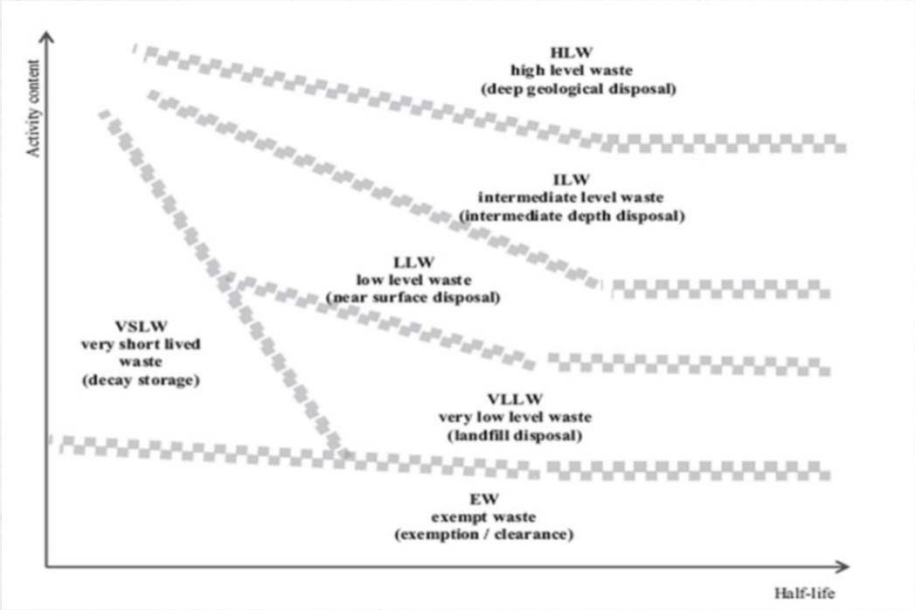
RADIOACTIVE WASTE STREAM in TURKEY

- TR-2 Research Reactor (water treatment system contaminated water, active resins and sludge)
- Nuclear research laboratories (compactable materials, contaminated liquid)
- Nuclear medicine (Radiotherapy, brachyteraphy 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 & TENORM, Contaminated stainless steel, contaminated slag, scrap metal
- Consumer products (Lightning rods, smoke detectors, etc...)
- Calibration sets

TÜRKİYE ATOM ENERJİSİ KURUMU

RWMD FACILITY:WASTE MANAGEMENT DIVISION

RADIOACTIVE WASTE CLASSIFICATION and CATEGORIZATION in TURKEY



Increasing Risk

Category	Practice	Activity Ratio A/D
1	RTG's; Irradiators; Teletherapy; Gamma Knife	A/D>1000
2	Gamma radiography Brachytherapy(HDR/MDR)	1000>A/D>10
3	Fixed industrial gauges (e.g.: level, dredger, conveyor gauges) Well logging	10>A/D>1
4	Brachytherapy (LDR except eye plaques & perm implants) Portable gauges; Static eliminators; Bone densitometers	1>A/D>0.01
5	Brachytherapy (eye pl. & perm implants); XRF; ECD	0.01>A/D>Exempt/D

A = source activity; D = radionuclide-specific "dangerous" activity

We use the IAEA's Classification and Categorization Methods

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RWMD FACILITY:WASTE MANAGEMENT DIVISION

Sealed Sources Conditioning Applications

Hot Cell Operations

- Dismantling
- Classification
- Categorization
- Storing
- Conditioning
- Packing
- Labelling
- Transport
- Interim Storage

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RWMD FACILITY:WASTE MANAGEMENT DIVISION

Sealed Sources Conditioning Applications

TÜRKİYE ATOM ENERJİSİ KURUMU

RWMD FACILITY:WASTE MANAGEMENT DIVISION

Sealed Sources Conditioning Applications

Most Common DSRS Examples Received by Turkish RWMD:










Teleteraphy devices are not conditioning yet, only received for storage

RWMD FACILITY:WASTE MANAGEMENT DIVISION

Liquid Waste Processing Applications

- In the treatment of aqueous wastes, other materials except than radionuclides are removed from the structure and thus waste volume is reduced.
- Water, chemicals, physical contaminants are separated from the structure by sequential processing steps including physical separation, chemical precipitation, filtration, ion exchange resins treatment and evaporation-precipitation methods.
- Condensed radionuclides must be solidified to ensure long-term storage activities can be safely maintained.
- Cementation method is an internationally preferred matrixing method since it is an easy method to supply necessary material which is very feasible and economical

RWMD FACILITY:WASTE MANAGEMENT DIVISION

Compactable Waste Processing Applications

- The compactable solid wastes contain the wastes classified very low-level and low-level waste which are contaminated while being used as consumables in radiological environments, which often shrink in volume inside the container where they are compressed under the influence of pressure (compactor).
- The most commonly accepted wastes are; plastic gloves, overshoes, paper towels, dust mask, disposable clothes, laboratory plastic equipment (sample containers, pipette tip, etc.).
- After these wastes are received by RWMD the preliminary inspections are made, and the waste packages are compressed into the drum in a compression equipment called in drum compactor and volume reduction is achieved.
- In this way, 3-5 times volume gain is provided.
- Each full drum is taken to the appropriate storage building after the measurement, labeling and marking processes are completed according to the waste packaging procedures.
- Depending on the half-life of the radionuclides in their content, some of them are subjected to decay storage. Some drums continue to be stored in order to be disposed of in the future.

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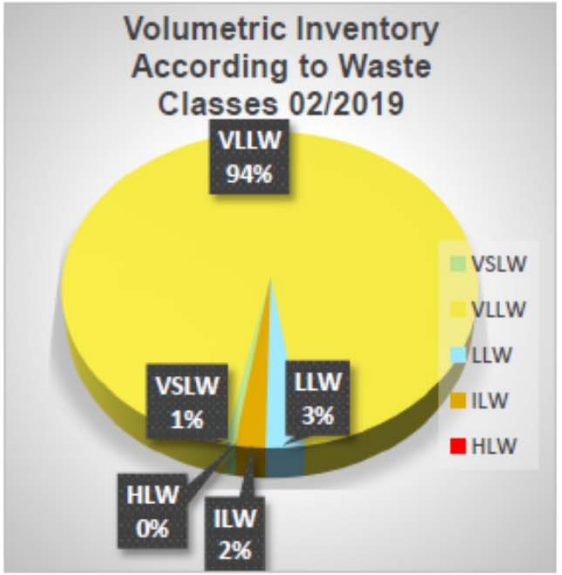
RWMD FACILITY:WASTE MANAGEMENT DIVISION

Current Radioactive Waste Inventory of RWMD

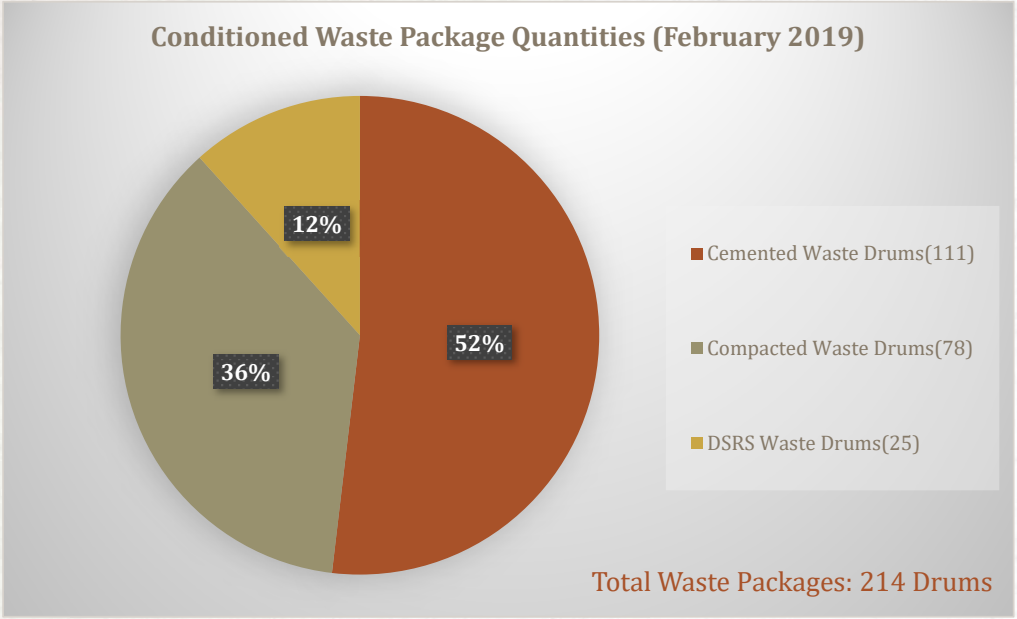
	VSLW	VLLW	LLW	ILW	HLW
	HL ≤ A few hundred days CL< A ≤100*CL	CL<AC	HL<30 years AC<10 MBq Cat.: II-III DSRS	HL<15, A<10 TBq, HL≤30, A<1000 TBq HL>30, A<40 MBq HL>30, A<10 GBq Cat: I DSRS	AC=10^4-10^6TBq/m^3, Spent Fuel
Inventory Details	Processed: 13 m^3 Unprocessed:3,3 m^3	NORM +TENORM :2080 m^3 Other scrap and products: 17 m^3	Unprocessed: 60 m^3 Processed: 2m^3	Unprocessed: 27 m^3 Processed: 21 m^3	-
Inventory Total	**16,6 m^3**	**2097 m^3**	**62 m^3**	**48 m^3**	-
Route	Clearance after the decay storage period	Current Last Application: Storage Last Route: Landfill Disposal	Current Last Application: Storage Last Route: Near Surface Disposal Bore Hole Disposal	Current Last Application: Storage Last Route: Intermediate Depth Disposal, Deep Geological Disposal or Bore Hole Disposal	Current Last Application: Repatriation Last Route: Deep Geological Disposal
TOTAL	**2223,6 m^3**				



RWMD Volumetric Waste Inventory According to Waste Classes-February 2019

RWMD FACILITY:WASTE MANAGEMENT DIVISION

Some Statistics of RWMD and Waste Stream



Waste Package Quantities of RWMD

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RWMD FACILITY:WASTE MANAGEMENT DIVISION

Some Statistics of RWMD and Waste Stream

Unconditioned 90 pcs. Teleteraphy heads are stored (most of them has DU shielding)

157 pcs. Unconditioned + conditioned radiography devices are stored because of DU shielding

RWMD RADIOACTIVE WASTE STORAGE FACILITY AND SITE

WHAT WE STORE ?

In TAEK-RWMD **Radioactive Waste Storage Facility** we store :

- Unconditioned DSRS which are waiting for treatment in installed equipment
- Unconditioned DSRS which doesn't have an installed treatment equipment yet (teleteraphy heads and neutron gauges etc.)
- Conditioned DSRS shields with Depleted Uranium
- Conditioned DSRS shields waiting for last contamination control results for sending recycling
- Conditioned drums
- NORM-TENORM
- Liquid waste waiting for processing

TÜRKİYE ATOM ENERJİSİ KURUMU

RWMD RADIOACTIVE WASTE STORAGE FACILITY AND SITE

RWMD RADIOACTIVE WASTE STORAGE FACILITY AND SITE

SECURITY OF THE SITE

- The site's around is covered with fences
- A camera system is watching site for 7/24 and it's control is on central security unit
- Security unit has enough human power and shifting day and night for 7/24
- Cekmece site has also another wider fence protection and camera system all around the center.
- RWMD storage area stands totally under 3 fencing systems and 2 CCTV systems
- There is no any past record for a security initiated incident.

RWMD RADIOACTIVE WASTE STORAGE FACILITY AND SITE

SECURITY OF THE SITE

- Radioactive Waste Treatment Facility and Offices are also covered with fences and cameras.
- Main doors are able to open only with authorized personnel identity cards.

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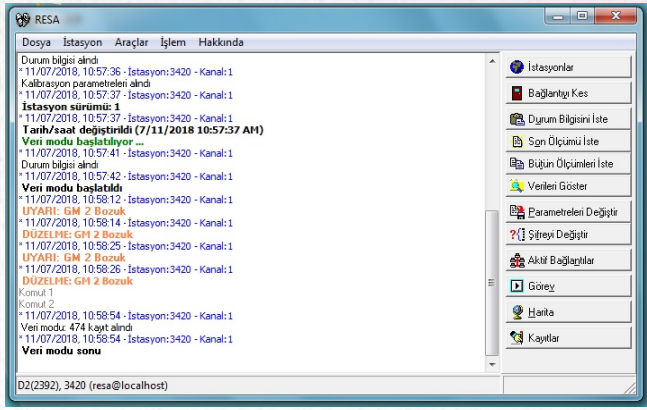
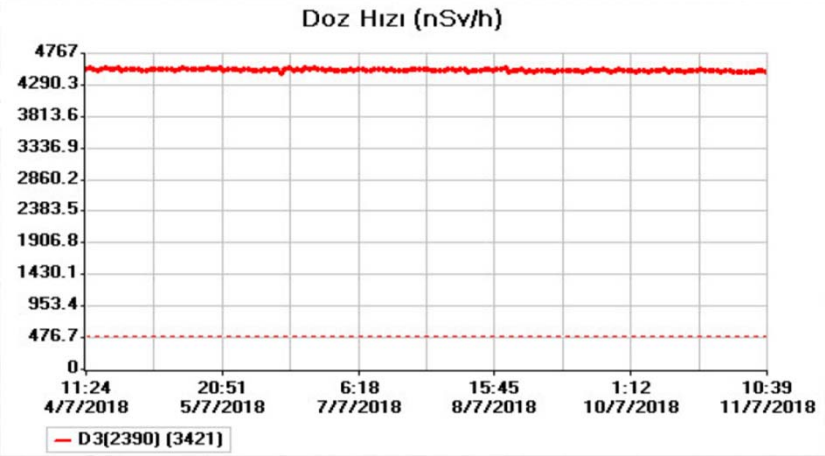
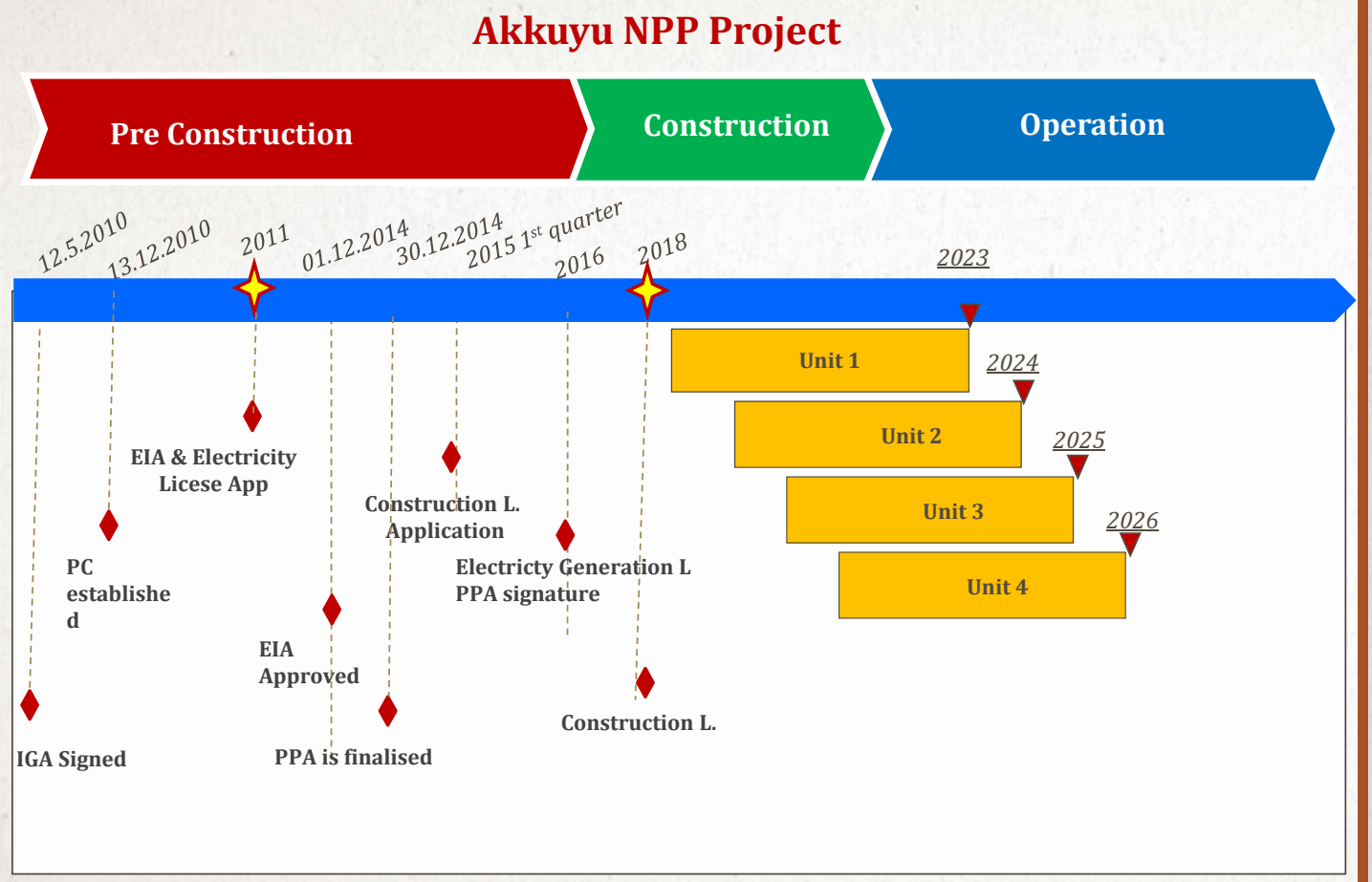
RWMD RADIOACTIVE WASTE STORAGE FACILITY AND SITE

RADIOGICAL MONITORING OF THE BUILDINGS

- Storage buildings has measurement station from TAEK's RESA (Radiation Early Monitoring System) monitoring system.
- RESA has a dial-up modem connection protocol
- On telephone lines, RESA software can connect all stations and receive the current measurements.
- When an alarm happened, RESA software can automatically call central emergency phone number
- Weekly, all RESA stations measurement values checked and reported to RPO of the RWMD.







THE FUTURE OF RWMD

Regarding policy changes and nuclear program

TÜRKİYE ATOM ENERJİSİ KURUMU

THE FUTURE OF RWMD

NUCLEAR POWER AGGREMENTS

Akkuyu NPP Project

IGA with Russian Federation on May 12, 2010.

4 units of VVER 1200		60 years
4800 MW (Total Capacity)	20 billions USD	35 billions kWh

Sinop NPP Project

IGA with Japan on May 3, 2013.

4 units of ATMEA 1		60 years
4480 MW (Total Capacity)	22 billions USD	33 billions kWh

THE FUTURE OF RWMD

Projects and Activities Regarding New Responsibilities

National Radioactive Waste Management Plan Activity

We already started to work on first national radioactive waste management plan. The first draft send to the TAEK Presidency for collecting comments of other stakeholders and planning for future evaluation activities.

After collecting first comments, the activity will keep on going with working group studies of stakeholders.

According to Presidential Decree No.4, The plan must be submitted to Ministry of Energy and Natural Resources (MENR) by December 2020 for approval and will be announced by the end of December 2020. The plan will be reviewed and updated in every years finishing with (0) and (5).

THE FUTURE OF RWMD

Projects and Activities Regarding New Responsibilities

Radioactive Waste Disposal Site Selection, Method Selection and Feasibility Project

This project started by 2018 and will be finished by 2021. It contains an approach to inventory regarding disposal method selection, site investigation and screening for site selection and feasibility of disposal method vs. inventory. This project will be continued with a facility design project in the future.

The stipulated outputs of the projects are;

- Site or sites will be selected for the purpose of disposal
- Method or methods will be selected related with dedicated current and future inventory
- Feasibility will show the cost-benefit analysis and give information to Accounts Management Board

Already some sites were investigated and some methods will be discussed. The project is in progress.

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THE FUTURE OF RWMD

Projects and Activities Regarding New Responsibilities

Other Project and Activities in Progress:

- TENORM Waste Volume Reduction Project
- Evaporator Production Activity
- New Waste Package Design Activity
- Cekmece-Old Nuclear Fuel Laboratories Decommissioning Activity
- New Inventory Database Development Activity

THE FUTURE OF RWMD

Projects and Activities in International Organizations

RWMD is honored participating in different projects in IAEA regional and international projects. It's been very useful to learn about new lessons from all Member States and implement new developments for radioactive waste management activities. Current IAEA participation of RWMD team is on the projects below. We're looking forward to improve the cooperation with all Member States in the future.

INT9183 : Overcoming the Barriers to Implementation of Decommissioning and Environmental Remediation Projects

RER0043: Enhancing Capacity Building Activities in the European Nuclear and Radiation Safety Organizations for the Safe Operation of Facilities

RER9146 :Enhancing Capacities in Member States for the Planning and Implementation of Decommissioning Projects"

RER9143: Enhancing Radioactive Waste Management Capabilities

TÜRKİYE ATOM ENERJİSİ KURUMU

THANK YOU!

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