State Enterprise "Radioactive Waste", Bulgaria

DECOMMISSIONING OF KOZLODUY NPP UNITS 1÷4 PROGRESS & CHALLENGES

With care for the future…

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SD "Decommissioning 1- 4 Unit", SE RAW

State Enterprise Radioactive Waste – Background, Management, Structure

Activity: Management of RAW and decommissioning of nuclear facilities.

Management : 1. Minister of Energy;
2. Management Board of SE RAW;
3. Executive Director – representative SE RAW.

Structure: 1. Head Office;
2. Four Specialized Divisions.

- ***SD "Radioactive Waste – Kozloduy" – management of RAW from NPP;***
- ***SD "Permanent Repository for Radioactive Waste – Novi Han" – management of RAW from nuclear application;***
- ***SD "National Repository for Radioactive Waste" – construction, commissioning and operation of a repository for long-term storage of low- and intermediate-level RAW;***
- ***SD "Decommissioning 1-4 Units" – decommissioning of nuclear facilities and management of RAW from decommissioning.***

Decommissioning Licences for Units 1 to 4

Units 1&2, VVER-440

- 18.10.2010 – SE RAW was granted licences for operation of Units 1&2 as installations for management of radioactive waste;
- 27.10.2014 – SE RAW was granted licences for decommissioning of Units 1&2.

Units 3&4, VVER-440

- 25.02.2013 –SE RAW was granted licences for operation of Units 3&4 as installations for management of radioactive waste;
- 28.07.2016 - SE RAW was granted licences for decommissioning of Units 3&4.

РЕПУБЛИКА БЪЛГАРИЯ
АГЕНЦИЯ ЗА ЯДРЕНО РЕГУЛИРАНЕ

ЛИЦЕНЗИЯ

Серия: ИЕ Регистрационен № 4650

ЗА ИЗВЕЖДАНЕ ОТ ЕКСПЛОАТАЦИЯ НА ЯДРЕНО СЪОРЪЖЕНИЕ

ИЗДАВА

РЕПУБЛИКА БЪЛГАРИЯ
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ЛИЦЕНЗИЯ

Серия: ИЕ Регистрационен № 4651

ЗА ИЗВЕЖДАНЕ ОТ ЕКСПЛОАТАЦИЯ НА ЯДРЕНО СЪОРЪЖЕНИЕ

ИЗДАВА

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АГЕНЦИЯ ЗА ЯДРЕНО РЕГУЛИРАНЕ

ЛИЦЕНЗИЯ

Серия: ХЕ Регистрационен № 5099

ЗА ИЗВЕЖДАНЕ ОТ ЕКСПЛОАТАЦИЯ НА ЯДРЕНО СЪОРЪЖЕНИЕ

ИЗДАВА

РЕПУБЛИКА БЪЛГАРИЯ
АГЕНЦИЯ ЗА ЯДРЕНО РЕГУЛИРАНЕ

ЛИЦЕНЗИЯ

Серия: ХЕ Регистрационен № 5100

ЗА ИЗВЕЖДАНЕ ОТ ЕКСПЛОАТАЦИЯ НА ЯДРЕНО СЪОРЪЖЕНИЕ

ИЗДАВА

Funding

Financial support from:

- **Radioactive Waste Fund (RWF) under the responsibility of the Minister of Energy;**

- **Decommissioning of Nuclear Facilities Fund (FDNF) under the responsibility of the Minister of Energy**

- **Kozloduy International Decommissioning Support Fund (KIDSF) – it was established by EC and is administered by the European Bank for Reconstruction and Development (EBRD).**

Strategy for Decommissioning of Units 1÷4 of Kozloduy NPP

- **The strategy for decommissioning of Units 1÷4 "brown field";**
- **Continuous dismantling of equipment;**
- **Completing the progress of Decommissioning of Units 1÷4 by 2030.**
- **Key Phases (Principal Activities):**

1. ***Pre-decommissioning activities;***
2. ***Facility shutdown activities;***
3. ***Procurement of equipment;***
4. ***Dismantling activities;***
5. ***Treatment of RAM and delivery for disposal;***
6. ***Site management and support;***
7. ***Project management and engineering;***
8. ***Management of SNF and activated materials.***

Accepted challenges

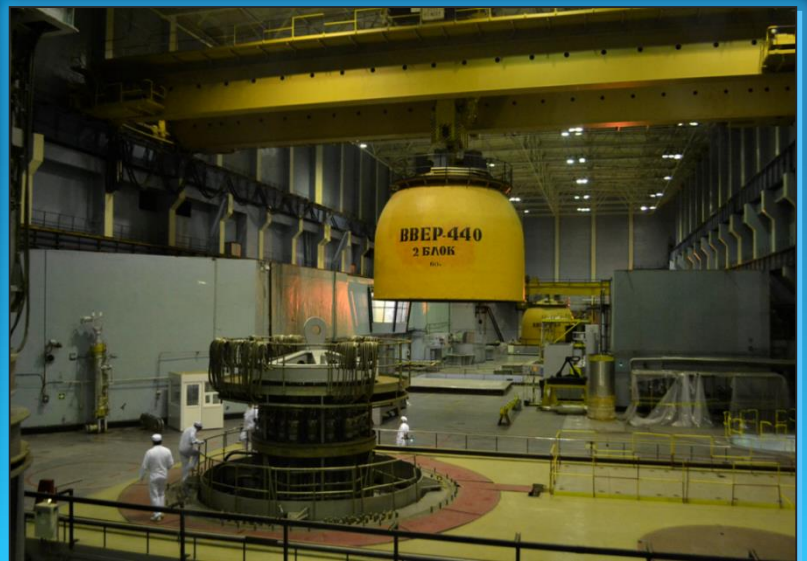
- Reducing of the period for implementation of the final purpose - initial deadline was 2037, now it is 2030;
- Simultaneous decommissioning of four units ;
- Availability of operational units on the site;
- Demolition of existing infrastructure and simultaneously erection of the new one for the decommissioning purposes;
- Implementation of the decommissioning activities with plantwide systems remaining in operation.

Dismantling activities

- TH - Almost all large equipment in the Turbine Hall is dismantled. Remaining for dismantling – pipelines, serving platforms, valves etc. The turbine foundations of Units 1&2 are also dismantled.

Dismantling activities

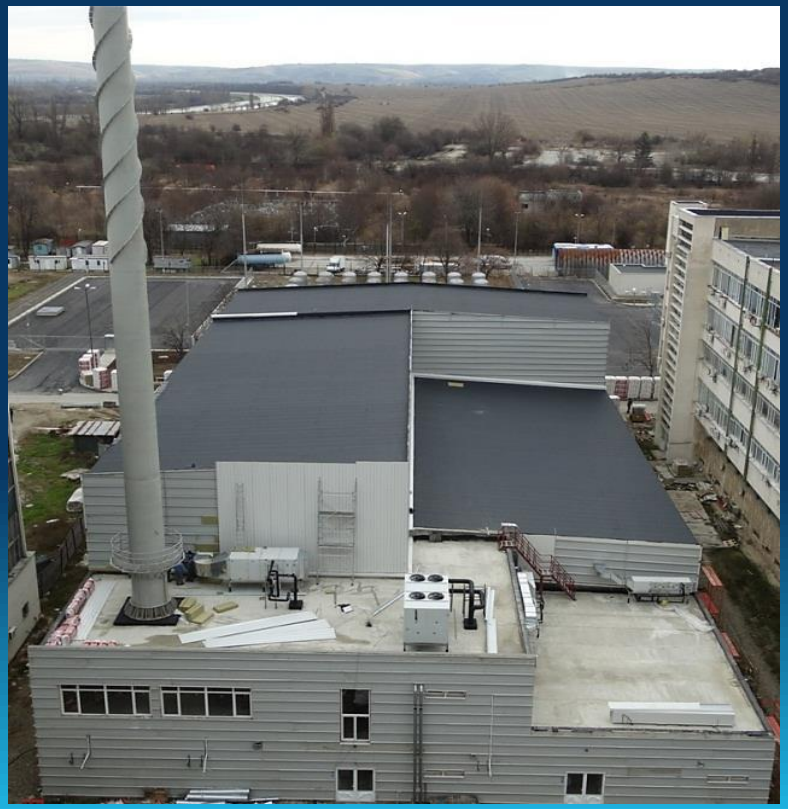
- CA – All dummy assemblies and boron absorbers are removed from the reactors and put into the Spent Fuel Pond-3. Boron units 1 and 2 are partially dismantled. The intermediate circuit of Unit 1 are currently in the process of dismantling.



New facilities

- **Sites for management of materials from the decommissioning activities;**

- **Size Reduction and Decontamination Workshop (SRDW);**



New facilities

- **Free Release Measurement Facility (FRM);**

- **Gamma-spectrometry Measuring System;**

New facilities

- **Plasma Melting Facility**

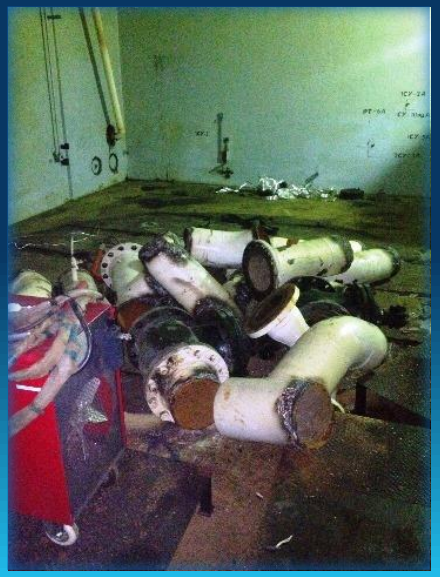
State Enterprise Radioactive Waste

Deliveries liveries of equipment

- **The equipment delivered under the implemented projects is: diamond rope cutting machines, machines for concrete structures demolishing, lifting equipment, multifunctional telescopic handler, mini-excavator and mini-loaders with various attaching devices, vertical and horizontal electric band-saws for cutting metal, crane *LIEBHERR 130 t,* richstaker, different types of containers etc.**

Important steps till 2016

- Receipt of decommissioning license for Units 1&2;
- Receipt of decommissioning license for Units 3&4;
- Further development of an integrated waste management strategy;
- Develop and approve new free release procedures;
- Development of Risk management procedure for decommissioning;
- Elaboration a register of potential risks to the process;
- Dismantling of over 21 000 tons of equipment (metal) in Turbine Hall of Units 1÷4;
- Dismantling of over 7000 tons civil structures in Turbine Hall of Units 1÷4
- Dismantling almost 250 tons in DGS-1;
- Dismantling about 300 tons equipment (metal) in CA;
- Decontamination EBT 1,2 and SFP



Annual implementation in 2016

	Planned	Realized
❖ Radioactive solutions in the Controlled Area of Units 1 to 4 drained and treated	2 010 m3	2 010 m3
❖ Draining and treatment of conservation solutions in Turbine Hall of Units 3 and 4	1 220 m3	1 220 m3
❖ Transport liquid RAW from ECT to SDRAW	160 m3	160 m3
❖ Transport solid RAW to SDRAW for treatment	91 m3	90 m3
❖ Dismantling of equipment in Turbine Hall	5 772 t	5 796 t
❖ Demolition of civil structures in Turbine Hall	3 105 t	3 114 t
❖ Dismantling of equipment in the Controlled Area	200 t	152 t
❖ Materials planned to be free released	8 680 t	8 025t

❖ Decontamination of Spent Fuel Pond (SFP) – 1, 2 and Emergency Boron Tank (EBT) – 1, 2:

✓ SFP-1 is decontaminated;

✓ SFP-2 is drained for decontamination;

✓ EBT -1, 2 are drained and decontaminated;

Upcoming activities

- Decontamination of SFP 4 and EBT 3,4;
- Updating cost assessment for Decommissioning 1-4 Units;
- Commissioning of Size reduction and decontamination workshop in 2017;
- Choose of technology of wet solid RAW treatment - Project 9b-2;
- Commissioning of Plasma Melting Facility in 2017;
- Receipt of accreditation for SE RAW's Inspection Body for testing and control;
- Reconstruction of the building of DGS-1 for producing of reinforced concrete containers.

Analyze of performance

- The process of decommissioning of Units 1÷4 is under implementation according to the approved schedule and dismantling work in the TH is expected to be completed by the end of 2018 or later in 2019.
- Management of dismantled materials is difficult due to the lack of licensed sites for management of materials from the decommissioning activities, as well as due to the long free release procedures. In order to solve the above mentioned issues, the following measures have been taken:

- ❖ Performance of a Project for Design and Construction of Sites for Management of Materials from the Decommissioning Activities at Kozloduy NPP Units 1÷4, which will be completed in the first quarter of 2017.

- ❖ Currently the construction activities are ongoing and sites 1&2 are fully completed.

- ❖ In accordance with the current Ordinance on the Release of Materials from Regulatory Control, which contain more than one radionuclide, a software and hardware upgrade was implemented on the FRM-02 and SE RAW expects to receive an Inspection Body accreditation.

Difficulties & solutions

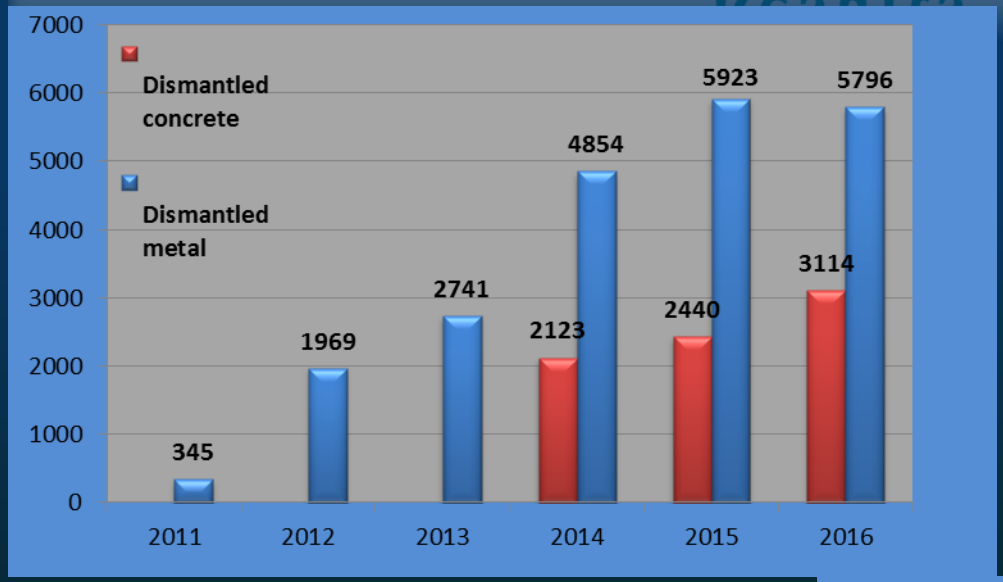
- The preparation of the CA and auxiliary buildings for dismantling has started on schedule, as well as the dismantling of potentially contaminated equipment. Management and treatment of decommissioning RAM and RAW will be assisted by putting into operation of the Size Reduction and Decontamination Workshop (SRDW) and Plasma Melting Facility (PMF) which is scheduled for 2017.

- Management of RAW from the Mortuaries in the CA is another challenge for SE RAW and in that regard a Feasibility Study for the Management of "Mogilnik" storages of KNPP Units 1÷4 is first planned to be carried out and thereafter a management approach is to be selected.

- Regarding dismantling in the CA, SE RAW is in the process of Elaboration of a Design for Dismantling of Equipment in the Controlled Areas of KNPP Units 1÷4.

- Based on the selected option for dismantling, particularly the Reactor Pressure Vessel (RPV), reactor internals and the rest activated components, the Consultant shall justify by relevant analyses the requirement for temporary storage areas for activated equipment by complying with the best international practices.

Results

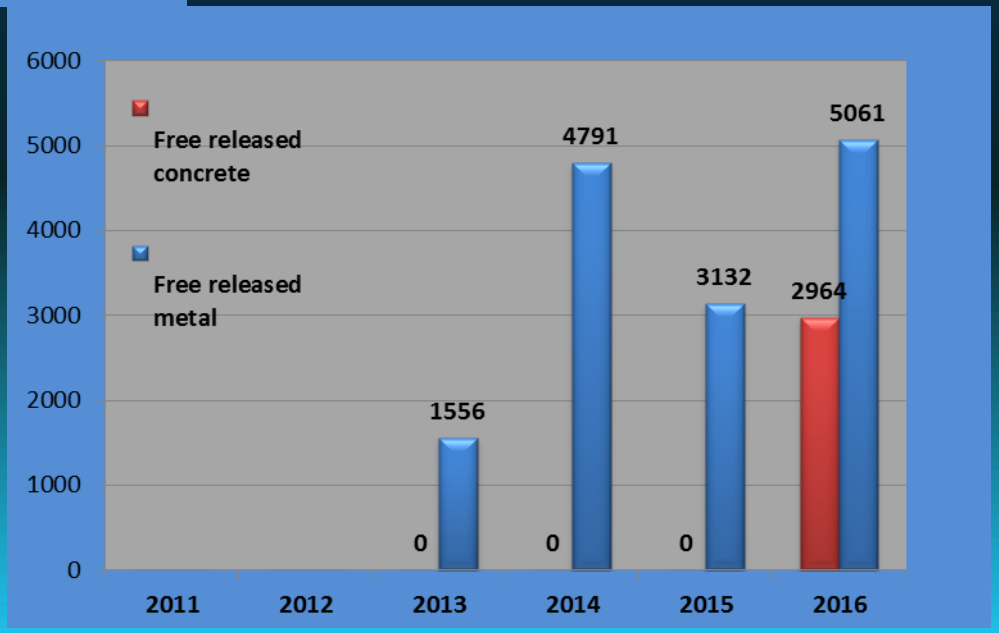


Dismantled metals - 21 628 t
Free released metals - 14 299 t

Dismantled concrete - 7 677 t
Free released concrete - 2 964 t

Dismantled materials - 29 305 t
Free released materials - 17 504 t

Dismantled materials on the site - 11 801 t



THANK YOU
FOR
YOUR ATTENTION!
With care for the future…