Iwaky
2019

RosRAO FSUE

Russian backend activity

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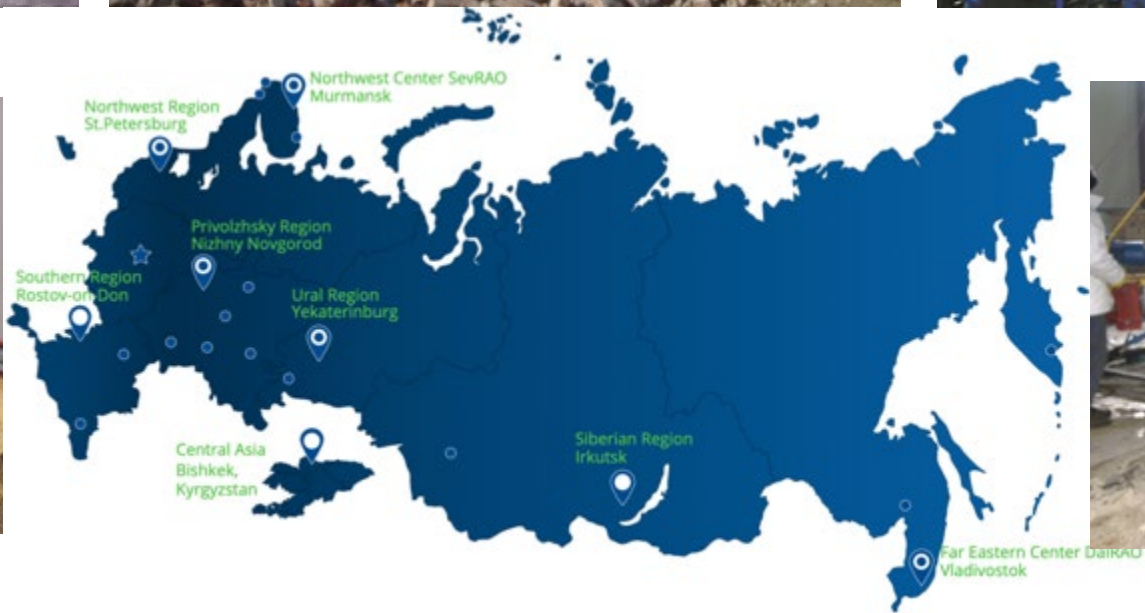
RosRAO: key facts

Russian RW Management System Evolution

1940-2011

Before State RW Management Law Approved

Legacy	Operating RW

There was not clear responsibility

✓ **Enterprises have their own local RW management strategies**

✓ **There was not goal to RW treatment and conditioning for disposal**

✓ **The main local strategy is RW storage**

✓ **There was not long-term solution for RW management – legacy volume increases.**

✓ **No system management – no financial efficiency**

2011 - currently

After State RW Management Law Approved

State budget	Operator's budget
Legacy	**Operating RW**
State responsibility	Operators responsibility

Removing

Treatment

Treatment

Conditioning

Storage & Disposal

✓ **All RW must be disposed**

✓ **New financial mechanism**

✓ **Reduce RW volume for storage**

✓ **Reduce safety risks**

✓ **Transparent system**

Government D&D programs and key goals

AMB 2	VVER 15	EGP 4	Rehabilitation
RW storages 40	SNF Storages 39	Test sites >20	R&D 7
Mining 3	Metallurgy 2	Radiochemistry 4	UGR 13
RBMK 11	RR 50	Landfills	

more then 100 sites

2008-2015
Nuclear and Radiation Safety Program 1
(2,35 B$)

- Determination of the legacy challenges
- New nuclear and radioactive safety monitoring system development
- Created disposal infrastructure for LLW

2016-2020
Nuclear and Radiation Safety Program 2
(9,6 B$)

- HLW disposal infrastructure
- The open pools of Liquide RW close
- SNF reprocessing infrastructure

Government D&D programs current performance

- 50 nuclear-hazardous sites decommissioned & rehabilitated
- New modern SNF dry storage facility in operation, 29 386 SNF assemblies transferred
- Closing down of Karachai Lake (=50 football fields).

- First Uranium-Graphite Reactor decommissioned
- Two historical nuclear research sites in Moscow decommissioned
- Rehabilitation of more than 2 mln.sq.m

SNF storages filled/ defected SNF	Uranium-graphite reactors shutdown	First research reactor in Moscow	Research plutonium centre	Karachai lake. 120 mln. Ci.

Before

After

Most of the SNF placed in the new modern facilities	Decommissioned by "Entombment"	Dismantled	Decommissioned to "brown" field	Closed down

Bochvar Institute D&D current projects

Building 53 (1974) U, Pu works
Co-60, Sr-90 sources, ³H, Be
High gamma
Area: 1121 м2
Characterization
Decontamination & Dismantling
License granted
2 years – project (2018)

Building B (1945) U, Pu labs
High alpha contamination
Area: 7 407 м2

Characterization
Decontamination & Dismantling
Tanks and laboratory equipment
dismantlement
Building dismantlement
Site rehabilitation
License granted
5 years (done)!
See next slide
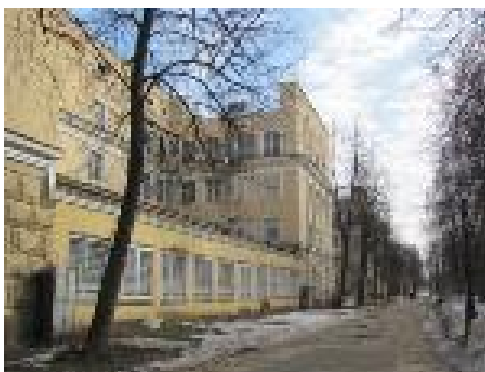
Building A (1945) Radiochemical
labs, Pu contamination

Area: 11 667 м2

Characterization
Project development
Legacy waste retrieval
License to apply
5 years – project (2023)

U-5 Facility (1946) Pu-plant prototype
Area: 750 м2
Characterization
Decontamination & Dismantling
Legacy waste retrieval
License granted
3 years – project (2020)

Residential area

Residential area

Main Sources of RW Generation in Future

3 units of NV NPP

2 units of Bel NPP

5 PPUG Reactors LRW facilities Unused buildings and constructions
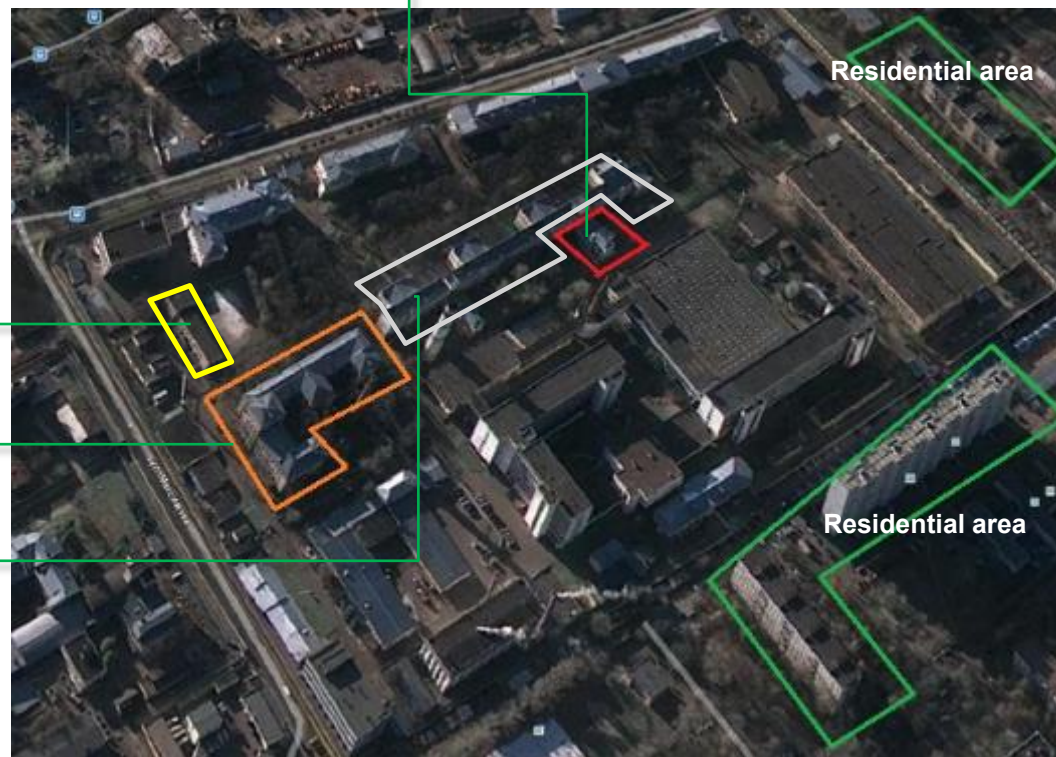
4 PPUG Reactors

LRW facilities Radiochemical complex

3 PPUG Reactors LRW facilities Radiochemical complex

Diffusion enrichment complex Sublimation complex

Mean values for D&D of 1 NPP unit:

20 000 tons of accumulated RW

Specific amount of metal 15 000 tons

Labor capacity 5600 personnel years

New-generated RW 14 000 tons

Map labels: Kola NPP, Leningrad NPP, Kalinin NPP, Smolensk, IPPE, Kursk NPP, Novovoronezh NPP, NIIAR, Rostov NPP, Balakovo NPP, UECC, Beloyarsk NPP, PO Mayak, PDC UGR, SCC, MCC, ECP, AECC, Bilibino NPP
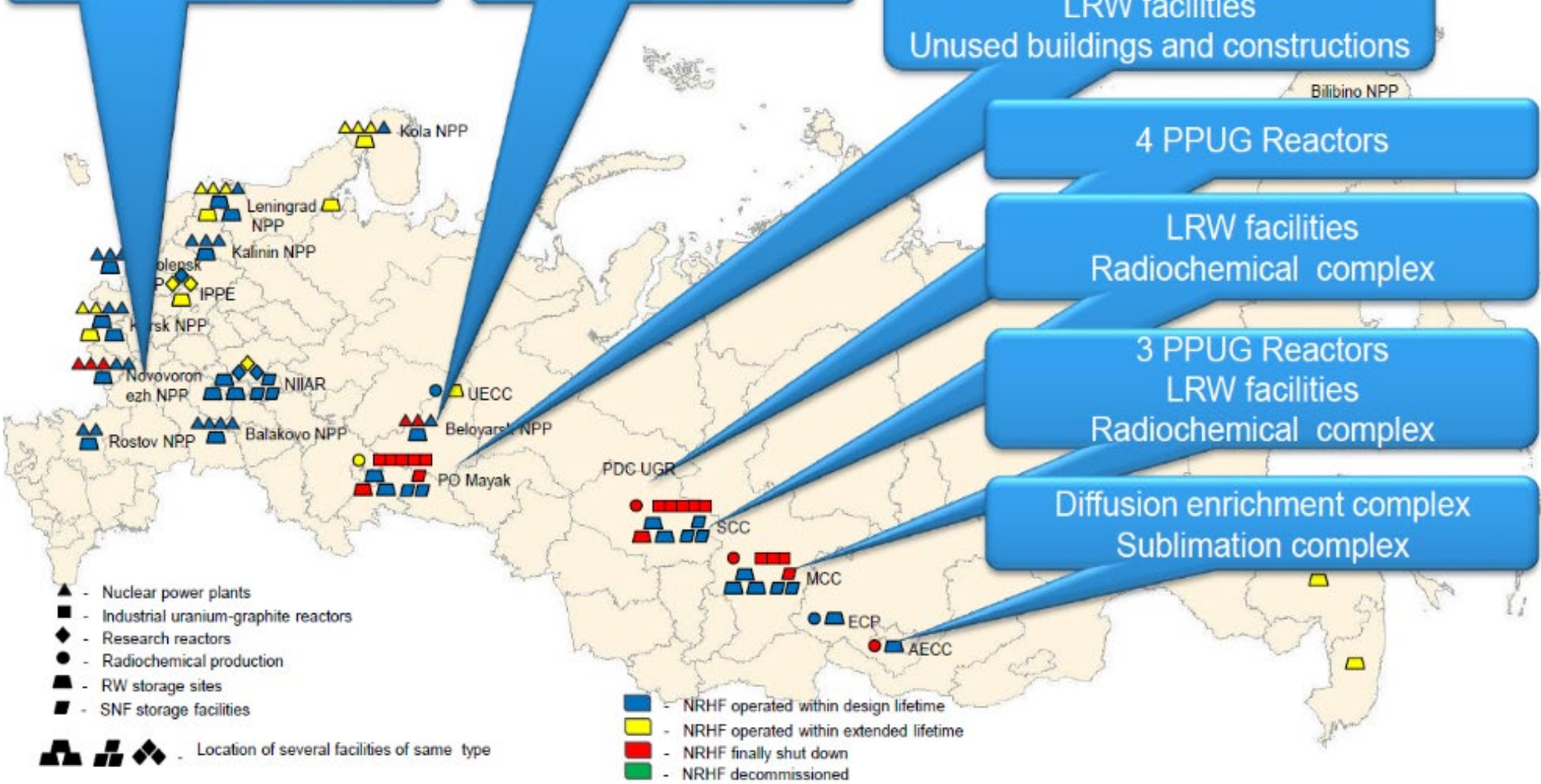
Legend:
- ▲ - Nuclear power plants
- ■ - Industrial uranium-graphite reactors
- ◆ - Research reactors
- ● - Radiochemical production
- 🝐 - RW storage sites
- 🝐 - SNF storage facilities
- 🝐 - Location of several facilities of same type

- ■ (blue) - NRHF operated within design lifetime
- ■ (yellow) - NRHF operated within extended lifetime
- ■ (red) - NRHF finally shut down
- ■ (green) - NRHF decommissioned

Impediments in RW Management

Typical Radwaste generated from decommission
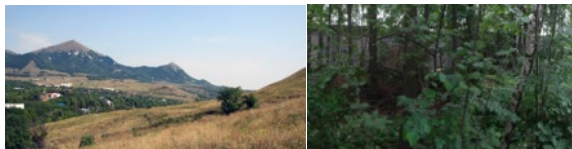
Concrete structure

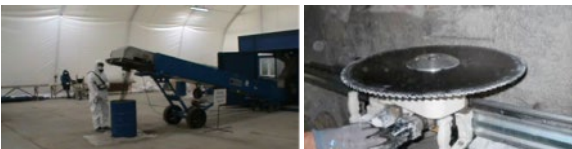### Metal structure

Equipment

Wood and organic waste

Soil and concrete sand

Other
(wire, glass, insulations, etc)

RosRAO average capacity of segregation and characterization ~ 0.2 m³/(man·hour)

The main challenges faced by RosRAO to raise of the capacity :

Aspect	Challenge to be resolved
1) Irregular shape	Impossible to perform surface activity measurement; change of distance between detector and object causes error in measurement
2) Mixed morphological composition	Unknown morphologic composition does not allow to define correctly the binding constant and estimate amount of nuclear materials in the object
3) Inaccessibility of interior of the equipment for measurements	Impossibility to measure internal surface activity of contaminated process equipment leads to false reduction of RW class
4) Integral character of the measured values	Conservative approach to detect total activity of the object leads to false increase of RW hazard class.
5) Absence of correlation between portions of waste	Knowing specific activity of a large amount of RW, it is impossible to guarantee that the specific activity of a portion will be similar
6) Huge amount of manual operations	Low rate of characterization

Ways to solve the problem:
- **minimization of measurement time (combined measurements);**
- **reduction of the segregated portion (accounting for internal activity of nuclides);**
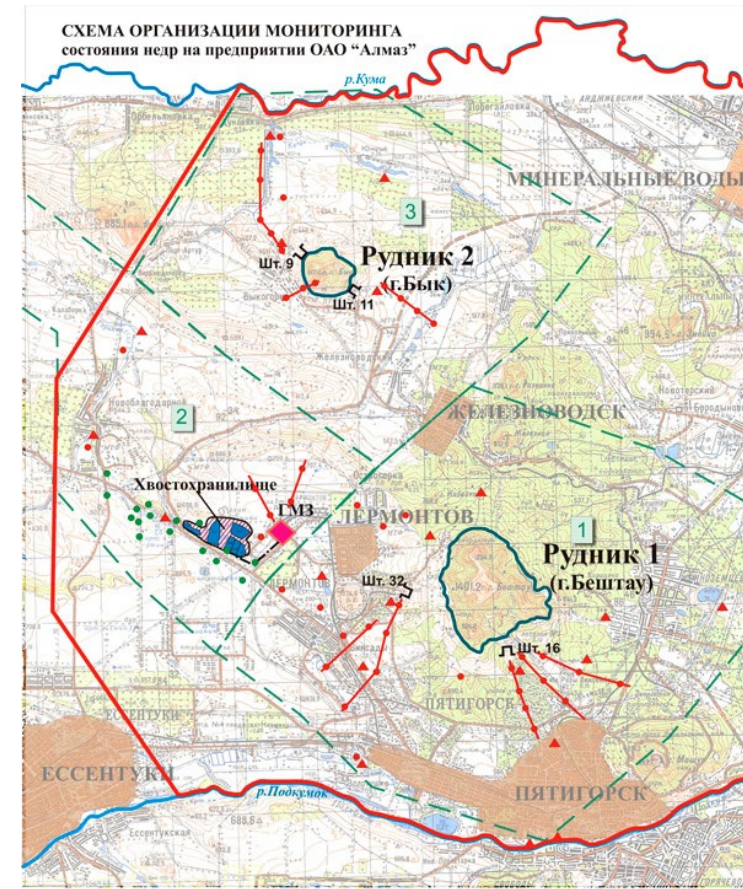- **refusal of manual labor (unification and automation of operations).**

Project "Rehabilitation of uranium mining company Almaz"

Uranium mining and processing company "Almaz" was established in 1952.
Due to economical reasons, mining was completed in 1975 (mine 1) and in 1988 (mine 2).

Scheme of ground water
monitoring system

Rehabilitation area – 922 000 m^2
Building and adits dismantlement. Elimination of the ventilation ducts,
crosscuts; filling adit's entrances;rock dumps remediation.
Remediation of the tailing dumps of the hydrometallurgical plant.
Reconstruction of the radon pipline (adit No16).

Project "Tritium Separation Verification Facility"

Public discussion before the project start

Movie about project

Today RosRAO R&D activity

Monitor of deep alpha contamination

RosRAO anthropomorphic manipulator

Alpha-Emitters Deep Contamination Scanner represents equipment for non-destruction rapid measurements of alpha-emitters contaminations in unconvinced RW

Concrete bricks with homogeneous distribution of 235U   6 mg/kg at the amount of 10 pcs.

Movie about project

Measuring in detail

To perform quickly

Outputs

Modern technologies allow performing D&D projects much faster however significantly more expensive.
Technologies aimed at reduction of RW storage areas are more risky.
Modern regulation doesn't meet modern technology.

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Thank you for your attention!