# Decommissioning of Nuclear Facilities in Russia. The Role of Business Enterprises in Completed Projects and Future Activities

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**Decommissioning of Nuclear Installations: Strategies, Practice and Challenges**

# Association AVERO – information about nonprofit partnership

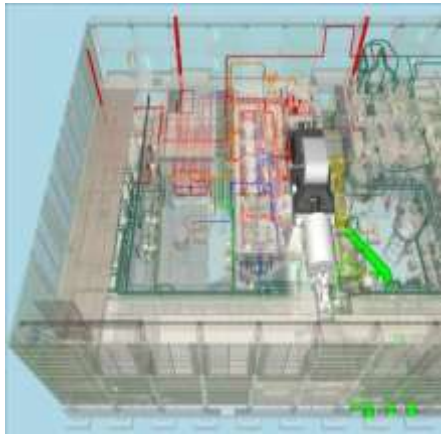
Association AVERO is the first non-state and nonprofit organization in Russia that combines companies and enterprises specializing in nuclear life-cycle end stage.
Year of establishment - 2012.

## Members of Association AVERO

# Association AVERO – key goals

- Formation and consolidation of business community in Russia that performs multiple tasks associated with D&D and radioactive waste management operations.
- Participation in development and realization of federal programs focused on nuclear waste legacy resolution.
- Involvement in development and analysis of normative documents, improvement of legislative base, support of legal amendments acceptance.
- Information and knowledge exchange, advanced technologies development and implementation in the field of D&D and radioactive waste management.






# A variety of nuclear facilities and sites are to be decommissioned in Russia

VVER 15

Uranium-Graphite Reactors 30

Nuclear research 57

Storage facilities of RW and SNF 79

Rehabilitation of contaminated lands

Nuclear Fuel Cycle 9

Waste landfills >100

*Source: Directorate of Nuclear and Radiological Safety of Rosatom*

# Association AVERO – D&D competencies


1. Characterization and modeling
2. Treatment of defect SNF
3. Design and engineering
4. Decontamination and dismantlement of equipment and building structures
5. Management with radioactive waste streams
6. Rehabilitation of contaminated territories

# Association AVERO – map of main projects


*Organizations:*

- Concern Rosenergoatom
- Leningradskaya NPP
- Beloyarskaya NPP
- Novovoronezhskaya NPP
- Kalininskaya NPP
- Bilibinskaya NPP
- Fuel Company TVEL
- Siberian Chemical Combine
- Bochvar Institute (VNIINM)
- Research Center “Kurchatov Institute”

*Facilities and Installations:* 1-st and 2-nd units of Beloyarsk NPP; Radiochemical Facility U-5 at the Bochvar Institute; Building «B» at the Bochvar Institute; Uranium-graphite reactors of the Siberian Chemical Combine; Uranium tailings of the Chepetsk Mechanical Plant; Nuclear Facility of the Chemical Metallurgical Plant in Krasnoyarsk

# Decommissioning of Building “B” at VNIINM facility -1

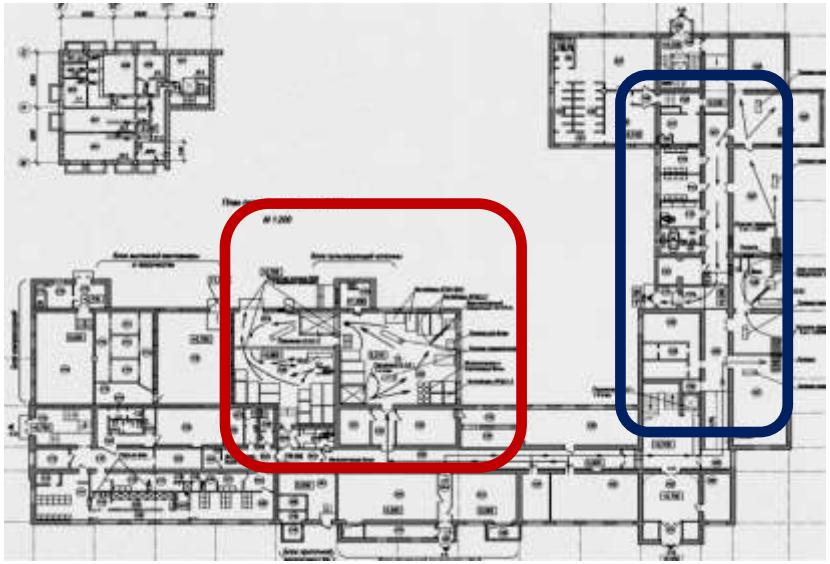
*Building “A” outlook*

- The building is located within the Moscow city boundaries
- The square of the building is 2407,2 $m^2$
- Total structural volume 40369 $m^3$
- Number of floors - 4 / 6
- Commissioned in 1945
- Wear of building structures - 60%

*Key project contributors (2012-2015)*

- ***ROSATOM***: VNIINM; FC NRC, FSUE ROSRAO, FSUE RADON
- **SME:** QUANT; RAOPROJEKT; NTC AMPLITUDA; UP-QUARK; EXPOSTROY; ECOMET-S

# Decommissioning of Building “B” at VNIINM facility -2



*Design solutions: units for radioactive waste (red) and non-radioactive waste (blue) treatment*

*Decontamination of interior rooms and systems*

- Design and engineering
- Characterization and survey of the building, including nuclear and radiological control
- Organization of work and establishment of temporary engineering systems and networks
- Dismantlement of equipment and decontamination of rooms
- Dismantlement of building structures
- Rehabilitation of ground
- Retrieval and transportation of radioactive and construction waste

# Decommissioning of Building “B” at VNIINM facility - 3

*Dismantlement of building structures*

*Organization of work and dust suppression*

- Total volume of waste – more than 15000 $m^3$
- Total volume of radioactive waste ~ 5000 $m^3$ including:
  - Process equipment and systems – 500 $m^3$
  - Building structures ~ 3700 $m^3$
  - Liquid waste streams ~ 30 $м^3$

# Application of IT 3D-models for D&D purposes

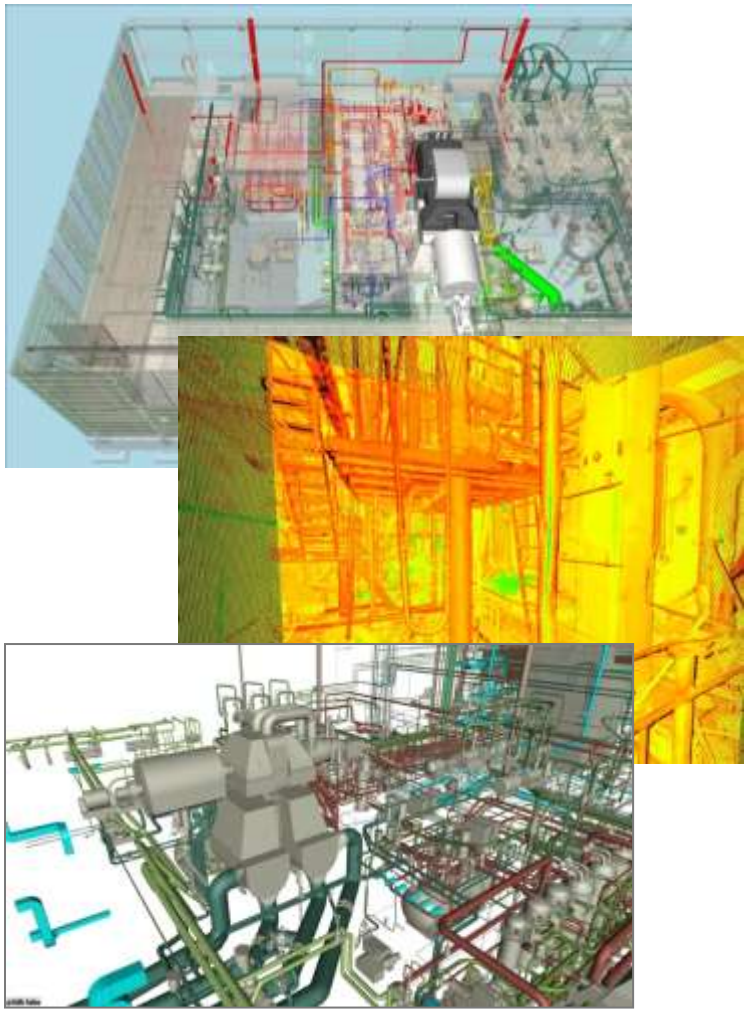
- Estimate of D&D operation loads

- Generation of needed plans, drawings in AutoCAD

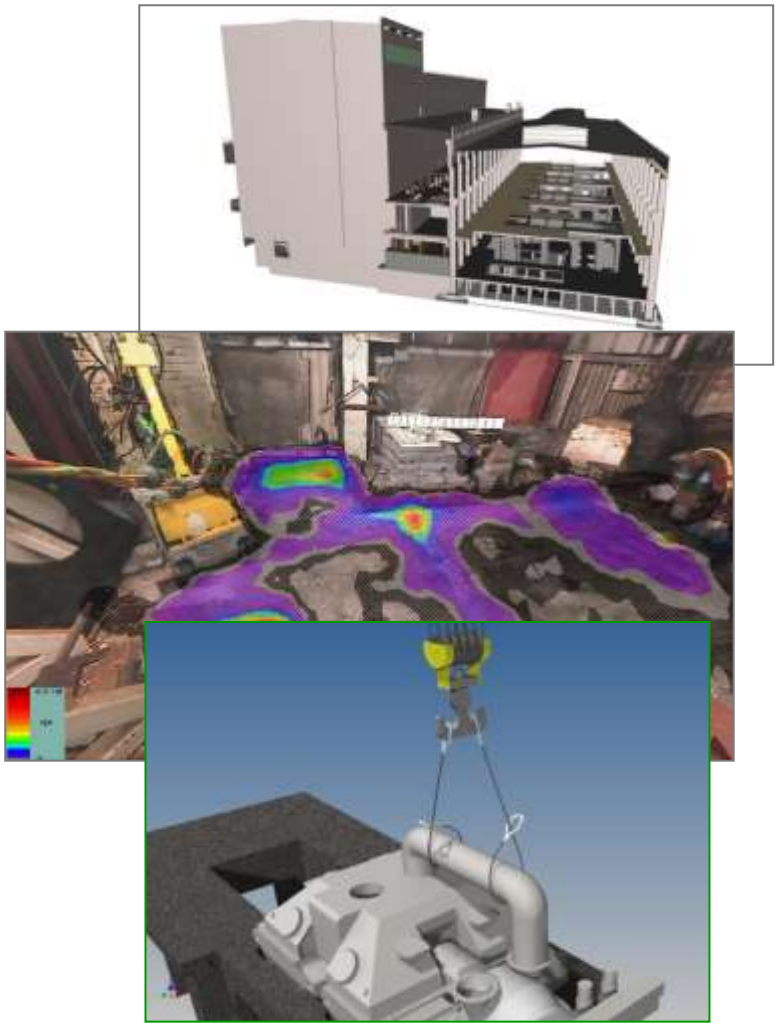
- 3-D modeling of engineering survey results;
- Assessment of decontamination workscope;
- Estimate of radioactive waste stream volumes

- Development of operational plans , simulations of nuclear and radiologically hazardous risks and operations

# 3-D modeling and simulating during D&D and ER

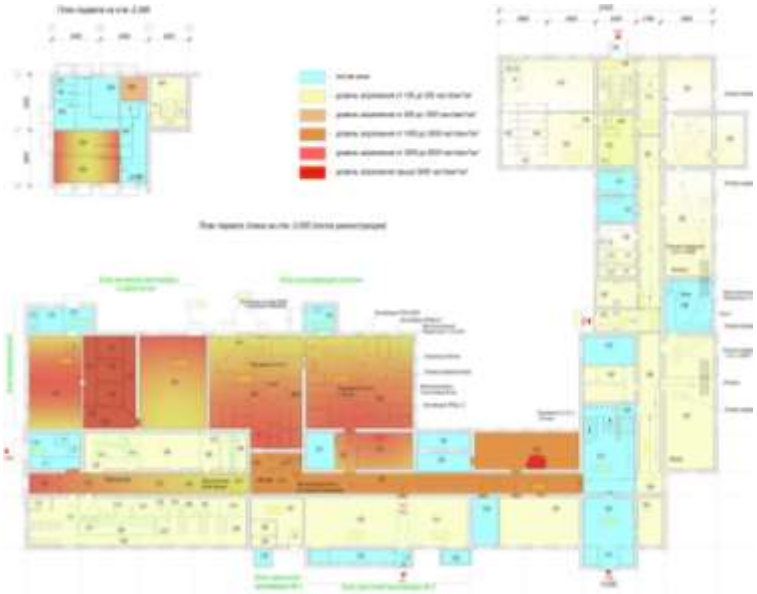


*3-D modeling and estimates of work loads (specifically for old "legacy" installations)*

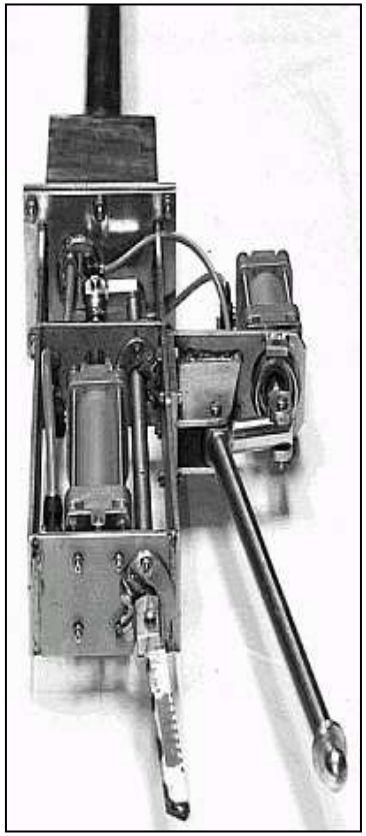


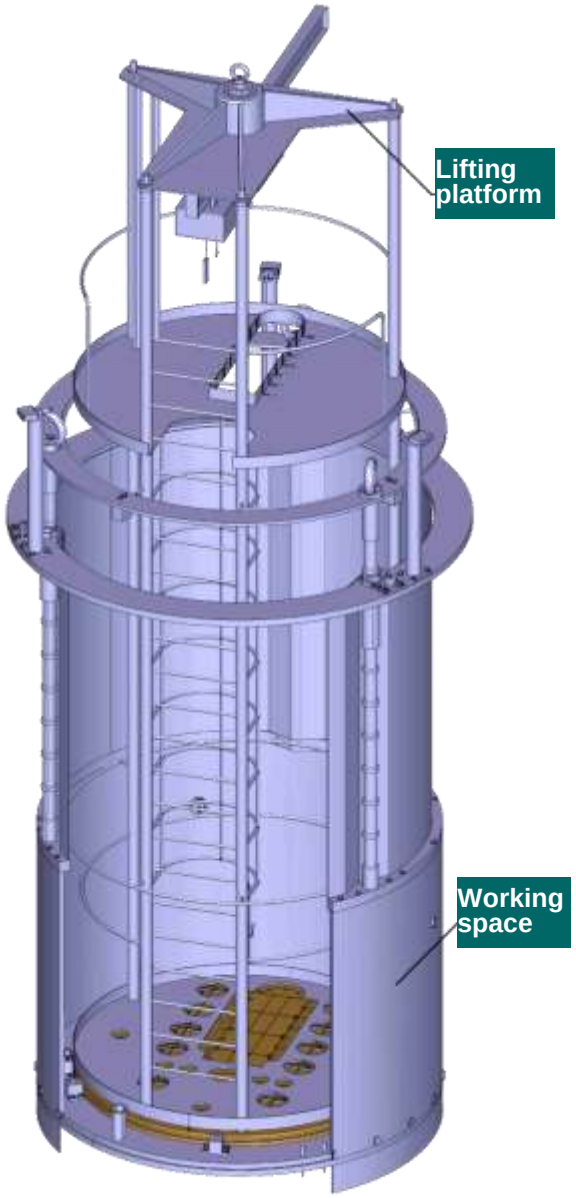
*Simulating models for complicated dismantlement operations*

# Engineering and radiological characterization of facilities and structures



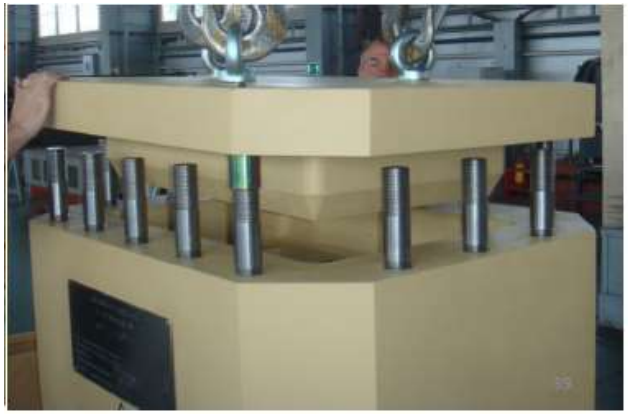
# Damaged SNF handling capabilities





# Dismantlement of building structures

# Packages for RAW and SNF storage and transportation



# D&D is a cooperation platform for the Government, Science and Business


- Creation of new jobs for qualified engineers and technicians
- New technologies development and application with the support of the Government and private innovation funds
- Universities play a substantial role in technology ideation and development
- Involvement of SMEs into the realization of long-term D&D and nuclear “legacy” programs and project (at least 20 %)
- Technology and efficiency driven approach for D&D operations

# Conclusion remarks

**Development of collaboration lines**

- Signed an agreement with the Skolkovo Foundation to collaborate in the field of innovation ecosystem development for D&D and RWM
- Established a specific direction D&D/ER in the Technology Platform “Technologies of Environmental Development” of the Ministry of Economic Development of Russia
- International presence is being developed (conferences/workshops, participation in tenders, etc.)

Skolkovo

WM Symposia 2016
March 6-10, 2016
Phoenix, Arizona
#WMS2016

Министерство экономического развития РФ

**What is required**

- Established tender quota for SMEs participating in the D&D and nuclear “legacy” activities.
- Unified practices and approaches for D&D are lacking – only high-level documents exist. Efforts are needed to establish and disseminate the knowledge “database”.
- Transparent information policy in terms of volumes of radioactive waste accumulated and technology flow-sheets that can be applied for RWM and D&D.
- Closer relations with Universities specializing in nuclear engineering are required (MEPHI, Mendeleev University, Tomsk National University, etc.).

**Thank you for your attention!**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