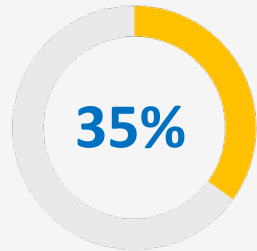


How we are making Global leaders in the field of the Decommissioning. **Three routes.**



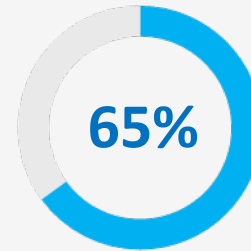
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DECOMMISSIONING IS A PROBLEMATIC AREA OF THE NUCLEAR INDUSTRY



ONLY 35% OF SUCCESSFUL PROJECTS

International investigations on results of the finalized projects demonstrate only 1 of 3 projects to be successfully realized, and that's why the decommissioning projects considered to be of high risk



65% OF PROJECTS DO NOT MEET THE PRIMARY CRITERIA

For decommissioning project realization, average deviation from the budget is 18%. Average time lag for project realization is 11 %. All deviations to higher values.

FAIL ACHIVEMENT OF THE PLAN IS DUE TO THE WRONG PLANNING OF PROJECTS REALIZATION CAUSED BY:

1 Unreasonable choice of technical and technology solutions at works execution

2 Miscalculated cost of decommissioning infrastructure creation and works execution

3 Absence or misapplication of project management system on the decommissioning area at works execution

In the industry, there are no decommissioning specialists capable to search and realize projects abroad

CURRENT SITUATION IN THE INDUSTRY

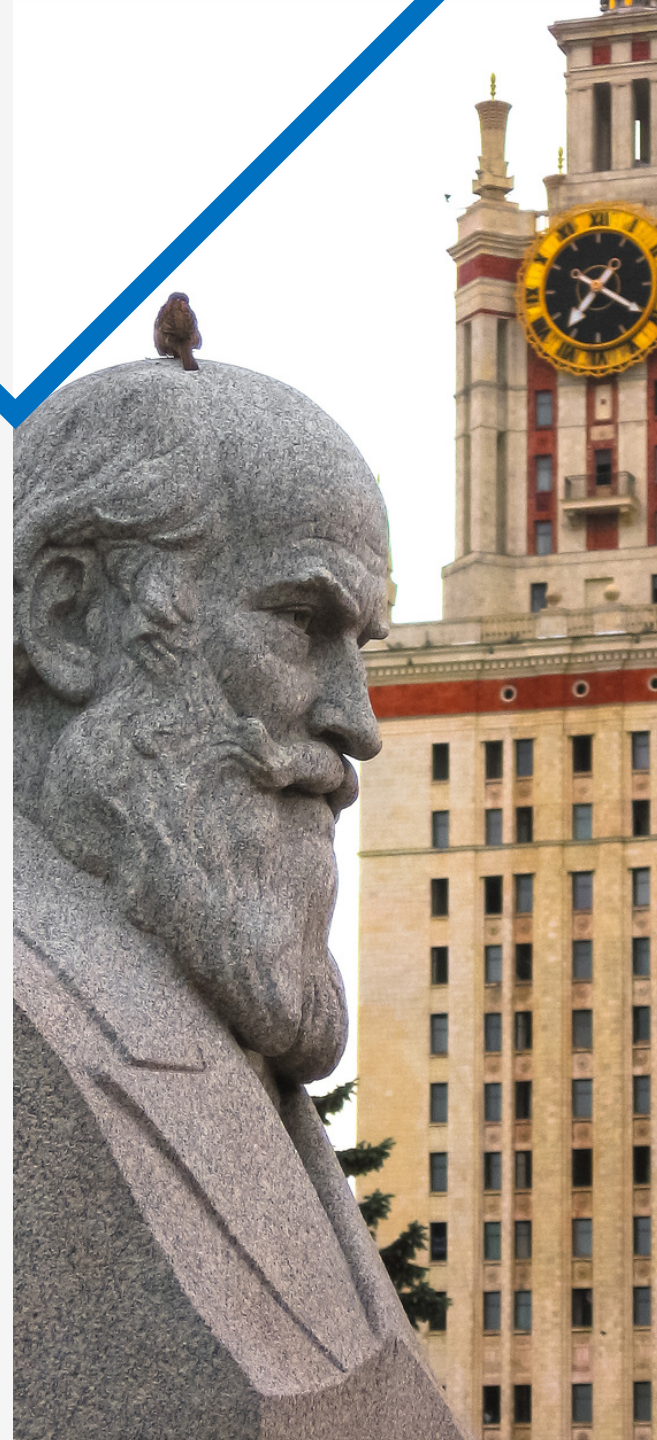
SPECIALISTS WITH ENGINEERING (PRODUCTION) COMPETENCY
SPECIALISTS WITH COMPETENCY IN IMPLEMENTATION OF INTERNATIONAL INITIATIVES

SPECIALISTS ON SEARCH AND IMPLEMENTATION OF INTERNATIONAL INITIATIVES WITH COMPETENCY IN DECOMMISSIONING

PLANNED STATUS

ABOUT MSU

- The oldest (**est. 1755**) and largest (40 000 + students) university in Russia
- In **Top100** universities in chemistry according to the international QS World University Rankings
- Has a large base of instrumental analysis and research activity
- Joint work together with the IAEA in the field of educational programs



MSU include **50** Departments and Institutes

40 000 + students

11 000 + research and teaching staff



Department of Chemistry
/18 divisions/

1300 + students

1100 + research and teaching staff



Division of Radiochemistry

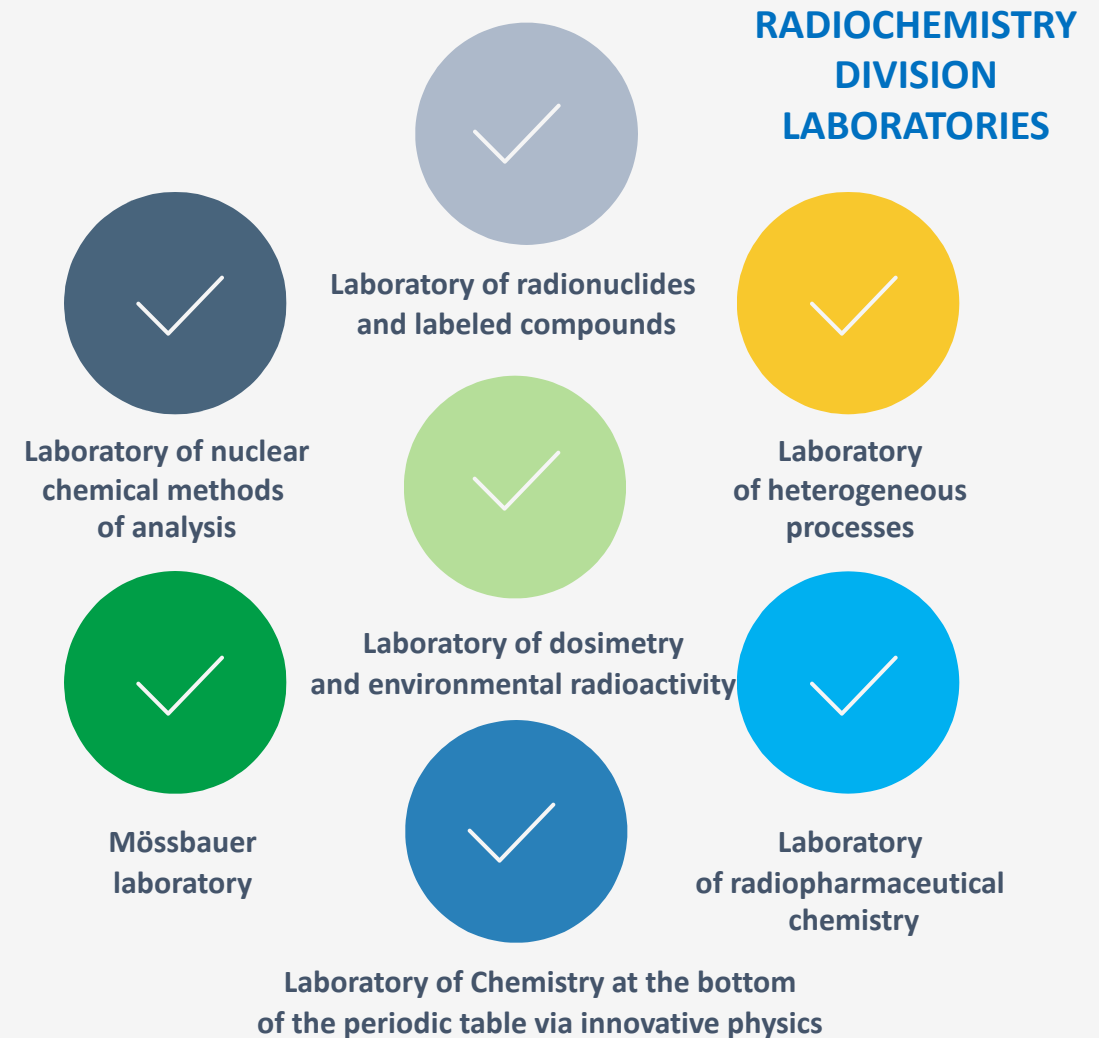
80 + employees

7 laboratories

RADIOCHEMISTRY DIVISION

Analytical capabilities to work with «hot» samples in MSU

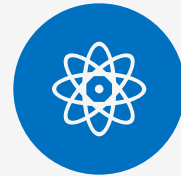
- «Hot» lab to work with large number of various radionuclides (for example up to 15 g of ^{239}Pu)
- Cold labs
- Counting techniques (4 HPGe detectors including 2 with Be window, LSC, alpha spec, ...), HPLC
- 200 kV High resolution field emission transmission electron microscope with the resolution of 0.17 nm (JEOL-2500) to work with radioactive samples
- X-ray Photoelectron Spectroscopy, μ -XPS, Auger
- Synchrotron source at RCC «Kurchatov Institute», 2.5 GeV, Current 120 mA, Vigler beamline, (XANES, EXAFS, XRD, HEXS, SAXS)
- Nanosizer Nano-ZS (Malvern)
- TRLIFS, etc.
- ESI-TOF-MS
- Vivarium



KEY POINTS



Agreement with IAEA
on educational
and training programs



State license to work
with radioactive materials



Experience in training
of foreign students
and specialists



Highly qualified experts



1st route

MASTERS PROGRAM
FOR MANAGERS,
without natural science
background



For the implementation of initiatives to access foreign decommissioning markets, a **principally new Masters program** was launched

BASIC COURSE

- Radiochemistry

STRUCTURE OF NUCLEAR FACILITIES

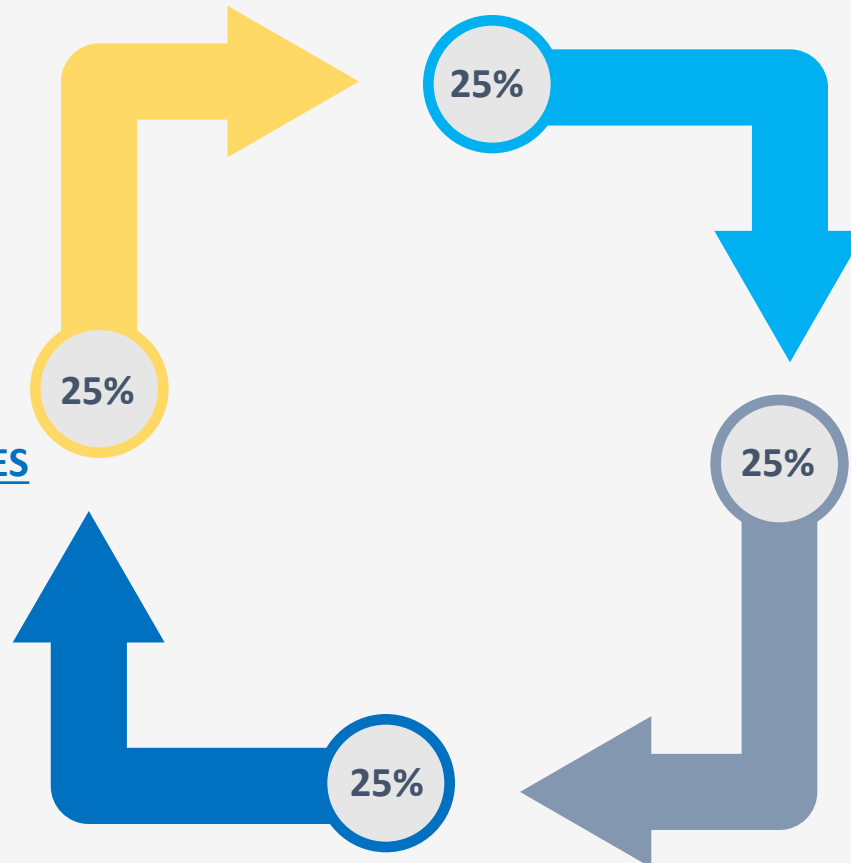
- NFC objects and their design features for the Nuclear facilities decommissioning
- NPP and RR and their design features for the Nuclear facilities decommissioning
- RW storage facilities and their design features for Nuclear facilities decommissioning

MANAGERIAL COMPETENCIES

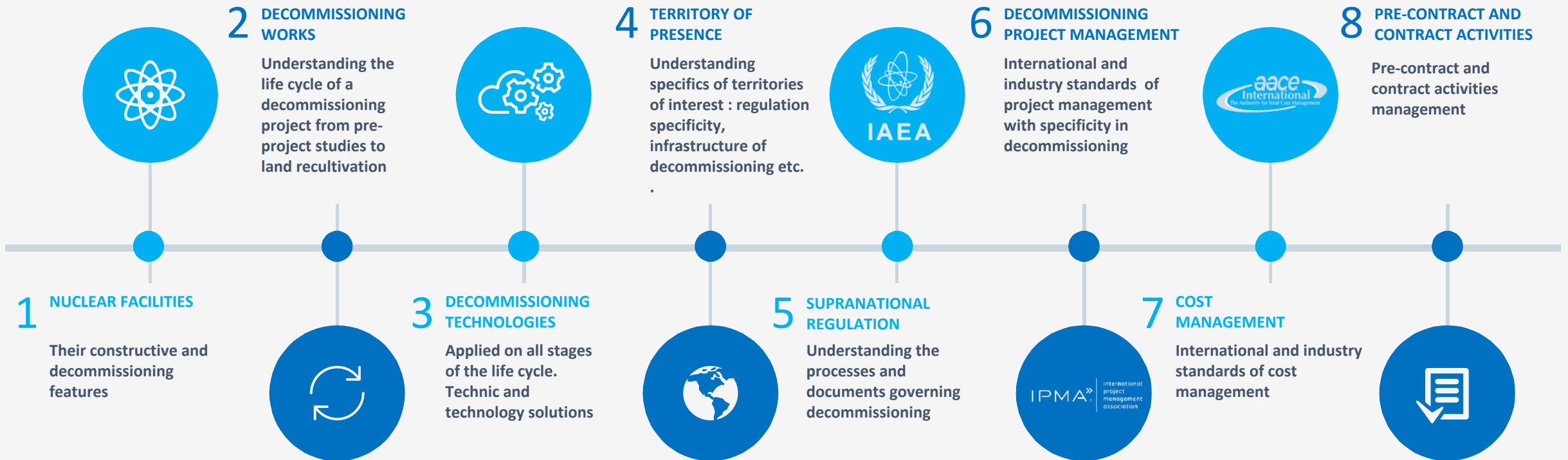
- Management of projects and programs in the field of Nuclear facilities decommissioning
- Financial and economic modelling
- Cost management
- Stakeholders relations management

METHODS OF WORK EXECUTION

- Methods of deconstruction and deactivation of building structures
- Methods of deconstruction and deactivation of thermomechanical and electrical equipment,
- RW management after decommissioning
- Land recultivation



Structure of Masters program



COURSE ON DECOMMISSIONING OBJECTS INFRASTRUCTURE



Nuclear facilities

1	Introduction To Nuclear fuel cycle	Types of objects in the Nuclear fuel cycle	Infrastructure
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2	Nuclear fuel cycle objects		
---	----------------------------	--	--

URANIUM MINING AND PROCESSING	URANIUM ENRICHMENT	FUEL FABRICATION	ELECTRICITY PRODUCTION	SNF MANAGEMENT	RW MANAGEMENT
<ul style="list-style-type: none"> • Uranium mining technology • Infrastructure objects in uranium mining technology 	<ul style="list-style-type: none"> • Uranium enrichment technology • Uranium enrichment infrastructure 	<ul style="list-style-type: none"> • Introduction to technology process of fuel fabrication, • Production infrastructure involved in each stage of fuel fabrication, design features 	<ul style="list-style-type: none"> • Nuclear power plants and research reactors. Types of Nuclear reactor facilities and their differences • Nuclear reactor concept. Basic equipment and zones of controlled and free access 	<ul style="list-style-type: none"> • Infrastructure of SNF management. Dry and wet storage processing plants. • Design features of the SNF infrastructure management 	<ul style="list-style-type: none"> • Infrastructure of RW management. Storage. Final waste disposal. • Design features of the RW infrastructure management

COURSE ON DECOMMISSIONING TECHNOLOGY

Within the program students will get an understanding about decommissioning technologies and their features



Methods of deactivation of equipment and structures

Equipment applied, their types and selection criteria, solutes used and their characteristics, cost estimation of works etc. The types of the RW generate in deactivation and their management.

1

Pre-dismantling decontamination

2

Decontamination of thermo-mechanical and activated equipment

3

Decontamination of building materials

4

Decontamination of electrical equipment



Methods of dismantling and fragmentation of equipment and structure

Equipment used , their types and selection criteria, cost estimation of works etc. Types of RW generate in deactivation and their management.

1

Dismantling of industrial equipment and structures

2

Dismantling and fragmentation of the activated equipment and structures

Equipment and tooling for dismantling and fragmentation including equipment for distant dismantling in zones of controlled access, robotics equipment, ordinary fragmentation etc.



Radioactive waste management

Production process chains for radioactive waste management, including extraction and conditioning, equipment used, etc.

1

Extraction of RW

2

Recycling and conditioning of RW

COURSE ON TERRITORIES OF PRESENCE

WITHIN THE PROGRAM
students will get an
understanding of NRHF
decommissioning
system on the
territories of their
business interests

1



Existing Nuclear facilities, their types and structural features, stop plans for them either extension of their operation

2



Existing system of RW management: the infrastructure made and to-be-made, limitations for technology scheme management, containers in use etc.

3



Regulatory system of decommissioning and RW management, specific features of national legislation, regulatory authorities and their functions, sanctions policy etc.

4



Funding of decommissioning. Approaches and principles for decision making and their application

5



Requirements for work execution. Requirements for the structure of documents, for tolerance, equipment, technologies and so on at execution of works on decommissioning of Nuclear facilities

6



Limitations at projects realization which ROSATOM may face at works execution on a certain territory

COURSE ON SUPRANATIONAL REGULATION

WITHIN THE PROGRAM

students will get an understanding of supranational requirements and approach towards regulation of the decommissioning activities

1



- Approaches to realization of supervisor function in direction of decommissioning of Nuclear facilities
- Sections on decommissioning and RW management. Key solutions and their influence on the realization of projects
- Acting and to-be-developed safety standards in the framework of relevant activities
- Others

2



- Functions of the organization. Existing groups on decommissioning and other related directions (e.g. robotics)
- Documentation (voluntary standards) on planning and realization of projects on decommissioning and RW management, incl. ISDC model. Management of uncertainty at decommissioning. Decommissioning objects management etc.
- Others

3

OTHERS

COURSE ON COST MANAGEMENT

WITHIN THE PROGRAM students will get an understanding of integrated managing of time and cost of project implementation at all stages

STUDENTS WILL GET KNOWLEDGE:

On methods for evaluating values in different classes of accuracy and principles of their application

On project budgeting methods and capital investment planning

On monitoring and cost control methods

1

Collection and analysis of product requirements, evaluation of its investment attraction, selection of project financing models, and analysis of the financial realizability, risks and their inclusion in project cost evaluation

2

Methods and accuracy of project cost estimation, project budget, mechanisms for specifying the cost and main investment indicators of the project, risk assessment and funds formation

3

Cost control and cost management mechanisms at stage of project execution

4

Completion phase- analysis of project financial performance, reassessment of business capabilities

THE COURSE IS SUPPLEMENTED BY A PRACTICAL COURSE ON THE FORMATION OF FINANCIAL AND ECONOMIC MODELS IN THE ENVIRONMENT OF MS EXCEL

THE COURSE IS REALIZED IN ACCORDANCE WITH REQUIREMENTS AND METHODS OF



* Incl., taking into account the content of the industry course in cost engineering

COURSE ON PROJECT MANAGEMENT

WITHIN THE PROGRAM

students will get an understanding for international certification in project management

AFTER COMPLETEING THE COURSE, THE STUDENT WILL GET KNOWLEDGE:

1 TO MANAGE THE PROJECT INTEGRATION

- *Composition of project integration management*
- *Characterization of inputs of project integration management*
- *Characterization of tools and methods of project integration management*

2 TO MANAGE THE PROJECT CONTENT

- *The composition of the project content management*
- *Characterization of inputs of project content*
- *Characterization of tools and methods of project content management*
- *Characterization of outputs of project content management*

3 TO PLAN AND TO MANAGE THE PROJECT DURATION

- *The composition of the project time management*
- *Characterization of process inputs by project dates Characterization of tools and methods of project time management*
- *Characterization of outputs of project content management*

4 TO MANAGE THE PROJECT COST

- *Composition of project cost management*
- *Characterization of inputs of project cost management*
- *Characterization of tools and methods of project cost management*
- *Characterization of outputs of project cost management*

5 TO MANAGE THE PROJECT QUALITY

- *Composition of project quality management*
- *Characterization of inputs of project quality management*
- *Characterization of tools and methods of project quality management*
- *Characterization of outputs of project quality management*

6 OTHER

IS GIVEN KNOWLEDGE OF THE INTERNATIONAL (METHODOLOGY) AND RUSSIAN (GOST STANDARD) REGULATORY FRAMEWORK.

CASES BASED ON REAL DECOMMISSIONING PRATICE

PREPARING FOR CERTIFICATION IN PROJECT MANAGEMENT

2nd route

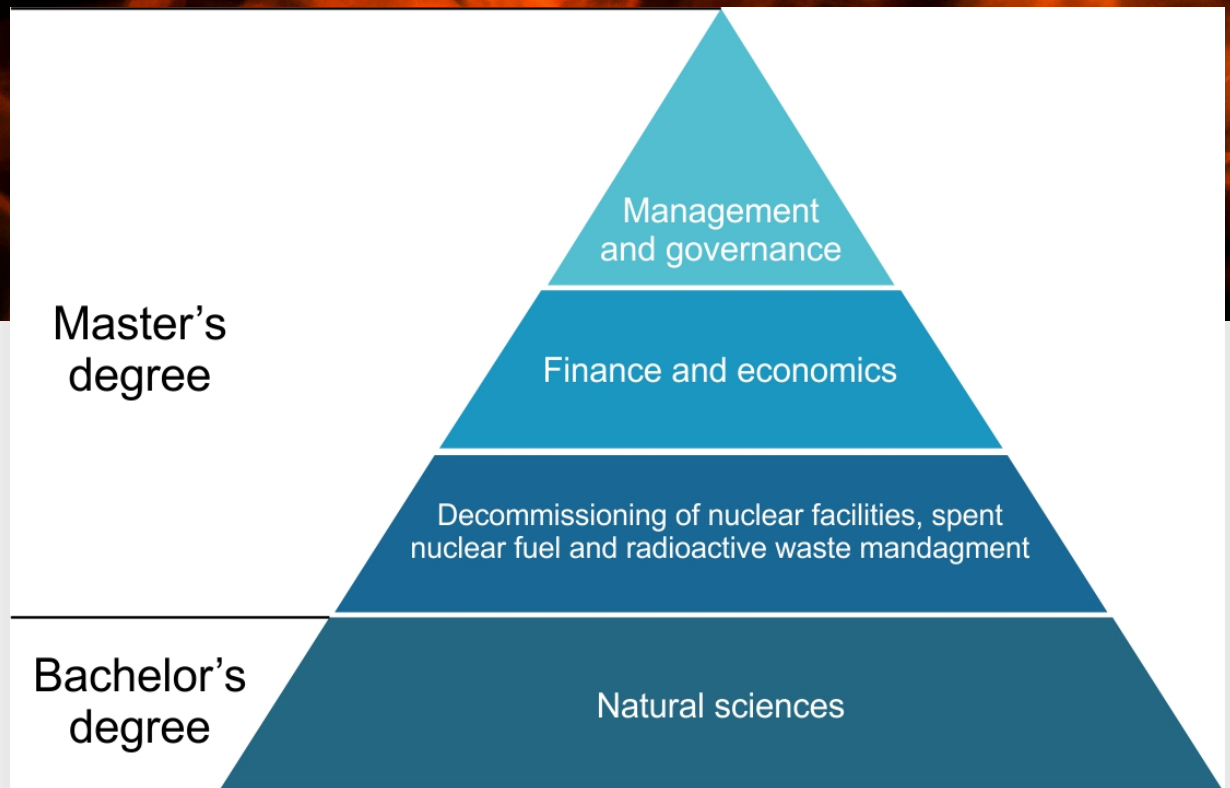
MASTERS PROGRAM
FOR MANAGERS,
with natural science
background



«PROJECT MANAGEMENT IN THE FIELD OF DECOMMISSIONING OF NUCLEAR FACILITIES» / including radioactive waste management /

Main topics:

- **Decommissioning** /National policy, Safety assessment, Technologies, Financial aspects, Process management/
- **Radioactive waste management** /Characterization, Technologies, National policy/
- **Financial aspects**
- **Human-resources**
- **Project management**
- **System approach and strategic thinking**



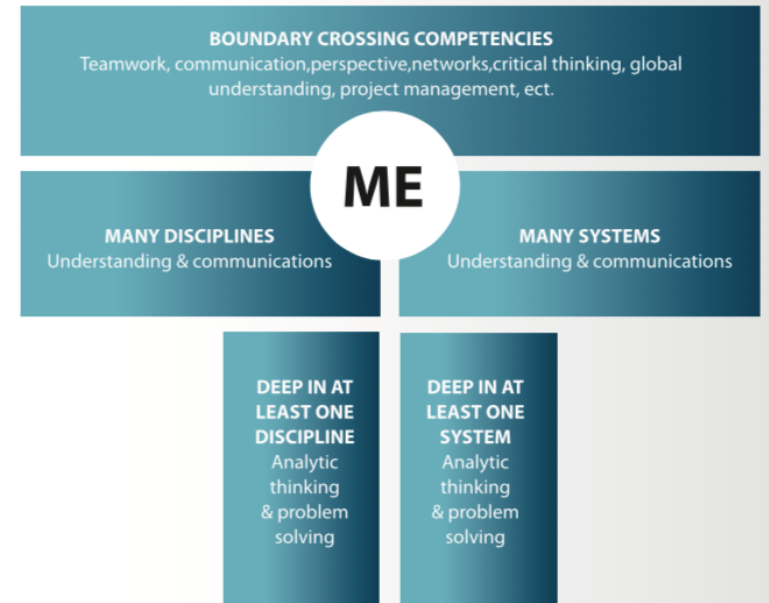
T-SHAPED PROFESSIONALS

THE PROGRAM PREPARES GRADUATES WHO HAVE MASTERED THE COMPLEX T-SHAPED COMPETENCIES:

- Graduates will boast fundamental knowledge and skills in key areas of the nuclear industry, as well as intercultural competencies that will enable them to hold an interdisciplinary dialogue and understand modern global business.
- Graduates will be successful cross-functional team members who have experience in raising and solving problematic questions using network communication resources and international knowledge bases

Prospective Career Paths

- Governmental institutions in the field of atomic energy
- Safety regulation institutions
- Organizations operating nuclear and radiation hazardous facilities or providing technical support to such facilities



DECOMMISSIONING MANAGEMENT MATRIX, INC. RWM (ROSATOM/MSU)

	Recognition Activities Decision-making	Transition (from operations to decommissioning)	Decommissioning (decontamination and dismantling)	Final site clearance (Demolition and land remediation)	Legacy* (Decommissioning was unplanned)	LTO concept (Long-term operation)
Legal framework	State Policy in Decommissioning (incl. Funds)	•				•
	State Policy in Waste Disposal (incl. Funds)	•				•
	Industry Strategy in Decommissioning	•				•
	Regulation in Public control	•				•
	Regulation in RWM	•				•
	Regulation in Decommissioning	•		•	•	•
Key strategic decisions	Site end state, Extent Clean Out	•	•	•	•	•
	Pace of Decommissioning (immediate or differed)	•	•	•	•	•
	Management of spent fuel	•	•	•	•	•
	Waste characterisation and technologies	•	•	•	•	•
	Documentation and knowledge inventory	•	•	•	•	•
	Cost of Decommissioning	•	•	•	•	•
Factors to consider	Risk management (ecological, financial, political...)	•	•	•	•	•
Implementation challenges	CERS** and design modification	•	•	•	•	•
	R&D planning	•	•	•	•	•
	D&D Infrastructure and Waste Technologies	•	•	•	•	•
	Capacity building	•	•	•	•	•
	Culture and organizational barriers	•	•	•	•	•
	Stakeholder involvement	•	•	•	•	•
	Knowledge management	•	•	•	•	•
Programme and project management in Decommissioning	Decommissioning service projects	•	•	•	•	Knowledge Based Management (Inc. Uncertainties management)
	Decommissioning of "turnkey" projects	•	•	•	•	
	National programs in Legacy	X	X	X	•	
	Integrated NPP projects (Decommissioning ratio in LCOE)	•			X	
	National Waste disposal programs	•				
	Global waste disposal infrastructure and criteria harmonisation	•				

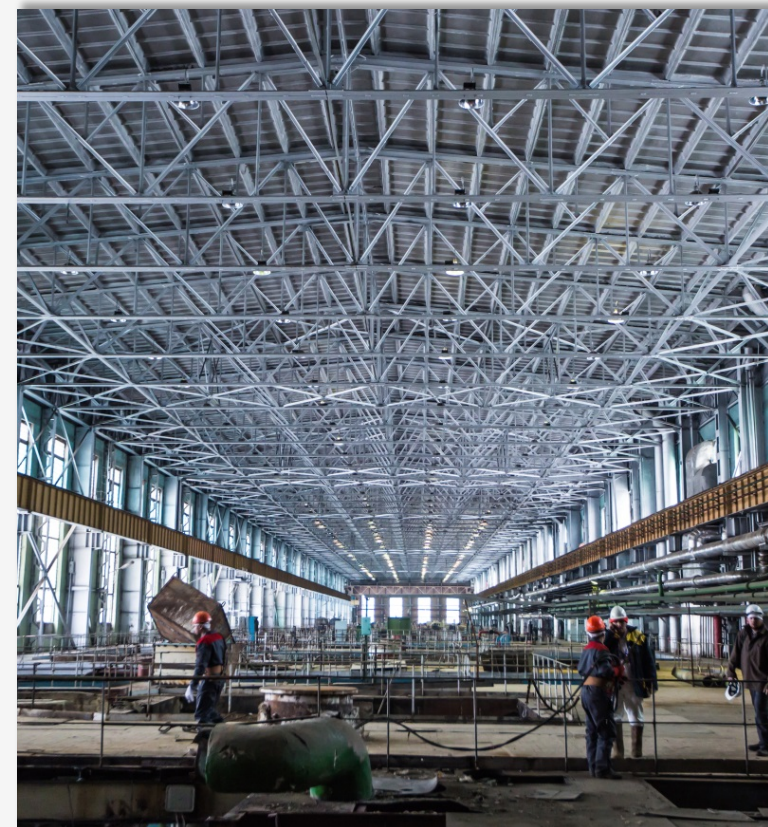
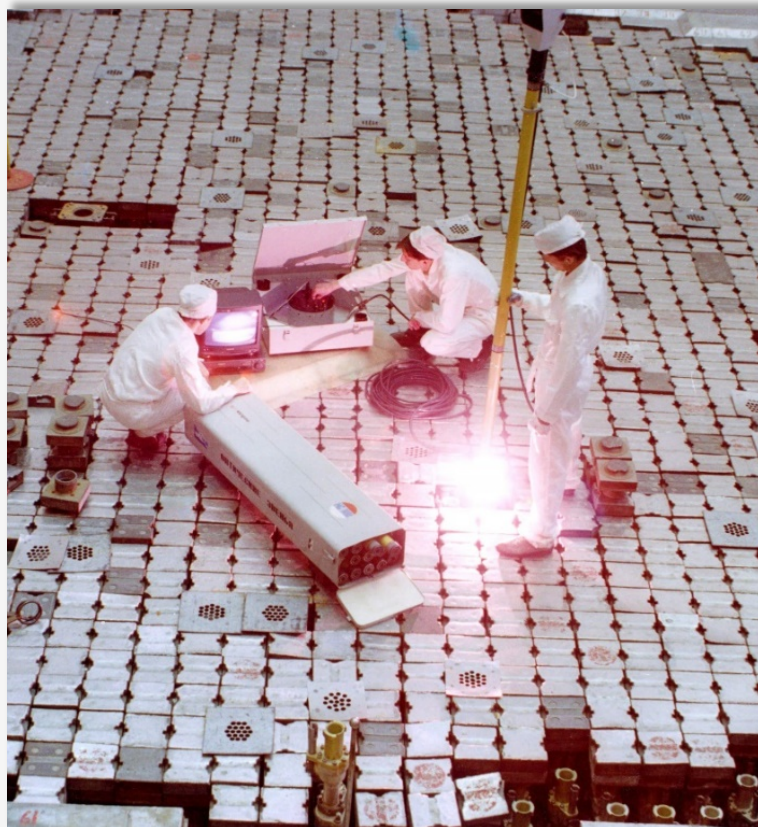
* Legacy in Decommissioning: Decommissioning was unplanned and/or history of exploitation was not keeping

** CERS – Comprehensive Engineering and Radiation Survey

PRACTICE

In companies
of
ROSATOM

One of the practices –
JSC «Pilot and Demonstration Center for Decommissioning
of Uranium-Graphite Nuclear Reactors» /«PDC UGR»/Seversk



3rd route

ADDITIONAL
EDUCATION PROGRAMS
IN DECOMMISSIONING
combinable for
customer needs

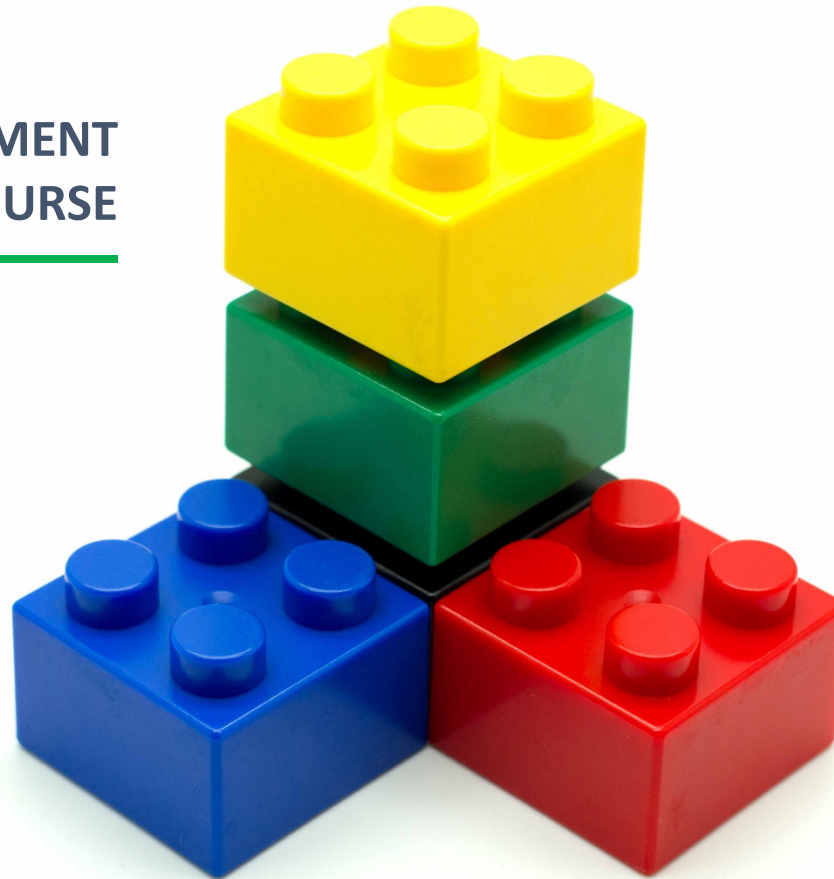


**OPTION TO COMBINED TRAINING BLOCKS
ACCORDING TO THE COUNTRY AND CORPORATE TASKS**

**COST MANAGEMENT
COURSE**

RADIOCHEMISTRY

**PROJECT MANAGEMENT
COURSE**



THANK YOU!



Andrey Putyatin

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