



РОСАТОМ

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Round Table “Economic efficiency, safety guarantees during implementation of reference solutions at the final life cycle stages of nuclear energy objects”

ГОСУДАРСТВЕННАЯ КОРПОРАЦИЯ ПО АТОМНОЙ ЭНЕРГИИ «РОСАТОМ»

Experience of Evaluation of RWM Integral Performance in the Atomic Energy Industry

Project Office on the Formation of Unified State System of RW Management

ROSATOM

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- Effectiveness evaluation depends on the position of an evaluator and on the situation in which the evaluation is made. This report was prepared by a Project Office of the State Atomic Energy Corporation "Rosatom" in the context of coming into force of the Federal Law No. 190-FZ "On Radioactive Waste Management...", implementation of the technological development and global competitiveness strategy as well as of the new political and economic situation.
- The State Atomic Energy Corporation "Rosatom" is at the same time a governmental body in the field of radioactive waste management and an industrial holding corporation, therefore an integral effectiveness evaluation is carried out with consideration of both macroeconomic and microeconomic effects.
- The Unified State System of Radioactive Waste Management is established for the purposes of safe and efficient radioactive waste management. The report is considering efficiency management providing the achieved safety level maintaining (more complex situations of "acceptable risk provision" and "safety management" are not considered).
- In this report we are not going to discuss the issues of effective management of accumulated waste which had been generated before the Federal Law No. 190-FZ came into force and which is currently in the federal ownership. Concepts and methods of effectiveness evaluation, which were originally developed in regard to radioactive waste resulting from the activities of business entities, will be applied to accumulated waste.

The situation in which the problem of radioactive waste management performance evaluation is solved. Presentation Outline.



1. Following the entry into force of the Federal Law No.190-FZ "On Radioactive Waste Management ..." concept of activities related to radioactive waste management has changed significantly: the transition from the concept of *safe RW storage at operation sites* to the concept of *RW disposal at centralized disposal facilities* is currently underway. It is necessary to develop an operating model conforming to this new concept. The problematic issue is that activities in the field of radioactive waste disposal are of infrastructural character.

2. One of the principles of the state policy is "accessibility and transparency of information in the field of nuclear and radiation safety" (including radioactive waste management). The model of public governance in the field of radioactive waste management is based on the principles of Good Governance (involvement of a broad range of stakeholders). The problematic issue is that future generations should also be included among the stakeholders.

3. In the crisis conditions, ROSATOM's strategy has been adjusted: it is necessary to provide the outrunning growth of labor productivity, revenue, and business portfolio. The activities in the field of radioactive waste management should contribute to priority growth rate of required infrastructure creation and removing of excessive conservatism. The problem point is how to take into account the specific characteristics of radioactive waste generation dynamics (quantitative / qualitative / temporal).

4. Since the Unified State System of Radioactive Waste Management is now being built, we should answer twice to the question about economic effectiveness of radioactive waste management:

- What is the initial economics of RW management?
- How will the effectiveness growth of radioactive waste management be provided after the creation of USS RWM?

The problem point is how to take into account ROSATOM's strategy adjustments.

1.1. Federal Law No.190-FZ about the change of concept in the field of RW management

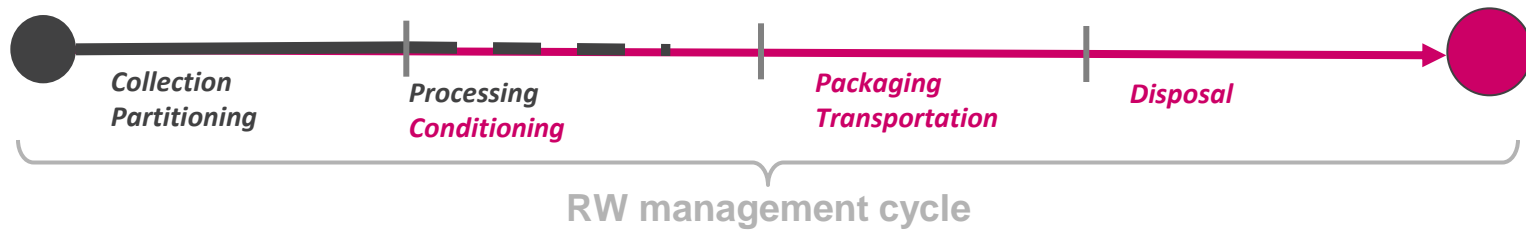
- The Unified State System of Radioactive Waste Management is established to organize and ensure **safe** and **cost-efficient** management of radioactive waste including its disposal (Article 10)
- Radioactive waste (hereinafter referred to as RW) ... are subject to obligatory disposal at RW disposal facilities (Article 12)
- RW generated after the entry into force of the Federal Law, are owned by the organization the activities of which resulted in RW generation (Article 9)
- RW generating organizations are responsible for ensuring safe management of RW until it is transferred to the national operator (Article 10). The national operator ensures safe management of radioactive waste accepted for disposal (Article 20)
- Financial provision of activities on radioactive waste management, including its disposal, is carried out at the expense of RW generating organizations (Article 10)
- The amount of payment is determined basing on the tariffs for RW disposal and the volume of RW brought into conformity with the eligibility criteria for the purpose of disposal (Article 21)

1.2. Change of the concept of RW management activities

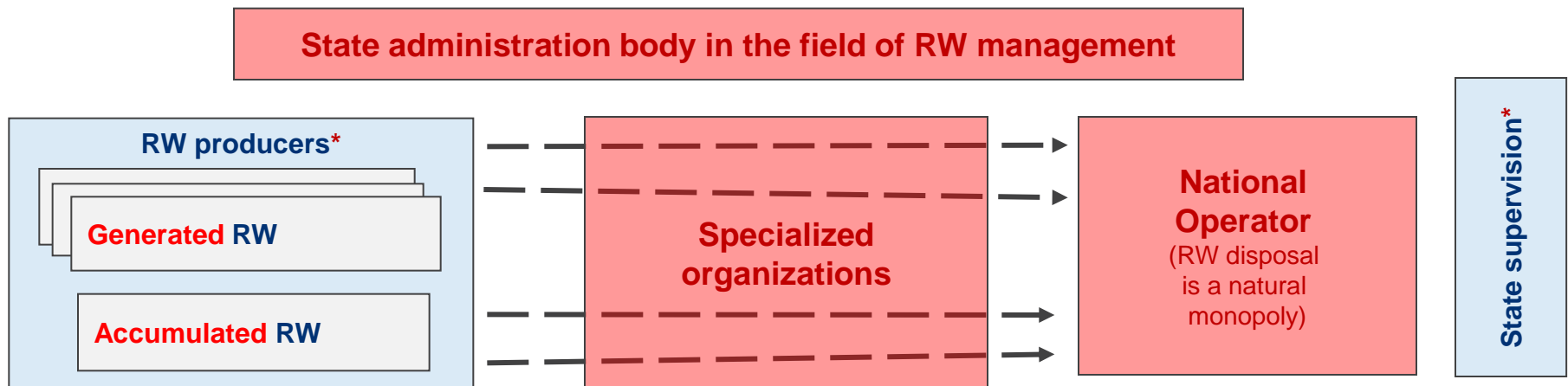
1. After the entry of the law into force RW management activities are considered in the context of a full technologic cycle

Previously organizations-operators of nuclear and radiation hazardous facilities bore the costs only at the initial stages of management

From the moment of the entry of the law into force organizations-operators of nuclear and radiation hazardous facilities will bear financial responsibility for all stages including disposal



2. Organizational structure of USS RWM has been defined

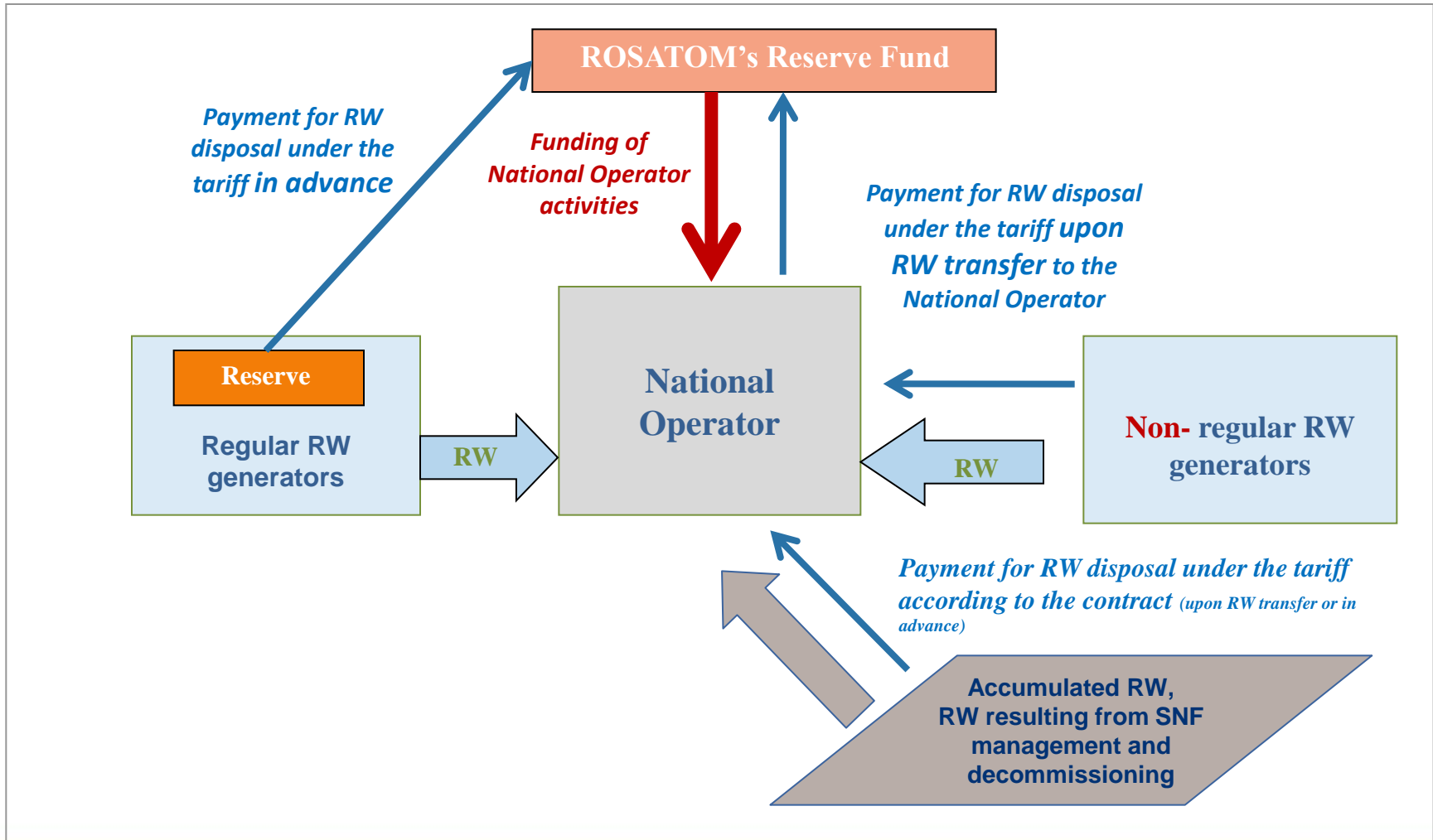


1.3. Change of the concept of RW management activities

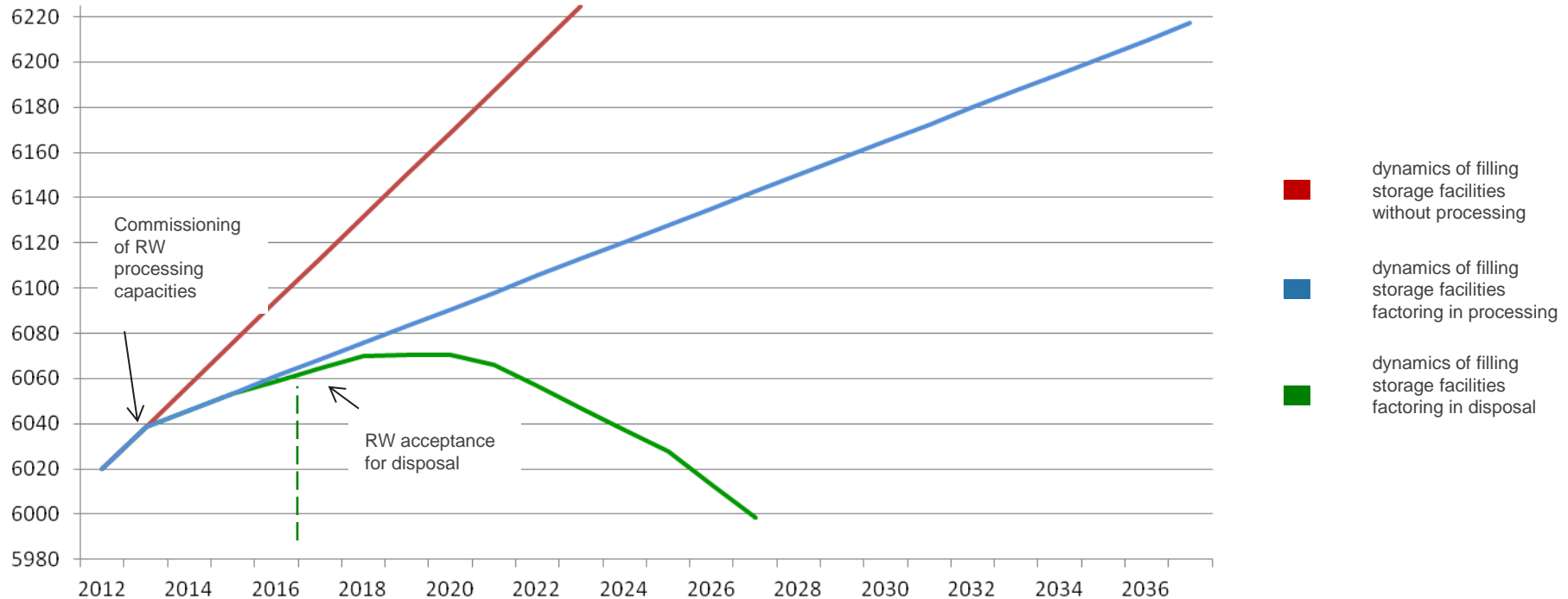


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3. The mechanism of financial support of RW disposal is determined



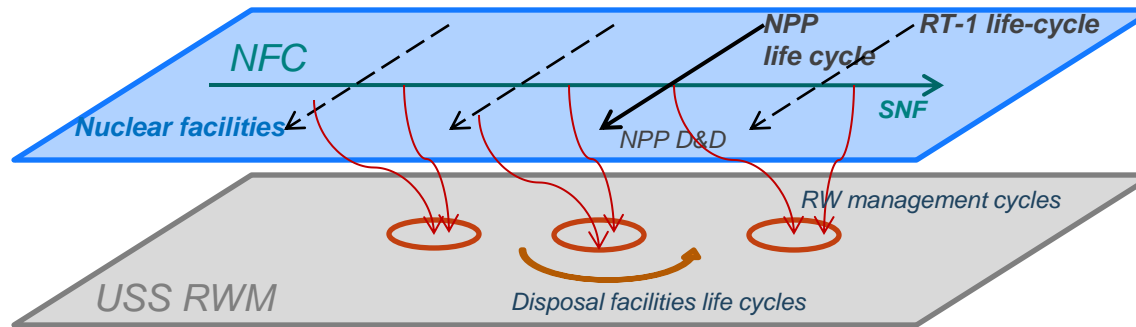
1.4. Example of estimation of dynamics of SRW storage facilities filling under transition to RW disposal concept



- ✓ Without the commissioning of new capacities for RW processing the storage facilities will be completely filled by 2022.
- ✓ Factoring in commissioning of new capacities for RW processing and reduction of RW volume the storage facilities will be filled by 2037.
- ✓ Starting from 2019 the disposal volume will actually become equal to the volume of RW generation and processing at the enterprises of the branch ~ 7 thousand cubic meters.
- ✓ By 2025 the volume of filling RW storage facilities will reach the level of 2013 and evacuation of accumulated RW from storage facilities will begin.

1.5. Problem points – RW management activities are infrastructural ... What are the effective infrastructures of USS RWM?

- RW management is not a link in the value chain and not the final stage of another cycle, but it is a separate technological cycle. To be more precise, two types of technological cycles: RW management cycles and disposal facilities life cycles.

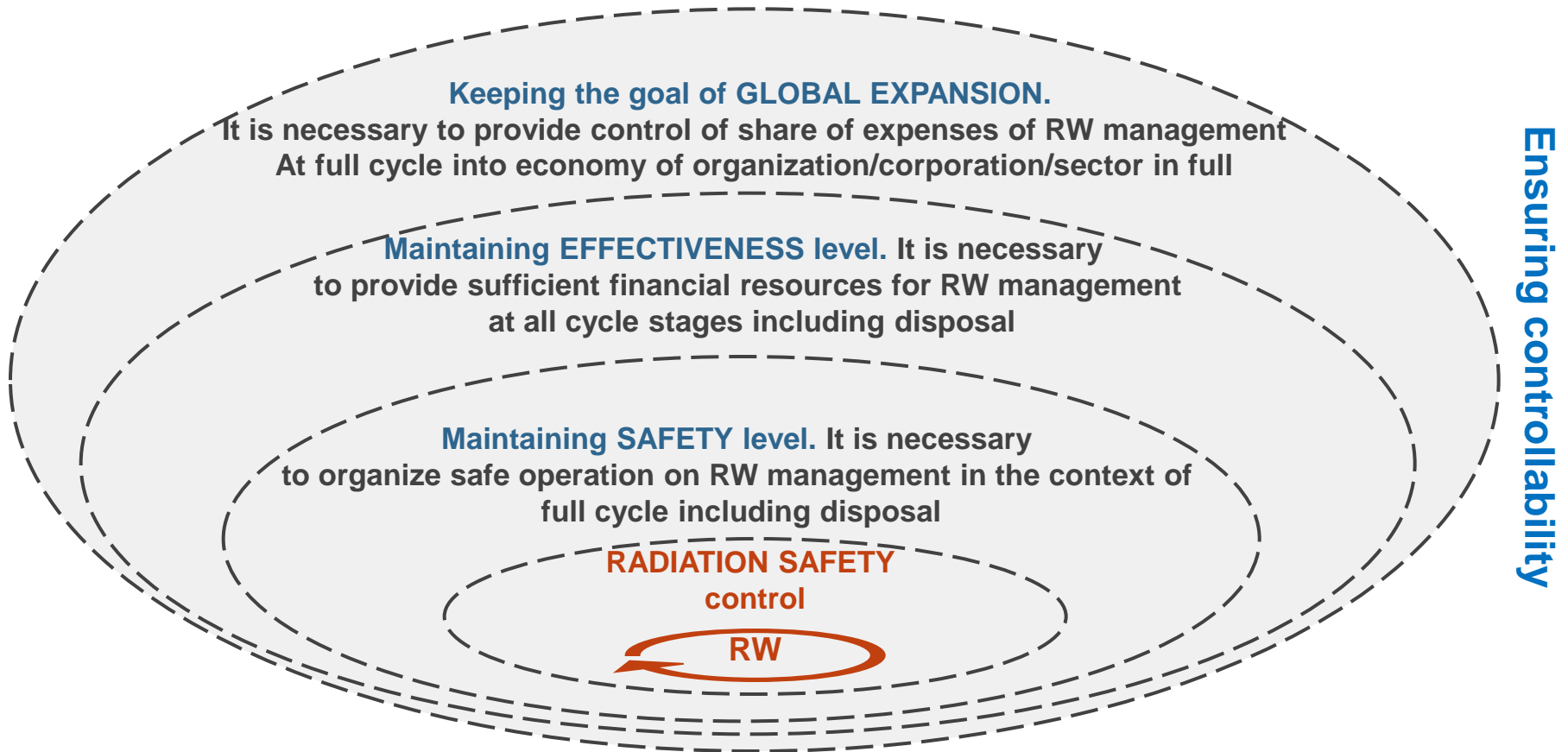


- RW management still is the only activity in Russia, for which the law establishes the principle of life-cycle management (taking into account all stages of management, including RW disposal).
- RW management cycles are the “longest” technological cycles, they have their roots in other technological cycle of nuclear power. Therefore they set the appearance and the time scale during the transition to the concept of industry lifecycle management.
- The activities on radioactive waste management are **infrastructural**. We should not hurry just to earn money from certain services for RW management and to achieve the efficiency of services. We must learn to create effective technological infrastructure for RW management. This is the key role of the centralized service.
- Technological infrastructures are efficient **if operation for RW management is organized as service activity**, which can render all the necessary service volume to operator organizations generating RW in all regions where these organizations operate.

2.1. Formation of the first circuit of RW management governance in the context of life-cycle management

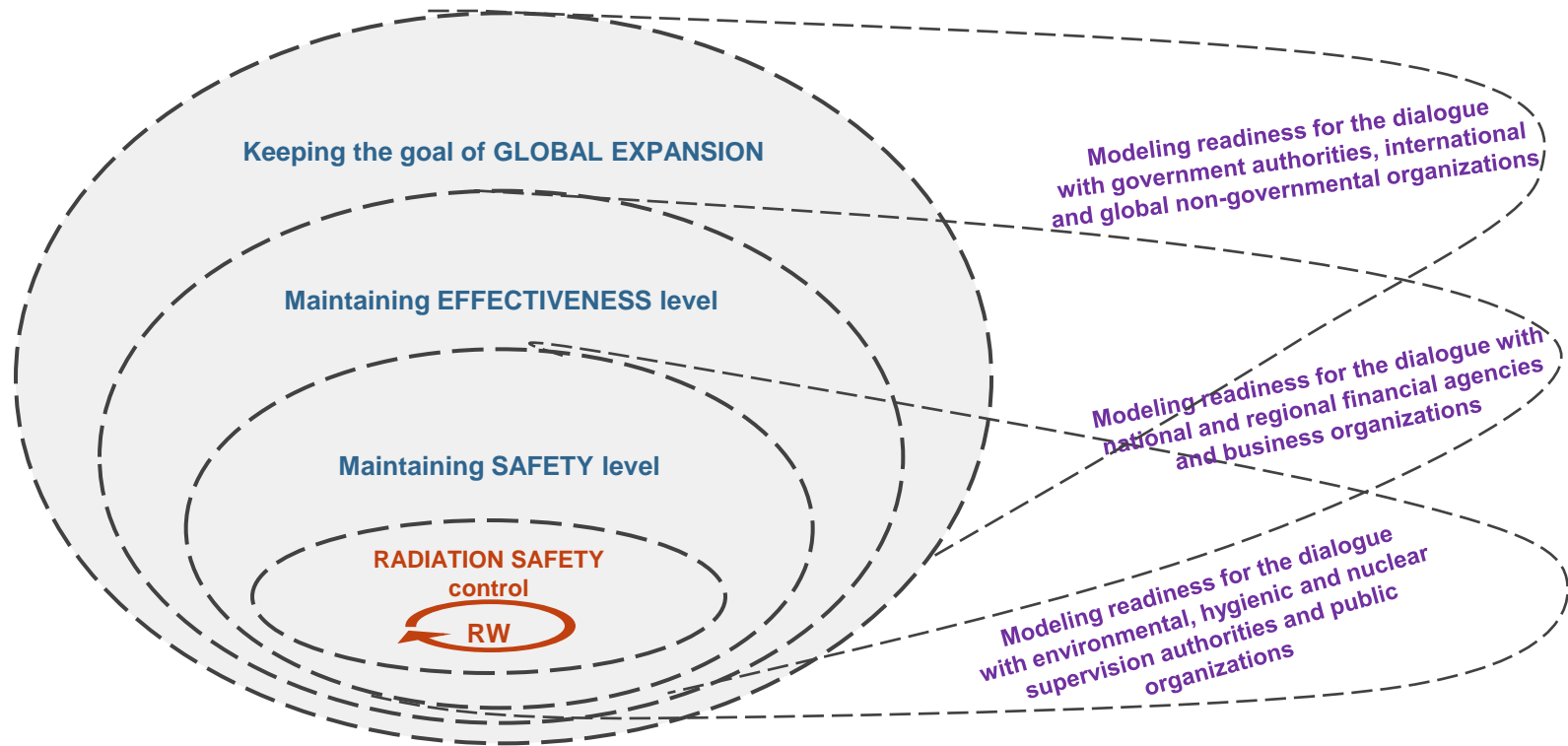


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Modeling of multilevel system of corporate governance
(Case Modeling)

2.2. Formation of the first circuit of RW management governance in the context of life-cycle management



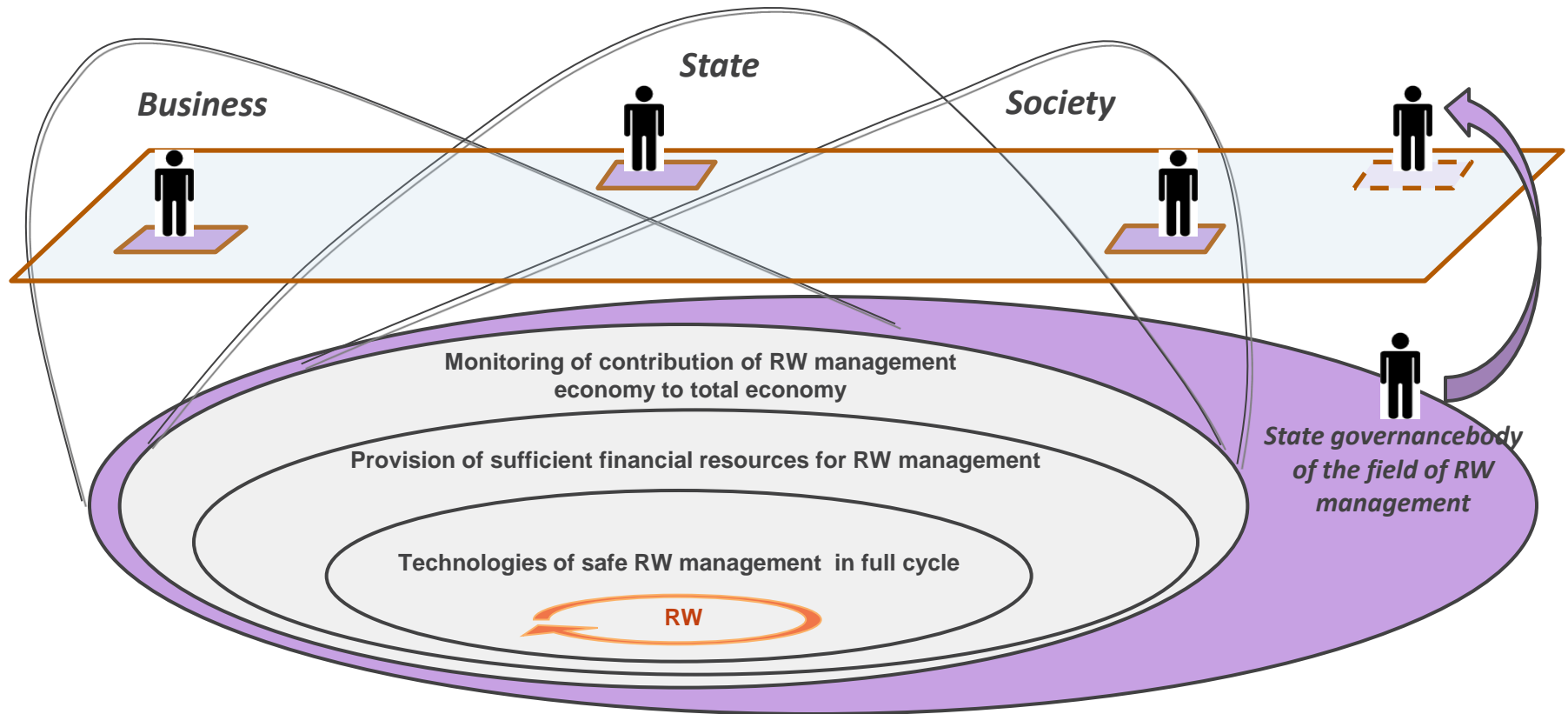
Ensuring public acceptance

Modeling multifocal strategic management system
as a decision-making system in a dialogue with stakeholders
(Procedural Modeling)

2.3. Two managerial circuits of the modern governance system in the field of RW management



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Good Governance principles:

- ✓ timely provision of all interested parties with sufficient information to make sound decisions
- ✓ conducting public dialogue with stakeholders

2.4. Problem point– future generations are a stakeholder...

- As future generations cannot participate today in decision-making to respect their interests the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management established the following principles:
 - vi) Strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;
 - vii) Aim to avoid imposing undue burdens on future generations.
- The “most effective” way of implementing these requirements i.a. in the field of radioactive waste management is to abandon nuclear technologies, to dispose of spent fuel and dispose of radioactive waste. But these nuclear and radiation technologies are now providing the multipolar global world order and further technological development of the mankind – and these are certainly positive consequences of the use of nuclear and radiation technologies from the point of view of future generations.
- Therefore, in the field of radioactive waste management (where we cannot disregard the interests of future generations) evaluation model of effects and efficiency is being developed (oriented on values of safety, environmental friendliness, public acceptance, etc.).
- As the activities on radioactive waste management is an infrastructure activity, the “implementation of values” in the field of radioactive waste management is achieved by:
 - linking technological cycles of RW with the main technological cycles and natural cycles, and then estimate the cost of radioactive waste management in such built-in cycles,
 - modeling of emergency / problem situations and assessing their probability; and then estimating the cost of measures to prevent these situations or mitigate the negative consequences.
 - revealing insidious (wicked) problems requiring applied research and creation of convergent technologies.

2.5. Implementing the values of cost effectiveness, safety and environmental compatibility: the Law No.190-FZ establishes 6 principles of USS RWM functioning



Cost effectiveness	Safety and environmental compatibility
<p>The principle of taking into consideration the interdependence between RW generation stages and RW management stages</p> <p>Polluter pays for generated from revenues resulting from his operation</p> <p>The law defines the source of funding</p>	<p>The principle of prohibition of import or export of radioactive waste”</p> <p>The ultimate responsibility of the State for the safety of radioactive waste management is limited to the waste resulting from the use of technologies and products of the Russian origin</p> <p>The law limits the ultimate responsibility of the State</p>
<p>The principle of financial support of radioactive waste management activities from the funds of organizations generating radioactive waste”</p> <p>Polluter pays</p> <p>The law determines who is responsible for financing</p>	<p>The principle of availability for people and public associations of the information related to safety and prevention of accidents in RW management, as well as other information, if it does not contain information classified as state secret</p> <p>Openness of information on safety</p> <p>The law established the principle of openness</p>
<p>The principle of responsibility of RW generating organizations for safe radioactive waste management”</p> <p>Polluter is responsible for safety</p> <p>The law determines who is responsible for safety</p>	<p>The principle of priority of protecting human life and health of present and future generations and the environment from negative impacts of radioactive waste</p> <p>Radiation safety is top priority</p> <p>The law determines priorities</p>

2.6. Implementing the values of cost effectiveness, safety and environmental compatibility: 6 principles of USS RWM governance were additionally introduced



Principles of cost effectiveness management	Principles of cost effectiveness	Principles of safety and environmental compatibility	Principles of safety and environmental compatibility management
Reduction of RW generation volumes (reduction inclusive of safe RW management costs i.e. optimization of RW generation volume)	RW producer pays for generated RW from the revenues from operating activities	Ultimate responsibility of the State for safe RW management is limited to the waste resulting from the use of technologies and products of Russian origin	State responsibility for nuclear legacy as related to RW disposal should be reliably estimated (in the context of decision on classification of waste as “special”, i.e. cost optimization for RW disposal)
«Pay and forget»	RW producer pays	Availability and openness of information on radiation safety during RW management	Transparency of information on radiation safety
Minimization of safe RW management costs	Polluter несет is responsible for safe management	Radiation and environmental safety is top priority при размещении объектов инфраструктуры	Regionalization USS RWM (USS RWM is developed with due account of regional specifics)

Microeconomy (Organization)

Macroeconomy (USS RWM)

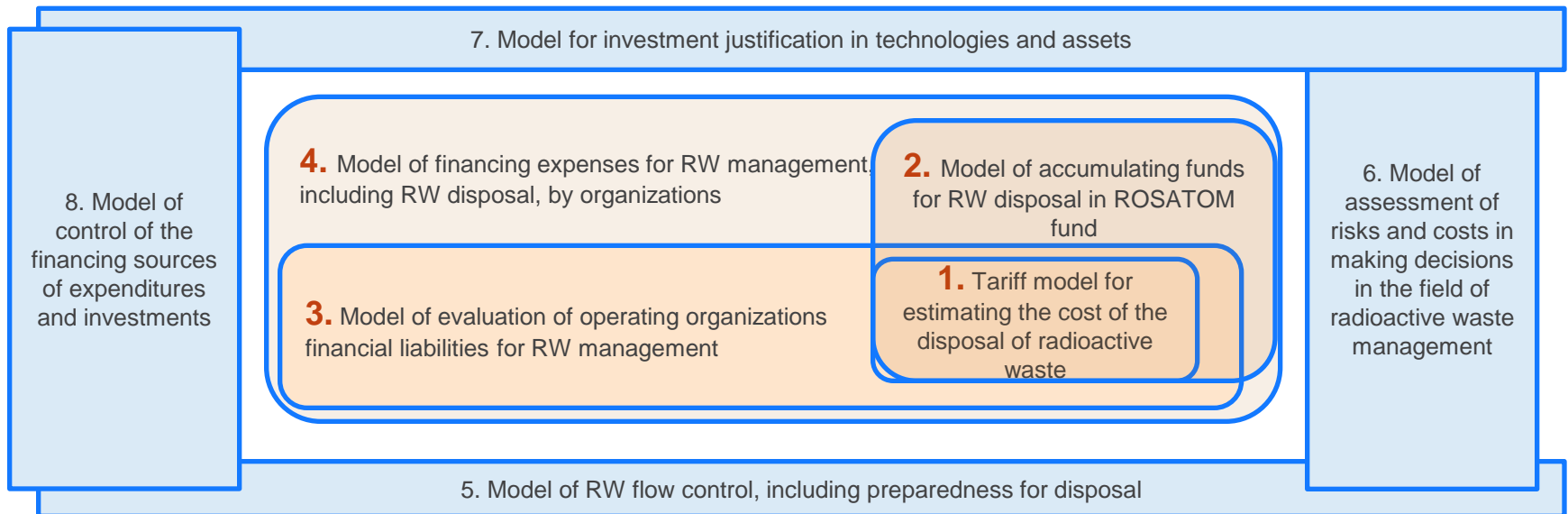
Integrated economy of the industry

2.7. Providing cost-effective management of radioactive waste: Cost estimation of radioactive waste management as a built-in cycle



For the purposes of integrated estimation of RW management performance in USS RWM 8 interrelated financial and economic models are used:

- Models 1,2,3,4 allow evaluating RW management costs if technology cycles interface with nature cycles,
- Models 5,6,7,8 allow evaluating the cost of RW management if RW management technology cycles interface with main technological cycles (nuclear fuel cycle, NPP life-cycle etc.)



During 2011-2012, the concepts of all the eight models were developed and models 1,2,3 and 4 are prepared for implementation.

In 2013 a REFERENCE POINT was set in ensuring effective RW management

New:

- Norms for allocations to the reserves for RW disposal were approved, and organizations are to transfer the money to the fund,
- Organizations have planned the expenditures on radioactive waste management,
- Organizations record in current accounting under Russian Accounting Standards their liabilities for RW management,
- ROSATOM has started financing the activities of the National Operator in accordance with the tariff model.

3.1. Experience of integrated evaluation of RW management performance: Adjustment of the initial economy



In 2010-2013, a model of assessment of financial liabilities of operating organizations for RW was developed .

At this stage, concept of the uniqueness of each company in the choice of technologies to prepare radioactive waste disposal was adopted, and applied a conservative approach when determining the assumptions of the model. Over the past three years, all industry organizations described their activities and the model has been refined to meet the peculiarities of all industrial enterprises.

In 2014, after the approval of the eligibility criteria for the purposes of waste disposal, it was planned to begin a 3-year work on the standardization of production and processing chains for the preparation of the waste for disposal, and after the completion of the valuation assessment model to clarify the obligations and remove excessive conservatism.

In crisis, additional tasks were set:

- 1) to develop a more detailed model of liabilities assessment in the field of radioactive waste management, which allows to carry out factor analysis, to identify conservative assumptions of the model and implement measures for the removal of excessive conservatism in the field of radioactive waste management;
- 2) taking into account the updated model in RW to finalize model in the field of spent nuclear fuel and the output of the D & D operation and form a package of compatible models.

As a result of the work of financial liabilities have been significantly adjusted

The table shows the results (effects) from the model itemization and excessive conservatism relieving.

Factors of liabilities change	RW, assessment	RW, actual	Effects
Liabilities as of 01.01.2014	7,07	7,07	
Discount amortization in 2014	0,23	0,57	
Liabilities increase in 2014 (new liabilities)	5,10	3,15	-1,95
Liabilities fulfillment in 2014	-3,50	-3,62	
Cumulative change of estimates as a result from activities	0	-2,19	-2,19
Other factors	0	0,06	
Liabilities as of 01.01.2015 (actual)	8,90	5,04	

Thank you for your attention!

