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Spent fuel management strategy development in Belarus

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Introduction

- The ultimate objective of the spent fuel management:
 - *To protect individuals, society and the environment from the harmful effects of ionizing radiation due to spent fuel and arising radioactive waste both now and in the future without imposing undue burdens on future generations.*
- Two distinct fuel cycles are employed:
 - *Open fuel cycle: spent fuel is considered to be high level radioactive waste (HLW)*
 - *Closed fuel cycle: spent fuel is reprocessed to recover unused uranium and the plutonium generated with the production of HLW*
- Some States have postponed the decision and are taking “wait and see” approach.

National Policy

The goal of the national policy of the Republic of Belarus in the field of spent fuel management is to ensure the protection of individuals, society as a whole and the environment from the harmful effects of ionizing radiation during the spent fuel management of the Belarusian NPP and the resulting radioactive waste; ensuring national security now and in the future without imposing excessive burdens on future generations; achieving optimum economic feasibility and environmental acceptability; fulfillment of obligations to the world community by creating a state system for spent fuel management, including legislative, organizational and financial mechanisms, labor resources, infrastructure facilities.

Principles for establishing the SNF strategy

- Responsibility for safety: the prime responsibility for safety rests with SNF generator.
- Role of government: legal and governmental framework for safety is established and must be sustained.
- Management of safety is established and must be sustained
- Justification of facilities and activities: they must yield an overall benefit.
- Optimization of protection must provide the highest level of safety that can reasonably be achievable.
- Limitation of risks to individuals: no individual bears an unacceptable risk of harm.
- Protection of present and future generations against radiation risks.
- Prevention of accidents: all practical efforts must be made to prevent nuclear or radiation accidents.
- Emergency preparedness and response: all necessary arrangements must be made in case of nuclear or radiation incidents.
- Protective actions to reduce existing or unregulated radiation risks: these must be justified and optimized.
- Public participation in decision making: decisions which may have a potential health, social or environmental impact should be made in consultation with those who may be affected.
- Sustainable development: In view of long periods of time that SNF and arising radioactive wastes must be safely managed, the sustainability considerations are relevant.⁴

Legal basis: Applicable International Conventions and Treaties

- The Joint Convention on the Safety of Spent Fuel management and on the Safety of Radioactive Waste Management (put into force for Belarus in 2002).
- Convention on Nuclear Safety (put into force for Belarus in 1999).
- Treaty on the Non-Proliferation of Nuclear Weapons (put into force for Belarus in 1993).
- Convention on the Physical Protection of Nuclear Material (put into force for Belarus in 1993).
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), put into force for Belarus in 2006.
- Vienna Convention on Civil Liability for Nuclear Damage (put into force for Belarus in 1998).
- Convention on Early Notification of a Nuclear Accident (put into force for Belarus in 1987).

Legal basis: Strategic decisions in the field of radioactive waste management

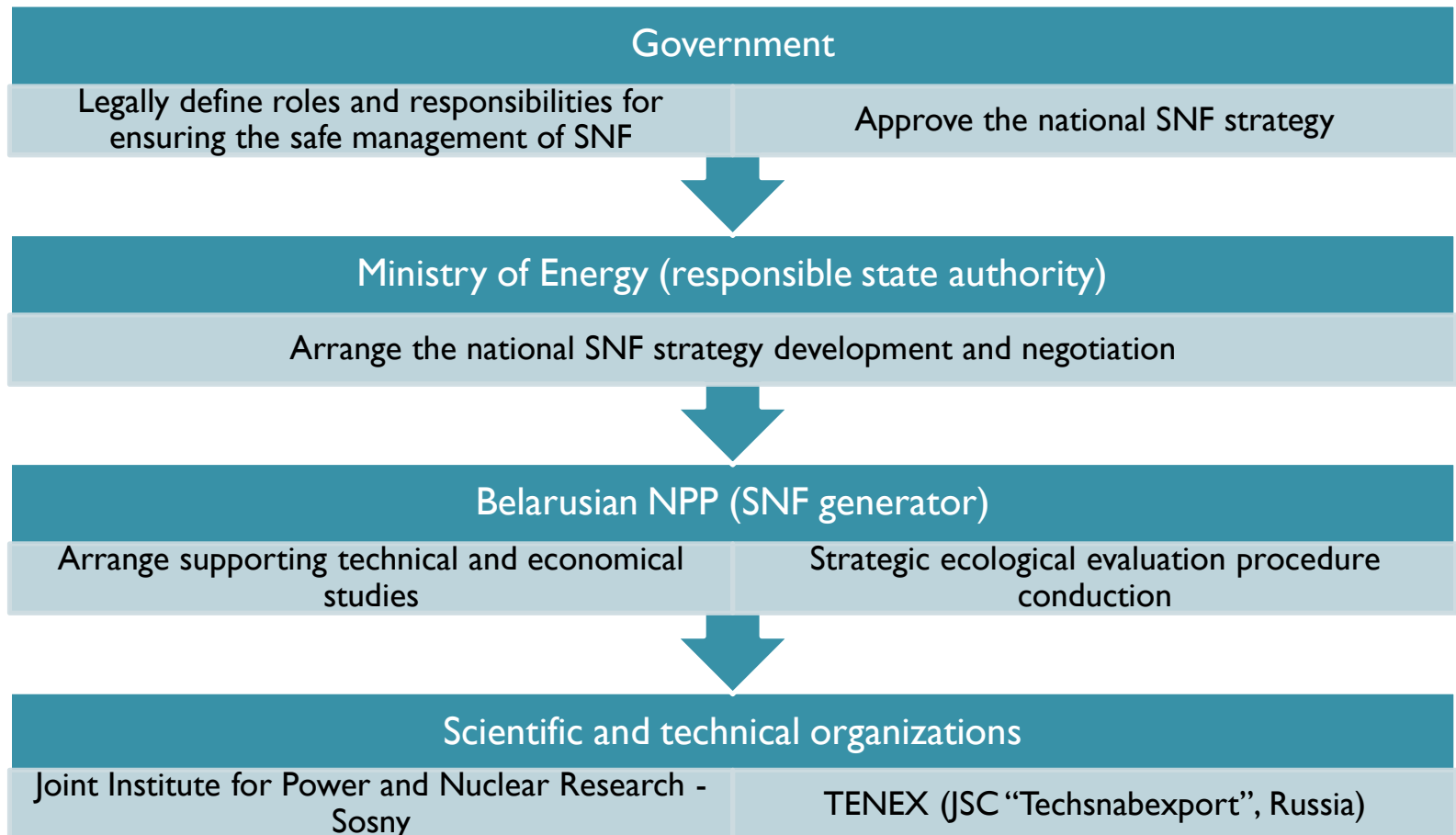
- The Republic of Belarus has developed and the Government has approved the Radioactive waste management strategy for the Belarusian NPP (June 2015).
- The Strategy estimates RW volumes, including HLW, generated over the entire operation period (60 years) and during the decommissioning of the Belarusian NPP (except for the spent fuel including possible waste from reprocessing).
- The need to ensure the storage of HLW (except for spent fuel) at the Belarusian NPP site during the NPPs life time is determined.
- The need to conduct R&D for constructing a disposal facility for HLW in a deep geological formation after the decommissioning of the nuclear power plant is indicated.

Spent fuel inventories

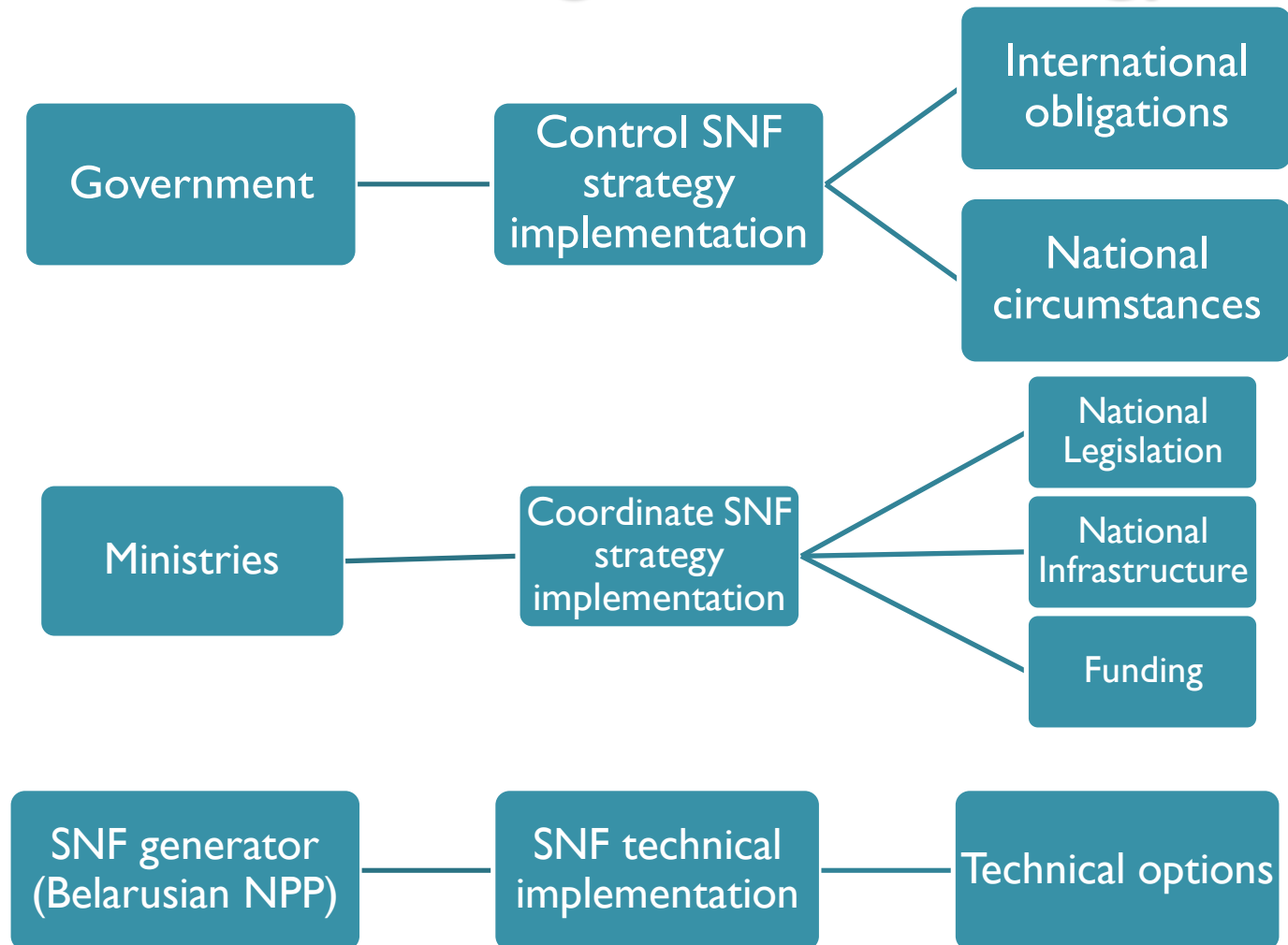
- Spent nuclear fuel of the decommissioned transportable nuclear power plant “Pamir 630D” and research reactor IRT-M was removed to the Russian Federation for the reprocessing in 2010. No HLW returned.
- Belarusian Nuclear Power Plant is being constructed on Ostrovets site with 2 units of WWER-1200.
- About 2500 tons HM SNF to be generated due to its operation in 12 month fuel cycle since 2020 until 2080.



Principle steps in the development of the SNF management strategy



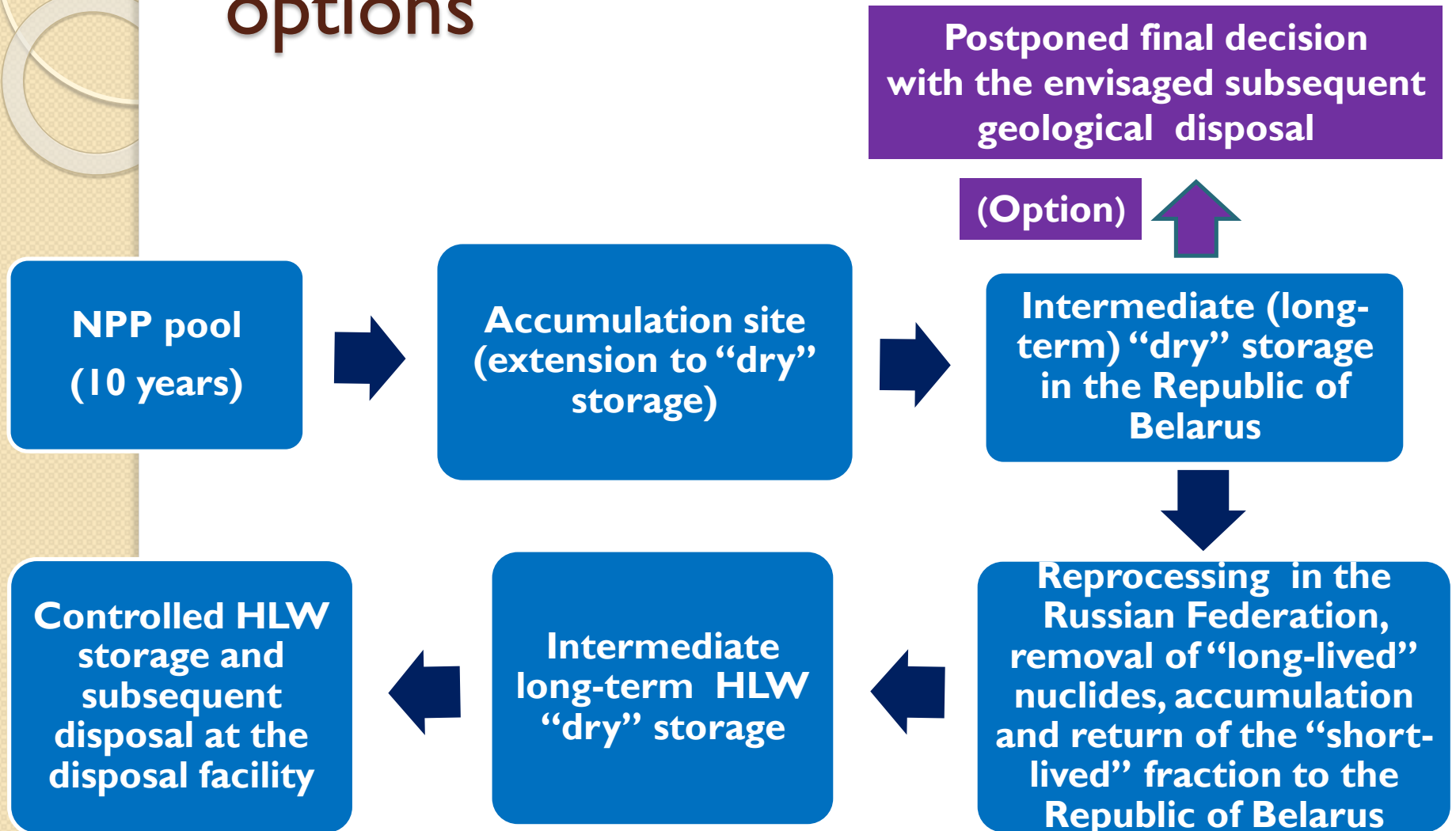
Principle steps in the implementation of the SNF management strategy



Principal conclusions of the technical and economical assessments

- The priority option for the treatment of SNF of the Belarusian NPP is currently the reprocessing of SNF in the Russian Federation with return to the Republic of Belarus of equivalent amount of HLW included in the glass-like matrix containing radionuclides of Cs-Sr (short-lived) fraction, excluding long-lived radionuclides, and its subsequent long-term controlled storage and disposal.
 - *According to the current agreement between the governments of the Republic of Belarus and the Russian Federation on cooperation in the construction of a nuclear power plant on the territory of the Republic of Belarus: SNF of the Belarusian NPP is to be returned to the Russian Federation for reprocessing under the conditions defined in a separate Intergovernmental Agreement.*
- The construction of long-term “dry” storage facility of SNF/HLW based on dual-purpose (transportation and storage) container solutions to safely and economically efficiently store and transport SNF to the Russian Federation, and plan the vitrified HLW return to the Republic of Belarus and its long term storage.
- The capacity of the intermediate storage should be optimal to ensure the flexibility of the SNF and HLW handling system taking into account existing uncertainties in SNF reprocessing options.
- Long-term SNF “dry” storage, “wait and see” approach and simultaneous R&D related to the direct disposal of SNF in deep geological formations are adapted if existing uncertainties in SNF reprocessing options will not be resolved in a timely manner.

Scenario conditions and possible options



Strategic environmental assessment

- The draft of the Belarusian NPP spent fuel management strategy in accordance with the national legislation is a subject for strategic environmental assessment (SEA).
- An environmental assessment was carried out with the aim of taking effective measures to protect the environment in the event that a significant change was identified.
- The Environmental report on SEA was developed.
- Impact factors associated with objects and installations were evaluated and described in qualitative terms. The forecast of changes in the state of environmental components under the influence of the phases considered in the implementation of the draft Strategy was based on assumptions about exposure levels and was assessed for compliance with environmental criteria.

Environmental Impact Assessment Methodology

An environmental impact assessment was carried out on the basis of a methodological approach to SEA in accordance with international practice. The method of justifying the choice of the preferred option was based on determining the indicators of the spatial scale of the impact, the time scale of the impact and the significance of the changes resulting from the impact, translating the qualitative characteristics and quantitative values of these indicators into points.

Based on the calculated indicators the priority option has the lowest environmental impact varying from (2213 to 2252 points) depending on the time when reprocessing facilities in Russian Federation will be ready to accept SNF from Belarusian NPP.

The option, assuming the direct geological disposal of spent fuel, has a more significant impact on the components of the environment compared to the priority option (3722 points).

Public hearing

- Public discussion on the Environmental Report on the Strategic Environmental Assessment of the draft of the Spent fuel management strategy of the Belarusian NPP was held in Ostrovets from 17 December 2018 to 15 January 2019.
- Public meeting was held in Ostrovets on January 14, 2019.
- 179 participants from Belarus, Russia, Ukraine and Kazakhstan.
- Representatives of environmental organizations, the media, the scientific community, foreign diplomats.
- Received 53 questions, which were given written answers.
- The revision of the Environmental Report and the draft of the Strategy has been carried out.



Principle steps to conclude the foreign trade contract for SNF reprocessing in Russian Federation

Agreement between the Governments of the Republic of Belarus and the Russian Federation on cooperation in the field of SNF management of the Belarusian NPP.

Long-term contract between the authorized organizations of the Republic of Belarus and the Russian Federation on the management of SNF of the Belarusian NPP in accordance with the chosen strategy of SNF management

Development of a “Single Project” and obtaining a positive conclusion of the state environmental expertise

Conclusion of an executive contract for the provision of services for the export to the Russian Federation of a batch of SFAs of the Belarusian NPP for reprocessing

Obtaining a one-time license of the Federal Service for Technical and Export Control for the import of SFA
Organization of transportation of SFAs to the Russian Federation



Thank you for attention!

**We express our gratitude to the
Department for contracting in the
back-end of TENEX**