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URF program in the Russian Federation

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1, 2 CLASSES (HLW) OF RADIOACTIVE WASTE. MAIN WASTE GENERATORS and PERSPECTIVE FINAL ISOLATION SITE

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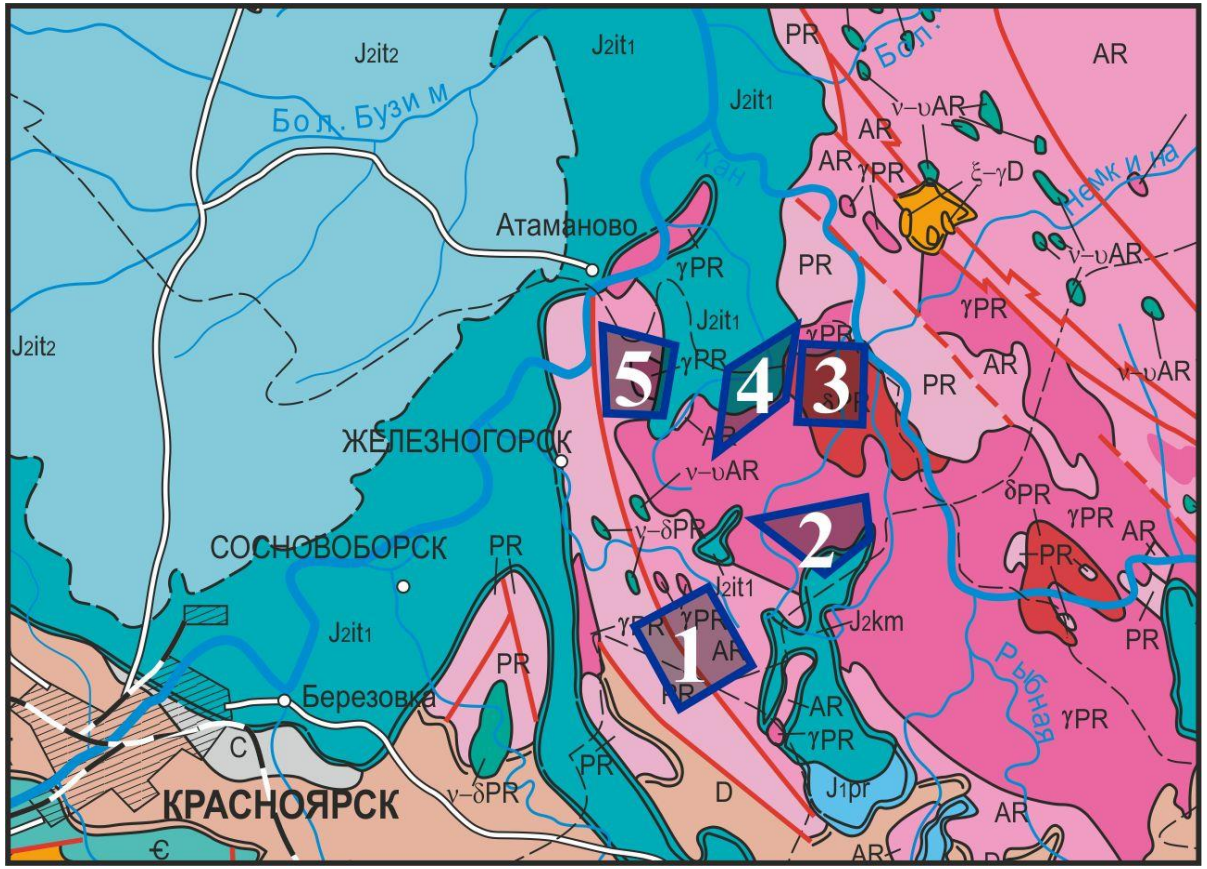
Feasibility study to select region for the URL siting

Research period	Prospective sites location	Rock massif characteristics	**Conclusion**
1970s, 2006, 2014	**Novaya Zemlya, south island, Chernaya mount**	Hard-rock, permafrost	Remoteness from radwaste sources. Considerable costs
1990s, 2006, 2017	**Kola Peninsula**	Hard-rock	**Refusal of local authorities**
1970s, 2014	**Kalmykiya, «Stepnoe» site**	Finely divided clay	**Refusal of local authorities**
1980s, 2015	**Territory of Mayak production association**	Hard-rock	Remoteness from radwaste sources. Disposal facility for radwaste of 3 and 4 class will be created.
1963-2001	**Underground complex of Mining and Chemical plant**	**Hard-rock, gneiss**	**The potential feasibility of rock massif of NKM is justified for radwaste disposal**

Preliminary researches at Niznekanskiy to select the site of the URL

Research periods	Prospective sites location	Works done
1992-1995	Within 100 km from MCP	Choice of 20 potential sites. Then 5 prospective sites were selected from those 20
	5 potential sites	The most prospective were «Verkhneitatskiy» and «Yeniseiskiy».
1996-1999	«Verkhneitatskiy»	Complex survey on surface and in deep wells
2002-2008	«Yeniseiskiy»	Phased reduction of the area: **70 – 25 – 5 - 1.1 km^2,** Increasing details of the researches on surface and in deep wells
Result	The Yeniseiskiy site was chosen to place the URL	

Selection of a perspective site



Site «Yeniseiskiy»

Selected as a result of long geological studies conducted within the Niznekansky rock massif in 1993 - 2005

Perspective sites

1 – «Southern»
2 – «Verkhneitatsky»
3 – «Nizhneitatsky»
4 – «Telsky»
5 – «Yeniseisky»

Implementation of the program for the creation of Underground Research Laboratory (URL) in the Russian Federation

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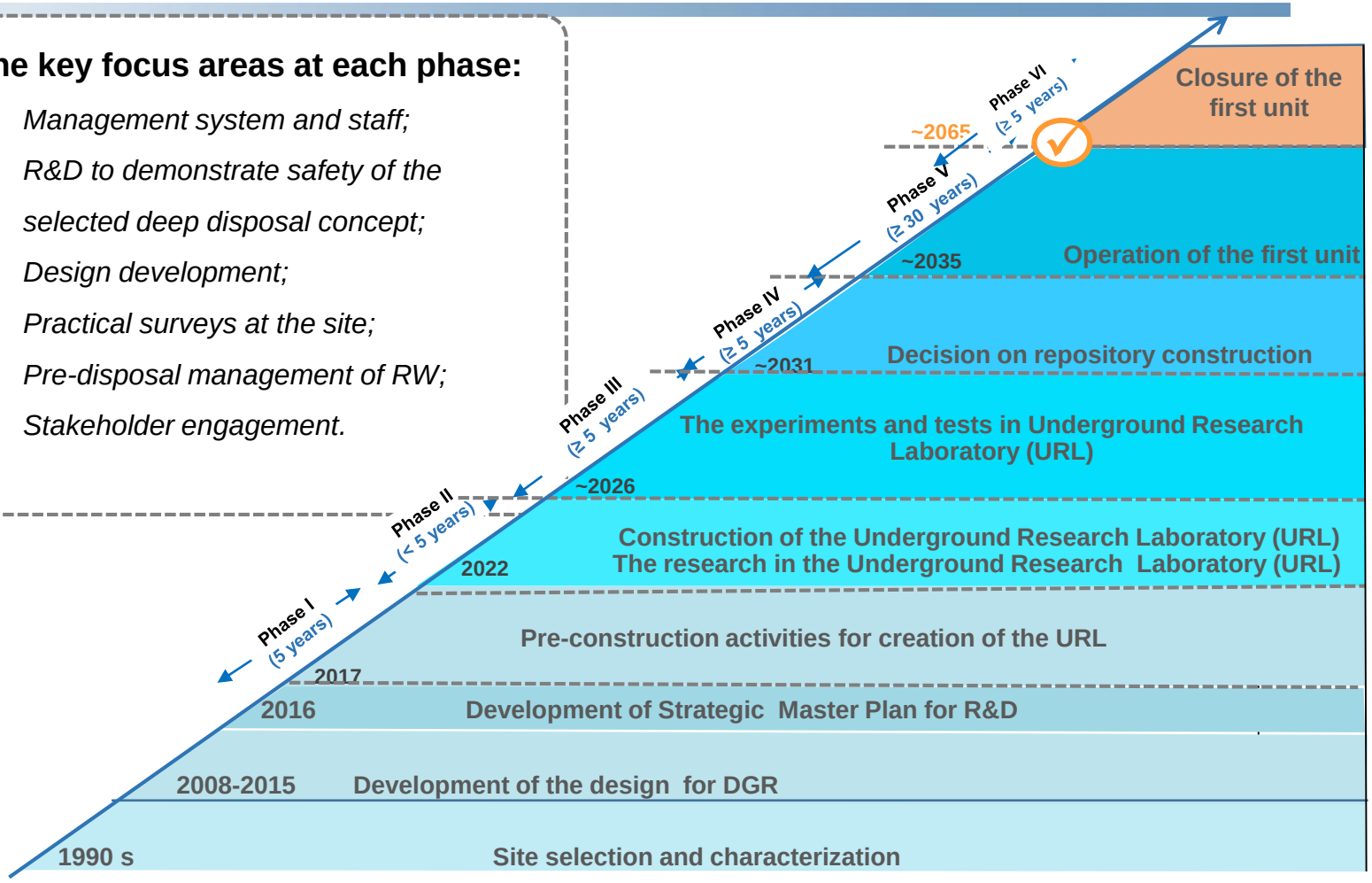
The key focus areas at each phase:

- *Management system and staff;*
- *R&D to demonstrate safety of the selected deep disposal concept;*
- *Design development;*
- *Practical surveys at the site;*
- *Pre-disposal management of RW;*
- *Stakeholder engagement.*



Creation of the Underground Research Laboratory in Nizhnekanskiy rock massif for final RW disposal

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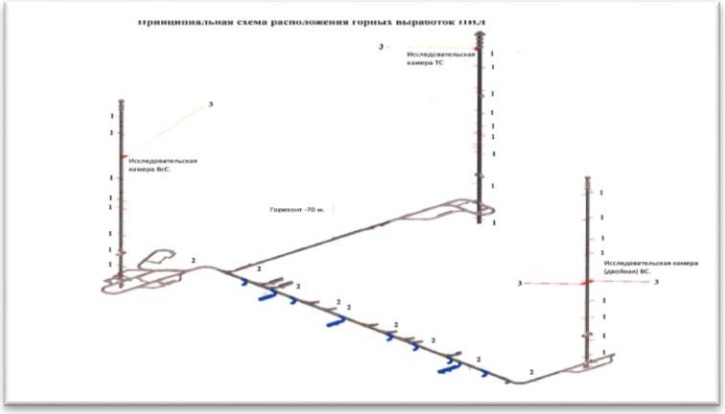
General plan of ground facilities



Scheme of the Underground Research laboratory, Nizhnekanskiy rock massif

The basic construction of Underground Research Laboratory

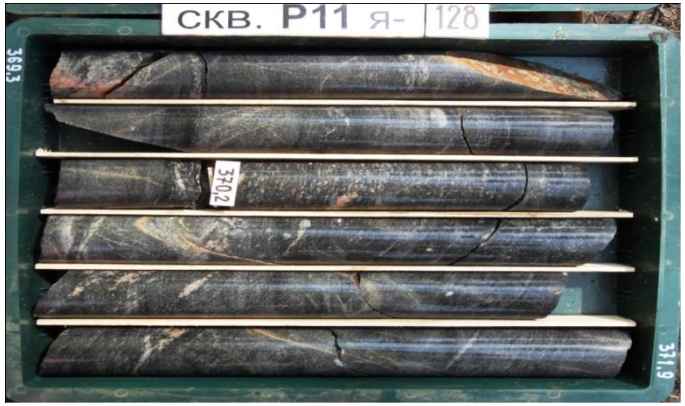
Tree vertical shafts: depth of 525 m, diameter 6.0 – 6,5 m

Surface infrastructure, including surface buildings and structures on the site with shaft

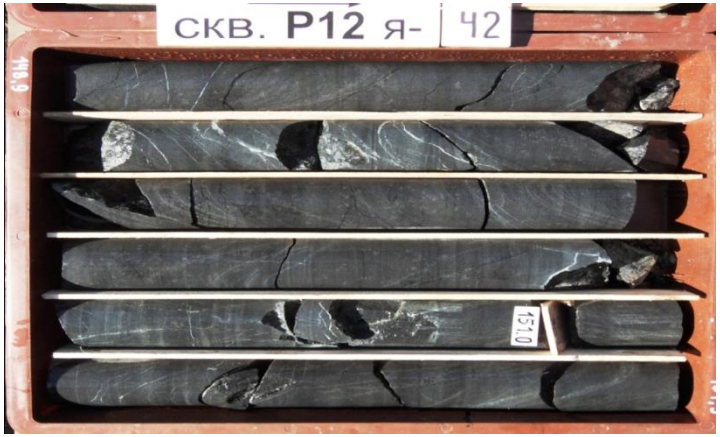
Horizontal capital mining galleries at a depth of 450 m and 525 m with the total length of 5 000 m

Basic rock massif

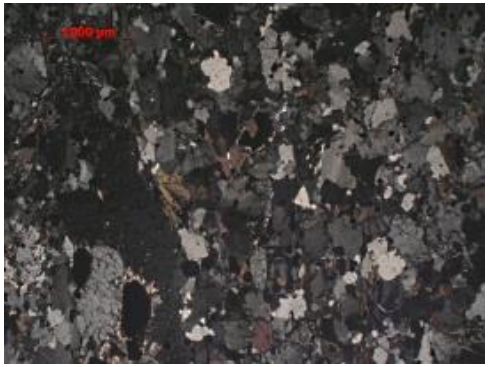
Gneiss (~80%)



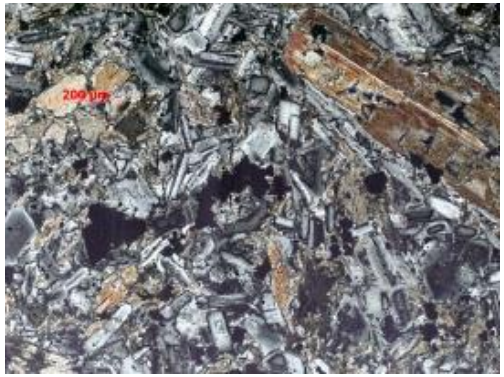
Dolerite (~20%)



Gneiss under microscope



Dolerite under microscope



The rock massif is represented in varying degrees of metasomatic altered gneisses of deferent composition and dolerite dykes and is a stable block mountain.

The Underground Research Laboratory key objectives

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- Sophisticated research of the host rock mass characteristics, confirmation (under natural conditions) of the rock mass suitability for safe deep disposal of long-lived conditioned radioactive waste
- Research and justification of the isolating properties of engineering barriers
- Testing of technical solutions for the construction of the object, including engineering barriers, on-site transport operations, final placement of waste packages and closure of disposal units
- Testing of transportation and technological schemes for the construction and operation of radioactive waste disposal facility, testing and development of non-standard equipment
- Demonstration to the experts and the public the safetycase and operation of future radioactive waste disposal facility
- Training of operational personnel to perform work in the facility

Scenarios of the project further development

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The results of the URL operational phase researches will form ground for the predictive calculations to prove the safety case of DGR

The following scenarios are possible:	Future steps under certain scenario:
1. Validation of design solutions, simulation results and long-term safety assessments	Applying for the DGR construction license
2. Conclusion that there is insufficient operational and / or long-term safety provided by the design of engineering protective barriers	Change of the composition, geometry or technology of engineering protective barriers construction
3. Conclusion that safety case of the facility is not proved by the primary safety barrier - geological environment	Reconsider (for safety reasons and / or economical aspects) the decision to place the facility of any type of waste
	Change type of waste appropriate for disposal

Conclusions on the creation of the Underground Research Laboratory (URL) in the Nizhnekanskiy rock massif

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1. The long term “Strategy for the development of Geological Disposal Facility” and the “Strategic Master Plan for Researches”, which provides a step-by step implementation of researches in 150 areas, has been developed. The results of comprehensive researches will be regularly presented in open media and at international conferences.
2. It is planned to create a Ground Demonstration Research Center and Underground Research Laboratory (URL) to carry out comprehensive research of the rock massif, optimize engineering barriers, work out radioactive waste management operations, demonstrate operational safety.
3. Depending on the results of research in the URL and the justification of long-term safety, various options are possible for the creation of a Deep Geological Disposal Facility, including significant reduction in the range and volume of isolated radioactive waste.
4. Creation of Deep Geological Disposal Facility and it’s operation are possible only after receiving the entire set of licences, permits and public acceptance.