



ФГУП «НАЦИОНАЛЬНЫЙ ОПЕРАТОР
ПО ОБРАЩЕНИЮ С РАДИОАКТИВНЫМИ ОТХОДАМИ»

Frame Action Plan for Construction of Underground Research Laboratory

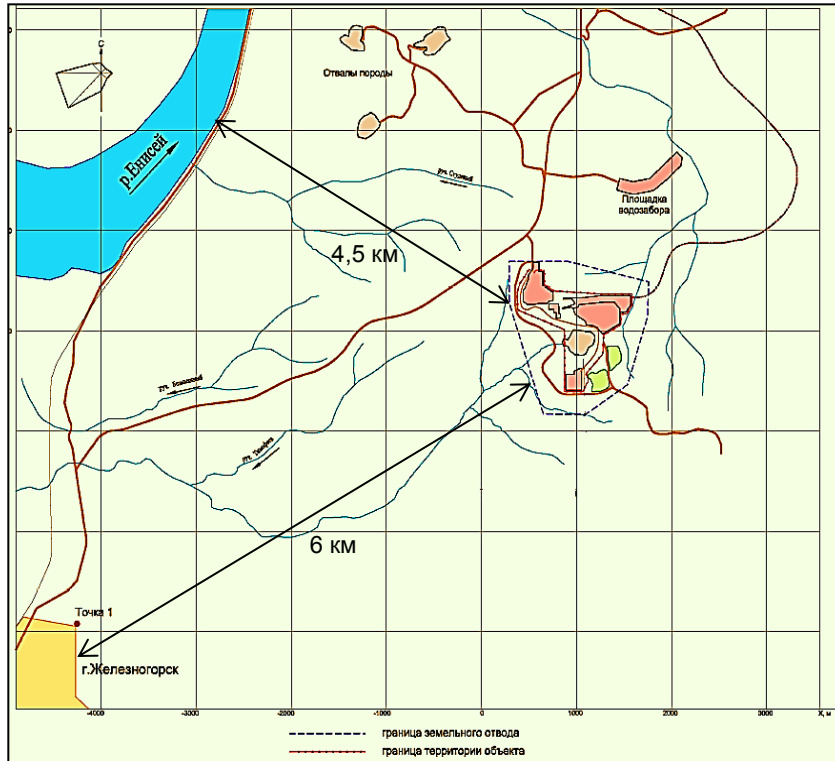
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Moscow, 2017

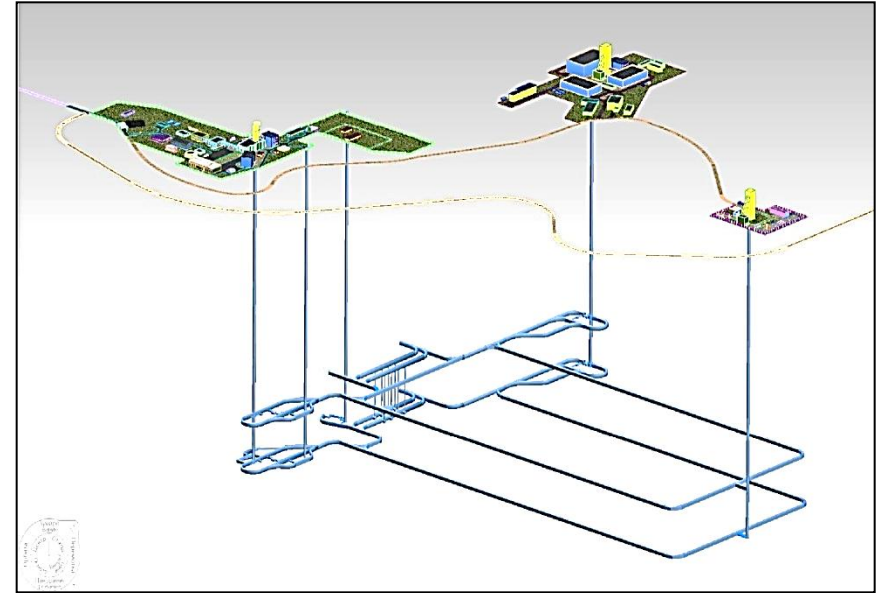


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Plan and Layout of the URL in the Approved Project



Plan of the URL



URL design in accordance with the approved project

- Distance form Zheleznogorsk - 6 km
from Yenisei River – 4.5 km
- **From 2030 – construction and exploitation,**
conduct of investigations to justify safety in the
long term



Change of the Conceptual Approach to URL Construction

- ❖ As of 2017 the project documentation of deep geological repository, including the underground research laboratory, was approved, public hearings were held and was received positive decision of the State Environmental Expertise, was obtained license for location and construction of the URL
- ❖ Nevertheless in the beginning the initial approach was to construct a deep geological repository while URL would be a first stage of the works
- ❖ At the moment the State Corporation ROSATOM have planned to construct precisely **URL, as an independent site**, to conduct comprehensive investigations in accordance with international recommendations and experience
- ❖ Long-term “**Strategy for construction of deep geological repository**” have been developed in accordance with international practice of organization of investigations in URL.
- ❖ “**Strategic master plan of investigations**” provides for stage-by-stage conduct of investigations in 150 different areas.
- ❖ Achieved results will be published on a regular basis and presented at international conferences.
- ❖ A step towards construction of deep geological repository can be made only after justification of safety and security in the long term, holding of public hearings and receipt of full range of the approval documents.



Basic Provisions on Layout of URL

❖ **Main construction solutions of URL:**

- Complex of surface facilities and buildings, infrastructure lines, utility systems and lines.
- Three shafts: auxiliary, technological, ventilation.
- Contour transport and ventilation drifts – only on the upper level of 450 meters.
- Shaft stations and diggings of URL for large-scale development and testing of the construction technology of technological shafts and techniques of waste emplacement – on the levels of 450 meters and 525 meters.

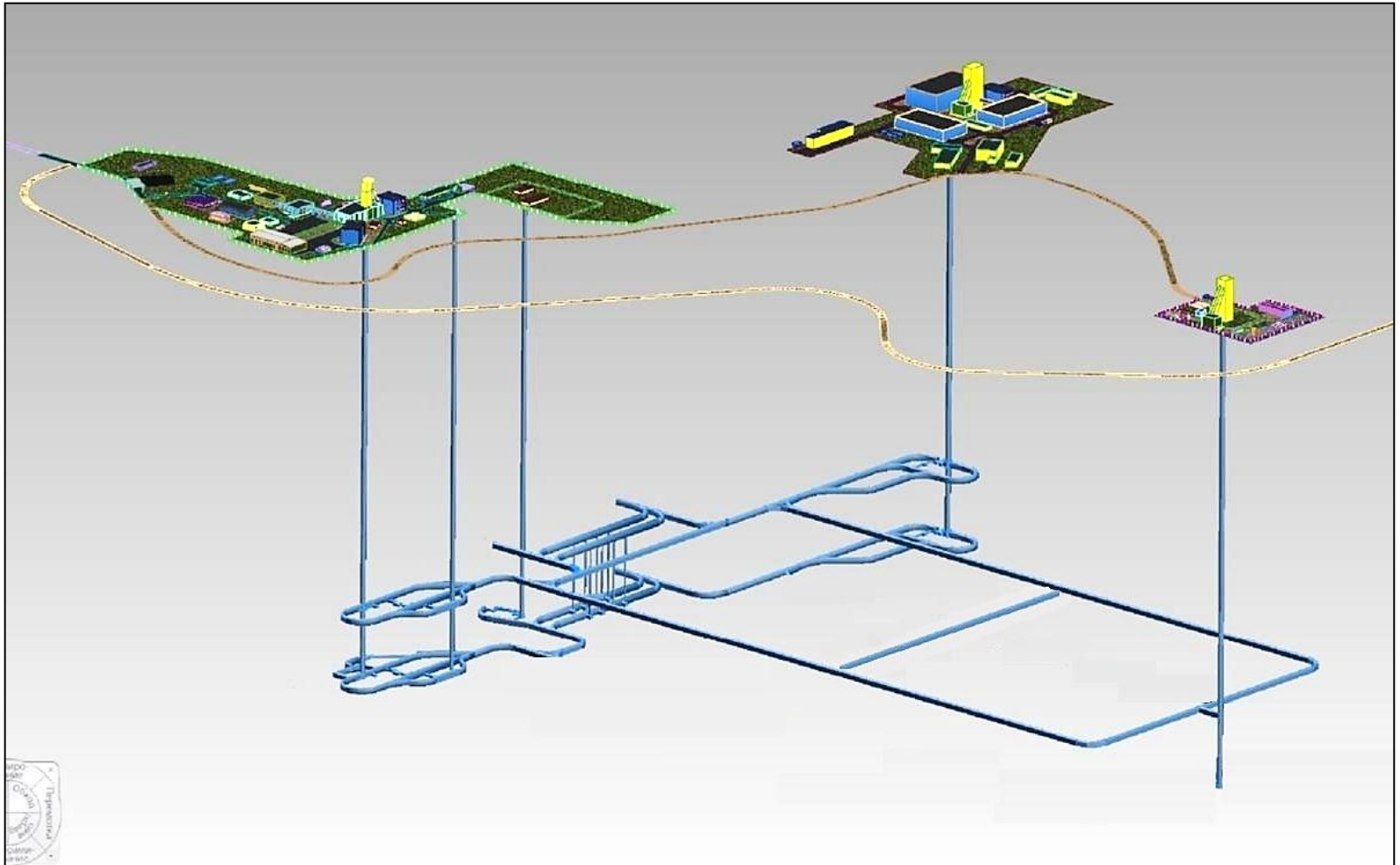
❖ **Additionally in order to conduct investigations it is provided for construction:**

- Cross-heading in the center between contour drifts on the level of 450 meters to analyze characteristics of the formation in the central part of the deep geological repository galleries.
- Surface research and demonstration center (RDC).
- Group of wells to study host rock in the far-field zone – beyond area “Yeniseyskaya” on the trajectory of migration of radionuclides.



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Layout of the URL





Areas of Research at URL in Accordance with “Strategic Master Plan”

1. Complex geodynamical, seismic, hydrological, hydrogeological, hydrogeochemical, gravimetric, electrical, magnetometric, hydrometeorological, biospheric and other **surface-based investigations**.
2. Comprehensive characterisation of the rock with use of **deep exploration wells in the near and far fields**.
3. Optimization of parameters of “low impact” technology of drilling and blasting operations when horizontal and vertical shafts are created.
4. Complex research in above-ground research and demonstration center.
5. **Final testing** in underground conditions of nonstandard equipment and transportation and technological processes of waste handling.
6. Integrated monitoring on the territory of URL and in the far-field zone.
7. Investigations to evaluate alternative variants of waste emplacement taking into account progressive international projects.



Research and Demonstration Center in Brief

Function:

- ❖ Advance testing of remote transportation and technological operations of underground radioactive waste management.
- ❖ Optimization of construction of engineering barriers and isolation materials, testing of nonstandard equipment, technique of emplacement of containers in technological shafts and their further isolation.
- ❖ Demonstration of the underlying principles and operational safety of the site.
- ❖ Training of personnel how to use specific equipment.

Structure:

- ❑ *Section 1 “Testing and demonstration of transportation and technological methods of waste handling”.*
- ❑ *Section 2 “Study and optimization of characteristics of engineering barriers”.*



Scenario Actions Depending on the Results of Investigations Conducted in URL (variants 1 and 2 - Project Adjustment)

Basic scenarios	Further actions
<p>1. <u>Design verification of the project</u>, confirmation of model confirmation and long-term assessment of safety (<i>base-case scenario</i>)</p>	<ul style="list-style-type: none">• Hold public hearings, receive positive decision of the State Environmental Expertise.• Obtain license for exploitation of deep geological repository.• Construct and operate deep geological repository in order to emplace project volumes of radioactive waste of first and second classes.
<p>2. Conclusion of operational and/or long-term safety <u>deficiency</u>, that multi-barrier system was aimed to provide.</p>	<ul style="list-style-type: none">• Improve project to enhance system of engineering barriers. Conduct <u>additional</u> field and laboratory investigations.• Justify and confirm long-term safety of project radioactive wastes in the light of enhanced engineering barriers. Obtain license for exploitation of deep geological repository.• Construct and operate deep geological repository in order to emplace project volumes of radioactive waste of first and second classes.



Scenario Actions Depending on the Results of Investigations Conducted in URL (variant 3 – Change of Waste Class)

Possible variants	Further actions
<p>3. Conclusion of impossibility to achieve necessary level of long-term safety of the site during emplacement of project volumes of <u>first and/or second class radioactive waste</u>.</p>	<ul style="list-style-type: none"> ➤ <u>Decrease volume</u> of project first and/or second class radioactive waste. Partial filling of storage shafts with third class radioactive waste, that is less ecologically dangerous. ➤ Justify and confirm long-term safety of amended project. Obtain license for exploitation. ➤ Construction of deep geological repository in order to emplace adequate volumes of first, second and third class radioactive waste. <hr/> <ul style="list-style-type: none"> ➤ Adopt decision on site exploitation only for emplacement of third class radioactive waste with further amendment of project approaches. ➤ Justify and confirm long-term safety of emplacement of third class radioactive waste. Obtain license for exploitation. ➤ Construction of deep geological repository to emplace less dangerous and easily handling third class radioactive waste (<i>which can be emplaced in surface disposal facilities</i>).



Summary

1. Management board of the State Corporation “ROSATOM” adopted decision to **construct precisely URL** to conduct comprehensive investigations in accordance with international recommendations and up-to-date similar projects.
2. Long-term “Strategy for construction of deep geological repository” and “Strategic master plan” have been developed, achieved results will be published on a regular basis and presented at international conferences.
3. Research and development center, as well as underground facilities of URL are under construction and are aimed at conducting comprehensive research of the geological block, testing of radioactive waste handling techniques, optimization of engineering barriers, demonstration of exploitation safety of deep geological repository, training of personnel.
4. A step towards construction of deep geological repository can be made only after holding of public hearings and receipt of full range of the approval documents
5. Depending on the results of studies conducted in URL and justification of long-term safety there are various possible alternatives of construction of deep geological repository, including considerable decrease in volume of radioactive waste to be emplaced.



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