State Enterprise "Radioactive Waste"
Present and Future Challenges

Georgi Gyoshev
State Enterprise Radioactive Waste

- ASUNE Art. 78
- Commerce Act Art. 62 (1)
- Non-commercial Company

- Manipulation, pre-treatment, treatment, conditioning, storage and disposal
- Transport of RAW
- Construction, operation, rehabilitation, reconstruction of RAW management facilities
- Decommissioning of RAW management facilities
- Decommissioning of Kozloduy units 1-2
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Organization of Activities

Strategy for management of SF and RAW

Three-years programs

One-year programs

Operational

Maintenance

Investment

Special
Processing of RAW:

- Pre-treatment of solid RAW – collection, sorting, decontamination of metal RAW and cutting
- Treatment of solid RAW – packaging in 200 L drums, pre-compaction (50 t), super-compaction (910 t)
- Conditioning of solid RAW in reinforced concrete containers (RCC)
- Evaporation of liquid RAW, cementation and packaging in reinforced concrete containers

Accumulated RAW for 2009:
- 463 m³ liquid RAW
- 1,450 m³ compactable RAW.
- 84.6 t metal RAW.
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Installation for treatment of solid RAW

Sorting → Pre-compaction → Closing → Measurement

Buffer Storage → Super-compaction → Packaging in RCC
• RAW Storage Facility
  total capacity - 1920 RCC
  on 31.12.09 - 943 RCC

• Lime Plant Site
  Trench Storage
  Storage of processed solid waste
  Site №1 and Site №2
  Site for storage of ISO containers
Reinforced concrete container testing
Management of institutional RAW

- Compliance checks
- Transportation
- Waste acceptance
- Treatment
- Conditioning
- Storage
- Radiation monitoring
- Dosemetric control
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Institutional RAW from:

- Industry
- Science and research
- Agriculture
- Medicine
RAW accepted in 2009:  
- 4,968 smoke detectors (6,527 sources), 31 GBq  
- 38 spent $^{241}$Am sources, 922 GBq  
- 969 spent $^{239}$Pu sources, 172 GBq  
- 94 spent sealed sources $^{137}$Cs, 430 GBq;  
- 82 spent sealed sources $^{60}$Co, 24.9 GBq  
- 3 Neutron surces Pu/Be, Am/Be, 129.12 GBq  
- 491.1 kg DU shieldings  
101 checks for compliance  
109 transfers of RAW
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CHALLENGES – Development of National Disposal Facility for Low- and Intermediate Level Waste

Decision of the Council of Ministers 683/25.06.2005

Development of documents for license application
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CHALLENGES – Development of National Disposal Facility

- Regulatory requirements
  - Development of conception and planning
  - Data collection and region analyses
  - Site characterization
  - Confirmation of the selected site
  - Facility design
  - Facility construction
  - Facility commissioning
  - Operation of the disposal facility
  - Closure of the facility
  - Institutional control

The safety of the disposal facility during operational and post-operational phase is assured by engineered and natural barriers and does not depend on any active measures according to the safety criteria.

Modern technologies and good practices
The safety of the disposal facility during operational and post-operational phase is assured by engineered and natural barriers and doesn’t depend on any active measures according to the safety criteria.
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Characterization of sites 2008
Marichin Valog, Radiana, Brestova Padina, Varbitza

1. Complex analysis of regional geophysical fields
2. Analysis of high accuracy geodesic measurements, geomorphologic and geotectonic surveys
3. Geological, hydrogeological, engineered-geological survey of Marichin Valog, Brestova Padina, Varbitza
4. Characterization of Radiana site
5. Geophysical survey of Radiana site
6. Additional study of Radiana site
7. Migration studies Marichin Valog, Brestova Padina, Varbitza
8. Migration studies for Radiana site
9. Summarization of results and selection of preferred site for site confirmation phase
Comparative assessment of the 4 sites

1. Location
2. Lithology & Stratigraphy
3. Tectonic & neotectonic settings
4. Geomorphologic settings
5. Geotechnical settings
6. Geochemical characteristics
7. Hydrogeological settings incl. r.n. migration
8. Seismisity
9. Surface dynamic processes (exogenic processes)
10. Flooding
11. Meteorological processes and events
12. Industrial hazard
13. Water and mineral resources
14. Land property and land use
15. RAW transport
16. Demography
17. Flora and fauna
18. National cultural and historical valuable
19. Nuclear experience of the population
20. Infrastructure
21. Possible effect on economic activities
22. Closeness to a state border
23. Public acceptability

1 – Radiana – PREFERED SITE
2 – Marichin Valog
3 – Varbitza
4 - Brestova Padina
- $^{241}$Am is retained within the repository structure
- $^{137}$Cs, $^{90}$Sr и $^{63}$Ni move at a distance of 1 m after 360, 260, 1300 years $C_{\text{max}} < 1,0 \text{ Bq/m}^3$
- $^{94}$Nb, $^{239}$Pu, $^{129}$I reach the aquifer:
  - $^{94}$Nb - 86 000 years - $1,78.10^{-3}$ Bq/L
  - $^{239}$Pu - 83 000 years - $3,89.10^{-4}$ Bq/L
  - $^{129}$I - 4 100 years - $5,59.10^{-3}$ Bq/L
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Trench type design
Design comparison and design selection

1) Proven technology and stakeholders acceptability
2) Safety – conventional and radiological
3) Operation
4) Site criteria
5) Procurement
6) Capital cost
7) Operational and maintenance cost
8) Post-operational cost
9) Schedule
10) Risks
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R-Project 1: Preparation of a detailed geodetic map of Radiana site
## State Enterprise “Radioactive Waste”

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Objectives

To select a suitable area/locality for final disposal of HLW and SF: deep geological repository (DGR)

Approaches

Stepwise assessment of the Bulgaria territory according to established selection scheme
Selection scheme is based on:
- Preferences
- Requirements
- Criteria

Usability of similar scheme also for surface repository site selection process
CHALLENGES – Development of Deep Geological Repository for Spent Fuel and High Level Waste

Selection scheme principles

- Preferences (recommendations)
  - generally accepted principles and conditions of geological settings suitability
- Requirements
  - specified principles and conditions of geological settings suitability, obligation to fulfill
- Criteria
  - qualitative and quantitative defined conditions of assessment criteria, limitations for site selection
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Basic principles of selection DGR

- geological and geomorphological conditions
- hydrogeological conditions
- geochemical conditions
- engineer-geological and geotechnical conditions and feasibility
- spontaneous natural changes in the future
- potential anthropogenic negative influence
- waste transport
- environmental protection
- economical and social aspects
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Techno scheme type A

1- RAW Container 2- Protective shield 3- Filling 4- Metal support 5- Railway on the main plate and beam 6- Solid support 7- Beam, 8 and 9- Longitudinal and transverse support of the beam, 10- „V“-shape platform for situating the containers 11- Anchors 12- Rock massif from clay marl, 13- Soil cover (of ballast)

External diameter of the containers $d_\text{K} = 900$ mm
The mass of the containers is around 10,5 t.
External diameter (in black) of the gallery $D_\text{H} = 4,00$ m

$b_1=700$ mm, $b_2=1800$ mm, $b_3=500$ mm, $h_1=350$ mm, $h_2=650$ mm
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Container for disposal of SF and HL RAW
THANK YOU FOR YOUR ATTENTION