NRPA bi-lateral regulatory cooperation

Regulatory challenges for nuclear and uranium legacy – experience from Russia, Central Asia and Ukraine

2 – 3 November 2015

Malgorzata Karpow Sneve
Norwegian Radiation Protection Authority

Natalya Shandala
Burnasyan Federal Medical Biophysical Center of FMBA

www.nrpa.no
Legacy Global Issue

Uranium Mining and Milling Waste

Nuclear Weapons Tests
Legacy sites: working definition

“A facility or area that has not completed remediation and is radioactively contaminated at a level which is of concern to regulatory bodies”

• Sites and facilities affected by major accidents and incidents
• Interim storage and disposal sites and facilities for radioactive waste
• Uranium mining and milling facilities and Naturally Occurring Radioactive Material
• Nuclear technology and development centers
• Former nuclear peaceful and weapons testing sites
Link to management of “existing situations”

Situations “that already exists when a decision on the need for control needs to be taken.” [IAEA IBSS. 2014]

Includes situations of exposure:

- “to natural background radiation.”
- residual radioactive material that derives from past practices that “were not subject to regulatory control or that remains after an emergency exposure situation.”

The latter are commonly referred to as legacies [IAEA TECDOC 1280, 2002].
Emergency/planned/existing situation: which is which?

“The descriptions of the three types of exposure situation are not always sufficient to determine unequivocally which type of exposure situation applies for particular circumstances. For instance, the transitions from an emergency exposure situation to an existing exposure situation may occur progressively over time; and some exposures due to natural sources may have some characteristics of both planned exposure situations and existing exposure situations.” [Para 1.21 IAEA IBSS, 2014]

Raises obvious uncertainties about selection of appropriate protection standards in different dynamic legacy situations!

How to start the remediation?

- RTG recovery from sea
- Poor storage for spent fuel
- Site of dropped RTG
- U factory, USA
- Poor stored waste recovery
Submarine Shore Technical Bases

Re-designated as Sites of Temporary Storage
Technical weaknesses

- Poor information on the radiological and physical condition of SNF and RW
- Risks associated with the operations to get more information to organise decommissioning
- SNF at dry storage facility not designed for this purpose from damaged store after accident
- Defective SNF assemblies and degradation
- Need for new specific technology and equipment
- Poor, unsafe infrastructure including physical buildings
- Need for specialized personal protection
- Insufficient qualified workers
The left side – before remedial works
The right side – after remedial works

Works to normalize radiological situation at DSF.

Dynamics of the radiation situation in Dry Storage Facility (DSF)
Regulatory weaknesses

- Absent methodological framework for the abnormal and out of specification conditions at the site
- Insufficient information on existing exposure situation and radiation conditions around the facility, so uncertainty in dose assessments of workers and public
- Insufficient organization of interaction between relevant agencies in case of emergencies
- Insufficient regulatory basis for further management of RW and SF, its transport off-site, treatment for storage and disposal
NRPA – FMBA Regulatory Cooperation

Objective: long-term enhancement of safety culture
Implementation via practical projects at real sites:

- Threat assessments to identify regulatory priorities
- Development of norms and standards, regulatory guides and procedures specific to the recognised problem
- Independent monitoring activities
- Emergency preparedness exercises
- Development of safety assessment and visualisation tools, for dose control and remediation planning

Main focus on spent fuel (SF) and radioactive waste (RW) at Andreeva Bay and Gremikha.
Initial analysis of threats

- Threat Assessment from regulatory perspective, to identify rules and procedures to be updated for abnormal conditions.

- Significant number of weaknesses in regulatory basis identified.
Regulatory improvements

Updated norms and standards applicable to abnormal conditions taking into account on-going development of international recommendations and guidance:

• Emergency preparedness and response
• Worker dose control and performance reliability assessment
• Protection of public and environment
• Independent radiological site characterisation and environmental monitoring
• Criteria for long-term site restoration
• Criteria for waste treatment and storage, prior to disposal or further management
# Norms of remediation

<table>
<thead>
<tr>
<th>Variant of remediation</th>
<th>Category of persons</th>
<th>Dose constraint, mSv·y⁻¹</th>
<th>Total</th>
<th>Dose limit from (NRB·99)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Due to residual contamination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conservation</td>
<td>Workers</td>
<td>2</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Public (SA territory)</td>
<td>0,1</td>
<td>0,1</td>
<td>1</td>
</tr>
<tr>
<td>Conversion (&quot;brown lawn&quot;)</td>
<td>Personnel group A</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Personnel group B</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Public (SA territory)</td>
<td>0,1</td>
<td>0,15</td>
<td>0,25</td>
</tr>
<tr>
<td>Liquidation (&quot;green field&quot;)</td>
<td>Public (former STS territory)</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Public (the rest territory)</td>
<td>0,1</td>
<td>-</td>
<td>0,1</td>
</tr>
</tbody>
</table>

Note: The dose limits are based on the norms in NRB·99.
Improving radiation situation at Andreeva Bay

External dose rate at STS Andreeva Bay, μSv/h
Visualization of scenario of the SFA removal
a) preliminary activities;
b) the SFA container removal from the cell to the load-transfer device;
c) lifting the SFA from the dirty container to the load-transfer device;
d) putting to the transport packing container.
Human factors: performance reliability

- Development of techniques for pre-shift monitoring of psycho-physiological condition
- Training and preparation for hazardous operations
Cooperation on main environmental effects from PA Mayak

East Urals Radioactive Trace, 1957

Karachai Radioactive Trace, 1967

Discharges to Techa River
Extension to areas affected by Mayak PA

Cooperation to support development of regulatory supervision of areas affected by releases from Mayak PA:

- Characterization of the current status of fish in the Techa River
- Study of treatment of surface water bodies at Mayak
- Study of internal exposure in population in Mayak area due to protracted exposure to long-lived radionuclides

Results presented at Workshop linked to ICRER conference, Beacelona September 2014. See also:

Outputs of bi-lateral cooperation in Russia

Enhanced regulatory requirements and guidance in abnormal situations:

- Improved procedures for emergency preparedness and response,
- Independent assessment of radiation situation at Andreeva
- Innovative approach to performance reliability monitoring
- Practical support in control of radiation exposures during the most hazardous remediation operations
- Radiological criteria for monitoring and site restoration
- Coordination of remediation activities with radioactive waste management programs
- Coordination of radiation regulation with relevant RF authorities
Many legacy issues in Central Asia and Ukraine

Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan
Features in our long-term strategy

- Planned
- Holistic
- Integrated
- Innovative
Planned

Regulatory Threat Assessments

Effective procedure to identify priority tasks and activities with clear objectives and scope
Holistic

Full range of Radiation Protection issues:

- Emergency preparedness and response
- Worker protection
- Public protection
- Environmental protection
- Radiological and safety assessment
- Environmental and workplace monitoring
- Long-term site management planning and optimization
- Radioactive waste management
Integrated

- Combined project progress meetings
- Recognition of other (non-radiological) hazards at most sites
- Engagement with all main relevant authorities
- Engagement with operators
- Engagement with international bodies
- Shared experience with other countries having nuclear legacies
- Participation and review by scientific community
Innovative

- Use of modern assessment methods supported by new science and technical tools:
  - Prognostic assessment of radiological impacts on humans and the environment, and
  - Safety assessments of technologies, to
  - Identify priorities for regulatory focus
- Practical application of the methods to address specific regulatory issues at specific sites
Key lessons for ourselves and others

- Scientific information to address *all* the environmental and human health issues, not just radiation
- Prognostic assessment of future conditions
- Science program on key assessment uncertainties to improve confidence in the prognoses
- Providing balanced advice to decision makers based on optimisation
- Use our results to improve international guidance
- Regulators, operators and other organisations – responsibility, transparency and dialogue
Supporting Effective Application of International Recommendations

Hierarchy
- Safety Fundamentals
- Basic Safety Standards
- National Law
- National Regulatory Requirements
- Regulatory Guidance

Optimisation
- One solution does not apply in all countries or sites
- Radiation is not the whole picture
- Balance between prescription of radiation safety and flexibility to account of other issues
How to establish acceptable criteria for clean-up?

- Acceptable to whom?
- At what/whose cost?

Our bi-lateral cooperation experience includes:
- Regulatory focus on radiation protection and nuclear safety
- Improvement of cooperation between
  - neighbouring countries,
  - radiation and other safety and environment authorities
  - operators, regulators and other stakeholders
How do local residents develop scenarios for modelling of dose?

- Local residents can provide relevant information about what is happening locally which might cause radiation exposure now and in the future.

- Inclusion of residents scenarios, even if not radiologically significant, can give them confidence in the process.

- The above should be supplemented by separate analysis based on wider assessment experience.
Communication of estimates of dose to the public and to interested parties?

• Local residents familiar with local environment. In case of old legacies they already “know” what is safe....
• More complex for new legacies.
• Is dose a useful tool for communicating risks to health?
• Confusion between what is safe and dangerous; and limits, constraints and reference levels.
• Is risk much better?
• Comparison with radiation background?
• Comparison with other more familiar risks?

Nothing works unless the parties trust the communicator.
Main sources of nuclear legacies

Abandoned uranium mine mill tailings

Poorly maintained SF and RW stores

Accidents

NORM processing

Weapons testing
Suggestion for way forward: Expert Group

Radiation Protection at Nuclear Legacy Sites

Objective: promote practical and optimized approach for the regulation of nuclear legacy sites, taking into account:

- IAEA’s Safety Fundamentals and the Basic Safety Standards
- new ICRP developments (TG work on-going) and
- lessons learnt and good practice at different types of legacy sites.
Expert Group RPNLS

- Address specific situations at real sites within the member countries and support all stakeholders involved at those sites.
- Assist member countries in deriving practical interpretation of generic radiation protection standards and guidance to nuclear legacy site management.
- Support and provide input to development of international guidance specific to nuclear legacy sites.
- Use a holistic and proportionate approach to all risks.

*It may be convenient to include international organisations concerned with chemical and other risks.*
EG RPNLS Outputs

- Explanation of current international standards and recommendations
- Case studies of real legacy sites and their regulation, historic and current examples, to learn from past and recent experience
- Recognition of common and distinguishing features of radiation situation at different legacy sites,
- Lessons learned for different legacies relevant to standards, regulatory framework, regulatory procedures, application of overall optimisation
- Recommendations on communication strategy and suggestions for improvement of international recommendation
Special concluding comment!

Dear Colleagues,

Many thanks for your kind attention! I hope we continue discussion in coming years!

Malgorzata.sneve@nrpa.no
www.nrpa.no