Costing Methodology for Decommissioning Nuclear Facilities in the Russian Federation

Stockholm
Content

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State Atomic Energy Corporation «Rosatom» (ROSATOM) is authorized, on behalf of the Russian Federation, to fulfill Russia’s international commitments in the field of peaceful uses of atomic energy and nuclear nonproliferation observance.

Main activities in the field of atomic energy use:

- Development of atomic science, technology and investment policy
- Spent nuclear fuel and radioactive waste management and nuclear decommissioning
- Nuclear fuel fabrication and electricity generation on NPPs
- Many other activities

ROSATOM manages more than 400 organizations, including administrative entities and support infrastructure.
2. Development of the detailed approach (slide 1/7)

Development of the methodology of decommissioning costs valuation

No special approach to decommissioning costs valuation. Estimation was based on expert commentaries.

Development of the methodology of nonspecific estimation of decommissioning costs.

Development of a more detailed approach to decommissioning costs valuation.

2010

Federal Law “About consolidated financial statements” was adopted.

2011

2015
2. Development of the detailed approach (slide 2/7)

Factors which have influence on a new approach to valuation of decommissioning costs

**External factors**
- Development of ISDC classification
- Need of comparison with decommissioning costs of foreign NF
- Accumulation of experience in realization of decommissioning projects

**Internal factors**
- Impossible to change list of activities
- Impossible to edit technology of decommissioning
- Limited capacity of factor analysis
- Estimation errors 30%-50%
The main features of the detailed approach

- ISDC classification has been adapted to the features of Russian nuclear industry for each type of nuclear facilities (called Classifier).
- Cost for each type of activity for the third level of the Classifier is determined.
- RW management costs are calculated according to the applied Cost methodology for RW management.
Comparison with ISDC classification of decommissioning activities

The Classifier represents a structured list of activities relevant to each type of nuclear facility.

**Similarities with ISDC**
- structure of classifier
- cost structure

**Differences from ISDC**
- number of groups of activities depends on a type of nuclear facility
- RW management costs are calculated separately from decommissioning costs
- SNF management is allocated into a separate block of valuation.
2. Development of the detailed approach (slide 5/7)

<table>
<thead>
<tr>
<th>Source of Information for rates used in the Classifier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industry data</strong></td>
</tr>
<tr>
<td>More than 15 cases of estimate documentations, different decommissioning concepts, programs and studies</td>
</tr>
<tr>
<td><strong>International practices</strong></td>
</tr>
<tr>
<td>Information about costs incurred during decommissioning of nuclear facilities abroad</td>
</tr>
<tr>
<td><strong>Expert analysis</strong></td>
</tr>
<tr>
<td>Data on costs incurred by companies which have an experience in decommissioning process</td>
</tr>
<tr>
<td><strong>Market data</strong></td>
</tr>
<tr>
<td>Concepts of practice and its market data related to the nuclear industry</td>
</tr>
</tbody>
</table>
2. Development of the detailed approach (slide 6/7)

Assessment of RW management cost (main principles)

RW management scheme is individual for each nuclear facility

Operating organization provides:
- data on the amount and physical characteristics of RW (volume, category, etc.)
- list of RW management schemes containing data on physical characteristics such as volume change during RW processing
- costs of RW processing

The Temporary list of RW containers for disposal was developed

This list includes main characteristics of containers (volume, value) and container stuffing costs recommended for all operating organizations for valuation of RW management costs

Disposal rates are established by the Government

The Order of the Ministry of Natural Resources of Russia
2. Development of the detailed approach (slide 7/7)

**Procedure of estimation of decommissioning cost**

- Selection of a decom concept
- Selection of a type of individual activities from the Classifier
- Determination of:
  - a schedule of decommissioning;
  - physical indicators (equipment weight, the area of decontaminated surface)
- Determination of:
  - the volume of generated RW;
  - RW management concepts
- Estimation of decommissioning costs
  - Individual activity
  - Individual cost
  - RW management cost
3. Specific issues (slide 1/4)

Assumptions and Limitations used for NPP decommissioning cost valuation

- **Not include**
  - Costs related to:
    - SNF management;
    - operational RW management;
    - infrastructure development for RW management

- **Final state**
  - Brownfield

- **Reactor building**
  - Building constructions, which contain contamination, are demolished

- **Concept of decom.**
  - An enterprise chooses a decommissioning concept (see Annex)
Distribution of decommissioning and RW management costs between main activities

- Pre-decommissioning activities: 17.3%
- Dismantling and decontamination activities during preparation for safe enclosure: 0.3%
- Dismantling and decontamination activities during safe enclosure: 0.3%
- Dismantling and decontamination activities during shutdown: 27.4%
- Site rehabilitation: 0.6%
- Project management, engineering and support: 14.7%
- Scientific and research work and design and experimental development: 0.6%
- Waste processing and packaging: 27.8%
- Waste transportation and disposal: 10.8%
3. Specific issues (slide 4/4)

- The use of the universal methodology of valuation of decommissioning costs
- The annual assessment of obligations
- The involvement of an independent consultant
- The annual audit of the value of the estimated liabilities
- Repeatability of evaluation according to the developed procedures

The principles of assessment

- Reliability
- Credibility
- Auditability
4. Main results of the development of the decommissioning costs valuation methodology

- Applicability of ISDC classification instead of the methodology of nonspecific estimation of decommissioning costs. Unit rates and activities were determined for each type of nuclear facilities.

- In 2015 ROSATOM provided the annual valuation of decommissioning costs according to a new methodology. The results of the assessment were audited by the external auditor.

- International experts will review our methodology of decommissioning costs valuation till the end of 2016.

- Further due to the increase of the amount of decommissioning objects and accumulation of knowledge of decommissioning costs valuation, a more detailed list of the decommissioning activities will be developed and the unit rates’ application will be expanded.

- Systematization of the list of RW management schemes, valuation and fixing of RW management costs and expansion of the list of RW containers for the final disposal.
### Types of reactor facilities in Russia and applied decommissioning concepts

<table>
<thead>
<tr>
<th>Type of reactor</th>
<th>Quantity</th>
<th>Decommissioning concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMB</td>
<td>2</td>
<td>Deferred dismantling - 45 years (including 25 years for save enclosure stage)</td>
</tr>
<tr>
<td>BN-600</td>
<td>1</td>
<td>Deferred dismantling - 50 years (including 30 years for save enclosure stage)</td>
</tr>
<tr>
<td>BN-800</td>
<td>1</td>
<td>Deferred dismantling - 50 years (including 30 years for save enclosure stage)</td>
</tr>
<tr>
<td>RBMK-1000</td>
<td>11</td>
<td>Immediate dismantling with specific elements of deferred dismantling - 40 years (including 20 years for abandonment stage)</td>
</tr>
<tr>
<td>VVER-440</td>
<td>6</td>
<td>Deferred dismantling - 50 years (including 30 years for save enclosure stage)</td>
</tr>
<tr>
<td>VVER-1000</td>
<td>12</td>
<td>Deferred dismantling - 50 years (including 30 years for save enclosure stage)</td>
</tr>
<tr>
<td>EGP</td>
<td>4</td>
<td>Entombment - 22 years</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>37</strong></td>
<td></td>
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</tbody>
</table>
THANK YOU FOR YOUR ATTENTION!