The costs of decommissioning in Korea

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Introduction

Overview of KHNP
Nuclear power plants in Korea

<table>
<thead>
<tr>
<th>Unit</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>24</td>
</tr>
<tr>
<td>Under construction</td>
<td>4</td>
</tr>
<tr>
<td>In planning</td>
<td>6</td>
</tr>
</tbody>
</table>

- **Hanul NPP**: Unit 6, Capacity 5,900MW
  - Shin Hanul #1-2: 1,400MW
  - Shin Hanul #3-4: 1,400MW

- **Cheonji #1-2**: 1,500MW

- **Wolsong NPP**: Unit 6, Capacity 4,779MW

- **Kori NPP**: Unit 6, Capacity 5,137MW
  - Shin Kori #3-6: 1,400MW
Basic plan for domestic units

Number of units starting Decommissioning

<table>
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<tbody>
<tr>
<td>Kori 1</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>4</td>
<td>5</td>
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</tbody>
</table>
2 Decommissioning costs
Cost estimation
Decommissioning costs

- Cost estimation

- Costs are estimated with engineering tool.
- Cost estimation was performed by the Korean government.
- Total cost for a unit is **616 M$ in 2014**.
- A unit cost is a standard decommissioning cost in Korea.
- Both PWR and PHWR are used to estimate costs.
- The standard of decommissioning costs revises biennially.
Decommissioning costs

Cost estimation methodology

A. Overall methodology
- Define a factor of decommissioning
- The combination of period and logic of activities in detail procedure
- Bottom up
- Consider purchase equipment and tool for work of specific environment

B. Structure organization
- Basic structure of cost and schedule estimation
- Making flow charts of cost estimation

C. Decommissioning procedure
- Define detail decommissioning procedure of whole project
- Define detail decommissioning progress of the work

D. Evaluation of the costs
- Define the categories
- Work break down list
- UCF, WDF
- Set, task, work unit
- Steps for estimation
- Investigation current adopted techniques
Decommissioning costs

Cost estimation procedure

1. Major assumption
2. Disaggregate of radioactive waste
3. Analysis the effect to the costs
4. The calculation of the amount of radioactive waste
5. Volume reduction of radioactive waste
6. The result of the costs
Decommissioning costs

Comparison activities for decommissioning costing

<table>
<thead>
<tr>
<th>Cost estimation in Korea</th>
<th>International structure of decommissioning costing</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Project management, planning and engineering</td>
<td>01 Pre-decommissioning</td>
</tr>
<tr>
<td></td>
<td>06 Site infrastructure and operation</td>
</tr>
<tr>
<td></td>
<td>08 Project management, engineering and site support</td>
</tr>
<tr>
<td></td>
<td>09 Research and development</td>
</tr>
<tr>
<td>02 Site reconfiguration</td>
<td>02 Facility shutdown activities</td>
</tr>
<tr>
<td>03 Dismantling activities within the controlled area</td>
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</tr>
<tr>
<td>04 Conventional dismantling and Demolition</td>
<td>03 Additional activities for safe enclosure or entombment</td>
</tr>
<tr>
<td>05 Procurement of equipment and services</td>
<td>07 Conventional dismantling, demolition and site restoration</td>
</tr>
<tr>
<td>06 Waste processing, storage and disposal</td>
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</tr>
<tr>
<td>07 Maintain systems related to spent fuel</td>
<td>10 Fuel and nuclear material</td>
</tr>
<tr>
<td>08 Research and development, taxes, insurances etc.</td>
<td>11 Miscellaneous expenditures</td>
</tr>
</tbody>
</table>
Decommissioning Policy in costs
Laws, acts, and notices
Decommissioning policy in costs

- **Laws, acts, and notices**

- **Laws**
  - Nuclear utility needs to accumulate a sum of money for a decommissioning and manage financially by accounting standards.

- **Acts**
  - The standard of decommissioning costs should be reviewed and revised biennially.
  - The Korean government committee which is composed of stakeholders and experts in finance, accounting, and nuclear vote for a scheme.

- **Notices**
  - The Korean Ministry of Trade, Industry and Energy issues a notification of the costs of decommissioning.
Decommissioning policy in costs

- Report annual financing plan

1. The status of provisions
   - The amount of reserves, usage, balance
   - Nuclear utility should report its annual financing plan to the Korean government

2. The prospect of provisions
   - Future prospect
     - The future accumulation prospects for next 10 years
     - The initial accumulation when a new unit complete

3. The financing plan
   - Raising money
     - Minimize liquidity risk
     - Maximize sales

Current status
Conclusions

Challenges and recommendations
Conclusions

◆ Challenges and recommendations

- Be aware of the specific characters of transition period.
- The cost of Kori #1 NPP needs to be re-estimated by characterization.
- Estimating a unit decommissioning cost separately.
- Shorten the period as much as possible, due to the financial source.
- Cost estimation needs to be performed by a utility.
THANK YOU