Key trends and Priorities in Nuclear Safety: Korea’s Experience

International Ministerial Conference on Nuclear Power in the 21st Century

31 October 2017
Nuclear Power in Korea
KHNP Overview

- **Establishment**: April 2, 2001, spin-off from KEPCO
- **Business**: Nuclear, Hydro, Pumped Storage, Renewables
- **Staff**: 11,513 Persons
- **Credit Rating**: AA (S&P), Aa2 (Moody’s)
- **Total Assets / Revenue**: 46.1 / 9.3 Billion USD

### Nuclear
- Op. unit: 24
- Capacity: 22.5 GW

### Hydro
- Op. unit: 35
- Capacity: 607 MW

### Pumped Storage
- Op. unit: 16
- Capacity: 4.7 GW

### Renewable
- Op. unit: 7
- Capacity: 22 MW
NPPs in Korea

<table>
<thead>
<tr>
<th>Operation</th>
<th>24 units</th>
<th>22,529 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>5 units</td>
<td>7,000 MW</td>
</tr>
<tr>
<td>Permanent Shutdown</td>
<td>1 units</td>
<td>578 MW</td>
</tr>
</tbody>
</table>

Power Generation (end of 2016)

- **TOTAL:** 540,441 GWh
- Nuclear: 161,995 GWh
- Gas: 39.6%
- Coal: 30.0%
- Oil: 5.5%
- Renewables (incl. Hydro): 22.3%

Installed Capacity (June 2017)

- **TOTAL:** 113,705 MW
- Nuclear: 22,529 MW
- Gas: 32.2%
- Coal: 31.4%
- Oil: 13.0%
- Renewables (incl. Hydro): 19.8%

Efforts for Nuclear Safety
Reactor Development

The efforts to strengthen the nuclear safety in Korea are on a same line with the history of reactor development.

Efforts for Nuclear Safety

OPR1000

<table>
<thead>
<tr>
<th>Type</th>
<th>PWR</th>
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</thead>
<tbody>
<tr>
<td>Life</td>
<td>40 Years</td>
</tr>
<tr>
<td>Output</td>
<td>1,000 MWe</td>
</tr>
<tr>
<td>Seismic</td>
<td>SSE 0.2g</td>
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</tbody>
</table>

APR1400

<table>
<thead>
<tr>
<th>Type</th>
<th>PWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life</td>
<td>60 Years</td>
</tr>
<tr>
<td>Output</td>
<td>1,400 MWe</td>
</tr>
<tr>
<td>Seismic</td>
<td>SSE 0.3g</td>
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</table>

APR+

<table>
<thead>
<tr>
<th>Type</th>
<th>PWR</th>
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</thead>
<tbody>
<tr>
<td>Life</td>
<td>60 Years</td>
</tr>
<tr>
<td>Output</td>
<td>1,500 MWe</td>
</tr>
<tr>
<td>Seismic</td>
<td>SSE 0.3g</td>
</tr>
</tbody>
</table>

EU-APR

- Acquisition of EUR certification (’17.10.9)
- NRC Design certification in process

US-APR
Safety Enhancement

**4-Train Safety System**
- Emergency Diesel Generator
- Safety Injection Pump
- In-containment Refueling Water Storage Tank
- Shutdown Cooling Heat Exchanger
- Shutdown Cooling Pump

**Improved Safety Injection System**
- Emergency Core Barrel Duct
- Fluidic Device

**Passive Auxiliary Feedwater System**
- Passive Condensation Cooling-water Tank
- Passive Condensation Heat Exchanger

**Passive Ex-vessel Corium Retaining and Cooling System**
- Sacrificial Concrete
- Downcomer Cooling Channel
- Carbon Steel
- Water Box Steel Liner
- In-containment Refueling Water Storage Tank
Shin-Hanul Unit 1&2
- Capacity: 1,400 x 2
- Reactor type: PWR (APR1400)
- Unit 1: Preparing for HFT
- Unit 2: Initial commissioning
- Progress rate: 95.29%

Shin-Kori Unit 5&6
- Capacity: 1,400 x 2
- Reactor type: PWR (APR1400)
- Unit 5: Excavation work on Intake/Drain
- Unit 6: Ground excavation
- Progress rate: 29.93%
Barakah Unit 1~4 (APR1400 x 4)

< EPC Progress rate >
- Unit 1&2: 94%
- Unit 3&4: 68%
- Total: 83%

※ Source: ENEC homepage

On Time & On Budget
Challenges
Safety & Security

Safety First Policy
- Enhance Safety Culture
- Improve Operation/Equipment Reliability
- Expand Investment in Safety

Enhancing Nuclear Security
- Raising Awareness to Nuclear Security
- Maintaining Independent IT System
- Collaborating with Government & Regulator & Operators

Declaration for Nuclear Safety Charter
Securing Public Acceptance through transparency and accurate information is a shortcut to enhance the Nuclear Safety.

The goal of P.A.:
Let people feel safe without mentioning ‘safety’
Saturation of on-site storage in Korea

Developing NPP D&D Technologies

Saturation of on-site storage

PHWR

Wolsong

2019

2024

2037

2038

PWR

Hanbit/Kori

Hanul

Shin Wolsong

Preparation of decommissioning plan

Request approval for DP

SF transfer complete

Shutdown (June 2017)

Public hearing with residents

Approval of DP

Termination of operation approval

Approval for decommissioning / Preparation for decommissioning plan

Decommissioning of S.S.C

Site restoration
**Human Resource Development**

**Company Profile**

**Decommissioning**

**New Build**

**HRD for Nuclear Power Plants**

**Safe Operation**

**Life Extension**

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**Third International Conference on Human Resource Development for Nuclear Power Programmes: Meeting Challenges to Ensure the Future Nuclear Workforce Capability**

28–31 May 2018, Gyeongju, Republic of Korea

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**20–31 May, 2018, Gyeongju in Korea**
THINK SAFETY

Thank You