U.S.-ROK Partnership for Nuclear Energy Cooperation
(Industrial Perspective)

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Current status of nuclear power in Korea
Nuclear Power Plants in Korea

In operation
- 20 units (17,716 MW)

Under construction
- 8 units (9,600 MW)

Radioactive Waste Disposal Facility (Under construction)

- Ulchin: 8 units
- Wolsung: 6 units
- Kori: 8 units
- Yonggwang: 6 units

Map of nuclear power plants in Korea.
History of reactor technology development

- **1970s**: Turn-Key Approach
  - Introduction of NPP
    - Kori 1
    - Kori 2
    - Wolsong 1

- **1980s**: Component Approach
  - Establishment of Localization (‘~’85)
    - Kori 3&4
    - Ulchín 1&2
    - Yonggwang 1&2

- **Early 1990s**: Technology Self-reliance
  - OPR1000 Development (’95)
    - Yonggwang 3&4

- **Late 1990s 2000s**: OPR1000 Construction
  - APR1400 Development (’02)
    - Ulchín 3,4,5&6
    - Wolsong 2,3&4
    - Yonggwang 5&6
    - Shin-Kori 1&2
    - Shin-Wolsong 1&2

- **2010s**: APR1400 Construction
  - APR+ Development (’15)
    - Shin-Kori 3&4
    - Shin-Ulchín 1&2
Status of electric power

Installed Capacity

Nuclear: 5,505 MW (7.6%)
Coal: 6,360 MW (8.8%)
Gas: 18,476 MW (25.5%)
Oil: 23,705 MW (32.7%)
Hydro: 17,716 MW (24.4%)

*The others: 728 MW (1.0%)
Total: 72,490 MW

Electricity Generation

Nuclear: 5,567 GWh (1.3%)
Coal: 21,801 GWh (5.1%)
Gas: 172,554 GWh (40.7%)
Oil: 72,615 GWh (17.1%)
Hydro: 150,958 GWh (35.6%)

*The others: 928 GWh (0.2%)
Total: 424,423 GWh

(As of the end of 2008)
Operation performance

Capacity Factor

<table>
<thead>
<tr>
<th>Country</th>
<th>Capacity Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>93.4</td>
</tr>
<tr>
<td>Japan</td>
<td>59.2</td>
</tr>
<tr>
<td>Canada</td>
<td>66.7</td>
</tr>
<tr>
<td>Russia</td>
<td>73.1</td>
</tr>
<tr>
<td>France</td>
<td>76.1</td>
</tr>
<tr>
<td>USA</td>
<td>89.9</td>
</tr>
</tbody>
</table>

World Average: 79.4%

Unplanned Capability Loss

<table>
<thead>
<tr>
<th>Country</th>
<th>Unplanned Capability Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>0.3</td>
</tr>
<tr>
<td>Japan</td>
<td>1.3</td>
</tr>
<tr>
<td>Russia</td>
<td>1.9</td>
</tr>
<tr>
<td>JAPAN</td>
<td>4</td>
</tr>
<tr>
<td>France</td>
<td>9.4</td>
</tr>
</tbody>
</table>

World Average: 5.3%

Source: IAEA

c Source: Nucleonics Week (2009. 3)
Low price of electricity with nuclear power

Economical efficiency

- Sales price (¥/kWh): Nuclear is the cheapest (year 2008)

<table>
<thead>
<tr>
<th>Source</th>
<th>Price (¥/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>49.8</td>
</tr>
<tr>
<td>Oil</td>
<td>14.8</td>
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<tr>
<td>Gas</td>
<td>11.0</td>
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<tr>
<td>Hydr</td>
<td>10.3</td>
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<tr>
<td>Wind</td>
<td>9.7</td>
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<tr>
<td>Coal</td>
<td>3.9</td>
</tr>
<tr>
<td><strong>Nuclear</strong></td>
<td><strong>3.0</strong></td>
</tr>
</tbody>
</table>

Contribution to national economy

- Consumer price 221.4% rise
- Electricity price 10.2% rise

1982 → 2008
Strength of Korea’s nuclear power

Well-organized nuclear infrastructure

Strong & consistent government nuclear policy

Well-qualified workforce to maintain nuclear power program

Close cooperation with international organization (IAEA, OECD/NEA, etc)
Reactor Technology of Korea

**OPR1000 (Proven Technology)**

<table>
<thead>
<tr>
<th>Type</th>
<th>PWR</th>
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</thead>
<tbody>
<tr>
<td>Design Life</td>
<td>40 Years</td>
</tr>
<tr>
<td>Electric Output</td>
<td>1,000MWe</td>
</tr>
<tr>
<td>Construction Period</td>
<td>47 Months</td>
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</tbody>
</table>

**APR1400 (Evolutionary Gen-III Reactor)**

<table>
<thead>
<tr>
<th>Type</th>
<th>PWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Life</td>
<td>60 Years</td>
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<tr>
<td>Electric Output</td>
<td>1,400MWe</td>
</tr>
<tr>
<td>Construction Period</td>
<td>48 Months</td>
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</table>

- APR1400: Advanced Power Reactor 1400MW
- OPR1000: Optimized Power Reactor 1000MW
The future direction of Korea’s nuclear power policy
Low-carbon, green growth is mapped out as Korea’s new national vision for a post-oil era.

< 4 Strategies>

- Low energy consumption
- Increasing clean energy
- Boosting green energy industry
- Affordable supply of energy

Increasing the share of nuclear power generation:
36% (’08) → 59% (’30)

Some 40 nuclear power plants will be in operation in 2030.
Vision and Challenges of nuclear power

**Vision**

- Nuclear is Driving force of Green Growth
  - Core energy source for energy security
  - Measures against climate change
  - Contribution to national economy development and enhancement of citizen’s life standards

**Challenges**

- Securing new plant sites
- Sustainable nuclear fuel supply system
- Promoting public acceptance
- Advancing the nuclear technology
- Exporting nuclear power plants
U.S.-ROK Cooperation on Nuclear Power
Status of Cooperation between Korea and the US (Industrial perspective)

Technology transfer for NPP construction

- Technology Transfer Agreement between KEPCO - ABB-CE
  Introduction of technology for Yongkwang 3,4 project (May. 1987)
- License Agreement between KEPCO - ABB-CE(Westinghouse)
  ABB-CE shall provide licensed technology (Jun.1997~ Jun.2007)

Supplying NPP equipment

- Westinghouse has provided NPP equipment of construction & operation parts.(RCP, MMIS, RVI, CEDM, etc.)

Supplying nuclear fuel

- U.S. provide the conversion and enrichment service of nuclear fuel
Status of Cooperation between Korea and the US (Industrial perspective)

Participating overseas projects

- **UAE consortium**
  Westinghouse participate on the KEPCO Team for UAE NPP
  (scope of supply is similar to Shin Kori 3,4 (RCP, MMIS, RVI, CEDM, etc.)
- **AP 1000 in U.S. NPPs (6 units)**
  Doosan : supply equipment (Reactor Vessel Head, S/G, etc.) for AP 1000
- **AP 1000 in China NPPs (6 units)**
  KOPEC have participated in design work of AP 1000
Status of Cooperation between Korea and the US
(Industrial perspective)

Technology cooperation for NPP

- KHNP-Exelon MOU for technology cooperation (Sep. 2005)
  - Technology exchange for operation, maintenance, construction.

- KHNP, membership of EPRI, signed the Master & Research Portfolio Agreement (Sep. 2008)
  - Joint study, provide program and code, information
Further Cooperation in the future

1. Strengthen the Cooperation for the peaceful uses of NP
   - Amend the current Agreement for Cooperation
     Recognize the progress of Korea’s nuclear situation and nuclear expansion program
   - Strengthen the cooperation in GNEP
     Pursue to achieve the GNEP goal

2. Long-term cooperation for overseas business
   - Expect cooperation for new plant export with long-term international business relationship

3. Promoting NP as a major GHG mitigation option
   - Inclusion of NP in CDM and other Kyoto Mechanisms
     Cooperation in the Post-Kyoto negotiations with concerned parties as well as in various international fora
Thank You