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Overview on Nuclear Power in the World

- Global NPP Status
- Prospects of World NPP Market
Countries operating NPPs: 31 countries
NPPs in operation: 433 units

Europe: 186 units
Asia: 97 units
North America: 121 units
Africa: 2 units
Latin America: 6 units
Korea: 21 units

Source: WNA, Dec. 2011
Predicted that the world NPP market would change with countries’ rethinking their nuclear policy.

IAEA Prediction

Additional 400 units by 2030

(Unit: GWe)

2008 2020 2030

372 453 546

431GWe 550

803

IAEA(International Atomic Energy Agency, 2010)
Part 2
Status of Korean Nuclear Industry

- Overview of Korean NPPs
- Status of Electric Power
- Low Price of Electricity with Nuclear Power
- Nuclear Power Prospect in Korea
- Korean Nuclear Industry
- Construction & Operation Experience
- Status of NPP Construction
Overview of Korean NPPs

- Seoul
  - Yonggwang: 6 units
- Kori
  - 4 units
- Shin-Kori
  - 8 units
- Wolsong
  - 4 units
- Shin-Wolsong
  - 2 units
- Ulchin
  - 6 units
- Shin-Ulchin
  - 4 units
- Yonggwang
  - 6 units

- In Operation: 21 units, 18,716 MW
- Under Construction: 7 units, 8,600 MW
- Under Planning: 6 units, 8,600 MW
31% of the nation’s electricity. World’s 5th largest nuclear power provider

**Installed Capacity**

- **Nuclear**: 18.716 MW (23.3%)
- **Coal**: (31.8%)
- **Gas**: (25.5%)
- **Oil**: (9.8%)
- **Others**: (9.6%)

TOTAL: 76,078 MW

**Electricity Generation**

- **Nuclear**: 148,596 GWh (31.3%)
- **Coal**: (40.8%)
- **Gas**: (20.3%)
- **Oil**: (5.3%)
- **Others**: (2.2%)

TOTAL: 474,660 GWh

* Installed Capacity of Nuclear as of Feb. 2011 : 18.716 MW (23.4%)

Source: KEPCO in Brief (2010)
Stabilized electricity price contributed to Korean Economy Development!
“Low Carbon & Green Growth is the vision of Korea in preparation for the post-oil era”

- 20 units: 6,915 million TCO₂
- 31 units: 72,491 million TCO₂
- 31% (46%) of installed capacity
- 1978: 9% (7%)
- 2008: 25% (36%)
- 2020: 31% (46%)
- 2030: 41% (59%)

- million TCO₂
- 105,195MW
- 40 units

GHG reduction target in 2020: -40% compared to BAU

BAU: Business As Usual

Nuclear energy will contribute to 40% of the CO₂ reduction target by 2020
Korean Nuclear Industry

- Design and Engineering
- Nuclear Fuel
- Maintenance and Services
- Equipment Manufacturing
- Construction

NSSC (Nuclear Safety & Security Commission)
- Nuclear Safety
- Licensing
- Inspection

KEPCO
- Contract
- Planning
- Overseas Business

KHNP
- Utility Project Management
- Commissioning
- O&M

Research and Development

KEPCO E&C

KEPCO

KPS

DOOSAN

DAEWOO E&C

SAMSUNG

HYUNDAI

SK

DAELIM

GS E&C
Phases of Development

1970s
Turnkey Phase
- 3 units completed
  - Kori #1, #2
  - Wolsong #1

1980s
Non-Turnkey Phase
- 6 units completed
  - Kori #3,4
  - Yonggwang #1,2
  - Ulchin #1,2

1990s
Self-Reliance Phase
- 11 units completed
  - Yonggwang #3,4,5,6
  - Ulchin #3,4,5,6
  - Wolsong #2,3,4

2000s
Advancement Phase
- 1 unit completed
- 7 units under construction
- 4 units exported
  - Shin-Kori #1,2
  - Shin-Wolsong #1,2
  - Shin-Kori #3,4
  - Shin-Ulchin #1,2
  - UAE#1,2,3,4
9 units in operation

- **Younggwang #3,4,5,6**
  - Completion: 95.3/96.1/02.5/02.12

- **Ulchin #3,4,5,6**
  - Completion: 98.8/99.12/04.7/05.4

- **Shin-Kori #1**
  - Completion: 2011.2

3 units under construction

- **Shin-Kori #2**
  - Work process: 99.57%
  - Completion: June 2012

- **Shin-Wolseong #1,2**
  - Work process: 97.95%

※ OPR : Optimized Power Reactor
4 units under construction

**Shin-Kori #3,4**
- Work progress: 81.45%
- Completion: '13.9 / '14.9

**Shin-Ulchín #1,2**
- Work progress: 26.34%
- Completion: ’17.6 / ’18.6

6 units under construction plan

- Shin-Kori # 7&8 (Completion: Jun. 2022 / Jun. 2023)

※ **APR**: Advanced Power Reactor
UAE Project

- Current work progress: 12.33%
- Commercial Operation Dates
  - Unit 1 in May 2017
  - Unit 2 in May 2018
  - Unit 3 in May 2019
  - Unit 4 in May 2020

May. 2017
- Unit 1 completion

- Fuel loading

Jul. 2014
- Reactor installation

Nov. 2012
- First concrete pouring

Apr. 2012
- Power block excavation

Dec. 2009
- Main contract
Part 3

Competitiveness of Korean Nuclear Power Plant

- World’s Best Operation Performance
- Competitiveness of Construction Capability
- Excellent Nuclear Human Resources
World’s Best Operation Performance (1)

Annual capacity factor

- 12% higher than the World average
- Highest capacity factor among Major NPP exporting countries

※ Source: Nucleonics Week, June 2011

Year of 2010

Korea Japan Canada France Russia U.S.A

World Average 69 71 74 75 89

※ Annual capacity factor

Annual average of load compared to the rated output
Considerably low compared to other exporting countries

Unplanned capability loss factor

3-year average unplanned capacity loss factor: 0.3% (World average: 5.5%)

The rate of capacity loss caused by unplanned plant shutdown compared to the output in normal operation
Proven Construction Period
18% shorter construction period through design improvement and repetitive construction
- Continuous construction (1 unit per year)
- Design standardization and construction method improvement
※ Pursue shorter construction period compared to Shin-Kori units 3,4 (APR1400)

Competitive Construction Cost
- Price competitiveness proven in UAE bidding
- 10% lower cost for APR1400 compared to OPR1000
First APR1400 project

- Capacity: 1,400MW x 2 Units
- Progress rate: 81% (as of late Nov. ‘11)

Recent Major Activities

- #3 RCB Structure Post-tensioning (Horizontal)
- #4 RCB RV Installation
- #3,4 TB Structure & MSR Installation

<table>
<thead>
<tr>
<th>Milestones</th>
<th>Unit 3</th>
<th>Unit 4</th>
</tr>
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<tbody>
<tr>
<td>Excavation</td>
<td>Sep. 2007</td>
<td>Sep. 2007</td>
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<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Concrete Pouring</td>
<td>Oct. 2008</td>
<td>Aug. 2009</td>
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<tr>
<td>COD</td>
<td>(Sep. 2013)</td>
<td>(Sep. 2014)</td>
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</tbody>
</table>
APR1400 project

Capacity: 1,400MW x 2 Units

Progress rate: 25% (as of Sep. ‘11)

Recent Major Activities

- Site Grading
- Cooling System Structure Installation
- Completion of Batch Plant
- Site Paving and Drainage Work

<table>
<thead>
<tr>
<th>Milestones</th>
<th>Unit 1</th>
<th>Unit 2</th>
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<tbody>
<tr>
<td>Excavation</td>
<td>May 2011</td>
<td>May 2011</td>
</tr>
<tr>
<td>1st Concrete Pouring</td>
<td>(Nov. 2011)</td>
<td>(Nov. 2012)</td>
</tr>
<tr>
<td>First Energizing</td>
<td>(Jun. 2014)</td>
<td>(May 2015)</td>
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APR1400 project

COD of the 1st Unit: May, 2017

Capacity: 1,400MW x 4 Units

Progress rate: 9.6% (as of Sep. ‘11)

Recent Major Activities

- Site infrastructure is being installed
- Dredging work for intake & discharge has started
- Boring work for warf has constructed
- Cutoff dam is being started
- Excavation for construction the main buildings
- 8 construction companies participating in NPP construction are not included above.
- HR development know-how transferred from Korea could greatly contribute to South Africa’s technology secureness and localization
Korea is ready to contribute to the development and prosperity of your country!
Thank you!