Energy Industry Development Profiles in Korea

Korean Energy Day
The International Energy Forum and the Korean Embassy in Saudi Arabia

The Kingdom of Saudi Arabia

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1. Overview
2. History of Energy Sector Development
3. Current Status of Korea’s Energy Sector
4. Long-term Energy Outlook
Korea at a Glance

- **Land Area: 99,646 km²**
  - More than 70%: Unproductive hill/mountains

- **Population: 49.8 million**
  - High population density
  - Skilled man powers

- **Moderate Climates**
  - Cold winter: Low productivity in agricultures

⇒ Economic Development Strategy:
  - High value-added industries
  - Export to international markets

- **GDP (2011)**
  - per capita: US$ 22,489
Energy Demand and Economic Growth in Korea

GDP (7.2%, pa)

Energy (6.6%, pa)

(1970 F.Y=100)

- 19.7 Mtoe
- 61.9 trillion won
- 271.4 Mtoe
- 1,081.6 trillion won
Final Energy Demand by Sector in Korea

Demand Driver Growth (1985 - 2011)
- Pig iron: 9 → 35MMT
- Cement: 21 → 52MMT
- Ethylene: 0.6 → 6.8 MMT
- Cars: 1.1 → 18.4 mill

199.9 million TOE
60.3% 18.5% 18.9% 2.3%
Domestic Energy Production in Korea

- Limited Energy Resources
  - Domestic Reserves: Anthracite, hydro, renewable
  - No oil, natural gas, bituminous coal, uranium

- Import dependence: 96.5%
  - Energy import: US$ 172.5 billion (2011)

Korea as a major energy importer
- Oil: 5th, 872.4 Mil. bbl (2010)
- LNG: 2nd, 32.6 Mil. tons (2010), 8th Gas import
- Coal: 2nd, 119.3 Mil. tons (2010)
Energy Mix Changes in Korea


- Oil: 61.1 → 53.8 → 38.5%
- LNG: 0 → 3.2 → 17.5%
- Coal: 30.1 → 26.2 → 28.8%
- Nuclear: 2.0 → 14.2 → 12.2%
Energy Balance Flow in Korea (2011)

Import
Energy dependency 96.5% (171.8 billion $)

Crude
Middle East (87%) • Saudi (31%) • UAE (9%) • Kuwait (13%) • Iran (9%)
Asia (11.8%)
Africa (0.1%)

Qatar • Oman • Indonesia
Australia • China • Indonesia
Russia • US • Australia
China • Australia • Vietnam
Domestic 3.5%

Supply (primary)
271.4 million toe (100%)

OIl
38.5%

LNG
17.5%

Bituminous coal
26.3%

Nuclear
12.2%

Anthracite
2.5%

Hydraulic Renewables
2.9%

Transf. & Loss
71.5 million toe [26.3%]

Refining
2.8 million b/d

City Gas
19.0 million ton

Thermal
1,785.8 1000 TOE

Electricity
4,992,100 million kWh

Nuclear
30.9%
Bituminous
38.8%
LNG
21.8%
Oil
4.8%
Anthracite
0.6%
Hydraulic Renewables
1.4%

Consumption (end-use)
199.9 million toe (73.7%)

Industrial 60.3%
Base materials (e.g. naphtha) 31.6%
Residential + Commercial 18.9%
Transportation 18.5%
Public 2.3%

Electricity
Industrial 53.1%
Res. + Com. 41.9%
Public 4.5%
Trans. 0.5%
Energy Development History in Korea

1970 – 80’s: Government Intervention

- Fuel diversification away from oil
  - Oil → Natural gas and nuclear,
- High investment for energy facilities (Refineries and power plants)


- Modernization of energy infrastructure,
  - Construction/expansion of nationwide natural gas and oil trunk pipeline systems
  - District heating/cooling system for household/commercial buildings
- Strengthening the market mechanism,
  - Petroleum prices were completely liberalized in 1997.
  - Energy security through improving market environment
- Increased environmental concerns
  - Energy conservation and efficiency improvement policies,
  - Renewable energy sources
## Overview of Korean Economy and Energy Sector Change

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Economy</th>
<th>Energy</th>
</tr>
</thead>
</table>
| 1960’s      | - Launching economic development  
- Rapid growth of light industry  
※ Undeveloped industrial structure (mainly focused on the agricultural sector) | - Efforts to secure stable energy supply for economic development |
| 1970’s      | - Industrialization  
- Rapid growth of heavy & chemical industry | - Establishment of oil-oriented energy supply system |
| 1980’s      | - Industrial diversification  
- Rapid economic growth | - Diversification of energy supply |
| 1990’s      | - Development of high-tech industries such as IT, ICT  
- OECD member  
- Liberalization of industry | - Liberalization of energy industry |
| 2000’s      | - Development of low-carbon industry and knowledge-based industry | - Toward low-carbon energy growth |
Energy Industry Structure of Korea

Promoting public companies and government-led development in the energy industry for a stable energy supply and active economic growth

Supporting & controlling energy infrastructure with mid-to long-term plans

Strengthening industrial competitiveness through liberalization of energy industry after the 1990s
- Oil industry was successfully liberalized and opened
- However, liberalization process of power industry and gas industry is still in progress

Public
- Government
  - KEPCO: Power generator, Transmitter, Distributor
  - KOGAS: Overseas gas developer, LNG Importer, Wholesaler
  - KDHC: District Heat Supplier
  - KNOC: Strategic Oil Stockpiling, Overseas & domestic oil developer

Private
- Oil Companies
  - Importers
  - 4 Refiners
  - Distributors
- City Gas Companies
  - Retailers
  - Territorial Monopolies
- Coal Companies
  - Importers
  - Producers
  - Distributors
## Other Institutions for Energy in Korea

<table>
<thead>
<tr>
<th>Institution</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea Energy Economics Institute (KEEI)</td>
<td>Energy Policy Planning and Research</td>
</tr>
<tr>
<td>Korea Energy Management Corporation (KEMCO)</td>
<td>Energy Audits &amp; Implementation of Conservation Programs</td>
</tr>
<tr>
<td>Korea Institute for Energy Research (KIER)</td>
<td>Energy Technology Research</td>
</tr>
</tbody>
</table>
Established ‘Master Plan for National Energy’ as top national strategy regarding energy policy since 1997
※ Master Plan for National Energy is the top energy plan which sets the basic direction and principle for mid- to long-term energy policy
- There are detailed plans for major energy sectors under the Master Plan for National Energy

**Structure of Energy Master Plan**

- Demand
  - Plan for rationalization of energy use
  - Plan for oversea resource development
  - Plan for underwater mineral resources

- Supply
  - Plan for oil reserve
  - Plan for power supply and demand
  - Plan for natural gas long-term supply
  - Plan for coal industry
  - Long-term Plan for renewable energy

- Plan for technology development of national energy resources
- Strategy for climate change (Master Plan for reducing greenhouse gas)

- All plans are mandated by laws.
- Responsible authority: Ministry of Knowledge Economy
Oil Industry Development in Korea

- The world’s 5th largest crude oil importer
  - Total crude oil imports: 927 million barrels (2011)

- The world’s 6th largest refinery capacity
  - Total refinery capacity: 2.78 million b/d (2011)

- Export of petroleum product recorded $52 billion in 2011

**World Crude Oil Import Share**
- USA 23%
- China 11%
- Japan 8%
- India 7%
- Korea 5%
- Germany 4%
- Other 42%

**Demand vs. Capacity**
- Over Capacity

**Petroleum Product Exports**
- [billion USD]

*source: IEA/OECD (2012)*
Oil Industry Development in Korea

- **Fully Privatization**: Entry, imports/export, and price linearization from 1997
- **4 Refiners**: SK (1,115 bpsd), GS-Caltex (770 bpsd), Hyundai (390 bpsd), S-oil (580 bpsd) + Foreign participation: Caltex, Aramco (Saudi)

Total Capacity: 0.64 (1980) → 2.855 million b/d (2010)
Oil Pipeline System in Korea

As the only company specializing in the construction and operation of oil pipelines, the DOPCO pipeline system connects refineries with major cities, airports, military bases and strategic petroleum storage terminals. This network ensures a safe and stable supply of petroleum to the nation.

The DOPCO pipeline network consists of 1,104KM of underground pipeline, 14 tank terminals with a 3,270Mbbl storage capacity and 11 booster pump stations.

DOPCO has also operated the Trans Korea Pipeline (TKP) for USFK (US Forces Korea) since 1999.

Source: Daehan Oil Pipeline Corporation, Homepage: www.DOPCO.co.kr
Oil Stockpiling in Korea

Nine stockpiling sites operated by the KNOC

Total capacity: 127MMB of reserves → 141MMB by 2013

Duration day: 191 days (IEA standards (net daily imports))

Source: Korea National Oil Corporation, Homepage: www.knoc.co.kr
Coal Development in Korea

- **Production Promotion in past**
  - Heavy subsidization for production increase in the 1970’s

- **Active Rationalization from the 1990’s**
  - Low productivity
  - Significant demand decreases

- **Coal production decreased:**
Natural Gas Industry in Korea

LNG Terminals and Pipeline

- 4 LNG terminals and a nationwide pipeline networks for transport of natural gas

**National Pipeline Network**

- **Storage**: 6,320 th.㎘ (48 tanks)
- **Main Pipeline**: 2,777 km
- **Regional Pipeline**: 31,435 km

<table>
<thead>
<tr>
<th>LNG Terminal</th>
<th>Start</th>
<th>Storage Capacity (1,000㎘, #)</th>
<th>Re-gas Capacity (Ton/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incheon</td>
<td>Oct. 1996</td>
<td>2,880 (20)</td>
<td>3,690</td>
</tr>
<tr>
<td>Pyeongtaek</td>
<td>Nov. 1986</td>
<td>1,560 (14)</td>
<td>3,376</td>
</tr>
<tr>
<td>Tongyeong</td>
<td>Sep. 2002</td>
<td>1,680 (12)</td>
<td>1,530</td>
</tr>
<tr>
<td>Gwangyang</td>
<td>Jul. 2005</td>
<td>200 (2)</td>
<td>170</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td></td>
<td><strong>6,320 (48)</strong></td>
<td><strong>8,766</strong></td>
</tr>
</tbody>
</table>

[Bird’s-eye view of LNG terminal] (As of Dec. 2009)
Natural Gas Industry in Korea

Natural Gas Import

- The world’s 7th largest natural gas importing country
- Natural gas imported from 9 countries by ship (LNG)
  ※ Korea is the world’s largest LNG shipbuilder

[Map showing natural gas import sources and LNG shipbuilder]

- Oman: 4.06 mmtpa ('00~'24)
- Qatar: 2.10 mmtpa ('07~'26)
- Egypt: 1.32 + 0.24 mmtpa ('08~'16)
- Yemen: 2 mmtpa ('08~'28)
- Indonesia: 2.0 mmtpa ('94~'14), 1.0 mmtpa ('94~'17)
- Russia: 1.5 mmtpa ('08~'28)
- Malaysia: 2.0 mmtpa ('95~'15), 1.5 + 0.5 mmtpa ('08~'28)
- Brunei: 0.7 mmtpa ('97~'13)
- Australia: 0.5 mmtpa ('03~'16)

[LNG ship built in Korea]

[Natural Gas Imports]

- '86: 7,000 (1,000 ton)
- '90: 14,000
- '95: 21,000
- '00: 28,000
- '08: 33,000
- '11: 35,000

Korea Energy Economics Institute
Electricity Development in Korea

- **Government Initiatives**
  - KEPCO
    - 6 Power Gen Companies
    - Transmission/Distribution by KEPCO

- **Fuel Diversification**
  - Power generation capacity by fuel
    - (1980 → 1990 → 2011, %)
    - Oil: 62.3 → 18.4 → 10.1
    - Coal: 8.0 → 17.6 → 30.5
    - LNG: 0 → 16.1 → 25.4
    - Nuclear: 6.3 → 36.2 → 23.6

- **Challenge**: Sites for power plants

![Power Generation Capacity (’11)](image)

- Total: 79,342 MW
Electricity Development in Korea

- **Rapid expansion of power generation capacity**
  - Power generation capacity: (1961) 367 MW → (2011) 79,342 MW (more than 200 times increase)

- **Establishing a nation-wide transmission and distribution (T&D) network**
  - Power line length: (1961) 9,171 c-km → (2011) 435,549 c-km

- The quality of T&D reached the world-class level

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**Transmission System Network**

(Unit: c-km/substations)

- 765kV: 835 / 6
- 345kV: 8,653 / 91
- 154kV: 21,280 / 644
Power generation by fuel

- Nuclear power: 30.3% of electric power production (2011)
  - 2nd largest generation source following coal-fired (40.3%)

- Big increase of LNG-fired: 20.8% (2011) from 15.1% (2009)

Power generation by fuel

- Oil: 79.8 → 22.8 → 5.3
- Coal: 6.3 → 26.4 → 40.3
- LNG: 0 → 11.5 → 20.8
- Nuclear: 7.2 → 36.3 → 30.3

Total 495.9 TWh
Nuclear Power Industry in Korea

- Korea operates a total of 21 nuclear power plants as of Dec. 31, 2011
- Korea possesses 95% technological independence with its Korean type nuclear reactors of OPR1000 and APR1400
- Korea won an order of building a nuclear power plant in UAE (2009. 12)
  - UAE Nuclear Energy Corporation (ENEC) selected the consortium of KEPCO as the final business proprietor for UAE nuclear power plant business (about 20 billion dollars deal)
  - Also, Korea conducted a research and training project in Jordan

<table>
<thead>
<tr>
<th>Site</th>
<th>In Operation</th>
<th>Under Const.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kori</td>
<td>5 (4,137)</td>
<td>3 (3,800)</td>
<td>8 (7,937)</td>
</tr>
<tr>
<td>Wolsong</td>
<td>4 (2,779)</td>
<td>2 (2,000)</td>
<td>6 (4,779)</td>
</tr>
<tr>
<td>Yonggwang</td>
<td>6 (5,900)</td>
<td>-</td>
<td>6 (5,900)</td>
</tr>
<tr>
<td>Ulchin</td>
<td>6 (5,900)</td>
<td>2 (2,800)</td>
<td>8 (8,700)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21 (18,716)</strong></td>
<td><strong>8 (8,600)</strong></td>
<td><strong>28 (27,316)</strong></td>
</tr>
</tbody>
</table>

(As of Dec. 31, 2011, Units: MW)
Electricity Development in Korea

Nurturing Power Industry as New Growth Engine

Power generation plants, transmission and distribution system, nuclear power plant, EPC and operation, management etc.

KEPCO’s Overseas Projects in Operation

* WAPP: West African Power Pool

<table>
<thead>
<tr>
<th>Country</th>
<th>Project Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lebanon</td>
<td>Plant O&amp;M, 870 MW</td>
</tr>
<tr>
<td>Egypt</td>
<td>T&amp;D Consulting</td>
</tr>
<tr>
<td>Libya</td>
<td>T&amp;D Consulting</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Egbin Plant (Boiler) Repair</td>
</tr>
<tr>
<td>China</td>
<td>Wuzhi: BOO, 112 MW</td>
</tr>
<tr>
<td></td>
<td>Gansu: BOO, 49 MW</td>
</tr>
<tr>
<td></td>
<td>Neimenggu: BOO, 139 MW</td>
</tr>
<tr>
<td></td>
<td>Shanxi: M&amp;A/BOO, 13,439 MW</td>
</tr>
<tr>
<td>Mongol</td>
<td>T&amp;D Consulting</td>
</tr>
<tr>
<td>Myanmar</td>
<td>T&amp;D Improvement</td>
</tr>
<tr>
<td>Philippines</td>
<td>Malaya: ROMM, 650 MW</td>
</tr>
<tr>
<td></td>
<td>Ilijan: BOT, 1,200 MW</td>
</tr>
<tr>
<td></td>
<td>Naga: M&amp;A, 206 MW</td>
</tr>
<tr>
<td></td>
<td>Cebu: BOO, 200 MW</td>
</tr>
<tr>
<td>Indonesia</td>
<td>T&amp;D Consulting</td>
</tr>
<tr>
<td>UAE</td>
<td>AR-1400 Nuclear Power Plants Construction (4 units)</td>
</tr>
<tr>
<td>Paraguay</td>
<td>T&amp;D Consulting</td>
</tr>
</tbody>
</table>

* source: KEPCO (Korea Electric Power Corporation)
Renewable Energy in Korea

- Solar Thermal: 0.4
- Photovoltaic: 2.4
- Biomass: 11.0
- Waste: 70.9
- Small Hydro: 11.6
- Wind Power: 3.7

Bar chart showing the increase in renewable energy from 1990 to 2009. The percentage chart shows the distribution with Waste at 70.9%, Biomass at 11.0%, Small Hydro at 11.6%, Wind Power at 3.7%, Photovoltaic at 2.4%, and Solar Thermal at 0.4%. The percentage chart illustrates the proportion of each type of energy.
Renewable Energy in Korea

- Renewable energy supply has increased at an annual rate of 16.3% during 1990-2010 (2.61% share in total energy consumption in 2010)

- Target for renewables share in energy mix: 11% (2030)
  - Key sources for renewable energy: bio-fuel, wind power, solar energy

### Supply Trend of Renewable Energy

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply [1,000 TOE]</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'90</td>
<td>1,000</td>
<td>0.36</td>
</tr>
<tr>
<td>'92</td>
<td>1,000</td>
<td>1.40</td>
</tr>
<tr>
<td>'94</td>
<td>1,400</td>
<td>2.06</td>
</tr>
<tr>
<td>'96</td>
<td>1,700</td>
<td>2.36</td>
</tr>
<tr>
<td>'98</td>
<td>2,000</td>
<td>2.61</td>
</tr>
<tr>
<td>'00</td>
<td>2,400</td>
<td>2.61</td>
</tr>
<tr>
<td>'02</td>
<td>2,900</td>
<td>2.61</td>
</tr>
<tr>
<td>'04</td>
<td>3,500</td>
<td>2.61</td>
</tr>
<tr>
<td>'06</td>
<td>4,100</td>
<td>2.61</td>
</tr>
<tr>
<td>'10</td>
<td>4,700</td>
<td>2.61</td>
</tr>
</tbody>
</table>

### Target for Renewables (2030)

<table>
<thead>
<tr>
<th>Type</th>
<th>2010</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geothermal</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Tide, Wave, Ocean</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Solar photovoltaic</td>
<td>0.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Hydro</td>
<td>0.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Solar thermal</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Wind</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Biomass</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Waste material</td>
<td></td>
<td>0.5</td>
</tr>
</tbody>
</table>
Energy Saving and Energy Efficiency Improvement

- Korea’s energy intensity has declined steadily since its peak in 1997
  - Energy efficiency has improved 1.1% per year from 1998 to 2011
  - Energy efficiency in Korea is one of the lowest in OECD countries (29th) due to the high share of manufacturing industry and energy intensive industries

- Especially, Korean power industry’s efficiency has greatly improved
  - The T&D loss rate, one of the indicators of power industry’s efficiency, has steadily improved to 3% level in 2011, even lower than the major developed countries (Japan 5%, USA 6%)

### Energy Intensity (toe/million won)

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>'81</td>
<td>0.31</td>
</tr>
<tr>
<td>'85</td>
<td></td>
</tr>
<tr>
<td>'90</td>
<td></td>
</tr>
<tr>
<td>'95</td>
<td>0.35</td>
</tr>
<tr>
<td>'00</td>
<td></td>
</tr>
<tr>
<td>'11</td>
<td>0.251</td>
</tr>
</tbody>
</table>

### T & D Loss Rate (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>T&amp;D Loss Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>'61</td>
<td>29.35</td>
</tr>
<tr>
<td>'70</td>
<td>11.84</td>
</tr>
<tr>
<td>'80</td>
<td>6.69</td>
</tr>
<tr>
<td>'90</td>
<td>5.62</td>
</tr>
<tr>
<td>'00</td>
<td>4.71</td>
</tr>
<tr>
<td>'11</td>
<td>3.69</td>
</tr>
</tbody>
</table>

The smallest T&D loss rate in the world
Overseas Energy Resource Development

- Government’s target of overseas E & P business
  - Overseas Oil Producing Amount equivalent to 18% of oil imports by 2012 and 28% by 2016 in overseas oil fields
Korea pursues more active overseas resource developments

- Target ratio of overseas resources development: 28% (2030)
  - Promotion of overseas exploration and production businesses to the companies
  - Strong government supports for fostering technologies and human resources over energy development
Korea’s Overseas Resource Development

- Total project number: 505 in 64 countries (oil & gas 198, Mineral 307)
- Achievement (2011): Oil & Gas 13.7 %, Coal 52.2 %, Uranium: 6.6 %, Iron Ore: 15.3 %, Copper: 10.2 %, Zinc: 24.7 %, Nickel: 30.5 %
Energy Technology Development

- Achieved a technological independence and localization in a short period of time by absorbing and introducing foreign technology
  - Benchmarking some institutions of advanced countries, technical exchanges and cooperation
  - Increasing R&D investments in energy technology
  - Vitalizing joint R&D efforts among universities, research institutions and private companies

- Reached a world-class energy plant technology
  - Drill ship, FPSO (floating production storage and offloading)/FSO (floating storage and offloading), LNG carrier, nuclear power, T&D, petroleum refinery and so on

- **Drill Ship**
  - Offshore drill ship
  - Arctic shuttle tanker

- **FPSO**
  - Crude oil-FPSO/FSO
  - LNG-FPSO

- **LNG Carrier**
  - Membrane-type
  - LNG-RV (Regasification vessel)

- **Nuclear Power**
  - APR1400 (New nuclear Reactor)
## Energy Demand Outlook in Korea (2030)

<table>
<thead>
<tr>
<th>Energy Demand (million toe)</th>
<th>2006</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Primary Energy</td>
<td>233.4</td>
<td>258.7</td>
<td>268.6</td>
<td>311.6</td>
<td>334.3</td>
</tr>
<tr>
<td>Coal</td>
<td>56.7</td>
<td>68.9</td>
<td>73.9</td>
<td>79.5</td>
<td>83.8</td>
</tr>
<tr>
<td>Oil</td>
<td>101.8</td>
<td>106.6</td>
<td>109.8</td>
<td>115.1</td>
<td>119.7</td>
</tr>
<tr>
<td>LNG</td>
<td>32.0</td>
<td>38.3</td>
<td>41.4</td>
<td>46.1</td>
<td>51.5</td>
</tr>
<tr>
<td>Nuclear</td>
<td>37.2</td>
<td>37.1</td>
<td>50.8</td>
<td>57.2</td>
<td>62.5</td>
</tr>
<tr>
<td>Hydro</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Renewables</td>
<td>4.4</td>
<td>6.5</td>
<td>9.4</td>
<td>12.3</td>
<td>15.4</td>
</tr>
</tbody>
</table>

Energy Mix Target


- Reduction of use of fossil fuels to decrease GHG emissions
  - Coal ↓, Oil ↓, LNG ↓

- Expansion of renewable energy and nuclear power capacity
  - renewable energy: from 2.5% in 2007 to 11.5% in 2030
  - nuclear energy: from 14.9% in 2007 to 27.8% in 2030

Reality seems to have been away from the plan due to the impact of Fukushima accident (2011)
Future Challenges

- **Securing Long Term Stable Energy Resources**
  - Strengthening Energy Diplomacy with energy producing/exporting countries
    - ME, SE Asia, Australia
    - Russia, Central Asia/Caspian region
  - Regional Energy Cooperation in Northeast Asia

- **Environmental Pressures**
  - Local: Air pollution, Sites for energy facilities (nuclear power plants)
  - Global: Mitigate Greenhouse gases
  - **⇒ Low-carbon energy system**

- **Energy Security in the Korean Peninsular**
  - Energy Crisis/Poverty Problem in North Korea
  - Energy Market Integration between South-North Korea
International Energy Cooperation Strategy

- Comprehensive Approaches
  - Combining Energy + High-value Added Industry + Infrastructure Development Projects
  - Enhancing partnership between government and business sectors
    - to Improve trade/investment environment

⇒ Korea–Saudi Arabia energy cooperation can provide with a win-win opportunity
Thank you very much

Gamsa’hamnida

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