Status of Distributed Generation, New & Renewable Energy in Korea

NOVEMBER, 2007

Korea Energy Management Corporation
I. KEMCO’s Major Activities

II. DSM in Korea

III. Combined Heat & Power

IV. New & Renewable Energy
I. KEMCO’s Major Activities
MOCIE (Korean Government)

KEMCO (Under MOCIE)

15 Departments, 12 Branches
1 Affiliate (New & Renewable Energy Center)

Energy Efficiency & Conservation

New & Renewable Energy

Climate Change Mitigation

Industry
- Energy Audit
-ESCO
- Soft Loan

Transport
- Indication Mileage
- Hybrid car

Building
- Certification
- MEPS
- Energy Label
- Rebate

Appliance
- CHP
- Hydrogen/fuel cell
- Photovoltaic
- Wind
- RD&D

Korea Energy Management Corporation
II. DSM in Korea
Demand Side Management

DSM of Energy

- Energy Efficiency
  - Retrofit or replacement of high efficiency end-uses

- Load Management
  - Least-cost planning for energy Supply and demand focused on load leveling

- Rate Policy (midnight power service, discounts for requested load adjustment)
- Energy Efficiency Standards and Certifications
- Financial Incentives (Rebates, loans, tax exemptions etc)
- Technical Audits (Consulting)
- Public Relations
Conventional DSM Categories

- Strategic Conservation
- Peak Clipping
- Strategic Load Growth
- Load Shifting
- Valley Filling
- Flexible Load Shape

Load Reductions and Energy Supply Cost Savings (Installation, Operation)
III. Combined Heat & Power
1. CHP’s Classifications & Figures

- **Small Scale Generation**: Self-consumption
- **Mass Energy System**: Supplying contract
- **Community Electricity System**: Direct delivery

- When a shortage of electric power occurs, Small Scale Generation is supplied with electric power from the electric supply company.
Electricity Market Structure

- **KPX** (Electricity Markets)
  - Bidding
  - Supplying contracts

- **KEPCO** (T&D, Sale)
  - Customers
  - Large Consumers

- **MES**
  - PPA Company

- **CES**
  - Customers

- **PPA**: Power Purchase Agreement
- **MES&CES**: Supplies heat and power

※ Electricity Flow
Income
2. Small Scale Generation

**Definition**
- High efficiency integrated energy system which produce and utilize heating and electricity simultaneously by means of gas engines and gas turbines below 10,000kW in power generation capacity using LNG as a source of fuel.

**Status**
- 187 (148MW) facilities are installed in 130 places in 2006. It takes up around 0.2% of total power generation capacity nationwide.
- 46 (76.5MW) facilities are installed in office buildings, consisting of 52.8% among total power generation capacity of SSG.
3. Mass Energy System

**Definition**

- The Mass Energy system supplies both heat and electricity produced at large-scale power.
- Consumers are apartments, buildings, industries located in the area.

**Status**

- The distribution rate of district heating amounts to 11% of total households in the end of 2006. The MES is being supplied to the 15 industrial complexes.
  - District Heating: 11 companies, 26 places
  - Industrial Complex: 20 companies, 21 places
Power generation capacity of MES amounts to 4.9% of the total national facility capacity, and the amount of power generated is 4.3%.

CES companies are going to business in 22 areas, and their power generation capacity take up 1.3%.

<table>
<thead>
<tr>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass energy system companies can be defined as CES companies according to the Electricity Business Act. MES and CES are equivalent in the facilities system (CHP).</td>
</tr>
<tr>
<td>Mass energy system companies are the core of heating supply, and CES (Community Electricity System) companies are the core of electricity supply.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Generation facility &amp; Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power generation capacity of MES amounts to 4.9% of the total national facility capacity, and the amount of power generated is 4.3%.</td>
</tr>
<tr>
<td>CES companies are going to business in 22 areas, and their power generation capacity take up 1.3%.</td>
</tr>
</tbody>
</table>
4. CES (Community Electricity System)

- Supplies produced electricity directly to end-users in the specific district not through the electricity market (Electricity Business Act).
- Supplies electricity and heating (heating, cooling and speed heating) by building combined heat & power generation facilities around the high demand areas, and also sell power generation, distribution, and electricity.

### Business Classification (Electricity Business Act)

<table>
<thead>
<tr>
<th>Business</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>New &amp; Renewable Energy</td>
<td>more than 60% of electricity demand in the specific supply area</td>
<td>Less than 35,000kW</td>
</tr>
<tr>
<td>MES</td>
<td>District Heating &amp; Cooling</td>
<td>Less than 150,000kW</td>
</tr>
<tr>
<td>Industrial complexes</td>
<td></td>
<td>250,000kW</td>
</tr>
</tbody>
</table>
Policies on Distribution of CHP

Mass Energy & CES
- Provide financial assistance within 80% of their necessary funds (90% to small and medium sized companies (public and non-profit organization))
- The loan interest rates are 3.50% to 4.75% which are about half of the current market (10% of Tax incentives are provided to the companies)

SSG
- Is being distributed by ESCO and financial support is given at the fixed interest rate of 3%. (ESCO are retrieving as much as energy they saved in return for their investment)
- Rebate for Small Scale CHP(< 10MW)
  - Installation rebates (30,000 won/kW)
  - Designing subsidy (5,000 won/kW)
IV. New & Renewable Energy
1. Category of NRE

11 types are included in the promotion Act for NRE:

- Solar thermal
- Photovoltaic
- Bio
- Marine energy
- Wind
- Waste
- Geothermal
- Hydro
- Fuel cell
- Hydrogen
- Synthetic fuel from coal liquefaction/gasification
## 2. Achievement in NRE

### NRE/Total Energy Consumption is 2.26% (2006)

- Targeting 5% of Total Energy Consumption by 2011

<table>
<thead>
<tr>
<th>Resource</th>
<th>Amount (1000toe)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste</td>
<td>3,975</td>
<td>76.1</td>
</tr>
<tr>
<td>Hydro</td>
<td>867</td>
<td>16.6</td>
</tr>
<tr>
<td>Bio</td>
<td>274</td>
<td>5.3</td>
</tr>
<tr>
<td>Wind</td>
<td>60</td>
<td>1.1</td>
</tr>
<tr>
<td>Solar Thermal</td>
<td>33</td>
<td>0.6</td>
</tr>
<tr>
<td>PV</td>
<td>8</td>
<td>0.1</td>
</tr>
<tr>
<td>FC, Geothermal</td>
<td>8</td>
<td>0.13</td>
</tr>
</tbody>
</table>
### 3. NRE Power Generation

NRE Power occupies 1.02% of total power generation.
- The amount of NRE generation largely has been affected by hydro power generation.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Power Generation</td>
<td>184,660</td>
<td>266,400</td>
<td>306,474</td>
<td>381,180</td>
</tr>
<tr>
<td>NRE Power Generation</td>
<td>84.4</td>
<td>103.8</td>
<td>203.3</td>
<td>3,899.4</td>
</tr>
<tr>
<td>NRE ratio</td>
<td>0.05</td>
<td>0.04</td>
<td>0.07</td>
<td>1.02</td>
</tr>
<tr>
<td>Commercial use</td>
<td>81.7</td>
<td>90.9</td>
<td>196.0</td>
<td>3,862.1</td>
</tr>
<tr>
<td>Non Commercial use</td>
<td>2.7</td>
<td>12.9</td>
<td>7.3</td>
<td>37.3</td>
</tr>
</tbody>
</table>

(Unit: GWh)
Hydro (88.9%), Wind (6.1%) and LFG (3.3%) are playing major roles in NRE Power generation.
4. Status of Wind Power

Sharp increase of Wind power is owing to Feed in Tariff (107.29 Won/kWh)

- Commercial Wind Farm (’06): 117 Units in 12 Farms, Total Capacity 175 MW
  * Daegwanryung (98 MW) Youngduk (40 MW) Hangwon (10 MW) Hankyung (6 MW)

- Demonstration and evaluation: 750 kW, 1.5 MW wind power system

- Construction of off-shore wind farm in Jeju
5. Deployment Target

5% of Total Energy Consumption by 2011

<table>
<thead>
<tr>
<th>Resources</th>
<th>2003</th>
<th>2006</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste</td>
<td>68.5</td>
<td>64.7</td>
<td>57.3</td>
</tr>
<tr>
<td>Hydro</td>
<td>27.6</td>
<td>23.6</td>
<td>12.3</td>
</tr>
<tr>
<td>Bio</td>
<td>3.0</td>
<td>8.3</td>
<td>7.8</td>
</tr>
<tr>
<td>Solar Thermal</td>
<td>0.7</td>
<td>0.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Photovoltaic</td>
<td>0.1</td>
<td>0.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Wind</td>
<td>0.1</td>
<td>2.1</td>
<td>9.7</td>
</tr>
<tr>
<td>Geothermal</td>
<td>-</td>
<td>0.2</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Goal: 2.1  2.5  5
6. R&D Policies

Achieve 70~90 % level of advanced countries’ by 2011
PV, Hydrogen/fuel cell in the 3rd rank in the world

Research & Development

- Large Project R&D
  - Hydrogen/Fuel cell, PV, Wind receive major support
  - Integration of the stages of development, demonstration, deployment

- General R&D
  - 7 areas such as Solar thermal, biomass and waste energy focused on commercialization

- Int. Collaboration
  - Multilateral: APP, IPHE, IEA/CERT, APEC etc
  - Bilateral: China, Germany, Japan, Mongolia etc
7. Deployment Policies

Loan & Tax Incentives

The government provides long-term, low-interest loans for the consumers or manufacturers of NRE systems which have been completely commercialized.

- Loans are provided for up to 90% of the total cost (up to 80% for large corporations, up to 50% for public institution).

10 percent of total investment in installation of NRE systems can be deducted from the income tax or corporate income tax.
Thank you!

wglee@kemco.or.kr