IEA DSM Task 17 Workshop
- ECN, Netherlands -

DER Status of Korea

July 2008
DER Overview in Korea

- **CHP for district heating and industrial cogeneration**
  - (2006, 4.0GW) district heating 1.3GW, industrial cogen 2.2GW, small cogen 0.5GW
    - 4.9% of total gen capacity (70.4GW) and 4.3% of total generation (404.7TWh)
  - Recently CHP has deployed in the forms of local community energy systems (21 sites under construction).

- **Renewables**
  - (2006) 5.3 million toe (2.2% of TPES), 3.9TWh (1.0% of total electricity generation)
  - Long-term targets of renewables is set up to 5.6% of Total Primary Energy Supply in 2012 and to 9.0% of TPES in 2030 by the National Energy Fundamental Plan.

- **DSM/DR**
  - DSM goals of electricity, together with load management and energy efficiency, are reduce about 14% of peak demand on the basis of BAU scenario in 2020. (energy efficiency takes up 4% of peak demand reduction)
    - Reserve margin targets of power systems: 10% in long-term perspectives and 6% reserves (near 4GW levels) in normal operations
Market Access of DER

- Mandatory market pools for electricity transactions
  - Generators above 200kW which want sales should register to KPX
  - Only KEPCO purchases all the electricity from the pool
  - DG/renewables is treated as the one of market participation entities.

- Compensate the market participated renewables with feed-in tariffs
  - The government compensates eligible renewable generators for any shortfall between the pool price and feed-in tariffs.

  Renewable standard prices (KRW/kWh, 2007): PV(700), Fuel Cell(283), Wind(107), Small Hydro(95)

<table>
<thead>
<tr>
<th>(As of 2006)</th>
<th>CHP</th>
<th>Renewables*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MW</td>
<td>GWh</td>
</tr>
<tr>
<td>Current Resources</td>
<td>3,455</td>
<td>17,244</td>
</tr>
<tr>
<td>Market Access</td>
<td>892</td>
<td>2,597</td>
</tr>
<tr>
<td>(Ratio)</td>
<td>26%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Source: KEMCO, KPX (* Hydro power is excluded, ** provisional data)
Grid Concerns focused on CHP

- Interconnection of DER (including renewables)

<table>
<thead>
<tr>
<th>Capacity</th>
<th>100kW</th>
<th>above 100kW</th>
<th>above 3MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interconnection</td>
<td>220V, 380V (DL)</td>
<td>22.9kV (DL)</td>
<td>154kV (Substation)</td>
</tr>
</tbody>
</table>

- Cogeneration Efficiency: 57%~92%
  - Typical Industrial Cogen Efficiency: Textiles(74.7%), Petrochemical(57.7%), Paper&Pulp(83.4%), Non-Metal(59.0%)

- No electricity market incentives for CHP
  - But, installation subsidy (35 USD/kW) and wholesale gas price reduction (below 5% in summer) can be supported from KOGAS
  - CHP facilities can be eligible for the government low interest loans.
DER Business Model in Korea

- **CHP**
  - Community Energy System (permission of zonal electricity business)

- **Renewables**
  - Feed-in-Tariffs, Renewable ESCO, RPA for the energy suppliers
  - RPS is planned

- **Energy Efficiency**
  - ESCO, DSM investment of energy suppliers
  - EERS (or White Certificates) is planned
DER Expansion Plan

- Focus on the Nuclear, CHP and renewables
  - Renewables are gradually increasing but not satisfactory
    - Renewable Generation(GWh): 350('04) → 404('05) → 511('06) → 830('07)

< Registered Generation Capacity to the Korean Electricity Markets (unit: GW, as of 2008) >

<table>
<thead>
<tr>
<th></th>
<th>Hydro*</th>
<th>Coal</th>
<th>Oil</th>
<th>LNG</th>
<th>Nuclear</th>
<th>CHP</th>
<th>Renewables</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>5.5</td>
<td>20.5</td>
<td>5.4</td>
<td>17.9</td>
<td>17.7</td>
<td>0.9</td>
<td>0.4</td>
<td>68.3</td>
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<tr>
<td>Share(%)</td>
<td>8.0</td>
<td>30.0</td>
<td>7.9</td>
<td>26.3</td>
<td>25.9</td>
<td>1.3</td>
<td>0.5</td>
<td>100</td>
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</tbody>
</table>

* Hydro(5,492MW): Large(1,528MW), Small(64.0MW), Pumped Storage(3,900MW)

< 2020 Generation Capacity Outlook (unit: GW) >

<table>
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<tr>
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<th>Renewables</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>6.3</td>
<td>26.4</td>
<td>2.3</td>
<td>26.2</td>
<td>27.3</td>
<td>3.8</td>
<td>2.0</td>
<td>94.3</td>
</tr>
<tr>
<td>Share(%)</td>
<td>6.7</td>
<td>28.0</td>
<td>2.5</td>
<td>27.7</td>
<td>29.0</td>
<td>4.0</td>
<td>2.1</td>
<td>100</td>
</tr>
</tbody>
</table>

* Source: the 3rd basic plan for Electric Power Supply and Demand (2006~2020)
Need of DER Integration

- Why integrate the resources?
  - (Objectives) Obtain better information, Promote better efficiency
  - For the diverse DERs of lower carbon or carbon free energy supply
    - CHP, renewables, energy efficiency … Most of them are small sized & widespread

- How can we integrate?
  - (Directions) Proper signals on the energy price and quality
    - Providing desirable competition between various DERs
  - Information exchange between DERs on the status of supply and demand
  - Mutual energy transfer or delivery if necessary
  - Smart grid implementation can be used as a groundwork
감사합니다

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