Resource Assessment and Implementation of DLC Programs for Large Customer

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Demand forecast and DSM projection
- Increase by average 8.4% per year last decade
- Consumption per person: 5,800kWh in 2002
- DSM deduced 3,130MW of peak demand in 2002
- DSM projection reach 10% of system peak in 2015

< Demand Forecast (unit 10 MW) >

<table>
<thead>
<tr>
<th>Year</th>
<th>Baseline demand (including DSM)</th>
<th>Baseline demand (excluding DSM)</th>
<th>Upper scenario (including DSM)</th>
<th>Upper scenario (excluding DSM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak load</td>
<td>Annual increasing rate</td>
<td>Peak load</td>
<td>Annual increasing rate</td>
</tr>
<tr>
<td>1992</td>
<td>2,044</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2002</td>
<td>4,577</td>
<td>8.4%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2006</td>
<td>5,374</td>
<td>4.1%</td>
<td>5,684</td>
<td>5.6%</td>
</tr>
<tr>
<td>2011</td>
<td>6,220</td>
<td>3.0%</td>
<td>6,781</td>
<td>3.6%</td>
</tr>
<tr>
<td>Net increase</td>
<td>1,642</td>
<td>2,204</td>
<td>3,069</td>
<td>3,929</td>
</tr>
</tbody>
</table>

* Source: 1st power demand/supply baseline plan
Outlook for Supply

- Capacity expansion plan
  - New capacity Need: 35,000MW by 2015
  - New expected capacity: 25,250 MW by 2011 (base on generator’s plan)
  - Generator’s plan classified by status
  - In case of capacity plan delayed, decrease in reserve margin below 10% after 2008

< Long-term power demand/supply outlook>

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand (10MW)</th>
<th>Nuclear</th>
<th>Coal</th>
<th>LNG</th>
<th>Oil</th>
<th>Hydro</th>
<th>Total</th>
<th>Reserve margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>4,577</td>
<td>1,572</td>
<td>1,593</td>
<td>1,399</td>
<td>428</td>
<td>388</td>
<td>5,381</td>
<td>15.3%</td>
</tr>
<tr>
<td>2006</td>
<td>5,374</td>
<td>1,772</td>
<td>1,867</td>
<td>1,864</td>
<td>467</td>
<td>556</td>
<td>6,527</td>
<td>17.8%</td>
</tr>
<tr>
<td>2011</td>
<td>6,220</td>
<td>2,452</td>
<td>2,377</td>
<td>2,044</td>
<td>395</td>
<td>639</td>
<td>7,906</td>
<td>24.9%</td>
</tr>
</tbody>
</table>
DSM in Korea – Programs

- Programs at present
  - Peak cutting: Special rate and Remote A/C
  - Energy efficiency: lighting, motor, inverter
  - Load Shift: Cooling/heat storage, Vending machine
  - PR and ME&V system development

- Direction after deregulation (2001)
  - Administration: Utility (KEPCO) → Government (MOCIE)
  - Funding: Utility cost → Public Goods Charge
  - Programs: introduction of DLC, DR
  - M&V: Resource Assessment, Monitoring, Verification etc.
  - Investment: increase up to 1% of total revenue
DSM in Korea – DLC programs

- Remote controlled A/C Program
  - start year: 2000
  - subject: KEPCO
  - target customer: residential, small commercial
  - target measure: air conditioner (package type)

- Direct Load Control Program
  - start year: 2002
  - subject: KEPCO, KEMCO
  - target customer: large customer of commercial & industrial
  - target measure: electric furnace, Pump, HVAC, etc.
Methodology for forecasting DLC Potential

- Load Characteristics Approach
- Energy Consumption Approach
- Diffusion Model Approach
Load Characteristics Approach

- Energy consumption ratio by customer
- Load curve by customer, end-use, seasonal hourly
- Hourly load factor by load type

estimating component ratio

Load component ratio
Estimating cooling demand through the load difference between system load by season.
Applicable to cooling load
- the difference between peak load and base load
- peak load: load at 15:00 in July, or August
- base load: average load of April and October

8,100 MW (Year 2000)
8,500 MW (Year 2001)
Available DLC Resources in Korea

- Cooling
- Ventilating
- Heating
- Pumping
- Electric Furnace, etc
Analysis 1 and 2 used top-down approach, but analysis 3 used bottom-up approach.

There are some variations in results by approaches.
# Incentive level in DLC program

<table>
<thead>
<tr>
<th>Classification</th>
<th>Process</th>
<th>Incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
<td>• Estimating real time MCP when DLC starts</td>
<td>900 Won/kWh</td>
</tr>
<tr>
<td></td>
<td>• Average SMP in Korea 45 won/kWh</td>
<td></td>
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<tr>
<td></td>
<td>• Spike rate when the supply was shortened : 20 times</td>
<td></td>
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<tr>
<td>Alternative 2</td>
<td>• Fixed cost of GT (Capital + O&amp;M Cost) : 58,000 won/kWh</td>
<td>LOLP 1.0 day: 2,440 Won/kWh</td>
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<td>• Setting the standard of LOLP: 0.7 - 1 day</td>
<td>LOLP 0.7 day: 3,480 Won/kWh</td>
</tr>
<tr>
<td>Alternative 3</td>
<td>• Applying a compensation payment which satisfies RIM test.</td>
<td>RIM 2.0: 2,615 Won/kWh</td>
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<td>• Estimating the level of incentive corresponding to basic B/C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(applying basic B/C as 1.0 - 3.0)</td>
<td></td>
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</tbody>
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Goal and Subjects of DLC Program

- **Types of DLC Program**
  - Normal load reduction
  - Emergency interruption Load
  - Secured system load
  - Peak load reduction
  - Demand Reserve

- **Objects of DLC Program**
  - System Availability
  - Market Price Stability
  - System Security
  - Profit model
Conclusion

- This Paper investigate three approaches to evaluate potential of DLC effects
- Demand estimation should be added to reflect component ratio by consumer
- We could apply market price or avoided cost in peak periods as criteria for incentive