Demand response management in Hungary

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Demand Response: the classic problem of peak shaving

- To meet high load requires the operation of expensive units
- To manage low system load might be problematic in lack of sufficient regulation capacity
- The purpose of DR programmes is to smooth the load curve
- Potential program participants: large as well as small customers
- Cost of DR << Cost of investment to meet peak demand
Weather-dependent generation is difficult to control - wind, Hungary

Average production, Q1 2010.
Definition

• US Department of Energy (DOE) defines demand response as:

“changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.”

• ETSO definition

“a voluntary temporary adjustment of power demand taken by the end-user as a response to a price signal (market price or tariffs) or taken by a counter-party based on an agreement with the end-user.”
DR and energy efficiency

• (short term) DR
  ▶ Short-term, discrete changes to demand profile
  ▶ Might result in increase in consumption (off-peak periods)
  ▶ Affects the power balance

• Energy Efficiency
  ▶ Permanent change (base load DR)
  ▶ It results in demand reduction in all hours
  ▶ Affects the energy balance

Of course, there could be synergies between the two
DR can increase system flexibility to respond to unpredicted changes in generation

• Large consumers can provide short-run system flexibility in much the same way as generators do
  ▸ many industrial processes are such that their electricity supply can be interrupted for a few hours without significant economic losses

• Future upgrades of the electricity network (so-called smart grids) will allow an increased use of large scale automated demand response
Example: Hungary – large industrial customers, 2009

• Survey among the largest industrial consumers who could be flexible in electricity consumption
  ▶ In person and telephone interviews

<table>
<thead>
<tr>
<th>Response speed</th>
<th>Curtailable load (MW)</th>
<th>Duration</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 minutes</td>
<td>5</td>
<td>2-3 hours</td>
<td>daily</td>
</tr>
<tr>
<td>15 minutes</td>
<td>4,5</td>
<td>1-2 hours</td>
<td>monthly</td>
</tr>
<tr>
<td>1 hour</td>
<td>30</td>
<td>24 hours</td>
<td>monthly</td>
</tr>
<tr>
<td>2 hours</td>
<td>4</td>
<td>48 hours</td>
<td>monthly</td>
</tr>
<tr>
<td>2 hours</td>
<td>1</td>
<td>15 minutes</td>
<td>weekly</td>
</tr>
<tr>
<td>12 hours</td>
<td>2</td>
<td>30 minutes</td>
<td>weekly</td>
</tr>
<tr>
<td>14 hours</td>
<td>6</td>
<td>48 hours</td>
<td>monthly</td>
</tr>
</tbody>
</table>

> Industry accounts for ~35% of the Hungarian domestic consumption
Example: Hungary – a consumer on the balancing (hourly reserve) market, 2009

<table>
<thead>
<tr>
<th>Bidder</th>
<th>Quantity</th>
<th>Number of availability hours</th>
<th>Availability price</th>
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<tr>
<td></td>
<td>[MW]</td>
<td>[h]</td>
<td>[HUF/MW/h]</td>
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<tr>
<td></td>
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<td>[-EUR/MW/h]</td>
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<td>1555</td>
</tr>
<tr>
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<td>1555</td>
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<tr>
<td>Borsodchem</td>
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<td>2808</td>
<td>1550</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>45</td>
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<td>Dunamenti power plant</td>
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<td>1850</td>
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<tr>
<td></td>
<td>159</td>
<td>144</td>
<td>1850</td>
</tr>
</tbody>
</table>

- EFT Budapest
- Rudnap - Hungary
- Borsodchem
- Dunamenti power plant

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as the table shows: the consumer was able to provide a very significant amount of reserve. Interview with Borsodchem: To the question why did not they bid before in this market, the answer was that the person who organized the bidding from their part was only hired in the beginning of this year, and he has reformed the electricity procurement and trading of the company since then. This is again a proof for the importance of ignorance and lack of information and knowledge of the staff at industrial consumers: they had the capability before, but not the knowledge and willingness. They told us how they had to fight for this bid within the company and that convincing the staff and explaining them how the ancillary market works took the most time. They also know the other consumers’ staff, and they also think that the biggest reason for their non-participation is the same as it was at Borsodchem previously. Table 2.2 on the curtailability of consumers participating in the survey shows, that there are more consumers who could participate on the hourly reserve market but somehow they did not appear on the tenders so far.

As for the minute reserves, consumers have not made any bids yet on this market, however in 2005 Mavir started negotiations with the aluminum producing company MAL (which refused to give us an interview). Furthermore, Borsodchem said that they were thinking in providing minute regulation, the only problem was that the required gradient was too fast for them, and it would have caused too many inconvenience, however they will reconsider the participation next year. Borsodchem did not find secondary regulation attractive due to the frequent modifications it requires and the necessary technical investments.

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Demand response types

- Incentive-based
  - Direct load control
  - Interruptible/curtailable rates
  - Emergency Demand Response
  - Capacity Market Programs
  - Demand Bidding/Buyback Programs

- Time-based rates
  - Time-of-Use Rates
  - Real-Time Pricing
  - Critical Peak Pricing
Direct load control

• Direct load control programs are typically operated to balance supply and demand at system peak, but are also operated to avoid high on-peak electricity purchases.

• **Hungary:** direct load control system among small consumers was initiated when the sector was vertically integrated
  ‣ Today this load is controlled by the DSO/Supplier, accounts for 1600 MW (25% of peak consumption)
  ‣ Remote control of consumption for customers equipped with a separate meter, 8 hours per day
  ‣ Only certain equipments are eligible to be served (electric boiler, electric heater)
  ‣ Price discount is offered for customers
Another example of direct load control

How does Cool Keeper work?
When you enroll in Cool Keeper, we'll connect a device next to your exterior central air conditioning unit. On a few selected weekdays during the summer, June through August, we'll automatically coordinate participating air conditioners to help manage the demand for electricity. There is no charge for signing up and installation of the Cool Keeper device is free.

Source: Rocky Mountain Power
Interruptible/Curtailable Rates

- Interruptible/curtailable rates provide a rate discount or bill credit to customers who agree to reduce load during system contingencies.
- A utility typically offers these rates to its largest industrial and commercial customers.
- **Hungary:** especially important in the natural gas industry
  - Winter peak load around 95 million m3 in 2005 while system peak capacity is the same
  - In case of supply disruption interruptible contracts can help to avoid load loss in a market friendly way
Time-of-use rates

- Time-of-use rates are the most prevalent time-based rate, especially for residential customers.
- Time-of-use rates typically establish two or more periods within a day that reflect hours when the system load is higher (peak) or lower (off-peak), and charge a higher rate during peak hours.
- Off-peak hours usually cover some part of the evening and night, as well as weekends.
- **Hungary**: for household customers application is limited by lack of smart metering
Real-time pricing

- Under real-time pricing, retail electricity prices vary at least hourly during the day, directly reflecting the underlying cost of electricity.
- The direct connection between the varying cost of power and retail rates made possible by real-time pricing introduces price responsiveness into the retail market if retail customers are directly exposed to such prices.
- **Hungary**: industrial customers can contract their electricity or gas purchases according to their consumption profile.
Potential benefits from a real time priced contract (Hungarian large customer)

• Within the observed price range of the year a more sophisticated procurement could have been resulted in significant cost savings, with a minor risk of loss.

• The cost savings must be measured against the cost of changing the present procurement procedure (more personal, management costs, in addition to setting up a separate trading entity if needed).
Potential peak load reduction

Source: FERC
Barriers to DR programmes

- Utility’s revenue might decrease – strong objection from their side
- Metering, measurement, cost of installing smart meters
- Most small customers are on fixed rates
- Access to metered individual data for independent aggregators