LOW ELECTRICITY PRICES IN SWEDEN
Drivers, problems and solutions

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31st May 2017
Electricity prices have dropped in level

Agenda:

1. What are the drivers behind the price drop?
2. What problems does it create?
3. How does the future look like?

Electricity prices in Sweden

€/MWh

Source: Nordpool.
Electricity market fundamentals

Price pr. MWh

Demand

Supply

MWh
Drivers for prices in Northern EU proved to be very different from EU expectations in 2008

<table>
<thead>
<tr>
<th>Demand: Electricity generation</th>
<th>EU 2008 expectations for 2015</th>
<th>Actual data (what happened)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>979 TWh</td>
<td>809 TWh</td>
</tr>
<tr>
<td>Supply: Wind and solar capacity</td>
<td>35 GW</td>
<td>85 GW</td>
</tr>
<tr>
<td>Marginal costs: ETS-price</td>
<td>21 €/t</td>
<td>5 €/t</td>
</tr>
</tbody>
</table>

Note: Data for Sweden, Finland, Denmark and Germany.
We’ve analysed the price drop with our power market model (CEPOM)

- Partial-equilibrium cost minimization model of the power market in Northern Europe

- Dispatch model with hourly time resolution and the equilibrium price is set as the marginal cost of the marginal generation technology
Lower demand is one of the main drivers behind low prices in Sweden

€/MWh


- Historical
- CEPOM results

w/o lower demand
w/o more wind and solar
w/o lower ETS price

Source: Nordpool and Copenhagen Economics calculations.
Without export opportunities, Swedish prices would have been even lower.

Source: SCB.
Low prices will not drive any new investments

Levelised costs of energy (2014)

Source: Elforsk (2014) El från nya och framtida anläggningar 2014. LCOE for commercial technologies that only generate electricity, excluding policy instruments 10% cost of capital.
Even reinvestments in hydro seem unattractive

Annual costs and revenue from hydropower production in a large-scale hydropower plant with 90 MW capacity

<table>
<thead>
<tr>
<th>Cost</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>O&amp;M costs</td>
<td>Low</td>
</tr>
<tr>
<td>Capital cost</td>
<td>High</td>
</tr>
<tr>
<td>Property tax</td>
<td>Total annualized production cost</td>
</tr>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>High</td>
</tr>
</tbody>
</table>

Note: Calculations assume 4000 full load hours per year in a plant with 90 MW capacity. “Low” refers revenue obtained if average price in 2015 is assumed for all hours. “High” refers to revenue obtained if average wholesale power price for the 4000 hours with the highest prices are used. The following assumptions for costs are used: O&M costs: 0.184 SEK/kWh, capital costs: 0.125 SEK/kWh, property tax: 0.083 SEK/kWh. Price data for 2015 from Nord Pool Spot.

Neighbour countries are increasing wind and solar production and need flexibility

Circle: Share of wind and solar in total power generation.
Bar: Wind and solar generation.

Wind and solar 2020
▲ Increase to 2030
■ Other

Sweden will not get much help in balancing volatile wind from neighbours

High correlation in wind production across countries, especially when low

Price extremes driven in part by large variation in capacity utilization and at the same time!

What can increase flexibility and what role can EU play?

- Storage
  - Pumped hydro
  - Batteries

- Demand side response
  - Smart grid
  - Aggregators

- Flexible supply
  - Hydro
  - Biomass

- Increased trade across countries
  - Interconnector
  - Market design harmonisation

Source: Adapted from the IEA (2016) World Energy Outlook.
Does it look better in the future?

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ETS price</strong></td>
<td>10 €/ton</td>
<td>30 €/ton</td>
</tr>
<tr>
<td><strong>Coal and gas prices</strong></td>
<td>▶️</td>
<td>▲</td>
</tr>
<tr>
<td><strong>RE target</strong></td>
<td>▲</td>
<td>▶️ ▶️</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>As planned</td>
<td></td>
</tr>
<tr>
<td><strong>Demand</strong></td>
<td>As today</td>
<td></td>
</tr>
</tbody>
</table>

**Average Swedish power market prices, 2025**

Conclusion

• Low electricity prices are driven by low demand, more wind and solar capacity and low ETS price

• This is a problem for two reasons
  – No new investments risking abrupt closure of nuclear plants
  – No hydro reinvestments could reduce flexibility

• The EU has an essential role to play in raising ETS-price and facilitating market design and interconnectors

• In a scenario with higher ETS and fossil fuel prices, electricity prices might return to levels ensuring needed investments