A regional electricity market
The Nordic experience

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Nord Pool Consulting

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Agenda

- Development and status of the Nordic power market
- Nord Pool – the Nordic power market operator
- The strength of the Nordic Market
- Remaining challenges in the Nordic Market
- Nord Pool Consulting
Placing the Nordic
Nordic resource mix
- potential for optimisation

Production cost

Hydro

Thermal

Pumped storage power

Hydropower (mean)

Combined heat and power production

Condensing, oil

Condensing, coal

Combined heat and power production

Nuclear power

Gas turbine

Annual Nordic consumption

100
200
300
400 TWh
# The Nordic power market: Key Figures

## Key figures 2007

<table>
<thead>
<tr>
<th></th>
<th>Nordel</th>
<th>Denmark</th>
<th>Finland</th>
<th>Iceland</th>
<th>Norway</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>mill.</td>
<td>25,0</td>
<td>5,5</td>
<td>5,3</td>
<td>0,3</td>
<td>4,7</td>
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<tr>
<td>Total consumption</td>
<td>TWh</td>
<td>412,6</td>
<td>36,4</td>
<td>90,4</td>
<td>12,0</td>
<td>127,4</td>
</tr>
<tr>
<td>Maximum load *</td>
<td>GW</td>
<td>61,1</td>
<td>6,1</td>
<td>12,5</td>
<td>1,3</td>
<td>18,6</td>
</tr>
<tr>
<td>Electricity generation</td>
<td>TWh</td>
<td>409,2</td>
<td>37,0</td>
<td>77,8</td>
<td>12,0</td>
<td>137,4</td>
</tr>
</tbody>
</table>

## Breakdown of electricity generation

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>Nordel</th>
<th>Denmark</th>
<th>Finland</th>
<th>Iceland</th>
<th>Norway</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydropower</td>
<td>%</td>
<td>55</td>
<td>0</td>
<td>18</td>
<td>70</td>
<td>98</td>
<td>45</td>
</tr>
<tr>
<td>Nuclear Power</td>
<td>%</td>
<td>21</td>
<td></td>
<td>29</td>
<td>-</td>
<td>-</td>
<td>44</td>
</tr>
<tr>
<td>Other thermal power</td>
<td>%</td>
<td>21</td>
<td>81</td>
<td>53</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Wind power</td>
<td>%</td>
<td>3</td>
<td>19</td>
<td>0</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Geothermal power</td>
<td>%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1) Measured 3rd Wednesday in January
The Nordic Power Market (Nord Pool)

- **Nordic Free Trade Area**
  - 400 TWh consumption

- **The exchanges**
  - 320+ Members
  - 400+ Members financial market
  - 121+ EUA members

- **Physically traded**
  - Nord Pool 70%
  - OTC 30%

- **Financial trade is 7 times the consumption**

Efficient wholesale market with adequate products and services for companies competing in the market.
European PXs

<table>
<thead>
<tr>
<th>PEX</th>
<th>Volume in TWh</th>
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<tbody>
<tr>
<td></td>
<td>2006</td>
</tr>
<tr>
<td>Nord Pool DAM</td>
<td>250</td>
</tr>
<tr>
<td>Nord Pool Financial</td>
<td>766</td>
</tr>
<tr>
<td>EEX DAM</td>
<td>89</td>
</tr>
<tr>
<td>EEX financial</td>
<td>1044</td>
</tr>
<tr>
<td>Powernext DAM</td>
<td>30</td>
</tr>
<tr>
<td>Powernext financial</td>
<td>83</td>
</tr>
<tr>
<td>APX DAM</td>
<td>19</td>
</tr>
<tr>
<td>ENDEX Financial</td>
<td>131</td>
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</tbody>
</table>
Nord Pool Spot

Physical Power Markets

**ELSPOT Overview**
- **Product:** Hourly contracts, physical delivery.
- **Delivery period:** All 24 hours through the next day (12-36 hours ahead in time).
- **Type of trading:** Auction trading. Accumulated bids and offers that form equilibrium point prices via an Implicit Auction that also reflects usage of available transmission capacities between bidding areas.
- **Trading days:** All days through the year.
- **Bidding:** Bids and offers in standard exchange format (internet, EDIEL).
- **Trade currencies:** Euro, NOK, SEK, DKK.
- **Price calculation:** 1200 am every day.

**ELBAS Overview**
- **Product:** Hourly contracts, physical delivery.
- **Delivery period:** All hours with Elspot price in present day and following day up to 60 minutes before delivery.
- **Type of trading:** Continuous
- **Trading days:** Every day throughout the year 24h
The Derivatives Market

- A market for price hedging and risk management
- Contracts are traded for financial delivery (settlement); time horizon of up to 6 years
- Members can identify profit and loss components in relation to portfolio’s market value
- Products:
  - Futures contracts
  - Forward contracts
  - Contracts for Difference (CfD)
  - European-style power options (EPO)
- All matching performed by the exchange’s electronic trading system, PowerCLICK
  - Orders entered via distributed PowerCLICK workstations or by telephone to the financial market’s helpdesk
Products in the Nordic market

- Physical market:
  - IDM: Adjustment market: Continuous hourly market. Handled by Nord Pool Spot – Elbas
  - Balance Service: 
    - Operated by Transmission System Operators (TSO)

- Financial market:
  - Cash settled Futures, Forwards and Options. Handled by Nord Pool ASA

- Clearing (financial):
  - Exchange trade
  - OTC Trade
  - Handled by Nord Pool Clearing ASA

- Emissions
  - EUA and CER
The Nordic Power Market – success factors

- Geographical, historical, cultural and lingual factors
- Political signals to form a common Nordic power market
- TSOs who co-operate to facilitate market operations
- Appropriate involvement by Regulator
- Appropriate market concentration
- A non-mandatory power exchange
  - A PX in competition with the bilateral market
  - Participants’ freedom to choose market
- A simple market concept - simplicity pays
- Transparency in price setting
- Organised distribution of neutral market information
- Market access for medium sized end-users
  - Trade representatives
  - Market analyses services
  - Portfolio management services
The Nordic Power Market – Remaining challenges

- No common legal framework for further integration
- Not always a integrated market (trans border limitations do occure)
- Not a common retail/end-user market
  - Common Nordic balance/imbalance management/settlement
- Uniform regulation of TSO’s is lacking
- TSO’s – Enhanced joint network planning.
  - Rules/procedures for available transmission capacity, congestion management etc. should be more transparent
  - More capacity should have been available for the Intra Day market
- National thinking is dominant, not Nordic
- Assists in electricity deregulation processes
- Provides strategic and management consulting services within the electricity business world wide.
  - Feasibility studies
  - Infrastructure & market design
  - Training
  - It implementation
  - Market simulation
- Leverage on specialists from its owner within their core business.
- Extended project co-operation with other selected companies
- Delivery of day-ahead trading platforms for power exchanges (SAPRI)
Power market seminars and training at Nord Pool

Nord Pool Consulting has during a number of years offered client tailor made seminars focusing on the Nordic power exchange – Nord Pool – and the Nordic power market. The seminars are lasting from half a day to four weeks and will be designed in close cooperation with the client. The seminars are based on the seven listed modules but other topics can be added or removed in line with the wishes of the client. A visit to the Nord Pool spot desk and the financial desk will normally be included in the seminars lasting more than one day. For seminars lasting a week or more business visits will be included and participation certificates issued.

Mini seminar “the Nordic power market”
What we call mini seminar is a three hour long presentation, where the client is introduced to the main principles and concepts of the Nordic power market.

The objective is to enable the client to understand the most important features of the Nordic power market.

One-day seminar “power market concepts”
During a one-day seminar the client is introduced to the main principles and concepts of the Nordic power market. In addition, price determination, congestion management, imbalance management, reference price, risk management and hedging/trading with derivatives will/can be treated.

The objective is to enable the client to understand the most important features of the Nordic power market.

Five-days combined seminar and workshop “power market concepts”
The combined seminar and workshops covers all important issues connected to a competitive power market as listed in the 7 modules. If necessary, detailed explanations and case studies will be given for additional understanding.

The client also has the opportunity to - on a simplified basis - simulate participation in day-ahead market and derivatives trading.

The objective is to enable the client to make his own opinion about market developments, regulations and framework. The client shall be able to discuss power market issues on a professional basis after attending this combined seminar and workshop. The client will also receive a certificate proving his/her participation in the training.

Multiple days combined seminar and workshop “comprehensive power market concepts”
The multiple days seminar lasting from 6-20 days is based on in-depth training, introduction of other topics, practical exercises, discussions, exam etc.