Electricity Market Design
Experiences and Issues in the Nordic Countries

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The Nordic Electricity Market

- Annual electricity consumption around 390 TWh
- High (Finland and Sweden) and very high (Norway) per capita consumption of electricity
- Hydropower close to 100% of generation in Norway and around 40% in the Nordic area
- C4 around 0.5 for the Nordic market but much higher for the national markets, particularly in Sweden
- Some foreign ownership in Sweden, but not in the other Nordic countries
Restructuring and market institutions

- The national electricity markets restructured between 1996 and 2000
- No border tariffs and a common power exchange, Nord Pool
- Nord Pool operates both spot and financial (futures/forward) markets
- National TSO:s responsible for system operation and the operation of real-time balancing markets
Key design features 1

• Competition in generation
• Regulated TPA to the transmission and distribution network
• Full market opening and retail competition
  – Legal separation between distribution and retailing in Sweden and Finland
  – Accounting and management separation between distribution and retailing in Norway
Key design features 2

• Point-of-connection transmission tariffs
  – Transmission prices independent of distance between sellers and buyers

• Congestion management rules
  – Each country is a “price area”
  – Norway divided into several “price areas”
  – Counter-trade in Sweden and Finland

• Capacity payments
  – In Norway the TSO buys options to use peak capacity
  – In Sweden the TSO pays the power companies to keep a certain amount of reserve capacity
Major experiences

• The lights are still on
  – But load close to capacity limits in January 2001
• Pre-tax electricity prices fell until 2002
  – But have increased in 2003
• Power industry productivity has increased
  – But around 4 000 MW of reserve capacity mothballed
• Significant restructuring of the power industry
  – Increasing integration of generation and retailing in Sweden
Elspot system and area prices (NOK/MWh)
Nord Pool system prices 1995-2001
Wholesale prices

- Significant variations in annual average prices
  - Primarily reflecting hydropower supply variations
- Average area prices do not differ significantly
  - Indicates that the wholesale market is well integrated
- Except for short term price spikes no obvious signs of market power 1996-2002
Autumn 2002 – spring 2003 (1)

- The summer and autumn 2002 was extremely dry both in Norway and Sweden
- As a result stored water reached the lowest level in 50 years
- In view of uncertainty about winter temperatures and precipitation power companies held back hydropower generation
Autumn 2002 – spring 2003 (2)

• As a result spot prices reached and remained at very high levels:
  – Above 65 €/MWh from early December to late January
  – Between 95 and 115 €/MWh from late December to early January
• But 2-year forward prices were not significantly affected
Spot and forward prices
October 2002 – April 2003
Observations

• The extremely high spot market prices did not create severe financial problems
  – Retail customers in Sweden to a large extent have fixed-price contracts, but less so in Norway
  – Generators, retailers and industrial customers were well hedged by financial contracts (forwards and futures)

• But the limited impact of high spot prices on consumer prices made demand very inelastic to spot market prices
Two issues for future investigation

• Was the reduced hydropower generation 2002-2003
  – Efficient precaution in view of major uncertainties?
  or
  – Exercise of market power?

• Fixed-price customers paid less than 30 €/MWh when the spot was above 65 €/MWh
  – How should retail contracts be designed in order to hedge price risks as well as to induce customers to react on spot price variations?
Market integration

• The wholesale market well integrated
  – “The law of one price” applies a significant share of the time (with 2000 as the majors exception)

• But the retail markets not integrated
  – Prices differ significantly between the countries
  – Most retailers operate only on their home market
Retail and wholesale prices
(NOK/MWh)

Norway, retail
Oslo
Sweden, retail
Stockholm
Why are retail prices so high in Sweden?

• 1996-2000: Free choice of supplier only for customers with real-time metering (high ”switching costs”)

• Increasing concentration in the Swedish retail market
  – To some extent reflecting economies of vertical integration of generation and retailing (made possible by the legal separation of distribution and retailing)
Emerging problems?

• ”Too” low short-term elasticity of demand with respect to the spot market price
  – Excessive price volatility
  – Inefficient consumption
• Market power in the retail market
• Inefficient or insufficient provision of peak-load capacity