European Electricity Market Restructuring: Lessons for the US

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Presentation at IAEE New England Chapter

MIT, Cambridge, 30th October 2002

Structure of talk

- Why liberalization of power markets?
- The status of European power markets
- The Nordic power market

Why liberalization of power markets?

- It is possible to have competition in generation due to enhanced transmission network capacity and new generation technologies
- Competition leads to increased efficiency
- Technological advances in metering, communications, and information processing facilitate retail market competition

Why liberalization of power markets? (cont.)

- The economic climate: global trends towards liberalization
- Shortcomings of the traditional model:

- excessive governmental intervention
- government's role as owner and regulator
- inefficient management
- insufficient public investment capacity

Policies in the new regime

- Liberalization: the wholesale market and the retail market
- Restructuring: unbundling of vertically integrated activities, action on horizontal concentration
- Privatization of government-owned assets

Basic features

- Unbundling of activities: generation and retailing open to competition, transmission and distribution remain regulated, many alternatives for system and market operation
- End-users can choose supplier
- Wholesale market
- Financial contracts for risk management
- Investment planning and some operations are no longer centralized activities
- Independent regulator

Electricity market design issues

Structural and governance issues:

- market players
- unbundling of regulated and non-regulated activities
- horizontal concentration
- remuneration of generators

Electricity market design issues (cont.)

Organizational issues:

- wholesale market
- retail market

Implementation issues:

- system operation
- timeframe

Wholesale market design

Transactions:

- bilateral contracts: physical bilateral contracts vs. mandatory organized market or a bilateral trade
- organized forward and futures markets: purely financial transactions, need confidence in the price-formation process, otherwise medium-term or long-term markets will not develop

Wholesale market design (cont.)

- short-term (spot) market: reference price, diversity of auction types
- ancillary services: use market mechanisms whenever possible, secondary and tertiary reserves
- balancing market: price related to use of secondary and tertiary reserves, heavy use not advisable, volume may be reduced by using short-term markets

Wholesale market design (cont.)

- Demand side bidding: a basic ingredient of the second generation of power exchanges, incentives and mechanisms needed
- Firmness of transactions: a series of markets approaching real time, each with firm transactions

Wholesale market design (cont.)

Proposals for long-term security of supply:

1. Let the market decide
2. Regulated capacity payments
3. Capacity markets
4. Hedging contracts

Wholesale market design (cont.)

- Auction design: simple, complex, iterative, successive, continuous
- Congestion and loss management: nodal or zonal prices or a single node
- Constrained-on generators: typically little room for competition
- Information disclosure

Issues and concerns wholesale market design

- True competition requires drastic reductions in the levels of horizontal concentration (e.g. market power)
- Market power: ”the ability to affect the market price profitably”
- Mitigation factors: elasticity of demand, sufficient supply, volume of forward contracts, uncertainty in demand
- Vertical and horizontal integration

Issues and concerns in wholesale market design (cont.)

- Long-term guarantee of supply
- Adequate transmission and distribution regulation
- Effective participation (response) of demand
- Market governance
- Stranded costs of generation and stranded benefits (those public goods that are lost because of a change from traditional regulation to competition)

The Norwegian Energy Act of 1990: goals

- Improve efficiency
- Decrease differences in end-user prices
- Balance generation and consumption
- Reduce the number of utilities in the power business since there were about 200 distribution companies, cost savings could be obtained through horizontal integration

The Nordic market

The Nordic concept:

- physical market: auction supply and demand intersection with constraint costs included (System Price)
- adjustment market: continuous with constraint costs included (Finland and Sweden)
- balance service: operated by the TSO

The Nordic market (cont.)

Some basic requirements:

- a transmission tariff structure where charges are independent of choice of counterparty
- access to transmission capacity on non-discriminatory basis
- market rules that do not interfere with system operator's responsibility regarding power quality and reliability
- a neutral TSO or independent system operator

The Nordic market: results

- continuing the Nordic region's history of cooperation
- 60-70% annual growth in the financial market, in 2001 the cleared volume (2770 TWh) was approximately seven times the physical delivery
- low average electricity household prices despite no new capacity: prices before taxes, 1993 - ca 0.40 NOK/kWh, 1999 - ca 0.37 NOK/kWh, 2001- ca 0.38 NOK/kWh
- 15-20% of households have switched supplier

Development of the Nordic market

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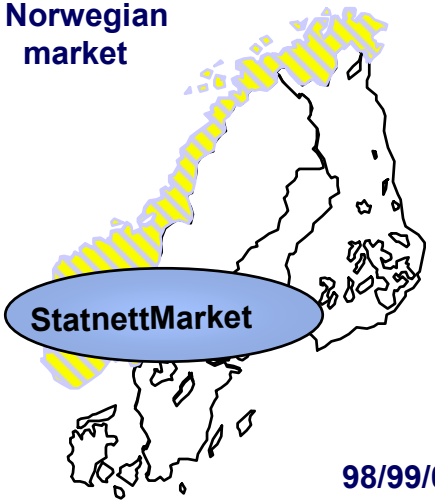
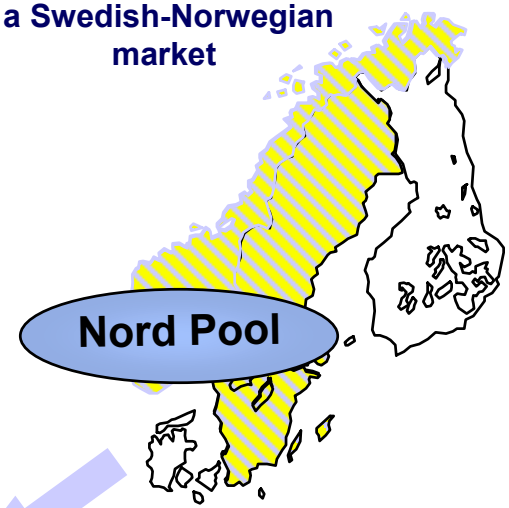
1991
A Norwegian market



1996
a Swedish-Norwegian market



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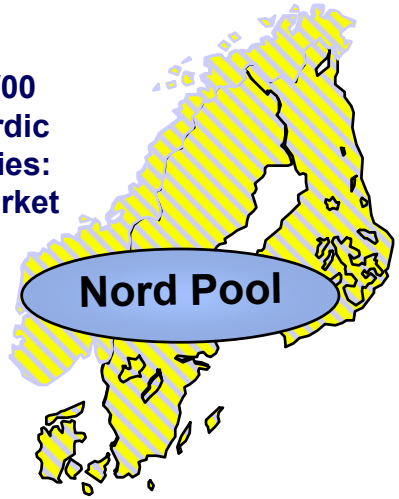
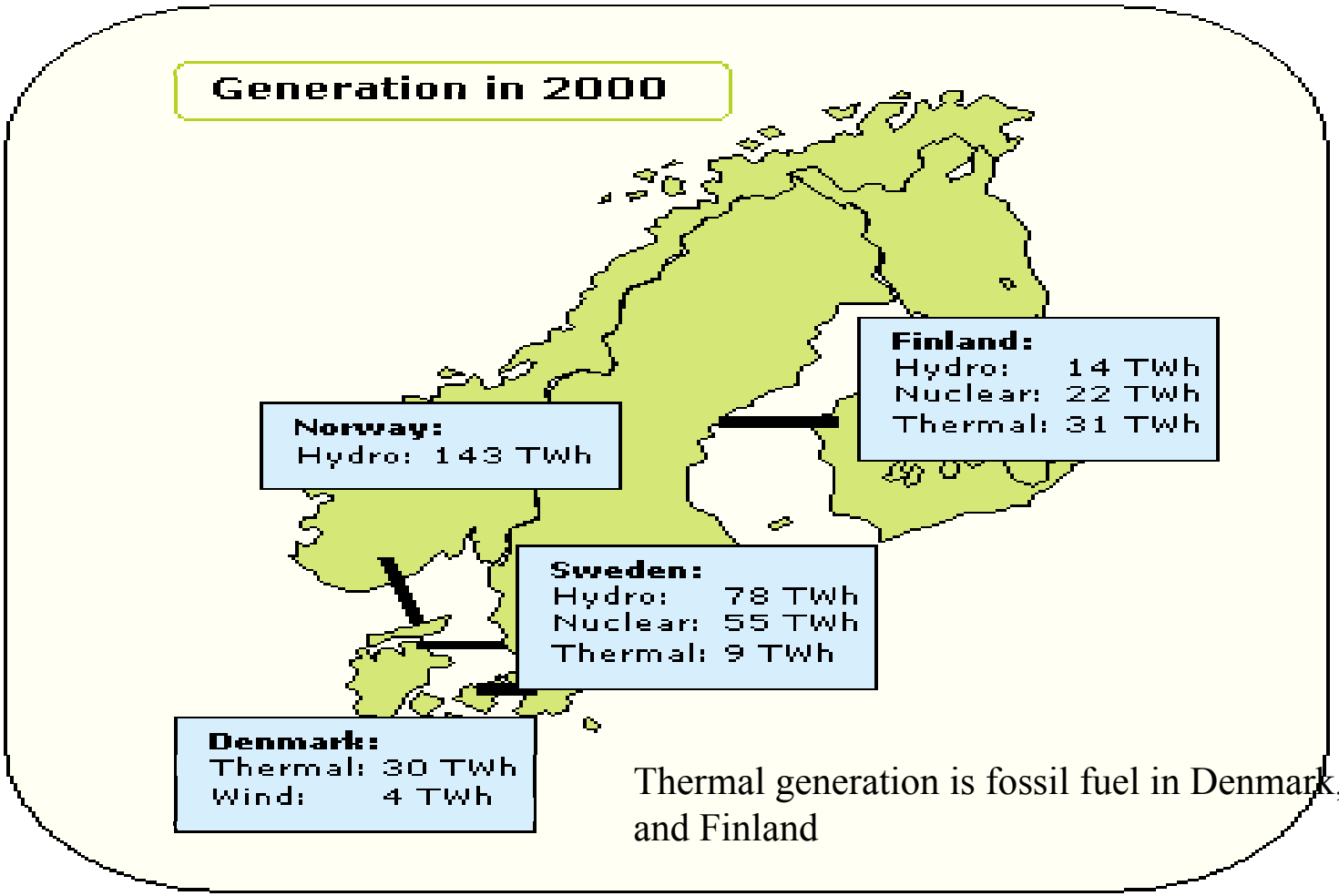
All Nordic countries:
one market



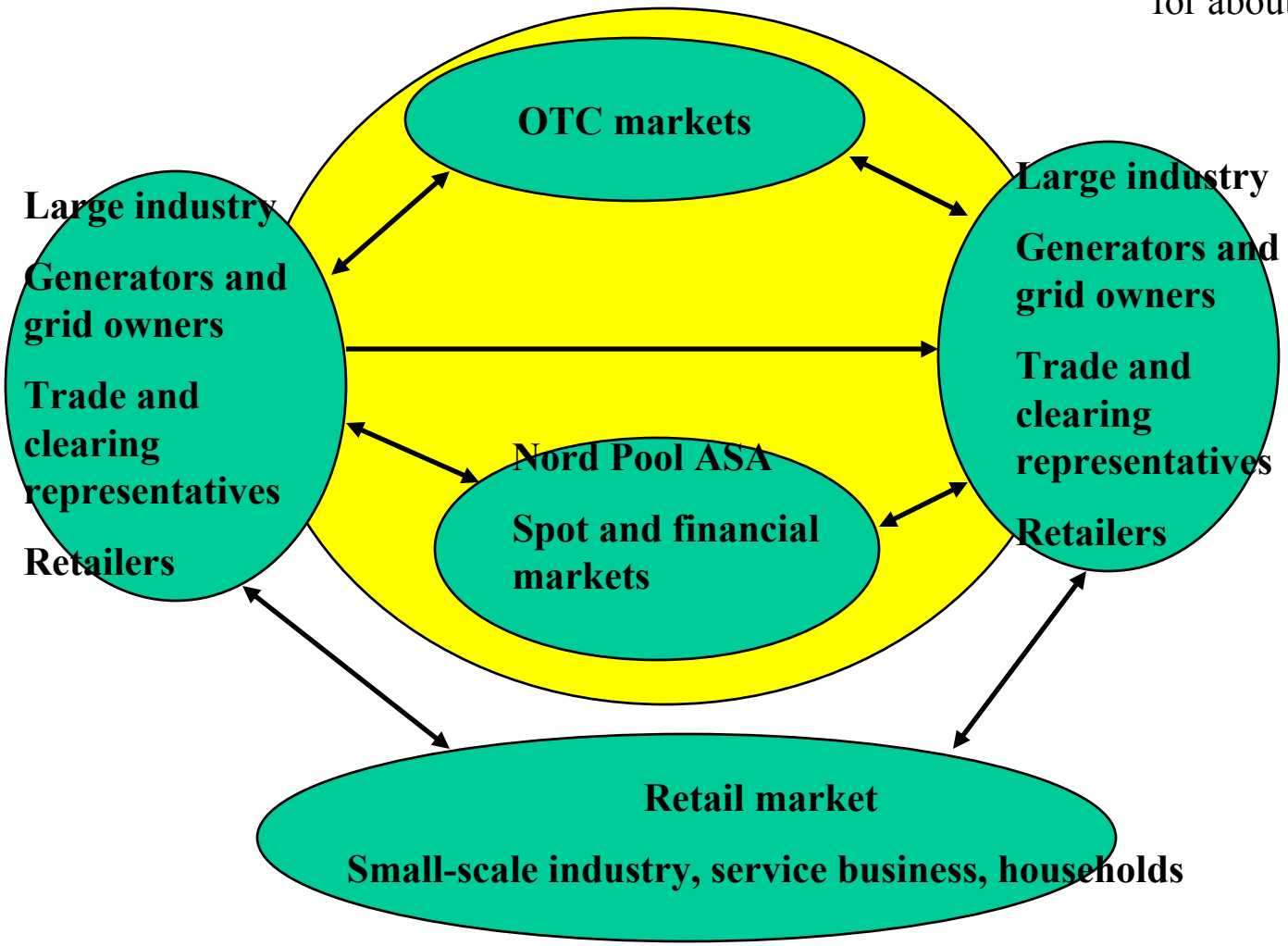
Fuel mix in the Nordic market



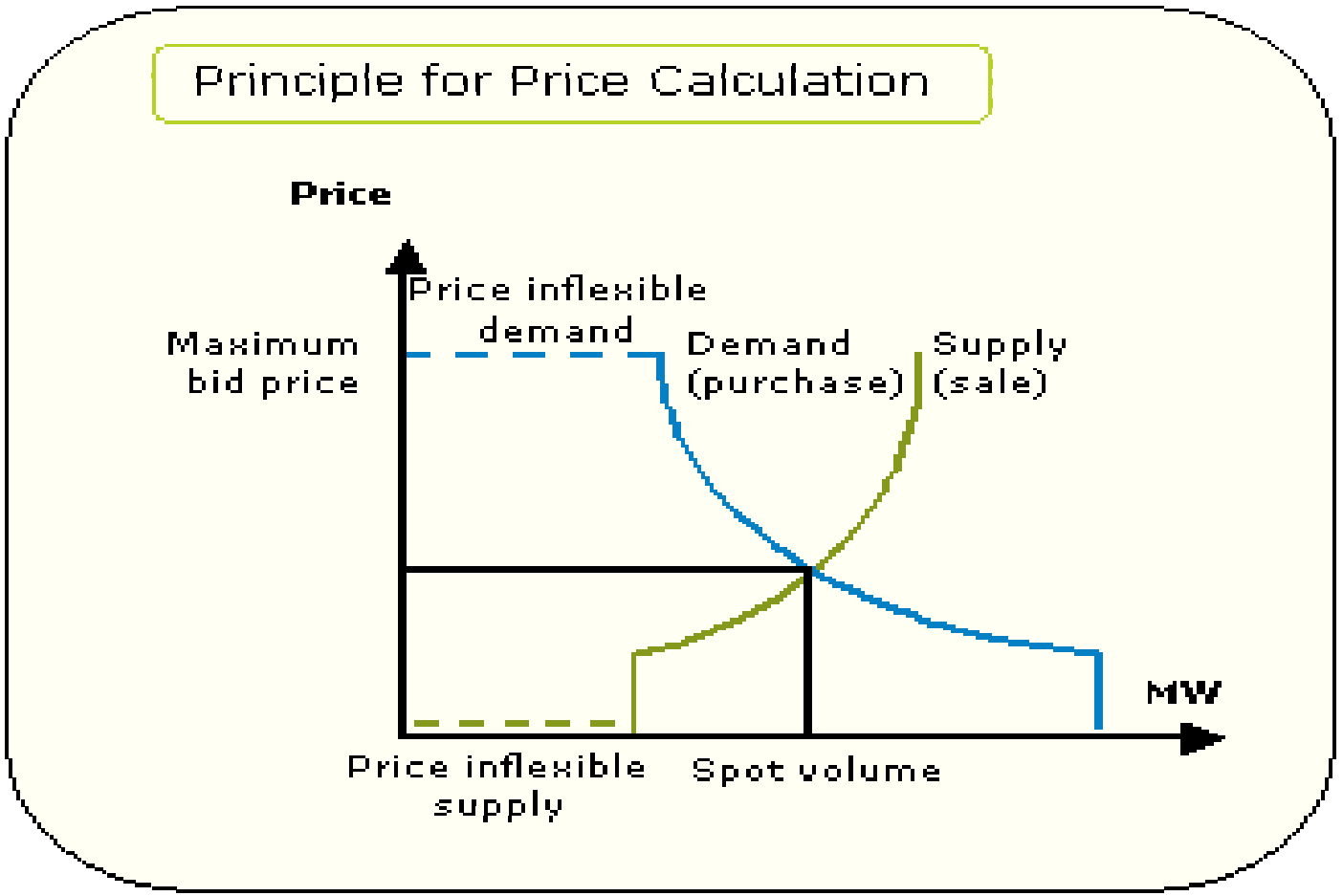
Thermal generation is fossil fuel in Denmark, Sweden, and Finland

The present Nordic power market

Norway's OTC market has existed for about 40 years



The Nordic physical market



The Nordic physical market (cont.)

- System Price is the unconstrained equilibrium price that balances aggregate supply and demand
- Physical network model, spot areas and currently 6 bidding areas
- Constraints defined by the TSO, informed by the exchange
- An auction trade system, day-ahead market, hourly and block contracts
- Price mechanism used for managing constraints

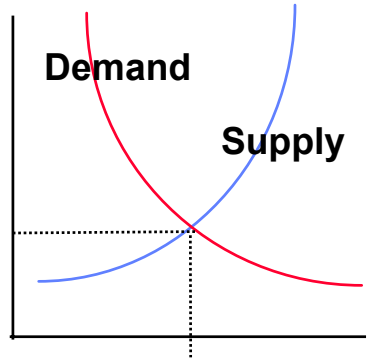
Market splitting

- When congestion is predicted, two or more spot price areas are defined
- The players must specify their bids in the different spot price areas
- Clearing at Nord Pool determines the prices in the different areas such that the power flow does not exceed the specified constraints
- A surplus area will then receive a lower price than a deficit area

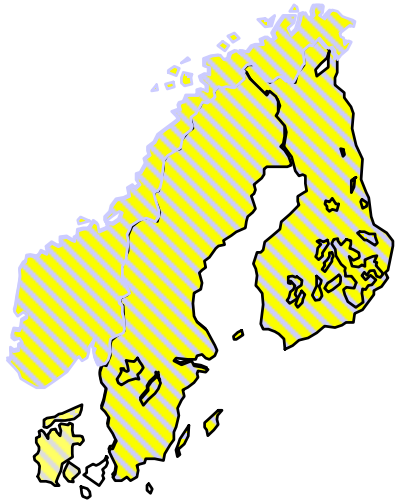
Market splitting (cont.)

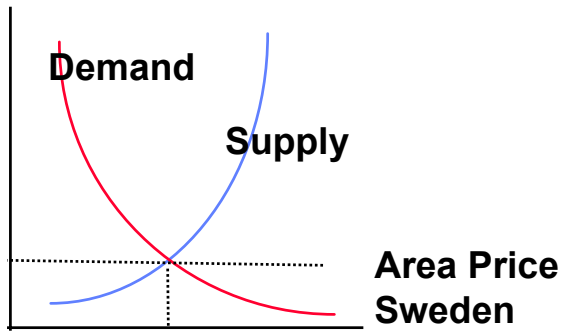
- Allocates transmission capacity based on the energy bids
- Results in energy flows according to the price signals
- Opens up international trading for all types of companies

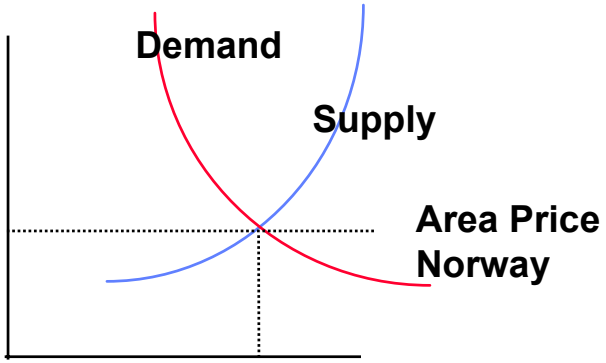
Example System Price – Area Prices calculation



System Price







- Transmission constraints between Sweden and Norway
- Assume electricity flow from Sweden to Norway

  Area Price Norway > System Price > Area Price Sweden

Reducing Area Price problems

- Increase transmission capacity
- Increase the use of TSO counter trading
- Contracts for Differences: a forward market product based on the difference between the future seasonal Area Price and System Price

Reducing Area Price problems (cont.)

- Market power issues: the size of the market, transmission constraints, market concentration, horizontal and vertical integration, technology mix, demand variations, ownership and incentives, collusion, asymmetric information, etc.
- Rules against use of market power

- competition rules
- exchange rules
- internal ethical guidelines

The exchange's role

- Nord Pool: an organized market for standardized contracts
- Public market prices
- An impartial and secure counterparty for participants
- Clearing: Nord Pool acts as counterparty in electricity contracts, reduces the financial risk for traders

The financial market Eltermin

- A market for risk management
- Financial contracts for delivery up to 4 years in the future
- Participants can perceive profit and loss in relation to their portfolio's market value
- Products: day, week, season, and year contracts are available

Why is the Nordic market a success?

- Political signals
- Long tradition of cooperation
- Regulatory framework
- TSO ownership of a power exchange
- Spot power exchange established in 1971
- First-mover advantages

Why is the Nordic market a success? (cont.)

- Appropriate market concentration
- Voluntary power exchange
- Information easy to access
- A market that facilitates establishment of service providers, trade representatives, and market analysts

The European power markets

- The Electricity Directive was to be implemented in national laws by February 1999
- Finland (1997), Germany (1998), Sweden (1998), UK (1998), Austria (2001), Denmark (2003), Spain (2003), Netherlands (2003)
- all Member States except France, Portugal, and Greece envisage full market opening in a legal sense before 2008

Existing power exchanges in Europe

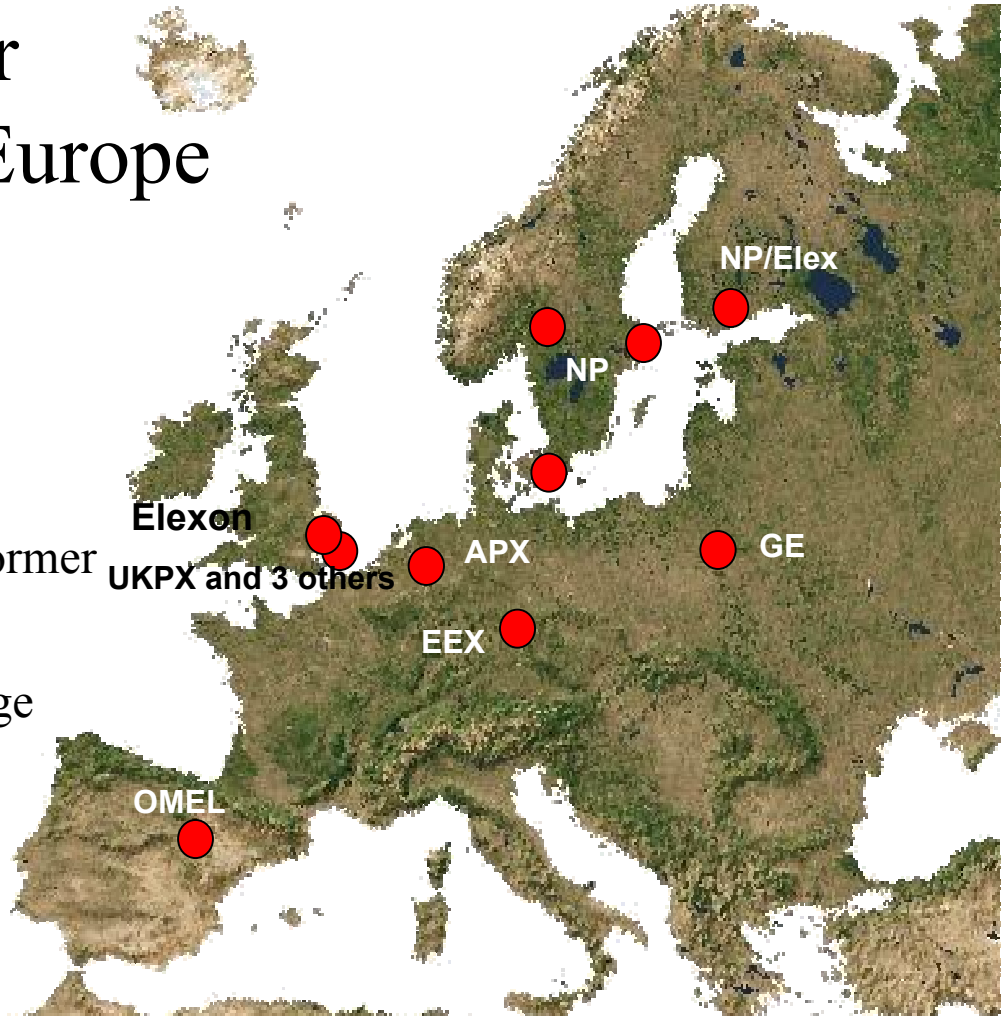
NP: Nord Pool

APX: Amsterdam Power Exchange

EEX: European Energy Exchange, merged with former LPX

GE: Polish power exchange

OMEL: Spanish power exchange



The German power market

- The largest fully-liberalized power market
- No requirement of unbundling
- No ISO or market operator
- Access to the transmission network is theoretically open
- No regulator
- Retail electricity prices have fallen

German power market obstacles

- Electricity trading represents a mere 2-3% of the physical volume of consumption
- Grid access charges are opaque, bilateral negotiation process
- Lack of market transparency
- Isolated complaints that it is difficult to gain access to utility grids at any price
- Six big generators which own 80% of the generation
- Bureaucratic barriers for newcomers

Key barriers to competition in Europe

- High network tariffs discourage third-party access (TPA) and may provide revenue for cross-subsidy of affiliated businesses in the competitive market
- High level of market power of existing generation combined with a lack of liquidity in wholesale and balancing markets expose new entrants to the risk of high imbalance charges

Key barriers to competition in Europe (cont.)

- Network tariff structures are not published in advance or subject to ex-ante approval and may lead to uncertainty or create costly, time-consuming disputes unless combined with full ownership unbundling
- Insufficient unbundling may obscure discriminatory cost allocation and lead to cross-subsidy

More cross-border transaction development needed

- Insufficient capacity to accomplish all trades
- Incoherent methods used to charge for cross-border transactions and to allocate capacity often discourage market activity

More cross-border transaction development needed (cont.)

- More cost-reflective tariff structures
- More frequent and more timely information provision
- Greater integration of capacity allocation between countries
- Greater integration with power exchanges

Public service

- Regulatory framework must be adjusted to ensure security of supply in a market environment
- Service standards can be maintained and improved in a market framework (e.g. benchmarking)
- Environmental objectives

Status in Autumn 2002

- Considerable asymmetries in the implementation of the Directives
- Distortion of the internal market in that some Member States' energy markets are more open to competitors and new entrants
- Affects both energy customers and energy companies; may lead to inefficiency and unfair outcome

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