

Det nordiske kraftmarkedet og integrasjon med det europeiske markedet

Tor Arnt Johnsen
Seksjonssjef analyse, NVE

Trender og viktige utviklingstrekk i energi- og kraftmarkdene
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Plan for presentasjonen

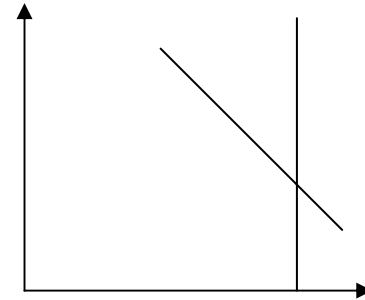
- Hvorfor krafthandel over landegrenser?
- Integrasjon vs. like priser
- Priser og overføringskapasitet i 2005-2008
 - Kapasitetsreduksjoner
- Flaskehalshåndtering/overføringskapasitet
 - Optimal benchmark
 - Geografisk aggregering
 - Lærdommer
- Oppsummering

Hvorfor krafthandel?

- Billigst (inkl. lave miljøkostnader) mulig produksjon
- Forbruk der verdien er størst
- Utnytte eksisterende produksjonsutstyr og nett best mulig
- Krafthandel i stedet for selvforsyning
- Minske sårbarhet – forsyningsikkerhet
- Investeringer

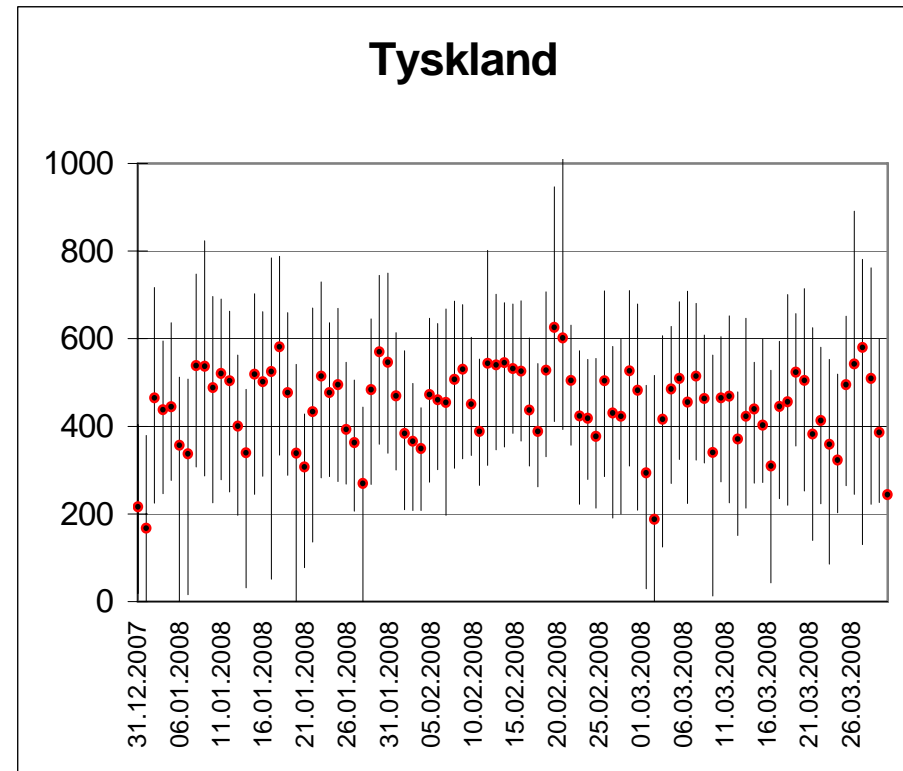
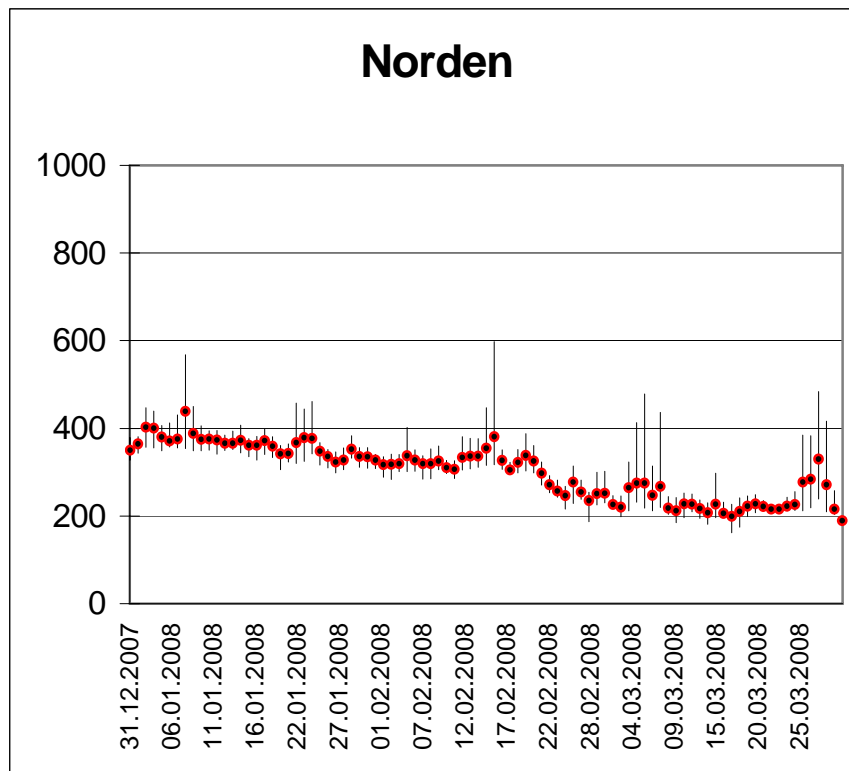
Integrasjon vs. like priser

- Prisforskjellen (flaskehalsavgiften) mellom to områder er prisen på den aktuelle overføringsforbindelse

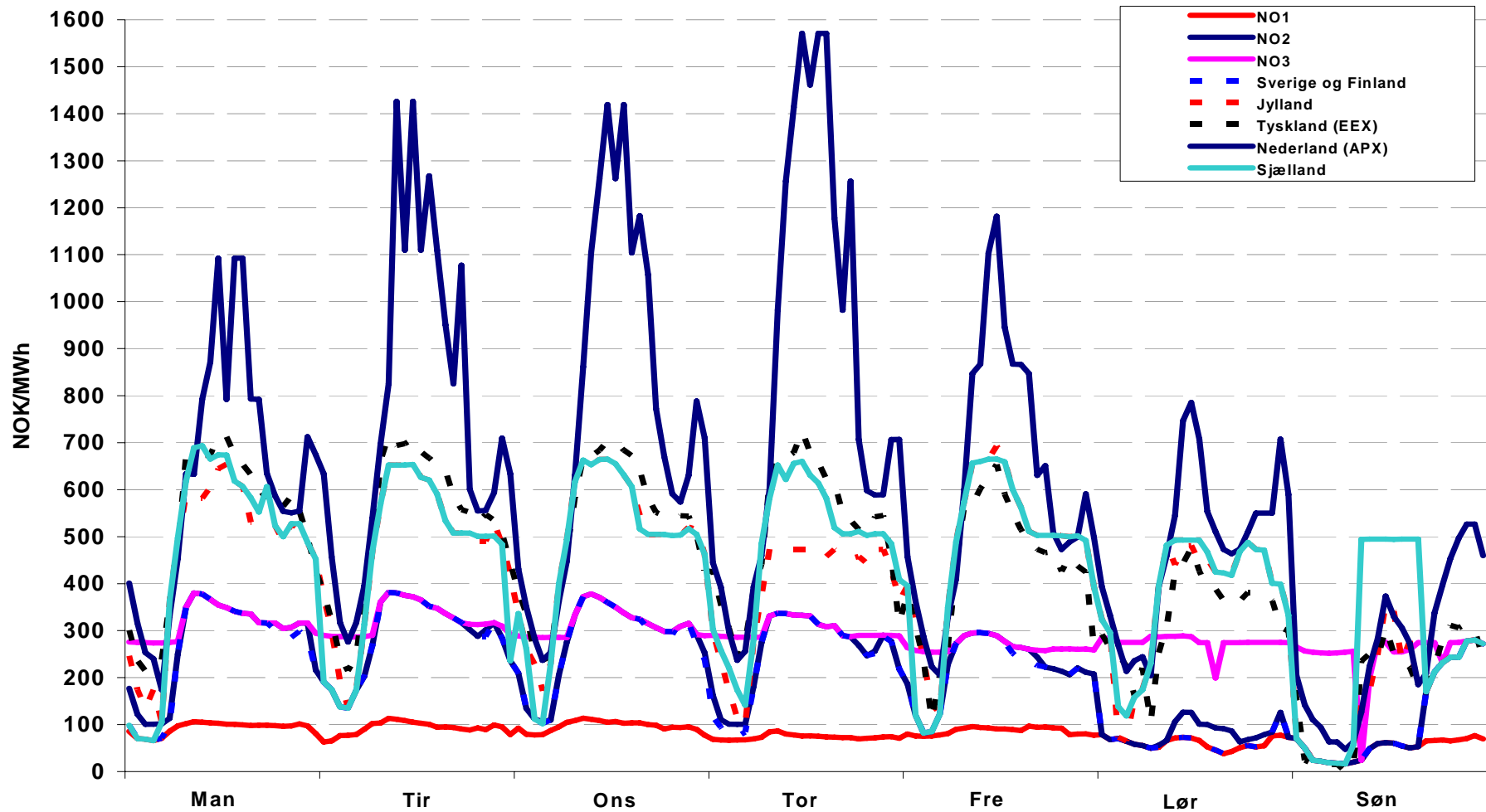


- Det er således ikke noe galt eller ineffektivt med å ha regionale prisforskjeller i kraftmarkedet
- Graden av integrasjon går mer på om markedet utnytter de eksisterende overføringsforbindelsene på en optimal måte

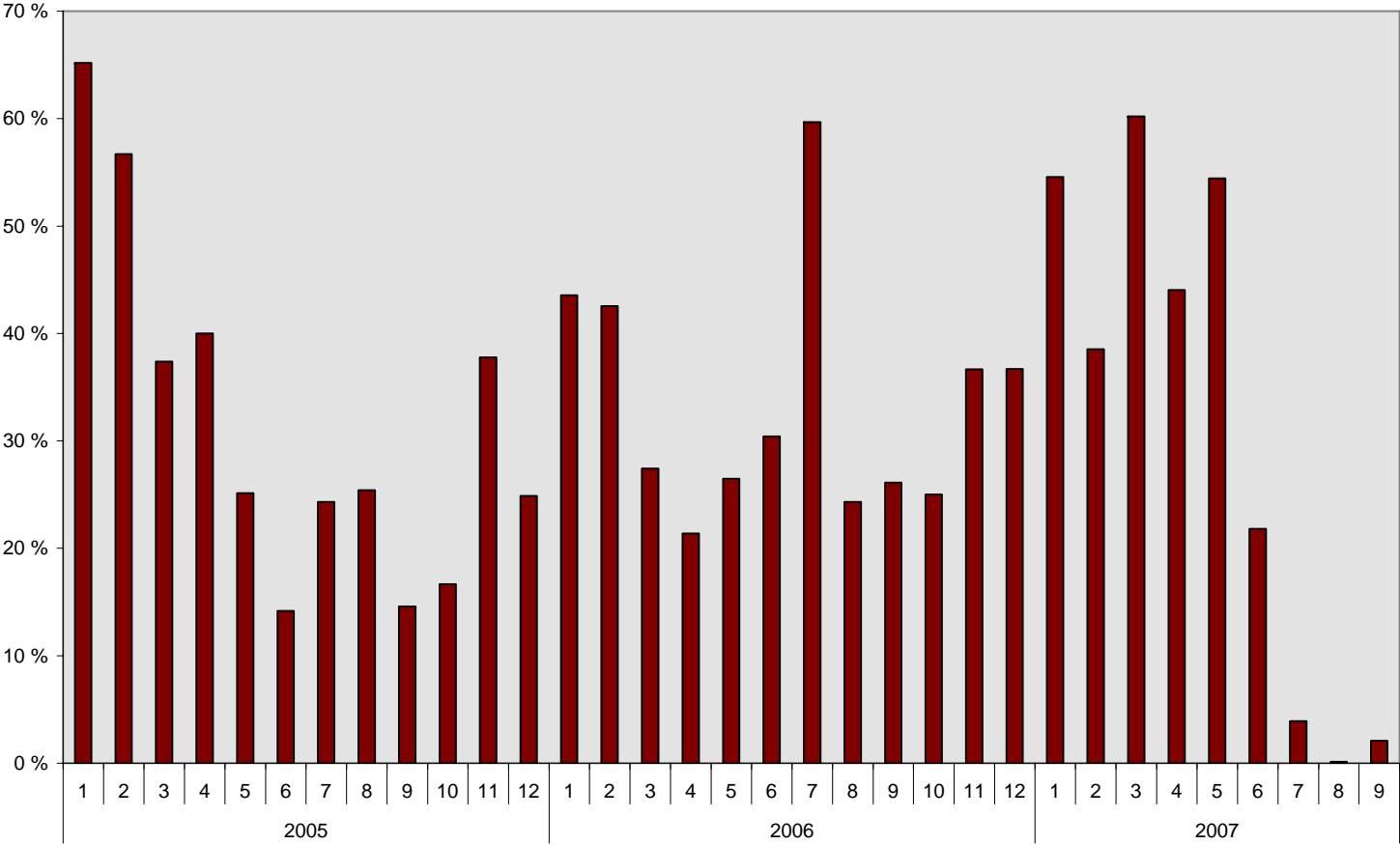
Nordisk og tysk døgngjennomsnitt og prisvariasjoner kr/MWh, 1. kv.08



Spotpriser i Norden, Nederland og Tyskland, uke 19/2008

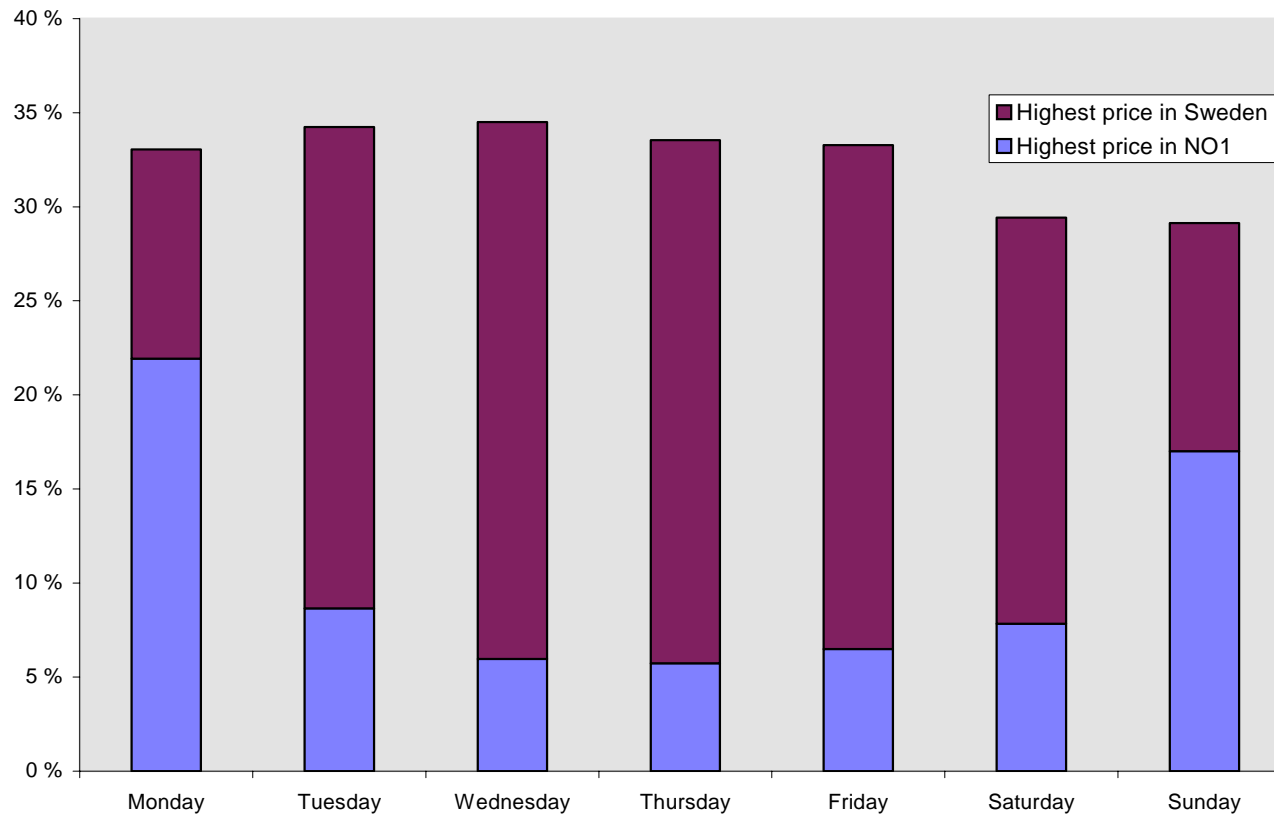


Share of hours with one price in all elspot areas*

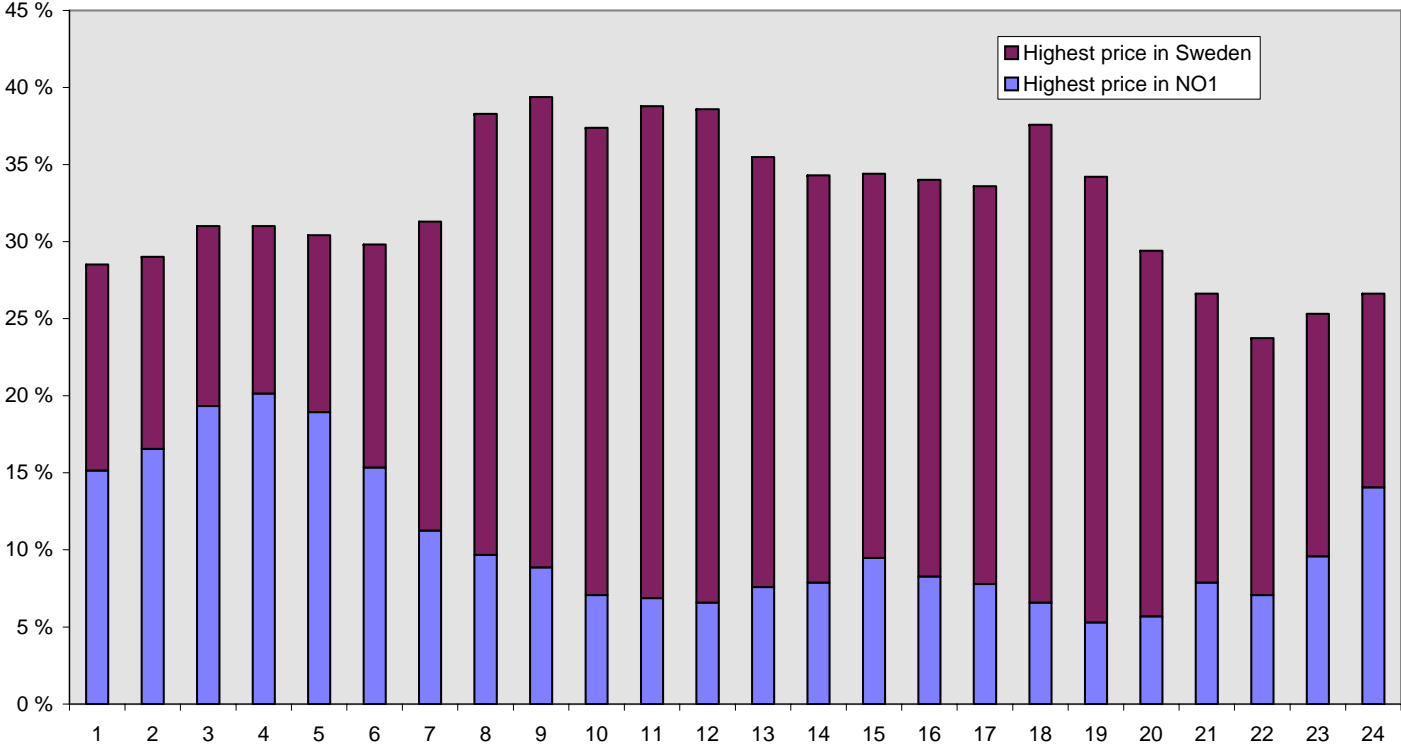


*Kontek is not included

Share of hours with price differences between Southern Norway (NO1) and Sweden.
Daily distribution over the week, 2005-2007.



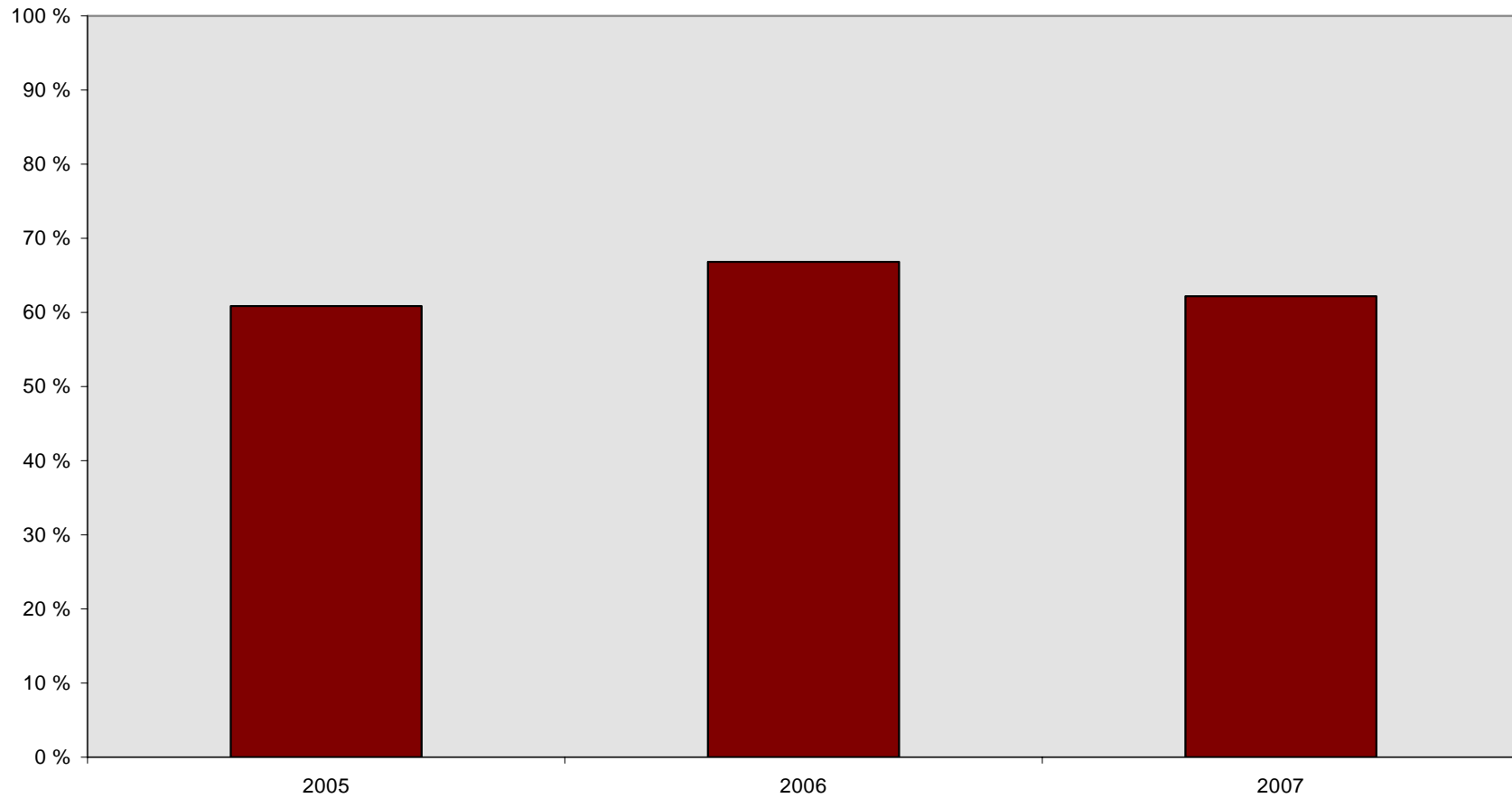
Share of Hours with price differences between Southern Norway (NO1) and Sweden. Hourly distribution over day and night.



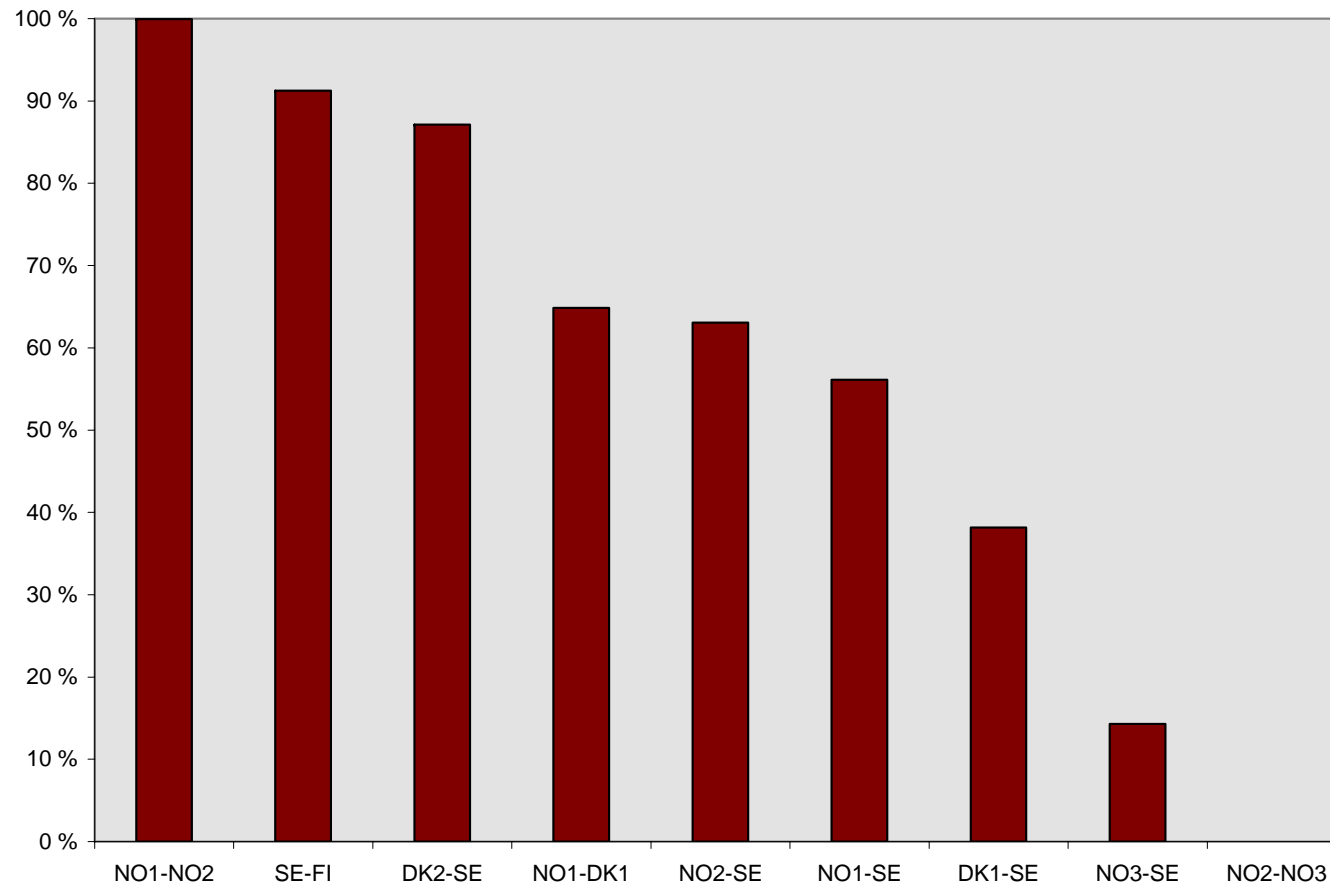
Capacity reductions

- Price differences between elspot areas reflect congestions on transmission lines between elspot areas
- These price differences may, however, be triggered by reductions on the transmission capacity between elspot areas
 - This may be a result of TSOs managing congestions in the grid within an elspot area
 - May also be a result of line revisions or errors on the lines
- Examination of data on capacity of transmission lines between elspot areas
 - Capacity reduction: More than 10 % below maximum (nominal) level
 - When there is higher price in an elspot area, how often is the capacity reduced on the line into that area?

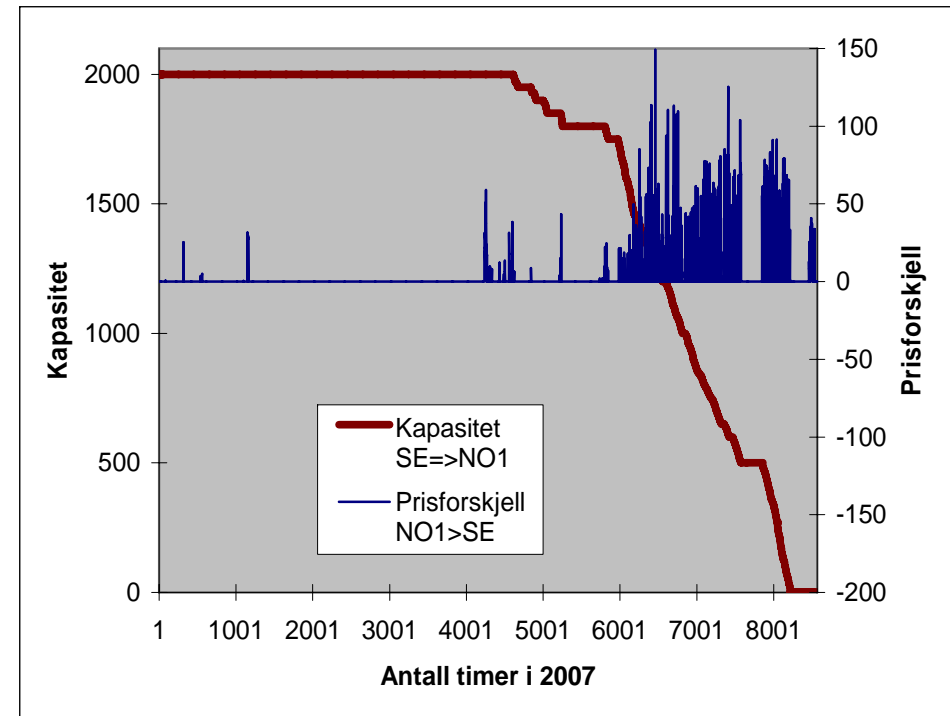
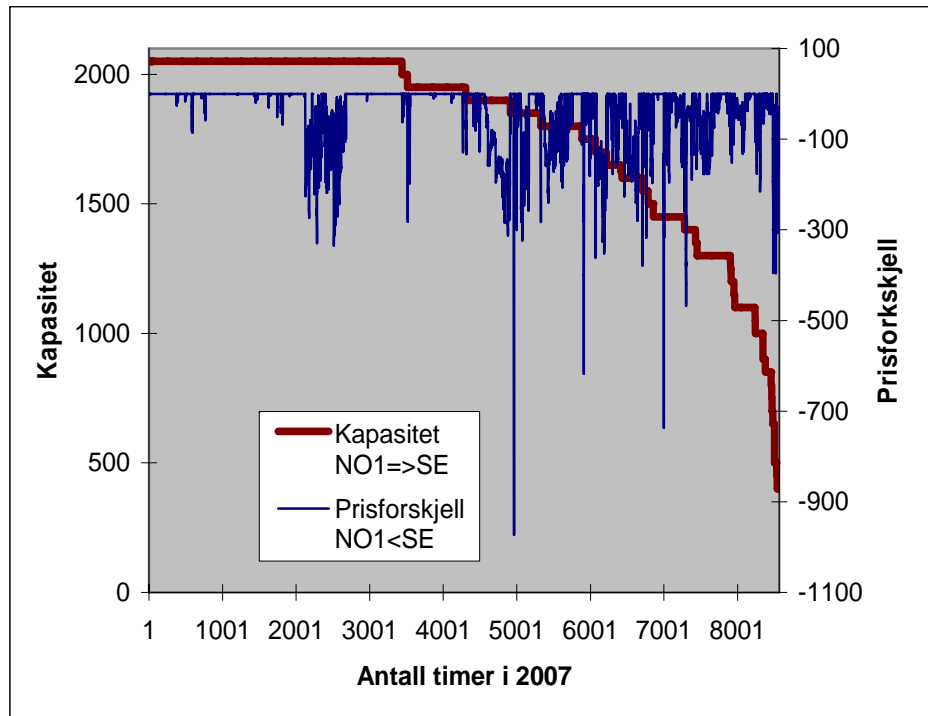
How often is price differences triggered by capacity reductions?
Share of hours with reduced capacity into high price area.
Average of all connections between the different elspot areas.



Share of hours with reduced capacity into high price area for different connections, 2006-2007.



Varighetskurve for kapasitet og tilhørende prisforskjeller Sør-Norge (NO1) og Sverige (SE)



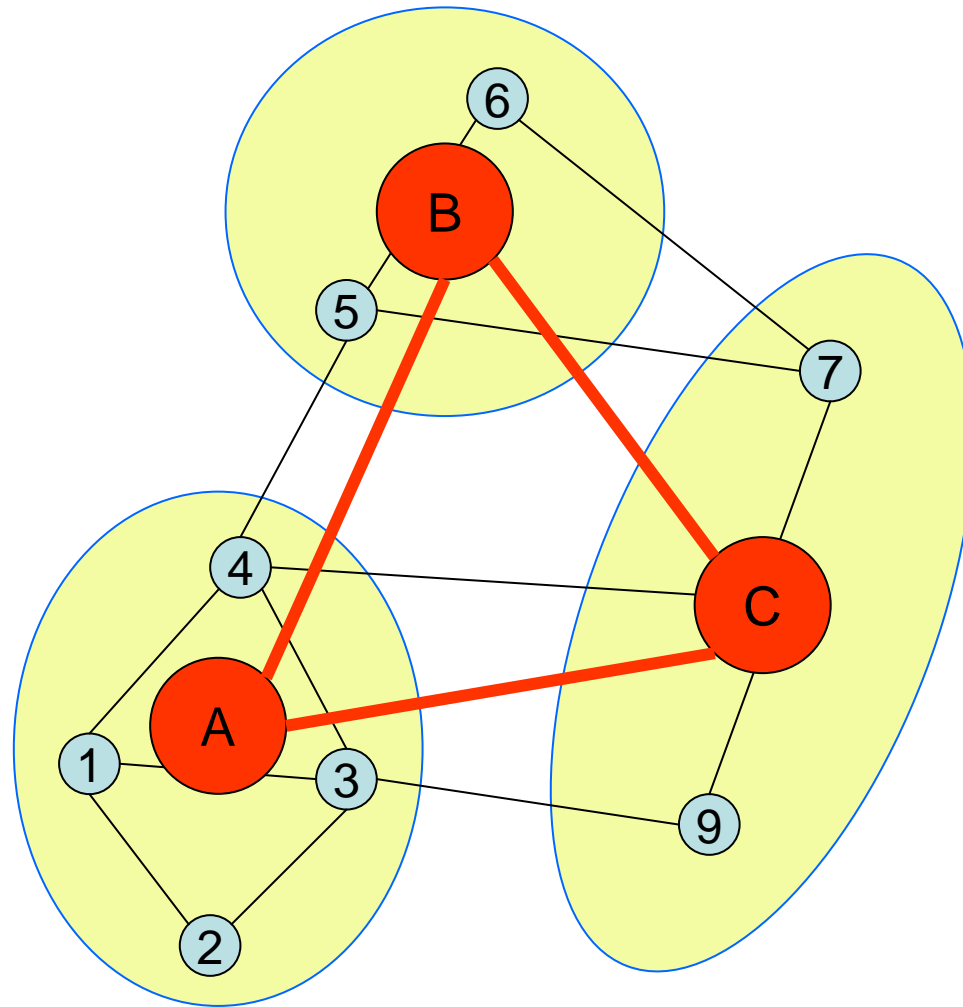
Congestion Management

- Objective
 - Optimal economic dispatch
 - Max social welfare (consumer benefit – production cost)
 - S.t. thermal and security constraints
 - Gives the value of power in every node
 - Benchmark
- Alternative methods to realize optimal dispatch
 - Nodal prices, Flowgate prices, Optimal redispatch...
- Provide price signals
 - For efficient use of the transmission system
 - For transmission, generation and load upgrades

Congestion management

- Nodal pricing is the benchmark and first best solution
- Zonal pricing / Market splitting
 - Day-ahead market
 - For the largest and long-lasting congestions in Norway and for congestions on the borders of the control areas
 - Aggregation method matters (physical / economic)
- Remaining intra zonal congestion (within zones)
 - Counter trading / Redispatching
 - Reductions in network capacities between zones

Aggregation – example



True network

- "All" nodes included
- "All" lines represented

Economic aggregation

- "All" nodes included
- "All" lines represented
- Zones with uniform prices

Physical aggregation

- Aggregate nodes
- Aggregate lines

Physical aggregation in relation to OPF-benchmark

- Issues for evaluating performance
 - The number of zones used
 - The definition of the areas
 - Fixed or flexible zones
 - How to deal with internal constraints
 - Uncertainty about the location of bids within zones
 - How to determine capacity on aggregated lines
 - Aggregate flow model without Kirchhoff's laws
 - Heuristic procedure for market splitting
 - How to deal with block bids and flexible hourly bids

Important research findings

- The differences in congestion costs can be substantial between different zone allocations
 - Optimal handling of capacity limitations can reduce bottleneck costs considerably
- The more zones the better results, but need not always have many zones to reach a near optimal solution
- Without flexible price areas
 - Important to have enough fixed price areas in order to deal with special situations due to inflows and load

Conclusions

- Large benefits from electricity trade across Europe will not be realized without explicit TSO coordination mechanism + Pool coordination.
- Good congestion management necessary which includes locational marginal pricing:
 - Nodal prices
 - Zonal prices based on economic aggregation
 - Prices based on location of bids and network conditions
 - Internal bottlenecks handled in an optimal way
 - Fair pricing is at the core of the whole EU idea
 - Prices to end users must reflect true marginal costs (demand response important)

Main messages to remember

- Aggregation
 - Economic
 - Physical
- Bids have to be nodal based
 - Network utilization, generation and consumption decided simultaneously
- Finally, prices can be computed on zonal level
 - Takes internal constraints directly into account
 - Are based on real limitations in the system

Oppsummering

- Krafthandel sparer ressurser og miljø
- Regionale prisforskjeller eksisterer og er en viktig og riktig del av godt integrerte og effektive kraftmarkeder
- En fornuftig markedesdesignen bør legge til rette for høy utnyttelse av tilgjengelig overføringskapasitet
- Overføringskapasiteter og priser bør fastsettes simultant slik at eksisterende ressurser utnyttes best mulig