Flow based market coupling in the Nordics

Brukermøte – Produksjonsplanlegging

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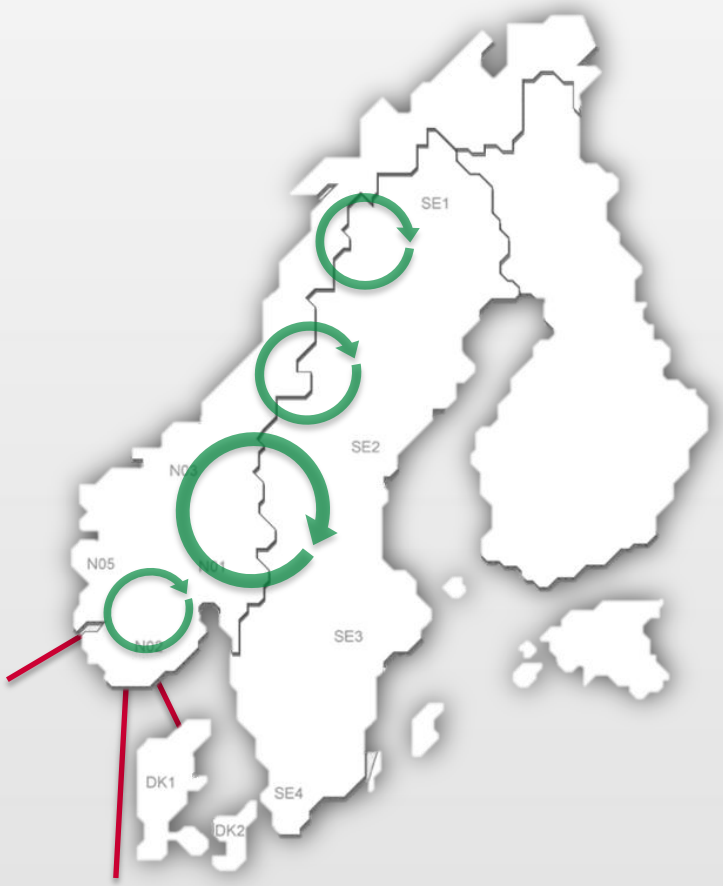
Increasing uncertainty makes capacity calculation challenging
Flow based market coupling may provide an answer



- A reinforced grid makes it more difficult to calculate capacity for the market
  - Ørskog-Fardal creates a more meshed grid
  - Stronger grid provides more options to the power flows
- History provides less guidance for capacity calculation
  - New interconnectors creates more volatile and uncertain power flows
  - Wind and small scale hydro power makes it more difficult to make assumptions on production distribution
- Requirement in CACM NC is in strong support for flow based
  - Flow based market coupling is the preferred solution unless where interdependencies between cross zonal capacity are low and the added value of the flow based method cannot be proven

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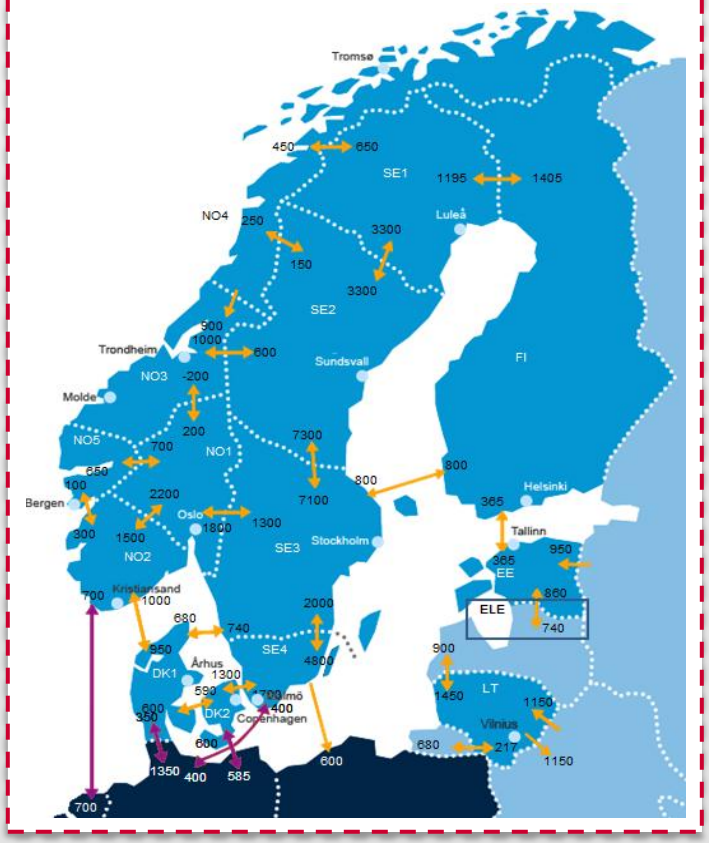
Current spot market in the Nordics

The TSOs decide capacity between market areas



Assumptions about production distribution guides the capacity given to the market

NordSpool Spot clears the market, calculating price and market flows

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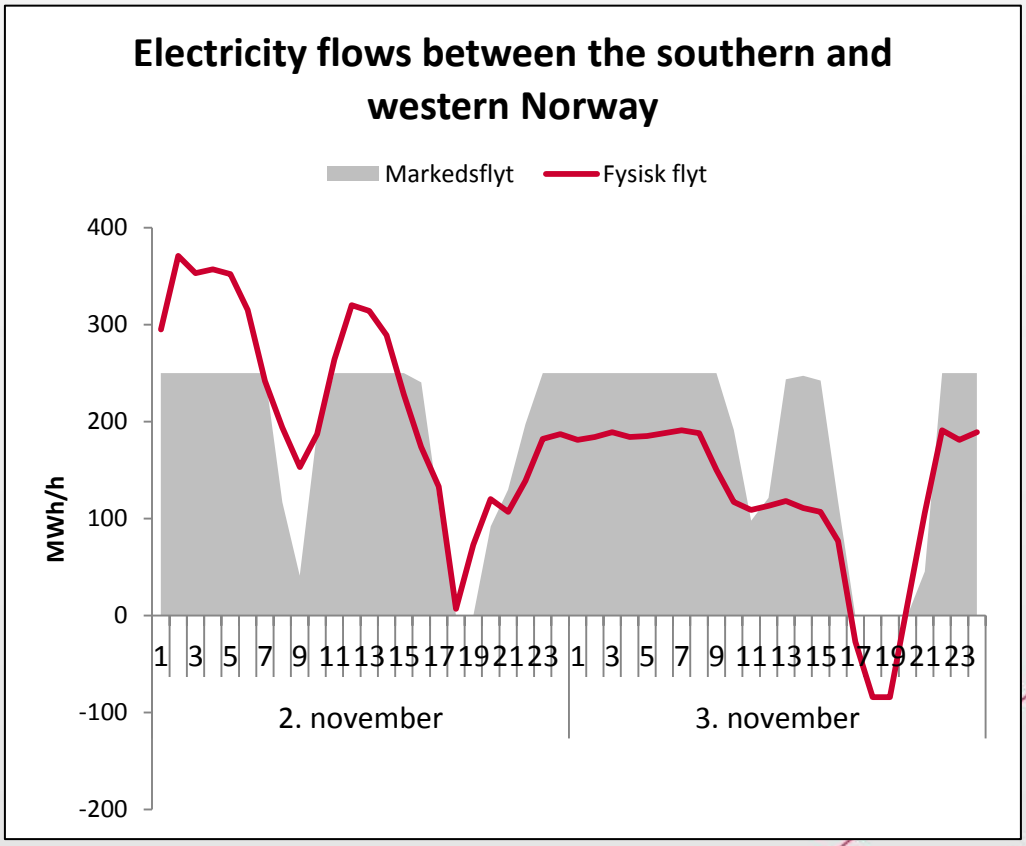
The market algorithm does'nt know physics → Difference between market flows and physical flows

Physical flows diverges from market flows → Uncertainty

- **Flows following physical laws**
- Uncertainty about production and consumption in the operation hour
- Use of remedial actions/counter trade

Uncertainty → weaker grid utilization

- Reliability margins
- Remedial actions – counter trade



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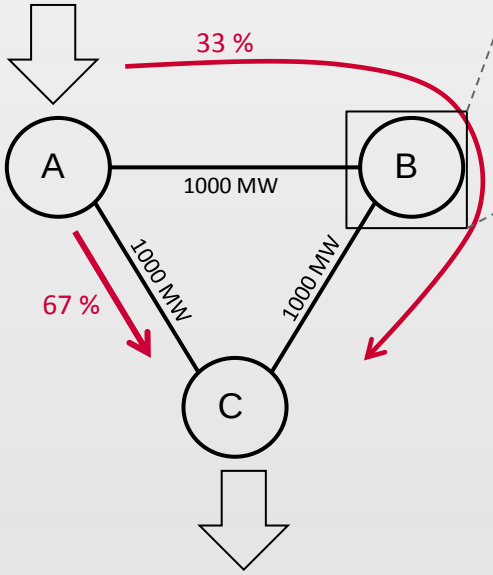
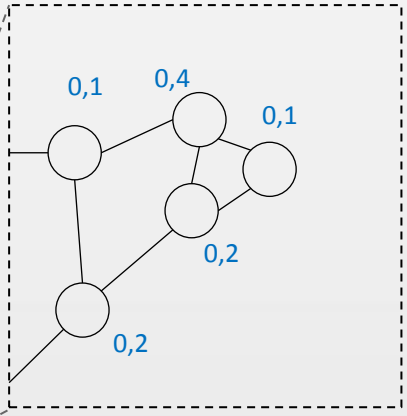
The ATC market "believes" the electricity flows to be controllable

However, physical flows follows patterns given by electric resistance in the grid





But not all of the physics are considered by flow based

ATC restrictions:

Line	Max flows
A -> B	750 MW
B -> C	750 MW
A -> C	750 MW

FB restrictions ("Grid model"):

Line	Max flows	Influence from area A	Influence from area B	Influence from area C
A -> B	1000 MW	33 %	- 33 %	0
B -> C	1000 MW	33 %	67 %	0
A -> C	1000 MW	67 %	33 %	0

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The best solution is not always available in ATC

Possible flow patterns:

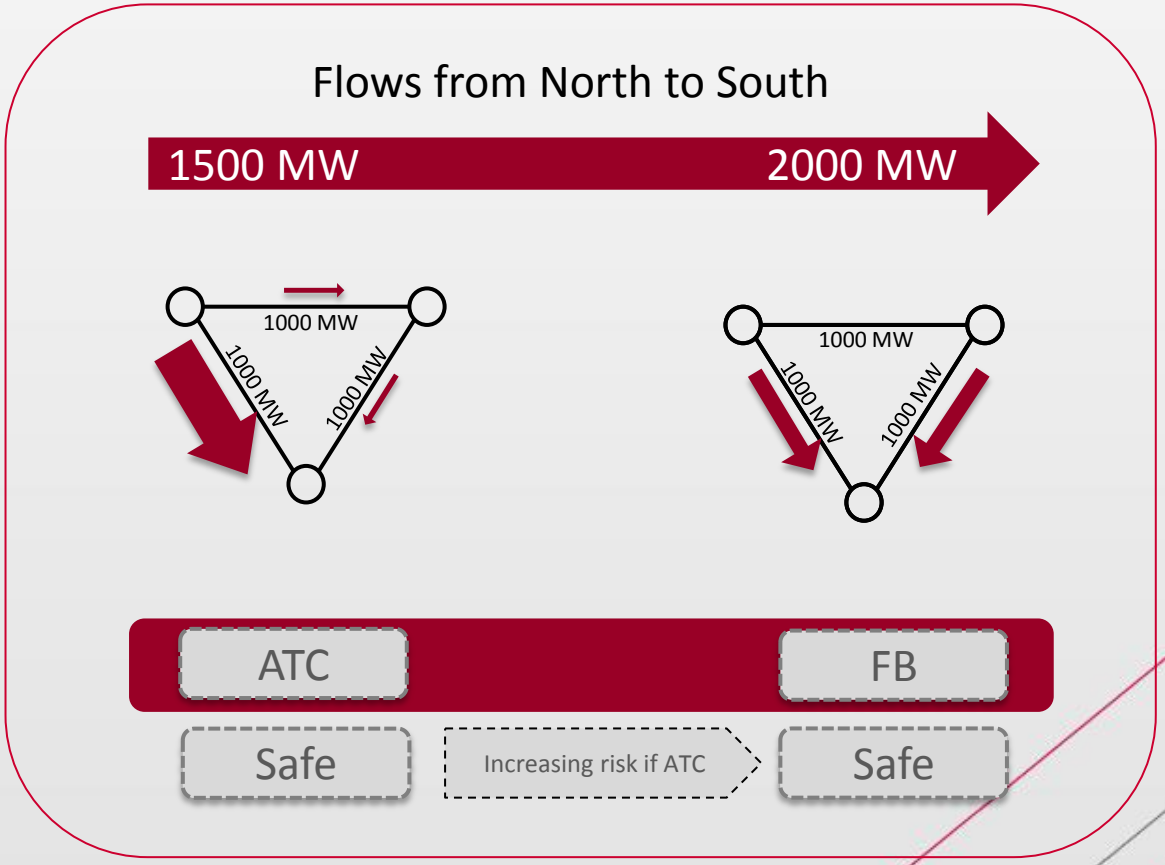
ATC: Statnett decide which flows are available to the market

- The market can not find the best solution if our assumptions on production distribution is wrong
- Statnetts assumptions "guides" the market

FB: All possible flows are available to the market which by itself determine the optimum flows and production distribution

Implications:

1. Increased flexibility
2. Possible to have increased flows with less operational risk
3. As good or better solution as ATC



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Flow based market clearing (FB) in a nutshell

- FB is about the market clearing process/algorithm
  - Not "nodal pricing" but "borrows" some of the technology
  - No further requirements for price areas than today
- The PX will still clear the market
- The objective function of the market algorithm remains the same
  - To maximize the welfare economic surplus
- FB impose a new set of restrictions in the algorithm
  - Current Available transfer capacity (ATC) is replaced by a grid model (PTDF matrix and capacities)
  - The TSOs calculates the grid model
- ➢ Market flows are brought closer to the physical flows

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Anticipated results from FB

- Better grid utilization
  - Possibility of more power flows
  - More "correct" power flows (and prices)
- Better access for renewables
- Decreased price differences
- Income redistribution: Less congestion income and more producer and consumer surplus
- A welfare economic gain in total

FB is a better congestion management method than ATC. FB performs best in congested systems and in meshed grids. If no initial congestion, or in radial grid systems, FB doesn't do much difference.

Important issues for producers and consumers

- New type of grid information
  - Current information on available capacity is replaced by PTDF-matrixes and maximum flows on important cuts
- Different price expectations
  - Implications for water value calculations
  - More or less the same effects as expected with new grid investments
- Hedging is unchanged
  - The Nordic financial market is solely based on prices – FB itself does not impose substantial changes to this
  - Hedging based on congestion income (physical and financial transmission rights) becomes less relevant?

Flow based market coupling in Europe

- Preferred future European market design (in regard to CACM NC and the European target model)
  - Unless in regions where interdependencies between cross zonal capacity are low and the added value of the flow based method cannot be proven
- Central Western Europe is currently working on the implementation of a flow based market coupling, expected in operation by the end of 2013
- No examples of an actual market using flow based market coupling yet!

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Takk for oppmerksomheten

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