



Market simulations

Joint NordREG / Nordic TSO workshop on
Flow-Based capacity calculation

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Measuring the performance of flow based market coupling

- ❖ Aim to compare the performance of flow based market coupling and the current approach
- ❖ Simulations will be performed by Nord Pool Spot
 - ✓ The same algorithm used to calculate the day-ahead prices
 - ✓ The same approach as used by the CWE TSOs
- ❖ Main result is Nordic welfare – *does the new method provide a superior market outcome?*



Status of the market simulations

- ❖ Technical tests of the simulation facility completed in cooperation with Nord Pool Spot
- ❖ FB parameters not yet of industrial quality
 - ❖ Not yet comparable to CNTC
- ❖ Results so far show both big gains and big losses
 - ❖ Cannot conclude on welfare (or prices) yet
 - ❖ Missing grid constraints and errors
- ❖ Project team currently working on improving the FB parameters



Economic indicators

- ❖ The simulation results will be evaluated based on an extensive list of indicators

Benefit of FB compared to CNTC

- ✓ Total welfare all areas and all parties

Main indicator

Redistribution

- ✓ Welfare of non-Nordic regions
- ✓ Congestion rent
- ✓ Consumer and producer surplus
- ✓ National welfare

Prices

- ✓ Area prices
- ✓ Average sell and buy price per area
- ✓ Price convergence
- ✓ Price volatility
- ✓ Price difference on borders
- ✓ Average Nordic price

Intuition

- ✓ Impact of the intuitive patch

Volume

- ✓ Total traded volumes
- ✓ Production and consumption per area and country
- ✓ Total scheduled flows

Validity

- ✓ Energy balance of hydro areas



Known challenges

- ❖ Same bids used for both FB and CNTC
 - Markets parties not reacting to new methodology
 - Energy balance in hydro areas may deviate from "realistic" values

- ❖ Level of security of supply may be different for FB and CNTC
 - Different sets of grid constraints and remedial actions may be considered for FB and CNTC
 - The uncertainty margins will not be the same for FB and CNTC

- ❖ Scheduled market flow on borders is not directly comparable
 - CNTC schedules may not be unique for a set of area prices / net positions
 - ✓ Fix: comparable flows on borders will be calculated using the area net positions and the FB PTDF matrix for both CNTC and FB



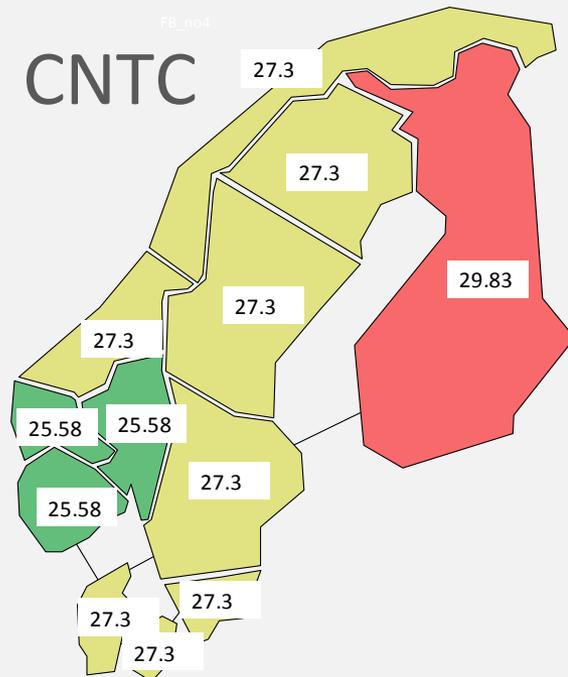
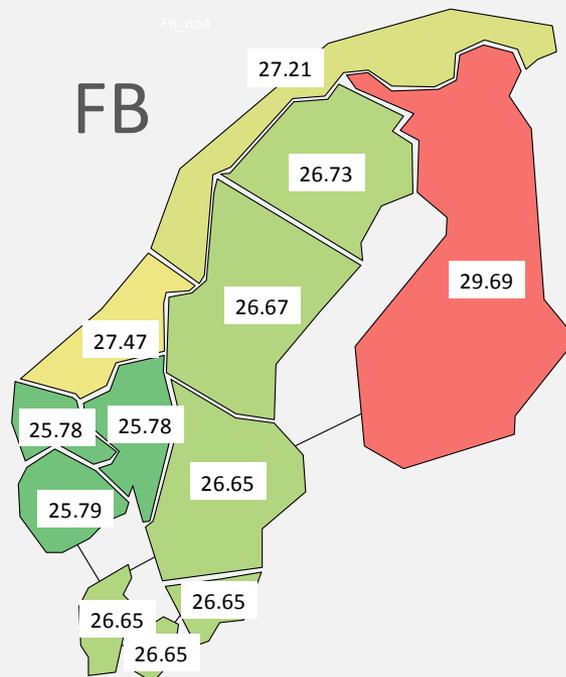
What to expect?

- ❖ Target function of the market coupling remains the same
- ❖ Improved market outcome
 - ✓ More options available to the market due to a more flexible approach
- ❖ More (and smaller) price differences
 - ✓ FB gives a unique priority to each area in order to maximize the total welfare
 - ✓ Unique priority = unique price
 - ✓ "Big" price differences reduced by prioritizing grid access for areas of very high or low prices
- ❖ Reduced congestion rent
 - ✓ Improved grid utilization likely to reduce the congestion rent, as reduction in price differences is greater than increase in power flows
 - ✓ Increased consumer+producer surplus
- ❖ For TSOs: increased visibility of grid components limiting the market
 - ✓ *Shadow prices* gives TSOs the marginal value of increasing capacity at specific grid components



Example results from market simulations

- ❖ March 24, hour 05-06
- ❖ FB: most area prices converge on the system price compared to CNTC
- ❖ FB: price differences indicate different impact on the limiting grid constraints

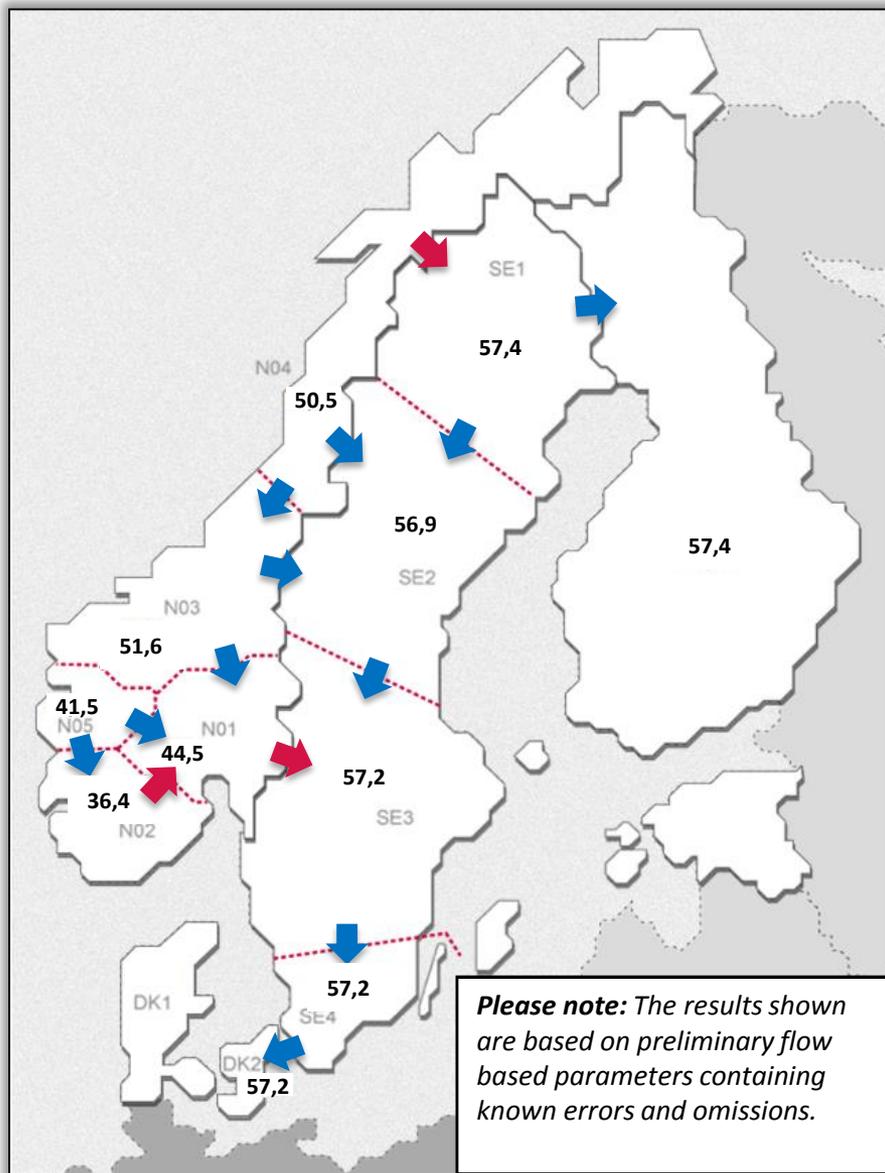


Please note: The results shown are based on preliminary flow based parameters containing known errors and omissions.





Explaining the price differences



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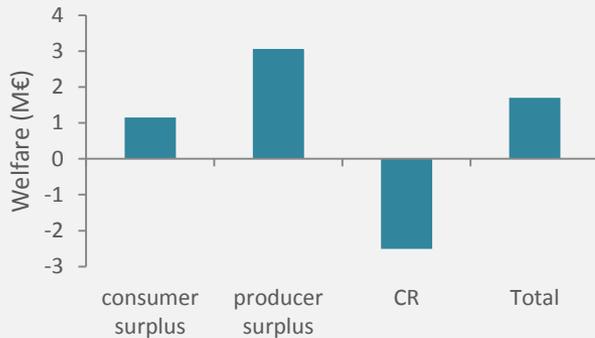
The red arrows shows the congestions in the grid

- ❖ SE1 has a higher price than SE2 relieves the congestion on border NO4-SE1 more efficiently
- ❖ NO3 has lower price than SE2 since it has a higher impact on border NO1-SE3
- ❖ SE2 has a lower price than SE3 since some of the exports adds to the congestion on NO1-SE3
- ❖ NO5 has higher price than NO2 due to a lower impact on the congested border NO2-NO1

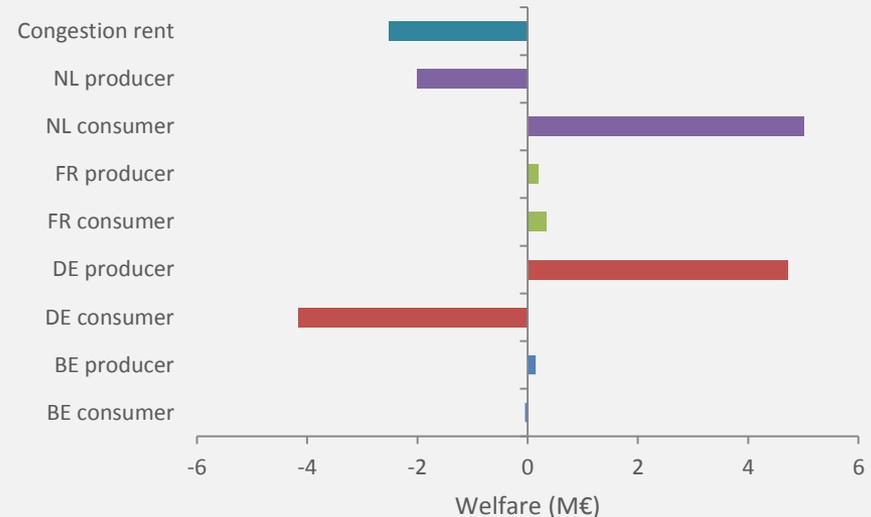


Economic results published by the CWE flow based project

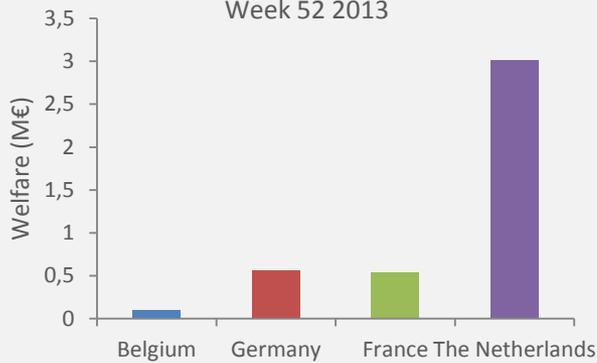
Global welfare distribution
Week 52 2013



Welfare distribution
Week 52 2013



Economic surplus per country
Week 52 2013



Source: Prices published by the CWE flow based project at
<http://www.casc.eu/en/Resource-center/CWE-Flow-Based-MC/Parallel-Run-Results>

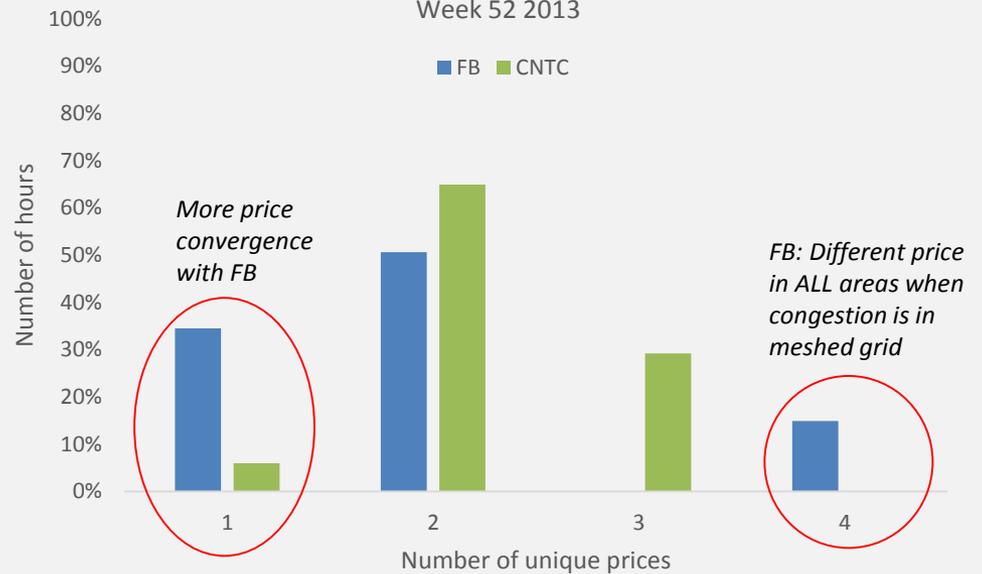


Economic results published by the CWE flow based project

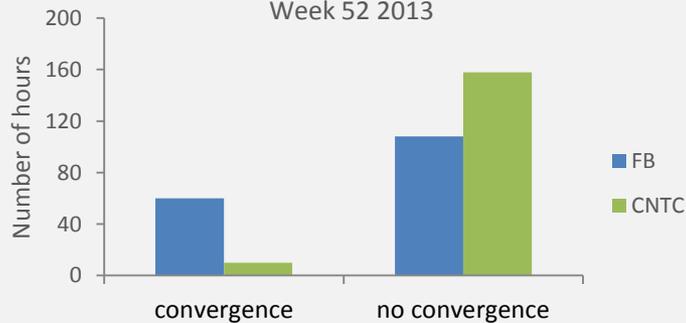
Price divergence
Week 52 2013



Number of unique prices
Week 52 2013



Price convergence
Week 52 2013



Source: Prices published by the CWE flow based project at <http://www.casc.eu/en/Resource-center/CWE-Flow-Based-MC/Parallel-Run-Results>



Questions?