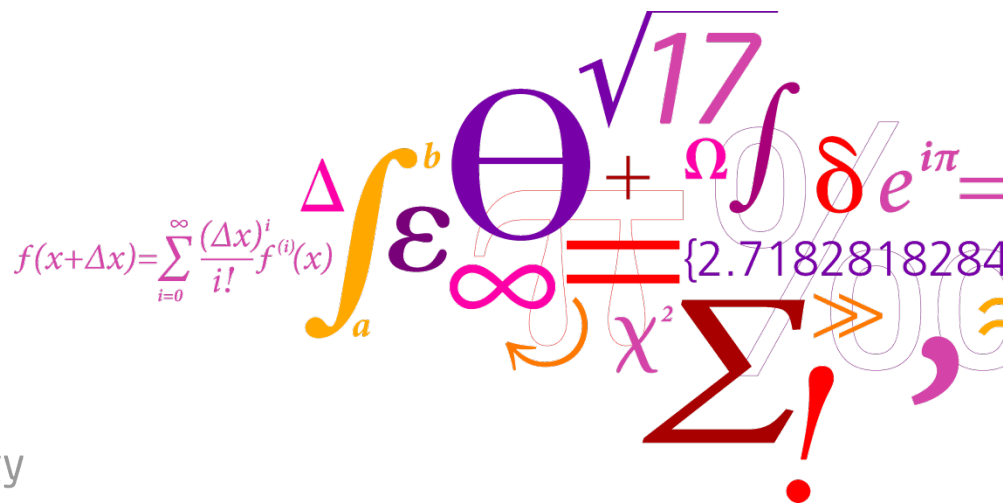


Electricity market design in multinational offshore grids

OffshoreDC workshop, Oslo

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October 17th, 2011



Outline

1. The need for HVDC – another major scenario calculation (from Germany)
2. Meshed grids
3. Support schemes
4. Overview: regulatory constellations
5. Results
6. Conclusions

The need for HVDC – another major calculation (from Germany)

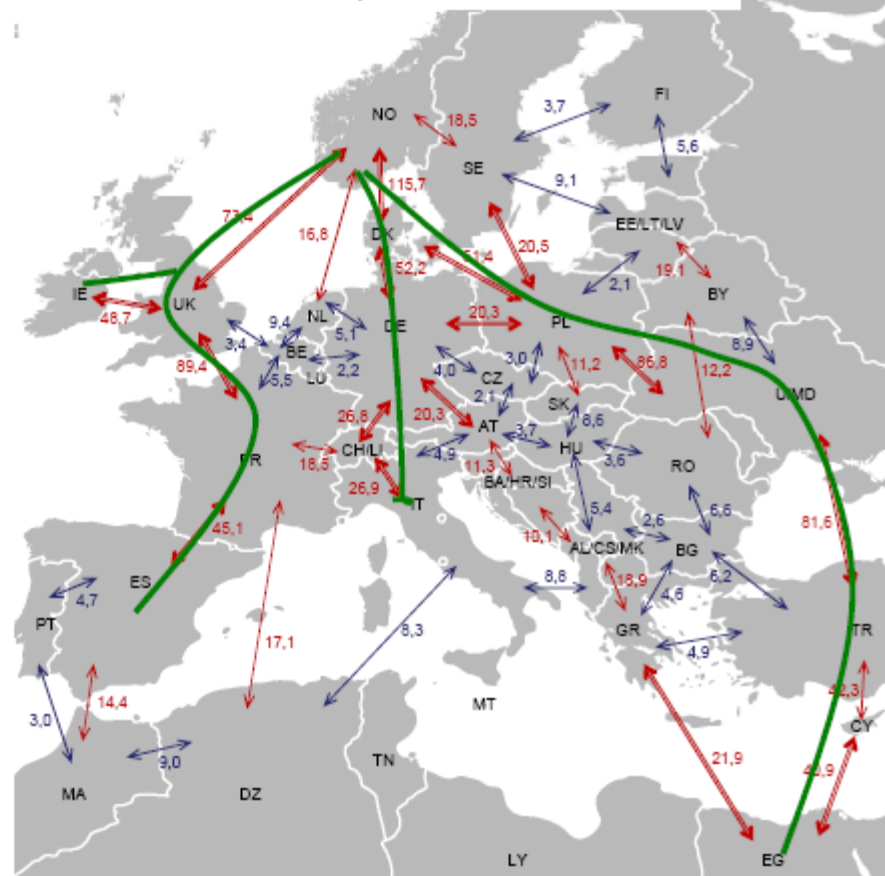
Scenario 2.1.a Maximum transmission capacities between DE – DK -NO



Source: O. Hohmeyer, German Council of Environmental Advisors (2011)

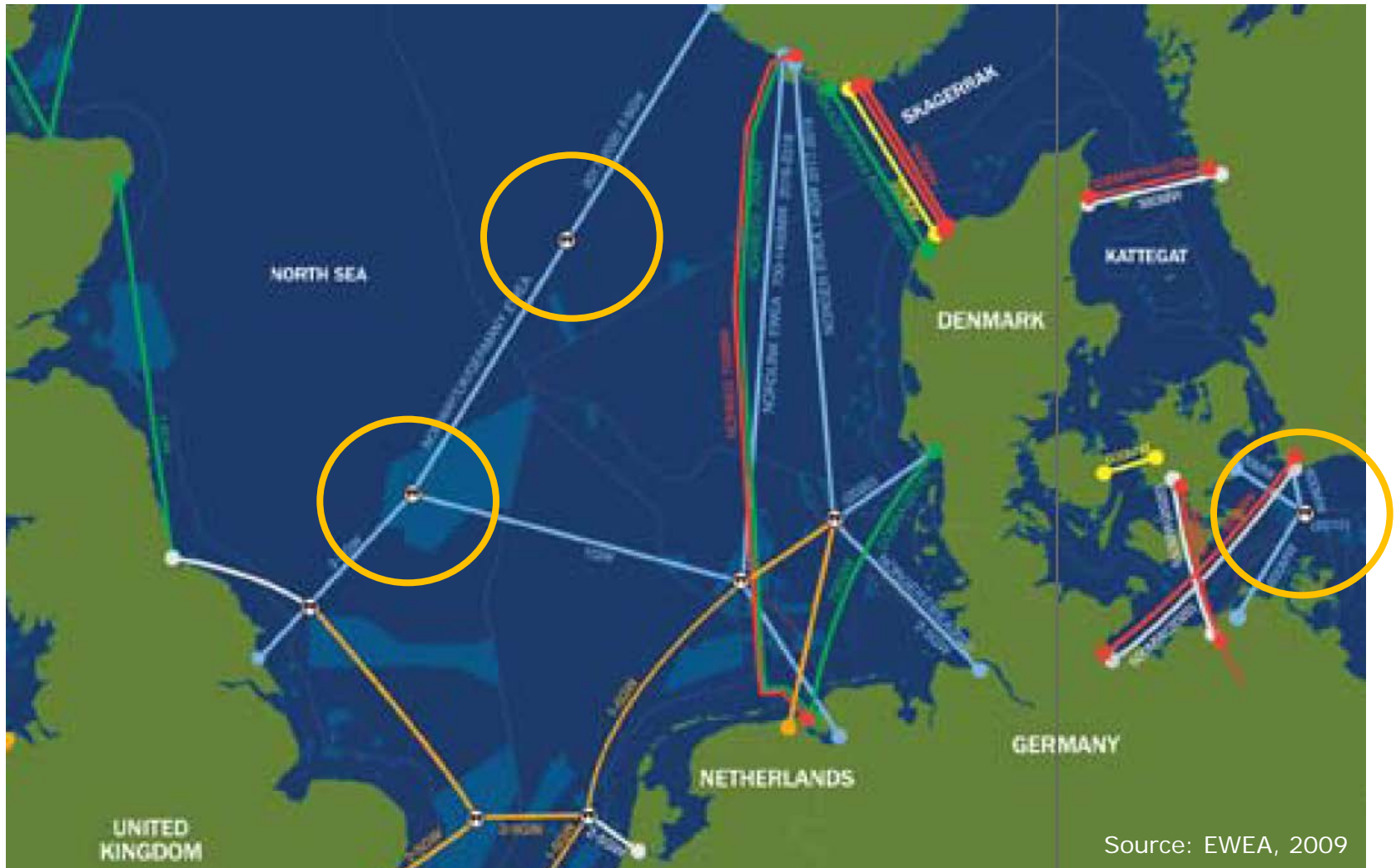
The need for HVDC – another major calculation (from Germany)

Scenario 3.a Maximum transmission capacities for all countries



Source: O. Hohmeyer, German Council of Environmental Advisors (2011)

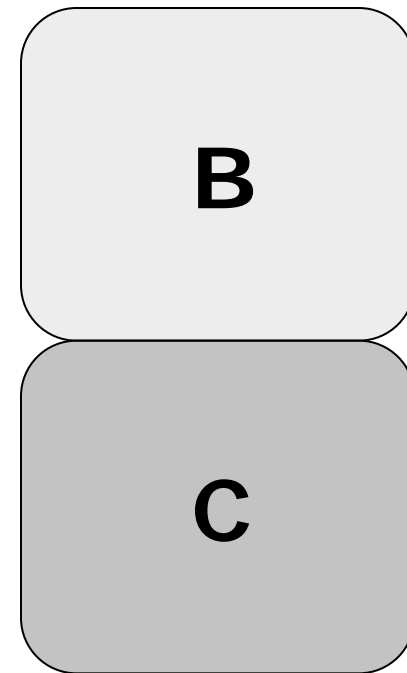
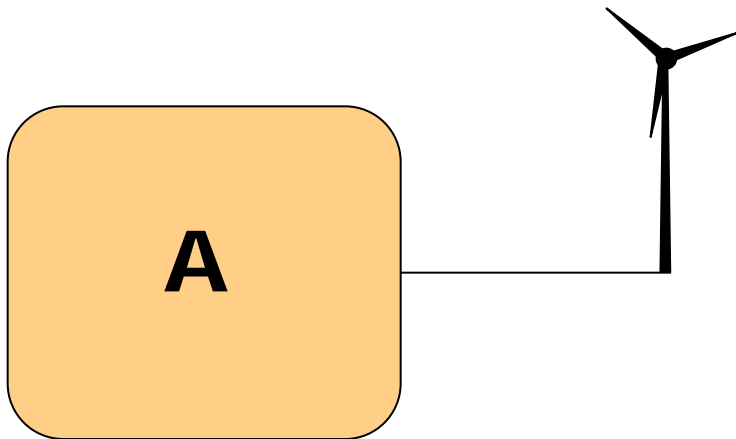
Issues in meshed grids



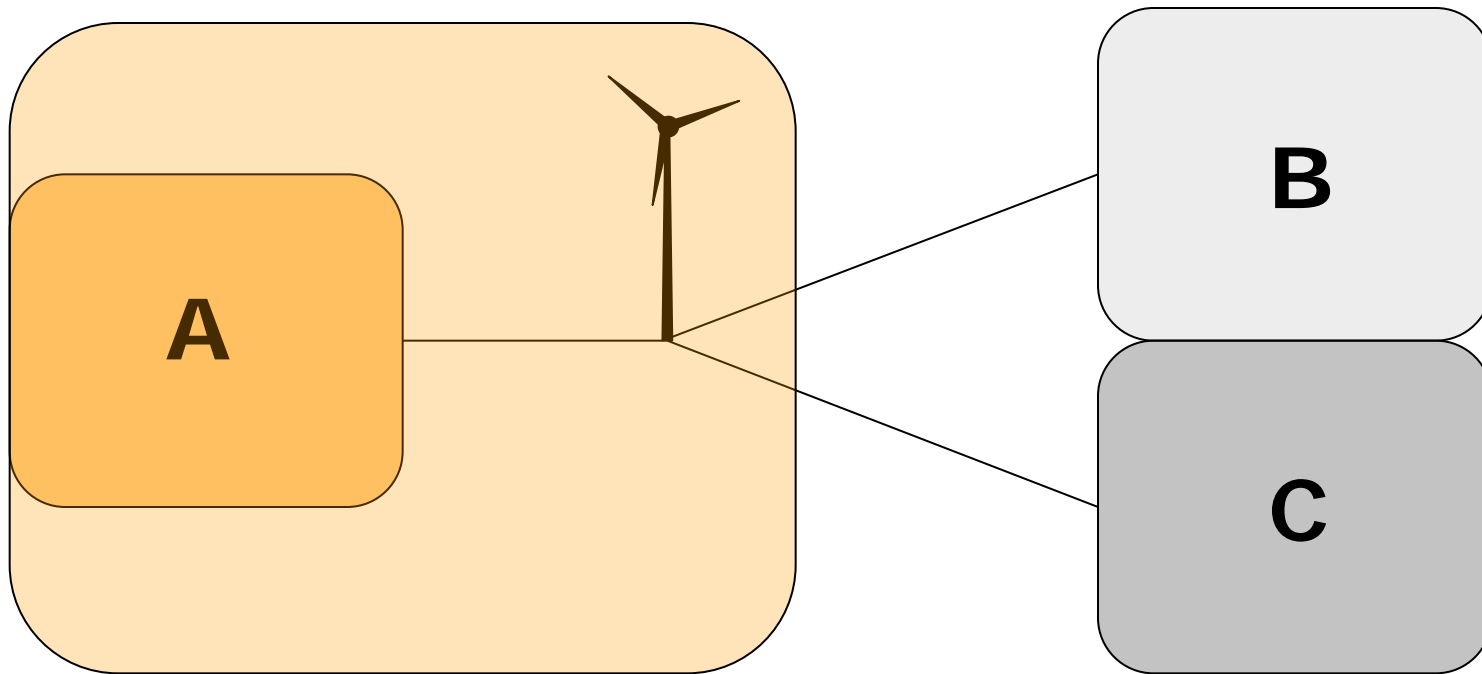
Support schemes

	<i>Price premium</i>	<i>Feed-in tariff</i>
Offshore wind farm	<p>Income = Spot market + fixed premium \pm regulation / imbalances</p> <p>manages deviations</p>	<p>Income = Feed-in tariff*max. amount</p>
Transmission system operator	<p>Congestion rents</p>	<p>Congestion rents, regulation / imbalances of offshore wind farm</p> <p>manages deviations</p>

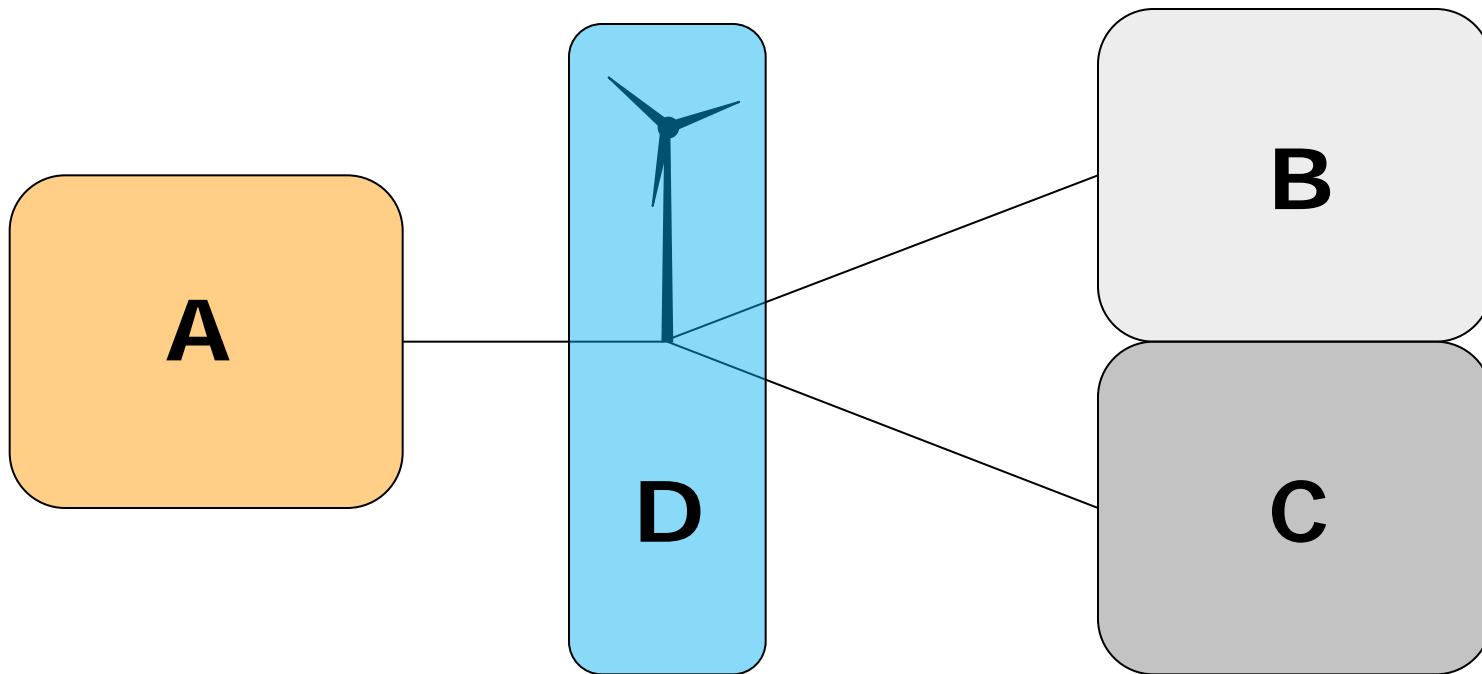
Possible constellations: Case I (benchmark)



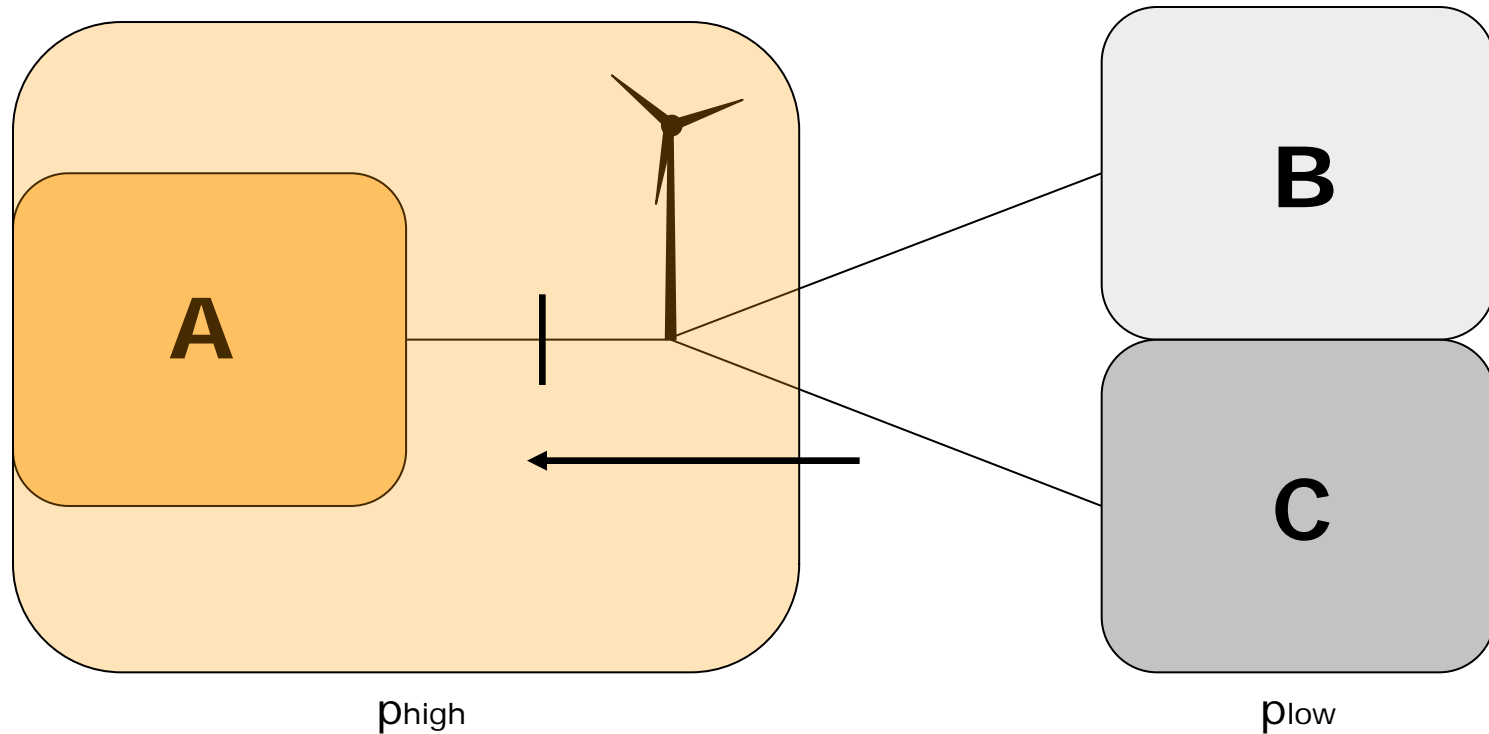
Possible constellations: Case II



Possible constellations: Case III

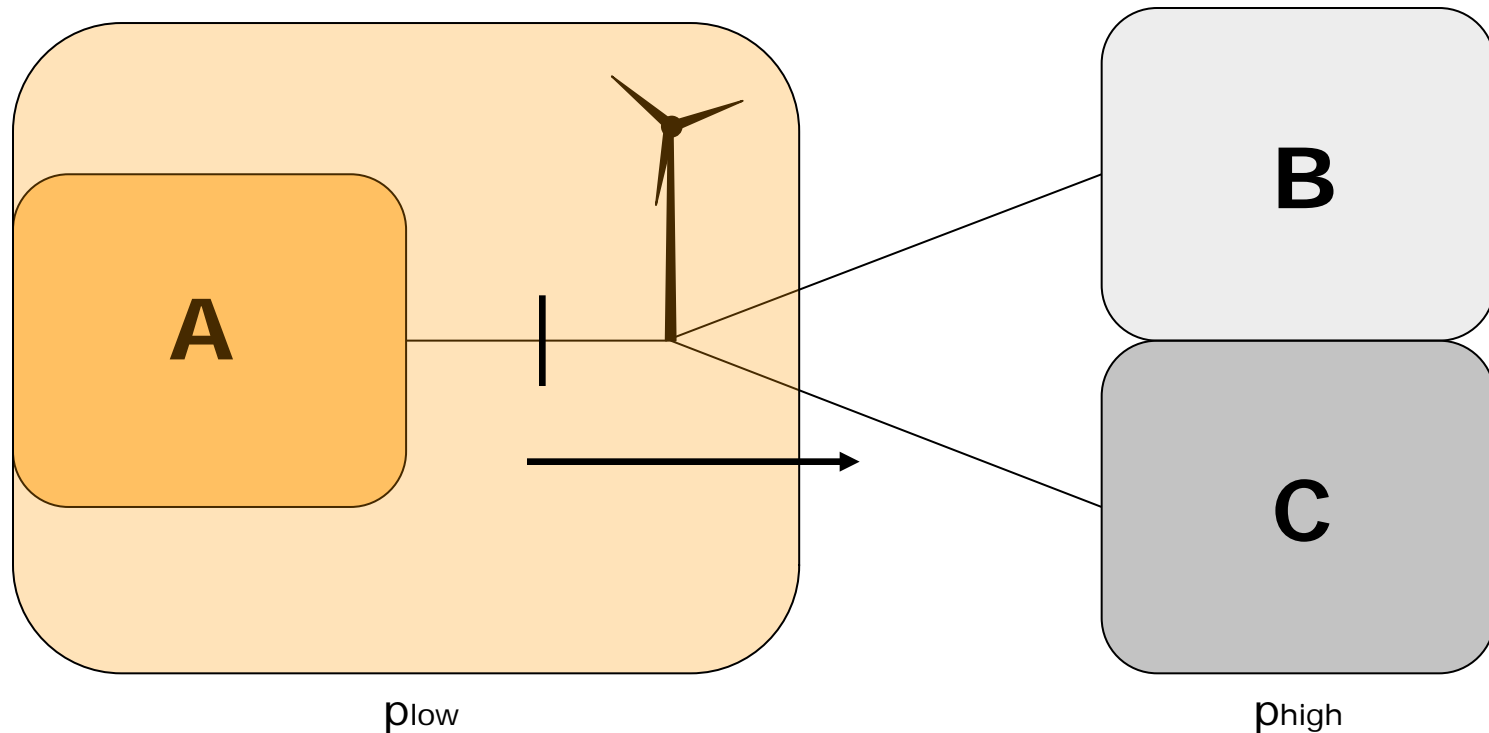


Results: Case II , price premium



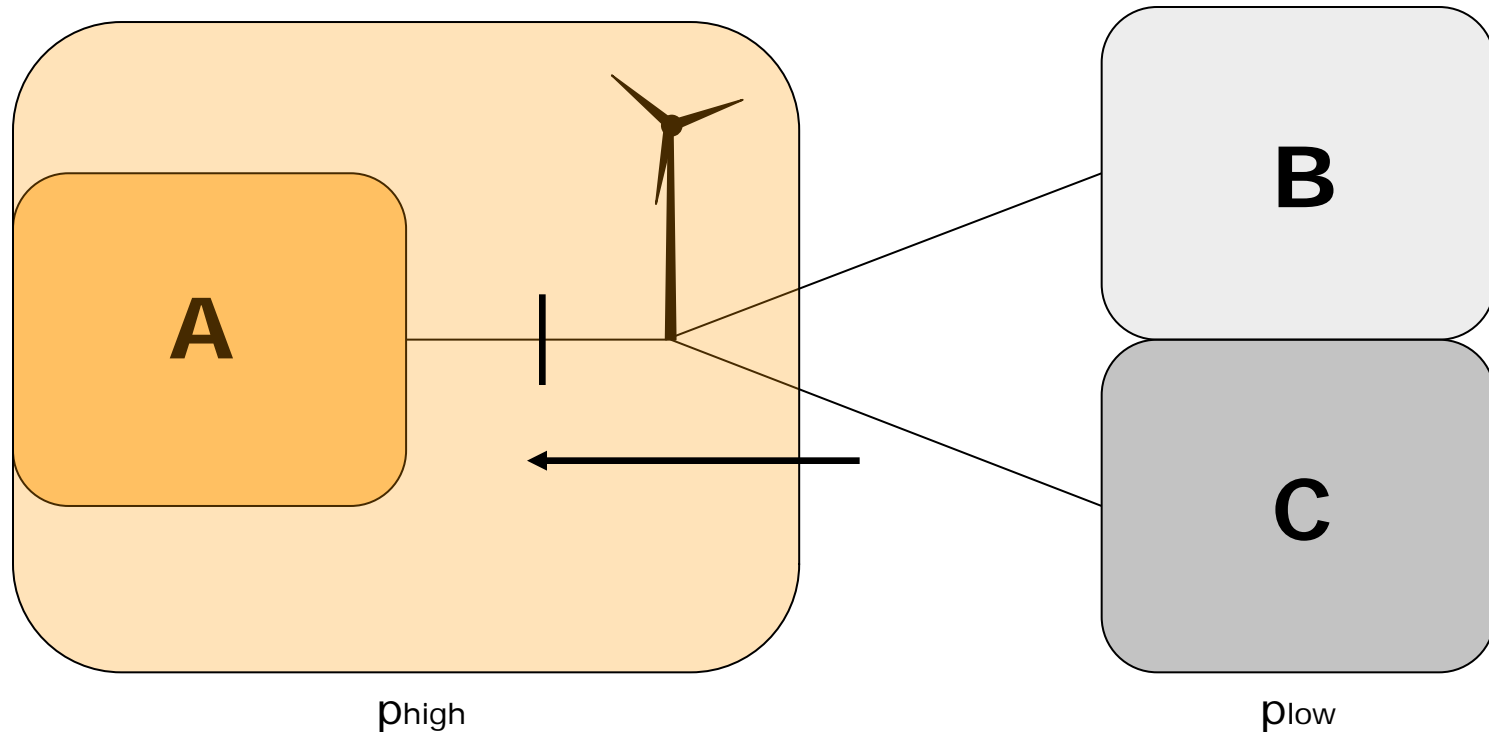
- The OWF sells more on the spot market than expected (if this is not outweighed by very high imbalance charges)
- TSO congestion rent income is reduced

Results: Case II , price premium



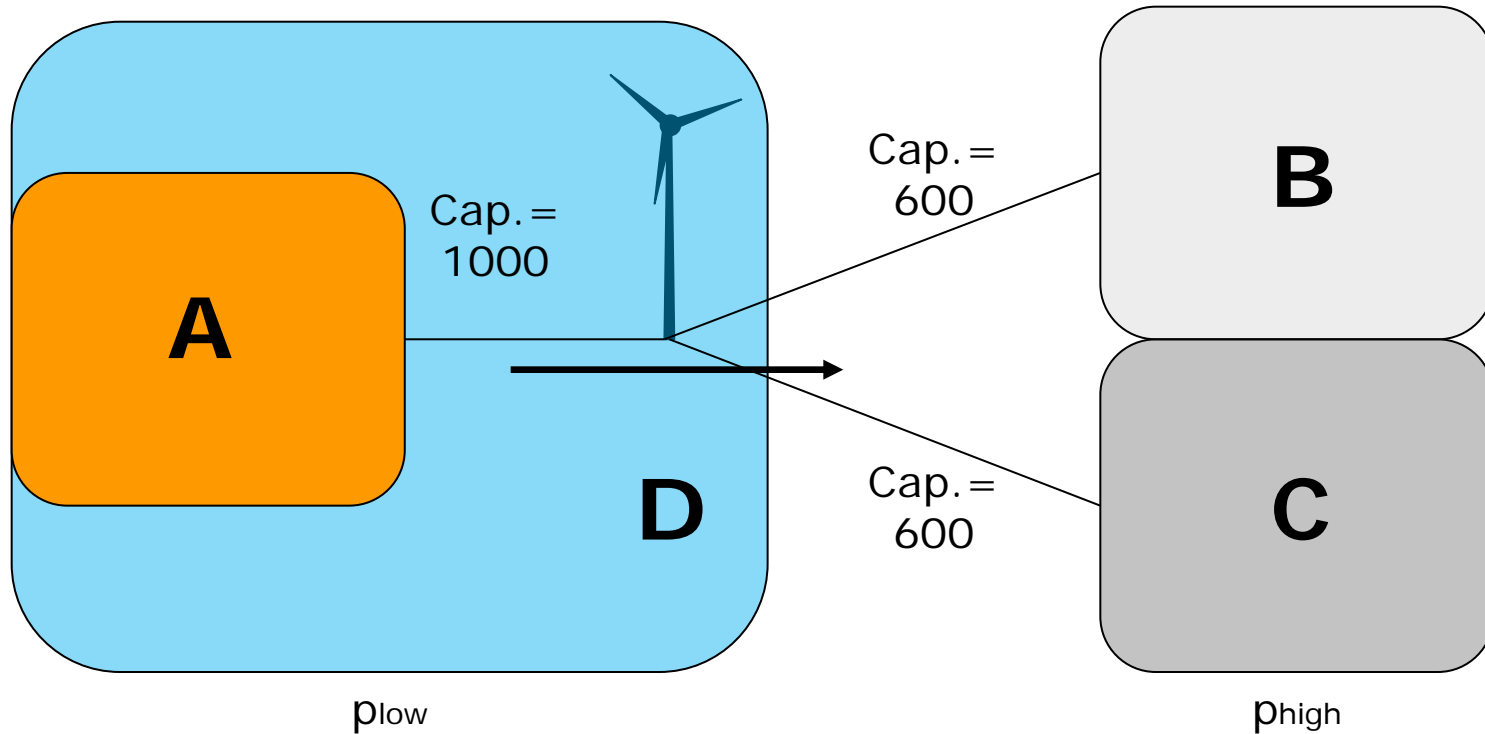
- The OWF may sell less on the spot market than expected to ensure access to B and C's high-price upregulation markets
- TSO congestion rent income is increased

Results: Case II, feed-in tariff



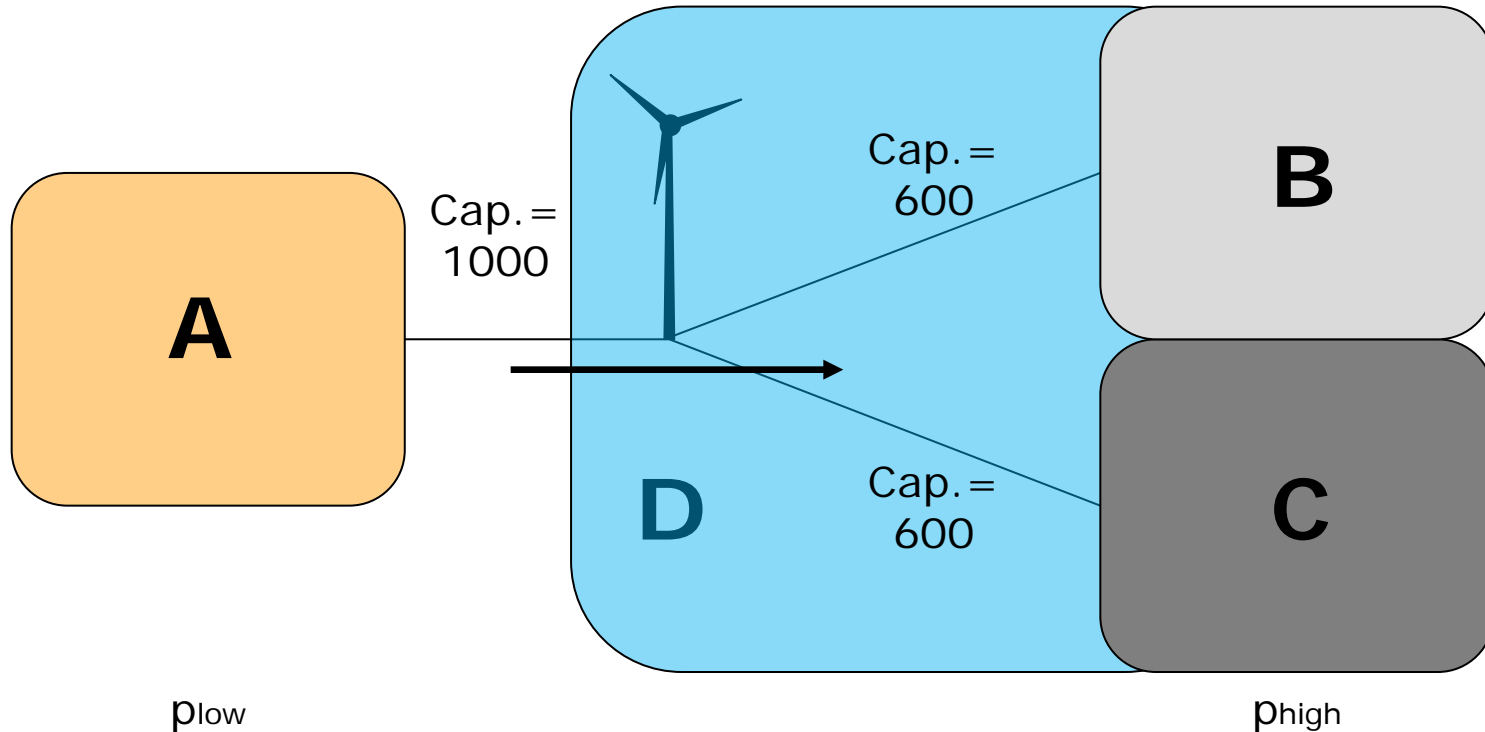
- A profit-maximising TSO bids less wind than expected in order to incur congestion rents
- Reason: Idle intraday/regulating capacity does not yield any income

Case III, price premium



- If interconnector capacities are identical, the OWF will never receive the highest price

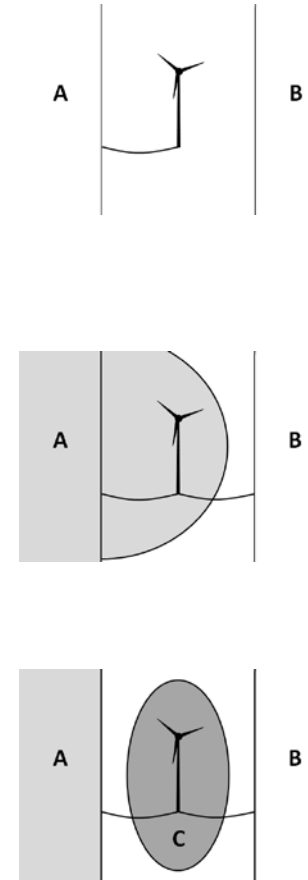
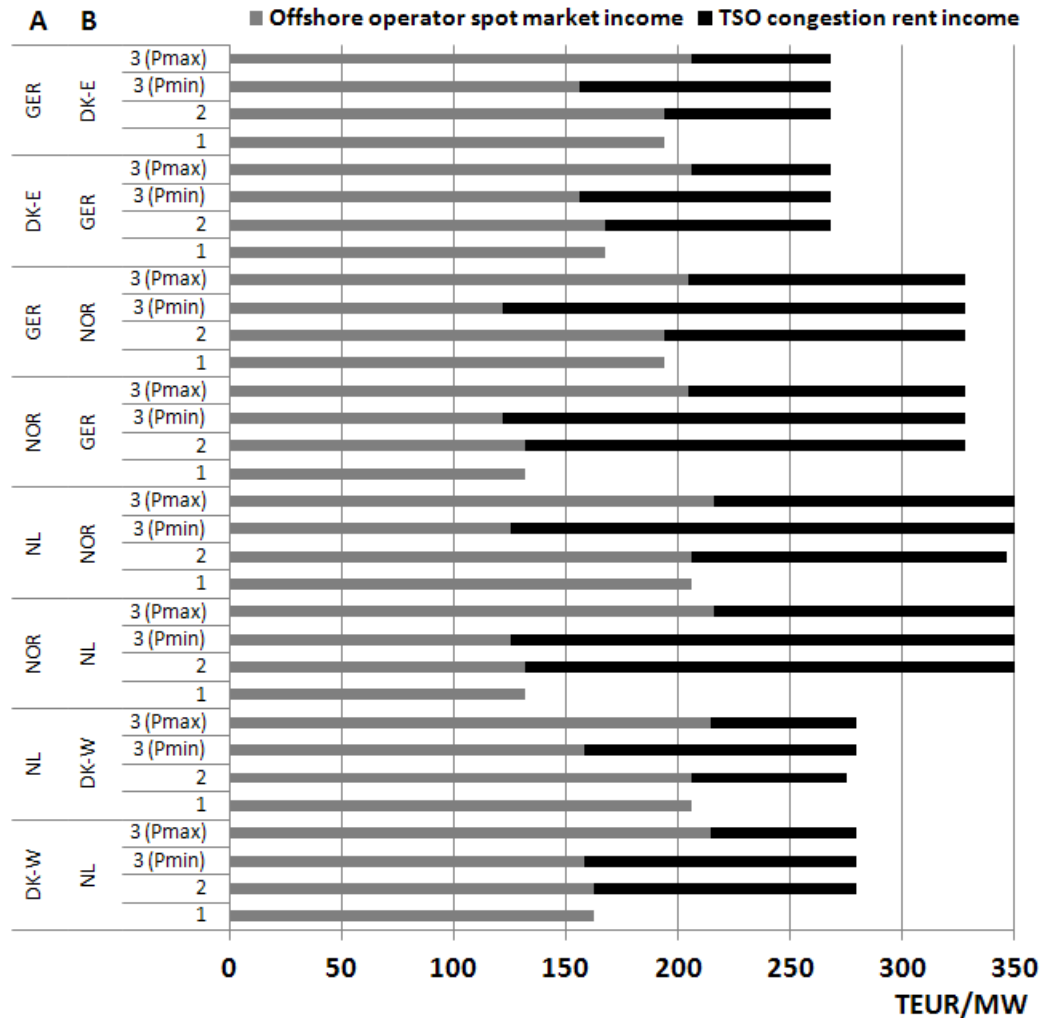
Case III, price premium



- If interconnector capacities are identical, the OWF will never receive the highest price
- If capacities are different, there is an incentive to bid too little in order to move the bottleneck (bid < 200 in the example above)
- TSO congestion rents are reduced

Quantitative estimation

- Hourly Horns Rev data, 2007-2008



Conclusions and policy recommendations

- Do we need special rules for offshore grids?
 - Yes, to make sure that an OffshoreGrid does not harm offshore wind energy investment!
- Do we want to induce truth-telling in all cases?
- Integrated capacity/imbalance management shows beneficial (feed-in tariffs)
- If the TSO is responsible of handling wind fluctuations under feed-in tariffs, curtailment compensation for not accepted generation should be paid
- Issue that explains many differences: only spot markets yield congestion rents
- In the short and medium run, offshore wind farm investors should be provided with a stable investment environment
- Long-run: nodal pricing or national affiliation?

Thank you for your attention!

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