COUPLING POWER MARKET MODELS TO EXPLOIT MUTUAL MODEL PERFORMANCE -EMPS MEETS THE INCREASINGLY INTERMITTENT CONTINENTAL POWER MARKET USING A SCENARIO APPROACH

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Sept. 2018



Operative Power Market Analysis in Statkraft





A bird's eye view for revealing the details





The starting point some years ago



- The Power Market Models which was used had overlapping areas that was remodelled, but different strengths and weaknesses was utilized.
- Power Market Model granularity not identical, and calendars were not equal.
- While one model had tariffs on subsea cables another model had none just a pragmatic approach of €0.01/MWh.
- Scenario coupling an issue and a very time consuming process.
- Weather dependent transmission capacities is (still) an issue on the Continent hence consistent weather approach across models is important.
- Flow Based Market Coupling (FBMC) partly implemented on the Continent (CWE)



A model between the models?

- The power markets are increasingly connected, now also with offshore grid(s) utilizing wind power production.
- The power markets are not uniform hence they can utilize independent strengths.
- Intermittent production is increasing all over Europe.



CGS-projektet

400 kV station









Model characteristics – amplifying the complexity

- When time steps are different, how to handle ramping issues on interconnectors? Different granularity a challenge.
- While modelling the Nordic market with EMPS this is an energy market approach, while the Continental markets are power markets where energy is rarely an issue (rather the other way around!).
- Continental Europe consist of several markets, large market areas, and different market characteristics with different amount of renewable market penetration. Hence a change «somewhere» might pop up somewhere unexpected.
- In general model(s) are too optimal (even before being coupled).



Some words about the future power market

This Is What Solar Is Doing to Power Markets

U.K. daily power demand



Chart shows demand in each half-hour, averaged over the 10 sunniest days. Projections for 2019, 2021 and 2023 using National Grid's Future Energy Scenarios. Source: Drax Electric Insights

Bloomberg



Special case, May 1st 2017 ... or was it?





Criteria for convergence – not a unique solution(?)

- The object function when coupling the power market models affects criteria for defining convergence criteria.
- In what "language" should the power market models communicate?

- Price?

- Remember the example with price profile on May 1st.
- Exchange?
- Other?
- Coupling one scenario for a specific time t is easy, but we need convergence over the entire sample space spanned by time, solar, wind, hydro, temperature, etc.
- Model iteration how many iterations are needed? Is this a static measure?



Conclusion(s)



- Power market modelling mutually improves when models are being coupled to a greater geographical area that influence the power market being modelled.
- The object function chosen will affect how model coupling are approached and criteria for convergence of sample space.
- Power markets are changing rapidly hence new challenges are likely to appear (soon?).
- Scenario approach is needed, and new technologies are expanding the sample space in focus.
- Consistent weather input is a necessity for improved mutual model performance when being coupled.







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