



CWE Flow Factor Competition Study

CWE Consultative Group

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Agenda

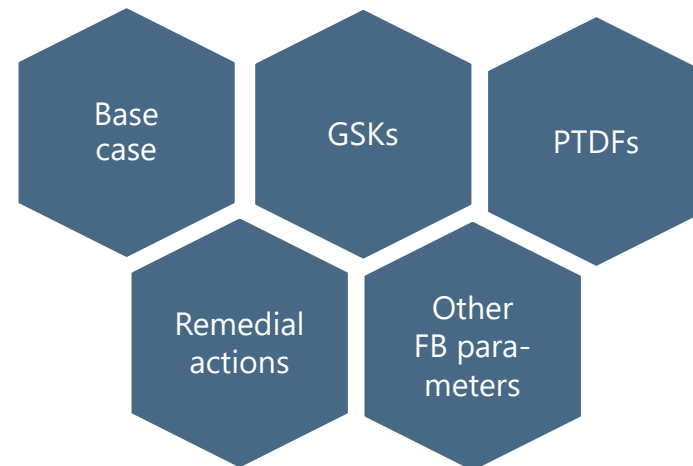
- 1 Overview and objective of CWE FFC study**
- 2 Task 1: Analysis and monitoring of flow factor competition in CWE**
- 3 Task 2: Modelling of alternative design polices and fairness assessment**
- 4 CWE Flow-based market coupling - Monitoring web tool**
- 5 Next steps**

Study context: Flow-factor competition and its fairness in CWE

- Flow-based market coupling (FBMC) in CWE region since 05/15
- **Flow factor competition**
 - Bids are selected by a welfare optimizing algorithm (EUPHEMIA)
 - FB constraints limit the selection of bids
 - FB methodology is based on modeling assumptions and design choices → monitoring
- **Scope of Task 1:**
Analysis of the status quo of CWE FFC, in particular quantitative analysis based on historical TSO and PX data
- **Fairness of flow factor competition**
 - “Flow factor competition is fair if it is based on the true impact of commercial exchanges on the network.”
 - **Scope of Task 2:**
Evaluation of the fairness of competition comparing the status quo with alternative design policies for FBMC



Map based on: ©Lutum+Tappert



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Task 1: Analysis of status quo of CWE FFC

(1) Qualitative analysis of FBMC processes

- What are drivers and design choices?
 - Impact on RAM, PTFDs and scope of managed congestion
- What are alternative design options?

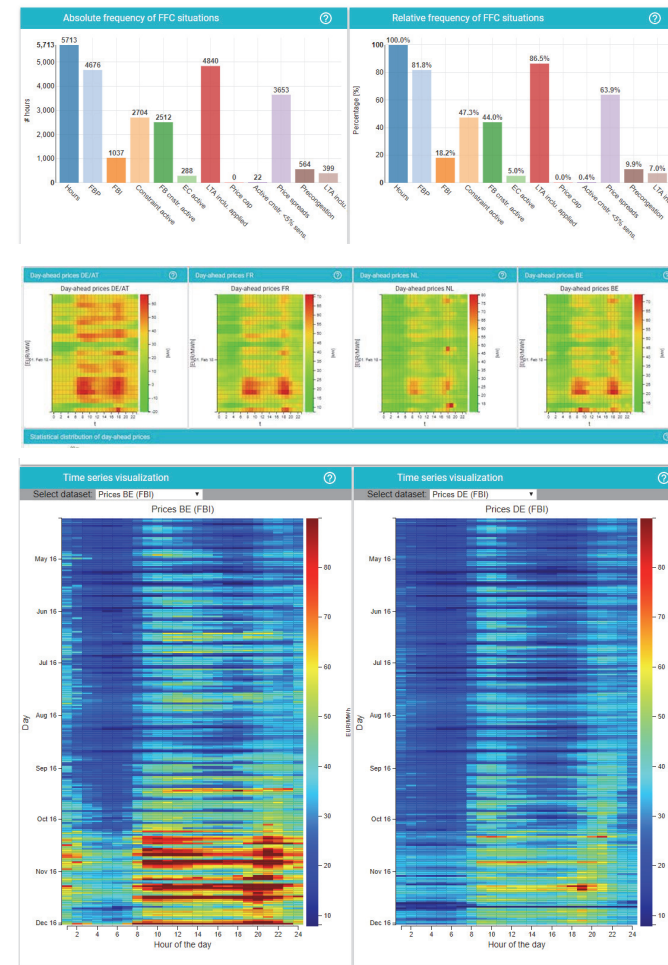
(2) Definition of indicators for monitoring FFC

- Indicators for frequency, severity and systematics of FFC

(3) Extensive evaluation of TSO and PX data

- Monitor decisive FB parameters such as active constraints, FRMs, external constraints by TSO/zone
- Monitor impact of LTA inclusion, FBI patch and pre-congestion
- Monitor modelling accuracy of the base case and GSKs

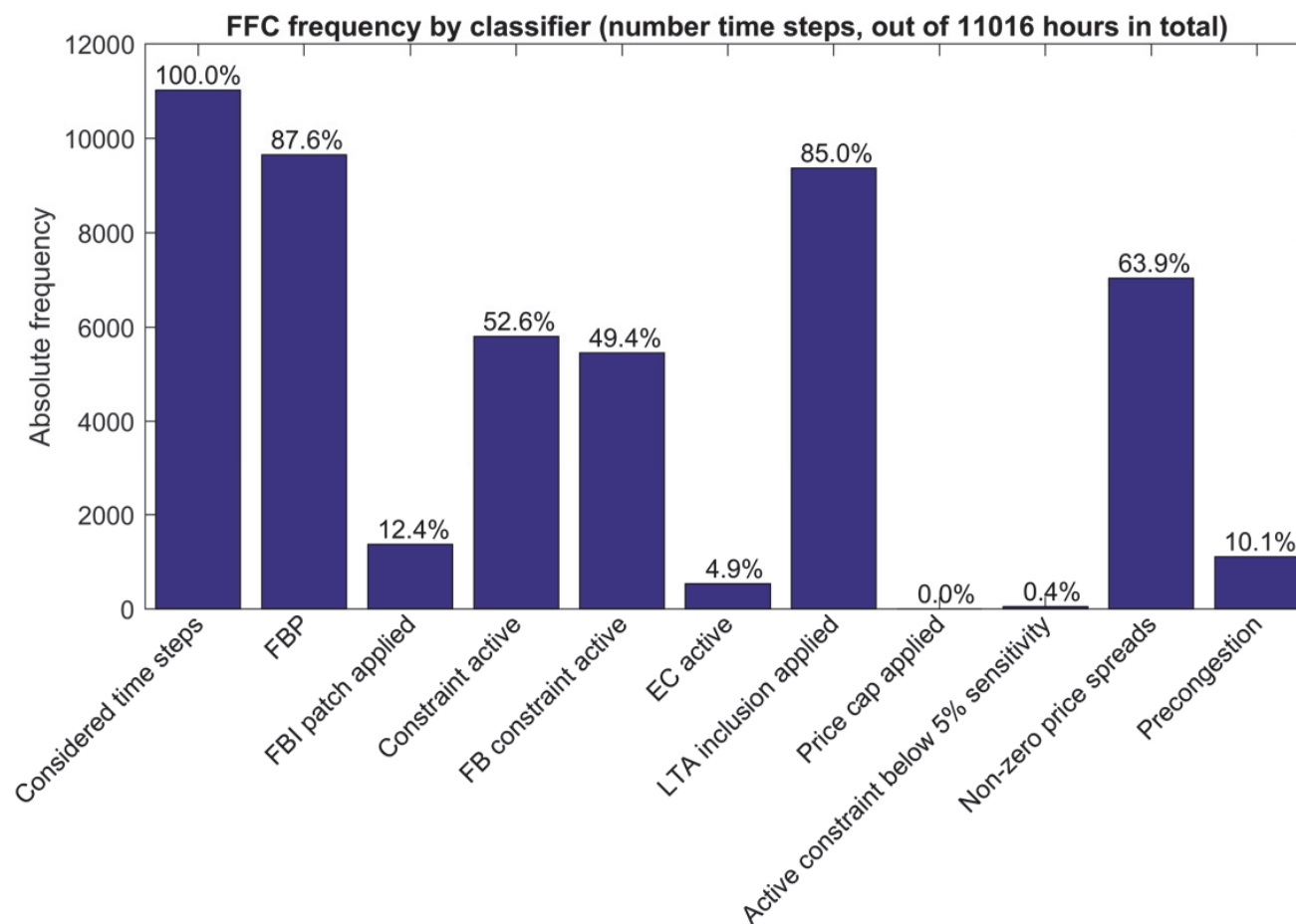
Sketch of selected monitoring results



Task 1: Analysis of status quo of CWE FFC

Monitoring period:
May 31st, 2015 to August 31st, 2016

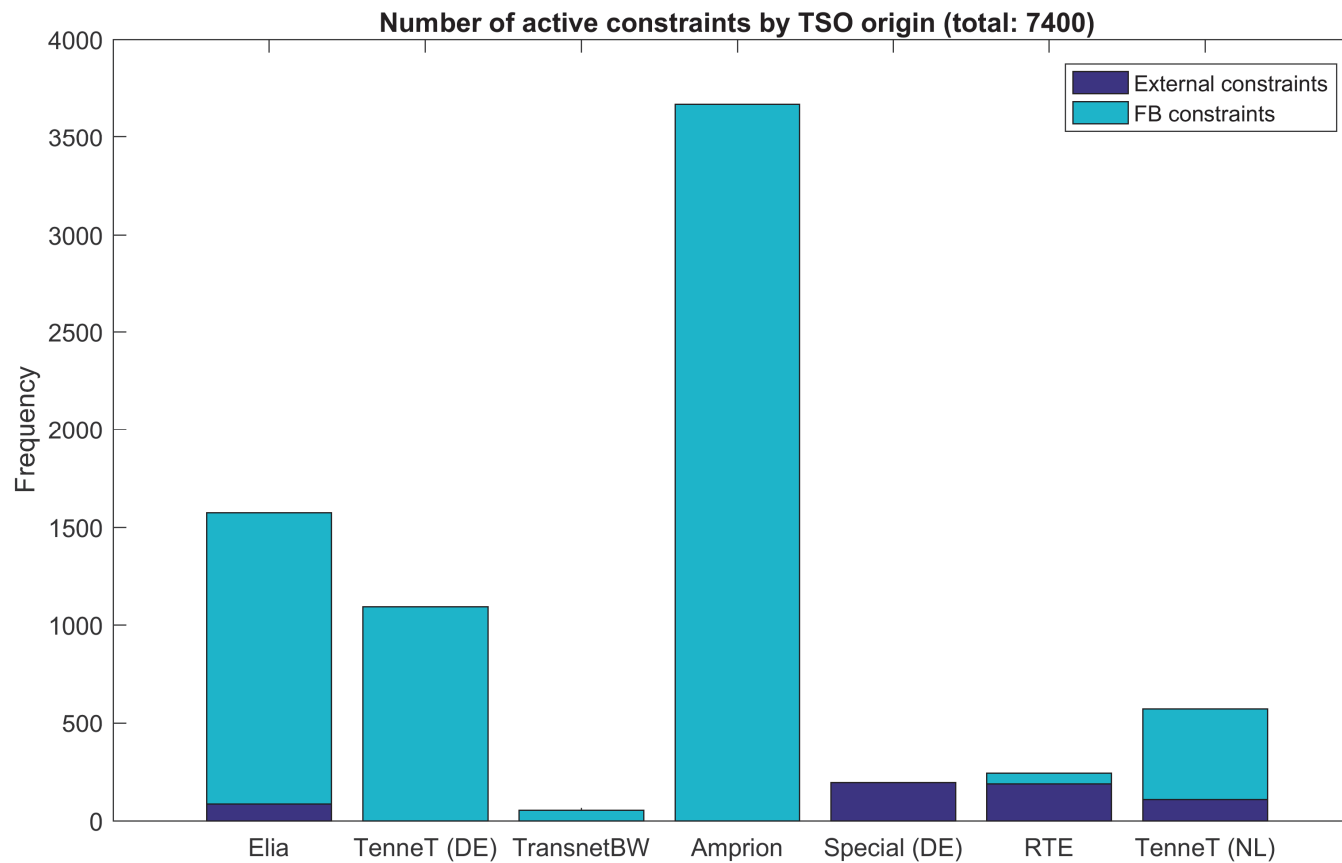
- ✓ How often are different types of constraints decisive for constraining the market?



Task 1: Analysis of status quo of CWE FFC

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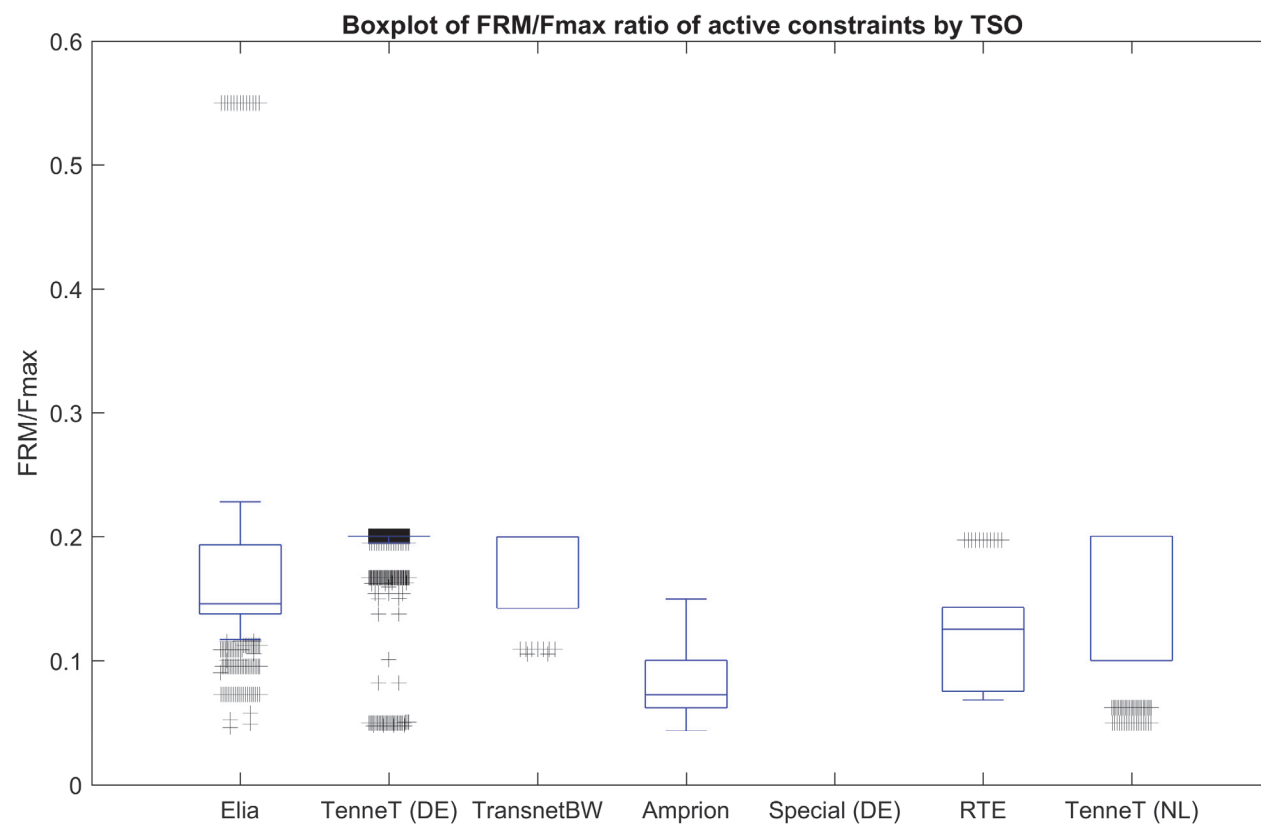
✓ Which constraints are most frequently constraining the market outcome?



Task 1: Analysis of status quo of CWE FFC

Monitoring period:
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- ✓ Are there significant differences between bidding zones / TSOs in modelling FB parameters? Example: Flow-Reliability Margin (FRM)



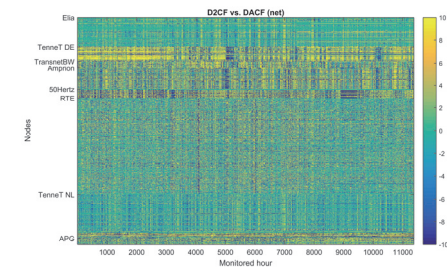
Task 1: Analysis of status quo of CWE FFC



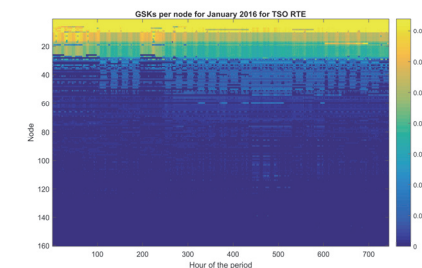
Further findings:

- **Base case accuracy**
 - Significant deviations between D2CF forecasts (base case) and DACF
 - Some forecasting deviations structural for longer periods
- **GSK modelling**
 - Significant deviations between observed generation shift and modelled GSKs
 - GSK application varies significantly among TSOs
- **FBI patch**
 - Partially extreme effect on prices (up to > 300 EUR/MWh)
 - Partially extreme effect on net positions (up to 2.900 MW)

Base case monitoring



GSK monitoring



FBI monitoring



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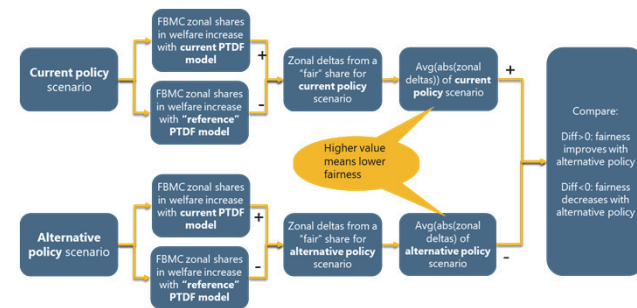
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Task 2: Analysis of alternative design policies and fairness

(1) Definition of a fairness indicator

- Fairness indicator
 - evaluates impact of a design policy on **zonal welfare shares** in relation to a **benchmark**
- Two benchmarks defined:
 - a) Nodal optimal power flow (OPF)
 - b) "Reference PTDF" scenario

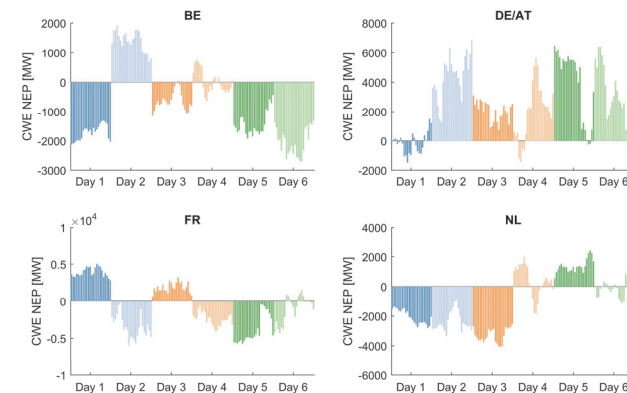
Quantitative fairness assessment methodology



(2) Modelling and simulation of alternative design policies

- Modelling of 6 alternative policies
- Market simulations for each policy for 144 hours (6 selected days)
 - with the original FBMC model
 - with the two benchmark models
- Evaluation of impact of individual policies on welfare, location of congestion, net positions,...
- Evaluation of the fairness indicator

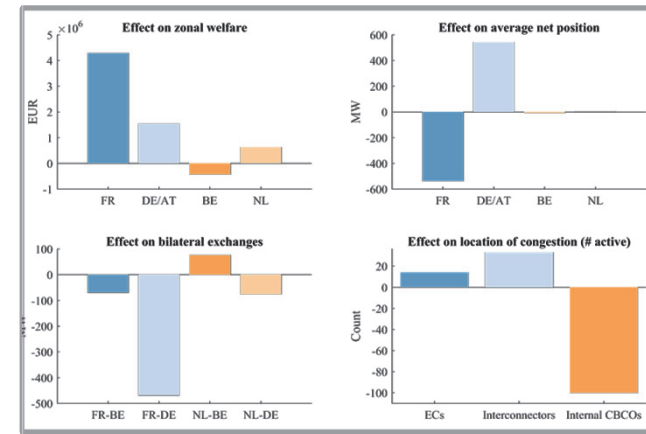
Net position impact of exemplary alternative design policy



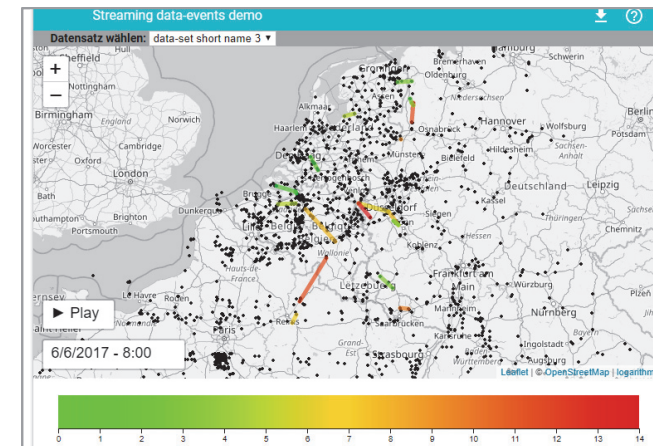
Task 2: Findings – Results for individual design policies (selected days only)

- **Scenario „Seasonal Fmax“:**
 - Increase of market welfare
 - Higher exports from DE/AT to FR, shift of congestion to interconnectors
- **Scenario „Alternative CBCO selection“**
 - Increase of market welfare (note: increased redispatch costs required)
 - Higher exports from DE/AT to FR, more interconnectors become restricting for the market
- **Scenario „Improved base case“:**
 - Decrease of market welfare
 - Shift of congestion to interconnectors
- **Scenario „No LTA inclusion“**
 - Decrease of market welfare, frequent infeasibility
 - Reduced exchanges, increase of all types of constraints being restricting for the market
- **Scenario „With/without FBI patch“**
 - Very limited welfare effect of FBI patch
 - Small impact on net positions, FBI patch reduces exports from DE/AT
- **Scenario „Alternative GSK“**
 - Decrease of market welfare
 - More internal branches become restricting for the market

Key indicators for impact of exemplary policy



Effect on location of congestion of exemplary policy



Task 2: Findings – Results of fairness assessment

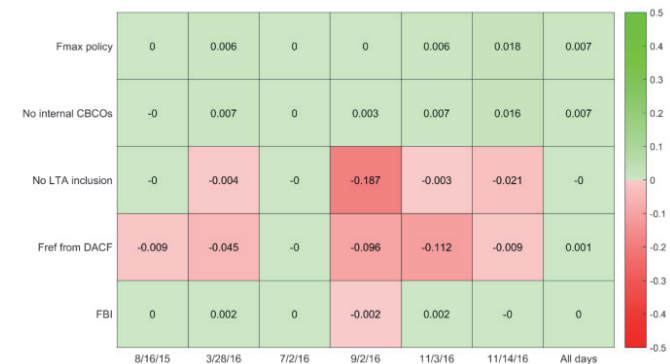
▪ Qualitative assessment

- Potential drivers of unfairness: policies that cause a not physically related adaptation of the FB domain
 - LTA inclusion
 - FBI patch

▪ Quantitative assessment based on simulations

- Tentatively, policies enlarging the FB domain led to an increase of fairness indicators
- Frequently fairness impact was not structural (sometimes advantages / sometimes disadvantages for zones)
- Consistent increase of fairness indicator in case of policies „seasonal Fmax“ and „alternative CBCO selection“

Exemplary fairness impact of alternative design policies for different days



▪ Nodal OPF insights

- Nodal OPF optimizes selection of individual bids considering their bid price and their topological location
- Nodal OPF led to higher exchanges and net positions than current FBMC given the same CBCO constraints
- Nodal OPF manages different scope of congestion

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Web-based CWE Monitoring Tool

- **Development of a web-based CWE Monitoring Tool**
 - Makes extensive data analyses of study available to users
 - Enables ongoing monitoring of CWE FBMC
- **Features for CWE Monitoring Tool**
 - Visualizations and analyses of
 - Prices, net positions and energy mix
 - CBCO information in a network map
 - CWE FBMC indicators
 - RAMs, active constraints, LTA inclusion
- **New live version based on public data**
 - Automatic integration of latest data from JAO and ENTSO-E
 - Can as well be provided to stakeholders

Screenshot of CWE Monitoring Tool



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Next steps

- **Publication of project results**
 - Executive summary and full report will be available on NRAs websites or JAO
- **Dialogue with CWE stakeholders and further studies**
 - NRAs are in discussion with TSOs and market participants for ongoing improvement of CWE FBMC
 - NRAs will set focus for future studies
- **Access to CWE monitoring web-tool**
 - Interested stakeholders can request access to the latest CWE FBMC monitoring tool
 - Contact: cwe@logarithmo.de
 - Possibly a free public version will be released

