

Context

In the CWE Consultative Group of 30/03/2016 it was agreed that TSOs would perform a Standard Procedure for Assessing the Impact of Changes (SPAIC) for a commonly agreed list of relevant changes, including the commissioning of new assets. This SPAIC presents an impact assessment of the integration of a new 700MW HVDC connector by Energinet.dk and TenneT TSO B.V. between the Netherlands and Denmark, known under the name COBRACable.

The commercial go-live data is currently planned for 7th September 2019. More information about the exact go-live data will be published with a market message on the following webpage:

https://www.tennet.org/english/operational_management/Operationalreports.aspx.

The two circuits are connected from substation Eemshaven (EEM380) in the TenneT TSO B.V. grid to substation Endrup in Energinet.dk grid. More general information on this project can be found at: <http://www.cobracable.eu/>

Methodology

A SPAIC analysis consists of a comparison of flow-based domains for 12 typical "reference" days commonly defined by CWE TSOs using a clustering algorithm, in order to estimate the impact of a change in grid topology or flow-based parameters. These 12 reference days are mapped to a whole year based on the characteristics of these days.

For this SPAIC, the '2017 reference days' for the period 1-1-2017 to 31-12-2017 have been used, and have been mapped to 363 days of the year 2017 (all days of 2017 excluding days with clock changes) due to the unavailability of a more recent set of reference days due to the recent DE/AT bidding zone split. Market Coupling Simulations have taken place for the whole period, to average out impact of specific order books for the "reference days" selected by the CWE TSOs. By averaging the results per cluster, the average impact of the different flow-based domains can be assessed. Based on a price sensitivity analysis we found out that there is an expected dominant flow direction from Denmark to the Netherlands which will be assumed within the SPAIC analysis.

Together with the new connection some changes will be performed in the CWE Flow-Based Capacity Calculation.

- New CBs linked to the outage of the HVDC interconnector will be introduced, respecting the CBCO selection criteria. Please find the whole list of added CBCOs in the file "Dataset 6 - SPAIC COBRA - Additional CBCOs added due to COBRA"

The following results are simulated and published:

1. Flow-Based Domains and CBCOs for three different scenarios for all reference days:
 1. The historical Flow-Based Domains and CBCOs ("Historical benchmark")
 2. Updated Flow Based Domains and CBCOs, taking into account changes which have taken place in the methodology between 2017 and the Doetinchem-Niederrhein SPAIC and the updated LTA inclusion setting of TenneT TSO B.V..

This includes for example the application of the 20% minimum RAM patch which is applied since April 2018. ("the updated historical benchmark"); and

3. The new pre-solved Flow-Based domains and CBCOs, corresponding with the most probable grid topology (when writing this document) applied to all reference days ("dataset including change"). For COBRACable a reference flow is used of 700MW in the direction from Denmark to the Netherlands, this is based on an analysis on the historical price difference of the previous years;
2. The market coupling results for 363 days of 2017 for all above three scenarios of Flow Based Domains and CBCOs.
 - All market coupling results of the SPAIC days are performed with the Market Coupling Algorithm Euphemia 10.3 (the version currently in operation for Market Coupling).

The data of the simulation results are attached in separate datasets. The contents of the datasets are explained below.

Published datasets

The table below summarizes the standard outputs of a SPAIC analysis that were agreed upon, including a reference to the joined datasets indicating where the corresponding information can be found.

#	Expected output	Description	Dataset
1	Description change and features of the typical days	<ul style="list-style-type: none"> A qualitative description of the foreseen change, period and expected high-level impact resulting from this A description of the main quantitative features of the 12 typical days A list of CBCOs which are added to the CWE 	<ul style="list-style-type: none"> Foreseen change: Cover note Description of the typical days: Dataset 5
2a	Capacity calculation indicators Dataset historical benchmark <ul style="list-style-type: none"> 24 PTDF matrixes + RAM for each typical day and for all fixed labels Min/max Net positions volume 	This is the dataset that is used as a reference for the change that is subject of the change	<ul style="list-style-type: none"> PTDF matrixes + RAM: Dataset 1 – Sheet “Historical Benchmark 2A” Min/Max NP: Dataset 2 – Sheet “Historical Benchmark 2A” Volume: Dataset 3
2b	Capacity calculation indicators Dataset updated historical benchmark <ul style="list-style-type: none"> 24 PTDF matrixes + RAM for each typical day and for all fixed labels Min/max Net positions volume 	This is the dataset that is updated, including all methodological changes that are known at the time of the study	<ul style="list-style-type: none"> PTDF matrixes + RAM: Dataset 1 – Sheet “Updated Historical Benchmark 2B” Min/Max NP: Dataset 2 – Sheet “Updated Historical Benchmark 2B” FB Domain Volume: Dataset 3
2c	Capacity calculation indicators Dataset including change <ul style="list-style-type: none"> 24 PTDF matrixes + RAM for each typical day and for all fixed labels Min/max Net positions volume 	This is the dataset that includes the change that is subject of the impact assessment	<ul style="list-style-type: none"> PTDF matrixes + RAM: Dataset 1 – Sheet “SPAIC 2C” Min/Max NP: Dataset 2 – Sheet “SPAIC 2C” FB Domain Volume: Dataset 3

#	Expected output	Description	Dataset
3a	Market simulation indicators for the dataset historical data	<p>After the capacity calculation is performed, also Market Coupling simulations have been performed to get insight in impact on the following market indicators</p> <ul style="list-style-type: none"> • Market prices • Market Spreads and Price Convergence • Market clearing volumes (Max executed Supply and Demand) • Net positions (MRC Net Position and balanced CWE Net Postion) • Social Welfare <ul style="list-style-type: none"> ○ Consumer Surplus, Producer Surplus per BZ and for CWE in total ○ Congestion Income for CWE ○ Total Social Welfare for whole CWE and whole MRC region • PRBs indicators (number of PRBs, magnitude of delta P) • Number of Euphemia solutions found 	<p>All information can be found in Dataset 4. Column A indicates whether the data refers to scenario #3a, 3b or 3c</p> <ul style="list-style-type: none"> • MRC Net Position, CWE Net Position and Market price: Sheet "MRC NP, CWE NP, P" • Price spreads and Price Convergence: Sheet "MarketSpread, convergence" • Market clearing volumes (max executed Supply and Demand): Sheet "Market Volumes" • Total CWE Social Welfare, MRC Social Welfare, PRB indicators (number of PRBs, magnitude of delta P), Euphemia Solutions found: Sheet "CWE SW, MRC SW, PRBs, Euphemias" • Consumer Surplus, Producer Surplus, CWE Congestion Income: Sheet "Social Welfare"
3b	Market simulation indicators for the dataset for the updated historical benchmark		
3c	Market simulation indicators for the dataset including changes		