Core TSOs survey on the static grid models

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Joint EFET and MPP response – 19 February 2021

The European Federation of Energy Traders (EFET) and the Market Parties Platform (MPP) welcome the opportunity to provide comments to the Core TSOs survey on their static grid models. Article 25 of the Core capacity calculation methodology (CCM) foresees that the Core TSOs will need to publish their static grid models on a bi-annual basis. We welcome this survey in its intention to clarify market participants needs on the basis of CWE TSOs' static grid models, and we look forward to the publication of improved static grid models by all the TSOs of the Core region.

1. How is the CWE static grid model published in CWE being used by Market Parties?

The CWE static grid models published are used to develop CWE market models for market simulations based on the DC power flow approximation. Those market models are used both for prospective as short-term studies, especially when it comes to prices forecasts closer to real-time.

2. Please reflect on those models and provide your feedback by: a) highlighting good examples; b) suggesting improvements; c) providing a clear description of the information used

Based on our use of the data, the following elements are required:
- A detailed and complete list of the transmission elements (lines, transformers and PST) as well as the corresponding substations they are connected to. The list should also contain their parameters (e.g. resistance, reactance, thermal capacity, etc.);
- A detailed description of the substations and their configuration (busbars, etc.);
- A comprehensive handbook explaining the elements of the list mentioned above (in particular the way seasonal ratings are defined) and detailing the underlying models (in particular for transformers);
- A comprehensive and complete grid map, with the names of the substations explicitly mentioned on it, and an indication of the number of circuits between the different substations;
- Naming conventions for grid elements should be aligned on that developed for Core flow-based market coupling.

Among the published datasets, we can highlight the following best practices:
- RTE's handbook details how to interpret the data given in the list of transmission elements. However, to the best of our knowledge, it is the only existing handbook among CWE static grid models;
- Elia's grid map indicates clearly where are the substations, their names and the number of circuits connecting the different substations for each voltage level. We welcome the fact that the grid map features two voltage levels lower than 380/220-kV (i.e. 150kV and 70kV) and seems to be complete for the represented voltage levels, as no substation appears to be left out;
- The CGMES grid model published in the framework of the TYNDP process is quite complete and can be considered as a good practice (although obtaining the actual grid model requires a clear mapping to filter out all new/future projects included in the CGMES format).

On the contrary, we note the following issues:
- Several static grid models published by CWE TSOs have not been updated for more than a year, which hinders the possibility for market participants to rely on an up-to-date, and thus reliable, grid model. To that extent, EFET and MPP welcome the obligation stemming from article 23 of the Core CCM to publish an up-to-date static grid model every six months;
- The completeness and the quality of several static grid models is far from being perfect, as radially connected substations are absent from some models and as there are inconsistencies between the list of transmission elements and grid maps (grid map published by TSOs or publicly available grid maps). This is for example the case for datasets published by Amprion and by TenneT Germany;
- Transmission grid parameters published by local TSOs should always correspond to the data available on ENTSOE transparency portal under https://tyndp.entsoe.eu/maps-data used in the common grid model (at the moment, we often observe differences in thermal rating of transmission lines and physical parameters of PSTs; also units of thermal capacity (Ampere/ MVA) and capacitance C (microfarad) or Charging B (uF) are not consistent with the values provided);
- The map published by 50hertz does not mention the name of the substations, neither the number of circuits between the substations;
- The map published by TenneT Germany does not indicate the number of circuits between the substations;
- The static grid models are not generally published in a standardised manner and in a unified data format that can be used in common data processing like .csv or .xlsx, e.g. APG publishes its static grid model on its web page in PDF format;
- It is unclear how to interpret some parameters given in the list of transmission elements (e.g. what is the difference between "Phase Regulation du (%)" and "Angle Regulation du (%)", as they are two different columns in the file of grid components of Tennet Netherlands?), in particular when there is no handbook detailed the meaning of these parameters.

3. What different or additional information would you like to have published in order to create added value for Market parties in light of transparency for capacity calculation and how? Please provide a clear and detailed description of the addition/different information

The following additional information would be useful to have:
- The load distribution (i.e. an hourly load curve per substation (historic data or average) or, at least, the peak load per substation);
- The generation location, and especially the distribution of the distributed generation per substation;
- The list of power plants (including offshore parks) connected to respective busbars (either 380/220/150 kV) in TSO's control area;
- The list of reactive power control equipment in substations e.g. static compensator, reactor with their (+ Mvar or -Mvar) capacities and connection to respective busbars;
- The range of PST tap available for the flow-based market coupling and available for the grid security. TSO should publish information regarding season-wise usage of PSTs e.g. phase angle, reactance and resistance values. Also, TSOs should clarify on which transmission line PSTs are connected. e.g. Hengelo-Gronau (Amprion-TenneT NL interconnector) has two circuits having identical parameters and only one PST at Gronau substation. Question remains on which line this PST is installed;
- The topology of the substation, especially for the ones with one or several PSTs. For that purpose, we would welcome a single-line diagram showing the detailed configuration of each substation;
- A handbook for every single dataset with a harmonized description of the data;
- The modifications of the grid expected in the years following the publication of the dataset (e.g. new lines, new substations);
- The updated list of power transformers 380/220 kV, 380/110 kV, 220/110 kV etc., including absolute value of resistance, reactance and tap changer settings (steps).
- A detail description on transmission line overloading criteria during load flow; calculations should be given. Additional information on contingency analysis would also be welcome (How do TSOs consider their network elements (or specify which network elements) in contingencies? Do TSOs consider a separate (N-1) criteria for interconnectors in addition to other internal grid elements?):
- The yearly average load factor of each individual substation and total renewable power feed-in (injection) into the substation.

From a publication standpoint, we recommend:
- Grid models that would be ready-to-use to run meaningful DC load flow simulations;
- A single static grid model for the whole region with a time consistency between TSOs, instead of individual grid models for each TSO representing different situations;
- An update of the static grid model(s) as soon as new elements are commissioned and integrated in the grid – in addition to the bi-annual update – in order to always reflect the most up-to-date situation of the grid;

- The publication of 4-10 grid models per year, representing a variety of situations. For example, the situations under consideration within the SPAIC studies could be subject to the publication of grid models.

When visuals are provided, we also attach below an example (Swiss/Austrian border) showing the difference in publication differences between:
- a "general public" publication (as published by ENTSOE)
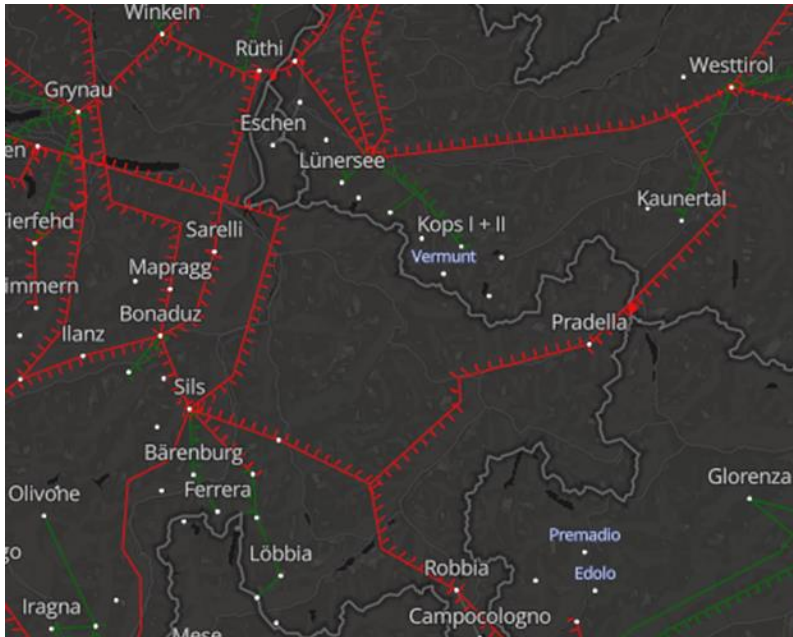
- and a "technical" publication as we want to see them (as published by SEPS)
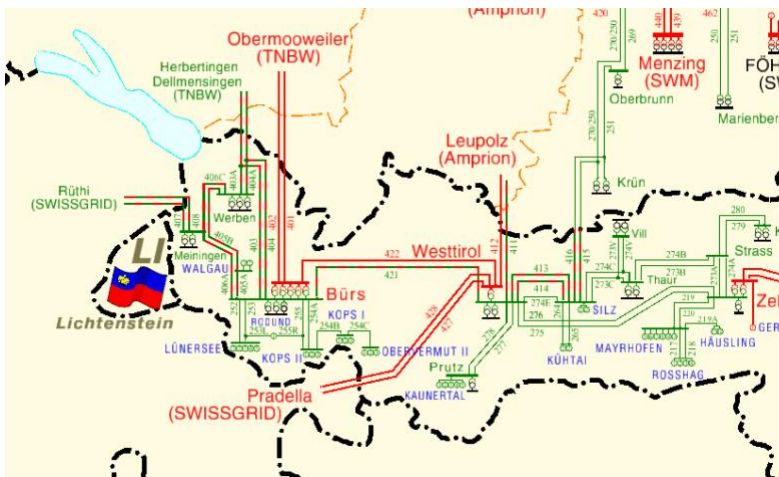
4. What is the preferred format of the static grid model? Please provide a clear description on preferred format(s)

The preferred format for the list of transmission elements should remain as it is currently (.csv or .xlsx). No information should be imbedded in pdf files.