Basic features of ENTSO-E network and market tools

The basic features of the ENTSO-E network and market tools, as currently used for developing the TYNDP, are described in this section.

In the case of electricity the TYNDP projects' assessment is done using two different types of tools: market simulation tools and network simulation tools. The choice of the tools depends on the regional groups and aims to accommodate all the regional particularities. In the TYNDP 2016 for example the regional groups used in most of the case least one tool with one Region using 4 tools in parallel using the same data. This approach helped the experts to assess the consistency of the outcomes but also to better understand the inherent differences between the simulation tools used and therefore sharing the knowledge cross regionally and pan-European. More information on which tools were used for which region can be found for example in the 2015 regional investment plans annex 7.2. ENTSO-E intends to extend the explanation of the simulation tools used and include further references associated to the simulation tools used in the future TYNDPs.

Role of the simulation tools in the TYNDP

ENTSO-E executes market and network studies assessment for each TYNDP project. This allows for the identification of the most relevant parameters with regard to the market and network impact. By executing the market studies, ENTSO-E calculates the socio-economic welfare (SEW), RES, CO_2 and the security of supply indicators (if the expected energy not served is chosen to be calculated by the market studies). By executing network studies, ENTSO-E calculates the transfer capability of the projects, the losses and the security of supply indicators (if the expected energy not served is chosen to be calculated through the network studies). In addition to projects assessments, the simulation tools are used in the initial phase for needs identification, where the market potential and network constraints are verified against the chosen scenario. This information is currently available in the regional investment plans.

Inputs to the simulation tools and representation of the electricity infrastructure

In a nutshell the input to the market tools is represented by the pan-European market data base (PEMDB) while the input for the network studies is represented by the detailed network data. Both data sets cover all the scenarios' study years (e.g. for the TYNDP 2016 the grid status represents the years 2020 and 2030).

The PEMDB data is either collected (bottom-up approach) or derived (top-down approach) for all TYNDP scenarios. These scenarios are developed together with the stakeholders every two years within the TYNDP process. Within the market simulation tools each market node is described by the following elements:

- installed generation capacities per technology and country;
- solar, wind and temperature profiles coming from the pan-European climate database;
- consumption profiles;

ENTSOG AISBL; Av. de Cortenbergh 100, 1000-Brussels; Tel: +32 2 894 5100; Fax: +32 2 894 5101; info@entsog.eu
www.entsog.eu, VAT No. BE0822 653 040

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- border reference capacities; and
- key assumptions for generator efficiencies, fuel prices and CO2 prices.

All market studies, with whatever simulation tool, are done for the whole ENTSO-E perimeter. They are all performed based on a full-year 8760 hour dispatch. For particular infrastructure projects more detailed modeling assumptions were tested, such as climatic conditions, multiple market nodes, re-dispatch optimizations, hydro constraints, etc. This information is clearly mentioned in the regional investment plans (for the infrastructure needs identification) and the individual projects sheets (for the project assessment).

Regarding the network tools, they follow the same approach as the market ones in the sense that they are chosen by the regional group so that they allows a good representation of the national and regional particularities. In each Region, at least two simulation tools were used in parallel. Even though the tools are different, they use a common exchange formats (CIM) which ENTSO-E currently working of further improving.

The TYNDP network data[1] is made available in six parts corresponding to the six regional groups in ENTSO-E's system development committee covering the whole ENTSO-E perimeter. The input data and parameters describe the electrical characteristics of the individual network assets (such as substations, lines, transformers, generators, etc.) facilitating load flow calculation and dynamic simulation.

More information on the market and the network simulation tools can be found in the Data and expertise insight report[2].

[1] E.g. TYNDP 2016 network data: https://www.entsoe.eu/publications/statistics/network-dataset/Pages/default.aspx
[2] http://tyndp.entsoe.eu/insight-reports/data-and-expertise/

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www.entsog.eu, VAT No. BE0822 653 040

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