A New Structure of European Power Grids and Markets

The European Union, EU, is about to take more control of European power grids and electricity markets. The Commission presented its visions in the so-called “Winter-package” in November 2016[1] with further details in a 110 pages proposal for a regulation on the internal market for electricity[2]. This note is an introduction to the proposal.

The new European electricity hierarchy

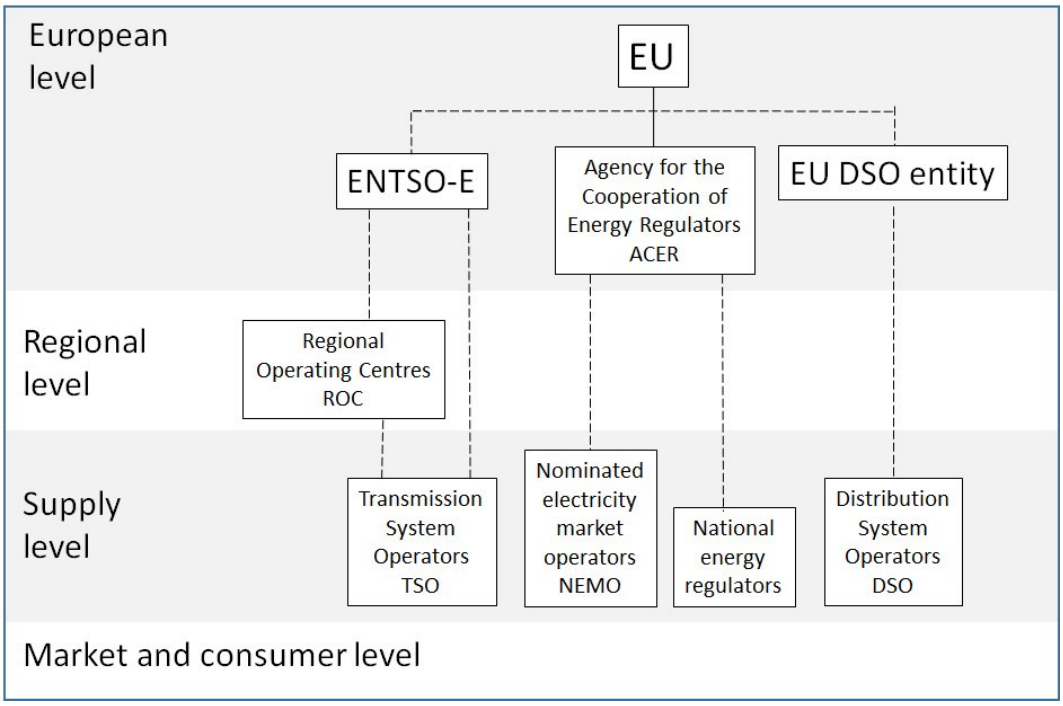

Fig. 1 - The proposal sets detailed rules for existing and new organisations

At the European level, the proposal gives detailed rules for three bodies:

- ENTSO-E, the European Network of Transmission System Operators, was established in 2008 by 42 electricity transmission system operators (TSOs).
- ACER, the Agency for the Cooperation of Energy Regulators, was established in 2011 as an EU agency.
- The EU DSO entity (a European entity of distribution system operators) is a new body, which will be established as a part of the package.

The ROCs are new regional operating centres. Each ROC is supposed to cover several TSOs. For instance, one ROC could cover the Nordic countries.

The NEMOs (nominated electricity market operators) are designated by competent authorities to manage the day-ahead and intraday markets. NEMOs must cooperate closely with the TSOs concerned. Nordpool is a NEMO.

[1] Clean Energy For All Europeans, COM(2016) 860 final
[2] Proposal on the internal market for electricity, COM(2016) 861 final, 2016/0379 (COD)

The proposal does not mention EURELECTRIC, The Union of the Electricity Industry.

Price zones must reflect technical barriers and not political borders

One reason for the proposal is that dealing with variable electricity production is more efficient in large regions. However, the current market arrangements have some barriers, particularly at the national borders. The introductory section has this clear message:

> *National market rules (e.g. price caps) and state interventions currently hinder prices from reflecting when electricity is scarce. Furthermore, price zones do not always reflect actual scarcity if poorly configured and instead follow political borders. The new market design aims to improve price signals to drive investment in areas where it is needed most, reflecting grid constraints and demand centres, rather than national borders. … The fact … that Member States have not been able to agree on appropriate price zones illustrates that there is a need for more coordination between Transmission System Operators (TSOs) and regulators.*

The proposal seems to adopt the Nordic electricity market model. One consequence of this model is that different market prices may occur at the same time within a country. Some countries (e.g. Germany) consider this consequence less acceptable. However, the unavoidable conclusion is:

> *To this end, TSOs could decide within 'Regional Operational Centres' (ROCs) on those issues where fragmented and uncoordinated national actions could negatively affect the market and consumers*

Besides, the powers of ACER and the national regulators on cross-border issues should be strengthened, and the role of ENTSO-E should be redefined.

The Commission will control the electricity market

The proposal has the following eight chapters:

I. Subject, matter, scope and definitions
II. General rules for the electricity market
III. Network access and congestion management
IV. Resource adequacy
V. Transmission system operation
VI. Distribution system operation
VII. Network codes and guidelines
VIII. Final provisions

Chapter II states that electricity trade must be based on supply and demand in a competitive market. The market arrangements must support decarbonisation by enabling the integration of electricity from renewable energy sources and providing incentives for energy efficiency. Day-ahead markets and intraday markets should be organized jointly by TSOs and NEMOs.

Priority dispatch for small CHP units

Load dispatch should be non-discriminatory, but with priority for renewable energy and efficient CHP[3] units with less than 500 kW electrical output. The capacity limit should be reduced to 250 kW for a member state when the share of prioritized capacity exceeds 15% of

[3] CHP: combined heat and power

the total installed capacity. From 2026, the two limits will be 250 kW and 125 kW. Based on Danish experiences, it is hard to justify giving priority to very small units. Types of fuel, efficiency and emission levels are more relevant than size.

The Commission can define the price zones

The first articles of *chapter III* demand a review of the bidding zones. The TSOs must submit proposals to the Commission, who will decide if the bidding zone borders should be changed or not. The proposal has identified inappropriate price zones as a major problem.

The highest possible cross-border transfer capacity within normal security limits must be made available to market participants. The capacity shall be allocated to market participants by either explicit or implicit capacity auctions.

When the demand for exchange between two price zones cannot be satisfied, a price difference between the two zones will occur. One result of the price difference will be a *congestion income* to the grid owners. It is difficult for anybody else than the TSOs to assess the security limits. The arrangement implies incentives for grid owners to maximize the congestion income by adjusting the transfer capacity. Therefore, the proposal limits the use of congestion income to guaranteeing the actual availability of the allocated capacity or to maintaining or increasing interconnection capacities.

Can adjusted EU regulations solve reserve capacity problems?

Chapter IV demands member states to monitor the resource adequacy within their own territory. ENTSO-E shall carry out an annual European adequacy assessment. The assessment must meet specified requirements a) to i). It is interesting that the proposal assumes that regulatory distortions can be the cause of adequacy problems. Member States shall in particular consider removing regulatory distortions in case of adequacy problems. This seems to indicate that EU wants to be part of the solution.

Member states may introduce *capacity mechanisms* after consultations with its electrically connected neighbouring member states, if the European adequacy assessment has identified a resource problem.

Chapter V sets the rules for the operation of the transmission systems.

A new ENTSO-E

A new ENTSO-E shall be established. The TSOs shall submit to the Commission and to ACER the draft statutes, a list of members and draft rules of procedure. The proposal specifies a list of tasks for the new ENTSO-E:

a) to elaborate network codes
b) to adopt a union wide ten-year network development plan
c) to prepare and adopt proposals related to the European resource adequacy assessment
d) to adopt recommendations relating to the coordination of technical cooperation between Union Community and third-country transmission system operators
e) to adopt a framework for the cooperation and coordination between regional operational centres
f) to adopt a framework for the cooperation and coordination between regional operational centres

g) to adopt common network operation tools to ensure coordination of network operation in normal and emergency conditions
h) to adopt an annual work programme
i) to adopt an annual report
j) to carry out and adopt seasonal adequacy outlooks

The proposal has several additional instructions for the new ENTSO-E.

New regional operational centres

The TSOs shall establish regional cooperation within the ENTSO. The geographical area covered by each regional cooperation structure may be defined by the Commission.

A regional operational centre shall be established in each region with the following tasks:

a) coordinated capacity calculation
b) coordinated security analysis
c) creation of common system models
d) consistency assessment of transmission system operators' defense plans and restoration plans
e) coordination and optimization of regional restoration
f) post-operation and post-disturbances analysis and reporting
g) regional sizing of reserve capacity
h) facilitate the regional procurement of balancing capacity
i) regional week ahead to intraday system adequacy forecasts and preparation of risk reducing actions
j) outage planning coordination
k) optimisation of compensation mechanisms between transmission system operators
l) training and certification
m) identification of regional crisis scenarios if this task is delegated by ENTSO for Electricity
n) preparation and carrying out of yearly crisis simulations in cooperation with competent authorities
o) tasks related to the identification of regional crisis scenarios if and to the extent they are delegated to the regional operational centres
p) tasks related to the seasonal adequacy outlooks if and to the extent they are delegated to the regional operational centres
q) calculate the maximum entry capacity available for the participation of foreign capacity in capacity mechanisms

The proposal gives further instructions about working arrangement, consultation procedure, adoption and revision of decisions and recommendations, management, organisation, equipment and staff.

It is not yet clear how the new operational centres will be equipped. Article 42 about equipment and staff says:

> *Regional operational centres shall be equipped with all the human, technical, physical and financial resources necessary for fulfilling their obligations under this Regulation and carrying out their functions.*

A new EU DSO entity

Chapter VI about Distribution System Operation demands independent distribution system operators (DSO) to cooperate at Union level through a European Entity for Distribution system operators ("EU DSO entity").

The main tasks of the EU DSO entity are:

a) coordinated operation and planning of transmission and distribution networks
b) integration of renewable energy resources, distributed generation and other resources embedded in the distribution network such as energy storage
c) development of demand response
d) digitalisation of distribution networks including deployment of smart grids and intelligent metering systems
e) data management, cyber security and data protection
f) participation in the elaboration of network codes

The Commission can set network codes and guidelines

Each country has its own network codes, but *chapter VII* gives the Commission the authority to set joint network codes or guidelines in order to achieve a minimum degree of harmonisation required to achieve the aims of the proposal.

A necessary regulation

The proposal is quite excessive, but it is increasingly obvious that there are unnecessary trade barriers in the present European market arrangements. Wind and solar power has developed rapidly in several countries over the last years, and the European electricity sector has not been able to develop grids, market arrangements and market couplings correspondingly. The EU Commission takes responsibility, where the electricity sector has failed. Therefore, the proposal is justified and necessary.

Fluctuating energy sources require more electricity transport. It is impossible to avoid bottlenecks in the grids, even with reinforced transmission systems. Therefore, the congestion management must be developed to maximize the transfer capabilities within the given physical conditions.

It is worth mentioning that the Nordic countries, and particularly Norway, have been pioneers in developing an efficient, international electricity market.