European Power Grids heavily loaded in 2018
France has overtaken Germany as the largest European exporter of electricity

Fig. 1 shows the net import 2017 and 2018 for 16 selected countries. The distribution of exporting and importing nations of electricity in Europe seems to be rather stable.

Five countries are powerhouses, providing electricity for the remaining 11 countries. Among the powerhouses, France has overtaken Germany as the largest supplier.

There are some interesting changes from 2017 to 2018.

Among the 16 selected countries, the 11 importing countries have imported 26% more in 2018 than in 2017. The result is that the group of 16 countries has changed from a net exporting group into a net importing group.

The net exchange for the 16 countries was 18.5 TWh export in 2017 and 6.3 TWh import in 2018.
The Belgian net import has increased by 11 TWh (fig. 3). This is a direct consequence of poor performance of the Belgian nuclear power plants. Up to six of the seven nuclear reactors in Belgium have been out of service at the same time (fig. 4). The area between the two curves corresponds quite well to the increased import.

The case demonstrates the importance of internationally shared reserves. The precondition for utilizing the reserves is sufficient transport capacity of the national grids and of the border crossing lines.

So far, Belgium has been interconnected with the Netherlands and with France (fig. 1). These interconnections have been loaded up to the capacity limits in the autumn 2018. A 1000 MW HVDV link between Belgium and England (the Nemo Link) is expected to be operational by January 2019.

Bloomberg reports that Belgium plans to phase out nuclear power by 2025. It is not clear how this capacity can be replaced. Belgium’s dense population limits the amount of land available to develop wind and solar farms. Bloomberg adds that some other European countries are struggling to keep older reactors safe.

Italy is still by far the largest importing country. The Italian net import has increased from 36 TWh to 42 TWh.

Import of electricity does not necessarily imply shortage of power. The international electricity markets have the purpose to set prices, which help moving electricity from low price areas to high price areas. The normal pattern of spot prices has lower prices in northern Europe than in southern Europe. Therefore, the main flow is from north to south.

During the autumn of 2018, Belgium needed power from both the Netherlands and France. A local price peak was the necessary driver (fig. 5).

**Inevitable bottlenecks**

Most interconnections have been very profitable. However, there is an upper level for profitable capacity. Therefore, bottlenecks between bidding zones are inevitable. Bottlenecks create different market prices on either side of the border.
Price levelling is only one of the purposes of interconnections. More important is the maintenance of a reasonable security of supply. Both irregularities in traditional power sources (as in Belgium) and increasing shares of fluctuating power (wind and solar) will require stronger local and international grids.

New power lines are expensive and in most countries not welcome. Therefore, it is important to develop the transmission systems with sufficient capacity for a reasonable security of supply. This capacity level will not be able to equalize the market prices. Some observers think that very volatile (oscillating) market prices can be necessary for the integration of the planned wind power and for mobilization of demand side management as a contribution to balancing the power systems.

The system operators are carefully analysing and monitoring grid stability in order to release as much capacity to the market as possible. In October 2018, ENTSO-E published its 150 pages technical report “Bidding Zone Configuration”. The report quantifies actual congestions, it explains methods for congestion management and it quantifies congestion income by country. The report includes the years 2015 to 2017.

The increasing penetration of wind- and solar power impairs the economy of traditional dispatchable power plants. It depends on the national capacity arrangements, when these units must be mothballed or decommissioned. The European security of supply will depend on a delicate balance between dispatchable capacity and grid reinforcements. The next few years will be interesting, as regards European market prices and power system performances.

The Danish capacity of controllable power plants is decreasing faster than expected a few years ago. However, Denmark is fortunate to have strong interconnections and new interconnections being installed. The net import was 15% of the consumption in 2018. According to the Danish transmission system operator, Energinet, the balance between interconnections and controllable power plants is expected to be satisfactory several years ahead.

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