European Power Grids heavily loaded in 2018

France has overtaken Germany as the largest European exporter of electricity

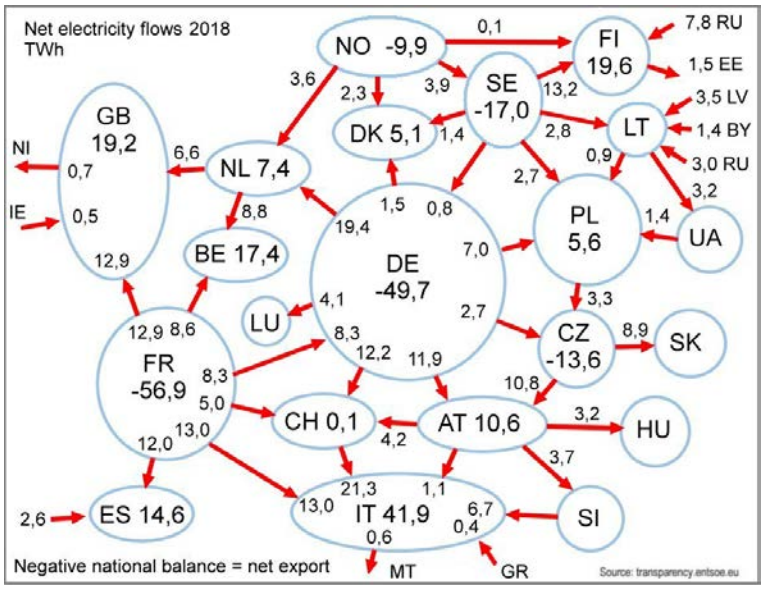

Fig. 1 - Net electricity flows in 2018 (TWh)

Fig. 2 shows the net import in 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.

Net import	2017 GWh	2018 GWh
IT	35616	41926
FI	20114	19581
GB	9556	19.205
BE	6447	17403
ES	14993	14590
AT	7807	10556
LT	8822	9770
NL	3539	7399
PL	1635	5591
DK	4687	5142
CH	6365	105
NO	-14591	-9875
CZ	-13243	-13626
SE	-19173	-16967
DE	-55454	-49736
FR	-35647	-54737

Fig. 2 - Net imports 2018, ranked for 2018

Net import	Change GWh
BE	10956
GB	9649
IT	6310
DE	5718
NO	4716
PL	3956
NL	3860
AT	2749
SE	2206
LT	948
DK	455
CZ	-383
ES	-403
FI	-533
CH	-6260
FR	-19090

Fig. 3 - Changed net import 2017 to 2018

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.

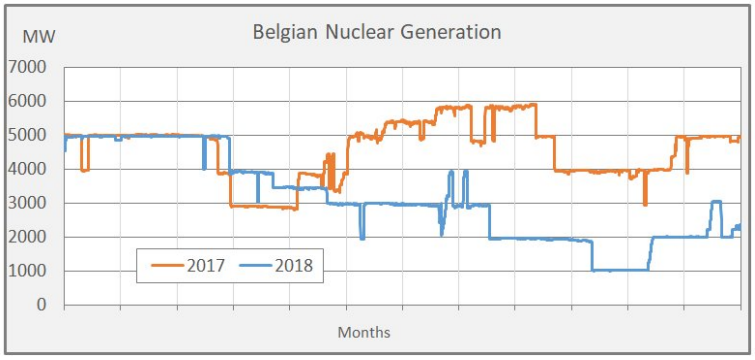

Fig. 4 - Belgian nuclear production dropped from 40 TWh in 2017 to 27 TWh in 2018

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.

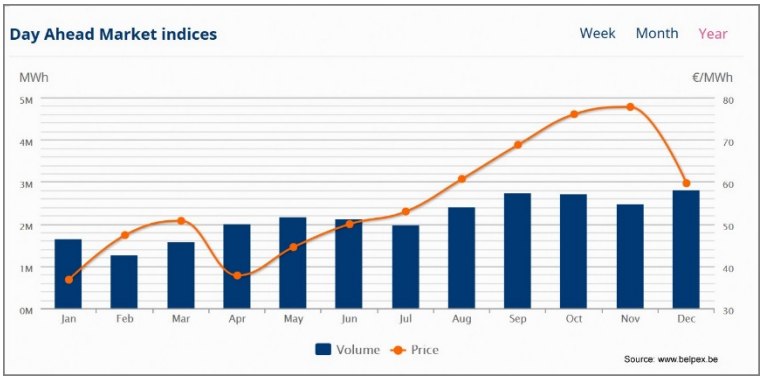

Fig. 5 - Belgian market prices were high in October and November 2018

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”[1]. 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.

[1] http://pfbach.dk/firma_pfb/references/entsoe_bidding_zone_configuration_oct_2018.pdf