

## Spot Prices Indicate Grid Problems

A year ago, I wrote about the spot price development during the first half of 2020. Cable faults, extreme inflow of water in Norway and delayed grid extensions caused regional energy imbalances and large price variations between countries and within countries. National grid authorities promised to take the necessary precautions to prevent similar problems in the future.

### Missing transmission capacity is the real problem

The promises are empty for good reasons. The green transition and close down of nuclear power have changed the production systems and increased the need for long distance transmission of electricity to a level, which seems to have taken the system planners by surprise. Huge transmission projects are under construction in several countries, but the establishment of new wind turbines is much faster than building transmission lines. Therefore, it is doubtful if a reasonable balance will ever be obtained.

### Energy trapped in Norway in 2020

The spot price profile from June 2020 has four price levels, which represent geographical areas with limited possibilities to exchange electricity (fig. 1).

Norway had a surplus of water in the hydro reservoirs, but insufficient capacity to export power. The result was average prices below € 5 per MWh.

The two northernmost Swedish price zones (SE1 and SE2) also had an energy surplus and a price level around € 10 per MWh.

The southern Sweden, Finland and Denmark had a price level around € 25 per MWh in common with Germany and other continental countries. The Baltic States had their own price level between € 35 and € 40 per MWh.

This sort of profile is characteristic for a market with limited movement of goods and unacceptable barriers to trade. Were the conditions in 2020 just an unfortunate coincidence?

### Spot price profiles in first half of 2021

January 2021 had a more uniform price profile with Norwegian prices between € 36 and € 48 per MWh and most other prices around € 50 per MWh (fig. 2). France was in the lead with € 60 per MWh.

From March 2021, an energy surplus pressed the prices in the hydro regions in Sweden and Norway (fig. 3). Most other regions had prices between € 40 and € 50 per MWh.

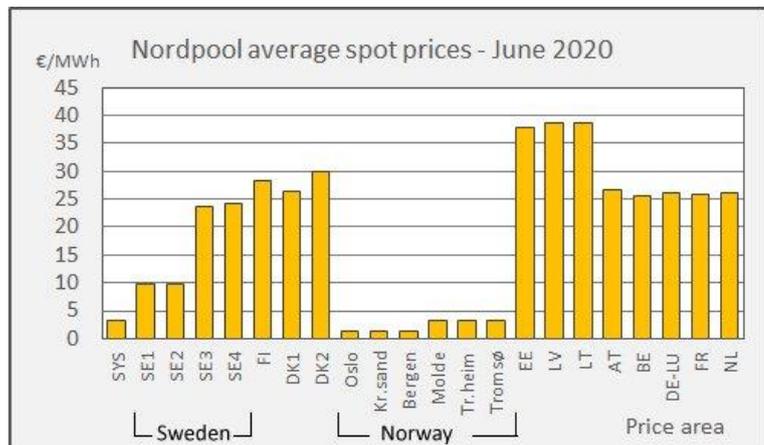


Fig. 1 - SYS: system price. Price zones: SE: Sweden. FI: Finland. DK: Denmark. Oslo to Tromsø: Norway. EE: Estonia. LV: Latvia. LT: Lithuania. AT: Austria. BE: Belgium. DE-LU: Germany/Luxembourg. FR: France. NL: the Netherlands.



Fig. 2 - January 2021



Fig. 3 - March 2021

The five northern regions cannot export sufficient power for equalization of the price differences (fig. 3 and 4).

The transmission lines from SE2 to SE3 were designed to move about 8 GW. 12.7 GW dispatchable hydro power were installed at 8 rivers<sup>1</sup> in SE1 and SE2. The consumption in the same areas is 3 to 5 GW.

In SE1 and SE2 4.9 GW wind power was installed by 2020 with another 4.8 GW under construction<sup>2</sup>. Thus, non-dispatchable wind power is adding another 5 to 10 GW to the need for transmission from north to south.

It is incomprehensible how this wind power expansion could be approved without corresponding reinforcements of the transmission system.

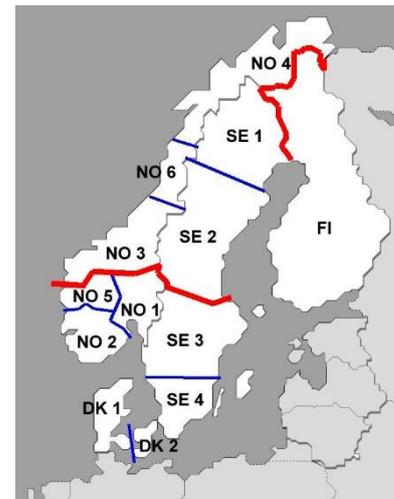


Fig. 4 - Congested borders

### Prices doubled since June 2021

The price differences in June 2021 were less dramatic than in June 2020, but large enough to indicate, that the electricity market does not work properly (fig. 5).

The Swedish bottleneck has moved south to the border between SE3 and SE4. The result was that wholesale prices in SE4 were nearly twice the prices in other Swedish regions and twice the prices a year ago (fig. 1).



Fig. 5 - June 2021

There are important Swedish business activities in SE4. Swedish media have expressed concern about the situation now and in the coming weeks. The reason is that the nuclear power plant, Ringhals at Gothenburg will be completely off the grid due to decommissioning of two units, maintenance of one unit and a two months delayed maintenance of the last unit.

<sup>1</sup> Cecilia Flood: Hydropower in Sweden, KTH, 2014

<sup>2</sup> Svensk Vindenergi: Statistics and forecast Q2 2020

The Swedish transmission system operator, Svenska Kraftnät (SKN), has made an agreement with a local energy company on the availability of a fossil fired power plant in order to maintain system stability and security of supply.

### **A political responsibility**

Critics claim that security of supply has deteriorated and that carbon emissions will increase. SKN answers that they are operating the system in the best possible way within the frameworks given by the Swedish government.

This statement transfers the responsibility to the political level.

Power system operators know that a power system needs reserves for unplanned events. It is important that the decision makers understand this basic condition. The current untenable situation for the Swedish power system could be a result of insufficient communication between the technical and the political level.

The market collapse in 2020 was not just an unfortunate coincidence. In 2021, other unplanned events are disturbing the market functions. Sweden had in the past one of the best planned power systems in the world. Now the grid reserves are insufficient. The problems will continue until a reasonable balance between production and transmission has been planned and implemented.