The Value of Reliable Seasonal Weather Forecasts in the Nordic Electricity Market

by

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Abstract

The Nordic power pool area consist of Norway, Sweden and Finland. Denmark will join the market this year. The total production in Norway, Sweden and Finland was 336,8 TWh in 1998 and 60% of this was hydro power. A total of 56 TWh was traded in the spot market. Much higher volumes was traded in the future market. The volumes traded at the pool in 1998 was 89 TWh, another 352 TWh was brought in for clearing, and not all the contracts in the future market is registered at the pool.

The large portion of hydro power production in this electricity market, gives a strong connection between price and water balance. The prices drops on heavy rainfall, especially during summer when it causes immediate inflow. During winter most of the *precipitation* falls like snow and will not cause inflow before spring. We therefore see a better connection between price and *inflow*. Best correlation is found between the price and *water balance*. The water balance refer to the amounts of water and snow relative to normal amounts at the time. When the balance is negative or low the prices are high, whereas prices are low at a high or positive balance. *Temperature* is also a very important parameter, because it determines the state of precipitation (rain or snow), the melting-intensity and the general consumption.

Precipitation and temperature forecasts from the meteorological institutes is used by the producers in their snow reservoir, inflow and price forecasts. Inflow and price forecast is then used to simulate production up to 3 years ahead (hydro power scheduling), which in turn is used together with the price forecast in the portfolio and risk management. These forecasts are also heavily used by the traders.

The *hydro power scheduling* is done based on the 7-days precipitation and temperature forecast, together with the snow reservoirs in the melting period. Beyond the 7-day periods, up to 3 years ahead, the scheduling is done based on the 1931-90 normal, adjusted for spring flood forecast during springtime. The spring flood forecast, based on the snow reservoirs, is the only seasonal forecast used today.

This hydro power scheduling is necessary in order to manage the water reservoir in an optimal way. Some of the reservoirs can take up to 3 years of normal annual precipitation, but most can take less than one year. The reservoir must have space for the spring flood and water has to be saved for periods with high consumption and higher prices. The 60 years in the 1931-90 period is used in the simulation, but if this normal could be adjusted by a reliable seasonal weather forecast, the optimization in the hydro power scheduling would be improved significantly for the producers. To fit the models, weekly data on precipitation and temperature is needed (monthly data will be divided into weeks). The probability in the forecasts is also of great interest. To fit the scheduling models, the normal period referred to is wanted to be as long as possible, 1931-90 or 1961-90 (in order of priority).

The seasonal weather forecast will also be of great interest by the traders. They use all obtainable weather forecasts. However the trading in the future market will not improve based on the seasonal weather forecasts. It is a zero-sum game where someone will have to loose in order to get winners.