

RESERVATION OF TRANSMISSION CAPACITY FOR THE EXCHANGE OF REGULATING RESOURCES IN NORTHERN EUROPE: IS THERE A BENEFIT?

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INTRODUCTION

The need for sustainable energy production leads to an increasing share of wind power production especially in northern Europe, along the coast of the northern sea. The intermittent wind power production results in a need for regulating resources to keep the electricity system in balance. The Norwegian hydro based power production has good capabilities for offering such regulating resources, utilizing the increasing interconnection capacity between the Nordic and the continental European power system. Contemporaneously the European Union enforces the liberalization and integration of the national European power markets. In order to exchange regulating resources, a reservation of transmission capacity on the interconnections might be beneficial. Some studies, which are done on a simplified level based on a statistical analysis, show a benefit of reserving transmission capacity for the regulating resource exchange [1], [2]. The withdrawal of transmission capacity from the day-ahead market is not taken into account in [1]. This paper describes the calculation of the socio-economic benefit of reserving transmission capacity for the regulating power market on the HVDC links between the Nordic area and continental Europe.

MODELLING

We use a three stage fundamental model, shown in Fig.1, which is presented in [3]. It simulates an integrated northern European regulating power market, which is based on a common day-ahead market.

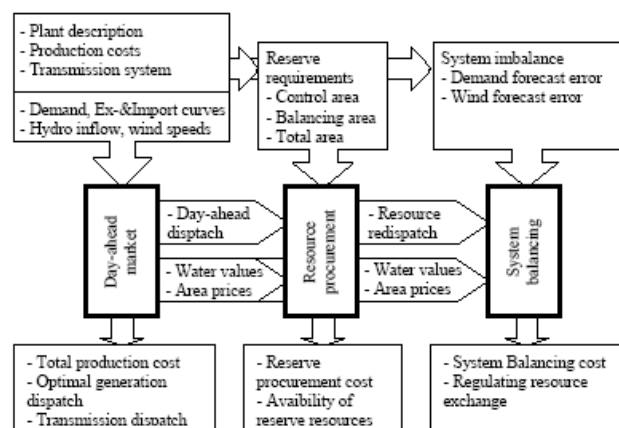


Fig. 1. Model structure [3]

In order to investigate the reservation of transmission capacity, the model is extended by taking into account available transmission capacity when procuring regulating reserves outside a balancing area. The reservation is done by reducing the available capacity in the first stage of the model, the day-ahead market, and making the full transmission capacity available

in the subsequent model stages. To estimate the socio-economic result, the outcome of the regulating power market as well as the outcome of the day-ahead market has to be taken into account. For the analysis three different cases are defined, where no, 5% and 10% of the available transmission capacity is reserved for the exchange of regulating resources. Preliminary results are shown in the following.

RESULTS

In Table 1, the results of these three different cases are presented. The simulations are done for a dry year, according to [3], which means there is a low inflow to the Nordic hydro system resulting in a tight situation of generation capacity.

Table 1. Results of transmission capacity reservation for the exchange of regulating resources

Capacity reservation	Balancing Costs M€	Upward regulation GWh	Downward regulation GWh	Net exchange GWh	Gross exchange GWh	Shutdown GWh
0%	74,6	3284	-3418	-912	1962	0,121
5%	57,6	3060	-3185	-561	2968	0,042
10%	45,0	2931	-3057	-289	3864	0,000

Table 1 shows that increased reservation of capacity leads to a reduction of the activated up- as well as downward regulating reserves, which results from an increased netting of the imbalances in the system. The strongest impact is on the gross exchange of regulating resources, which are nearly doubled when 10% of the transmission capacity is reserved for the exchange of regulating resources. Additionally, by a transmission capacity reservation also the shutdown of generation capacity for downward regulation can be reduced to zero. Looking at the costs in the regulating power market, it can be seen that they are reduced to approximately 60% by reserving 10% of the transmission capacity, which corresponds to 30M€ However, this reduction results in an increase of the costs in the day-ahead market by 116M€ As discussed in [3], the costs of the regulating reserves are only rough estimates so far.

CONCLUSION

In this paper an estimation of the socio-economic outcome of the reservation of transmission capacity for the exchange of regulating reserves in the northern European area is done. It shows that a small reservation of transmission capacity can increase the exchange of regulating resources significantly. This results in a reduction of balancing costs, which however is lower than the increase in costs in the day-ahead market, suggesting that such a reservation is not profitable.

REFERENCES

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