



Nordic Capacity Calculation Methodology Project (Nordic CCM)

Nordic CCM

External Parallel Run Market Report for
Week 52

20.01.2023





Abbreviations

CCM - Capacity Calculation Methodology

CGM – Common Grid Model

ENDK – Energinet

EPR – External Parallel Run

FB – Flow-based

FG – Fingrid

IGM – Individual Grid Model

IVA – Individual Validation Adjustment

JAO – Joint Allocation Office

LHF – Last Hour Flow

MTU – Market Time Unit

MAS – Modelling Authority Set

NP – Net Position

NTC – Net Transfer Capacity

PTC – Power Transfer Corridor

RRC – Nordic Regional Coordination Centre

SA WG – Simulation & Analysis Working Group

SEW – Socio-economic Welfare

SF – Simulation Facility

SN – Statnett

Svk – Svenska kraftnät



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Introduction

This market report presents the comparison of the market results between the current Net Transfer Capacity (NTC) calculation method and the simulated Flow-Based (FB) capacity calculation method of the day-ahead market timeframe. NEMO Simulations has produced the simulated FB market results by using Euphemia test environment.

The analysis presented in the market reports focuses on the socio-economic welfare (SEW) outcome of the Nordic power systems. During the external parallel run (EPR) weekly reports are published along with supplementary data and additional documents.

Chapter 1 gives an overview of the input data and TSO remarks regarding the FB domains.

Chapter 2 elaborates on the overall comparison of NTC vs. simulated FB market results of week 52.

The capacity calculation tool and the data used for the capacity calculation are under development and continuously being improved by the Nordic TSOs. The outcome of the FB calculations is considered valid for comparison with NTC even with some known disclaimers that are being continuously evaluated and improved by the TSOs.

Please refer to the phenomena report found on the RCC website for in-depth descriptions of known issues with input data, modelling, and methodology that could potentially influence the simulation results.

In the Appendix detailed market results of each Nordic country are presented.

The Nordic TSOs welcome comments and questions from the stakeholders. Please send an email to CCM@nordic-rcc.net.



Data quality

The following table provides information about the data quality during the TSO operator domain validation process, such as substituted domains and IVA provision. More details regarding the quality of the FB domains for this report are presented in the Appendix.

Energy Delivery Day:	Mon. 26/12	Tue. 27/12	Wed. 28/12	Thu. 29/12	Fri. 30/12	Sat. 31/12	Sun. 1/1
Substituted IGMs	16	8	5	8	2	0	3
IVA provision	0	0	0	1	0	0	1
Final domain acceptance (1 TSO =25%)	100%	100%	100%	100%	100%	100%	100%

Table 1. Data from Norcap reporting. Note: IGM refer to hourly national power system models, and the IVA refer to manual adjustments of the domain capacities. The final domain acceptance must be 100% for the data to be published.

Data quality remarks

As seen in Table 1, after adjustments the final FB domain was accepted by all TSOs for 7 out of 7 days for week 52.

All of the substitutions happened because of nonconvergence of IGMs which was caused by modified power flow calculation settings by one of the TSOs.

One TSO applied IVA on a cross-border connection on the 29th of December and the 1st of January.

Disclaimer

The TSOs are looking into the high surplus in NO₄ in FB compared to NTC and can see that the modelling in FB is not fully comparable with NTC. The TSOs are working on improving this.

For the 26th and 27th of December the capacities for aFRR were not been included in the FB domain due to a data processing error but were included in the NTC domain. This has resulted in a larger FB domains, thereby skewing the results towards a



more positive FB system outcome. Had this FB solution been the actual day-ahead results, it would have caused TSOs to bring the system back to an acceptable level of security with a loss in SEW.

Reoccurring disclaimers can be found in the phenomena report.



Market outcome NTC vs. simulated FB for week 52

This chapter presents a comparison of the market results for week 52 (December 26-January 1 2022-2023) between NTC and simulated FB with regards to changes in socio-economic welfare along with individual bidding zone price changes.

Aggregated price results

Bidding zone	Price FB [€/MWh]	Price NTC [€/MWh]	Price FB-NTC [€/MWh]	Price diff (FB-NTC)*100/NTC [%]
DK1	35.21	36.23	-1.02	-2.82
DK2	37.06	34.35	2.71	7.89
FI	47.3	48.32	-1.02	-2.11
NO1	99.59	109.01	-9.42	-8.64
NO2	85.83	109.01	-23.18	-21.26
NO3	62.39	43.26	19.13	44.22
NO4	39.98	33.48	6.5	19.41
NO5	97.52	112.33	-14.81	-13.18
SE1	37.63	34.92	2.71	7.76
SE2	35.27	34.92	0.35	1.0
SE3	39.08	36.38	2.7	7.42
SE4	39.22	36.5	2.72	7.45

Table 2. Average price per bidding zone with NTC and flow based, week 52.

Table 2 shows the weekly average prices from the FB simulations and with NTC per bidding zone, and the price difference between FB and NTC. The prices from this week were low compared to prior weeks in December. This was due to the demand being lower because of the holiday period and because of favorable wind conditions that persisted during the entirety of the week. The largest price increase is found in NO3, where the prices increased by 19,13 €/MWh on average in FB compared to NTC. The largest price decrease occurred in NO2, where the prices were lowered by 23.18 €/MWh.

Error! Reference source not found. shows the hourly prices for the three bidding zones that noted the largest price difference between FB and NTC. These three bidding zones are NO2, NO3, and NO5. It is clear that the lower prices in NO2 and NO5 are caused by the increase in net position in area NO3. This can be seen in Figure 2. With FB parameters, the market algorithm identifies the increase in net position in NO3 and the increased southward flow in Norway to increase the SEW welfare. This helps explain why Norway has a high SEW gain during week 52.

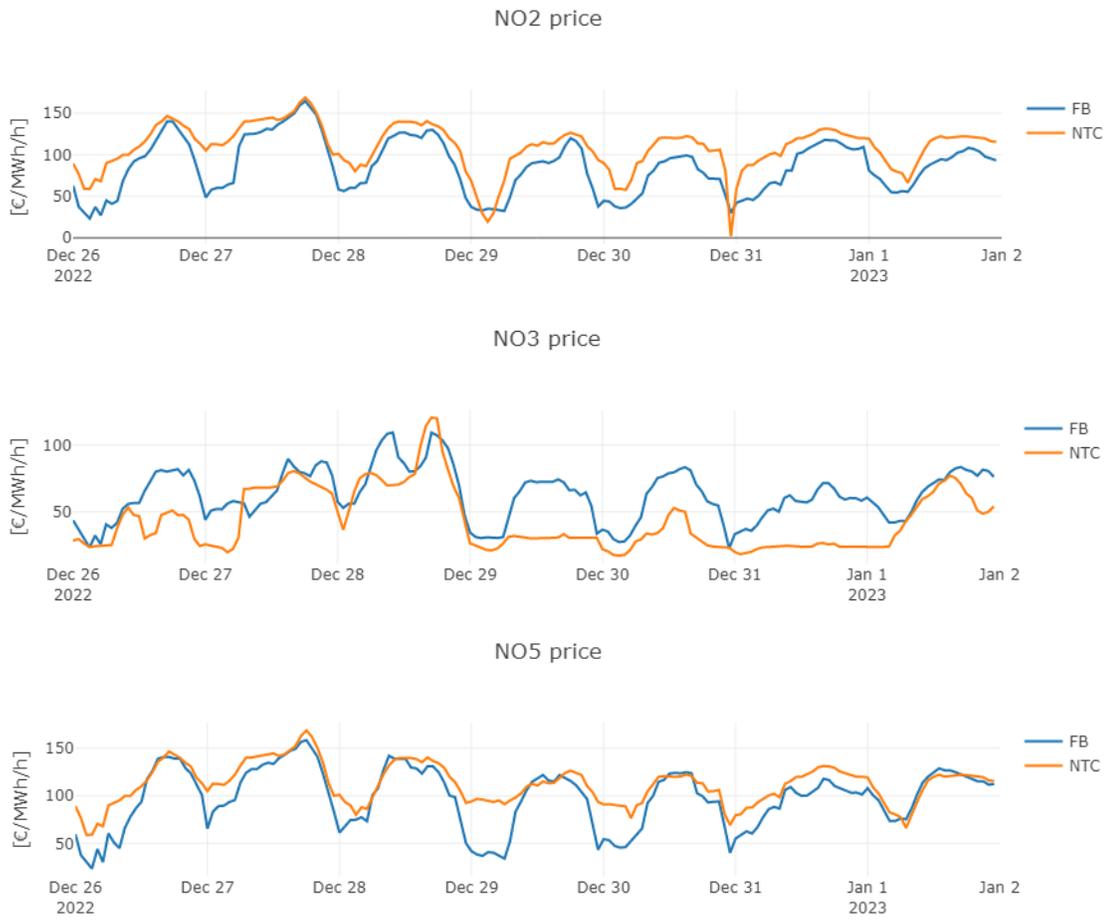


Figure 1. Hourly prices for bidding zones NO1, NO2, and NO5 for week 52 in NTC and FB.

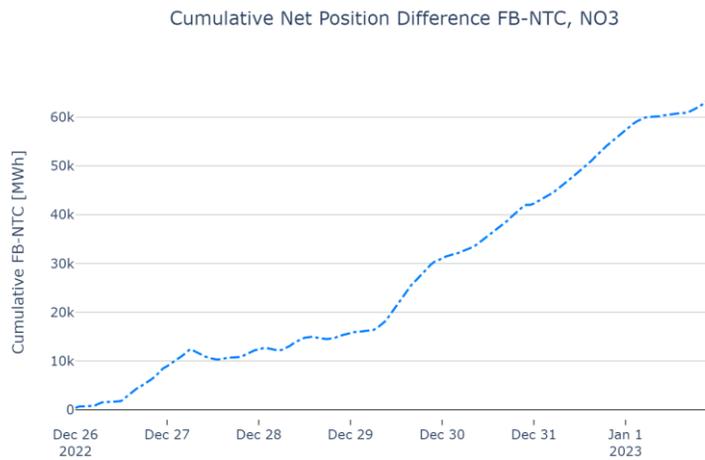


Figure 2. Cumulative increase in net position between FB and NTC.



Socio-economic welfare results

	Denmark	Norway	Sweden	Finland	Sum
Congestion income	-3.62 M€	7.65 M€	-0.28 M€	-0.49 M€	3.26 M€
Consumer surplus	-0.35 M€	17.51 M€	-5.90 M€	1.53 M€	12.79 M€
Producer surplus	0.73 M€	-5.08 M€	4.94 M€	-0.89 M€	-0.29 M€
Sum	-3.24 M€	20.08 M€	-1.24 M€	0.16 M€	15.76 M€

Table 3. SEW gain per country for the Nordic CCR. The values represent the difference in SEW between FB and NTC. Positive numbers indicate higher SEW in FB than NTC.

In Table 1 the Nordic CCRs SEW difference between FB and NTC for week 52 can be seen. The table shows how the change has impacted each stakeholder type per country. The overall SEW change in FB compared to NTC for week 52 is 15,76 M€, which is in large part due to a high gain of consumer surplus in Norway.

If the congestion income on the HANSA and Baltic borders are included in the SEW calculation, the overall SEW changes. The congestion income diminishes with -7,64 M€, where only half of that loss is attributed to the Nordic area. The resulting in a total SEW of 8,78 M€ for week 52 for the SDAC area.

Figure 3 shows the change in consumer surplus, producer surplus and the congestion income for week 52. Figure 4 shows how the consumer surplus, producer surplus and congestion income changes each day of week 52. There is a positive SEW gain each day of the week.

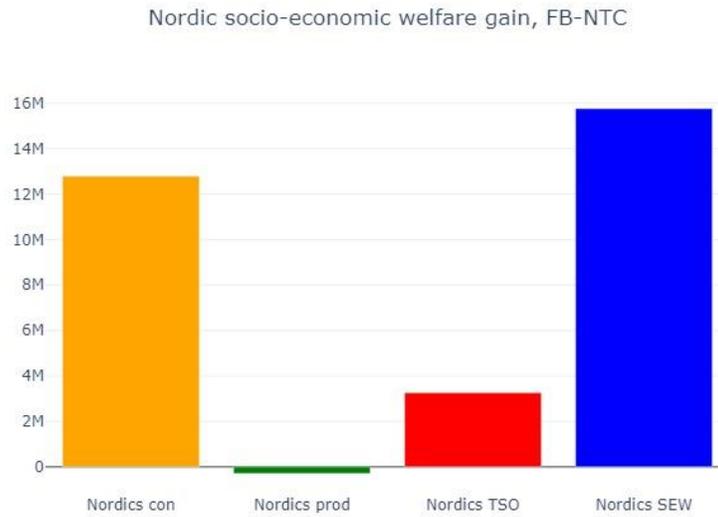


Figure 3. Nordics consumer, producer and congestion income change. Total Nordic socio-economic welfare gain over the simulation period is the sum of the previous three.

Nordic socio-economic welfare per stakeholder and day



Figure 4. Nordics consumer, producer and congestion income change per day.



Figure 5 shows the change in SEW between FB and NTC for each bidding zone in the Nordics. The two Danish bidding zones have a loss in SEW as well as the two southern Swedish bidding zones, SE3 and SE4. The largest gain in SEW is made in the five Norwegian bidding zones as well as in SE2.

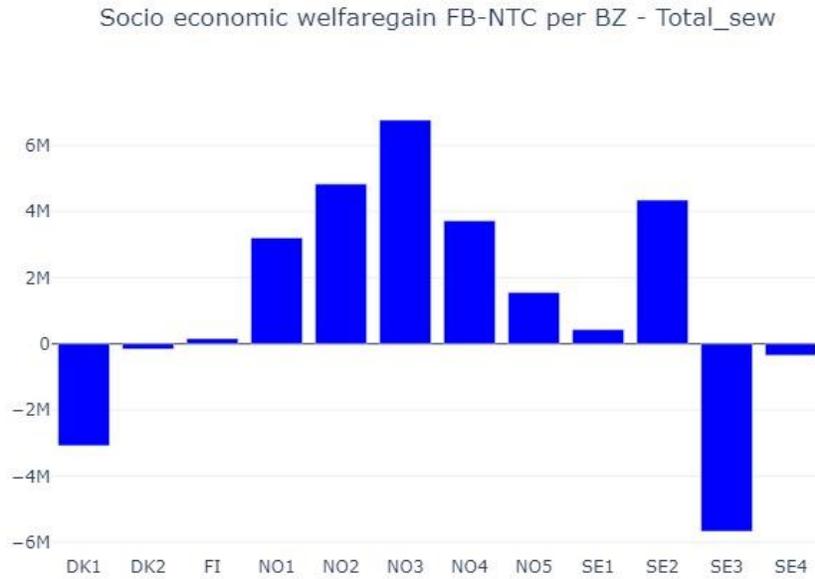


Figure 5. Change in Nordic socio-economic welfare per bidding zone.