

Current requirements for production plans and imbalances, monitoring and the use of production plans in balancing

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1. Introduction

In the Nordic countries, each balance responsible party (BRP) is bound to provide their respective transmission system operator (TSO) with a production plan, which informs the TSO about the BRPs expected production for that day. As the main principle, each production plan covers 24 hours and it includes 24 production sums, one for each hour of the day.

The purpose of this document is to describe the current setup with regards to provision and utilisation of production plans in the Nordics. Section 2 provides an overview on how, and what kind of production plans that are currently provided. The role of production plans to perform congestion management and proactive balancing are described in section 3 of this document.

This document focuses on the final production plans, which are delivered 45 min before the operating hour (H-45min) in all Nordic countries. The current financial incentive in the imbalance settlement is only applicable for the final production plans. In the single price – single balance model this financial incentive is removed, as production plans will not be a component in the imbalance settlement anymore. However, the need for good quality production plans for the TSOs still remains for operational purposes also after the implementation of single price – single balance. The current financial incentive in the common Nordic settlement of the production imbalance is only applicable on an aggregated level (sum of production plans per bidding zone per BRP), and for the average ability to follow plan during the imbalance settlement period (ISP) (energy measurement, not power measurement).

2. General description of the production plans

2.1 Timeline of providing production plans

Productions plans are initially sent daily in the afternoon 16-17:00 CET, the day before the planned production (D-1), depending on the country¹. Final production plans must be delivered 45 mins before the start of the operational hour (except the 5 minute power plans in DK1, which can be updated by the BRPs up until a few minutes before real-time). This means that the final production plans are submitted after the gate closure of the intraday market (H-1). Finland is an exception, as the intraday gate closure time has been 30 min before the operating hour during recent years and has now been changed to 0 min before the operating hour in the beginning of 2020. However, also in Finland gate closure time for production plans is 45 min before start of delivery hour.

2.2 Level of detail

In Denmark, it is required for BRPs to deliver two types of production plans to the TSO; 1-hour time resolution production plans with values covering one day to be delivered at D-1 initially at 16:00 CET and 5-minute time resolution power plans (only relevant in DK1) with values covering one day to be delivered at D-1 at 17:00 CET. Both time resolution plans, the 1-hour time resolution plans and the 5-minute time resolution plans, must also

¹ Regarding the hourly production plans, in Denmark, Norway and Sweden the deadline is at 16:00 CET and in Finland the deadline is at 16:30 CET. Regarding the Danish 5 min power plans for DK1 the deadline is at 17:00 CET.

be provided regarding the expected consumption to Energinet by the BRPs handling adjustable consumption.

There is no obligation for the BRPs to update the hourly plans, however most of them update the hourly production plan in order to have production imbalances settled in the consumption imbalance instead and thereby be exposed to a single price settlement instead of a dual price settlement.

For the 5-minute time resolution power plans in DK1 there are different requirements for different types and sizes of production plants / consumption points²:

- Production plant / consumption point ≥ 10 MW: a separate 5-min time resolution plan must be sent per production plant / consumption point.
- Production plant / consumption point < 10 MW: a 5-min time resolution plan must be sent, which sums up the production / consumption of all production plants / consumption points smaller than 10 MW.
- Off-shore wind park ≥ 25 MW: a separate 5-min time resolution plan must be sent per wind park.
- On-shore wind park ≥ 25 MW:
 - If the BRP actively uses the wind park in the spot-, intraday-, or balancing market by using remote controlling, a separate 5-min time resolution plan must be sent for each wind park.
 - If the BRP handles non-adjustable wind power they are not required to send any production plans to the TSO.

The 5-minute production/consumption plans in DK1 must be updated during the day of operation to reflect the actual operation. If the expected physical production or consumption of a BRP differs from the production/consumption plans by more than 10 % of the installed power of the plant or by more than 10 % of the sum for plants smaller than 10 MW for more than 10 minutes, the BRP is expected to submit an updated production/consumption plan to Energinet. The 5-minute production plans are settled according to a separate power imbalance settlement scheme³.

In Finland, it is required to deliver individual production plans for one or more power plants of the same production type (regulation object), located in the same transmission area. There are two transmission areas in Finland, north and south of 64° latitude. Also, individual production plans are required for all plants over 100 MW. Consumption is not required to deliver consumption plans.

In Norway, it is required for BRPs to deliver production plans per station group. For power stations with a larger capacity than 50 MVA, production plans shall in addition be reported per unit level. Statnett defines the actual station groups for production on a case by case basis, as required to be able to handle and monitor congestions.

Plans shall be reported with a quarterly resolution, but with constant power output (average hourly power output).

² A consumption point is adjustable consumption from a single point which is managed by a BRP.

³ For a further description of the Danish power imbalance settlement scheme see: <https://energinet.dk/-/media/6FAC56FB9C7F45E182C1CoC7D1596D63.pdf> (description only available in Danish).

Production plans are final 45 min before real-time, but if a larger deviation than 50 MW is expected after that point in time, it shall nevertheless be informed to Statnett. In given cases, Statnett shall also be informed in case of deviation smaller than 50 MW.

In Sweden, it is required for BRPs to deliver plans per regulation object, which consists of one or more generation facilities of the same production type, located in the same bidding zone. Regulation objects for production are defined by the TSO and BRP in cooperation, following the basic principles as expressed in the BRP agreement.

Depending on the type of regulation object, plans are reported either as 60 min or as 15 min average power values. Deviations from production plans under operation shall only be done when coordinated with Svenska kraftnät.

In all the Nordic countries except Denmark, in situations where the BRPs plan a change in power output larger than 200 MW between two consecutive hours, the BRP is required to reschedule production and provide quarterly plans which need to respect certain requirements on how to ramp the production. In Norway, it is possible to participate in a voluntary arrangement called production smoothing instead of delivering quarterly plans (gives an exemption from the requirement of quarterly plans).

2.3 Contractual requirements and monitoring

In some of the Nordic countries, there are currently legal and contractual requirements in place with regards to the BRPs following their production plans and planning in balance:

- **In Denmark** there is no formal requirement that BRPs should follow their submitted production plans. However, in addition to the common settlement of imbalances based on the hourly production plans, a power imbalance settlement scheme based on the 5-minute power plans is in place for DK1, which punishes the BRP in case of differences between expected production and actual production. The BRP obligations are detailed in the BRP agreement⁴. Energinet relies on the imbalance settlement and does not specifically monitor BRP imbalances.
- **In Finland** it is required that each BRP shall plan and control its energy purchases and deliveries so that the hourly imbalance remains reasonable with respect to the BRP's scope of operations. A BRP shall not use open deliveries for systematic energy purchases or deliveries. The BRP obligations are detailed in the BRP agreement⁵. Fingrid monitors the BRP imbalances in cooperation with eSett and contacts the BRPs in case of misuse of imbalance power.
- **In Norway** it is a requirement by law for BRPs to follow their production plan on a continuous basis. In addition, it is a requirement by law for BRPs to plan themselves in balance. Statnett

⁴ Energinet's BRP agreement: <https://energinet.dk/-/media/78A24AF7B0564463B6D49BD6E77F2867.pdf> and <https://energinet.dk/-/media/81A587A820554F71B34CE9184BBB5104.pdf>. Energinet's requirements for production plans: <https://energinet.dk/-/media/3534D10E511349099E57233C4F46DCE1.pdf> and <https://energinet.dk/-/media/6F9EAC34038A4E4EA4AF122C126C744B.pdf>.

⁵ Fingrid's general terms and conditions concerning balance management: <https://www.fingrid.fi/globalassets/dokumentit/en/customers/balance-service/appendix-1-part-1-fingrid-ovjs-general-terms-and-conditions-concerning-balance-management.pdf>

makes a weekly analysis of the BRPs imbalances and evaluates if the imbalances are acceptable. In case of unacceptable imbalances (which are not remedied), the BRP shall be reported to the Norwegian NRA in accordance with the law. All the requirements by law are given by "Forskrift om systemansvaret i kraftsystemet"⁶. The requirement to plan in balance is also followed up in the BRP agreement⁷.

- **In Sweden** it is a contractual requirement that the BRP continuously shall strive to establish hourly balance between its power injections and withdrawals. The BRP obligations are detailed in the BRP agreement⁸. Svenska kraftnät monitors BRP imbalances based on eSett reporting.

The monitoring of market and BRPs behavior is one of the tasks of eSett⁹. To perform the task, eSett collects required settlement information and calculates key performance indicators (KPIs) which evaluate the market performance of BRPs. After data is collected it is compiled and presented to the public in a transparent and equal way; by publishing a list of public KPIs and BRP specific KPIs, where BRPs can see their KPI ranking in comparison to other BRPs and the best performers.

Additionally, eSett has monitoring tools for the imbalances, to follow up the quality of the imbalance settlement data.

⁶ The Norwegian regulation "Forskrift om systemansvaret i kraftsystemet": <https://lovdata.no/dokument/SF/forskrift/2002-05-07-448>

Information about how Statnett follows up on the regulation: <https://www.statnett.no/for-aktorer-i-kraftbransjen/systemansvaret/retningslinjer-for-systemansvaret/>

⁷ Statnett's BRP agreement: <https://www.statnett.no/contentassets/6d34576d29d042859511eda73bbacd45/balanseavtale-gjeldende-fra-01.05.18.pdf>

⁸ Svenska Kraftnät's BRP agreement: <https://www.svk.se/balansansvarsavtal>

⁹ Energinet does not yet use eSett for imbalance settlement. This will happen in Q1 2021.

2.4 Country summary

Table 1 summarises how production plans are provided in the different Nordic countries.

Country	Timetable	Time resolution	Level of detail
Denmark	<ul style="list-style-type: none"> 16:00 CET D-1, updated continuously, latest 45 min before. 	<ul style="list-style-type: none"> 60 min plans for imbalance settlement. 	
	<ul style="list-style-type: none"> 17:00 CET D-1 for 5 min plans, updated continuously, for DK1 only 	<ul style="list-style-type: none"> 5 min power plans for operational purposes and power imbalance settlement. 	<ul style="list-style-type: none"> For the 5-min power plans, individual plans are sent for production plants / consumption points larger than 10 MW. Specifics regarding wind power, see section 2.2. BRPs sum up the smaller plants.
Finland	<ul style="list-style-type: none"> 16:30 CET D-1, updated continuously, latest 45 min before. 	<ul style="list-style-type: none"> 60 –min plans. 	<ul style="list-style-type: none"> Individual production plans consisting of one or more power plants of the same production type, located in the same transmission area. Individual production plan for all plants over 100 MW.
Norway	<ul style="list-style-type: none"> 16:00 CET D-1, updated continuously, latest 45 min before. 	<ul style="list-style-type: none"> 60 min plans with a quarterly resolution but constant output. 	<ul style="list-style-type: none"> Per station group. For power stations with a larger capacity than 50 MVA, plans shall in addition be reported per unit level.
Sweden	<ul style="list-style-type: none"> 16:00 CET D-1, updated continuously, latest 45 min before. 	<ul style="list-style-type: none"> 60 min or 15 min plans depending on the type of regulation object. 	<ul style="list-style-type: none"> Individual production plans consisting of one or more power plants of the same production type.
Common Nordic (except Denmark)		<ul style="list-style-type: none"> Requirement for BRPs with change ≥ 200 MW to deliver 15 min plans with given requirements (exemption in Norway if participating in production smoothing). 	

Table 1. Summary of production plan provision in different Nordic countries.

3. How the final production plans are used

3.1 Bottleneck management, proactive balancing and use of production shifts

Current Nordic balancing practices are described in detail in the document "Nordic Balancing Philosophy"¹⁰. This section gives only a short overview on how final production plans are used in bottleneck management, proactive balancing and in the production shift process.

The Nordic TSOs operate the system based on the information that is available for the operators. Each TSO has their own real time monitoring and control system (scada) in addition to supportive planning systems. The production plans are important input in the supportive planning systems.

Production plans are used as a basis for the production prognoses, which together with forecasts for variable renewables and consumption in addition to exchange plans are used to estimate the future imbalances and need for activation of balancing energy. The production plans also inform the operators of when and where in the grid (due to geographical

¹⁰ Nordic Balancing Philosophy, https://docstore.entsoe.eu/Documents/Publications/SOC/Nordic/Nordic_Balancing_Philosophy_160616_Final_external.pdf

resolution) production will change, and thereby supports the identification of future congestion issues and needed actions.

The production shift process is used to further adjust the ramp profile of production to contribute to the momentaneous power balance of the system. This is a measure in addition to the general requirements for providing quarterly plans in case of over 200 MW shifts in production (or through participation in the volunteer production smoothing scheme in Norway instead), which has been described earlier in this document. The production shift process uses the information provided in the production plans to identify when production will start change in power output and the need to further adjust the profile of the expected power changes.

The Nordic TSOs rely on mFRR to perform congestion management and balancing. This is done mostly proactively in order to ensure safe operations (avoid overloads) and satisfactory frequency quality. If the data in the production plans are incorrect, the operators might not perform the correct measures. This can lead to both challenging operational situations for the TSOs and less economically efficient operation.

3.2 Other purposes of production plans

Production plans are also used for other purposes, but these are not described in this document as the focus is on the final production plans, which currently have financial incentive as part of the imbalance settlement. Other purposes include load flow analysis as well as planning for outage and critical operational situations (e.g. assessing a need to start up peak load reserve plants). In addition to the production shift process in the operational hours, they are also used for planning for hour shifts with regards to ramping performed D-1.

Production plans are also used as a basis for market transparency data when TSOs create and publish production forecast.