

LOAD FREQUENCY CONTROL

Annual Report 2025

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From: System Operations Committee

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Executive Summary

According to Article 16 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation, the transmission system operators (TSOs) of each European Union Member State are obliged to provide ENTSO-E with the necessary data and information for the preparation and creation of the annual LFC report (ALFC Report). Subsequently, ENTSO-E is obligated to publish the annual report.

The LFC report aims to present the results of the frequency quality evaluation criteria for each synchronous area and LFC block, and the FCR obligations and the initial FCR obligations of each TSO for each month of the preceding two years. Additional details include a description and the date of implementation of any mitigation measures and ramping requirements to alleviate deterministic frequency deviations in which TSOs were involved during the last preceding year.

In 2024 and 2025, the Continental Europe Synchronous Area reached its frequency quality target. With 13.922 minutes in 2025, the frequency quality target parameter stayed within the target of 15.000 minutes, as defined in the SOGL Annex III Table 2 and was significantly better than in the previous two years, where numbers were close to 15.000 minutes. All LFC blocks and TSOs provided their data and have explained any mitigation measures where applicable.

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INTRODUCTION

The load-frequency control (LFC) annual report is a requirement of the Commission Regulation (EU) 2017/1485 of 2 August 2017, establishing a guideline on electricity transmission system operation (SOGL).

Article 16 of SOGL requires transmission system operators (TSOs) of each European Union Member State to provide ENTSO-E with the necessary data and information for the preparation and creation of the LFC annual report. ENTSO-E is required to publish the annual report. On the grounds of SOGL Article 2(2), the synchronous areas of Cyprus and Iceland are excluded in this report as islands of Member States not operated synchronously with CE, Nordic, IE/NI and Baltic are excepted from the annual LFC reporting requirement.

All ENTSO-E member TSOs agreed to provide the necessary data and information for the preparation and publication of the annual LFC report. Subsequently, each annual report is separately approved for publication by the ENTSO-E System Operations Committee.

The objectives of the report include:

- the identification, graphical representation, and associated monitors for each synchronous area, LFC block, and TSO of the four synchronous areas (Ireland/Northern Ireland, Nordic, Continental Europe, and Baltic).
- the frequency quality evaluation criteria results for each synchronous area and LFC block.
- the description and date of implementation of any mitigation measures and ramping requirements to alleviate deterministic frequency deviations in which TSOs were involved during the preceding year.
- the FCR obligation and the initial FCR obligation of each TSO for each month of the preceding two years.

Synchronous areas, LFC blocks and TSO identification

In this paragraph, the requirements of SOGL Article 16(2)(a), (b) and (c) are reported with the goal of identifying the LFC blocks, LFC areas, and monitoring areas in the ENTSO-E. The location of each member state in relation to the European synchronous areas and LFC blocks is also reported.

The three synchronous areas included in this document are Continental Europe, Nordic, Ireland and Northern Ireland, as shown graphically in Figure 1 below. Furthermore, the Synchronous Area of GB exist, which is not in the focus of this report. All LFC blocks and LFC block monitors are reported in Tables 1-4. For the Baltic Synchronous Area, the data collection process for 2024 is not performed as the Baltic States power system was asynchronously connected to Continental Europe through the LitPol Link between Lithuania and Poland and to the Nordic Synchronous Area through the NordBalt link between Lithuania and Sweden and Estlink 1 and 2 between Estonia and Finland. With the Baltic synchronisation with Continental Europe in February 2025, operating their systems under the frequency of the Continental European System and under the EU rules, data is collected from February 2025 onwards.



Figure 1 European Synchronous Areas and LFC Blocks

According to Article 133 of the SOGL, all TSOs of a synchronous area shall, in the synchronous area operational agreement, appoint one TSO of that synchronous area as the synchronous area monitor. The synchronous area monitor shall implement the data collection and delivery process of the synchronous area referred to in Article 132 of the SOGL and implement the criteria application process referred to in Article 129 of the SOGL.

Furthermore, the synchronous area monitor shall collect the frequency quality evaluation data of its synchronous area and perform the criteria application process, including the calculation of the frequency quality evaluation criteria, once every three months and within three months after the end of the analysed period.

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According to Article 118 of the SOGL, there exist the following synchronous areas and associated monitors:

- Swissgrid (south CE), Amprion (north CE), EirGrid (Ireland and Northern Ireland), Statnett SF-SN (Nordic) and National Grid ESO (Great Britain)¹.

LFC Block	LFC Area	LFC Block Monitor	Country
AK	OST, KOSTT	OST	Albania, Kosovo ²
APG	APG	APG	Austria
Baltic	AST + Elering + Litgrid	Litgrid	Estonia, Latvia, Lithuania
CEPS	CEPS	CEPS	Czech Republic
ELIA	ELIA	ELIA	Belgium
ESO	ESO	ESO	Bulgaria
Germany	TNG, TTG, AMP, 50HZT, EN, CREOS	AMP	Germany, Denmark-West, Luxembourg
IPTO	IPTO	IPTO	Greece
MAVIR	MAVIR	MAVIR	Hungary
PSE	PSE	PSE	Poland
REE	REE	REE	Spain
REN	REN	REN	Portugal
RTE	RTE	RTE	France
SEPS	SEPS	SEPS	Slovak Republic
SG	SG	SG	Switzerland
SHB	NOS BiH, HOPS, ELES	ELES	Bosnia and Herzegovina, Croatia, Slovenia
SMM	EMS, MEPSO, CGES	EMS	Serbia, North Macedonia, Montenegro
TEIAS	TEIAS	TEIAS	Turkey
TEL	TEL	TEL	Romania
TERNA	TERNA	TERNA	Italy
TTB	TTB	TTB	Netherlands
UAMD	Ukrenergo, Moldelectrica	Ukrenergo	Ukraine, Moldova

Table 1 Continental Europe SA identification of LFC blocks

¹ National Grid ESO / NGESO (Great Britain) has been removed from the scope of this report.
² This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

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LFC Block	LFC Area	LFC Block Monitor	Country
EirGrid+SONI	EirGrid, SONI	EirGrid	Ireland, Northern Ireland

Table 2 IE/NI SA identification of LFC blocks

LFC Block	LFC Area	LFC Block Monitor	Country
Nordic	FG, SN, SvK, DK-E	SN	Finland, Norway, Sweden, Denmark-East

Table 3 Nordic identification of LFC blocks

FREQUENCY QUALITY EVALUATION

Introduction and target parameters

To maintain the power system frequency within secure limits, TSOs shall maintain the balance between load and generation on a short-term basis. The first step of balancing actions is the application of Frequency Containment Reserves (FCR). These reserves are activated quickly (typically within 30s), stabilising the power system frequency and ensuring that the frequency deviation will not further increase. The Frequency Containment Process (FCP) will stabilise the frequency with an offset from 50 Hz, but it is the change of speed of the rotating masses, inertia, that ensures the frequency change is damped so that FCR is able to contain and stabilise the frequency at a value close to 50 Hz.

The second step is assigned to Frequency Restoration Reserves (FRR) which replace FCR and restore the frequency to the target frequency. SOGL defines two types of FRR: automatic (aFRR) and manual (mFRR). FRR is activated by an automatic control device or by manual activation, which reduces the Frequency Restoration Control Error (FRCE) to zero. For aFRR, this control device usually is called a Load-Frequency Controller (LF-Controller). The LF-Controller is physically a process computer that is implemented in the TSOs' control centre systems (SCADA/EMS/AGC) and collects FRCE measurements every 4–10s, thus providing—in the same time cycle—automated instructions to balancing service providers that are connected by data communication links.

The Frequency Restoration Process (FRP), aFRR and mFRR, restores frequency by replacing the power from the FCR. This principle is applicable for normal imbalances such as the activation of a light bulb, the start of a train, or the sudden outage of a large power plant. Market behaviour, such as the stop and start of production units at hour shift, will also create a power imbalance and result in frequency deviations.

All frequency deviations are recorded carefully for further analyses. SOGL defines processes for the calculation and the evaluation of frequency data, and the required parameters for each synchronous area and each LFC block (defined in SOGL in Articles 127–131 and in Annex III–V) are presented below in Tables 4 and 5.

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Data item	CE	GB	IE/Nl	Nordic
Standard frequency range	± 50 mHz	± 200 mHz	± 200 mHz	± 100 mHz
Maximum instantaneous frequency deviation	800 mHz	800 mHz	1000 mHz	1000 mHz
Maximum steady-state frequency deviation	200 mHz	500 mHz	500 mHz	500 mHz
Time to recover frequency	Not used	1 minute	1 minute	Not used
Frequency recovery range	Not used	± 500 mHz	± 500 mHz	Not used
Time to restore frequency	15 minutes	15 minutes	15 minutes	15 minutes
Frequency restoration range	Not used	± 200 mHz	± 200 mHz	± 100 mHz
Alert state trigger time	5 minutes	10 minutes	10 minutes	5 minutes

Table 4 Frequency quality defining parameters of synchronous areas, as shown in Annex III Table 1 of the SOGL

Data item	CE	GB	IE/Nl	Nordic
Maximum number of minutes outside the standard frequency range	15 000	15 000	15 000	15 000

Table 5 Frequency quality target parameters of synchronous areas, as shown in Annex III Table 2 of the SOGL

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Considering the aforementioned information for each synchronous area during operation in a normal state or an alert state, the following values are reported on a monthly basis for the instantaneous frequency data:

- i. The mean value.
- ii. The standard deviation.
- iii. The 1st, 5th, 10th, 90th, 95th and 99th percentiles.
- iv. The total time during which the absolute value of the instantaneous frequency deviation was larger than the standard frequency deviation, distinguishing between positive and negative instantaneous frequency deviations.
- v. The total time during which the absolute value of the instantaneous frequency deviation was larger than the maximum instantaneous frequency deviation, distinguishing between positive and negative instantaneous frequency deviations.
- vi. The number of events in which the absolute value of the instantaneous frequency deviation of the synchronous area exceeded 200% of the standard frequency deviation and the instantaneous frequency deviation was not returned to 50% of the standard frequency deviation for the CE synchronous area and to the frequency restoration range for IE/NL and Nordic synchronous areas, within the time to restore frequency. The data distinguish between positive and negative frequency deviations.
- vii. For the IE/NL synchronous area, the number of events for which the absolute value of the instantaneous frequency deviation was outside of the frequency recovery range and was not returned to the frequency recovery range within the time to restore frequency, distinguishing between positive and negative frequency deviations.

For LFC blocks from the CE and Nordic areas, the following data are reported:

- i. For a dataset containing the average values of the FRCE of the LFC block over time intervals equal to the frequency restoration time:
 - the mean value;
 - the standard deviation;
 - the 1st, 5th, 10th, 90th, 95th and 99th percentiles; and
 - the number of time intervals in which the average value of the FRCE was outside the Level 1 FRCE range, distinguishing between positive and negative FRCE, and the number of time intervals in which the average value of the FRCE was outside the Level 2 FRCE range, distinguishing between positive and negative FRCE.
- ii. For a dataset containing the average values of the FRCE of the LFC block over time intervals with a length of one minute, the number of events on a monthly basis for which the FRCE exceeded 60% of the reserve capacity on FRR and was not returned to 15% of the reserve capacity on FRR within the time to restore frequency, distinguishing between positive and negative FRCE. The calculation procedures of these target parameters are set in both the Nordic and the Continental Europe Synchronous Area Operational Agreements. The objective behind the Level 1 and Level 2 parameters is to provide quality targets for the individual FRCE quality of each LFC block. Since it is the responsibility of each TSO in its LFC block to keep FRCE as low as possible, the Level 1 and Level 2 parameters must not be exploited to reduce reserves or reserves activation. These parameters should rather be interpreted as an absolute warning limit that shows

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that the FRCE quality is below the required standard and that the respective countermeasures have been reported and will be implemented urgently.

For the LFC blocks of the IE/Nl synchronous area, during operation in a normal state or alert state and in accordance with Article 18(1) and (2), the following data are presented on a monthly basis and for a data-set containing the average values of the FRCE of the LFC block over time intervals with a length of one minute: the number of events for which the absolute value of the FRCE exceeded the maximum steady-state frequency deviation and the FRCE was not returned to 10% of the maximum steady-state frequency deviation within the time to restore frequency, distinguishing between positive and negative FRCE.

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Continental Europe

Frequency Performance

In the following figures, data for the Continental Europe synchronous area are presented. Input values for frequency are based on instantaneous frequency values. Based on the input values, the mean value, standard deviation and percentiles were calculated in Figure 2 on an annual level and in Figure 3 on a monthly basis.

Moreover, in Figure 4 and 5 any time periods and events where the system frequency was outside of predefined ranges were also indicated. For data points where the frequency was outside the 50, 100 and 800 mHz range, time is measured in minutes.

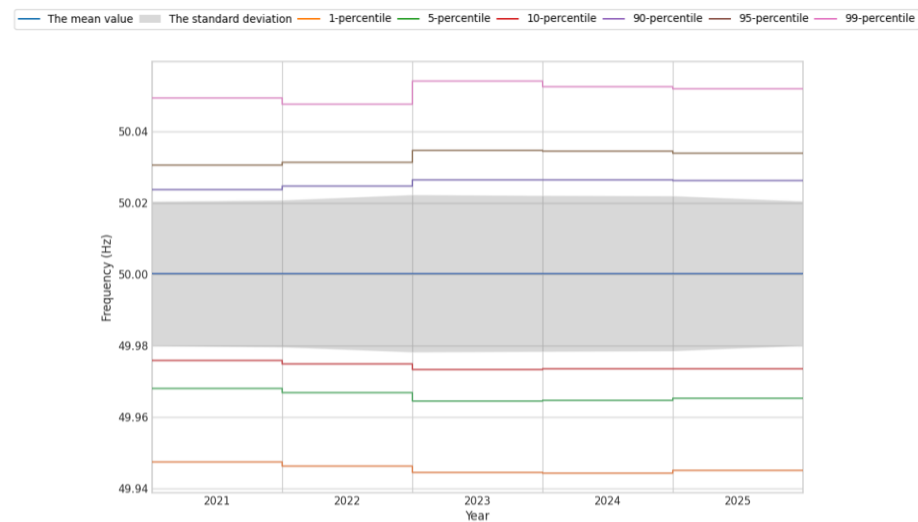


Figure 2 Annual frequency percentiles and standard deviation in Continental Europe for 2021–2025

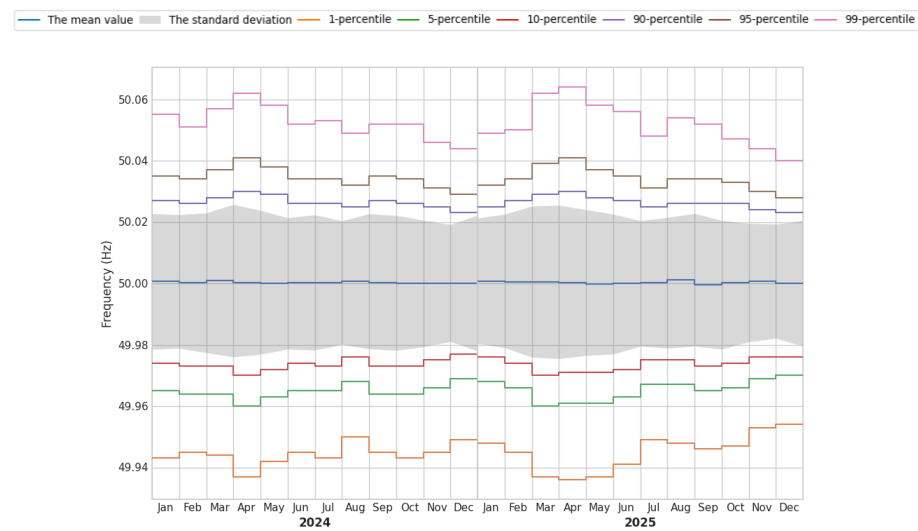


Figure 3 Monthly frequency percentiles and standard deviation in Continental Europe for 2024 and 2025

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In Figures 4 and 5, the accumulated minutes outside standard ranges are presented for the previous years. Figure 4 shows the annual number of minutes outside the standard range from 2021 to 2025. Figure 5 shows the monthly number of minutes outside the standard range from 2024 to 2025. The frequency quality target parameter, as defined in the SOGL, is 15000 minutes per year for each synchronous area. The monthly target parameter can be considered as 1/12 of this value, that is, 1250 minutes.

Figure 4 shows that the frequency quality target for 2023 was not fulfilled in Continental Europe. The reason behind exceeding the target were frequent situations of long-lasting frequency deviations (LLFD) in the first half of 2023, mostly in direction of over-frequency, and especially in the months of March, April and May. The control blocks of Bulgaria and France were the most significant contributors of the increase, but other control blocks contributed as well. Mitigation measures to reach quality target parameters are provided in the respective year. The frequency quality for 2024 slightly improved so the frequency quality target was fulfilled again. By 2025, the values have improved further and remained within the required limits.

The annual trend shows that for 2021 and 2022 the frequency was around 11 000 minutes outside the standard frequency range of +/- 50mHz in Continental Europe and for 2023 and 2024 this value has levelled off around 15 000 minutes and then decreased in 2025. In general, the measured values are much higher compared to the other synchronous areas; however, the other synchronous areas have much higher standard frequency ranges e.g. of +/- 100 or +/-200 mHz whereas CE has only +/- 50 mHz.

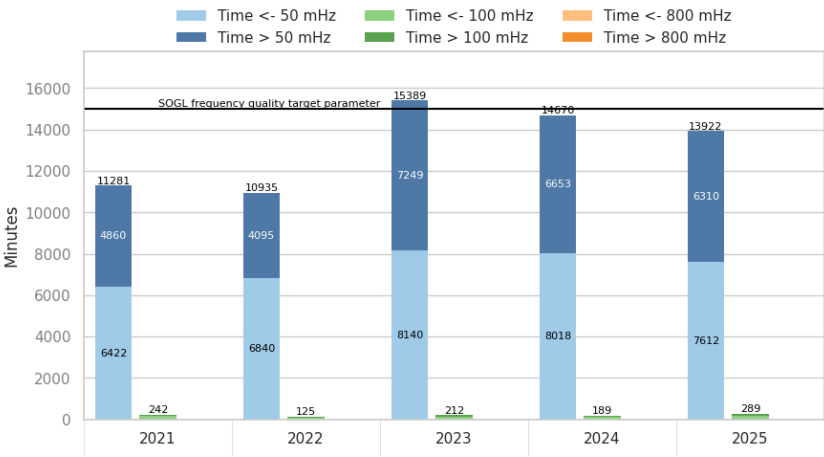


Figure 4 Annual number of minutes outside the standard ranges in Continental Europe for 2021–2025

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Figure 5 shows that the monthly number of minutes outside the standard frequency ranges was exceptionally high in March, April and May of both 2024 and 2025, but improved in the second half of both years.

So that summarized for both years the frequency quality criteria were inside the limits of SOGL. This trend has already been observed in previous years, for example in 2023 when values were also particularly high between March and May.

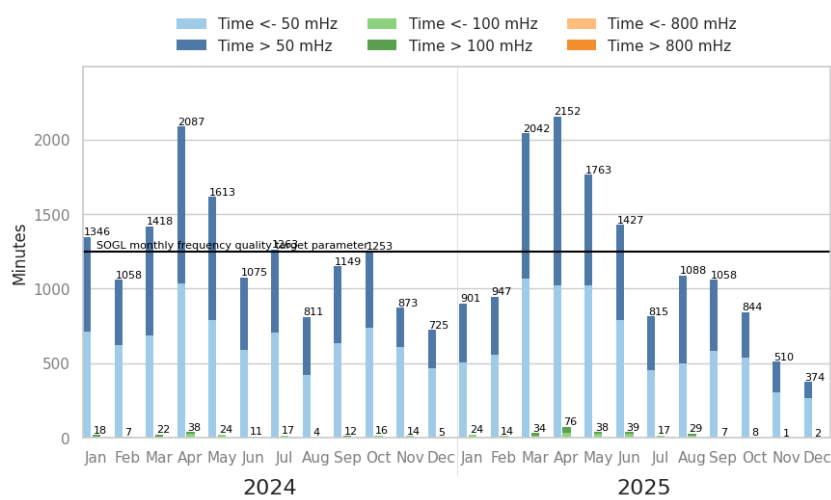


Figure 5 Monthly number of minutes outside the standard ranges in Continental Europe for 2024 and 2025

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LFC Block Performance

This chapter presents the Frequency Quality Evaluation Criteria for LFC blocks in Continental Europe. The limits for Level 1 and Level 2 are calculated retroactively in line with Synchronous Area Framework Agreement for Continental Europe, whose entry into force was 14th of April 2019. FRCE values are calculated on a basis of 15 min Area Control Error (FRCE) data. Additionally, events which indicate where FRCE exceeds 60 % of FRR used and not returned to 15 % of FRR within 15 minutes time period are reported. The complete list of data provided by LFC blocks is shown in the Appendix II.

Level 1 and Level 2 statistics

The level 1 and level 2 FRCE target parameters for the Continental Europe LFC blocks are presented in Table 6 for the respective years and measured in MW. Level 1 and level 2 FRCE ranges are the first and second range used for system frequency quality evaluation purposes on LFC block level, within which the FRCE should be kept for a specified percentage of the time.³

In Figure 6.1 and 6.2 the percentage of time where the average FRCE was outside the level 1 and level 2 targets for the respective years is shown. For better readability, TSOs with values close or equal to zero were excluded from the Figures 6.1 and 6.2. Figure 7 – 10 show the monthly distribution of FRCE time intervals outside Level 1 and Level 2 ranges in absolute numbers. For better readability only the TOP 5 TSOs with the highest values were depicted. Regardless of the illustrations in Figure 6.1 – 10, all data is included in Appendix II. In all figures dark colours indicate positives values whereas the light colours indicate negative ones. Level 1 values are depicted in blue and level 2 in red. The results for 2024 and 2025 and level 1 and level 2 are presented in different figures for better readability.

LFC Block	2024		01.01-30.06.2025		01.07-31.12.2025	
	Level 1	Level 2	Level 1	Level 2	Level 1	Level 2
AK	27	52	30	58	27	54
APG	71	135	62	118	56	110
Baltic	N/A	N/A	37	71	34	66
CEPS	73	139	65	126	59	117
ELIA	81	153	71	137	64	127
ESO	53	100	45	87	41	81
Germany	203	384	179	346	163	322
IPTO	61	115	55	106	50	99
MAVIR	53	100	48	92	43	86
PSE	111	211	100	193	91	179
REE	148	281	135	260	123	242
REN	60	113	55	106	50	99
RTE	185	349	173	334	157	311
SEPS	44	83	41	79	37	73
SG	66	125	63	120	57	112
SHB	55	105	53	101	48	94

³ SOGL Art. 3 – Definitions (134) and (135)

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SMM	56	106	53	102	48	95
TEIAS	155	293	144	277	131	258
TEL	63	120	58	113	53	105
TERNA	147	279	132	255	120	237
TTB	88	166	85	163	77	152
UAMD	86	163	78	151	71	141

Table 6 Level 1 FRCE range and the level 2 FRCE range (in MW) for the Continental Europe Synchronous Area for 2024 and 2025

Limit	2024		2025	
	Level 1	Level 2	Level 1	Level 2
Limit for the maximum number of 15-minute time intervals per year outside the level 1 and level 2 FRCE ranges for each LFC Block	10512	1752	10512	1752

Table 7 Limits for the number of 15-minute time intervals per year outside the level 1 and level 2 FRCE ranges, as defined in Articles 3(134) and 3(135) of the SOGL

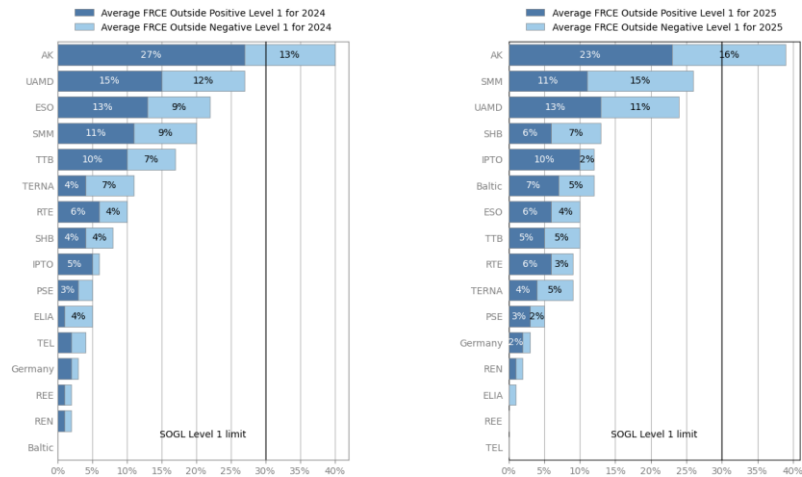


Figure 6.1 Percentage of time average FRCE was outside level 1 targets for 2024 and 2025
Note: TSOs with values close to or equal to zero have been excluded from this figure. All values can be found in Appendix II.

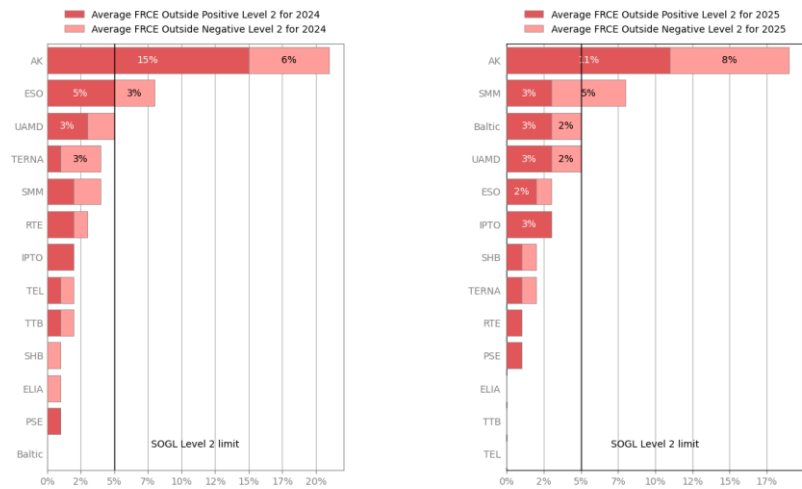


Figure 6.2 Percentage of time average FRCE was outside level 2 targets for 2024 and 2025
Note: TSOs with values close to or equal to zero have been excluded from this figure. All values can be found in Appendix II.

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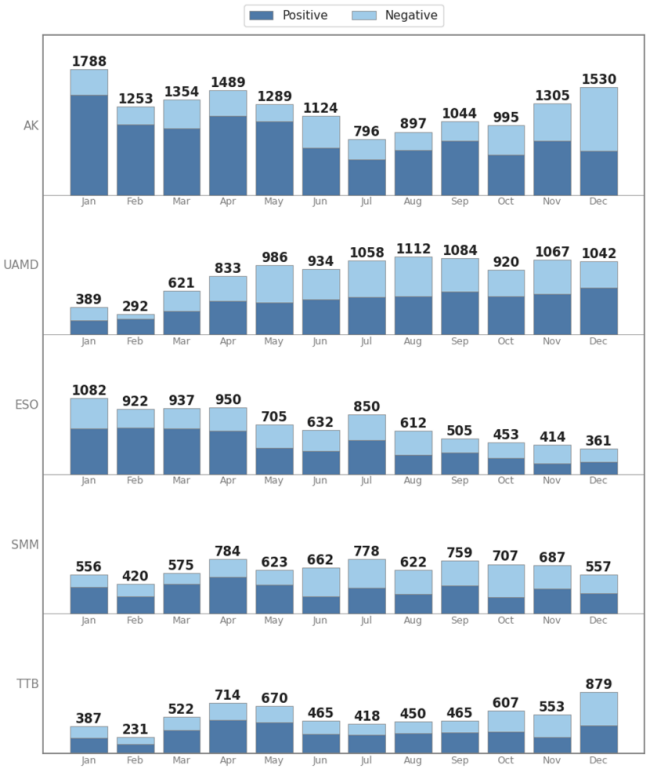


Figure 7 TOP 5 LFC Blocks in CE with the highest FCRCE Time Intervals outside Level 1 Range for 2024
The data for lower ranking LFC Blocks is presented in Appendix II.

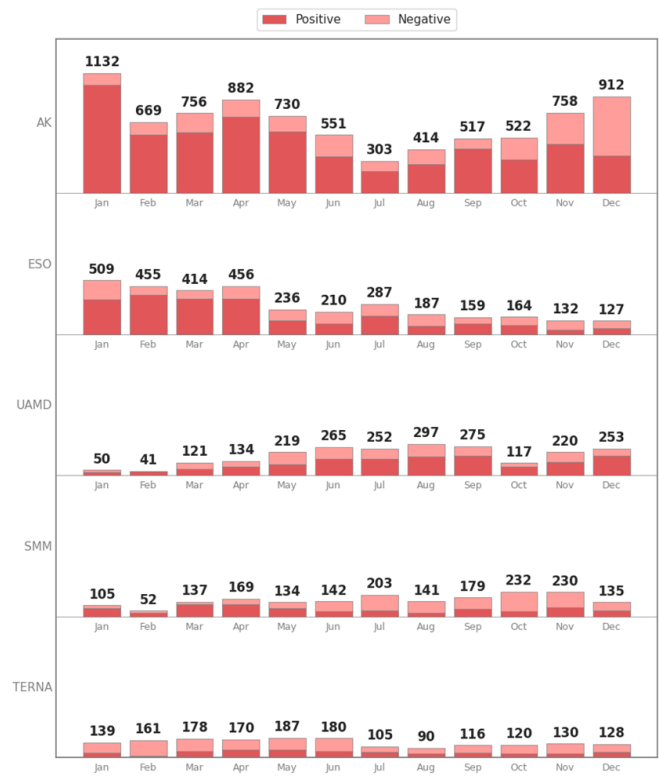


Figure 8 TOP 5 LFC Blocks in CE with the highest **FCRCE** Time Intervals outside Level 2 Range for 2024
The data for lower ranking LFC Blocks is presented in Appendix II.

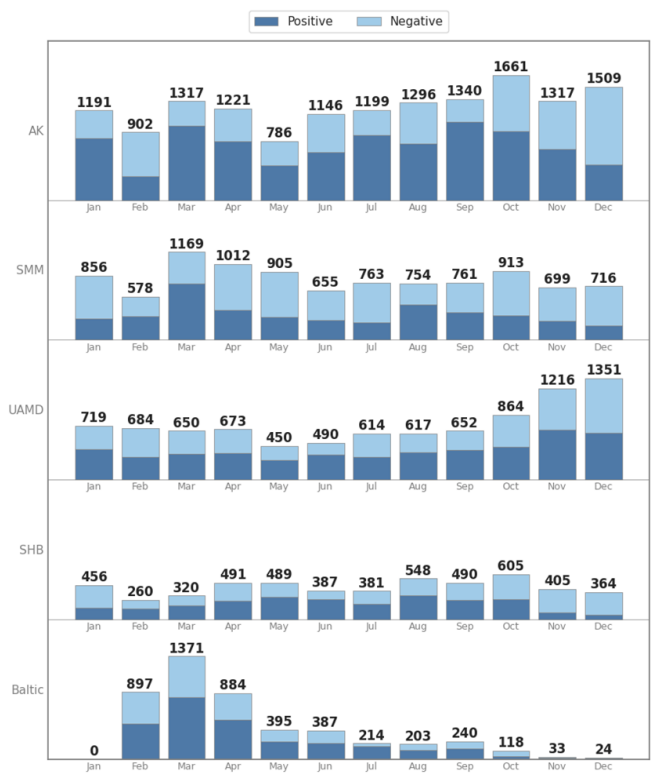


Figure 9 TOP 5 LFC Blocks in CE with the highest FCRCE Time Intervals outside Level 1 Range for 2025
The data for lower ranking LFC Blocks is presented in Appendix II.

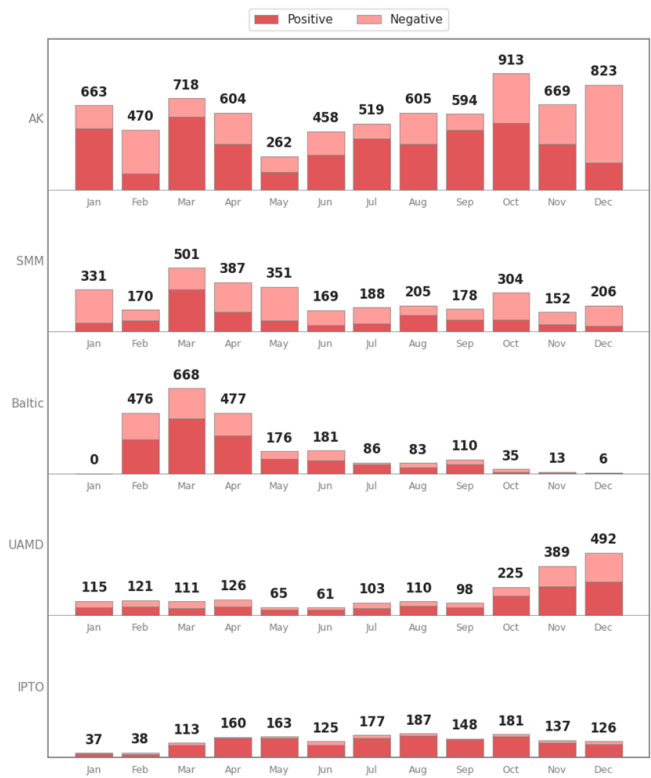


Figure 10 TOP 5 LFC Blocks in CE with the highest **FCRCE** Time Intervals outside Level 2 Range for 2025
The data for lower ranking LFC Blocks is presented in Appendix II.

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FRCE vs. FRR

The ability of LFC blocks to regulate their own FRCE can be assessed by comparing the FRCE to the reserve capacity from the dimensioning process, as described in Article 157 of the SOGL. Both automatic (aFRR) and manual (mFRR) FRR are included. Voluntary energy bids can optionally be included.

Positive and negative FRR is considered individually, that is, positive FRR (FRR+) is compared to the negative FRCE, and negative FRR (FRR-) is compared to the positive FRCE. FRCE values include all correction signals (e.g., for TSOs part of an Imbalance Netting Process) ~~and is the value after the adjustment process for TSOs part of an FRR activation process~~. The values used are the 1-minute average values. The granularity of the FRCE values (used to calculate the 1-minute average) is 10 seconds or lower.

The reported number of events indicates the occurrence of large imbalances in LFC blocks (equal or higher than 60 % of dimensioned FRR) and an insufficient capability of LFC blocks to solve them during the time to restore frequency.⁴

For better visualization, Figures 11 and 12 only show the TOP 5 LFC Blocks in CE with the highest FRCE Outside FRR Capacity within 15 minutes for 2024 and 2025. Regardless of the illustration, all data is included in Annex II.

⁴ SOGL Annex III, Table 1 - Frequency quality defining parameters of the synchronous areas

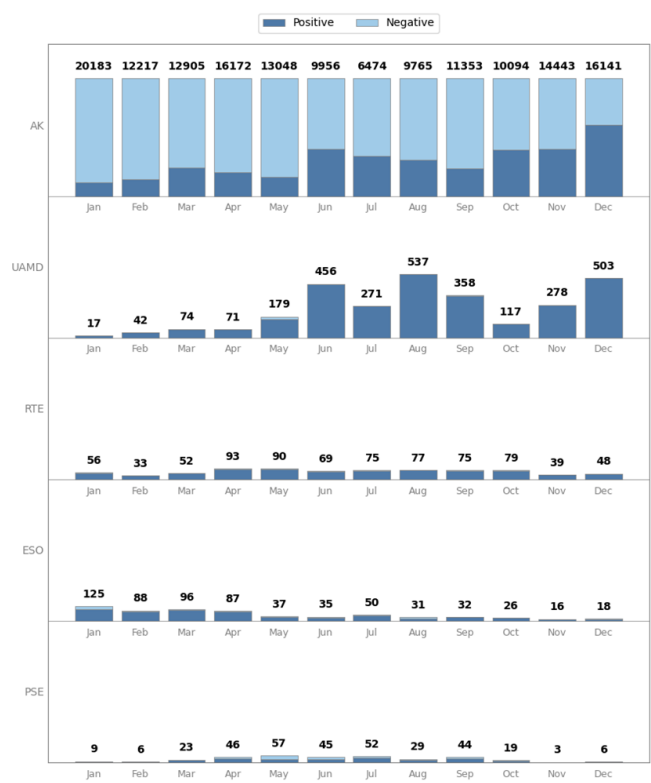


Figure 11 TOP5 LFC Blocks in CE with the highest FRCE Outside FRR Capacity within 15 minutes for 2024
For better visualization the Figure only show the TOP 5 LFC Blocks in CE; regardless of the illustration, all data is included in Annex II. To improve readability, the bars were capped at a maximum value of 1000, which means the bars for AK are limited to this value.

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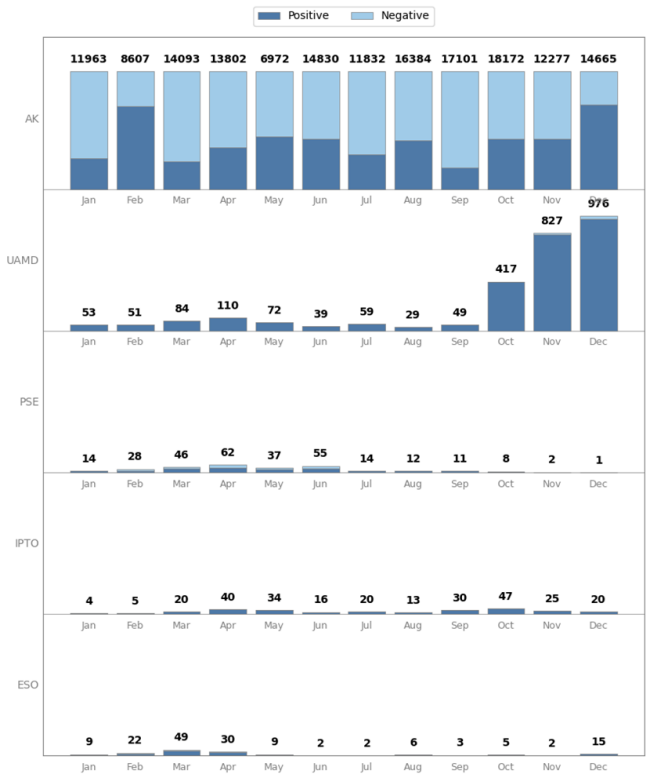


Figure 12 TOP5 LFC Blocks in CE with the highest FRCE Outside FRR Capacity within 15 minutes for 2025
For better visualization the Figure only show the TOP 5 LFC Blocks in CE; regardless of the illustration, all data is included in Annex II. To improve readability, the bars were capped at a maximum value of 1000, which means the bars for AK are limited to this value.

Frequency quality evaluation

I. Mitigation Measures Analysis

The annual report on load-frequency control provides a description and date of implementation of any mitigation measures and ramping requirements in which TSOs were involved taken in the previous calendar year to alleviate deterministic frequency deviations in accordance with SOGL Articles 137 and 138

In accordance with Article 138 of the SOGL, when the values calculated for the period of one calendar year with respect to the frequency quality target parameters are outside the targets set for the synchronous area, all TSOs of the relevant synchronous area should provide analysis and mitigation measures. Furthermore, when the values calculated for one calendar year with respect to the FRCE target parameters are outside the targets set for the LFC block, all TSOs of the relevant LFC block should provide analysis and mitigation measures.

In accordance with Article 138 of the SOGL, this information should contain:

- (a) analysis of whether the frequency quality target parameters or the FRCE target parameters will remain outside the targets set for the synchronous area or for the LFC block and, in case of a justified risk that this may happen, analysis of the causes and a set of recommendations; and
- (b) description of any mitigation measures developed to ensure that the targets for the synchronous area or for the LFC block can be met in the future.

For the reporting period, encompassing the years 2024 and 2025, in line with Figure 6.1 and Figure 6.2, the following analysis and mitigation measures were reported from LFC blocks in Continental Europe:

Mitigation measures for year 2024:

SMM

Analysis	Occasional scarcity of reserve in North Macedonia
Mitigation measures	MEPSO is going to join local imbalance netting process within SMM CB and remove obstacles for the cross-border exchange of mFRR reserve within SMM CB.

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Mitigation measures for year 2025:

Baltic

Analysis	Baltic Power system has synchronized with the Continental Europe synchronous area at 2025-02-09. From the synchronization moment until 2025-04-16 Baltic Power system due to technical issues at PICASSO balancing platform were not connected to the system. During the stan, Baltic TSO had to rely on the internal resources which has drifted the target values. After PICASSO platform GO-LIVE, the parameters were maintained within the target level. Minding the trends noticed from 2025-04-16, it is not expected to notice breach of the target parameters during 2026.
Mitigation measures	After PICASSO platform GO-LIVE, the parameters were maintained within the target level. Minding the trends noticed from 2025-04-16, it is not expected to notice breach of the target parameters during 2026.

SMM

Analysis	Occasional scarcity of reserve in North Macedonia.
Mitigation measures	MEPSO is going to join local imbalance netting process within SMM CB and remove obstacles for the cross-border exchange of mFRR reserve within SMM CB.

UAMD

Analysis	1) Significant loss of generation certified for ancillary services, caused by Russia's military aggression. 2) 1-hour settlement period, which makes it impossible to adjust the schedule closer to the moment of real time.
Mitigation measures	1) The need to develop new generation and ESS to ensure adequacy of reserves. 2) Transition in the next 1-2 years to 15-minute settlement period on the electricity market.

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Ireland/Northern Ireland

Frequency Performance

The tables and figures in the Section present frequency performance for the synchronous area of Ireland/Northern Ireland for the years 2024 and 2025, along with five-year annual values for 2021–2025. The input values for frequency are based on instantaneous frequency values. Based on the input values, the mean value, standard deviation and percentiles were calculated.

Moreover, any time periods and events when the system frequency was outside of predefined ranges were also indicated. For data points when the frequency was outside the 200–1000 mHz range, time is measured in minutes.

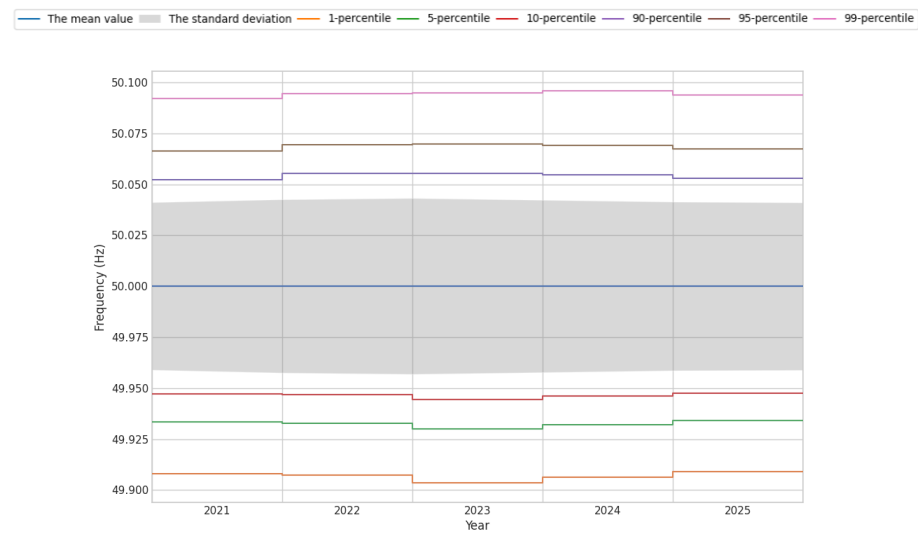


Figure 13 Annual frequency percentiles and standard deviation in Ireland/Northern Ireland for 2021–2025

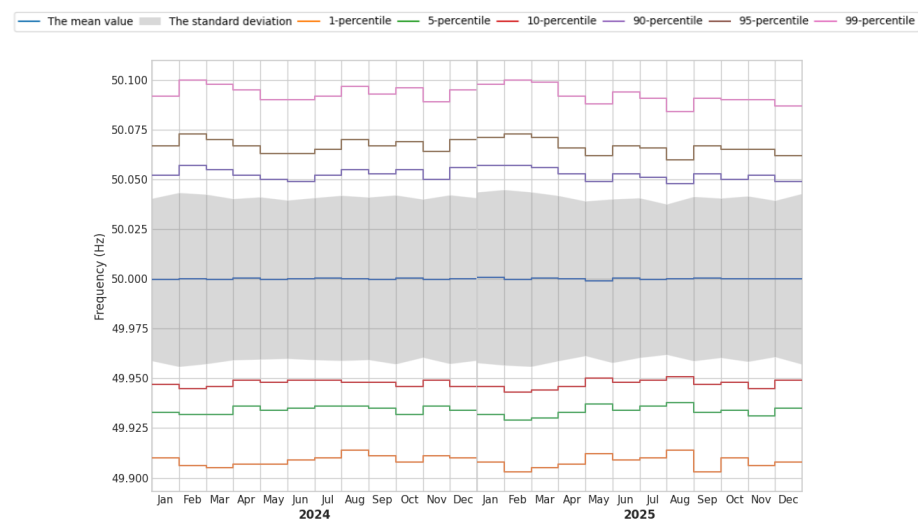


Figure 14 Monthly frequency percentiles and standard deviation in Ireland/Northern Ireland 2024 and 2025

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In Figures 15 and 16, the accumulated minutes outside standard ranges are presented for the previous years. Figure 15 shows the annual number of minutes outside the standard range from 2021 to 2025, whereas Figure 16 shows the monthly number of minutes outside the standard range from 2024 to 2025. The frequency quality target parameter, as defined in the SOGL, is 15000 minutes per year for each synchronous area. The monthly target parameter can be considered as 1/12 of this value, that is, 1250 minutes.

The following graphs below show that the frequency quality was exceptionally good and that all frequency quality target parameters from SOGL were fulfilled in the Ireland/Northern Ireland Synchronous Area for the respective years.

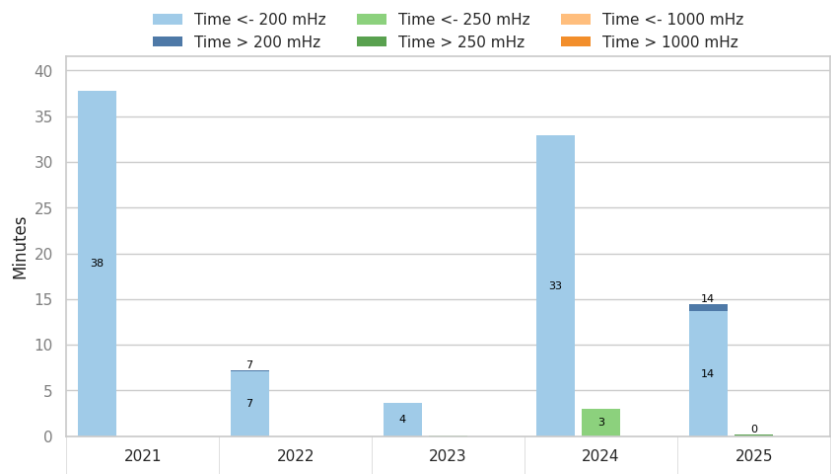


Figure 15 Annual number of minutes outside the standard ranges in Ireland/Northern Ireland for 2021–2025

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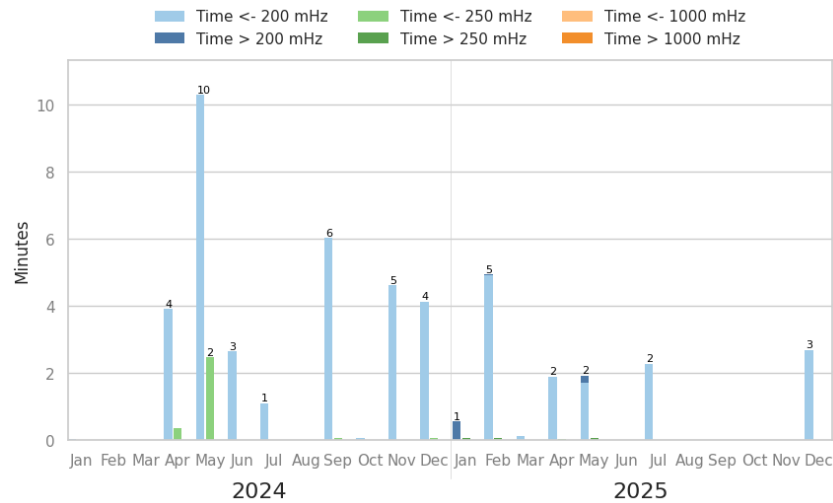


Figure 16 Monthly number of minutes outside the standard ranges in Ireland/Northern Ireland for 2024 and 2025 by month

The yearly trend shows that only very few minutes were observed where the frequency was outside the standard frequency range of +/- 200mHz for IE/Nl. Just as in other synchronous areas, the data here (albeit to a much lesser extent) shows that a cluster of cases can be observed, particularly around spring.

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Nordic

Frequency Performance

In the following figures, data are presented from 2024 and 2025 for the Nordic synchronous area. Input values for frequency are based on instantaneous frequency values. Based on the input values, the mean value, standard deviation and percentiles were calculated. Moreover, any time periods and events where the system frequency was outside of predefined ranges were also indicated. For data points where the frequency was outside the 100–1000 mHz range, time is measured in minutes.

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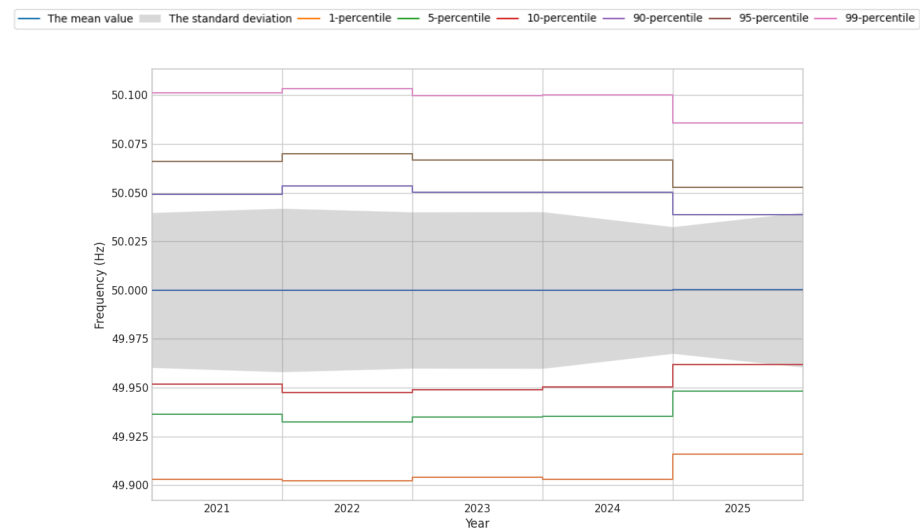


Figure 17 Annual frequency percentiles and standard deviation in the Nordic synchronous area for 2021–2025

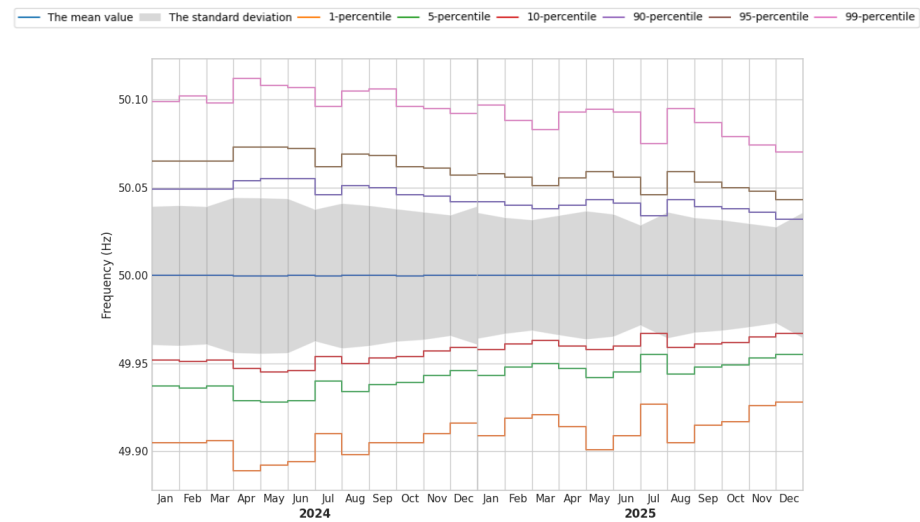


Figure 18 Monthly frequency percentiles and standard deviation in the Nordic synchronous area for 2024 and 2025

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In Figures 19 and 20, the accumulated minutes outside standard ranges are presented for the previous years. Figure 19 shows the annual number of minutes outside the standard range from 2021 to 2025, whereas Figure 20 shows the monthly number of minutes outside the standard range from 2024 to 2025. The frequency quality target parameter, as defined in the SOGL, is 15000 minutes per year for each synchronous area. The annual trend for 2021–2024 shows a stable trend, where the frequency was outside the standard frequency range (of +/- 100mHz) for only around 10,000 minutes per year in the Nordics. In 2025, a significant improvement can be observed.

The following graphs below show that the frequency quality was exceptionally good and that all frequency quality target parameters from SOGL were fulfilled in the Nordic Synchronous Area.

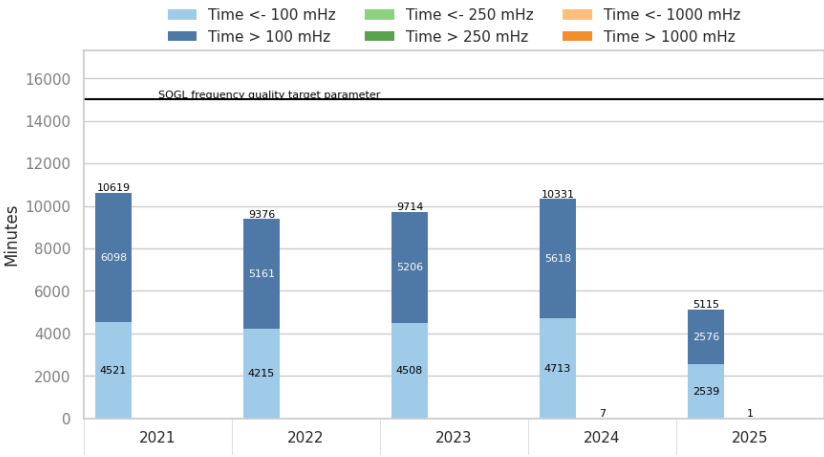


Figure 19 Annual number of minutes outside the standard ranges in the Nordic 2021–2025

Commented [MS1]: Information that may be added to shed light on nordic situation

The Nordics has had an internal goal of 10.000 minutes outside 100 mHz, as to have some margin to the target specified by SOGL. This explains the value being around 10.000 For the last few years. We are still investigating the root causes of the drastic improvement in frequency quality since 2025 (which is even more pronounced in 2026), but expected drivers are

- The effects of new FCR requirements and products
- High volume of batteries in both FCR markets and in balancing markets. (Higher activation speed in a/mFRR)
- 15 minute DA market improving alignment between market and physics.

Commented [CA2R1]: Dear Martin, Thanks for the explanation so far, we will incorporate your input! KR, Alexander & Nora

Commented [PV3R1]: I believe it's well established that the improved frequency quality is due to the Go Live of the Nordic Energy Activation Marked (EAM) on 4th March 2025. It introduced an automated, proactive mFRR activation based on imbalance forecasts, and is a "paradigm shift" in the Nordic system operation. Finer time resolution (15 min MTU) is also important.

Commented [NF4R1]: Thank you for the additional explanation! After an internal discussion, we propose that, as this report is published under the legal mandate of Article 16 SOGL, we should avoid including possible root causes and only include verified explanations. Unless you disagree and can provide a verified explanation, we would prefer to keep the text as it is. KR, Alexander & Nora

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The frequency quality target parameter, as defined in the SOGL, is 15000 minutes per year for each synchronous area. The monthly target parameter can be considered as 1/12 of this value, that is, 1250 minutes.

The graph shows that the frequency quality target parameters from SOGL were fulfilled for the respective months in the Nordic Synchronous Area with significant improvements in 2025.

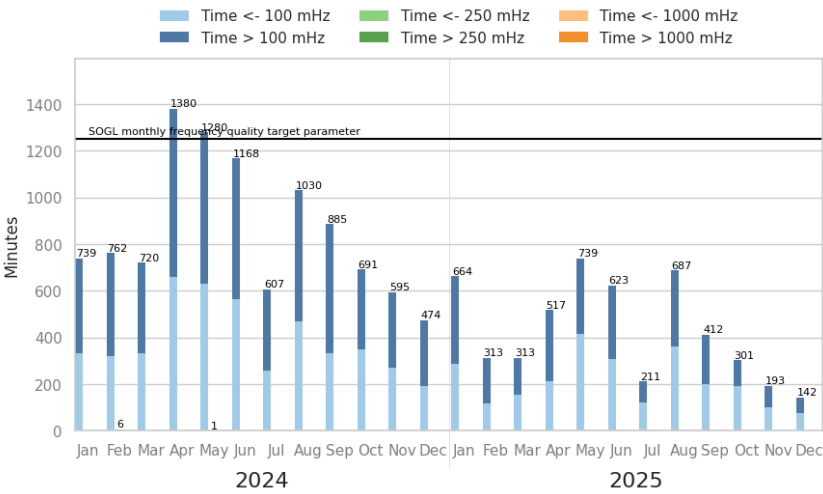


Figure 20 Monthly number of minutes outside the standard ranges in the Nordic synchronous area for 2024 and 2025

Level 1 and Level 2 statistics

Figures 21 to 24 present the monthly distribution of FRCE time intervals outside the Level 1 range and Level 2 range for positive and negative time intervals is presented by month and year. If the maximum number of intervals exceeds 10512 for Level 1 or 1752 for Level 2, then mitigation measures must be proposed and taken.

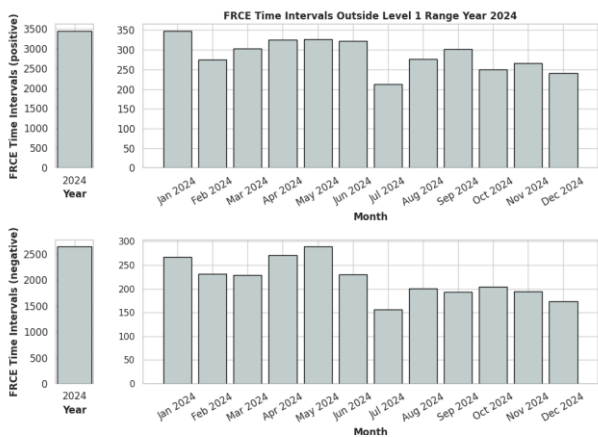


Figure 21 Nordic LFC 2024 FRCE Time Intervals Outside Level 1 Range

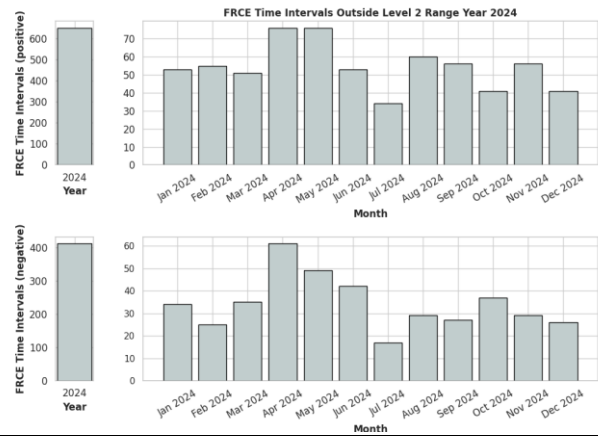


Figure 22 Nordic LFC 2024 FRCE Time Intervals Outside Level 2 Range

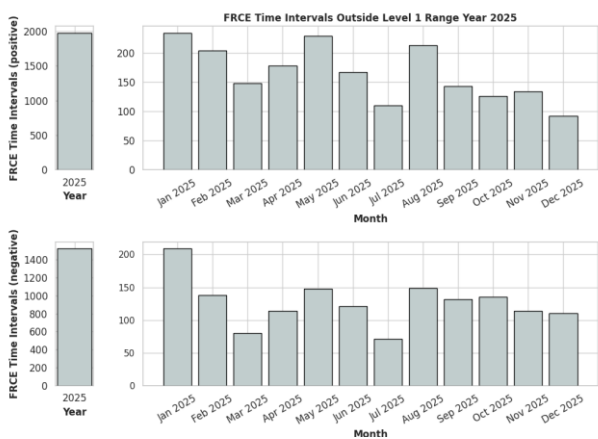


Figure 23 Nordic LFC 2025 FRCE Time Intervals Outside Level 1 Range

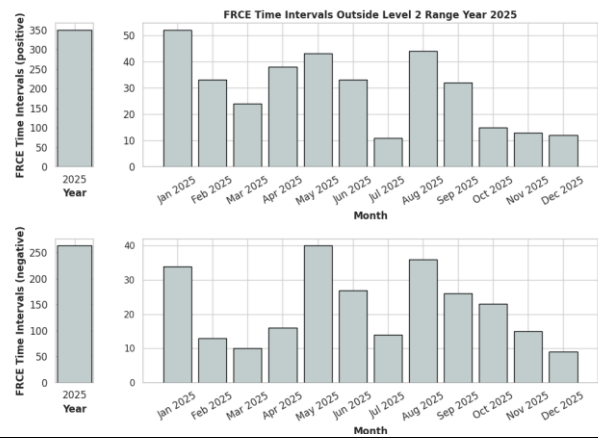


Figure 24 Nordic LFC 2025 FRCE Time Intervals Outside Level 2 Range

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FRCE vs. FRR

The ability of LFC blocks to regulate their own FRCE can be assessed by comparing the FRCE to the reserve capacity from the dimensioning process, as described in Article 157 of the SOGL. Both automatic (aFRR) and manual (mFRR) FRR are included. Voluntary energy bids can optionally be included. Positive and negative FRR is considered individually, that is, positive FRR (FRR+) is compared to the negative FRCE, and a negative FRR (FRR-) is compared to the positive FRCE. FRCE values include all correction signals (e.g., for TSOs part of an Imbalance Netting Process) and is the value after the adjustment process for TSOs part of an FRR activation process. The values used are the 1-minute average values. The granularity of the FRCE values (used to calculate the 1-minute average) is 10 seconds or lower.

The reported number of events indicates the occurrence of large imbalances in LFC blocks (equal or higher than 60 % of dimensioned FRR) and an insufficient capability of LFC blocks to solve them during the time to restore frequency.

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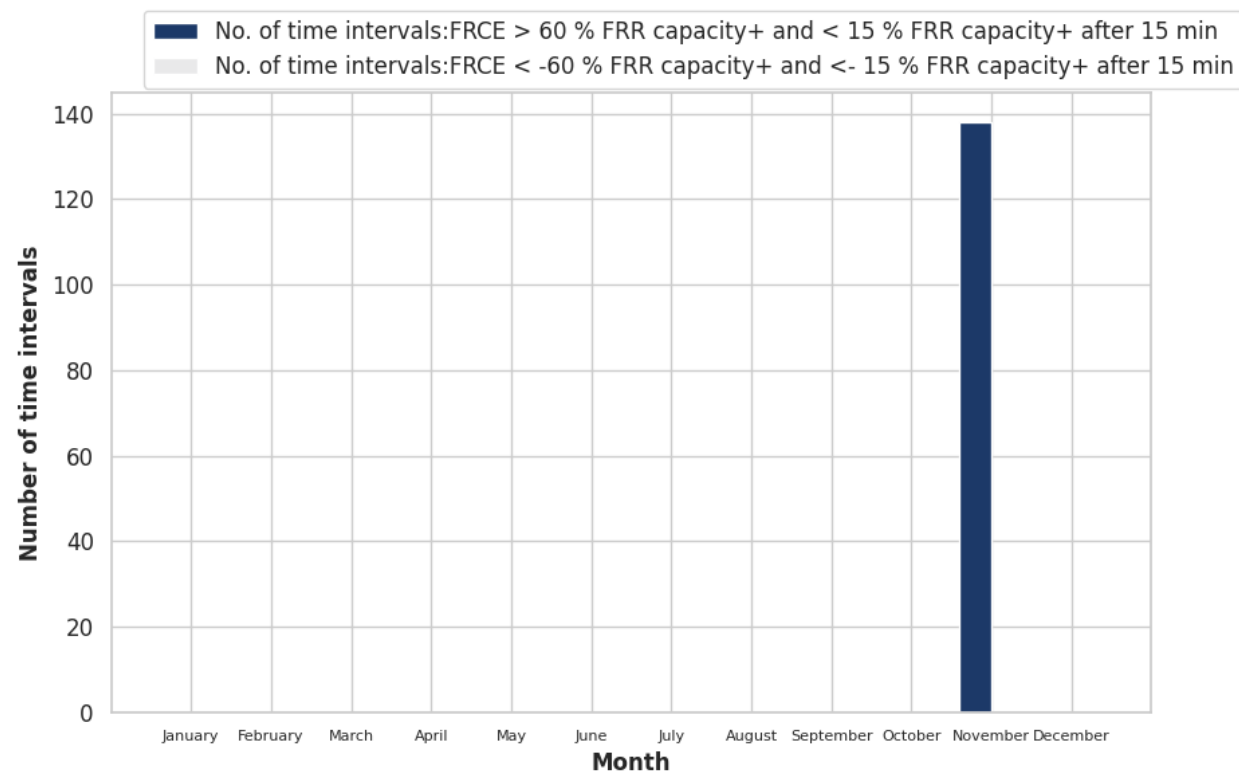


Figure 25 Nordic LFC 2024 FRCE Outside FRR Capacity within 15 minutes

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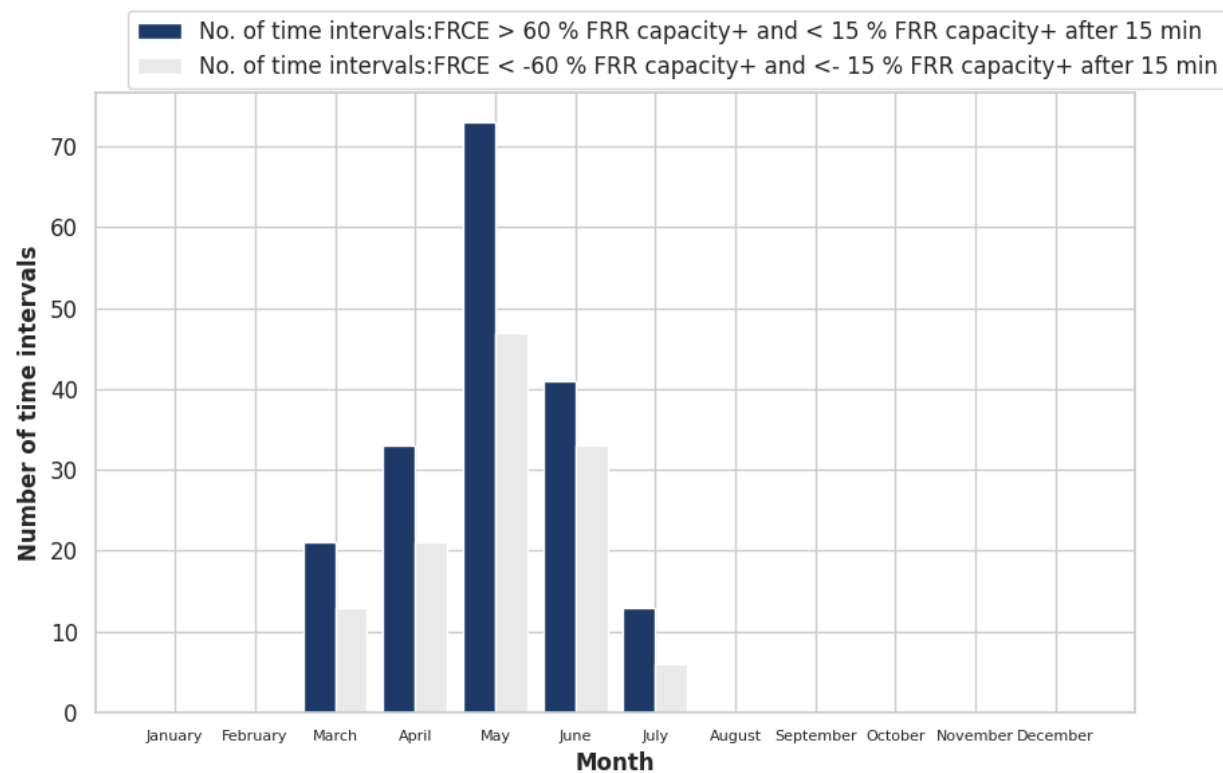


Figure 26 Nordic LFC 2025 FRCE Outside FRR Capacity within 15 minutes

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Frequency quality evaluation

I. Mitigation Measures Analysis

The annual report on load-frequency control provides a description and date of implementation of any mitigation measures and ramping requirements to alleviate deterministic frequency deviations taken in the previous calendar year in accordance with SOGL Articles 137 and 138, in which TSOs were involved.

In accordance with Article 138 of the SOGL, when the values of the frequency quality target parameters calculated for the period of one calendar year are outside the targets set for the synchronous area, all TSOs of the relevant synchronous area should provide analysis and mitigation measures. Furthermore, when the FRCE target parameter values are outside the targets set for the LFC block, all TSOs of the relevant LFC block should provide analysis and mitigation measures.

In accordance with Article 138 of the SOGL, the information contains:

(a) analysis of whether the frequency quality target parameters or the FRCE target parameters will remain outside the targets set for the synchronous area or for the LFC block and, in case of a justified risk that this may happen, an analysis of the causes and a set of recommendations; and

(b) description of any mitigation measures developed to ensure that the targets for the synchronous area or for the LFC block can be met in the future.

For the reporting period, which included the years 2023 and 2024, in line with Figures 21–24, the following analysis and mitigation measures were reported from the Nordic LFC Block:

Mitigation measures for year 2024:

There were no mitigation measures applied as FRCE performance was in the required range.

Mitigation measures for year 2025:

There were no mitigation measures applied as FRCE performance was in the required range.

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FCR DATA

Introduction

The annual report on load-frequency control provides information on the FCR obligations and the initial FCR obligations of each TSO, covering each month of at least two previous calendar years. Furthermore, the SOGL requests that companies report two separate values regarding FCR with the following definitions:

- a) FCR obligation refers to the portion of all the FCR that falls under the responsibility of a TSO; and
- b) Initial FCR obligation refers to the amount of FCR allocated to a TSO on the basis of a sharing key.

Initial FCR obligation is reported on a monthly basis as an average value of FCR in MWs for the reported month. For TSOs that have the same value of initial FCR obligation for the whole year, TSO reports the same value for all months for the reported year. Otherwise, if the initial FCR obligation is not constant during a period, the TSO reports an average value of the FCR on a monthly level for the reported year.

Continental Europe TSOs

In Table 8 and 9, the FCR is given for every Continental Europe TSO from January (I) to December (XII) for 2024 and 2025, respectively. If more than one TSO is operating inside the Member State (e.g., Germany) the provided value per TSO is summarised for the Member State to enable comparability. The determined value describes the amount of initial FCR obligation inside the respective TSO, divided by the amount of procured FCR inside the TSO. This value is calculated as a percentage. Values higher than 100% indicate that respective TSO exported a percentage amount of FCR to other TSOs, while if the reported value is lower than 100%, this means that the TSO imported part of its FCR from other TSOs (Part of its initial FCR obligation is contracted outside its responsibility area). If the value is equal to 100%, this mean that all FCR is ensured inside the TSO's area of responsibility.

Nordic TSOs

In Table 10 and 11, the FCR is pictured for every Nordic TSO from January (I) to December (XII) for 2024 and 2025, respectively. The initial FCR obligation for each TSO is FCR-D capacity, that is, the frequency containment reserve (FCR) used to stabilise the frequency deviations between 50.5 to 50.1 and 49.9 to 49.5 Hz during disturbances. Each TSO ensures these capacities with a combination of mandatory provision, internal markets, and a common market.

IE/Nl

In Table 12 to 13 below, the FCR is presented from January (I) to December (XII) for 2024 and 2025. The FCR requirement for the Synchronous Area of IE/Nl is dynamic and it varies over a day; therefore, it is represented as a historical monthly MW average. In calculating the 'Average monthly FCR', the record spot FCR values are averaged over the monthly period. The amount of FCR obtained inside the area of TSO is also given as a percentage.

The following tables (Table 8-13) show FCR per TSO separately for each Synchronous Area presented in this report.

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TSO data

Continental Europe

It should be noted that twelve TSOs participated in the FCR Cooperation to procure their FCR in 2024 and 2025. Therefore, the value of procured FCR can be different from the initial FCR obligation due to export and import. These countries (TSOs) are Austria (APG), Belgium (Elia), Czech Republic (CEPS), France (RTE), Germany (50Hertz, Amprion, TenneT DE, TransnetBW), the Netherlands (TenneT NL), Slovenia (ELES), Switzerland (Swissgrid) and Western Denmark (Energinet). More information about the FCR Cooperation can be found at https://www.entsoe.eu/network_codes/eb/fcr/.

Furthermore, bilateral cooperation between TSOs might impact the procured FCR. For example, between and CEPS. Additionally, due to non-divisible bids TSO could procure slightly more FCR than obligated like in the case of PSE.

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2024														
	Initial obligation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
50Hertz	116 MW	210.0 %	206.4 %	215.1 %	203.1 %	211.3 %	190.8 %	182.0 %	175.4 %	196.8 %	214.9 %	220.7 %	201.1 %	
APG	72 MW	101.4 %	106.9 %	119.4 %	136.1 %	116.7 %	65.3 %	127.8 %	134.7 %	84.7 %	94.4 %	125.0 %	122.2 %	
Amprion	204 MW	97.7 %	100.7 %	98.5 %	94.4 %	80.4 %	97.5 %	93.3 %	98.7 %	94.8 %	93.4 %	90.3 %	94.3 %	
CEPS	76 MW	100.0 %	98.7 %	100.0 %	101.3 %	101.3 %	88.2 %	101.3 %	101.3 %	101.3 %	100.0 %	100.0 %	100.0 %	
CGES	3 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
ELES	14 MW	3.8 %	2.7 %	1.6 %	14.0 %	10.6 %	16.5 %	15.5 %	9.5 %	10.2 %	2.9 %	4.0 %	3.5 %	
EMS	35 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
ESO	40 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
Elia	93 MW	30.2 %	30.1 %	30.1 %	30.1 %	32.2 %	34.6 %	32.8 %	30.9 %	30.6 %	30.1 %	32.9 %	32.6 %	
Energinet (CE)	25 MW	12.8 %	12.6 %	9.1 %	16.0 %	14.2 %	15.2 %	12.2 %	11.5 %	12.5 %	8.0 %	6.4 %	9.3 %	
HOPS	17 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
IPTO	53 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
KOSTT	3 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
MAVIR	40 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
MEPSO	6 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
Moldelectrica	5 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
NOS BiH	13 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
OST	7 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
PSE	177 MW	100.6 %	100.0 %	101.1 %	100.0 %	100.0 %	101.7 %	99.4 %	100.6 %	100.6 %	100.0 %	99.4 %	100.6 %	
REN	51 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
RTE	486 MW	129.8 %	129.8 %	129.8 %	129.8 %	129.8 %	129.9 %	128.2 %	128.2 %	128.0 %	125.9 %	119.0 %	118.9 %	
Red Eléctrica	314299 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
SEPS	28 MW	103.5 %	103.0 %	103.6 %	99.6 %	103.2 %	103.4 %	105.5 %	102.6 %	95.6 %	103.8 %	105.7 %	101.7 %	
Swissgrid	62 MW	98.4 %	75.8 %	69.4 %	103.2 %	140.3 %	183.9 %	193.5 %	172.6 %	166.1 %	114.5 %	129.0 %	100.0 %	
TEIAS	343 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
TenneT DE	172 MW	88.8 %	101.9 %	102.5 %	84.8 %	94.0 %	92.2 %	88.4 %	92.9 %	97.0 %	100.7 %	100.6 %	102.4 %	
TenneT NL	110 MW	52.8 %	63.6 %	66.0 %	62.8 %	63.0 %	55.3 %	48.5 %	49.2 %	45.9 %	45.8 %	45.6 %	52.3 %	
Terna	310 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
Transselectrica	57 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	
TransnetBW	72 MW	12.7 %	4.9 %	4.2 %	8.9 %	11.0 %	9.2 %	10.2 %	8.8 %	9.5 %	10.0 %	8.5 %	9.6 %	
Ukrenerg	99 MW	34.7 %	45.6 %	36.1 %	15.6 %	5.1 %	7.0 %	27.8 %	23.6 %	30.3 %	51.1 %	67.6 %	49.4 %	

Table 8 FCR statistics for each TSO in Continental Europe for 2024

Commented [O5]: The FCR value for 2024 was 324 MW; 299 MW was the value corresponding to 2023

Commented [CA6R5]: I checked the k-factor list from SGSF for 2024 and the value there for REE is 314 MW, but your colleagues uploaded 299 MW.

Anyway, we will correct this. Thanks for the remark.

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2025

Name	Initial obligation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
50Hertz	109 MW	206.6 %	213.4 %	213.6 %	187.5 %	189.8 %	180.8 %	216.5 %	192.1 %	179.9 %	203.4 %	216.5 %	221.4 %
APG	65 MW	125.6 %	114.8 %	113.9 %	134.7 %	137.2 %	132.6 %	122.9 %	129.6 %	121.8 %	117.8 %	110.5 %	94.2 %
AST+Elering+Litgrid	23 MW	N/A	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
Amprión	191 MW	97.8 %	102.3 %	108.2 %	101.7 %	91.6 %	99.1 %	102.9 %	105.4 %	106.9 %	109.5 %	110.5 %	111.7 %
CEPS	73 MW	98.6 %	100.0 %	98.6 %	100.0 %	100.0 %	100.0 %	100.0 %	98.6 %	100.0 %	98.6 %	98.6 %	100.0 %
CGES	4 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
ELES	14 MW	1.9 %	1.4 %	6.0 %	10.1 %	15.4 %	14.4 %	8.1 %	10.2 %	8.5 %	6.0 %	4.2 %	1.2 %
EMS	39 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
ESO	35 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
Elia	86 MW	32.7 %	34.1 %	44.5 %	55.3 %	55.7 %	58.7 %	54.6 %	70.1 %	66.6 %	70.5 %	58.4 %	58.2 %
Energinet (CE)	25 MW	11.6 %	8.9 %	15.4 %	37.1 %	33.9 %	35.6 %	40.7 %	40.6 %	43.3 %	36.0 %	25.1 %	30.7 %
HOPS	18 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
IPTO	53 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
KOSTT	7 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
MAVIR	39 MW	100.3 %	100.3 %	100.8 %	100.9 %	100.3 %	100.4 %	100.1 %	100.0 %	100.1 %	100.1 %	100.0 %	100.1 %
MEPSO	6 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
Moldelectrica	6 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
NOS BiH	14 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
OST	9 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
PSE	171 MW	100.8 %	102.0 %	110.9 %	116.9 %	115.3 %	118.8 %	108.9 %	104.3 %	106.7 %	107.1 %	101.2 %	101.5 %
REN	52 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
RTE	516 MW	123.2 %	124.0 %	122.2 %	126.9 %	129.7 %	126.5 %	118.5 %	116.5 %	121.1 %	119.1 %	125.0 %	123.7 %
Red Eléctrica	313 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
SEPS	29 MW	98.2 %	95.6 %	99.7 %	100.1 %	100.1 %	100.0 %	101.5 %	99.9 %	96.7 %	99.1 %	99.8 %	99.7 %
Swissgrid	67 MW	70.0 %	57.5 %	43.9 %	43.0 %	71.3 %	89.1 %	119.4 %	120.1 %	137.9 %	89.6 %	63.6 %	63.3 %
TEIAS	356 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
TenneT DE	161 MW	104.4 %	105.1 %	103.5 %	102.5 %	89.6 %	97.2 %	91.8 %	95.6 %	81.7 %	76.6 %	72.0 %	84.9 %
TenneT NL	123 MW	45.7 %	38.9 %	39.4 %	42.1 %	44.3 %	41.9 %	39.0 %	38.2 %	41.9 %	43.4 %	36.7 %	37.9 %
Terna	333 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
Transelectrica	58 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
TransnetBW	67 MW	10.8 %	10.4 %	10.8 %	11.7 %	9.5 %	10.7 %	11.5 %	7.4 %	7.5 %	13.9 %	11.6 %	11.6 %
Ukrenergó	95 MW	43.9 %	40.9 %	47.4 %	77.4 %	82.6 %	85.5 %	91.6 %	95.3 %	99.6 %	102.8 %	102.8 %	102.8 %

Table 9 FCR statistics for each TSO in Continental Europe for 2025

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Nordic

2024

Name	Initial obligation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energinet (Nordic)	44 MW	98.0 %	130.5 %	107.3 %	125.2 %	119.9 %	115.7 %	110.6 %	132.7 %	116.3 %	138.1 %	130.7 %	126.8 %
Fingrid	284 MW	101.8 %	102.3 %	102.8 %	100.4 %	87.0 %	89.3 %	100.3 %	101.5 %	101.6 %	102.1 %	102.7 %	104.0 %
Statnett	527 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
Svenska kraftnät	462 MW	95.7 %	93.4 %	98.0 %	96.1 %	100.9 %	98.8 %	97.6 %	100.9 %	103.3 %	98.9 %	99.6 %	100.4 %

Table 10 FCR statistics for each TSO in the Nordics for 2024

LFC ANNUAL REPORT 2025



Final | 20.05.2026

2025

Name	Initial obligation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energinet (Nordic)	46 MW	128.1 %	129.5 %	121.8 %	94.1 %	121.8 %	117.4 %	124.7 %	121.2 %	139.0 %	137.7 %	146.7 %	138.5 %
Fingrid	289 MW	96.0 %	95.7 %	97.3 %	100.7 %	98.8 %	101.5 %	98.2 %	96.6 %	98.8 %	103.6 %	104.8 %	103.6 %
Statnett	548 MW	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
Svenska kraftnät	533 MW	99.2 %	99.1 %	98.3 %	97.0 %	97.0 %	95.9 %	97.1 %	98.3 %	95.5 %	93.2 %	93.2 %	94.2 %

Table 11 FCR statistics for each TSO in the Nordics for 2025

LFC ANNUAL REPORT 2025

entsoe

Final | 20.05.2026

Ireland/Northern Ireland

Commented [CA7]: Values updated for Ireland/Northern Ireland.

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Average Monthly FCR [MW]	306	305	300	321	335	333	337	325	323	316	326	301
FCR obtained inside the area of TSO [%]	30 %	30 %	31 %	29 %	27 %	27 %	28 %	28 %	28 %	29 %	28 %	31 %

Table 12 FCR statistics for Ireland/Northern Ireland for 2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Average Monthly FCR [MW]	325	306	333	341	354	343	336	334	330	323	331	323
FCR obtained inside the area of TSO [%]	26 %	26 %	24 %	25 %	25 %	23 %	24 %	24 %	25 %	25 %	25 %	27 %

Table 13 FCR statistics for Ireland/Northern Ireland for 2025

GLOSSARY

Abbreviation	Meaning
AGC	Automatic Generation Control
CE	Continental Europe
EMS	Energy Management System
FCP	Frequency Containment Process
FRCE	Frequency Restoration Control Error
FRP	Frequency Restoration Process
FRR	Frequency Restoration Reserves
GB	Great Britain
IE/Ni	Ireland and Northern Ireland
LF-Controller	Load-Frequency Controller
LFC	Load-Frequency Control
PGM	Power-Generating Module
SCADA	Supervisory Control And Data Acquisition
SOC	System Operations Committee
TO	Transmission owner
TSO	Transmission System Operator
aFRR	Automatic Frequency Restoration Reserves
mFRR	Manual Frequency Restoration Reserves

Table 14 Abbreviations

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APPENDIX I – SYNCHRONOUS AREA DATA

Continental Europe

2024													
Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	50.00060	50.00016	50.00086	50.00032	49.99994	50.00027	50.00020	50.00065	50.00012	49.99994	50.00009	50.00005	50.00027
The standard deviation	0.0222	0.0218	0.0228	0.0249	0.0235	0.0215	0.0221	0.0202	0.0220	0.0220	0.0207	0.0191	0.0219
1-percentile	49.943	49.945	49.944	49.937	49.942	49.945	49.943	49.950	49.945	49.943	49.945	49.949	49.944
5-percentile	49.965	49.964	49.964	49.960	49.963	49.965	49.965	49.968	49.964	49.964	49.966	49.969	49.965
10-percentile	49.974	49.973	49.973	49.970	49.972	49.974	49.973	49.976	49.973	49.973	49.975	49.977	49.974
90-percentile	50.027	50.026	50.028	50.030	50.029	50.026	50.026	50.025	50.027	50.026	50.025	50.023	50.027
95-percentile	50.035	50.034	50.037	50.041	50.038	50.034	50.034	50.032	50.035	50.034	50.031	50.029	50.035
99-percentile	50.055	50.051	50.057	50.062	50.058	50.052	50.053	50.049	50.052	50.052	50.046	50.044	50.053
Time(min) > 50 mHz	633	437	730	1051	825	483	555	387	514	518	265	256	6653
Time(min) < -50 mHz	713	622	688	1036	788	591	708	424	635	736	608	470	8018
Time(min) > 800 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
Time(min) < -800 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq. deviation > 100 mHz and not < 25 mHz	0	0	3	1	1	0	0	0	0	1	0	0	6
No. of events freq. deviation < -100 mHz and not < -25 mHz	0	0	0	0	1	0	1	0	0	0	0	0	2

Table 15 CE SA Performance for Year 2024

LFC ANNUAL REPORT 2025



Final | 20.05.2026

2025

Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	50.00077	50.00055	50.00044	50.00026	49.99974	49.99995	50.00015	50.00113	49.99951	50.00023	50.00070	50.00001	50.00029
The standard deviation	0.0205	0.0218	0.0247	0.0250	0.0238	0.0229	0.0205	0.0214	0.0217	0.0210	0.0194	0.0187	0.0218
1-percentile	49.948	49.945	49.937	49.936	49.937	49.941	49.949	49.948	49.946	49.947	49.953	49.954	49.945
5-percentile	49.968	49.966	49.960	49.961	49.961	49.963	49.967	49.967	49.965	49.966	49.969	49.970	49.965
10-percentile	49.976	49.974	49.970	49.971	49.971	49.972	49.975	49.975	49.973	49.974	49.976	49.976	49.974
90-percentile	50.025	50.027	50.029	50.030	50.028	50.027	50.025	50.026	50.026	50.026	50.024	50.023	50.026
95-percentile	50.032	50.034	50.039	50.041	50.037	50.035	50.031	50.034	50.034	50.033	50.030	50.028	50.034
99-percentile	50.049	50.050	50.062	50.064	50.058	50.056	50.048	50.054	50.052	50.047	50.044	50.040	50.052
Time(min) > 50 mHz	395	390	975	1133	741	638	359	587	475	307	203	106	6310
Time(min) < -50 mHz	506	556	1067	1019	1022	789	456	501	583	537	307	268	7612
Time(min) > 800 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
Time(min) < -800 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq. deviation > 100 mHz and not < 25 mHz	0	0	1	3	0	1	0	0	0	0	0	0	5
No. of events freq. deviation < -100 mHz and not < -25 mHz	1	0	0	0	1	0	0	0	0	0	0	0	2

Table 16 CE SA Performance for Year 2025

LFC ANNUAL REPORT 2025



Final | 20.05.2026

Ireland/Northern Ireland

2024													
Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	49.99966	49.99993	49.99981	50.00040	49.99979	50.00008	50.00047	50.00024	49.99970	50.00033	49.99981	49.99993	50.00001
The standard deviation	0.0409	0.0438	0.0427	0.0406	0.0408	0.0399	0.0408	0.0416	0.0409	0.0425	0.0398	0.0425	0.0414
1-percentile	49.910	49.906	49.905	49.907	49.907	49.909	49.910	49.914	49.911	49.908	49.911	49.910	49.909
5-percentile	49.933	49.932	49.932	49.936	49.934	49.935	49.936	49.936	49.935	49.932	49.936	49.934	49.934
10-percentile	49.947	49.945	49.946	49.949	49.948	49.949	49.949	49.948	49.948	49.946	49.949	49.946	49.948
90-percentile	50.052	50.057	50.055	50.052	50.050	50.049	50.052	50.055	50.053	50.055	50.050	50.056	50.053
95-percentile	50.067	50.073	50.070	50.067	50.063	50.063	50.065	50.070	50.067	50.069	50.064	50.070	50.067
99-percentile	50.092	50.100	50.098	50.095	50.090	50.090	50.092	50.097	50.093	50.096	50.089	50.095	50.094
Time(min) > 200 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
Time(min) < -200 mHz	0	0	0	4	10	3	1	0	6	0	5	4	33
Time(min) > 1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
Time(min) < -1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
No.of events freq.dev > 400 and > 200 mHz within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq.dev < -400 and < -200 mHz within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq.dev > 500 mHz and > 1 min	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq.dev < -500 mHz and > 1 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 17 IE/Ni SA Performance for Year 2024

LFC ANNUAL REPORT 2025



Final | 20.05.2026

2025

Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	50.00076	49.99984	50.00035	50.00026	49.99903	50.00059	49.99980	50.00011	50.00052	50.00008	50.00013	50.00002	50.00012
The standard deviation	0.0430	0.0442	0.0439	0.0416	0.0389	0.0412	0.0402	0.0379	0.0414	0.0401	0.0417	0.0394	0.0411
1-percentile	49.908	49.903	49.905	49.907	49.912	49.909	49.910	49.914	49.903	49.910	49.906	49.908	49.908
5-percentile	49.932	49.929	49.930	49.933	49.937	49.934	49.936	49.938	49.933	49.934	49.931	49.935	49.933
10-percentile	49.946	49.943	49.944	49.946	49.950	49.948	49.949	49.951	49.947	49.948	49.945	49.949	49.947
90-percentile	50.057	50.057	50.056	50.053	50.049	50.053	50.051	50.048	50.053	50.050	50.052	50.049	50.052
95-percentile	50.071	50.073	50.071	50.066	50.062	50.067	50.066	50.060	50.067	50.065	50.065	50.062	50.066
99-percentile	50.098	50.100	50.099	50.092	50.088	50.094	50.091	50.084	50.091	50.090	50.090	50.087	50.092
Time(min) > 200 mHz	1	0	0	0	0	0	0	0	0	0	0	0	1
Time(min) < -200 mHz	0	5	0	2	2	0	2	0	0	0	0	3	14
Time(min) > 1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
Time(min) < -1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
No.of events freq.dev > 400 and > 200 mHz within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq.dev < -400 and < -200 mHz within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq.dev > 500 mHz and > 1 min	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of events freq.dev < -500 mHz and > 1 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 18 IE/Ni SA Performance for Year 2025

LFC ANNUAL REPORT 2025



Final | 20.05.2026

Nordic

2024													
Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	49.99997	50.00008	50.00018	49.99988	49.99985	50.00018	49.99986	49.99993	50.00020	49.99984	50.00010	50.00014	50.00002
The standard deviation	0.0394	0.0398	0.0391	0.0441	0.0443	0.0439	0.0375	0.0412	0.0399	0.0377	0.0363	0.0343	0.0398
1-percentile	49.905	49.905	49.906	49.889	49.892	49.894	49.910	49.898	49.905	49.905	49.910	49.916	49.903
5-percentile	49.937	49.936	49.937	49.929	49.928	49.929	49.940	49.934	49.938	49.939	49.943	49.946	49.936
10-percentile	49.952	49.951	49.952	49.947	49.945	49.946	49.954	49.950	49.953	49.954	49.957	49.959	49.952
90-percentile	50.049	50.049	50.049	50.054	50.055	50.055	50.046	50.051	50.050	50.046	50.045	50.042	50.049
95-percentile	50.065	50.065	50.065	50.073	50.073	50.072	50.062	50.069	50.068	50.062	50.061	50.057	50.066
99-percentile	50.099	50.102	50.098	50.112	50.108	50.107	50.096	50.105	50.106	50.096	50.095	50.092	50.101
Time(min) > 100 mHz	407	443	387	719	648	604	349	560	551	342	324	284	5618
Time(min) < -100 mHz	332	319	333	661	632	564	258	470	334	349	271	190	4713
Time(min) > 1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
Time(min) < -1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
No.of events freq.deviation > 200 mHz and > 100 mHz within 15 minutes	1	1	0	0	1	0	0	1	1	0	0	0	5
No.of events freq.deviation < -200 mHz and< -100 mHz within 15 minutes	0	0	0	2	1	0	0	1	0	0	0	0	4

Table 19 Nordic SA Performance for Year 2024

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Final | 20.05.2026

2025

Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	49.99999	50.00024	50.00020	50.00027	50.00014	50.00022	50.00027	50.00025	50.00020	50.00016	50.00030	50.00020	50.00020
The standard deviation	0.0358	0.0330	0.0314	0.0340	0.0364	0.0348	0.0284	0.0358	0.0326	0.0314	0.0294	0.0273	0.0325
1-percentile	49.909	49.919	49.921	49.914	49.901	49.909	49.927	49.905	49.915	49.917	49.926	49.928	49.916
5-percentile	49.943	49.948	49.950	49.947	49.942	49.945	49.955	49.944	49.948	49.949	49.953	49.955	49.948
10-percentile	49.958	49.961	49.963	49.960	49.958	49.960	49.967	49.959	49.961	49.962	49.965	49.967	49.962
90-percentile	50.042	50.040	50.038	50.040	50.043	50.041	50.034	50.043	50.039	50.038	50.036	50.032	50.039
95-percentile	50.058	50.056	50.051	50.055	50.059	50.056	50.046	50.059	50.053	50.050	50.048	50.043	50.053
99-percentile	50.097	50.088	50.083	50.093	50.094	50.093	50.075	50.095	50.087	50.079	50.074	50.070	50.086
Time(min) > 100 mHz	377	198	160	304	323	317	90	326	213	111	92	66	2576
Time(min) < -100 mHz	287	115	153	214	416	306	121	361	199	190	101	76	2539
Time(min) > 1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
Time(min) < -1000 mHz	0	0	0	0	0	0	0	0	0	0	0	0	0
No.of events freq.deviation > 200 mHz and > 100 mHz within 15 minutes	2	0	0	0	0	0	0	0	0	0	0	0	2
No.of events freq.deviation < -200 mHz and < -100 mHz within 15 minutes	0	0	0	0	0	1	0	0	0	0	0	0	1

Table 20 Nordic SA Performance for Year 2025

APPENDIX II – BLOCK DATA

Continental Europe

AK

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	35.9	20.3	14.8	22.6	20.0	6.9	6.2	8.6	15.5	4.8	7.8	10.2	12.8
The standard deviation	36	21	24	33	18	22	14	20	18	22	25	29	23
1-percentile	-32	-20	-29	-28	-18	-41	-20	-43	-10	-29	-37	-73	-32
5-percentile	-16	-12	-25	-28	-5	-24	-16	-18	-5	-19	-23	-66	-22
10-percentile	-6	-7	-19	-11	1	-20	-14	-16	0	-12	-17	-42	-14
90-percentile	73	45	48	73	44	31	20	28	37	29	53	25	42
95-percentile	87	52	55	75	56	33	25	36	41	40	56	35	49
99-percentile	131	58	61	76	59	54	38	54	63	71	64	41	64
Number of time intervals: average FRCE > Level 1 positive	1428	999	949	1122	1046	671	504	635	768	569	769	625	10085
Number of time intervals: average FRCE < Level 1 negative	360	254	405	367	243	453	292	262	276	426	536	905	4779
Number of time intervals: average FRCE > Level 2 positive	1020	550	576	722	579	347	208	274	420	319	463	351	5829
Number of time intervals: average FRCE < Level 2 negative	112	119	180	160	151	204	95	140	97	203	295	561	2317
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	2345	1769	3145	3273	2167	3974	2211	3033	2709	3963	5765	9807	44161
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	17838	10448	9760	12899	10881	5982	4263	6732	8644	6131	8678	6334	108590

Table 21 LFC Block Performance for Block AK for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	16.2	12.3	21.2	5.3	2.1	2.7	12.7	8.0	17.5	4.2	2.3	-17.2	5.2
The standard deviation	32	34	24	36	17	26	20	36	18	38	20	30	28
1-percentile	-160	-189	-114	-187	-116	-145	-90	-158	-100	-218	-127	-172	-148
5-percentile	-67	-115	-58	-95	-54	-67	-49	-71	-50	-110	-81	-113	-77
10-percentile	-37	-71	-35	-50	-33	-47	-31	-47	-29	-69	-57	-84	-49
90-percentile	91	35	86	64	41	56	64	61	71	81	62	43	63
95-percentile	145	57	118	85	57	75	88	96	93	110	87	65	90
99-percentile	248	103	205	116	98	113	178	267	130	179	130	111	156
Number of time intervals: average FRCE > Level 1 positive	827	315	984	778	459	632	864	754	1039	916	680	467	8715
Number of time intervals: average FRCE < Level 1 negative	364	587	333	443	327	514	335	542	301	745	637	1042	6170
Number of time intervals: average FRCE > Level 2 positive	479	129	570	358	138	273	403	359	470	522	358	210	4269
Number of time intervals: average FRCE < Level 2 negative	184	341	148	246	124	185	116	246	124	391	311	613	3029
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	3169	6071	3318	4843	3127	6373	3449	6761	3153	7707	5269	10486	63726
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	8794	2536	10775	8959	3845	8457	8383	9623	13948	10465	7008	4179	96972

Table 22 LFC Block Performance for Block AK for Year 2025

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entsoe

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APG

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.2	0.2	0.2	0.1	0.5	0.5	0.4	0.2	0.2	0.0	-0.4	-0.1	0.2
The standard deviation	26	25	30	31	35	33	32	38	37	34	22	23	31
1-percentile	-85	-82	-91	-95	-102	-98	-94	-115	-110	-105	-71	-77	-94
5-percentile	-41	-39	-47	-51	-53	-49	-51	-63	-60	-56	-34	-37	-48
10-percentile	-23	-23	-28	-31	-31	-29	-34	-40	-39	-35	-20	-22	-30
90-percentile	24	24	29	31	32	30	33	40	38	34	19	22	30
95-percentile	40	40	47	50	53	49	51	61	59	55	31	35	48
99-percentile	82	78	92	96	107	102	94	108	112	106	61	66	92
Number of time intervals: average FRCE > Level 1 positive	1	0	5	0	4	8	2	2	6	0	0	2	30
Number of time intervals: average FRCE < Level 1 negative	0	0	4	1	0	3	0	1	2	0	4	2	17
Number of time intervals: average FRCE > Level 2 positive	0	0	2	0	3	5	2	0	2	0	0	1	15
Number of time intervals: average FRCE < Level 2 negative	0	0	0	0	0	1	0	0	0	0	4	0	5
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	1	0	1	0	1	1	1	0	0	0	0	0	5
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 23 LFC Block Performance for Block APG for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-0.2	-0.3	0.4	-0.1	-0.1	0.5	0.3	0.6	0.4	0.5	0.5	0.4	0.2
The standard deviation	23	24	24	30	32	34	20	18	22	20	15	17	23
1-percentile	-78	-81	-75	-95	-98	-95	-57	-54	-70	-67	-52	-60	-73
5-percentile	-37	-38	-36	-48	-51	-49	-26	-25	-32	-30	-18	-24	-35
10-percentile	-21	-21	-21	-29	-31	-30	-15	-14	-19	-17	-10	-13	-20
90-percentile	21	21	22	28	30	30	15	15	19	18	11	14	20
95-percentile	34	34	35	45	48	48	25	25	31	30	18	24	33
99-percentile	65	64	67	86	89	98	61	58	64	59	46	52	67
Number of time intervals: average FRCE > Level 1 positive	0	0	3	4	2	12	5	2	0	0	2	0	30
Number of time intervals: average FRCE < Level 1 negative	3	5	0	7	3	8	3	0	6	0	0	0	35
Number of time intervals: average FRCE > Level 2 positive	0	0	2	1	1	6	3	1	0	0	1	0	15
Number of time intervals: average FRCE < Level 2 negative	1	4	0	3	3	4	1	0	2	0	0	0	18
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	1	1	1	2	1	0	0	0	0	0	6
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	1	1	0	1	1	0	0	0	0	0	0	0	4

Table 24 LFC Block Performance for Block APG for Year 2025

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entsoe

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Baltic

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value													
The standard deviation													
1-percentile													
5-percentile													
10-percentile													
90-percentile													
95-percentile													
99-percentile													
Number of time intervals: average FRCE > Level 1 positive													
Number of time intervals: average FRCE < Level 1 negative													
Number of time intervals: average FRCE > Level 2 positive													
Number of time intervals: average FRCE < Level 2 negative													
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min													
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min													

Table 25 LFC Block Performance for Block Baltic for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.0	3.5	10.2	7.5	4.5	1.8	4.5	1.6	1.8	-0.4	-0.2	0.1	2.9
The standard deviation	0	57	67	59	34	35	23	21	28	18	11	9	30
1-percentile	0	-151	-164	-153	-94	-114	-39	-68	-85	-61	-26	-19	-81
5-percentile	0	-90	-89	-82	-38	-46	-15	-21	-24	-16	-13	-12	-37
10-percentile	0	-59	-63	-47	-18	-20	-10	-12	-14	-10	-8	-8	-22
90-percentile	0	70	88	74	28	26	19	16	17	9	8	8	30
95-percentile	0	106	124	111	56	56	41	31	34	15	13	12	50
99-percentile	0	177	218	200	127	125	109	81	109	46	23	24	103
Number of time intervals: average FRCE > Level 1 positive	0	481	824	526	240	217	176	129	145	44	16	17	2815
Number of time intervals: average FRCE < Level 1 negative	0	416	547	358	155	170	38	74	95	74	17	7	1951
Number of time intervals: average FRCE > Level 2 positive	0	267	430	298	117	101	72	50	72	11	7	6	1431
Number of time intervals: average FRCE < Level 2 negative	0	209	238	179	59	80	14	33	38	24	6	0	880
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	5	11	13	3	0	0	0	1	0	0	0	33
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 26 LFC Block Performance for Block Baltic for Year 2025

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entsoe

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CEPS

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.0	-0.2	-0.1	-0.5	-0.9	0.2	0.1	0.1	0.1	0.0	0.0	0.1	-0.1
The standard deviation	28	27	29	32	30	38	32	35	38	37	33	33	33
1-percentile	-87	-89	-93	-100	-91	-96	-85	-94	-101	-101	-89	-87	-93
5-percentile	-38	-38	-44	-50	-45	-57	-49	-55	-60	-60	-52	-50	-50
10-percentile	-21	-22	-27	-32	-29	-41	-35	-39	-42	-42	-37	-36	-34
90-percentile	22	22	27	31	27	42	35	40	42	42	38	37	34
95-percentile	38	38	45	48	44	58	49	56	59	60	54	52	50
99-percentile	85	84	91	93	89	98	84	96	100	99	93	91	92
Number of time intervals: average FRCE > Level 1 positive	3	0	1	3	2	3	1	2	3	0	0	1	19
Number of time intervals: average FRCE < Level 1 negative	6	2	4	3	3	5	0	0	1	0	0	1	25
Number of time intervals: average FRCE > Level 2 positive	1	0	1	0	1	0	0	0	1	0	0	1	5
Number of time intervals: average FRCE < Level 2 negative	2	0	0	1	0	1	1	0	0	0	0	0	5
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 27 LFC Block Performance for Block CEPS for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
The standard deviation	38	35	35	35	31	30	24	23	27	28	24	25	30
1-percentile	-99	-94	-90	-93	-83	-77	-59	-59	-70	-75	-58	-60	-76
5-percentile	-55	-52	-54	-53	-48	-46	-35	-34	-41	-42	-38	-38	-45
10-percentile	-39	-38	-39	-38	-35	-33	-26	-25	-30	-31	-29	-29	-33
90-percentile	40	39	39	38	35	33	26	25	30	31	29	29	33
95-percentile	56	53	56	53	48	45	35	34	41	42	38	38	45
99-percentile	110	95	95	91	83	79	57	56	70	75	58	62	78
Number of time intervals: average FRCE > Level 1 positive	7	0	0	1	0	1	1	0	0	0	0	0	10
Number of time intervals: average FRCE < Level 1 negative	4	2	0	0	1	0	2	0	1	1	0	0	11
Number of time intervals: average FRCE > Level 2 positive	1	0	0	1	0	0	1	0	0	0	0	0	3
Number of time intervals: average FRCE < Level 2 negative	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 28 LFC Block Performance for Block CEPS for Year 2025

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ELIA

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-7.8	-9.2	-11.2	-9.7	-18.9	-13.8	-12.5	-12.1	-16.4	-22.5	-19.2	-8.1	-13.5
The standard deviation	40	35	50	54	45	55	43	45	49	39	40	24	43
1-percentile	-156	-127	-193	-165	-155	-198	-172	-184	-175	-164	-167	-71	-160
5-percentile	-66	-59	-81	-76	-80	-90	-75	-71	-84	-86	-88	-40	-75
10-percentile	-42	-41	-51	-50	-58	-58	-50	-47	-55	-61	-56	-30	-50
90-percentile	30	25	31	32	19	27	24	25	25	14	16	17	24
95-percentile	43	39	51	52	39	47	42	40	46	29	29	32	41
99-percentile	95	73	111	123	121	121	92	89	89	57	68	54	91
Number of time intervals: average FRCE > Level 1 positive	39	17	65	61	62	61	45	36	39	14	14	5	458
Number of time intervals: average FRCE < Level 1 negative	110	79	146	123	147	180	123	129	153	167	166	21	1544
Number of time intervals: average FRCE > Level 2 positive	8	2	18	18	15	16	11	6	10	2	1	0	107
Number of time intervals: average FRCE < Level 2 negative	24	17	41	30	31	53	37	41	43	36	37	5	395
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	8	5	0	0	0	0	0	13
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	1	0	2	7	10	1	0	0	1	1	0	0	23

Table 29 LFC Block Performance for Block ELIA for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-12.1	-7.5	-11.9	-9.6	-9.7	-6.3	-2.0	-9.3	-7.3	-9.9	-9.5	-8.0	-8.6
The standard deviation	30	24	50	26	23	30	55	23	23	25	39	23	31
1-percentile	-95	-74	-236	-84	-84	-89	-89	-58	-59	-72	-77	-62	-90
5-percentile	-52	-40	-48	-45	-41	-36	-38	-37	-37	-42	-49	-40	-42
10-percentile	-38	-30	-34	-33	-28	-26	-26	-30	-30	-35	-38	-29	-31
90-percentile	16	18	16	16	10	14	18	12	18	16	16	14	15
95-percentile	29	29	26	25	17	22	39	21	27	26	29	27	26
99-percentile	60	63	62	59	40	42	198	52	51	52	69	53	67
Number of time intervals: average FRCE > Level 1 positive	20	15	23	15	5	10	95	20	14	20	36	18	291
Number of time intervals: average FRCE < Level 1 negative	65	27	83	49	36	43	44	19	25	39	64	27	521
Number of time intervals: average FRCE > Level 2 positive	4	0	7	2	3	1	55	7	1	1	12	3	96
Number of time intervals: average FRCE < Level 2 negative	11	8	46	9	10	16	13	6	6	8	8	3	144
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	3	2	2	0	2	2	0	0	0	0	11
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	1	0	0	0	0	2	0	0	0	0	0	0	3

Table 30 LFC Block Performance for Block ELIA for Year 2025

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ESO

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	10.1	33.0	22.7	16.6	2.6	-0.9	3.4	-4.9	4.4	1.0	-4.3	-1.0	6.9
The standard deviation	83	108	83	82	61	56	61	52	48	47	41	40	64
1-percentile	-219	-155	-149	-172	-154	-174	-158	-179	-124	-150	-142	-137	-159
5-percentile	-112	-78	-74	-93	-83	-84	-88	-85	-65	-71	-79	-62	-81
10-percentile	-73	-50	-51	-58	-57	-55	-60	-59	-37	-40	-48	-34	-52
90-percentile	107	123	110	110	63	57	76	49	57	44	32	34	72
95-percentile	157	244	181	170	94	87	109	78	88	70	55	60	116
99-percentile	253	488	343	332	228	170	185	136	176	149	117	127	225
Number of time intervals: average FRCE > Level 1 positive	646	666	654	619	371	327	488	271	307	234	154	179	4916
Number of time intervals: average FRCE < Level 1 negative	436	256	283	331	334	305	362	341	198	219	260	182	3507
Number of time intervals: average FRCE > Level 2 positive	327	372	334	335	132	102	172	80	100	83	43	59	2139
Number of time intervals: average FRCE < Level 2 negative	182	83	80	121	104	108	115	107	59	81	89	68	1197
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	101	81	89	79	33	28	44	22	31	23	16	15	562
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	24	7	7	8	4	7	6	9	1	3	0	3	79

Table 31 LFC Block Performance for Block ESO for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-0.1	-4.6	0.9	5.4	2.2	3.7	4.6	5.5	5.9	0.2	-0.1	4.7	2.4
The standard deviation	35	40	59	49	29	25	26	26	24	30	25	44	34
1-percentile	-110	-142	-199	-120	-72	-77	-68	-60	-50	-102	-86	-86	-98
5-percentile	-55	-72	-83	-55	-38	-29	-29	-24	-20	-46	-34	-30	-43
10-percentile	-29	-42	-48	-32	-23	-15	-13	-11	-9	-23	-16	-15	-23
90-percentile	27	27	56	46	28	30	32	33	31	26	21	28	32
95-percentile	48	50	90	79	49	46	50	50	48	46	38	51	54
99-percentile	119	117	169	176	104	85	93	103	95	94	82	143	115
Number of time intervals: average FRCE > Level 1 positive	168	170	384	296	167	152	207	217	194	184	123	196	2458
Number of time intervals: average FRCE < Level 1 negative	192	245	313	190	85	73	77	64	44	174	115	109	1681
Number of time intervals: average FRCE > Level 2 positive	67	59	157	124	45	26	52	53	50	45	30	73	781
Number of time intervals: average FRCE < Level 2 negative	61	83	142	68	21	24	18	14	11	48	32	33	555
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	7	16	39	24	8	2	2	6	3	5	2	12	126
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	2	6	10	6	1	0	0	0	0	0	0	3	28

Table 32 LFC Block Performance for Block ESO for Year 2025

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Germany

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	2.9	10.0	20.8	11.6	19.1	6.5	1.1	10.4	10.1	13.4	15.6	5.0	10.5
The standard deviation	88	83	120	96	107	98	81	88	80	69	61	57	86
1-percentile	-249	-231	-261	-264	-216	-255	-221	-239	-212	-172	-129	-124	-214
5-percentile	-135	-111	-126	-118	-109	-119	-113	-103	-101	-61	-78	-81	-104
10-percentile	-86	-70	-81	-78	-67	-74	-78	-63	-60	-34	-55	-61	-67
90-percentile	93	95	125	117	107	88	82	98	87	81	93	76	95
95-percentile	137	139	203	180	156	147	129	155	138	108	108	99	142
99-percentile	249	239	382	300	400	362	257	288	251	229	184	170	276
Number of time intervals: average FRCE > Level 1 positive	48	53	150	107	83	97	62	84	60	41	14	19	818
Number of time intervals: average FRCE < Level 1 negative	57	41	55	59	34	47	35	44	31	18	3	3	427
Number of time intervals: average FRCE > Level 2 positive	7	6	28	10	30	24	9	11	9	5	0	2	141
Number of time intervals: average FRCE < Level 2 negative	4	6	5	10	4	11	2	11	3	6	0	0	62
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	1	0	0	0	0	0	0	0	1
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 33 LFC Block Performance for Block Germany for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	4.2	-1.0	14.3	24.2	15.4	-3.7	-9.8	2.3	8.8	-4.0	10.9	4.1	5.5
The standard deviation	75	71	66	81	94	86	59	82	93	79	102	84	81
1-percentile	-142	-139	-120	-165	-263	-312	-199	-198	-229	-203	-212	-189	-198
5-percentile	-93	-90	-80	-78	-97	-115	-96	-116	-153	-139	-138	-131	-110
10-percentile	-70	-68	-58	-54	-65	-81	-68	-88	-107	-100	-103	-99	-80
90-percentile	85	74	90	110	110	79	51	97	120	96	136	114	97
95-percentile	114	98	112	139	150	111	75	137	169	138	178	149	131
99-percentile	223	188	188	218	229	192	121	196	247	200	282	201	207
Number of time intervals: average FRCE > Level 1 positive	53	32	37	55	78	35	7	50	124	52	142	67	732
Number of time intervals: average FRCE < Level 1 negative	14	13	11	27	52	69	41	40	84	60	68	41	520
Number of time intervals: average FRCE > Level 2 positive	7	9	6	13	18	2	1	2	4	1	20	2	85
Number of time intervals: average FRCE < Level 2 negative	6	6	0	7	14	22	10	10	1	1	10	3	90
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	3	1	3	2	3	4	0	4	1	0	1	2	24
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	2	2	2	2	2	3	2	3	2	2	1	1	24

Table 34 LFC Block Performance for Block Germany for Year 2025

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IPTO

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	14.6	14.5	16.9	20.1	10.2	5.0	2.2	1.5	7.5	11.1	6.2	5.8	9.7
The standard deviation	46	51	61	90	54	30	31	31	42	39	34	31	45
1-percentile	-62	-53	-46	-56	-56	-63	-66	-84	-80	-67	-66	-67	-64
5-percentile	-27	-25	-22	-29	-27	-31	-34	-37	-38	-28	-31	-35	-30
10-percentile	-16	-16	-14	-20	-17	-21	-22	-24	-25	-17	-21	-20	-19
90-percentile	53	45	50	51	34	29	24	24	38	47	34	34	39
95-percentile	93	84	109	124	59	47	38	41	71	80	56	56	71
99-percentile	228	252	279	523	215	115	102	110	179	168	127	118	201
Number of time intervals: average FRCE > Level 1 positive	250	200	254	259	138	102	73	77	172	215	124	131	1995
Number of time intervals: average FRCE < Level 1 negative	32	17	10	24	19	33	36	58	56	39	36	39	399
Number of time intervals: average FRCE > Level 2 positive	105	110	138	156	67	27	27	27	72	78	39	34	880
Number of time intervals: average FRCE < Level 2 negative	12	3	3	8	3	7	7	14	11	10	7	9	94
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	26	32	53	25	19	11	7	7	24	22	6	10	242
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	1	1	0	0	0	0	0	0	0	0	2

Table 35 LFC Block Performance for Block IPTO for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	4.9	3.9	14.1	20.4	16.2	12.7	13.3	16.7	15.4	10.8	9.7	10.3	12.4
The standard deviation	30	29	48	51	47	45	47	47	44	49	45	41	44
1-percentile	-66	-72	-68	-60	-82	-90	-92	-82	-73	-84	-88	-81	-78
5-percentile	-30	-34	-30	-30	-37	-44	-43	-41	-35	-45	-40	-36	-37
10-percentile	-20	-21	-17	-17	-21	-25	-25	-23	-21	-29	-24	-24	-22
90-percentile	30	29	54	73	69	61	64	72	62	59	49	49	56
95-percentile	45	47	84	109	107	91	100	104	96	105	83	84	88
99-percentile	110	103	210	226	196	167	200	175	174	214	186	149	176
Number of time intervals: average FRCE > Level 1 positive	110	100	287	412	392	328	381	457	367	344	278	294	3750
Number of time intervals: average FRCE < Level 1 negative	50	47	45	39	70	81	121	99	76	118	97	83	926
Number of time intervals: average FRCE > Level 2 positive	32	23	100	153	150	100	153	170	138	162	116	106	1403
Number of time intervals: average FRCE < Level 2 negative	5	15	13	7	13	25	24	17	10	19	21	20	189
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	4	5	20	40	34	16	20	13	30	47	25	20	274
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 36 LFC Block Performance for Block IPTO for Year 2025

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entsoe

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MAVIR

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.5	0.8	0.1	0.2	0.7	1.1	-0.2	0.3	0.9	0.5	-1.1	0.6	0.4
The standard deviation	17	16	20	19	19	20	17	20	15	12	21	11	17
1-percentile	-52	-48	-61	-52	-53	-52	-59	-45	-41	-48	-34	-50	
5-percentile	-24	-25	-30	-31	-28	-27	-26	-27	-19	-16	-18	-16	-24
10-percentile	-16	-16	-20	-20	-19	-18	-16	-16	-11	-9	-11	-10	-15
90-percentile	17	18	19	18	20	18	15	16	13	11	10	11	15
95-percentile	24	25	28	26	29	27	24	25	20	17	17	16	23
99-percentile	46	45	53	50	51	64	48	59	44	36	36	33	47
Number of time intervals: average FRCE > Level 1 positive	20	15	31	22	28	45	23	39	20	8	6	2	259
Number of time intervals: average FRCE < Level 1 negative	26	22	45	26	31	25	29	41	14	18	24	8	309
Number of time intervals: average FRCE > Level 2 positive	4	1	1	2	5	10	0	8	5	1	0	0	37
Number of time intervals: average FRCE < Level 2 negative	3	1	9	4	1	3	4	9	1	1	7	0	43
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 37 LFC Block Performance for Block MAVIR for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.8	-0.1	0.3	1.0	0.9	0.8	-0.6	-0.2	-0.3	0.0	-0.1	0.1	0.2
The standard deviation	15	16	20	19	18	15	15	14	14	14	11	11	15
1-percentile	-44	-54	-57	-58	-47	-40	-42	-44	-42	-44	-34	-30	-45
5-percentile	-22	-22	-27	-27	-23	-22	-24	-21	-23	-21	-16	-15	-22
10-percentile	-14	-13	-17	-16	-14	-15	-15	-14	-15	-14	-11	-10	-14
90-percentile	15	14	18	19	17	16	14	15	14	14	11	11	15
95-percentile	23	23	27	30	26	23	22	21	23	22	16	16	23
99-percentile	41	46	48	54	48	47	42	38	42	43	32	30	43
Number of time intervals: average FRCE > Level 1 positive	16	23	30	45	30	25	26	19	28	30	9	10	291
Number of time intervals: average FRCE < Level 1 negative	23	35	40	46	25	13	29	33	24	31	16	11	326
Number of time intervals: average FRCE > Level 2 positive	1	0	2	7	3	0	1	0	1	1	0	0	16
Number of time intervals: average FRCE < Level 2 negative	2	5	3	6	2	3	2	0	3	3	2	1	32
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 38 LFC Block Performance for Block MAVIR for Year 2025

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entsoe

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PSE

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	1.0	1.9	5.2	8.5	0.6	5.2	12.2	4.8	8.6	0.2	0.2	1.2	4.1
The standard deviation	55	55	91	105	121	96	114	77	94	61	42	38	79
1-percentile	-154	-153	-174	-253	-422	-241	-246	-207	-198	-190	-120	-98	-205
5-percentile	-85	-84	-101	-115	-137	-73	-86	-83	-75	-71	-58	-52	-85
10-percentile	-53	-54	-69	-80	-89	-42	-58	-54	-48	-46	-38	-37	-56
90-percentile	55	60	76	91	90	44	72	61	61	48	39	39	61
95-percentile	84	87	113	149	143	88	140	92	100	77	62	60	99
99-percentile	154	163	293	394	363	335	506	307	375	185	122	114	276
Number of time intervals: average FRCE > Level 1 positive	77	70	154	223	224	117	187	116	129	61	35	32	1425
Number of time intervals: average FRCE < Level 1 negative	82	74	114	160	211	81	80	89	71	66	33	18	1079
Number of time intervals: average FRCE > Level 2 positive	11	16	48	84	75	63	99	52	64	24	8	7	551
Number of time intervals: average FRCE < Level 2 negative	10	9	16	38	80	41	35	27	22	26	8	3	315
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	5	5	19	33	25	24	40	19	30	10	0	5	215
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	4	1	4	13	32	21	12	10	14	9	3	1	124

Table 39 LFC Block Performance for Block PSE for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	4.6	2.6	12.8	9.0	4.7	6.4	3.0	6.1	4.0	1.7	-0.4	0.1	4.5
The standard deviation	60	70	124	113	84	118	48	69	61	48	33	27	71
1-percentile	-138	-226	-232	-317	-219	-328	-106	-89	-125	-118	-88	-73	-172
5-percentile	-61	-68	-80	-87	-85	-102	-58	-55	-66	-66	-49	-42	-68
10-percentile	-40	-44	-49	-57	-55	-65	-40	-38	-47	-45	-34	-30	-45
90-percentile	51	50	63	73	57	71	41	40	47	46	33	29	50
95-percentile	77	83	116	137	99	127	65	59	69	63	46	40	82
99-percentile	210	245	597	462	332	448	187	201	187	127	76	68	262
Number of time intervals: average FRCE > Level 1 positive	99	97	178	205	148	185	75	64	86	75	19	10	1241
Number of time intervals: average FRCE < Level 1 negative	51	68	98	122	105	154	47	27	72	60	27	17	848
Number of time intervals: average FRCE > Level 2 positive	34	38	98	105	70	95	32	34	31	19	3	3	562
Number of time intervals: average FRCE < Level 2 negative	17	32	34	57	43	66	5	3	9	7	2	3	278
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	10	15	33	40	23	33	13	11	10	6	0	1	195
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	4	13	13	22	14	22	1	1	1	2	2	0	95

Table 40 LFC Block Performance for Block PSE for Year 2025

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entsoe

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REE

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	15.8	20.7	19.6	19.6	11.1	11.3	7.7	2.0	5.9	3.7	0.2	-1.2	9.7
The standard deviation	53	66	63	74	67	59	61	58	66	64	48	40	60
1-percentile	-126	-142	-150	-157	-186	-133	-170	-163	-173	-206	-178	-119	-158
5-percentile	-51	-58	-53	-68	-67	-62	-75	-85	-74	-74	-61	-47	-64
10-percentile	-31	-30	-29	-36	-39	-40	-44	-54	-50	-45	-38	-32	-39
90-percentile	69	80	80	80	71	68	62	56	65	56	42	28	63
95-percentile	92	105	104	111	99	106	87	80	93	79	61	43	88
99-percentile	162	193	175	251	206	174	166	160	172	163	109	87	168
Number of time intervals: average FRCE > Level 1 positive	37	56	58	77	60	40	34	35	44	36	11	13	501
Number of time intervals: average FRCE < Level 1 negative	18	23	31	36	51	23	49	43	48	51	45	21	439
Number of time intervals: average FRCE > Level 2 positive	5	15	15	23	16	8	8	10	10	14	3	4	131
Number of time intervals: average FRCE < Level 2 negative	5	9	13	7	14	5	11	8	11	14	8	6	111
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	2	2	2	3	1	2	3	0	1	0	0	1	17
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	2	2	2	1	1	1	1	1	1	0	0	12

Table 41 LFC Block Performance for Block REE for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	1.2	1.6	-0.1	-0.7	-0.6	-2.0	-0.5	-0.5	0.2	-1.6	-1.2	-0.6	-0.4
The standard deviation	44	66	68	63	51	60	40	40	52	39	42	29	49
1-percentile	-102	-109	-214	-165	-148	-204	-91	-93	-99	-124	-127	-72	-129
5-percentile	-45	-48	-62	-60	-63	-58	-46	-46	-48	-50	-52	-37	-51
10-percentile	-31	-32	-39	-37	-37	-39	-31	-30	-33	-34	-34	-27	-34
90-percentile	30	33	38	36	36	36	30	29	32	30	32	26	32
95-percentile	46	51	62	57	54	50	44	42	45	44	48	35	48
99-percentile	101	164	218	156	129	110	80	83	98	81	85	64	114
Number of time intervals: average FRCE > Level 1 positive	24	39	60	34	27	19	14	18	23	9	15	6	288
Number of time intervals: average FRCE < Level 1 negative	19	23	52	38	41	43	14	16	21	32	32	7	338
Number of time intervals: average FRCE > Level 2 positive	13	18	23	12	14	6	3	5	11	3	3	0	111
Number of time intervals: average FRCE < Level 2 negative	2	13	26	15	10	16	8	5	10	6	4	3	118
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	1	1	1	2	0	1	0	0	2	1	1	0	10
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	1	2	0	0	0	2	1	0	0	0	0	6

Table 42 LFC Block Performance for Block REE for Year 2025

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entsoe

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REN

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	3.6	0.8	5.5	4.1	1.6	-0.8	-1.0	-1.4	-0.7	0.7	-0.6	-0.6	0.9
The standard deviation	31	34	20	24	23	28	19	17	19	19	14	21	22
1-percentile	-73	-104	-26	-32	-71	-97	-72	-76	-54	-54	-44	-52	-63
5-percentile	-32	-47	-12	-15	-18	-29	-21	-18	-18	-19	-18	-19	-22
10-percentile	-17	-26	-8	-9	-11	-13	-11	-11	-12	-12	-11	-13	-13
90-percentile	28	29	21	18	14	12	10	9	10	12	11	10	15
95-percentile	52	51	38	30	24	22	15	14	15	21	15	15	26
99-percentile	119	117	95	91	86	79	45	35	43	63	37	44	71
Number of time intervals: average FRCE > Level 1 positive	119	112	81	56	54	44	16	14	21	37	10	18	582
Number of time intervals: average FRCE < Level 1 negative	51	96	3	7	38	71	40	38	27	22	15	23	431
Number of time intervals: average FRCE > Level 2 positive	40	31	18	21	15	17	1	1	9	7	1	10	171
Number of time intervals: average FRCE < Level 2 negative	10	24	1	4	11	23	13	13	6	4	3	7	119
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	47	26	27	17	17	28	8	4	8	2	3	5	192
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	13	10	1	0	8	7	5	4	0	4	4	4	60

Table 43 LFC Block Performance for Block REN for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.0	0.7	0.1	1.9	0.0	-0.5	0.0	-0.6	0.0	-0.7	-2.2	-0.3	-0.1
The standard deviation	22	17	21	31	14	15	15	13	14	29	28	24	20
1-percentile	-47	-40	-57	-34	-36	-39	-42	-46	-39	-89	-111	-80	-55
5-percentile	-18	-16	-19	-15	-16	-16	-15	-16	-17	-34	-35	-30	-21
10-percentile	-12	-11	-13	-11	-11	-11	-10	-11	-11	-18	-20	-17	-13
90-percentile	11	12	12	13	11	10	10	10	11	17	18	17	13
95-percentile	18	19	20	19	16	14	14	14	15	29	28	28	20
99-percentile	60	61	71	55	33	31	30	30	35	77	54	64	50
Number of time intervals: average FRCE > Level 1 positive	35	31	41	29	12	10	16	10	12	90	36	45	367
Number of time intervals: average FRCE < Level 1 negative	23	11	32	12	17	15	20	25	18	92	105	67	437
Number of time intervals: average FRCE > Level 2 positive	12	8	14	13	4	2	5	1	2	12	12	14	99
Number of time intervals: average FRCE < Level 2 negative	6	5	10	2	3	6	7	4	4	26	38	18	129
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	1	1	2	3	1	1	0	0	1	4	3	1	18
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	5	2	3	3	5	0	3	1	0	8	5	13	48

Table 44 LFC Block Performance for Block REN for Year 2025

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entsoe

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RTE

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	1.8	4.0	15.2	17.2	25.5	20.3	21.0	21.6	16.8	17.5	11.2	7.5	15.0
The standard deviation	163	135	156	205	181	170	155	146	186	158	126	137	160
1-percentile	-538	-451	-386	-554	-418	-422	-352	-364	-522	-434	-346	-424	-434
5-percentile	-219	-191	-171	-228	-178	-171	-163	-149	-187	-170	-154	-186	-181
10-percentile	-140	-120	-98	-140	-115	-118	-112	-101	-124	-110	-106	-124	-117
90-percentile	140	129	132	182	171	157	155	148	152	145	128	130	147
95-percentile	205	185	211	306	315	262	254	257	259	241	195	201	241
99-percentile	533	429	551	670	710	698	666	574	707	587	421	443	582
Number of time intervals: average FRCE > Level 1 positive	175	141	181	280	271	217	228	227	215	206	159	172	2472
Number of time intervals: average FRCE < Level 1 negative	193	142	127	195	139	114	114	94	148	120	91	150	1627
Number of time intervals: average FRCE > Level 2 positive	64	45	82	122	138	103	90	95	110	86	49	57	1041
Number of time intervals: average FRCE < Level 2 negative	77	37	37	68	42	39	29	30	49	44	25	48	525
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	50	29	49	82	85	66	72	76	69	74	37	45	734
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	6	4	3	11	5	3	3	1	6	5	2	3	52

Table 45 LFC Block Performance for Block RTE for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	9.1	9.0	11.0	22.7	16.1	14.3	18.1	13.3	19.2	7.8	6.9	8.0	13.0
The standard deviation	155	141	158	171	137	122	119	108	138	104	103	85	128
1-percentile	-467	-388	-452	-371	-286	-274	-197	-209	-289	-244	-273	-196	-304
5-percentile	-186	-181	-186	-168	-156	-142	-130	-124	-155	-135	-135	-121	-152
10-percentile	-127	-117	-125	-111	-103	-103	-94	-88	-106	-98	-98	-90	-105
90-percentile	138	134	143	147	140	129	120	110	140	112	112	103	127
95-percentile	218	194	217	238	212	197	179	169	218	153	156	136	191
99-percentile	497	485	551	695	501	475	477	398	529	338	273	240	455
Number of time intervals: average FRCE > Level 1 positive	207	166	224	232	205	181	186	168	234	144	141	104	2192
Number of time intervals: average FRCE < Level 1 negative	164	153	170	134	108	88	86	79	140	105	101	73	1401
Number of time intervals: average FRCE > Level 2 positive	75	60	85	102	77	62	59	50	82	37	22	16	727
Number of time intervals: average FRCE < Level 2 negative	56	36	50	33	22	16	5	8	26	17	22	3	294
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 46 LFC Block Performance for Block RTE for Year 2025

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entsoe

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SEPS

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-0.1	0.4	0.3	0.6	0.1	0.2	0.2	-0.5	0.8	-0.1	-0.5	-0.2	0.1
The standard deviation	7	7	8	11	11	8	10	7	11	7	9	6	8
1-percentile	-21	-18	-21	-27	-34	-24	-27	-22	-26	-21	-32	-17	-24
5-percentile	-10	-10	-11	-11	-13	-11	-12	-11	-11	-10	-12	-8	-11
10-percentile	-7	-6	-7	-7	-9	-8	-8	-8	-7	-7	-7	-5	-7
90-percentile	7	7	7	8	9	8	8	6	9	7	6	5	7
95-percentile	9	10	10	13	13	12	12	10	14	10	10	7	11
99-percentile	16	19	20	38	34	21	33	20	43	19	21	14	25
Number of time intervals: average FRCE > Level 1 positive	0	3	9	26	18	6	15	2	27	3	1	3	113
Number of time intervals: average FRCE < Level 1 negative	2	0	3	5	10	5	6	6	5	0	14	1	57
Number of time intervals: average FRCE > Level 2 positive	0	0	0	3	2	0	3	0	3	1	0	0	12
Number of time intervals: average FRCE < Level 2 negative	1	0	0	0	0	0	0	0	0	0	4	0	5
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 47 LFC Block Performance for Block SEPS for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.1	-0.2	-0.1	-0.3	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.4	0.0
The standard deviation	5	6	6	6	5	6	4	3	6	7	3	4	5
1-percentile	-16	-15	-19	-19	-18	-21	-12	-11	-19	-22	-11	-9	-16
5-percentile	-8	-7	-7	-10	-9	-9	-5	-5	-8	-7	-5	-4	-7
10-percentile	-5	-5	-4	-6	-5	-5	-2	-3	-5	-4	-3	-3	-4
90-percentile	5	4	4	5	5	5	3	3	5	4	3	3	4
95-percentile	7	7	7	9	8	8	5	5	8	7	5	5	7
99-percentile	16	13	16	16	18	12	11	17	17	10	11	14	
Number of time intervals: average FRCE > Level 1 positive	2	1	3	0	0	4	2	1	4	8	0	1	26
Number of time intervals: average FRCE < Level 1 negative	0	4	2	2	0	6	2	0	5	3	0	0	24
Number of time intervals: average FRCE > Level 2 positive	1	0	2	0	0	0	1	0	0	1	0	0	5
Number of time intervals: average FRCE < Level 2 negative	0	1	0	0	0	0	1	0	0	1	0	0	3
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 48 LFC Block Performance for Block SEPS for Year 2025

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entsoe

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SG

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.1	0.1	0.1	0.1	0.0	-0.2	4.0	-0.2	-0.1	-0.1	0.0	-0.1	0.3
The standard deviation	6	6	8	6	6	6	108	5	5	5	5	6	14
1-percentile	-18	-17	-17	-18	-17	-18	-19	-15	-16	-16	-14	-16	-17
5-percentile	-10	-11	-11	-11	-10	-10	-11	-9	-10	-9	-8	-9	-10
10-percentile	-7	-7	-7	-7	-6	-7	-8	-6	-7	-6	-6	-6	-7
90-percentile	6	7	7	7	6	6	7	6	6	6	5	6	6
95-percentile	9	9	10	10	9	9	10	8	9	8	7	8	9
99-percentile	14	15	17	16	15	14	20	13	14	13	12	12	15
Number of time intervals: average FRCE > Level 1 positive	0	0	2	0	0	0	12	0	0	0	0	0	14
Number of time intervals: average FRCE < Level 1 negative	0	0	0	0	0	1	1	0	0	0	0	2	4
Number of time intervals: average FRCE > Level 2 positive	0	0	2	0	0	0	6	0	0	0	0	0	8
Number of time intervals: average FRCE < Level 2 negative	0	0	0	0	0	0	0	0	0	0	0	1	1
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	2	2	0	0	0	0	4
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 49 LFC Block Performance for Block SG for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
The standard deviation	5	10	5	5	5	6	6	7	5	5	5	4	6
1-percentile	-15	-23	-15	-15	-15	-15	-15	-14	-15	-13	-12	-11	-15
5-percentile	-10	-16	-8	-8	-8	-9	-9	-8	-9	-8	-7	-7	-9
10-percentile	-6	-10	-6	-5	-6	-6	-6	-5	-6	-6	-5	-5	-6
90-percentile	6	10	6	5	6	6	6	6	6	6	5	5	6
95-percentile	8	15	8	8	8	9	8	8	8	8	7	7	9
99-percentile	14	30	14	13	15	16	15	13	15	13	12	11	15
Number of time intervals: average FRCE > Level 1 positive	0	0	0	0	0	0	2	2	0	0	1	0	5
Number of time intervals: average FRCE < Level 1 negative	0	1	0	0	0	0	0	1	0	0	0	0	2
Number of time intervals: average FRCE > Level 2 positive	0	0	0	0	0	0	0	1	0	0	0	0	1
Number of time intervals: average FRCE < Level 2 negative	0	1	0	0	0	0	0	1	0	0	0	0	2
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 50 LFC Block Performance for Block SG for Year 2025

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entsoe

Final | 20.05.2026

SHB

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	5.8	8.2	0.4	5.8	8.7	-0.8	4.0	-2.3	5.0	3.4	-6.4	-9.8	1.8
The standard deviation	26	27	29	32	30	86	35	40	46	30	38	36	38
1-percentile	-65	-75	-88	-103	-80	-313	-85	-120	-122	-96	-132	-124	-117
5-percentile	-33	-29	-42	-39	-37	-57	-38	-61	-62	-44	-71	-72	-49
10-percentile	-18	-14	-25	-23	-20	-35	-25	-40	-41	-26	-49	-51	-31
90-percentile	31	36	24	36	40	39	31	30	55	30	28	23	34
95-percentile	43	49	40	50	56	60	48	43	79	45	43	36	49
99-percentile	90	96	91	99	102	135	122	100	147	96	84	71	103
Number of time intervals: average FRCE > Level 1 positive	101	108	87	116	164	160	128	103	288	100	81	65	1501
Number of time intervals: average FRCE < Level 1 negative	52	53	87	88	69	160	68	184	180	107	241	265	1554
Number of time intervals: average FRCE > Level 2 positive	19	18	21	26	26	46	40	27	73	17	13	7	333
Number of time intervals: average FRCE < Level 2 negative	14	6	21	28	13	68	21	47	44	22	51	54	389
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	1	3	4	2	7	6	2	9	1	1	1	37
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	2	0	0	0	0	0	0	2

Table 51 LFC Block Performance for Block SHB for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-4.6	3.6	4.2	0.6	7.4	10.9	2.8	5.4	5.0	-4.1	-8.3	-9.2	1.2
The standard deviation	43	43	39	49	44	41	37	43	42	51	35	34	42
1-percentile	-127	-142	-89	-144	-126	-95	-96	-110	-130	-154	-106	-112	-119
5-percentile	-81	-46	-50	-72	-59	-48	-51	-63	-60	-75	-66	-65	-61
10-percentile	-53	-29	-33	-48	-33	-29	-35	-41	-41	-52	-50	-48	-41
90-percentile	39	40	39	48	53	52	39	50	46	44	25	20	41
95-percentile	56	55	59	80	78	69	60	73	66	67	40	31	61
99-percentile	161	147	185	169	127	154	116	143	122	134	79	62	119
Number of time intervals: average FRCE > Level 1 positive	102	147	185	250	302	270	211	317	264	266	96	68	2537
Number of time intervals: average FRCE < Level 1 negative	295	113	135	241	187	117	170	231	226	339	309	296	2659
Number of time intervals: average FRCE > Level 2 positive	31	20	69	85	72	77	54	78	61	71	14	5	637
Number of time intervals: average FRCE < Level 2 negative	73	44	22	68	52	27	33	52	59	105	41	53	629
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	1	1	5	5	6	8	6	5	2	4	2	2	47
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	1	0	0	0	0	0	0	0	0	1	1	0	3

Table 52 LFC Block Performance for Block SHB for Year 2025

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entsoe

Final | 20.05.2026

SMM

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	8.2	3.6	9.8	10.0	8.2	-7.6	-2.7	-2.2	1.5	-13.3	-2.2	0.4	1.1
The standard deviation	47	42	47	55	52	53	58	50	58	66	67	49	54
1-percentile	-102	-96	-100	-137	-166	-148	-176	-161	-158	-292	-278	-159	-164
5-percentile	-59	-62	-56	-73	-67	-91	-106	-90	-94	-116	-107	-76	-83
10-percentile	-42	-46	-41	-53	-46	-67	-70	-61	-64	-81	-61	-53	-57
90-percentile	64	34	68	67	68	42	63	55	57	49	64	56	57
95-percentile	86	42	92	85	89	58	83	72	73	70	84	76	76
99-percentile	134	50	157	104	132	75	127	109	92	118	151	123	114
Number of time intervals: average FRCE > Level 1 positive	382	246	422	520	417	249	370	281	398	233	359	294	4171
Number of time intervals: average FRCE < Level 1 negative	174	174	153	264	206	413	408	341	361	474	328	263	3559
Number of time intervals: average FRCE > Level 2 positive	79	36	112	116	74	49	58	37	69	49	82	55	816
Number of time intervals: average FRCE < Level 2 negative	26	16	25	53	60	93	145	104	110	183	148	80	1043
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	6	3	8	6	3	3	5	1	5	2	5	2	49
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	1	1	0	2	0	3	1	1	2	6	1	0	18

Table 53 LFC Block Performance for Block SMM for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-16.6	-0.2	10.5	-10.9	-17.0	-8.4	-11.9	6.3	-1.5	-12.9	-8.1	-14.7	-7.1
The standard deviation	65	51	85	67	70	54	47	50	51	62	45	47	58
1-percentile	-232	-155	-324	-183	-270	-199	-149	-137	-135	-236	-125	-157	-192
5-percentile	-133	-79	-110	-127	-148	-92	-88	-67	-82	-115	-81	-98	-102
10-percentile	-96	-53	-71	-92	-92	-61	-65	-47	-58	-78	-61	-72	-71
90-percentile	50	59	107	72	54	50	40	63	58	51	45	35	57
95-percentile	75	86	141	107	82	73	60	89	81	79	64	54	83
99-percentile	127	144	214	166	130	121	114	151	122	129	120	107	137
Number of time intervals: average FRCE > Level 1 positive	280	313	754	399	305	263	232	469	371	323	255	187	4151
Number of time intervals: average FRCE < Level 1 negative	576	265	415	613	600	392	531	285	390	590	444	529	5630
Number of time intervals: average FRCE > Level 2 positive	68	90	333	155	88	51	60	132	91	91	58	42	1259
Number of time intervals: average FRCE < Level 2 negative	263	80	168	232	263	118	128	73	87	213	94	164	1883
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	1	3	8	6	6	3	5	1	5	2	5	2	47
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	3	1	0	2	2	3	1	1	2	6	1	0	22

Table 54 LFC Block Performance for Block SMM for Year 2025

LFC ANNUAL REPORT 2025

entsoe

Final | 20.05.2026

TEIAS

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-12.7	-12.1	-7.2	-4.5	-13.1	-7.4	-10.5	-13.0	-14.2	-13.4	-15.3	-16.3	-11.6
The standard deviation	37	43	42	43	43	45	37	34	42	41	39	35	40
1-percentile	-115	-140	-132	-132	-159	-126	-97	-114	-120	-121	-92	-96	-120
5-percentile	-65	-73	-64	-64	-70	-60	-59	-60	-67	-64	-61	-60	-64
10-percentile	-52	-56	-50	-46	-53	-48	-47	-48	-52	-51	-50	-50	-50
90-percentile	29	35	36	41	32	38	28	26	29	30	22	19	30
95-percentile	40	46	49	55	46	54	41	36	42	45	39	32	44
99-percentile	70	97	91	105	84	117	83	68	83	101	105	79	90
Number of time intervals: average FRCE > Level 1 positive	2	7	3	6	7	15	10	2	10	12	11	7	92
Number of time intervals: average FRCE < Level 1 negative	7	9	8	13	23	22	8	10	13	15	9	9	146
Number of time intervals: average FRCE > Level 2 positive	0	0	1	0	0	0	1	0	2	2	3	1	10
Number of time intervals: average FRCE < Level 2 negative	1	1	1	5	4	4	0	0	1	0	2	1	20
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	1	0	0	0	0	1	2	0	0	0	1	0	5
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	1	0	0	0	1	0	1	0	0	3

Table 55 LFC Block Performance for Block TEIAS for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-14.6	-14.7	-11.1	-7.1	-7.8	-6.3	-10.0	-7.4	-8.7	-11.3	-13.0	-14.8	-10.6
The standard deviation	37	38	45	47	45	47	35	37	36	37	37	35	40
1-percentile	-108	-106	-131	-154	-145	-135	-89	-112	-121	-103	-93	-100	-116
5-percentile	-60	-66	-68	-68	-69	-63	-58	-57	-56	-60	-59	-63	-62
10-percentile	-50	-53	-51	-50	-52	-46	-46	-46	-44	-47	-48	-51	-49
90-percentile	24	25	33	41	40	38	31	36	32	28	25	23	31
95-percentile	37	40	49	58	56	53	42	48	45	41	40	38	46
99-percentile	83	82	108	116	109	104	76	74	81	104	110	86	94
Number of time intervals: average FRCE > Level 1 positive	5	4	3	3	2	1	2	0	0	5	9	2	36
Number of time intervals: average FRCE < Level 1 negative	9	10	8	21	8	14	10	23	10	9	18	13	153
Number of time intervals: average FRCE > Level 2 positive	0	0	0	2	0	1	1	0	0	0	0	0	4
Number of time intervals: average FRCE < Level 2 negative	1	2	1	4	2	3	1	1	0	0	4	0	19
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	1	0	0	0	0	1	2	0	0	0	0	4
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	1	0	0	0	1	0	1	0	3

Table 56 LFC Block Performance for Block TEIAS for Year 2025

LFC ANNUAL REPORT 2025

entsoe

Final | 20.05.2026

TEL

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	1.5	6.8	6.8	4.6	2.0	-3.9	-0.8	0.2	-0.4	0.5	-4.1	-0.7	1.0
The standard deviation	32	37	40	49	41	49	58	40	42	34	28	23	39
1-percentile	-92	-43	-59	-141	-140	-197	-202	-125	-179	-123	-143	-77	-127
5-percentile	-22	-17	-18	-36	-30	-53	-46	-29	-31	-26	-28	-26	-30
10-percentile	-13	-11	-12	-17	-16	-19	-21	-16	-16	-16	-18	-17	-16
90-percentile	14	21	21	24	18	13	21	16	17	16	12	14	17
95-percentile	24	54	50	65	42	23	45	26	34	27	16	21	36
99-percentile	123	184	179	209	161	137	162	145	136	128	30	43	136
Number of time intervals: average FRCE > Level 1 positive	65	119	136	150	106	69	103	84	93	74	7	22	1028
Number of time intervals: average FRCE < Level 1 negative	50	21	28	89	84	121	118	80	93	67	76	44	871
Number of time intervals: average FRCE > Level 2 positive	31	57	77	72	51	33	50	40	37	34	2	10	494
Number of time intervals: average FRCE < Level 2 negative	18	8	11	37	35	55	58	32	53	31	39	14	391
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 57 LFC Block Performance for Block TEL for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	0.8	-1.4	-0.3	0.8	-1.5	-0.3	-0.7	0.3	-0.1	-1.6	-0.6	-0.9	-0.5
The standard deviation	17	22	25	22	24	17	19	14	13	20	11	16	18
1-percentile	-35	-85	-93	-66	-80	-36	-47	-33	-31	-78	-36	-35	-55
5-percentile	-20	-21	-20	-21	-21	-19	-19	-16	-18	-16	-17	-16	-19
10-percentile	-13	-14	-13	-13	-14	-13	-13	-10	-12	-11	-11	-11	-12
90-percentile	13	11	12	14	12	13	12	10	12	10	10	10	12
95-percentile	20	17	19	21	18	19	18	16	16	14	15	14	17
99-percentile	52	39	63	80	37	33	34	35	27	25	26	24	40
Number of time intervals: average FRCE > Level 1 positive	32	20	35	49	19	12	16	17	7	5	2	2	216
Number of time intervals: average FRCE < Level 1 negative	11	46	39	36	48	20	27	16	7	32	14	21	317
Number of time intervals: average FRCE > Level 2 positive	12	8	17	21	4	3	3	5	1	0	0	1	75
Number of time intervals: average FRCE < Level 2 negative	2	23	24	13	24	7	14	2	2	23	4	11	149
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 58 LFC Block Performance for Block TEL for Year 2025

LFC ANNUAL REPORT 2025

entsoe

Final | 20.05.2026

TERNA

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-12.0	-33.0	-13.0	-4.0	-7.0	-15.0	0.0	0.0	-4.0	-7.0	-13.0	-7.0	-9.6
The standard deviation	126	134	131	133	146	145	112	106	120	120	122	129	127
1-percentile	-501	-596	-463	-464	-504	-547	-367	-351	-384	-426	-501	-416	-460
5-percentile	-215	-290	-242	-200	-221	-242	-154	-157	-194	-178	-203	-197	-208
10-percentile	-103	-169	-136	-118	-127	-134	-105	-103	-116	-106	-117	-124	-122
90-percentile	63	65	90	103	107	96	103	101	110	93	90	105	94
95-percentile	111	92	137	175	171	146	151	142	158	134	131	156	142
99-percentile	346	205	380	405	462	420	347	299	349	324	295	372	350
Number of time intervals: average FRCE > Level 1 positive	106	51	131	178	196	143	158	139	169	122	114	166	1673
Number of time intervals: average FRCE < Level 1 negative	220	307	276	220	251	268	157	168	210	196	216	240	2729
Number of time intervals: average FRCE > Level 2 positive	41	16	61	77	72	59	52	39	47	38	35	50	587
Number of time intervals: average FRCE < Level 2 negative	98	145	117	93	115	121	53	51	69	82	95	78	1117
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	3	0	6	2	7	5	1	0	0	2	1	0	27
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	8	12	3	2	7	8	0	0	0	1	2	5	48

Table 59 LFC Block Performance for Block TERN A for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-2.0	-2.0	-8.0	0.0	-1.0	0.0	5.0	3.0	0.0	-2.0	-3.0	-2.0	-1.0
The standard deviation	91	80	121	118	119	100	107	92	84	89	80	68	96
1-percentile	-274	-256	-144	-377	-399	-299	-311	-254	-268	-295	-289	-235	-283
5-percentile	-137	-120	-26	-166	-174	-156	-133	-128	-125	-131	-119	-107	-127
10-percentile	-90	-82	-8	-108	-101	-103	-93	-84	-90	-83	-77	-69	-82
90-percentile	83	74	316	102	102	97	101	88	87	79	71	64	105
95-percentile	119	103	327	172	163	153	156	137	124	122	101	96	148
99-percentile	267	237	329	366	344	297	380	279	227	247	214	164	279
Number of time intervals: average FRCE > Level 1 positive	117	86	140	205	197	175	231	187	153	154	100	73	1818
Number of time intervals: average FRCE < Level 1 negative	158	113	241	212	209	188	185	163	162	163	142	125	2061
Number of time intervals: average FRCE > Level 2 positive	35	21	45	70	74	41	74	54	26	33	21	8	502
Number of time intervals: average FRCE < Level 2 negative	36	27	73	77	76	53	48	37	34	44	39	29	573
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	1	0	1	0	2	0	0	0	1	0	5
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	1	2	0	2	0	1	1	1	1	0	0	9

Table 60 LFC Block Performance for Block TERN A for Year 2025

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TTB

2024

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	2.7	1.7	7.8	12.5	8.3	4.9	4.6	5.1	6.4	1.2	-4.8	-2.1	4.0
The standard deviation	38	33	47	67	55	51	53	49	45	50	54	61	50
1-percentile	-102	-89	-113	-140	-144	-136	-133	-116	-123	-146	-149	-173	-130
5-percentile	-59	-51	-62	-75	-69	-62	-57	-58	-59	-78	-78	-101	-67
10-percentile	-39	-35	-40	-45	-47	-42	-37	-38	-39	-54	-58	-73	-46
90-percentile	47	38	59	77	69	54	51	54	56	57	48	69	57
95-percentile	65	53	82	110	100	76	69	74	78	78	69	95	79
99-percentile	110	88	147	212	171	136	121	140	129	124	120	154	138
Number of time intervals: average FRCE > Level 1 positive	217	128	336	479	440	282	263	283	301	313	232	403	3677
Number of time intervals: average FRCE < Level 1 negative	170	103	186	235	230	183	155	167	164	294	321	476	2684
Number of time intervals: average FRCE > Level 2 positive	20	7	60	121	98	43	35	56	42	45	33	91	651
Number of time intervals: average FRCE < Level 2 negative	19	15	27	52	49	37	37	28	34	53	53	97	501
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	0	0	1	4	3	8	6	1	2	2	3	30
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	1	2	1	2	0	0	0	0	0	0	6

Table 61 LFC Block Performance for Block TTB for Year 2024

2025

Data item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Yr.
The mean value	-1.2	-1.0	1.0	0.8	-1.0	-0.7	0.4	-2.7	-1.1	-3.9	-0.9	-1.2	-1.0
The standard deviation	72	66	72	65	60	48	40	33	41	33	34	28	49
1-percentile	-196	-172	-202	-170	-166	-121	-113	-91	-102	-96	-86	-73	-132
5-percentile	-122	-108	-113	-104	-104	-74	-65	-58	-65	-58	-54	-45	-81
10-percentile	-86	-78	-80	-75	-72	-53	-47	-45	-48	-42	-40	-34	-58
90-percentile	84	73	82	74	69	51	46	36	48	33	39	34	56
95-percentile	114	103	111	98	95	71	62	50	65	49	55	47	77
99-percentile	183	172	173	159	144	114	98	80	102	86	87	76	123
Number of time intervals: average FRCE > Level 1 positive	288	195	415	305	280	88	90	39	113	39	46	29	1927
Number of time intervals: average FRCE < Level 1 negative	307	224	396	306	295	100	90	55	111	56	43	24	2007
Number of time intervals: average FRCE > Level 2 positive	47	30	44	40	32	7	4	3	7	0	1	0	215
Number of time intervals: average FRCE < Level 2 negative	53	33	55	53	53	14	5	0	4	3	2	0	275
Number of events: FRCE > 60 % FRR capacity - and not < 15 % FRR capacity - within 15 min	0	2	1	4	5	3	0	1	5	1	2	3	27
Number of events: FRCE < -60 % FRR capacity + and not > - 15 % FRR capacity + within 15 min	0	0	1	1	0	0	0	1	1	0	0	0	4

Table 62 LFC Block Performance for Block TTB for Year 2025

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Ireland/Northern Ireland

2024

Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No.of events: FRCE > 500 mHz and > 50 mHz after 15 min	0	0	0	0	0	0	0	0	0	0	0	0
No.of events: FRCE < -500 mHz and< -50 mHz after 15 min	0	0	0	0	0	0	0	0	0	0	0	0

Table 63 IE/Ni LFC FRCE Statistic for Year 2024

2025

Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No.of events: FRCE > 500 mHz and > 50 mHz after 15 min	0	0	0	0	0	0	0	0	0	0	0	0
No.of events: FRCE < -500 mHz and< -50 mHz after 15 min	0	0	0	0	0	0	0	0	0	0	0	0

Table 64 IE/Ni LFC FRCE Statistic for Year 2025

Additionally, the synchronous area of IE/Ni requires to report the number of time intervals outside Level 1 and Level 2 FRCE ranges over the course of one year. The time intervals are aligned with Annex III, Table 1 of the SOGL. The number of time intervals is calculated using the following procedure:

1. If the frequency deviation is ≥ 200 mHz over a 15 -minute period or ≤ -200 mHz over a 15-minutes period, this qualifies as a Level 1 event.
2. If the frequency deviation is ≥ 500 mHz over a 1-minute period or ≤ -500 mHz over a 1-minute period, this qualifies as a Level 2 event.
3. The Level 1 FRCE target parameter = 3%, which is 35 040 (periods) × 0.03 = 1051 periods.
4. The Level 2 FRCE target parameter = 1%, which is 525 600 (periods) × 0.01 = 5256 periods.
5. The number of Level 1 periods calculated in step 1 must be less than or equal to 1051.
6. The number of Level 2 periods calculated in step 3 must be less than or equal to 5256.

Data item	2024	2025
Number of time intervals frequency deviates outside +/- 200 mHz	0	0
Number of time intervals frequency deviates outside +/- 500 mHz	0	0

Table 65 IE/Ni LFC Number of Time Intervals Outside Range for Years 2024 and 2025

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Nordic

The Nordic LFC block performance is presented in the following tables. The Level 1 and Level 2 limits are calculated according to the methodology defined in the Synchronous Area Framework Agreement. The Level 1 and Level 2 Frequency Restoration Control Error Target Parameters for the Nordic LFC block are presented in Table 72.

FRCE target parameters	Level 1	Level 2
FRCE range	40 mHz	76 mHz
Target for the maximum number of 15 minutes time intervals per year outside the level 1 and level 2 FRCE range	30 %	5%

Table 66 Level 1 FRCE range and the level 2 FRCE range for the Nordic Area and targets for the number of 15 minutes time intervals per year outside the level 1 and level 2 FRCE range

The methodology for the calculation of these target parameters is as defined in the Nordic Synchronous Area Operational Agreement. FRCE values are calculated on a basis of 15-minute frequency data. The percentages in Table 72 refer to 30% or 5% of the time intervals of the year. Additionally, events which indicate where FRCE exceeds 60% of FRR used and is not returned to 15% of FRR during a 15-minute time period are reported.

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Nordic LFC Block Performance

2024

Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	49.99997	50.00008	50.00018	49.99988	49.99985	50.00018	49.99986	49.99993	50.00020	49.99984	50.00010	50.00014	50.00002
The standard deviation	0.0394	0.0398	0.0391	0.0441	0.0443	0.0439	0.0375	0.0412	0.0399	0.0377	0.0363	0.0343	0.0398
1-percentile	49.905	49.905	49.906	49.889	49.892	49.894	49.910	49.898	49.905	49.905	49.910	49.916	49.903
5-percentile	49.937	49.936	49.937	49.929	49.928	49.929	49.940	49.934	49.938	49.939	49.943	49.946	49.936
10-percentile	49.952	49.951	49.952	49.947	49.945	49.946	49.954	49.950	49.953	49.954	49.957	49.959	49.952
90-percentile	50.049	50.049	50.049	50.054	50.055	50.055	50.046	50.051	50.050	50.046	50.045	50.042	50.049
95-percentile	50.065	50.065	50.065	50.073	50.073	50.072	50.062	50.069	50.068	50.062	50.061	50.057	50.066
99-percentile	50.099	50.102	50.098	50.112	50.108	50.107	50.096	50.105	50.106	50.096	50.095	50.092	50.101
Number of time intervals: average FRCE > Level 1 positive	348	275	303	325	327	323	212	276	301	249	266	241	3446
Number of time intervals: average FRCE < Level 1 negative	267	232	229	271	289	230	157	201	193	204	195	174	2642
Number of time intervals: average FRCE > Level 2 positive	53	55	51	76	76	53	34	60	56	41	56	41	652
Number of time intervals: average FRCE < Level 2 negative	34	25	35	61	49	42	17	29	27	37	29	26	411
No. of time intervals: FRCE > 60 % FRR capacity + and < 15 % FRR capacity + after 15 min	0	0	0	0	0	0	0	0	0	0	138	0	138
No. of time intervals: FRCE < - 60 % FRR capacity + and < -15 % FRR capacity + after 15 min	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 67 Nordic LFC Block Performance for Year 2024

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2025

Data item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr
The mean value	49.99999	50.00024	50.00020	50.00027	50.00014	50.00022	50.00027	50.00025	50.00020	50.00016	50.00030	50.00020	50.00020
The standard deviation	0.0358	0.0330	0.0314	0.0340	0.0364	0.0348	0.0284	0.0358	0.0326	0.0314	0.0294	0.0273	0.0325
1-percentile	49.909	49.919	49.921	49.914	49.901	49.909	49.927	49.905	49.915	49.917	49.926	49.928	49.916
5-percentile	49.943	49.948	49.950	49.947	49.942	49.945	49.955	49.944	49.948	49.949	49.953	49.955	49.948
10-percentile	49.958	49.961	49.963	49.960	49.958	49.960	49.967	49.959	49.961	49.962	49.965	49.967	49.962
90-percentile	50.042	50.040	50.038	50.040	50.043	50.041	50.034	50.043	50.039	50.038	50.036	50.032	50.039
95-percentile	50.058	50.056	50.051	50.055	50.059	50.056	50.046	50.059	50.053	50.050	50.048	50.043	50.053
99-percentile	50.097	50.088	50.083	50.093	50.094	50.093	50.075	50.095	50.087	50.079	50.074	50.070	50.086
Number of time intervals: average FRCE > Level 1 positive	234	204	148	178	229	167	110	213	143	126	134	92	1978
Number of time intervals: average FRCE < Level 1 negative	209	138	80	114	148	121	71	149	132	135	114	110	1521
Number of time intervals: average FRCE > Level 2 positive	52	33	24	38	43	33	11	44	32	15	13	12	350
Number of time intervals: average FRCE < Level 2 negative	34	13	10	16	40	27	14	36	26	23	15	9	263
No. of time intervals: FRCE > 60 % FRR capacity + and < 15 % FRR capacity + after 15 min	0	0	21	33	73	41	13	0	0	0	0	0	181
No. of time intervals: FRCE < - 60 % FRR capacity + and < -15 % FRR capacity + after 15 min	0	0	13	21	47	33	6	0	0	0	0	0	120

Table 68 Nordic LFC Block Performance for Year 2025

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