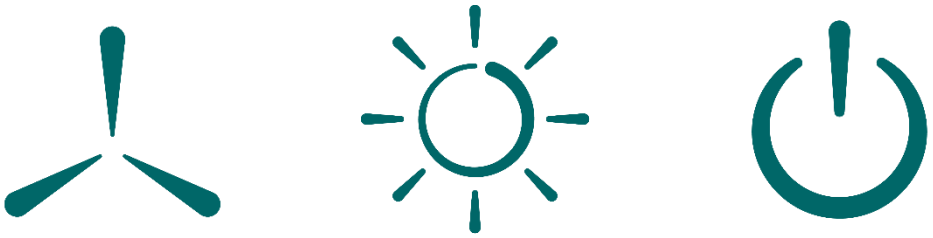
Article 13 Clean Energy Package Redispatching Annual Report - 2023

June 2024



EirGrid SONI

Contents

Disclaimer

Please note that the historical data contained in this report is indicative and the best available data at the time of writing. While every effort has been made in the compilation of this report to ensure that the information herein is correct, the TSOs do not accept liability for any loss or damage arising from the use of this document or any reliance on the information it contains. Use of this document and the information it contains is at the user's sole risk.

1. Executive Summary

This report to the Utility Regulator and the CRU is to fulfil the requirements of Article 13(4) of Regulation 2019/943[1] for both SONI & EirGrid TSO.

The report covers calendar year 2023 and the focus is on renewables which are dispatched outside of the bid/offer mechanism that is in place for other market participants in the Balancing mechanism.

The report also highlights the measures being taken by SONI & EirGrid TSO to minimise redispatch, the level of development and effectiveness of market-based redispatching mechanisms and digitalisation of the grid infrastructure.

[1] REGULATION (EU) 2019/ 943 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of 5 June 2019 - on the internal market for electricity (europa.eu)

2. Introduction

2.1. Legislation

Article 13(4) of Regulation 2019/943[2] requires the Transmission System Operators (TSOs) and Distribution System Operators (DSOs) to report at least annually to the Regulatory Authorities (RAs) on:

(a) the level of development and effectiveness of market-based redispatching mechanisms for power generating, energy storage and demand response facilities;

(b) the reasons, volumes in MWh and type of generation source subject to redispatching;

(c) the measures taken to reduce the need for the downward redispatching of generating installations using renewable energy sources or high-efficiency cogeneration in the future including investments in digitalisation of the grid infrastructure and in services that increase flexibility.

The regulatory authority shall submit the report to ACER and shall publish a summary of the data referred to in points (a), (b) and (c) of the first subparagraph together with recommendations for improvement where necessary.

2.2. Approach to development of this report

From the initial request for this report, SONI & EirGrid TSO has researched what other European TSOs have done to meet compliance. We have also discussed with other centrally dispatched TSOs on their approach. From this research, it is evident there is not one agreed template. For example, National Grid only report on downward actions[3]. While National Grid publishes its report, the majority of TSOs do not. Each TSO also has different categories of reasons (constraints) that it reports against to reflect the dominant constraints on their Transmission system.

The approach taken for this report is based on discussions with CRU and UR. The focus is on renewables which are dispatched via a priority dispatch hierarchy rather than a market price in the Balancing Mechanism.

[2] REGULATION (EU) 2019/ 943 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of 5 June 2019 - on the internal market for electricity (europa.eu)
[3] download (nationalgrideso.com)

3. Reasons for Redispatching

The Balancing Market Principles Statement (BMPS)[4] has been prepared by the TSOs (EirGrid and SONI) in accordance with their respective Transmission System Operator Licence obligations (Condition 22B of SONI's TSO licence, Condition 10B of EirGrid's TSO licence) and SEM Committee decision SEM-16-058 dated 7 October 2016 entitled 'Balancing Market Principles Statement Terms of Reference'. The objective in publishing the BMPS is to set out in a clear and comprehensible manner how the TSOs fulfil the statutory obligations that govern the scheduling and dispatch process in the Single Electricity Market (SEM).

The scheduling and dispatch process incorporates a range of activities associated with the close to real-time planning and the real-time operation of the power system. It is a continuous '24/7' process managed in a coordinated manner from control centres in Dublin and Belfast using a range of common operational systems and processes. The scheduling and dispatch process is built around the SEM Balancing Market. Utilisation of the balancing market offers and bids provided by participants is the main mechanism by which we dispatch units to manage operational security constraints, (including the provision of System Services), maximise priority dispatch generation and efficiently operate the balancing market.

The objective of this scheduling and dispatch process is to allow SONI TSO to fulfil obligations on:

- ensuring operational security;
- maximising priority dispatch generation;
- efficient operation of the SEM; and
- provision of transparency.

This implementation is illustrated in Figure 1 below.

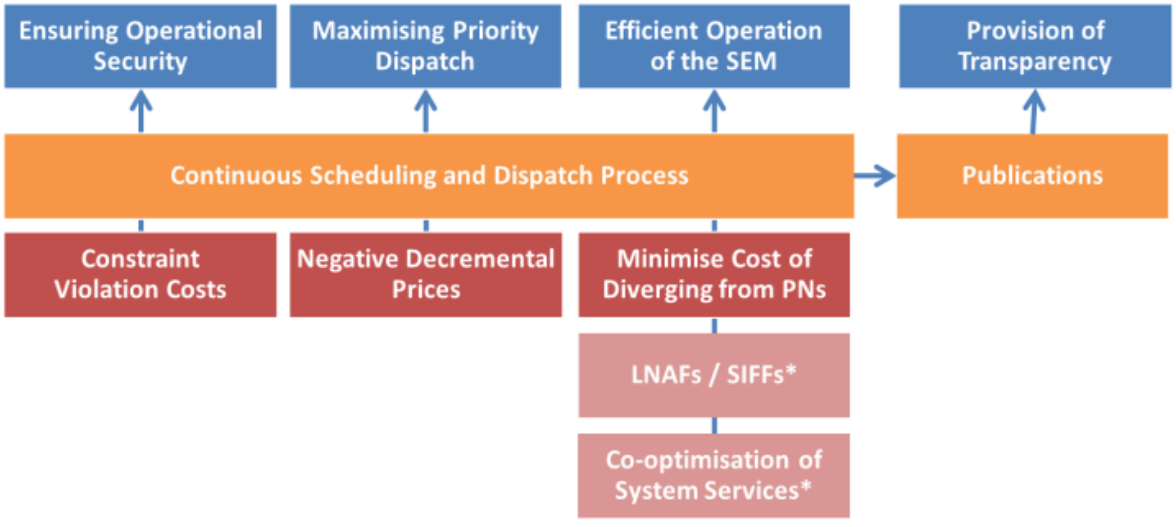


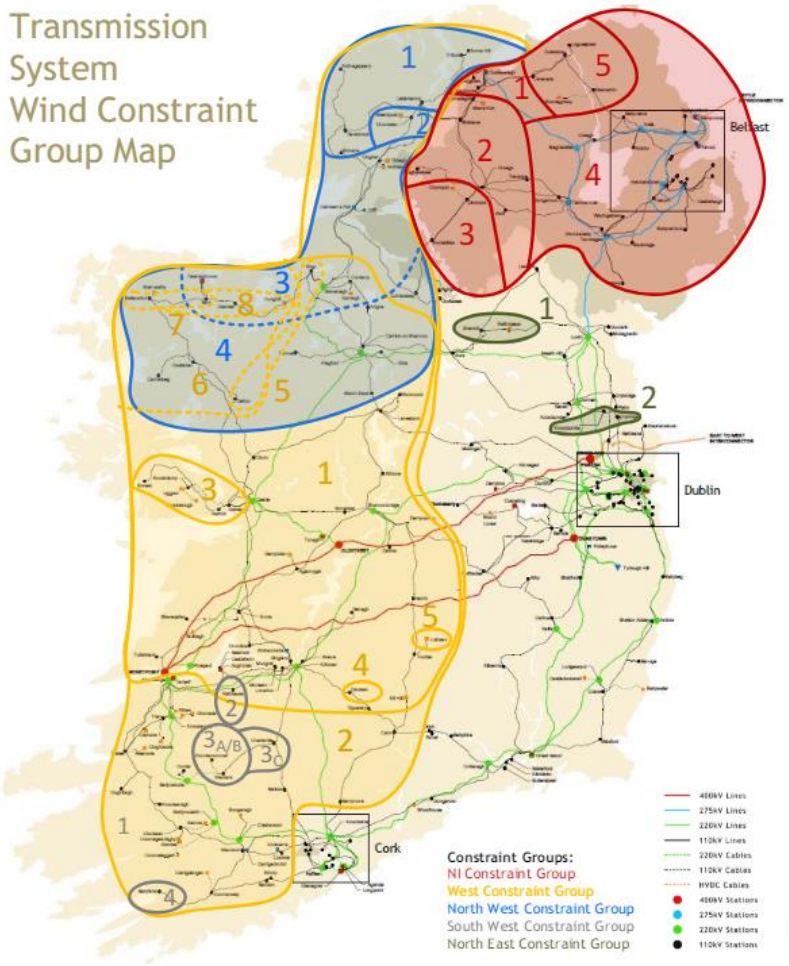
Figure 1 Scheduling and Dispatch Overview

(*LNAF and SIFF currently set to zero per SEM-20-075.

[4] EirGrid-and-SONI-Balancing-Market-Principles-Statement-V7.0.pdf (sem-o.com)

Further detail on the TSOs Scheduling & Dispatch Process can be found in section 4 of the Balancing Market Principles Statement (BMPS)[5].

In relation to renewables, the dispatch is via the Wind Dispatch Tool[6] with the constraint groups published as shown below



Data from the wind dispatch Tool and SCADA forms the basis for the reporting.

[5] EirGrid-and-SONI-Balancing-Market-Principles-Statement-V7.0.pdf (sem-o.com)
[6] https://cms.eirgrid.ie/sites/default/files/publications/Wind-Dispatch-Tool-Constraint-Group-Overview_0.pdf

1. Level of Dispatch-Down Energy in 2023

The following provides a summary of the dispatch-down of wind and solar energy in 2023 for Ireland and Northern Ireland. (**Note:** The values are based on the best available data at the time of writing.) More details and figures are provided in Appendix A.

2.1 All-Island

In 2023, the share of electricity demand from renewable sources in Ireland and Northern Ireland was 40.5% (Figure 2). This is broken down as follows:

- 34.1% provided by wind.
- 1.3% provided by solar.
- 2.3% provided by hydro.
- 2.8% provided by other renewable energy sources.

The total wind energy generated was 13,757 GWh in Ireland and Northern Ireland. There was an estimated total of 1,663 GWh of dispatch-down energy from wind farms.

This level of dispatch-down of wind represents 10.7% of total available energy from wind resources in Ireland and Northern Ireland.

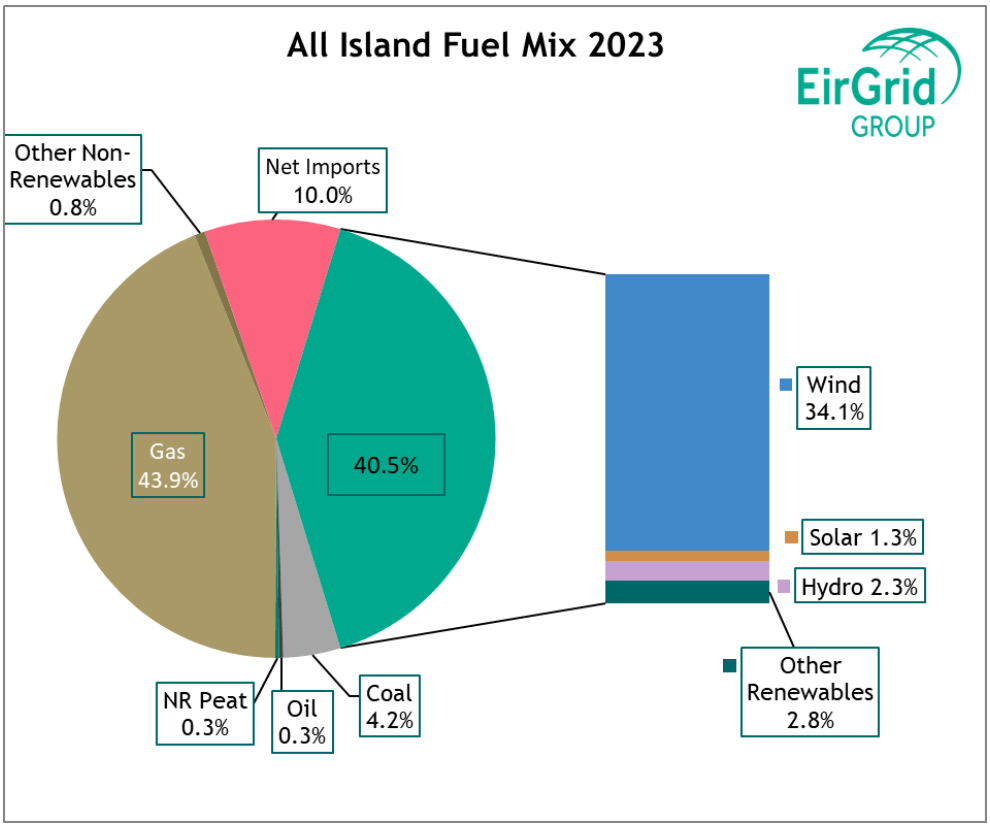


Figure 2: All-Island Fuel Mix for 2023 as Percentage of Demand

2.2 Northern Ireland

In 2023, the total dispatch-down energy from wind generation in Northern Ireland was 539 GWh. This is equivalent to 18.6% of total available wind energy in that jurisdiction.

In 2023, the total dispatch-down energy from solar generation in Northern Ireland was 10 GWh. This is equivalent to 7.9% of total available solar energy in that jurisdiction.

2.3 Ireland

In 2023, the total dispatch-down energy from wind generation in Ireland was 1,124 GWh. This is equivalent to 8.9% of total available wind energy in Ireland.

In 2023, the total dispatch-down energy from solar generation in Ireland was 39 GWh. This is equivalent to 9.5% of total available solar energy in that jurisdiction.

2. Contributory Factors for Dispatch-Down of Wind and Solar

3.1 Installed Wind and Capacity Factor

As explained previously, it is sometimes necessary to limit the maximum level of wind generation on the system for security or safety reasons. The impact of these limits on the level of dispatch-down will depend on two factors: the amount of wind generation installed on the system; and the capacity factor of the wind generation.

In 2023, 217 MW was added to the wind installed capacity on the island. The breakdown of wind installed capacities between Ireland and Northern Ireland[7] is shown below in Table 1.

EirGrid GROUP	Wind Installed Capacities (MW)								
	Ireland			Northern Ireland			All Island		
Year End	TSO	DSO	Total	TSO	DSO	Total	TSO	DSO	Total
2010	727.8	662.6	**1,390.4**	0.0	392.2	**392.2**	727.8	1,054.8	**1,782.6**
2011	769.2	815.4	**1,584.6**	73.6	438.8	**512.4**	842.8	1,254.2	**2,097.0**
2012	769.2	934.3	**1,703.5**	73.6	526.0	**599.6**	842.8	1,460.3	**2,303.1**
2013	845.2	1,078.1	**1,923.3**	73.6	566.4	**640.0**	918.8	1,644.5	**2,563.3**
2014	1,046.6	1,219.9	**2,266.4**	73.6	655.5	**729.1**	1,120.2	1,875.4	**2,995.5**
2015	1,152.6	1,294.7	**2,447.3**	73.6	677.4	**751.0**	1,226.2	1,972.1	**3,198.3**
2016	1,371.3	1,423.5	**2,794.8**	73.6	869.0	**942.6**	1,444.9	2,292.5	**3,737.4**
2017	1,591.5	1,710.8	**3,302.3**	121.1	1,032.6	**1,153.7**	1,712.6	2,743.4	**4,456.0**
2018	1,774.5	1,892.6	**3,667.0**	121.1	1,155.2	**1,276.3**	1,895.6	3,047.8	**4,943.3**
2019	1,932.5	2,180.3	**4,112.8**	121.1	1,155.2	**1,276.3**	2,053.6	3,335.5	**5,389.1**
2020	2,064.8	2,258.1	**4,322.9**	121.1	1,155.2	**1,276.3**	2,185.9	3,413.3	**5,599.2**
2021	2,074.1	2,258.1	**4,332.2**	121.1	1,229.5	**1,350.6**	2,195.2	3,487.6	**5,682.8**
2022	2,234.7	2,292.6	**4,527.3**	121.1	1,229.5	**1,350.6**	2,355.8	3,522.1	**5,877.9**
2023	2,416.8	2,313.7	**4,730.4**	121.1	1,243.2	**1,364.3**	2,537.9	3,556.9	**6,094.7**

Table 1: Installed wind capacities on the island from 2010 to 2023

Over the year, the capacity factor[8] of wind farms was 26% which was slightly lower than in 2022. For comparison, it was 29%, 24% and 27% in 2020, 2021 and 2022 respectively.

[7] Some of Northern Ireland's DSO wind connection dates are currently unavailable. Best estimates for the annual installed capacities are used instead.

[8] The capacity factor is the amount of energy produced (MW output) relative to the theoretical maximum that could have been produced if the wind generation operated at full capacity.. This capacity factor is indicative and based on real-time SCADA data.

3.2 Generation and Transmission System Outages in 2023

Across the year, generators and interconnectors will take planned outages at various times. There will also be transmission system outages. These outages may affect dispatch down figures. In N. Ireland across the summer period, there were periods where significantly transmission outages were taken for reinforcement works to increase network capacity. These outages included periods where double/both circuits outages were required to be taken.

3.3 Demand Level

The level of demand is another important factor which may affect the dispatch-down of renewable generation. Increased demand generally enables greater levels of wind and solar to be accommodated on the system.

3.4 Changes to Operational Policy

Since the introduction of SEM-11-062, there is a requirement to dispatch-down wind and solar generators based on their controllability category. This is defined under the Grid Codes and is verified through performance monitoring and testing.

The key operational policies in 2023 that impacted on curtailment levels were as follows:

- **System Non-Synchronous Penetration (SNSP)**: 75% limit applied for the full year. The 75% SNSP trial which started on 15 April 2021 continued to 31 March 2022 at which point the 75% SNSP limit became formal operational policy.
- **Minimum Number of Units**: A minimum requirement of 8 units (3 in N. Ireland and 5 in Ireland) applied for the full year. On 30th May 2023, a 7 set trial commenced (3 in N. Ireland and 4 in Ireland)
- **Inertia**: 23,000 MWs floor applied for the full year.
- **Reserve**: No significant change. The requirement for 50 MW of negative reserve to be held on conventional generators in NI continued through 2023.

In N. Ireland the closure of the coal units in September 2023 and the delay in commissioning of new units resulted in a large CCGT being made “must run”. This generator is located in a high wind region and hence will have impacted dispatch-down of renewables.

3. Breakdown of Wind Dispatch-Down Constraints vs Curtailments

Table 2 shows the aggregate breakdown[9] of wind dispatch-down on the island over the last eleven years.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Dispatch Down Levels	3.2%	4.1%	5.1%	2.9%	4.0%	6.0%	7.7%	12.1%	7.4%	8.5%	10.7%
Constraints	0.9%	1.4%	1.8%	1.4%	1.2%	2.2%	4.0%	6.2%	4.4%	5.0%	6.1%
Curtailments	2.3%	2.6%	3.3%	1.5%	2.7%	3.8%	3.7%	5.9%	3.0%	3.5%	4.7%

Table 2: All-Island Yearly Breakdown of Wind Dispatch-Down Levels into Constraints and Curtailments

Individual breakdowns for Ireland and Northern Ireland can be found in the Appendix.

4.1 Curtailment

Curtailment refers to the dispatch-down of wind / solar for system-wide reasons. There are different types of system security limits that necessitate curtailment:

1. System stability requirements (synchronous inertia, dynamic and transient stability),
2. Operating reserve requirements, including negative reserve,
3. Voltage control requirements,
4. System Non-Synchronous Penetration (SNSP[10]) limit.

In order to securely operate the system these limits result in minimum generation requirements on the conventional (synchronous) generation portfolio. The implementation of these security limits is described in detail in the Operational Constraints Update paper. This document is published[11] on the EirGrid Group website.

SNSP is a system security metric that has been established from the results of the DS3 programme.

SNSP (System Non-Synchronous Penetration) is the sum of non-synchronous generation (such as wind, solar and HVDC imports) as a percentage of total demand and exports. When the SNSP limit is raised, a trial period takes place before it becomes permanent. During the trial period, the system is operated at this increased SNSP limit except during adverse system events or during system testing.

[9] A more accurate methodology for calculating wind dispatch down was implemented from 2016. Figures from previous years are best estimates.

[10] SNSP is the ratio of non-synchronous generation (wind and HVDC imports) to demand plus HVDC exports.
[11] http://www.eirgridgroup.com/library/index.xml

The power system is now permanently operated to an SNSP Limit of 75%. The SNSP limit can reduce the ability to accommodate wind and solar generation, particularly during lower demand periods.

The impact of curtailment can be seen in Figure 5, which shows the total annual all-island dispatch-down of energy by hour of day. There are more curtailments in the night hours (11pm to 7am) when compared to constraints because the demand is lower (Figure 5 is essentially the mirror image of the demand curve).

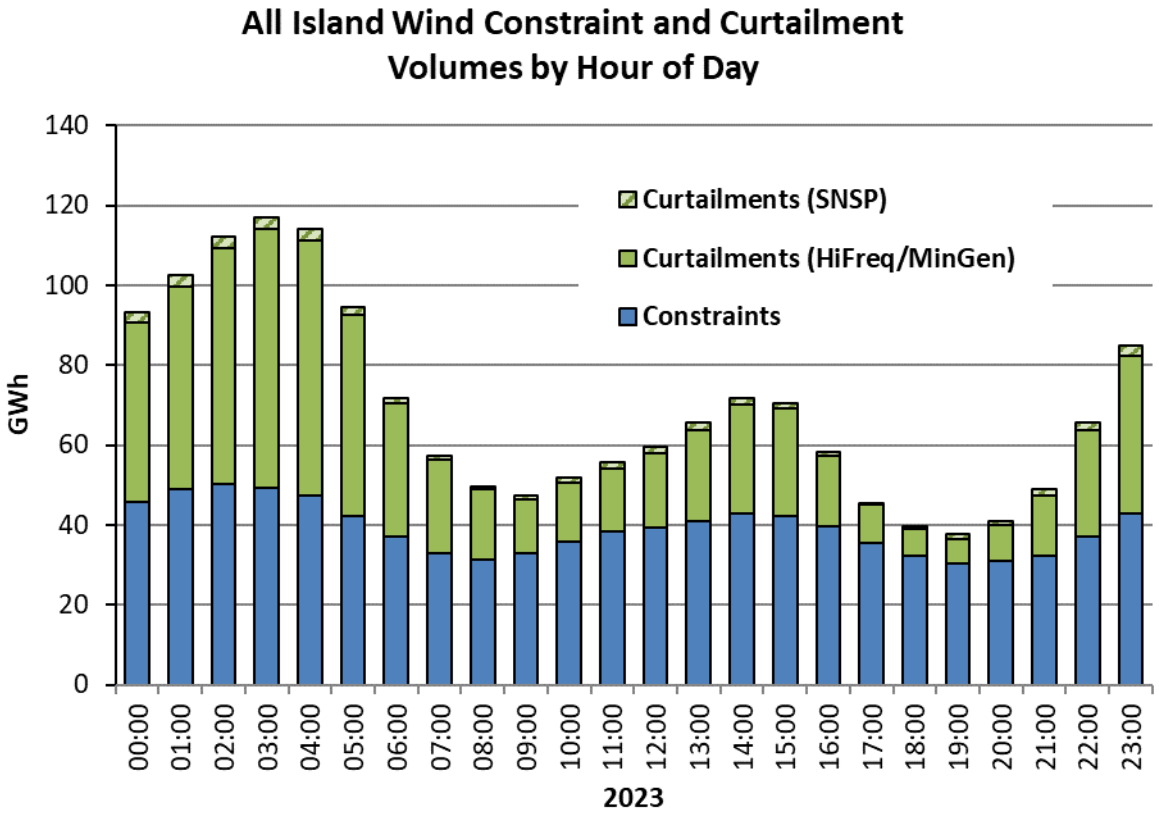


Figure 5: All-Island breakdown of wind constraints and curtailments in 2023 by hour of day

Due to the nature of solar, constraints and curtailments are experienced during daylight hours with the highest level of dispatch down between 10am and 4pm as shown in Figure 22 in the Appendix.

4.2 Constraints

The dispatch-down of wind for network reasons is referred to as a constraint.

Constraint of wind and solar can occur for two main reasons:

- more wind generation than the localised carrying capacity of the network; or
- during outages for maintenance, upgrade works or faults.

In order to reinforce the network to facilitate more wind and solar generation, a number of major capital works projects are scheduled during the transmission outage season each year. These outages may reduce the renewable generation capacity of the network for the duration of any works. In the short term, this

leads to a rise in the levels of constraint in these areas. However, in the long term, this reinforcement of the network increases its capacity. This enables the accommodation of more generation in that area.

The level of all-island dispatch-down attributable to constraints (rather than curtailment) was 6.1% in 2023, which was higher than the 5.0% constraint levels experienced in 2022.

However, it is possible to experience constraints on the transmission system during intact conditions when there is more renewable generation available than the localised carrying capacity of the network.

4.3 Wind Dispatch-Down by Region

The areas with the highest levels of wind dispatch-down (constraints and curtailment) in 2023 were the West and North West of Ireland (Figure 6). The following are the main factors for high wind dispatch-down in these regions:

Northern Ireland:

In general, wind constraints are trending upwards in Northern Ireland due to the amount of wind on the Northern Ireland system relative to its size. At times there is no option but to constrain wind (and solar) if all the online conventional units are at minimum generation, while also managing the potential loss of the tie-line. The loss of the tie-line is flagged as a Northern Ireland constraint as opposed to curtailment, as it does not affect wind in Ireland, i.e. it's a local Northern Ireland issue.

From a Northern Ireland perspective, there will always be occasions throughout the year when outages required to maintain the network can increase constraints. In 2023 there were a number of significant outages that impacted dispatch-down. These outages which included double circuit outages were needed to upgrade the network.

Following the closure of the coal units in N. Ireland and the delay in replacement units a "must run" constraint was implemented on a large CCGT that is located in a high wind region. This was implemented to maintain Security of Supply.

In addition, interconnector imports from GB into N. Ireland have increased and TSOs have observed imports even at time of high wind on the island.

Ireland:

In recent years significant capital works have been undertaken to upgrade the transmission system to allow more wind generation to be exported from wind farms on the system particularly in the North West and South West regions of Ireland. These areas have previously experienced the greatest level of restrictions for the export of wind. Every year a range of planned transmission outages are undertaken which at times will increase constraints.

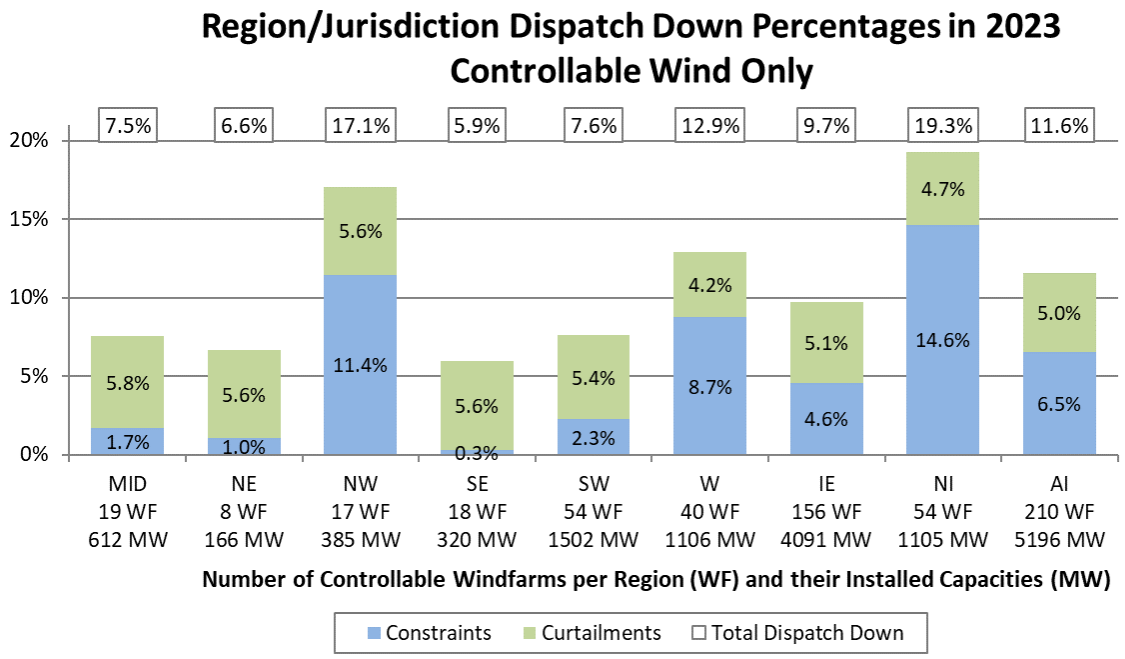


Figure 6: Regional/Jurisdictional Controllable Wind Dispatch-Down Percentages in 2023

Notes:

- Installed capacities are indicative end of year figures and do not reflect capacity changes throughout the year.
- This chart reflects the dispatch down levels and breakdowns for controllable windfarms only which are different from the levels for all windfarms quoted elsewhere in this report.
- IE = Ireland, NI = Northern Ireland, AI = All Island.

4. Future Measures to reduce downward redispatch

4.1. Current Status

It should be noted that the electricity power system is currently designed and operated such that at any instant in time 75% of energy sources can be accommodated by renewable generation (primarily wind and solar) or high-efficiency cogeneration.

The TSOs operate a priority dispatch order which at all times looks to maximises energy production from renewable energy sources and minimises downward redispatch. The output of these units is maximised as far as technically feasible. Within this categorisation there is a hierarchy of units as shown below in Figure 2. Note that this hierarchy sits within other dispatch requirements related to hydro stations during flood risk situations, the treatment of interconnector schedules (avoiding curtailment of market schedules), other units (non-priority dispatch) and TSO-led Cross-Zonal Actions over the interconnectors.

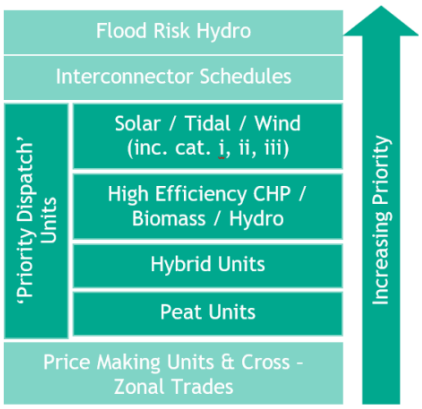


Figure 2: Priority Dispatch Order

The TSOs will actively looks to increase exports on HVDC Interconnectors to GB via an agreed coordinated approach with the GB System Operator (National Grid).

The TSOs (EirGrid & SONI) operate a common Energy Management System (EMS) with common security assessment applications. The visibility of a common system enhances system security and optimises redispatch.

The transmission system has a high level of digitalisation with all circuits monitored and controlled via the EMS. In addition:

- The HVDC Interconnectors and batteries are fully integrated into the EMS to allow monitoring and control. Future changes in schedules are automated incorporated into the EMS.
- The TSOs have a real time transient security analysis application to ensure system security while maximising renewable production. This application gives results for the current state of the power system and also forecasts into the future time periods. Scenario analysis is automatically completed.

- The TSOs have a voltage trajectory tool. Similar to the transient analysis it takes current information along with forecast to determine the optimum management of the voltage on the power system.

In addition the TSOs have deployed high speed data digital recording devices at numerous nodes on the power system to allow monitoring of any transient behaviour as inertia on the power system is lowered.

The TSOs have a volume of short duration batteries and demand side units that provide System Services (Ancillary Services) that minimise the need for these services to be provided by conventional generation. The TSOs contract for System Services from a wide range of suppliers including renewable generators, batteries and demand side users (DSUs). An overview of this is via the DS3 programme[12]

4.2. Future Roadmap

The TSOs have developed a multiyear road map[13] of activities that are all focused on reducing downward redispatching of renewable energy sources. An extract from this roadmap is shown below in Figure 3.

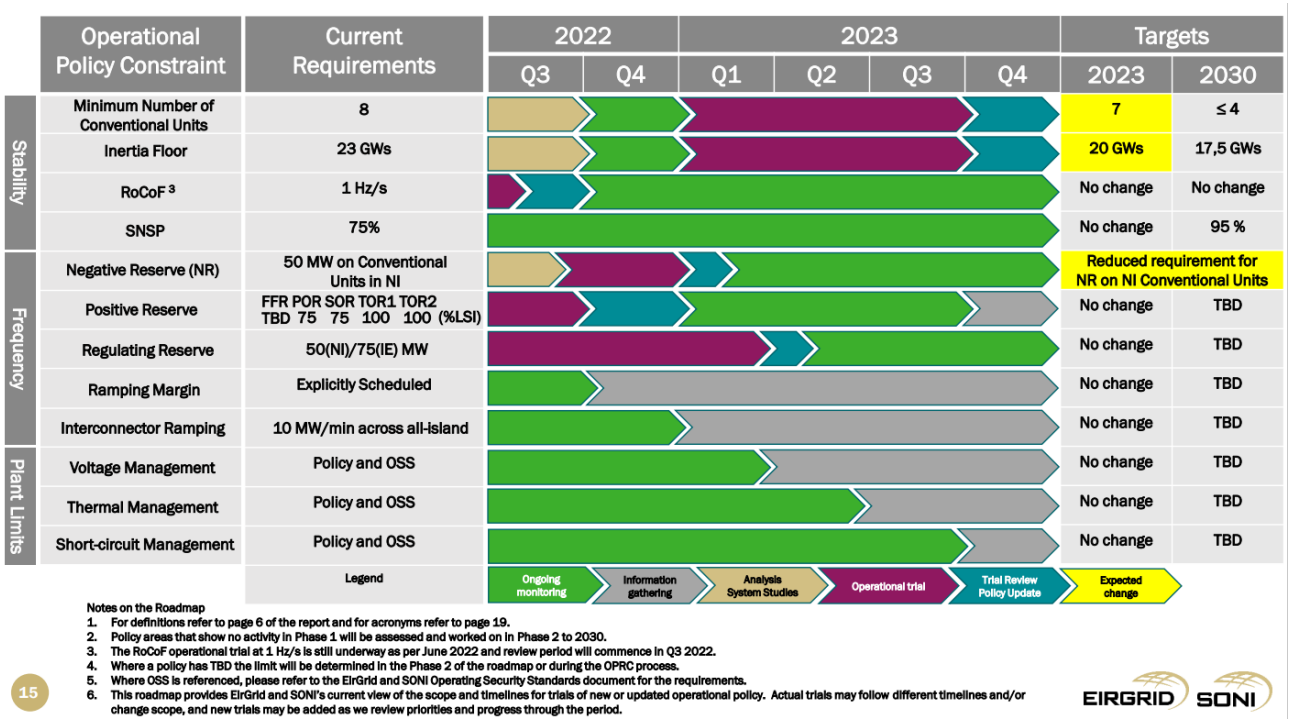


Figure 3: Operational Policy Roadmap

In 2023, a trial was started to reduce the minimum number of conventional units from 8 to 7. By reducing the number of conventional generation units, it provides for more renewable generation. This is part of an ongoing trial to continually reduce conventional generation at times of high renewable energy sources. The roadmap is updated regularly to reflect the latest operational experience from trials.

[12] DS3 Programme (soni.ltd.uk)
[13] PowerPoint Presentation (soni.ltd.uk)

In 2023, a procurement exercise commenced to source Low Caron Sources of Inertia (LCSI)[14]. It is anticipated that in 2024, contracts will be awarded. This will allow inertia to be provided from sources other than conventional generation.

5. Development and effectiveness of market based redispatching mechanisms

The TSOs are able to effectively dispatch by electronic means all the fuel types highlighted in this report while ensuring safety and security of supply.

Across 2024, market based systems are being updated so that storage provider such as batteries can submit a negative PN to better reflect charging.

[14] https://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-SONI-Plan-for-procurement-of-LCIS-Webinar.pdf

5. Appendix A – Detailed Results

The following charts provide a breakdown of the wind and solar dispatch-down categories both in volumes and in percentage of available energy.

More detailed monthly and regional figures are available in our final monthly wind and solar dispatch-down reports for 2023. Our user guide provides a detailed description of the dispatch-down categories and the methodology used. Both the monthly report and the user guide are available on our website:

http://www.eirgridgroup.com/how-the-grid-works/renewables/

http://www.soni.ltd.uk/how-the-grid-works/renewables/

6.1 Reason Codes

This is a list of all the reason codes used when constraining and curtailing wind and solar:

- Transmission (TSO) Constraints: Used to resolve a local network issue,
- Testing (TSO): Used when wind/solar farm testing is carried out by the TSO, e.g. for commissioning and monitoring,
- Curtailments:
    - High Frequency/Minimum generation: Used when attempting to alleviate an emergency high frequency event or in order to facilitate the minimum level of conventional generation on the system to satisfy reserve requirements, priority dispatch or to provide ramping capabilities,
    - SNSP Issue: Used to reduce the System Non-Synchronous Penetration,
    - ROCOF/Inertia: Used when the Rate of Change of Frequency (ROCOF) value for the loss of the largest single infeed is unacceptably high and wind/solar must be dispatched down as a result or when the system inertia is too low.
- Other Reductions:
    - DSO/DNO Constraints: Used when a dispatch is carried out as a result of a request from the Distribution System Operator or the Distribution Network Operator,
    - Developer Outage: Used when a wind/solar farm must reduce output mainly to carry out software upgrades,
    - Developer Testing: Used when testing is carried out by a wind/solar farm developer.

6.2 All-Island Wind

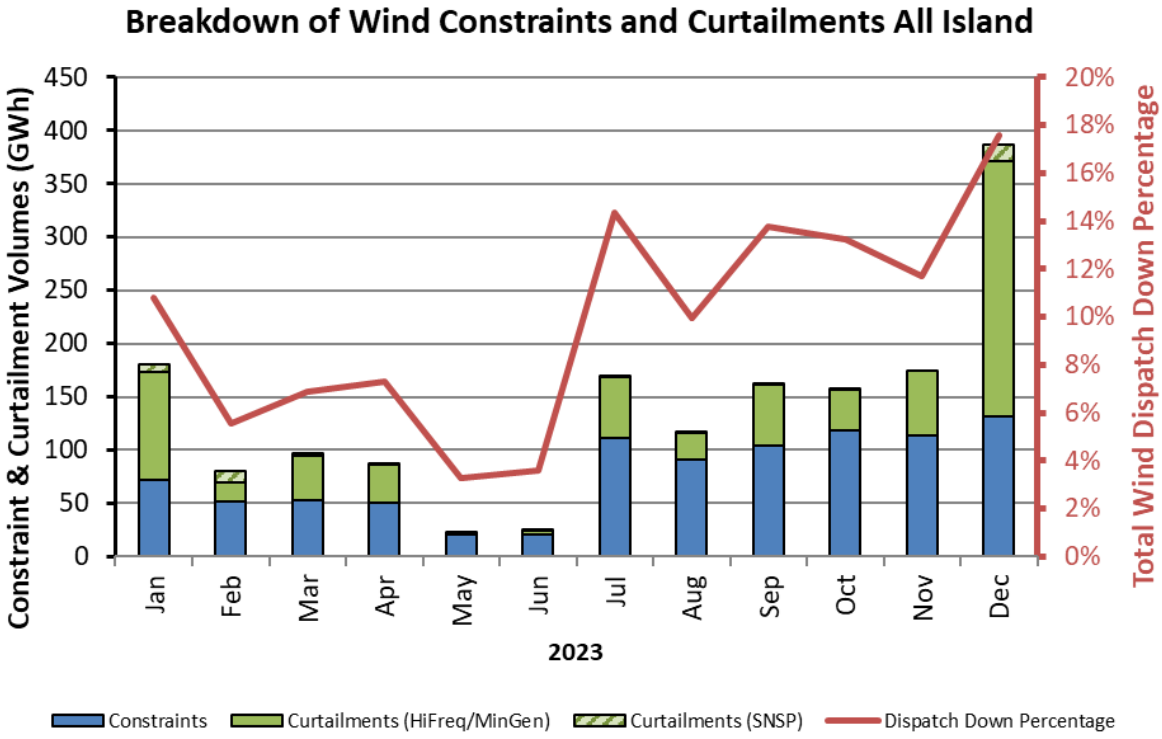
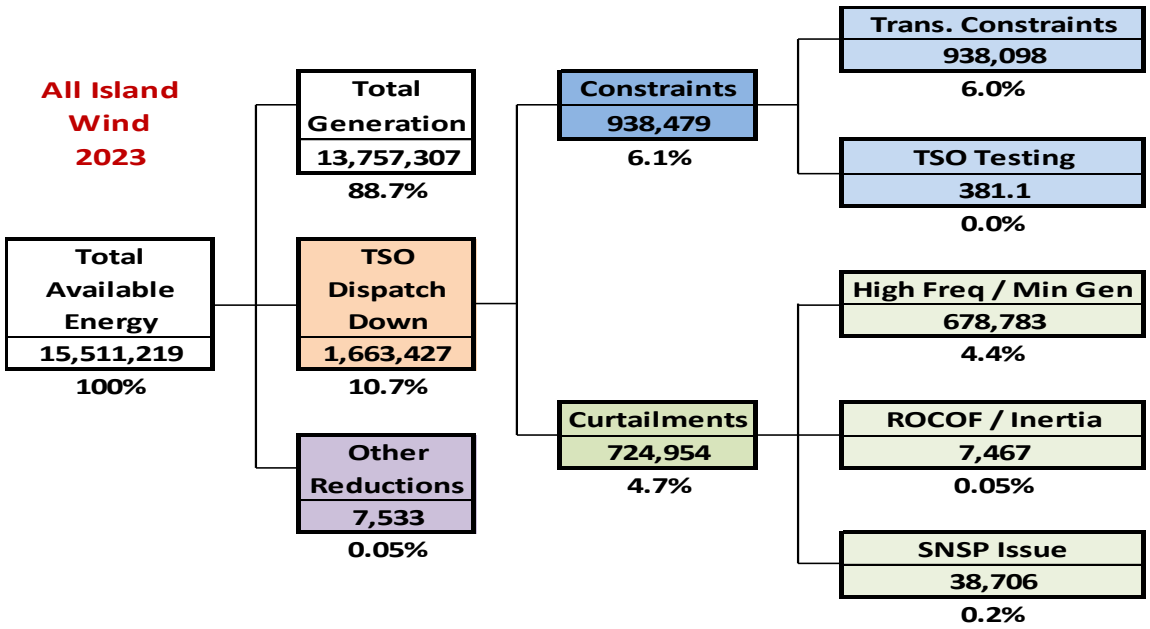


Figure 7: Monthly breakdown of all-island wind constraints and curtailments in 2023



Wind energy breakdowns: Volumes (MWh) and percentages.
Other reductions include DSO constraints, developer outage and developer testing.
Certain types of reductions are outside of the control of the TSO and are not logged.
Therefore, Available Energy ≠ Generation + TSO Dispatch Down + Other Reductions

Figure 8: Graphical representation of all-island wind dispatch-down categories in 2023

6.3 Ireland Wind

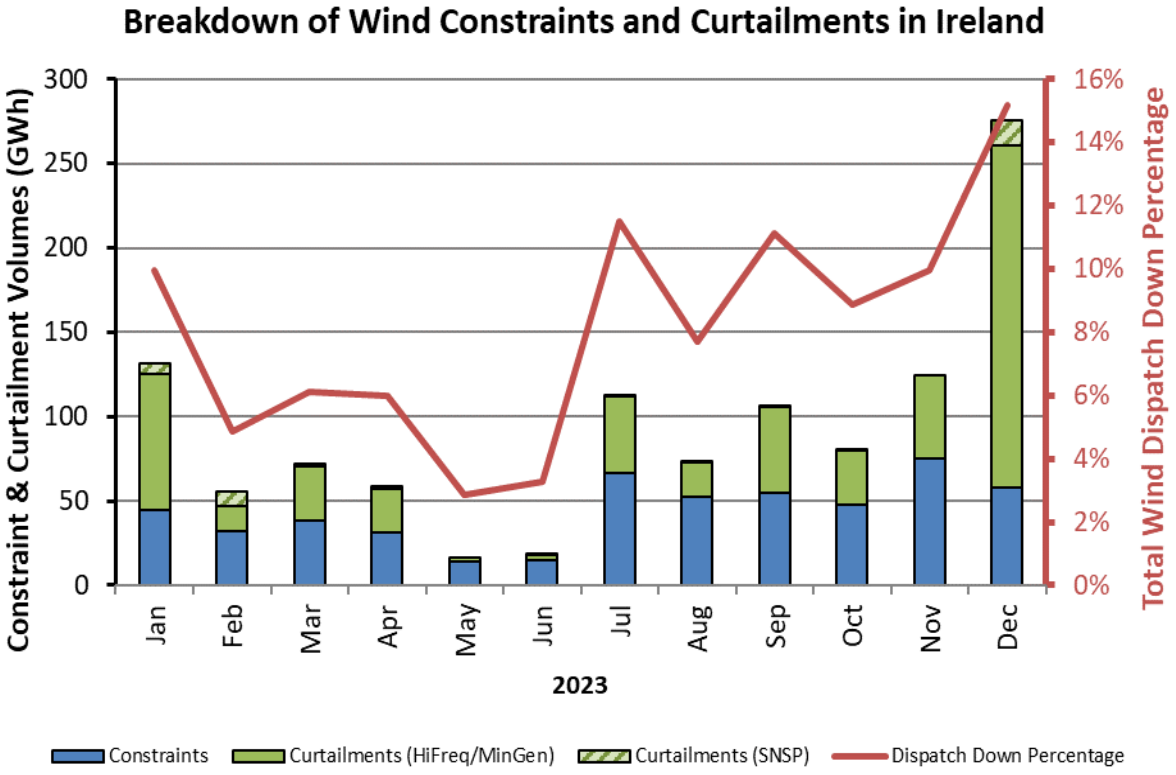
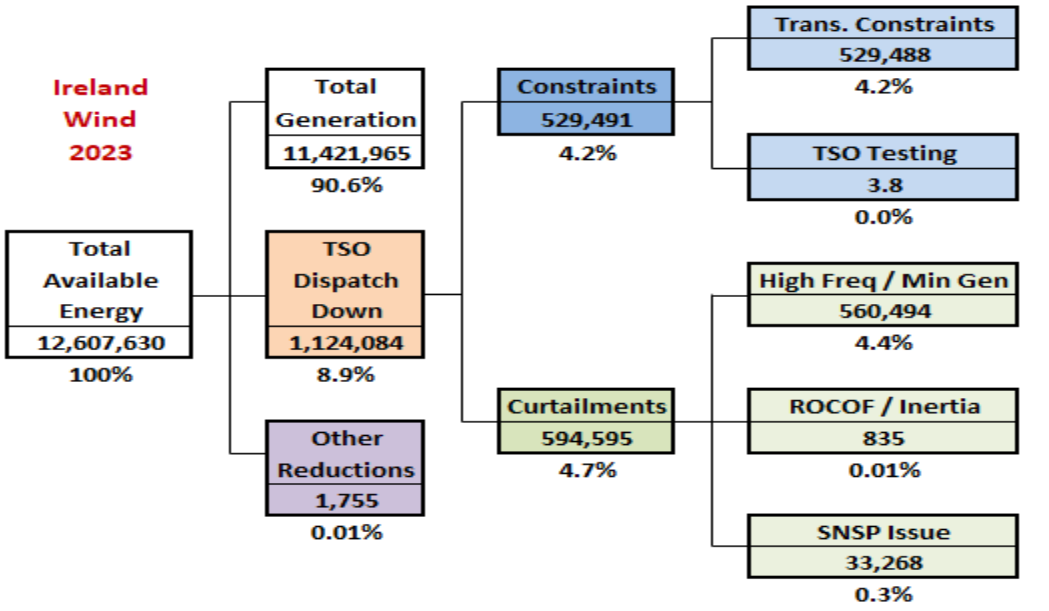


Figure 9: Monthly breakdown of the main wind dispatch-down categories in Ireland in 2023



Wind energy breakdowns: Volumes (MWh) and percentages.
Other reductions include DSO constraints, developer outage and developer testing.
Certain types of reductions are outside of the control of the TSO and are not logged.
Therefore, Available Energy ≠ Generation + TSO Dispatch Down + Other Reductions

Figure 10: Graphical representation of wind dispatch-down categories in Ireland in 2023

6.4 Northern Ireland Wind

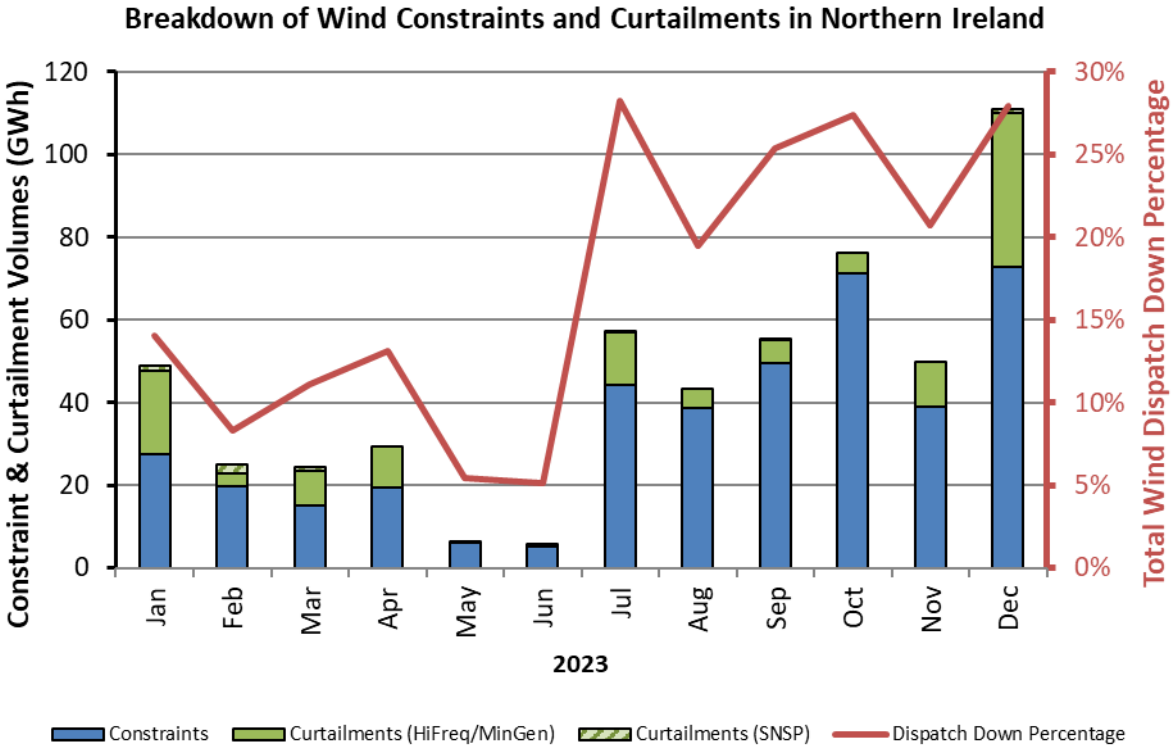


Figure 11: Monthly breakdown of wind dispatch-down categories in Northern Ireland in 2023

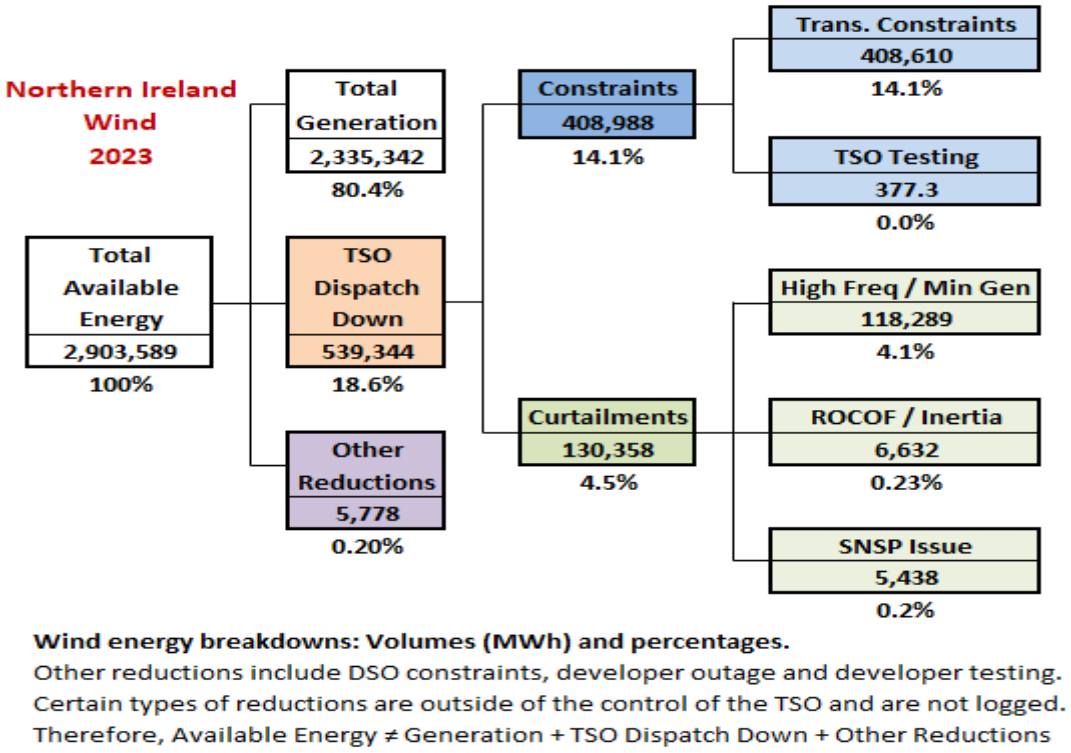


Figure 12: Graphical representation of Northern Ireland wind dispatch-down categories in 2023

6.5 All-Island Solar

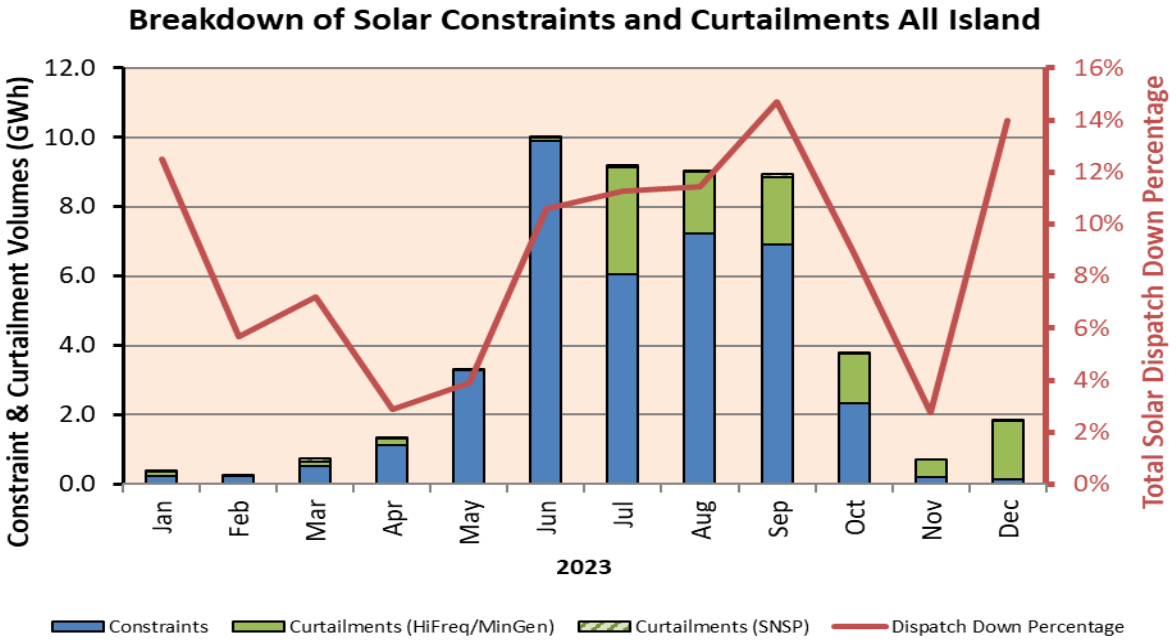
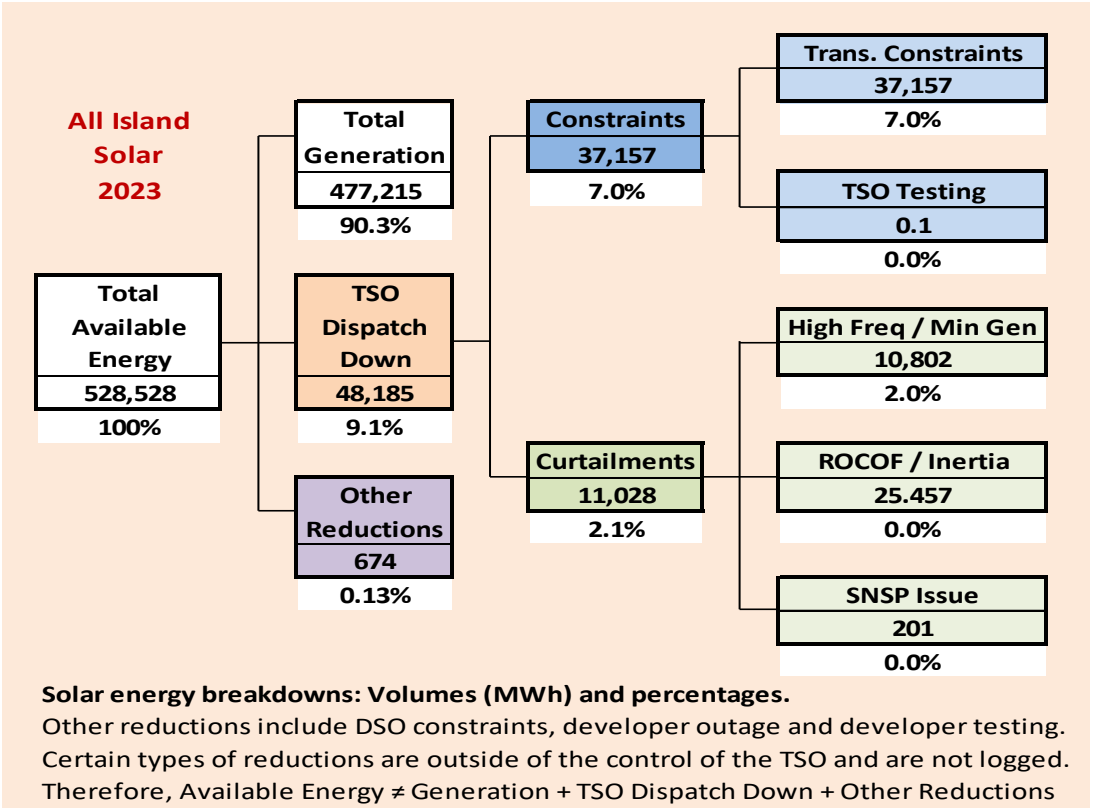


Figure 13: Monthly breakdown of all-island solar constraints and curtailments in 2023



Solar energy breakdowns: Volumes (MWh) and percentages.
Other reductions include DSO constraints, developer outage and developer testing.
Certain types of reductions are outside of the control of the TSO and are not logged.
Therefore, Available Energy ≠ Generation + TSO Dispatch Down + Other Reductions

Figure 14: Graphical representation of all-island solar dispatch-down categories in 2023

6.6 Ireland Solar

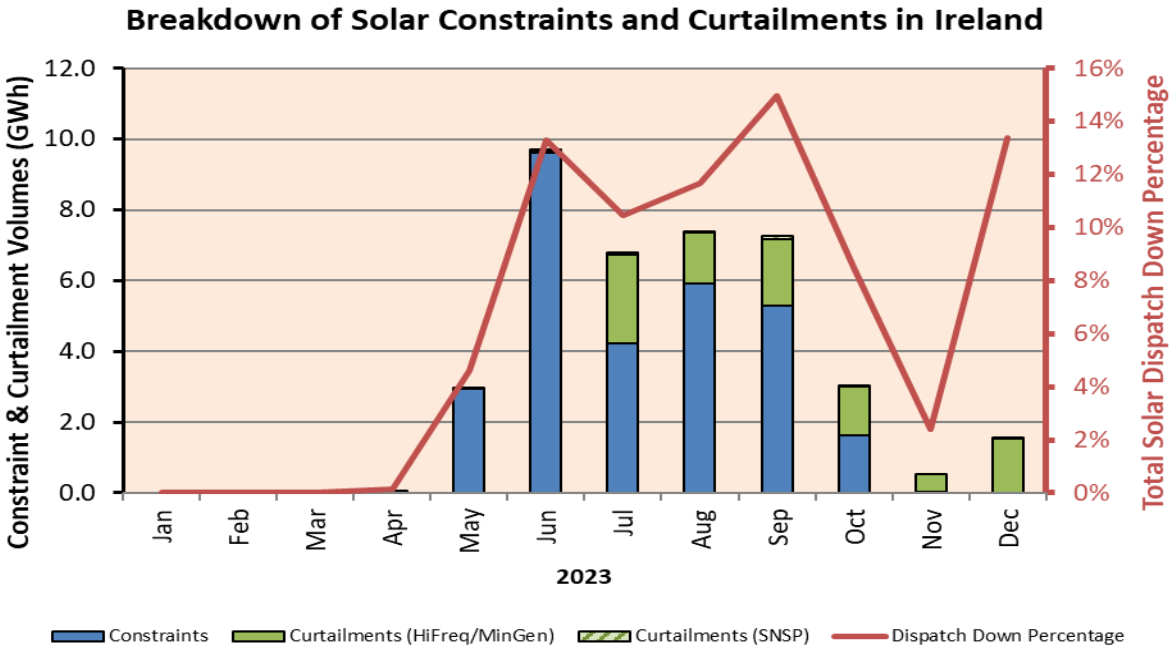


Figure 15: Monthly breakdown of the main solar dispatch-down categories in Ireland in 2023

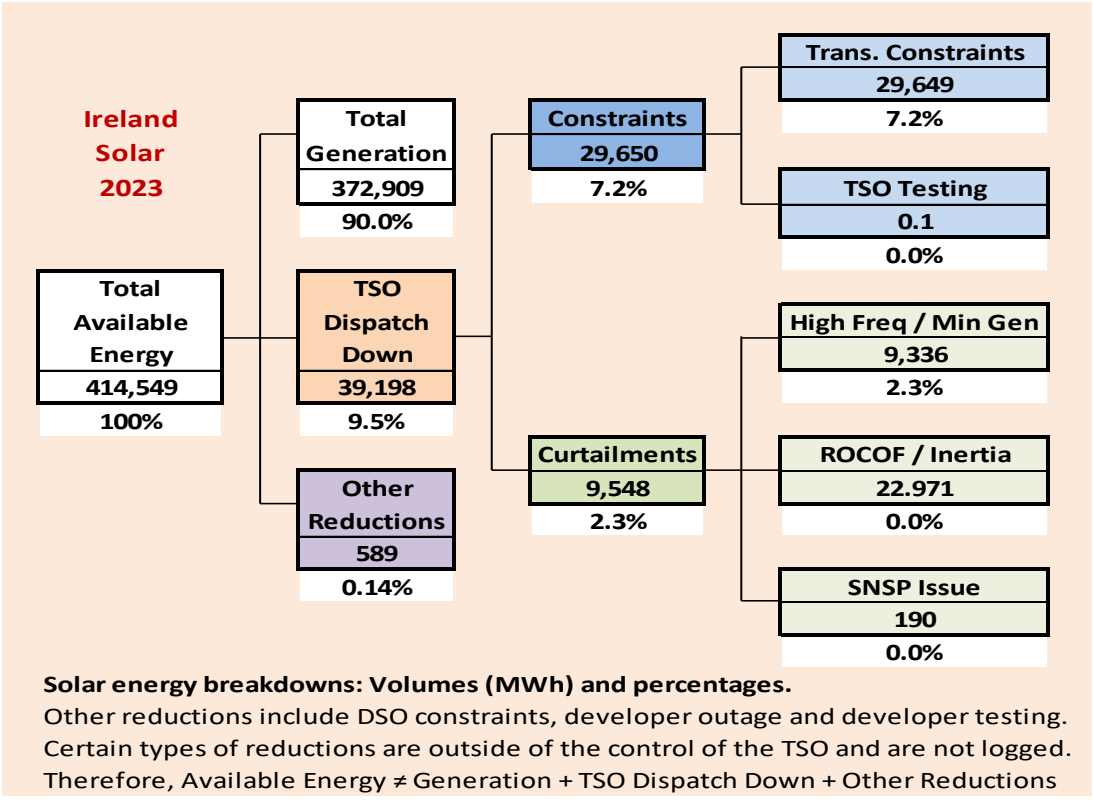


Figure 16: Graphical representation of Ireland solar dispatch-down categories in 2023

6.7 Northern Ireland Solar

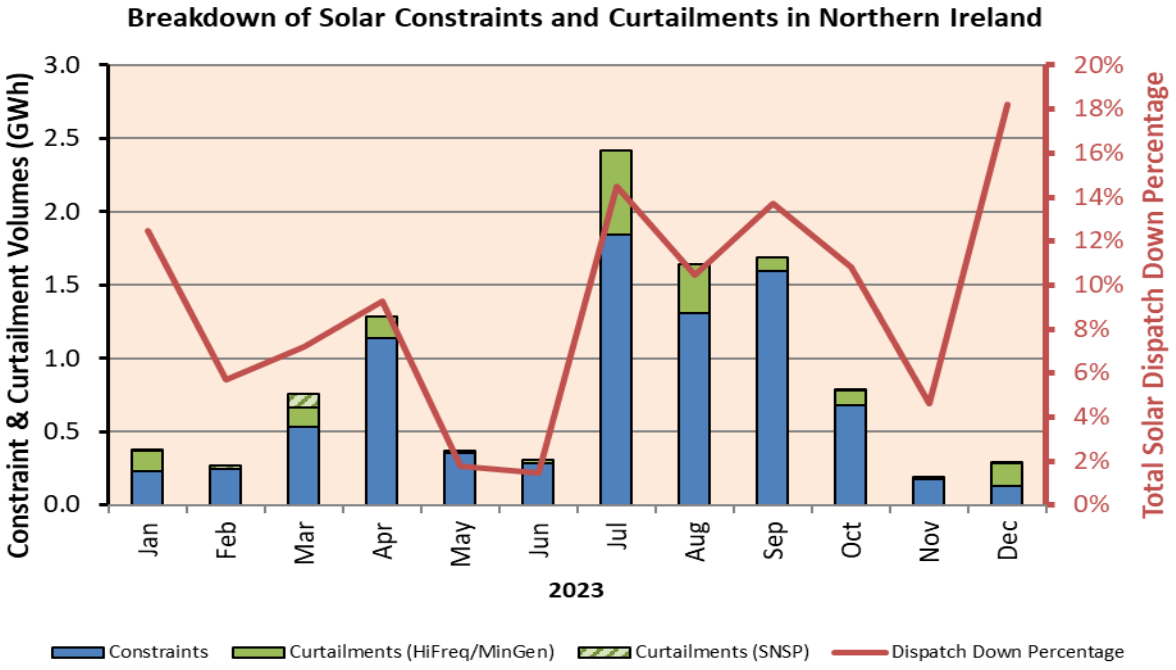


Figure 17: Monthly breakdown of solar dispatch-down categories in Northern Ireland in 2023

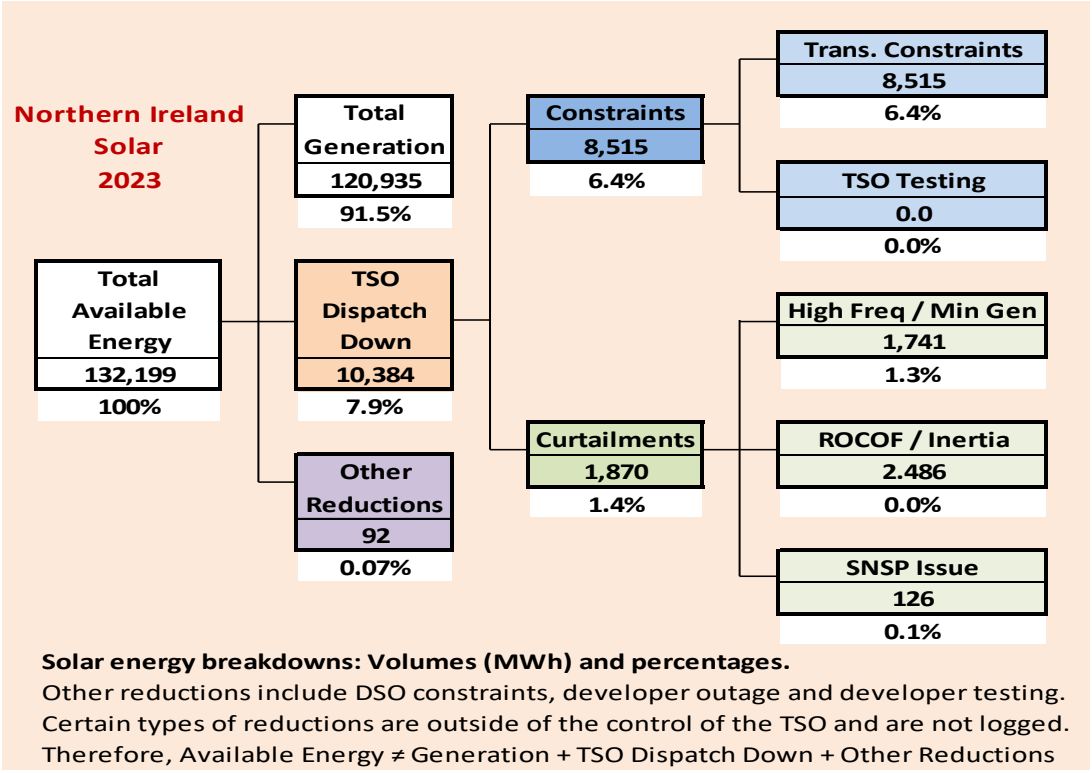


Figure 18: Graphical representation of Northern Ireland solar dispatch-down categories in 2023

Table 3: Historical Wind Dispatch-Down Summary in Ireland, Northern Ireland and All-Island

Historical Wind Dispatch Down (Constraint and Curtailment) Percentages for Ireland (IE), Northern Ireland (NI) and All Island (AI)

	2011			2012			2013			2014			2015			2016			2017			2018			2019			2020			2021			2022			2023		
Month	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**	**NI**	**IE**	**AI**
Jan	0.0%	0.8%	0.6%	0.5%	2.2%	1.9%	0.7%	0.4%	0.5%	2.9%	4.9%	4.5%	4.3%	4.3%	4.3%	3.4%	3.5%	3.5%	2.4%	1.9%	2.0%	5.7%	3.5%	3.9%	9.7%	3.8%	5.1%	12.3%	9.0%	9.8%	5.2%	5.3%	5.3%	8.6%	9.1%	8.9%	14.1%	9.9%	10.8%
Feb	0.0%	0.6%	0.5%	0.2%	2.8%	2.2%	0.3%	0.7%	0.6%	3.2%	3.7%	3.6%	4.6%	4.1%	4.2%	2.3%	3.3%	3.1%	2.0%	1.7%	1.7%	2.9%	2.0%	2.2%	10.7%	6.8%	7.7%	17.4%	12.3%	13.4%	11.5%	10.2%	10.5%	8.0%	8.1%	8.1%	8.3%	4.9%	5.6%
Mar	2.7%	1.8%	2.0%	0.8%	2.4%	2.0%	0.6%	0.3%	0.3%	1.8%	4.0%	3.5%	11.4%	8.0%	8.8%	0.9%	2.4%	2.1%	3.0%	3.4%	3.3%	5.9%	4.4%	4.7%	11.8%	9.2%	9.8%	14.5%	10.7%	11.4%	9.8%	12.8%	12.2%	6.0%	7.4%	7.1%	11.1%	6.1%	6.9%
Qtr1	0.7%	1.0%	0.9%	0.5%	2.4%	2.0%	0.6%	0.4%	0.5%	2.7%	4.2%	3.9%	6.9%	5.4%	5.8%	2.4%	3.2%	3.0%	2.4%	2.3%	2.4%	4.9%	3.3%	3.6%	10.8%	6.8%	7.7%	14.9%	10.9%	11.7%	9.4%	9.7%	9.6%	7.7%	8.2%	8.1%	11.3%	7.1%	7.9%
Apr	1.3%	1.2%	1.3%	0.2%	1.4%	1.2%	2.6%	4.7%	4.3%	1.8%	4.2%	3.7%	2.8%	1.8%	2.0%	0.8%	1.4%	1.3%	4.2%	3.5%	3.6%	19.2%	7.4%	9.8%	11.4%	9.0%	9.6%	21.8%	9.0%	11.8%	4.7%	2.1%	2.5%	6.5%	5.5%	5.7%	13.1%	6.0%	7.3%
May	2.2%	3.5%	3.2%	0.6%	1.6%	1.4%	3.7%	6.1%	5.6%	1.5%	2.8%	2.5%	3.8%	4.5%	4.3%	1.1%	1.2%	1.2%	3.6%	3.5%	3.5%	6.1%	4.7%	5.0%	3.8%	4.1%	4.0%	19.8%	12.6%	13.9%	10.1%	11.8%	11.5%	6.7%	10.2%	9.4%	5.5%	2.9%	3.3%
Jun	0.4%	0.8%	0.7%	0.4%	4.0%	3.3%	1.9%	3.7%	3.4%	0.6%	3.3%	2.7%	4.2%	5.0%	4.8%	0.3%	0.7%	0.7%	4.7%	3.9%	4.1%	11.0%	8.0%	8.6%	11.2%	5.6%	6.7%	26.2%	15.4%	17.5%	2.1%	2.4%	2.4%	13.1%	10.1%	10.7%	5.2%	3.3%	3.6%
Qtr2	1.6%	2.3%	2.2%	0.4%	2.2%	1.9%	2.9%	5.0%	4.6%	1.5%	3.4%	3.0%	3.7%	3.9%	3.8%	0.8%	1.2%	1.1%	4.2%	3.7%	3.8%	13.0%	6.6%	8.0%	9.4%	6.6%	7.2%	22.7%	12.7%	14.6%	6.0%	6.1%	6.1%	8.6%	8.6%	8.6%	9.2%	4.4%	5.3%
Jul	0.2%	3.3%	2.8%	0.5%	1.9%	1.6%	0.8%	4.2%	3.4%	1.6%	3.9%	3.4%	2.8%	3.8%	3.7%	6.2%	2.3%	3.1%	4.4%	2.8%	3.2%	2.1%	1.9%	2.0%	8.2%	3.8%	4.8%	12.4%	9.2%	9.8%	5.9%	0.5%	1.2%	11.4%	3.2%	5.0%	28.2%	11.5%	14.4%
Aug	0.0%	0.7%	0.5%	4.0%	4.2%	4.1%	2.4%	5.4%	4.7%	3.8%	3.5%	3.6%	5.0%	5.8%	5.6%	7.0%	4.6%	5.0%	3.1%	2.8%	2.9%	5.8%	2.2%	3.0%	15.2%	8.4%	9.8%	14.4%	11.4%	11.9%	7.0%	7.1%	7.1%	8.9%	3.5%	4.6%	19.5%	7.7%	9.9%
Sep	2.4%	3.9%	3.7%	0.4%	4.8%	3.7%	0.5%	4.2%	3.3%	0.1%	2.2%	1.8%	1.5%	2.7%	2.5%	5.8%	5.6%	5.6%	4.2%	5.4%	5.1%	13.1%	5.5%	7.4%	8.4%	8.2%	8.2%	9.0%	9.0%	9.0%	7.5%	5.5%	5.9%	8.1%	7.0%	7.2%	25.4%	11.1%	13.8%
Qtr3	1.5%	3.1%	2.8%	1.5%	3.8%	3.3%	1.3%	4.6%	3.9%	2.4%	3.3%	3.1%	3.1%	4.1%	3.9%	6.3%	4.4%	4.8%	3.9%	3.9%	3.9%	8.7%	3.6%	4.8%	11.0%	7.3%	8.0%	11.6%	9.8%	10.2%	7.1%	5.1%	5.4%	9.4%	4.8%	5.8%	24.3%	10.1%	12.7%
Oct	2.4%	4.7%	4.3%	0.0%	0.3%	0.2%	1.6%	5.9%	5.0%	4.5%	8.2%	7.4%	4.2%	3.8%	3.9%	1.9%	1.8%	1.8%	14.6%	9.2%	10.6%	10.2%	6.9%	7.7%	7.4%	6.4%	6.6%	12.4%	13.9%	13.6%	9.7%	8.0%	8.4%	13.8%	11.8%	12.2%	27.4%	8.9%	13.2%
Nov	1.2%	2.3%	2.1%	0.1%	1.0%	0.8%	4.0%	3.0%	3.2%	2.0%	3.2%	3.0%	6.9%	6.8%	6.9%	2.7%	1.0%	1.3%	3.2%	2.5%	2.6%	10.2%	5.2%	6.4%	7.4%	3.9%	4.5%	12.8%	13.4%	13.3%	6.4%	6.1%	6.2%	11.3%	9.3%	9.7%	20.7%	10.0%	11.7%
Dec	0.7%	2.2%	1.9%	0.8%	2.8%	2.5%	2.0%	4.4%	3.8%	4.5%	5.0%	4.9%	6.2%	6.3%	6.3%	3.8%	3.1%	3.3%	5.3%	2.5%	3.1%	14.9%	7.2%	8.9%	16.2%	9.6%	11.0%	9.8%	9.7%	9.7%	6.4%	5.4%	5.6%	10.0%	7.5%	7.9%	28.0%	15.2%	17.6%
Qtr4	1.4%	2.9%	2.6%	0.4%	1.6%	1.4%	2.4%	4.5%	4.0%	3.9%	5.7%	5.3%	6.1%	6.0%	6.0%	3.0%	2.1%	2.3%	8.5%	4.9%	5.7%	11.7%	6.4%	7.7%	11.1%	6.9%	7.8%	11.6%	12.3%	12.2%	7.5%	6.4%	6.6%	11.9%	9.7%	10.1%	26.0%	12.1%	14.8%
Year Total DD	**1.3%**	**2.4%**	**2.2%**	**0.7%**	**2.5%**	**2.1%**	**1.9%**	**3.5%**	**3.2%**	**2.8%**	**4.4%**	**4.1%**	**5.3%**	**5.1%**	**5.1%**	**3.2%**	**2.8%**	**2.9%**	**5.0%**	**3.7%**	**4.0%**	**9.4%**	**5.0%**	**6.0%**	**10.7%**	**6.9%**	**7.7%**	**14.8%**	**11.4%**	**12.1%**	**7.8%**	**7.3%**	**7.4%**	**9.4%**	**8.3%**	**8.5%**	**18.6%**	**8.9%**	**10.7%**
Constraints	0.3%	0.5%	0.4%	0.3%	0.9%	0.8%	0.5%	1.0%	0.9%	1.0%	1.5%	1.4%	1.9%	1.8%	1.8%	1.3%	1.4%	1.4%	1.9%	1.0%	1.2%	4.0%	1.7%	2.2%	4.7%	3.8%	4.0%	6.6%	6.1%	6.2%	4.2%	4.5%	4.4%	5.8%	4.8%	5.0%	14.1%	4.2%	6.1%
Curtailments	1.1%	2.0%	1.8%	0.4%	1.5%	1.3%	1.3%	2.5%	2.3%	1.8%	2.9%	2.6%	3.4%	3.3%	3.3%	1.9%	1.4%	1.5%	3.1%	2.6%	2.7%	5.4%	3.3%	3.8%	6.0%	3.1%	3.7%	8.2%	5.3%	5.9%	3.6%	2.8%	3.0%	3.6%	3.5%	3.5%	4.5%	4.7%	4.7%
Wind Installed Capacity (MW)	512	1,585	2,097	600	1,703	2,303	640	1,923	2,563	729	2,266	2,996	751	2,447	3,198	943	2,795	3,737	1,154	3,312	4,466	1,276	3,667	4,943	1,276	4,120	5,396	1,276	4,300	5,576	1,351	4,332	5,683	1,351	4,527	5,878	1,364	4,730	6,095
Wind Generation (GWh)	943	4,256	5,198	1,020	4,102	5,122	1,259	4,642	5,901	1,453	5,116	6,568	1,803	6,537	8,339	1,725	6,115	7,840	2,051	7,229	9,280	2,391	8,685	11,076	2,462	9,532	11,994	2,630	11,138	13,768	2,168	9,527	11,695	2,781	10,895	13,676	2,335	11,422	13,757
Wind Capacity Factors	21%	31%	28%	21%	28%	27%	23%	29%	28%	24%	28%	27%	28%	32%	31%	23%	27%	26%	22%	27%	26%	22%	28%	27%	22%	28%	26%	24%	30%	29%	19%	25%	24%	24%	28%	27%	20%	28%	26%
SNSP Limit	50%			50%			50%			50%			55% Trial from Oct			55% Perm from Mar 60% Trial from Nov			60% Perm from Mar 65% Trial from Nov			65% Perm from Apr			65%			65%			70% Trial from Jan 70% Perm from Apr 75% Trial from Apr			75% Perm from Apr			75%		

Notes:

"Dispatch Down" consists of constraints + curtailments. All wind figures included (controllable + non-controllable).

The darker shaded cells indicate higher dispatch-down percentages in order to produce a graphical representation similar to a heat map.

A more accurate methodology for calculating wind dispatch down was implemented from 2016. Figures from previous years are best estimates.

Wind installed capacities, generation and capacity factors are indicative and based on the latest available information.

SNSP (System Non-Synchronous Penetration) is the sum of non-synchronous generation (such as wind, solar and HVDC imports) as a percentage of total demand and exports.

When the SNSP limit is raised, a trial period takes place before it becomes permanent. During the trial period, the system is operated at this increased SNSP limit except in times of extreme system events or during system testing.

For more infomration see our annual and monthly dispatch down reports on: http://www.eirgridgroup.com/how-the-grid-works/renewables/ or: https://www.soni.ltd.uk/how-the-grid-works/renewables/

Wind Dispatch Down Percentages and Breakdown per Region (Controllable Windfarms only)

Controllable Wind By Region	Cap (MW)	2021 Jan	Feb	Mar	Qtr1	Apr	May	Jun	Qtr2	Jul	Aug	Sep	Qtr3	Oct	Nov	Dec	Qtr4	2021
MID	612	3.9%	6.3%	6.0%	5.5%	0.8%	5.7%	0.6%	2.7%	0.0%	7.8%	3.7%	4.7%	5.6%	3.8%	4.8%	4.8%	4.6%
Constraints		0.4%	0.5%	1.3%	0.7%	0.2%	2.7%	0.6%	1.3%	0.0%	2.8%	0.2%	1.2%	1.7%	0.4%	0.0%	0.6%	0.9%
Curtailments		3.5%	5.9%	4.7%	4.8%	0.6%	3.0%	0.0%	1.4%	0.0%	5.0%	3.6%	3.4%	4.0%	3.4%	4.8%	4.1%	3.7%
NE	166	2.9%	6.6%	5.4%	5.2%	1.3%	4.8%	0.0%	2.3%	0.0%	3.1%	3.3%	2.7%	3.0%	3.0%	4.3%	3.5%	3.8%
Constraints		0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Curtailments		2.9%	6.6%	5.4%	5.2%	1.0%	4.8%	0.0%	2.2%	0.0%	3.0%	3.3%	2.6%	3.0%	3.0%	4.3%	3.5%	3.8%
NW	385	5.3%	13.9%	9.8%	10.4%	2.4%	21.6%	2.0%	8.9%	1.4%	5.5%	8.1%	6.3%	8.5%	7.0%	9.8%	8.5%	9.0%
Constraints		3.1%	7.3%	5.1%	5.5%	1.8%	18.6%	2.0%	7.7%	1.4%	1.6%	7.0%	4.4%	3.8%	4.8%	4.4%	4.3%	5.5%
Curtailments		2.2%	6.6%	4.7%	4.8%	0.6%	3.0%	0.0%	1.2%	0.0%	3.9%	1.1%	1.8%	4.8%	2.2%	5.4%	4.2%	3.5%
SE	320	3.2%	5.7%	5.5%	4.9%	0.6%	7.1%	0.1%	3.1%	0.0%	3.9%	3.4%	2.9%	3.1%	3.6%	5.3%	4.1%	4.0%
Constraints		0.0%	0.0%	1.1%	0.3%	0.0%	3.7%	0.0%	1.5%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.4%
Curtailments		3.2%	5.7%	4.5%	4.6%	0.6%	3.5%	0.1%	1.6%	0.0%	3.7%	3.4%	2.8%	3.1%	3.6%	5.3%	4.1%	3.6%
SW	1,502	7.0%	12.9%	19.4%	13.2%	3.1%	12.9%	1.5%	6.8%	0.8%	5.8%	6.7%	4.8%	10.2%	8.1%	4.9%	7.3%	8.8%
Constraints		4.7%	8.3%	16.1%	9.6%	2.7%	11.0%	1.5%	5.9%	0.8%	2.8%	4.4%	2.8%	6.9%	4.8%	1.6%	4.1%	6.1%
Curtailments		2.4%	4.6%	3.3%	3.6%	0.4%	1.9%	0.0%	0.9%	0.0%	3.1%	2.3%	2.0%	3.3%	3.3%	3.3%	3.3%	2.7%
W	1,106	6.5%	12.8%	16.1%	12.1%	2.4%	18.1%	6.7%	9.7%	0.3%	13.6%	6.8%	8.7%	11.5%	7.7%	8.1%	9.1%	10.2%
Constraints		4.2%	7.4%	12.4%	8.2%	1.9%	16.3%	6.6%	8.8%	0.3%	9.2%	4.7%	6.0%	8.5%	5.4%	3.7%	5.8%	7.2%
Curtailments		2.3%	5.4%	3.6%	4.0%	0.5%	1.9%	0.1%	0.9%	0.0%	4.4%	2.1%	2.7%	3.0%	2.3%	4.5%	3.3%	3.0%
Controllable Wind Totals:																		
AI	5,196	5.7%	11.4%	13.3%	10.4%	2.8%	12.5%	2.6%	6.6%	1.3%	7.7%	6.4%	5.9%	9.1%	6.7%	6.1%	7.2%	8.0%
Constraints		2.9%	5.7%	9.2%	6.0%	2.3%	10.0%	2.6%	5.5%	1.3%	4.2%	4.0%	3.5%	5.8%	3.5%	2.0%	3.6%	4.8%
Curtailments		2.8%	5.6%	4.1%	4.4%	0.5%	2.5%	0.0%	1.2%	0.0%	3.5%	2.5%	2.4%	3.3%	3.2%	4.1%	3.6%	3.2%
IE	4,091	5.8%	11.2%	14.1%	10.6%	2.3%	13.0%	2.7%	6.7%	0.5%	7.8%	6.1%	5.6%	8.8%	6.7%	6.0%	7.1%	8.0%
Constraints		3.2%	5.9%	10.2%	6.5%	1.8%	10.7%	2.7%	5.6%	0.5%	4.0%	3.7%	3.1%	5.4%	3.7%	1.9%	3.5%	4.9%
Curtailments		2.6%	5.3%	3.9%	4.1%	0.5%	2.3%	0.0%	1.1%	0.0%	3.8%	2.4%	2.5%	3.4%	3.0%	4.1%	3.5%	3.1%
NI	1,105	5.4%	12.0%	10.2%	9.8%	4.9%	10.5%	2.2%	6.2%	6.2%	7.3%	7.8%	7.4%	10.1%	6.7%	6.7%	7.8%	8.2%
Constraints		1.7%	5.2%	5.1%	4.3%	4.6%	7.2%	2.1%	4.8%	6.2%	5.4%	5.1%	5.4%	7.1%	2.6%	2.5%	4.0%	4.4%
Curtailments		3.7%	6.9%	5.1%	5.5%	0.4%	3.3%	0.0%	1.4%	0.0%	2.0%	2.7%	2.0%	3.1%	4.2%	4.2%	3.8%	3.8%
All Wind (Controllable + Non-Controllable) Totals:																		
AI		5.3%	10.5%	12.2%	9.6%	2.5%	11.5%	2.4%	6.1%	1.2%	7.1%	5.9%	5.4%	8.4%	6.2%	5.6%	6.6%	7.4%
Constraints		2.7%	5.3%	8.4%	5.5%	2.1%	9.2%	2.3%	5.0%	1.2%	3.9%	3.6%	3.2%	5.3%	3.2%	1.8%	3.3%	4.4%
Curtailments		2.6%	5.2%	3.8%	4.1%	0.4%	2.3%	0.0%	1.1%	0.0%	3.2%	2.2%	2.2%	3.1%	2.9%	3.8%	3.3%	3.0%
IE		5.3%	10.2%	12.8%	9.7%	2.1%	11.8%	2.4%	6.1%	0.5%	7.1%	5.5%	5.1%	8.0%	6.1%	5.4%	6.4%	7.3%
Constraints		2.9%	5.4%	9.3%	5.9%	1.7%	9.7%	2.4%	5.1%	0.5%	3.7%	3.3%	2.9%	4.9%	3.4%	1.7%	3.2%	4.5%
Curtailments		2.4%	4.8%	3.5%	3.8%	0.4%	2.1%	0.0%	1.0%	0.0%	3.4%	2.2%	2.2%	3.1%	2.7%	3.8%	3.2%	2.8%
NI		5.2%	11.5%	9.8%	9.4%	4.7%	10.1%	2.1%	6.0%	5.9%	7.0%	7.5%	7.1%	9.7%	6.4%	6.4%	7.5%	7.8%
Constraints		1.6%	4.9%	4.9%	4.1%	4.4%	6.9%	2.0%	4.6%	5.9%	5.1%	4.9%	5.2%	6.8%	2.5%	2.4%	3.8%	4.2%
Curtailments		3.6%	6.6%	4.9%	5.3%	0.4%	3.2%	0.0%	1.3%	0.0%	1.9%	2.6%	1.9%	3.0%	4.0%	4.0%	3.7%	3.6%

Controllable Wind By Region	2022 Jan	Feb	Mar	Qtr1	Apr	May	Jun	Qtr2	Jul	Aug	Sep	Qtr3	Oct	Nov	Dec	Qtr4	2022
MID	11.4%	5.3%	5.4%	7.0%	4.2%	2.8%	1.9%	3.0%	0.9%	0.7%	2.5%	1.5%	8.2%	5.8%	7.1%	7.0%	5.5%
Constraints	1.9%	0.0%	2.1%	1.1%	1.2%	0.0%	1.1%	0.7%	0.1%	0.4%	0.4%	0.3%	0.0%	1.0%	0.1%	0.4%	0.6%
Curtailments	9.6%	5.2%	3.4%	5.9%	3.0%	2.8%	0.8%	2.3%	0.8%	0.3%	2.1%	1.2%	8.2%	4.8%	7.0%	6.7%	4.8%
NE	8.6%	4.5%	6.4%	6.3%	3.0%	3.4%	0.6%	2.4%	0.5%	0.2%	1.6%	0.8%	5.8%	3.1%	6.9%	5.1%	4.4%
Constraints	0.0%	0.4%	2.1%	0.7%	0.3%	1.1%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.2%	0.4%
Curtailments	8.6%	4.1%	4.3%	5.6%	2.7%	2.2%	0.6%	1.9%	0.5%	0.2%	1.6%	0.8%	5.3%	3.1%	6.9%	4.9%	4.0%
NW	9.8%	9.6%	7.1%	9.0%	6.7%	24.8%	18.4%	17.0%	3.0%	7.3%	13.6%	8.2%	31.4%	24.9%	8.2%	23.0%	14.9%
Constraints	1.4%	5.5%	2.6%	3.4%	4.0%	23.4%	18.0%	15.5%	2.6%	7.2%	11.3%	7.2%	26.8%	22.0%	0.2%	18.2%	11.2%
Curtailments	8.4%	4.2%	4.4%	5.6%	2.7%	1.4%	0.4%	1.5%	0.4%	0.1%	2.3%	1.0%	4.6%	2.9%	8.0%	4.8%	3.7%
SE	8.9%	6.1%	3.1%	6.0%	2.9%	2.5%	1.0%	2.2%	0.5%	0.3%	2.1%	1.1%	6.3%	5.1%	7.0%	6.1%	4.5%
Constraints	0.2%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%	0.1%
Curtailments	8.8%	5.9%	3.1%	5.9%	2.8%	2.5%	1.0%	2.1%	0.5%	0.3%	2.1%	1.1%	6.3%	5.0%	7.0%	6.0%	4.4%
SW	9.3%	10.6%	10.5%	10.2%	6.5%	5.7%	9.2%	7.1%	3.4%	1.4%	6.9%	4.3%	9.6%	7.0%	6.8%	7.8%	7.9%
Constraints	0.8%	6.7%	8.3%	5.5%	3.9%	3.9%	8.7%	5.4%	2.9%	1.1%	4.5%	3.1%	2.9%	3.4%	0.6%	2.5%	4.1%
Curtailments	8.6%	4.0%	2.1%	4.7%	2.6%	1.8%	0.6%	1.7%	0.5%	0.3%	2.4%	1.2%	6.7%	3.6%	6.1%	5.4%	3.8%
W	10.6%	9.2%	8.1%	9.4%	7.4%	20.3%	19.4%	16.0%	6.4%	8.4%	13.6%	9.7%	18.8%	15.9%	11.1%	15.5%	12.9%
Constraints	4.3%	6.1%	4.9%	5.2%	5.0%	19.4%	19.0%	14.8%	6.2%	8.2%	12.7%	9.2%	13.5%	12.8%	6.1%	11.2%	9.9%
Curtailments	6.2%	3.1%	3.2%	4.1%	2.4%	1.0%	0.4%	1.2%	0.3%	0.2%	1.0%	0.5%	5.2%	3.1%	5.0%	4.4%	3.0%
Controllable Wind Totals:																	
AI	9.8%	8.8%	7.7%	8.8%	6.2%	10.2%	11.7%	9.3%	5.3%	5.1%	7.9%	6.2%	13.2%	10.4%	8.5%	10.9%	9.2%
Constraints	1.8%	4.4%	4.8%	3.7%	3.6%	8.4%	11.0%	7.6%	5.0%	4.9%	6.1%	5.4%	7.0%	6.9%	2.3%	5.6%	5.4%
Curtailments	8.0%	4.4%	3.0%	5.1%	2.5%	1.8%	0.6%	1.7%	0.4%	0.2%	1.8%	0.9%	6.3%	3.6%	6.2%	5.3%	3.8%
IE	9.9%	8.9%	8.2%	9.0%	6.0%	11.1%	11.1%	9.4%	3.4%	3.9%	7.8%	5.3%	12.9%	10.1%	8.0%	10.5%	9.1%
Constraints	1.9%	4.8%	5.3%	4.1%	3.4%	9.4%	10.6%	7.7%	3.0%	3.7%	5.8%	4.3%	6.6%	6.4%	1.8%	5.2%	5.3%
Curtailments	8.0%	4.1%	2.9%	4.9%	2.6%	1.7%	0.6%	1.7%	0.5%	0.2%	1.9%	1.0%	6.3%	3.7%	6.2%	5.3%	3.8%
NI	9.5%	8.6%	6.2%	8.2%	6.7%	6.9%	13.6%	8.9%	11.8%	9.2%	8.4%	9.8%	14.4%	11.7%	10.4%	12.3%	9.9%
Constraints	1.4%	3.2%	3.0%	2.6%	4.6%	4.8%	12.7%	7.2%	11.8%	9.2%	7.2%	9.3%	8.1%	8.7%	4.3%	7.3%	6.1%
Curtailments	8.1%	5.4%	3.3%	5.6%	2.1%	2.2%	0.9%	1.7%	0.1%	0.1%	1.2%	0.5%	6.3%	3.0%	6.1%	5.0%	3.8%
All Wind (Controllable + Non-Controllable) Totals:																	
AI	8.9%	8.1%	7.1%	8.1%	5.7%	9.4%	10.7%	8.6%	5.0%	4.6%	7.2%	5.8%	12.2%	9.7%	7.9%	10.1%	8.5%
Constraints	1.6%	4.1%	4.4%	3.4%	3.4%	7.7%	10.2%	7.0%	4.6%	4.5%	5.6%	4.9%	6.4%	6.4%	2.1%	5.2%	5.0%
Curtailments	7.3%	4.0%	2.7%	4.7%	2.3%	1.7%	0.6%	1.6%	0.4%	0.2%	1.7%	0.8%	5.8%	3.3%	5.8%	4.9%	3.5%
IE	9.1%	8.1%	7.4%	8.2%	5.5%	10.2%	10.1%	8.6%	3.2%	3.5%	7.0%	4.8%	11.8%	9.3%	7.5%	9.7%	8.3%
Constraints	1.7%	4.4%	4.8%	3.7%	3.1%	8.6%	9.6%	7.1%	2.7%	3.3%	5.3%	3.9%	6.1%	5.9%	1.7%	4.8%	4.8%
Curtailments	7.3%	3.8%	2.6%	4.5%	2.4%	1.6%	0.5%	1.5%	0.4%	0.2%	1.8%	0.9%	5.7%	3.4%	5.8%	4.9%	3.5%
NI	8.6%	8.0%	6.0%	7.7%	6.5%	6.7%	13.1%	8.6%	11.4%	8.9%	8.1%	9.4%	13.8%	11.3%	10.0%	11.9%	9.4%
Constraints	1.2%	2.9%	2.9%	2.4%	4.4%	4.6%	12.2%	6.9%	11.3%	8.8%	6.9%	8.9%	7.8%	8.4%	4.1%	7.1%	5.8%
Curtailments	7.4%	5.1%	3.2%	5.3%	2.1%	2.1%	0.9%	1.7%	0.1%	0.1%	1.2%	0.5%	6.0%	2.9%	5.9%	4.8%	3.6%

Controllable Wind By Region	2023 Jan	Feb	Mar	Qtr1	Apr	May	Jun	Qtr2	Jul	Aug	Sep	Qtr3	Oct	Nov	Dec	Qtr4	2023
MID	8.1%	3.3%	5.4%	5.8%	4.4%	1.3%	1.5%	2.8%	11.8%	5.3%	10.8%	9.4%	7.5%	6.0%	14.7%	10.4%	7.5%
Constraints	0.5%	0.3%	1.5%	0.8%	1.1%	0.7%	1.0%	1.0%	5.9%	2.1%	2.8%	3.7%	2.3%	1.1%	1.3%	1.5%	1.7%
Curtailments	7.6%	3.1%	3.9%	5.0%	3.2%	0.6%	0.5%	1.8%	5.9%	3.1%	8.0%	5.7%	5.2%	4.9%	13.4%	8.9%	5.8%
NE	6.5%	2.1%	4.1%	4.4%	3.7%	0.8%	0.5%	2.1%	10.0%	11.6%	5.6%	9.2%	4.0%	5.1%	15.0%	9.4%	6.6%
Constraints	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%	2.3%	8.7%	0.6%	3.9%	0.7%	0.8%	0.6%	0.6%	1.0%
Curtailments	6.5%	2.1%	4.1%	4.4%	3.7%	0.6%	0.5%	2.0%	7.8%	2.9%	5.1%	5.3%	3.4%	4.3%	14.4%	8.8%	5.6%
NW	15.1%	5.3%	12.3%	10.8%	8.5%	3.2%	8.8%	7.2%	21.8%	17.9%	25.5%	21.6%	16.7%	28.6%	28.0%	24.9%	17.1%
Constraints	8.3%	3.6%	7.9%	6.5%	5.8%	2.5%	8.4%	5.6%	16.0%	16.4%	19.3%	17.2%	13.9%	22.1%	12.2%	15.2%	11.4%
Curtailments	6.9%	1.7%	4.4%	4.4%	2.6%	0.7%	0.4%	1.6%	5.7%	1.5%	6.2%	4.4%	2.8%	6.5%	15.8%	9.7%	5.6%
SE	7.1%	3.5%	2.5%	4.5%	3.3%	0.4%	0.6%	1.7%	5.7%	2.9%	9.5%	6.1%	4.2%	4.8%	15.0%	9.3%	5.9%
Constraints	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.3%	0.0%	3.4%	1.2%	0.0%	0.0%	0.0%	0.0%	0.3%
Curtailments	7.0%	3.5%	2.5%	4.5%	3.3%	0.4%	0.4%	1.7%	5.4%	2.9%	6.1%	4.9%	4.2%	4.8%	15.0%	9.3%	5.6%
SW	9.6%	3.3%	3.9%	5.7%	4.5%	2.7%	2.4%	3.5%	11.4%	5.8%	9.5%	9.0%	8.0%	9.0%	13.2%	10.7%	7.6%
Constraints	1.1%	0.5%	0.9%	0.8%	0.8%	2.3%	1.9%	1.5%	6.3%	3.3%	2.9%	4.2%	3.3%	5.2%	0.1%	2.5%	2.3%
Curtailments	8.5%	2.9%	3.0%	4.9%	3.7%	0.4%	0.5%	1.9%	5.1%	2.5%	6.6%	4.7%	4.7%	3.8%	13.1%	8.2%	5.4%
W	14.4%	9.2%	11.7%	11.8%	10.9%	5.5%	6.3%	8.2%	14.4%	11.4%	14.1%	13.3%	12.2%	14.3%	19.2%	16.0%	12.9%
Constraints	8.9%	8.0%	9.0%	8.6%	8.7%	5.1%	5.5%	6.8%	10.5%	9.5%	10.1%	10.0%	9.2%	10.4%	7.7%	8.9%	8.7%
Curtailments	5.5%	1.2%	2.8%	3.2%	2.2%	0.5%	0.9%	1.4%	3.9%	2.0%	4.0%	3.3%	3.0%	3.9%	11.5%	7.1%	4.2%
Controllable Wind Totals:																	
AI	11.6%	6.0%	7.4%	8.5%	7.9%	3.6%	3.9%	5.7%	15.5%	10.7%	14.9%	13.7%	14.4%	12.6%	19.0%	16.0%	11.6%
Constraints	4.7%	3.9%	4.1%	4.2%	4.5%	3.1%	3.3%	3.8%	10.2%	8.4%	9.6%	9.4%	11.0%	8.3%	6.3%	8.0%	6.5%
Curtailments	7.0%	2.2%	3.3%	4.3%	3.4%	0.4%	0.6%	1.9%	5.3%	2.4%	5.3%	4.3%	3.4%	4.3%	12.7%	7.9%	5.0%
IE	10.8%	5.3%	6.6%	7.7%	6.5%	3.1%	3.6%	4.8%	12.5%	8.4%	12.1%	11.0%	9.7%	10.8%	16.6%	13.2%	9.7%
Constraints	3.7%	3.0%	3.5%	3.4%	3.4%	2.7%	3.0%	3.1%	7.4%	6.0%	6.2%	6.6%	5.8%	6.5%	3.5%	5.0%	4.6%
Curtailments	7.1%	2.3%	3.1%	4.3%	3.1%	0.5%	0.6%	1.7%	5.1%	2.4%	5.9%	4.5%	3.9%	4.3%	13.1%	8.2%	5.1%
NI	14.6%	8.6%	11.6%	11.8%	13.6%	5.7%	5.3%	9.5%	29.2%	20.2%	26.5%	25.1%	28.7%	21.4%	29.0%	27.0%	19.3%
Constraints	8.2%	6.8%	7.2%	7.4%	9.0%	5.4%	4.9%	7.0%	22.7%	18.0%	23.8%	21.5%	26.8%	16.7%	18.0%	20.3%	14.6%
Curtailments	6.4%	1.9%	4.4%	4.3%	4.6%	0.3%	0.5%	2.5%	6.4%	2.2%	2.7%	3.7%	1.9%	4.7%	11.0%	6.7%	4.7%
All Wind (Controllable + Non-Controllable) Totals:																	
AI	10.8%	5.6%	6.9%	7.9%	7.3%	3.3%	3.6%	5.3%	14.4%	9.9%	13.8%	12.7%	13.2%	11.7%	17.6%	14.8%	10.7%
Constraints	4.3%	3.6%	3.8%	3.9%	4.2%	2.9%	3.1%	3.5%	9.4%	7.8%	8.9%	8.7%	10.1%	7.7%	5.9%	7.4%	6.1%
Curtailments	6.5%	2.0%	3.1%	4.0%	3.1%	0.4%	0.5%	1.7%	4.9%	2.2%	4.9%	4.0%	3.1%	4.0%	11.7%	7.3%	4.7%
IE	9.9%	4.9%	6.1%	7.1%	6.0%	2.9%	3.3%	4.4%	11.5%	7.7%	11.1%	10.1%	8.9%	10.0%	15.2%	12.1%	8.9%
Constraints	3.4%	2.8%	3.2%	3.1%	3.1%	2.4%	2.8%	2.9%	6.8%	5.5%	5.7%	6.0%	5.3%	6.0%	3.2%	4.6%	4.2%
Curtailments	6.6%	2.1%	2.9%	4.0%	2.8%	0.4%	0.5%	1.6%	4.7%	2.2%	5.4%	4.1%	3.6%	3.9%	12.0%	7.5%	4.7%
NI	14.1%	8.3%	11.1%	11.3%	13.1%	5.5%	5.2%	9.2%	28.2%	19.5%	25.4%	24.3%	27.4%	20.7%	28.0%	26.0%	18.6%
Constraints	7.9%	6.5%	6.9%	7.2%	8.6%	5.2%	4.7%	6.8%	22.0%	17.4%	22.8%	20.7%	25.6%	16.2%	17.3%	19.5%	14.1%
Curtailments	6.2%	1.8%	4.2%	4.1%	4.5%	0.3%	0.5%	2.4%	6.2%	2.1%	2.6%	3.6%	1.8%	4.5%	10.6%	6.5%	4.5%

Table 4: Historical breakdown of wind dispatch down percentages by region and jurisdiction

			2023																
			Jan	Feb	Mar	Qtr1	Apr	May	Jun	Qtr2	Jul	Aug	Sep	Qtr3	Oct	Nov	Dec	Qtr4	2023
Wind	AI	Dispatch Down	10.8%	5.6%	6.9%	7.9%	7.3%	3.3%	3.6%	5.3%	14.4%	9.9%	13.8%	12.7%	13.2%	11.7%	17.6%	14.8%	10.7%
		Constraints	4.3%	3.6%	3.8%	3.9%	4.2%	2.9%	3.1%	3.5%	9.4%	7.8%	8.9%	8.7%	10.1%	7.7%	5.9%	7.4%	6.1%
		Curtailments	6.5%	2.0%	3.1%	4.0%	3.1%	0.4%	0.5%	1.7%	4.9%	2.2%	4.9%	4.0%	3.1%	4.0%	11.7%	7.3%	4.7%
	IE	Dispatch Down	9.9%	4.9%	6.1%	7.1%	6.0%	2.9%	3.3%	4.4%	11.5%	7.7%	11.1%	10.1%	8.9%	10.0%	15.2%	12.1%	8.9%
		Constraints	3.4%	2.8%	3.2%	3.1%	3.1%	2.4%	2.8%	2.9%	6.8%	5.5%	5.7%	6.0%	5.3%	6.0%	3.2%	4.6%	4.2%
		Curtailments	6.6%	2.1%	2.9%	4.0%	2.8%	0.4%	0.5%	1.6%	4.7%	2.2%	5.4%	4.1%	3.6%	3.9%	12.0%	7.5%	4.7%
	NI	Dispatch Down	14.1%	8.3%	11.1%	11.3%	13.1%	5.5%	5.2%	9.2%	28.2%	19.5%	25.4%	24.3%	27.4%	20.7%	28.0%	26.0%	18.6%
		Constraints	7.9%	6.5%	6.9%	7.2%	8.6%	5.2%	4.7%	6.8%	22.0%	17.4%	22.8%	20.7%	25.6%	16.2%	17.3%	19.5%	14.1%
		Curtailments	6.2%	1.8%	4.2%	4.1%	4.5%	0.3%	0.5%	2.4%	6.2%	2.1%	2.6%	3.6%	1.8%	4.5%	10.6%	6.5%	4.5%
Solar	AI	Dispatch Down	12.5%	5.7%	7.2%	7.7%	2.9%	3.9%	10.6%	6.5%	11.3%	11.4%	14.7%	12.3%	8.9%	2.8%	14.0%	7.8%	9.1%
		Constraints	7.7%	5.2%	5.0%	5.5%	2.5%	3.9%	10.5%	6.4%	7.4%	9.2%	11.3%	9.1%	5.5%	0.8%	1.0%	3.2%	7.0%
		Curtailments	4.7%	0.5%	2.2%	2.1%	0.4%	0.0%	0.1%	0.1%	3.9%	2.3%	3.4%	3.2%	3.4%	2.0%	13.0%	4.5%	2.1%
	IE	Dispatch Down					0.1%	4.6%	13.3%	7.5%	10.5%	11.7%	14.9%	12.1%	8.5%	2.4%	13.4%	7.4%	9.5%
		Constraints					0.0%	4.6%	13.2%	7.4%	6.5%	9.3%	10.9%	8.7%	4.6%	0.1%	0.0%	2.4%	7.2%
		Curtailments					0.1%	0.0%	0.1%	0.1%	4.0%	2.3%	4.0%	3.4%	3.8%	2.3%	13.4%	5.0%	2.3%
	NI	Dispatch Down	12.5%	5.7%	7.2%	7.7%	9.3%	1.8%	1.4%	3.5%	14.5%	10.5%	13.7%	12.9%	10.8%	4.6%	18.2%	9.8%	7.9%
		Constraints	7.7%	5.2%	5.0%	5.5%	8.2%	1.7%	1.3%	3.2%	11.0%	8.4%	12.9%	10.6%	9.4%	4.3%	7.9%	7.5%	6.4%
		Curtailments	4.7%	0.5%	2.2%	2.1%	1.1%	0.1%	0.1%	0.3%	3.4%	2.1%	0.8%	2.2%	1.4%	0.3%	10.3%	2.2%	1.4%

Table 5: Wind and solar monthly dispatch down percentages and breakdowns in 2023

	All Island						Ireland						Northern Ireland					
Year	Wind	Solar	Renewable Waste	Hydro	Other RES	Total RES	Wind	Solar	Renewable Waste	Hydro	Other RES	Total RES	Wind	Solar	Renewable Waste	Hydro	Other RES	Total RES
2016	2.9%	0.0%	0.0%	0.0%	0.0%	2.3%	2.8%	0.0%	0.0%	0.0%	0.0%	2.2%	3.2%	0.0%	0.0%	0.0%	0.0%	2.7%
2017	4.0%	0.0%	0.0%	0.0%	0.0%	3.3%	3.7%	0.0%	0.0%	0.0%	0.0%	3.0%	5.0%	0.0%	0.0%	0.0%	0.0%	4.3%
2018	6.0%	0.0%	10.0%	0.0%	0.0%	5.1%	5.0%	0.0%	10.0%	0.0%	0.0%	4.2%	9.4%	0.0%	0.0%	0.0%	0.0%	8.0%
2019	7.7%	4.2%	8.2%	0.0%	0.0%	6.5%	6.9%	0.0%	8.2%	0.0%	0.0%	5.8%	10.7%	4.2%	0.0%	0.0%	0.0%	9.3%
2020	12.1%	6.3%	10.2%	0.0%	0.0%	10.6%	11.4%	0.0%	10.2%	0.0%	0.0%	10.0%	14.8%	6.3%	0.0%	0.0%	0.0%	12.9%
2021	7.4%	2.9%	4.9%	0.0%	0.0%	6.5%	7.3%	0.0%	4.9%	0.0%	0.0%	6.4%	7.8%	2.9%	0.0%	0.0%	0.0%	6.6%
2022	8.5%	4.6%	5.5%	0.0%	0.0%	7.6%	8.3%	0.0%	5.5%	0.0%	0.0%	7.4%	9.4%	4.6%	0.0%	0.0%	0.0%	8.4%
2023	10.7%	9.1%	3.7%	0.0%	0.0%	9.5%	8.9%	9.5%	3.7%	0.0%	0.0%	8.0%	18.6%	7.9%	0.0%	0.0%	0.0%	16.0%

Table 6: All renewable sources dispatch down in from 2016 to 2023

Notes:

RES: Renewable Energy Sources.

Other RES category consists of generation from Biomass, Biogas and Landfill Gas.

A more detailed version of the above table is available online in spreadsheet format including monthly DD volumes and percentages for all renewable types.

7 Appendix B – Wind and Solar Dispatch Down by Hour of Day

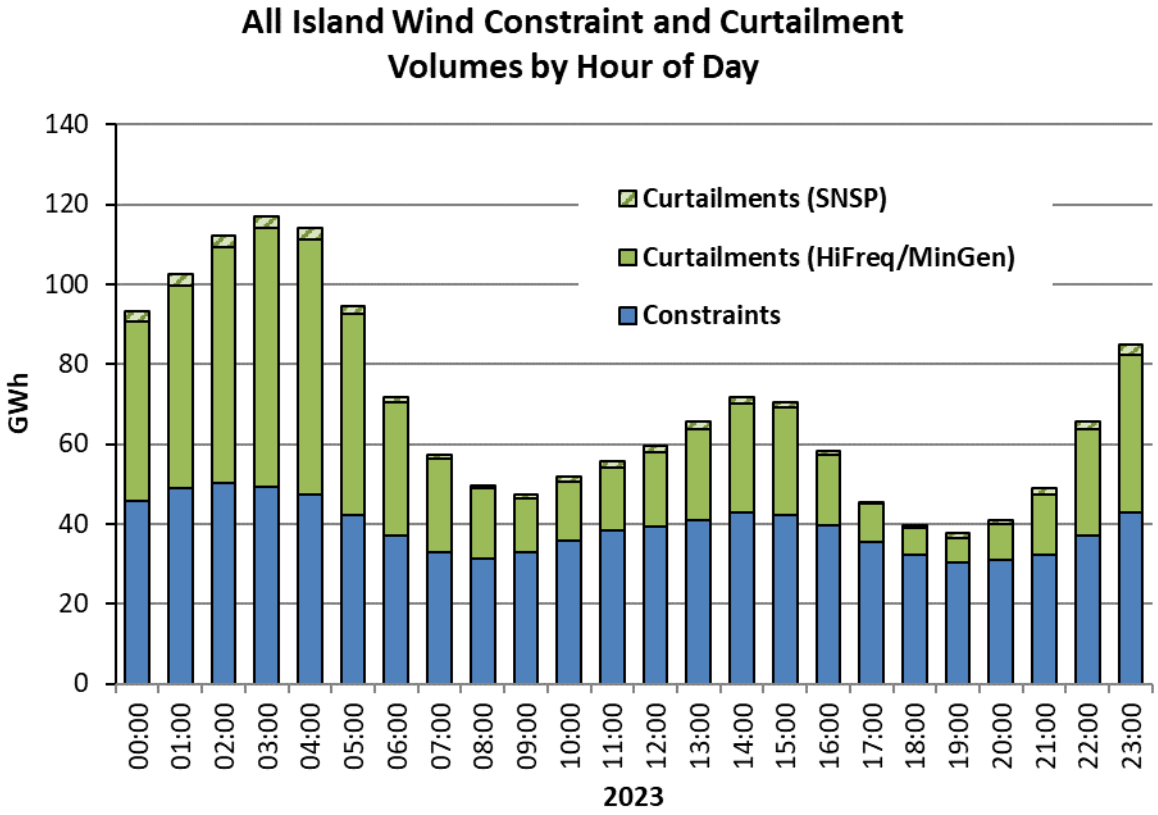


Figure 19: All-Island breakdown of wind constraints and curtailments in 2023 by hour of day

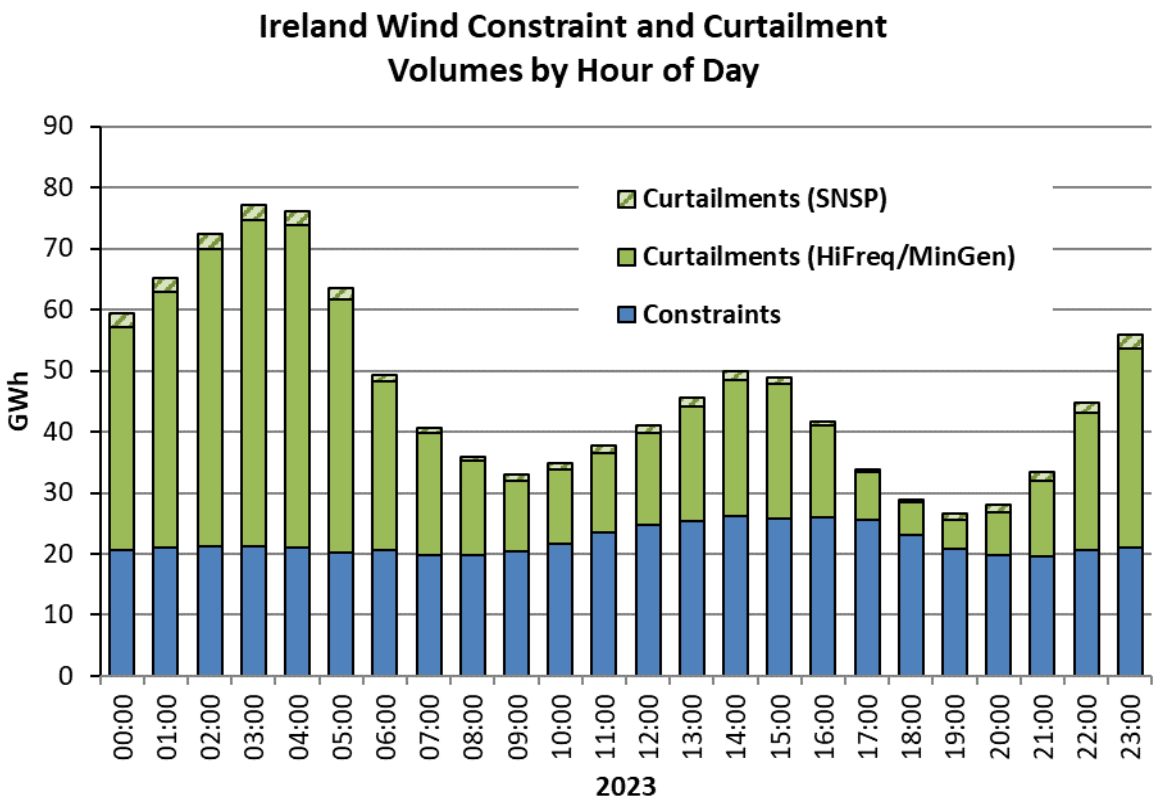


Figure 20: Breakdown of wind constraints and curtailments In Ireland in 2023 by hour of day

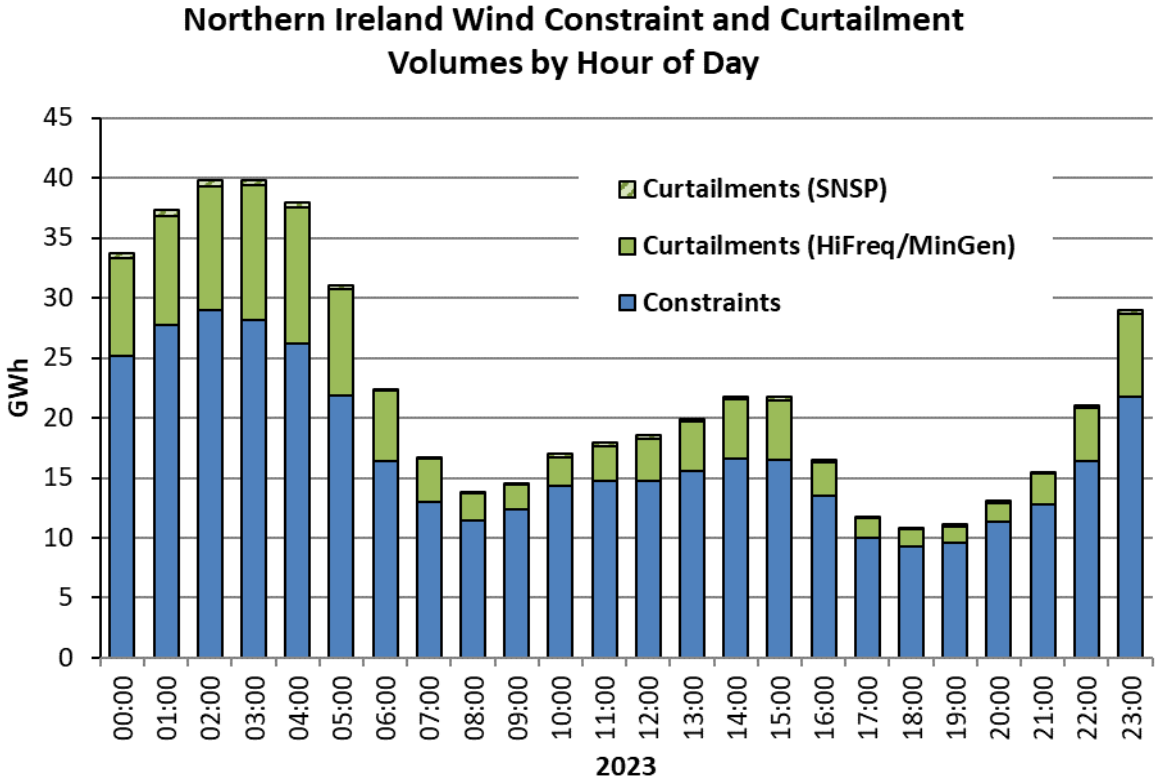


Figure 21: Breakdown of wind constraints and curtailments in NI in 2023 by hour of day

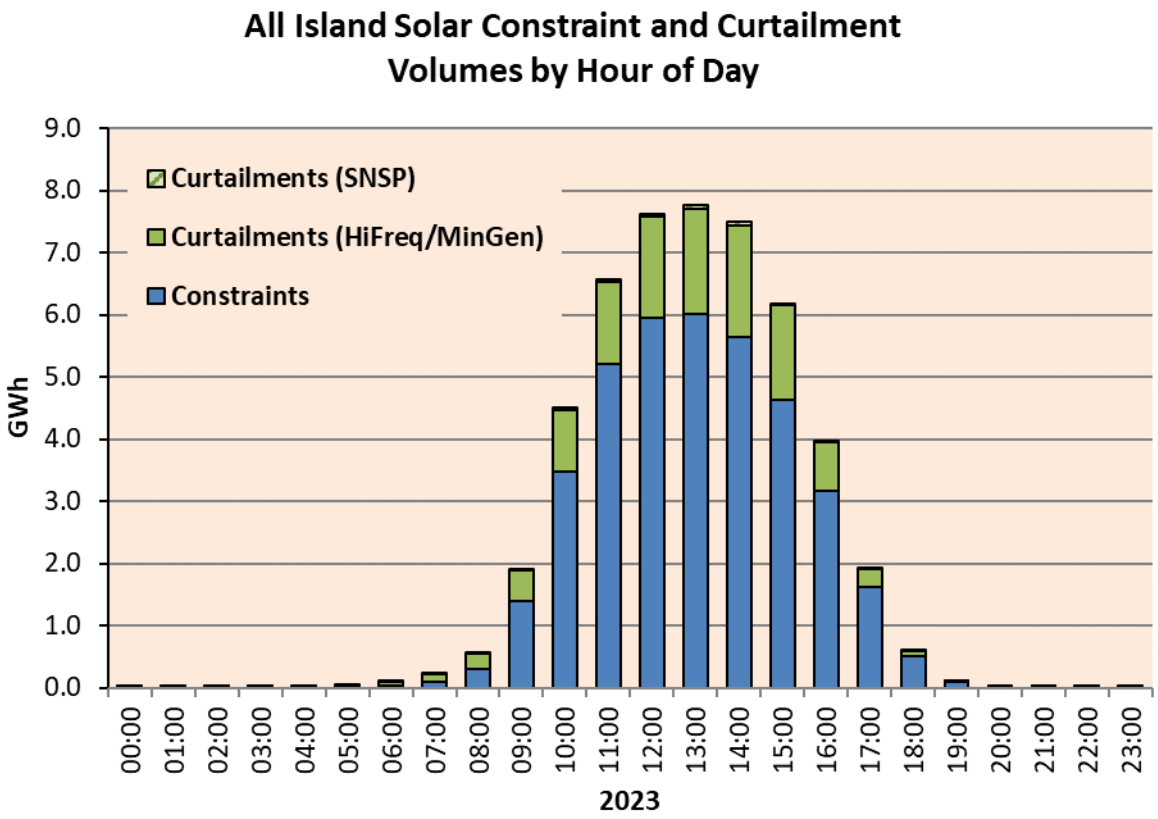


Figure 22: All-Island breakdown of solar constraints and curtailments in 2023 by hour of day

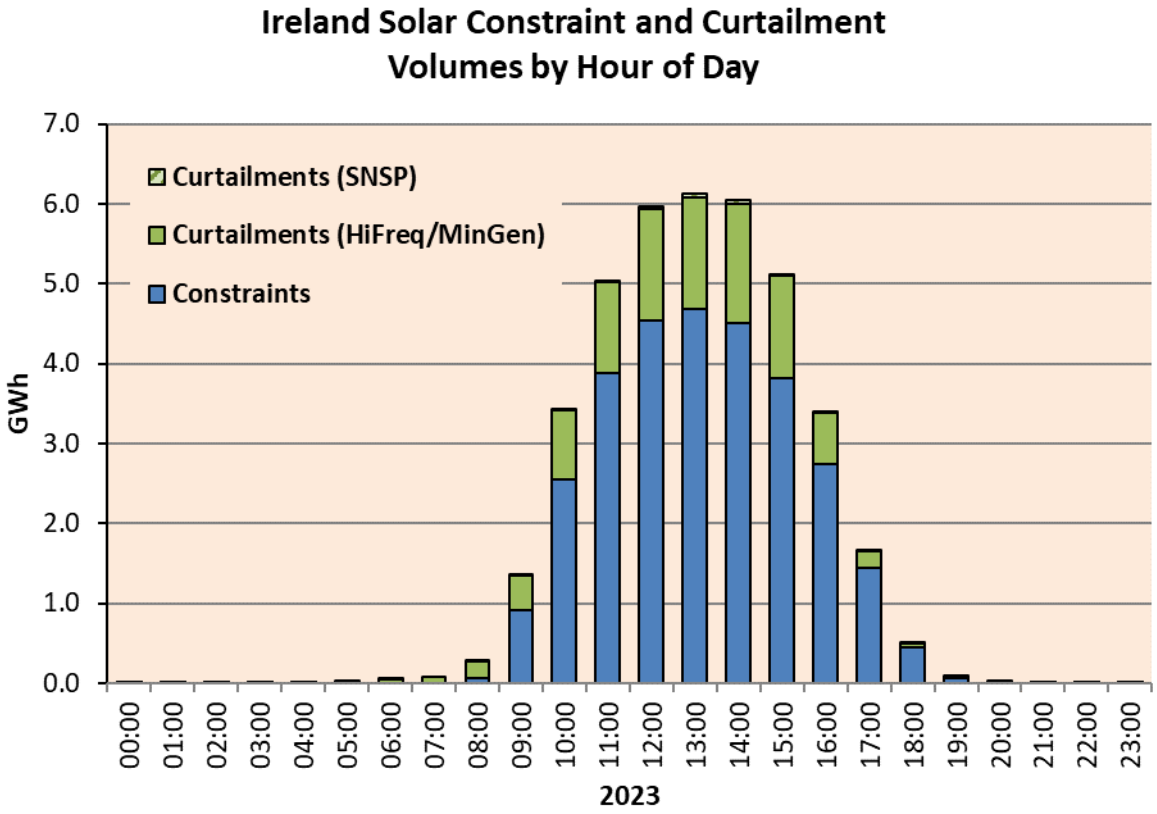


Figure 23: Breakdown of solar constraints and curtailments In Ireland in 2023 by hour of day

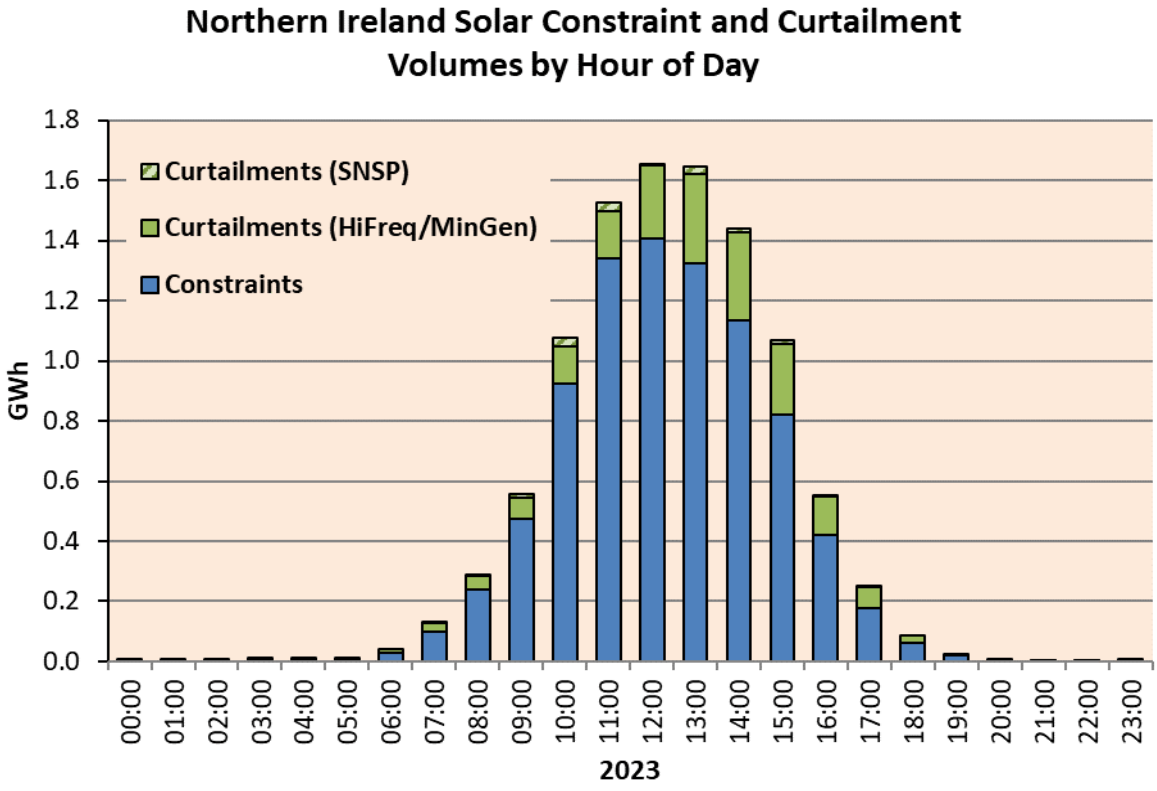


Figure 24: Breakdown of solar constraints and curtailments in NI in 2023 by hour of day

Appendix C – Abbreviations

CHP	Combined Heat and Power
CRU	Commission for Regulation of Utilities
DfE	Department for Economy, Northern Ireland
DNO	Distribution Network Operator
DSO	Distribution System Operator
EWIC	East West Interconnector
GW	Gigawatt
GWh	Gigawatt-hour
HVDC	High Voltage Direct Current
IT	Information Technology
kV	Kilovolt
MID	Midlands (region)
MW	Megawatt
MWh	Megawatt-hour
NI	Northern Ireland
NW	North West
RES-E	Renewable Energy Sources (Electricity)
RoCoF	Rate of Change of Frequency
S.I.	Statutory Instrument
SCADA	Supervisory Control and Data Acquisition
SEF	Strategic Energy Framework
SEM	Single Electricity Market
SNSP	System Non-Synchronous Penetration
SO	System Operator
SOEF	Shaping Our Electricity Future
SONI	System Operator Northern Ireland
TCG	Transmission Constraint Group
TSO	Transmission System Operator
UR	Utility Regulator Northern Ireland