Curtailed renewables in GB and Ireland 2025

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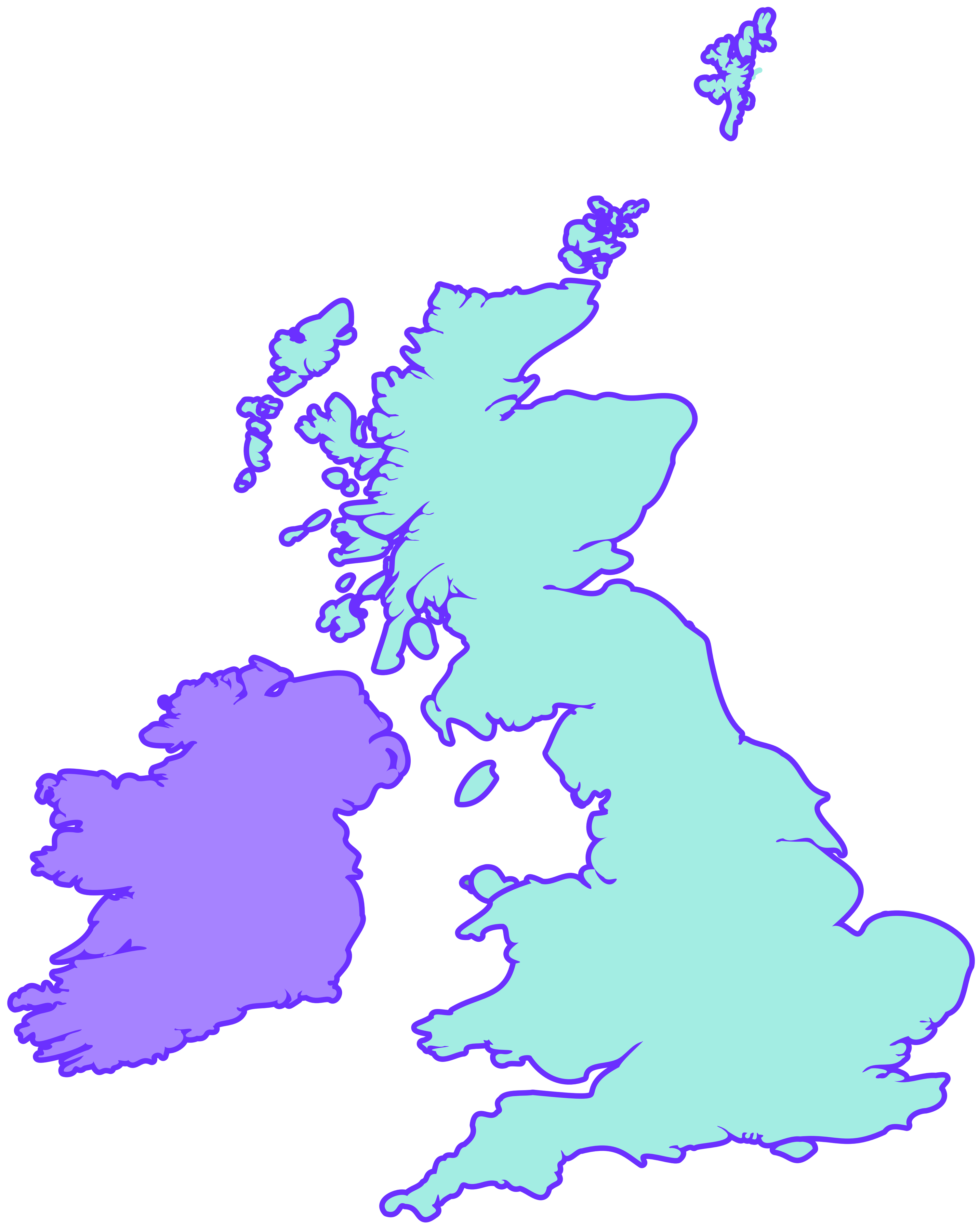


Highlights

Irish Single Electricity Market

Total volume of curtailed renewable electricity	2.1TWh
Curtailment volumes: 2025 vs 2024	-3%
Curtailed wind energy in Northern Ireland	24%
Increase in Irish solar curtailment 2024 to 2025	4x

Great Britain

Total volume of curtailed renewable electricity	10TWh
Curtailment volumes: 2025 vs 2024	+22%
Total cost of curtailment payments	£363m
Minimum total cost of upward actions to replace lost wind power	£1bn
2025 vs 2024:	+20%

Executive summary

For decades, renewable generation capacity in Great Britain (GB) and Ireland has been increasing substantially. Driven by growing concerns around both the climate crisis and energy security, wind and solar power account for an ever-rising proportion of electricity generation in both markets.

However, for a variety of reasons, not all of the power available from these renewable sources is making it to end consumers. Much of the volume is being curtailed[1], meaning it is switched off at source. This contributes to increased energy bills.

In order to understand the real impacts of these actions, this report investigates and quantifies the volume of curtailed renewable power, as well as the costs associated with those curtailment actions, in both the British and Irish power markets.

Over time, the volume of curtailed renewables across GB and Ireland has increased. Much of the curtailed volume is located in areas of weaker grid infrastructure, as physical constraints on the transmission system mean that no matter how much power is produced in a given area, only a certain amount can flow through the network and make it to consumers at any one time.

The amount of renewable electricity curtailed in GB in 2025 (10TWh) could have met the combined electricity demand of every domestic household in London for the entire year.[2]

Over the same period, enough wind and solar generation has been curtailed on the island of Ireland to meet all domestic electricity consumption in County Dublin in 2025.

Curtailed wind volume often necessitates that other generators be switched on to replace the lost power at an additional cost to the grid. The cost of these upward actions far outstrips that of the downward actions, putting the total bill for consumers in GB at over £1bn.

To meet the ambitious net zero targets set out by the governments of the UK and Republic of Ireland, greater amounts of renewable generation are required to come onstream than ever before. For this to be utilised effectively, energy policy needs to take a holistic view that will ensure the system can maximise the value of renewable electricity.

Highlights from 2025:

Great Britain
- Total volume of curtailed renewable electricity: over 10TWh. This is a 22% increase year-on-year.
- Total cost of curtailment payments: £363m representing a 10% decrease year-on-year.
- Total cost of upward actions to replace lost wind power where necessary: over £1bn, a 20% rise year-on-year.
- 98% of curtailed volumes and 94% of curtailment costs were due to turning down wind turbines in Scotland.

Island of Ireland
- Total volume of curtailed renewable electricity was 2.1TWh, which could have powered all domestic electricity demand for every home in County Dublin. This is a 3% decrease year-on-year, driven in part by a new GB-Ireland interconnector.
- In Northern Ireland, 24% of all available wind energy was curtailed.
- Solar curtailment in the Republic of Ireland has increased more than fourfold from 2024 to 2025.

Great Britain

Current situation

In GB, the system operator (NESO) is able to use a tool called the Balancing Mechanism (BM) to balance supply and demand in real-time. This is a crucial tool because if the system is too far out of balance, then blackouts and outages could occur. In practice, this means turning generation up when more power is needed to meet demand and turning it down where there is an oversupply. Since generators in the BM are providing a net benefit to the system by generating either more or less power when instructed to do so, they are paid for these actions.

The BM can also be used to solve locational issues. Due to there being finite grid infrastructure, there can be bottlenecks when moving power from the place it is generated to where it is used. This is most clearly seen in GB when comparing Scotland and London. London is a significant demand centre, requiring a lot of power. However, one of the country's biggest generation centres is in northern Scotland where conditions are favourable for wind farms. Transferring the power from north to south not only relies on sufficient power grid infrastructure, but must also take into account energy lost as power is moved through the cables. In instances like this, the BM can be used to turn down generators on one side of the bottleneck (e.g wind farms in Scotland) and turn others up (e.g. gas plants near London) on the other side.

Scotland has a low population density and a windy climate. This makes it attractive to developers of wind farms who want to locate their renewable power generation where they will provide the most value.

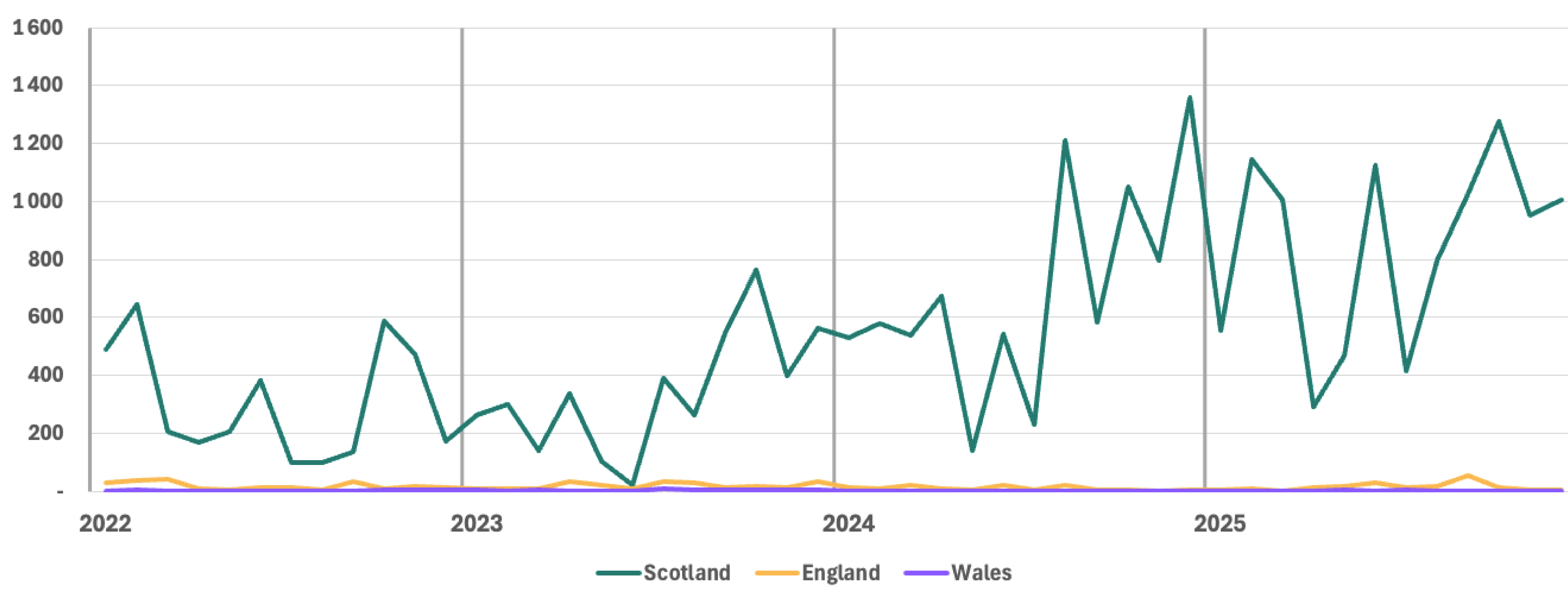
The result is that a large number of wind farms have been built in Scotland and off the Scottish coast. However, many of the same attributes that make Scotland attractive to wind developers mean that there is little power demand in Scotland compared to England.
Therefore, much of the electricity generated by Scottish wind farms is sent via the grid into England.

With limited grid infrastructure to transfer this power, wind generators in Scotland are frequently turned down in the BM. One of the key physical constraint areas is the border between the SSEN and Scottish Power transmission areas. This roughly divides northern and southern Scotland. The boundary bisects Scotland with Glasgow and Edinburgh being in the southern half. Another important area of congestion is the Scottish border with England.

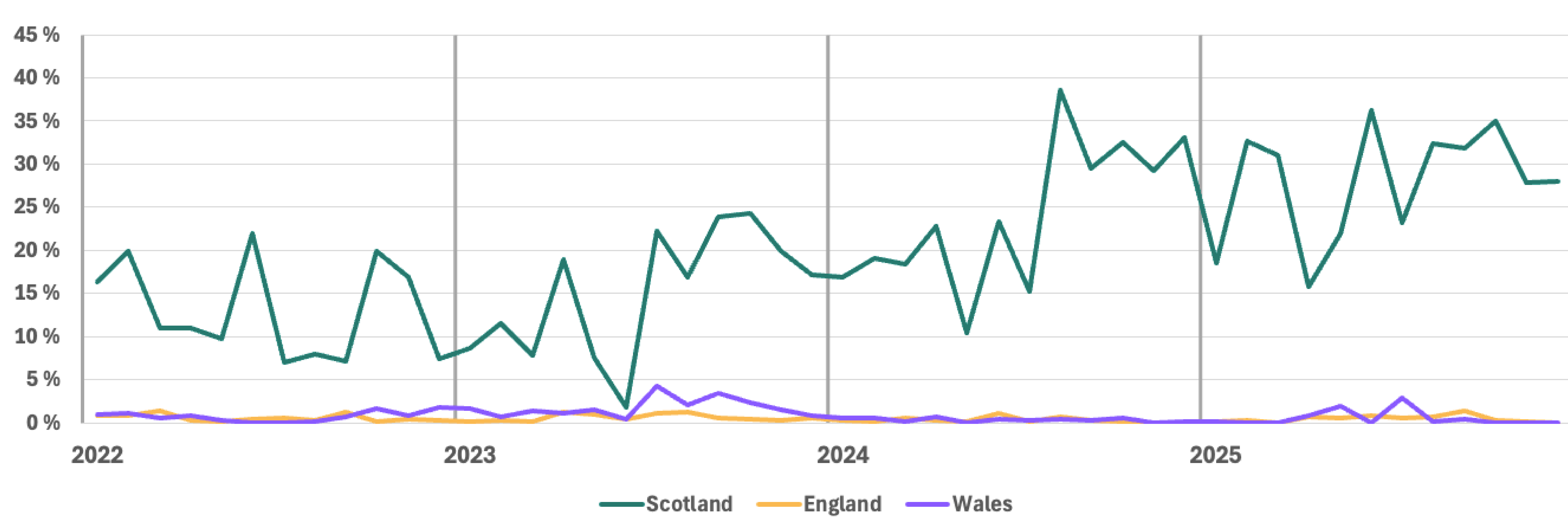
The region of northern Scotland has seen the most curtailed renewable volume of any region in GB by far. As an increasing amount of wind generation capacity has come online, total curtailment of wind output in northern Scotland has reached over 50% of what is available in some months. Over 8.8TWh (terawatt hours) of wind power in northern Scotland was switched off in 2025 at a cost of almost £300m. This would be enough to power all Scottish domestic electricity demand for the year[3] , representing around 39% of all the energy from wind that could have been used. This means that only 61% of the energy which could have been generated in the region made it to the grid.

		Renewable Curtailment Volumes and Costs		
		Scotland	England	Wales
2022	Volume (GWh)	3,660	220	20
	Cost (GBP)	£ 219 000 000	£ 15 400 000	£ 1 600 000
2023	Volume (GWh)	4,080	220	40
	Cost (GBP)	£ 286 500 000	£ 29 400 000	£ 3 600 000
2024	Volume (GWh)	8,220	120	10
	Cost (GBP)	£ 393 300 000	£ 12 900 000	£ 800 000
2025	Volume (GWh)	10,060	170	10
	Cost (GBP)	£ 343 400 000	£ 19 200 000	£ 1 300 000

Curtailed renewables by country (MWh)



Proportion of available wind curtailed by country



Because most wind farms in GB are in receipt of subsidies, NESO will, in most cases, pay the wind farms to turn down at a cost that is similar to that of the subsidies. This is because the assets would otherwise lose that revenue by reducing their output. Both the subsidy and the compensation for switching off are paid for by energy consumers as part of their electricity bill.

On top of payments to wind generators, there are often additional costs associated with replacing the lost power using generation elsewhere on the system. For example, turning down a wind farm in Scotland because its power cannot be used locally or transferred to England means that the demand in England must be supplied from a local source south of the border. Often this means gas peaker units (or, more recently, batteries) will be paid to increase their output and replace the lost wind power.

The total cost of these upward balancing actions is several times greater than the cost of the downward actions. Under the assumption that the cheapest upward actions were always the ones taken to replace the curtailed renewables, the total cost of replacing the renewable generation curtailed in 2025 was over £1bn. The overall cost could be higher if the cheapest actions in the stack were taken for other reasons, and the higher cost actions were taken to replace curtailed volume. Over 98% of this cost was due to switching off wind farms in Scotland. The upward balancing costs for the year are around 20% higher than in 2024 when total spending on upward actions to replace wind was ~£850m.[4]

	Minimum Total Cost of Upward Balancing Actions Associated with System-Tagged Wind Bid Volumes (GBP)	Minimum Total Cost of Upward Balancing Actions Associated with System-Tagged Wind Bid Volumes in Scotland (GBP)
2024	£ 847 000 000	£ 834 000 000
2025	£ 1 022 000 000	£ 1 011 000 000

	Total Scottish renewable downward dispatch volume (GWh)	Total Scottish renewable downward dispatch cost (GBP)
2022	3,660	£ 219 000 000
2023	4,080	£ 286 500 000
2024	8,220	£ 393 300 000
2025	10,060	£ 343 400 000

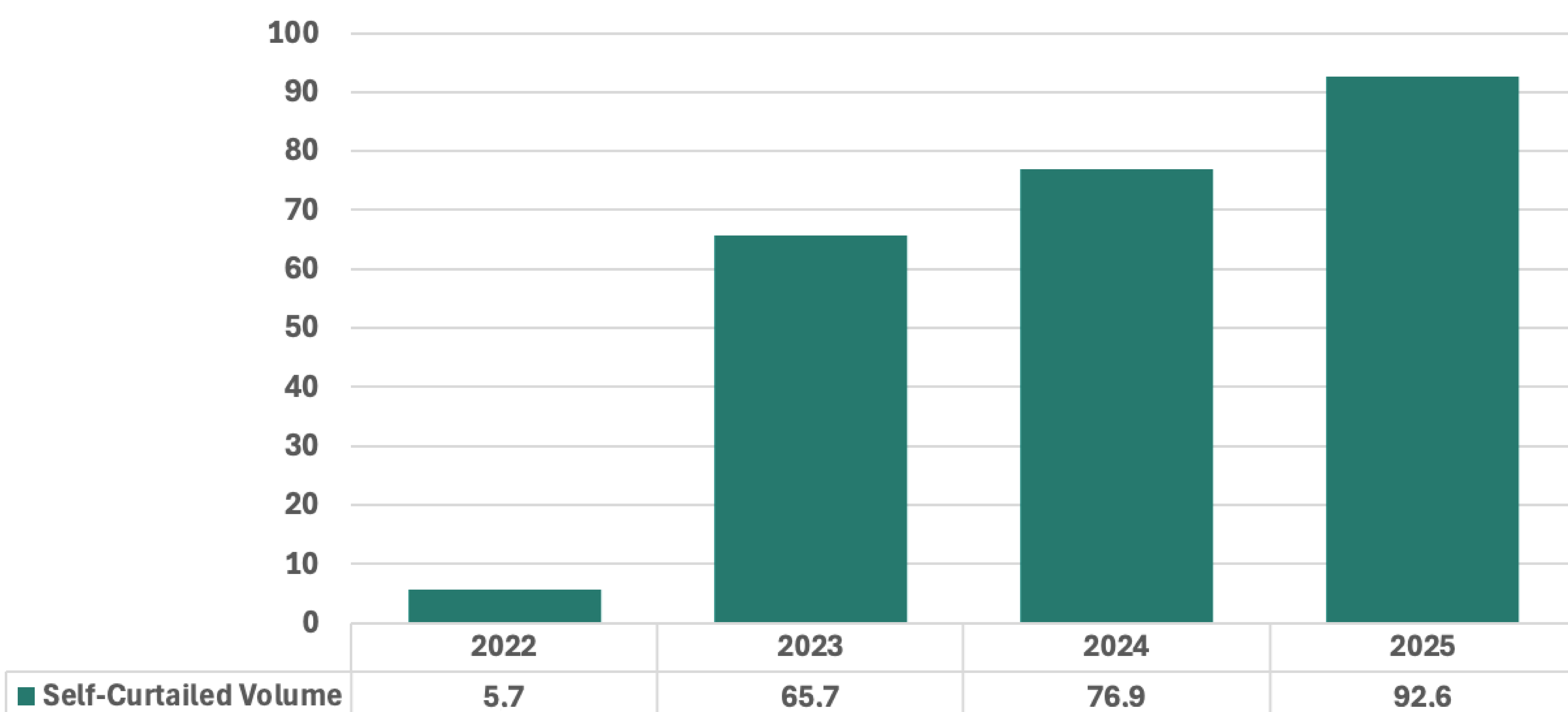
Solar curtailment costs rose over the year to total over £252k. While this is substantially lower than the corresponding figures for wind, it represents a rise from the negligible costs associated with solar curtailment in 2024.

The costs of balancing the system are ultimately fed back to the consumer in the form of a tariff on their energy bills. NESO are obliged to balance the system using the lowest-cost solutions available to them, but even with this mandate, expensive balancing actions are still required given the physical constraints of the system.

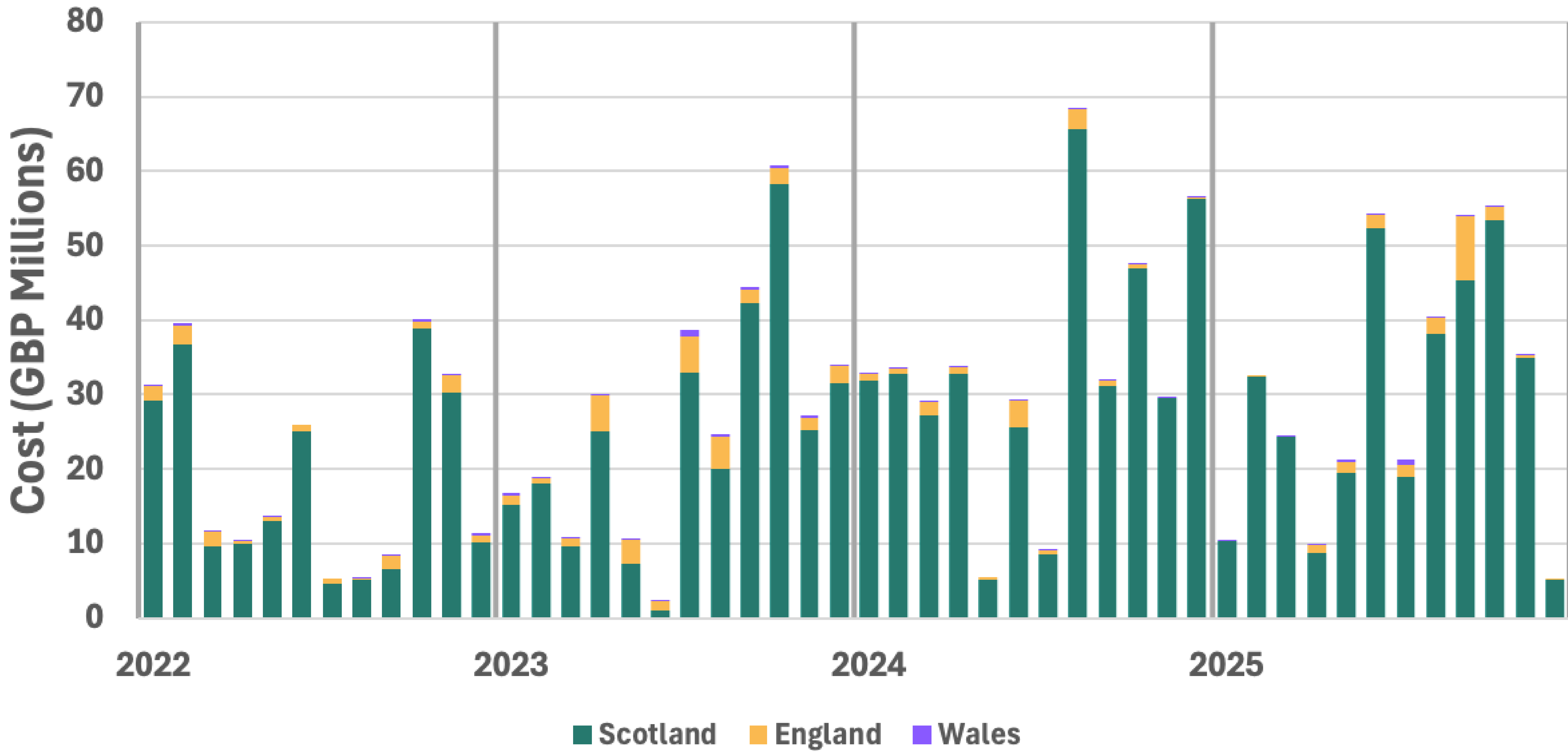
Although balancing costs remain high, the figures for 2025 represent a reduction compared with similar periods in 2024. The table above shows that even as greater levels of curtailment volumes have been required in 2025 compared to 2024, the total cost of curtailment payments has reduced. This is due to increasing numbers of wind farms coming online since 2024, including the Moray West farm, which creates increased competition in balancing pricing. However, this is offset by the rise in the cost of the corresponding upward actions of over £350m from 2024 to 2025.

In 2025, there was also a continuing rise in curtailment from renewable generation outside the BM. Curtailment to solve bottleneck issues via the BM is not the only way for renewables to be turned down. Renewable assets can self-curtail if economic conditions are not favourable enough for them to generate. The subsidy contracts for many existing grid-scale wind and solar farms are designed to ensure that there would have to be an oversupply of renewable energy for an extended period before it was economically favourable for the wind farms to self-curtail. Montel estimates that 2025 saw more self-curtailment from renewable energy sources in GB than any previous year, continuing the rise seen over the past several years.

Self-curtailment volume estimate (GWh)



Cost of curtailed renewables by country by month



GB Forward Outlook

The issue of renewable curtailment and its associated costs has been the centre of much debate, most notably in the recent discussion around zonal pricing in GB. Some market participants have argued that a zonal market could have helped solve the problem of renewable curtailment by encouraging demand to relocate to areas of higher curtailed renewable volumes, where electricity would likely be cheaper. It may also have sent stronger signals to investors to build generation capacity in areas of fewer curtailed renewable volumes, where their power could be sold at higher prices. The government has decided to opt for a reformed national market which aims to solve locational issues through stronger regional differentials in transmission network charges and connection costs, rather than splitting GB into several regional wholesale markets.

However, the rollout of wind projects in Scotland is not currently expected to slow down. In the Scotwind leasing rounds in 2022, 20 offshore wind projects acquired seabed rights in Scottish waters[5] . Should all these projects be completed, almost 30GW of additional wind generation capacity would be added to the Scottish grid. These projects alone would increase the total Scottish wind generation capacity more than threefold. If local flexibility and the rate of grid buildout were to remain at current levels, curtailment volumes and costs could rise by a similar order of magnitude.

The UK government has commissioned NESO to develop the Strategic Special Energy Plan (SSEP) which aims to offer a system-level view of infrastructure planning, including generation, demand and grid buildout for the future. The SSEP is due to be published in 2026, giving guidance on what the future energy system can be expected to look like.

This is of particular importance given the rapidly growing interest in installing data centres in GB, which could dramatically change how the grid is operated in the coming years.

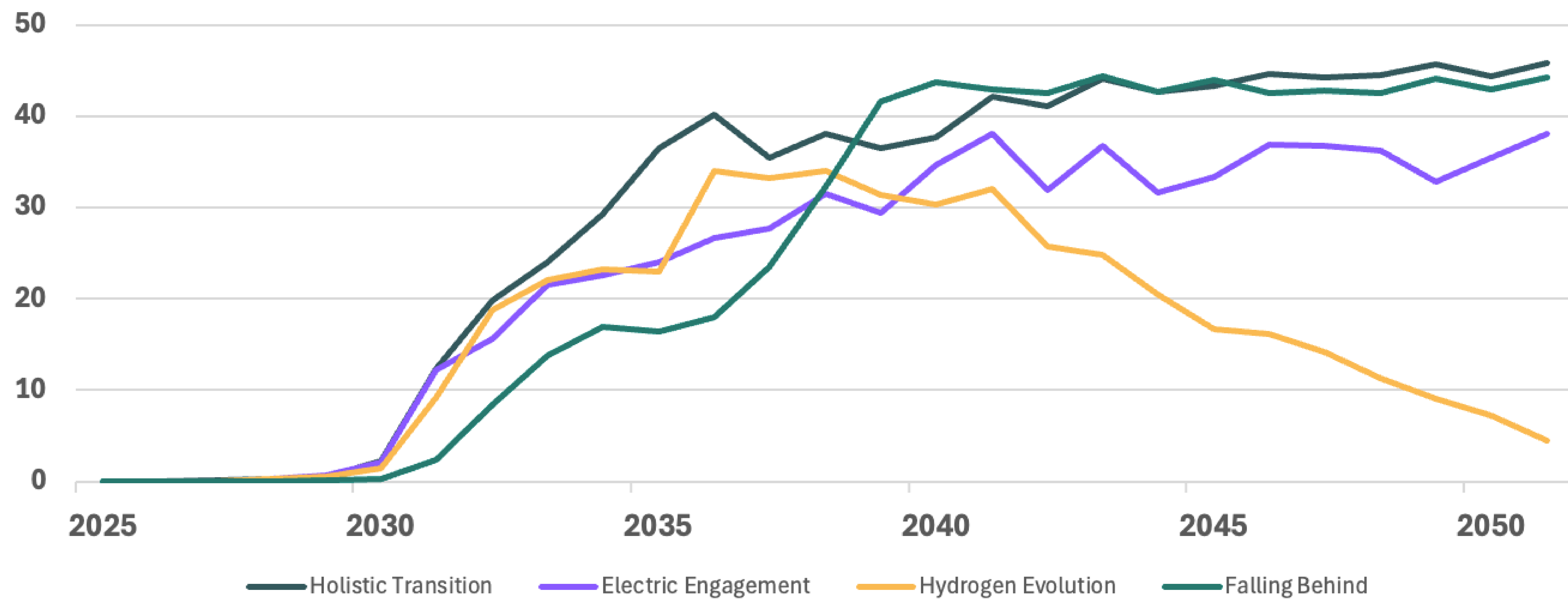
Ofgem has already approved £10.3bn of upfront investment into infrastructure in the electricity system as part of its recent investment framework review. They have also confirmed an automatic approval for projects identified by NESO as key to its strategy in its planning process, potentially pointing towards a power system with more centralised planning in future. The government's Clean Power 2030 Action Plan requires that twice the grid infrastructure be built in the period 2025-2030 than had been built from 2015-2025. Further funding beyond Ofgem's upfront investment would be required to reach this target, perhaps as much as £70bn, according to Ofgem's estimates.

Many of the assets coming on stream in the future will have stricter subsidy rules than existing assets, meaning that any period of renewable oversupply and negative pricing in the wholesale market would result in renewable units losing their subsidy payments, encouraging them to simply switch off without needing to be instructed to do so by NESO. This could save consumers money as fewer curtailment payments may need to be made. However, project developers and investors would also need to factor this into revenue projections.

Periods of self-curtailment are expected to be driven by weather conditions. For example, on particularly windy or sunny days where renewable generation can supply most, if not all, the power required to meet demand. This is due to a phenomenon known as revenue cannibalisation. This describes a scenario where, for example, conditions are so sunny, that power demand is being met by solar generation. Therefore, each extra MWh of generation produced by solar is valued at a lower price in the wholesale market. When prices drop below £0/MWh, these assets would likely switch off and self-curtail. Otherwise, they would be paying to generate power.

This cannibalisation effect is likely to result in a much more significant volume of renewable energy being self-curtailed in future. The self-curtailment figures for 2025 already indicate that curtailment outside of the BM is rising year-on-year, and the new subsidy rules could boost this further. In its forward-looking Future Energy Scenarios publication, NESO suggests that volumes of renewable self-curtailment could rise to ~35-40TWh per year by 2040[6] . However, this could drop by 2050 depending on the development of electrified demand (including Electric Vehicles, heat pumps and more) as well as the hydrogen rollout. These figures do not include the system-constrained curtailment volumes we have seen historically.

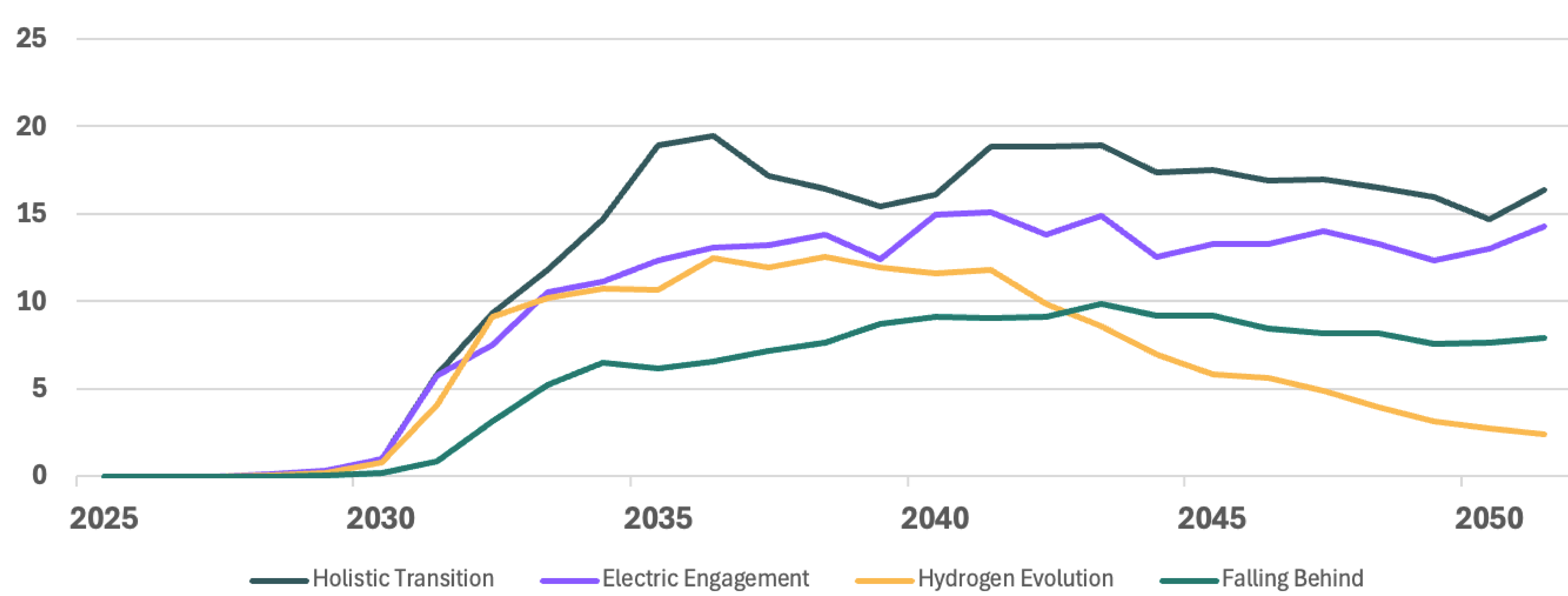
Annual curtailment FES 2025 (TWh)



While grid-scale solar curtailment in the BM is currently smaller than wind, with less than 10GWh being turned down in 2025, the self-curtailment of solar may increase substantially over the coming years. NESO suggests that solar self-curtailment volumes could rise to ~10-20TWh by 2040.

Should the minimum threshold for mandatory participation in the BM be lowered in future (as the government indicates) this would also allow NESO greater control over a wider number of solar assets for balancing purposes. This could further increase the volumes of renewable curtailment.

Solar curtailment per year FES (TWh)



Ireland

Current situation

In the all-island Single Electricity Market (SEM) in Ireland, many of the same issues around constraints that are present in GB are relevant. Much like Scotland, Ireland has a windy climate and a low population density, making it attractive to developers of renewables. Similarly, the grid infrastructure that connects areas of supply and demand is limited.

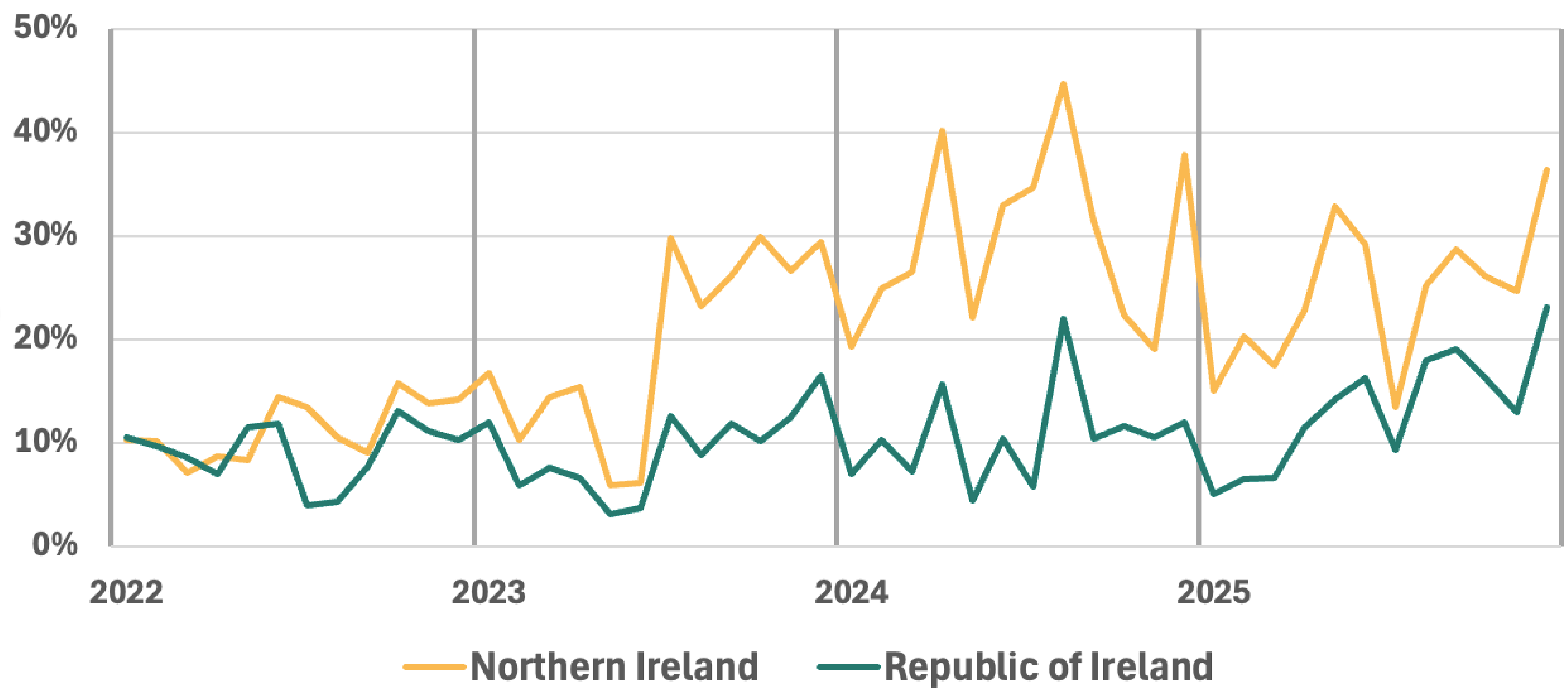
Consequently, there are large volumes of renewables that are curtailed due to either system-level reasons or due to local network constraints[7] . Wind is the renewable resource that is most commonly curtailed, particularly in Northern Ireland.

In 2025, over 2TWh of energy was turned down from renewable generators across the island of Ireland. This is estimated to be more than the total electricity demand of all domestic consumers in County Dublin over the year[8] .

More wind generation has been curtailed in the Republic of Ireland (ROI) than in Northern Ireland (NI) but this is due to a greater amount of wind power In NI, more electricity from wind farms has been curtailed as a proportion of the total available to the system.

	Renewable Curtailment Volumes and Costs			
	Northern Ireland		Republic of Ireland	
	Wind	Solar	Wind	Solar
Total Downward Balancing Volumes 2025 (GWh)	634	18	1,419	149
Percentage of Available Electricity Switched Off 2025	24 %	15 %	13 %	12 %
Total Downward Balancing Volumes 2024 (GWh)	867	19	1,234	36
Percentage of Available Electricity Switched Off 2024	30 %	18 %	11 %	6 %

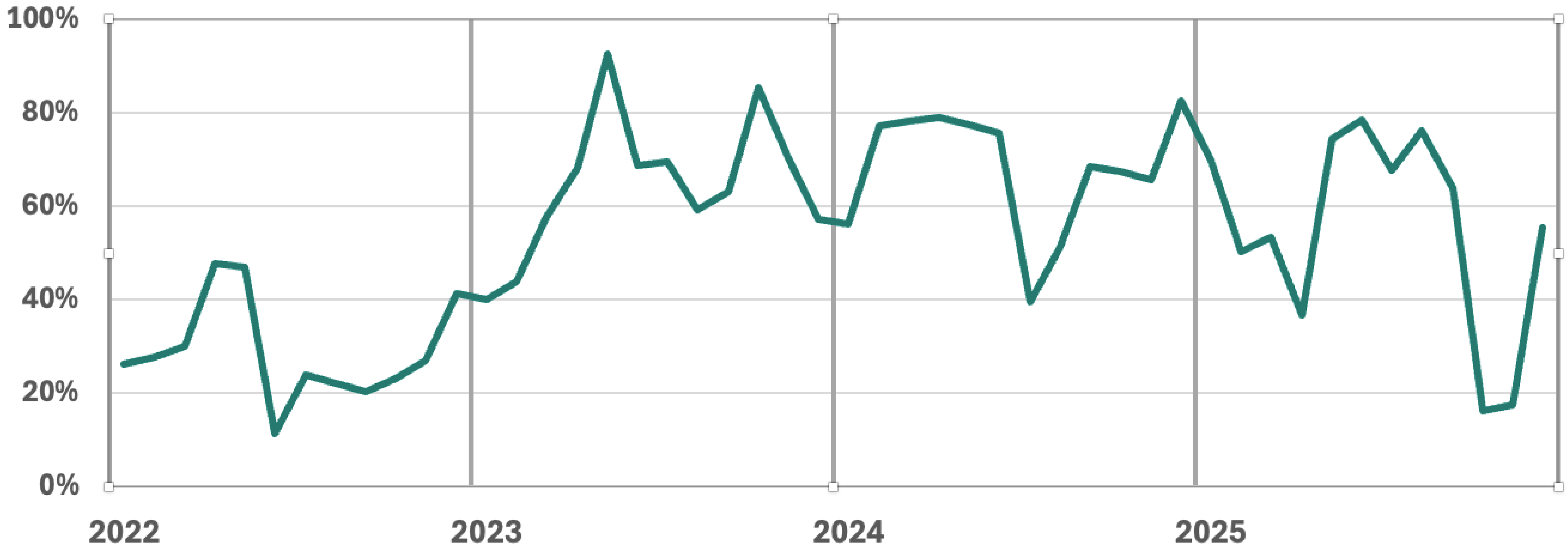
Curtailed wind generation as a proportion of availability



In 2025, around 24% of the available wind energy in NI did not make it to the system and was switched off. This is lower than the 30% average of the previous year. One of the primary drivers for this drop is the connection of the new Greenlink interconnector, which began commercial operations in early 2025. Utilisation of the Moyle interconnector, importing power from Scotland into NI, has dropped in favour of increased imports through Greenlink which imports from Wales into ROI. This is due to the more favourable loss factor of the newer cable, which results in less energy being wasted when power is transferred across it compared with Moyle. As a result, there has been a greater demand requirement in NI that is not being met by imports, resulting in less curtailment for wind farms whose energy can be consumed locally. However, the volume of curtailed wind in NI remains much higher than it was before 2023. In part, this is due to the continuing decline of demand in Northern Ireland and the increased wholesale power price differential between GB and Ireland. With increased levels of power imports from GB into Ireland, including imports through Moyle, there has been less of a local requirement for power in NI than has been historically observed.

Power exports from NI into ROI are limited due to the finite capacity of the transmission infrastructure between the two jurisdictions. This forms a key bottleneck within the Irish market, as power can often not be efficiently transferred from where it is generated to where it is used. 51% of the renewables turned down in NI did not make it onto the system due to issues moving power from NI to ROI. This is lower than the 68% of renewable curtailment that was switched off for this reason in 2024. Again, the Greenlink interconnector is a key factor that facilitated the drop in 2025.

Proportion of curtailed Northern Irish wind curtailed due to constraints with Republic



In ROI, the greatest change in balancing for renewables has been the recent surge in solar generation capacity. With a rising number of grid-scale solar assets coming online, solar power has been used more extensively in balancing the Irish system and so the volume of curtailed solar output has increased accordingly. In 2025, around 149GWh of power from solar was curtailed in ROI. This is almost four times the volume of solar that was curtailed in ROI in 2024. Although solar power currently represents a small proportion of the overall generation mix in Ireland, solar capacity in ROI is seeing an acceleration in buildout which is reflected in the balancing volumes.

Island of Ireland forward outlook

Over the coming years, a number of fundamental changes to the Irish market will likely change the makeup of curtailment volumes and the associated costs. The first change, expected to come in 2026, is a change to how the market handles the prioritisation of renewables. Under the existing market rules, renewable assets such as wind and solar have priority dispatch, meaning that they will be scheduled to run if they are available and will only be switched off if curtailment is required for system-level reasons.

As such, they are priced into the balancing market at zero, meaning there is no cashflow associated with instructing renewable units for balancing purposes.

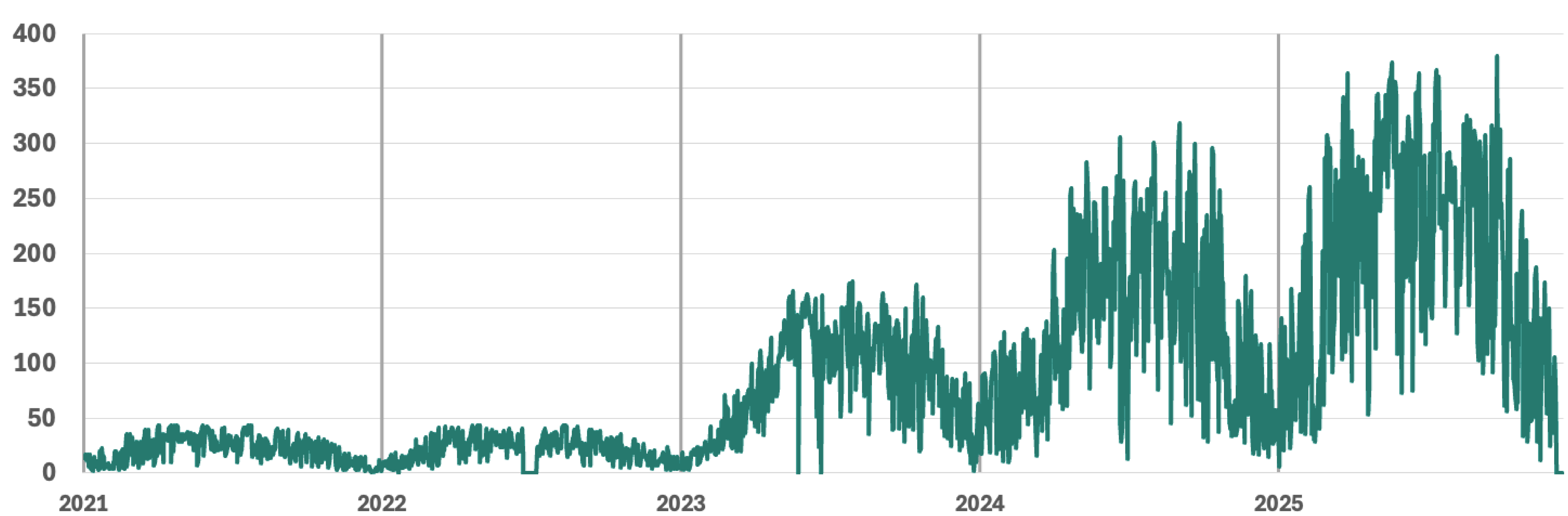
However, once this pending rule change is implemented, newer renewable assets will no longer have priority and will need to price themselves into the balancing market competitively. This will introduce a cashflow for their balancing actions but will also allow for a more competitive environment with the whole market, potentially reducing balancing costs overall.

The second large upcoming change is the introduction of the North-South interconnector, expected to go live in the late 2020s or early 2030s. This cable may ease the bottleneck moving power between NI and ROI by providing additional transmission capacity. The result will likely be reductions in curtailment volumes for renewable assets in both jurisdictions.

However, the continuing rise in utility scale solar generation capacity, which has risen by an order of magnitude in the last three years, may counteract this to a degree.

Solar generation is quickly becoming a very significant component in the Irish energy mix, as evidenced by the fourfold increase in downward dispatch volumes from 2024 to 2025. If the buildout continues at a similar pace to the past several years, the total solar downward dispatch volume could rise to be higher than that of wind in a matter of years.

Daily peak solar generation in Island of Ireland (MW)



Conclusion

The analysis paints a clear picture. Curtailed volumes of electricity are rising on average and may continue to do so as more renewable capacity comes online in both GB and Ireland. Now is the time for government to come together with industry and build the holistic view of policy which will enable the optimal siting of generation, sufficient investment in grid infrastructure and the correct investment signals to help alleviate grid constraints. The Strategic Spatial Energy Plan (SSEP) and the wider reformed national market workstream will be key to achieving these aims.

In Ireland, a boost in electricity system infrastructure in the form of the Greenlink interconnector has led to tangible benefits in reducing the downward dispatch of renewable generation. Further investments, such as the development of the North-South interconnector, will be vital to improve the overall efficiency of the system amid growing renewable deployment.

Unless policymakers pay attention to the need to marry renewable power with public systems and infrastructure, then outdated transmission networks could continue to drive up consumer bills as NESO, Eirgrid and SONI are forced to operate networks unfit for the net-zero future.

Methodology

1. “Curtailed renewables” is defined in this report as generation from either wind or solar assets which could have been used but was turned down in the balancing market for any reason. This means that embedded and behind-the-meter generation are not considered. Neither are self-curtailing renewables that reduced output due to economic reasons or the size of their grid connection.

To calculate curtailment volumes in GB, the accepted by-unit balancing volumes as published by Elexon were aggregated using a mapping of BMU ID codes and asset details such as location.
Cashflows were produced using by-unit balancing pricing data from Elexon.
It was assumed that the generation from assets’ Final Physical Notifications (FPNs) as published by Elexon would have been available in an unconstrained system.
The cutoff date for data processing was 2nd January 2026. Any updates to historic data at source after this date will not be accounted for in this report.

2. Assumptions around average household energy usage based on Ofgem estimate of 2,700kWh per year: https://www.ofgem.gov.uk/average-gas-and-electricity-usage. Total London domestic household consumption estimated by multiplying Ofgem average usage figure by 3.527m households according to statistics sourced from the Office for National Statistics:
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/datasets/householdsbyhouseholdsizeregionsofenglandandgbconstituentcountries

3. Total Scottish domestic household consumption estimated by multiplying Ofgem average usage figure by 2.7m Scottish dwellings according to housing statistics sourced from Scottish Government:
https://www.gov.scot/news/housing-statistics-for-scotland-2022-23/

4. To value the upward actions associated with renewable curtailment in GB, by-unit balancing data from Elexon was analysed. Only the volume of bids tagged as system actions were considered, since renewable power that was switched off due to national oversupply will not have any associated upward actions.

The assumption was made that the cheapest actions in the stack of accepted upward balancing actions were taken to counteract the system-tagged wind volume. The total cashflows by year represent the sum over all relevant settlement periods. In each settlement period, the cashflow was calculated as the total cost associated with the cheapest upward actions that were required to match the magnitude of the system bid volumes in that period from renewable generators in the BM. Marginal actions were partially valued, attributing only the volume required to meet the system-tagged bid volume to the total cost associated with curtailment.

5. Scotwind leasing round results:
https://www.crownestatescotland.com/scotlands-property/offshore-wind/scotwind-leasing-round

6. Future Energy Scenarios 2025:
https://www.neso.energy/publications/future-energy-scenarios-fes

7. In the SEM, there is a distinction made between curtailment and constraints. Curtailment is downward balancing dispatch due to system-level reasons of renewable oversupply. Constraints are downward balancing dispatch volumes required due to issues moving power around the local network. These are handled differently from a financial point of view. For the purposes of this report, both are referred to as "curtailment" for the sake of consistency of comparison with GB.

To calculate curtailment volumes in the SEM, by-unit balancing volumes as published by SEMO were aggregated using a mapping of SEMO ID codes and asset details including jurisdiction. Constraint volumes broken down by reason for curtailment were published at the same source and were aggregated in the same manner. It was assumed that all the generation from assets' availability forecasts published by SEMO would have been available in an unconstrained system.

8. Irish housing data assumptions sourced from Central Statistics Office: https://www.cso.ie/en/releasesandpublications/ep/p-cpr/censusofpopulation2022-preliminaryresults/housing/

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