UK Government

Clean Power 2030 Action Plan: A new era of clean electricity

Connections reform annex

December 2024

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Introduction

This annex provides a detailed breakdown of the Clean Power Action Plan pathway and capacity ranges, for the purposes of aligning the NESO-led process of connection reform with 2030 Clean Power (subject to NESO's final proposals being approved by Ofgem).

This includes GB-level capacity ranges, informed by NESO's 2030 advice and in line with the government's 2030 pathway for most generation technologies, and regional breakdowns for onshore wind (ONW), solar, and batteries.

We have also set out technology capacity ranges to 2035 to provide a 10-year horizon for connection offers. These are mainly derived from NESO's net zero-aligned 2035 Future Energy Scenarios (FES) 2024, with a bespoke approach for onshore wind and unabated gas (see the note on bespoke approaches).

Subject to Ofgem's final decision, raising entry requirements and aligning capacity with our Clean Power Action Plan could release approximately 500GW of capacity on our network. This would cut the size of the queue by around two thirds, creating opportunities to turbo charge generation and demand projects that are ready and are needed. This will not only drive us forward towards Clean Power by 2030 but will accelerate key industries from data centres to gigafactories, unlocking £billions in investment in GB.

Connections reform

The electricity network is a critical enabler for delivering clean power by 2030 and accelerating towards net zero. To ensure we have the necessary network in place, we need to speed up both the build of new network infrastructure and fundamentally reform the grid connections process. Measures to accelerate infrastructure build are covered in the 'Networks and Connections' chapter of this Action Plan.

As the government set out jointly with Ofgem in its 'Open Letter on aligning connections with strategic plans',[1] we know that neither the current connections process, nor reforming the process based on readiness alone, will deliver clean power by 2030. NESO has now consulted on its proposals for a strategically aligned process and reform of the existing connections queue[2] and expects to submit final recommendations to Ofgem by the end of 2024, for a decision by the end of Q1 2025.

The government strongly supports connections reform and plans to introduce legislation, when parliamentary time allows, to ensure connections reform aligns with strategic energy and network plans and supports delivery of Clean Power by 2030. This should provide certainty to all parties on the direction of travel for connections.

[1] DESNZ (2024), 'Open letter from DESNZ and Ofgem: Aligning grid connections with strategic plans' (5 November 2024).
[2] NESO (2024) Phase 3: Consultation Documents

If approved by Ofgem, NESO's proposals will deliver the radical overhaul of grid connections that is critical to enable delivery of clean power by 2030 and net zero. By removing unviable projects, re-ordering the queue, and accelerating connection timescales for the projects we need most, these reforms will unleash investment in renewable generation and electrification of the wider economy – investment that has been held back for too long.

A strategically aligned connections process will also bring inherent efficiencies in network design, planning, and build, and provide long-term confidence not only for investors in renewable energy, but also for all demand sectors that will depend on clean energy for electrification (from data centres and gigafactories, to electric vehicle charging and heat pumps), as well as related supply chains and the jobs these will create.

It is critical that the new connections process provides timely connections for all demand customers - ultimately, it is new and growing sources of demand that drive the need to connect renewable generation. Growth of demand connections will not be constrained by the Clean Power pathways (subject to NESO being content that system stability and security of supply requirements are met) and we expect that the capacity released by prioritising generation connections in line with capacity ranges, and removing excess generation from the connections queue, will enable accelerated connections for many demand customers.

Demand projects in scope of reform and connecting to the transmission network are by nature strategically important given the size of their connections and will deliver investment and wider social value. It is therefore essential that steps are taken to ensure major demand investors can continue to bring forward and progress investments in Great Britain both ahead of reform and as reforms are progressed.

Similarly, it is important that smaller projects are treated proportionately and are not unduly caught up in transmission processes. Projects connecting to the distribution network that are below regional thresholds for Transmission Impact Assessment (TIA) will not be constrained by the capacity ranges set out in this plan. Currently, the lower threshold for TIA is 1 MW in England and Wales, 200 kW in mainland Scotland, and 50 kW in the Scottish Islands.[3]

Pathways to Clean Power

Moving from a 'first come, first served' system to one that is strategically aligned requires that we set out the capacities we will need in each technology type. To do this, we have set out national pathway figures for the capacity which should be prioritised for all technologies, and further regional breakdowns for the capacity which should be prioritised for solar, batteries and onshore wind. This will enable network companies to accelerate, and developers to bring forward, projects which best align with strategic need.

Subject to the final agreed approach to connections reform, we expect that NESO will use the top-end of the government's 2030 pathway (i.e. DESNZ 'Clean Power Capacity Range'), to

[3] National Grid Electricity Transmission have proposed raising the threshold for TIA in England and Wales, see: [Ofgem Connections Delivery Board - October 2024 minutes]

underpin connection offers for projects in and before 2030. To provide developers and investors with a 10-year horizon for connection offers, we expect that NESO will use the technology capacity ranges in Table 1, derived from their 2035 Future Energy Scenario (FES) 2024[4] to underpin connection offers out to 2035. These FES-derived ranges do not constitute a government pathway, but rather an established, public basis through which to provide longer-term certainty on connections, ahead of the Strategic Spatial Energy Plan (SSEP), due to be published in 2026.

This approach does not imply government commitment to further fiscal measures, levy support, or policy mechanisms to help meet the level of deployment in the 2035 ranges. Such measures will be subject to separate decisions.

Where a viable project exceeds the relevant 2035 technology capacity ranges, it will receive an indicative 'Gate 1' offer if directly transmission-connected (or revert to its initial DNO connection agreement if embedded) and will have opportunities to join the queue in future where gaps emerge and/or where capacity ranges are revised upwards by the first SSEP.

Where there is under-supply against capacity ranges up to 2030, NESO will look first to substitute viable projects of the same technology from adjacent, over-supplied, zones. Where this is not possible or there is still under-supply after substitutions, NESO will reserve network capacity up to the top of the capacity range to ensure sufficient network infrastructure is built ahead of future projects applying to connect. This will provide future connections opportunities where deployment is currently underdeveloped, for example in onshore wind.

For most technologies, GB-level capacity ranges will be sufficient to enable NESO to deliver efficient connection reform. This is because these technologies are characterised by a small number of discrete projects (e.g. nuclear), are less locationally sensitive, or are already subject to a coordinated design exercise (e.g. offshore wind). Aggregated, higher-level pathways also minimise any risk of over-determining future deployment ahead of the SSEP.

For solar, batteries, and onshore wind, we need to ensure that ready projects can progress while delivering a balanced energy system for 2030. Regional breakdowns are needed to give network companies greater control over capacity allocation for these technologies because they are characterised by a larger number of smaller projects, are geographically dispersed and, in the case of solar and batteries, are oversubscribed nationally in our current connection queue. For these technologies, using pathways limited to GB-level would create significant risks of sub-optimal network design and could limit the ability to connect strategically important demand projects.

Government sets out regional breakdowns in Table 2, 4, and 6. Overall capacities for prioritisation for each technology are based on the government's Clean Power Action Plan, which provides a national pathway to achieving clean power by 2030 and a 'Clean Power Capacity Range' (see Table 1).

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[4] FES scenarios are already used by NESO for the purposes of wider investment plans. See, for example: NESO Beyond 2030

To determine a regional breakdown of the government's pathway, government asked NESO to consider how best to distribute capacity regionally. NESO's analysis is informed both by the existing connections queue, to ensure that there is an adequate supply of projects, and power sector modelling, to ensure that assets are located where they can reduce the level of unabated gas used and help keep future system costs low.

Ofgem is due to decide on NESO's proposed reforms to the connections process by the end of Q1 2025. Should Ofgem approve the changes, the GB 'Clean Power Capacity Ranges' and regional breakdowns in this annex would be used within the connections process to prioritise projects that best meet our strategic needs.

This annex also includes a regional breakdown for technologies required beyond 2030, to 2035, based on analysis from NESO. This should be used to provide certainty to investors by ensuring a continued pipeline of grid connections. Projects aligned with the 2035 breakdowns may be able to connect before 2031 where there is spare capacity, under-supply, or project attrition post offer acceptance.

Government will build on this plan in the publication of the SSEP in 2026. The SSEP will examine the mix of technologies in the pipeline and consider whether capacity reserved for undersupplied technologies should be released for other technologies. The 2035 figures in this technical annex are therefore interim to enable connection agreement reform to proceed at pace and are subject to updates through the SSEP. In line with proposals set out in NESO's consultation, we expect that introduction of the SSEP pathway will not alter connections agreements already issued for projects connecting using the FES-derived ranges set out here – subject to those projects continuing to meet progression milestones – but may lead to changes in the prioritisation of capacity for future connection offers. NESO proposes not to replace projects that have been provided a connection offer in the 2031-35 period but subsequently exit the queue, to maximise scope for the first SSEP to optimise the future network.

Subject to Ofgem approval, additional flexibilities will be included in the reformed connection process to allow for project attrition, and over- or under-supply. These should include:

- Allowing pre-2030 connections for ready projects that exceed 2030 capacity ranges but are within the 2035 ranges, where there is spare capacity after projects within the 2030 ranges have been assessed. This will avoid imposing a hard limit on pre-2030 connections and ensure that no project will be denied a pre-2030 connection solely because it is not aligned with Clean Power 2030
- Allowing substitutions of the same technology from adjacent zones where there is over- or under-supply, so long as this does not cause material network constraints
- Allowing any project with a connection date in 2025 or 2026 that is already under construction to retain its connection date

Additionally, to avoid impacting projects whose development is already well advanced, NESO has proposed that any project that has been awarded a Contract for Difference or Capacity Market contract, an Interconnector or Offshore Hybrid Asset Cap and Floor agreement, Merchant Interconnector approval, or has secured planning permission as a Nationally Significant Infrastructure Project or via relevant Town and Country Planning Acts (including through devolved governments' planning regimes), will be included in the new reformed connections queue provided they have also met the Gate 2 Readiness Criteria. Government supports this proposal.[5]

It should be noted that prioritised connection offers alone will not guarantee that a project will progress to completion. Projects will still be required to secure planning consent, (if not already granted) and meet NESO progression milestones to retain connection agreements and progress to energisation.

There will also be specific projects that require certainty beyond 2035, such as large scale nuclear. In government's view NESO should consider how the Project Designation Methodology recently consulted on can be used to provide early certainty to these projects.

For technologies not included within the pathways set out below, or generation connecting from outside GB, NESO should separately consider the correct route through the connections process to facilitate timely connections for these projects, as appropriate. Further, the capacity range only applies to projects which need to complete Transmission Impact Assessments, subject to specific network operators' rules.

[5] NESO (2024), 'Open letter on connections reform' (published 10 December 2024, viewed December 2024).

Table 1: Installed GB-level capacity in 2030 in the NESO 'Further Flex and Renewables' and 'New Dispatch' Scenarios, and the DESNZ 'Clean Power Capacity Range', compared to installed capacity in 2024 (GW)

Technology	Current Installed capacity (2024)[6]	NESO 'Further Flex and Renewables' Scenario	NESO 'New Dispatch' Scenario	DESNZ 2030 'Clean Power Capacity Range'[7]	2035 FES-derived Capacity Range[8]
Variable					
Offshore wind	14.8	51	43	**43 – 50**	**72 - 89**
Onshore wind	14.2	27	27	**27 – 29**	**35 - 37**[9]
Solar	16.6	47	47	**45 – 47**[10]	**45**[11]**- 69**
Firm					
Nuclear	5.9	4	4	**3 - 4**	**4 - 6**

[6] Latest publicly available data for Great Britain at the point of publication. The data source for renewables is DESNZ (2024), 'Energy Trends 6.1', Q2 2024 data. The data source for nuclear, unabated gas, and LDES is DESNZ (2024), 'DUKES 2024 5.12', 2023 data. The data source for consumer-led flexibility is NESO (2024), 'Clean Power 2030 Table 2' 2023 data. The data source for batteries is Modo Energy (2024), 'Indices & Benchmarks', Q4 2024 data. The data source for interconnectors is Ofgem (2024), 'Interconnectors', 2024 data. Low carbon dispatchable power includes biomass, power BECCS, gas CCUS and hydrogen to power. The data source for biomass and power BECCS is NESO (2024), 'Clean Power 2030 Table 2', 2023 data where available. Gas CCUS and hydrogen to power are new technologies so there is no installed capacity at the point of publication. All links viewed December 2024.
[7] In addition to the two NESO scenarios, these ranges have been informed by internal modelling and an assessment of maximum feasible deployment based on current knowledge of the project pipeline. Therefore, the range differs from the range of the two NESO scenarios in some instances. However, for solar, there is scope to exceed the 47GW upper limit, subject to system need, noting for example the potential of rooftop solar to boost deployment – see detail within this annex.
[8] 2035 ranges have been developed using ranges from the NESO FES24 net zero aligned scenarios.
[9] Onshore wind capacity ranges for 2035 include an uplift of 6 GW from the FES24 2035 estimate, this is to reflect the potential for higher growth rates in ONW in England and Wales after the lifting of the de facto ban.
[10] NESO engagement with Distribution Network Operators indicates that an additional 9-10 GW of rooftop solar projects, which are not subject to Transmission Impact Assessments (see page 5) could deploy before 2030. It is therefore possible that the 2030 Clean Power solar capacity range of 45-47 GW could yield around 54-57 GW in 2030 (subject to solar PV pipeline of rooftop solar projects).
[11] Given that we wouldn't expect solar installed capacity to decrease between 2030 and 2035, we have re-calibrated the 2035 range so it starts at the bottom-end of the DESNZ Clean Power Capacity Range.

Technology	Current Installed capacity (2024)[6]	NESO 'Further Flex and Renewables' Scenario	NESO 'New Dispatch' Scenario	DESNZ 2030 'Clean Power Capacity Range'[7]	2035 FES-derived Capacity Range[8]
Dispatchable					
Low Carbon Dispatchable Power[12]	4.3	4	7	**2[13] –7**	**Up to 25**
Unabated gas	35.6	35	35	**35[14]**	Subject to separate NESO designation process[15]
Flexible					
LDES[16]	2.9	8	5	**4 – 6**	**5-10**
Batteries[17]	4.55	27	23	**23 – 27**	**24-29**
Interconnectors	9.8	12	12	**12 – 14**	**17-24**
Consumer-led flexibility[18]	2.55[5]	12	10	**10 – 12**	**29**

[12] Dispatchable technologies are ones which combust fuel to produce electricity and, by varying the rate at which fuel is burned, can respond to meet the needs of the grid with varying levels of flexibility. This category includes biomass, power BECCS, gas CCUS and hydrogen.

[13] The low end of the range represents the minimum capacity we expect to have in 2030. There is uncertainty on the amount of biomass capacity that will be on the system in 2030 with some existing support arrangements ending from 2027 onwards. HMG is considering the position on potential future support arrangements, but no decisions have yet been taken

[14] While delivering its Clean Power ambition for 2030, the government's aim is to ensure there will be sufficient flexible capacity on the system to meet security of supply. This includes retaining existing unabated gas capacity.

[15] Government expects unabated gas connections would be subject to NESO's designation methodology.

[16]As per the position set out in the Government Response to the LDES Consultation, LDES are storage technologies with a minimum duration of at least 6 hours. Government is currently considering whether to increase the minimum duration beyond 6 hours, including through advice being provided by NESO. Government will confirm the final position in Q1 2025, in the LDES Technical Decision Document it will publish with Ofgem. See Designing a policy framework to enable investment in long duration electricity storage: government response.

[17] Refers to battery storage projects which do not meet the definition of LDES, as per the forthcoming LDES Technical Decision Document.

[18] Excluding storage heaters. Connection offers will not be issued under this technology category.

Note on bespoke approaches for 2035 capacity ranges for onshore wind and unabated gas

The FES 2035 range for onshore wind is 29-31 GW. This only represents a 2 GW uplift above our 2030 pathway (27-29 GW) for the 2031-35 period, which amounts to an annual deployment rate of 0.4 GW. NESO has confirmed the FES modelling is based on assumptions about the planned onshore wind pipeline in England and Wales that do not reflect action taken by the Secretary of State in July to remove the de facto onshore wind ban.

We consider that the FES 2035 range therefore no longer represents an accurate reflection of the potential for onshore wind deployment over the next 10 years and is misaligned with the objectives of the Onshore Wind Taskforce. DESNZ internal analysis indicates significant upside potential for onshore wind deployment beyond 31 GW FES figure by 2035, plausibly between 35 and 37 GW.[19] It therefore follows that there is strong justification to deviate from the FES range for onshore wind.

We have therefore increased the capacity range for onshore wind in 2035 to 35-37 GW, above that set by FES. We acknowledge that locational uncertainty in the onshore wind pipeline relative to network development following lifting the de facto ban makes it challenging to calculate a regional breakdown of the government's 2035 onshore wind capacity uplift to the same level of granularity as solar and batteries. We have therefore decided to proceed with a two-zone split between: i) Scotland and ii) England & Wales for onshore wind, with no split between transmission and distribution. The two-zone split is shown in Table 6.

We have decided to allocate the 6 GW uplift in onshore wind to the England and Wales zone (totalling 16 GW), with the onshore wind allocated to Scotland consistent with the FES 2035 estimates (21 GW). This is consistent with our rationale that pursuing the uplift was necessary to reflect the expected higher growth rates in onshore wind in England and Wales following lifting of the de facto ban. We will continue to engage with NESO, Ofgem and devolved governments to consider the most cost-effective spatial optimisation of wind generation technology through the SSEP, including having regard to the Scottish Government's future vision for Onshore Wind.

The technologies set out in Table 1 represent a portfolio of established and emerging renewable and low carbon technologies to deliver decarbonisation of the power sector, and we expect to increase deployment of these technologies to ensure that we can meet electricity demand with a rising share of low-carbon power. In doing so, we recognise the importance of securing gas capacity to maintain security of supply on our transition to Clean Power, and beyond. This means retaining sufficient unabated gas capacity until well beyond 2030, when it can be safely replaced by low carbon technologies that can provide the amount of long duration flexibility necessary to keep the system balanced at all times. Subject to Ofgem's approval, NESO's project designation process will ensure priority access to available capacity /

[19] This range has been informed by DESNZ analysis from published Energy and Emissions Projections Annex O, as well as more recent internal analysis modelling a credible power sector pathway to reach Clean Power in 2030 (see Technical Annex).

earlier connection dates where projects meet various criteria, including those deemed to be critical to security of supply.

Regional capacity breakdowns for solar, onshore wind and batteries

Regional capacity breakdowns have been agreed in collaboration with NESO. The 2030 breakdowns presented below reflect the upper end of the capacity range in the DESNZ 'Clean Power Capacity Range' for solar, onshore wind and batteries. The regional capacity breakdowns for 2035 are informed by NESO's FES-24 net zero aligned scenarios, and the bespoke capacity range for onshore wind. The breakdowns have been estimated using a variety of sources, including but not limited to, current connection queue data, planning data and the Capacity Market register. For transmission and distribution network connected technologies, these breakdowns have been presented in 11 and 8 regions respectively. These regions were chosen to balance between the dual needs of i) providing enough geographical specificity to effectively manage and plan the future electricity network and, ii) the need for sufficient levels of flexibility in the reformed connections process to allow for future market changes to be reflected in our regional technology mix.

The regional capacities for Onshore wind (Scotland, England and Wales) are presented in Table 6. Transmission and distribution level regional breakdowns for onshore wind have not been presented for the 2031-35 period for the reasons outlined in this annex.

Transmission connected technologies

Table 2: Regional capacity breakdowns for transmission connected technologies required for 2030[20] and 2035[21]

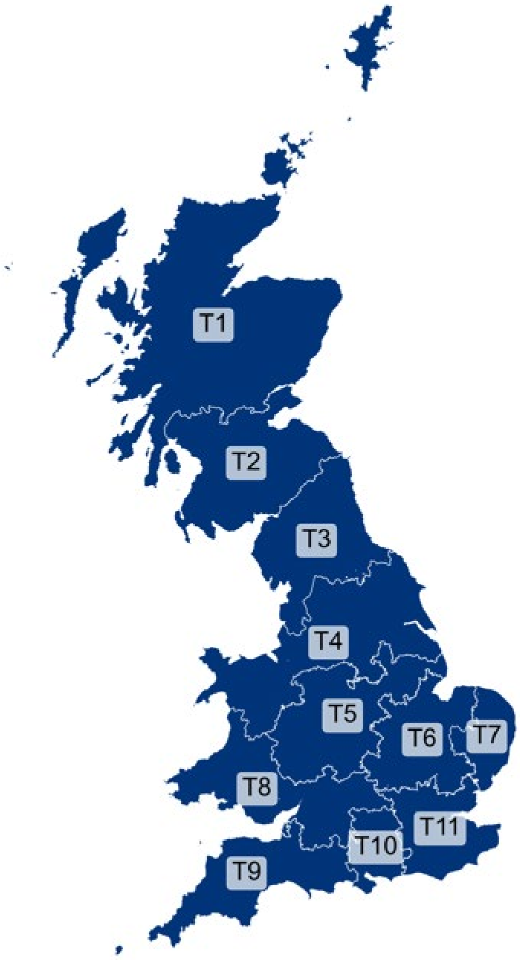
Transmission network region	Solar (MW) 2030	Solar (MW) 2035	Onshore wind (MW)[22] 2030[23]	Onshore wind (MW) 2035	Batteries (MW)[24] 2030	Batteries (MW) 2035
N. Scotland	100	800	5,500	-	1,900	1,900
S. Scotland	600	800	8,800	-	3,900	3,900
N. England	500	1,400	-	-	800	800
N. Wales, the Mersey and the Humber	1,200	1,700	300	-	4,200	4,200
Midlands	4,000	5,200	-	-	1,300	1,300
Central England	2,100	3,300	-	-	500	500
E. Anglia	100	900	-	-	200	200
S. Wales and the Severn	1,100	1,300	1,300	-	900	900
S.W. England	300	300	-	-	400	400
S. England	200	200	-	-	100	100
South East England	600	1,100	-	-	1,700	1,700
GB total	**10,800**	**17,000**	**15,900**	**-**	**15,900**	**15,900**

Note: MW capacity figures have been rounded to the nearest 100 MW.

[20] The national total capacities (MW) per technology, are aligned with the DESNZ Clean Power Capacity ranges for 2030.
[21] The 2035 figures are informed by FES24 net-zero aligned scenarios.
[22] We have not presented onshore wind's breakdown by transmission network region for 2035. The capacity split between Scotland and England and Wales has been presented in Table 6.
[23] Some onshore wind regional capacities are blank for 2030 due to the lack of known pipeline transmission connected projects in these regions at the point of publishing.
[24] The 2 GW total uplift in estimated capacity between 2030 and 2035 for batteries has been allocated to distribution connected batteries only. There is, therefore, no change in the capacity breakdown for transmission connected batteries between 2030 and 2035.

Table 3: Mapping of transmission network region codes to transmission region names

Transmission network region code	Transmission network region name
T1	N. Scotland
T2	S. Scotland
T3	N. England
T4	N. Wales, the Mersey & the Humber
T5	Midlands
T6	Central England
T7	E. Anglia
T8	S. Wales & the Severn
T9	S.W. England
T10	S. England
T11	South-East England



Distribution connected technologies

Table 4: Regional capacity breakdowns for distribution connected technologies required for 2030[25] and 2035[26]

Distribution network region	Solar (MW) 2030	Solar (MW) 2035	Onshore wind (MW)[27] 2030	Onshore wind (MW) 2035	Batteries (MW) 2030	Batteries (MW) 2035
Scottish and Southern Electricity Networks (SSEN) – Scottish Hydo Electric Power Distribution (SHEPD)	1,100	1,700	3,500	-	900	900
SP Distribution (SPD)	1,100	1,800	2,700	-	800	900
Northern Powergrid (NPg)	4,400	6,500	1,900	-	1,900	2,100
Electricity North West (ENWL)	1,500	2,300	700	-	900	1,000
SP Manweb	1,500	2,200	1,000	-	400	500
National Grid Electricity Distribution (NGED)	13,900	19,900	2,400	-	3,000	3,600
UK Power Networks (UKPN)	8,100	11,800	900	-	2,100	2,400
SSEN – Southern Electric Power Distribution (SEPD)	4,600	6,200	100	-	1,200	1,400
GB total	**36,200**	**52,400**	**13,200**	**-**	**11,200**	**12,800**

Note: MW capacity figures have been rounded to the nearest 100 MW.

[25] The national total capacities (MW) per technology, are aligned with the DESNZ Clean Power Capacity ranges (Table 1).
[26] The 2035 figures are informed by the FES24 net-zero aligned scenarios.
[27] We have not presented onshore wind's breakdown by distribution network region for 2035. The capacity split between Scotland and England and Wales has been presented in Table 6.

Table 5: Mapping of distribution network region code to distribution region name

Distribution network region code	Transmission network region name
D1	SSEN - SHEPD
D2	SP Distribution
D3	ENWL
D4	NPg
D5	SP Manweb
D6	NGED
D7	SSEN - SEPD
D8	UKPN

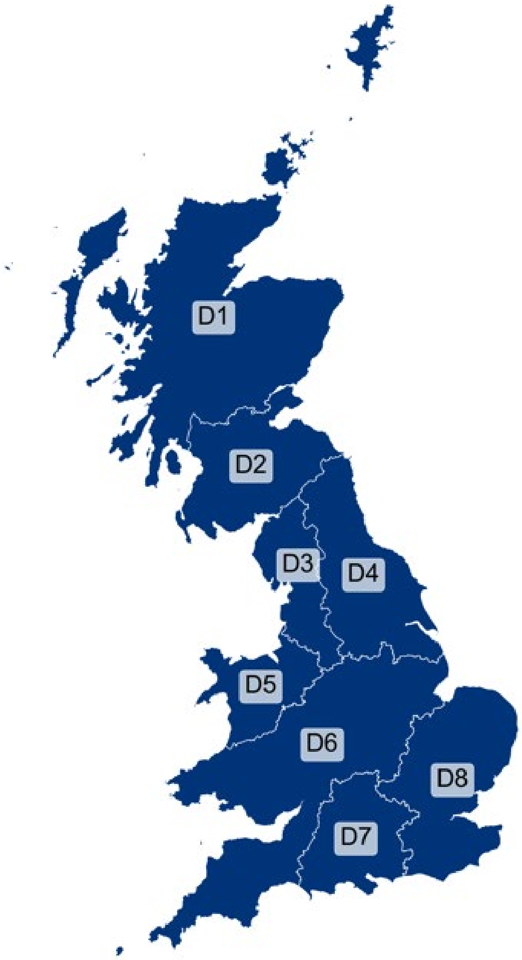


Table 6: Total capacities for Scotland, England and Wales by technology

GB region	Solar (MW) 2030	Solar (MW) 2035	Onshore wind (MW) 2030	Onshore wind (MW) 2035	Batteries (MW) 2030	Batteries (MW) 2035
Scotland	2,900	5,100	20,500	21,200	7,500	7,600
England and Wales	44,100	64,300	8,600	15,800	19,600	21,100
GB total	**47,000**	**69,400**	**29,100**	**37,000**	**27,100**	**28,700**

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