Public

NESO Connections Reform Data Impact Assessment

December 2024

December: Please note this version includes updated CP30 permitted capacities and the RFI v2

NESO
National Energy System Operator

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Purpose of this document

This document sets out the potential impact on the connections queue (for connection to or use of the electricity transmission system) of our connections reform proposals.

Detail on our connections reform proposals are set out in separate documents and are not covered here. Please see our accompanying suite of documents.[1]

This document is split into two parts:

1. The potential impact of applying the 'readiness' element of the proposed Gate 2 criteria to the connections queue; and
2. The potential impact of applying the 'strategic alignment' element of the proposed Gate 2 criteria to the connections queue.

This is a draft impact assessment as we will refresh the analysis within this document once Government publishes its CP30 Action Plan.

[11] https://www.neso.energy/industry-information/connections/connections-reform

PART 1: The potential impact of the 'readiness' element of the proposed Gate 2 criteria to the connections queue

Overview

As set out in our accompanying documentation, we propose that the reformed connections queue is only formed of projects which meet both the 'readiness' and 'strategic alignment' elements of the newly proposed Gate 2 criteria.

This part of the report considers the potential impact on the queue of applying just the 'readiness' element of the newly proposed Gate 2 criteria. Part 2 considers the potential impact on the queue of applying both the 'readiness' and the 'strategic alignment' elements.

Part 1 addresses the following points:

- **[1] Current Transmission Queue and potential growth without connections reform**
  - Current queue and potential continued growth of connections queue and resulting technology mix connecting over time without connections reform, compared with potential future needs of the energy system, including our Future Energy Scenarios (FES)
- **[2] Transmission Pipeline Analysis (Industry Data)**
  - Verification of NESO data and projections using industry data; analysis of transmission queue (supported by Regen) to verify status of connections projects and to validate Land Rights RFI findings
- **[3] Transmission Queue & 'readiness' element of Connections Reform**
  - Day 1 and later impact on GW capacity/ technology mix of GB transmission connections queue if the 'readiness' element of connections reform are implemented as proposed

Baseline Data

Based on the TMO4+ scope, a project list has been created.

In-Scope	Out-of-scope
• Directly Connected Generation • Directly Connected Interconnectors & OHAs • Directly Connected Demand • Large Embedded Generation • Relevant Small and Medium Embedded Generation (i.e., that impacts the transmission system)	• Embedded Demand • Small and Medium Embedded Generation that does not impact the transmission system • New Transmission Assets

Table 1. Project Scope for CMP435 Implementation

For transmission projects, data is taken from September 2024 NESO connection information. For distribution projects, data is taken from the June 2024 ENA (Energy Networks Association) DNO data workbook.

Register	Project Count	Capacity (MW)
Distribution	1862	159,509
Transmission	1607	557,395
Transmission (Direct Demand)	92	19,632
Grand Total	**3561**	**736,536**

Table 2. Breakdown of projects in scope for analysis by count and MW capacity

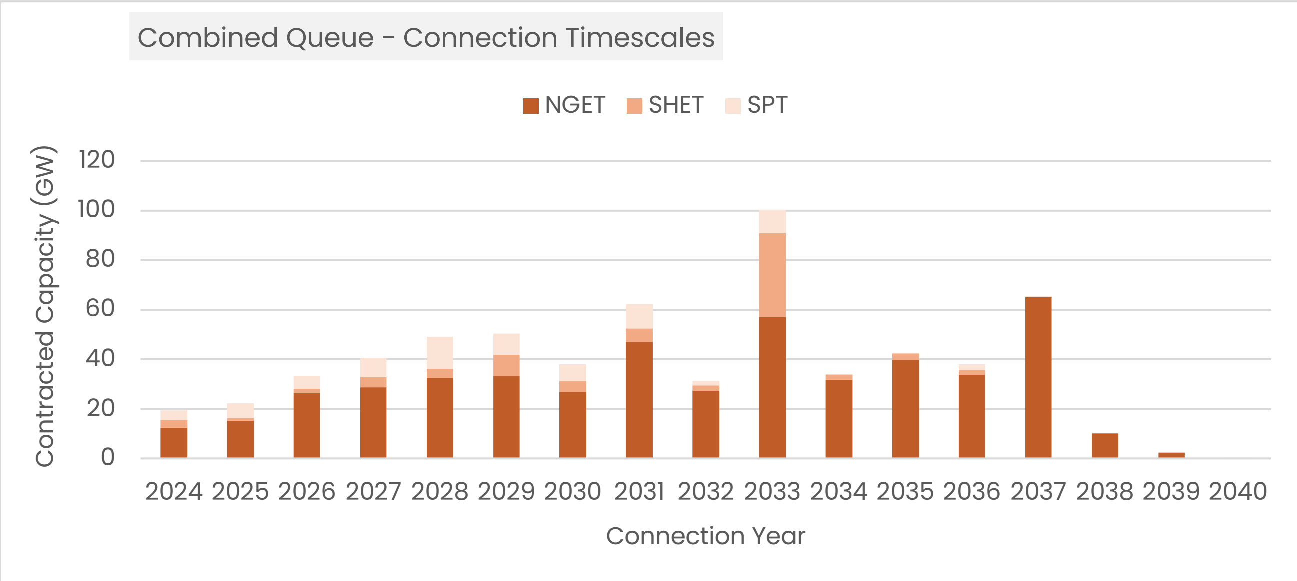


Figure 1. Combined connections queue - capacities connecting between 2024 and 2040

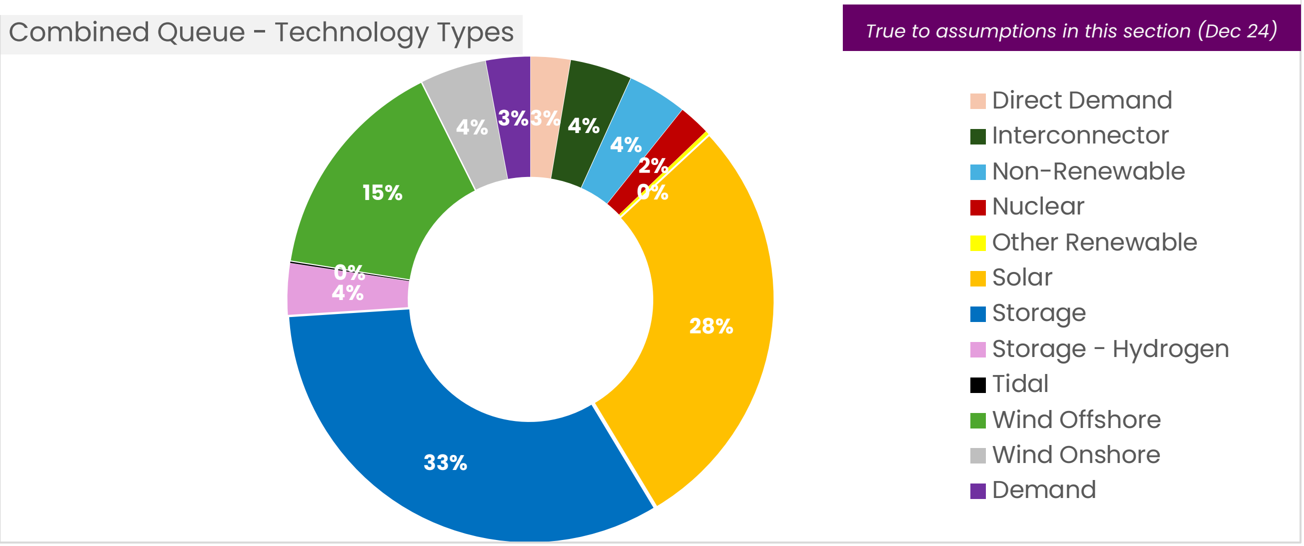


Figure 2. Aggregated technology types for transmission and distribution connected projects

Assumptions/ Notes

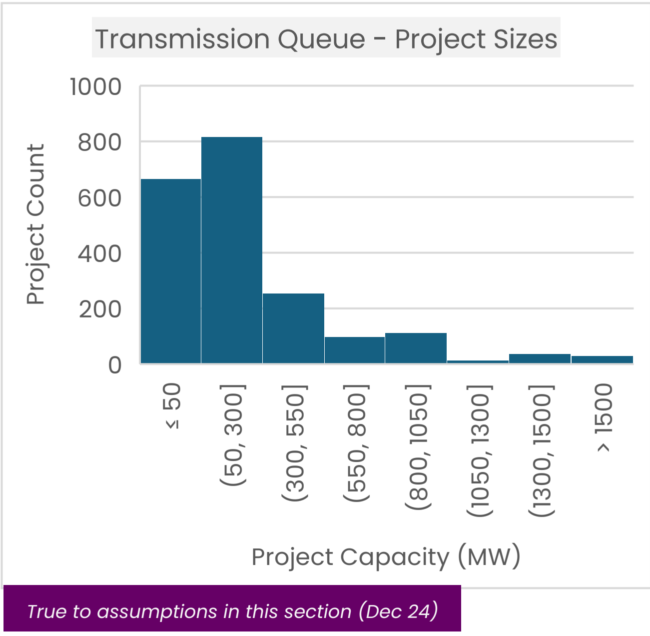
- Where Combined Queue is mentioned, this refers to the Transmission Queue (as of September 2024) in addition to the Distribution Queue (as of June 2024)

1. Current Transmission Queue and TMO4+ Counterfactual Growth

Since NESO (then ESO) started its Connections Reform programme in October 2022, the transmission connections queue has grown by more than 300GW.

NESO has observed an average growth of 12GW a month, for the last 30 months. This is despite the tactical actions that have been introduced as part of the NESO's 5 Point Plan and the ENA's 3 Point Plan.[2]

The Rising Volume of Applications



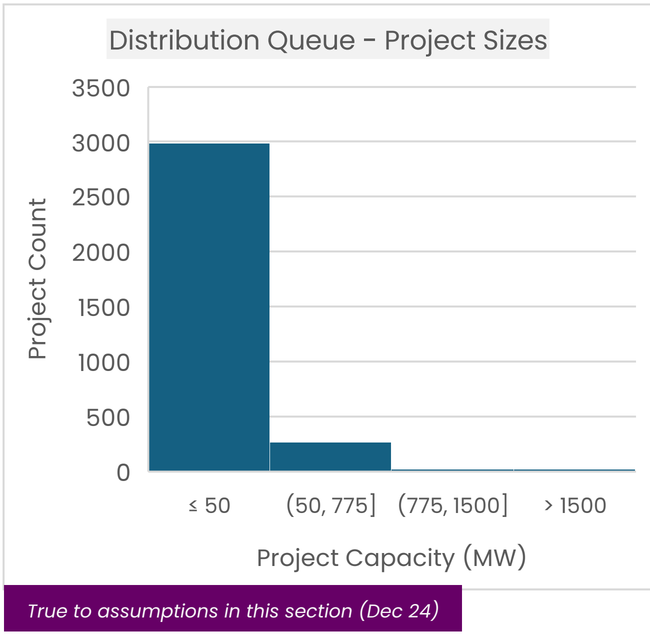


Figure 3. Transmission Queue - Project Sizes (Left) Distribution Queue – Project Sizes (Right)

All transmission connection projects originate from applications submitted to the NESO.

While not all applications will clock start and lead to a connection offer, it's important to note the steep increase in applications processed by the NESO and assessed by the TOs.

[2] NESO Workgroup Consultation Paper: CMP435: Application of Gate 2 Criteria to existing contracted background– What is the Issue? [Updated]

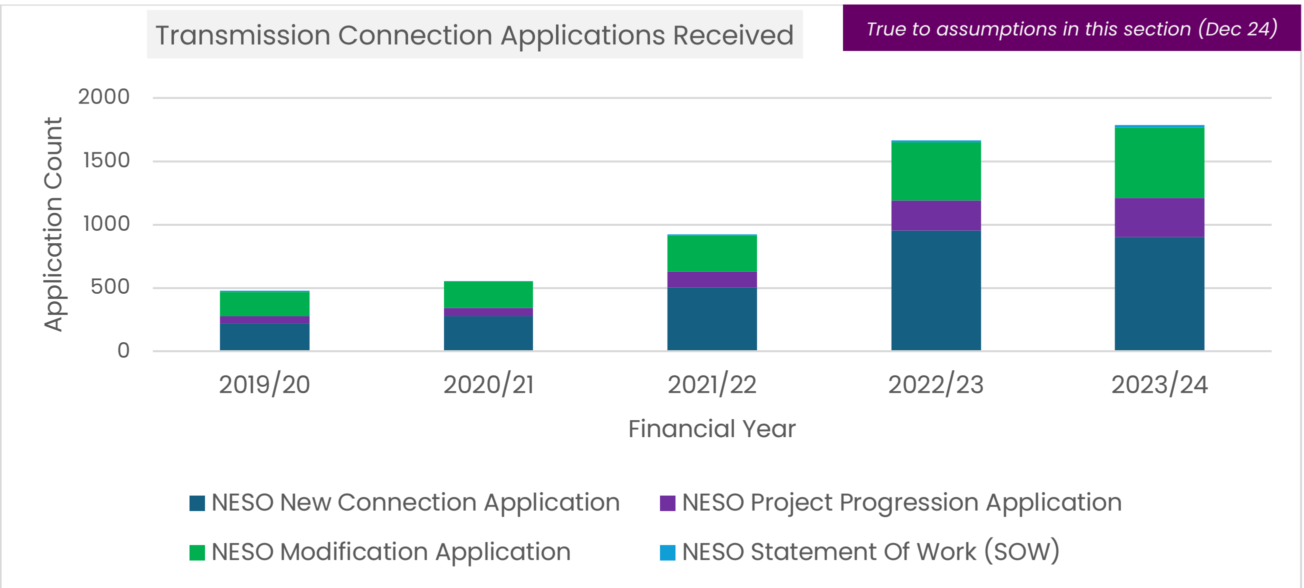


Figure 4. Licensed applications received by the NESO for transmission-level connections

Assumptions/ Notes

- This information illustrates Transmission Connections
- Across the period shown, total applications received by financial year rose by 275%
- There is little-to-no correlation between applications received and connections energised, meaning connections aren't being energised at a fast enough rate to offset application growth.

The Growing Gap between Requested and Offered Connection Dates

Upon submitting their connection application, transmission customers provide a date by which they would like to connect. Following the Transmission Owners' (TOs) technical assessment, a connection date is offered to the customer; this date factors in the works required for the connection.

The difference between these dates is growing. Developers are waiting longer to connect, in part, because the rate of queue growth exceeds the rate of project energisation. As long as the queue system is 'first come, first served', it will remain a challenge to offer connection dates in line with customer requests.

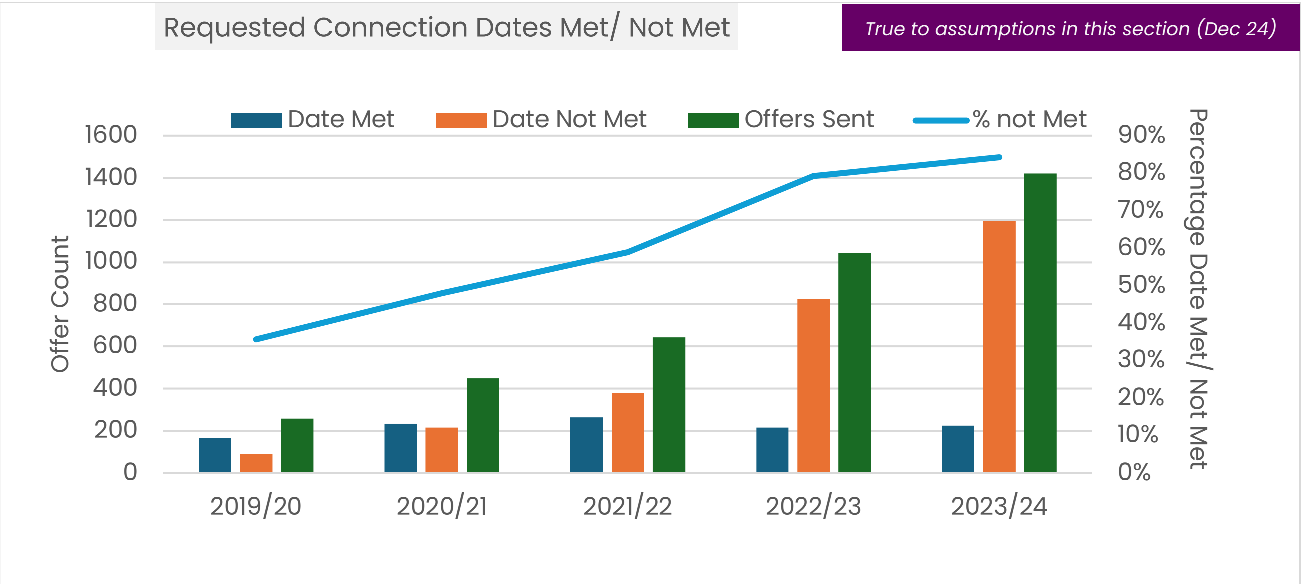


Figure 5. Proportion of offered connections dates met (Transmission Only)

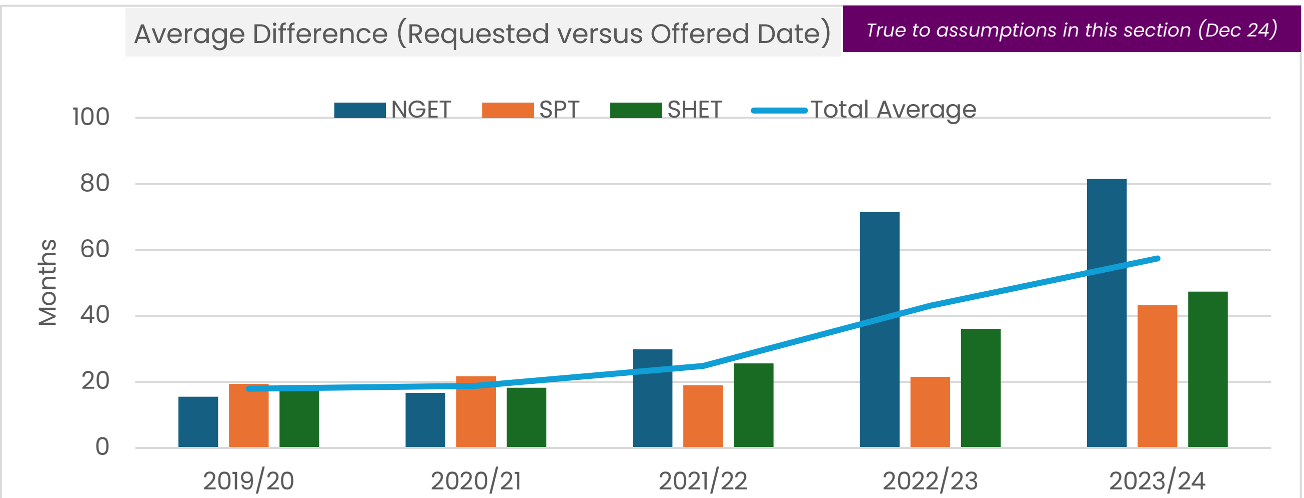


Figure 6. Average Difference (Requested versus Offered Connection Dates)

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Assumptions/ Notes

- These figures represent the transmission queue only
- The number of requested dates not met (See top chart "No") is rising by more than 10% each year
- The difference between requested and offered dates (where requested date is not met) is increasing by an average of 10 months each year
- Following the introduction of Two-Step and transitional offers in mid-2024, (provisional) offered dates are expected to venture into the 2040s

The Growth Rate of the Transmission Connection Queue

Rising application and offer figures have a direct impact on the size of the queue. Connections Reform comes at a critical time as the queue is growing at a far greater rate than connections are energised (or that attrition removes projects from the queue).

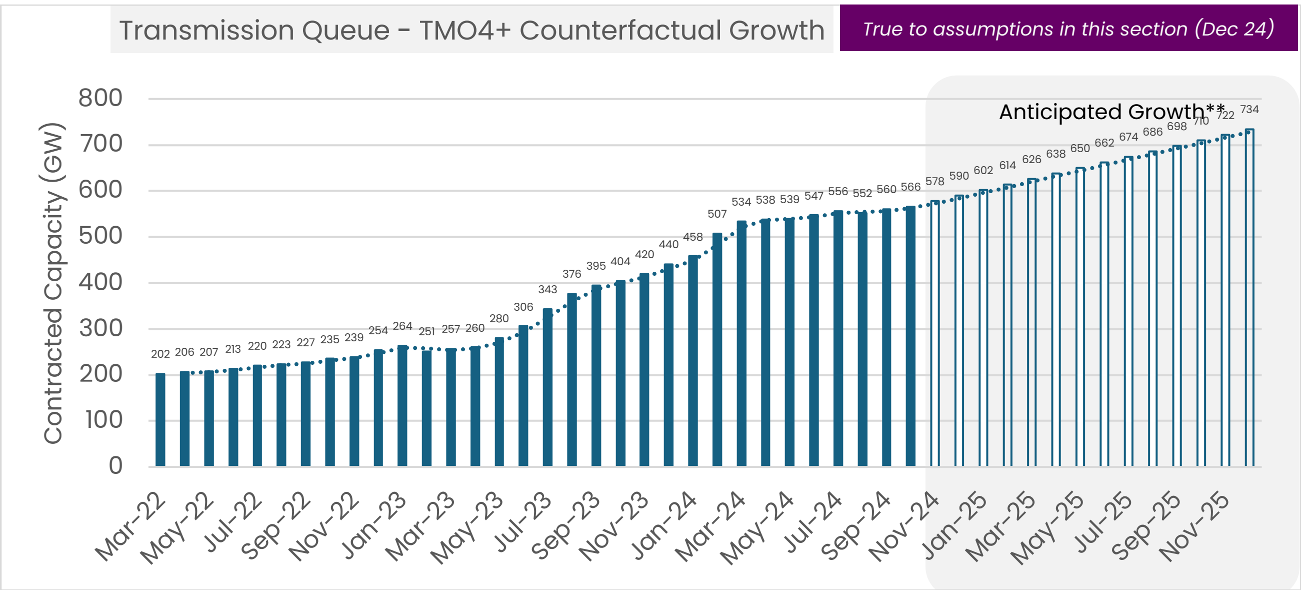

Figure 7. Transmission Queue – TMO4+ Counterfactual Queue Growth

Assumptions/ Notes

- This chart anticipates queue growth for transmission connections (this does not include directly connected demand, nor distribution)
- An increase of 12GW per month has been applied beyond August 2024, representing the average increase from March 2022 to August 2024

- While this forecast is based on historical trends, it cannot predict the actual queue growth (based on customer/ market influences) and is intended to demonstrate the possible rate of growth.
- NESO understands that this growth rate cannot be sustained indefinitely
- There is insufficient information available to forecast the impact of additional 'barriers to entry' that fall short of the 'readiness' element of the Gate 2 criteria (for example the current Letter of Authority entry requirement) on the growing queue figure.

Transmission Queue Compared to Future Energy Scenarios

This section compares the current and (potential) future connections queue with the Future Energy Scenarios 2024. The analysis demonstrates that, across most technologies, the capacity in the current queue exceeds the upper limit of capacity under the FES 2024 scenarios. In some cases, it significantly exceeds even 2050 figures.

Future Energy Scenarios 2024

FES Range: The lower FES value represents the *counterfactual*[3], and the upper FES value represents the *holistic transition*[4] capacity.

Connection Project Data

This is a static view of the queue and doesn't represent projects that could join the queue and/or become 'ready' over time (both in terms of projects in the existing queue and new applicants).

Transmission Queue: This is NESO transmission connections data up to September 2024

Combined Queue: Where applicable, this includes September 2024 Transmission and June 2024 Distribution data

Reformed Transmission Queue: This reflects currently contracted capacity in the transmission queue that could meet the 'readiness' element of the Gate 2 criteria by 1st January (based on responses to our Requests for Information to industry (V1 and V2), supplemented by projects we

[3] FES 2024: Counterfactual - The Counterfactual sees the least renewable capacity and has heavy reliance on natural gas, which leads to net zero missed. Because of the lower needs for flexibility, lower electricity storage, interconnectors and low carbon dispatchable power are present.

[4] FES 2024: Holistic Transition - Highest renewable capacity with unabated gas dropping sharply to zero after 2036. Moderate levels of nuclear capacity and lowest levels of hydrogen dispatchable power present. Supply side flexibility is high, delivered through electricity storage and interconnectors

know to have submitted consents as a minimum, including those with consents achieved; under construction/ commissioning).

The green line increases over time as we have plotted the projects that are 'ready' against the current connection dates of those projects in the current queue. However, as stated above we have not plotted projects that could become 'ready' over time.

Further details and data on our RFI and supplementary analysis are provided in section 2.

Interconnectors

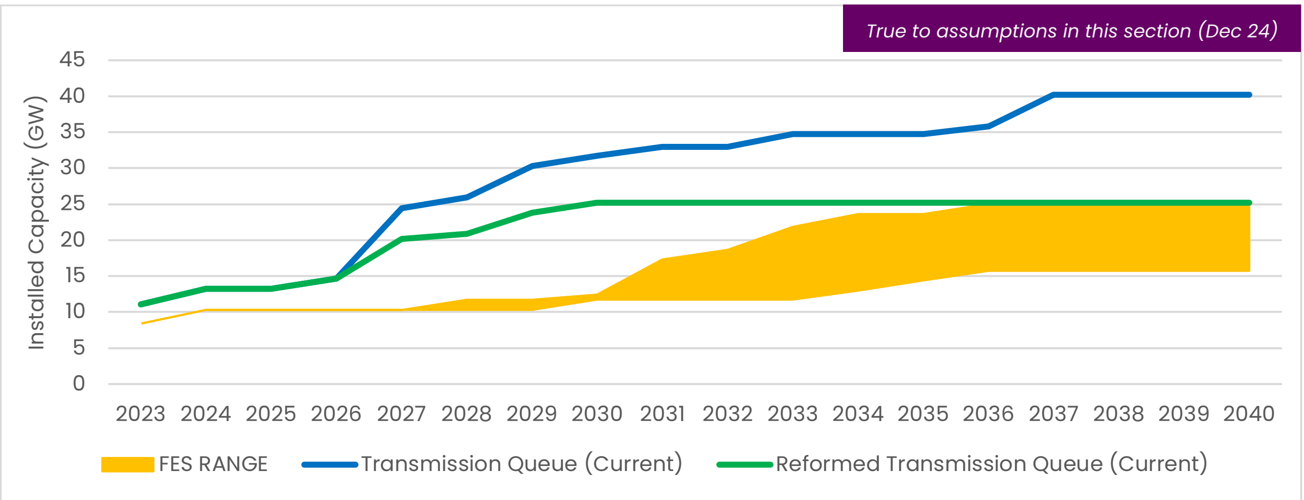

Figure 8. Current Interconnector queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Offshore Wind

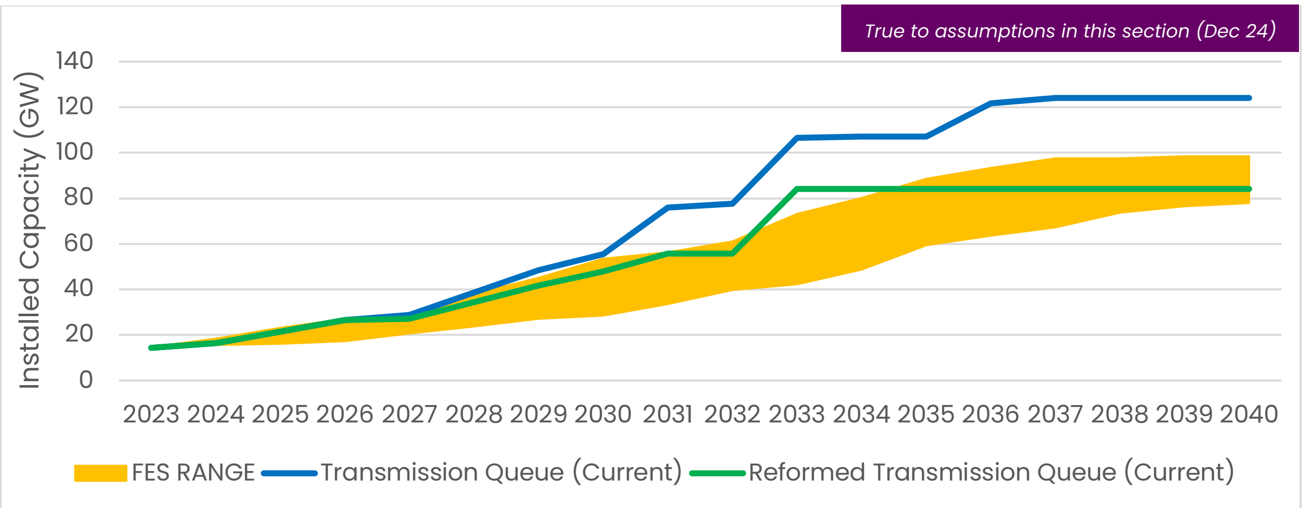

Figure 9. Current Offshore Wind queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Onshore Wind

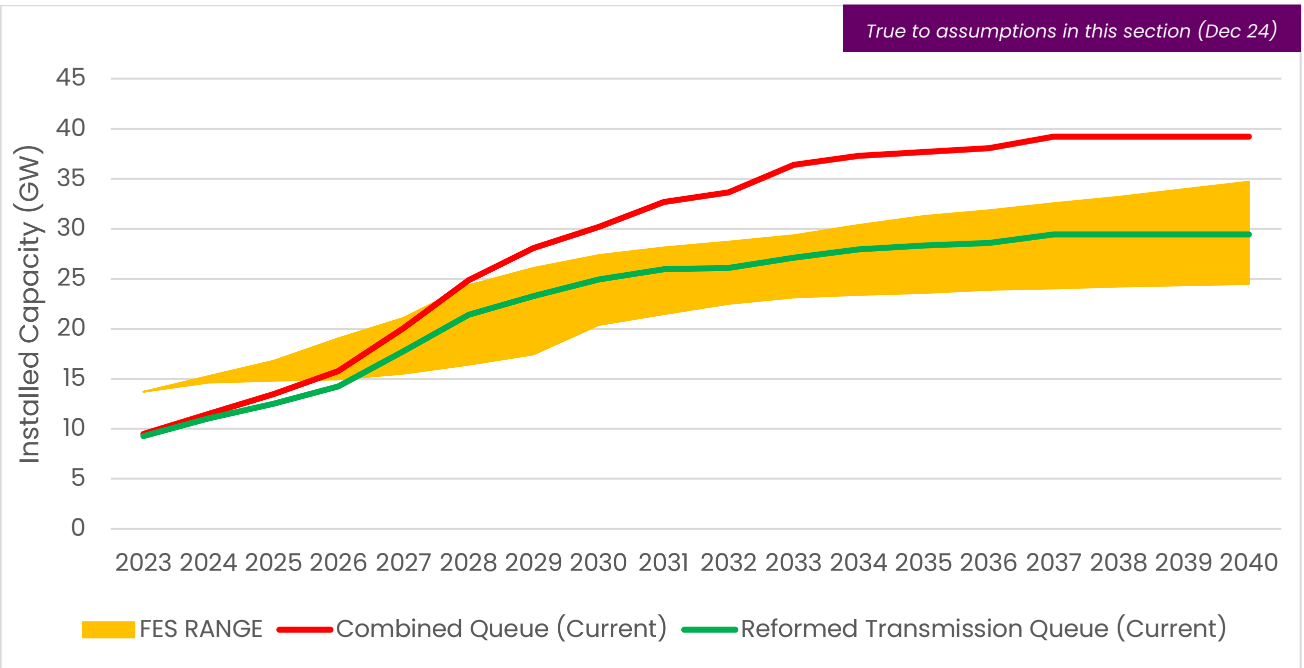

Figure 10. Current Onshore Wind queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Solar

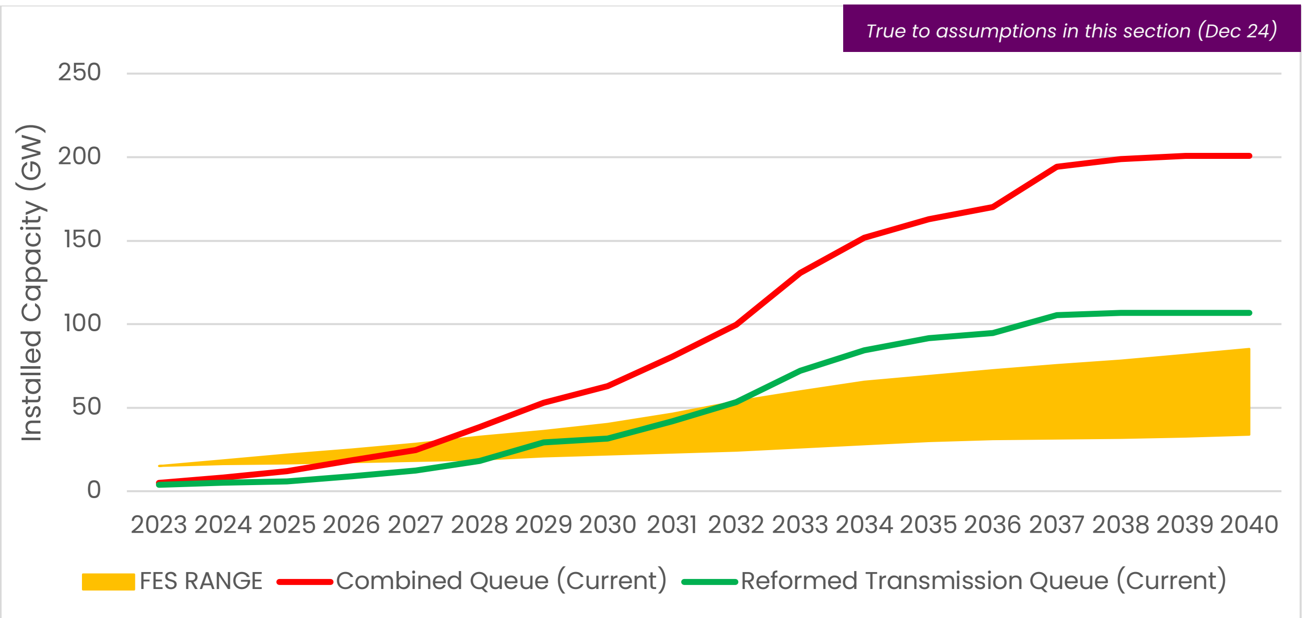

Figure 11. Current Solar queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Tidal

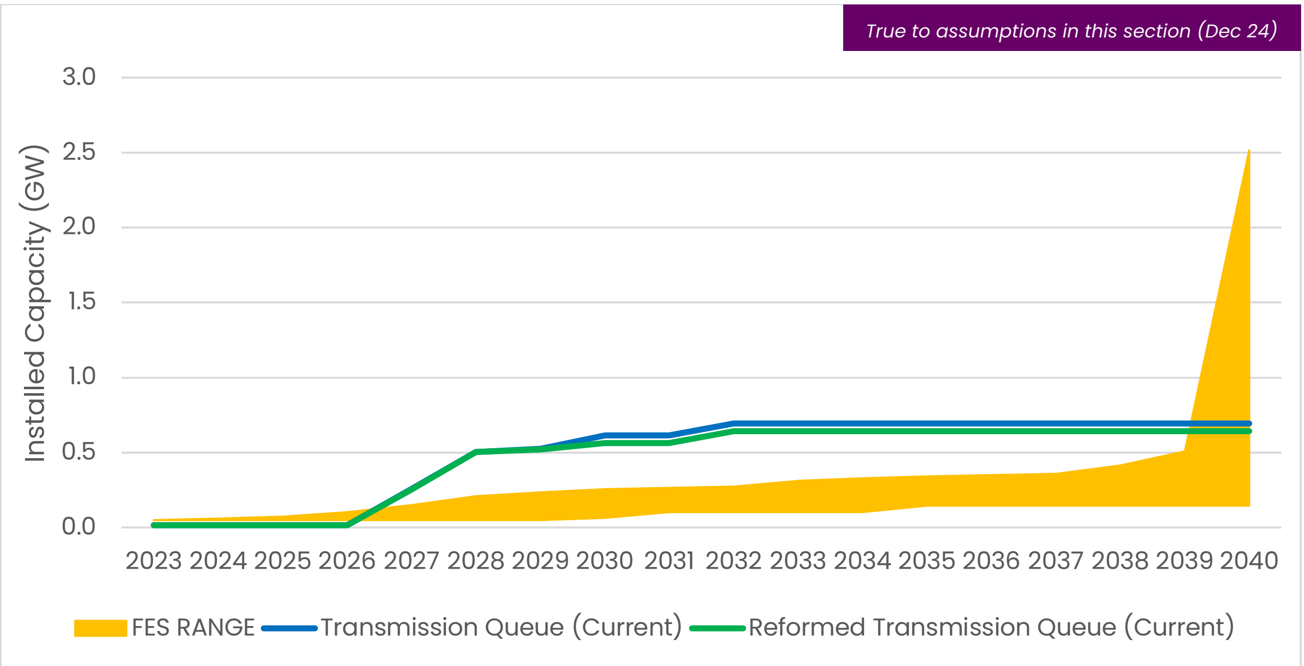

Figure 12. Current Tidal queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Storage

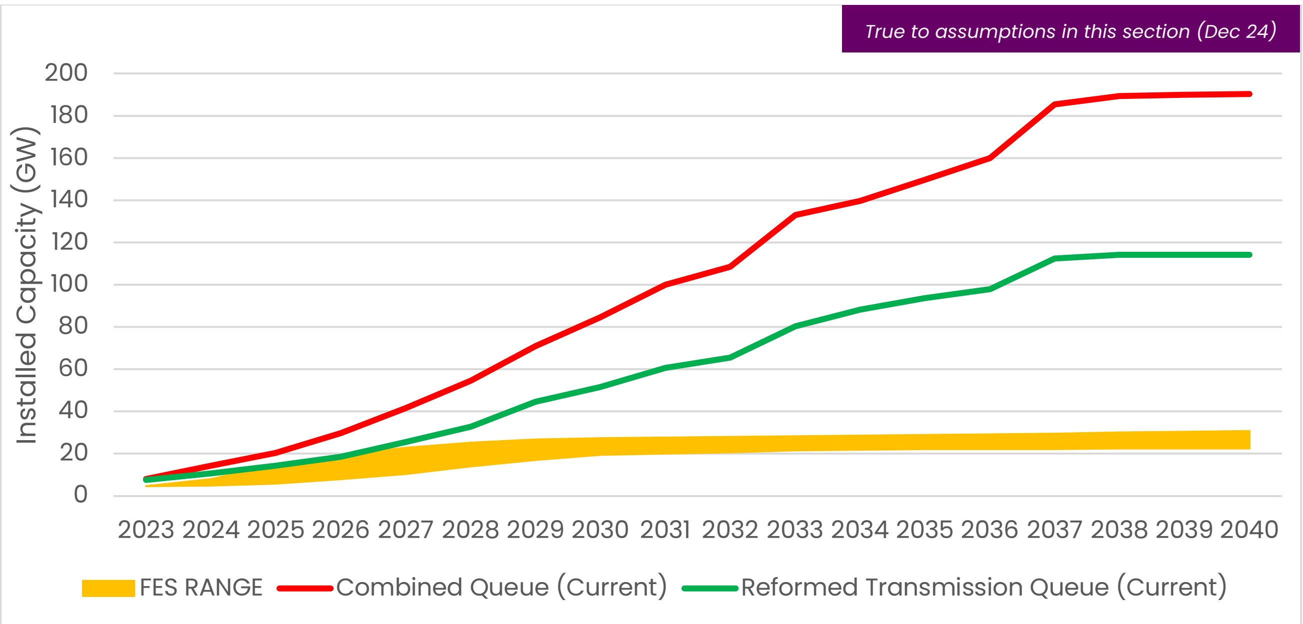

Figure 13. Current Energy Storage queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Nuclear

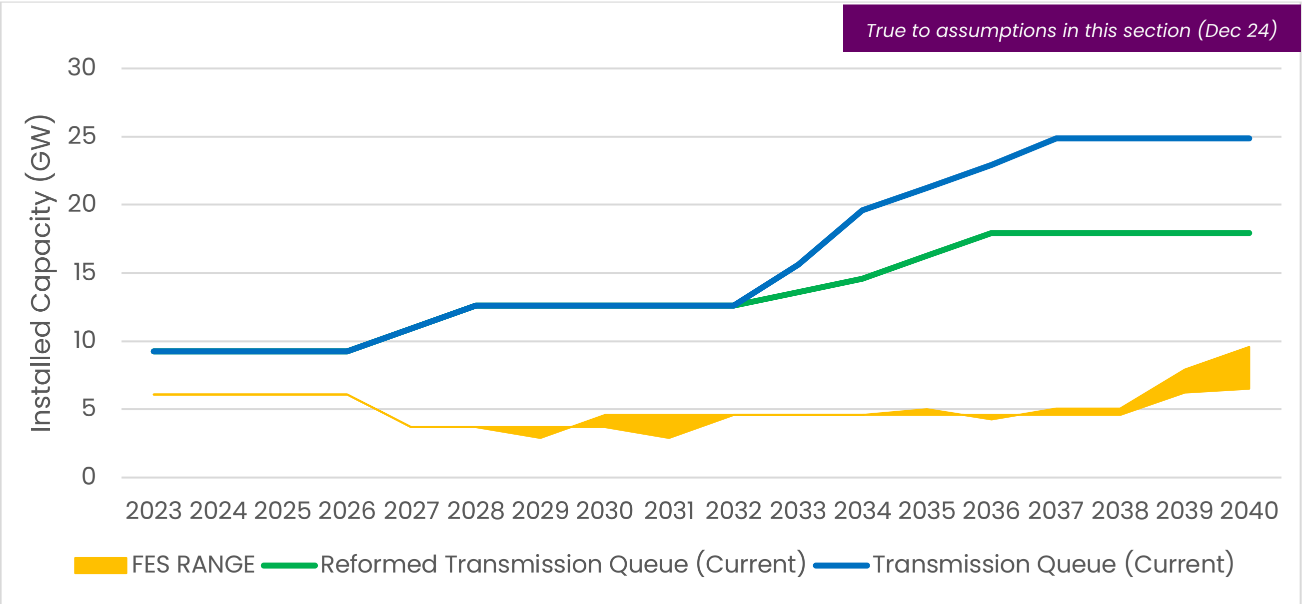

Figure 14. Current Nuclear queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Non-Renewable

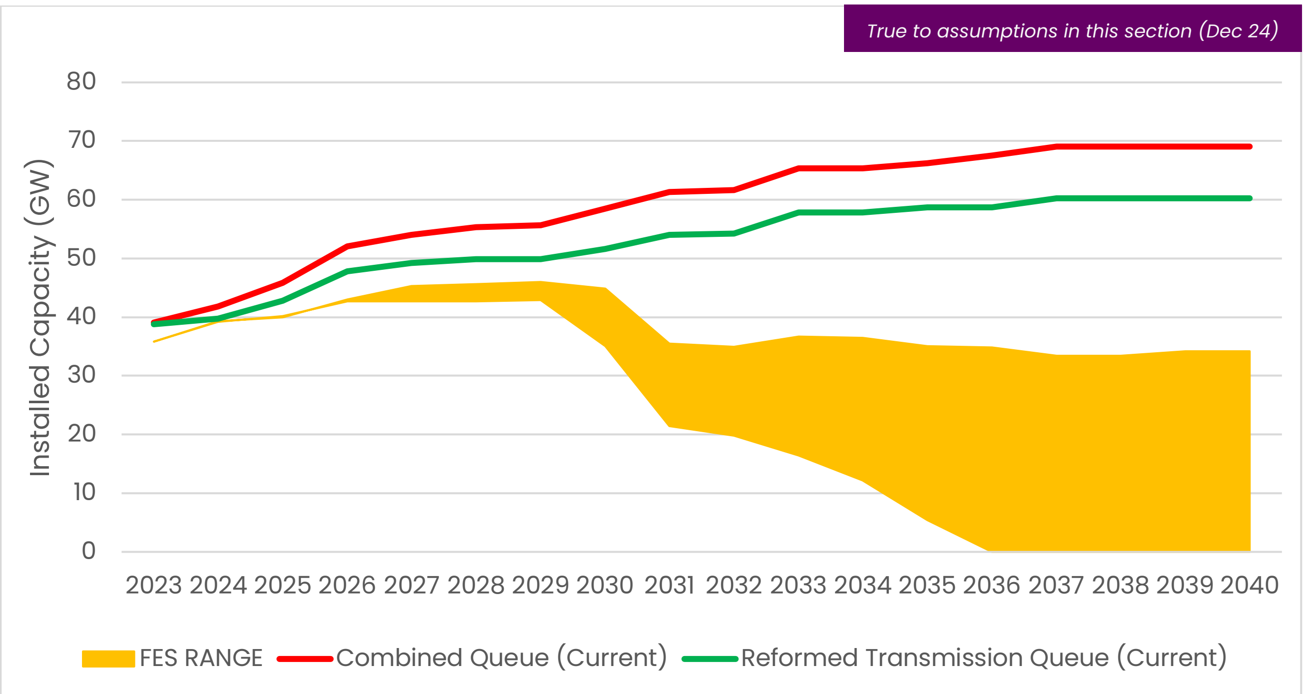

Figure 15. Current Non-Renewable queue and potential future reformed transmission queue (static 2024 view) versus FES 2024 Scenarios

Assumptions/ Notes

- FES figures are based on FES 2024
- The FES 2024 range includes generation connecting at transmission and distribution level
- For multi-technology (hybrid) projects, the technology type is aggregated to the plant with the highest typical export capacity
- Storage
    - Refers to Energy Storage System-only projects (with no other technology types represented in this category)
    - Around 500 transmission generation projects include a storage element; these projects are categorised by the generation technology (i.e., the storage element of those projects is not included in the above data / charts)
- Non-Renewable
    - Non-Renewable includes projects referenced as Fossil Fuel in the FES publication
    - The FES range (decline) anticipates the retirement of the existing gas fleet, as well as any connections of new non-renewable capacity
    - Under certain FES scenarios we see the retirement of unabated gas [5]by end of 2035; this therefore is included in the FES range and counters the introduction of Power CCS and H2 generation.[6]
    - A provisional line has been added to illustrate a potential decline in non-renewable generation based on the retirement of these technologies (this isn't currently supported by any data)

Conclusion – Current Transmission Queue and TMO4+ Counterfactual Growth

- Connection figures are growing at an unprecedented rate; this is reflected in application, offer and contracted project volumes
- Although the cumulative growth of the queue has slowed slightly towards mid/late 2024, there remains a queue of over 1500 transmission projects and over 1800 distribution projects (representing over 700GW of capacity) waiting to connect to the electricity network

[5] CCGT (Combined Cycle Gas Turbine); CHP (Combined Heat and Power); Coal; Gas Reciprocating; OCGT (Open Cycle Gas Turbine); Oil & AGT (Advanced Gas Turbine)
[6] Energy Analyst - System Operator Strategy & Regulation

- (Transmission) An average of 5GW of projects is energised (Final Operational Notification) each year; this rate needs to be increased significantly to help meet net zero targets.
- Data on stalled projects (and reasons) is limited; however, it is likely that a significant proportion of contracted projects are stuck behind projects with a higher queue position but a lower readiness to connect. This is observed through modifications to connection agreements (customer driven) where connection dates are pushed further out[7]

[7] CMP376 – Queue Management will provide a means of tracking projects readiness, ensuring developers can demonstrate they are progressing towards their connection, while terminating developers who fail to meet their milestones. This initiative aims to eliminate stalled projects, but it will take months, possibly years, for this initiative to impact (reduce) the queue size materially.

2. Transmission Pipeline Analysis (Industry Data)

Customer Data - Land Rights Request for Information

RFI Overview

As part of the process to understand the readiness of developers holding connection offers, NESO (then ESO) issued an RFI to all contracted connection holders in May 2024.

The initial RFI closed on 28 June 2024. NESO (then ESO) commissioned Regen to undertake a high-level review of the survey results to assist in their review of the responses. Regen was also commissioned to assess the planning status of the UK electricity transmission project pipeline.[8]

The RFI was not exhaustive, with only a proportion of the transmission queue and an even smaller proportion of the distribution queue responding but it provided a means of verifying NESO projections with more accurate data, via consultation with industry.

The RFI questionnaire asked project developers to identify which of the following four criteria around demonstrating land rights that they would be able to meet, either now or by 01 January 2025[9]:

1. The project developer owns or is a tenant on the land on which the site will be situated
2. The project developer has agreed to lease the land from the owner of the land on which the site will be situated
3. The project developer has an option to purchase or lease the land on which the project will be situated
4. For offshore projects, the developer has agreed to use the seabed on which the site will be situated.

Follow-Up RFI

In September 2024, NESO issued a follow-up RFI, targeted towards the non-respondents. This closed in mid-October 2024. NESO has reviewed the findings of the follow-up information request and has revisited the data assessment report, as indicated. We saw an increase of 294 responses (over 60GW) following the second RFI request.

[8] ESO Transmission Pipeline Report published by Regen – September 2024
[9] At the time the RFI was issued, January 2025 was the proposed date for Connections Reform

RFI	V1	V2
Transmission	901	1038
Distribution with BEGA/BELLA	338	342
Distribution	1337	1489
Total	**2576**	**2869**

Table 3. Breakdown of total RFI responses received in 1st and 2nd RFI submissions (Response Rate)

RFI	V1	V2
Transmission	370.45	427.62
Distribution with BEGA/BELLA	32.88	32.78
Distribution	90.42	98.98
Total	**493.75**	**559.38**

Table 4. Number of total RFI responses received in 1st and 2nd RFI submissions (GW capacity)

RFI Response

Two thirds of the total RFI responses (across v1 and v2) represented projects seeking to connect to the distribution network. This also included distributed generators holding a Bilateral Embedded Generator Agreement (BEGA) or a Bilateral Embedded Licence Exemptible Large Generator Agreement (BELLA) in Scotland.[10]

The vast majority of respondents to the RFI (across v1 and v2) stated that they would be able to demonstrate some form of access to land by 01 January 2025, with over c.1300 projects able to meet one of the four criteria highlighted.

By technology, RFI responses were dominated by solar PV and battery storage projects and a notable number of wind projects (both offshore and onshore wind).

Combined RFI v1 and v2 Analysis Artefacts

[10] Adapted from ESO Transmission Pipeline Report published by Regen – September 2024

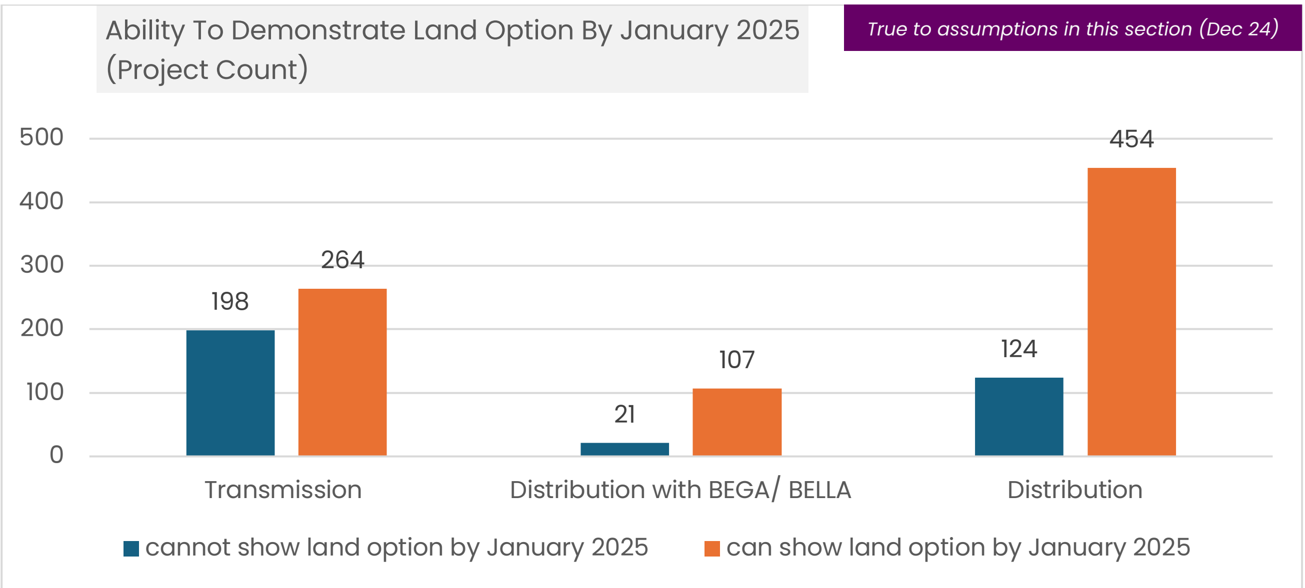

Figure 16. Ability To Demonstrate Land Option By January 2025 (Project Count)

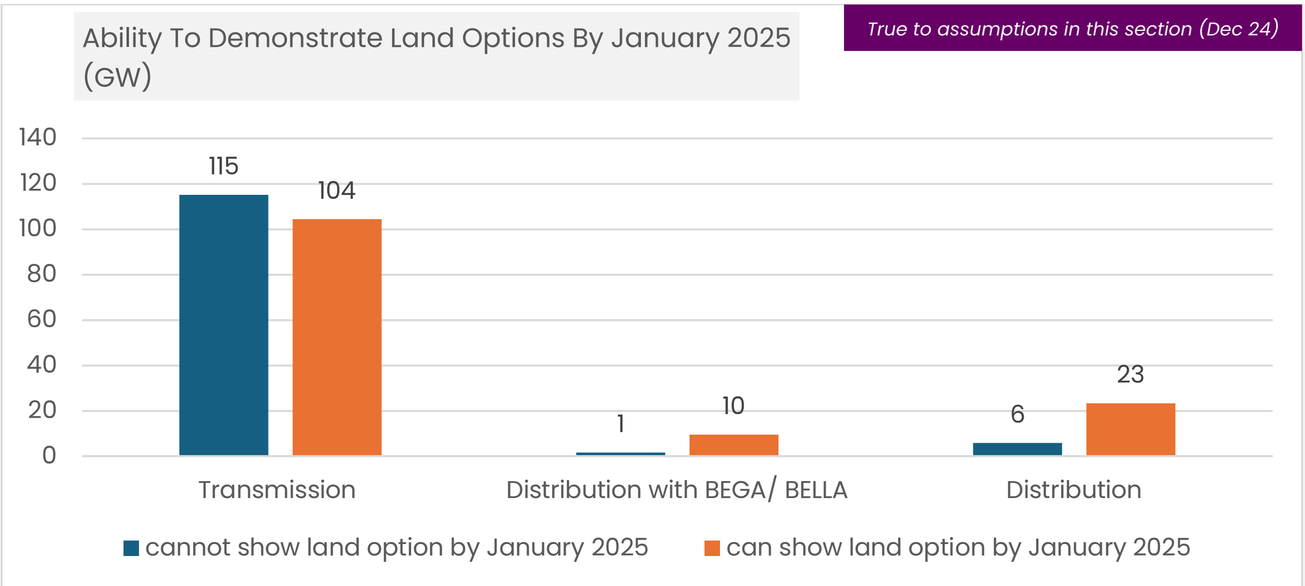

Figure 17. Ability To Demonstrate Land Options By January 2025 (GW)

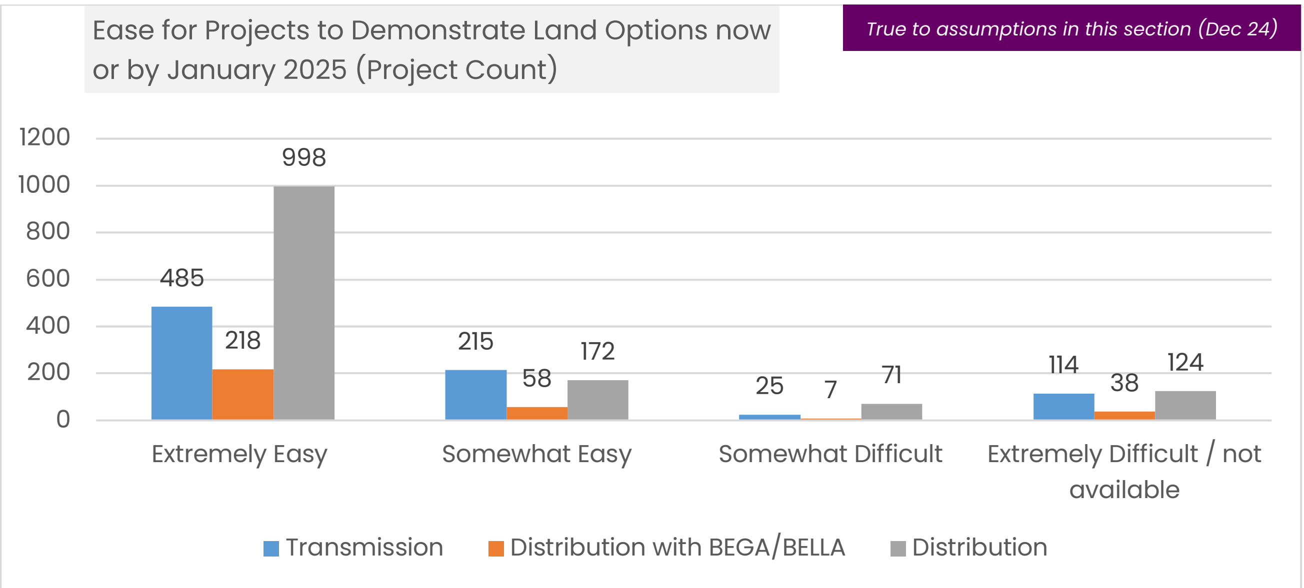

Figure 18. Ease for Projects to Demonstrate Land Options now or by January 2025 (Project Count)

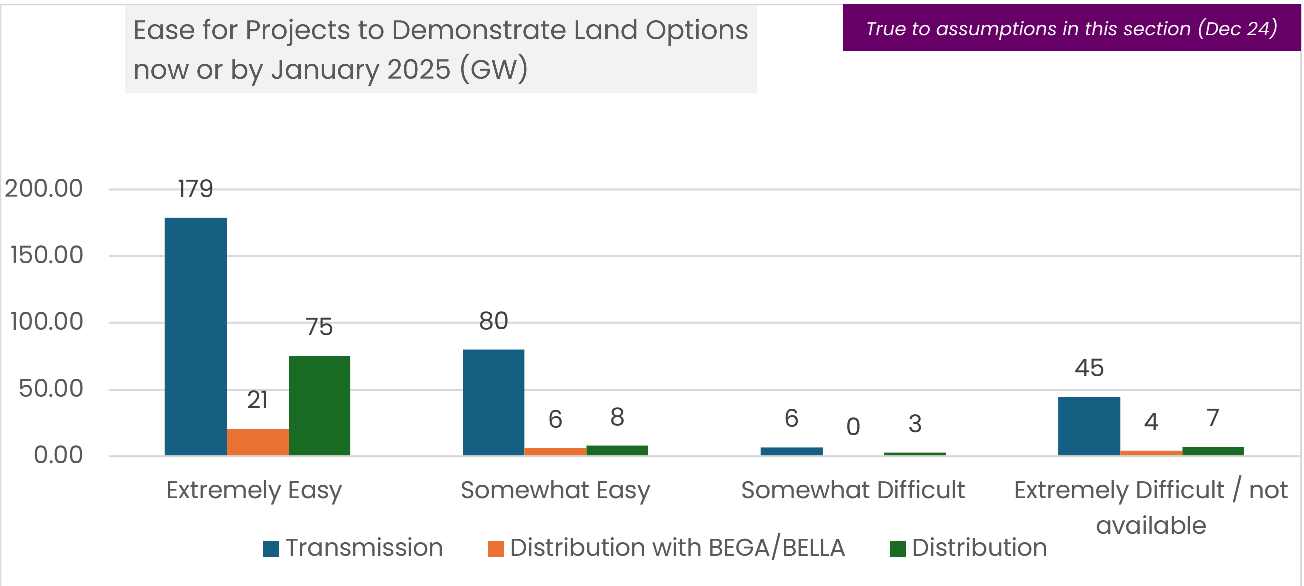

Figure 19. Ease for Projects to Demonstrate Land Options now or by January 2025 (GW)

NESO Project Data – Transmission Pipeline / Project Statuses

Assessment Findings

NESO provided Regen with an extract of the current GB transmission connection queue in to assess each project's current planning status. This dataset detailed 1,586 pipeline projects, totalling 521GW across nine technology sectors.

Due to locational data being unavailable for a proportion of the pipeline, only 67% (1,061 sites) could be searched.

Project data for operational sites and historic planning applications was extracted from the REPD and Searchland, supplemented with data from the English Nationally Significant Infrastructure Project (NSIP) register.

Welsh and Scottish projects were sourced from the REPD and supplemented with data from online project databases.

Planning status	Number of sites	Capacity (GW)
Already operational	13 (0.2%)	0.7 (1.2%)
Under construction	67 (5.5%)	16.7 (6.3%)
Granted in planning	259 (18.3%)	55.7 (24.5%)
Submitted in planning	153 (11.5%)	35.1 (14.4%)
Pre-planning	338 (38.6%)	118.1 (31.9%)
Rejected, expired, abandoned or withdrawn	19 (0.7%)	2.1 (1.8%)
Not found in planning	211 (24.5%)	77.5 (19.9%)

Table 5. Regen transmission pipelines findings

Approximately 5% of sites were positively identified as having been awarded a Contract for Difference (CfD), increasing their intentions to progress through buildout and operation.

Of the projects required to apply for a marine licence (offshore wind, tidal, and interconnectors), approximately 28% were found to have already been granted a marine licence, with 10% having applied and 37% in pre-planning stages.

Overall, a significant proportion of the searchable pipeline (c.75% of projects) was found to be in the planning system (across all regimes), with 18% holding a granted planning approval alongside their connection agreement with the NESO. Around 25% of sites that could be searched (211 projects, 77 GW) could not be found in planning.[11]

From a site-matching analysis, 850 matches were identified across the RFI 1 responses and the pipeline connections datasets. This is a strong representative sample of the transmission pipeline, allowing a comparison of planning statuses identified through desktop research and as indicated in the RFI response.

Of those sites that were matched:

- For 500 sites (59% of matched sites), the planning status found in the pipeline analysis was the same as the planning status identified in the matching RFI response
- For 101 sites (12% of matched sites), there was some level of variance in the planning statuses found/indicated. Of these, 87 (10%) were stated to be a stage further along in planning in their RFI response data than they were found to be in the pipeline research, and 8 (1%) were found to be a stage further along in the pipeline research than they were in their RFI response.
- Only 6 (>1%) sites were found to have a major difference between the planning stage in the pipeline research and that stated in the corresponding RFI response.

Of those sites where a difference between the planning stages was found:

- No information was found for 59 sites (19.4 GW) stated to be further along in their RFI response than in the pipeline research. These sites were at the "Scoping", "Pre-application", or "Feasibility/Ecological studies" stage, where information about the project isn't often publicly available or inputted into planning databases.
- 14 sites (6.1 GW) were at the "Under construction" stage in their RFI response but were only found to have consent "Granted" in the pipeline research. Again, this is understandable as information on the commencement of construction work isn't always public.[12]

Pipeline Assessment: Sites not found in planning

Many sites could not be found in planning. Therefore, they were not attributed a planning status. Excluding those that could not be properly searched due to a lack of locational data or insufficient identification details, such as a distinct site name, 211 sites (24.5%) were categorised as "not found in planning".

The most likely reason is that these sites have not yet begun planning despite applying for a grid connection. These sites are likely to have applied for a grid connection within the past year or

[11] ESO Transmission Pipeline Report published by Regen – September 2024

[12] ESO Transmission Pipeline Report published by Regen – September 2024

two. Where sites without planning information have held a grid connection offer for over two years, it becomes more likely that these sites may no longer be progressing. [13]

Conclusion - Transmission Pipeline Analysis (Industry Data)

Following the first RFI, it was decided in order to ensure we had an accurate view of the existing contracted background, that a higher number of responses was needed. This would ensure that we had a clear picture of the effects of TMO4+. The follow up RFI exercise targeted customers who did not respond to the initial RFI.

The second opportunity to respond to the RFI has only consolidated the findings of the first analysis.

Based on the above, NESO is comfortable that the RFI results so far are a 'best-endeavours' reflection of the 'ready' transmission queue (based on responses).[14]

[13] ESO Transmission Pipeline Report published by Regen – September 2024
[14] In the absence of responses, an assumption has been applied that the unmatched projects and non-responses have not met Gate 2

3. Transmission Queue & Connections Reform[15]

With a view of the connections queue, and the supplementary RFI findings, we can explore how the 'readiness' element of the Gate 2 criteria within the TMO4+ proposal could reduce the size of the transmission connections [16]queue at:

- Day 0 (this refers to today's queue, if connections reform were implemented)
- Reform Day 1 (this refers to when we intend to start implementing connections reform, May 2025, rather than when we intend to issue connections offers as a result of the Gate 2 to the whole queue process by end 2025); and
- over time beyond that.

Connections Queue Composition – Day 0

If we were to apply the 'readiness' element of the Gate 2 criteria to the current transmission-connected queue today, the potential results are shown below.

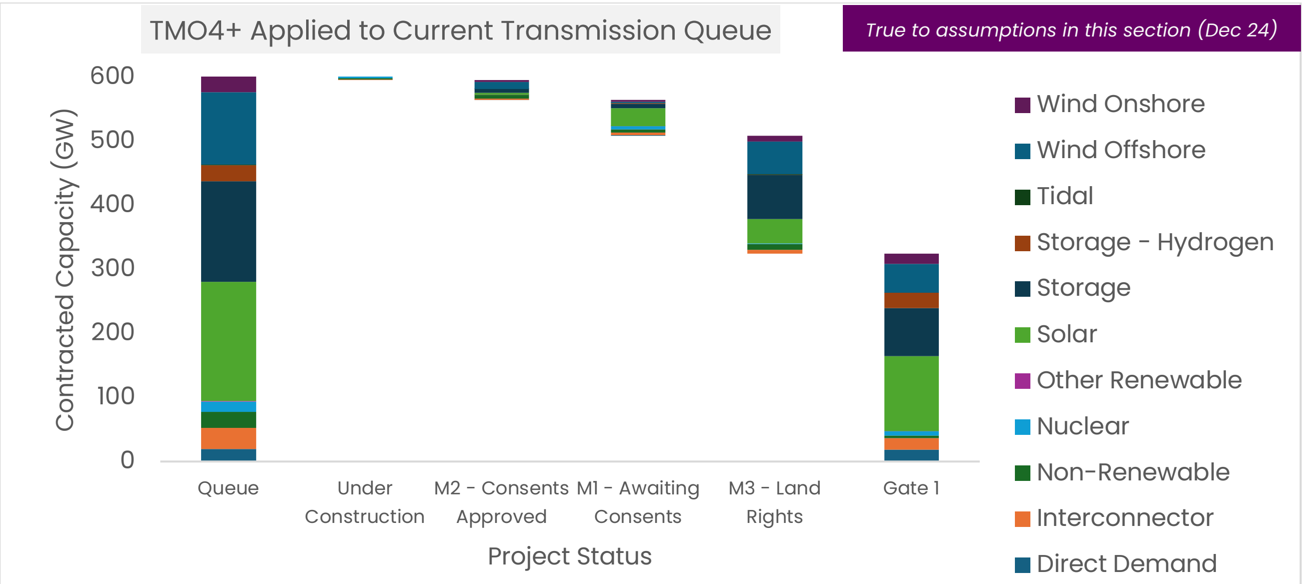

Figure 20. Potential transmission connection queue breakdown into Gate 1 and 2 by technology type

[15] Section 3 -Transmission Queue & Connections Reform has been updated with latest RFI results and queue information as of November 2024
[16] NESO does not have sufficient project-level distribution data to reconcile with the RFI results, therefore section 3, only includes the transmission-connected queue

Technology	Under Construction	M2 - Consents Approved	M1 - Awaiting Consents	M3 - Land Rights	Gate 1	Grand Total
Direct Demand	0.1	0.2	1.0	6.9	11.5	19.6
Interconnector	1.5	2.0	4.1	8.0	16.8	32.4
Non-Renewable	1.5	5.7	5.7	9.6	3.1	25.6
Nuclear	3.3		4.3	1.0	6.9	15.6
Other Renewable	0.1	0.4	0.1		0.2	0.8
Solar	0.5	2.5	27.8	55.3	99.9	186.0
Storage	0.5	8.6	7.2	87.6	55.4	159.3
Storage (Hydrogen)			1.0	0.9	23.6	25.5
Tidal		0.1	0.2	0.4	0.1	0.7
Wind Offshore	2.9	11.0	2.1	55.3	41.7	113.0
Wind Onshore	0.1	3.1	2.8	13.2	10.5	29.7
Grand Total	**10.4**	**33.5**	**56.3**	**238.0**	**269.8**	**608.1**

Table 6. Potential transmission connection queue breakdown into Gate 1 and 2 – Supporting Table (GW)

Assumptions/ Notes

- Represents the current transmission queue (December 2024)
- Gate 2 'readiness' is comprised of projects that are under construction (10GW), have submitted consents (56GW), have achieved consents (33GW) and a further 238GW of matched responses based on the RFI 2
- The M3 – Land Rights category includes around 50GW of 'Offshore Additions' (Offshore Wind and Interconnector projects that have been assumed to be Gate 2 ready based on some knowledge of the specific projects)
- Gate 1 projects are those with a project status of Scoping, where we have been unable to confirm Gate 2 readiness, following the RFI

Connections Queue Composition – Day 1

Looking ahead to Reform Day 1 implementation, if we applied the 'readiness' element of the Gate 2 criteria to the transmission-connected queue on 1st May 2025, the results are shown in the figure below.

As we forecast outwards, we lose some granularity of individual project technology and but it's still possible to anticipate the size of each project status area.

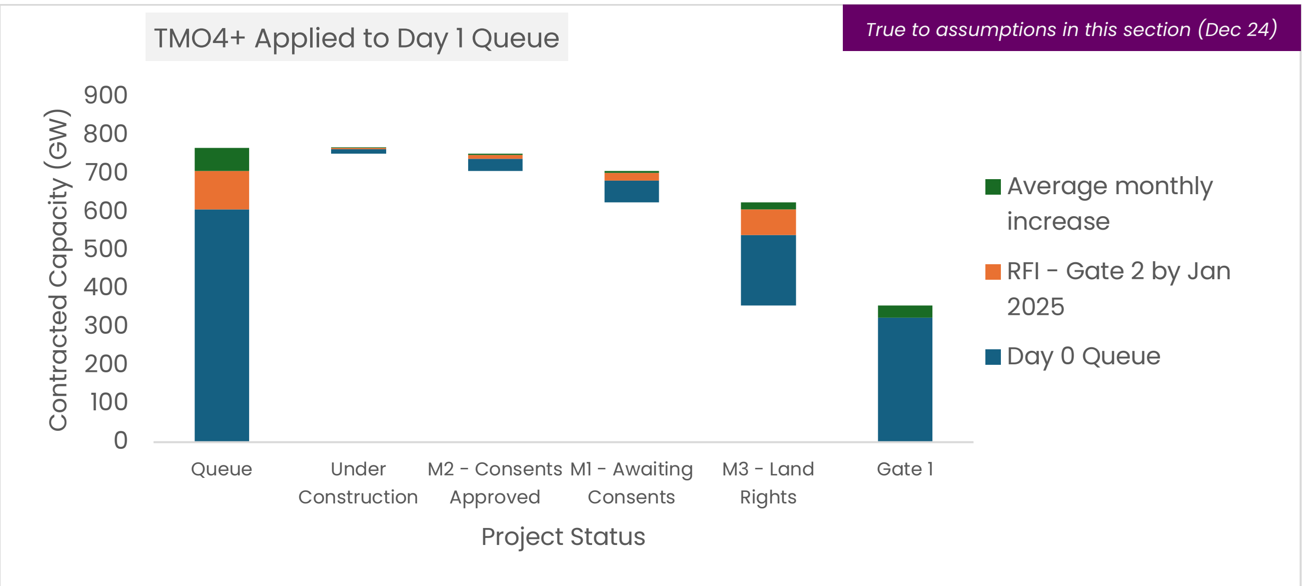

Figure 21. Potential transmission connection queue breakdown into Gate 1 and Gate

Category	Queue	Under Construction	M2 - Consents Approved	M1 - Awaiting Consents	M3 - Land Rights	Gate 1
Day 0 Queue	608	10	34	56	238	270
RFI - Gate 2 by Jan 2025	102	3	10	17	71	0
Average monthly increase	60	1	3	6	23	27
Surplus	0	755	708	629	296	0
Total	770	15	47	79	333	296

Table 7. Potential transmission connection queue at Day 1 – Supporting Table (GW)

Assumptions/ Notes

- Represents the new reformed transmission queue as of 1 May 2025 (based on instant implementation on 1 May)
- While the RFI form requested a portal reference from respondents, this wasn't always interpreted as project number, therefore, we cannot provide an exact match for every RFI response and transmission connection register entry
- The Day 0 queue figures have been used as a baseline
- An average monthly increase of 12GW has been applied to the queue between December 2024 and April 2025 (60GW)
- The potential 60GW increase has been spread across the project statuses in equal proportion (46% added to Gate 2, 54% added to Gate 1)

Connections Queue Composition – Beyond Day 1

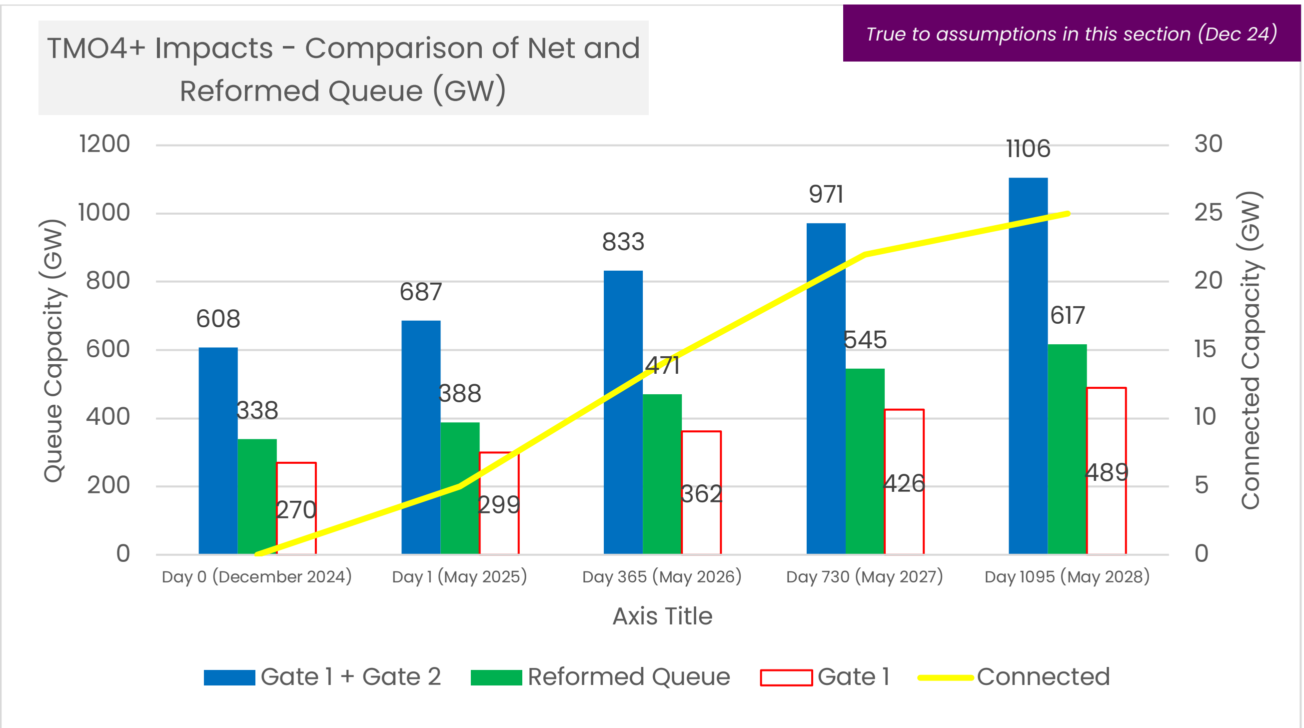

Figure 22. Potential Reformed Queue (GW) over time if TMO4+ readiness element applied

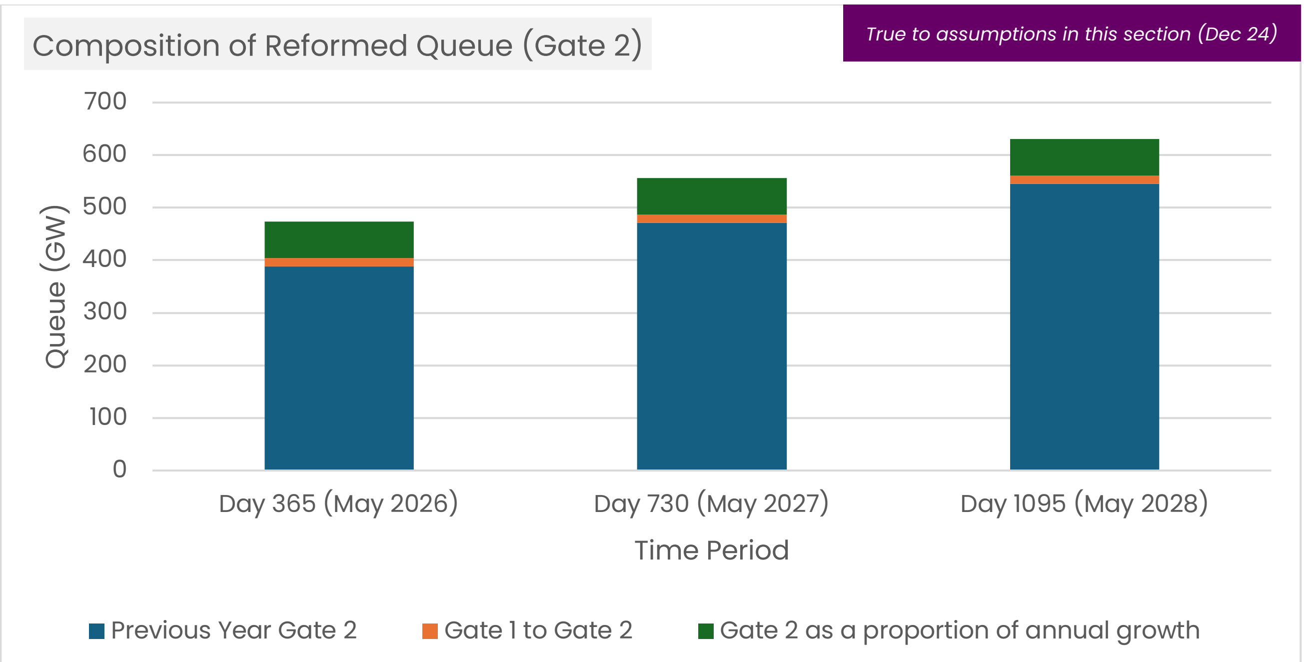

Figure 23. Potential composition of Reformed Queue (Gate 2) over time

Assumptions/ Notes

- The average monthly queue increase is 12GW (March 2022 – August 2024)
- 50% of projects that join the Gate 1 group as a result of the Gate 2 to the whole queue exercise will remain in Gate 1 indefinitely
- Of the remaining 50% that do leave Gate 1 we assume that 25% (i.e., 25% of the 50%) meet Gate 2 every year
- On top of the above, we assume that we get 144GW (12 x monthly average) of new applicants every year, of which 46% meet Gate 2 every year
- The *Connected* line represents the Gate 2-ready projects that are contracted to connect within the time periods shown (these are removed from the *Reformed Queue* figure)
- We have not made any assumptions about projects terminating and therefore leaving the reformed queue as this is hard to estimate at this stage given the limited data set due to recent introduction of queue management milestones

Conclusion - Transmission Queue & Connections Reform

- On Day 1 of the new Connections queue (1st May 2025), if the Gate 2 readiness criterion was applied, the reformed connections queue could contain c338GW of capacity (with c 270GW of projects having a Gate 1 contract). This would result in significant amounts of capacity being released from the queue which could be allocated to projects remaining in the reformed queue, to accelerate their connection dates, although any acceleration is dependent on the current queue position of projects that exit the queue (e.g. if most of these are towards the back of the queue this would not lead to much acceleration).
- NESO is unable to predict the impact of that released capacity on connection dates as this is dependent on numerous factors, e.g. (a) network availability (b) dependencies between reinforcement works (c) developer's ability to demonstrated Gate 2 readiness in time for the application windows; (d) regional variations; (e) the current queue position of projects that leave the connections queue; etc.
- While NESO cannot currently quantify project acceleration, it can be concluded that as the new Gate 2 queue would have a higher proportion of projects with a greater readiness to connect, on average those projects should receive more favourable connection timescales and be able to connect sooner than under the current arrangements.

Conclusion of Part 1

The transmission connections queue is growing at an unprecedented rate and the current connections process cannot sustain the influx of projects. The consequence is a 600GW+ (transmission connected capacity only), slow-moving queue of contracted projects. In this queue, many of those ready-to-connect may be unable to do so as quickly as they would wish (on account of being stuck behind stalled projects).

NESO estimates that, on Reform Day 1[17], the queue size could be cut from c690GW[18] to 340GW. This shorter queue should provide readier projects a more favourable connection date on average.

However, a significant number of projects would still remain in the queue, and that queue would likely grow over time (e.g., up to potentially c550GW by mid-2027). The capacity of projects remaining in the reformed queue would still significantly exceed capacities in all our FES scenarios, with a particularly material oversupply in some technologies (e.g., short-duration storage, and to a lesser extent, solar)

The next step for ESO Connections is to consider the impacts of Government's Clean Power 2030 Action Plan ("CP30 Action Plan") and to understand how the output scenarios could shape the reformed connections queue.

[17] ESO Connections Reform Day 1 – 1st May 2025
[18] Transmission queue; including Directly Connected Generation & Demand and Embedded Generation

PART 2: The potential impact of applying the ‘strategic alignment’ element of the proposed Gate 2 criteria to the connections queue

As set out in our accompanying documentation, we propose that the reformed connections queue is aligned to strategic energy plans. More specifically, we propose that the reformed connections queue is aligned to the maximum value of the permitted capacities (to 2030 and to 2035) for each technology within scope of Government’s Clean Power 2030 Action Plan (CP30 Plan) – we refer to this maximum value as the ‘permitted capacity’.

The charts below show the estimated “ready” connections queue (with a high case and low case) to compare potential differences between the connections queue and the 2030 and 2035 permitted capacities within the CP30 Action Plan. The analysis includes the entire queue of projects in scope of connections reform (transmission- and distribution-connected generation requiring a transmission impact assessment).

The differences in modelling between Part 1 and Part 2 are:

- Part 2 Includes both transmission and distribution
- Part 2 does not include technology types out of scope of the CP30 Action Plan (demand, wave, tidal, non-GB generation)
- Comparison is to CP30 Action Plan permitted capacities (rather than FES)
- For national analysis, current built capacity is based on CP30 modelling figures for 2023 plus known built projects since the start of 2024.
- The data sources in Part 2 have a lower total connections queue than those in Part 1 (c.650GW vs c.700GW of generation projects in queue). This is because of different data sources for information i.e. differences between TEC register and our other databases.

Clean Power 2030 Plan

Within this document we compare the connections queue with the permitted capacities (to 2030 and to 2035) for each technology within scope of Government’s CP30 Action Plan.

When representing the connections queue we typically include a high case (full queue) and low case (RFI v1 and v2 respondents with land, or more advanced) ‘readiness’ estimate of the revised connections queue. We have also included various other representations of the connections queue:

- Showing the capacities of ‘protected’ projects (as per our open letter of 10th December 2024 and as per our accompanying connections methodologies)
- Showing the capacities of projects in the current queue based on different ranges of current connection dates (2026, 2027, 2028, 2030, 2035)

- Showing zonal and transmission- and distribution-connected breakdowns for onshore wind, solar and batteries (short duration).

Updates since our draft November Impact Assessment

Following the publication of Draft – Connections reform Data Impact Assessment on 5th November, this impact assessment has changed to reflect amendments to our policy proposals and to reflect publication of Government's CP30 Action Plan, rather than the indicative pathways that were included as part of our November advice to Government on its CP30 Action Plan. Some of the key changes in this document are:

- Using Government's CP30 Action Plan[19] as a data source rather than our indicative pathways
    - This includes a different zonal breakdown (detailed below) for onshore wind, solar and batteries (short-duration) and GB-wide breakdown for other in-scope technologies
    - It also includes differences to some of the permitted capacities to 2030 and 2035
    - Removal of out of scope technologies: wave, tidal and non-GB generation (demand was already not included in our draft Impact Assessment)
- Updated RFI data (combining RFI v1 with v2, as described in Part 1)
- Showing the impact of our proposal to 'protect' certain types of projects
- Analysis of the full queue compared to 2035 permitted capacity in the CP30 Action Plan.

CP30 Action Plan zones

Within its CP30 Action Plan Government has set out eight distribution zones based on the contiguous ownership boundaries of the distribution network operators (DNOs). Our advice and the previous impact assessment referred to the fourteen DNO licence areas.

Government has also referred to 11 rather than 17 transmission zones. These zones are amalgamations of the zones we included in our advice and were in part based on boundary constraints.

For onshore wind between 2031 and 2035 Government has also determined that: i) Scotland and ii) England and Wales, should be treated as two separate zones, without a distinction between transmission- and distribution connected onshore wind in those zones.

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[19] https://assets.publishing.service.gov.uk/media/675c0b261857548bccbcf99d/clean-power-2030-connections-reform-annexi.pdf

Government has decided in its CP30 Action Plan that it will only provide a zonal element for solar, short-duration batteries and onshore wind. For all other technologies in scope of the CP30 Action Plan, Government has set out GB-wide rather than zonal permitted capacities.

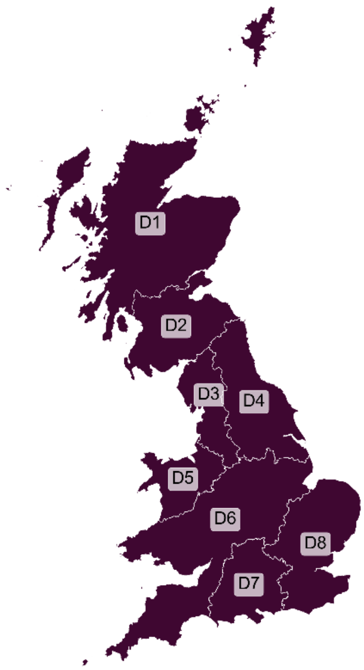

Figure 24. Distribution zones in CP30 Action Plan

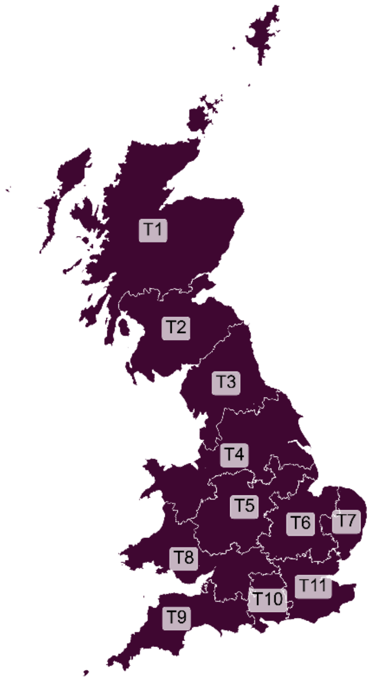

Figure 25. Transmission zones in CP30 Action Plan

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

Table 8. Mapping of distribution network region codes to distribution region names in CP30 Action Plan

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

Table 9. Mapping of transmission network region codes to transmission region names in CP30 Action Plan

4. The impact of our proposal to protect certain types of projects

Connections reform proposals include strategic alignment with the CP30 Action Plan, by technology capacity, location and transmission- or distribution-connected (where this granularity is specified in the CP30 Action Plan). To address the perceived risk of our proposals on the timely delivery of well-developed projects, we are providing up front comfort to certain types of projects that they will be included in the reformed connections queue. This should support the timely connection of projects that would help deliver Clean Power by 2030.

The data modelling and charts in the next few sub-sections show the impact if certain types of projects are deemed to have met the strategic alignment criteria (we refer to this hereafter as 'protected') and what deviations these could cause from the CP30 Action Plan permitted capacities per technology. We start with the types of projects we intend to 'protect' and then also show the impact if we had extended that protection to other types of projects.

Note that as fossil fuels (eg unabated gas) and nuclear are already oversupplied (in terms of built capacity) compared to the 2030 or 2035 permitted capacities, the analysis shows further oversupply against the CP30 Action Plan permitted capacities. We have worked closely with Government on this and are not concerned about this further oversupply as the 2030 and 2035 permitted capacity figures for unabated gas and nuclear anticipate significant decommissioning and/or retirement of those technologies.

Projects that have secured planning consents

The purpose of the analysis was to review the impact of protecting projects that have secured planning consents. We also show the impact of protecting projects that had submitted planning applications.

The modelling has used the principle of using the most accurate and trustworthy data sources where possible. The analysis below uses:

Transmission:

- Regen report planning data (as referred to in Part 1).
- Where Regen data is not available the modelling uses the status from the Tec Register

Distribution:

- RFI responses for all projects that responded to RFI and stated their planning status at time of RFI. Note this is not scaled for the c.49GW of non-respondents.

Note this analysis does not account for the connection date of the project, therefore it will show some projects with planning consents secured or applied for that are due to connect beyond 2030.

Full queue

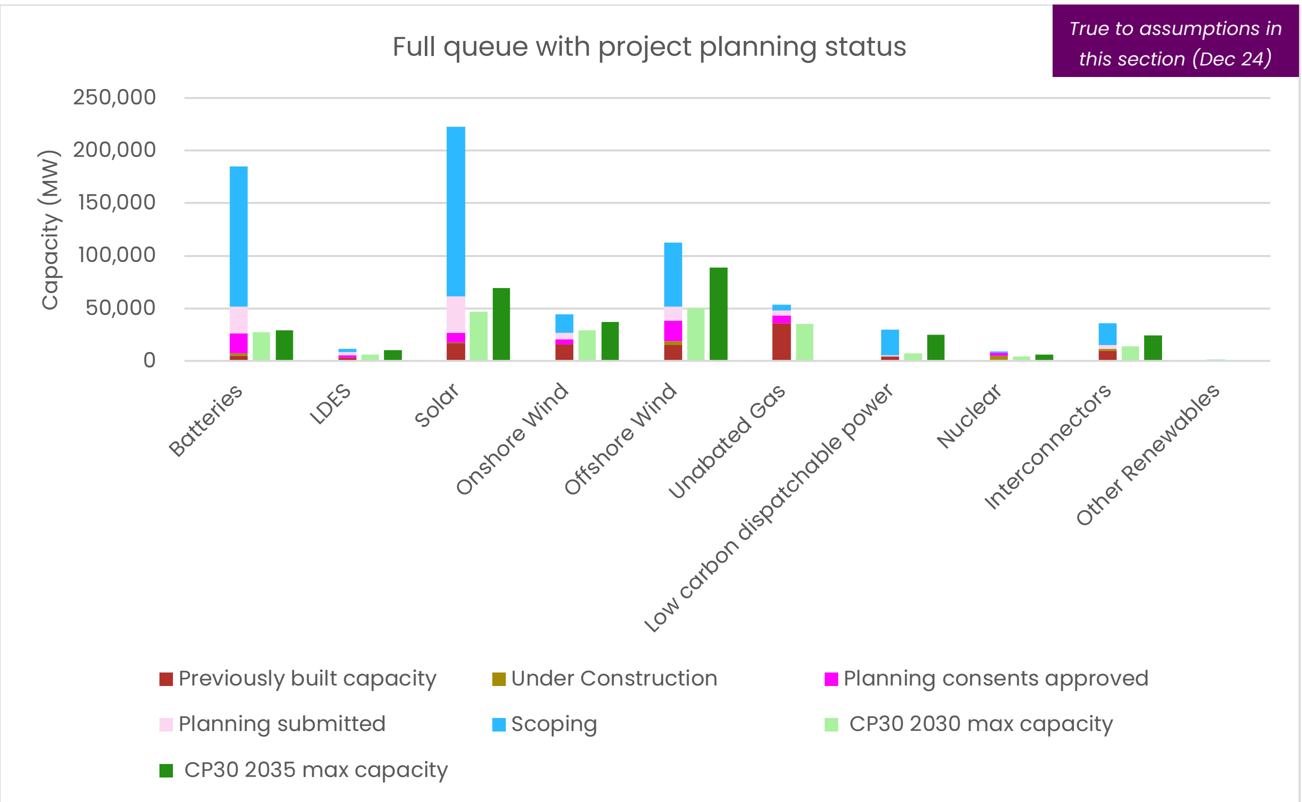

Figure 26. Full queue with project planning status

'Planning consent approved' above also includes distribution-connected projects in construction.

In Figure 26 we can see that there is less capacity in projects with consents approved than the 2035 permitted capacity for all technologies other than unabated gas and nuclear. This means that if all known projects with planning consents approved were built, this would not exceed the 2035 permitted capacity for any of the technologies other than unabated gas and nuclear.

This will be an underestimate of how many projects will have secured planning consents at the time of 'go live' of connections reform (estimated as May 2025) due to additional projects being granted planning consent in the meantime. However, Figure 26 shows that even if all projects that have submitted planning planning by 'go live' this would only exceed the GB-wide 2035 permitted capacity for batteries. Given that this would take the total installed battery capacity up to c50GW however, we do not consider that it would be prudent to extend protection against the GB permitted capacities to 2035 to all projects currently in planning that have not secured planning consent by 'go live'.

Transmission level

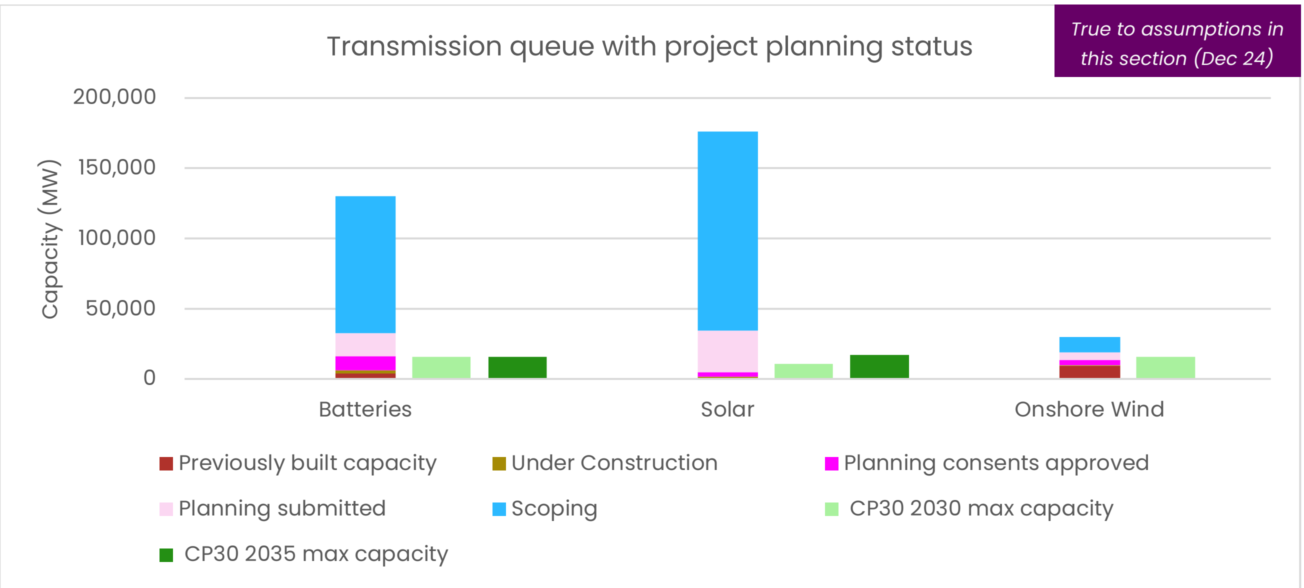

Figure 27. Transmission queue with project planning status

At national transmission level, there is no oversupply of projects with planning consents for solar or onshore wind, although there is a small oversupply of batteries compared with the 2035 permitted capacities.

Figure 27 shows that there is a high proportion of transmission-connected solar and battery projects that have submitted planning, which would significantly exceed the CP30 2030 and 2035 transmission-level permitted capacities if it all gained planning consent before 'go live'.

Distribution level

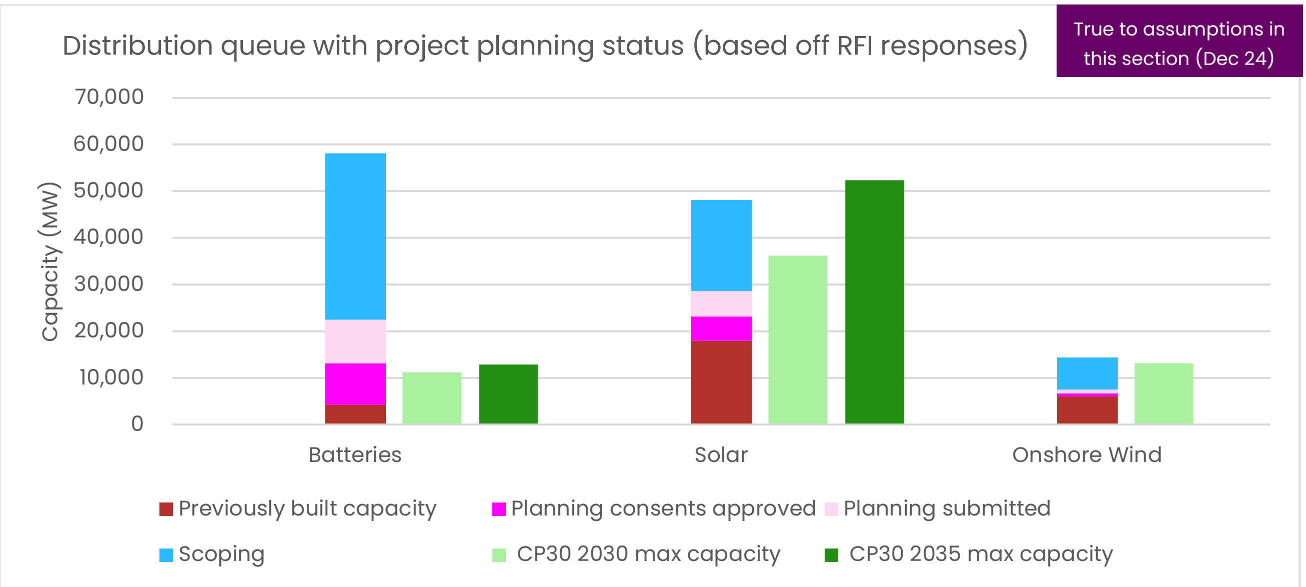

Figure 28. Distribution queue with project planning status (based off RFI responses)

At national distribution level, there is not an oversupply of projects with planning consents for batteries, solar or onshore wind.

However, there is a high proportion of distribution-connected battery projects that have submitted planning, which would exceed the CP30 2035 distribution-level permitted capacities if it all gained planning consent before 'go live'.

Projects with CfDs

Projects with CfDs only make up a small proportion (**5%**) of the full queue. Including projects with CfDs does not lead to oversupply against any of the CP30 permitted capacities (except nuclear). As projects with CfDs need to have secured planning consent, we have not shown the cumulative figures for projects with CfDs as well as projects with planning consents secured.

Full queue

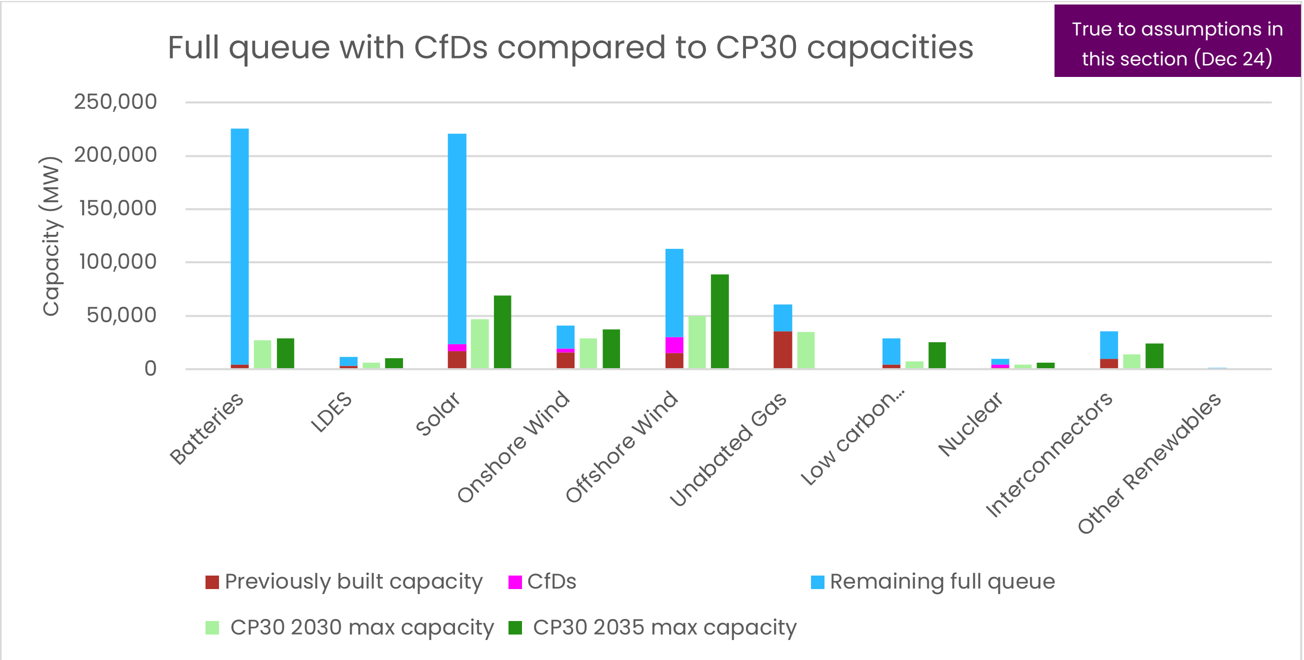

Figure 29. Full queue with CfDs compared to CP30 capacities

Transmission level

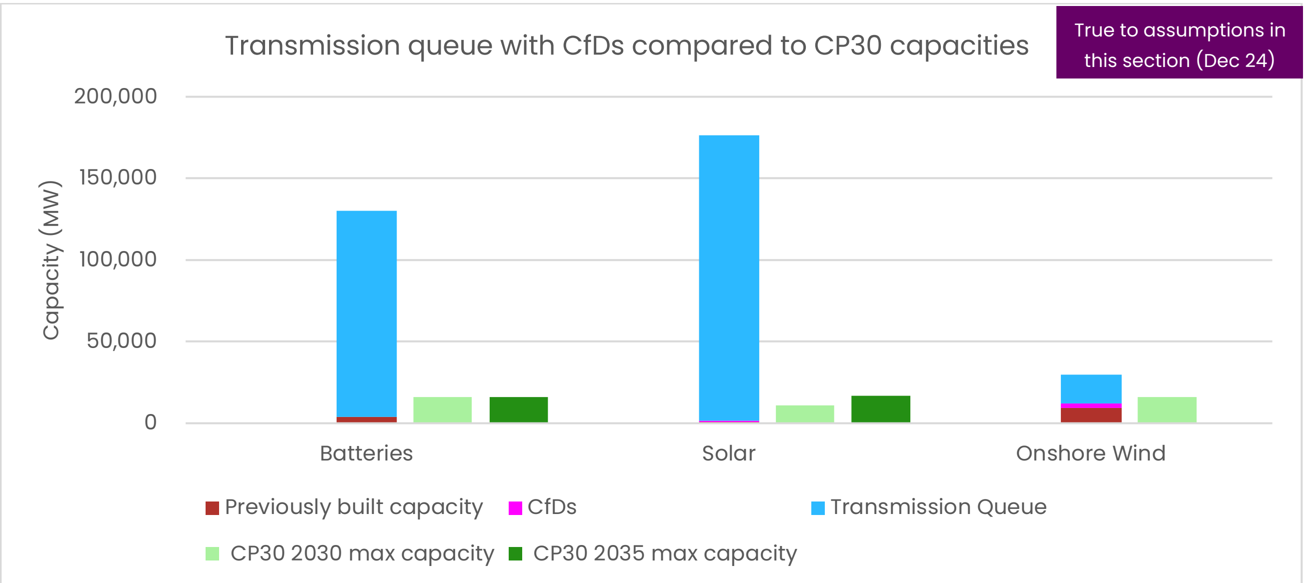

Figure 30. Transmission queue with CfDs compared with CP30 capacities

Distribution level

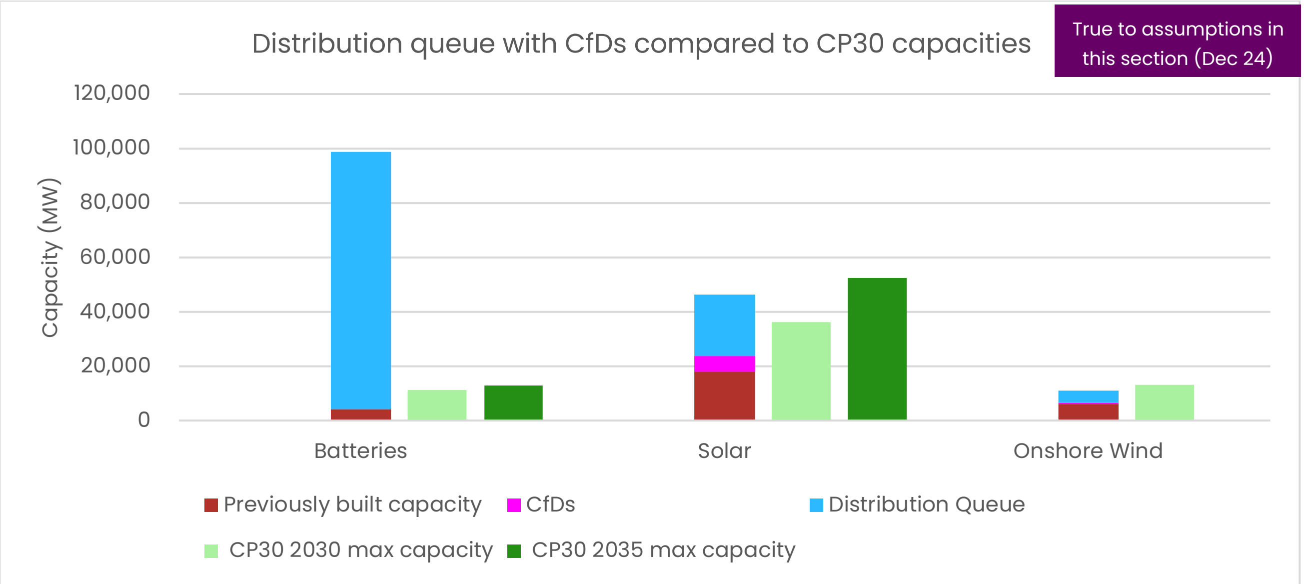

Figure 31. Distribution queue with CfDs compared with CP30 capacities

Projects with CM Contracts

Including projects with CM contracts does not lead to oversupply against any of the CP30 permitted capacities (except unabated gas). As projects with CM contracts need to have secured planning consent, we have not shown the cumulative figures for projects with CM contracts as well as projects with planning consents secured.

Full queue

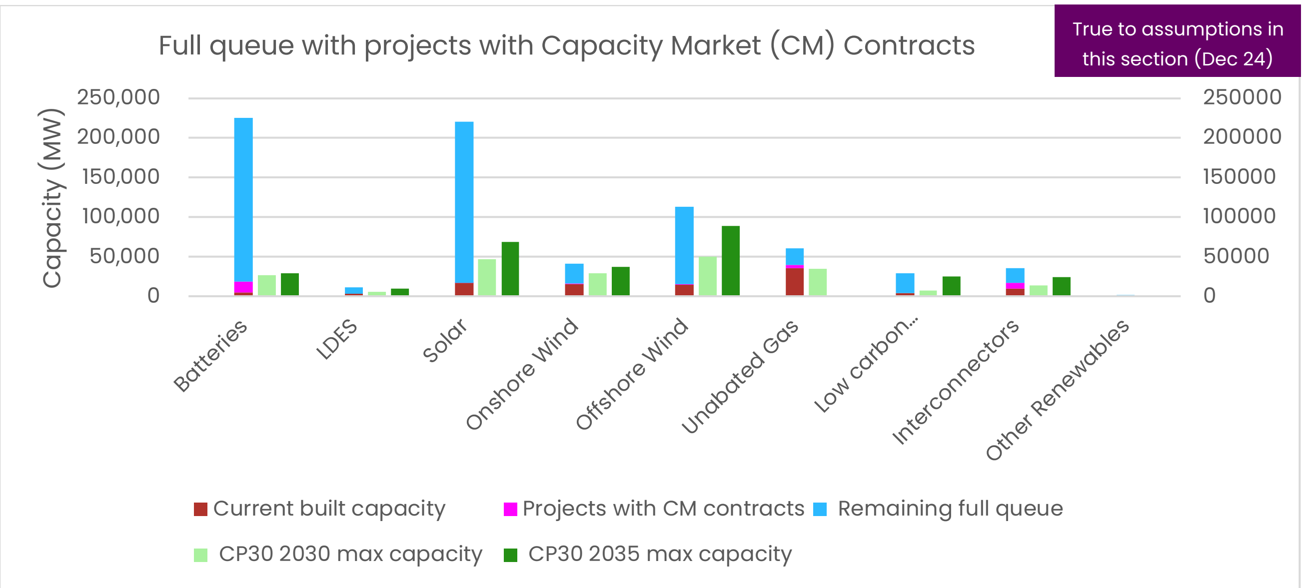

Figure 32. Full queue with projects with Capacity Market (CM) Contracts

Transmission level

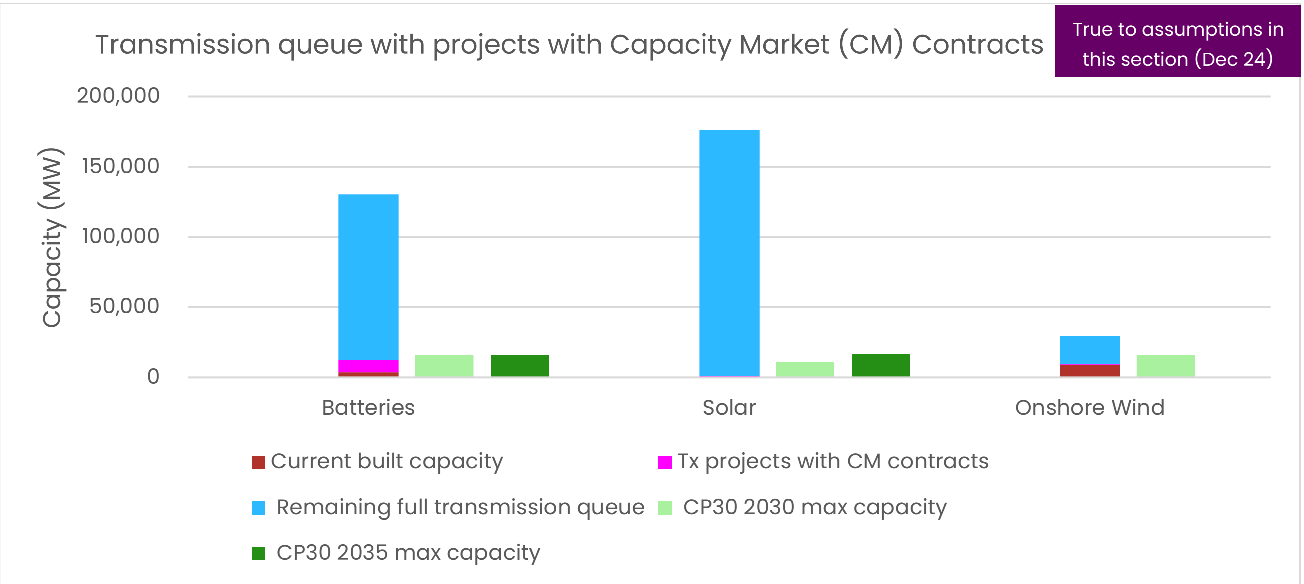

Figure 33. Transmission queue with projects with Capacity Market (CM) Contracts

Distribution level

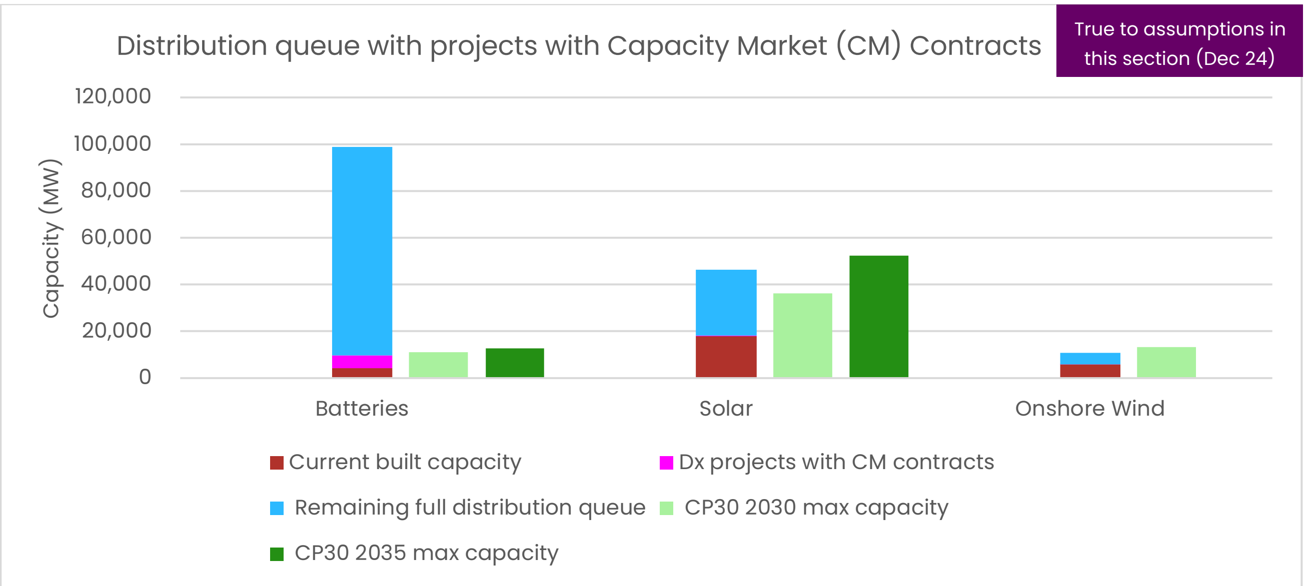

Figure 34. Distribution queue with projects with Capacity Market (CM) Contracts

Projects that are due to be connected in 2026, 2027 and 2028

Including projects with connection dates to end 2026 does not lead to oversupply against any of the CP30 permitted capacities (except unabated gas). Including projects with connection dates to end 2027 leads to oversupply against the CP30 permitted capacities for batteries as well as unabated gas. Including projects with connection dates to end 2028 further increases the oversupply of batteries.

Projects must demonstrate that they have met queue management milestones M2 and M7 (we refer to that in shorthand below as 'under construction') and be due to connect by end 2026 in order to meet the protection criteria. To analyse this, we have used the RFI responses for projects under construction, which provides a larger estimate than the TEC Register status or Regen information. The RFI was not scaled to non-respondents, so this analysis will be an underestimate as more projects will begin construction before 'go live' and it is possible that some non-respondents may be under construction.

Full Queue

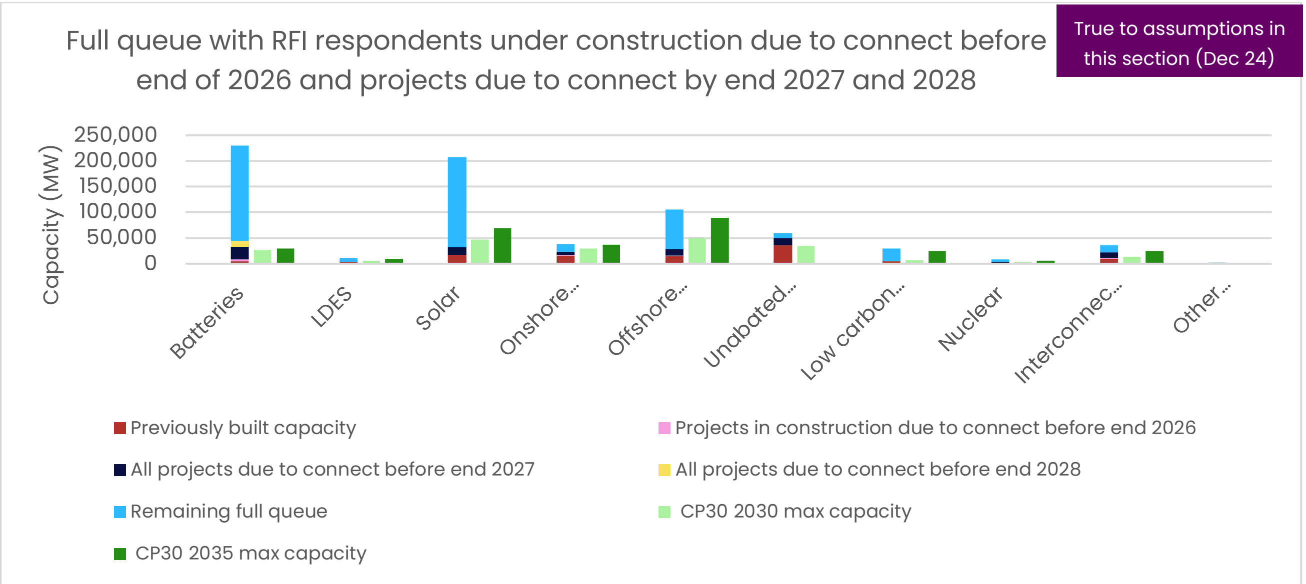

Figure 35. Full queue with RFI respondents under construction due to connect before end of 2026 and projects due to connect by end 2027 and 2028

Transmission Queue

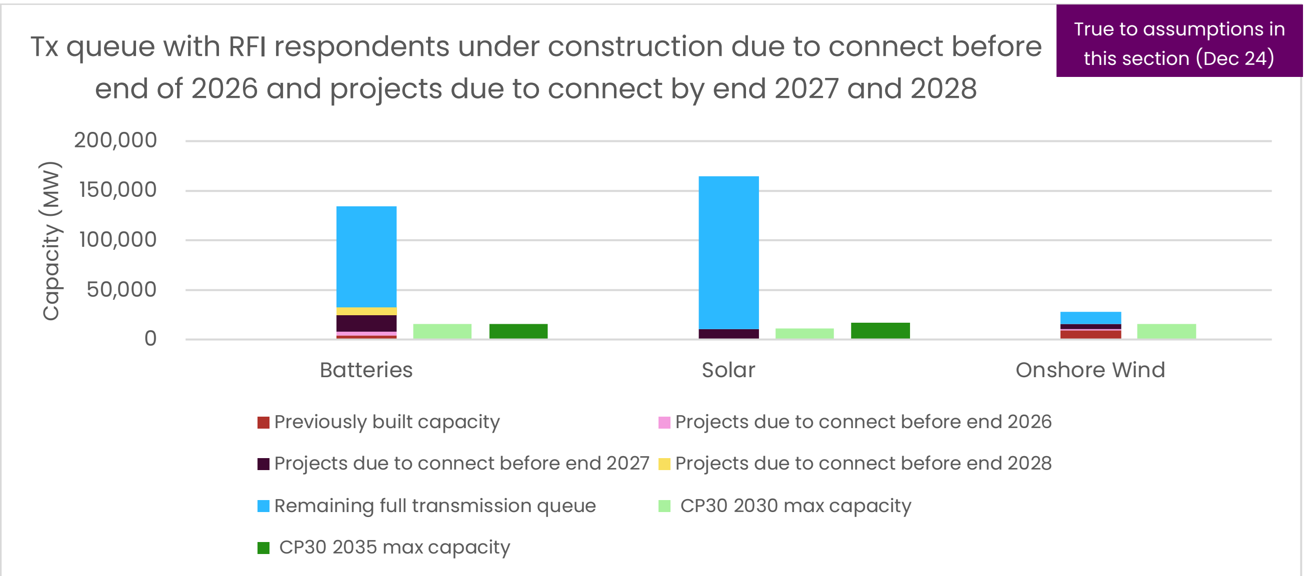

Figure 36. Tx queue with RFI respondents under construction due to connect before end of 2026 and projects due to connect by end 2027 and 2028

Distribution Queue

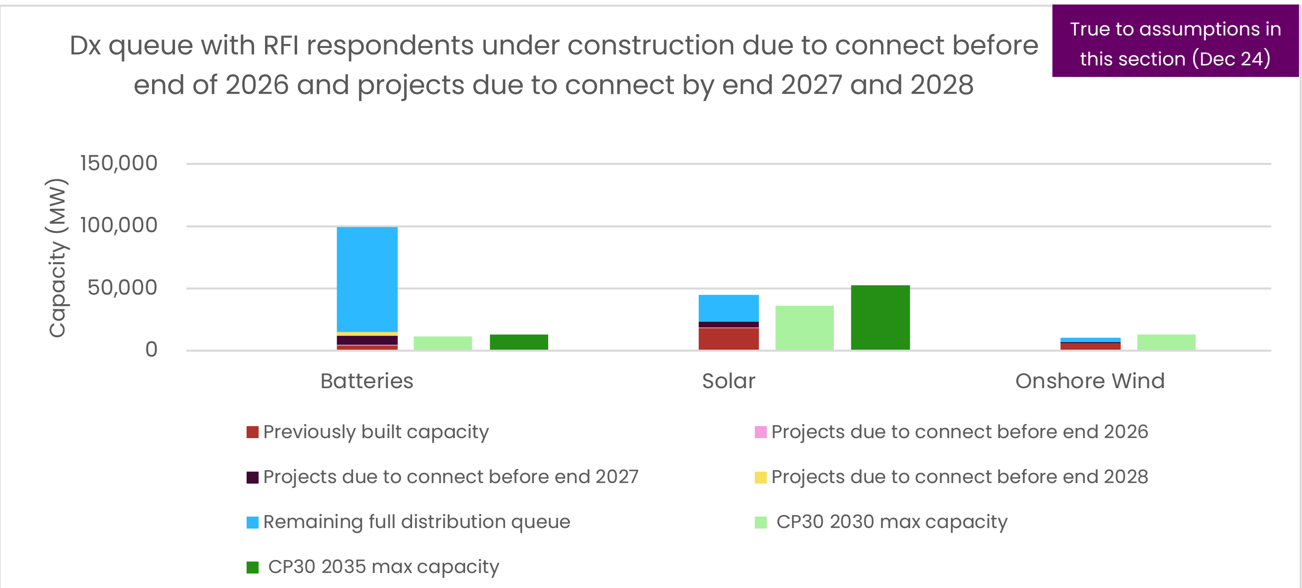

Figure 37. Dx queue with RFI respondents under construction due to connect before end of 2026 and projects due to connect by end 2027 and 2028

All interconnector and OHA projects that have Ofgem cap and floor or merchant route approval

Connections reform will also protect all interconnector and Offshore Hybrid Asset (OHA) projects that have Ofgem cap and floor or merchant route approval.

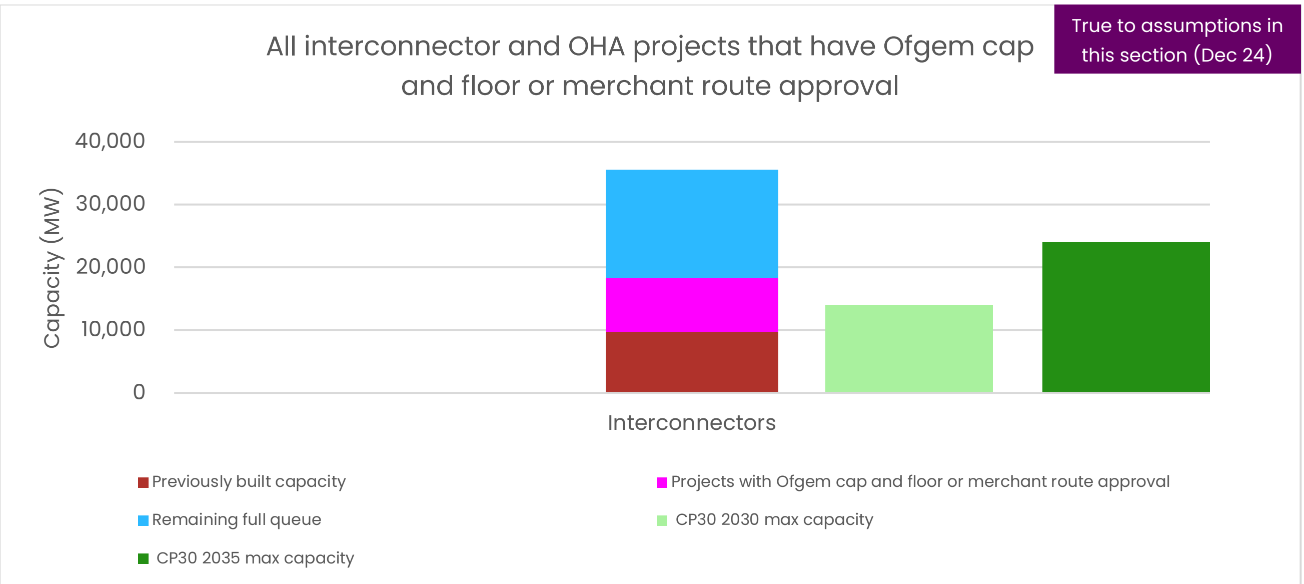

Figure 38. All interconnector projects that have Ofgem cap and floor or merchant route approval

Summary of ‘protecting’ projects

Based on the above analysis we conclude that:

- Protecting projects that have currently secured planning consent, have CfD, CM or IC/OHAs with Ofgem approval does not cause material deviation away from the GB-wide CP30 permitted capacities for 2035 for any technologies (apart from unabated gas and nuclear that are already over the permitted capacities based on installed capacity). Batteries could potentially exceed the GB-wide capacity by up to 20GW if all battery projects in the planning process secured planning consent by go live of connections reform. However, even in that extreme scenario, this would still reflect a c200GW reduction of batteries compared to current levels in the full queue. Nuclear and unabated gas would also be oversupplied but as explained earlier, we are not concerned about this due to the levels of retirements of existing projects expected in those technologies.
- Protecting projects with connection dates by end 2028 would lead to no less than a c15GW oversupply of batteries. However, the inclusion of projects just based on their current connection date makes no distinction based on the relative planning status and level of readiness of those projects and therefore is more risky and less appropriate in terms of meeting CP30 2030 and 2035 capacities than protecting projects with planning consent secured.
- There is likely to be oversupply of onshore wind, solar and batteries in some zones (transmission- and distribution-connected) compared to the CP30 Action Plan 2035 capacities as a result of providing protections to projects with planning consent secured.
- Overall, we consider that our overall approach to protecting projects is proportionate as we need to balance full alignment against the granular CP30 Action Plan against providing investor confidence and not removing the most viable / well-developed projects that would help deliver Clean Power by 2030.

5. Full connections queue compared to CP30 2030 and 2035 permitted capacities

For our analysis we compare the full queue and an estimate of the 'ready' queue to the CP30 permitted capacities for each technology. Our analysis uses:

- Current built capacity: From Clean Power 2030 action plan
- Queue: All projects from transmission and distribution registers
- Low case queue: This queue is an estimate of the low case 'ready' queue that will meet the Gate 2 readiness criteria. It is made only from RFI respondents that could prove land rights at the time of the RFI.
- CP30 2030 max capacity: the highest value of the range to 2030 for each technology published in the CP30 Action Plan (ie the 2030 permitted capacity).
- CP30 2035 max capacity: the highest value of the range to 2035 for each technology published in the CP30 Action Plan (ie the 2035 permitted capacity).
- Low carbon dispatchable power: Power generation technologies that can be turned on or off or adjusted to meet demand and have low carbon emissions (e.g. hydroelectric power, biomass, or certain types of gas plants with carbon capture and storage).
- Offshore wind: Wind power generated from turbines located in bodies of water, typically oceans or large lakes, which harness wind energy to produce electricity.
- Nuclear: Energy produced from nuclear reactions, typically through the process of nuclear fission in reactors, providing low-carbon source of electricity.
- Carbon: Refers to carbon emissions, particularly CO_2.
- Batteries: Energy storage systems that store electricity for later use, helping to balance supply and demand and integrate renewable energy sources into the grid.
- LDES: Long Duration Energy Storage systems that can store energy for extended periods, typically from several hours to days, to provide grid stability and support renewable energy integration.
- Solar: Energy harnessed from the sun using photovoltaic panels or solar thermal systems to generate electricity or heat.
- Onshore wind: Wind power generated from turbines located on land, which convert wind energy into electricity.
- Unabated gas: Natural gas power generation without carbon capture and storage, resulting in the release of CO_2 emissions into the atmosphere.

- Interconnectors: High-voltage cables that connect the electricity grids of different regions or countries, allowing for the transfer of electricity across borders.
- Other renewables: Includes a variety of renewable energy sources such as geothermal, tidal, and wave energy, which contribute to a diverse and sustainable energy mix.

Queue to 2030 compared to CP30 permitted capacities to 2030

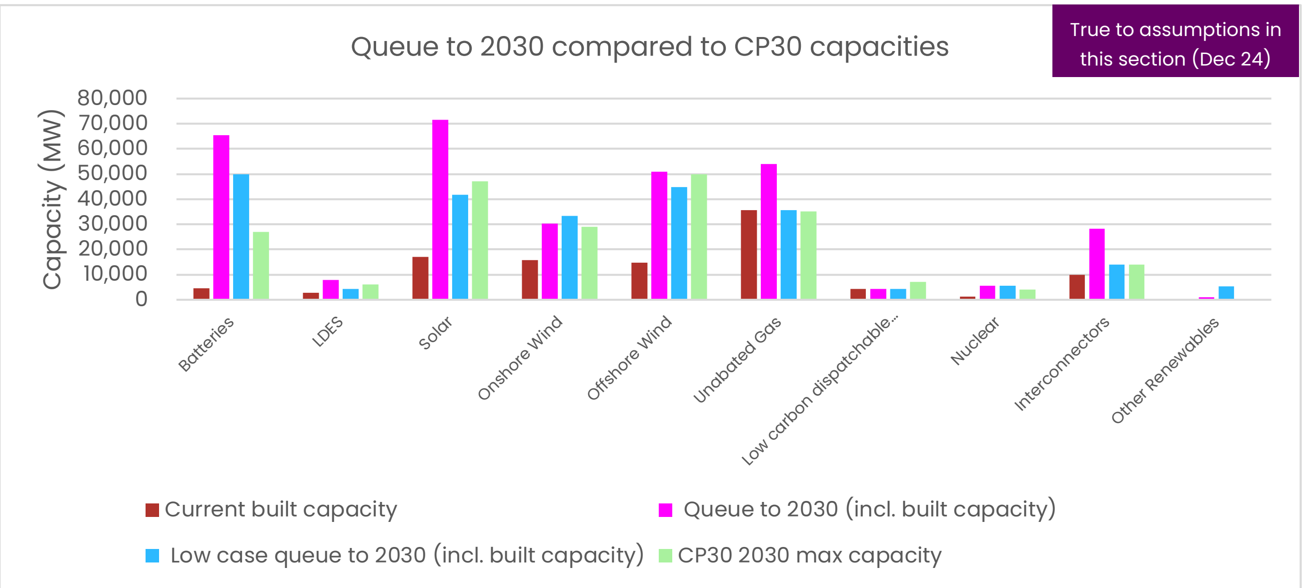

Figure 39. Queue to 2030 compared to CP30 2030 permitted capacities

There is an estimated oversupply (no less than c20GW) of 'ready' storage in the current queue to 2030 (ie with current 2030 or before connection dates) compared to the CP30 2030 permitted capacities, as shown in **Error! Reference source not found.**. For other technologies, such as interconnectors, nuclear, and onshore wind, the low readiness case often closely matches the 2030 permitted capacities. However, the low readiness case for offshore wind and solar are slightly below the 2030 permitted capacities which means there could be an undersupply of 'ready' projects for these technologies (if the low readiness scenario were to eventuate). However, this doesn't take account of 'ready' projects with current connection dates beyond 2030 taking advantage of freed up capacity and being accelerated to 2030 or before.

Clearly the low readiness case may also be a material underestimation of the 'ready' projects, as it doesn't include projects that have told us they would be 'ready' by 1 Jan 2025 (or beyond) and assumes all non-respondents to the RFI would not be ready. It also does not take into consideration any new applications meeting the Gate 2 'readiness' criteria over time. So, any potential undersupply against the low readiness case should be treated with some caution given the factors above.

Queue to 2030, with 20% of capacity accelerated projects from the 2031-2035 queue, compared to CP30 permitted capacities

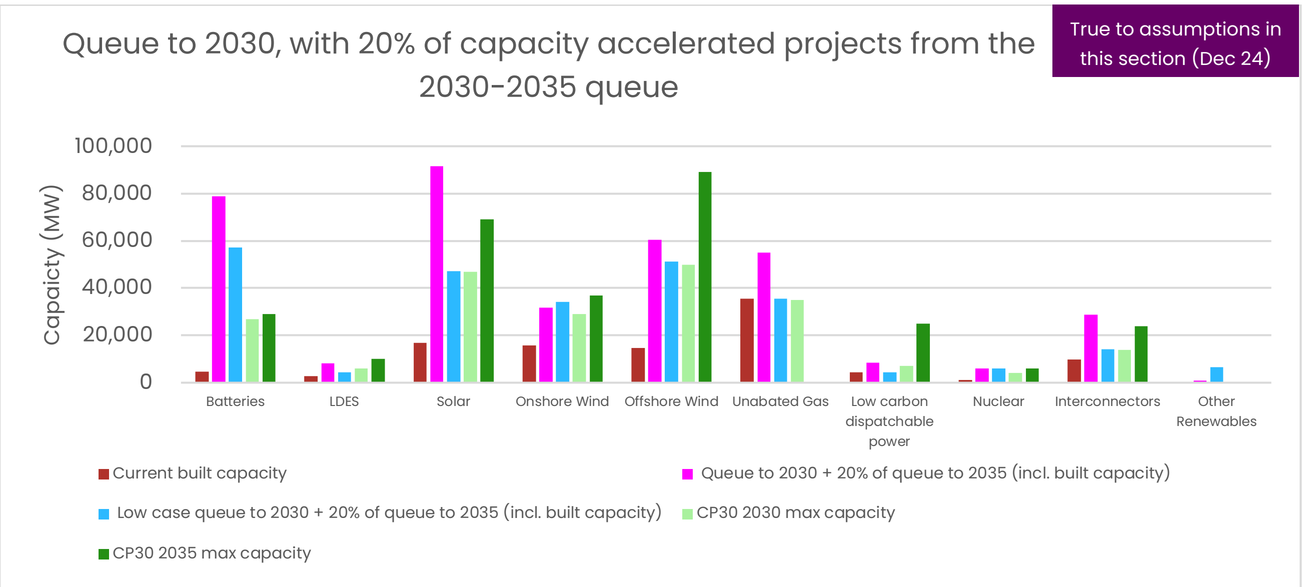

Figure 40. Queue to 2030, with 20% of capacity accelerated projects from the 2030-2035 queue, compared to CP30 permitted capacities

To address potential undersupply, connections reform could enable required 'ready' projects later in the queue to accelerate and meet that undersupply (as capacity would have been freed up ahead of them in the queue from 'non-ready' projects receiving Gate 1 contracts and exiting the queue). Figure 40 shows the potential revised under- or oversupply where we could accelerate 20% of the current 2031-35 queue to meet undersupply against the CP30 permitted capacities in the period to 2030. This would reduce potential undersupply compared to the 2030 permitted capacities, although if the low readiness scenario were to eventuate there may be slight undersupply in the solar category (although noting the potential for the low readiness scenario to be overly-pessimistic as set out above).

Queue to 2035 compared to CP30 2035 permitted capacities

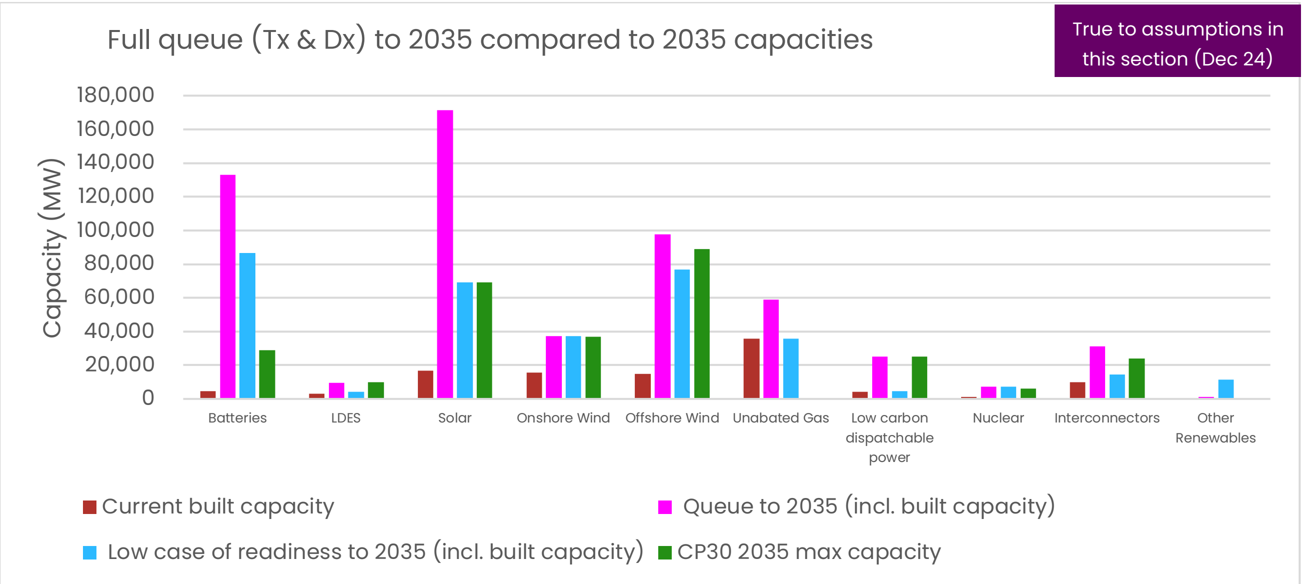

Figure 41. Queue to 2035 compared to 2035 permitted capacities

Figure 41 shows the connections queue to 2035 compared to the CP30 permitted capacities to 2035. This shows that there is an estimated oversupply (no less than c50GW) of 'ready' batteries in the current queue to 2035 compared to the 2035 permitted capacities. For other technologies the low readiness case fairly closely matches the 2035 permitted capacities. However, the low readiness case for offshore wind is below the 2035 permitted capacity which means there could be an undersupply of 'ready' projects (if the low readiness scenario were to eventuate and noting the potential for the low readiness scenario to be overly-pessimistic as set out above). The graph shows a potential undersupply of interconnectors; however, our proposals for protecting interconnector or offshore hybrid asset projects with Ofgem approval should ensure that there is no undersupply of those projects in the reformed connections queue.

Full queue, including beyond 2035, compared to 2035 permitted capacities

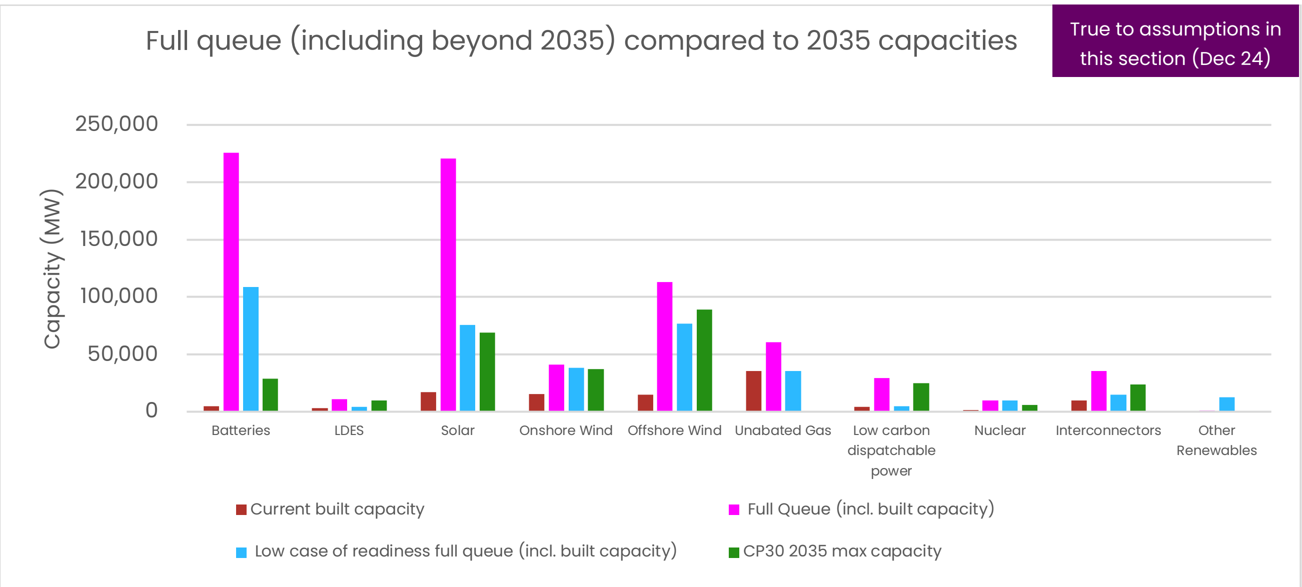

Figure 42. Full queue, including beyond 2035, compared to 2035 permitted capacities

Error! Reference source not found. shows the full current queue (i.e. all currently contracted projects in the queue) compared to the CP30 permitted capacities to 2035. The full current queue has c450GW more supply than the permitted capacities to 2035, which is largely driven by the oversupply of batteries. The only two technologies to change materially in this figure compared to **Error! Reference source not found.** are batteries and solar, where the full queue and the low case readiness queues have both increased. A total capacity of c380GW of projects fall under the low case readiness category across all technologies (compared to c350GW under the low case readiness category in Figure 42).

The large additional capacities in the current queue illustrates the large pool of projects that could potentially become ready, either by Day 1 of connections reform, or before SSEP is introduced and used to set new permitted capacities for the connections queue (currently estimated as late 2026). As set out in Part 1, we estimate that the capacity of 'ready' transmission-connected projects (if the Gate 2 criteria just reflected the 'readiness' element) could increase materially over time, to c330GW by May 2025, then c415GW by May 2026 and to c505GW by May 2027. Including 'ready' relevant distribution-connected projects would increase this capacity of 'ready' projects in the queue further (e.g. to over 400GW by May 2025).

This compares to the total CP30 2035 permitted capacity of c.290GW – also noting that: a) the 2035 permitted capacities includes distribution-connected projects as well as transmission-connected projects; and b) the 2035 permitted capacities include built capacity, of which there is currently more than 100GW, which means that the 2035 permitted capacities only requires a queue of an additional c210GW (taking account of retirements of nuclear and unabated gas).

This clearly represents both an opportunity and a risk.

- The opportunity is that any undersupply relating to the 2035 permitted capacities may be addressed through a combination of 'ready' projects from the current queue and / or new 'ready' projects moving from Gate 1 to Gate 2 or new Gate 2 ready projects joining the connections queue in future Gate 2 windows.
- The risk is that, without intervention (i.e. without using overall design 2 as per our 5th November 2024 consultation), the total capacity of 'ready' projects may substantially exceed the total 2035 permitted capacity, potentially by as much as 125-215GW by the time SSEP is introduced and used to set new permitted capacities for the connections queue. This is the risk we referred to in our consultation with regards to overall design 3. Under overall design 3 this additional 125-215GW of capacity would be at the back of the new queue (beyond 2035) and there is a risk that much of it may not align with the SSEP permitted capacities, in terms of capacity/technology/location mix, which would represent a significant risk to either consumers or project developers (or both). To further illustrate this point, the total capacities of the technologies of some 'ready' projects in the queue (particularly batteries, but potentially also solar) may be substantially beyond even what we need by 2040 or 2050 (if the FES are used as a proxy for what we may need beyond 2035).

Onshore wind to 2035

The Government CP30 annex includes a CP30 permitted capacity for 2035 for England & Wales and Scotland. The below graphs compare this to the current full queue and low case 'ready' queue to the onshore wind permitted capacities for 2030 and 2035.

As current built capacity was only provided for the full GB level, the model uses all projects with connection dates before 13/12/2024 from the transmission and distribution registers for the current built capacity in Scotland, and the remaining capacity from the CP30 Action Plan is allocated to England and Wales.

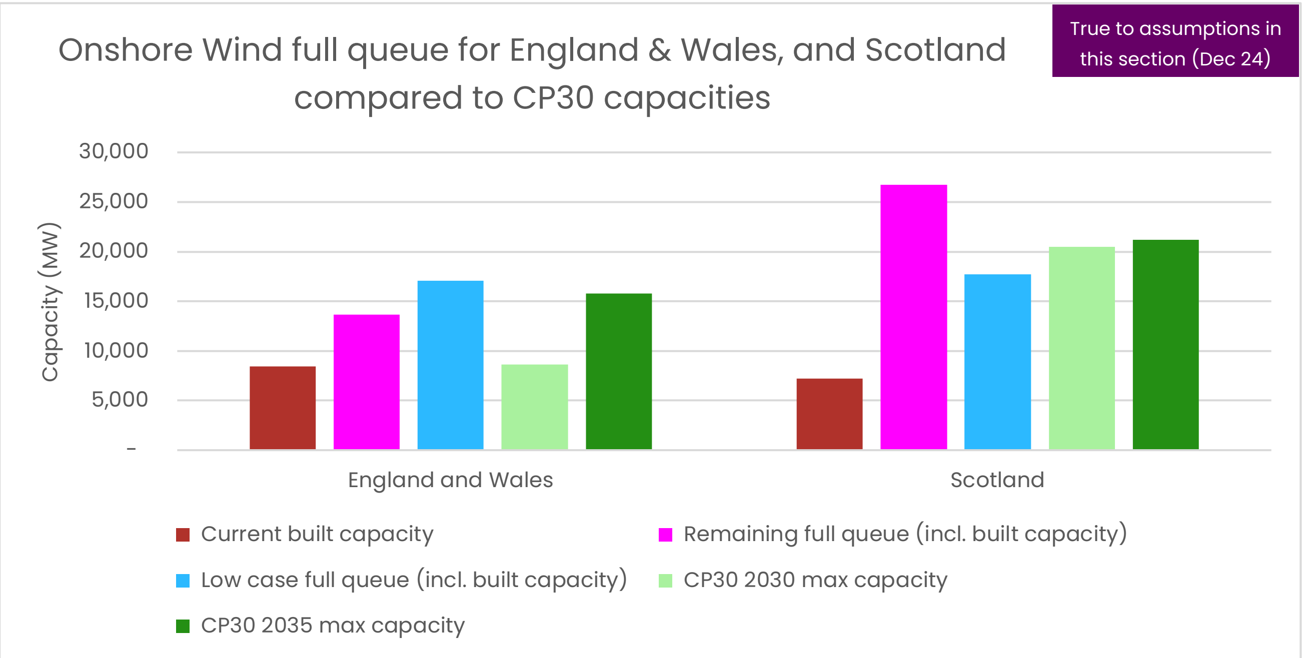

Figure 43. Onshore Wind full queue for England & Wales, and Scotland compared to CP30 permitted capacities

The low case queue in the model is larger for England and Wales than the full queue, which is an inaccuracy driven by the data quality of RFI responses and technology grouping, as per the assumptions below.

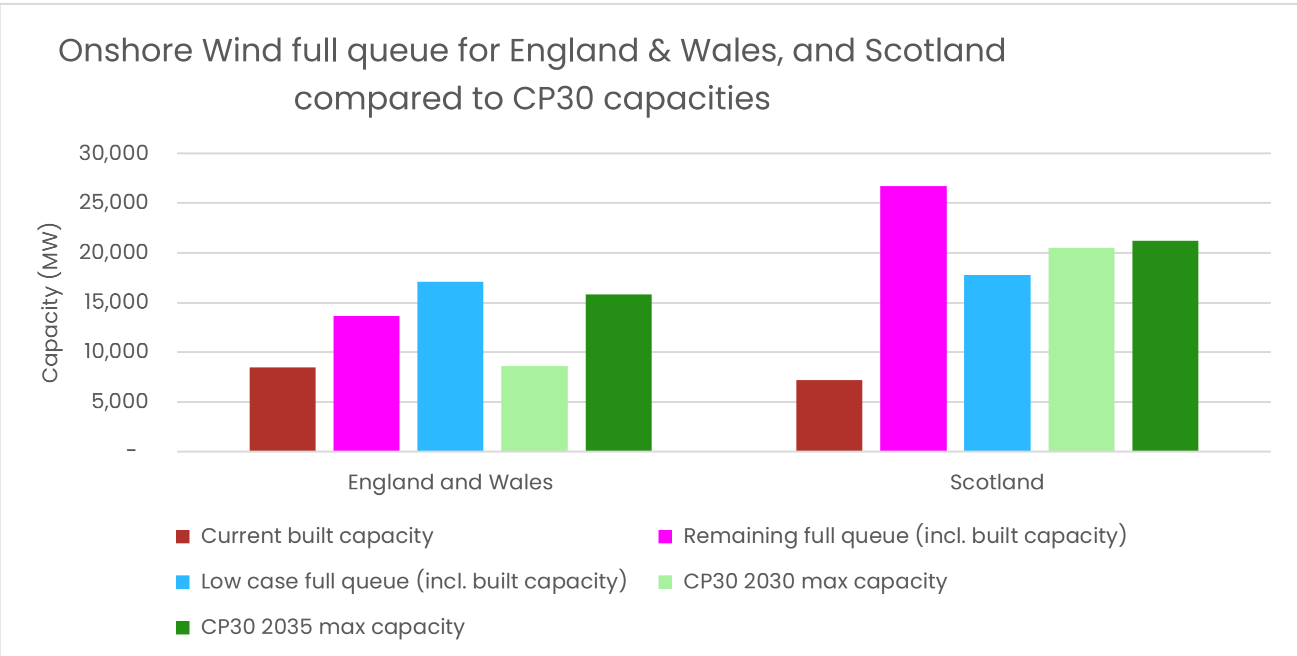

Figure 43 shows that there may be sufficient (or close to sufficient) 'ready' onshore wind projects to meet the 2035 permitted capacities in England and Wales, and in Scotland. However, the discrepancy between the low case queue and the full queue figures in England and Wales suggest that there is a risk of undersupply against the 2035 permitted capacities in England and Wales.

Modelling assumptions

- Full queue represents our high case of readiness for projects. This represents that all projects are 'ready' and meet the Gate 2 requirements.
- Low case represents the scenario that only respondents to the RFI (v1 and v2) with land at time of RFI (June 2024) would be ready.
  - Exception for nuclear, where known nuclear projects with land was used which is deemed more accurate than RFI.
  - Exception for offshore wind, where the Crown Estate Land Registry was used to find projects with seabed lease, which is deemed more accurate than RFI.
- Low carbon dispatchable power only includes transmission projects or RFI respondents that have a name or technology type suggesting they are biomass, power BECCS, gas CCUS and hydrogen to power.
  - Distribution projects could not be categorized into low carbon dispatchable power as this is not a category included in the data received from aggregated distribution databook.
  - This may cause the low case to be larger than the full queue due to the inclusion of distribution projects.
- Current built capacity for the non-zonal queue is taken from Clean Power 2030 Action Plan: Connections reform annex, in the column Current Installed capacity (2024).
  - Exception for nuclear, where current built projects was adjusted to only include Sizewell B, as this is the only currently built project online in 2030.
- The model does not account for projects that will retire / disconnect before 2030/2035. Note:
  - Projects may not disconnect even when assets reach end of life, new projects could be developed at the same site.
  - Any implementation of connections reform will need to take into account where projects disconnect from the system.
- Contracted Capacity
  - We have assumed that contracted connection capacity will be the generation capacity of projects, as our dataset does not include generation capacity behind the meter. This is because contracted connection capacity represents maximum instantaneous import/export from network and limited information on any more/less capacity behind the meter.

  - In the future, decisions regarding individual projects will be based on the specifics of those projects i.e. the information the developer provides regarding their project. We will use this information to consider how the project aligns with the criteria for entry into the reformed queue.
- The queue and CP30 technology type has been normalised to the TEC & Dx Register to only 9 categories due to the limitations of distribution data, which already categorises projects into these categories.
- Multi-technology projects
  - For multi-technology (hybrid) projects, the technology type is aggregated to the plant with the highest typical export capacity. Given there are c240GW of projects listed with more than one technology type (hybrid projects), this categorisation approach potentially overestimates generation and may misestimate storage.
  - In the future, decisions regarding individual projects will be based on the specifics of those projects i.e. the information the developer provides regarding their project. We will use this information to consider how the project aligns with the criteria for entry into the reformed queue.
- Batteries
  - Refers to battery-only projects (with no other technology types represented in this category)
  - Around 500 transmission generation projects include a storage element; these projects are categorised by the generation technology (i.e., the storage element of those projects is not included in the above data / charts). From import capacity, there could be c.180GW of increased storage capacity in the queue from these projects.
- Queue Visibility:
  - The TEC Register, Interconnector Register, Clean Power 2030 Data Workbook, distribution data, and internal datasets reflect the connection queue. We assume that the technology type, contracted capacity, and connection dates listed are reflective of the project's characteristics.
  - Due to time constraints, we were not able to incorporate DRC data or project specific DNO data, instead using aggregated data sources.
  - Note there is a limitation in our distribution data, which is taken from aggregated distribution workbook, where 67GW (45%) of projects do not have connection dates. For data quality purposes these have been added to our full queue analysis but have not been added in pre-2030 or pre-2035 models.
  - In reality, the data sources shown will not reflect the entire connection queue but are the most up-to-date and complete data available at the time of the modelling for this report. These sources provide a high-level view of the queue for

comparison to CP30. The data will continue to be updated as Connections Reform is implemented.

- We have assumed CP30 sets the permitted capacities for 2035. These models do not account for if SSEP increases the permitted capacities for 2035.
- G98 projects which do not need to make a connection application are not included in our queue data:
  - Some micro generation projects which are within the scope of the Energy Network Associations (ENA) Engineering Recommendation G98[20] do not need to apply for a connection with the DNO and therefore are not included in our figures for the current queue.
  - For the purposes of connections reform and the Gate 2 criteria or Connections Network Design Methodology, we do not intend to include generation that will not have an impact on the transmission system within the scope of connections reform.
  - In some graphs 'other renewables' shows as higher in the 'low case' than in the full queue. This is driven because the RFI data has some responses that do not provide detail, and state "Other" as their categorisation. These have been grouped with "Other Renewables", however these responses in the RFI are larger than that in the full queue. The RFI follow up was sent which has provided more responses for the queue, which has grown all categories including other renewables.
  - As transmission-connected demand, tidal, wave, and non-GB generation are out of scope of 'strategic alignment', these projects have been excluded from the queue modelling.

Conclusions - Full Queue Analysis

- The current connections queue to 2030 has between c.20GW to c.100GW more 'ready' capacity than the total from CP30 2030 permitted capacities, however with a technology type consideration applied, technology such as offshore wind could be undersupplied. Batteries also stands out as having a large oversupply of 'ready' projects of at least c.20GW to 2030.
- Connections reform could enable 'ready' projects which align with the Government's Clean Power Plan which are currently later in the queue to accelerate and meet undersupply (as capacity would have been freed up ahead of them in the queue from 'non-ready' and/or non-aligned projects receiving Gate 1 contracts and exiting the

[20] https://www.energynetworks.org/publications/erec-g98-requirements-for-connection-of-fully-type-tested-micro-generators

queue). If 20% of required projects from 2030-2035 were accelerated, the low case of 'ready projects' would move significantly to close the gap of undersupply.

- The full current queue has up to c500GW more supply than 2035 permitted capacities, which is largely driven by the oversupply of batteries.
  - This provides an opportunity to address any undersupply in the Clean Power 2030 permitted capacities through a combination of 'ready' projects from the current queue and / or new 'ready' projects moving from Gate 1 to Gate 2 or new Gate 2 ready projects joining the connections queue in future Gate 2 windows
  - However, the risk is that, without intervention (i.e. without using overall design 2 as per our accompanying documents), the total capacity of 'ready' projects may substantially exceed the total capacity for the CP30 2035 capacity, potentially by as much as 125-215GW by the time SSEP is introduced and used to set a new/additional permitted capacities for the connections queue. This excess capacity may not align with the SSEP permitted capacities, in terms of capacity/technology/location mix, which would represent a significant risk to either consumers or project developers.

6. Transmission and distribution analysis

The modelling below uses the CP30 action plan transmission and distribution permitted capacities for solar, batteries and onshore. The CP30 2035 permitted capacity for onshore wind is not included, as this is not split out into transmission and distribution in the CP30 action plan.

The current built capacity also differs from the analysis above, as it is not published in the CP30 action plan. As an alternative, the models use FES24 Holistic Transition for 2024, which provides similar data on built capacity and does provide the split of transmission and distribution.

Distribution analysis

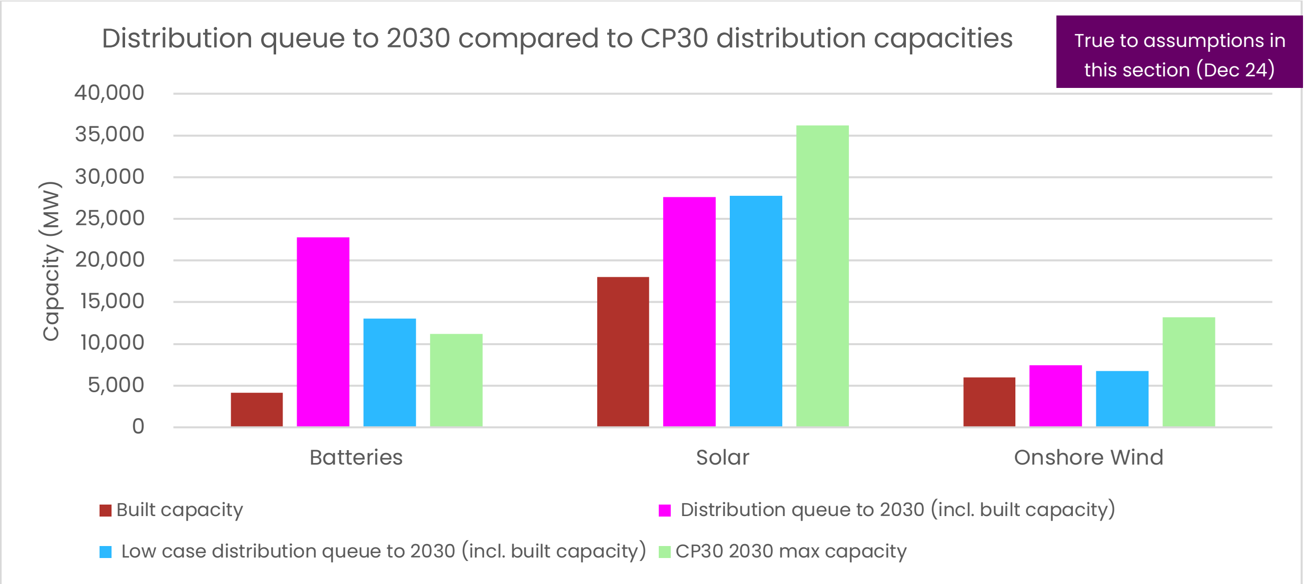

Figure 44. Distribution queue to 2030 compared to CP30 distribution permitted capacities

Figure 44 above shows the distribution-connected queue to 2030 compared to the distribution element of the CP30 permitted capacities to 2030. The distribution-connected queue only corresponds to those distribution-connected projects that would be in scope of connections reform, therefore it doesn't include all distribution-connected projects. The graph excludes nuclear or interconnectors as these don't tend to connect to the distribution network. Of the remaining technologies, the trends are similar to the combined transmission and distribution connections graphs to 2030; however, a key difference is solar, which is undersupplied compared to the 2030 permitted capacities. Onshore wind is likely to be undersupplied in terms of 'ready' projects compared to the CP30 2030 permitted capacity.

To meet Government targets for solar requires significant roll out of this technology. In developing our advice to Government our modelling indicated that the most efficient point to connect significant volumes of new solar was to the distribution network.

Government has not included micro solar in the CP30 2030 and 2035 permitted capacities for solar at a distribution level. If we also took account of micro solar this would significantly reduce or remove the theoretical 'undersupply' of solar shown in **Error! Reference source not found.**.

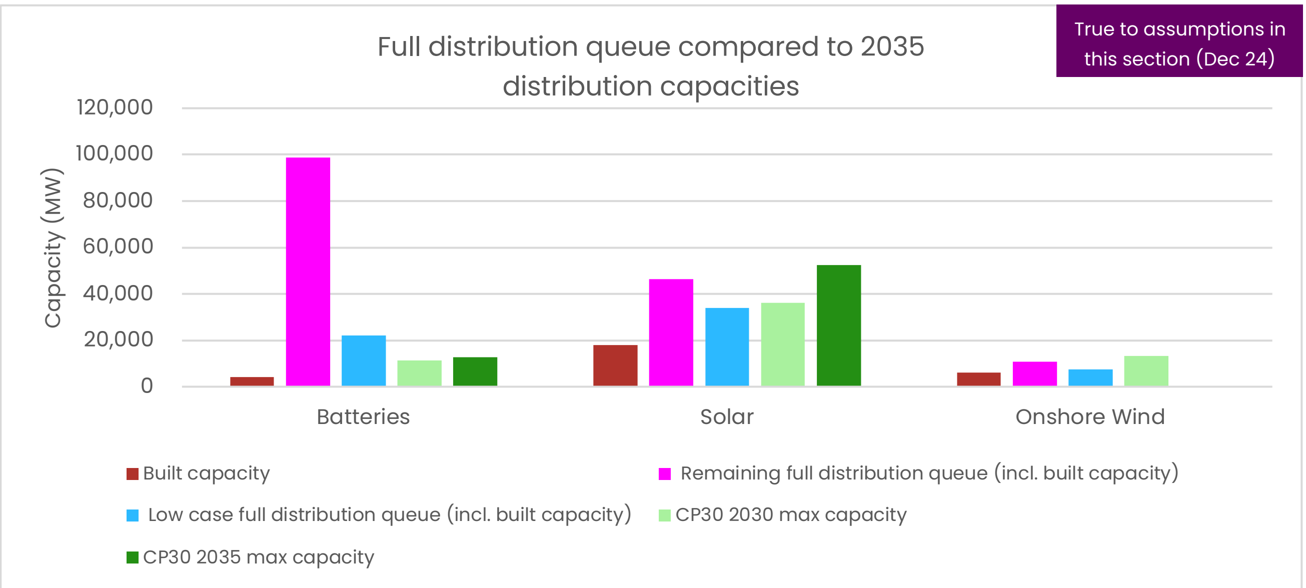

Figure 45. Full distribution queue compared to CP30 2035 distribution permitted capacities

Figure 45 shows the full distribution queue compared to the CP30 2035 distribution permitted capacities. Batteries exhibit a significantly higher capacity in the full distribution queue, ranging between 90 and 100GW, compared to much lower figures in the 2030 and 2035 permitted capacities, indicating a potentially large oversupply of 'ready' projects. Solar and onshore wind are likely to be undersupplied in terms of 'ready' projects compared to the CP30 2035 permitted capacities (although the undersupply in solar may be mitigated by micro solar as referred to earlier).

Transmission analysis

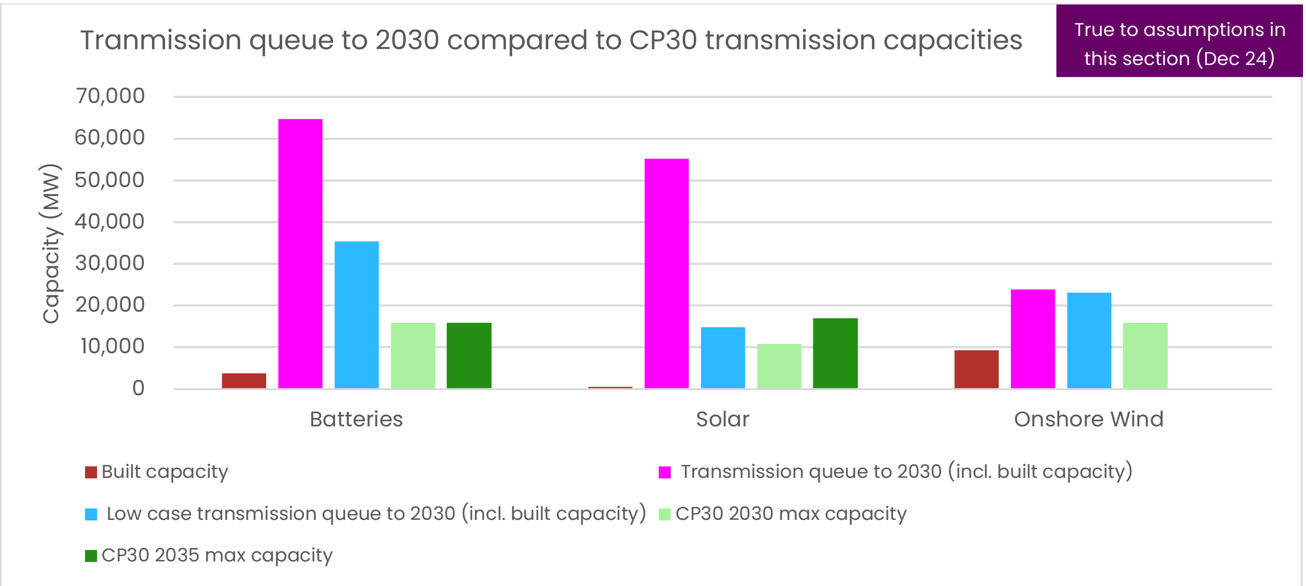

Figure 46. Transmission queue to 2030 compared to CP30 transmission permitted capacities

Figure 46 above shows the transmission-connected queue to 2030 compared to the transmission element of the CP30 Plan, to 2030. The trends are similar to the combined transmission and distribution connections (queue to 2030) graphs to 2030, so no further comment is made here.

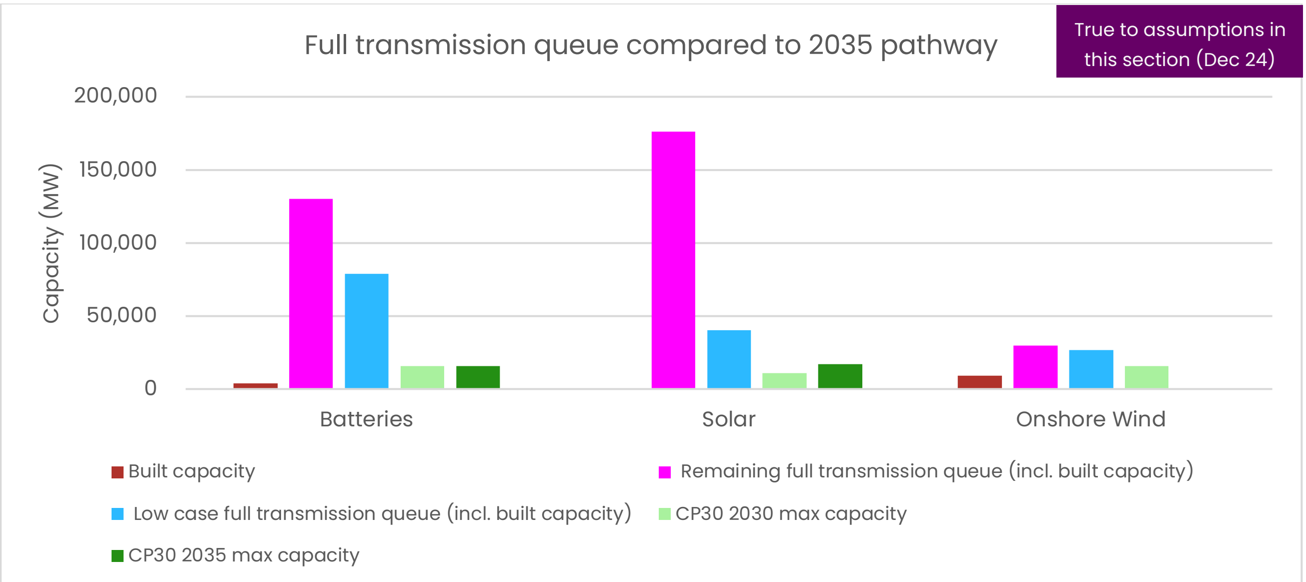

Figure 47. Full transmission queue compared to CP30 2035 permitted capacities

Figure 47 above shows the full transmission-connected queue compared to the transmission element of the CP30 Plan, to 2035. The trends are similar to the combined transmission and distribution connections (full queue) graphs to 2035, so no further comment is made here.

Assumptions/ Notes

- The current built capacity is taken from FES24 Holistic Transition.
- The remainder of assumptions are the same as those in the Full connections queue compared to CP30 2030 and 2035 permitted capacities.

Conclusion - Transmission and Distribution Analysis

- The distribution-connected queue shows potential undersupply, especially for onshore wind and solar projects, although as per the notes above, this may be because we have not included micro solar in our connections queue analysis - but also because there may be a gap between what is currently due to connect and Government policy aspirations (eg shortfall in onshore wind in England and Wales). There are also other limitations to the distribution data, as listed above, that mitigate the potential scale of undersupply, so figures need to be treated with caution.
- The transmission-connected queue trends are similar to those of the full transmission-connected and distribution-connected queue.

7. Locational Analysis

The following section shows the full queue and the estimated low case “ready” queue compared to the permitted capacities in the CP30 Plan, split by transmission- and distribution-connected zone. As set out earlier, this analysis only focuses on onshore wind, batteries and solar as these are technologies that have a zonal or transmission- and distribution-connected split of permitted capacities within the CP30 Action Plan.

Location Analysis by transmission zone for transmission-connected queue

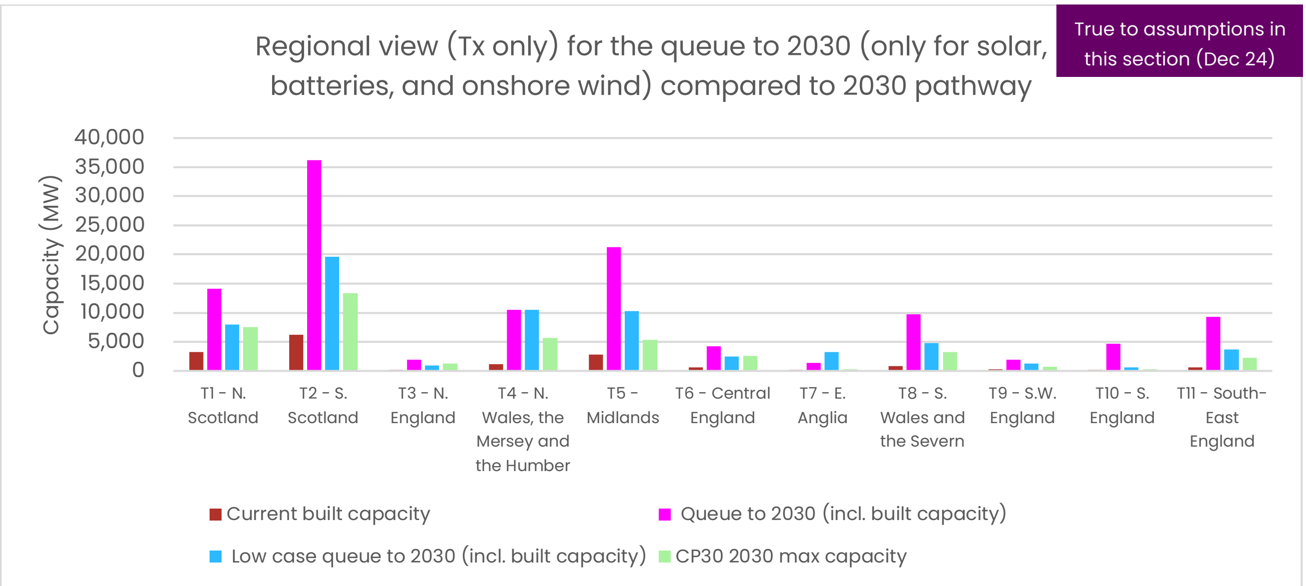

Figure 48. Regional view (Tx only) for the queue to 2030 (only for solar, batteries, and onshore wind) compared to 2030 permitted capacities

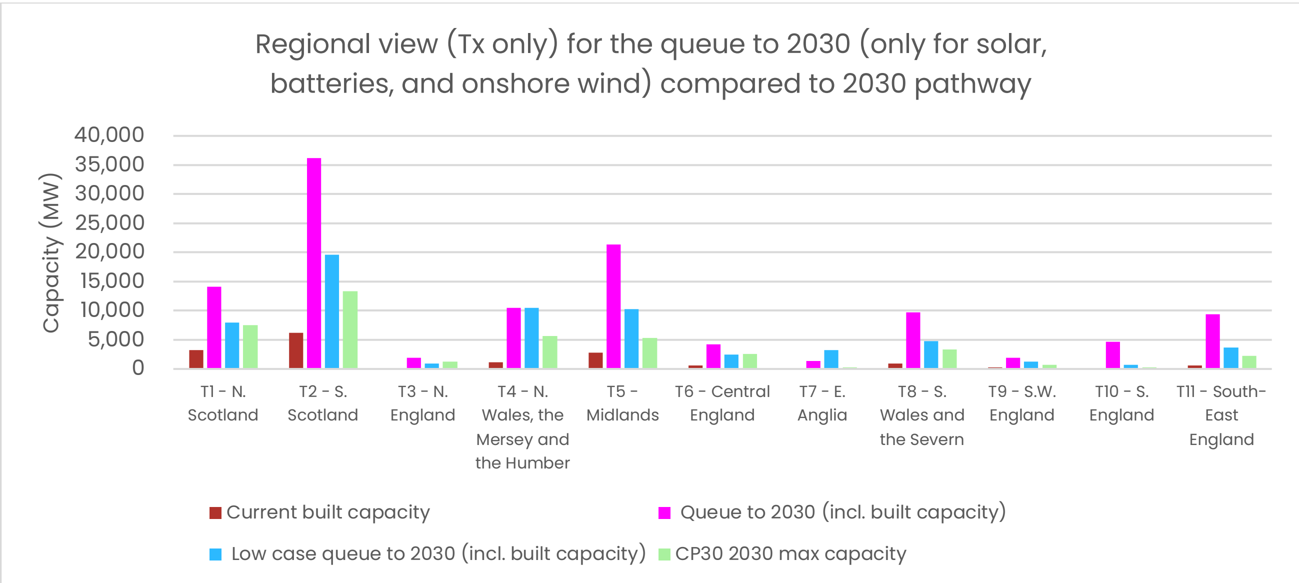

Figure 48 shows significant zonal variations in capacity for solar, batteries, and onshore wind in the queue to 2030 compared to the CP30 2030 permitted capacities.

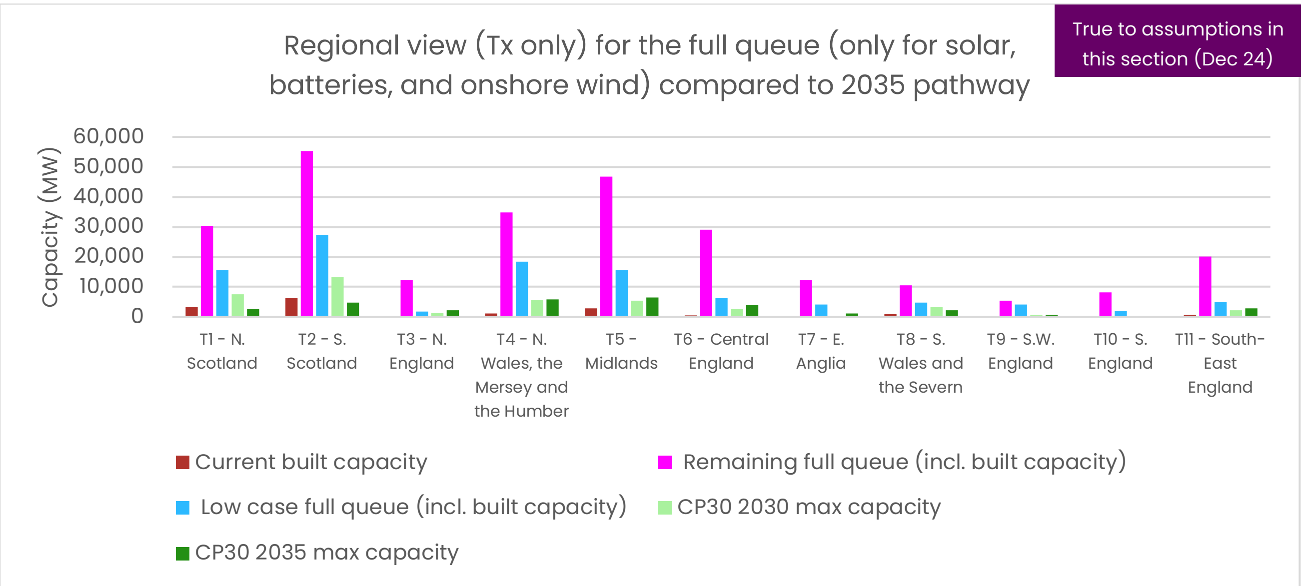

Figure 49. Regional view (Tx only) for the full queue (only for solar, batteries, and onshore wind) compared to 2035 permitted capacities

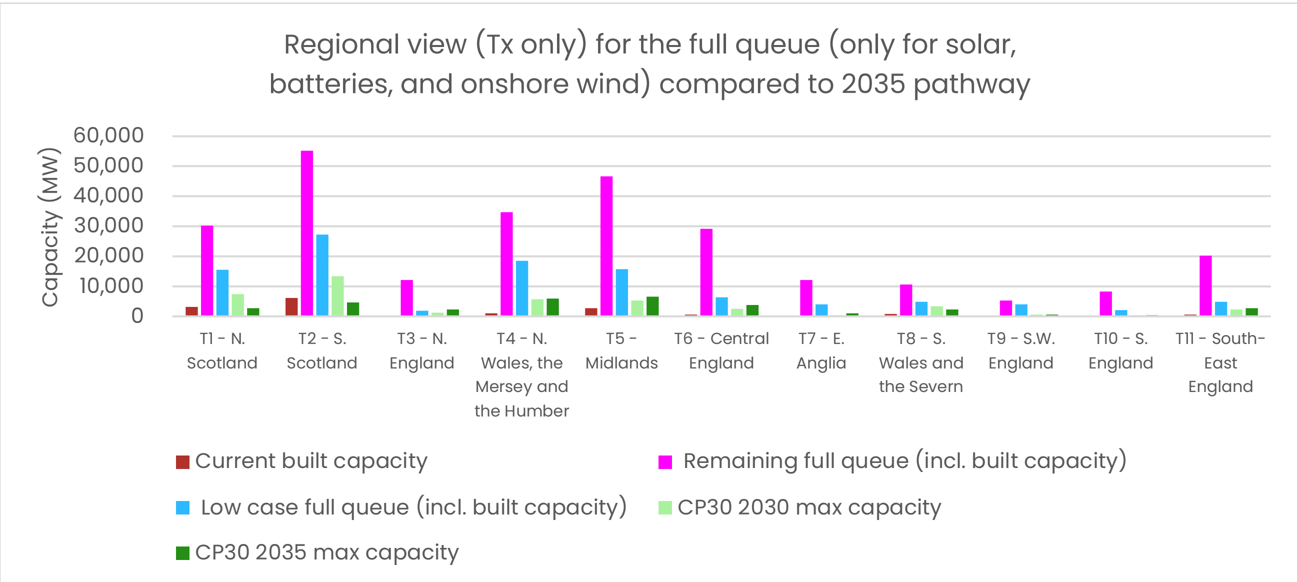

Figure 49 continues to shows significant zonal variations in capacity for solar, batteries, and onshore wind in the full queue compared to the CP30 2035 permitted capacities, with oversupply of 'ready' projects across all zones, largely driven by batteries.

Zonal transmission queue

Transmission queue to 2030 and low readiness case to 2030 split by each technology transmission zone against the CP30 2030 permitted capacities for batteries, solar and onshore wind

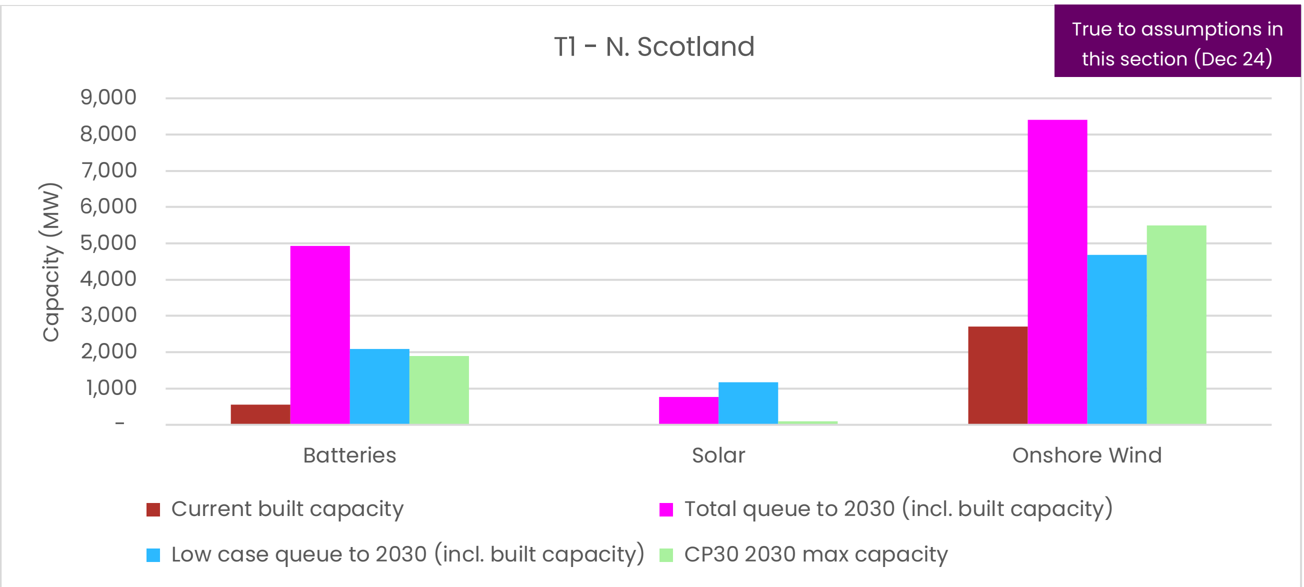

Figure 50. T1 – N. Scotland - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

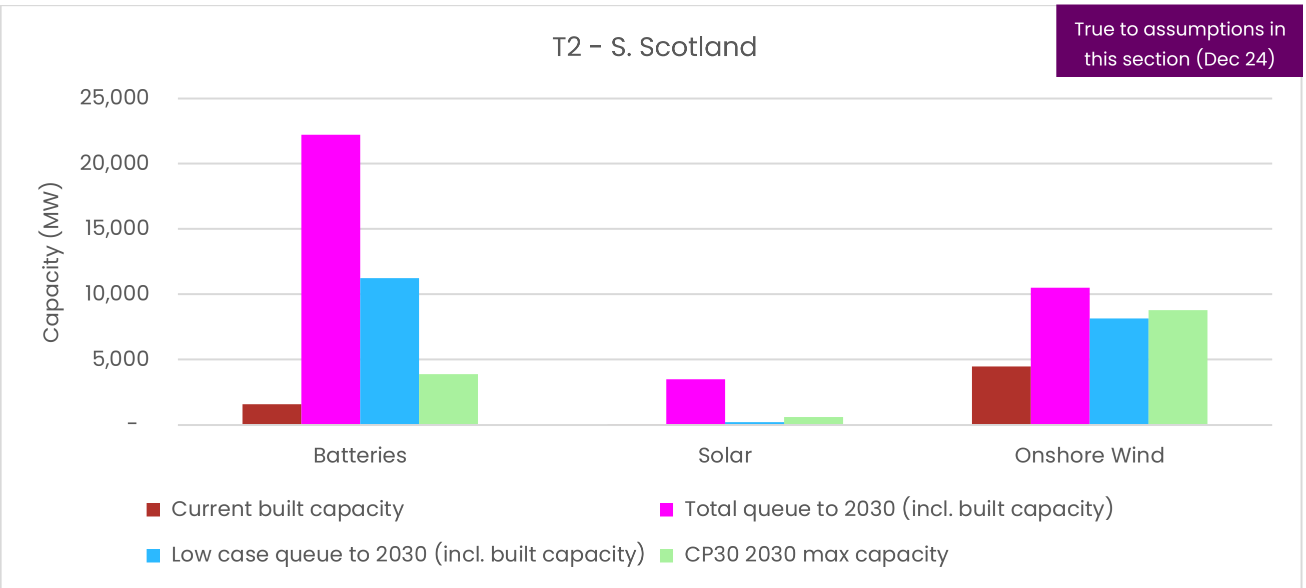

Figure 51. T2 – S. Scotland - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

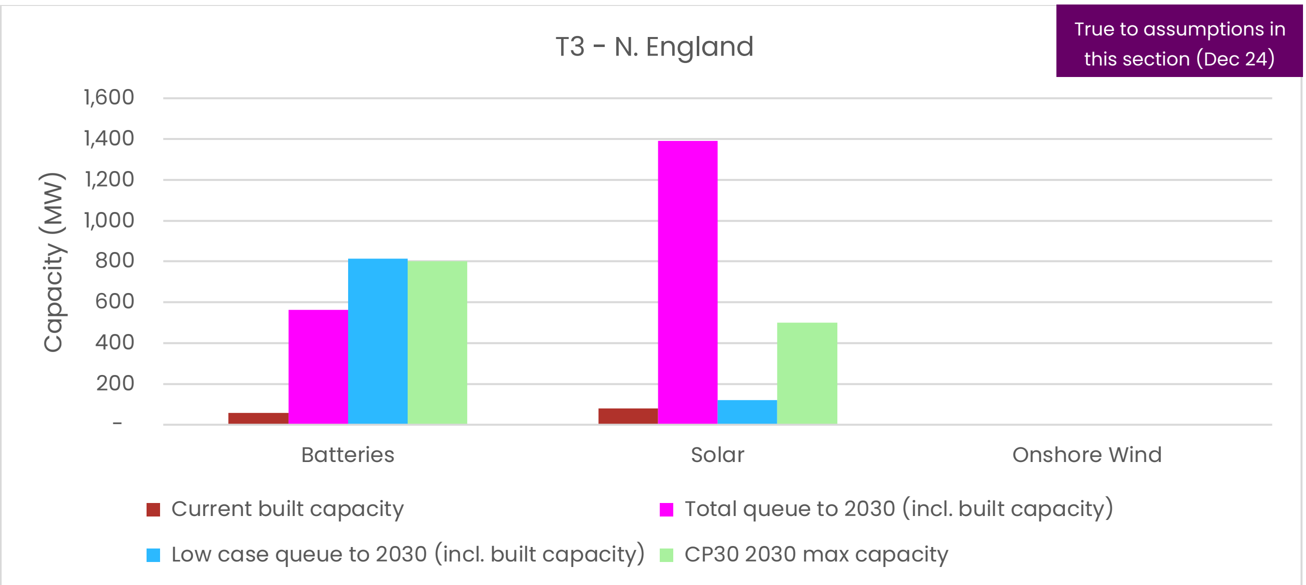

Figure 52. T3 – N. England - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

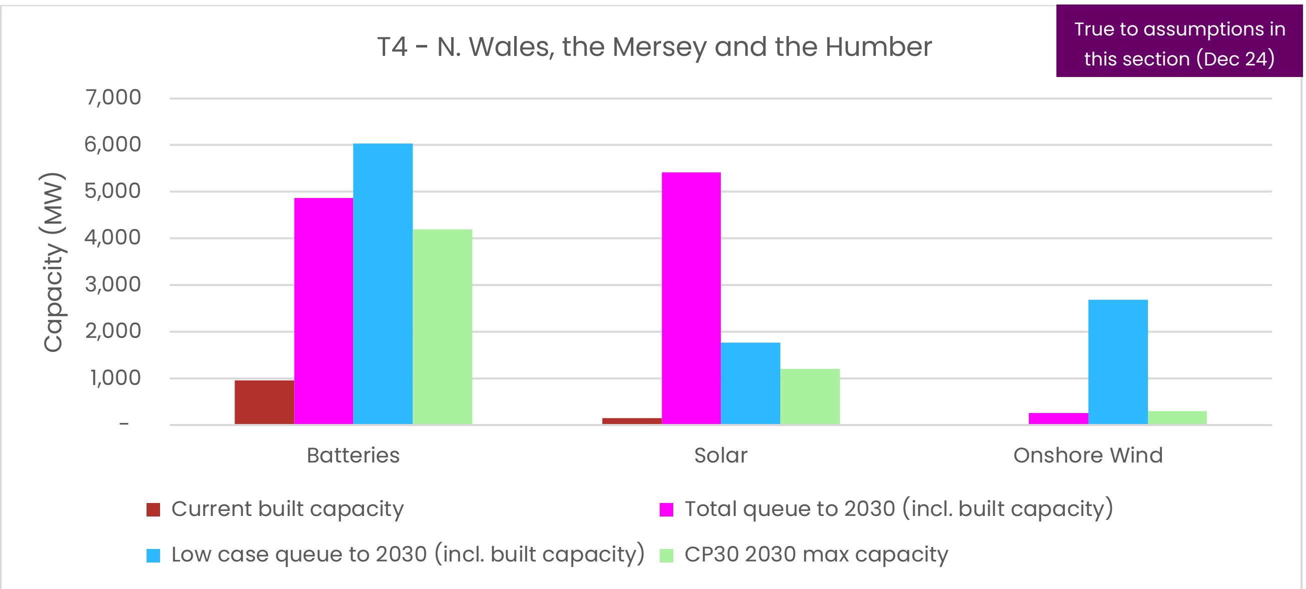

Figure 53. T4 – N. Wales, the Mersey and the Humber - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

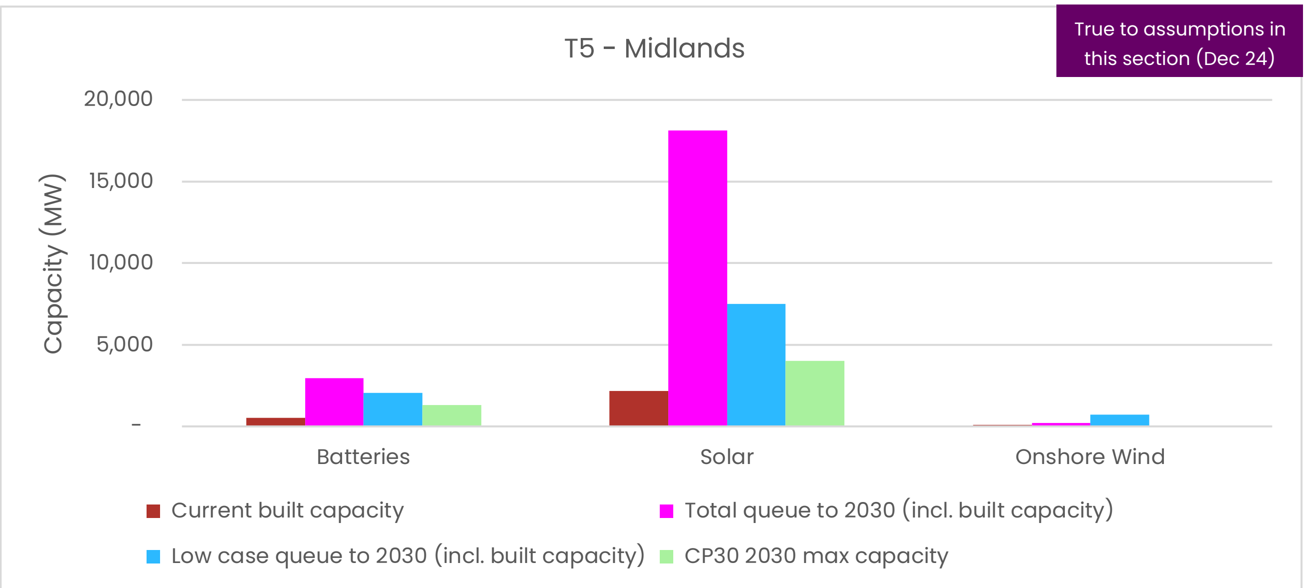

Figure 54. T5 – Midlands - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

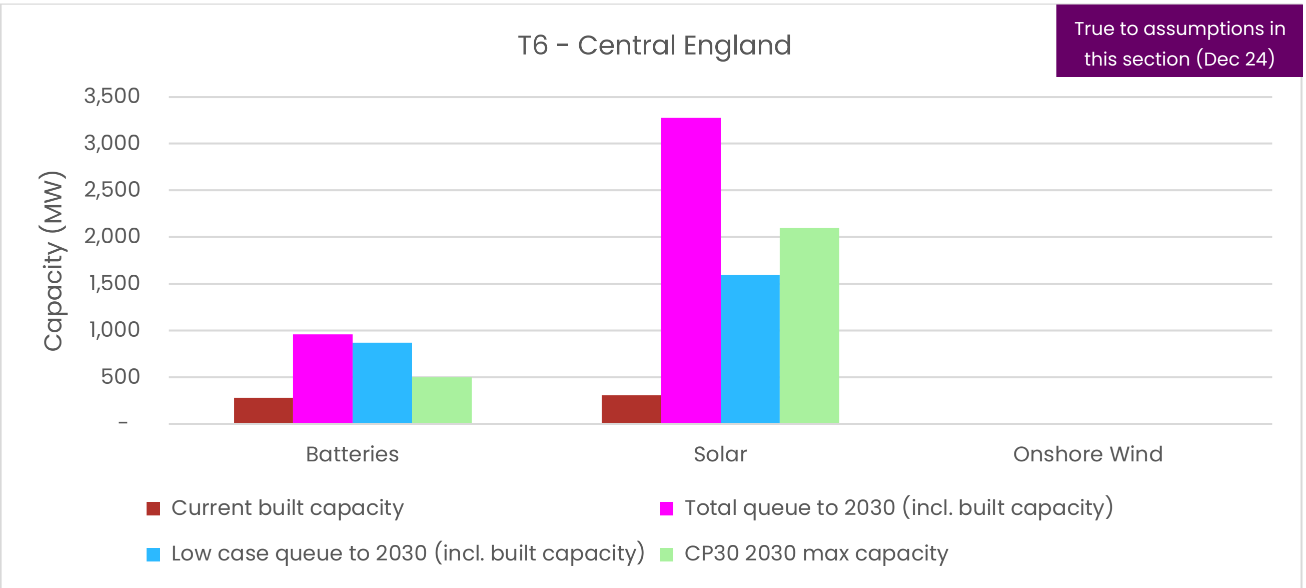

Figure 55. T6 – Central England - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

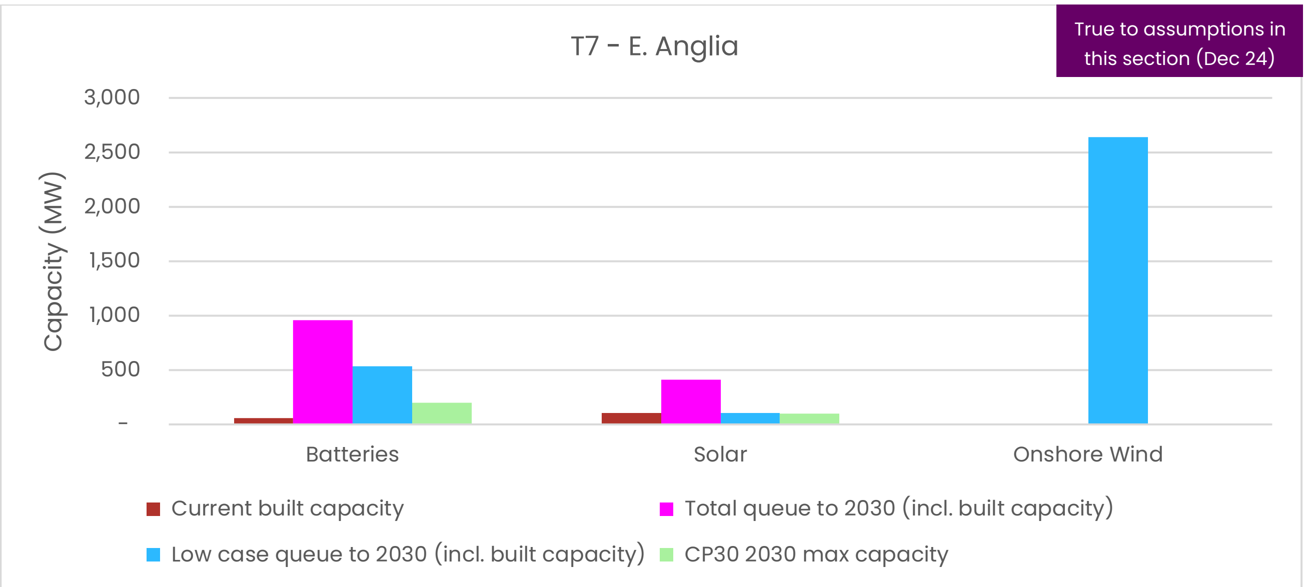

Figure 56. T7 – E. Anglia - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

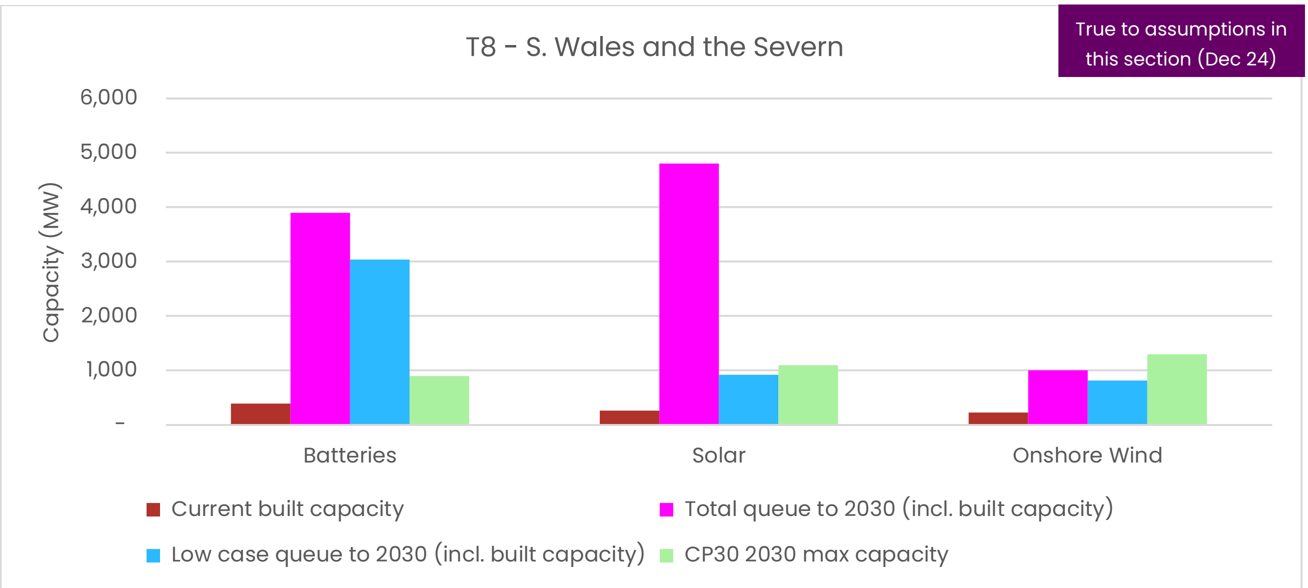

Figure 57. T8 S. Wales and the Severn - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

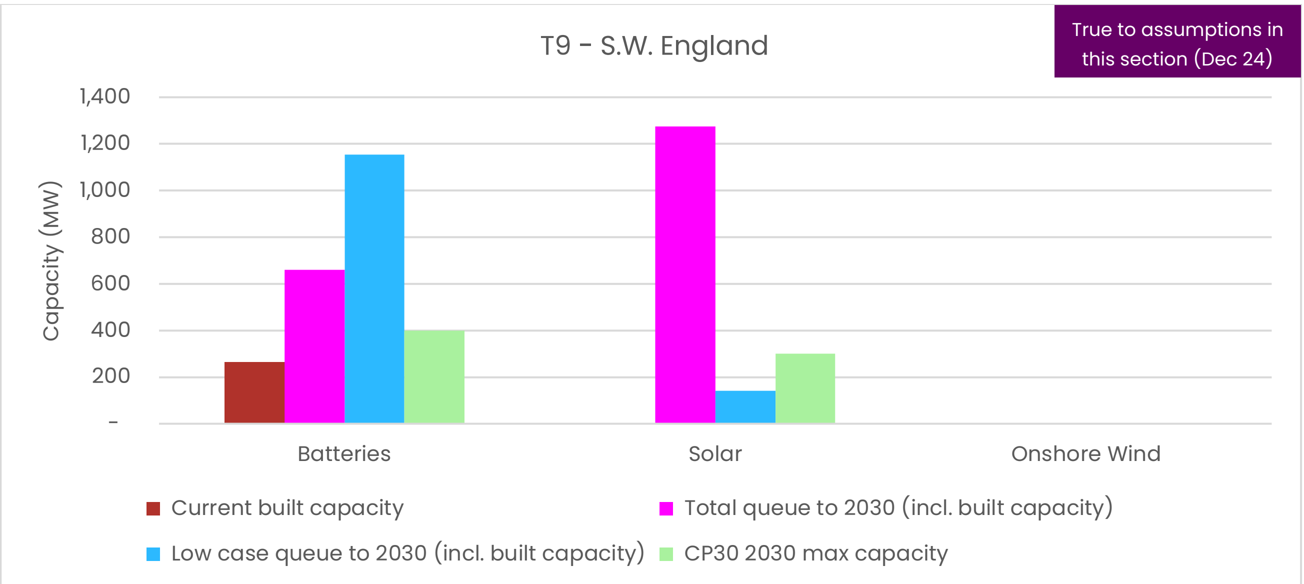

Figure 58. T9 – S.W. England - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

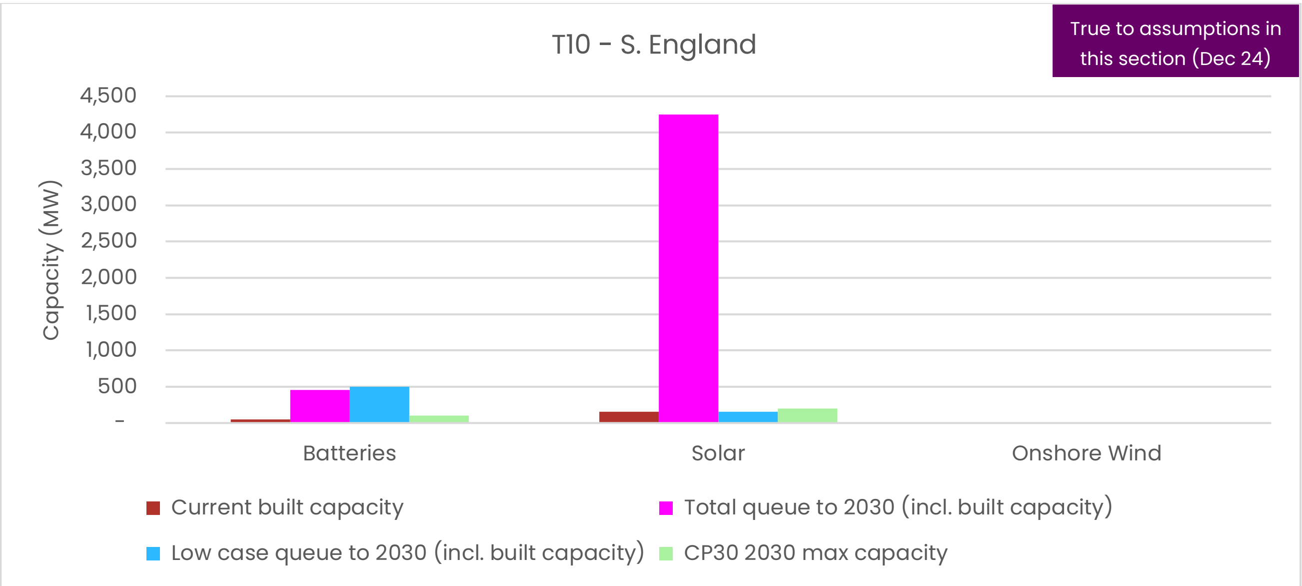

Figure 59. T10 – S. England - Transmission queue to 2030 and low readiness case to 2030 split by technology transmission zone against the CP30 2030 permitted capacities

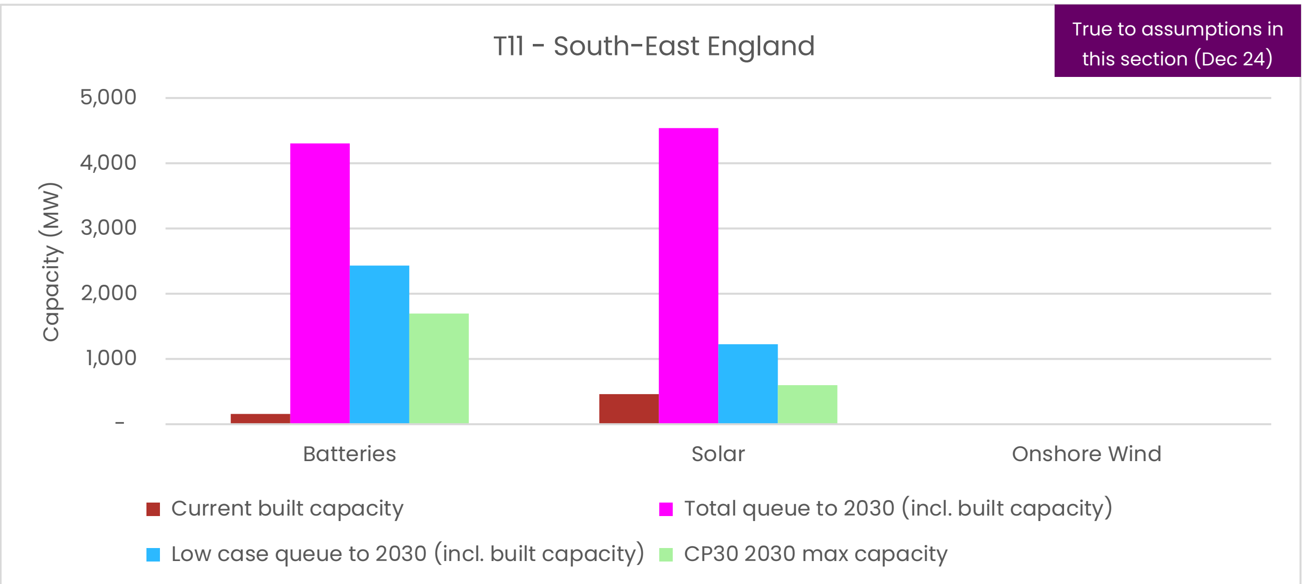

Figure 60. T11 - South-East England - Transmission queue to 2030 and low readiness case to 2030 split by technology the transmission zone against the CP30 2030 permitted capacities

Full transmission Queue by zone compared to CP30 2035 permitted capacities, for onshore wind, solar and batteries

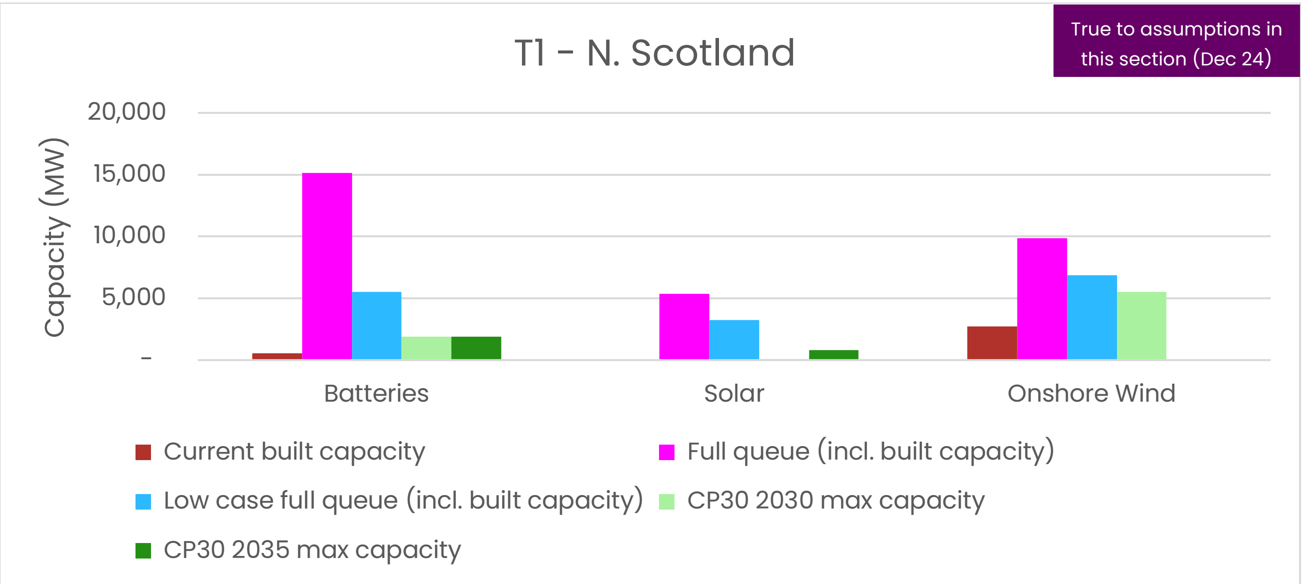

Figure 61. T1 - N. Scotland - Full transmission queue compared to CP30 2035 permitted capacities

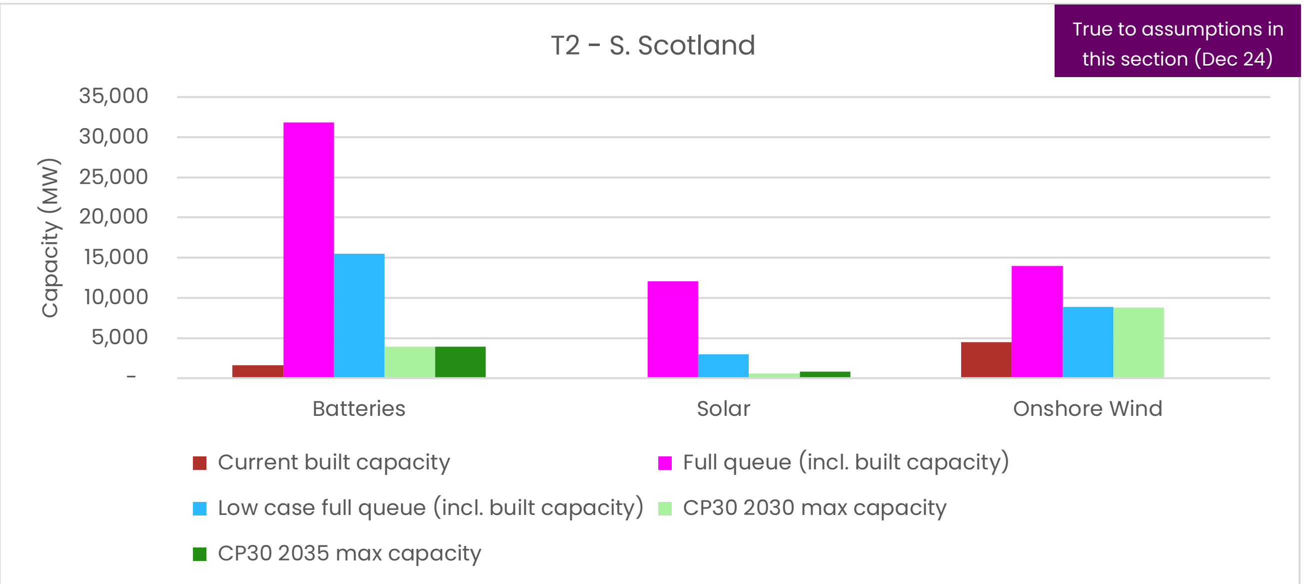

Figure 62. Central England - Full transmission queue compared to CP30 2035 permitted capacities

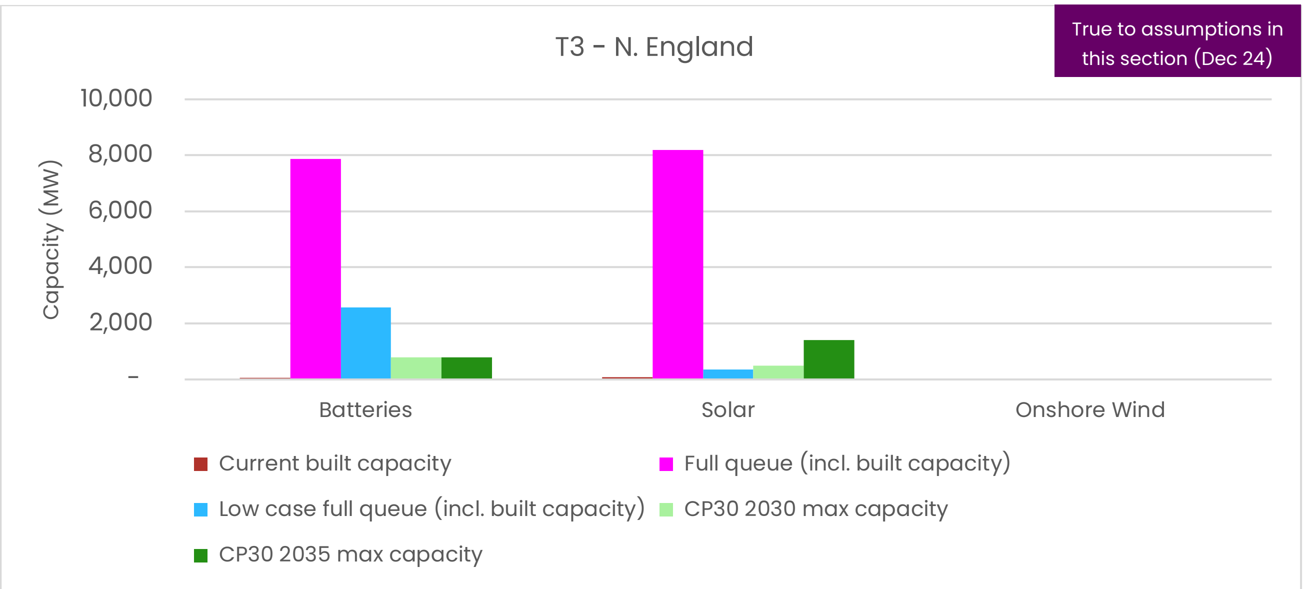

Figure 63. T3 – N. England - Full transmission queue compared to CP30 2035 permitted capacities

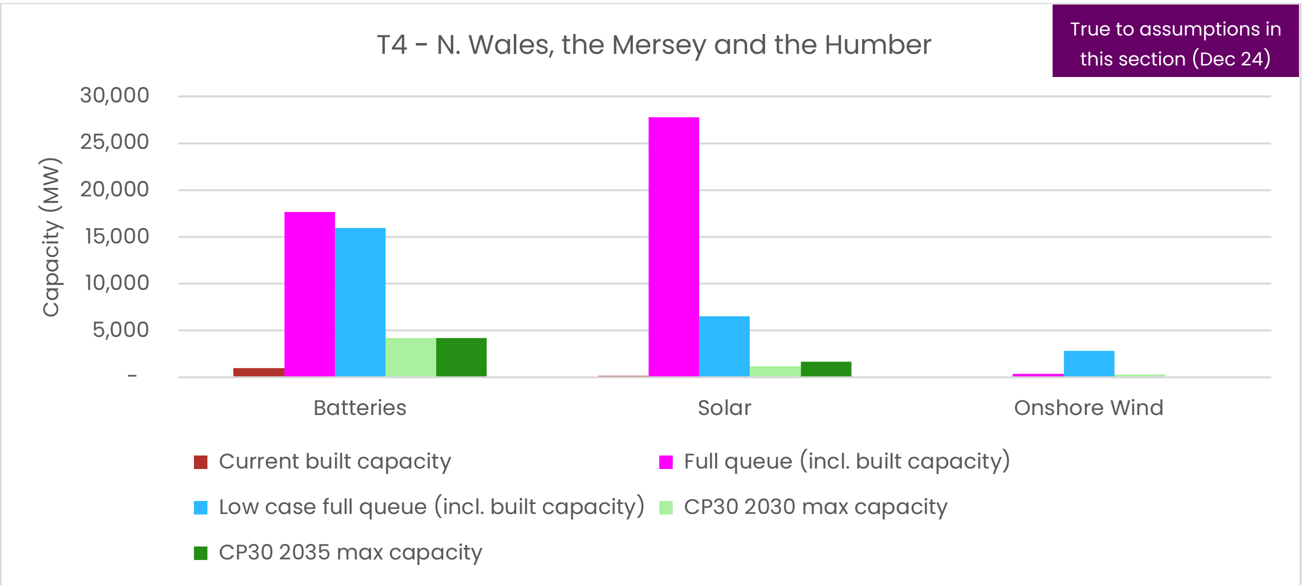

Figure 64. T4 – N. Wales, the Mersey and the Humber - Full transmission queue compared to CP30 2035 permitted capacities

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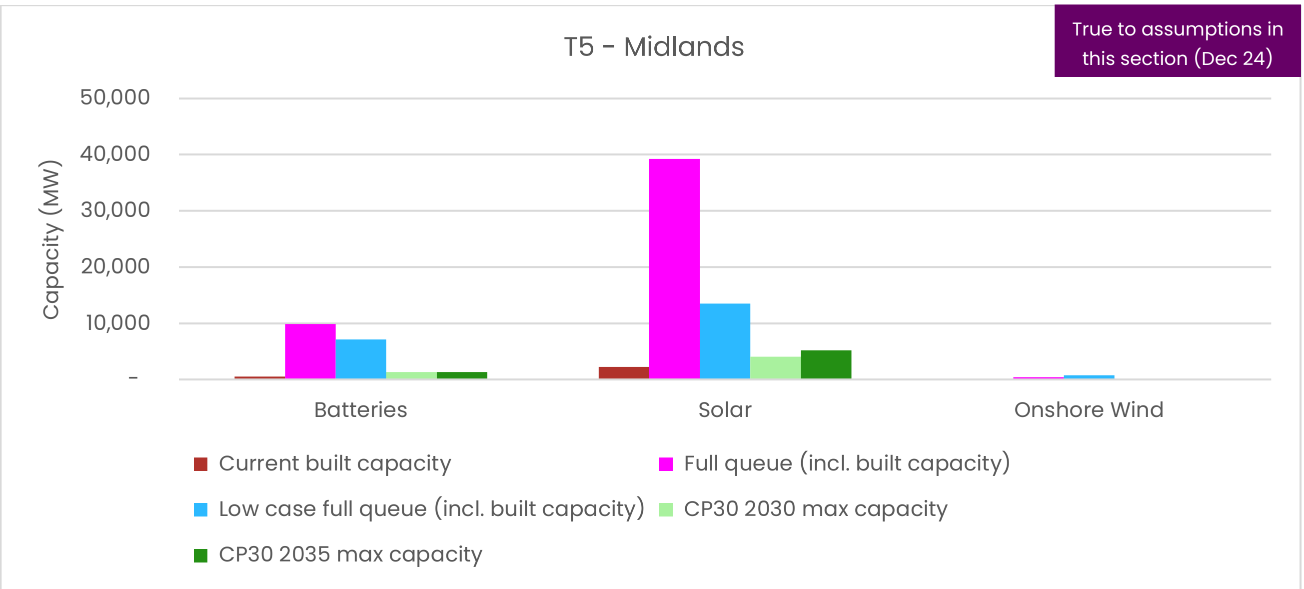

Figure 65. T5 - Midlands - Full transmission queue compared to CP30 2035 permitted capacities

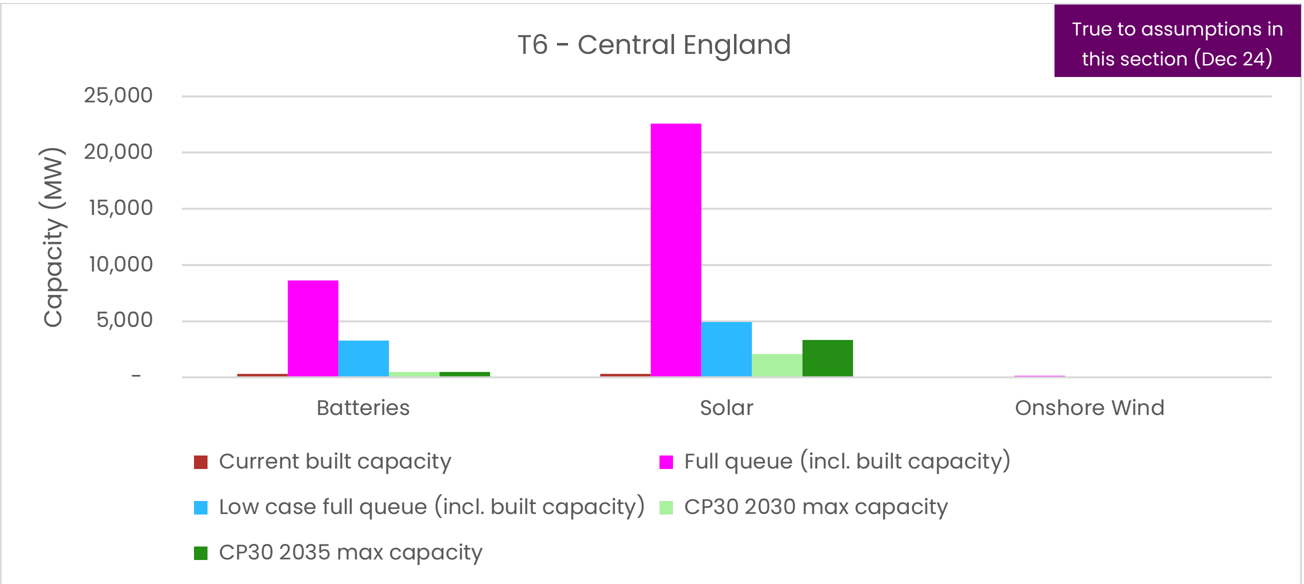

Figure 66. T6 – Central England - Full transmission queue compared to CP30 2035 permitted capacities

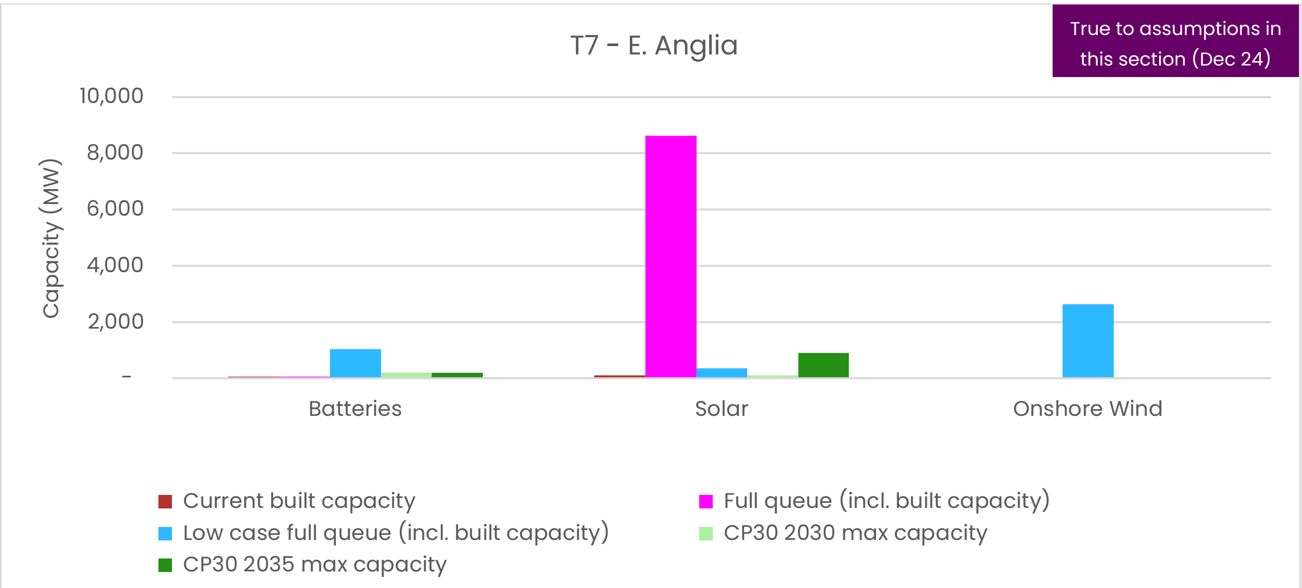

Figure 67. T7 – E. Anglia - Full transmission queue compared to CP30 2035 permitted capacities

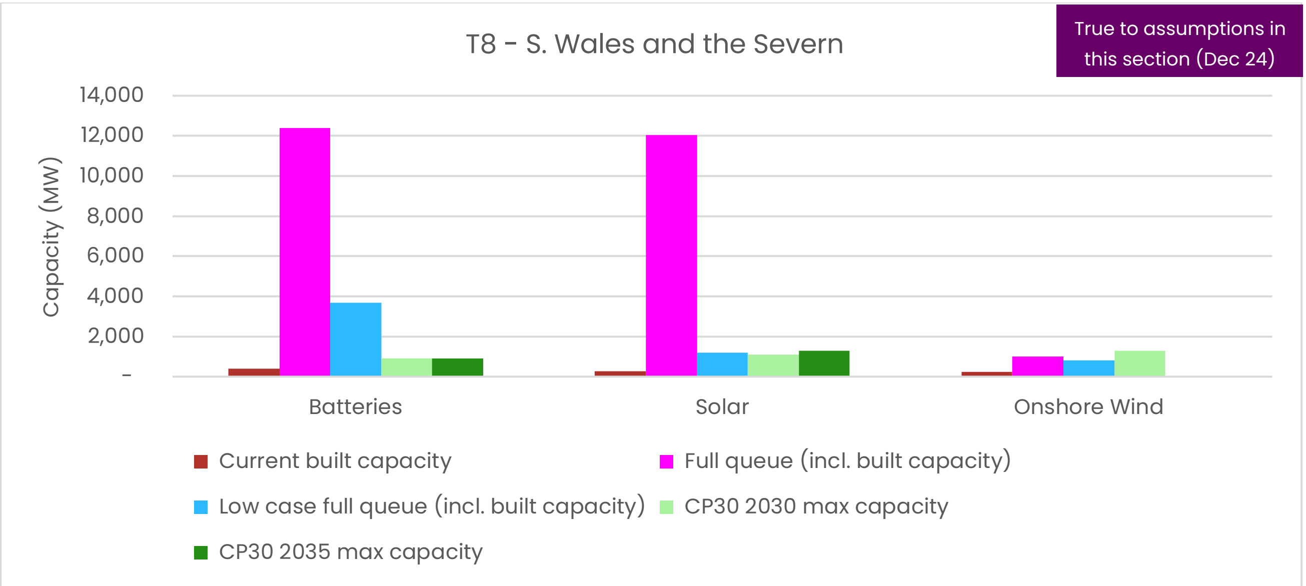

Figure 68. T8 – S. Wales and the Severn - Full transmission queue for S. Scotland compared to CP30 2035 permitted capacities

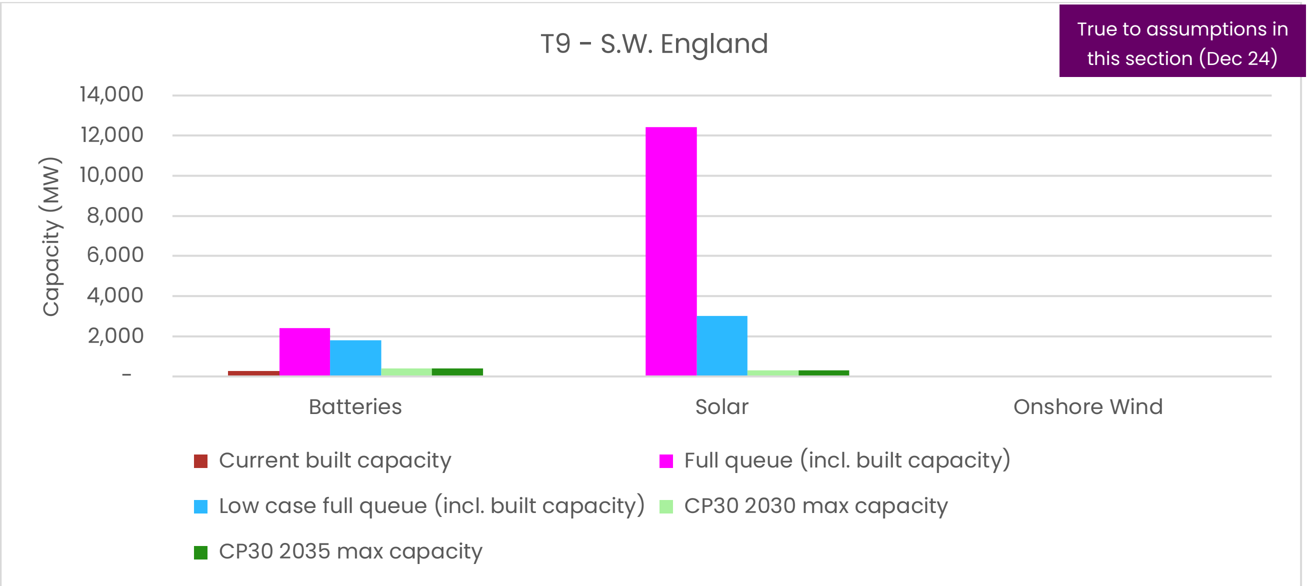

Figure 69. T9 - S.W. England - Full transmission queue compared to CP30 2035 permitted capacities

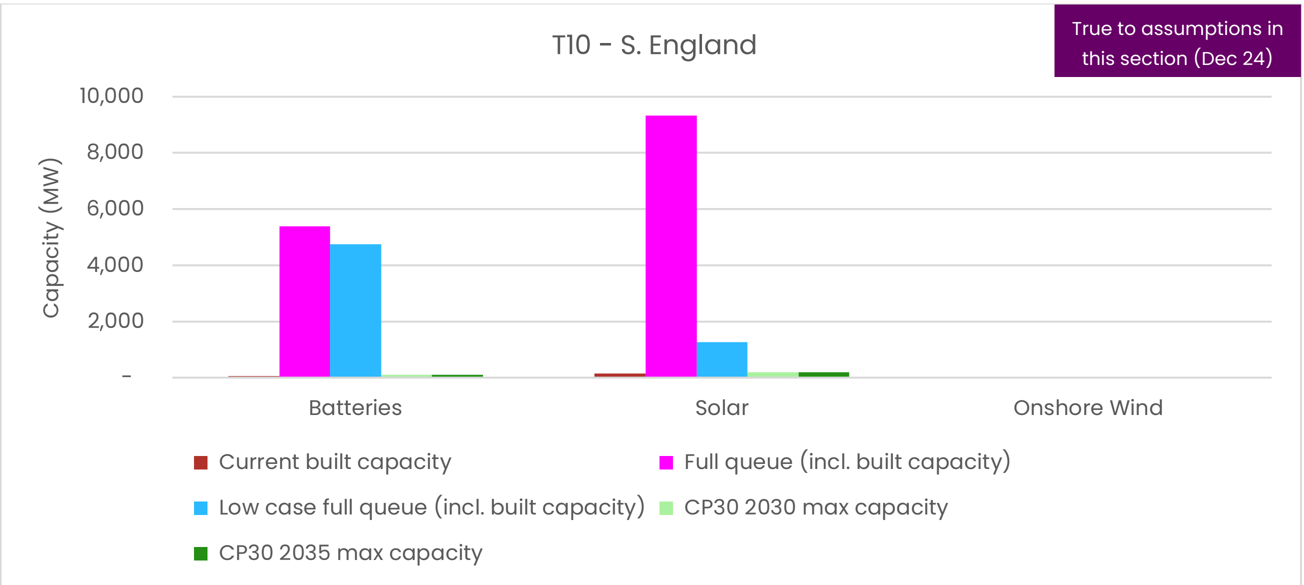

Figure 70. T10 – S. England - Full transmission queue compared to CP30 2035 permitted capacities

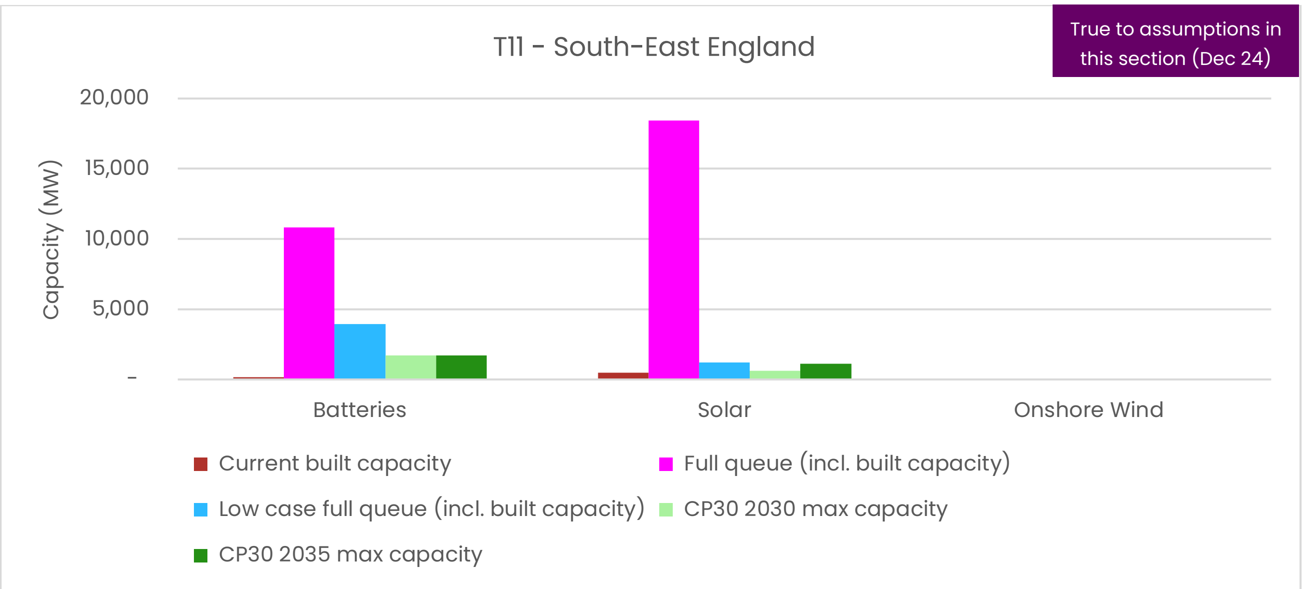

Figure 71. T11 - South- East England - Full transmission queue compared to CP30 2035 permitted capacities

Figures 50-71 above show the whole queue and the low case readiness queue mapped against each of the 11 zones for transmission-connected projects.

These graphs show some variations by zone. The generation capacity in the CP30 permitted capacities for 2030 and 2035 generally align to where there are already projects in the queue for that zone (with some exceptions where there is undersupply of 'ready' projects particularly in the 2030 permitted capacity period), therefore the majority of what is required for clean power 2030 and for the 2035 period at transmission level can be met by the existing 'ready' queue.

Undersupply is somewhat evenly distributed between zones, but there is much less undersupply compared to the 2035 permitted capacities, with only 3 cases of undersupply of 'ready' projects out of 33 technology zones (3 technologies x 11 zones). The largest amount of undersupply of 'ready' projects for the total transmission queue in any single zones is never higher than 2GW, compared to 2035 permitted capacities.

Figures 50-71 also show that overall generation capacity (full queue) is far higher in some zones compared to 2035 permitted capacities, particularly with regards batteries. In terms of 'low case ready' projects, this oversupply is typically no more than 2GW; however, in two instances there is c10GW of oversupply of batteries and in two instances there is oversupply of over c5GW of solar.

However, the above graphs do not show the zonal breakdown of projects that would be protected through having secured planning consent, so where there is oversupply of 'ready' projects, this does not always mean that all that oversupplied capacity would be removed from the new connections queue (as some of the oversupply may have secured planning consent before 'go live' of connections reform).

Finally, the CP30 2035 permitted capacities for onshore wind are not shown in the graphs as the 6GW uplift in the CP30 Action Plan has not been assigned to specific zones and/or to transmission or distribution-connected zones.

Assumptions/ Notes

- Current built capacity differs to previous model as it is created from projects listed as built or have connection dates in the past that are in the TEC Register. Note that this provides a lower estimate of built capacity than from our previous assumptions (using CP30 estimates).
- The current built capacity is included in the full queue and low case for all graphs.
- Projects have been mapped to each zone based on their sub-station location. 99.8% of projects were matched to a location.
- The remainder of assumptions are the same as those in section: Full connections queue compared to 2030 and 2035 permitted capacities.

Location Analysis by DNO Region (Distribution-connected Queue)

For distribution connections analysis, our data sources have limitations. The data used provides high level connections per zone and for a significant portion (45%) of the distribution queue does not provide the connection dates. These projects have been excluded from our analysis of the queue to 2030.

Therefore, it should be noted that the data in the following tables may be a significant underestimate of actual connections queue figures.

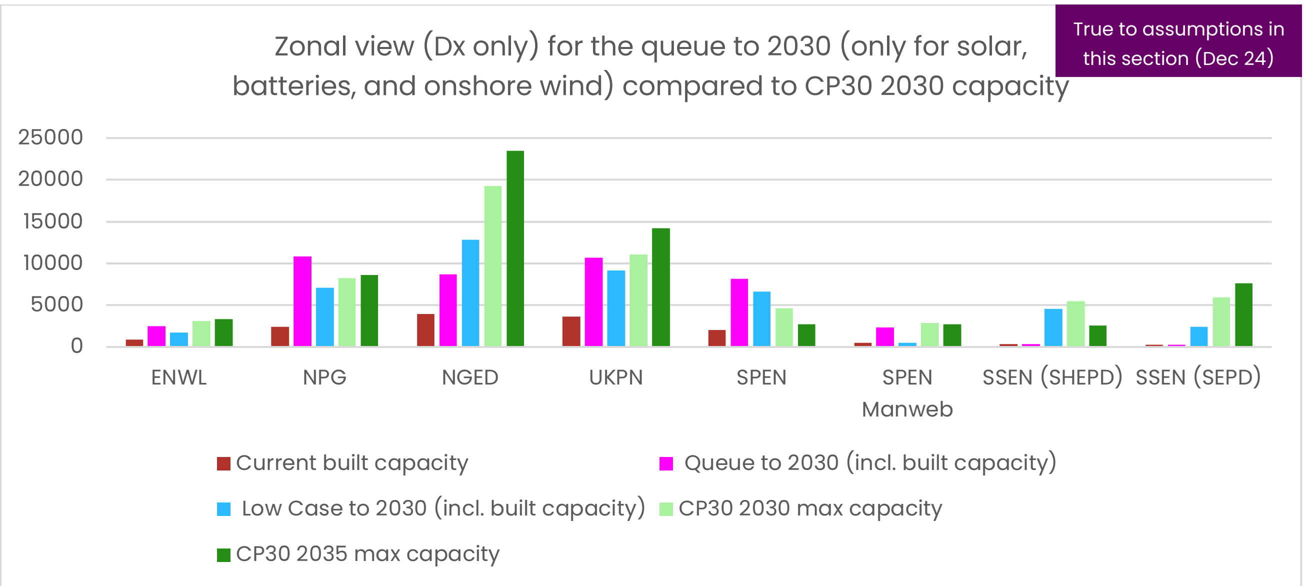

Figure 72. High-level zonal view of the distribution-connected queue and low case readiness to 2030 (only for solar, batteries, and onshore wind) by distribution zone against CP30 permitted capacities to 2030

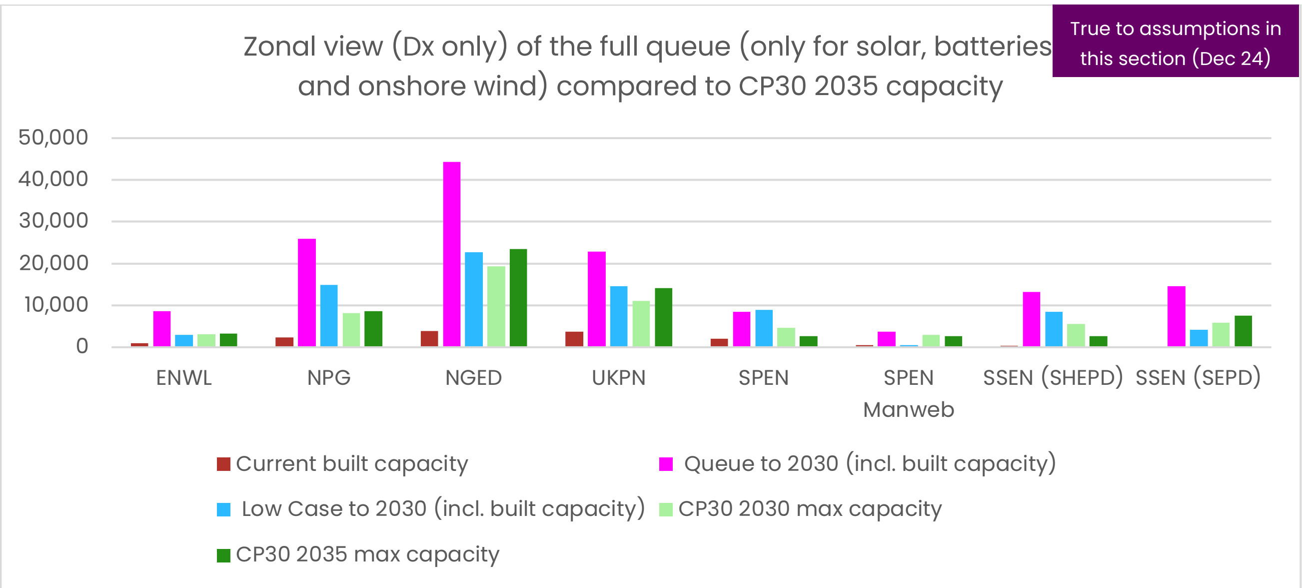

Figure 73. High-level zonal view (Dx only) of the full queue and 'low case readiness' queue (only for solar, batteries, and onshore wind) by distribution zone against CP30 permitted capacities to 2035

Figure 73 shows a more complete picture of the dx queue, which shows there is a potential oversupply for all zones in the full queue compared to the CP30 2035 permitted capacities. However, taking account of the low case of readiness, there could be undersupply of 'ready' projects in 5 zones relative to CP30 2035 permitted capacities. Earlier comments re micro solar should be noted however, which could significantly reduce any actual undersupply.

Distribution zones

Current distribution queue to 2030 by zone compared to CP30 2030 permitted capacities for onshore wind, solar and batteries

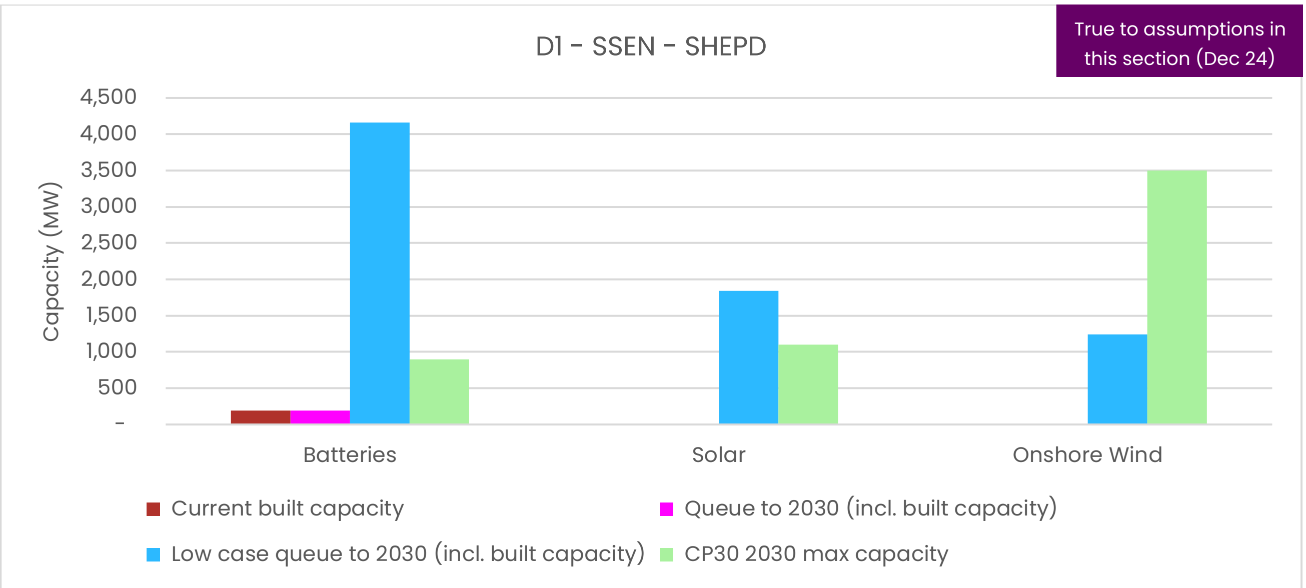

Figure 74. D1 – SSEN - SHEPD – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

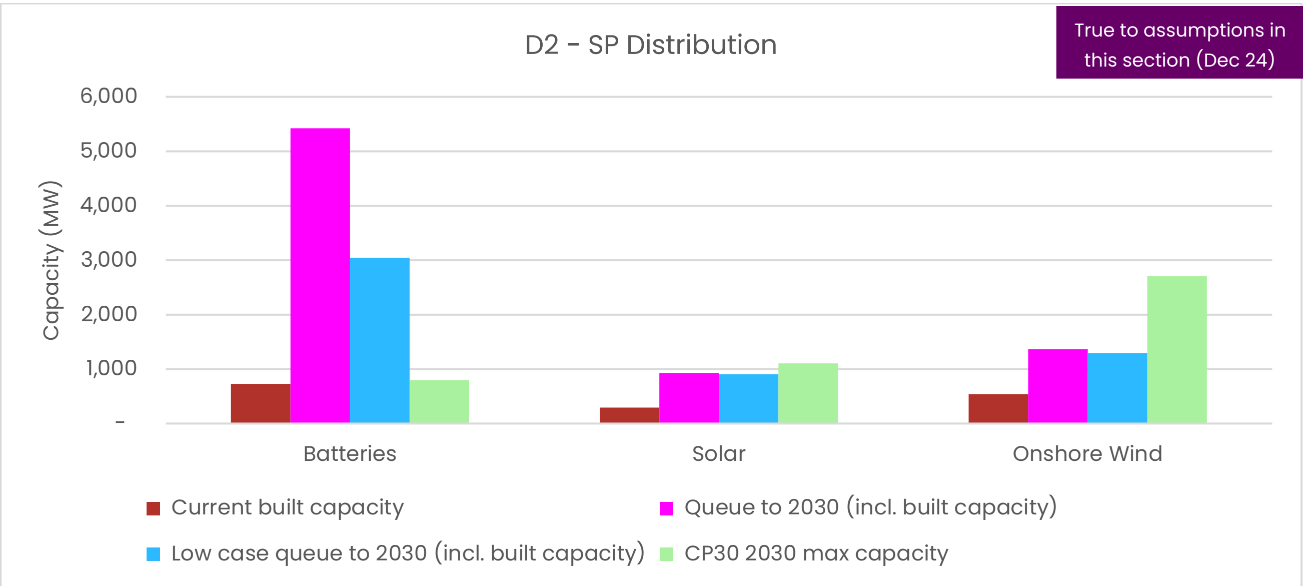

Figure 75. D2 – SP Distribution – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

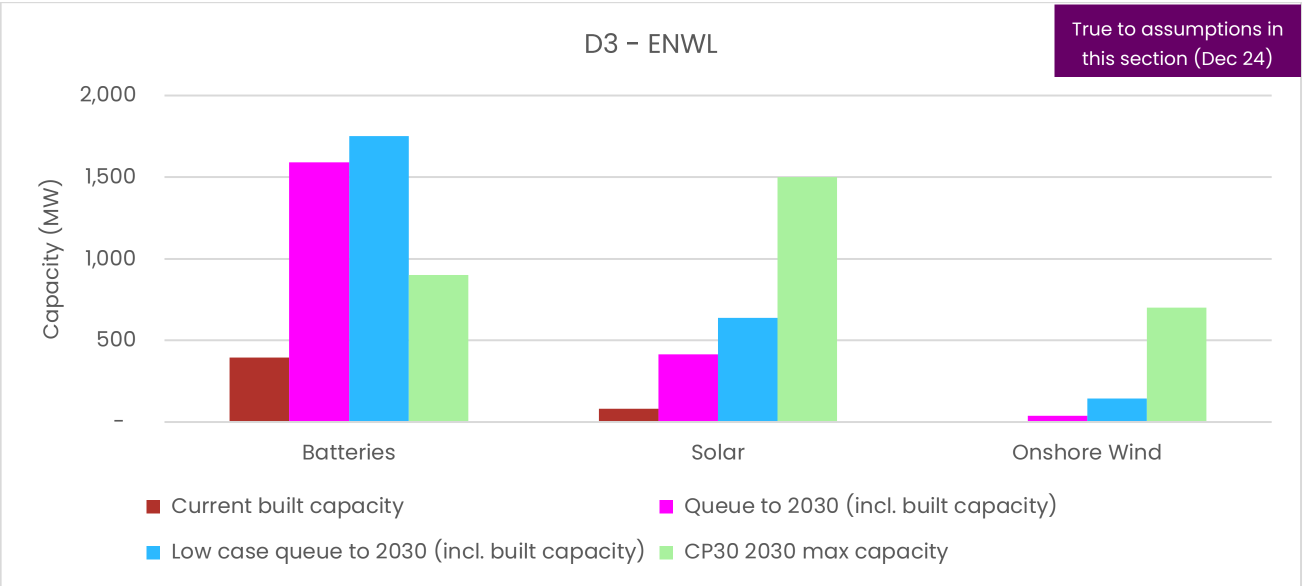

Figure 76. D3 - ENWL – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

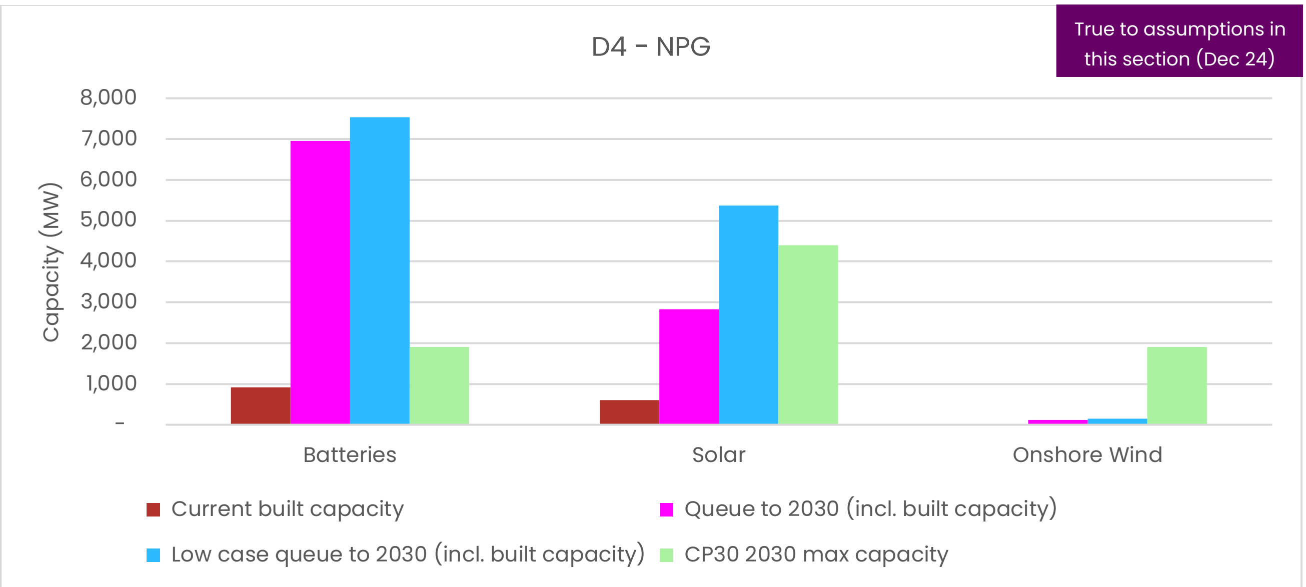

Figure 77. D4 - NPG – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

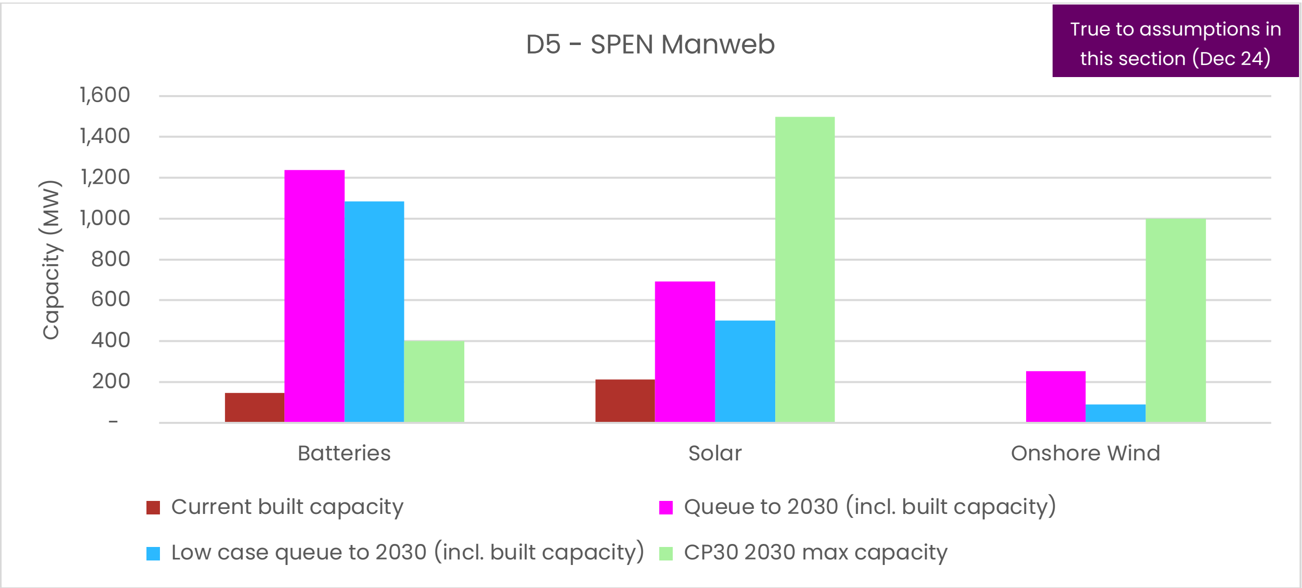

Figure 78. D5 – SPEN Manweb – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

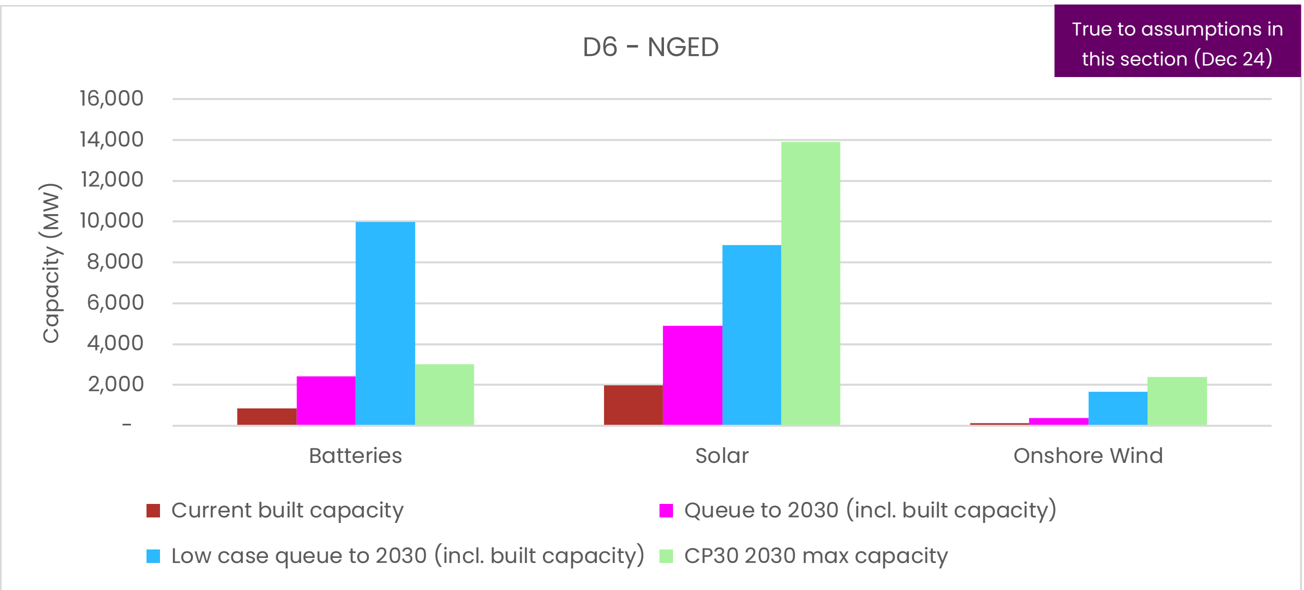

Figure 79. D6 - NGED – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

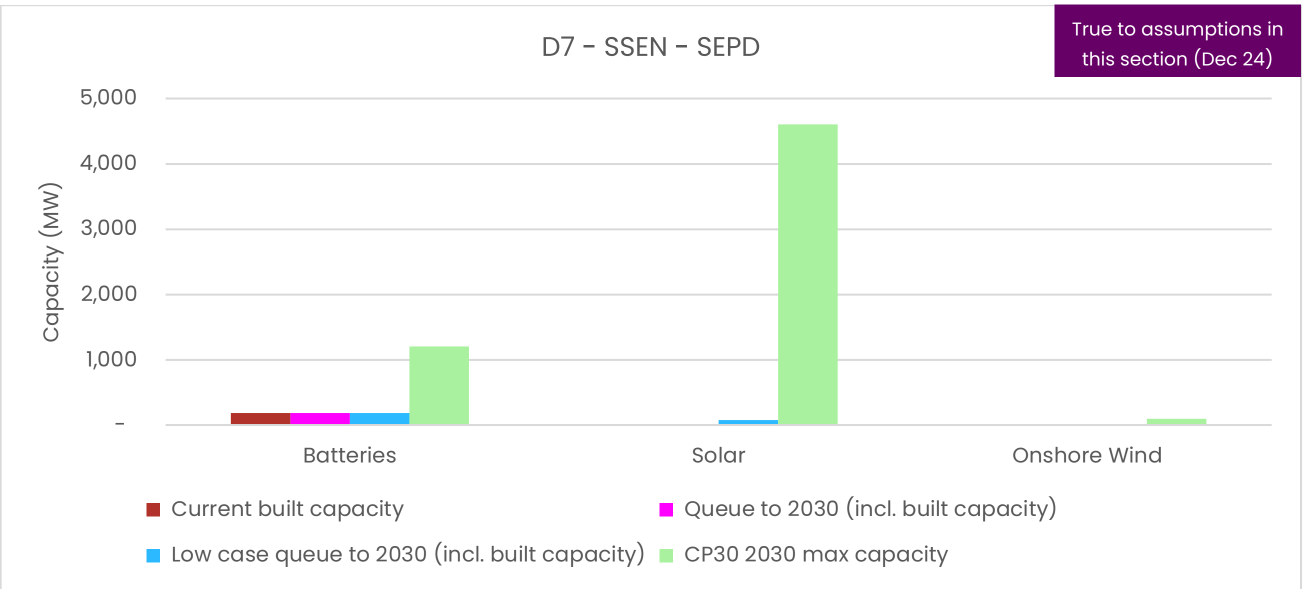

Figure 80. D7 - SSEN - SEPD – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

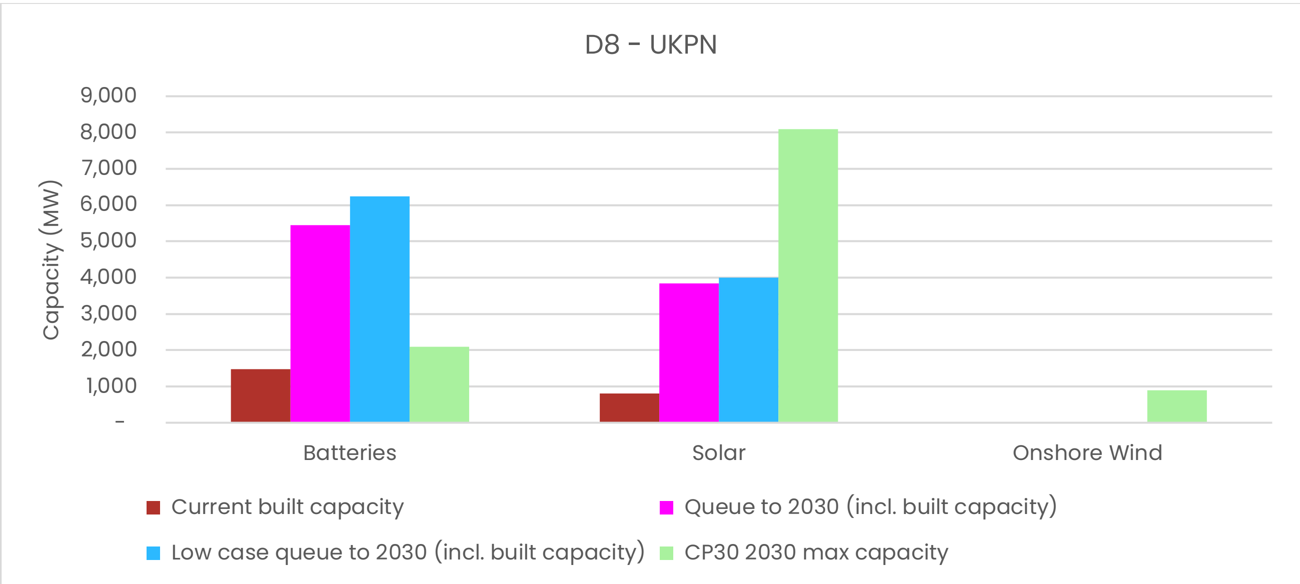

Figure 81. D8 - UKPN – Queue to 2030 and low readiness case queue to 2030 (MW) compared to CP30 2030

Full distribution queue by zone compared to CP30 2035 permitted capacities for onshore wind, solar and batteries

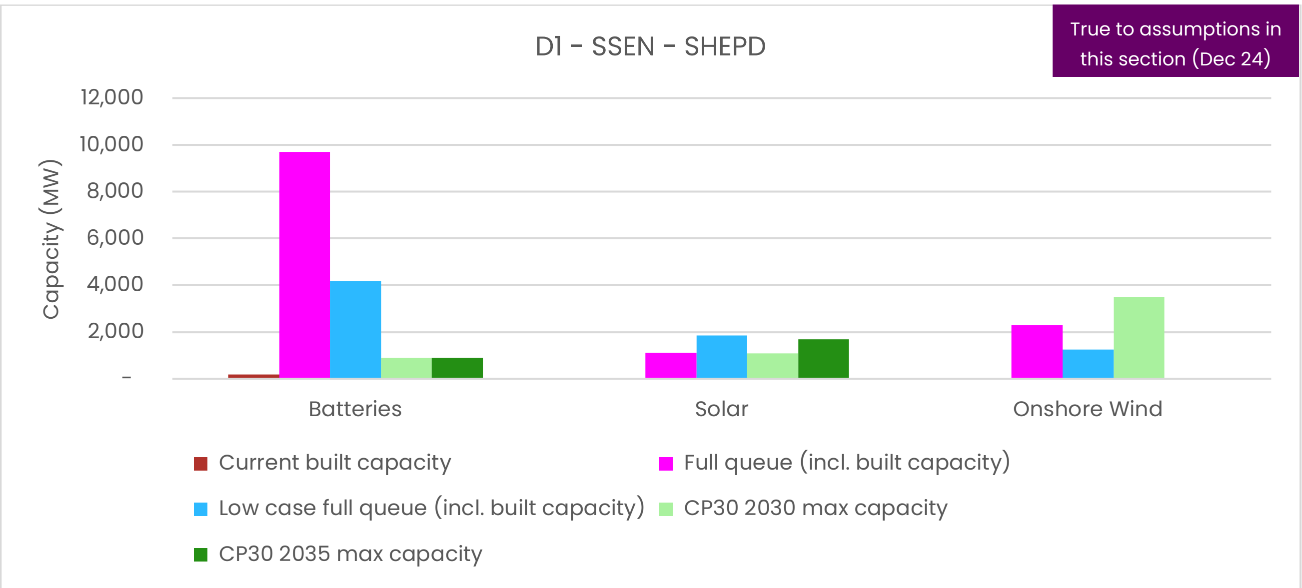

Figure 82. D1 – SSEN -SHEPD - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

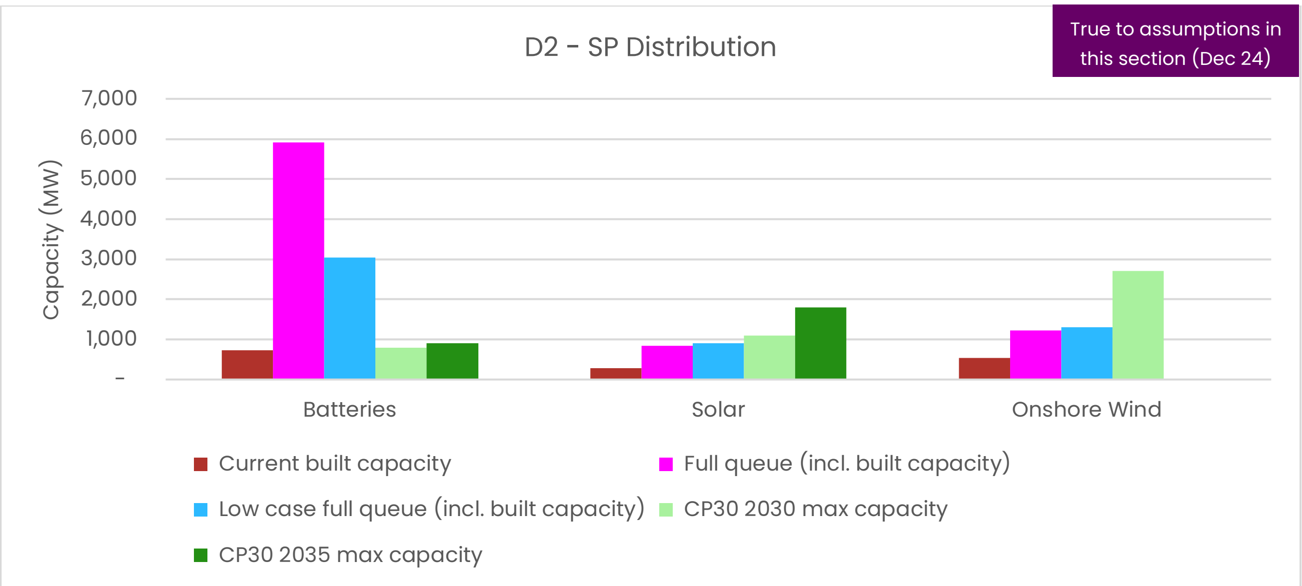

Figure 83. D2 – SP Distribution - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

Figure 84. D3 - ENWL - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

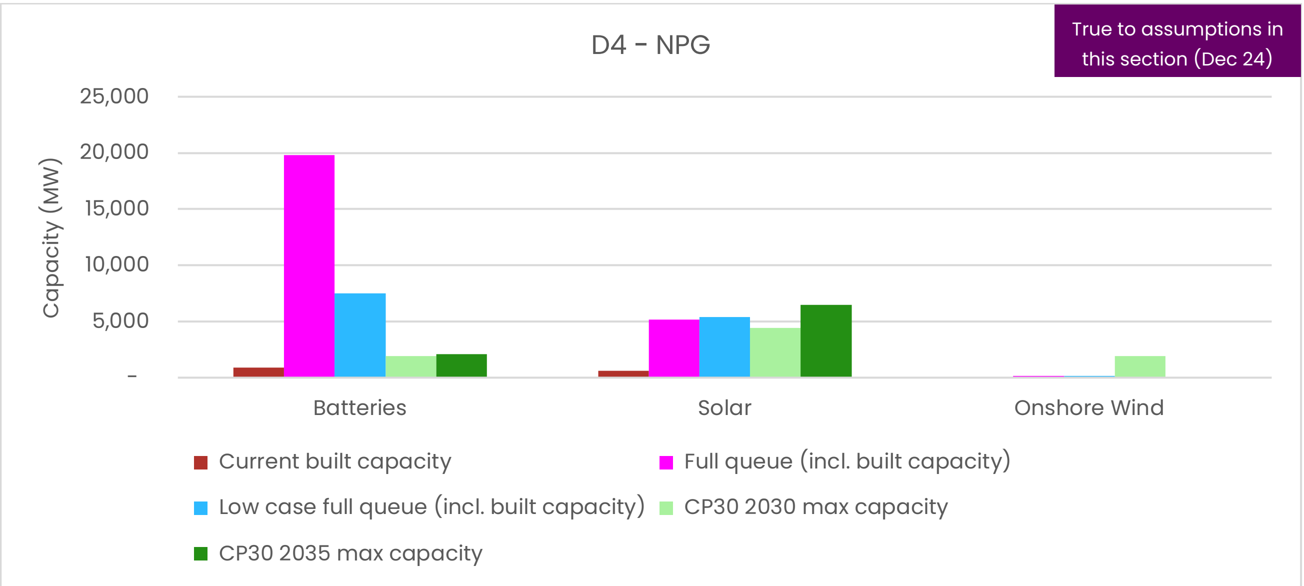

Figure 85. D4 - NPG - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

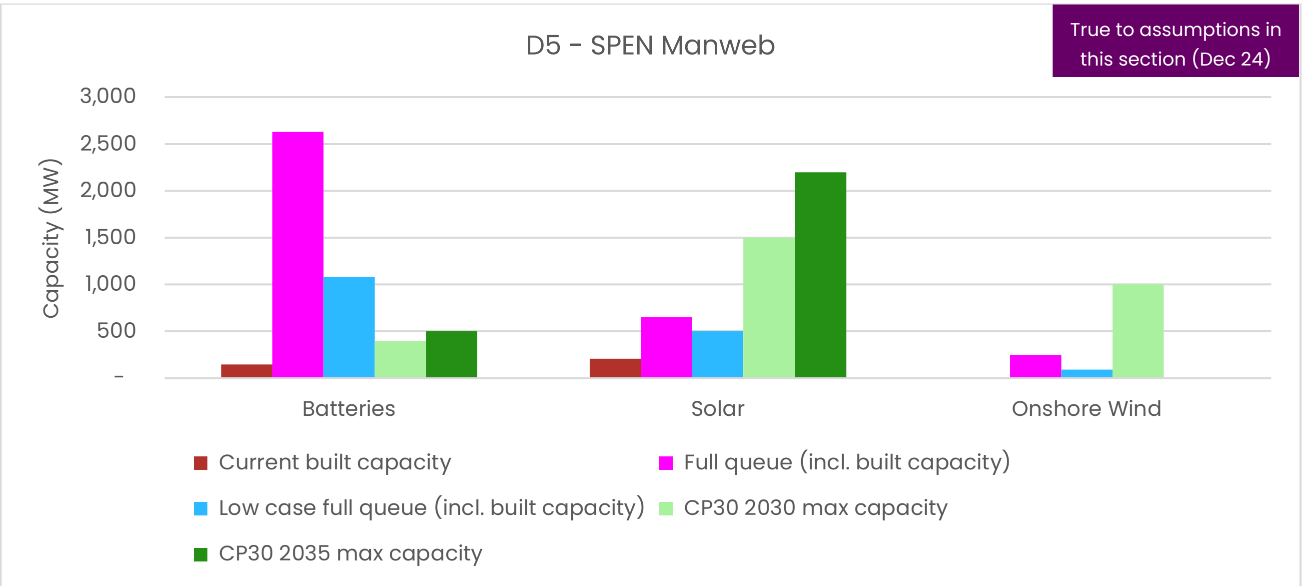

Figure 86. D5 – SPEN Manweb - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

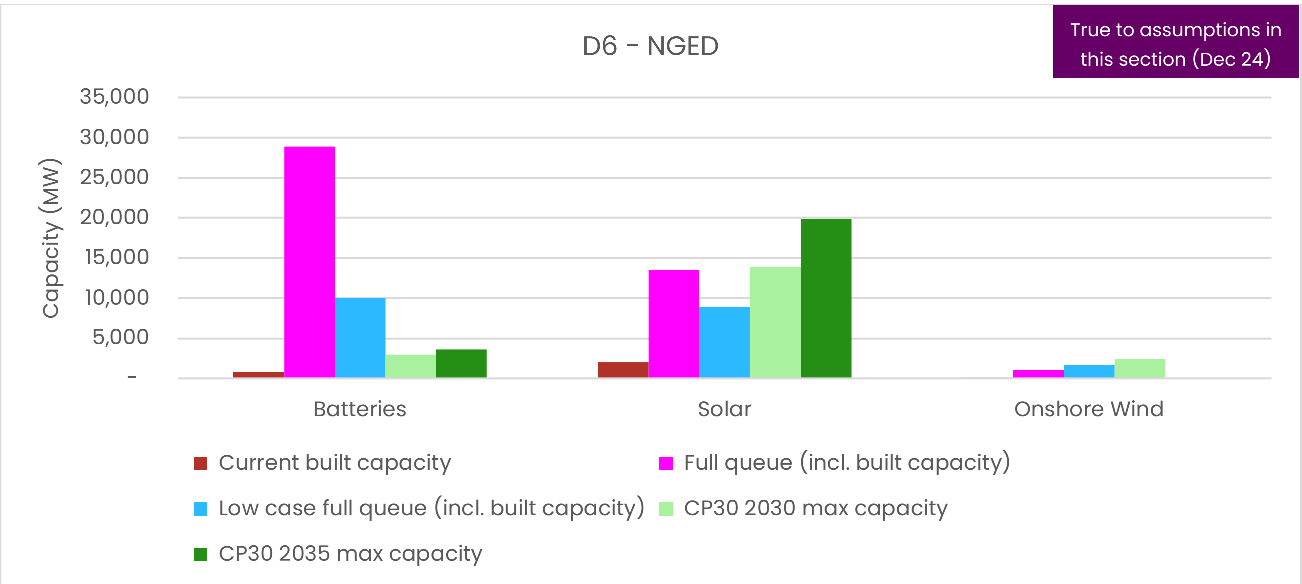

Figure 87. D6 - NGED - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

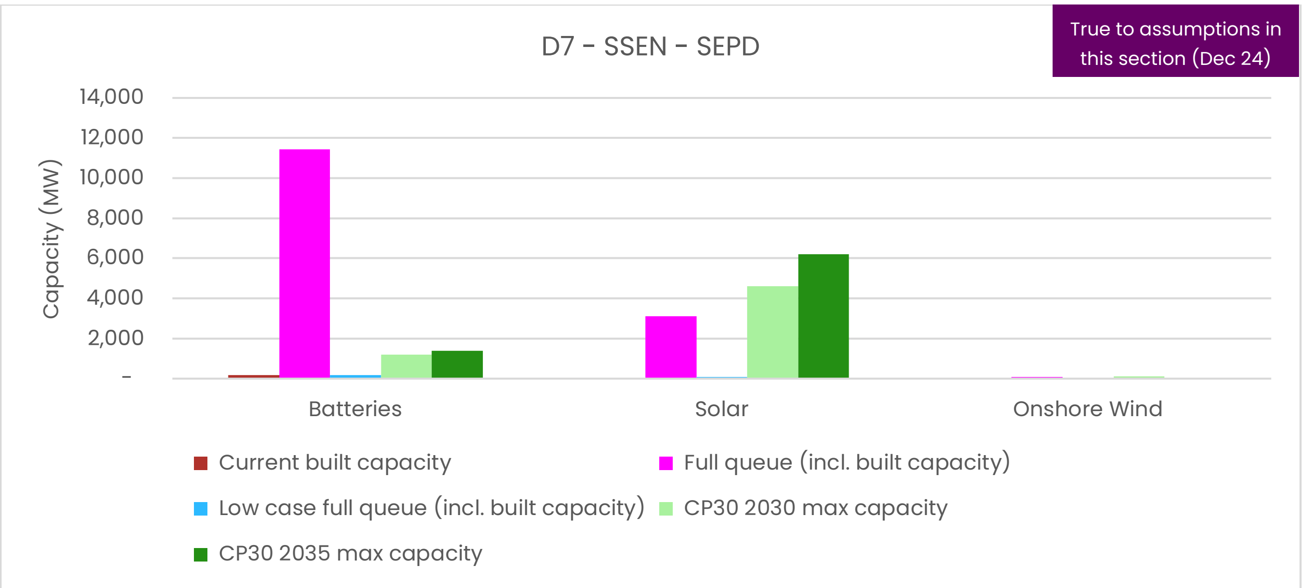

Figure 88. D7 - SSEN - SEPD - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

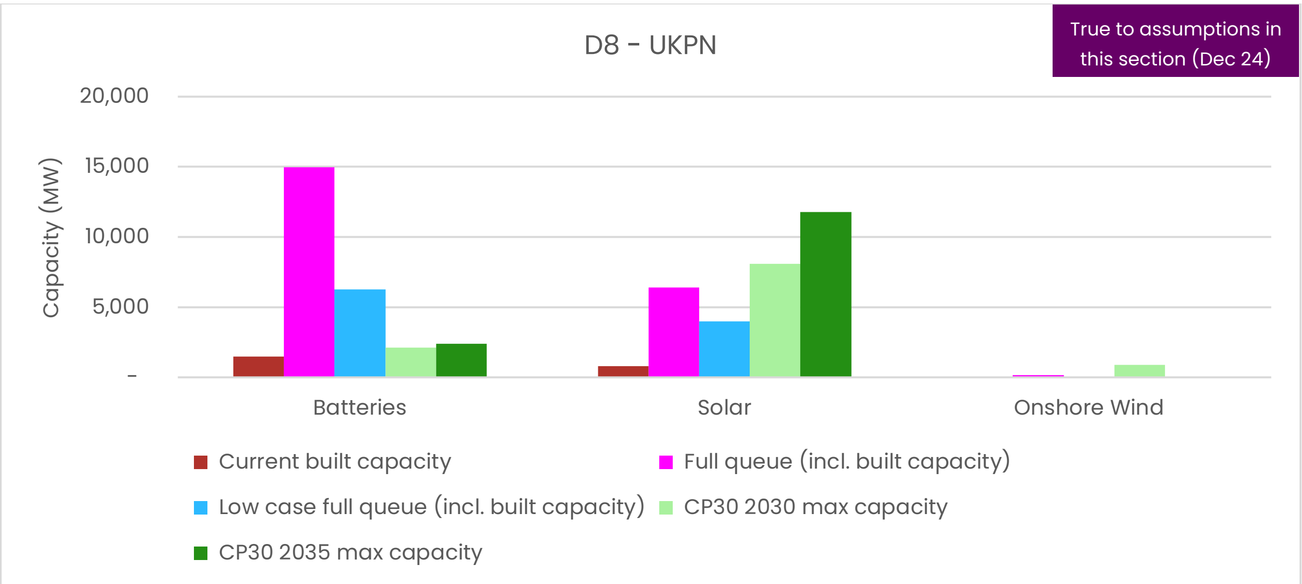

Figure 89. D8 - UKPN - Split of the full queue and low readiness case queue, split by technology compared to CP30 2035 permitted capacities for batteries, solar and onshore wind

Figures 74-89 above show the whole queue and the low case readiness queue mapped against each of the 8 zones for distribution-connected projects.

These graphs show some variations. The current queue (full queue and low case readiness) is oversupplied in all zones (with one exception) for batteries, but undersupplied in all zones for solar and onshore wind compared to 2030 and 2035 CP30 permitted capacities.

Undersupply of solar and onshore wind is typically between 1-5GW, with an average of c2-3GW per zone.

There is significant oversupply of 'ready' batteries in all but one zone, with an average of over 3GW oversupply per zone. However, the above graphs do not show the zonal breakdown of projects that would be protected through having secured planning consent, so where there is oversupply of 'ready' battery projects, this does not always mean that all oversupplied capacity would be removed from the new connections queue (as some of the oversupply may have secured planning consent before 'go live' of connections reform).

As set out earlier and below, for distribution connections analysis, our data sources have limitations, which mean these graphs potentially significantly underestimate the capacities of distribution-connected projects that are already connected and/or that are in the current connections queue. Earlier comments re micro solar should also be noted, which could significantly reduce undersupply in solar.

As set out earlier, the CP30 2035 permitted capacities for onshore wind are not shown in the graphs as the 6GW uplift in the CP30 Action Plan has not been assigned to specific zones and/or to transmission or distribution-connected zones.

Finally, as set out within our accompanying CNDM, we propose as part of the Gate 2 to Whole Queue exercise to allow substitutions of the same technology across adjacent transmission and distribution zones where this does not lead to material system impacts. Where there is undersupply of 'ready' projects in distribution zones for onshore wind and solar, this could therefore potentially be filled by oversupply of 'ready' transmission-connected onshore wind and solar in adjacent transmission zones. This might naturally be the case anyway before we consider making substitutions, due to transmission connected solar and onshore wind projects securing planning consent and being protected and included in the new connections queue.

Assumptions/ Notes

- As mentioned above, the data used provides high level connections per zone and for a significant portion (45%) of the distribution queue does not provide the connection dates. These projects have been excluded from our analysis of the queue to 2030.
- Current built capacity is based off projects listed as built or have connection dates in the past that are in the Distribution register. Note that this provides a lower estimate of built capacity than from our previous assumptions.
- The current built capacity is included in the full queue and low case for all graphs.

- The remainder of assumptions are the same as those in section: Full connections queue compared to 2030 and 2035 permitted capacities.

Appendices

Information Sources

- NESO CMP434 Proposal Document
- NESO CMP435 Proposal Document
- NESO Future Energy Scenarios 2024 Publication (Data Workbook)
- NESO Transmission Connections Registers (September 2024)
- ENA Distribution Databook (June 2024)
- DESNZ: Clean Power 2030 Action Plan: A new era of clean electricity: Connections reform annex
- NESO Request for Information (RFI) on Land Rights and Planning Status (v1 and v2)
- NESO Internal data sets
- Regen NESO Transmission Pipeline Report

End of Document