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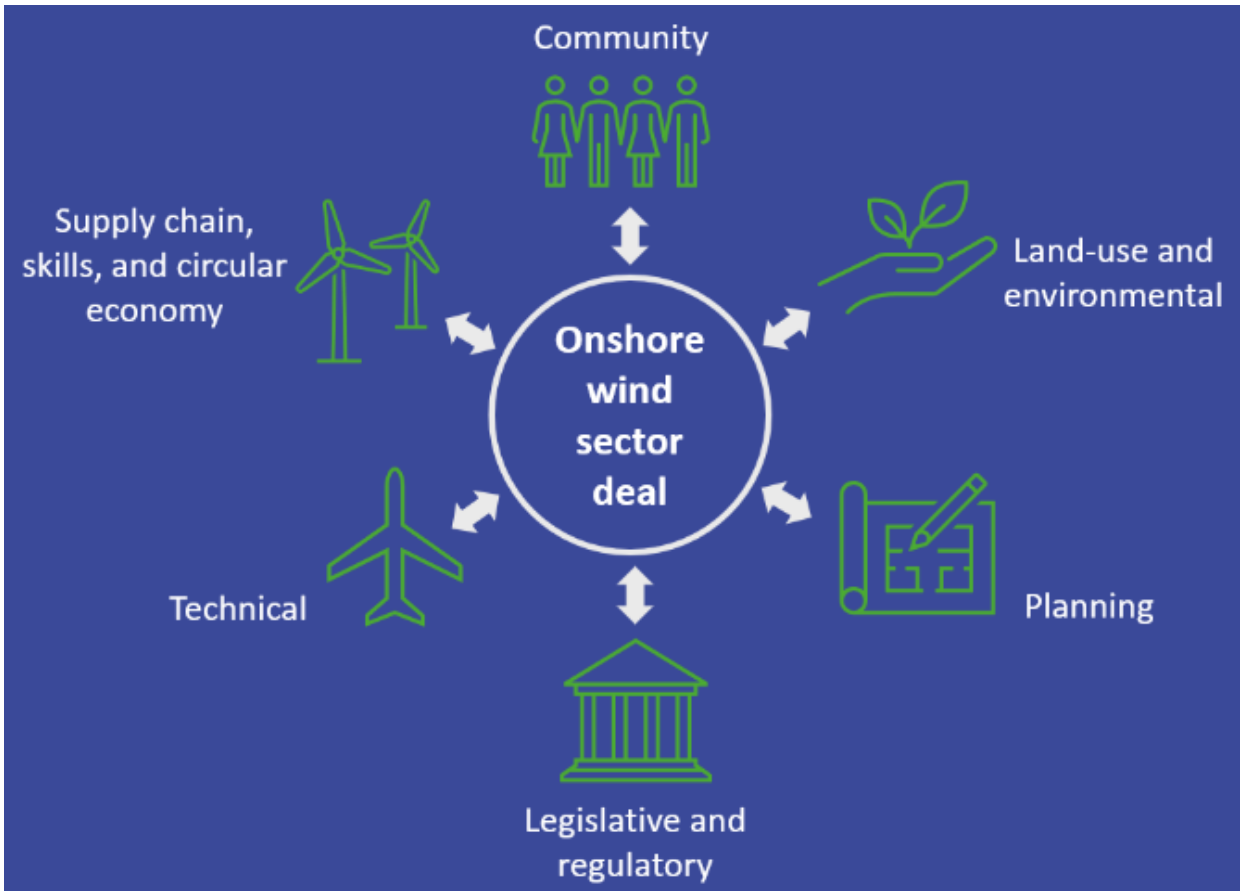

Client discretion

Scotland onshore wind pipeline analysis 2023-2030

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1. Introduction

In September 2023 the Scottish Government (SG), Scottish renewables (SR) and the onshore wind sector launched the Scottish Onshore Wind Sector Deal (SOWSD), outlining an ambition of 20 GW of operational onshore wind in Scotland by the end of 2030 and setting out the actions that Government and the sector will take to realise that ambition.

To help support the delivery of the 2030 ambition, and to address a specific commitment of the SOWSD itself, BVG Associates (BVGA) was commissioned by SR to build a database that facilitates a detailed analysis of the onshore wind pipeline in Scotland.

This report presents the database and initial pipeline analysis, providing insights into the scenarios under which Scotland may achieve its ambition of 20 GW of onshore wind by 2030, examining the sensitivities to assumptions on key parameters such as the duration of the planning process, repowering, and project viability.

The analysis presented in this report is produced by an Excel model built specifically for this work. This model holds data on all known projects in Scotland, both operational and in development/construction. It provides a simple user interface through which a user can adjust key parameters and analyse their effect on the pipeline through to 2030 and beyond.

The baseline data used by the model was kindly provided by Renewable UK (rUK) from their EnergyPulse database (EPDB) and was augmented by information provided through direct engagement with developers.

2. EnergyPulse database

As of August 2023, the EPDB contained 1,370 projects in Scotland, totalling 30.5 GW. Thirty one of these projects did not have a nameplate capacity assigned to them, but they all had a value for the number of turbines. We estimated their capacity assuming 3 MW turbines, providing an extra 400 MW in total.[i]

The spread of capacity across the stages of a project lifetime is shown in Figure 1.

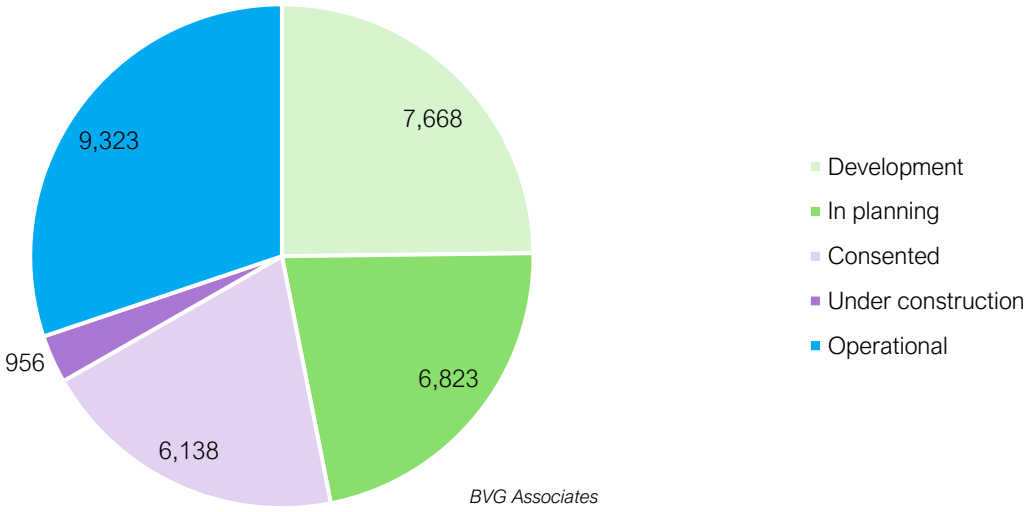

Figure 1 Summary of pipeline of Scottish projects in the EPDB [ii]

These projects are being developed, constructed, and operated by 213 different developers and are currently owned by 227 different commercial entities.

A key part of the analysis was engaging with the developers and owners to review the data held for their projects, as outlined in the following section.

[i] Their average tip height was 166 m, so this is likely a conservative estimation. All except 20 MW were in the pre-submission phase.

[ii] Includes any changes on status and/or project capacity as advised through the engagement process.

3. Developer engagement

For the engagement process, we contacted the members of the G12 developer group, plus seven other major developer/owners. [iii,iv] This enabled us to review approximately 65% of all the capacity currently listed in the EPDB.

We asked each developer to confirm the details of their projects in each of the five lifecycle stages, as reported by EPDB. In addition, we asked them to provide information regarding future projects they were developing but which were not yet in the public domain. An example of the pro-forma which we used to gather this information is shown in Appendix A.

We received a total of 17 responses, adjusting/confirming timelines on 288 projects (18.9 GW), correcting details on 73 projects (5.4 GW) and adding 81 future projects (11.0 GW – 8.6 GW of which are "new" projects, and 2.4 GW of which are repowering projects). The feedback received on the 73 existing projects was generally minor edits on ownership, capacity, and turbine details. Of the 73 existing projects with edits, the majority (53 projects, 4.9 GW) were not yet operational.

[iii] The "G12" is a group of 13 major developers formed as a key stakeholder group representing the interest of industry during the development of the SOWSD. The members of the G12 are: Banks Renewables, EDF Renewables, Energiekontor, ESB, Fred. Olsen, Muirhall, Renantis, RES, RWE, ScottishPower Renewables, SSE Renewables, Statkraft, Vattenfall.

[iv] The other seven developers we reached out to were: Belltown Power, Community Windpower, E Power, Force 9 Energy, Infinergy, Muirden Energy, Vento Ludens.

4. Model overview

4.1. Project lifecycle milestones

The model develops project lifetimes, marking the milestones of when a project:

- Is submitted for planning consent
- Receives its final consent decision
- Starts construction
- Reaches commercial operation, and
- Reaches end of life.

For any of the above dates that are not yet known, the model allows user-defined values to determine how long on average projects take to transition from one state to the next as shown in Figure 2.

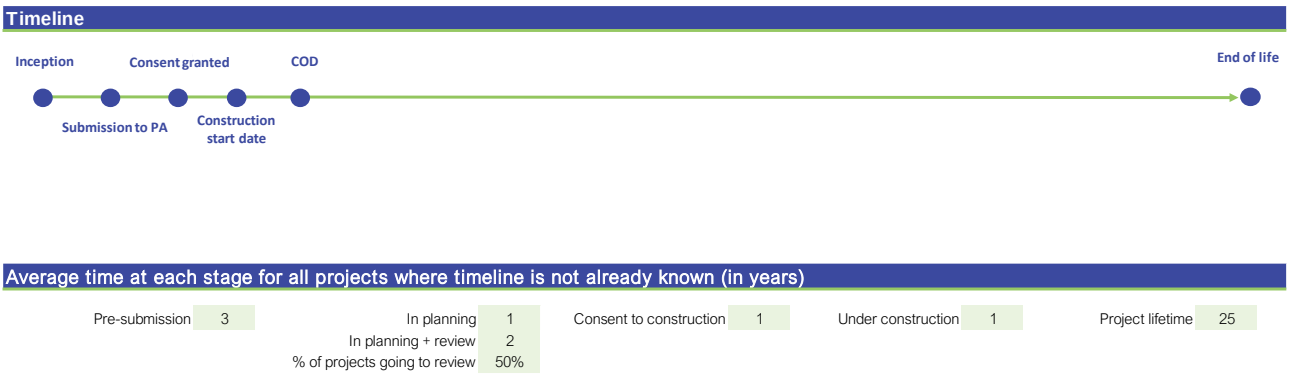

Figure 2 User interface: Project lifecycle milestones

4.2. Pipeline projects which may not reach commercial operation

The model provides a series of options for the user to test thresholds which will stop some projects from progressing to the next stage. For any project where at least one of these thresholds are exceeded, the model will remove the project from the analysis These options are shown in Figure 3 and consist of:

- Maximum length of time that a project can remain at a milestone without progressing further. If a project has not progressed after a reasonable amount of time we could consider it dormant and unlikely to be progressed further by the developer.
- Specifications of the consented turbines that present a barrier to projects being built as the consented dimensions (specifically the turbine tip-height) and proposed turbine are no longer available on the market.
- Overall progression rates for projects moving through the milestones. Specifically, we consider projects moving from general development into an actual planning submission and, having submitted a planning application, projects subsequently receiving a positive consent decision.

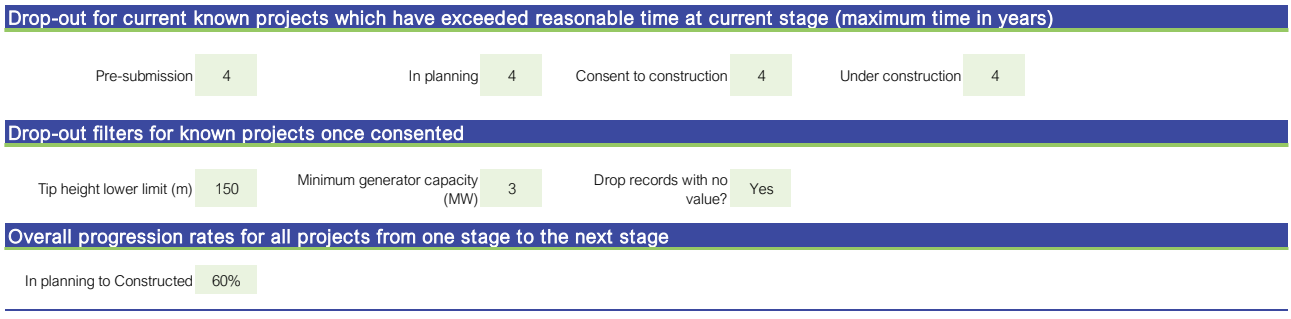

Figure 3 User interface: "Drop-out" parameters

4.3. Developer timelines

The user can override the standard durations between milestones with project specific dates provided by the developers as part of the engagement process. The user can also choose to include the future projects as provided by the developers.

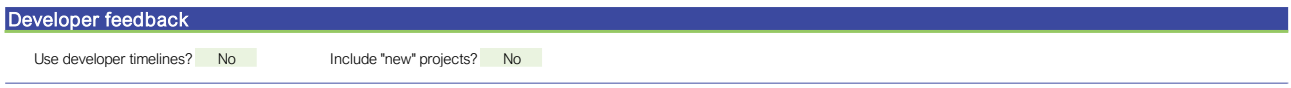

Figure 4 User interface: Developer feedback

4.4. Repowering and deficit backfill parameters

There are two scenarios where the model itself introduces new projects into the pipeline:

- When a current project reaches the end of its life, it may get repowered. The user can choose what percentage of projects are repowered, by how much repowering will increase the nameplate capacity of the site, and what size of turbines will be used on the repowered site.
- If the total operational capacity in 2030 is less than the target 20 GW, the model will calculate how much new capacity needs to be introduced into the timeline to address the deficit, and when. The user can specify the capacity of each additional backfill project that will be required, and the capacity of the turbines that will be used.

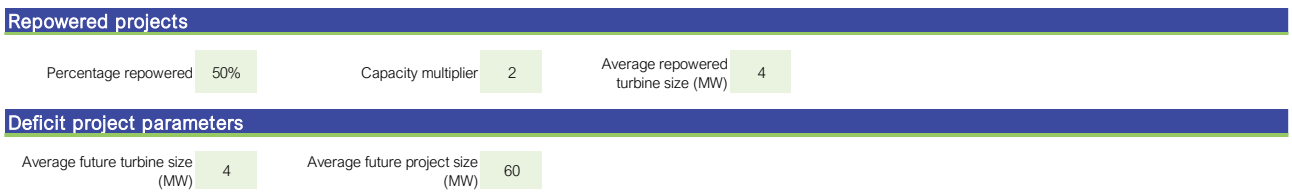

Figure 5 User interface: Backfill parameters

4.5. Output calculation parameters

The model outputs information on four key performance indicators:

- The amount of community benefit created
- The amount of abnormal loads to be managed
- The amount to projects going through the planning process at any given time, and
- The amount of capacity that may be required to be allocated in future contract for difference (CfD) rounds.

The user has access to basic input parameters for these parameters, as shown in Figure 6.

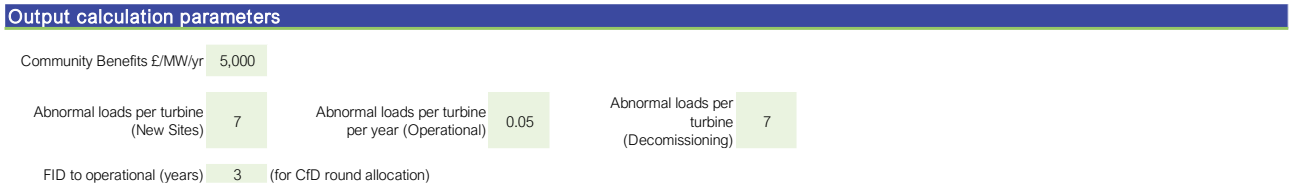

Figure 6 User interface: Output calculation parameters

5. Analysis

5.1. EPDB data

While the pipeline model facilitates the analysis of numerous scenarios, we focussed initial analysis on establishing what the current entries in the EPDB tells us in terms of likely scenarios out to 2030. This required the sequential addition of several filters which result in projects being removed from the pipeline. We considered the following:

- Projects remaining in the same development status for too long, using this as an indication that they are likely dormant.
- Projects with turbine attributes which today would likely put that project at a commercial disadvantage. We used maximum tip height and turbine rating as proxies for this.
- Generic attrition rates as projects progress through the stages. We used EPDB records for Scottish projects to determine attrition rates for progressing from development into a planning submission, and from submitting a planning application to receiving a positive consent decision. We assumed that all projects with a positive consent decision will progress to construction and into operation.

We also examined the effect of a consenting decision being challenged. The term "challenged" is a catch-all to capture the effect of any consenting decision having to be reviewed. For Section 36 applications this specifically means going through a public inquiry process. In order to keep the model simple, we apply the same timelines regardless of whether the consenting is done via the Section36 route or at LPA level.

The effect on operating capacity in 2030 on the application of these individual filters is shown in Figure 7.

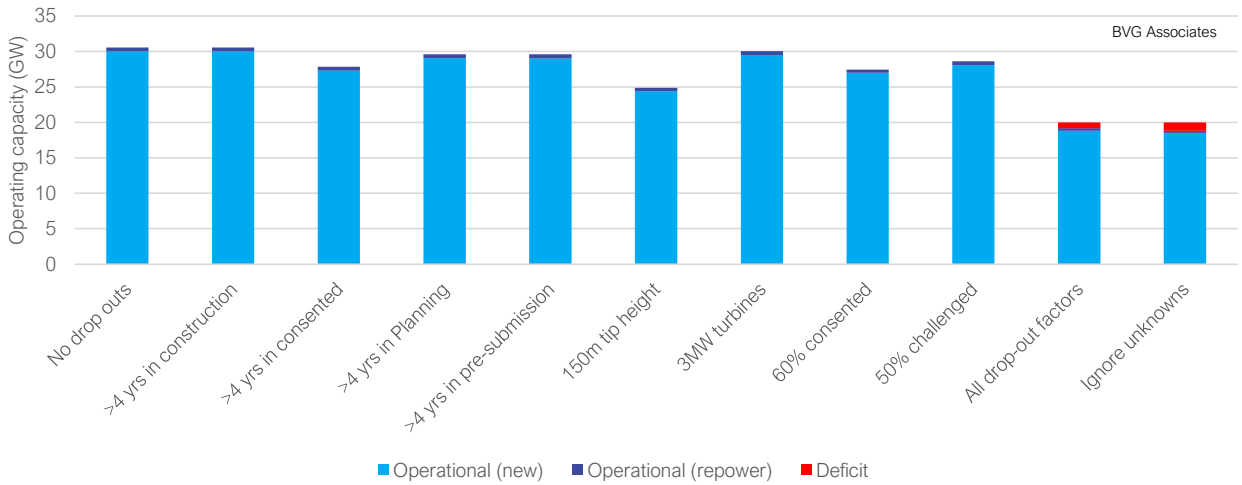

Figure 7 Effect on 2030 operating capacity from various filters

Figure 7 shows that should all the projects in the EPDB come to fruition within expected timeframes then the operating capacity in 2030 would reach just over 30 GW. The most limiting of the individual filters applied are the dropping of projects with a tip height of 150 m or less, and the overall attrition rate of 60% of planning submissions granted consent.

Together, applying all nine filters reduces the expected operating capacity in 2030 to around 18.8 GW. There are 12 projects in the EPDB that are missing tip height values, and 35 that are missing turbine capacity values. If we estimate these missing values then the overall deficit is 0.8 GW ("all drop-out" values) rather than the 1.2 GW shown as "Ignore unknowns".

Figure 8 shows the timeline from 2023 to 2030.

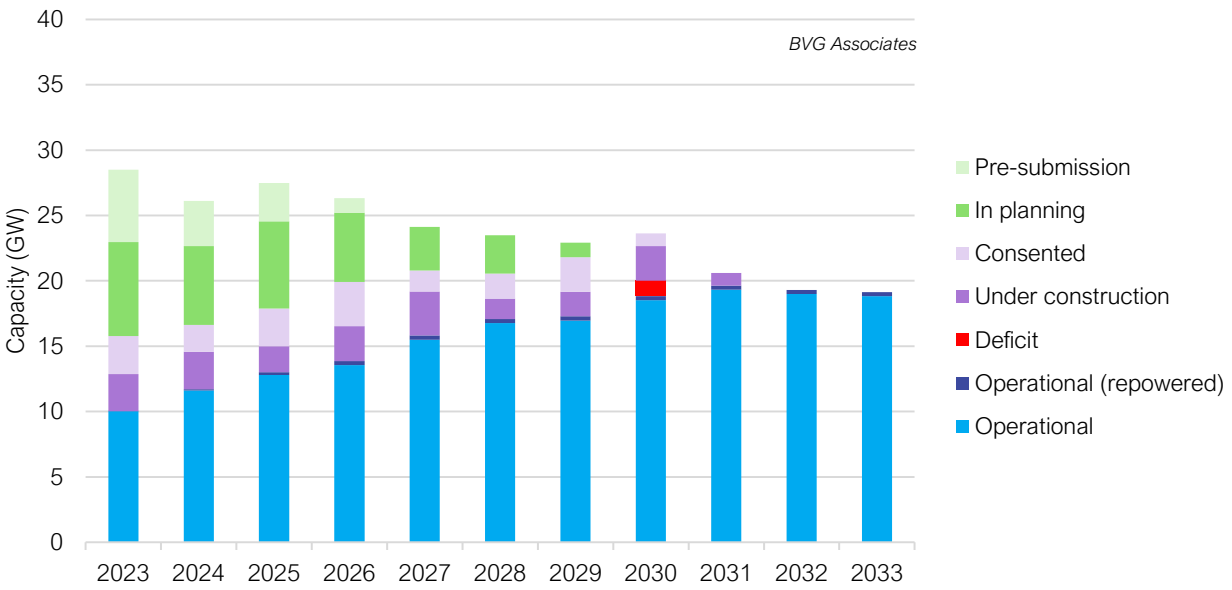

Figure 8 Expected timeline to 2030 from existing EPDB projects

Assuming the default project timings, there are actions that could be taken which would increase the likelihood of reaching 20 GW in 2030:

- Re-instate the projects removed by the limits of 150 m tip height and 3 MW turbine rating. This simply keeps the project in the analysis using, its current milestone dates, for the purpose of counting its capacity and turbines in the 2030 totals. It ignores the practicalities that may be required in reality, such as re-submitting the application with larger turbines and a different layout.
- Reduce the default planning durations to the shorter ones committed to by the SOWSD. The default planning duration is two years, extending to four years if the decision is challenged (such as the need for a public inquiry for Section 36 applications). The timelines committed to by the SOWSD reduce this to one year, extending to two years if challenged. We also introduce a lower risk of challenge overall due to other commitments in the SOWSD.[v]
- Repower all sites at end of life, assuming an uplift on the original capacity of 100% (that is, a 30 MW wind farm will be repowered as 60 MW).

The effects of the individual actions are shown in Figure 9.

[v] We did not try evaluate the rate of consent challenges from recent history. As a starting point we have assumed 50% of decisions are challenged in "business as usual", reducing to 20% following the SOWSD. As noted elsewhere, we have also assumed that the duration of the planning process is the same for both Section 36 and LPA applications.

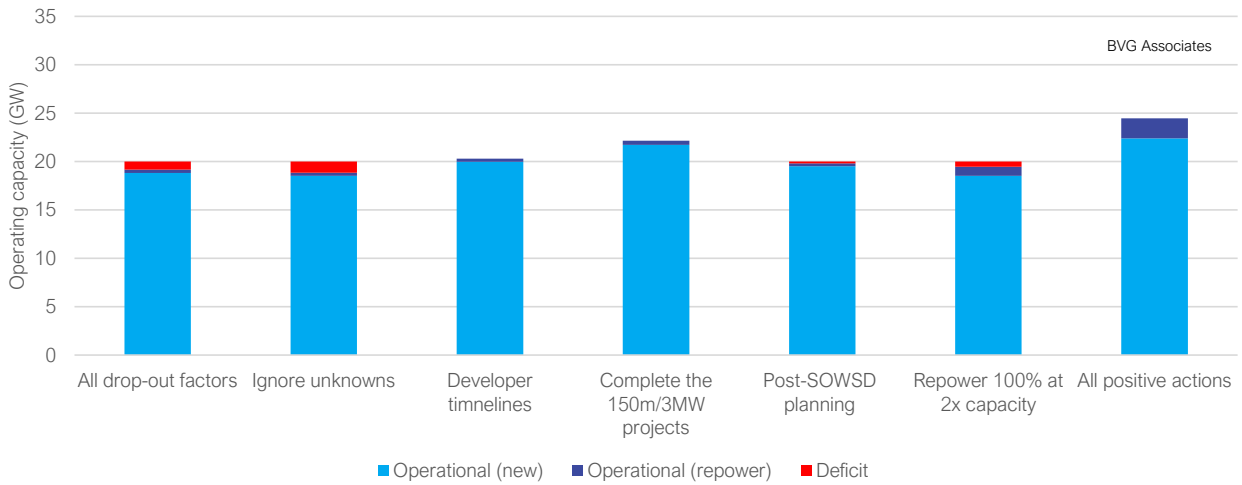

Figure 9 Actions to increase operating capacity by 2030

Figure 9 shows that the most effective individual action would be to ensure that all the 150 m tip height and 3 MW turbine sites progressed. We have not made any assumptions about how this is achieved. As these smaller turbines are unlikely to be available, it is expected that these projects will have to define amended layouts or propose larger turbines, thus requiring a re-submission of the planning application etc. For simplicity, we have not attempted to model the impact of such practical requirements, choosing to simply keep the projects in the analysis using their current milestone dates. However, this action alone would not reach 20 GW by 2030.

All three actions combined are likely to reach around 24.5 GW operating by 2030, including an expected 2.1 GW of repowered sites.

This timeline out to 2030 is shown in Figure 10.

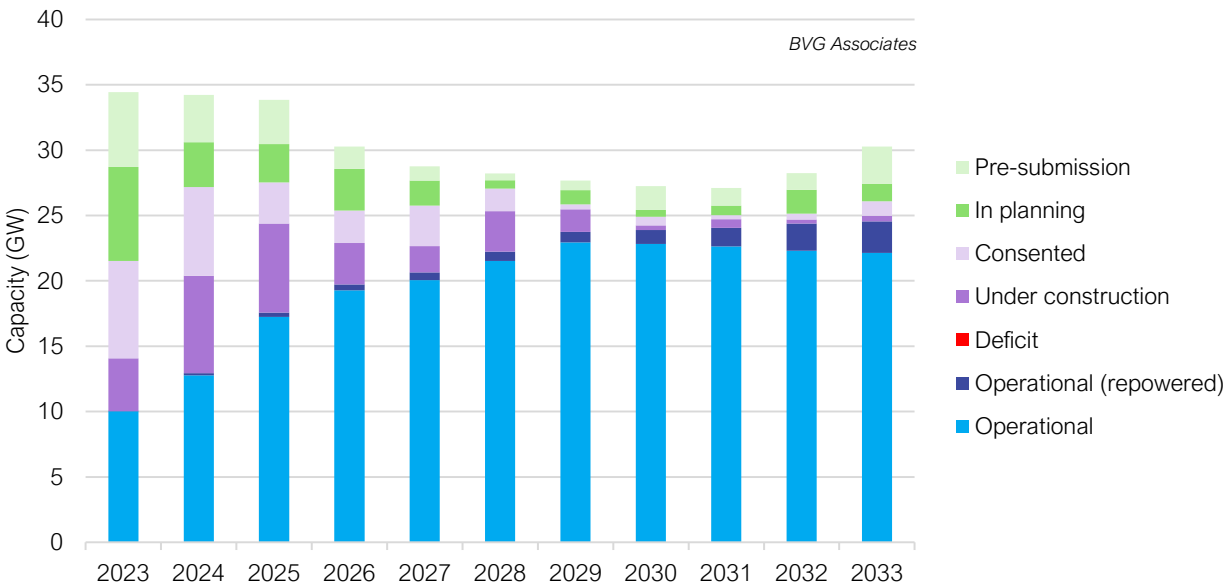

Figure 10 Timeline to 2030, assuming all three positive actions are implemented

5.2. Developer feedback

We then examined the effect of introducing the feedback from the developer engagement process. We used the developer's milestone dates where they were provided. We then examined the effect of introducing the future projects that developers indicated were being considered but which were not yet in the EPDB. In total, we examined five scenarios:

- Using only EPDB projects and applying the drop-out filters, but with developer timelines overriding our standard timing assumptions.
- As above, but with the future projects included.
- Using EPDB projects and the future projects, but using business as usual timings.
- As above, but using the more optimistic post-SOWSD timings.
- As above, but including 50% of all end of life projects being repowered at 2x capacity.
- As above, but using the developer timelines where available.

The timeline when using the developer timelines is shown in Figure 10.

The summary of each scenario is shown in Figure 12.

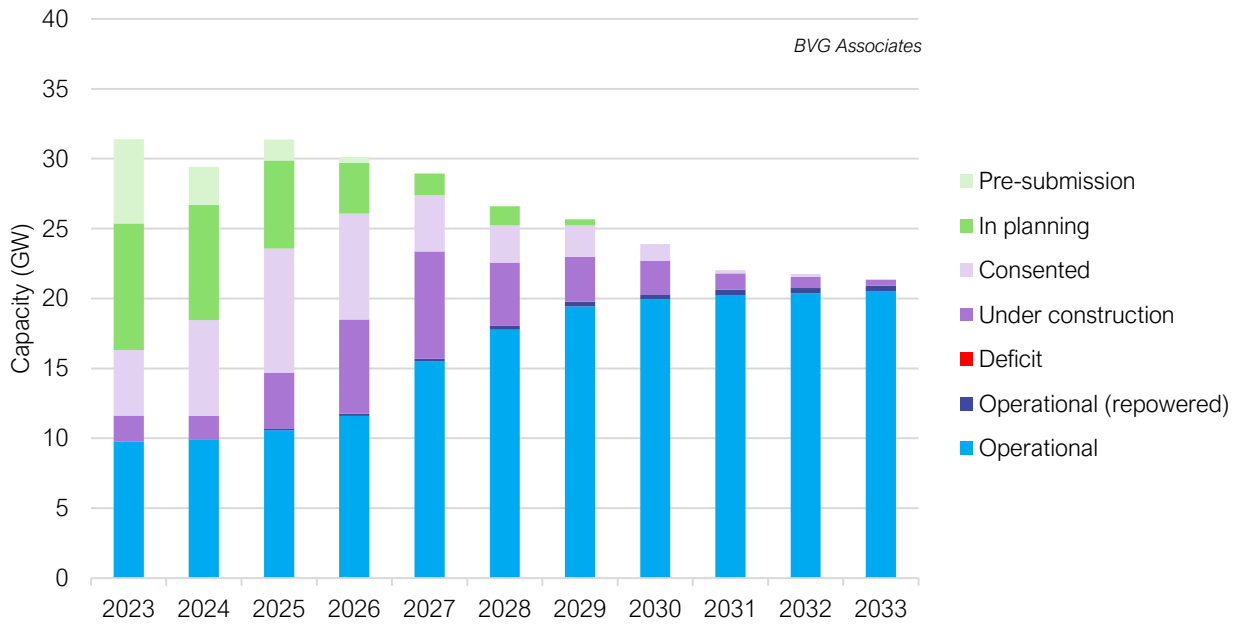

Figure 11 Overriding with developer timelines where available

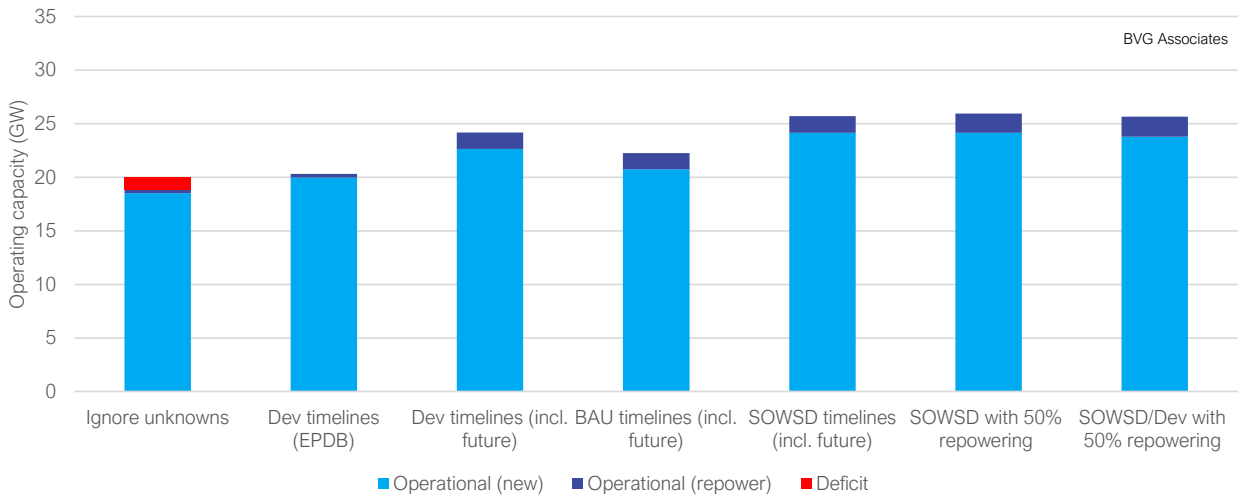

Figure 12 Operating capacity in 2030, scenarios with future projects included

All scenarios that include the 11 GW of future projects are likely to exceed the 20 GW target. The “future" projects include over 2 GW of repowering projects, the effect of which is shown clearly in the data.

The timeline to 2030, including future projects, is shown in Figure 13.

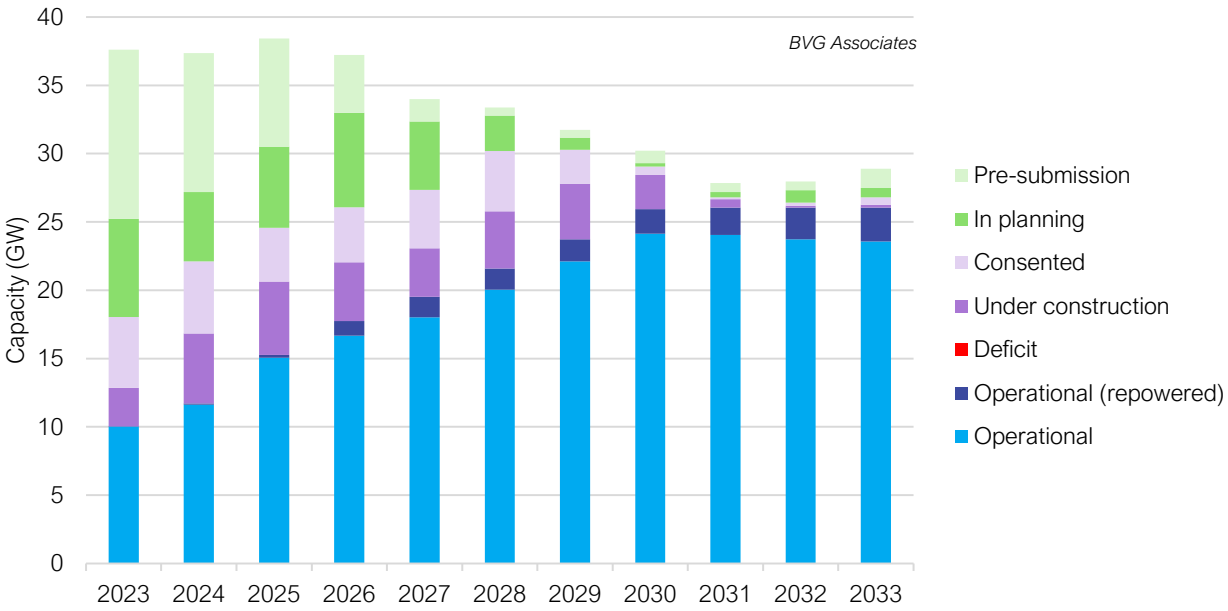

Figure 13 Timeline to 2030, including future projects

6. Pipeline KPIs

The model can also convert the expected timeline into relevant measures that will help the industry and key stakeholders to consider the impact of this increase in deployment. We have focussed on the following four measures, calculated annually:

- Number of projects going through the planning process.
- Number of abnormal loads. We have assumed seven loads per turbine for both construction and decommissioning, and 0.05 loads per turbine per year for operational sites.[vi,vii,viii]
- Contribution to community benefits. We have assumed all operational projects will contribute £5,000/MW/yr.
- Required onshore wind capacity allocations in CfD rounds. For this we assumed that the route to market for all the capacity is via CfD which of course may not be the case as alternative routes such as corporate PPAs and merchant will exist. We also assumed that the CfD must precede commercial operations by three years.

If we continue with the optimistic assumption of the timeline shown in Figure 13 we arrive at the KPIs shown in Figure 14 to Figure 17. The potential CfD allocations are presented in Table 1.

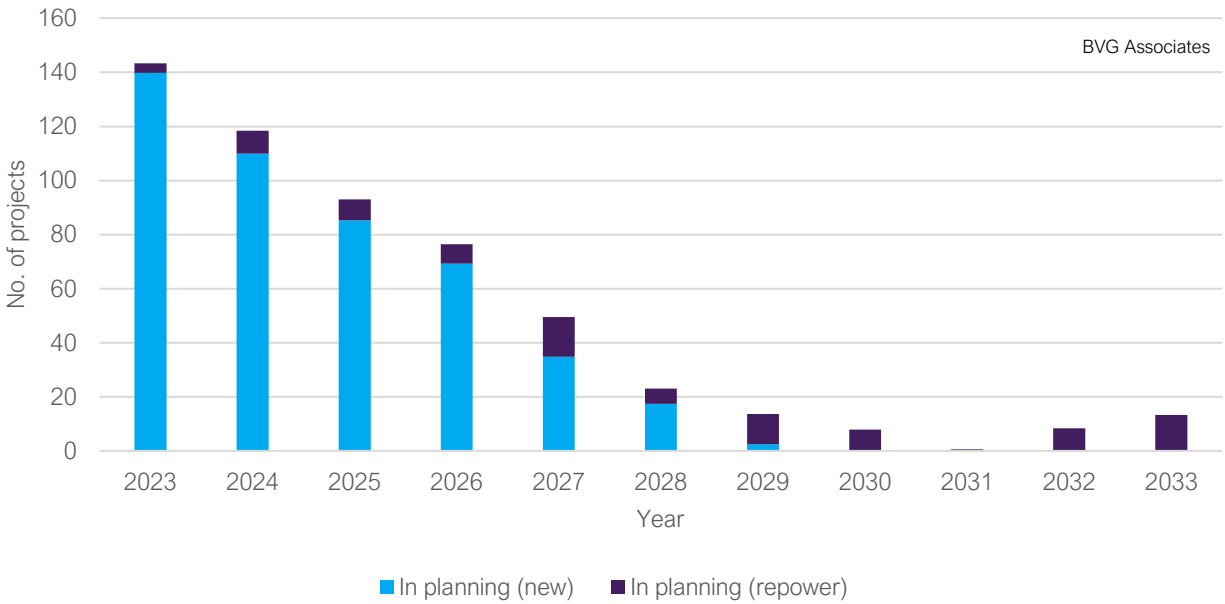

Figure 14 Number of projects in the planning process

[vi] 7 loads per turbine: 3 blades, 2 tower sections, 1 nacelle, 1 transformer.

[vii] 0.05 loads per turbine per year: Averages for major component exchange across entire Scottish onshore wind portfolio in any given year, based on previous work on failure rates and circularity opportunity - 1% of gearboxes, 1% of generators, 2% of transformers, 1% of blades.

[viii] Number of loads based on major component movements only. Crane movements not included.

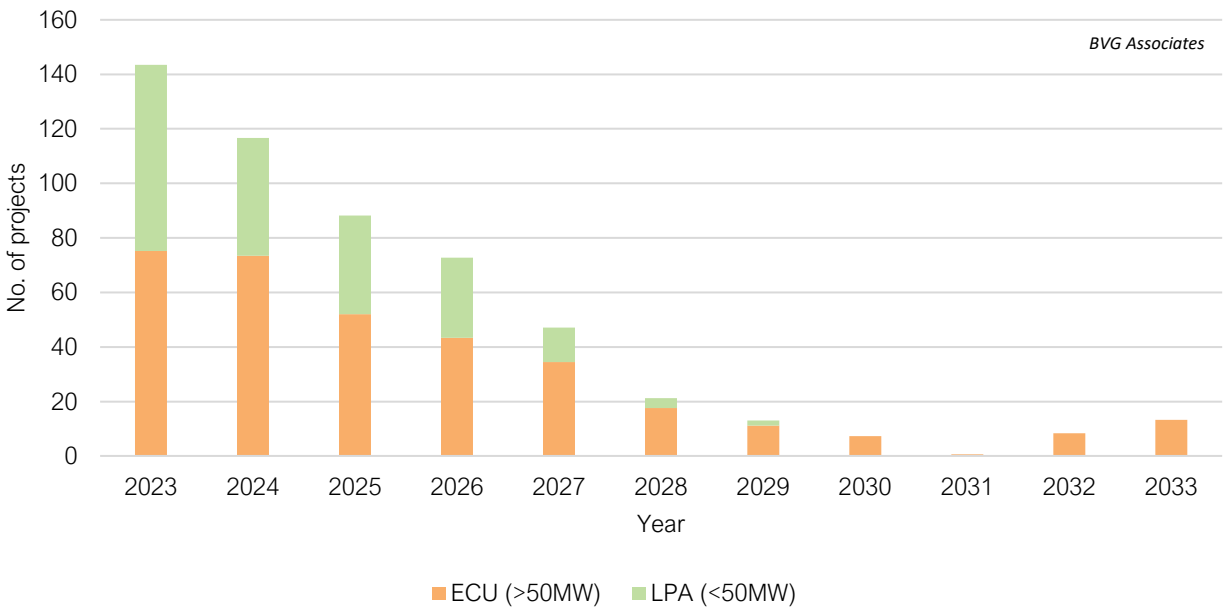

Figure 15 Planning

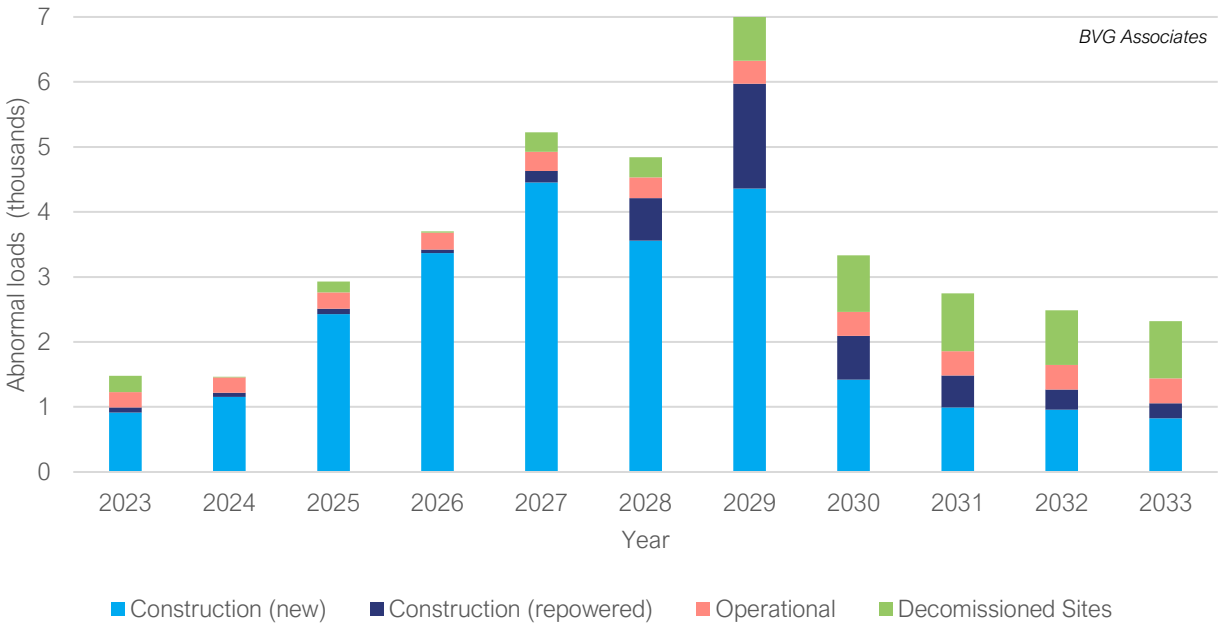

Figure 16 Number of abnormal loads

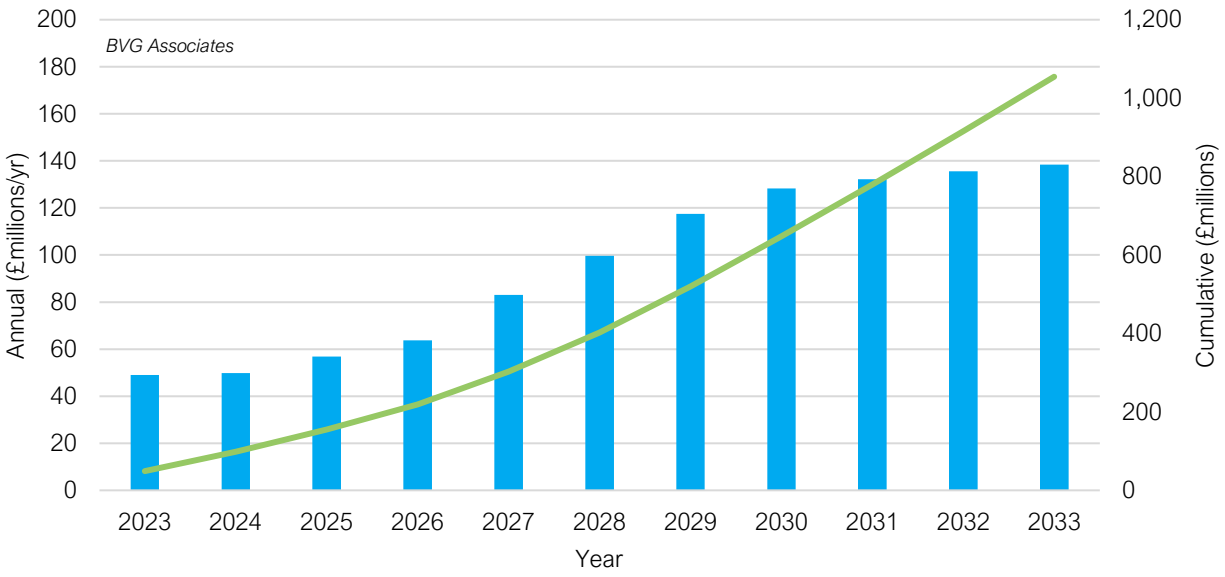

Figure 17 Community benefit contributions

6.1. CfD allocations

From the various scenarios examined previously, we can identify a practical "low end" scenario that would achieve around 20 GW of operational onshore wind by 2030, and a more ambitious "high end" scenario that would achieve around 25.7 GW by 2030.

Assuming the UK government will undertake annual CfD allocations for the rest of the decade, Table 1 shows the capacity for each annual allocation between 2023 and 2028 inclusive required to achieve either scenario.

There was 1.7 GW of onshore wind secured in CfD allocation round 5 earlier this year (2023). This is on target to achieve the low end scenario (1.5 GW required) but is significantly lower than the 3.0 GW required to be on track for the high end scenario.

For both scenarios it is clear that subsequent rounds will need to increase their allocated capacities to between 3 to 4 GW annually if Scotland is to stay on course to reach 20 GW or above by 2030.

Table 1 CfD round allocation requirements

CfD allocation round	CfD allocation year	Required capacity (GW)	
		Low end	High end
5	2023	1.5 (1.7 actual)	3.0 (1.7 actual)
6	2024	3.4	3.0
7	2025	3.3	3.4
8	2026	2.9	3.6
9	2027	0.4	3.6
10	2028	0.3	0.5

7. Local authorities

The model breaks down all relevant measures to local planning authority (LPA) level.

The breakdown by LPA and year for projects in planning, abnormal loads, and community benefits are shown in Table 2 to Table 5.

Table 2 Projects in planning (ECU) – high end scenario

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Aberdeen City Council	0	0	0	0	0	0	0	0	0	0	0	0
Aberdeenshire Council	2	2	2	2	1	1	0	0	0	0	0	9
Angus Council	0	0	0	0	0	0	0	0	0	0	0	0
Argyll and Bute Council	4	4	5	7	4	1	0	0	0	0	0	25
City of Edinburgh	0	0	0	0	0	0	0	0	0	0	0	0
Clackmannanshire Council	0	0	0	0	0	0	0	0	0	0	0	0
Dumfries & Galloway Council	13	8	6	6	3	2	0	0	0	0	0	38
Dundee City Council	0	0	0	0	0	0	0	0	0	0	0	0
East Ayrshire Council	3	3	4	1	0	0	0	0	0	0	0	10
East Dunbartonshire Council	0	0	0	0	0	0	0	0	0	0	0	0
East Lothian Council	0	0	1	1	0	0	0	0	0	0	0	1
East Renfrewshire Council	0	0	0	0	0	0	0	0	0	0	0	0
Falkirk Council	0	0	0	0	0	0	0	0	0	0	0	0
Fife Council	0	0	0	0	0	0	0	0	0	0	0	0
Glasgow City Council	0	0	0	0	0	0	0	0	0	0	0	0
Highland Council	22	11	11	11	5	1	0	0	0	0	0	61
Inverclyde Council	0	0	0	0	0	0	0	0	0	0	0	0
Midlothian Council	0	0	0	1	1	0	0	0	0	0	0	1
Moray Council	1	1	1	1	0	0	0	0	0	0	0	4
Western Isles Council / Comhairle nan Eilan Siar	0	1	1	0	0	0	0	0	0	0	0	1
North Ayrshire Council	0	0	0	1	1	1	0	0	0	0	0	2
North Lanarkshire Council	0	0	1	1	0	0	0	0	0	0	0	1
Orkney Islands Council	0	0	0	0	0	0	0	0	0	0	0	0
Perth & Kinross Council	0	0	2	4	2	0	0	0	0	0	0	8
Renfrewshire Council	0	0	0	0	0	0	0	0	0	0	0	0
Scottish Borders Council	4	3	2	4	2	0	0	0	0	0	0	14
Shetland Islands Council	0	0	0	0	0	1	1	0	0	0	0	1
South Ayrshire Council	3	2	1	0	0	0	1	0	0	0	0	6
South Lanarkshire Council	2	1	1	1	1	1	0	0	0	0	0	7
Stirling Council	1	1	0	0	0	0	0	0	0	0	0	2
West Dunbartonshire Council	0	0	1	1	0	0	0	0	0	0	0	1
West Lothian Council	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	2	5	6	8	2	12	7	8	18	15	83
The Cairngorms National Park	0	0	0	0	0	0	0	0	0	0	0	0
The Loch Lomond and the Trossachs National Park	0	0	0	0	0	0	0	0	0	0	0	0
Total	55	37	42	44	28	9	13	7	8	18	15	

Table 3 Projects in planning (LPA) – high end scenario

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Aberdeen City Council	0	0	1	1	0	0	0	0	0	0	0	1
Aberdeenshire Council	5	4	2	1	0	0	0	0	0	0	0	12
Angus Council	1	0	0	0	0	0	0	0	0	0	0	1
Argyll and Bute Council	2	1	2	1	0	0	0	0	0	0	0	6
City of Edinburgh	0	0	0	0	0	0	0	0	0	0	0	0
Clackmannanshire Council	0	0	0	1	1	0	0	0	0	0	0	1
Dumfries & Galloway Council	8	4	4	3	2	0	0	0	0	0	0	20
Dundee City Council	0	0	0	0	0	0	0	0	0	0	0	0
East Ayrshire Council	4	2	4	3	1	0	0	0	0	0	0	14
East Dunbartonshire Council	0	0	0	0	0	0	0	0	0	0	0	0
East Lothian Council	0	0	0	0	0	0	0	0	0	0	0	0
East Renfrewshire Council	2	0	0	0	0	0	0	0	0	0	0	2
Falkirk Council	0	0	0	0	0	0	0	0	0	0	0	0
Fife Council	0	0	0	1	1	0	0	0	0	0	0	1
Glasgow City Council	0	0	0	0	0	0	0	0	0	0	0	0
Highland Council	12	5	8	8	2	0	0	0	0	0	0	36
Inverclyde Council	0	0	0	0	0	0	0	0	0	0	0	0
Midlothian Council	0	0	0	0	0	0	0	0	0	0	0	0
Moray Council	2	1	1	0	0	0	0	0	0	0	0	4
Western Isles Council / Comhairle nan Eilan Siar	0	0	0	1	1	0	0	0	0	0	0	1
North Ayrshire Council	2	0	0	0	0	0	0	0	0	0	0	2
North Lanarkshire Council	4	5	2	1	1	0	0	0	0	0	0	13
Orkney Islands Council	4	3	1	1	1	0	0	0	0	0	0	9
Perth & Kinross Council	0	0	0	1	1	0	0	0	0	0	0	1
Renfrewshire Council	0	0	0	0	0	0	0	0	0	0	0	0
Scottish Borders Council	3	4	3	2	1	0	0	0	0	0	0	14
Shetland Islands Council	2	1	1	0	0	0	0	0	0	0	0	4
South Ayrshire Council	2	0	1	1	1	1	0	0	0	0	0	6
South Lanarkshire Council	10	6	7	4	0	0	0	0	0	0	0	26
Stirling Council	0	0	0	0	0	0	0	0	0	0	0	0
West Dunbartonshire Council	0	0	0	0	0	0	0	0	0	0	0	0
West Lothian Council	4	2	1	1	0	0	0	0	0	0	0	7
Unknown	0	0	0	1	2	3	2	0	0	0	0	7
The Cairngorms National Park	0	0	0	0	0	0	0	0	0	0	0	0
The Loch Lomond and the Trossachs National Park	0	0	0	0	0	0	0	0	0	0	0	0
Total	66	38	35	31	13	4	2	0	0	0	0	

Table 4 Abnormal loads – high end scenario

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Aberdeen City Council	0	0	0	0	0	0	0	0	0	0	0	3
Aberdeenshire Council	39	74	71	98	144	354	271	239	62	53	94	1,500
Angus Council	2	2	2	2	2	2	2	2	2	2	2	23
Argyll and Bute Council	260	13	211	167	435	481	494	124	150	366	173	2,873
City of Edinburgh	0	0	0	0	0	0	0	0	0	0	0	0
Clackmannanshire Council	1	1	1	1	1	1	1	1	1	1	1	13
Dumfries & Galloway Council	149	190	388	927	1,082	635	450	446	358	149	212	4,986
Dundee City Council	0	0	0	0	0	0	0	0	14	0	0	15
East Ayrshire Council	196	18	84	225	444	768	2,124	23	20	20	20	3,944
East Dunbartonshire Council	0	0	0	0	0	0	0	0	0	0	0	0
East Lothian Council	3	3	3	38	63	29	4	4	4	4	4	160
East Renfrewshire Council	1	1	1	15	1	1	1	1	1	1	1	26
Falkirk Council	1	1	1	1	1	1	1	1	1	1	1	15
Fife Council	4	4	4	4	4	4	4	4	4	4	4	42
Glasgow City Council	0	0	0	0	0	0	0	0	0	0	0	1
Highland Council	75	145	498	858	1,243	1,232	1,334	445	418	352	255	6,856
Inverclyde Council	1	1	1	1	1	1	1	1	1	1	1	9
Midlothian Council	0	0	0	0	10	61	57	1	1	1	1	134
Moray Council	10	15	341	341	192	158	39	172	233	15	15	1,532
Western Isles Council / Comhairle nan Eilan Siar	2	8	2	2	141	97	84	72	4	25	4	442
North Ayrshire Council	15	6	6	3	3	3	87	2	44	2	23	196
North Lanarkshire Council	75	6	30	25	7	7	527	296	7	21	14	1,015
Orkney Islands Council	2	11	35	33	12	9	30	9	2	16	2	160
Perth & Kinross Council	8	8	45	64	28	192	308	300	13	13	125	1,103
Renfrewshire Council	0	0	0	0	0	0	0	0	0	0	0	0
Scottish Borders Council	47	323	452	342	370	192	698	199	124	325	173	3,245
Shetland Islands Council	224	127	38	135	158	39	3	3	3	82	3	815
South Ayrshire Council	36	143	188	128	191	129	37	18	407	41	610	1,929
South Lanarkshire Council	243	327	366	140	166	212	145	46	73	215	320	2,254
Stirling Council	4	4	66	54	5	5	5	5	5	257	3	409
West Dunbartonshire Council	0	0	0	0	0	18	35	18	1	1	1	72
West Lothian Council	24	27	94	17	5	5	5	5	5	5	5	195
Unknown	56	0	0	75	226	31	1,686	781	748	330	28	3,962
The Cairngorms National Park	0	0	0	0	0	0	0	0	0	0	0	0
The Loch Lomond and the Trossachs National Park	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,480	1,462	2,928	3,697	4,935	4,667	8,435	3,218	2,706	2,303	2,096	

Table 5 Community benefits (£millions) – high end scenario

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Aberdeen City Council	0	0	0	0	0	0	0	0	0	0	0	0
Aberdeenshire Council	3	3	3	3	3	4	5	5	5	5	5	45
Angus Council	0	0	0	0	0	0	0	0	0	0	0	1
Argyll and Bute Council	2	2	2	2	3	5	8	8	8	9	9	58
City of Edinburgh	0	0	0	0	0	0	0	0	0	0	0	0
Clackmannanshire Council	0	0	0	0	0	0	0	0	0	0	0	3
Dumfries & Galloway Council	6	6	6	7	14	17	19	20	21	21	21	156
Dundee City Council	0	0	0	0	0	0	0	0	0	0	0	0
East Ayrshire Council	5	5	5	5	6	7	11	8	8	8	8	74
East Dunbartonshire Council	0	0	0	0	0	0	0	0	0	0	0	0
East Lothian Council	1	1	1	1	1	1	1	1	1	1	1	12
East Renfrewshire Council	0	0	0	0	0	0	0	0	0	0	0	2
Falkirk Council	0	0	0	0	0	0	0	0	0	0	0	2
Fife Council	0	0	0	0	0	0	0	0	0	0	0	5
Glasgow City Council	0	0	0	0	0	0	0	0	0	0	0	0
Highland Council	11	11	11	13	17	21	24	27	28	29	29	219
Inverclyde Council	0	0	0	0	0	0	0	0	0	0	0	1
Midlothian Council	0	0	0	0	0	0	1	1	1	1	1	3
Moray Council	3	3	3	4	6	6	7	7	6	6	6	55
Western Isles Council / Comhairle nan Eilan Siar	0	0	0	0	0	1	1	2	2	2	2	9
North Ayrshire Council	1	1	1	1	1	1	1	1	1	0	0	6
North Lanarkshire Council	1	1	1	2	2	2	2	2	2	2	2	20
Orkney Islands Council	0	0	0	0	0	0	0	0	0	0	0	4
Perth & Kinross Council	2	2	2	2	2	2	3	4	4	4	4	29
Renfrewshire Council	0	0	0	0	0	0	0	0	0	0	0	0
Scottish Borders Council	4	4	6	7	8	9	10	10	10	10	12	90
Shetland Islands Council	0	0	0	0	0	1	1	1	1	1	1	8
South Ayrshire Council	3	3	3	4	4	5	6	6	6	5	5	49
South Lanarkshire Council	7	7	10	10	10	11	12	12	12	12	13	115
Stirling Council	1	1	1	1	1	1	1	1	1	1	1	12
West Dunbartonshire Council	0	0	0	0	0	0	0	1	1	1	1	3
West Lothian Council	1	1	1	1	1	1	1	1	1	1	1	15
Unknown	0	0	0	0	2	2	2	6	10	11	12	46
The Cairngorms National Park	0	0	0	0	0	0	0	0	0	0	0	0
The Loch Lomond and the Trossachs National Park	0	0	0	0	0	0	0	0	0	0	0	0
Total	49	50	57	64	83	99	116	126	130	133	136	

8. Summary

Through this work we have built a model which enables the user to look ahead to 2030 and beyond, examining the sensitivities of the future pipeline to a number of key parameters.

We have conducted an extensive engagement with 20 developers whose combined portfolios cover a total of around 65% of the available pipeline capacity. Their feedback has enabled us to both adjust likely project timelines, including the important aspect of bringing repowering options forward in time, and to introduce to the pipeline potential projects that are not yet in the public domain.

Our analysis shows that reaching the target of 20 GW by 2030 with the current pipeline is possible. This relies on achieving the timelines that are the current "best estimate" by developers, and assumes the improved planning timelines promised by the SOWSD.

With the additional "new" capacity of around 11 GW identified by the developers, combined with some of the planning commitments set out in the recent SOWSD and assuming a typical attrition rate of 60%, the analysis suggests that up to 25.7 GW by 2030 may be achievable, assuming that these new projects can be brought through the development and planning process without further delay.[ix] This also assumes however that there is a viable route to market for these extra projects, and we note that the first opportunity to secure this – CfD round 5 allocation in 2023 – fell short of the required target by around 1.2 GW.

Our analysis also provides insight into some key industry measures, down to LPA level per year. These measures will help industry and key stakeholders better prepare for the demands on planning officers, and Police Scotland and Transport Scotland, by establishing likely timelines for projects transitioning through the planning process and the demand for abnormal loads on the roads networks.

[ix] The 11 GW of "new" capacity includes 2.4 GW of early repowering.

Appendix A Engagement pro-forma

The following text is an example of the information request that was sent to developers as part of the engagement process.

BVGAssociates

Project information request

Background

The Onshore Wind Industry, supported by Scottish Renewables, and the Scottish Government are working together to create a Scottish Onshore Wind Sector Deal, due to be published on 21 September of this year.

One of the commitments in the deal will be that an analysis of the full pipeline of onshore wind projects in Scotland is developed, validated, and regularly maintained. This pipeline will be analysed to estimate a number of different key statistics, including:

- The gap between existing pipeline and the 12 GW of additional capacity by 2030 target
- Resources required to deal with planning applications
- Resources required to deal with abnormal loads and other transport related issues
- Circular economy challenges, and
- Training and education challenges.

The current estimation of the pipeline is based on the data held by RenewableUK in their EPDB database. With this request, we are reaching out to you to help validate that data, with a focus on future milestone dates and gaining sight of any future projects you may have in your pipeline which have not yet been recorded in the RUK database.

Milestone dates

For every known onshore wind project, and any future “unknown” ones not currently listed in the dataset, we are building a project timeline, establishing the following key dates:

- Start of development
- Submission of planning application
- Date of consent
- Start of construction
- Start of operation
- End of life

In the following sections we briefly explain what we need from you for each of these milestones, working back in maturity from operational sites to sites in pre-submission. This is presented as five “status” categories (indicating the status between each pair of milestones), plus a sixth category asking you for any information you can provide on sites that have not yet made it into the public domain (and so are absent from the current RUK database)

There is an associated XLS file which we ask you to complete – the tables shown in this document are for context only and are not to be filled in.

Confidentiality

We understand that some of the project data we are requesting is commercially sensitive, especially that relating to future pipeline projects. We would like to explicitly state that this information will not be shared with anyone outside of the BVGA team working on this project. We will only report summarised information, with aggregated and anonymised data being presented at both national and planning authority level. We will not publish details of individual projects, or assumptions that we have applied to them in the analysis. The only exception to this is where the information is already publicly available. For example, the location and details for operational projects and projects already in the planning systems are publicly available, so we may show these explicitly on a map and in data tables. If you have any concerns regarding confidentiality, please bring then to our attention and we will be happy to discuss.

BVGAssociates

Your operational sites

Table 6 lists all sites which we believe to be operational.

In the XLS, please provide the expected “end of project life” (the date when you expect the site to be either decommissioned or repowered), providing any notes for context (including if the expectation is to decommission or repower). Please also indicate if any of the existing data are wrong.

Table 6 Projects which are currently operational.

Project	Project MW	Make	Model	Number	Rating (MW)	LPA	Hub Height (m)	Tip Height (m)	Rotor Diameter (m)	Fully Commissioned Date	Expected project end date	Notes
Ardkinglass/Clachan Flats	15	Ecotecnia	Ecotecnia 74	9	1.7	Argyll and Bute Council	60	93	66	01-Jun-09		
Arecleoch	120	Gamesa	Gamesa G80	60	2.0	South Ayrshire Council	78	118	80	14-Jun-11		
Beinn an Tuirc	30	Vestas	Vestas V47	45	0.7	Argyll and Bute Council	40	64	47	01-Dec-01		
Beinn an Tuirc Extension	44	Siemens	SWT-2.3-82	19	2.3	Argyll and Bute Council	59	100	82	01-Apr-14		
Beinn an Tuirc Phase 3	50	Vestas	Vestas V112-3.0	14	3.0	Argyll and Bute Council	70	126	112	28-Oct-21		
Black Law 1 (Construction Phase 1)	97	Siemens	SWT-2.3-82	42	2.3	South Lanarkshire Council	69	110	82	01-Sep-05		
Black Law 1 (Construction Phase 2)	28	Siemens	SWT-2.3-82	12	2.3	South Lanarkshire Council	70	110	80	01-Sep-06		
Black Law Extension	45	Alstom	Alstom	23	2.0	South Lanarkshire Council	Unknown	125	Unknown	21-Apr-17		
Black Law Extension Phase 2	18	Alstom	Alstom ECO 74	11	1.7	North Lanarkshire Council	90	127	74	21-Apr-17		
Cruach Mhor	30	Vestas	Vestas V52	35	0.9	Argyll and Bute Council	40	66	52	06-Jul-04		
Dersalloch	69	Siemens	Siemens (unknown model)	23	3.0	South Ayrshire Council	Unknown	125	Unknown	29-Nov-16		
Ewe Hill	37	Siemens	SWT-2.3-93	16	2.3	Dumfries & Galloway Council	65	112	93	15-Jun-17		
Ewe Hill 6	14	Siemens	SWT-2.3-93	6	2.3	Dumfries & Galloway Council	63	108	93	15-Jun-17		
Glen App	22	Gamesa	Gamesa G90	11	2.0	South Ayrshire Council	81	126	90	30-Jun-17		
Green Knowes	27	Acciona	Acciona AW 70/1500	18	1.5	Perth & Kinross Council	60	95	70	24-Sep-08		
Hagshaw Hill Extension	26	Siemens	SWT-1.3-62	20	1.3	South Lanarkshire Council	49	80	62	01-Oct-08		
Halsary Forest	30	Vestas	Vestas V100-1.8/2.0/2.2	15	2.0	Highland Council	70	120	100	27-Jul-21		
Hare Hill (Dumfries and Galloway)	2	Vestas	Vestas V47	3	0.7	Dumfries & Galloway Council	40	64	47	01-Nov-00		
Hare Hill (East Ayrshire)	11	Vestas	Vestas V47	17	0.7	East Ayrshire Council	40	64	47	01-Nov-00		
Hare Hill Extension	30	Gamesa	Gamesa G52	35	0.9	East Ayrshire Council	65	91	52	31-May-17		
Harestanes	136	Gamesa	Gamesa G87	68	2.0	Dumfries & Galloway Council	80	125	90	30-Jun-14		
Kilgallioch (Arecleoch Phase 2)	239	Gamesa	Gamesa G114; Gamesa G90	96	2.5	Dumfries & Galloway Council & South Ayrshire Council	89	146	114	28-Sep-17		
Mark Hill	56	Gamesa	Gamesa G87	28	2.0	South Ayrshire Council	66	110	87	14-Jun-11		
Wether Hill	18	Siemens	SWT-1.3-62	14	1.3	Dumfries & Galloway Council	62	93	62	01-May-07		
Whitelee Phase I Extension	108	Alstom	Alstom ECO 100	36	3.0	East Renfrewshire, South Lanarkshire & East Ayrshire	90	140	100	31-Oct-12		
Whitelee Phase II Extension	109	Alstom	Alstom ECO 100; Alstom ECO 74	39	2.8	East Ayrshire Council	90	140	100	15-Jan-13		
Whitelee, Eaglesham Moor (Part 1)	322	Siemens	SWT-2.3-82; SWT-2.3-93	140	2.3	East Renfrewshire, South Lanarkshire & East Ayrshire	69	110	93	01-May-09		

Sites currently under construction

Table 7 lists all sites which we believe to be currently under construction.

In the XLS, please provide the expected COD and expected “end of project life” (the date when you expect the site to be either decommissioned or repowered).

Please provide notes for context and indicate if any of the existing data are wrong.

Table 7 Sites currently under construction

Project	Project MW	Make	Model	Number	Rating (MW)	LPA	Hub Height (m)	Tip Height (m)	Rotor Diameter (m)	Date construction started	Expected COD	Expected Project End Date	Notes
No projects													

Sites with consent

Table 8 lists all sites which we believe to be currently consented but not yet in construction.

In the XLS, please provide:

- If you expect the project to progress to construction
- The expected start of construction
- The expected COD, and
- The expected “end of project life” (the date when you expect the site to be either decommissioned or repowered).

Please provide notes for context and indicate if any of the existing data are wrong.

Table 8: Projects which have been consented.

Project	Project MW	Number of Generators	Generator Capacity	LPA	Hub Height (m)	Tip Height (m)	Rotor Diameter (m)	Consented Date	Expected to proceed?	If "no" - why?	Expected start of construction	Expected COD	Expected end date	Notes
Arecleoch Extension	74.1	13	5.7	South Ayrshire Council	Unknown	200	Unknown	16-Nov-21						
Cumberhead West	119.7	21	5.7	South Lanarkshire Council	Unknown	200	Unknown	18-Nov-21						
Kilgallioch Extension	51.3	11	4.67	Dumfries & Galloway Council	Unknown	180	Unknown	08-Dec-21						

In planning

Table 9 lists all sites which we believe to be submitted to the planning authority but not yet in consented.

In the XLS, please provide:

- If you expect the project to progress
- The expected decision date
- The expected start of construction
- The expected COD, and
- The expected “end of project life” (the date when you expect the site to be either decommissioned or repowered).

Please provide notes for context and indicate if any of the existing data are wrong.

Table 9: Projects which have been submitted for planning consent.

Project	Project MW	Number of Generators	Generator Capacity	LPA	Max. Hub Height (m)	Max. Tip Height (m)	Max. Rotor Diameter (m)	Status	Submission date	Expected to proceed?	If "no" - why?	Expected decision date	Expected start of construction	Expected COD	Expected end date	Notes
Clauchrie	100.8	18	5.6	South Ayrshire Council	Unknown	200	Unknown	Submitted (S36/PINS)	18-Dec-19							
Earraghail	78	13	6	Argyll and Bute Council	Unknown	180	Unknown	Submitted (S36/PINS)	21-Feb-22							
Euchanhead	126	21	6	Dumfries & Galloway Council	Unknown	230	Unknown	Submitted (S36/PINS)	30-Oct-20							
Harestanes South Extension	44.8	8	5.6	Dumfries & Galloway Council	Unknown	200	Unknown	Submitted (S36/PINS)	07-Dec-20							
Hollandmey	50	10	5	Highland Council	Unknown	149.9	Unknown	Submitted (S36/PINS)	19-Nov-21							

Sites in pre-submission

Table 10 lists all sites which are in the public domain, but not yet submitted to the planning authority.

In the XLS, please provide:

- If you expect the project to progress
- The expected submission date
- The expected decision date
- The expected start of construction
- The expected COD, and
- The expected “end of project life” (the date when you expect the site to be either decommissioned or repowered).

Please provide notes for context and indicate if any of the existing data are wrong.

Table 10: Projects in development but not yet submitted for planning consent.

Project	Project MW	Number of Generators	Generator Capacity	LPA	Max. Hub Height (m)	Max. Tip Height (m)	Max. Rotor Diameter (m)	Status	Status Updated on	Expected to proceed?	If "no" - why?	Expected submission date	Expected decision date	Expected start of construction	Expected COD	Expected end date	Notes
Beinn Tharsuinn - Repower	84	Unknown	Unknown	Highland Council	Unknown	Unknown	Unknown	Met Mast Approved	02-Dec-19								
Fasque	90	Unknown	Unknown	Aberdeenshire Council	Unknown	Unknown	Unknown	Met Mast Approved	27-Jan-20								
Harestanes West	78	13	6	Dumfries & Galloway Council	Unknown	220	Unknown	Scoping	16-Mar-23								

Future projects

In addition to what is already in the above, we are seeking to gain insight into projects which you are developing or expecting to develop but which are not yet in the RUK database. We understand that this information is commercially sensitive, and it will only ever be treated "in aggregate" to show the total effect across all developers at local and national level. The analysis will not identify these as individual projects, or as aggregated values for individual developers.

We ask you complete the following table, preferably at project level, but your aggregates for at the LPA level would be adequate (e.g. "3 projects totalling 200 MW in Highlands").

If you are only able to provide ambitions at national level (e.g. "5 projects totalling 600 MW in Scotland") then please provide that.

For each line, we ask you provide estimates for all six milestone dates, as shown in Table 11.

Table 11 Milestone dates for future pipeline

Project	Project MW	LPA	Expected start of development	Expected submission date	Expected decision date	Estimated start of construction	Estimated COD	Estimated end date	Notes