Awel y Môr Offshore Wind Farm

WTG Size Technical Note

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Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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Contents

Figures

Tables

No table of figures entries found.

1 Wind Turbine Generator size technical note

1.1 Introduction

1 The Awel y Môr Offshore Wind Farm (AyM OWF, or AyM) project has undergone an iterative design and site selection process, in order to define a project that makes the greatest contribution to renewable energy targets while minimising environmental impacts and following principles of good design.

2 The process of identifying the array area is described in the Environmental Statement (ES) Volume 1, Chapter 4, Site Selection & Alternatives (application ref: 6.1.4):

- Section 4.7 describes the identification of the array area;
- Section 4.11 describes the process of refining the array area for the purposes of pre-application statutory consultation and the Preliminary Environmental Information Report (PEIR); and
- Section 4.13 describes the further refinement of project design following review of statutory consultation responses (on the PEIR) and Environmental Impact Assessment (EIA) studies.

3 The iterative changes have been a response to stakeholder feedback received during the EIA Scoping, Evidence Plan process, and PEIR consultations and in response to likely available wind turbine generator (WTG) models at the time of procurement and construction.

4 While the overall array area has now been fixed, in common with other nationally significant offshore wind energy projects, AyM is adopting the Rochdale Envelope (or maximum design scenario, MDS) approach for the array design, with flexibility being sought for the exact locations, number, size and capacity of WTGs, as explained in ES Volume 1, Chapter 3, EIA Methodology (application ref: 6.1.3), and set out in detail in Volume 2, Chapter 1, Offshore Project Description (application ref: 6.2.1).

5 The MDS approach ensures that the scenario that would result in the greatest impact (e.g. largest footprint or largest dimensions) is assessed. Unless otherwise identified any other (lesser) scenario for that impact would result in no greater significance than that assessed in the EIA.

6 This technical note provides further information in relation to:

- Offshore WTG change over time
- Availability and viability
- Consent flexibility
- Benefits of larger turbines

1.2 Offshore WTG change over time

7 The size of offshore WTGs has increased significantly over time, with those installed for the Blyth OWF (the first in the UK) in 2000 having a 95 m tip height, while those currently being installed for the Sofia OWF have a 252 m tip height. Furthermore, current projects within the consenting process include WTGs at a greater scale than AyM is considering, reaching 370 m in some cases (e.g. Hornsea 4). It is anticipated that this linear growth in turbine size will continue for the foreseeable future, with construction equipment following the same trajectory.

8 AyM's WTGs will have a tip height of up to 332 m (rotor diameter up to 306 m) and their capacity (or rating) will be a minimum of 11.5 MW each.

9 The following two graphs (Figure 1 and Figure 2) show how turbine rating (in MW) and turbine rotor diameter (in metres) have, and will continue to, increase over time (rotor diameter is presented here as tower heights – and therefore tip heights – are site-specific). While these graphs include information on some future WTG models and their planned first installation dates, it is of note that there are a number of other planned models of WTGs that AyM is discussing with the WTG manufacturers but are not yet in the public domain and therefore cannot be presented here due to commercial confidentiality. Figures 1 and 2 therefore show a 'trend' line that, for future WTG models, represents the anticipated rating and size of upcoming models.

10 Figure 3 shows how taller turbines power more homes.

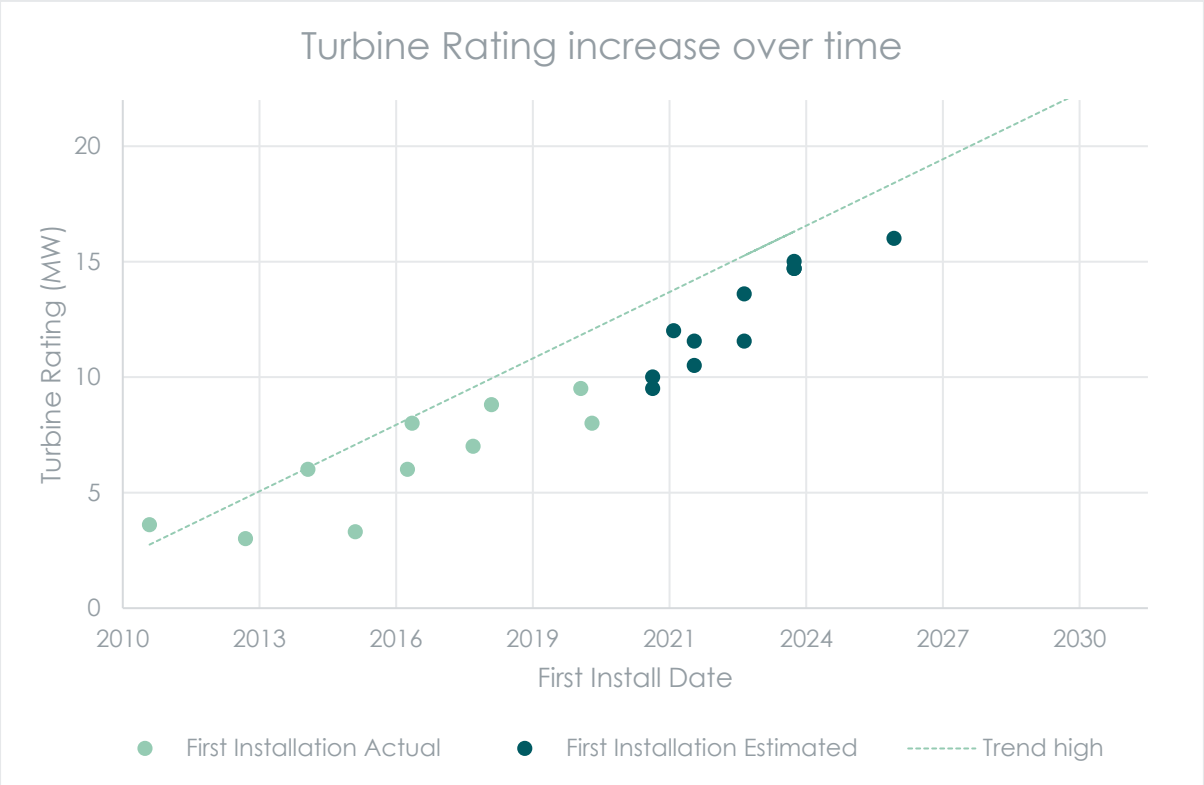

Figure 1 Construction of new WTG models over time, shown by the date each model was, or is planned to be, first installed (source: RWE via publicly-available information).

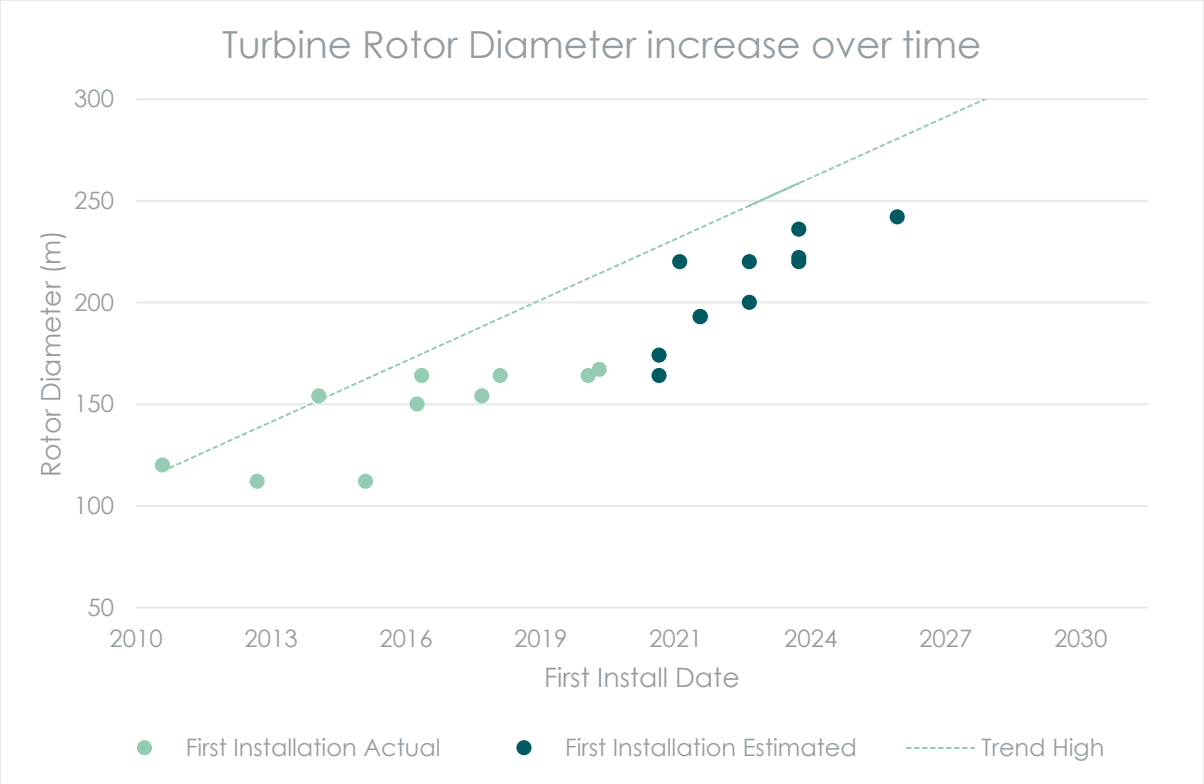

Figure 2 Construction of new, larger, WTG models over time, shown by the date each model was first installed (source: RWE via publicly-available information).

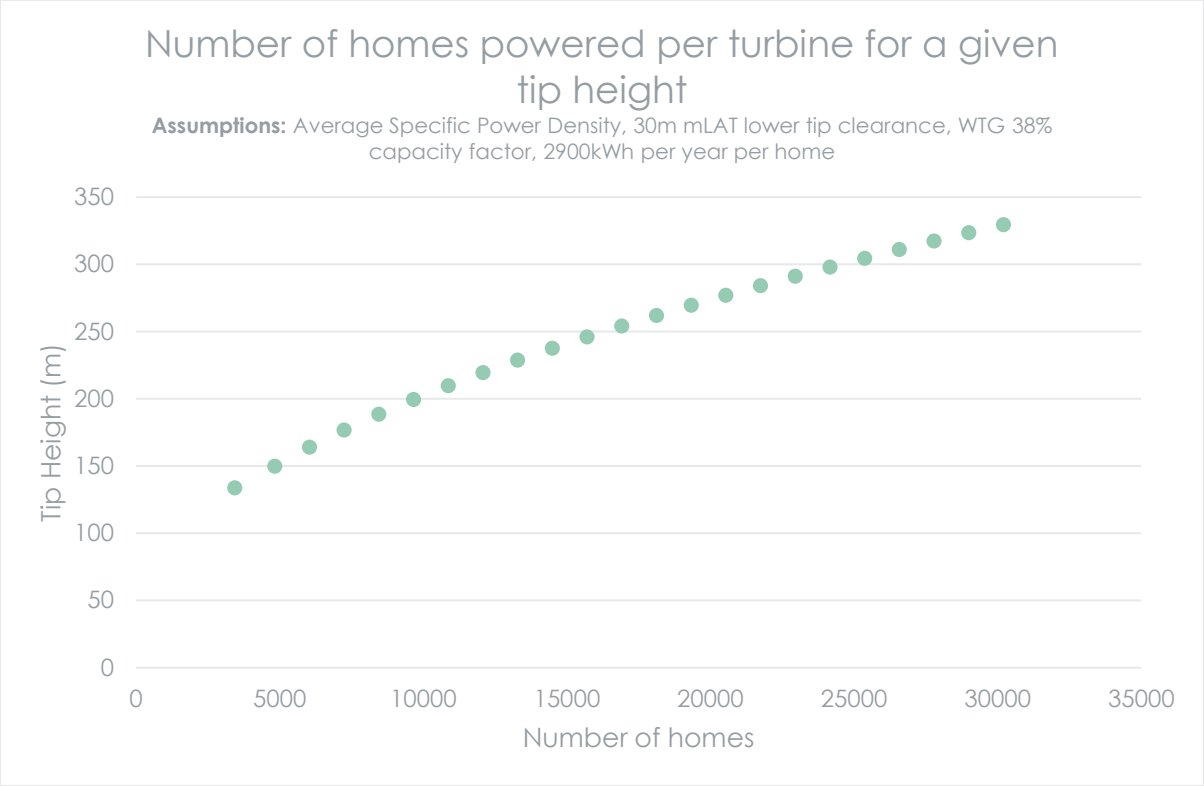

Figure 3 Tip height vs homes powered (source: RWE via publicly-available information).

11 Together, Figures 1 to 3 clearly show how the UK offshore wind industry has been able to generate more electricity and power more homes as WTGs have increased in size and capacity. At the same time, and as a result of these changes, the cost of energy (illustrated by the electricity 'strike price') has declined as shown in Figure 4 and described further below.

1.3 Availability and viability

12 Smaller scale turbines (such as the 175 m tip height, specified in Natural Resources Wales's (NRW) '*Stage 3 Report, Seascape & visual sensitivity assessment for offshore wind farms*' (White, S. Michaels, S. King, H, 2019) (the White Report)) are quickly going out of production as larger, more powerful turbines are developed, and the smaller models are rendered less economically efficient.

13 WTG manufacturers do not make formal announcements about the termination of production of specific models so this information is not publicly available. However, WTGs of less than 175 m are unlikely to be economically viable or even available to purchase at the time when AyM's WTGs are expected to be procured (from 2026) and constructed (2027/8).

14 Array design is a key driver in achieving a Contract for Difference (CfD) which is the UK Government's principal finance mechanism and route to market for an OWF. The lowest offer of cost per megawatt is the deciding factor in the CfD process. Securing a CfD is often (and will be for AyM) the determinant of whether an offshore wind farm can be constructed and thereby produce renewable energy to meet ambitious carbon reduction targets. In the timescale for AyM being developed, it is vital that there remains maximum flexibility of turbine height balanced with acceptable environmental effects, in order for the development to have any chance of being built.

15 Figure 4 shows how strike prices awarded under the CfD system have declined over time. This is directly related to the increase in turbine size and rating, shown in Figure 1 and Figure 2. In the simplest terms, for a project to win a CfD and progress to construction it must compete on strike price, which requires a project to achieve lowest cost of energy, which in turn demands the best and most efficient (and therefore larger) WTGs.

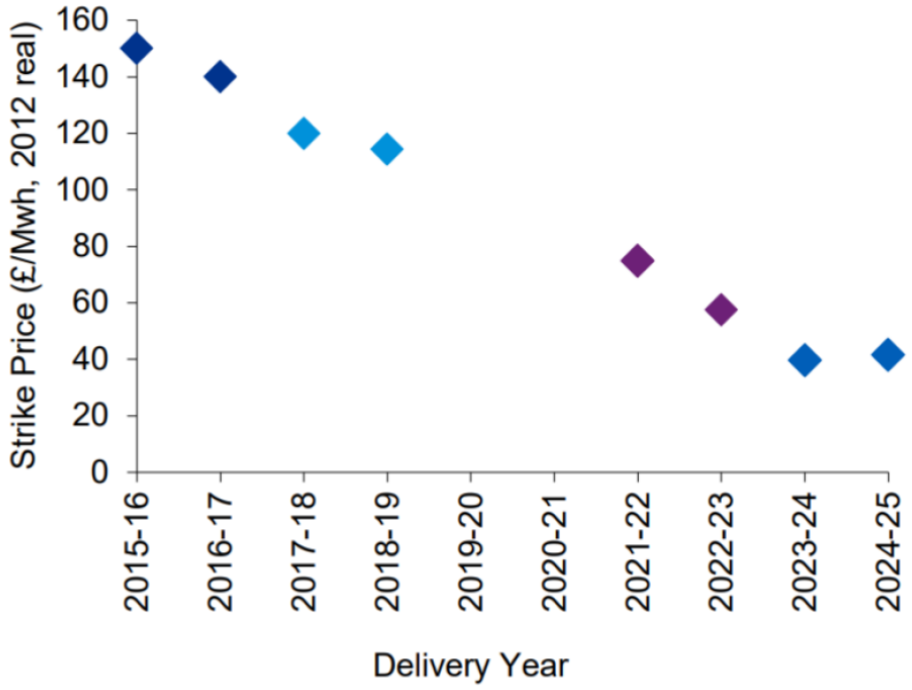

Figure 4 Strike prices awarded under the CfD (source: BEIS)

1.4 Consent flexibility

16 The development process for offshore wind projects can take 10 years. The pace of change in the offshore WTG market (shown in Figures 1 and 2, and by the quoted change between Blyth OWF (2000, 95 m tip height, 2 MW capacity) and Sofia OWF (under construction, 252 m tip height, 15 MW capacity)) means that WTGs for sale at the inception of a project (or at submission of applications for consent) will be different from those available at procurement.

17 The consenting process has taken account of this challenge for many years. The principle is captured within both the extant and draft NPS EN-3 which notes (at paragraph 2.7.22) that "*flexibility will be needed in relation to the dimensions of the turbines, including tip height, hub height and rotor diameter*".

18 As described above, the layouts used to inform the EIA for AyM are reflective of a maximum design scenario (MDS), and as such represent the greatest potential for a significant effect.

1.5 Benefits of larger turbines

19 The benefits of an offshore wind farm are evident and reflected in national and international policy. The benefits of using larger turbines, beyond simple deliverability and economics include:

- A lower cost of energy to the end consumer due to:
  - Greater power output from larger machines
  - Greater consistency of the wind resource at height
  - Fewer WTGs required for same power output means fewer foundations, faster build, less O&M cost
  - All of which supports a competitive bid for CfD/ viability.
- Environmental benefits
  - Fewer turbines and therefore foundations (reducing environmental effects on the seabed and archaeological resources);
  - Greater sea room and therefore a reduced interaction with shipping and navigation interests;
  - Reduced bird collisions; and
  - Fewer piling events, reducing the effects of underwater noise on marine mammals, fish, and shellfish.

1.6 Summary and conclusions

20 In following an iterative design process for AyM, mitigation measures have focussed on reducing as far as practicable those parameters that can be reduced; i.e. the lighting of the project at night during clear conditions (which the Applicant has committed to reducing), and the horizontal spread of the project. The horizontal spread has been reduced markedly through consultation from a maximum area of 107 km^2 to 78 km^2, the entire reduction being focussed on reducing the westerly extent of the horizontal spread of the project and the impact on sensitive receptors along the North Wales coastline.

21 Large WTGs are critical to viability, and smaller WTGs may not be available at the point of procurement for this project or may be in limited supply which would restrict any procurement. AyM considers that there is not an alternative WTG envelope which would meaningfully minimise harm while also providing the significant benefits of the scheme, particularly when considered in the context of meeting climate change targets and seeking to address the Climate Emergency which is reflected across all relevant local planning authorities and the Welsh Government.

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