

Moanmore Lower Wind Farm Grid Technical Report

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1 Introduction

GreenSource has requested MullanGrid to prepare a Technical Report on the grid connection for Moanmore Lower Wind Farm. MullanGrid's review focuses on the grid connection aspects of the proposal and MullanGrid also provide comment on the wind farm's contribution towards renewable targets. Moanmore Lower Wind Farm intends to apply for planning permission for three wind turbines with an expected electrical capacity of up to 15MW.

MullanGrid Consulting is one of Ireland's leading grid connection consultancies with experience of advising on the connection of renewable generators in Ireland and Northern Ireland.

2 Local Network and Generation

Moanmore Lower Wind Farm is expected to have a maximum export capacity (MEC) of 15MW. Typically, a wind farm of this size connects at MV (Medium Voltage, 20kV) or 38kV connection voltage to the nearest 110/38kV or 110/MV substation.

The nearest 110/38kV substation is located at Tullabrack and referred to as Tullabrack 110kV substation, see Figure 1. This substation contains one existing 31.5MVA 110/38kV transformer. The substation is connected to the wider 110kV network via a 'T-connection' to a circuit that connects Moneypoint 400kV substation to Ennis 110kV substation via Booltiagh 110kV substation. This 110kV circuit has a minimum circuit rating of 178MVA and is not considered a candidate for uprating to a higher capacity.

There are three existing wind farms connected at Tullabrack 110kV substation. These are Carrownaweellaun 4.6MW, Moanmore 12.6MW and Tullabrack 13.8MW wind farms. In addition Einagh Solar (previously Moanmore Solar) 16.7MW has been included in the ECP-2.2 batch. There are also two projects in planning that could connect to Tullabrack 110kV substation. This includes Ballykett Solar which could have an MEC of 20MW, and Dougill Wind Farm which could have an MEC of 5.9MW. Please note that the MEC's of the projects in planning have been estimated by MullanGrid based on publicly available information (County Council Planning Portal) and the capacity should only be treated as indicative. See Figure 2 for a map of the existing and future generation.

There is a significant volume of connected (mainly wind) and contracted generation (c.230.4MW) associated with this part of the 110kV network. The circuit connecting Tullabrack to Booltiagh cannot be uprated further and as such alternative solutions may be required to connect additional generation in the area. An example of these solutions could be implementing dynamic line rating technology on the 110kV circuit or moving new generation to the 220kV or 400kV networks/substations in the area. Therefore, Moneypoint 400kV substation could be an alternative viable connection option for Moanmore Lower Wind Farm.

3 Connection Method

Considering the connected and contracted generation at Tullabrack 110kV substation the most likely connection method for the proposed Moanmore Lower Wind Farm could be a 38kV connection to the existing Tullabrack 110kV substation via a 110/38kV transformer upgrade from 31.5MVA to 63MVA, or Moanmore Lower could have an MV connection to Tullabrack 110kV substation via a new 110kV/MV or 38kV/MV transformer.

An alternative connection point could be a distribution connection to Moneypoint 400kV substation. A new 110kV transformer would be required in Moneypoint substation. It is

understood that there is a spare 110kV bay in Moneypoint substation for the connection of this new transformer.

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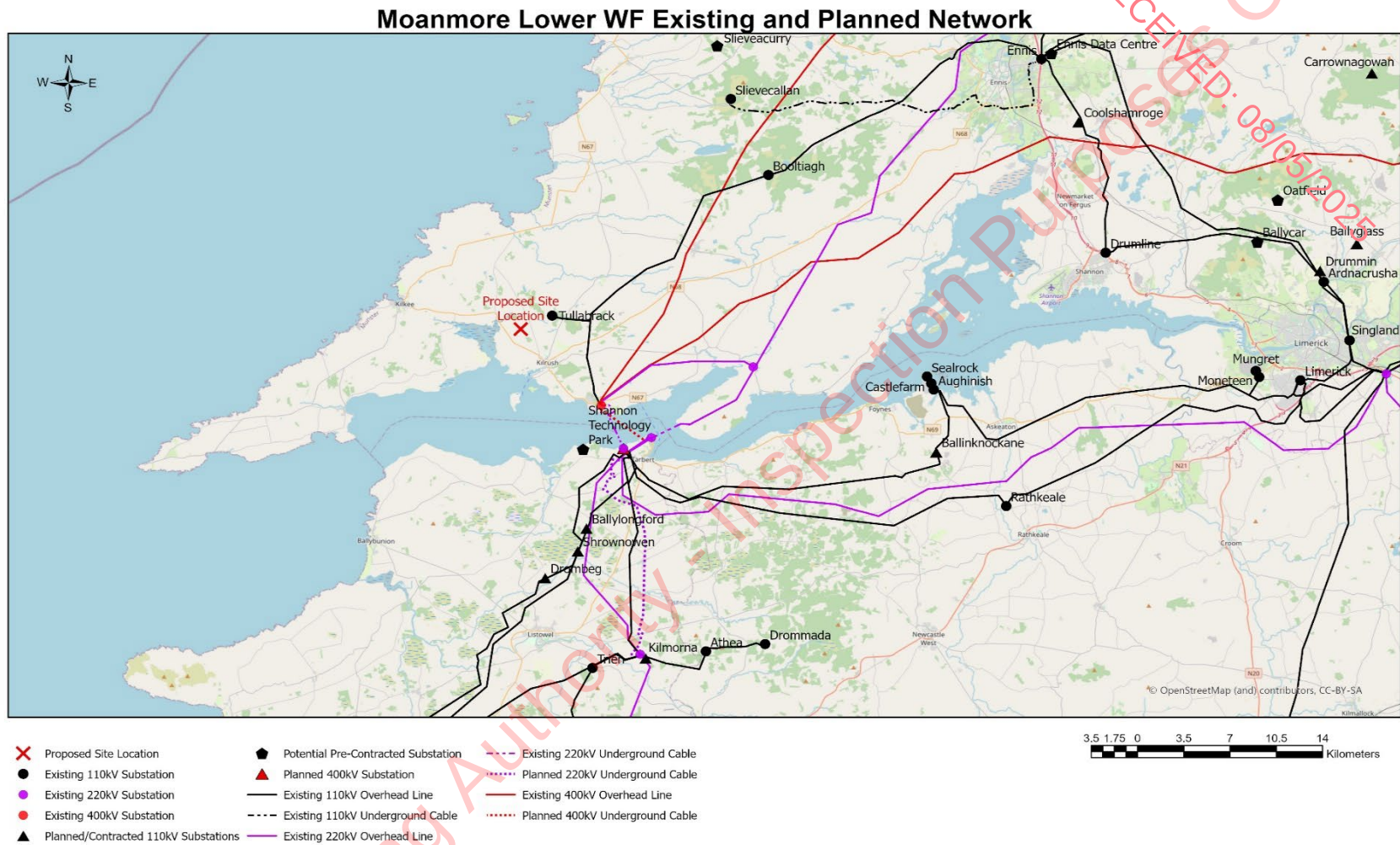
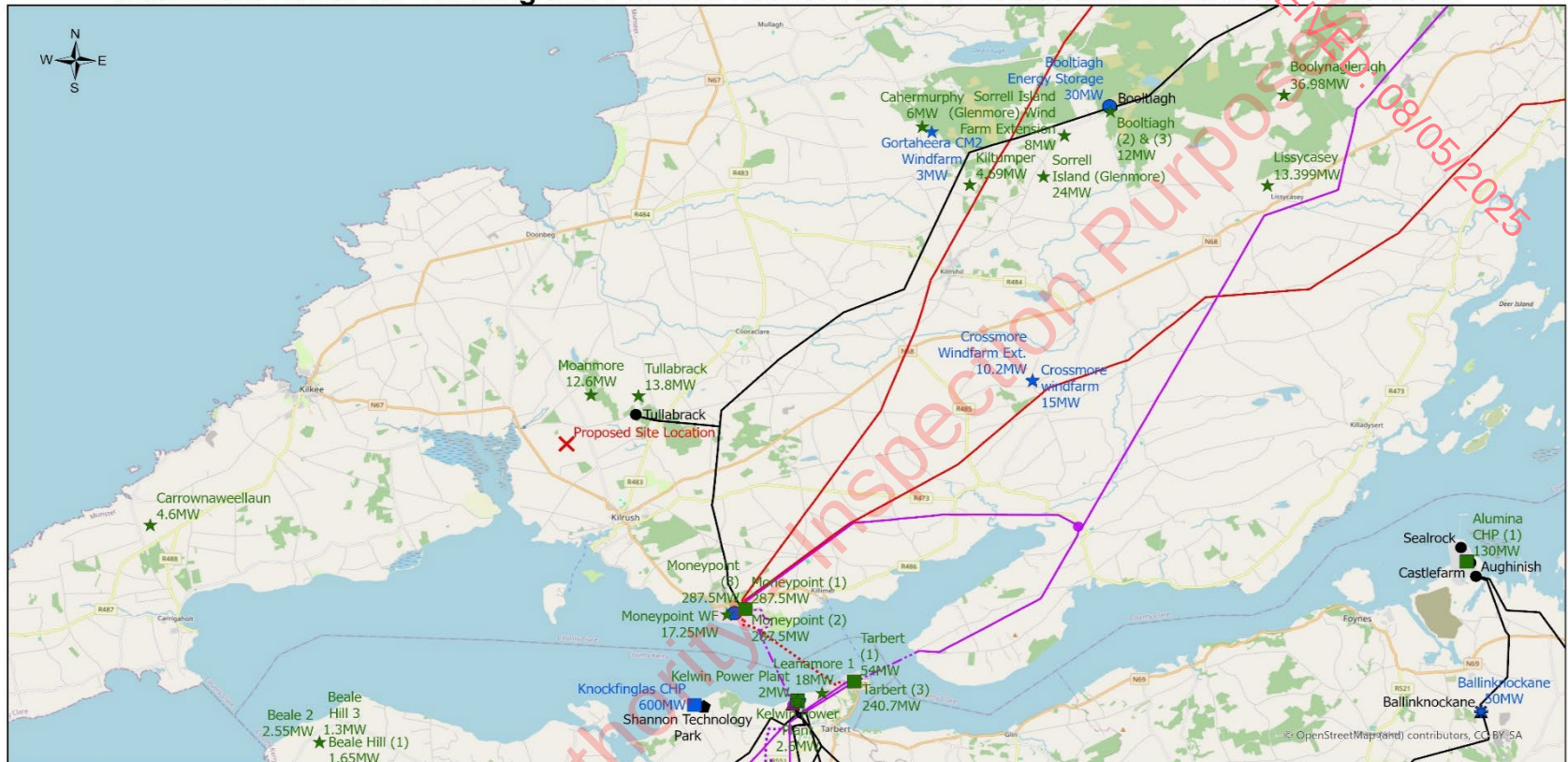


Figure 1 Existing & Planned Network

Moanmore Lower WF Existing and Planned Network and Connected and Contracted Generation



- | | | | |
|--|---------------------------------------|---------------------------------------|------------------------------|
| ✗ Proposed Site Location | ▲ Planned 400kV Substation | Planned 400kV Underground Cable | ● Contracted Battery |
| ● Existing 110kV Substation | — Existing 110kV Overhead Line | ★ Connected Windfarm | ■ Contracted Conventional |
| ● Existing 220kV Substation | — Existing 220kV Overhead Line | ● Connected Battery | ● Other Contracted Generator |
| ● Existing 400kV Substation | --- Existing 220kV Underground Cable | ■ Connected Conventional | |
| ▲ Planned/Contracted 110kV Substations | Planned 220kV Underground Cable | ★ Contracted Windfarm | |
| ◆ Potential Pre-Contracted Substation | — Existing 400kV Overhead Line | ★ Contracted Solar Park | |

2 1 0 2 4 6 8 Kilometers

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Figure 2 Connected & Contracted Generation

4 Renewable Energy Targets

The Irish Government has published the Climate Action Plan 2024¹. The plan sets a roadmap to cut emissions by 51% by 2030 and reach net zero by at least 2050.

Among the metrics listed to deliver emissions abatement in the electricity sector by 2030 were:

- Up to 80% share of renewable electricity (RES-E)
- Up to 9GW of onshore wind capacity

The plan also details a number of enabling targets to ensure emissions reductions are achieved, this includes a target to expand and reinforce the grid through new lines, substations and new technologies.

The proposed Moanmore Lower Wind Farm with an estimated connection date of 2027/28, if connected could contribute towards delivering the target of 9GW of onshore wind capacity and the target for 80% RES-E in 2030.

5 Conclusion

MullanGrid have prepared a technical report on the grid connection for Moanmore Lower Wind Farm.

The most likely connection method for the proposed Moanmore Lower Wind Farm could be a 38kV connection to the existing Tullabrack 110kV substation via a 110/38kV transformer upgrade from 31.5MVA to 63MVA, or Moanmore Lower could have an MV connection to Tullabrack 110kV substation via a new 110kV/MV or 38kV/MV transformer.

The Moneypoint 400kV substation could be an alternative option for Moanmore Lower Wind Farm. The connection method for this option would likely be a distribution connection to Moneypoint via a new 110/38kV or a 110kV/MV transformer. The new transformer can likely be connected within the existing Moneypoint facility.

Moanmore Lower Wind Farm can apply for a grid connection once a planning application is deemed complete. Assuming a connection offer is issued in 2025 and based on the timeline to complete the 38kV works, the wind farm could be energised in 2027/28.

The electrification of Ireland's energy system could drive significant demand growth across the transport, residential, industrial and commercial sectors. Connecting as much renewable generation capacity as possible will be vital to ensuring Ireland's interim and 2030 RES-E targets are achieved to deliver the necessary emissions reductions on the pathway to net zero emissions. Moanmore Lower Wind Farm with an estimated connection date of 2027/28 could make an important contribution to Ireland meeting its renewable energy targets.

¹ <https://www.gov.ie/en/publication/79659-climate-action-plan-2024/>