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ENERGY SERVICES

Cush Wind Farm – Phase II

Environmental Impact Assessment Report Non-Technical Summary

Cush Wind Limited

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1.0 Introduction

Cush Wind Limited is proposing to develop Cush Wind Farm – Phase II, a three-turbine extension to the permitted Cush Wind Farm, approximately 4 km north of Birr in County Offaly.

The Proposed Development will include three wind turbines, access tracks, an electrical switch room and other associated works. The wider Project also includes approximately 5 km of underground electricity line to connect the wind farm to the separately proposed Mullanafawnia 110 kV substation, and works along the route used to deliver the wind turbines. These additional works have been considered in the environmental assessment, although they are not part of the current planning application to Offaly County Council.

An Environmental Impact Assessment Report (EIAR) has been prepared to examine how the Project could affect the environment. This includes potential effects on people, wildlife, water, land, noise, traffic and the landscape. The assessment considers the effects of building, operating and eventually removing the wind farm, as well as its combined effects with other developments, including the permitted Cush Wind Farm.

This Non-Technical Summary presents the main findings of the EIAR in plain language. It explains the possible environmental effects of the Project, the mitigation measures proposed to avoid or reduce them, and any effects that may remain. Further details are provided in the full EIAR, which is available with the planning application documents at www.cushwindfarmplanning.ie. General information about the Project is also available at www.cushwindfarm.ie.

2.0 Site Location

The proposed wind farm is located in rural County Offaly, approximately 4 km north of Birr. The site extends across the townlands of Galros East, Whigsborough, Ballycollin, and Eglish. Its location is shown at **Figure 1**.

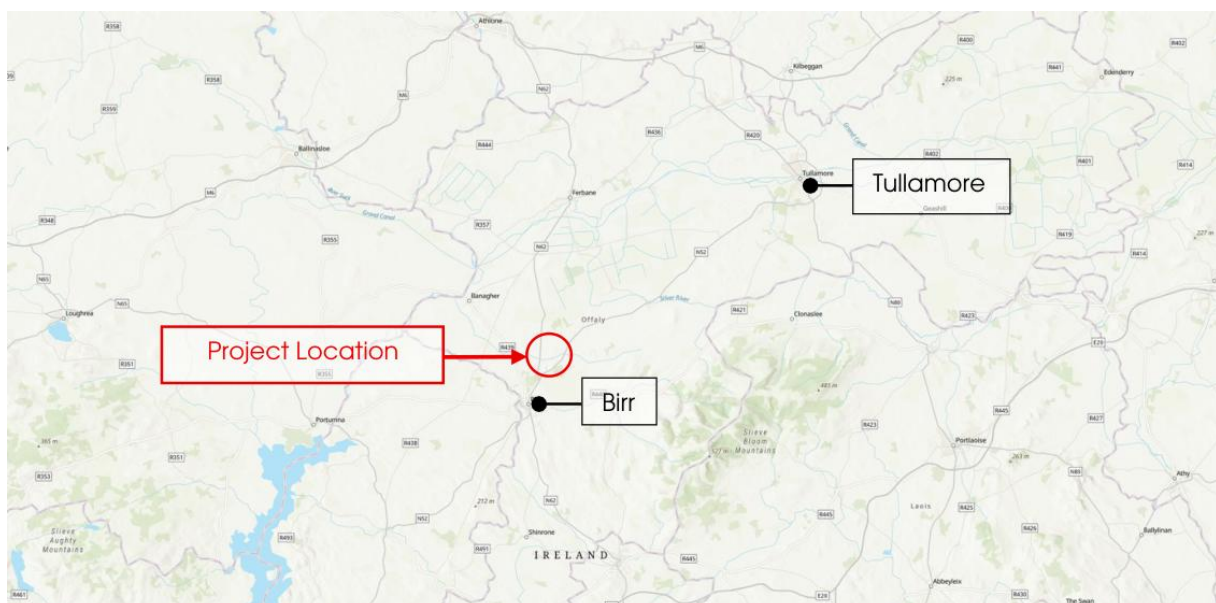


Figure 1: Project Site Location

The three proposed wind turbines will be located on Galros Bog, where peat was previously extracted on an industrial scale. The site is now mainly cutaway bog, with a network of drainage channels. The surrounding area includes farmland, hedgerows, forestry, local roads and scattered houses. The land is generally flat or gently sloping.

The N62 national road runs along the western side of Galros Bog. The proposed electrical switch room will be located on agricultural land to the south of the bog.

An underground electricity line will extend approximately 5 km from the switch room to the proposed Mullanafawnia 110 kV substation. The route will mainly cross agricultural land, crossing beneath the N52 national road, the L7006 local road and the Rapemills River at two locations. The underground electricity line forms part of the wider Project assessed in the EIAR, but is not included in the current planning application. The proposed substation is a separate development, and its potential combined environmental effects have also been considered.

3.0 Assessment of Project Alternatives

Several alternatives were considered before the proposed wind farm design was selected. These included different renewable energy technologies, locations, numbers and positions of turbines, turbine sizes, access routes and electricity connections. The option of not proceeding with the development was also considered.

If the Project did not proceed, there would be no construction or operation effects from the proposed three-turbine extension. The additional renewable electricity and associated local economic and community benefits would also not arise. The permitted Cush Wind Farm and planned rehabilitation of Galros Bog could still proceed separately.

Solar energy was considered as an alternative to wind energy. However, a solar farm with a similar generating capacity would require a larger area of land, potentially placing greater constraints on the planned rehabilitation of Galros Bog. Wind energy was also preferred because of the opportunity to make use of infrastructure associated with the permitted Cush Wind Farm.

The proposed location was selected partly because it is close to the permitted Cush Wind Farm and provides opportunities to share infrastructure. The site has also been influenced by previous peat extraction and other land uses. The three proposed turbines had previously formed part of an earlier eleven-turbine layout for Cush Wind Farm but were omitted before the application for the permitted eight-turbine development was submitted.

Both three-turbine and four-turbine layouts were examined. The four-turbine option included an additional turbine to the south, close to an existing 400 kV overhead electricity line. This presented technical difficulties, and the three-turbine layout was selected.

The positions of the turbines, access tracks and electrical infrastructure were further refined to take account of nearby homes, wildlife, drainage, ground conditions and other environmental considerations. Different turbine sizes were also considered, with the assessment allowing for a range of turbine dimensions rather than a single model.

Different electricity connection routes and construction methods were also examined. Two possible grid connections were considered, at Ballaghanoher and Mullanafawnia. The Ballaghanoher option was not progressed because a connection to the existing electricity network at that location was found to be technically unfeasible. The Mullanafawnia option was therefore selected, using approximately 5

km of underground electricity line.

Alternative routes for delivering turbine components and construction materials were also considered. The route from Galway Port, previously assessed for the permitted Cush Wind Farm, was found to remain suitable, subject to some minor changes to the works needed along the route.

Further information on the alternatives considered and the reasons for selecting the proposed design is provided in **Chapter 2 (Assessment of Project Alternatives)** of the EIAR.

4.0 Description of the Project

Planning permission has already been granted by An Coimisiún Pleanála for Cush Wind Farm, comprising eight wind turbines on lands near Galros Bog (ref. ABP-318816-24). The proposed Cush Wind Farm – Phase II would extend the permitted wind farm by adding three further turbines, bringing the total to eleven. The three proposed turbines will be located to the northeast of the permitted wind farm, as shown in **Figure 2**.

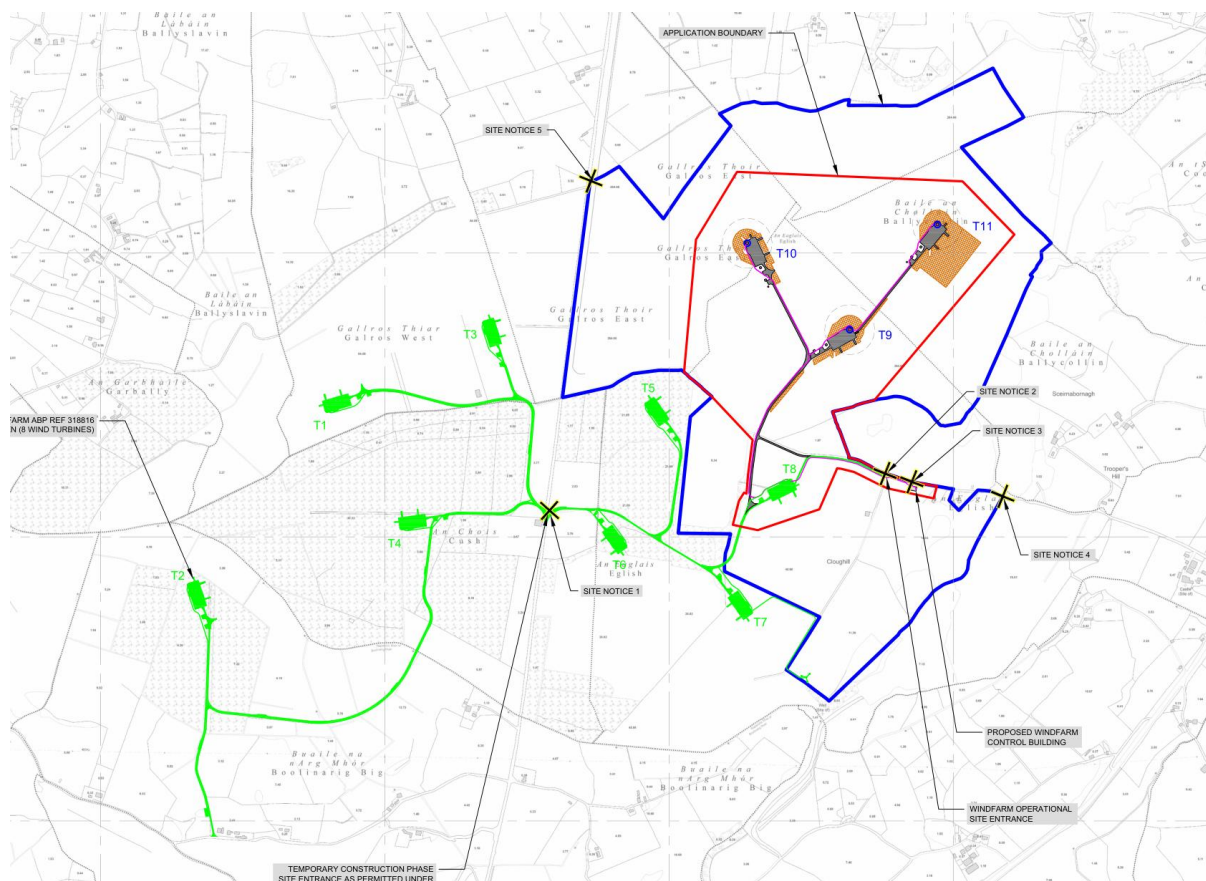


Figure 2: The Proposed Development

The Proposed Development will include three wind turbines, each approximately 200 m tall, together with the infrastructure needed to build and operate them. This includes turbine foundations, areas for cranes to operate, approximately 1.7 km of access tracks, underground cables and an electrical switch room. Drainage and other works will also be carried out as part of the development. The Proposed Development will also make use of some of the entrances, access tracks and construction facilities already permitted for Cush Wind Farm.

The exact turbine model has not yet been selected. Each turbine will have three blades, which will sweep a circle between 158 m and 175 m in diameter. Depending on the model selected, the three turbines will have a combined electricity generating capacity of approximately 18–22 megawatts (MW).

Electricity generated by the turbines will be carried through underground cables to a new electrical switch room. From there, an underground electricity line of approximately 5 km is proposed to connect to the planned Mullanafawnia substation. The electricity line is not part of the current planning application but has been assessed as part of the wider Project in the EIAR.

The large turbine components are expected to be transported from Galway Port to the wind farm by road. Some temporary works will be needed along the delivery route to allow the vehicles carrying these components to pass safely. A short section of wall in Galway City will also be permanently removed and replaced with fencing. These works have also been assessed as part of the Project in the EIAR but are not part of the current planning application.

The proposed Mullanafawnia substation is being developed separately by another developer. It is not part of the wind farm Project, but its potential combined environmental effects have been considered in the EIAR.

Construction of the wind farm is expected to take approximately 15–18 months. This will involve preparing the site, building access tracks and turbine foundations, installing the turbines and connecting them to the electricity network. Normal construction hours will be 7 am to 7 pm, Monday to Friday, and 7 am to 1 pm on Saturdays. Some activities, such as turbine deliveries and concrete pouring, may need to take place outside these hours. Nearby residents and the Planning Authority will be notified in advance where works outside normal hours are required.

Planning permission is being sought for a 10-year period, meaning that construction could begin at any time within 10 years of permission being granted. The wind farm is expected to operate for 35 years from commissioning. During this time, the turbines will generate electricity and will be regularly inspected and maintained. The surrounding land will continue to be used for agriculture and bog rehabilitation where appropriate.

At the end of its operational life, the turbines and other above-ground equipment will be removed. Materials will be reused or recycled where possible, and disturbed areas will be restored. Some underground infrastructure and access tracks may remain where removing them would cause unnecessary disturbance or where tracks are required for continued use by landowners.

Further information about the proposed development is provided in **Chapter 3 (Description of the Project)** of the EIAR.

5.0 Population & Human Health

This assessment considers how the proposed wind farm could affect people living, working or visiting the surrounding area. It looks at potential effects on local communities, employment, businesses, tourism, recreation and human health. The assessment draws on information about the local population and economy, together with the findings of other environmental assessments, including those relating to noise, air quality, landscape and shadow flicker.

During construction, nearby residents and road users may experience temporary

increases in traffic, noise and dust. Some short-term disruption may also occur along the turbine delivery route and the underground electricity line route. Mitigation measures will be put in place to manage these effects, including controls on working hours, construction traffic, noise and dust. With these mitigation measures in place, no significant adverse effects on population or human health are expected from construction.

The construction workforce is expected to peak at approximately forty people. The total investment associated with the Project is estimated at approximately €31.3 million, of which around €7.8 million could be spent within County Offaly. Construction will also create opportunities for local businesses supplying materials, services and accommodation. Smaller economic benefits will continue during operation through maintenance and other local expenditure, with up to five engineers and technicians expected to provide operational support.

During operation, the turbines will be visible from parts of the surrounding area. Operational noise has been assessed and is not predicted to cause significant adverse effects on human health. An automatic turbine shutdown system will be used to prevent shadow flicker at nearby dwellings. The assessment does not predict significant adverse effects on human health, tourism or recreational activities.

The Developer has committed to a Community Benefit Fund at a rate of €2 for each megawatt-hour of electricity generated. The amount available each year will depend on how much electricity the wind farm produces. A Near Neighbour Scheme will also provide annual payments to eligible households closest to the wind farm. Under the proposed scheme, eligible households within 1 km will receive €2,000 annually, with payments reducing on a sliding scale for eligible households between 1 km and 2 km. These payments will form part of the Community Benefit Fund, which will also support local community projects.

A Community Liaison Officer will be available to provide information, respond to queries and address concerns raised by local residents during construction and operation.

During decommissioning, temporary effects associated with traffic, noise and disturbance are expected to be similar in nature to those experienced during construction, but of a substantially smaller scale and shorter duration.

Overall, no likely significant adverse effects on population or human health are expected once the proposed mitigation measures are in place. The development is also expected to provide employment, local spending and community funding benefits. No significant cumulative effects on population or human health are predicted when the Project is considered alongside the permitted Cush Wind Farm and other relevant developments.

Further information is provided in **Chapter 4 (Population & Human Health)** of the EIAR.

6.0 Biodiversity

The biodiversity assessment examines how the proposed wind farm and associated works could affect wildlife and natural habitats. This includes birds, bats, other animals, plants, rivers and protected nature conservation sites.

The wind farm site is mainly former industrial peatland. Although peat extraction has changed its original character, the area continues to support habitats and wildlife. The underground electricity line will mainly cross agricultural land, including

hedgerows, drainage channels and the Rapemills River.

Ecological surveys were carried out to identify the habitats and species present and assess how they could be affected by the development. These included surveys of birds, bats, mammals, plants and aquatic habitats.

During construction, some habitats will be permanently lost where turbines, access tracks and other infrastructure are built. Other areas will be temporarily disturbed and restored following construction. Construction activity could also disturb birds and other wildlife, while soil, fuel or other materials entering drains and rivers could affect aquatic habitats.

During operation, birds and bats could be at risk of collision with moving turbine blades. The assessment examined these risks using information collected during ecological surveys.

A range of mitigation measures will be put in place to avoid or reduce effects on wildlife and habitats during construction and operation. An ecologist will oversee relevant construction activities and check for protected species before works begin. Construction activities will be managed to avoid unnecessary disturbance to habitats, nesting birds and other wildlife, while pollution-prevention measures will protect drains and rivers. Temporarily disturbed habitats will be restored, and affected hedgerows and trees will be replaced where required. The existing open buffers around turbines will be maintained to preserve separation from bat habitats. From commissioning, turbine blades will be feathered below their normal cut-in wind speed, from sunset to sunrise during April–October. Feathering turns the blades out of the wind to slow their rotation. Weather-related parameters will be agreed with the Planning Authority. Feathering can subsequently be relaxed at individual turbines with the Planning Authority's agreement where monitoring in years 1 and 2 demonstrates low collision risk.

Bird monitoring will be undertaken during the first three years of operation. Bat activity and fatality monitoring will also be undertaken in years 1–3, coordinated with the permitted Cush Wind Farm monitoring programme. Increased turbine cut-in speeds will be implemented where either activity or fatality monitoring identifies elevated bat collision risk.

The cumulative effects of the Project have been assessed in combination with the permitted Cush Wind Farm, the planned rehabilitation of Galros Bog and other relevant developments.

A separate Natura Impact Statement (NIS) has been prepared to examine potential effects on six European protected sites. It concludes that the Project will not adversely affect the integrity of these sites, either on its own or together with other developments, provided the identified mitigation measures are implemented. Offaly County Council will carry out its own independent Appropriate Assessment before making a decision.

Overall, the biodiversity assessment concludes that no significant adverse effects on important habitats or wildlife are expected to remain once the proposed mitigation measures are in place.

Further information is provided in **Chapter 5 (Biodiversity)** of the EIAR and the accompanying Natura Impact Statement.

7.0 Land & Soils

This assessment examines how the proposed wind farm and associated works could affect the land, peat, soils and underlying geology.

The wind turbines will be located on Galros Bog, where peat was previously extracted. Surveys and ground investigations were carried out to establish the depth and condition of the remaining peat and assess the stability of the ground.

Bord na Móna (BnM) has prepared a draft rehabilitation plan for Galros Bog, which aims to encourage vegetation to grow on exposed peat and reduce the amount of sediment entering nearby waterways. The proposed wind farm has been designed to remain compatible with the wider rehabilitation of the bog.

Construction will involve excavating peat and soil to build turbine foundations, access tracks, cable trenches and other infrastructure. Some of this material will be reused to restore disturbed areas, while surplus peat and soil will be placed in specially designed areas on the site. These works will result in some permanent changes to the ground. The permanent wind farm infrastructure will occupy approximately 2.3 hectares, mainly comprising previously worked bog, together with a small area of agricultural land.

A detailed assessment of peat stability found that the site is at low risk of peat failure or ground movement. Mitigation measures will be put in place to ensure that excavation, drainage and the storage of excavated material are carefully managed. A specialist engineer will inspect the works during construction and for six months afterwards.

The proposed underground electricity line will cross part of the Kilcormac Esker, a locally important geological feature formed by sand and gravel deposited during the last ice age. Installing the cable will disturb small areas of the esker, but the ground will be restored to its original levels and the overall shape of the esker will remain. Some minor permanent effects on the underlying geological material will remain.

Mitigation measures will also be implemented to prevent soil erosion and pollution from fuels and other construction materials. These include careful storage and handling of materials, drainage controls and the restoration of disturbed ground.

Overall, some slight to moderate local effects on land and soils will remain following construction. However, the assessment concludes that these effects will not be significant, and the risk of peat instability will be negligible once the proposed mitigation measures are in place.

Further information is provided in **Chapter 6 (Land, Soils & Geology)** of the EIAR.

8.0 Water

The water assessment considers rivers, streams, drains, groundwater, drinking-water supplies and flooding. It examines how construction, operation and decommissioning could affect water quality or drainage, including downstream habitats and protected sites.

Galros Bog has an established drainage network connected to the Rapemills River system. The underground electricity line runs beside the Rapemills River for part of its route and crosses beneath it twice. The assessment also considers the Rath Group Water Scheme and other relevant water supplies.

The assessment reviewed existing information and carried out site surveys, ground

investigations and water sampling to establish local water conditions. A separate Flood Risk Assessment was also prepared. The assessment considered the proposed development alongside the permitted Cush Wind Farm, the proposed Mullanafawnia substation and other relevant developments. It also considered the Galros Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026) and the environmental objectives for local rivers and groundwater.

The main potential effects on water would arise during construction. Excavation and ground disturbance could allow peat, soil and sediment to enter nearby drains and watercourses. Accidental spills of fuel, concrete or other construction materials could also affect water quality if not properly controlled.

The two river crossings will be installed by drilling beneath the riverbed rather than opening a trench through the channel. Mitigation measures will be implemented to prevent drilling fluids entering the river and to respond to any accidental release.

The wind farm infrastructure is located in an area identified as having a low probability of river flooding. Parts of the electricity line route pass through mapped river flood zones. Although the cable will be buried and the ground restored, temporary flood precautions will be required during construction.

During operation, tracks, hardstands and other developed areas can alter the way rainwater moves across a site. A drainage system will manage runoff and maintain existing drainage patterns as far as practicable. The design has also taken account of the planned rehabilitation of Galros Bog, which aims to restore vegetation and improve the environmental condition of the former peat extraction lands.

A range of mitigation measures will be implemented to protect water quality during construction. Clean rainwater will be diverted away from disturbed areas where possible, while water from construction areas will be collected and treated to remove sediment before being released. Untreated construction runoff will not be discharged directly into watercourses.

Other mitigation measures will include maintaining appropriate distances from watercourses, carefully managing excavated peat and soil, controlling water pumped from excavations, and storing fuels and chemicals securely. Additional precautions will apply at the Rapemills River crossings.

Water quality will be monitored during construction, with inspections and corrective action where necessary. Specific mitigation measures will also be implemented for the Rath Group Water Scheme and other potentially affected water supplies. During operation, the drainage system will be inspected and maintained. Similar mitigation measures will apply during decommissioning.

With the proposed drainage, pollution-prevention and flood-management mitigation measures in place, no significant effects on rivers, groundwater or drinking-water supplies are predicted. The Project is not expected to cause deterioration in the status of water bodies or prevent them achieving their environmental objectives. No likely significant cumulative water effects have been identified with the relevant developments assessed.

Further information is provided in **Chapter 7 (Water)** of the EIAR.

9.0 Air Quality

The air quality assessment considers dust and vehicle or plant emissions during construction and decommissioning, together with the wider benefits of renewable

electricity generation during operation. Nearby homes, other sensitive uses and ecological areas have been considered. Existing air quality in the surrounding rural area is generally good, with background levels of airborne particles well below the relevant air-quality limits.

Existing air-quality information and the location of nearby sensitive receptors were reviewed. The assessment considered dust from earthworks, construction, minor demolition works along the turbine delivery route, and the movement of vehicles carrying mud or dust onto roads. The scale of activities and distance to receptors were used to identify appropriate mitigation measures for the wind farm, electricity line and delivery haul route works. There are no residential properties within 250 m of the wind farm construction works, although some properties are located closer to works along the underground electricity line and delivery route.

Excavation, handling of soil, vehicle movements and construction activities can generate dust, particularly in dry or windy weather. The extent of dust depends on the conditions at the time and how the works are managed. Vehicle and plant exhaust emissions will also occur, but these will be associated mainly with the temporary construction period. The assessment identified a low risk of dust affecting nearby properties or human health. However, without mitigation measures, construction dust could result in localised, short-term, moderate negative effects.

The combined effect of concurrent construction with the permitted Cush Wind Farm has been considered, together with the proposed Mullanafawnia substation and other relevant developments. The assessment identifies the mitigation measures needed to control dust soiling, protect human health and avoid effects on sensitive vegetation. Decommissioning will involve similar types of activity, generally at a reduced scale.

During operation, the turbines will generate electricity without the combustion emissions associated with fossil-fuel electricity generation. Maintenance traffic will be limited, and the Project will make a small positive contribution to wider air quality by reducing reliance on fossil fuels. The assessment estimates that renewable electricity generation will avoid approximately 12.1–13.8 tonnes of nitrogen oxides each year. Nitrogen oxides are air pollutants associated with fuel combustion that can adversely affect human health and the environment.

Mitigation measures to control dust will include management of exposed ground and stockpiles, water suppression when required, appropriate vehicle speeds, covering of loads where appropriate, wheel cleaning and road cleaning. Vehicle engines will be switched off when stationary, and dust-generating activities will be managed to minimise emissions.

The working areas and nearby roads will be inspected, with additional mitigation measures introduced if conditions require them. Dust controls will be coordinated with water-management mitigation measures so that water used for suppression does not carry untreated sediment into watercourses. The relevant construction mitigation measures will also be implemented during decommissioning.

Following implementation of the proposed mitigation measures, construction and decommissioning effects on air quality are assessed as localised, short-term and not significant. Renewable electricity generation will provide an indirect, long-term, slight positive air-quality effect during operation. No significant cumulative air-quality effects are predicted.

Further information is provided in **Chapter 8 (Air Quality)** of the EIAR.

10.0 Climate

The climate assessment considers both the greenhouse gas emissions associated with the Project and how the Project could be affected by a changing climate. It examines emissions from construction materials, turbine manufacture, transport, land disturbance and site activities, together with the emissions avoided through renewable electricity generation. Greenhouse gases, including carbon dioxide, contribute to climate change by trapping heat in the atmosphere.

The assessment estimates emissions over the Project's 35-year operational life, including those associated with manufacturing, construction, operation and decommissioning, and compares them with the emissions that could be avoided by generating renewable electricity instead of electricity from other sources. It uses the assessed turbine dimension range and the electricity output expected from the relevant configurations. The results are considered in the context of national climate and electricity-sector targets.

A separate climate-risk review considers the potential effects of changing rainfall patterns, flooding, high winds and temperatures. It examines whether the turbines, foundations, tracks, drainage, buildings and electrical infrastructure will remain suitable under future conditions, taking account of their design and management.

Construction and decommissioning will generate greenhouse gas emissions through the production and transport of materials, use of machinery and disturbance of peat and soils. These emissions are included in the assessment rather than considering the electricity generation benefit on its own.

The Project is expected to generate around 48–55 million kilowatt-hours of renewable electricity each year. Using the electricity generation assumptions adopted in the assessment, the estimated annual greenhouse gas saving is approximately 9,500–10,800 tonnes of carbon dioxide equivalent. These estimates take account of the emissions associated with the Project, spread over its proposed operational life. Carbon dioxide equivalent is a way of expressing different greenhouse gases on a common basis. The saving represents the benefit of displacing electricity that would otherwise be generated using a mix of energy sources, including fossil fuels.

The climate-risk assessment identifies drainage and construction activities among the matters requiring consideration during heavy rainfall and other extreme weather. The design and management measures reduce the Project's remaining vulnerability to climate hazards to a low level.

Measures to minimise greenhouse gas emissions during construction and decommissioning will reduce unnecessary material use, fuel consumption and waste, and encourage reuse and recycling. Construction emissions, resource use and waste will be monitored to identify opportunities for further reductions. Peat and soil disturbance will be managed through the layout and construction plans.

The design of drainage, turbines and other infrastructure will take account of the relevant climate conditions. Construction planning will include weather forecasts and response procedures, while operation and maintenance arrangements will provide for inspections and upkeep of drainage and other sensitive infrastructure.

Construction and decommissioning will have slight negative climate effects, while electricity generation will have a long-term, slight positive effect. Overall, the Project's climate effect is assessed as long-term, slight and positive, and not significant in Environmental Impact Assessment (EIA) terms. The assessment also concludes that no

significant effects on the Project from climate-change hazards are likely with the identified measures in place. No significant cumulative climate effects are predicted. Further information is provided in **Chapter 9 (Climate)** of the EIAR.

11.0 Landscape

The landscape assessment considers how the Project will change the character of the surrounding landscape and the views available to people living, working, travelling or enjoying recreational activities within it. It includes the wind farm, associated infrastructure, underground electricity line and turbine delivery haul route works, as well as the combined appearance of the Project with other wind farms.

The assessment reviewed landscape character, planning designations, scenic views, settlements, roads and amenity or heritage locations. Fieldwork and a computer-based visibility study helped identify where the turbines could be seen. Photomontages show the proposed turbines in representative views, allowing their scale and relationship with the surrounding landscape to be examined. A comparative set of photomontages was also prepared to consider the range of proposed turbine dimensions.

A total of 27 representative viewpoints were assessed. The assessment considers the most visually prominent turbine configuration within the proposed dimension range and includes the permitted Cush Wind Farm and other relevant existing, permitted and proposed wind energy developments. The full photomontages accompany the EIAR and should be consulted to understand how the proposed turbines would appear from individual viewpoints.

The site forms part of a working rural landscape containing cutaway peatland, agriculture, forestry, roads, scattered houses and existing or permitted wind farms. Construction will introduce machinery, earthworks and cranes for a limited period. Reinstatement will reduce the appearance of temporary working areas once those activities finish.

During operation, the turbines will become additional features in views from parts of the surrounding area. The greatest changes will occur close to the site, particularly to the north and west, with effects generally reducing as distance, landform and vegetation provide greater separation or screening.

The assessment classifies the highest local landscape and visual effects as 'Substantial-moderate', principally within the immediate surroundings of the turbine group. Landscape effects reduce to moderate within the central study area and to slight or imperceptible at greater distances. These classifications describe the degree of change to landscape character and views under the assessment method. Having considered the location, limited extent and landscape context of those changes, the specialist assessment concludes that they are not significant in Environmental Impact Assessment (EIA) terms.

The proposed turbines will generally appear as an extension of the permitted Cush Wind Farm. The cumulative assessment considers both the additional presence of turbines and the way the proposed and permitted turbines would appear together as a related group. More distant views, including those from Birr and the wider landscape, have been assessed with regard to their particular sensitivity and the intervening distance and screening.

The electricity line will be underground, with the surface reinstated after installation,

and will not introduce an overhead line into views along its route. The switch room is a smaller-scale building whose appearance will be managed through its siting, finish and landscaping.

The main landscape mitigation has been incorporated through the selection and refinement of the turbine layout, its relationship with the permitted Cush Wind Farm and the positioning of associated infrastructure. A consistent turbine finish, underground cabling, controlled working areas and reinstatement will reduce visual disturbance where practicable.

The turbines will remain visible during operation. Their visual effects are therefore accounted for in the assessment rather than being assumed to be eliminated by mitigation. At decommissioning, the turbines and other above-ground infrastructure will be removed and disturbed areas reinstated in accordance with the agreed plan.

The more noticeable effects will be localised around the wind farm, with lower effects across the wider area. Residual landscape and visual effects are assessed as not significant in EIA terms. The cumulative landscape and visual assessment also concludes that significant effects are not likely.

Further information is provided in **Chapter 10 (Landscape)** of the EIAR.

12.0 Cultural Heritage

The heritage assessment considers archaeology, historic buildings and other cultural heritage. It examines the possibility of physical disturbance during groundworks and changes to the surroundings or setting of heritage features when the turbines are operating. These are considered separately because a feature can remain physically unchanged while its wider surroundings and views change.

The assessment reviewed archaeological and architectural records, historic maps, previous investigations and other published information. Field investigations included site inspections, a specialist archaeological peatland survey of Galros Bog and a geophysical survey along the proposed underground electricity line route. Geophysical surveying uses instruments to identify possible archaeological features beneath the ground without excavation. These surveys helped establish the archaeological potential of the areas where construction works are proposed and informed the proposed protection measures. The potential effects on the surroundings of heritage features were assessed using site visits, the landscape assessment and photomontages.

The study considered the wind farm, electricity line and turbine delivery haul route works, and the potential for combined effects with the permitted Cush Wind Farm and other relevant developments. Recorded monuments, protected structures, historic landscapes and Birr Observatory at Birr Castle were among the features examined.

The layout avoids recorded archaeological and architectural features within the areas affected by the wind farm and electricity line works. Groundworks could nevertheless uncover remains that have not previously been recorded. Archaeological investigation and monitoring are therefore proposed before and during construction, including at relevant historic boundaries.

During operation, the turbines will be visible from or in the wider setting of some heritage features. The assessment identifies moderate visual effects on 10 Recorded Monuments within 2 km of the wind farm and moderate to slight effects on two Registered Historic Monuments within 5 km. The effect on Birr Observatory is assessed

as imperceptible.

Effects on the settings of the protected structures assessed within 5 km range from imperceptible to moderate. These effects relate to views and the surrounding landscape; the structures themselves will not be physically altered by the turbines. The setting effects will continue during operation and are reversible following turbine removal.

The underground electricity line will be buried and the ground reinstated, so no continuing visual effects on heritage features are predicted from that element. The assessment also considers ground disturbance at the turbine delivery haul route works, including the localised wall-removal works in Galway City.

Archaeological test excavations, carried out under the appropriate licence, will be undertaken at the turbine-base and hardstand footprints before construction. Archaeologists will monitor the relevant construction excavations, including the electricity line and historic boundaries. If remains are found, provision will be made for their appropriate investigation, excavation and recording in accordance with the relevant requirements.

Written and photographic records will be made of affected historic boundaries before work begins. Archaeological monitoring will also apply during decommissioning where previously undisturbed ground is affected. The location and methods of work will be coordinated with the measures for managing ground conditions and protecting water quality.

Following mitigation, no significant residual construction or decommissioning effects on cultural heritage are predicted. Changes to the settings of heritage features during operation will remain as assessed, with effects ranging up to moderate. These effects will be reversible when the turbines are removed. No likely significant cumulative heritage effects have been identified.

Further information is provided in **Chapter 11 (Cultural Heritage)** of the EIAR.

13.0 Noise & Vibration

The noise assessment considers construction activity, road traffic, turbine operation and decommissioning. It examines nearby homes and other locations sensitive to noise, taking account of the existing sound environment. Vibration from relevant construction methods has also been considered.

Background noise was measured at representative locations to establish the existing conditions and inform the noise limits used in the assessment. Construction activities and traffic were assessed using recognised methods. A computer model was used to predict turbine noise at nearby homes and other sensitive locations under the relevant wind conditions.

The operational assessment considers the noise characteristics of the turbine options within the assessed range of turbine dimensions. The final turbines and their operating settings will be selected to meet the noise requirements identified by the assessment. Predictions examine Cush Wind Farm – Phase II alone and in combination with the permitted Cush Wind Farm and other relevant wind farms.

Construction plant, excavation, deliveries and installation works will produce temporary noise. Shorter-duration works near individual homes and other sensitive locations, including turbine delivery haul route works and the Galway City wall-removal location, have been assessed separately from the main wind farm works. The

duration and position of activities, working hours and proposed mitigation measures inform the conclusions.

The turbines will produce sound during operation, with the level at a particular location influenced by wind conditions, distance from the turbines and the turbines' operating settings. The assessment finds that Cush Wind Farm – Phase II, on its own, meets the adopted noise criteria. The cumulative assessment identifies the need for operational mitigation measures under particular wind conditions to reduce noise from the proposed Phase II turbines.

The operational mitigation measures will apply to the final Cush Wind Farm – Phase II turbine model selected. The permitted Cush Wind Farm will remain subject to its own planning permission and associated noise conditions. Similar noise mitigation measures will apply during decommissioning, which will generally involve a reduced scale of activity.

Construction mitigation measures will include working-hour restrictions, selection and maintenance of suitable equipment, careful positioning of plant and temporary noise screening where required. Nearby residents will be informed of relevant activities, with a procedure for receiving and investigating complaints.

During operation, the required turbine-specific mitigation measures, including curtailment, will be implemented for Cush Wind Farm – Phase II. Curtailment means operating a turbine in a quieter mode or restricting its operation under particular wind conditions to reduce noise. The final operating arrangements will be established for the installed turbines in accordance with the noise assessment and planning requirements.

Noise monitoring following commissioning will be undertaken to check compliance with the applicable limits. The management arrangements will also provide for investigation of complaints and any particular noise characteristics that require further attention. Further adjustments will be made where necessary to ensure compliance with the applicable noise requirements.

With the proposed construction mitigation measures and operational noise controls implemented, residual noise and vibration effects are assessed as not significant. After mitigation, predicted cumulative turbine noise is within the adopted criteria at 128 of the 131 assessed locations. Small residual exceedances of less than 0.5 dB remain at H019, H057 and H083; these are assessed as negligible and not significant. The mitigation measures and monitoring commitments form part of the Project's continuing management requirements.

Further information is provided in **Chapter 12 (Noise & Vibration)** of the EIAR.

14.0 Shadow Flicker

Shadow flicker can occur when sunlight passes through moving turbine blades and produces an alternating pattern of light and shadow at a nearby building. It depends on the position of the sun, the turbine and the building, as well as sunlight, wind and screening. It can arise only while a turbine is operating; the switch room, underground electricity line and delivery haul route works do not produce shadow flicker.

A computer model examined the potential for shadow flicker at 131 locations, including nearby homes and other buildings, within the adopted 2,000 m study area around the proposed and permitted Cush Wind Farm turbines. It considered the turbine dimension range and combined effects with the permitted Cush Wind Farm

and other relevant wind farms.

The assessment presents a conservative 'worst-case' daily duration and an 'expected' annual duration that allows for average sunshine conditions. The model assumes exposed windows and does not rely on screening from intervening vegetation or buildings. The predictions are used to establish when turbine shutdown could be required.

The assessment uses the limits recommended in the 2006 Wind Energy Development Guidelines of 30 minutes per day and 30 hours per year. Although the Draft Revised Wind Energy Development Guidelines 2019 have not been adopted, the Developer has committed to the more stringent standard of preventing shadow flicker at dwellings.

For Cush Wind Farm – Phase II in isolation, 28 of the locations assessed are predicted to exceed the 30-minute daily criterion used in the assessment under conservative 'worst-case' modelling conditions. None of the 131 locations assessed is predicted to exceed the 30-hour annual criterion under the 'expected' scenario.

When Cush Wind Farm – Phase II is considered together with the permitted Cush Wind Farm and the other relevant wind farms, 46 locations are predicted to exceed the daily criterion under 'worst-case' conditions. No location is predicted to exceed the annual criterion under the 'expected' scenario.

These results represent model predictions before mitigation. The Developer has committed to preventing shadow flicker attributable to Cush Wind Farm – Phase II at dwellings through automated turbine shutdown. The predicted daily exceedances will therefore be addressed by the mitigation measures described below.

Each Cush Wind Farm – Phase II turbine will have an automated shadow flicker control system. The system will use predicted shadow-flicker periods and sunlight conditions to stop the relevant turbine when needed. Settings will be based on the final turbine dimensions and the locations of turbines and receptors, taking account of the final configuration of the permitted Cush Wind Farm.

Within 12 months of the commencement of commercial operation, a shadow flicker survey will be undertaken by a suitably qualified person to verify the effective operation of the automated shutdown system. This will include monitoring during each calendar season, at locations and times when shadow flicker is predicted to occur.

The monitoring will record relevant weather conditions, turbine operation and the timing and duration of automated shutdowns. Any complaints received during the operational life of the Project will be investigated, with additional monitoring undertaken where required. The turbine control settings will be adjusted where necessary to maintain the commitment to preventing shadow flicker at dwellings.

With the automated shutdown mitigation measures implemented, no shadow flicker attributable to Cush Wind Farm – Phase II is predicted at dwellings. The Project will therefore make no residual contribution to cumulative shadow flicker at nearby dwellings, and no significant residual shadow flicker effects are predicted.

Further information is provided in **Chapter 13 (Shadow Flicker)** of the EIAR.

15.0 Material Assets

Transport & Access

This assessment examines the delivery of construction materials and turbine

components, access to the site, the underground electricity line works and traffic during construction, operation and decommissioning. The turbine delivery route from Galway Port and the works needed to accommodate long vehicles have been surveyed.

The assessment reviewed the road network, existing traffic information, vehicle types and estimated construction deliveries. Route surveys examined whether turbine delivery vehicles can pass junctions and other constraints. The assessment also considered concurrent construction with the permitted Cush Wind Farm and the relevant road-management requirements.

Construction will temporarily increase traffic, including heavy goods vehicles carrying materials and large vehicles delivering turbine components. Delivery activity will vary through the programme, with busier periods during concrete pours and turbine installation. The main construction access will use the N62 entrance permitted for the permitted Cush Wind Farm.

Accommodation works are required at selected points along the surveyed route. Most involve temporary adjustments to verges, junctions or street furniture, followed by reinstatement. The identified removal of a wall in Galway is a permanent alteration. Traffic management will be needed while works and abnormal-load deliveries take place.

The electricity line lies mainly on private land, and the road crossings will use drilling beneath the carriageway. Local traffic and access will be managed at working areas. Once the wind farm is operating, traffic will be limited mainly to occasional maintenance visits. Decommissioning traffic will be lower than during construction.

A Traffic Management Plan will form a key part of the proposed mitigation measures and will coordinate deliveries, access arrangements, abnormal loads and the timing of works. Relevant road authorities and other stakeholders will be consulted, and the necessary permits obtained. Residents, businesses and landowners will receive information about activities affecting their access.

Mitigation measures will include maintaining local access, managing vehicle speeds, keeping roads clean and inspecting road condition before and after construction. Deliveries will be coordinated with the permitted Cush Wind Farm where construction overlaps. Any Project-related road damage will be addressed through the agreed arrangements.

Following implementation of the mitigation measures, residual transport effects are assessed as slight, negative and short-term, with no significant residual effects predicted. Operational traffic will be low, and no significant cumulative transport or access effects are expected with the identified mitigation measures in place.

Aviation

The aviation assessment considers whether the turbines and temporary construction cranes could affect aviation activity or safety. Their height and location have been examined with regard to the requirements of the relevant aviation bodies.

The assessment reviewed the location of aviation facilities and relevant published information, together with consultation with the Irish Aviation Authority and the Department of Defence. It considered both temporary construction activity and the continuing presence of the turbines.

The main aviation consideration is the presence of tall structures. Construction activity

at ground level is not expected to have a significant effect on aviation. Cranes and turbines will be managed with the appropriate notification, marking and lighting arrangements so that their locations and heights are known to the relevant bodies.

Aviation mitigation measures will include installing aviation warning lighting in accordance with the specification agreed with the Irish Aviation Authority and Planning Authority. Required information on turbine positions, heights and construction activities will be supplied, and the agreed lighting and marking arrangements maintained.

With the identified aviation mitigation measures implemented, no significant residual aviation effects are predicted from the Project, either individually or in combination with the relevant developments assessed.

Telecommunications

The assessment considers television reception, radio and telecommunications links, mobile services and the Irish Low Frequency Array radio telescope at Birr Castle, known as I-LOFAR. Turbines can affect signals in some circumstances, so the location of links and the requirements of service providers have been examined.

The assessment used published information, mapping and consultation with network and service operators. A specialist Radio Telescope Impact Assessment examined the relationship with I-LOFAR, including potential obstruction, reflection and emissions from turbine equipment.

Significant construction effects on telecommunications are not predicted. During operation, the main considerations are the protection of fixed communication links and the possibility of local television reception being affected. ESB Networks has identified the need for further detailed coordination for turbines within its link-protection area.

The specialist I-LOFAR assessment concludes that the Project is not likely to have a significant effect on the radio telescope. It considers the small change to the visible horizon and the relevant technical characteristics of the equipment. The cumulative relationship with the permitted Cush Wind Farm has also been examined.

As part of the proposed mitigation measures, the Developer will continue coordination with ESB Networks and other relevant operators to assess and protect identified links. The agreed protocol with 2rn provides a process for investigating and resolving television reception problems attributable to the wind farm. Appropriate technical remedies will be provided at the Developer's expense where Project-related interference is established.

The final equipment and operating arrangements will incorporate the mitigation measures identified in the specialist assessments. Complaints will be recorded and investigated with the relevant service provider.

With the required mitigation measures for communication links and television reception implemented, no significant residual effects on telecommunications or I-LOFAR are predicted.

Resources & Utility Infrastructure

This assessment considers construction materials and the Project's relationship with existing electricity, telecommunications and other utility infrastructure. It also examines whether the works could affect other renewable or non-renewable resources.

Available information and mapping were used to identify resources and services within or close to the works. The assessment examined construction requirements, utility crossings and the arrangements needed to protect existing services. Relevant developments and infrastructure were considered cumulatively.

Construction will use materials such as stone, sand, concrete, steel and electrical equipment. Suitable excavated material will be reused where practicable, with imported material obtained from authorised suppliers. Waste that cannot be reused or recycled will be taken to appropriately authorised facilities.

Work near existing underground or overhead services requires care to avoid accidental damage or interruption. The switch room and underground electricity line will provide the proposed connection to the separately proposed Mullanafawnia 110 kV substation. During operation, the Project will contribute an additional source of renewable electricity to the national network.

Mitigation measures will include identifying existing services and confirming their positions before work begins. Construction methods and crossing arrangements will be agreed with the relevant providers where required. Material use, reuse and waste handling will be managed through the construction environmental and waste-management arrangements.

No significant residual effects on resources or utility infrastructure are predicted with the identified mitigation measures in place. The operation of the Project will provide a continuing renewable electricity contribution, with limited routine demands on transport and other services.

Further information is provided in **Chapter 14 (Material Assets)** of the EIAR.

16.0 Interactions

All environmental factors are interrelated to some degree. The assessment of these interactions is an important requirement of the environmental impact assessment process. The assessment considers how effects on one aspect of the environment could influence another, or how different effects could combine to produce a greater overall effect.

The principal interactions considered include the relationship between population and human health and landscape, noise, shadow flicker and traffic; between biodiversity, land and soils, and water; between ground disturbance and cultural heritage; and between construction traffic, air quality and climate. The potential for changes to the landscape to affect the setting of archaeological monuments and historic buildings has also been considered.

These interactions have been assessed during construction, operation and decommissioning, taking account of the mitigation measures identified in the relevant environmental assessments. For example, drainage and pollution-prevention mitigation measures will help protect both water quality and aquatic habitats, while traffic management and dust-control mitigation measures will reduce the potential for combined effects on nearby residents.

Although the Project will result in some adverse environmental effects, including localised landscape and visual effects, the assessment concludes that interactions between environmental factors are not likely to give rise to additional significant adverse effects or substantially increase the effects identified in the individual assessments.

Further information is provided in **Chapter 15 (Interactions of the Foregoing)** of the EIAR.

17.0 Summary of Likely Significant Effects

This Non-Technical Summary outlines the findings of the EIAR for Cush Wind Farm – Phase II. The full assessments and supporting information are provided in Volumes I and II. They consider the construction, operation and decommissioning of the Project as a whole, together with the relevant combined effects of the permitted Cush Wind Farm and other developments.

Construction will bring temporary activity and changes within the site and along the delivery and electricity line routes. Traffic, noise, dust, excavated materials and water will be managed through the identified mitigation measures, including construction management plans and specialist supervision. Reinstatement will follow temporary works, and monitoring will check that the mitigation measures operate as intended.

During operation, the turbines will add to wind energy development in the surrounding landscape. The greatest landscape and visual changes will be localised around the site, with lower effects at greater distances. Changes to the setting of some heritage features will remain, assessed at up to moderate and reversible following turbine removal. These effects have been retained in the assessment conclusions.

The required noise mitigation measures and monitoring will apply to Cush Wind Farm – Phase II, and automated shutdown will prevent its contribution to shadow flicker at dwellings. With the identified mitigation measures implemented, significant residual effects on biodiversity, land and soils, water, air quality, population and human health, and material assets are not predicted. The specialist landscape and heritage assessments reach the conclusions summarised in Sections 11 and 12.

The Project will generate renewable electricity and contribute to reducing emissions associated with fossil-fuel electricity generation. Employment, local expenditure, commercial rates and the community benefit arrangements will also provide economic and social benefits. Overall, the EIAR concludes that no likely significant adverse environmental effects are predicted from the construction, operation or decommissioning of the Project, subject to implementation of the identified mitigation measures and monitoring commitments. Some localised environmental effects will remain, particularly in relation to landscape and views, as described in the relevant assessments.



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