PREFACE

This Environmental Statement (ES) has been prepared in support of a planning application for a proposed wind farm at Mynydd Maen, between Newbridge and Cwmbran, partly in Caerphilly County Borough and partly in Torfaen County Borough.

The ES is contained within four separate volumes:

Volume 1 Non Technical Summary of the detailed Environmental Statement.
Volume 2 Main text of the Environmental Statement.
Volume 3 Figures and plans referred to in the text of Volume 2.
Volume 4 Technical Appendices referred to in the text of Volume 2.

A separate Planning Statement and Design and Access Statement have been prepared to accompany the planning application.

The ES has been prepared by RES Ltd (RES) in consultation with Planning and Environment Decisions Wales (PEDW), Caerphilly County Borough Council, Torfaen County Borough Council, various statutory consultees and in collaboration with the following specialist consultants:

The Statutory and Policy Framework David Bell Planning Ltd 26 Alva Street Edinburgh EH2 4PY	**Landscape and Visual** Pegasus Ltd. Pavilion Court Green Lane Garforth Leeds LS25 2AF	**Cultural Heritage** The Heritage Collective The Office Leeds 1 Aire Street Leeds LS1 4PR
Ecology and Ornithology BSG Ecology Merlin House 1 Langstone Business Park Langstone Newport NP18 2HJ	**Socioeconomics** Oxford Economics Lagan House Sackville Street Lisburn BT27 4AB	

The full ES may be viewed on the Project Website https://www.mynyddmaen-windfarm.co.uk/

Hard copies of the full ES are available to purchase from RES at a cost of £250. Copies of the full ES are available on USB free of charge. Hard copies of the non-technical summary are available free of charge. Requests for documents should be made in writing, including payment if purchase of the full ES is required, to RES Ltd, Cedar House, Greenwood Close, Cardiff Gate Business Park, Cardiff, CF23 8RD or to chris.jackson@res-group.com.

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All figures are listed in Volume 3 of this ES

RES has an Environmental Management System which actively encourages the reduction of paper consumption and promotes recycling where possible. To further reduce paper use, RES would prefer that the ES is viewed on the project website or that copies of the ES are requested in USB format.

INTRODUCTION

Renewable Energy Systems Ltd ('RES') is applying for planning permission to develop a wind farm at Mynydd Maen between Newbridge and Cwmbran, partly in Caerphilly County Borough and partly in Torfaen County Borough. The proposed wind farm is centred at E325643 N197926 and is shown in Figure 1.1: Site Location Plan.

The proposed wind farm comprises 13 horizontal axis wind turbines up to a maximum tip height of 149.9 m. The 13 turbines would have a total installed capacity of approximately 55 MW. The proposed wind farm would include an improved site entrance, new access tracks, crane hardstandings, control building and substation compound, electricity transformers, underground cabling and drainage works (see Figure 3.1: Infrastructure Layout). The Proposed Development would be operational for a period of up to thirty-five (35) years.

The proposed wind farm would produce sufficient electrical energy to meet the average requirements of approximately 55,000 homes, equivalent to nearly half of the homes in Caerphilly County Borough and Torfaen County Borough put together. The proposal is the culmination of over four years' work by RES, during which time the site's suitability and detailed environmental interests have been assessed.

RES (the applicant) is one of the world's leading wind energy companies and has constructed or developed medium to large-scale wind farms around the world, with a combined capacity of over 23,000 MW.

RES's award winning eco-friendly headquarters and education centre in Kings Langley, Hertfordshire, is self-sufficient in renewable energy which is generated on-site and includes solar power, energy crops, and a wind turbine next to the M25. RES also has a number of regional offices in key markets worldwide, including its Welsh office in Cardiff.

ENVIRONMENTAL IMPACT ASSESSMENT

The aims of the Environmental Impact Assessment (EIA) are:

- To gather information on the existing environment and identify environmental constraints and opportunities associated with the development of the area which may be affected by the proposed wind farm;
- To identify and assess potential effects that may arise from the construction, operation and decommissioning of the proposed wind farm;
- To outline measures and/or design criteria that may be pursued to mitigate potential concerns or effects.

The Environmental Statement (ES) has been prepared to accompany an application for planning permission for the proposed wind farm. The EIA process considers all significant effects that the proposed wind farm is likely to have on the environment. The findings of the EIA process are reported in the ES.

NEED FOR THE PROJECT

The background to the current drive to increase the use of renewable sources of energy has its roots in the recognition that the burning of fossil fuels has an adverse effect on the climate of the world as a whole and that global measures are required to deal with it. International, European and UK policies have become increaingly more focussed on the concerns about global

warming and climate change. The use of renewable resources as an increasing proportion of our total energy consumption is seen as a key part of the ultimate sustainable solution, alongside energy efficiency and conservation, especially as it does not rely on the consumption of fossil fuels for its fuel supply, and needs to be developed alongside a campaign of increasing awareness by the public and industry of the need for energy efficiency.

A critical part of the response to the challenge of climate change was the Climate Emergency which was declared in Wales on 29 April 2019. The declaration of climate emergency needs to be viewed in the context in which it was declared (advice from the Committee on Climate Change) and in response to commitments under the Paris Agreement and what followed from it as a result of the declaration. The Welsh Government has committed to achieving a carbon neutral public sector by 2030 and to coordinating action to help other areas of the economy to make a decisive shift away from fossil fuels, involving academia, industry and the third sector and to achieve Net Zero by 2050.

In October 2021, The UK Government published the Net Zero Strategy in October 2021. This sets out policies and proposals for keeping in the UK on track in relation to carbon budgets and the UK's nationally determined contribution (NDC)8 and establishes the long-term pathway to net zero by 2050. The Net Zero Strategy sets out the Government's plans for reducing emissions from each sector of the UK economy, related to carbon budget and to the eventual target of net zero by 2050. In the same month, the Welsh Government published Net Zero Wales Carbon Budget 2 (2021-2025) ("the Net Zero Wales Plan"). The Net Zero Wales Plan represents a new phase in the country's decarbonisation journey with a new legally binding Net Zero target. It focuses on Wales's Second Carbon Budget (2021-2025) but looks ahead to Carbon Budget 3 and Wales's 2030 target as well as Net Zero by 2050.

In 2021, the Welsh Government published Future Wales: The National Plan 2040 (Future Wales). Future Wales is the Welsh Government's National Development Framework and is the highest tier of the development plan in Wales. As the most recent expression of national planning policy and as the highest tier of the Development Plan, Future Wales has primacy in the planning policy hierarchy. The introduction to Future Wales (Chapter 1) sets out that it is a development plan with a strategy for addressing key national priorities through the planning system including sustaining and developing a vibrant economy and achieving decarbonisation and climate resilience, as well as developing strong ecosystems and improving the health and well being of communities. Chapter 2 of Future Wales explains how the policy document has been informed by a range of challenges and opportunities and a key matter is climate change. The document sets out the Welsh Government's intentions for Wales to become a world leader in renewable energy technologies, and commits its support for both large and community scaled projects to reduce carbon emissions.

More recently, in March 2023 the UK Government (Department for Energy Security and Net Zero) published 'Power Up Britain' which comprises a series of documents including an Energy Security Plan and Net Zero Growth Plan. The Energy Security Plan sets out the steps that the UK Government is taking to ensure that the UK is more energy independent, secure and resilient. It builds upon the British Energy Security Strategy and the Net Zero Strategy. The report sets out that the Government is aiming for a doubling of Britain's electricity generation capacity by the late 2030s in line with the aim to fully decarbonise the power sector by 2035, subject to security of supply.

On 24th January 2023, the Welsh Government issued a consultation document entitled 'Review of Wales' Renewable Energy Targets'. The document confirms that in 2017 the Welsh Government set renewable energy targets (as described above). The report states that in 2021, renewables in Wales generated the equivalent of 55 % of electricity use against the 70 % target by 2030. It adds that Wales has achieved nearly 90 % of its target of at least 1 GW of renewable energy capacity to be locally owned by 2030, representing an estimated 1.9 GWh of generation in 2021. The report also acknowledges that deployment of renewables in Wales and the UK has slowed since 2015, largely as a result of the UK Government's approach to renewable incentives, specifically withdrawing key subsidies that secured a route to market. As a result, whilst renewable based electricity capacity continues to increase year-on-year, it is acknowledged that the current rate of growth will not be enough to meet demand, especially in the light of growing electricity needs. The consultation document addresses the generation target, namely 70 % of consumption from renewable sources by 2030. In light of the advice that the Welsh Government has received from the Climate Change Committee (CCC) and given the increased focus of the use of electricity across the economy, the Government proposes to retain the scope of this target namely focusing on generating electricity to meet future demand. However, the significant change proposed relates to the level of ambition for the target and in this regard, the proposal (subject to consultation) is that the target be changed to generate the equivalent of Wales's total annual electricity demand from renewables by 2035.

Given the proposals are the subject of consultation, they can only be afforded limited weight at this time. However, it is evident from the consultation document that the Welsh Government is following the advice of the CCC and recognises that there needs to be a significant increase in renewable electricity generation and indeed that the pace of deployment needs to accelerate. The proposed wind farm would contribute to not only the current renewable electricity generation and local ownership targets, but also to the revised targets should they come into force in due course.

DESCRIPTION OF THE PROJECT

The project has been identified and designed through consideration of a wide range of relevant documented information and on-site studies. RES has applied its own stringent site selection criteria to confirm the suitability of the Mynydd Maen site for a wind farm:

- Wind Speeds/Energy Yields: Sufficiently high wind speeds to ensure energy production from the wind turbines that would yield an adequate return on investment;
- Planning: A site which complies with planning policy and in particular, avoids unacceptable effects on areas that have been designated by statutory agencies; maintains appropriate distances from dwellings to avoid unduly impacting local amenity; and avoids impeding or interfering with major electromagnetic transmission and airport communication systems;
- Area of Site: A site must have sufficient area to accommodate the number of wind turbines required for economic viability;
- Access: Adequate vehicular access to a site using existing roads wherever possible to minimise the amount of civil works, particularly during the construction phase;
- Local Terrain and Topography: Terrain and topography affect wind flow across a site and need to be considered in relation to turbine performance, specification and life-span;

- Ground Conditions: A site must have suitable ground conditions for the construction of wind turbine foundations, erection of the turbines and the provision of access tracks and cables.

Detailed consultations were undertaken with a wider range of statutory and non-statutory consultees to determine the appropriateness of the site. Site visits were also made by staff from RES's development, technical and engineering teams, as well as external consultants. This process confirmed the suitability of the site for a wind farm of this scale.

The layout of the proposed wind farm evolved in response to specialist surveys and community consultation, including four public exhibitions in 2022 and 2023, to ensure that potential adverse environmental effects were minimised, while maximising the operation of the wind farm.

The land take for a wind farm development is relatively small. The wind turbines have to be spaced apart so as not to interfere aerodynamically with one another (to avoid array losses). The actual permanent land take is limited to the area of the towers themselves and the gravel path around them, the access tracks leading to them, the crane hardstandings, the control building, external transformers, and the substation.

Each turbine would begin by generating power automatically at a wind speed of around 3-4 m/s and would shut down at a wind speed of around 25 m/s. A typical wind turbine is illustrated in Figure 3.2: Typical Wind Turbine Elevation. The likely colour and finish of the wind turbines would be a pale grey colour with a semi-matt finish.

The on-site substation is proposed to be located centrally within the site and all electrical cabling between the turbines and the substation would be underground. The connection to the electricity grid would be directly to the existing overhead electricity lines above the substation. The Distribution Network Operator (National Grid Electricity Distribution) is responsible for installing and maintaining the grid connection.

Construction of the wind farm would take approximately 12-15 months. This timing is somewhat weather dependent and could be affected by ground conditions found at the site.

Access tracks would be built to provide access to each turbine (see Figure 3.1: Infrastructure Layout) and would be approximately 5 m wide with widening on bends and at passing places and would be made of crushed and graded stone. The access tracks have been designed to minimise environmental disturbance, land take, and to avoid disruption to existing activities where practicable.

Each foundation typically consists of a tapered octagonal block of concrete with its base approximately 2.5-3.5 m below ground level. The volume of concrete used to make each foundation is typically 450-700 m^3, which is reinforced by approximately 50-65 tonnes of steel bar. The depth of the excavation below foundation varies for each turbine location according to the depth to suitable formation level. The excavation area for each foundation would be approximately 650-1000 m^2. The foundation surface would lie up to 1 m below the normal ground surface and is back filled with soil and reinstated.

Wind farms are operated remotely from a central computer system. Because of this a large amount of infrastructure is not required. The proposed wind farm would not be permanently manned, and traffic would be limited to small maintenance vehicles with typically four maintenance crew visits per month. In addition a local person may be employed to regularly inspect the proposed wind farm, generally on a weekly basis.

Each turbine would have its own internal control system interfaced to a central control system located in the sub-station. The turbines would be automatic in their everyday operation. Were a fault to develop which required an operator to intervene then the supervisory control system would make contact with on-duty staff via a mobile messaging system. The operators would be able to shut down one or all of the wind turbines remotely.

The expected operational life of the wind farm is 35 years from the date of commissioning. At the end of this period a decision would be made as to whether to refurbish, remove, or replace the turbines.

If a decision were to be taken to decommission the proposed wind farm this would entail the removal of all the turbine components, transformers, the substation and associated buildings. Some of the access tracks could be left on-site to ensure the continued benefit of improved site access for the landowners, commoners and members of the public, or they could be reinstated. It is not usual to remove the buried concrete foundations from the site as this would cause more land damage than leaving them in situ. The entire foundation would be graded over with soil.

One advantage of wind power generation over other forms of energy production is the ease of decommissioning. A wind farm can be easily and quickly dismantled and the site restored, leaving no visible trace of its existence, and no pollution for future generations.

LANDSCAPE AND VISUAL

The design of the proposed wind farm is the result of a considered iterative process which has sought to minimise landscape and visual effects whilst achieving the technical and commercial requirements to ensure project viability without public subsidy. Appropriate offsets from all properties and settlements have been maintained to ensure that no property would experience an overbearing visual impact. Furthermore, all the proposed turbines and infrastructure would be located within Pre-Assessed Area 10 as defined under Policy 17 of Future Wales: The National Plan 2040.

The Landscape and Visual Impact Assessment (LVIA) identifies the likely significant effects arising from the proposed wind farm on landscape character and visual amenity. The assessment has been undertaken in accordance with all relevant published guidance on the topic, and has involved desk-based and field-based assessments. The approach and scope of the assessment was agreed through scoping and through consultation with local planning authorities. The assessment of effects considers the embedded mitigation achieved through the design process, as set out in the Environmental Statement Chapter 2: Design Evolution & Alternatives.

The LVIA identifies that the proposed wind farm would result in direct and significant effects on the Visual and Sensory Aspect Areas within which it is located and indirect significant effects on Visual and Sensory Aspect Areas extending to approximately 5 km north. In relation to visual effects, it is accepted that the proposed wind farm would be visible from some nearby properties, settlements as well as the surrounding road and footpath network. Significant visual effects would be experienced at 14 of 37 viewpoints. All properties or groups of properties located within 2 km of a proposed turbine have been assessed in detail within the Residential Visual Amenity Study in Technical Appendix 5.6 and illustrated in Figure 1 of Technical Appendix 5.6. This found that 19 properties or groups of properties would experience a significant visual effect but none would experience such an overbearing or overwhelming effect on their visual amenity that their properties would become unattractive places in which to live.

The assessment found that residents in the settlements of Pantygasseg and parts of Cwmbran, Pontypool, Pantside, Swffryd and Brynithel would experience significant visual effects. Walkers would experience significant visual effects on short intermittent parts of the Cambrian Way, the Cistercian Way, the Torfaen Trail, the Rhymney Valley Ridgeway Walk, the Sirhowy Valley Walk and National Cycle Route 423. Road users travelling on the minor road at Pantygasseg would experience significant visual effects.

The assessment of cumulative effects found that when the consented schemes are considered to form part of the baseline, the wider landscape would be characterised by wind energy development to a very minor additional degree, but one which was barely perceptible in the context of the other built form and landform in the landscape.When the in-planning scheme at Mynydd Carn Y Cefn Wind Farm is added into the baseline, significant cumulative effects would arise in the intervening landscape between the proposed wind farms. The addition of the Scoping stage schemes would add a notable presence of wind energy across the landscape to the north of the site, of which the proposed wind farm would be the most southerly element.

Localised significant effects on landscape character and visual amenity are inevitable as a result of commercial wind energy development anywhere in the UK. Whilst the LVIA identified some significant landscape and visual effects it is considered that the landscape has the capacity to accommodate the effects identified, especially given that it is located within an area that has been assessed by the Welsh Government as being capable of accommodating wind energy.

There are no definitive quantifiable thresholds of acceptability in landscape and visual impact assessment. The identified effects on landscape character and visual amenity therefore need to be balanced against the other benefits of the proposed wind farm and the planning context.

ECOLOGY

The ecological impact assessment for the proposed Mynydd Maen Wind Farm has been informed by desk study and survey work completed over a number of years (2020-2023). The approach to field survey and assessment work has been closely based on industry standard guidance, and has evolved in consultation with nature conservation stakeholders.

The proposed wind farm would not result in impacts on statutory sites of nature conservation interest. The Site is subject to various non-statutory designations (SINCs). These are designated for common land and associated habitats; the extent of several would be reduced. The proposed wind farm would result in the loss of dry heath and dry heath acid grassland mosaic habitats, but has been designed to avoid loss of more restricted habitats such as wet heath and acid flush. The common land swop application would offset the loss of acid grassland.

Potential impacts on bat species, particularly noctule and common pipistrelle, on great crested newt and on reptiles are likely in the absence of mitigation. Mitigation for bat fatality will involve the cut in speed for generation being curtailed to 4 m/s at nacelle height. This is likely to substantially mitigate risk of collision based on data relating to the conditions in which bats use the site. Monitoring is proposed to test this conclusion and inform any further mitigation requried.

The on-site great crested newt population is low, and at potential risk of extinction, as the ponds the animals use are in poor condition. The construction of the wind farm has the potential to result in killing and injury of animals by construction traffic and effects on their dispersal. Construction phase mitigation to address this would need to be detailed in a European Protected Species licence application, and pond creation is proposed to improve the local conservation status of the species. Mitigation for reptiles would be through a method statement delivered as

part of the CEMP. Mitigation for other protected species would include a precautionary working method statement for dormouse and be informed by pre-construction survey respectively to ensure the baseline hasn't changed in the intervening period.

Biodiversity net benefit would be achieved through implementation of measures to bring the vegetation on the common into better condition. It would involve implementation of measures including bracken control, creation of mixed-age heather and further pond creation initiatives. The extent of common land would be maintained through a land swop application that would bring peripheral land areas into common use. Some complementary habitat creation would be undertaken in these areas.

The residual effects of the proposed wind farm on ecological features do not conflict with any national or local planning policies or any relevant legislative protection. The proposed wind farm would deliver biodiversity net benefit in accordance with planning policy.

ORNITHOLOGY

The ornithological impact assessment for the proposed wind farm has been informed by desk study, consultation and wide-ranging ornithological survey work and considers potential effects on habitats and protected species at each of the construction, operational and decommissioning phases of the proposed wind farm. This has allowed important ornithological features to be avoided or minimised through design and standard construction phase control measures, which would be set out in a detailed Construction Environmental Management Plan that would be overseen on the ground by an ecological clerk of works. Additional measures to address potentially significant effects and ensure biodiversity net benefit is achieved have been identified, and would be delivered through a habitat management plan.

The approach to field survey and assessment work has been completed in accordance with industry standard guidance and has evolved in consultation with nature conservation stakeholders. Survey work conducted between April 2020 and September 2022 has comprised VP survey, breeding raptor survey, breeding wader survey and nightjar survey.

Impacts have been assessed based on the approach set out by the Chartered Institute of Ecology and Environmental Management. Impacts on relevant statutory designated sites of nature conservation importance are unlikely to arise due to their distance from the proposed wind farm. Target species recorded during the survey work, for which no residual effects are anticipated were; osprey, marsh harrier, hen harrier, goshawk, hobby, peregrine, merlin, kittiwake, golden plover, short-eared owl, long-eared owl and nightjar. Impacts that have been identified are:

- Collision related fatality of kestrel resulting in the loss of a locally breeding pair, of significance at the County level.
- Collision related fatality of non-breeding red kite, of significance at the Local level.
- Kestrel regularly forage and breed, or are likely to occur at a number of other wind farm sites in the Zone of Influence, defined as the area within which there may be ornithological features subject to effects from the proposed wind farm. A cumulative effect on kestrel of significance at the County level is anticipated.

Compensatory management to offset a reduction in habitat for kestrel and red kite would be delivered through a habitat management plan.

CULTURAL HERITAGE

The report has analysed data from the Glamorgan Gwent Archaeological Trusts Historic Environment Record (HER), the National Monuments Record (NMR) and data held by Cadw to provide a detailed assessment of known elements of the historic environment within and around the proposed wind farm. A study area of 2 km was used for HER and NMR data and a 10 km search area used for designated historic assets around the site. The search has included analysis of scheduled monuments, listed buildings, conservation areas and registered historic parks and gardens.

One World Heritage Site, and 1001 listed buildings were initially identified, along with 33 conservation areas, 11 RHPGs and 74 scheduled monuments.

Of the 74 Scheduled Monuments identified within the 10 km study area, six were considered in more detailed during the assessment process. It was concluded that the proposed wind farm would cause harm to the setting of two of these scheduled monuments within the 10 km study area, this would be at a low level not causing any impact to the significance of the monuments.

Further consideration was given to all other designated sites, their heritage interests and significance, and the contribution made to this significance by their settings and the contribution of the site within that setting (if any). Following this staged approach there were no other designated heritage assets whose significance would be harmed by the level of change posed within their settings (if any change was identified at all).

Based on the information within the HER and NMR, supplemented by historic mapping, the proposed wind farm is considered to have a moderate potential for prehistoric archaeological remains, as a possible cairn is recorded on the HER/NMR and two possible round barrows and an area of potential cairns have been identified by Lidar analysis.

There is a low potential for archaeological remains of the Roman period, due to the paucity of known records in the vicinity. There is also a low potential for remains of the early medieval and medieval periods as the site lies on an upland area that would have likely been used for animal grazing rather than any occupation or other activity. There is a moderate potential for archaeological remains of post medieval date to be present within the site, with known boundary markers located within the proposed wind farm as well as areas of known quarrying, including features identified from Lidar analysis. There is a low potential for remains of modern date to be present, excluding the area where remains of the HF-DF radar station are present.

The majority of the proposed wind farm area has not been subject to previous development and appears to have been used as open common land since the medieval period. Areas of quarrying, the HF-DF radar station and modern building associated with communications masts are present but these occupy a small part of the proposed wind farm.

For buried archaeological remains mitigation could be implemented for direct impacts from the proposed wind farm in the form of evaluation investigations across the development area followed by excavation or other forms of recording as appropriate to any remains revealed. The one area where a potential impact to archaeology may occur is in Lidar Area 4 where the potential for prehistoric cairns has been identified, although due to the quantity of possible mounds and their juxtaposition, they are more likely associated with vegetation growth than human activity. Based on the assessment it is not anticipated that any below ground archaeological remains will be of such high significance that they could be a constraint to the proposals, and that any such

remains can be dealt with through appropriate mitigation by way of conditions on planning permission.

The scope of any further archaeological works that would be needed in advance or during development of the proposed wind farm would need to be discussed and agreed with Planning Services at Glamorgan Gwent Archaeological Trust in their capacity as archaeological advisors to Blaenau Gwent and Torfaen County Borough Councils. Cadw and the Conservation Officers would respond on issues regarding the designated historic assets in the study area.

HYDROLOGY AND HYDROGEOLOGY

Coal Mining

Coal Authority mapping shows the entire site to sit in an area where coal mining has been reported.

A desktop Coal Mining Risk Assessment (CMRA), followed by an intrusive Geotechnical Investigation (boreholes and trial pits) at targeted turbine locations was undertaken to establish the ground conditions and assess the identified risk from shallow coal workings.

The boreholes recorded intact sandstone bedrock throughout and there was no evidence of any underground coal mining to the full depths of drilling. The assessment concluded that no further investigation or remediation with regards to coal mining hazards is required.

Hydrology, Hydrogeology and Geology

Although British Geological Survey maps indicate a lack of superficial deposits, the exploratory holes encountered a layer of peat over varying amounts of clay, sands and gravels, with sandstone bedrock at relatively shallow depths. The bedrock includes Hughes Member Sandstone over Rhondda Member Sandstone in turn over Deri Formation (Mudstone) and South Wales Coal Measures Formation.

An extensive peat survey has been carried out within the site bounds. Relatively little peat was found within the site, compared with peatland sites further north in Wales and the rest of the UK. There is no obvious evidence of historical peat mining on the site, and the likely explanation for the limited amount of peat is that the site has been, and is, climatically marginal for blanket mire development.

Possible impacts on water and geology from the proposed wind farm are related to the potential for erosion and sediment transport, pollution affecting groundwater and surface water quality, and alteration of natural surface and groundwater flows, as a result of construction activities. The sensitive features on and around the site include watercourses, private water supplies and the groundwater system.

The proposed wind farm track layout was developed to avoid significant watercourse crossings as far as practicable. Infrastructure would be located at least 50 m from surface water features, with the exception of an upgrade to an existing access track crossing.

Mitigation to reduce or eliminate potential effects has been undertaken through careful design of the project and during construction would be managed according to best practise guidelines, including environmental monitoring. These factors have been considered in the assessment of potential effects. Particular attention was paid to the risk of affecting private water supplies, pollution prevention and interruption of surface water flows.

With the necessary mitigation in place, it is considered that the proposed development would have only negligible to minor impacts on the hydrology, hydrogeology and geology of the area.

TRAFFIC, TRANSPORT AND ACCESS

An assessment of the potential impact of the proposed wind farm on traffic and transport was undertaken, involving consultation with the local Highway Authorities, relevant County Borough Council, Network Rail, and South Wales Trunk Roads.

The proposed access route for Abnormal Indivisible Loads (AILs) is to depart from the Port of Swansea via Baldwin Crescent, joining the A483 eastbound before exiting onto the M4 continuing east direction. The AILs would exit the M4 at junction 28, proceeding northbound on the A467 and exiting onto Central Avenue. AILs would continue northbound on Old Plant Rd before turning onto Abercarn Mountain Road, and proceeding eastbound to the proposed site entrance.

Works would be required to upgrade the site access off the Abercarn Mountain Road. The works would be planned and agreed in consultation with Caerphilly County Borough Council. It is assumed that vehicles from most suppliers based in the area would follow the A467 or the A472 onto Central Avenue, proceeding via Old Pant Road northbound then eastbound along the Abercarn Mountain Road to the proposed site entrance.

Prior to construction commencing, a Construction Traffic Management Plan (CTMP) would be developed in consultation with the relevant local authorities. Implementation of the CTMP would minimise the temporary disruption to road users.

The route for transporting AILs and construction traffic has received no objections from the local Highway Authorities, Network Rail, or South Wales Trunk Roads. AILs would be scheduled to occur during off-peak periods, at times to be agreed with the Police and the local authorities. The residual effect would therefore be minimal.

The AIL and the HGV routes have been assessed as acceptable in the ES. The assessment demonstrates that the construction of the proposed wind farm would result in a short-term increase in traffic levels on identified sections of the access route. These increases are considered to be insignificant due to the expected low percentage increase in traffic on these roads.

ACOUSTIC

An assessment of the acoustic impact from both the construction and operation of the proposed wind farm was undertaken, taking into account the identified nearest residential properties.

The operational noise impact was assessed according to the guidance described in the 'The Assessment and Rating of Noise from Wind Farms', referred to as 'ETSU-R-97', and its associated Good Practice Guide (GPG), as recommended for use in relevant planning policy. The methodology described in this document was developed by a working group comprised of a cross section of interested persons including environmental health officers, wind farm operators and independent acoustic experts. It provides a robust basis for assessing the noise impact of a wind farm and has been applied at the vast majority of wind farms currently operating in the UK.

ETSU-R-97 makes clear that any noise restrictions placed on a wind farm must balance the environmental impact of the wind farm against the national and global benefits that would arise through the development of renewable energy sources.

Representative baseline conditions (the "background noise level") at nearby residential properties were established by undertaking noise surveys. These measured levels were then used to infer the background noise levels at other nearby residential properties as the ETSU R 97 document recommends. As background noise levels depend upon wind speed, as indeed do wind turbine noise emissions, the measurement of background noise levels at the survey locations were made concurrent with measurements of the wind speed and wind direction. These wind measurements are made at the wind turbine site rather than at the survey locations, since it is this wind speed that would subsequently govern the proposed wind farm's noise generation.

The relevant noise limits were then determined through analysis of baseline conditions and the criteria specified by the ETSU-R-97 guidelines. The general principle regarding the setting of noise criteria is that limits should be based relative to existing background noise levels, except for very low background noise levels, in which case a fixed limit may be applied. This approach has the advantage that the limits can directly reflect the existing noise environment at the nearest residential properties and the impact that the wind farm may have on this environment. Different limits are applicable depending upon the time of day. The daytime limits are intended to preserve outdoor amenity, while the night-time limits are intended to prevent sleep disturbance.

A sound propagation model was used to predict the noise levels due to the proposed wind farm at nearby residential properties over a range of wind speeds, taking into account the position of the proposed wind turbines, the nearest residential properties, and the candidate wind turbine type. The model employed took account of attenuation due to geometric spreading, atmospheric absorption, ground effects, topographical barriers and wind direction. It has been shown by measurement-based verification studies that this model tends to slightly overestimate noise levels at nearby residential properties.

The assessment shows that the overall requirements of ETSU-R-97, in terms of the proposed wind farm operating in isolation and cumulatively with other potential development in the area, can be met provided that the appropriate mitigation, in the form of turbine curtailment, is implemented at the site. As such, the resultant operational sound impacts are considered not significant.

Construction noise from the proposed wind farm has been discussed in terms of relevant limiting requirements and the use of 'best practicable means' to reduce potential noise levels. In instances where construction activities and site access tracks are located in close proximity to neighbouring residences enhanced mitigation measures are proposed. Sound associated with construction activities is expected to meet the limiting requirements with reasonable mitigation measures implemented and is considered not significant as a result.

SHADOW FLICKER & REFLECTED LIGHT

In sunny conditions, any shadow cast by a wind turbine will mirror the movement of the rotor. When the sun is high, any shadows will be confined to the wind farm area but when the sun sinks to a lower azimuth moving shadows can be cast further afield and potentially over adjacent properties. Shadow flicker is generally not a disturbance in the open as light outdoors is reflected from all directions. The possibility of disturbance is greater for occupants of buildings when the moving shadow is cast over an open door or window; since the light source is more directional. Whether shadow flicker is a disturbance depends upon the observer's distance from the turbine, the direction of the dwelling and the orientation of its windows and doors from the wind farm,

the frequency of the flicker and the duration of the effect, either on any one occasion or averaged over a year.

In any event and irrespective of distance from the turbines, the flickering frequency will depend upon the rate of rotation and the number of blades. It has been recommended (Clarke, 1991) that the critical frequency should not be above 2.5 Hz, which for a three-bladed turbine is equivalent to a rotational speed of 50 rpm. The turbines at the proposed wind farm would rotate at a maximum of approximately 18 rpm, well below this threshold. As with shadow flicker, certain weather conditions and solar positions are required before an observer would experience the phenomenon. There is no guidance on shadow flicker in Welsh planning policy. However, the Update to Shadow Flicker Evidence Base (2011), published by the then Department for Energy and Climate Change (DECC), states that assessing shadow flicker effects within ten times the rotor diameter of wind turbines has been widely accepted across different European countries, and is deemed to be an appropriate area.

In accordance with the DECC report, the starting point for analysis would be performing analysis on all occupied houses within ten rotor diameters of any proposed wind turbine. This shadow flicker assessment is based on turbines with a 117 m rotor diameter and the planning application includes a 50 m micro-siting distance for infrastructure. As such, this 50 m distance is added to the ten-rotor diameter 1170 m distance to give a total distance of 1220 m from any turbine. Analysis should be undertaken for shadow flicker at all properties within 1220 m from any wind turbine.

There are 48 properties that are predicted to experience shadow flicker in this assessment of the worst-case scenario. However, mitigation measures can be incorporated into the operation of the proposed wind farm to reduce the instance of shadow flicker. Mitigation measures include planting tree belts between the affected dwelling and the turbines or shutting down individual turbines during periods when shadow flicker could theoretically occur.

AVIATION AND ELECTROMAGNETIC INTERFERENCE

Wind turbines can potentially interfere with systems that use electromagnetic waves as the transmission medium, including, but not limited to, radar systems used for aviation safeguarding and electromagnetic communications systems. Wind turbines can potentially interfere with aviation operators by either physically affecting the safeguarding of an aerodrome by the close proximity of the turbines or through interference with the Air Traffic Control (ATC) radars that direct aircraft in flight. The likely significant effects on aviation and radar associated with the construction, operation and decommissioning of the proposed wind farm have been assessed.

The assessment of potential effects on aviation considers technical acceptability, based on air navigation safety, rather than following a strict EIA process of assessing the significance of effects. Such effects often require the implementation of technical mitigation solutions to ensure continued safe operation in the presence of a wind farm. The assessment of effects on these receptors is therefore one of technical analysis and consultation and seeks to identify whether the effect is likely to be 'acceptable' or 'not acceptable' to air navigation services provision.

The assessment identifies and considers the potential effects that the proposed wind farm may have on civilian and military aviation and air safeguarding and, if required, the mitigation measures proposed to prevent, reduce or offset any potential adverse effects where

possible. RES consulted with all relevant organisations which could be affected by the proposed wind farm.

The proposed wind farm is approximately 35 km north-east of the Cardiff Airport primary radar and approximately 40 km north-west of the Bristol Airport primary radar. In relation to military and civil aviation assets it considers potential impacts on any military Air Traffic Control (ATC) Radars, the NATS En Route Ltd (NERL) radars and nearby airports, and the potential mitigation measures identified to address these. The proposed wind farm is approximately 86 km south-west of the NERL Clee Hill radar.

Prior to mitigation, it is considered that the proposed wind farm could affect the operation of the NERL Clee Hill radar and both primary radars at Cardiff and Bristol Airports. There are a number of mitigation options available to alleviate problems caused by wind turbines to aviation and radar. Mitigation solutions are highly specific to the effect in question. Consultation with relevant consultees is key to establishing the appropriate method of mitigation. It is expected that the impacts can be mitigated with a suitable mitigation scheme that could be secured through an appropriately worded suspensive planning condition. A suitable planning condition has been agreed with Cardiff Airport to mitigate the potential effects of the proposed wind farm. Discussions are ongoing to agree a suitable mitigation with Bristol Airport and it is hoped that similar wording can be agreed with NERL. An infrared lighting scheme would also be agreed with the DIO prior to the proposed wind farm becoming fully operational.

Wind turbines can also potentially cause interference to multiple forms of electromagnetic communication systems, including point to point electromagnetic links, air <-> ground communication systems and others. This interference can be by the reflection, scattering, diffracting and blocking of the electromagnetic signal.

Consultation has been undertaken with relevant operators to identify potential impacts and mitigate as necessary. For all operators other than JRC, responses were received with a confirmation of no objection, with one exception where no response was received following multiple contact attempts. All consultation is detailed in Chapter 13. In discussion with JRC, it was agreed that a detailed solution would be developed post-consent, and a potential planning condition has been agreed, subject to approval of the planning authority.

SOCIOECONOMICS

The proposed wind farm would consist of 13 turbines, with a total capacity of approximately 55 MW and a planned operational lifespan of 35 years. It is anticipated that the proposed wind farm would generate enough energy to power nearly 55,000 homes.

The estimated quantifiable benefits of the construction and operational phase of the proposed wind farm have been considered – focussing on employment, gross value added (GVA) and wages. An assessment of the potential fiscal and environmental benefits is also included and an overview of the pertinent socioeconomic conditions at the regional and local level. Furthermore an insight into current global and national topics and a brief analysis of links concerned with tourism and visitor perceptions is addressed and conclusions are drawn relating to the socioeconomic impact of the proposed wind farm. Finally, the likely effects on land use and public access associated with the construction and operation of the proposed wind farm is considered.

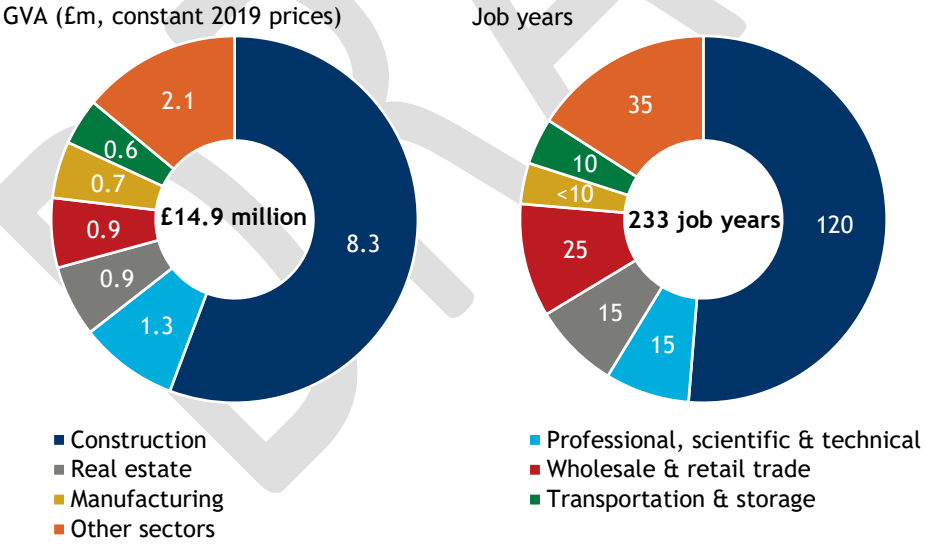
The proposed wind farm would offer economic and environmental benefits to the local area and region as a whole. Given the economic and social need to create new job opportunities, private sector investment should be viewed favourably. During the operational phase of the proposed

wind farm, business rates payable to the local and regional government would increase. The proposed wind farm would also further efforts to reach energy targets set by both the Welsh Government and the UK Government. The proposed wind farm could provide a significant private sector investment in the Welsh economy. Of the total investment during the proposed wind farm's construction, £26.3 million would be spent within Wales. This investment, alongside the further spending it generates down the supply chain and as those employed directly or indirectly as a result of the proposed wind farm spend their wages, could support a total of 233 full-time equivalent jobs in Wales over the course of the construction phase, with an associated £5.68 million in wages. It would also create £14.89 million in gross value added in the Welsh economy. Furthermore, £1.87m in tax receipts could be collected during the construction phase of the proposed wind farm from income and value added taxes.

Although these impacts are at the regional level, the applicant has stated their intention to continue their history of using local contractors where possible. Therefore, both Caerphilly and Torfaen County Borough Councils would be expected to enjoy some uplift at the local level.

The proposed wind farm could also provide a sustained positive economic impact over its 35 year operational life. Once operational, 8 jobs a year could be supported in Wales, with £160,000 in annual wages, and a total contribution of £590,000 in gross value added per year to the Welsh economy. Furthermore, £1.07 million could be collected annually in business rates, alongside £50,000 in income and value-added tax receipts.

Total sectoral (direct, indirect, and induced) GVA and employment benefits from the construction phase



Source: RES, Oxford Economics. Note: may not sum due to rounding.

The proposed wind farm's key role should be seen as its contribution to regional environmental objectives. With an estimated electricity generation of 192.8 GWh per year, the proposed wind farm could meet the electricity needs of approximately 55,000 homes, or 45 percent of the current combined housing stock in Caerphilly and Torfaen County Borough Councils. This would help the Welsh government in its attempts to achieve 70 percent of electricity demand being met from Welsh renewable electricity sources by 2030. Additionally, the proposed wind farm is

estimated to be able to provide a gross reduction in CO_2 emissions of 83,300 tonnes each year, equivalent to 88,200 newly registered cars.