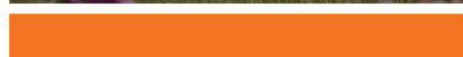


LLANBRYNMAIR WIND FARM

Supplementary Environmental Information
August 2013

Non-Technical Summary



NON-TECHNICAL SUMMARY

1.1 Introduction

- 1.1.1 RES UK & Ireland Ltd ('RES') applied to the Department of Energy and Climate Change (DECC) for consent to construct and operate a wind farm development on land between the villages of Llanerfyl and Llanbrynmair, north west of Newtown, Powys in April 2009.
- 1.1.2 To support the application five rounds of Supplementary Environmental Information (SEI) were submitted between 2010 and 2012. The planning application for this wind farm is currently under consideration and is due to be appraised at the Mid-Wales (Powys) Conjoined Wind farms Public Inquiry.
- 1.1.3 The Proposal has undergone considerable changes since the original submission. In order to update and consolidate these changes RES have combined all relevant information into this single overarching SEI package.
- 1.1.4 The changes to the Proposal have culminated in a design that has comprehensively considered environmental aspects and one that would deliver environmental gains.

The Application

- 1.1.5 The application includes the erection of 30 three-bladed, horizontal axis wind turbines, each up to 126.5m maximum height to tip and associated infrastructure including, on-site tracks, underground cabling and crane hardstandings, a communications mast (25m high), a permanent (80m high) free standing lattice wind monitoring mast, borrow pits, water crossings, electrical transformers, electrical connection works, a substation and control building, for a period of 25 years.
- 1.1.6 Thirty wind turbines are planned, each up to a height of 126.5m to blade tip and with a capacity of between 2MW and 3MW, providing an installed capacity of 60MW to 90MW. This would be sufficient to power more than 37,000 homes, or nearly two-thirds of the houses in Powys.
- 1.1.7 Consultation has been ongoing with consultees since 2005. Such discussions offered instrumental advice and input into the detailed site design and mitigation options and therefore enabled development of a wind farm with minimal effect on the environment.

1.2 Renewable Energy and Local Policies

- 1.2.1 Climate change is regarded by many as one of the most serious threats facing the world's environment, economy and society.
- 1.2.2 The UK Renewable Energy Strategy (UKRES) was issued by the Department of Energy and Climate Change (DECC) in July 2009. The Strategy states that the UK needs to "radically increase our use of renewable electricity...." The document sets out the means by which the UK can meet the legally binding target of 15% of energy consumption from renewable sources by 2020. This will mean a 7-fold increase in the share of renewables in little more than a decade.
- 1.2.3 In the UKRES, a 'lead scenario' is presented which suggests that more than 30% of electricity should be generated from renewables by 2020, which would be up from approximately 5.5% in 2009. The majority of this is expected to come from wind power, both on and offshore.
- 1.2.4 The Overarching National Policy Statement (NPS) for Energy (EN-1) and the NPS for Renewable Energy Infrastructure (EN-3). These documents have been considered despite the application being determined under section 36 of the Electricity Act 1989 and not the Planning Act 2008.
- 1.2.5 Welsh guidance on renewable energy is contained within Planning Policy Wales (2012) and its complementary Technical Advice Note (TAN) 8: Planning for Renewable Energy.

- 1.2.6 TAN8, published in July 2005, set out the policy context for the then current position on renewable energy and the target figures for 2010 and 2020, although whereas those for 2010 were expressed both in total output (4TWh) and additional installed capacity of renewables (about 1000MW), those for 2020 were given only as output (7TWh).
- 1.2.7 Planning Policy Wales (2012) has revised the current target and expects a maximum of about 1,666MW of onshore wind to be installed in the seven SSAs by the end of 2017.
- 1.2.8 Local planning documents considered include the Powys Unitary Development Plan (UDP) adopted in March 2010 to guide development during the plan period until mid-2016.

1.3 Description of the Project

- 1.3.1 The current proposal consists of 30 wind turbines of maximum height to tip of 126.5m, as shown in Volume III, Figure 3.6. To construct the wind farm the following infrastructure is required:
 - 30 wind turbines;
 - Associated foundations and crane hardstandings;
 - Access tracks;
 - A permanent anemometry mast;
 - 10 temporary wind monitoring masts;
 - One substation;
 - Two welfare buildings;
 - Six borrow pits (to win on-site stone for construction);
 - Five temporary site compounds; and
 - One concrete batching plant.
- 1.3.2 The most suitable turbine model for a particular location can change with time and therefore a final choice of machine for Llanbrynmair Wind farm has not yet been made and the most suitable machine for the proposed site would be chosen shortly before the time of construction, within the overall tip height limit of 126.5m.
- 1.3.3 The total permanent land take from new access tracks, turbine foundations, crane hardstandings, met mast, substation and welfare buildings would be approximately 16.5ha; roughly equivalent to 1.00% of the total site area.
- 1.3.4 The construction period is expected to last for a period of 24 months.
- 1.3.5 The anticipated operational life of the wind farm is 25 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.

1.4 Landscape and Visual Amenity

Introduction

- 1.4.1 The landscape and visual impact assessment considers the effect that Llanbrynmair Wind farm will have upon the landscape and the people who view that landscape. The assessment is informed by current good practice guidance prepared by the Landscape Institute and the Institute of Environmental Management and Assessment (including the 2002 second edition and the recently updated 2013 third edition), and photomontages have been prepared in accordance with Scottish Natural Heritage's Visual Representation of Wind farms Good Practice Guidance (2006) and the Landscape Institute's Advice Note on photography and photomontage in landscape and visual impact assessment (2011).
- 1.4.2 The assessment involved a desk study, field survey and computer modelling. The methodology and choice of representative viewpoints for the assessment were adopted in

response to comments received from the Powys County Council (PCC) and Natural Resources Wales (NRW). Photomontages and computer generated drawings were produced for 24 viewpoints around the site to illustrate the likely nature of effects.

Baseline

- 1.4.3 The site is located to the north east of the village of Llanbrynmair in Powys County, approximately 15km east of Machynlleth. The site comprises an area of upland grassland with blocks of coniferous woodland and falls within TAN 8 Strategic Search Area (SSA) B and the majority of the turbines fall within the Refined Boundary of Strategic Search Area (SSA) B, (Powys County Council TAN 8 Annex D Study, 2006).
- 1.4.4 The absence of national and county level landscape designations indicates that this site is not valued at the national or county scale for its landscape or scenic quality. However, the Snowdonia National Park falls within 5.8km of a turbine at its closest point and the Upland Ceredigion SLA falls within 16km of the site at its nearest point.
- 1.4.5 The Llanbrynmair Wind Farm site is located in the Cambrian Mountains Regional Character Area (RCA), within the Landscape Character Area (LCA) 5: Dyfnant Forest/Llanbrynmair Moors (Powys LCA).
- 1.4.6 The main wind farm site spans three Visual & Sensory Aspect Areas (according to NRW's LANDMAP Geographical Information System): 15 turbines lie within the Banwy Forest Aspect Area, 11 turbines in the Banwy Upland Aspect Area and 4 turbines in the Pen Coed Upland Aspect Area. NRW's objectives for these three areas are to improve the species diversity of forestry blocks by introducing broadleaf native species, feather forestry edges to follow landform, introduce intermittent broadleaf tree cover to plateau edges emphasising landform and valley courses, control invasive bracken and gorse growth, restore / reintroduce moorland vegetative cover and improve public access.
- 1.4.7 In addition, the offsite access route passes through the Llanerfyl Mosaic Farmlands Visual & Sensory Aspect Area (to the north-east) and Carno Grazing Visual & Sensory Aspect Area (to the south-west). NRW's objectives for the Llanerfyl Mosaic Farmlands and Carno Grazing are to encourage further use of traditional land management techniques i.e. hedge laying / coppicing, enrich and strengthen field boundaries (including replanting hedgerows) and to ensure new development is carefully integrated into existing landscape character.
- 1.4.8 There are a number of potential visual receptors, both close to, and some distance from, the wind farm site. These include residents in villages along the A470 Corridor and Caersws Basin (including Llanbrynmair, Llan, Dolfach, Talerddig, and Carno); people in villages along the A458 corridor (including Llangadfan and Llanerfyl), people in other villages in the ZTV including Llanfihangel-yng Ngwynfa, Llan, Bont and Dolgadfan; travellers on the A470, A458, and the Shrewsbury/Aberystwyth Rail Line; and recreational users of local footpaths in the surrounding hills, the Glyndwr's Way National Trail and visitors to Snowdonia National Park.
- 1.4.9 Views towards the skyline of the Snowdonia National Park are a key visual characteristic of the area.
- 1.4.10 The proposed wind farm has been designed to minimise potential landscape and visual effects. For example the visibility of turbines has been minimised from sensitive viewpoints (this has resulted in a reduction from 43 to 30 turbines over the course of the project design), the length of onsite tracks has been minimised (and edges of tracks will be reinstated after construction using turf reduce visual effects of tracks), the substation has been relocated adjacent to the proposed Carnedd Wen substation and ground modelling proposed to hide as much of the development as possible while also blending seamlessly into the natural contours of the hillside, felling and thinning of forest coupes and/or forest edges will create more open areas, and the overall quality of the blanket bog habitat will be improved (including restoration of currently afforested areas to blanket bog). In addition, the Llanbrynmair turbines will have a blade diameter similar to the proposed adjacent Carnedd Wen scheme to minimise visual difference.
- 1.4.11 In relation to the offsite highway works refinements have been made to the design of works to mitigate or limit landscape and visual effects and to introduce features to assimilate the

road into the landscape, including minimising loss of landscape features (particularly mature trees, hedge banks and hedgerows), using grass reinforcement surfacing for road widening and laybys to minimise impact on the character of the road, using root balled extra heavy standards for all replacement trees so they make an immediate contribution to landscape character, using stone facing on new retaining structures to blend them into their rural setting e.g. at Gosen Bridge, and improving the condition of features e.g. through reinstatement of poor quality hedge banks and introducing management that reflects local character (e.g. coppicing and laying hedges).

- 1.4.12 In the absence of the Llanbrynmair Wind farm it is likely that the land would continue under the same land use for a while. However, even if the Llanbrynmair Wind farm were not to go ahead, it is likely that another wind energy proposal would be proposed in this location due to its location within a TAN 8 Strategic Search Area for large scale (over 25MW) onshore wind developments.

Results of the Landscape and Visual Impact Assessment

During Construction

- 1.4.13 During construction, the landscape and visual impact assessment identifies a significant (major) effect on the character of the site and along localised parts of the offsite access road between Llanerfyl and Talerddig (where road widening, passing bays, structural works to bridges and new sections of track are being constructed) as a result of the presence of construction activities and loss of landscape features alongside the road. This will particularly affect Gosen bridge, Glen Menial bridge, Dolwen Isaf bridge, Neinthirion and the road widening/laybys between Llanerfyl and the northern site access. However, landscape features will be replanted and this effect will be localised and temporary. The agreed mitigation measures will ensure that the works will be assimilated successfully into the landscape within a period of approximately 5 years.
- 1.4.14 These construction activities will also result in a significant (major) temporary visual effect on people walking the Glyndwr's Way National Trail between Pen Coed and Brynaere.
- 1.4.15 There will be significant (moderate) temporary visual effects on residents of Llan and travellers on the A470 (on localised sections between Carno and Talerddig and west of Llanbrynmair) as a result of seeing the turbines being constructed on the skyline at relatively close proximity.
- 1.4.16 In addition, the offsite access works will result in a significant (major) temporary effect on views from a few properties (less than 5) in Diosg, three properties on the approach to, and at, Gosen Bridge, and motorists on the section of road between Llanerfyl and site access 4; and a lesser, but still significant, (moderate) effect on views from residents around the junction in Llanerfyl, residents at Sychtyn Farm, 3-4 Properties in Neinthirion, two properties at Cwmdrwen, a property at Nant-yr-egair-wen Farm and motorists on the section of road between Talerddig and site access 4. These effects will be short-lived (i.e. during the 24 month construction period).

Operational Effects

- 1.4.17 During operation, landscape and visual effects have been minimised through careful siting and design. Nevertheless, the landscape and visual impact assessment identifies a significant (major) long-term effect on the character of the Application Site - this will affect a localised part of the Cambrian Mountains Regional Character Area, a localised part of the Dyfnant Forest/ Llanbrynmair Moors LCA, and localised parts of three of the LANDMAP visual & sensory aspect areas (Banwy Forest, Banwy Upland and Pen Coed Upland).
- 1.4.18 The operational wind farm will also have a characterising effect on the landscape around the site, affecting perceptual character (visual and sensory characteristics) up to approximately 3km from the turbines. This will affect a localised part of the Cambrian Mountains Regional Character Area, localised parts of six of the Powys Landscape Character Areas (the Dyfnant Forest/ Llanbrynmair Moors, Mynydd y Cemmaes, Tregynon/ Llanerfyl,

Esgair Cwmowen, Trannon and Carno Valley) and parts of seven Visual and Sensory Aspect areas that cover this same area.

- 1.4.19 The assessment also identifies that there will be some significant (major) long term effects on viewers close to the site (e.g. from points along the Glyndwr's Way between Moel Ddolwen and Brynaere and points along the minor road between Llanerfyl and Talerddig) as a result of the addition of turbines, tracks and ancillary features at close proximity which will inevitably change views. There will be moderate (also significant) effects on viewers within 10km of the site (e.g. from points more distant locations on Glyndwr's Way and the minor road between Llanerfyl and Talerddig, on Llan Village, on the A470 at Talerddig and on elevated locations within 10km such as Bryn y Gadair). Viewers at viewpoints beyond 10km will not experience significant effects.
- 1.4.20 The assessment identifies a significant (major) long term effect on views from one route (the Glyndwr's Way between Pen Coed and Brynaere) due to the proximity of the development to this National Trail; and a significant (moderate) effect on views from localised sections of the A470 (T) as a result views of the turbines. However, there will be minor (not significant) changes to views from other more distant routes (e.g. the A458 and the railway line linking Shrewsbury and the Midlands with Aberystwyth). It should be noted that any wind farm development in this TAN 8 area would result in a significant effect on the Glyndwr's Way National Trail.
- 1.4.21 There will be a significant (moderate) long term effect on views from the settlement of Llan due to the upper parts of 11 turbines being clearly visible on the skyline in views up the village street; and a significant (moderate) medium term effect on views of residents in three properties around Gosen Bridge due to the extent of works required to widen Gosen Bridge and the length of time it will take for vegetation (particularly trees) to re-establish. There will be no other significant effects on views from any other settlement.
- 1.4.22 Of the individual properties assessed, eight of the 63 assessed will experience a high magnitude of change to views as a result of a large proportion of the Proposal being visible from their primary outlook or curtilage. For these properties an assessment of the changes in visual amenity 'in the round' was undertaken to inform an assessment of effects on the visual component of 'living conditions'. In all cases it was found that the Proposal will not appear dominant, oppressive or overwhelming.
- 1.4.23 None of the special qualities of the Snowdonia National Park (as set out in the Snowdonia National Park Management Plan 2010-15) will be affected by the Proposal and, although there will be views of turbines from the National Park (see VPs 16, 18, 19 and 21), they will not cause "significant visual intrusion".
- 1.4.24 The Proposal will not result in a significant effect on the perceptual character or the 'primary landscape qualities and features' set out in Ceredigion CC's 'Designation of Special Landscape Areas'.
- 1.4.25 All the operational effects identified are reversible.

Cumulative Effects

- 1.4.26 An assessment of potential cumulative effects arising from the Llanbrynmair Wind farm in combination with other existing and proposed wind energy developments within TAN 8's Strategic Search Area B (Carno North) was informed by Scottish Natural Heritage's internal guidance on the Cumulative Effect of Wind Farms (2012).
- 1.4.27 The cumulative assessment concludes that the presence of all existing and proposed wind farms in Strategic Search Area B (Carno North) would inevitably result in a significant change to landscape character in a localised area at the northern end of the Cambrian Mountains RCA. This will create a landscape with wind farms in an area which is recognised at a national level as being suitable area for wind farm development, and in which landscape change is expected.
- 1.4.28 The role that the Llanbrynmair Wind farm plays in this change was assessed according to two potential scenarios:

- 1.4.29 Scenario A: Llanbrynmair in the context of existing and consented wind farms (Carno I and II, Cemmaes 2, Mynydd Clogau and Tirgwynt)
- 1.4.30 Scenario B: Llanbrynmair in the context of existing, consented and proposed wind farms (Carno I, II and III, Cemmaes 2 and 3, Mynydd Clogau, Tirgwynt, Esgair Cwmowen, Mynydd Waun Fawr, Carnedd Wen and Dyfnant Forest)
- 1.4.31 The cumulative assessment concludes that the addition of Llanbrynmair in the context of Scenario A would result in a significant (moderate) additional change to landscape character, but the addition of Llanbrynmair in the context of Scenario B would not result in a significant additional change. This is because in Scenario A Llanbrynmair would introduce a new group of turbines and would be the largest group (after the Carno group) whereas in Scenario B Llanbrynmair would appear to form an extension to the Carnedd Wen Wind Farm and would fit with the pattern of other proposed developments in the SSA.
- 1.4.32 The same two scenarios were assessed for cumulative visual effects.
- 1.4.33 The cumulative assessment concludes that in the context of Scenario A, there will be a significant (moderate) additional effect on views at cumulative viewpoints within 10km of the Proposed Development (CVPs 1, 2, 9, 10, 13) largely due to the prominence of the Llanbrynmair turbines compared to other existing/ consented turbines in these views. In the case of CVP10 Llanbrynmair would fill the gap between Cemmaes and Tirgwynt. This cumulative scenario would also result in a significant (major) additional effect on views from the minor road between Llanerfyl and Talerddig and the Glyndwr's Way National Trail between Pen Coed and Brynaere due to Llanbrynmair being more prominent in views from these routes than other existing/consented schemes.
- 1.4.34 In the context of Scenario B there would be fewer significant cumulative (additional) visual effects resulting from Llanbrynmair because other proposed schemes would have a greater influence on views than Llanbrynmair in most cases. There will still be a significant (albeit lesser) moderate additional effect on views from the Glyndwr's Way National Trail between Pen Coed and Brynaere. Although other proposed turbines will also be close to this route the Llanbrynmair turbines will remain prominent thereby resulting in a significant additional effect on views. This additional change will also affect CVP8 which is on the Glyndwr's Way crossing Pen Coed. There will continue to be a significant (major) additional effect on views from the minor road between Llanerfyl and Talerddig due to Llanbrynmair having a greater visual influence on views from this route than other existing and proposed schemes.
- 1.4.35 The residential visual amenity assessment considered potential cumulative change to views and visual amenity as a result of introducing the Proposal to a baseline which already contained Carnedd Wen Wind Farm. Of the 63 properties assessed six properties were judged to experience a high magnitude of cumulative change as a result of the addition of Llanbrynmair. For these properties an assessment of the changes in visual amenity 'in the round' was undertaken to inform an assessment of effects on the visual component of 'living conditions'. In all cases it was found that the turbines of Llanbrynmair, if present in isolation or alongside the proposed turbines of Carnedd Wen Wind Farm, would not appear dominant, oppressive or overwhelming.

1.5 Ecology

Introduction

- 1.5.1 This assessment provides baseline information, identifies potential impacts of the Proposal on the ecology of the area (covering the vegetation/habitats and mammals other than bats. Bats and bird issues are dealt with in other sections), assesses the significance of those impacts, describes mitigation measures to avoid, reduce, or compensate for those impacts, and assesses the significance of the residual effects.
- 1.5.2 The Proposal is situated in Montgomeryshire in Powys. The area is in the uplands north-east of Llanbrynmair village. The Site is an undulating plateau lying over Silurian geology, covering roughly 17 square kilometres and runs from about 200 metres above sea level in Cwm Nant yr Eira up to 475 metres near Llyn Gwyddior. It is bordered by conifer plantations

and agriculturally improved pasture, but also unimproved upland habitats, such as acid grassland and smaller areas of heath and mire.

- 1.5.3 Rather species-poor acid, marshy or improved pasture and conifer plantations cover large parts of the Site, but there are also large areas with a mosaic of mire, marshy and acid grassland, and a little heath. The Site is mainly divided by fences. Sheep and cattle were grazing parts of the Site at the time of the survey.

Methodology

- 1.5.4 Following consultation and desk studies, ecological surveys necessary to describe baseline conditions and identify potential impacts of the Proposal were identified. These ecological surveys were carried out using standard recognised methodologies during 2006, 2007 and 2008, with further updates in 2012 and 2013. These included surveys for vegetation, habitats, and mammals other than bats. Surveys for peat took place in 2011 and 2013. The proposed access route along roads off the Site required a number of road improvement works. As this would involve some effects on roadside habitats, the northern access route between the Site and the A458 was surveyed in October 2008. Any sensitive habitats were identified and mitigation measures developed. Following amendments to the Site access route, habitats were surveyed along the entire minor road between the A470 in the south and the A458 in the north. These surveys took place in the spring of 2013.

Results

- 1.5.5 The habitat surveys confirmed the site comprises a variety of habitats, mostly modified by agricultural practice. No rare plants were discovered. There are areas of improved and grazed agricultural pasture alongside forestry and mosaics of modified but marshy areas with parcels of remnant bog and heath vegetation. There were also some large areas of bog habitat that are valued in national habitat lists, but not specifically designated. Following the surveys changes were made to the proposed design and the layout of the Site has been designed to avoid these sensitive habitats as far as reasonably practicable, but there will be a loss of just over 14 hectares of peatland habitat. Construction methods have been developed to minimise impact and ensure restoration of surrounding vegetation following construction.
- 1.5.6 The access route will involve the removal of a number of short sections of hedges and other works. Mitigation including re-planting and enhancing hedges is given.
- 1.5.7 The surveys revealed a relatively sparse mammal population, as is found in many such upland sites and no protected species will be affected.
- 1.5.8 A detailed Habitat Management Plan covering large areas of the site, including the restoration of priority bog areas and removal of conifer plantations, has been developed.

Conclusions

- 1.5.9 There will be no impact on the sparse mammal population. The impact of proposals for the access route, following mitigation, is not considered significant. The loss of over 14 hectares of peatland habitat is considered significant. However, following the implementation of the Habitat Management Plan over 200 hectares of existing peatland habitat will be under suitable management and 150 hectares of existing conifer plantation will be restored to peatland habitat. It is considered that this will ensure a net conservation gain from these proposed habitat enhancement measures.

1.6 Ornithology

Introduction

- 1.6.1 Ornithological surveys of the site were carried out during 2005 and 2006, following current SNH guidance on survey and assessment methodologies. The study area was defined to include all areas in which wind turbines may be located and the areas that could be affected

by them, plus a buffer zone around this. The bird surveys included breeding and wintering bird surveys, specific breeding surveys of scarce raptor species and black grouse, and vantage point observations to quantify bird flight activity. Further surveys on the key ornithological issue at the site, curlew were carried out during 2011 and 2012.

- 1.6.2 The baseline data were used to identify ornithological constraint areas that formed part of the site design process. This included avoiding locating turbines within areas of particular importance for black grouse, curlew and potentially suitable hen harrier nesting habitat.

Results

- 1.6.3 Bird populations within the potential impact zone of the proposed wind farm were generally low, as the wind farm was designed to avoid any important populations and/or protected areas. They did however still include several species of conservation importance. The breeding bird community within the study area included 8 high sensitivity species: hen harrier, red kite, goshawk, peregrine, black grouse (the small local population of which forms part of a nationally important population in a Welsh context, though recent evidence indicates that the local population has gone to extinction), curlew (the 10 pairs of which recorded during the 2005 and 2006 surveys are nationally important in a Welsh context, though more recent surveys in 2011 and 2012 showed that the local population had reduced to only 2 pairs), barn owl and common crossbill.
- 1.6.4 Sixteen species were classed as medium sensitivity: kestrel, cuckoo, skylark, tree pipit, dunnoek, song thrush, grasshopper warbler, wood warbler, spotted flycatcher, pied flycatcher, starling, house sparrow, linnet, lesser redpoll, bullfinch and reed bunting. All are UK BAP priority species. A further 14 breeding species were determined to be low sensitivity.
- 1.6.5 Overall, given the range of species present and their status in Wales, the Study Area as a whole was considered as nationally important in a UK and Welsh context for its breeding bird community.
- 1.6.6 Outside the breeding season, of the main target species, 8 high sensitivity species were observed (red kite, hen harrier, goshawk, merlin, peregrine, black grouse, golden plover and barn owl), 1 medium sensitivity (lapwing; a UK BAP priority species) and 8 low sensitivity target species were recorded. Other incidental records of other species of conservation importance obtained during the winter surveys included one high sensitivity species, crossbill, and 5 medium sensitivity UK BAP priority species (skylark, song thrush, starling, lesser redpoll and bullfinch).
- 1.6.7 No species was observed regularly over-flying in important numbers and no important regular flight lines were noted. The main species of interest seen over-flying during the vantage point watches included red kite, hen harrier, goshawk, peregrine, merlin, black grouse and golden plover.
- 1.6.8 Standard collision risk modelling showed that the collision risk to all of the key species would be of negligible magnitude and not significant for any species. Birds may be displaced from a small zone around the wind turbines but this effect was predicted to be of at most low magnitude and not significant for any species. Mitigation measures would be implemented to ensure compliance with the nature conservation legislation.

Conclusion

- 1.6.9 It is concluded that the Proposal would comply with relevant planning policies to ornithology. Overall, no ornithological impacts are likely to occur as a result of the Proposal that would be considered significant under the EIA Regulations, nor would it result in any breach of the Habitats Regulations. The proposed Habitat Management Plan should result in a net conservation gain. In addition an ornithological monitoring programme will be implemented to provide detailed information about the effects of the wind farm on the local bird populations and on the habitat enhancement programme.

1.7 Cultural Heritage

- 1.7.1 This assessment analyses the predicted effect of the proposed wind farm on the cultural heritage resource; this includes both the historic landscape as a whole and individual historic assets within it. Historic asset is a catch-all term for all kinds of sites, structures or areas of historic interest. It covers assets with formal designations, such as Listed Buildings, Scheduled Monuments and Conservation Areas and a wide range of undesignated assets that have been recorded, including archaeological sites.
- 1.7.2 The construction and decommissioning phases of the proposed development have the potential to harm historic assets during ground-breaking works, directly disturbing or destroying features of interest. During its operational phase, the Proposal may affect historic assets through changes in their setting; such effects would generally be visual. The setting of a historic asset is the area within which it is experienced. This can contribute to what is valued about an asset and therefore change in the setting may be harmful.
- 1.7.3 This assessment has identified that the proposed development would result in adverse effects on historic assets during the construction phase and operational period. None of the resulting effects would be considered significant under the EIA Regulations. Careful management of the decommissioning phase would ensure that no further adverse impacts occur on assets already damaged by construction works.
- 1.7.4 Construction works would damage three undesignated assets within the wind farm site: an area of peat cutting, an area of clearance cairns and a single clearance cairn. These are considered to be adverse effects of no more than Minor Significance. Construction works could also damage currently unrecorded sub-surface archaeological features; this is considered to be an adverse effect of no more than Moderate Significance. All adverse effects due to construction works would be fully mitigated by an appropriate programme of archaeological excavation and recording.
- 1.7.5 Operation of the wind farm would affect the heritage significance of three historic assets through visual change in their settings. There would be adverse effects of Minor Significance on a hillfort at Moel Ddolwen (Scheduled Monument), the Church of St Mary, Llan (Listed Building Grade II*) and Llan Conservation Area. Operation of the wind farm would also affect the character of the historic landscape surrounding the wind farm, leading to a moderate visual impact on the historic landscape.
- 1.7.6 Any effects on the historic landscape or the setting of historic assets would occur for the duration of the operational life of the wind farm and then be fully reversed on decommissioning. Mitigation has been achieved, where possible, through design of the wind farm and minimises the level of harm to the historic assets.

1.8 Hydrology and Hydrogeology

Introduction

- 1.8.1 The proposed Llanbrynmair wind farm site generally slopes to the east from approximately 430m elevation on the higher ground to approximately 240m in elevation at the valley forming the Afon Gam watercourse which flows in a north easterly direction to the Afon Banwy. All site infrastructure is located within the Afon Gam surface water catchment. The potential effects of the development of the project were assessed in relation to the water environment and the geological resource. A baseline study was undertaken to determine the current status, location, extent and use of water, water dependent habitats and geology, in particular peat, across the site.

Baseline

- 1.8.2 The site and surrounding area are characterised by: a relatively thin and discontinuous layer of peat with peat thickness of between 0m and 3m overlying clay or sedimentary bedrock; two sites designated as SSSIs; a total of 18 private water supplies supplying 15 properties; the presence of spawning habitat within the upper reaches of the Afon Gam; good to

moderate water quality within the classified watercourses that are connected to the site and limited, generally slow moving groundwater in soils of rocks.

- 1.8.3 Peat is present beneath an estimated 65% of the area of site infrastructure, however across the majority, 95%, the peat depth is less than one metre, with areas of deeper peat (>1.5m) being found in small pockets rather than large areas of blanket bog. The peat depths tend to be greatest under mire vegetation or within forestry (where it was planted on peat), with shallower areas of peat found on the steeper slopes of the site.
- 1.8.4 A total of 22 watercourse crossings will be constructed on site. Of these 18 are new and 4 are existing and will be upgraded.

Assessment

- 1.8.5 The main project interactions with water and geology are the potential for sedimentation and erosion; pollution; alteration of natural drainage patterns, runoff volumes and rates; flood risk and alteration of the geological environment through the excavation and drainage of peat.
- 1.8.6 Based on extensive peat probing and coring there are only 4 turbines that will be located on areas of peat of depth >0.5m and these will require additional probing, coring and slight refinement of position post felling. These are the 4 turbines at R18, R31, R35 and R36 which are all located on degraded peat that has been afforested and which will be felled and the peatland habitat restored.
- 1.8.7 Conservative calculations of the volume of peat that will require to be excavated for the installation of site infrastructure predict a total volume of peat of about 121,000m³, this is comprised of about 50,000m³ of the upper highly vegetated layer of peat and about 71,000m³ of the lower highly decomposed peat.
- 1.8.8 Where sections of peat and underlying material are excavated for the installation of turbine bases, tracks or other infrastructure there is the potential for the water within the adjacent peat to drain to these excavations potentially resulting in the adjacent peat to dry out and for its quality to deteriorate. Conservative calculations predict that the total volume of peat that may be impacted by all wind farm infrastructure is about 53,600m³. Of this 18,900m³ will be temporary and 34,700m³ will be permanent.
- 1.8.9 The total area of the site is 1695 ha which contains 633 ha of habitats that are dependent on groundwater. A total of 9.6 ha (1.5%) will be lost due to the infrastructure development.
- 1.8.10 Assessment of the potential catchment area associated with the 18 private water supplies indicates that five could be connected to project activities.
- 1.8.11 A flood risk assessment was conducted for the area and included a desk study based on the size, land use, topography and geology of the Afon Gam catchment and EA Flood Maps that show the area and routing of flood events. Rainfall runoff modelling was undertaken to determine the potential effects from flooding at a number of watercourse crossings and infrastructure locations. The potential probability and significance of flooding associated with the development at each of the four crossing locations was determined.

Potential effects from Proposed Development

- 1.8.12 The assessment to determine significant effects from the project on the water environment and geological resource has assumed that the best practice techniques and guidance will be used throughout the project construction, operation and decommissioning phases.
- 1.8.13 The assessment has determined that there is the potential for significant effects from the development of the project from erosion and sediment transport at the following locations:
- Turbine R31;
 - Track sections: Track junction of R42 to R23, Access point 4 to R9 and the sections from R5 to R31 and R32;
 - Watercourse crossings 13, 14, 15, 21 and 22 within the upper Afon Gam;

- Construction compound 1; and
 - Forestry within Area 2 of HMP (30 ha) and (17.5 ha).
- 1.8.14 The assessment has determined that there is the potential for significant effects from the development of the project from alteration of natural drainage patterns on:
- The peat resource through drainage from infrastructure on a temporary and permanent basis; and
 - The groundwater dependent habitats.
- 1.8.15 The assessment has determined that there is the potential for significant effects from the development of the project from the alteration of the geological resource at the following locations:
- The total volume of peat that will be excavated;
 - Turbines - R18, R31, R35, R36 and R37; and
 - Track - Track Junction to R35 and R36, R36 to R37 and R38, R37 to R26, R14 to R15, R41 to R39, R5 to R31.
- 1.8.16 The assessment has determined that there are no significant effects from the development of the project with respect to flood risk or from pollution.

Mitigation and Residual Effects

- 1.8.17 Specific mitigation and management for erosion and sediment control will include:
- the production of detailed drainage and sediment control plans in advance of works to capture and control all potentially sediment laden drainage and deal with it accordingly;
 - close liaison with the regulatory authorities with respect to construction methodologies, especially for watercourse crossings where the appropriate authorisations and permits will be obtained;
 - additional vigilance and a higher frequency of monitoring at these locations due to the proximity and sensitivity of the watercourse and the gradient; and
 - delivery of regular reports to the regulatory authorities on monitoring of the water environment.
- 1.8.18 Specific mitigation and management for the alteration of natural drainage patterns will include:
- The development of a peat restoration plan in the five afforested areas to fell all the trees and allow peat habitats to be restored and groundwater levels to be raised to near surface through ditch blocking. A relatively conservative assumption of only a 0.1 m rise in groundwater level across the 150 hectare area is equivalent to a total volume of peat re-saturation of 150,000m³. This is many times greater than the potential permanent impact from dewatering from infrastructure of 35,000m³; and
 - The 150 hectare restoration plan will also lead to the creation of flushes and other wetland features associated with the blocking of ditches and raising of groundwater levels that will compensate for the minor loss of habitats (9.6ha) that are dependent on groundwater.
- 1.8.19 Specific mitigation and management for the alteration of geological resource will include:
- The peat management plan presents the areas where the estimated 70,500m³ of catotelm and 50,400m³ of acrotelm that will be excavated from will be reused to create new peat habitat and improve degraded peat habitat. These plans will enable the excavated peat to retain its integrity, retain carbon and allow areas of previously degraded and afforested peatland to regenerate and produce new peat.
- 1.8.20 These mitigation measures and management plans, over and above best practice, would result in there being no significant effects from the Proposal.

Conclusions

- 1.8.21 The assessment identified areas of activity, particularly during the construction period, that have the potential to effect the water environment and geological resources of the site. The significance of these potential effects was assessed, covering sedimentation/erosion, pollution, alteration to natural drainage patterns, flood risk and alteration of the geological resource. Prior to specific mitigation, over and above best practice techniques, there is the potential for significant effects to occur in regard to water quality (sediment), peat hydrology, peat resource and habitats that are dependent on groundwater. To reduce these effects a number of mitigation measures and management plans are recommended which, when incorporated fully, result in these activities having no remaining significant effects on the water environment or geological resource.

1.9 Acoustic Assessment

- 1.9.1 The acoustic assessment considers the impact of noise from construction, operation and de-commissioning of the proposed site.
- 1.9.2 Baseline noise measurements at five locations have been used to derive operational noise limits for the night-time and day-time hours following the principles of ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*.
- 1.9.3 Operational noise predictions have been carried according to ISO9613-2, *Attenuation of Sound during Propagation Outdoors - Part 2: General method of calculation*, with regard to the assumptions specified in the Institute of Acoustics *Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*.
- 1.9.4 Predictions of construction noise have been carried out and assessed according to the requirements of BS5228, Code of Practice for Noise and Vibration Control on Construction and Open Sites.
- 1.9.5 Predictions of operational noise have been compared with the derived ETSU-R-97 night-time and upper day-time noise limits based on background noise data for five sample locations. These limits are shown to be met by a comfortable margin.
- 1.9.6 Predictions of construction noise have been compared with example limits included in BS5228 and meet the criteria for day-time noise by a reasonable margin for the noisiest single activity (track construction) and for the noisiest combination of traffic accessing the site and construction plant on the site.
- 1.9.7 An assessment of cumulative operational noise has also been carried out to assess the predicted impact of the site as operated alongside the proposed adjacent Carnedd Wen site. This demonstrates that the limits continue to be met by a reasonable margin, for both sites operating together for a worst case combination of wind speed and wind direction.

1.10 Transportation and Access

- 1.10.1 The proposed Llanbrynmair Wind Farm uses both the A458 and the A470 for access with the Llanerfyl to Talerddig road, the C2031, being modified to accommodate proposed construction traffic and turbine components.
- 1.10.2 The route from Talerddig and the A470 will be the principal access for construction traffic for the site and for the enabling works along the C2031. The A458 at Llanerfyl will only be used by turbine components and escort vehicles.
- 1.10.3 The transportation and access proposals for the Llanbrynmair Wind Farm have evolved to the current position via an iterative design process and consultation with stakeholders and the multi-disciplinary design team. This process is detailed as a part of the LTMP in Appendix 10.1.
- 1.10.4 The temporary increase in traffic during construction is proposed to be mitigated through enabling works which have been designed to be in harmony with the local environment and to maintain the existing road character in the longer term. The mitigation works for the

temporary construction traffic provide a number of improvements to existing roads and bridges, which will have a lasting permanent positive effect on the route. There is considered to be a permanent community and general network benefit of the road improvement works proposed.

- 1.10.5 This assessment of effects has shown that, in terms of the revised transportation and access element of the scheme, the effect is considered to be significant in the short term during the construction period on the more southern sections of the Llanerfyl to Talerddig road. This informed the access strategy and design process which removed traffic from the more northern section of the road nearing Llanerfyl and led to highway modifications on the southern sections of the road to mitigate construction traffic impact.

1.11 Other Issues

Electromagnetic Interference

- 1.11.1 Wind turbines have the potential for causing interference to television reception. RES have performed a full technical assessment through prediction modelling of the scale and location of TV interference that might occur as a result of the wind farm.
- 1.11.2 The Office of Communications (Ofcom) and the BBC have joint responsibility for protecting TV services in the UK. They state that digital television is much more robust to interference than the analogue system and so the following comments refer specifically to existing analogue services.
- 1.11.3 Application of the interference model showed that any interference caused by the proposed wind farm is not predicted to be widespread. There is no predicted interference to any of the transmitters in inhabited areas. However, isolated cases of interference at properties close to the wind farm can never be ruled out, and so terrestrial television reception at isolated properties within 2.5km of the wind farm could be affected.
- 1.11.4 Following the switchover to digital any effects of interference are considered to be negligible.
- 1.11.5 The BBC have no evidence to suggest that wind farms cause interference to local or national radio reception.
- 1.11.6 Microwave links can be affected by reflection, diffraction, blocking and radio frequency interference caused by wind turbines in their 'line of sight'. RES consulted widely with organisations and system operators, which could be affected by the proposed wind farm. Ofcom identified that there were links operated by two companies that were within the consultation area considered by RES. Both companies have confirmed that the Proposal will not affect their existing or currently planned operations.

Aviation

- 1.11.7 The Ministry of Defence (MoD) and Civil Aviation Authorities (CAA) have been consulted. In the UK, the need for aviation obstruction lighting on 'tall' structures depends upon their location in relationship to aerodromes.
- 1.11.8 The turbines at Llanbrynmair would have a tip height of up to 126.5m. All aviation stakeholders have been consulted and no concerns over obstruction or hazard have been raised plus the turbines do not constitute an 'aerodrome obstruction'.
- 1.11.9 The CAA confirmed in August 2012 that they have no observations regarding this Proposal.
- 1.11.10 NATS (En-Route) Public Limited Company ("NERL") confirmed no safeguarding objection to the proposal in August 2012.
- 1.11.11 The MoD confirmed in September 2012 that they have no objection to a wind farm at this location.

Shadow Flicker

- 1.11.12 Under specific circumstances moving blades of a wind turbine can produce a disturbance effect termed shadow flicker. 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.
- 1.11.13 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.
- 1.11.14 An analysis of shadow flicker throughout the year from Llanbrynmair Wind farm was carried out and showed that five of the houses considered in the analysis could be subject to shadow flicker from the Llanbrynmair wind farm.
- 1.11.15 It should be emphasised that this analysis provides an extremely conservative estimate of the extent that houses will be affected by shadow flicker. Due to frequent cloud cover, turbines not turning at all times and turbine rotors not being aligned with the sun in a way to cast maximum shadow onto habitations, the actual amount of shadow flicker seen in these areas is likely to be much less.
- 1.11.16 The assessment concludes that that the Proposal will not cause a material reduction to residential amenity owing to shadow flicker.

1.12 Socio-Economic Assessment

Introduction

- 1.12.1 The socio-economic assessment considers the predicted adverse and beneficial effects of the proposed Llanbrynmair Wind farm on the socio-economics at local, regional and national scales during construction, operation and decommissioning of the proposed wind farm. The socio-economic assessment describes the economic effects of the Proposal and wind energy in general, the potential effects on tourism, recreation and education, and sets out the proposed mitigation measures designed to reduce any potentially significant effects.

Baseline

Economic

- 1.12.2 In Powys there is an unemployment rate of 1.7%; this is compared to a Wales rate of 2.2% (Powys, 2007). In 2006 the average weekly gross wage in Powys was £334.00, compared to a Welsh average of £388.40. While the Welsh average percentage annual change was an increase of 4.7%, Powys wages increased by an average of 9.5%. According to 2001 census data 66% of people in Powys are economically active, whereas the Welsh average is 60.9%.

Recreation

- 1.12.3 A number of Public Rights of Way (PRoW) exist within the study area such as the Glyndŵr's Way National Trail. Horse riders and walkers use the different rights of way but the amount of use has not been ascertained.

Tourism

- 1.12.4 Within the local, regional and national context it is clear that the area surrounding Llanbrynmair receives low numbers of visitors and income from tourism relative to other areas in Mid Wales. This reflects the lower concentration of visitor attractions and tourist accommodation than seen in many other areas of Mid Wales.

Assessment

Economic

- 1.12.5 The construction and operation of the proposed wind farm would have a positive effect on the local economy, in terms of local employment during the construction phase, and also in the longer term from landowner rentals, business rates, local services, and employment of maintenance staff. Using 2007 / 2008 rates, wind farms in Wales will be subject to business rates of 44.4p in the pound, and attract a rateable value of £5,000 per MW of installed capacity, which means that, based on an installed capacity of 90MW, the Llanbrynmair wind farm would contribute over £219,500 per annum to the funding of central government services.

Recreation

- 1.12.6 Direct effects on Public Rights of Way (PRoW) will occur where the site tracks cross and coincide with PRoW. A length of Glyndŵr's Way from the road at Dolauceimion towards may not be available to the public whilst being upgraded and used as an access track. In order to mitigate or reduce such effects, temporary diversions will be put in place. Areas of construction activity would be cordoned off to exclude the public.
- 1.12.7 The Site in general is not considered to be used much by horse riders. Two turbines lie within 200m from Glyndŵr's Way, and a turbine is within 200m of the bridleway.
- 1.12.8 Direct effects on the use of Public Rights of Way in the vicinity of the proposal are considered to be minimal and primarily occurring during the construction process.

Tourism

- 1.12.9 RES is keen that the proposed wind farm becomes a feature of the area, attracting interest from locals and visitors alike. Proposals for a community fund are intended to provide tangible benefits to the local community and to enable worthwhile initiatives throughout the wind farm's life.

Additional Mitigation and Enhancement

- 1.12.10 RES would also be willing to make the bridleway that leads from Neinthirion west to the forest at Graig Llwyd more suited for horse riders.
- 1.12.11 RES would be willing to finance the cost of improving Glyndŵr's Way and the bridleway that runs from R14 north west into the forest to the forestry road.
- 1.12.12 Between Dolwen and Dolauceimion where Glyndŵr's Way runs along the minor road RES would be willing to undertake works within the highways verge to make it more suited for horse riders.
- 1.12.13 The wind farm would represent a useful educational resource for the area given that most schools and colleges now have energy, sustainable development and the environment on the curriculum. RES undertakes talks at schools and arranges site visits for school groups at its existing wind farms in the UK

Conclusions

- 1.12.14 The likely effects of the Llanbrynmair wind farm have been reviewed. It is considered that the proposed wind farm would have little or no impact on the local economy, tourism and recreation of the area. In addition the proposed wind farm has associated positive environmental effects related to displacement of fossil fuels and the contribution that the scheme will make to the Government's renewable energy targets.

1.13 Conclusions

- 1.13.1 The Environmental Impact Assessment for the Proposal has been carried out in accordance with regulatory requirements and recognised assessment methods. This Supplementary Environmental Information package identifies how environmental effects have been minimised through careful design. Where potential effects have been identified, specific mitigation has been identified as appropriate to reduce potential effects to an acceptable level.
- 1.13.2 Where significant landscape and visual and cultural heritage effects on setting have been identified, these are considered within in the context of National Policy. The Proposal has been designed to minimise landscape and visual effects as far as possible, whilst balancing the needs of other environmental and technical constraints.
- 1.13.3 No significant effects have been identified on ecology and ornithology. Best practice construction measures and control measures to ensure compliance with environmental legislation have been set out to minimise effects. A net gain has been proposed for affected habitats and carbon storing peatland through the Habitat Management Plan.
- 1.13.4 No significant effects are predicted to occur as a result of hydrology, noise, transport, access, electromagnetic interference, ice throw, aviation, shadow flicker or socio-economics.
- 1.13.5 The carbon savings of the Proposal has the potential to make a significant contribution towards national renewable energy targets and ultimately helping to reduce the impacts of climate change.