Section 3

Site Selection, Site Design and Approach to EIA

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3.1 INTRODUCTION

3.1.1 This section sets out the main stages followed in the evolution of the proposed Pen y Cymoedd Wind Farm. It demonstrates how the site design and the layout of the turbines has evolved through the application of various constraints and site specific factors, and it highlights the key design criteria applied. It also describes the processes applied in undertaking the Environmental Impact Assessment for the proposed wind farm, and in compiling this Environmental Statement.

3.1.2 The Pen y Cymoedd area has been identified as potentially being suitable for wind farms as it forms part of one of the Welsh Assembly Government's (WAG) Strategic Search Areas (SSA) for wind farm development (SSA F, as defined in Technical Advice Note 8: Planning for Renewable Energy). Having been selected by the tender process put in place by Forestry Commission Wales to progress the development of a wind farm on WAG land within this area, Nuon was legally obliged with developing a wind farm design that satisfied all of the various development criteria in a sensitive way. Nuon did not approach the development of a wind farm at Pen y Cymoedd with any pre-conceived ideas as to what the final size, layout and design of the wind farm would be, but instead, its aim has always been to produce a deliverable scheme within SSA F that strikes an acceptable balance between impacts and energy yield, ensuring that the potential for SSA F's delivery of clean renewable energy is maximised, and that the resulting contribution to the TAN 8 targets could be delivered within a sensible timescale. The iterative approach to the design process that has been followed, coupled with extensive consultation at all stages, has ensured that this aim has, as far as possible, been achieved.

3.1.3 In parallel with this process, Nuon were also actively engaged in assessing and developing other potential wind farm sites throughout Wales, and elsewhere, and it became apparent as part of that work that the Pen y Cymoedd project represented one of the best opportunities for meeting these aims within the timescales set by TAN 8.

3.1.4 Thus the key stages in the identification of the Pen y Cymoedd site and in the evolution of the wind farm design, considered in detail below, are as follows:

- Identification of SSA F by the WAG.
- The Forestry Commission Wales (FCW) tender process.
- Detailed site design and consultation following award of tender.

3.2 SITE SELECTION PROCESS AND PRELIMINARY SITE DESIGN

Identification of Strategic Search Area F by the Welsh Assembly Government

3.2.1 One of the Welsh Assembly Government's aims through Technical Advice Note (TAN) 8: Planning for Renewable Energy was to identify areas for the development of onshore wind farms that encompassed sufficient land to deliver its energy policy aspirations for Wales. The identification of Strategic Search Areas considered in a country-wide context those areas within Wales most suitable for such developments. A series of environmental constraints were applied across the whole country and, within the least constrained land, areas identified that in landscape terms were considered to be most suitable for large scale (over 25 MW) wind farm development. The results of that country-wide site identification process, in the form of the seven SSAs, are now enshrined in policy, with the proposed development of large scale wind farms within these areas allowing the more sensitive parts of the country (i.e. within nationally designated landscapes), to remain free of turbines.

3.2.2 TAN 8 also envisages that local planning authorities will undertake local refinements within the SSAs in order to 'guide and optimise' development within each area. Within SSA F, that process has been carried out jointly by Neath Port Talbot (NPT) County Borough Council and Rhondda Cynon Taf (RCT) County Borough Council, who along with other South Wales Valleys authorities, commissioned an independent report from specialist consultants (Consortium of South Wales Valleys Authorities, TAN 8 Annex D Study of Strategic Search Areas E and F: South Wales Valleys, Ove Arup and Partners Limited December 2006). The refinement of the SSA, recommended in that report, has significantly reduced the part of SSA F considered to be suitable for wind turbine development, yet the proposed Pen y Cymoedd wind turbines generally fall within both the wider TAN 8 SSA F boundary, and both the NPT and RCT refinement areas as recommended by Arup (although these refinements had not been published at the time of the FCW tender process).

The Forestry Commission Wales Tender Process

3.2.3 In response to the publication of TAN 8, Forestry Commission Wales, acting as agents of the WAG, tendered the award of options to develop wind farms on the land which FCW manages on behalf of the WAG in each of the SSAs defined in TAN 8. This is the National Forest Estate Wind Farm Programme, which aims to assist delivery of the wind energy targets set out in TAN 8 through the development of wind farms on land managed by FCW on behalf of the WAG within each SSA.

3.2.4 An advertisement was published in December 2005 inviting expressions of interest in tendering for developing wind farms in relation to the National Forest Estate Wind Farm Programme. All completed Pre-Qualification Questionnaires (PQQ) received were evaluated and a shortlist of bidders selected. Developers who submitted a PQQ were notified of the outcome of the short listing evaluation in

February 2006. All of those shortlisted were then invited to submit a response to a tender for the Lots for which they were shortlisted.

3.2.5 Following confirmation that Nuon had been shortlisted to submit a tender for all of the areas, including 'Lot 6', the Coed Morgannwg Strategic Search Area (i.e. SSA F), the initial stages of the preliminary design process began in February 2006.

3.2.6 Due to the normal limitations of a pre-tender process, only initial consultations and site surveys were possible, and a desktop Geographical Information System (GIS) screening process was used to identify those areas within Lot 6 that were considered most suitable for the location of wind turbines. This was based on the following criteria:

- Only land owned by the WAG and managed by FCW and within the boundary of SSA F was considered, and whilst within other Lots some areas had been excluded by FCW, within Lot 6 all WAG owned land was made available for the potential location of wind turbines.
- All nationally designated areas (e.g. Sites of Special Scientific Interest) were considered unsuitable for the location of wind turbines.
- Areas where terrain slope angles were calculated to be greater than 20% were considered to be technically unsuitable.
- Areas within 750 m from known dwellings were discounted.
- Potential wind resource was also considered.

3.2.7 This process identified areas within Lot 6 that appeared viable for the location of wind turbines, and initial on-site surveys were then undertaken to further assess their suitability, and to identify any additional design constraints not highlighted from the GIS studies. These included various topographical and other physical and technical constraints such as;

- general observed ground conditions, including peat and hydrological conditions;
- terrain and topographic factors not apparent from the mapping;
- the presence of potentially noise sensitive dwellings not included in the Post Office 'address point' database;
- the general condition and category of strategic forest tracks, including major river crossings, bridges and culverts;
- the general condition and adequacy of the highways network giving access to the various areas, with regard to the size of turbine components likely to be required; and
- The presence of other existing infrastructure such as communications masts, gas mains, water supply reservoirs etc.

3.2.8 Additional general information on ecological, environmental and landscape constraints was also gathered and assessed, along with information on cultural heritage and archaeology, including Scheduled Ancient Monuments (SAMs) and historic landscapes. Direct consultation with the Royal Society for the Protection of Birds (RSPB) identified some specific areas where a wind farm development might be of potential concern, and these were avoided. Areas of significant amenity, recreation and community use were also identified, and considered in the design process, along with such things as proximity to other wind energy projects, and known communications infrastructure (i.e. microwave links). A preliminary assessment of Landscape and Visual Impact was also undertaken to identify areas where visual impacts could be considered particularly sensitive.

3.2.9 This process generated a set of areas on WAG land within SSA F where wind farm development appeared technically feasible, and initial designs for a suitable wind farm were then drawn up, using standard design criteria to define turbine size, spacing and orientation, with due consideration to optimising the turbines operational performance. Appropriate set backs were also applied from all Public Rights of Way (PRoWs), from FCW site tracks, and from watercourses shown on the Ordnance Survey mapping. Where possible, turbines were located within areas of the forest that were either recently clear felled, or were scheduled for felling prior to construction, or which had been recently replanted, with a view to minimising the impacts of the wind farm on FCW forestry.

3.2.10 Some of these design constraints are illustrated in Figure 3.1, in Volume 2, and throughout the FCW tender process the design was refined in accordance with the key design criteria discussed above, with a view to maximising the potential contribution of renewable energy whilst also seeking to minimise potential impacts. The fundamental design premise was to submit a realistic, deliverable design which Nuon believed could be consented within the TAN 8 2010 timeframe, and built shortly thereafter.

3.2.11 The various iterations in the site selection process are illustrated in Figure 3.2 in Volume 2, which shows clearly how the extent and scale of the proposed development was refined over the course of the design process carried out during the tender process, from Layout 1 (comprising 253 turbines) to Layout 4 (comprising 112 turbines), with the number of turbines and their geographical extent, being reduced from one iteration to the next, largely to address perceived landscape and ecological issues, but also to reduce the overall impacts of the proposed wind farm to an acceptable level. This has significantly reduced the extent of SSA F that will potentially be directly impacted by the wind farm, and has produced a more focused and cohesive design that is still capable of making a significant contribution to TAN 8 targets.

3.2.12 Layout 4 was used to inform the final tender submission, which was presented to FCW in January 2007, along with an overview of Nuon's intended approach to the development of the wind farm, and to specific issues such as peat and community benefits.

3.2.13 Nuon UK Ltd was informed of their preferred bidder status for 'Lot 6' within SSA F in January 2008, and the formal contract between Nuon and the Welsh Assembly Government was signed by The First Minister at the end of March 2008.

3.3 FURTHER CONSULTATION AND SCOPING

Formal EIA Consultation Process

3.3.1 Nuon wanted to make the best use of local knowledge to inform the Environmental Impact Assessment (EIA) process and following a tender process, Natural Power Consultants Ltd (NPC) were selected to give technical support to the design process, manage the in-depth site survey work and produce the Environmental Statement (ES), working with a number of locally based and specialist contractors.

3.3.2 The formal EIA process began with the integration of information gathered during the preparation of the FCW tender with information already held by some of the project consultants, several of whom already had extensive prior knowledge of the site and the surrounding areas, and who had been appointed on that basis. This existing level of knowledge and understanding allowed the EIA process to commence soon after Nuon had completed the contractual arrangements with the WAG and ensured the appropriateness of the assessment methodologies applied. Pre-scoping consultation was undertaken with statutory and non-statutory consultees with regard to the broad area of the proposed development and immediately surrounding countryside. Where further consultation was required, the lead consultant (NPC) engaged with the relevant consultees. This early work helped to identify and clarify key issues and to promote dialogue with both consultees and other stakeholders concerning key issues, and to confirm and agree the proposed methods for survey, evaluation and assessment. Pre-scoping consultation was followed up with the circulation of a formal scoping document in August 2008, and responses under the EIA Regulations were requested from statutory and non-statutory consultees. The responses were reviewed in partnership with the specialist sub-consultants in order to make sure all relevant issues identified were assessed as part of the site survey work, and were subsequently included in the ES. A summary of the scoping responses is set out in Table 3.1, with details of other consultation responses given in Table 3.2.

3.3.3 In addition to the formal scoping and consultation, meetings and discussions took place with both county borough councils, CCW and RSPB to agree the specifics of survey methodologies and the opportunities to share results and to update these consultees on progress. The outcomes of these meetings and discussions have played an important role in shaping both the Pen y Cymoedd scheme, and the scope and content of this ES. Further detail regarding this consultation, and documents relating to it, are set out in the relevant sections of the ES.

Table 3.1: Summary of responses from scoping consultations

ADDRESSEE	SCOPING RESPONSE
Countryside Council for Wales (CCW)	Impacts of grid connections and transport links should be covered in the EIA as well as the impact of the wind farm on SSSI's. EIA needs to address users of Public Rights of Way (PRoW), and suggested separation distance of 4 times the height of turbine for bridleway and 3 times height (with 200 m being minimum) for any other routes. **ECOLOGY:** • Important that the EIA is based on comprehensive, sound ecological surveys followed by appropriate monitoring programmes. • Detailed bird survey work should include breeding bird survey, vantage point surveys and targeted surveys for specific species. • Bat surveys need to be undertaken within the development site and within 2 km of site boundary. • Recommended surveys for great crested newts, otters, badgers, reptiles and pine marten. • Comprehensive surveys should be carried out on extent, depth and condition of peat deposits and there is a need to thoroughly investigate and exploit opportunities for biodiversity enhancements. **LANDSCAPE/VISUALISATION:** • Recommend that both the Brecon Beacons National Park and the Gower Area of Outstanding Natural Beauty are considered when assessing the landscape and visual impacts of the proposed wind farm. • Recommend that both wire lines and photomontages produced for each viewpoint. • Zones of Theoretical Visibility (ZTVs) should be carried out to a distance of 35 km from the proposed wind farm. • Include cumulative impact assessments with operational wind farms and submitted wind farm applications.
Rhondda Cynon Taf (RCT) County Borough Council	Need to ensure that all aspects of LANDMAP are included in the ES. (LANDMAP is the national information system for taking landscape into account in the decision-making process). The section on highway requirements is considered appropriate and acceptable in principle. **LANDSCAPE/VISUALISATION:** • Suggested photomontages would be reasonably representative of the visual impact likely to be experienced. • Plans of access tracks at appropriate widths including corners should be provided in sensitive areas such as steep slopes and/or where visible from adjacent settlements. • Given the size and extent of the project, up to 50 full assessment viewpoints are expected. **ECOLOGY:** • Consultation with Botanical Society of the British Isles, Glamorgan Bird Club, Glamorgan Moth Recording Group, Mammal Society etc. is recommended. • Potential for peat bog and habitat restoration within Forestry Commission Wales holdings investigated by Glamorgan Biodiversity Advisory Group. Peat bog modified by planting could be restored and there is a huge potential for this. Need to identify and map the peat land areas as well as survey, assess and categorize the form and type of peat bogs within the site and identify how active they are. • Consideration is needed on how the existing (and potential) bird interest of this area can be maintained and enhanced. • There may be a requirement for more specific species surveys depending on turbine location, and more detailed statutory protected species survey work following results of Phase 1 Habitat Survey and desk study.
Neath Port Talbot (NPT) County Borough Council	• Surveys should be undertaken on badgers, pine marten, red squirrel, crossbills and various dragonfly species. • Further archaeological investigation may be required if significant archaeological features identified during desk based study.

ADDRESSEE	SCOPING RESPONSE
Department of Energy and Climate Change (DECC)	The following needs to be covered in the ES: • Landscape - including capacity, character, quality value and visual effects (cumulative impact within a 30 km radius). • Construction and operational noise. • Site selection. • Amount and source of construction material required. • Details of grid connection. • Flora and fauna, including impact on any area or species protected. • Impact on designated areas e.g. national parks, SSSI, and Public Rights Of Way etc. • Impact on local economy, including tourism. • Impact on sites of historic landscape and registered parks and gardens. • Impact on archaeology. • Impact on cultural heritage within 10 km of site boundary. • Impact on aviation. • Hydrology, hydrogeology and geology.
Civil Aviation Authority (CAA)	• Advised that the location of the wind farm might impact upon operations associated with Cardiff International Airport and upon local, charted gliding activity at Rhigos. • There may be a need to install aviation obstruction lighting to some, or all of the associated wind turbines and all turbines should be painted white. • There is a civil aviation requirement in the UK for all structures over 300 feet high to be charted on aviation maps. The developers will need to provide details of the development to the Defence Geographic Centre.
Brecon Beacons National Park (BBNP)	• The BBNP Management Plan defines the special qualities of the park as the landscape and natural beauty, peace and tranquility, opportunities for walking and access to the open country, open spaces and qualities of remoteness, traditionally managed farmland and wildlife. Protection of these requires careful control of development that straddles the park boundary or is conspicuous from within the park. • The Ministerial Interim Planning Policy Statement 01/2005 acknowledges that renewable energy projects should be supported by local planning authorities provided environmental impacts are avoided or minimised and national parks are not compromised. • TAN 8 describes national parks as visually sensitive receptors and that developments should maintain the integrity and quality of the landscape i.e. no change in landscape character from wind turbine development. • With regards to the wind farm, the extent and scale of the development is likely to have a significant impact on the park and its special qualities and it is essential that the proposal thoroughly assesses the likely impact upon the national park. • Suggest the proposal include wire lines and photomontages from the 21 viewpoints suggested by CCW, which the BBNP supports.

ADDRESSEE	SCOPING RESPONSE
Welsh Assembly Government (WAG)	**The Rural Affairs, Heritage and Technical Division** provided the following comments: • ES should include detailed explanation/justifications to account for each decided option such as turbine sitings, the location of on-site structures, size and location of borrow pits. • Include potential impacts arising from the disturbance of peat and organic soils in terms of carbon loss and description of how and where soil is to be stored. • Inclusion of surveys of aquatic features to highlight whether further targeted surveys are required in relation to invertebrates or amphibians. • Assess the potential impacts associated with tree-felling e.g. impact on water chemistry. • The transport assessment should include consideration of the potential for cumulative impacts on transportation routes. **The Nature Conservation and Biodiversity Branch** provided the following comments: • The mammal survey does not include the potential for dormice to be present and that confirmation is advised from CCW, local records centre and FCW. • Mitigation measures need to include comprehensive method statements detailing how European Protected Species will be dealt with. Cadw confirmed that the scope of the archaeological assessments is acceptable. (Cadw is the historic environment service of WAG). In preparation of the ES, it was advised that the Coal Authority and mining interests should be consulted regarding the safeguarding of the resource.
Royal Society for the Protection of Birds (RSPB)	• Area is very important for nightjars and raptors, especially honey buzzards. • Welcome the level of survey within the scoping document and it is vitally important that approved methodologies are employed. • A three-visit Brown and Shepherd survey should be undertaken up to a minimum of 500 m from site boundary and raptor surveys up to 2 km from the area of interest. • Expect that appropriate and innovative technologies are utilised in order to reveal an appropriate level of information. Expect the developer to use technologies available to monitor nightjar. • The ES should assess the likelihood of collision risk with wind turbines using the Band Collision Risk Modelling method. • Would like to see an Ecological Enhancement chapter or annex included in the ES. • Chapter should also include methods to mitigate for ecological damage, compensate for loss and maximise the ecological opportunities both on and off site.
Environment Agency (EA)	• Site assessment should include an assessment of the past land use for each turbine, consideration of the relationship between turbine location and water catchment and likely depth of excavation and construction in addition to the area of impermeable footprint associated with the turbine. • The Water Features Survey should include identification of all water features, both surface and groundwater within 300 m radius of site and their usage, an indication of the flow regime of springs or surface water features drawn on map and assessment of the likely impacts from the development on both quantity and quality of surface water. • Risk Assessments and Method Statements must be included detailing design and construction methods of proposed tracks and turbines as well as pollution prevention measures to be put in place. • ES should include surface water drainage arrangements, details of how groundwater will be dealt with, plans showing proposed grid route, location of site compound etc. • Strong recommendation that surveys for otters, water voles, reptiles, amphibians, mammals and birds be included. • EIA needs to consider the use of water at the site during construction and as to whether waste material will be imported for use at the site.

Table 3.2: Summary of responses from other consultations

ADDRESSEE	CONSULTATION RESPONSE
AVIATION	
Ministry of Defence (MOD)	No concerns with the proposal.
National Air Traffic Services (NATS)	Response handled by NATS En-Route Ltd (NERL) safeguarding team who stated they had no safeguarding objection to the proposal.
Cardiff International Airport	Cardiff Airport and NATS have no safeguarding objections to the above wind farm application with respect to services at Cardiff Airport.
British Gliding Association	Proposal unlikely to have any adverse effect on the safety of gliding operations at Rhigos and therefore, do not object.
ARCHAEOLOGY	
Glamorgan-Gwent Archaeological Trust Ltd (archaeological advisors to NPT and RCT councils)	Records indicate that land in the vicinity and including Mynydd Blaenrhondda and Mynydd Ystradffernol are included in the Register of Historic Landscapes of Special Historic Interest as being part of the Rhondda. An aassessment of the Significance of Impacts of Development on Historic Landscape 2 (ASIDOHL2) is to be completed as part of the landscape assessment. General outline of the archaeological assessment and methodology is acceptable. Jan 2009, walkover methodology is appropriate and meets 'best practice'.
Royal Commission on the Ancient and Historic Monuments of Wales	Number of archaeological sites within area of interest and summary can be found on the Coflein database.
Cadw	Fourteen Scheduled Ancient Monuments (SAMs) could potentially be affected. Twelve SAMs nearby but not affected.
EXISTING INFRASTRUCTURE	
Wales and West Utilities	Nothing directly impacting on development.
National Grid Ltd	Based on the information provided and the proximity and sensitivity of these networks to the proposal, a set back from the gas pipeline of 1.5 times the turbine hub height was requested.
Sustrans	Sustrans are generally in support of the development of renewable energy, however they do not comment on specific proposals. A general response on wind farms was received: wind farms and renewable energy generally does not fall directly within Sustrans' core business or professional focus for expertise. Sustrans' position on wind farms carries the caveat that any intervention which is going to be truly sustainable must also be locally appropriate.
Garden History Society	No response received.
Glyncorrwg Ponds Co-operative	Agreed to work with the developer towards resolving any issues that may arise following determination.
British Horse Society	June 2009, approach to the turbine/PRoW issue is going to stand as an excellent benchmark for other developers to follow.
Local Authority PRoW officers	December 2008 – March 2009. PRoW officers initially requested all turbines to be tip height distance from these routes (145 m). This was not always possible, and in three instances where 145 m was unachievable, PROW officers requested alternative permissive routes to be proposed as mitigation.
Dŵr Cymru	Digital dataset received. No infrastructure within site boundary.
TELECOMMUNICATIONS	
O_2	No issues with anything they have in the area.
National Grid Wireless	The proposed area is close to the Croeserw transmitting station and Re-Broadcast links to and from this site could be affected depending on turbine locations. Area of the proposed wind farm is responsibility of Arqiva and Nuon UK Ltd were advised to contact them. They were also strongly recommended to contact Ofcom.

ADDRESSEE	CONSULTATION RESPONSE
TELECOMMUNICATIONS	
BT	Only one link within development area (Ofcom Reference: 504927). BT requires a 100 m clearance from the blade tip to the link path. However, wind farm should not cause interference to BTs current and presently planned radio networks.
Arqiva	Development may affect UHF Re-Broadcast that feeds between our main station at Presely (SN 172 306) and a relay at Croeserw (SS 858 952). Recommend contacting Ofcom.
CSS Spectrum Management Services Ltd	No objection to the proposed wind farm.
BBC Wind Farm Tool	Likely to affect zero homes for whom there is no alternative off-air service. In addition, may affect up to seventeen homes for which there may be an alternative off-air service.
Ofcom	Eighty-three Fixed Link end(s) or Paths go through the area (radius of 10 km from centre point).
Joint Radio Company	Do not foresee any potential problems based on known interference scenarios.
Orange	Nine microwave links within the radius specified and details provided. However, there are no Orange microwave links affected by this application.
Vodafone Group Services Ltd	Unlikely to be any adverse impacts on the existing or proposed network at this time.
T Mobile UK	Proposed development will not affect any T-Mobile microwave links or radio sites.
Channel 5	Arqiva will consult on behalf of Channel 5.
Cable and Wireless	No objection. There are no Cable and Wireless operations in the vicinity of the area.
MLL Telecom	One link in the area although the proposal will not have a significant impact.
Networks By Wireless Ltd	One link identified in the area regulated by Ofcom.
Airwave solutions	Awaiting formal response.
Hutchison 3G UK Ltd	Proposed development will not affect any 3G UK microwave links or radio sites.
South Wales Police	No response received. Link identified from Pager Power database.
ECOLOGICAL	
The Wildlife Trust of South & West Wales	No response received.
Brecknock Wildlife Trust	No response received.

ADDRESSEE	CONSULTATION RESPONSE
NOISE	
NPT Environmental Health Officer	August 2008, consultation meeting took place to agree approximate areas for assessment. October 2008, no adverse comments with regards to suggested monitoring locations. January 2009, would prefer the lower ETSU-R-97 limit to be achieved, but would consider the appropriateness of applying a higher limit.
RCT Environmental Health Officer	August 2008, Consultation meeting took place to agree approximate areas for assessment. November 2008, confirmation of acceptance of locations used for noise monitoring assessment and that ETSU-R-97 guidance should be followed for assessment purposes.
MINING	
Local Authority Mining Officers	May 2009, no site-specific issues or concerns were identified with respect to geology, mining and mineral resources. The county borough council will rely on guidance from the Coal Authority in respect of matters concerning ground stability from past, present or future coal mining operations, and in particular, the current joint County Borough Council and Coal Authority Pilot Study Project regarding proposed developments and abandoned coal mine entries.
Coal Authority	June 2009, confirmation of mining operations in the area, fully described in Table 10.2 (Section 10 of this ES).

Public Consultation

3.3.4 From the outset, Nuon took the decision to commit to a thorough public engagement process in line with general best practice principles.

3.3.5 Nuon chose to operate within the guidelines for engagement described in the 'Protocol for Public Engagement with Proposed Wind Energy Developments in Wales'[1], which requires that the public have;

- access to information;
- the opportunity to contribute ideas;
- the opportunity to take an active part in developing proposals and options;
- the opportunity to be consulted and make representations on formal proposals and policies; and
- the opportunity to receive feedback and be informed about progress and outcomes.

3.3.6 Adhering to these principles necessitates a robust but flexible and reactive engagement process, as well as supporting communications and public relations work. As a matter of principle, Nuon appointed independent consultants to design and to co-deliver the engagement programme, working with their own team and the communications consultancy.

The programme was developed to combine;

- opportunities for any member of the public to engage at a general level;
- opportunities for stakeholders to engage at a more detailed level;
- a formally structured and targeted consultation;
- more than one opportunity to engage;
- active attempts to outreach to key, potentially 'hard to reach' groups;
- a regular, transparent two-way flow of project information throughout; and
- production of a final, full report and 'audit trail'.

3.3.7 Early meetings were convened with the two relevant authorities, NPT and RCT, and informal contact was established with a number of local groups and organisations. The first truly public activity was the production and distribution of a newsletter (see Appendix 3.1.6 in Volume 4A). This was sent to more than 30,000 households in an area agreed as part of the consultation process with the local authorities. This area was broadly defined by a 3 km inclusion zone (drawn 3 km from the turbines positions in Layout 4, the then current iteration of the wind farm design), which was extended to include entire communities where the inclusion line dissected a community or settlement (see Appendix 3.1.4). Other communities beyond this 3 km zone were also included (e.g. Cilfrew and Penderyn) where it was felt that this was appropriate, based on discussions with relevant stakeholders and the planning authorities. Many others, identified by the engagement team as being stakeholders (those that feel they have an interest in the project), also received this newsletter and subsequent communications.

3.3.8 As well as providing general information about Nuon and the proposed project, the newsletter, local media (see Appendix 3.1.7 for press release) and the project website[2] promoted the first round of 'drop-in' events. These were held in late January 2009 in eight locations around the area and were fully staffed, each lasting most of a day and evening. Due to a third party delay in delivering the newsletters around Hirwaun, a second event was held to give those who missed the first the opportunity a chance to attend the second. At this early stage in project, with significant modifications to the design still ongoing, the main focus was on communicating general issues and ideas. The then current, provisional plans and visualisations were also on display to illustrate the scope and scale of the project. The newsletter, website and all drop-in events, as well as any follow-up contact were all fully bilingual, ensuring every opportunity for participants to communicate in the language of their choice.

3.3.9 Over 600 people visited the first round of drop-in events, spending over an hour (on average) and contributing a large number of issues and ideas as well as questions and comments. The results showed a high level of concern about the scale of the project and its impacts, as well as some objections in principle to any wind power schemes. However, the results also showed support for Nuon's intentions in relation to ecology, transport, employment and community benefits. All who signed in at the sessions were sent a summary report of the consultation, with the full report being sent to key people, and both reports being made available on the website[3] (and shown in Appendix 3.1.9 to 3.1.10).

3.3.10 Shortly after the drop-in events, two stakeholder workshops were held (see Appendix 3.1.11 to 3.1.12). At these workshops, local people (e.g. from community councils) discussed the proposals and the emerging results and began to offer some outline principles for what the community benefits package might be used for and how it should be managed. Reports were sent to all attendees.

[1] Protocol for Public Engagement with Proposed Wind Energy Developments in Wales. A report for the Renewables Advisory Board and Department of Trade and Industry (DTI) (2007). Available online from: http://www.berr.gov.uk/files/file38706.pdf (last accessed 02/10/09).

[2] Available online from: http://www.penycymoeddwindfarm.info (last accessed 02/10/09).

[3] Available online from: http://www.penycymoeddwindfarm.info/welcome/information_pack.html (last accessed 02/10/09).

3.3.11 A second newsletter was circulated in February/March 2009 (see Appendix 3.1.14). It contained;

(a) more project information;

(b) a report on the first events; and

(c) notification of the next round of drop-in events.

3.3.12 The second round of drop-ins presented design Layout 6(i) (Figure 3.3 in Volume 2) and included nine events, in late March and early April 2009 (see Appendix 3.1.16 for issues sheets that were displayed at the events and Appendix 3.1.18 for the handout). In response to feedback from the first round, some of the drop-ins were at different locations and times to those in Round 1. This time the emphasis switched to the revised wind farm design. The wind turbine layout was illustrated using several forms of visualisation. There were also sheets on display, clarifying key points and elaborating what developments had happened since Round 1. People attending were able to respond with a simple questionnaire (see Appendix 3.1.17). Approximately 450 people attended these events, of which about one third had previously attended Round 1. The results shown in Appendix 3.2 indicate that, in most cases, people had noticed and were appreciative of the way the applicant had responded to their issues and questions, although concerns (some lessened, some still fundamental) remained for many. By this stage, the primary concern was the visual impact (other issues had become less important, in part because concerns had been addressed). This was particularly the case for those in Glyncorrwg, where people would see turbines on the horizon from many or wide aspects and where a well-planned campaign of objection to a closer wind power scheme had been underway for some time. See Appendix 3.1.19 to 3.1.20 for full report and summary report for the second round of drop-in events.

3.3.13 Shortly after the second round of drop-in events, a sample survey of just over 500 people was undertaken by BMG Ltd through door-to-door interviews. The sample was selected to represent the variation within the population local to the project, in terms of demographics, socio-economic living conditions and proximity to/impact from the proposed project. The methodology used for this survey is shown in Appendix 3.3. The sample also specifically tried to include a significant proportion who had not attended the drop-in events. Those questioned were briefed on the scope of the project and shown a map of the proposed development. The results were noticeably different to those from the drop-in events, showing a fairly high level of support for wind farms in general (Figure 3.4 opposite). In addition, 83% of the sample population support in principle the development of renewable energy facilities in this part of Wales. The sample population were also asked to rate the importance of issues that surround wind farm developments (Figure 3.5 opposite) and rate their level of concern over some of the key potential impacts from Pen y Cymoedd. (Figure 3.6 below).

Figure 3.4: Opinions of wind farm developments as a whole

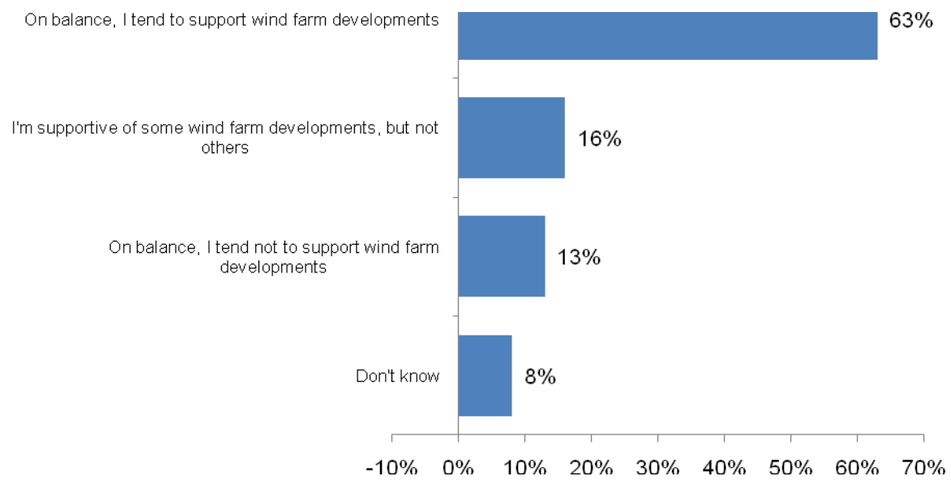


Figure 3.5: Ranking of issues relating to wind turbine development

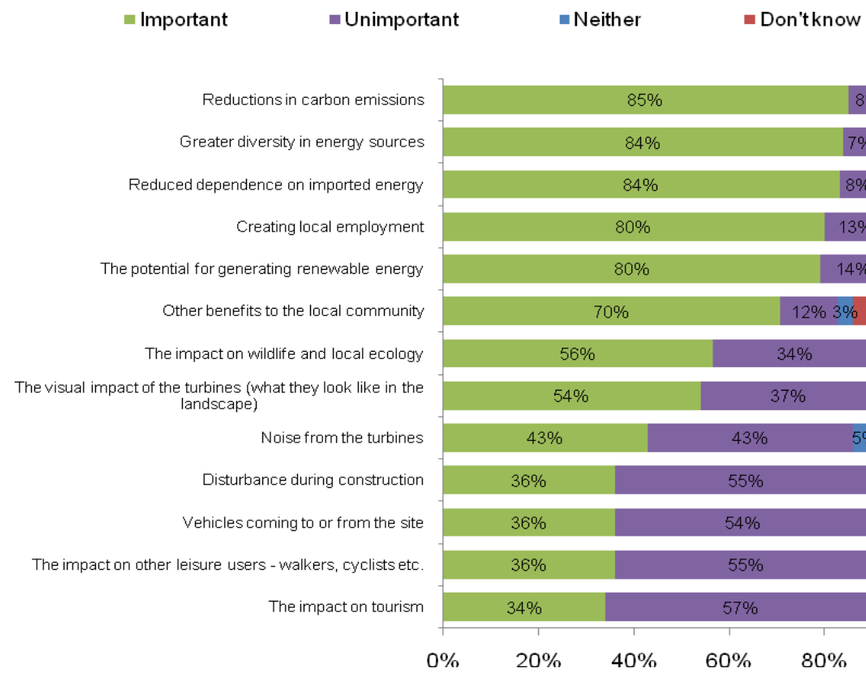
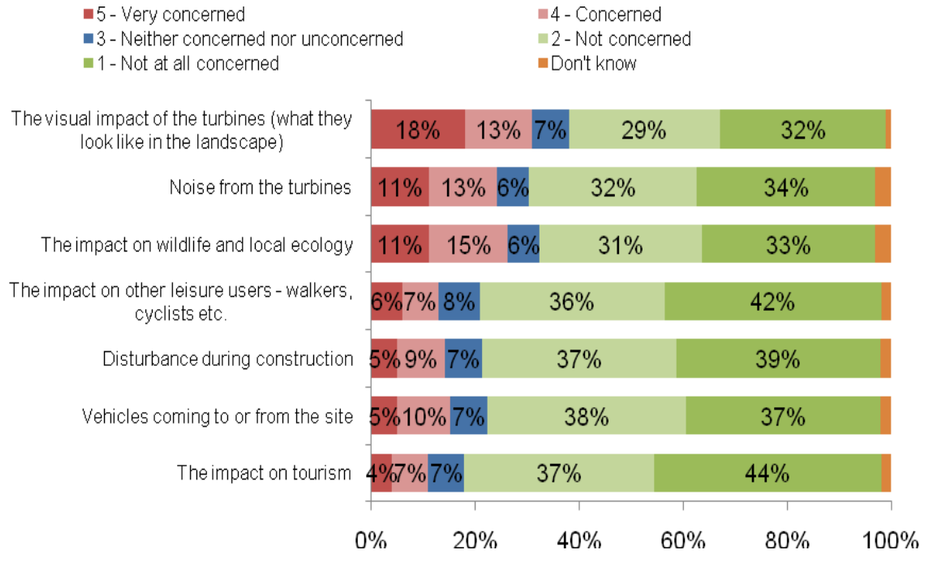


Figure 3.6: Public concern regarding Pen y Cymoedd



3.3.14 Following this second phase of events, a third newsletter was circulated and a further stakeholder workshop convened before submission of the planning application. These focused mainly on the final plans and also the community benefit package.

3.3.15 Throughout the development of the wind farm design, a number of changes were made to the layout as a direct result of community input. These are described in more detail in the subsection on site design (Paragraphs 3.4.45 to 3.4.56), but largely related to landscape and visual issues, such as removing turbines that communities felt were too close or overbearing, and reducing impacts on locally important amenity sites such as Penpych woodland park.

3.3.16 For some participants at the drop-in events, and others who engaged directly and indirectly (e.g. via the local media) with the applicant, the fundamental question underlying all their concerns seemed to be the fact that the engagement was primarily about how the development might best happen, not *whether* it should happen. The topic of 'whether' schemes should come forward within the SSAs had largely been addressed in the earlier, government-led planning stages.

3.3.17 For those with fundamental objections, none of the changes made throughout the engagement process and ongoing project refinement would be satisfactory. For the majority of participants willing to move beyond the 'whether to' issues, and to engage with the project and Nuon's aims to make the project as good as it possibly could be, the number, type and degree of changes made in response to consultation results was acknowledged as considerable. The full report outlining the attendances and analysis of comments made is available in Appendix 3.2.

3.4 DETAILED DESIGN OF PEN Y CYMOEDD WIND FARM

3.4.1 Following completion of the agreement between Nuon and the Welsh Assembly Government at the end of March 2008, the evolution of the site design and layout (which had begun during the FCW tender process) continued throughout the EIA process. Underlining all stages of the design process has been Nuon's wish to promote a deliverable scheme that strikes an acceptable balance between harnessing the available clean renewable energy resource within SSA F and any resulting impacts.

3.4.2 The preliminary wind farm design produced as part of the FCW tender process was largely based on industry standard layout criteria (in terms of turbine size, spacing, and other technical constraints etc). However, as the project progressed and more information was gathered (both from on site measurement and from the consultation process), the design was refined, particularly with the benefit of emerging industry experience of locating turbines within plantation forestry (both from other developers, and from direct company experience within the Nuon group), leading to a more sophisticated but potentially more efficient design.

3.4.3 The wind farm layout has gone through numerous design iterations. As part of that ongoing process, and in order to keep these in focus, a series of formal design reviews were held at key stages, with the then current design crystallised at the end of each review stage and circulated for internal comment, for presentation to FCW and other consultees, as well as for discussion with community groups as part of the public consultation process. Regular monthly meetings were also held with the FCW National Forest Estate Wind Farm Programme team, to keep them appraised of developments in the design process.

3.4.4 Figure 3.3 in Volume 2 shows key stages in the site design evolution, subsequent to Nuon being awarded the FCW tender, and illustrates the iterative process that has resulted in the final proposed scheme of 84 turbines. This final layout has emerged from a process, during which technical requirements, and environmental and visual considerations have been identified and addressed through site survey, consultation with the relevant parties including the public, and consultant contribution. For the reasons given below, this has resulted in the proposed maximum turbine tip height of 145 m based on a hub height of around 100 m, higher than the turbines used in the tender process. The design of the grid connection has evolved separately, and is dealt within Section 16 of this ES.

3.4.5 Through each of the design iterations considered for Pen y Cymoedd, key technical and environmental constraints, and design criteria have been applied: they are described in more detail below, with the way that they have been reflected in the various design iterations being discussed in subsequent paragraphs.

Forestry

3.4.6 From the outset, and in accordance with the advice in TAN 8, and the National Forest Estate Wind Farm contract signed with the First Minister, Nuon has sought to minimise the loss of forestry resulting from the development of the wind farm. Where practicable, turbines have been located in areas that have been, or will be, clear felled as part of the planned management of the forest, but this has not been possible for a significant number of turbines. As forestry can significantly affect the wind resource, it is usual to either fell significant areas of trees prior to wind farm development, or to install turbines in small 'key-hole' felled areas, and to ensure that they are a sufficient height above the forest canopy to enable their effective operation.

3.4.7 As part of the FCW tender process, and in order to minimise the amount of felling, Nuon would work with FCW to design felling to wind firm edges. However, after an exhaustive consultation process with FCW a modified approach has been agreed which equally gives due consideration to the need of minimising the risk of windthrow damage to the remaining crops. The resultant approach is explained in more detail in Section 12, along with the agreed rationale outlined in Appendix 12.1, Volume 4B.

Wind Resource

3.4.8 Throughout the site selection and tendering process, the area was known to have a good wind resource and to be technically suitable for the development of a wind farm, with mean annual wind speeds in excess of 8.0m/s (as predicted by the Energy Technology Support Unit's 'NOABL' wind resource model[4]).

3.4.9 However, a combination of the steep slopes surrounding Pen y Cymoedd, and the mature forestry both within and in close proximity to the site are expected to affect the wind resource experienced across the site. This may result in effects, such as elevated levels of turbulence and wind shear. In order to determine the magnitude of these effects, a Ventos® Computational Fluid Dynamic (CFD) analysis of the wind quality was commissioned. Digital terrain data sourced from the Ordnance Survey was used, together with detailed forestry maps accounting the tree heights, porosity and location of any felled areas, based on coupe information provided by FCW.

3.4.10 The results of this analysis, which were correlated against data measured from on site anemometry masts, confirmed the need to ensure that the turbine rotor is sufficiently elevated above the surrounding forest canopy. This is required to enable the effective operation of the wind turbines. The results indicate that an appropriate turbine hub height of around 100 m Above Ground Level (AGL) suitably reduces the predicted turbulence levels to those within the design parameters given by the International Standard for the Design Requirements for Wind Turbines[5]. This approach has been corroborated by recently emergent industry experience of operating turbines within forests (including some within the Nuon group).

Other Technical Constraints

3.4.11 Decisions on turbine size and number also require consideration of various technical constraints, such as the separation distance between turbines needed to limit turbulence effects, and the capacity of existing access routes and the local grid network. On-site factors such as topography, ground conditions, existing infrastructure, ecological sensitivities, public rights of ways and archaeological features all affect the size and location of the turbines. These factors are all considered in detail in the context of each of the design iterations described in Paragraph 3.4.25 onwards.

Key Landscape Design Criteria

3.4.12 A key aim of the design process was to avoid overly complex and visually confusing layouts, and to seek to achieve simplicity and consistency within the proposed wind farm design, whilst reducing its overall impact when viewed from local settlements and from the national park. The ongoing input into the design iterations by the landscape consultant ensured that residual visual impacts were reduced, that the coherence and simplicity of the layout were maximised, and that the overall visual structure of the development from surrounding communities and the Brecon Beacons National Park was improved. In addition, the relationship between the proposed Pen y Cymoedd Wind Farm, the operational Ffynnon Oer Wind Farm and the consented Maerdy Wind Farm was an important factor taken account of at all stages in the design of the scheme to avoid significant adverse cumulative impacts.

3.4.13 A review was undertaken of design guidance documents including the Neath Port Talbot Interim Planning Guidance - Wind Turbine Development (IPG), the TAN 8 Annex D study of Strategic Search Areas E and F: South Wales Valleys and other standard texts on wind farm development produced by Scottish Natural Heritage (SNH).

3.4.14 The results of the appraisal identified the following aims as being of importance:

- A three-bladed turbine on a tapered tower is considered the most acceptable design.
- Turbines should be off-white or light grey in colour.
- Turbines should be of a similar appearance and size.
- Large-scale wind farms should be sited on large-scale landforms.

[4] Available online from: http://www.berr.gov.uk/energy/sources/renewables/explained/wind/windspeed-database/page27326.html (last accessed 02/10/09).

[5] IEC 61400 1 Wind Turbine Safety and Design.

- Ridgelines and complex landscapes should be avoided.
- Turbines should be a minimum of 500 m from dwellings.
- Turbines should be set back from skylines, valley sides and hill fringes.
- Turbines should reflect the scale of the landscape.
- The strong glacial landform and drainage pattern landform should be respected.
- The interaction of turbines with the extensive coniferous plantation needs consideration.
- Turbines should avoid dominating adjacent settlements particularly to the south.

3.4.15 Paragraphs 6.5.39 onwards consider in detail how these criteria were applied to the various design stages of the Pen y Cymoedd Wind Farm proposal.

3.4.16 Regard was also given to the 2007 Development Control Report prepared by Arup for RCT ('RCT Onshore Windfarms, Development Control Support, July 2007') which considered the landscape and visual issues relating to a number of applications that the Council was, at that time, considering. Whilst this report has no planning status and was considering wind farms significantly smaller than the Pen y Cymoedd proposal, certain of the relevant criteria applied in that report were been considered in the design process carried out for this scheme. Those criteria that, if rigidly followed, would have the effect of sterilising large areas of SSA F and preventing development were not considered appropriate within the context of the Pen y Cymoedd proposal.

3.4.17 In terms of landscape criteria, in order to minimise effects upon sensitive local landscape character and avoid distortion of the sense of scale, turbines were, as far as possible without sterilising large areas of the SSA, set back from the edge of the plateau. This has also had the effect of reducing the turbines' visual height to present a balanced relationship with the landform in which they are placed.

3.4.18 In addition, turbines have, as far as possible without sterilising large areas of the SSA, been set back from the break of slope in order to minimise breaking skylines and over dominant effects on the skyline when viewed from sensitive landscapes and viewpoints. The break of slope from surrounding settlements was identified using Land Survey Systems and without unduly compromising the potential for this part of the SSA.

3.4.19 With regard to visual criteria, the design approach was to limit the field of view occupied by the turbines and their proximity from settlements and dwellings to ensure the turbines would not be dominant or overwhelming and would not surround residential areas, and to ensure the field of view and proximity of turbines was minimised at viewpoints heavily used by recreational users.

3.4.20 To illustrate this process, wire line landscape visualisations from selected viewpoints are presented in Volume 2 (following Figure 3.7, which identifies the selected view point locations), and these clearly demonstrate how some of the changes to the turbine layout have minimised the visual impacts when viewed from the national park and nearby settlements, by decreasing the number of turbines and hubs visible. Presenting example views of the changing design from layout 5 to the final layout (7), these highlight the significant changes that have reduced the potential impacts of the proposed wind farm:

- **Viewpoint 1: Rhigos** - Moving the front row of turbines southwards away from the break of slope, increasing their distance from Rhigos, and halving the number of hubs visible.
- **Viewpoint 5: Cwmdare** - The removal of the 4 closest turbines above the Dare Valley Country Park, improving the visual structure of the remaining turbines visible above The Darren.
- **Viewpoint 18: Croeserw** – Removal of one turbine in the group closest to the operational Ffynnon Oer, reducing the visual overlap of turbines.
- **Viewpoint 20: Glyncorrwg** – Removal of turbines and relocating others away from the break in slope, reducing the number of visible turbines from the settlement by 4.
- **Viewpoint 23: Cynonville** – Removal of two turbines, halving the number of turbine hubs visible.
- **Viewpoint 24: Tonmawr** – Removal of turbines and moving others away from the break of slope, reducing the number of turbine hubs visible from 7 to 3, and preventing any tips from being visible when viewed from the centre of the settlement.
- **Viewpoints 40 and 48: Ystradfellte Fort and Penderyn** – Removal of turbines in the eastern and western extents of the site, reducing the subtended angle of view of the wind farm and its visibility from the Brecon Beacons National Park.
- **Viewpoints 65 and 67: Ergyd Isaf and Mountain Centre** - Removal of turbines in the central and western areas of the site, reducing the subtended angle of the wind farm visible from elevated views to the south-west.
- **Viewpoint 73: A465 SW of the former Baverstock Hotel** – Removal of turbines in the eastern part of the site, reducing the subtended angle of the wind farm visible from this point. Also relocation of turbines in the central and eastern area away from the edge of the escarpment, improving the visual structure and reduced the number of turbine hubs visible.

- **Viewpoint 76: M4 West of Neath** – Removal of 3 turbines from the western extent, and relocation of turbines away from the break of slope, reducing the number of hubs and tips visible, and improving the visual structure of the wind farm from this point.

Influence of the Policy Context

3.4.21 In relation to the full range of impacts, the design philosophy was mindful of the advice in the Ministerial Interim Planning Policy Statement on Planning for Renewable Energy (MIPPS) and TAN 8 that the environmental impact of schemes in an SSA must still be avoided or minimised where possible. In relation to landscape impacts the design approach was also mindful that TAN 8 expressly acknowledges that placing large wind farms in SSAs will cause landscape change, that this is acceptable and that the implicit objective within (and immediately adjacent) to SSAs is *'to accept landscape change i.e. a significant change in landscape character from wind turbine development'* (Paragraph 8.4, Annex D). The design was also developed in the knowledge that RCT and NPT were following the advice in TAN 8 to guide large wind farms to the areas within the SSAs they considered the most suitable. To date this has taken the form of the commissioning of a report from Arup which recommended a refined SSA boundary, which boundary has been included in Interim Planning Guidance in NPT, and which is included in the evidence base for the RCT deposit draft Local Development Plan.

3.4.22 The iterative design process was brought to a conclusion, and the final design fixed, when it was considered that an acceptable balance had been struck in the context of the policies in MIPPS and TAN 8 applied to the particular features of SSA F (including the proximity to the National Park and settlements), and the various other considerations identified in this Section. This produced a design with all the turbines in the final layout within the SSA and also within the proposed refined SSA area recommended in the Arup report.

The Evolution of Pen y Cymoedd Site Design

3.4.23 The following paragraphs explain in detail the evolution of the Pen y Cymoedd Wind Farm, from the tendered layout of 112 turbines, to the final layout of 84 turbines, a process which is illustrated graphically in Figure 3.3 in Volume 2. The design process was driven by Nuon's aim of developing a scheme that achieves an acceptable balance between impacts and energy generation. As a result, and applying the criteria discussed above, the landscape and visual impacts (principally on the national park, dwellings and settlements) have been considered for each layout and, as with other technical constraints, changes have been made to the proposal to minimise those impacts.

3.4.24 **Pre-scoping – Tendered layout, Layout 4, 112 Turbines.** A map was issued as part of the initial consultation and scoping process which showed an area of interest, which was based on the tendered layout, but which also included a wider area to encompass any potential variations in the design. The accompanying report outlined the details of the project (including number, height, and anticipated capacity of the turbines), together with the surveys that it was proposed to include to inform the ES.

3.4.25 **First Iteration of Site Design – Production of Layout 5, 113 Turbines.** In September 2008, the site design underwent a first iteration based on the results then available from the scoping responses and the initial findings of the various site surveys. Information from all pre-scoping consultation responses and from on-site survey work, including ornithological and protected species studies, that had been received by that date were reviewed and fed into the design process, resulting in Layout 5, as shown in Figure 3.3 (Volume 2).

3.4.26 As the habitat within the forest constantly changes with ongoing forestry operations, initial constraints identified by the ecology specialists were not that extensive. One known honey buzzard nest site was identified within the development area, and in consultation with RSPB and CCW, was given a setback of 600 m. The potential impacts on the honey buzzard population are discussed in more detail in Section 8.

3.4.27 Nightjars were another bird noted in the scoping response from RSPB. This migratory bird arrives in late spring and nests in recently felled areas, generally where replanting is between 2 and 12 years old. As nightjar are not faithful to specific nesting sites, and the habitat changes that occur with ongoing forestry operations throughout the wider forest will open up more habitat which the population will follow in rotation, specific nightjar nesting locations were not considered as constraints, although appropriate habitat management is still proposed, as discussed in Section 8.

3.4.28 Watercourses and ponds identified both from the desk study, and in the initial on-site surveys, were given a 35 m buffer to proposed turbine locations.

3.4.29 Desk studies using sources such as British Geological Survey data, Cranfield University Soil Maps and aerial photography (Ordnance Survey 25 cm resolution aerial photographs taken in June 2006) were used to identify areas of peat, and from this a conceptual model of the extent of peat deposits was made, to inform both the design process, and further survey work.

3.4.30 A mining and geological desk study was undertaken, as described in Section 10, and where possible, areas of historic shallow mining, and potential coal and stone reserves were avoided.

3.4.31 As part of the noise assessment, existing residential dwellings were identified and appropriate turbine set back distances maintained, in order to comply with the Energy Technology Support Unit Report ETSU-R-97, which is the approved noise assessment method (as stated in TAN 8). A detailed noise monitoring and assessment programme was also commenced, as discussed in Section 11, to enable any noise impacts to be accurately quantified. Consideration of potential noise impacts continued throughout the design process, which led to a number of turbines being moved further away from some dwellings that were perceived to be potentially noise sensitive. In addition, a number of the changes to the layout that

have reduced the visual impact of the proposal on nearby dwellings and settlements have also minimised the potential impact from noise. The overall input of the noise assessment into the design process ensures that the 84 turbine proposal will meet the noise emission levels recommended in ETSU-R-97.

3.4.32 Consultation responses identified several communication links that passed through the site. For the purposes of the first design iteration, a 200 m setback was applied to these links and a specialist survey was commissioned to inform the second design review, with a view to reducing this setback. The full documentation of the communication and aviation impact assessment is described in Section 15.

3.4.33 Consultation with Wales and West Utilities identified a high-pressure gas main running through the central and western areas of the site. The pipeline is managed by National Grid Ltd, who was consulted and advised that a setback of 1.5 times turbine hub height should be maintained between the pipeline and any turbines. As there was some doubt as to the exact location of the pipeline, a provisional set back of 180 m was applied, and an independent survey of the exact location of the pipeline was commissioned to inform the next design iteration.

3.4.34 Consultation with the Rights of Way Officers and NPT and RCT county borough councils initially suggested that turbines should be set back from PRoWs by at least the turbine tip height (i.e. 145 m). Scoping responses from CCW requested that any development be at least 4 times tip height (i.e. 580 m) from any PRoW. However, given that the site as a whole is open access land for walkers (under the Countryside Rights of Way Act 2000), and given that maintaining this setback would effectively mean that almost no turbine locations could be located within the core of the refined SSA, the setback proposed by CCW was deemed to be unachievable. Where possible, the design process maintained a setback of 150 m from bridleways and the two national trails, and a 50 m setback from other PRoWs and permissive mountain bike trails, as well as from all existing FCW tracks.

3.4.35 Scheduled Ancient Monuments and unscheduled historical features were identified following consultation with Cadw and The Royal Commission on Ancient and Historical Monuments Wales. Initially a 20 m setback was advised as appropriate by Glamorgan Gwent Archaeological Trust, and this was applied to all identified historical features, although each such feature potentially impacted by the development would subsequently be assessed in more detail.

3.4.36 The ongoing consideration of visual and landscape impacts also led to various design changes, including some turbines being moved back from the break of slope lines, thereby reducing impacts on key settlements and from the national park.

3.4.37 **Second Iteration of Site design – Production of Layout 6(i), 106 Turbines.** A considerable amount of the key site-specific survey work was carried out during the late autumn and early winter months of 2008, providing constraints information that was additional to that considered in the first iteration.

3.4.38 Technical studies confirmed that the 6 x 4 diameter turbine spacing applied in previous design iterations was acceptable, but advised that the orientation of the long axis in the elliptical spacing should be changed from 225º to 255º, to better reflect the predominant wind direction, established by analysis of on-site measured wind data. This led to a major reshuffle of turbine locations, which helped the overall visual appearance by 'breaking-up' up the rows of turbines apparent in earlier design iterations. A complete summary of the technical input that has informed an appropriate range of turbine sizes and the various design iterations to produce the final layout is discussed in Paragraphs 3.4.49 to 3.4.56.

3.4.39 Assessment of the visual impacts of the proposed wind farm resulted in the removal of five turbines, including the string of four turbines in the extreme south-east of the eastern area, and in minor relocation of other turbines.

3.4.40 The 600 m setback applied to the honey buzzard nest was extended to encompass an exclusion area following survey results which identified flight lines from the nest into the Vale of Neath. This, combined with compliance with the refined SSA boundary adopted in Neath Port Talbot's Supplementary Planning Guidance (Subsection 5.8), resulted in a redesign of the northern part of the western area and the subsequent removal of three turbines.

3.4.41 A report was received detailing the impact of Layout 5 on the eleven known closest communication links to the option area, including two known microwave paths crossing the site boundary. For further clarification, 3D communication link analysis reports were also commissioned for the two potentially impacted links, which concluded that the movement of one turbine in the western area would be sufficient to significantly reduce any potential impact.

3.4.42 The independent survey of the gas pipeline identified the accurate location of the high-pressure gas pipeline, and the set back was now reduced to 150 m, in accordance with National Grid Ltd advice.

3.4.43 Initial peat probing was carried out to verify the available map data, and to assist in designing track and turbine positions, as well as to inform a peat slide risk assessment (Appendix 4.3 in Volume 4A). The initial phase was completed in November 2008, with a qualitative peat slide risk assessment being prepared by specialist consultants in December 2008. During this stage of design, ecology field work was progressed to classify the various peat habitats, using vegetation and measured peat depth data. A more detailed survey was then commissioned following consultation with the local authority ecologists and with CCW. The results and conclusions were incorporated in the final design iteration, and are discussed in Appendix 4.2.

3.4.44 The archaeological desk study identified scheduled and unscheduled monuments in the study area, and advised on which features the design team should class as significant. The 20 m setback applied in the first iteration was maintained in these instances.

3.4.45 **Third Iteration of Site Design – Production of Layout 6(ii), 96 Turbines.** The site-specific survey work was consolidated during the beginning of 2009. In addition, the first round of public consultation events had been held, and comments from attendees to these events were assessed, and where possible, applied to Layout 6(i), resulting in the production of Layout 6(ii), as shown in Figure 3.3 (Volume 2). Overall, the number of turbines was reduced from 106 down to 96, with the removal of some of the remaining visually prominent turbines reflecting the findings of the public consultation.

3.4.46 Six turbines were removed from the western area due to further consideration of honey buzzard flight lines, and to improve the visual balance of the layout by excluding isolated individual turbines. This reduced the visual impact on the communities to the west and south of this area, especially Tonmawr, Duffryn, Rhondda and Cynonville. The effects of these changes are shown in the wire line visualisations for Viewpoints 23 and 24 in Figure 3.7. The visualisation for Viewpoint 23 shows how the removal of two turbines has halved the number of turbine hubs visible from Cynonville, whilst that for Viewpoint 24 shows how the removal of turbines, and the location of others away from the break of slope, has reduced the number of turbines hubs and blade tips visible when viewed from the settlement of Tonmawr.

3.4.47 In the central area, two prominent turbines were relocated away from the northern edge of the plateau to improve views from the valleys to the north. These turbines, along with another from the group north of Maerdy were relocated into the south-west of the central area since the results from the on-site survey work indicated it was suitable for wind turbines. A large number of the turbines within the central area were also relocated to improve the visual structure and minimise the prominence of single or small groups of turbines upon the landscape. Partly in response to public consultation, this included the relocation of turbines along the eastern edge of the central area to improve views from the valley to the east, and to reduce the visual impact upon Penpych.

3.4.48 In the eastern area, two turbines were relocated as they were considered too close to the eastern escarpment above the Rhondda Fawr. A further five turbines were moved further away from this edge to improve views from the valley to the west. Another relocation of turbines away from the northern edge was implemented in order to reduce the visual impact from the north, and protect the views from the Dare Valley Country Park and the glacial cwms in this area. In total, this resulted in the removal of three turbines from the main eastern area, and one turbine in the group above Maerdy. The effect of these changes is shown in the wire line visualisation for Viewpoint 5 (Figure 3.7).

3.4.49 **Final Iteration of Site Design - Production of Layout 7, 84 Turbines.** The final iteration of site design (Layout 7, as shown in Figure 3.3 in Volume 2) combined the remaining site-specific survey work, with further input from the second round of public consultation events, and further landscape and visual assessment. This refinement further reduced the magnitude of the impact from the development upon the site and local communities, especially from communities in the Rhondda Fach and Cynon Valleys, and around Glyncorrwg. The number of turbines was reduced from 96 down to 84, and the effects of this change are shown in the wire line visualisation for Viewpoint 20 (see Figure 3.7), which demonstrates how removing these turbines and locating others away from the break in slope has reduced the number of visible turbines from Glyncorrwg.

3.4.50 The ongoing peat survey work had by this point generated sufficient data to develop a detailed peat investigation design, intended to fully satisfy the requirements of both the ecological studies and a peat slide risk assessment. A comprehensive working methodology for the collection and analysis of further peat data was produced by the team of ecologists, hydrologists and geotechnical engineers. This dictated the spatial distribution of further peat probes, and data recording and habitat appraisal methodologies.

3.4.51 The detailed survey was completed in April 2009, and was followed by data interrogation and gap analysis. Representative data was recovered from all turbine areas and tracks, as well as specific areas of habitat interest. Pre-planting aerial photographs were also used to inform the process. Due to the dense forestry in parts of the site, some peat probes could not be undertaken exactly on the proposed turbine centre point, but numerous probes at each location are considered representative of the wider peat distribution within the area covered by the micrositing tolerance.

3.4.52 Following this detailed work, substantial layout changes designed to reduce impacts on peat were implemented, including the removal of all six proposed turbines from Castell Nos Bog, and it was also a key consideration in the removal of six turbines from areas to the west of Glyncorrwg, where deeper peat was identified. The location of other infrastructure has been adjusted as far as possible to reduce the impacts on areas of peat.

3.4.53 Whilst it was not possible to treat Sites of Importance for Nature Conservation (SINC) as an absolute constraint (virtually all of the 'refined' SSA area within RCT is designated SINC), it was a significant factor in the decision to not include turbines in the far east of the originally proposed areas, thus ensuring that at least two SINC were not impacted at all, which otherwise might have contained a significant number of turbines (as were included in the original tendered layouts).

3.4.54 The removal of the six turbines on the Castell Nos area also significantly reduced the visual impact from communities in the Rhondda Fach and Cynon Valleys, including the Dare Valley Country Park. This also resulted in a reduction in the extent of the view from the Brecon Beacons National Park. The area has been identified for potential ecological enhancement, as discussed in Section 8, the aim being to return it to a habitat similar to that which would have existed prior to afforestation.

3.4.55 The detailed peat probing surveys identified potential opportunities for micro-relocation of some new track sections. However, the fact that much of the site is currently covered by relatively impenetrable forestry means that the full extent of these opportunities will not be known until the felling has been completed. Once the felling has been carried out, detailed topographical surveys will enable a fully detailed design to

be completed, and it is envisaged that minor changes to the infrastructure layout will be permitted by a micrositing condition and detailed in the Construction Method Statement.

3.4.56 Further consideration was given to the central area, specifically to the visual impact of the third iteration upon the community of Glyncorrwg. In order to reduce this impact and the concerns identified by attendees to the consultation event in the village, the six most prominent turbines were removed from the part of the site to the west of the community. This resulted in a significantly reduced impact of views to the west and down the valley, removing the impression that the development surrounds the community. This also resulted in improvements to views from the south, around Croeserw, by removing prominent turbines from view.

3.5 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

Overview of the EIA Process

3.5.1 Essentially, two separate assessments have been carried out in the process of site selection and design of Pen y Cymoedd Wind Farm. The first of these was a very broad assessment of potential wind farm sites within Lot 6, to inform Nuon's tender submission to FCW. Following the confirmation that Nuon had been awarded exclusive development rights, the main EIA process began, running concurrently with the finer site selection and design process. The full EIA methodology was based on a number of guidance documents including, in particular, the Electricity Works (England and Wales) (Environmental Impact Assessment) Regulations 2000 (SI2000/1927).

3.5.2 The process of environmental assessment was as follows:

- **Stage 1: Development Characteristics.** Initial description of broad construction and operational characteristics of the most feasible onshore wind farm in Lot 6 based on Nuon's desk studies and some initial on-site survey work to inform the National Forest Estate Wind Farm Programme's submission.

- **Stage 2: Scoping of EIA.** Initial consultation and scoping process to identify sensitive environmental and human receptors that could potentially be affected by the characteristics identified in Stage 1.

- **Stage 3: Gathering of Existing Data.** Collection and collation of existing literature and data for the general site area.

- **Stage 4: Baseline Surveys.** Identification and consultation on the nature and extent of further baseline studies, to gather data to identify/confirm the technical constraints of the site and attributes of the environment that may be potentially affected by the proposal. Carrying out the agreed surveys.

- **Stage 5: Site Design and Mitigation.** Identification of preferred site layout and initial site design, initial assessment of effects and where necessary, further design iterations and assessment of mitigation measures to avoid, minimise and mitigate against adverse effects arising from the proposal.

- **Stage 6: Determination of Significance of Residual Impacts.** Estimation of the magnitude of any residual effects following inclusion of all mitigation measures into the site design and choice of construction operations and assessment of the 'significance' of these residual effects.

Stage 1: Development Characteristics

3.5.3 The important characteristics of the development, including the construction and operation phases, were defined based on Nuon's experience of existing operational onshore wind farms, with reference to anticipated turbine technology improvements likely to be available by the time of construction.

3.5.4 Important characteristics of the development that were considered for the purposes of the initial scoping stage included:

- turbine size and number;
- turbine layout;
- foundation type and installation requirements;
- specification for vehicles carrying turbine components of the size likely to be considered for the site;
- the route on the public highway to the site;
- on-site track length and construction techniques based on the vehicle specifications, and on standard FCW specifications;
- wind farm cabling design and installation;
- substation and turbine control infrastructure;
- grid connection cabling characteristics, both overhead and underground;

- time scale of construction and decommissioning periods;
- lifetime of the wind farm; and
- decommissioning of the wind farm.

Stage 2: Scoping of the EIA

3.5.5 The nature of environmental and social effects can be divided into a number of different categories. Firstly, there are categories of environmental and human receptors (e.g. breeding birds, migrating birds, ecological habitats, cultural and archaeological sites and artefacts, human settlements, noise sensitive properties, users of landscape amenity) that may be affected. Secondly, there are the various stages and components of the wind farm proposal which may have differing characteristics with relation to the environment (e.g. the construction, operation and decommissioning stages and the turbines, tracks, power cables and substation), as separate components of the proposed development.

3.5.6 Scoping exercises were undertaken to identify the environmental effects that could result from a development with the characteristics defined during Stage 1 of the process, with reference to the environmental receptors specific to the area in the vicinity of the proposal. An essential part of this involved identifying the sensitive environmental receptors of the site and its surroundings.

3.5.7 In defining types of environmental effects, the applicant and their primary consultant, Natural Power, have made use of their long experience in carrying out EIAs for onshore wind farm proposals. In addition, reference was made to guidance documents issued by government agencies and non-governmental organisations. The guidance documents referred for individual elements of the EIA are detailed in the relevant sections within this ES.

3.5.8 A draft scoping report giving the proposed scope of the EIA was drawn up and submitted to the relevant statutory and non-statutory bodies, as described in Paragraph 3.3.2. Responses to the draft scoping document led to revision of the scope of the EIA where appropriate. The final scoping document was sent out in August 2008; the responses are detailed in Table 3.1.

Stage 3: Gathering of Existing Data

3.5.9 A number of existing data sources were collected and reviewed prior to the initiation of survey work targeted directly on gathering data for the EIA of the proposal. It was understood that existing data sources would, in most cases, be unlikely to provide sufficient data alone to use in the EIA but would provide a valuable initial stage with which to form methodologies for further survey. An example of such existing data sources is given below:

- Information on birds of prey from RSPB and CCW (obtained during consultations in early 2005).
- The National Monuments Record (NMR) maintained by Cadw.
- The Archaeological Sites and Monuments Record (COFLIEN) maintained by The Royal Commission on the Ancient and Historical Monuments Wales (RCAHMW).
- Inventory of Historic Gardens and Designed Landscapes citations.
- Details of existing data sources and coverage are presented within the relevant sections of this ES.

Stage 4: Baseline Surveys

3.5.10 Baseline surveys were carried out by specialist consultants in a number of different study areas. These were aimed at gathering sufficient data to form a picture of the current status of environmental and human elements in the vicinity of the proposal, and filling in any gaps in existing historical data. The ultimate aim was to allow the prediction of the potential effects of a subsequent detailed development proposal upon these elements.

3.5.11 Baseline survey methodologies and coverage are described in detail in the relevant assessments in Sections 6 to 16 of this ES.

Stage 5: Site Design and Mitigation of Impacts

3.5.12 The consultation process, baseline studies and surveys, and initial impact assessments identified technical constraints and more sensitive environmental receptors within the option area. The goal was to design a wind farm within the boundaries of technical and economic constraints that would avoid any unacceptable environmental and visual impacts. The initial process of site selection took account of broad environmental and technical constraints across FCW managed land within SSA F. This has been described in detail in Subsections 3.1 to 3.4.

3.5.13 Mitigation measures were identified and incorporated into the design, as environmental and visual assessments were developed, and any potentially higher magnitude impacts were identified. The design process continued until it was considered by the applicant and specialist consultants that the most appropriate wind farm design had been developed. In this way, the proposal presented here can be seen to have incorporated mitigation measures directly into the design process, and the findings and conclusions of the environmental assessments reflect the incorporation of those measures.

Stage 6: Determination of Significance of Residual Impacts

3.5.14 Once a final design had been adopted, which reduces environmental and visual impacts of the proposal through design and definition of construction techniques, the specialist consultants assessed the residual environmental impacts of the proposal. When undertaking these assessments, a common outline methodology was adopted wherever possible, in order to form an opinion on whether or not specific potential effects were 'significant' with reference to Electricity Works (England and Wales) (Environmental Impact Assessment) Regulations 2000 (SI2000/1927). The methodology is outlined in Paragraphs 3.5.19 to 3.5.24. The exceptions to this approach are the methodologies undertaken by Ecology Matters, Glamorgan Gwent Archaeological Trust and The Welsh Economy Research Unit in the Ecology, Cultural Heritage and Socio-economic and Tourism assessments respectively, as outlined below.

3.5.15 Ecology Matters have utilised a methodology drawing upon Institute of Ecology and Environmental Management (IEEM, 2006)[6] guidelines for Ecological Impact Assessment.

3.5.16 The assessment on archaeological features conforms to the Institute for Archaeologists' Standards in British Archaeology: Archaeological desk-based assessments. The assessment of the significance of both the direct and indirect effects of the proposal on the historic landscape (ASIDOHL2) has been conducted[7]. Consultation with archaeological advisors to both Neath Port Talbot and Rhondda Cynon Taf confirmed that the walkover methodology used to assess the impact in both cases is appropriate and meets best practice.

3.5.17 This methodology was not applied to the Socio-economics and Tourism section of the assessment. The Welsh Economy Research Unit at Cardiff University has applied its knowledge and understanding of existing tourism research and statistics to assess the likelihood of potential impacts from the wind farm on the local tourism resource.

3.5.18 While some of the individual assessments evaluated significance of impacts using the exact definitions given in the outline methodology, a number of key assessments adapted the outline methodology to suit the environmental and social receptor being assessed. For example, this was the case for the Landscape and Visual, Cultural Heritage and the Ecological assessments. Operational noise of the wind farm is assessed under ETSU-R-97 guidance.

3.5.19 The basic outline methodology for assessing significance was developed after consideration of relevant guidance/regulations including;

- The Department of the Environment Planning Research Programme's Preparation of Environmental Statements for Planning Projects that Require Environmental Assessment - A Good Practice Guide (HMSO, 1995);
- Electricity Works (England and Wales) (Environmental Impact Assessment) Regulations 2000 (SI2000/1927);
- Guidelines for Landscape and Visual Impact Assessment 2nd Edition: E and FN Spon, (2002), published by the Institute of Environmental Management and Assessment and the Landscape Institute; and
- Guidelines for Environmental Impact Assessment (2004): Institute of Environmental Management and Assessment (IEMA).

3.5.20 In determining the significance of a potential residual effect, the magnitude of change arising from the proposal is correlated with the 'sensitivity' of the particular environmental attribute under consideration. Magnitude of change is evaluated in accordance with the definitions set out in Table 3.3 below.

Table 3.3: Definitions of 'magnitude' of effect

High	Total loss or major alteration to key elements/features of the baseline (i.e. pre-development) conditions.
Medium	Partial loss or alteration to one or more key elements/features of the baseline (i.e. pre-development) conditions.
Low	Minor shift away from baseline (i.e. pre-development) conditions.
Negligible	Very slight change from baseline (i.e. pre-development) conditions.

3.5.21 Where applicable, in carrying out individual assessments, a scale of increasing 'sensitivity' of the environmental or social receptor is defined. This may be defined in terms of quality, value, rarity or importance to other elements, and be classed as low, medium, or high. For certain assessment areas, guidance can be taken from value attributed to elements through designation or protection under law, i.e. landscapes or ecological resources given various levels of protection under planning law. Where assessment of this nature has taken place, the correlation of magnitude against 'sensitivity' determines a qualitative expression for the significance of the effect. This is demonstrated in Table 3.4.

[6] Guidelines for Ecological Impact Assessment. Institute of Ecology and Environmental Management (2006).

[7] Guide to Good Practice on Using the Register of Landscapes of Historic Interest in Wales in the Planning and Development Process. Second Edition. Cadw (2007).

Table 3.4: Significance matrix

MAGNITUDE OF EFFECT			
High	Moderate	Moderate/Major	Major
Medium	Low/Moderate	Moderate	Moderate/Major
Low	Low	Low/Moderate	Moderate
Negligible	Negligible/Low	Low	Low/Moderate
	Low	**Medium**	**High**
	SENSITIVITY OF RECEIVING ELEMENT		

3.5.22 Although significance is usually assessed in terms of varying degrees, those effects indicated as 'major' and 'moderate/major' are likely to be regarded as being equivalent to 'significant effects' when discussed in terms of The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000. Following the iterative design process identified earlier, the significance of each effect would be confirmed or reassessed.

3.5.23 The significance of the effect may also need to be qualified with respect to the international, national, regional or local scale over which it may be felt. The significance of an effect may also be affected by its duration (e.g. the length of the construction period) and by its reversibility, i.e. the degree to which a site could be returned to its baseline conditions following decommissioning.

3.5.24 Each of the impact assessments detailed in the relevant sections of this statement have been formulated in a similar way, giving an evaluation of the magnitude, sensitivity and significance of residual impacts following the implementation of stated mitigation measures.