3. Proposed Development

Introduction

Site Description

3.1 The Proposed Upper Ogmore Wind Farm and Energy Storage Facility, hereafter referred to as the 'Proposed Development' is located on agricultural land to the south of the A4107 in Bridgend County between Blaengwynfi, Nantymoel and Blaengarw. A small portion of the application boundary, relating to off-site access upgrades on a Natural Resources Wales forestry track, is located in Neath Port Talbot County. The Proposed Development is centred at E29150 N19450. The location of the site is shown in Figure 1.1: Site Location.

Proposed Development

3.2 The Proposed Development comprises seven three-bladed, horizontal axis wind turbines. Four turbines of the turbines (T3, T4, T5 and T7) are up to a maximum tip height of 149.9m, and three of the turbines (T1, T2 and T6) are up to a maximum tip height of 130m. The seven turbines will have a total installed capacity of approximately 25.2 MW. The Proposed Development would include an improved site entrance, new access tracks, crane hardstandings, control building and substation compound, electricity transformers, underground cabling, energy storage containers, drainage works and upgrades to a forestry track and associated tree felling, and a possible short diversion of the forestry track. During construction there would be a number of temporary works including a construction compound with car parking, temporary parts of crane hardstandings and welfare facilities. The Proposed Development also includes one temporary and two permanent diversions to public rights of way and provision of a new area of common land to replace that occupied by some infrastructure.

3.3 The purpose of the Proposed Development is the generation and storage of renewable electricity. The Proposed Development will generate electricity through onshore wind technology.

3.4 The Planning Application Boundary (red line boundary) is shown in Figure 1.2: Planning Application Boundary. This boundary contains the main Wind Farm and Energy Storage Facility site, including positions of the turbines and associated infrastructure with 50 m micrositing, and the proposed upgrades required along the access route.

3.5 A detailed plan of the Proposed Development showing the position of the turbines and other infrastructure is shown on Figure 3.1: Infrastructure Layout.

3.6 This chapter provides a description of the physical characteristics of the Proposed Development for the purpose of identifying and assessing the main environmental impacts of the proposal.

3.7 In this chapter in order to differentiate between land take and infrastructure that will be present for the life time of the Proposed Development, and land take and infrastructure which is only required for short term works during the construction period, the term 'permanent' is used to describe the former and 'temporary' used to describe the latter. However it should be noted that the Proposed Development would have a temporary operational lifetime of approximately 35 years from the date of commissioning, after which the above ground infrastructure would be removed and the land reinstated. Therefore the effects are largely long-term temporary as opposed to permanent.

3.8 Planning permission is being sought for the Proposed Development comprising the following:

- Seven three-bladed horizontal axis wind turbines, four of up to 149.9 m tip-height and three of up to 130 m tip height.
- Turbine foundations
- Hardstanding areas at each turbine location for use by cranes erecting and maintaining the turbines
- Approximately 4.3 km of new access track
- An upgraded site entrance off the public road
- Wind farm substation compound containing electrical apparatus and a control building
- Energy storage containers
- On-site electrical and control network of underground (buried) cables
- Temporary construction compound
- Permanent and temporary drainage works
- Two borrow pits
- Off-site road improvement works along forestry track and possible short diversion of the forestry track
- Associated forestry felling
- Temporary and permanent diversions to public rights of way
- Secondary application under section 16 of the Common Act 2006 will be submitted in association with this primary application
- Associated ancillary works

Site Layout and Flexibility

3.9 Although the design process and evolution seeks to combine environmental and economic requirements, the Applicant would nevertheless wish some flexibility, where necessary, in micrositing the exact positions of the turbines and routes of on-site access tracks and associated infrastructure. Any repositioning would not encroach into environmentally constrained areas, but could, for example, avoid unrecorded archaeological features which might be revealed during the construction phase. Therefore, 50 m flexibility is requested in infrastructure positioning which might help mitigate any potential environmental effects. See Figure 3.1: Infrastructure Layout for details.

Project Description

Wind Turbines

3.10 The wind turbine industry is evolving at a remarkable rate. Designs continue to improve technically and economically. The most suitable turbine model for a particular location can change with time and therefore a final choice of machine for the Proposed Development has not yet been made. The most suitable machine will be selected before construction, with a maximum tip height of 149.9 m for turbines T3, T4, T5 and T7 and a maximum tip height of 130 m for turbines T1, T2 and T6.

3.11 For visual and acoustic assessment purposes, the most suitable candidate turbines available in the market place at these tip heights have been assumed. Most of the dominant wind turbine manufacturers are now producing turbines that are classed as suitable for the wind regimes typical of Wales and many are also producing turbines that meet the up to 149.9 m and 130 m tip height specification for the Proposed Development. Exact tower and blade dimensions vary marginally between manufacturers. A diagram of a typical turbine at these tip heights is given in Figure 3.2: Typical Wind Turbine Elevation.

3.12 Turbines begin generating automatically at a wind speed of around 3 to 4 metres per second (m/s) and have a shut-down wind speed of about 25 m/s. Each turbine would have a transformer and switchgear. The transformer's function is to raise the generation voltage from approximately 690 volts to the higher transmission level that is required to transport the electricity into the grid. Depending on the turbine supplier, the transformer and switchgear may be located inside or outside each turbine.

Foundations and Crane Hardstandings

3.13 The wind turbines would be erected on steel re-enforced concrete foundations. It is anticipated that the foundations would be of gravity base design, but there may be the requirement to use piled foundations where ground conditions dictate.

Final base designs will be determined after a full geotechnical evaluation of each turbine location. Figure 3.3: Wind Turbine Foundation provides an illustration of a typical gravity base wind turbine foundation design.

3.14 During the erection of the turbines, crane hardstanding areas would be required at each turbine base. Please see Figure 3.4: Crane Hardstanding General Arrangement. Typically, these consist of one main permanent area of 1100 m2 adjacent to the turbine position, where the main turbine erection crane will be located. The other areas, totalling 530 m^2, will be temporary and used during the assembly of the main crane jib. The hardstanding will be constructed using the same method as the excavated access tracks. This involves the topsoil being replaced with suitable structural fill to finished level.

3.15 After construction operations are complete, the temporary crane pad areas will be reinstated. There will be a requirement to use cranes on occasion during the operational phase of the Proposed Development, so the main crane hardstanding (1100 m2) will be retained to ease maintenance activities. This approach complies with current best practice guidance[1] which recommends crane hardstandings are left uncovered for the lifetime of the Proposed Development.

Site Tracks

3.16 The on-site access track layout has been designed to minimise environmental disturbance by avoiding sensitive features and keeping the length of track commensurate with the minimum required for operational safety. The track route also takes cognisance of the various identified environmental constraints. No watercourse crossings are necessary. Approximately 4.3 km of new access tracks are proposed to access the turbine locations. Access track running width will be 4.5 m, with 0.25 m shoulders either side. Where necessary, access track widths will be increased on bends to accommodate abnormal load deliveries. Typical access track designs are shown in Figure 3.5: Access Track Typical Details.

RES Control Building & Substation Compound and Energy Storage

3.17 The layout and elevations of the proposed control building and substation compound are shown in Figure 3.6 and the communications mast elevation is shown in Figure 3.13. The control building will be designed and constructed to the standard required by the distribution network operator (Western Power Distribution, WPD) for the accommodation of substation equipment.

3.18 The control building and substation compound will contain power quality improvement equipment, including up to two auxiliary transformers. The control building will accommodate metering equipment, switchgear, the central computer system and electrical control panels. A spare parts store room, and welfare

[1] SNH, Scottish Renewables, SEPA and the Forestry Commission Scotland (2010) "*Good Practice during Wind Farm Construction*"

facilities will also be located in the control building. The building will be attended by maintenance personnel on a regular basis.

3.19 Following an assessment of foul treatment options through a review of GPP4 Treatment and disposal of wastewater where there is no connection to the public foul sewer, it was determined that both the toilet, wash hand basin and sink should drain to a small package treatment plant located adjacent to the control building, with effluent to discharge to a soakaway (subject to infiltration tests). The foul treatment system will be constructed and located in accordance with the relevant Building Standards and agreed with the Local Authority.

3.20 A permanent external environmental waste storage area will be provided with a minimum of 6 m clearance from the buildings. The area will consist of a concrete plinth surrounded with a palisade fence and a double gate.

3.21 25 permanent containers housing energy storage devices, inverters and other ancillary equipment will be positioned adjacent to the control building and substation compound on hardstanding used originally for the temporary construction compound. Please see Figure 3.7: Energy Storage Layout Plan and Figure 3.8: Energy Storage Elevations. These units are a means of storing electrical energy just like a rechargeable battery, cell phone or electric car. These are means by which power can be stored and released and the application is of course of a larger scale but the basic principle is the same.

3.22 One of the roles of energy storage is to act as a power reserve, when electricity generation drops below demand. This reserve capacity can be called on at a moment's notice to enable the necessary balancing of the emerging low carbon electrical system.

3.23 Another example of the flexibility services that energy storage could provide includes distribution, reinforcement and deferral services. These enable existing electrical network assets such as substations and overhead lines to have their capacity increased, without the need for building new grid infrastructure.

3.24 All of these uses of energy storage involve charging a battery system with electricity, storing electricity for a period, or discharging electricity. Ultimately the Proposed Development will make a valuable contribution to a secure, low carbon and affordable electrical system.

Description of Access

3.25 The proposed access route for the delivery of large turbine components, known as abnormal indivisible loads (AILs), is shown in Figure 9.1: Abnormal Load Delivery Route. The improved entrance for AILs is proposed directly off the A4107 Road.

3.26 Figures 9.2 and 9.3 show a swept path analysis of all points along the turbine delivery route that require either overrun or oversail beyond the road edge. Figure 9.2 relates to the public road network, where requirements are limited to temporary removal of street furniture. Figure 9.3 relates to a forestry track managed by Natural Resources Wales (NRW), which requires strip widening in the verge at various locations along a stretch of approximately 3.6 km.

3.27 The ownership of a length of forestry track approximately 15m long is in the process of being transferred. Depending on who the owner is at the time of construction of the Proposed Development, it might be necessary to divert the access track east of the existing track prior to delivery of turbine components. The diverted route is approximately 180m long and is shown on Figure 9.3 sheet 2.

3.28 At the end of the construction period and in consultation with the local roads authority, any reinstatement required to any street furniture which may be removed on a temporary basis will be undertaken. In the unlikely event that a replacement blade is required during the operational phase of the Wind Farm, any works will be undertaken following consultation with the local roads authority.

3.29 Details of the proposed site entrance can be seen in Figure 3.9: Site Entrance.

3.30 Please see Chapter 9 for as an assessment of Traffic and Transport effects.

Temporary Compound and Energy Storage

3.31 A temporary construction compound will be located on the site, as illustrated in Figure 3.1: Infrastructure Layout. Details of the temporary compound layout are included in Figure 3.10: Temporary Construction Compound Layout Plan. The compound will include the following:

- Temporary portable cabins for office accommodation, monitoring of incoming vehicles and welfare facilities
- Self-contained toilets with provision for waste storage and removal
- Containerised storage areas for tools, small plant and parts
- An area for site vehicle parking and storage of larger material items
- A standing and turning area for vehicles making deliveries to the site
- A bunded area for storing fuels, oils and greases.

3.32 On completion of the construction work these facilities will be removed and the areas not being used for energy storage will be reinstated.

Borrow Pits

3.33 Borrow pits are proposed as a potential source of site won rock for use primarily in the construction of new tracks and hardstandings. The location of the borrow pit areas of search are shown on Figure 3.1.

3.34 These areas of search are shown as the maximum potential area of borrow pit extraction, but it is not anticipated that these areas would be fully exploited. Areas of search are shown as the nature and quality of the underlying geology will not be defined until the results of detailed pre-construction ground investigation are known. At this point, the exact extent of borrow pit extraction cannot be defined. Indicative borrow pit drawings for the two proposed borrow pit areas are shown on

Figure 3.11. On these drawings, indicative excavation areas are shown to illustrate the potential works if the materials within the search area(s) prove to be suitable for use in the construction of the Proposed Development.

Electrical Connection

3.35 Assuming the use of the currently available models, each wind turbine would generate electricity at 690 V and would have an ancillary transformer located either within or outside the base of the tower to step up the voltage to the required on-site distribution voltage. Each turbine would be connected to any adjacent turbines by underground cables.

3.36 The Proposed Development substation would be located as shown in Figure 3.1: Infrastructure Layout. All power and control cabling on the Wind Farm will be buried underground in trenches located, where possible, along the route of site access tracks. These trenches will be partially backfilled with topsoil. The vegetation soil tuft will be stripped and laid beside the trench and used to reinstate the trench to the original ground level immediately after the cables have been installed.

3.37 The connection of wind farms to the electrical grid typically follows a separate consenting process and it is normally the responsibility of the network operator to progress the relevant consent, where required. RES has received a grid connection offer for Upper Ogmore from the network operator Western Power Distribution (WPD) including an indicative grid connection method and route.

3.38 Although not a part of the planning application for the Proposed Development, the proposed grid connection route is illustrated and the environmental effects have been assessed. These are presented in Figure 3.14 and in Appendix 3.1.

Forestry Felling

3.39 To accommodate the upgrades to the forest track outlined in the previous section, up to approximately 8.6 ha of trees may need to be felled. The maximum felling requirements have been agreed in consultation with NRW and have been designed to ensure that trees will be felled back to a firm edge to avoid wind throw. However, it is anticipated that significantly less felling will be required, as only minor widening (and possible short diversion) of the forest track is required. Exact felling requirements will be agreed with the AIL delivery haulier prior to construction.

Common Land

3.40 The Proposed Development includes the provision of 16.81 ha of replacement common land to replace 16.81 ha of land take by the Proposed Development within common land. Please see **Chapter 12: Socioeconomics, Land Use and Public Access** for further details and the secondary application under section 16 of the Commons Act 2006 which accompany this application.

Temporary and Permanent Diversions to Public Rights of Way

3.41 The Proposed Development includes a permanent diversion to bridleway BW64GWV and footpath FP103GWV, both of which run through the application site, in order to maintain a suitable distance from the proposed wind turbines. In addition, a temporary diversion to footpath FP31 OGV is proposed to maintain a suitable set back distance from the borrow pits. As the borrow pits will only be in use during construction of the Wind Farm, this temporary diversion will only apply during the construction period. The original footpath route will be re-opened when construction of the Wind Farm is completed.

3.42 Details of the proposed diversions are shown in Figure 12.1: Public Rights of Way Proposed Diversions and described further in Chapter 12: Socioeconomics, Land Use and Public Access.

Typical Construction Activities

3.43 Prior to commencement of construction, a detailed Construction & Decommissioning Method Statement will be prepared and agreed with the relevant authorities to incorporate best practice working methods. As a minimum, the following best practice construction methods will be adhered to:

- Where possible and in order to minimise impacts of earthworks, excavations will be kept to a minimum with granular material being reused where appropriate.
- Consideration will be given to weather conditions when stripping soil. For example, during periods of heavy rain (>25 mm in 24 hours), significant snow event (>75 mm lying) or an extended period of freezing conditions (ground penetration >100 mm), soil stripping works will be reviewed to take into account any adverse weather conditions and, where deemed applicable, works will cease until site conditions prevail that are compatible with this activity.
- Vegetated turves shall be stripped and stockpiled separately prior to excavation of topsoil in all work areas
- Vegetated turves will be reused as quickly as possible
- Excavations will be monitored for changing soils types to prevent cross mixing of soils in stockpiles
- Topsoil shall be stripped and stored carefully for use in reinstatement works, which shall be carried out as soon as possible after sections of work are complete. Topsoil will be stripped prior to excavation of subsoil in all work areas
- Any remaining subsoil will be excavated down to a suitable bearing stratum and set-aside for later use in landscaping, backfilling around structures and verge reinstatement

- Reinstatement will be ongoing as the works are constructed to minimise the amount of time in which any material will be stockpiled
- Where required, all stockpiled material will be sited in areas with zero or shallow peat depths and avoiding all 50 m watercourse buffer zones, and ecological and cultural heritage constraints
- All stockpiles shall be shaped to promote run-off. Detailed SUDS drainage and silt control methods shall be designed for each stockpile.

- Additionally, a “toolbox talk” will be provided by the site management team to highlight possible events causing slope instability and provide guidance on best practice when operating in areas of peat and/or increased slopes. In addition, a workforce engagement event shall be performed at least once for the project and shall be organised by the project team and be attended by RES and the project contractor’s workforce. The event will set and communicate the required safety culture and working practices for the project.

Access Tracks

3.44 In areas of peat with a depth greater than 0.5 m consideration has been given to the use of floating tracks. The feasibility of a floating road construction is dependent upon a number of factors, namely: the geomorphology of the peat; topography; length of road section; Proposed Development layout; number of vehicle movements for each option; restoration requirements; peat re-use considerations. All parameters noted above will be assessed at detailed design stage post consent and the best practice road construction type will be informed from the various design constraints.

3.45 The access track itself will be constructed of inert material of suitable grade to withstand the expected traffic loading. Road construction techniques and roadside ditches will be designed to minimise the effect on natural hydrology as much as possible.

3.46 The depths of the ditches will be kept to the minimum required for free drainage of the road. Individual drain lengths will be minimised to avoid significant disruption of natural drainage patterns and avoid accumulation of large volumes of water within an individual drain.

3.47 Drains will not directly flow into watercourses, but into a buffer zone. Buffer zones are used to allow filtration of suspended solids in the water and reduction of runoff velocities. This reduces the sudden increase of flow and encourages deposition of sediments and allows pollutants to be filtered out.

Temporary Compound and Energy Storage

3.48 The location of the temporary compound has been selected to avoid environmental constraints and for reasons of security, practicality and to obtain suitable ground conditions. The proposed temporary compound area will be constructed by top soil excavation in a similar manner to the access tracks, laying stone over a geotextile membrane.

3.49 During construction, temporary fencing will be erected as required, around the construction compound.

3.50 On completion of the construction phase work on the Wind Farm, the temporary construction compound infrastructure will be removed and replaced with the Energy Storage Facility.

3.51 The Energy Storage Facility will comprise 25 permanent containers housing energy storage devices, associated inverters and ancillary equipment. Permanent fencing will enclose the containers. These are illustrated in Figures 3.7 and 3.8 Energy Storage Layout Plan and Energy Storage Elevations.

Borrow Pits

3.52 The daily operation and management of the borrow pits will be the joint responsibility of RES and the contractor. The general methodology set out below for careful management of the borrow pits will be adhered to in order to minimise potential environmental impact.

3.53 A Borrow Pit Method Statement will be agreed with the Local Authority prior to the commencement of construction. Provisions for the control of surface run-off during and post construction (SuDs) and the re-vegetating of working faces post construction will be included.

3.54 It is not anticipated that blasting of stone will be necessary throughout the borrow pits. However, as a worst case, it is anticipated that blasting may occur up to 2-5 times a week for the first six months, before tapering off and becoming less frequent.

3.55 Appropriate dust suppression at the borrow pits and any materials storage areas will be provided as required.

3.56 Once operations are sufficiently underway, restoration will take place progressively behind the working area to encourage re-vegetation. This will minimise any impact to the surrounding environment by minimising the working area at any point.

Sustainable Drainage Systems

3.57 The drainage measures and Sustainable Drainage System (SuDS) designs have been directed by recommendations in Chapter 8: Hydrology and Hydrogeology and are included in the Sustainable Drainage Management Plan (SDMP) provided in Appendix 3.2.

3.58 The drainage system will be designed to mimic natural conditions to mitigate against increased flashiness in watercourses and reduced groundwater recharge. The SuDS will protect the status of watercourses and groundwater.

3.59 Construction will be carried out according to the SDMP. Pollution control measures during the construction phase will be included in the Construction & Decommissioning Method Statement (CDMS), which will be agreed with the Local Authority before starting construction work on site.

3.60 Mitigation measures to minimise the hydrological effect of constructing the access tracks have been identified in Chapter 8: Hydrology and Hydrogeology.

Crane Hardstandings

3.61 Figure 3.4: Crane Hardstanding General Arrangement shows the crane hardstanding layout configuration in plan. The hardstanding would be constructed using the same method as the excavated access tracks. This involves the topsoil and subsoil being replaced with imported stone, ensuring an adequate bearing capacity has been achieved to carry the anticipated loads. The final position of the hardstanding would be decided at detailed design stage and prior to construction and shall be based on a number of considerations, including: size of crane required, depth of excavation required, hydrological/ecological features in the vicinity, local topography (it is preferable to position the crane hardstanding on the same level, or higher level than the turbine foundation level since this eases lifting operations).

Turbine Foundations

3.62 The turbine towers are fixed to a concrete foundation. The foundation proposed in Figure 3.3: Wind Turbine Foundation comprises a gravity base design.

3.63 Each foundation typically consists of a tapered octagonal block of concrete with its base approximately 2.5-3.5 m below ground level. The volume of concrete used to make each foundation is typically 350-500 m^3, which is reinforced by approximately 40-55 tonnes of steel bar. The depth of the excavation below foundation varies for each turbine location according to the depth to suitable formation level. The excavation area for each foundation will be approximately 650-1000 m^2.

3.64 The foundation is typically poured in two parts, with a suitable construction joint between them. This will be detailed in the CDMS. Following the pouring and curing of the concrete, the foundation is backfilled with material which is initially excavated and meeting the density requirements, leaving only the tower plinth, typically 4.5 m – 5.5 m diameter, sitting above ground level. Surplus excavated material will be stored in appropriate areas identified in the CDMS prior to construction. The proposed plan will calculate generated excavated material and identify space for the excess volume of material.

3.65 The exact quantities of concrete, reinforcement, depth and dimensions will vary on the final choice of turbine model. In the detailed pre-construction design of each foundation, geotechnical tests are carried out to determine the strength of the subsoil layers beneath the turbines and the soil behaviour under loading over time. This information is used to confirm a final design and incorporates factors for safety.

3.66 An earthing mat or electrode consisting of up to three interconnected concentric rings of bare stranded copper conductor is laid around the foundation of each tower and transformer, approximately 0.5 m below the finished ground level. In addition, earthing rods padded by bentonite (a water retaining clay mineral) are required at set locations around the foundation, and are positioned vertically below the earthing mat. The number of rods and length is dependent upon the electrical resistivity of the soil which is confirmed during the site investigation, prior to construction.

3.67 Sulphate resistant cement, or higher cement content, within the concrete will be used if the site is identified to have waters with potentially low pH. This is so that they do not have a corrosive effect on turbine bases.

Wind Turbine Erection

3.68 Wind turbine towers, nacelles and turbine blades will be transported to the site as abnormal loads as described in Chapter 9: Traffic and Transport. The tower sections and other turbine components will be stored at each turbine hardstanding until lifted into position.

3.69 The components would be lifted by adequately sized cranes and constructed in a modular fashion. Assembly, in general requires only fixing of bolts, torqueing of nuts and electrical and hydraulic connections.

Cabling, Substation and Control Building

3.70 The location of the substation and control building is shown in Figure 3.1: Infrastructure Layout. Layout and elevation drawings for these buildings are presented in Figure 3.6. All cabling between the turbines and the substation on the site will be connected using underground trenched cables. Where excavated, the top layer of soil will be removed and used to reinstate the excavation following the installation of the cables. Where cables are being laid in areas of peat, the various different layers will be separated and replaced appropriately. Cabling would generally run parallel to the adjacent site tracks. Figure 3.12: Cable Trench Details presents a typical underground cable trench cross-section. In addition and in an effort to ensure that the cable trench does not act as a preferential drain, impermeable bunds will be installed perpendicular to the cable direction at suitable intervals (taking into account local ground conditions and topography).

Re-instatement

3.71 A programme of reinstatement would be implemented upon completion of construction. This would relate to the temporary areas of the crane hardstandings, cable trenches and track shoulders where appropriate. There remains a potential to use cranes during the operational phase of the Development, therefore the main crane hardstanding will remain uncovered.

3.72 It is essential that the access track width is retained during the operation of the Development to allow occasional access if required. Therefore no works to reduce the track width, post turbine erection, are proposed.

Construction Programme

3.73 It is anticipated that construction of the Wind Farm would take 10 months. Construction of the Energy Storage Facility would take approximately six months which, due to grid constraints, is likely to take place at a later date than the Wind Farm. The Wind Farm and Energy Storage Facility indicative construction programmes are shown in Diagrams 3.1 and 3.2.

Diagram 3.1 - Wind Farm Indicative Construction Programme

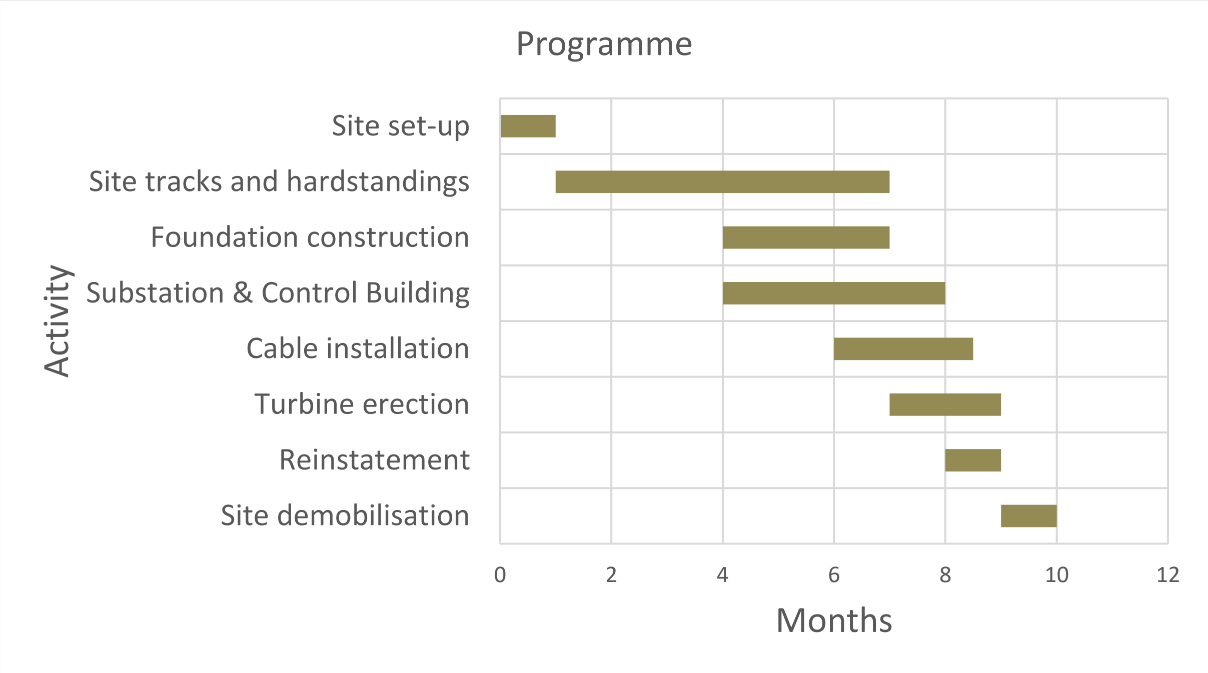
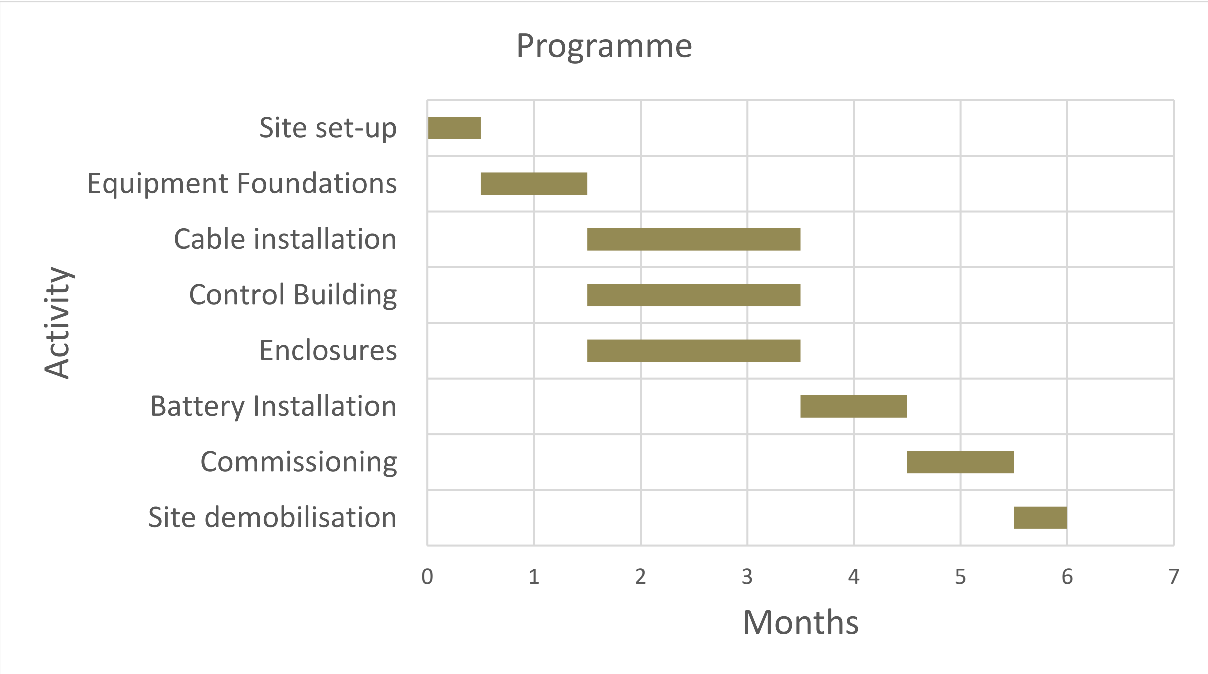


Diagram 3.2 - Energy Storage Facility Indicative Construction Programme



Hours of Work

3.74 Construction work will take place between the hours of 0700-1900 Monday to Friday and 0700 – 1300 on Saturdays. Outside these hours, work at the Site shall be limited to turbine erection, testing/commissioning works and emergency works. Deliveries may occur outside these times to minimise disruption to local residents.

Construction Traffic and Plant

3.75 In addition to staff transport movements, construction traffic will consist of heavy goods vehicles (HGVs) and abnormal load deliveries (AILs).

3.76 As outlined in Chapter 9: Traffic and Transport, taking into account forecast vehicle numbers from construction activities (3,612 trips) and forecast staff vehicle numbers (7,540 private car, mini bus or land rover trips), the total number of two-way vehicle movements generated during the construction period would therefore be 11,152 journeys. Approximately 70 abnormal load deliveries would be generated for the turbine erection stage which would typically result in eight deliveries per day. However, the actual number will be determined in the development of the Construction Traffic Management Plan (CTMP) which will be written in consultation with the Local Authority post-consent.

3.77 Turbine components will be supervised during their transportation using appropriate steerable hydraulic and modular trailer equipment where required. Axle loads would be appropriate to the roads and access tracks to be used. The transportation of turbine components would be conducted in agreement with the relevant highways authorities and local police. RES will notify the police of the movement of abnormal length (e.g. turbine blade delivery) and any abnormal weight (e.g. crane) vehicles and obtain authorisation from the relevant overseeing highways authority prior to any abnormal vehicle movements.

3.78 Vehicle escorts will be used where necessary and the appropriate permits obtained for the transportation of AILs, to ensure that other traffic is aware of the presence of large, slow moving vehicles. Where long vehicles have to use the wrong side of the carriageway or have potential to block the movement of any vehicles travelling in the opposite direction, a lead warning vehicle will be used and escort vehicles will drive ahead to hold oncoming traffic. Vehicles will also be marked as long/abnormal loads. For return journeys, the extendible trailers used for wind turbine component delivery will be retracted to ensure they are no longer than that of a normal HGV.

Construction and Decommissioning Method Statement

3.79 A Construction and Decommissioning Method Statement (CDMS) will be prepared once planning consent has been gained. This will be submitted to the Local Authority prior to any construction works taking place. This will describe the detailed methods of construction and working practices, work to reinstate the site following completion of construction activities and methods to reinstate the site post operation.

Operation and Management

Life of the project

3.80 The expected operational life of the Wind Farm and Energy Storage Facility is 35 years from the date of commissioning. At the end of this period, a decision is made whether to refurbish, remove or replace turbines. If refurbishment or replacement were to be chosen, relevant planning applications will be made. Alternatively, if a decision is taken to decommission the Development, this would entail the removal of all of the turbine components, transformers, the substation and associated buildings. Specific sections of the access tracks may remain on-site to ensure the continued benefit of improved access for the landowners. The concrete foundations will normally remain in place to avoid the unnecessary intrusion to the ground. The exposed concrete plinth may be removed to a specified depth, but the entire foundation will be graded over with topsoil and replanted appropriately to restore the land to its original conditions.

Maintenance Programme

3.81 Wind turbines and wind farms are designed to operate largely unattended. Each turbine at the Proposed Development would be fitted with an automatic system designed to supervise and control a number of parameters to ensure proper performance (e.g. start-up, shut-down, rotor direction, blade angles etc.) and to monitor condition (e.g. generator temperature). The control system would automatically shut the turbine down should the need arise. Sometimes the turbines would re-start automatically (if the shut-down had been for high winds, or if the grid voltage had fluctuated out of range), but other shut-downs (e.g. generator over temperature) would require investigation and manual restart.

3.82 The Development itself would have a sophisticated overall Supervisory Control and Data Acquisition system (SCADA) that would continually interrogate each of the turbines and the high voltage (HV) connection. If a fault were to develop which required an operator to intervene then the SCADA system would make contact with duty staff via a mobile messaging system. The supervisory control system can be interrogated remotely. The SCADA system would have a feature to allow a remote operator to shut down one or all of the wind turbines. This is monitored 24 hours a day, 7 days a week.

3.83 An operator would be employed to operate and maintain the turbines, largely through remote routine interrogation of the SCADA system. The operator would also look after the day-to-day logistical supervision of the Development and would be on-site intermittently.

3.84 Routine maintenance of the turbines would be undertaken approximately twice yearly to ensure the turbines are maintained to Industry Standard. This would not involve any large vehicles or machinery.

3.85 If a fault should occur, the operator would diagnose the cause. If the repair warranted the Development being disconnected from the grid then the operator would make contact with WPD. However, this is a highly unlikely occurrence as most fault repairs can be rectified without reference to the network utility. If the fault was in the electrical system then the faulty part or the entire Development would be automatically disconnected until the fault is rectified.

3.86 Signs would be placed on the Development giving details of emergency contacts. This information would also be made available to the local emergency services and WPD.

Decommissioning

3.87 One of the main advantages of wind power generation over other forms of energy production is the ease of decommissioning and the simple removal of components from the site. The residual impact on the site is limited to the continued presence of the foundations and access tracks. All above ground structures can be removed from the site.

3.88 If the Proposed Development obtains planning approval it is expected that a planning condition would be imposed to provide for the decommissioning and restoration of the site in accordance with a scheme to be agreed in writing with Bridgend County Borough Council, which would consider the long term restoration of the site at the end of the lifetime of the Development.

3.89 The Proposed Development will be decommissioned in accordance with best practice at that time and/or in compliance with any planning conditions. Current best practice includes the removal of all above ground structures (e.g. turbines, substation etc); the removal of certain underground structures where required (e.g. cables); and reinstatement of disturbed areas all of which will be subject to any necessary consents. Consideration will be given to the retention of the Wind Farm access tracks.

Construction and Decommissioning Management

3.90 This section details the environmental management controls that would be implemented by RES and its contractors during the construction of the Proposed Development to ensure that potential significant adverse effects on the environment are, wherever practicable, prevented, reduced and where possible offset.

3.91 A CDMS will be agreed with the relevant statutory consultees prior to construction commencing. The purpose of the CDMS is to:

- Provide a mechanism for ensuring that measures to prevent, reduce and where possible offset potentially adverse environmental impacts identified in the ES are implemented;
- Ensure that good construction practices are adopted and maintained throughout the construction of the Development;
- Provide a framework for mitigating unexpected impacts during construction;
- Provide a mechanism for ensuring compliance with environmental legislation and statutory consents;
- Provide a framework against which to monitor and audit environmental performance.

3.92 The CDMS will, as a minimum, include details of the following:

- Pollution prevention measures
- Erosion and compaction management
- Control of contamination/pollution prevention
- Drainage management
- Spoil management
- Control of noise and vibration
- Control of dust and other emissions to air.

Site Induction

3.93 The principal contractor would ensure that all employees, sub-contractors, suppliers and other visitors to the site are made aware of the content of the CDMS and its applicability to them. Accordingly, environmental specific induction training would be prepared and presented to all categories of personnel working on and visiting the site.

3.94 As a minimum, the following information would be provided to all inductees:

- Identification of specific environmental risks associated with the work to be undertaken on site by the inductee
- Summary of the main environmental aspects of concern at the site as identified in the CDMS
- Environmental Incident and Emergency Response Procedures (including specific Environmental Communication Plan requirements).

3.95 A conveniently sized copy of an Environmental Risk Map or equivalent would be provided to all inductees showing all of the sensitive areas, exclusion zones and designated washout areas. The map would be updated and reissued as required. Any updates to the map would be communicated to all inductees through a tool box talk given by specialist environmental personnel. Regular tool box talks would be provided during construction to provide ongoing reinforcement and awareness of environmental issues.

Pollution Prevention, Water Quality Monitoring and Emergency Response Plan

3.96 The CDMS will detail a number of measures to deal with pollution prevention, including RES' policies and procedures such as 'Environmental Requirements of Contractors' and 'Procedure in the Event of a Contaminant Spill'.

3.97 Contractors and sub-contractors would be required to follow all pertinent Pollution Prevention Guidance. The following pollution control measures will be incorporated into the CDMS:

- Equipment shall be provided to contain and clean up any spills in order to minimise the risk of pollutants entering watercourses, waterbodies or flush areas
- Trenching or excavation activities in open land shall be restricted during periods of intense rainfall and temporary landscaping shall be provided as required to reduce the risk of oil or chemical spills to the natural drainage system
- Sulphate-resistant concrete[2] shall be used for the construction of turbine bases to withstand sulphate attack and limit the resultant alkaline leaching into groundwater
- All refuelling will be undertaken at designated refuelling points. There will be no refuelling within catchments contributing to water supply points
- Equipment, materials and chemicals shall not be stored within or near a watercourse. At storage sites, fuels, lubricants and chemicals shall be contained within an area bunded to 110%. All filling points shall be within the bund or have secondary containment. Associated pipework shall be located above ground and protected from accidental damage
- Any on-site concrete wash-out shall occur in allocated bunded areas
- Drip trays shall be placed under machinery left standing for prolonged periods
- All solid and liquid waste materials shall be properly disposed of at appropriate off site facilities
- Routine maintenance of vehicles shall be undertaken outwith the site
- There shall be no unapproved discharge of foul or contaminated drainage from the Development either to groundwater or any surface waters, whether direct or via soakaway

[2] BS EN206:1 : 2000 Concrete Part 1: Specification, performance, production and conformity and BS 8500 – 1 : 2006 Concrete – Complementary British Standard to BS EN 206 – 1 Part 1

- Sanitary facilities shall be provided and methods of disposal of all waste shall be approved by regulatory bodies
- RES has a policy that no wind turbines, auxiliary and electrical equipment would contain askarels or Polychlorinated biphenyls (PCBs).

3.98 In the unlikely event of an environmental pollution incident, there will be an emergency response procedure to address any accidental pollution incident. For example, a procedure requiring the use of spill kits to contain the material and procedures to ensure that NRW is notified on their Pollution Hotline number (0300 065300) within 30 minutes of an incident (unless unsafe to do so), will be applied.

General Drainage Design

3.99 As set out in Chapter 8: Hydrology and Hydrogeology, buffers to watercourses have taken account of and infrastructure designed in accordance with best practice guidance.

3.100 The potential impact of preferential routing of drainage and associated erosion and sediment wash-off within the sub-catchments draining the site would be mitigated through the following measures which would be incorporated into the SuDS Design:

- Site track construction materials would be free draining, strong, durable and well graded
- Attenuation ponds and silt fences would be provided adjacent to the drains to prevent pollution and sedimentation of watercourses
- Direct drainage into existing watercourses would also be avoided to ensure that sediment and runoff from disturbed ground is not routed directly to the watercourses
- Larger drains would be piped directly under the track through appropriately sized drainage pipes or culverts. Appropriate scour prevention and energy dissipation structures would be constructed at each culvert outlet. Where appropriate, a shallow, lateral drainage swale would be installed at the toe of site track cuttings to intercept the natural runoff. This lateral drain would be piped under the track at regular intervals through correctly sized cross drains away from watercourses. Again appropriate scour prevention and energy dissipation structures would be constructed at each culvert outlet
- Flow and sediment transport in any track drainage swales would be minimised by reducing concentrated flows, installing regular cross culverts and the use of check dams placed at regular intervals within the trackside drainage swales
- Track drainage swales, where required, would discharge into attenuation ponds excavated on the downslope side, or silt fences. A shallow drainage swale would be cut directly downhill as a fan and at minimum slope until the bottom of the swale reaches the natural surface level. The discharge point of

track drains would be constructed to minimise concentrated flows and ensure flows are dispersed over a large area with appropriate surface protection

- The depth of individual drainage swales would be kept to the minimum necessary to allow free drainage of the tracks and swale lengths would be minimised to avoid disruption of natural drainage paths. Direct drainage into existing watercourses would be avoided to ensure that sediment and runoff from disturbed ground is not routed directly to the watercourses.

Runoff and Sediment Control Measures

3.101 The following measures would be used to mitigate any potential impacts on the water quality of the sub-catchments through peat erosion, stream acidification and metals leaching during construction. These are incorporated into the Sustainable Drainage Management Plan (SDMP):

- Appropriate sediment control measures (silt fences, attenuation ponds, etc.) would be used in the vicinity of watercourses, springs or drains where natural features (e.g. hollows) do not provide adequate protection
- Sediment control measures (e.g. check dams, silt fences etc.) would be employed within the existing artificial drainage network during construction. These would be regularly checked and maintained during construction and for an appropriate period following completion
- The extent of all excavations would be kept to a minimum and during construction activities surface water flows shall be captured through a series of cut-off drains to prevent water entering excavations or eroding exposed surfaces. If dewatering of excavations is required, pumped discharges would be passed through attenuation ponds and silt fences to capture sediments before release to the surrounding land
- Where there is a permanent relocation of peat, the ground would be reinstated with vegetation as soon as practicable
- Where practicable, vegetation over the width of the cable trenches would be lifted as turfs and replaced after trenching operations to reduce disturbance
- The movement of construction traffic would be controlled to minimise soil compaction and disturbance. Vehicle movements outside the defined tracks and hardstandings would be avoided
- Trenching or excavation activities in open land would be restricted during periods of intense rainfall and temporary landscaping would be provided, as required, to reduce the risk of sediment transport to the natural drainage system
- Construction of the track and cable crossings will cease during periods of heavy rain (>25mm in 24 hours), significant snow event (>75mm lying) or extended period of freezing conditions (ground penetration>100mm). If necessary,

upstream of the crossing would be dammed and water pumped around the construction zone. The construction period would be minimised as far as practicable.

Traffic Management Plan

3.102 As detailed in Chapter 9: Transport and Traffic, a Construction Traffic Management Plan (CTMP) would be developed pre-construction to ensure road safety for all users during transit of AILs. The CTMP would outline measures for managing the AILs and would set out procedures for liaising with the emergency services to ensure that police, fire and ambulance vehicles are not impeded by the loads. The CTMP would be developed in consultation with Bridgend County Borough Council, the police and the local community and agreed before deliveries to the Site commence.

Construction Environmental Management Plan

3.103 A Construction Environmental Management Plan (CEMP) would be prepared and implemented through the CDMS to set out the measures required to protect ecology and hydrology at the Site during the construction phase. The detail of the CEMP would be prepared and agreed with Bridgend County Borough Council prior to commencement of construction.

Potential Construction and Decommissioning Phase Environmental Impacts

3.104 Construction is predominantly a civil engineering operation and would be phased over an approximate 10-month period for the Wind Farm, and an additional six months for the Energy Storage Facility. Construction of tracks and foundations would be progressive, minimising the number of simultaneously active locations and ensuring that traffic density is kept low. Erection would span approximately nine weeks toward the end of the work programme.

3.105 A programme of site reinstatement and enhancement would be put in place to minimise the visual and ecological impacts on the land.

3.106 The Proposed Development would operate for approximately 35 years and would require only limited maintenance and inspection visits.

3.107 A detailed restoration plan / Decommissioning Method Statement would be prepared and agreed with the relevant authorities towards the end of the Development’s operational life.

Carbon Balance Assessment

3.108 Volume 4 Appendix 3.3 contains an assessment of the carbon balance of the Proposed Development. The assessment concludes that the Proposed Development will effectively pay back its expected carbon debt from manufacture, construction, impact on habitat and decommissioning within 1.5 years, assuming it replaces electricity generated by fossil fuels.