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Mid Wales Conjoined Wind Farm Inquiry - Grid Session 4 Evidence

Supplementary Environmental Information on Grid Connection Scenarios

Final Report

Prepared by LUC on behalf of Vattenfall, Fferm Wynt Llaithddu Cyf (FWL), RES UK & Ireland Limited (RES') and RWE Npower Renewables Limited (RWE)

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Contents

Overview of the Assessment	1
Background	1
Grid Connection Options Scenarios	2
Assessment of Environmental Impacts and Limitations	4
Summary of Environmental Information	5

Figures

- Figure 1: Grid Connection Scenario 1
- Figure 2: Grid Connection Scenario 2
- Figure 3: Grid Connection Scenario 3
- Figure 4: Grid Connection Scenario 4
- Figure 5: Grid Connection Scenario 5
- Figure 6: Grid Connection Scenario 6
- Figure 7: Grid Connection Scenario 7
- Figure 8: Grid Connection Scenario 8a
- Figure 9: Grid Connection Scenario 8b

Appendices

- Appendix 1: Summary of Environmental Information on Grid Scenarios

Overview of the Assessment

Background

- 1.1 Vattenfall, Fferm Wynt Llaithddu Cyf (FWL), RES UK & Ireland Limited (RES') and RWE Npower Renewables Limited (RWE) (herein referred to as 'the developers') have submitted Section 36 applications under the Electricity Act 1989 for consent to construct and operate wind farms in the Mid Wales Strategic Search Areas (SSA) B & C.
- 1.2 Each of the developers has an agreement with SP Manweb (SPM) for provision of a grid connection into the existing electricity grid network. SPM's current proposals are to connect the wind farms via overhead line connections to a proposed new 400kV grid substation being proposed by National Grid near Cefn Coch. The SPM proposal is known as the SP Manweb Mid Wales Grid Connections Project (MWC) and also incorporates grid connection requirements for a further four Windfarms¹. In total SPM has eight 'contracted schemes'. From Cefn Coch, National Grid is proposing to construct a new 400kV in part overhead and part underground cable connection to the existing electricity network near to Lower Frankton, approximately 40km North East from Cefn Coch.
- 1.3 In addition to the developers' applications, an application has also been made under section 36 by Celtpower Limited ("Celtpower") for consent to construct and operate a wind turbine generating station at Llandinam in Powys, Mid Wales. This is a repowering of an existing wind farm. It is not proposed that this generating station will connect to the new 400kV substation at Cefn Coch. Instead it will export electricity via a new 132 KV overhead line connection to the existing Welshpool substation. An application has been made by SPM under section 37 of the Electricity Act 1989 to install this new line.
- 1.4 A summary of the proposed wind farm schemes to which this review relates are set out in **Table 1** below:

Table 1: S36 Wind Farm Proposals in SSA B and SSA C

SSA	Wind farm	Developer	Mega Watt Capacity (Application)	Mega Watt Capacity (Contracted Capacity to DNO)
SSA B	Llanbrynmair	RES	90	90
	Carnedd Wen	RWE	150	150
SSA C	Llaithddu	Fferm Wynt Llaithddu Cyf	62.1	80
	Llanbadarn Fynydd	Vattenfall	59.5	61.2
	Llandinam repowering	Celt Power Ltd.	102	90

- 1.5 **Table 1** sets out both the capacities (in terms of megawatt) that the 'developers' have submitted S36 applications for, and the contracted capacities with the Distribution Network Operator (DNO), in this case is SPM. The wind farm options used in this report are based upon the application capacity. However should different wind farm options be based upon the contracted capacities to the DNO, these would not alter the basic infrastructure elements required for each grid option scenario.

¹ The four wind farms include: Dyfnant Forest, which is at pre-application stage and is expected to be submitted to the Planning Inspectorate in 2014; Rhyd Ddu, which will be part of the Mynydd Lluest y Graig application and is at pre-planning stage and is expected to be submitted in 2014; Carno III was submitted in July 2010 and a decision is pending; and Neuadd Goch Bank was submitted in January 2012 and is still in the planning process.

- 1.6 All six applications (i.e. the five wind farms and the Llandinam grid connection) are currently the subject of a conjoined public inquiry. The main parties at the inquiry include: Powys County Council, Natural Resources for Wales, Fferm Wynt Llaithddu Cyf, Vattenfall, RES, RWE, Celt Power, SPM and various local action/ interest groups. Questions have been asked in the Inquiry by the Inspector and the Alliance regarding the need for, and environmental effects of, the proposed Mid Wales Grid Connection.
- 1.7 As the MWC Project necessarily identifies grid connection options taking account of all eight contracted schemes, it is likely that if less than five of the wind farms listed in **Table 1** above, were to be granted approval, the grid connection options would be different to that proposed by SPM in the MWC Project. On this basis, to inform the Inquiry on the potential environmental implications of the different grid connection scenarios associated with the developments in SSA B and SSA C, 'the developers' have commissioned LUC and Mott MacDonald to prepare Supplementary Environmental Information. This comprises:
- A technical assessment of the various options available for connecting the proposed wind farms to the grid and the (grid) connection infrastructure that this may require. This is set out in the accompanying *Connections Options Review Report* (December 2013) prepared by Mott MacDonald.
 - A high level desk based assessment of the environmental effects of the various grid options (as set out in the accompanying *Connections Options Review Report*).
- 1.8 This report sets out the findings of the high level assessment of environmental effects of the possible alternative grid connection options.
- 1.9 It should be highlighted that the 'baseline' situation for the potential grid connection scenario within Mid Wales, comprises that being currently proposed by SPM as their SP Mid Wales Connections Project. This is on the basis that, in accordance with the Electricity Act 1989, SPM plc, the licence holder for the electricity network at 132kilovolt (kV) and below in Mid Wales, has agreed terms to provide connections for eight wind farms in Mid Wales to the electricity network. As licence holder, SPM is required under the Electricity Act 1989 to identify electrical connections that meet the technical requirements of the electricity network and cause, on balance, the least disturbance to the environment and the people who live, work and recreate within it.
- 1.10 As four of the five wind farms which are involved in the conjoined inquiry (Llanbrynmair, Carnedd Wen, Llaithddu and Llanbadarn Fynydd), are also contracted with SPM, and therefore represented by the SP Mid Wales Connections Project, the findings of the ongoing routeing work being undertaken by SPM are therefore considered to represent the baseline situation for the grid connection scenario.
- 1.11 The alternative scenarios considered within this study, as requested by the Inspector, are therefore hypothetical, and are being considered to inform the inquiry as to the possible situation should the contracted SP Mid Wales Connections Project not proceed in its current form.

Grid Connection Options Scenarios

- 1.12 The accompanying *Connections Options Review Report* (December 2013) identifies eight grid connection option scenarios, as set out in **Table 2** below and in **Figures 1-9**. Please refer to the *Connections Options Review Report* for a detailed justification of why the scenarios were selected for review. The scenarios are based on potential circuit loadings but for added clarity, a summary of the potential wind farm options that could be accommodated by each scenario has been included in **Table 2**. A summary of the proposed grid solution is also provided, along with an approximation of the potential length of the grid route.

Table 2: Summary of Grid Connection Scenarios Assessed

No	Scenario	Wind Farm(s) options that could be connected					Grid Solution	Approximate Length of Route
		Llanbryn-mair (SSA B)	Carnedd Wen (SSA B)	Llaihddu (SSA C)	Llanbadarn Fynydd (SSA C)	Llandinam repowering (SSA C)		
1	Up to 160 MW (one or two wind farms) in SSA C; no wind farms in SSA B			●			132 kV HDWP line from SSA C to connect to the SP Manweb network at Welshpool. Requires significant SP Manweb reinforcements north of Welshpool	114km
					●			
				●	●			
					●	●		
2	Over 160 MW (all three wind farms) in SSA C; no wind farms in SSA B ²			●	●	●	Connection to Welshpool, as outlined in option 1, plus a 132 kV HDWP connection to Shrewsbury	141km
3	Over 160 MW (all three wind farms) in SSA C; at least one wind farm in Area B ³	●		●	●	●	Connection to Welshpool, as outlined in option 1, plus a 132 kV HDWP from SSA C to SSA B. This assumes there must be (at least) one circuit to Legacy.	216km
			●	●	●	●		
4	Up to 160 MW (one wind farm) in SSA B; no wind farms in SSA C	●					132 kV HDWP circuit to Welshpool from SSA B	32km
			●					
5	Up to 117.8 MW or 167.2 MW (one wind farm) in SSA B; two wind farms in SSA C of up to a total of 160 MW ⁴	●		●	●		132 kV HDWP circuit (124 MVA or 176 MVA) to Legacy from SSA B, plus connection option 1	186km
			●	●	●			
		●			●	●		
6	Up to 97.2 MW (Llanbryn-mair) in SSA B; all three wind farms in SSA C	●		●	●	●	132 kV HDWP circuit (176 MVA) to Legacy from SSA B, plus connection option 1, plus 132 kV HDWP between SSA B and SSA C	215km
7	Both wind farms in SSA B; up to 160 MW (two wind farms) in SSA C ⁵	●	●	●	●		2 x 132 kV HDWP circuits to Legacy from SSA B, plus connection option 1	251km
		●	●		●	●		
8a	All five wind farms	●	●	Any contribution from SSA C or SSA D			2 x 132 kV circuits (2 x HDWP or an L4 tower line) to Legacy from SSA B, plus a 132 kV circuit between SSA B and SSA C, plus connection option 1	281km
8b	All five wind farms	●	●	Any contribution from SSA C or SSA D			National Grid 400kv circuit to Lower Frankton from National Grid 400kv substation at Cefn Coch, plus a 132 kV circuit between SSA B and SSA C, plus option 1	199km

² Two wind farms in SSA C may also exceed 160MW if one includes Llandinam. Whilst constraining generation at times of minimum loading may be the more likely solution, the potential for two wind farms in SSA C to be connected using this grid solution cannot be ruled out.

³ Two wind farms in SSA C may also exceed 160MW if one includes Llandinam. Whilst constraining generation at times of minimum loading may be the more likely solution, the potential for two wind farms in SSA C to be connected using this grid solution cannot be ruled out.

⁴ Connections including Llandinam and Llanbadarn in this scenario only fall within the capacity limits if the DNO capacities are used.

⁵ The connection including Llandinam and Llanbadarn in this scenario only falls within the capacity limits if the DNO capacities are used.

Assessment of Environmental Effects and Study Limitations

- 1.13 As requested by the Inspector, a high level review of existing environmental information has been undertaken. The assessment of effects has necessarily been based on a desk study of existing published environmental information with regards to known potential grid route options. The following published environmental information has been used in the preparation of this report:
- SP MANWEB (Sept 2013). *SP Mid Wales Connections, Line Routing Methodology & Appraisal - Phase 3 Report.*
 - SP MANWEB (Oct 2013). *Volume 1: New 132kV Overhead Line Connection from Llandinam Wind Farm to Welshpool Substation - Updated Environmental Statement.*
 - National Grid (Sept 2013). *Mid Wales Connection Project, Draft Substation Site Report.*
 - National Grid (Sept 2013). *Mid Wales Connection Project, Draft Route Report.*

Limitations

- 1.14 There are no existing studies that have been undertaken looking at a potential grid connection route from Cefn Coch to Legacy, or from SSA C to Shrewsbury. Scenarios 2 outlined in **Table 2** above requires a grid route connection to Shrewsbury and Scenarios 3, 4, 5, 6 and 7 (see **Table 2**) all require part of their grid connection to link to Legacy. As no information is available on these sections of routes, this limits the ability to draw conclusions with respect of the likely environmental effects of grid connections along these sections.
- 1.15 The four main publications used (see para 1.13) also vary considerably in the level of information they contain. The SPM and National grid studies provide a high level assessment of the potential environmental issues associated with these routes, whereas the Llandinam to Welshpool grid Connection ES comprises the findings of a detailed Environmental Impact Assessment. Care has been taken to try to provide comparable information in **Appendix 1, Tables B to J.**
- 1.16 The required number of connections from the wind farms to the wider grid network will also vary depending on which wind farms are consented or not. For example under Scenario 1, it will not be necessary to construct a grid connection from Llaithddu to the Llandinam route if it is not approved. The summary of environmental information for each scenario therefore presents a maximum effect scenario – assuming that Llaithddu and Llanbadarn Fynydd are both constructed.
- 1.17 The proposed routes from the wind farms identified by SPM in the MWC Project were all aimed at connecting up with the substation at Cefn Coch. If Llanbadarn Fynydd was to use the proposed Llandinam grid connection route instead of Cefn Coch, it is likely that this would take a more direct route than that proposed by the MWC Project. No environmental information is however available on the more direct route and therefore only the MWC project routes have been considered in this assessment. Individual developers with extensive knowledge of the constraints and receptors pertaining to their own schemes may be in a better position to attempt assessments of hypothetical connections not covered by the scope of this study.
- 1.18 It should also be noted that line route sections CC2, CC3 and CC4 in SSA C, as identified by SPM in the MWC Project, are relatively short connections, with limited associated environmental constraints and have therefore been summarised within CC1 line route Section 1's environmental information in the MWC Project Phase 3 Report. This approach has been maintained in the environmental information presented in **Tables B – J (Appendix 1)** for any Scenario identified in **Table 2** which includes a wind farm in SSA C. However, for clarity, the line routes for the scenarios are shown as commencing from the relevant wind farm substations on the respective maps (**Figures 1 – 9**).

Summary of Environmental Effects

- 1.19 The tables set out in **Appendix 1** provide a summary of the environmental information that is available for identified scenarios. **Table A** in **Appendix 1** sets out the publications that have been used to assess the environmental effects of each scenario. **Tables B- J (Appendix 1)** set out in detail the potential environmental issues for each scenario under the following topic headings:
- Air Quality and Emissions (incl. dust).
 - Ecology/Biodiversity and Geological Conservation.
 - Climate Change.
 - Electric and Magnetic Fields.
 - Forestry and Woodland.
 - Geology and Soils.
 - Historic Environment.
 - Land Use.
 - Landscape and Visual Amenity.
 - Lighting.
 - Noise and Vibration.
 - Socio Economics (including Tourism and Recreation).
 - Traffic and Transport.
 - Waste Management.
 - Water Environment.
- 1.20 The information for each section of the route or substation is presented (where available) along with an overall summary of the key environmental issues for the topic in question. Please note that this summary does not constitute an assessment of the cumulative impacts of the scenario, as that requires a level of information and assessment that is not available for this study.
- 1.21 **Tables 3-6** below set out the key environmental effects that have been identified for each scenario as drawn from the summary columns in **Tables B-J** in **Appendix 1**.
- 1.22 The same summaries of environmental effects are presented for some scenarios, for the following reasons:
- **Scenarios 1 and 2** both include the Llandinam route to Welshpool. Scenario 2 also requires a 132kV connection to Shrewsbury but there is no environmental information available for this connection.
 - **Scenarios 3, 6 and 8a** all require the Llandinam connection to Welshpool, a 132 kV HDWP from SSA C to SSA B and (at least) one circuit to Legacy. 8a requires 2 x 132 kV circuits to Legacy. No environmental information is available for the route to Legacy.
 - **Scenario 5** requires the Llandinam connection to Welshpool and one circuit 132kV HDWP circuit to Legacy from SSA B. **Scenario 7** is the same but it requires 2 x 132 kV HDWP circuits to Legacy. No environmental information is available for the route to Legacy.
 - No assessment of the environmental effects for **Scenario 4** has been provided as there is no identified route or environmental information for a connection from SSA B to Welshpool.
- 1.23 Where topics (such as air quality) have been scoped out of the assessments contained in the relevant publications, they are not included in the tables below.

Table 3: Summary of Effects for Scenarios 1 and 2 - Llandinam connection to Welshpool

Note: The following table does not include any environmental information for the effects of constructing a 132kV line to Shrewsbury which would be required for Scenario 2.

Topic	Summary of Environmental Effects
<p>Ecology/Biodiversity and Geological Conservation</p>	<p>Birds: There is potential for birds particularly larger species (such as swans) to collide with the overhead lines. This represents a long-term, permanent hazard to certain groups of birds but the use of bird deflectors is likely to help to reduce this risk.</p> <p>Designated Sites: The proposed routes to Llandinam and the Man Web Collector Station do not cross any nature conservation designations. Several sites do however lie within close proximity to the route.</p> <p>Peatland: The route will pass through areas identified as having potential peatland habitats.</p> <p>Habitat Management Plans: Due to the location of the wind farm substations, the routes will pass through a wind farm HMP area.</p> <p>Protected Species: Protected species are likely to be located in proximity to the routes. However full compliance with relevant protected species legislation is likely to help to minimise any effects.</p>
<p>Forestry and Woodland</p>	<p>Some trees and hedgerows will be lost to facilitate construction of the grid connection routes. The loss of trees may result in potential habitat loss for bats, although this is expected to be a localised effect.</p> <p>In some locations, mature trees as well as Ancient and Semi-Natural woodland may be affected by construction of the proposed routes. Although this will be avoided where possible at the detailed design stage, limited felling may be required in some locations.</p>
<p>Historic Environment</p>	<p>The Llandinam Route is the only route corridor that has designated historic assets within it, as two SAMs are located within the route. The Llandinam Route and other routes included in this scenario pass within 1-2km of other historic assets, including: SAMs, Conservation Areas, Listed Buildings (primarily lower grade II but also including higher grade), registered historic landscapes, registered historic parks and gardens, and undesignated below-ground sites/features. Assuming that mitigation measures are successfully implemented, long-term direct impacts on cultural heritage are not expected to be significant.</p> <p>There may be significant visual impacts on the setting of some historic assets such as Crugyn Bank Dyke and Bryn Cwmyrhiwdre Round Barrow.</p> <p>Only the Llandinam route passes through a Registered Historic Landscape resulting in significant effects.</p>
<p>Landscape and Visual Amenity</p>	<p>Landscape and visual effects are likely to arise along the routes of this scenario, however the effects will be localised and will diminish rapidly with distance from the route. Localised effects have been identified for visual receptors utilising a proportion of the footpaths, roads and residential properties sited close the routes/sites of this scenario.</p> <p>Overall, effects are more likely for landscape and visual receptors located close to the southern sections of the proposed routes. This is because this is generally a more elevated area with lower levels of vegetation cover consequently there would be greater potential visibility for the routes. In comparison, the central and northern sections of the Llandinam – Welshpool route is routed through more diverse and enclosed landscape character types, although the corollary is that these sections tend to be more populous, therefore a greater number of receptors are likely.</p>

Topic	Summary of Environmental Effects
Water Environment	Flood risk is not expected to be an issue for the routes included in this scenario. The routes will cross a number of tributaries, including rivers within SSSIs and SACs however these can be spanned by wood pole infrastructure and mitigation measures are likely to ensure their protection during construction.

Table 4: Summary of Effects for Scenarios 3, 6 and 8a - Llandinam connection to Welshpool, a 132 kV HDWP from SSA C to SSA B and (at least) one 132 kV HDWP to Legacy

Note: The following table does not include any environmental information for the effects of constructing any 132kV lines to Legacy.

Topic	Summary of Environmental Effects
Ecology/Biodiversity and Geological Conservation	<p>Birds: There are a number of ornithological 'hot-spots' in proximity to the proposed routes, whereby there is potential for larger species, (such as swans) to collide with overhead lines which presents a long-term permanent hazard to birds. However the use of bird deflectors is likely to reduce this risk. There is also a concern that the movements and noises associated with the construction of the NG substation may have a detrimental effect upon birds that nest nearby.</p> <p>Designated Sites: No designated sites are likely to be directly affected by the proposed grid connections, however there are a number of designated sites which lie in close proximity to the routes.</p> <p>Habitat Management Plans: Due to the location of the wind farm substations, the routes will pass through a number of wind farm HMP areas.</p> <p>Protected Species: Protected species are likely to be located in proximity to the routes. However full compliance with relevant protected species legislation is likely to help to minimise any effects.</p> <p>Peatland Habitats: A number of the routes pass through areas of potential peatland habitat.</p>
Forestry and Woodland	<p>Some trees and hedgerows will be lost to facilitate construction of the grid connection routes. The loss of trees may result in potential habitat loss for bats, although this is expected to be a localised effect.</p> <p>In some locations, mature trees as well as Ancient and Semi-Natural woodland may be affected by construction of the proposed routes. Although this will be avoided where possible at the detailed design stage, limited felling may be required in some locations.</p>
Historic Environment	<p>Two designated features (SAMs) are located within the Llandinam route and one within the SP MWC BNC route. The Llandinam Route and other routes included in this scenario pass within 1-2km of other historic assets, including: SAMs, Conservation Areas, Listed Buildings (primarily lower grade II but also including higher grade), historic landscapes, Registered Historic Parks and Gardens and undesignated below-ground sites/features. Mitigation measures will be deployed to minimise direct effects on features. However significant effects on the setting of a number of features are predicted.</p> <p>Only the Llandinam route passes through a Registered Historic Landscape resulting in significant effects.</p>

Topic	Summary of Environmental Effects
Landscape and Visual Amenity	<p>Landscape and visual effects are likely to arise along the routes of this scenario, however the effects will be localised and will diminish rapidly with distance from the route.</p> <p>Localised significant effects have been identified for visual receptors utilising a proportion of the footpaths, roads and residential properties sited close to the routes of this scenario.</p> <p>Overall, for the SSAC connection to Welshpool, effects are more likely for landscape and visual receptors located close to the southern sections of the proposed route. This is because this is generally a more elevated area with lower levels of vegetation cover consequently there would be greater potential visibility for the routes. In comparison, the central and northern sections of the Llandinam – Welshpool line is routed through more diverse and enclosed landscape character types, although the corollary is that these sections tend to be more populous, therefore a greater number of receptors are likely.</p> <p>The SSAC connection to Cefn Coch will be visible as it crosses roads and within valleys and there are likely to be potential visual effects on a number of residential properties.</p> <p>Landscape and visual effects are likely along line route section 1 of BNC 3, BNC 4 and BNC5. However, these elements of this scenario will be screened from some receptors and directions. The overhead line may potentially be seen alongside other above ground equipment such the turbines of the planned wind farms.</p> <p>Effects are likely for landscape and visual receptors around the substation at Cefn Coch than the SP Manweb Collector Substation: Option A. It is anticipated that there would be unrestricted and filtered views of the substation at Cefn Coch from the surrounding area, and it would potentially be seen alongside above ground equipment such as overhead electricity lines and the turbines of the planned wind farms.</p>
Water Environment	<p>Flood risk is not expected to be an issue for the routes included in this scenario. The routes will cross many tributaries, including rivers within SSSIs and SACs however these can be spanned by wood pole infrastructure and mitigation measures are likely to ensure their protection during construction.</p>

Table 5: Summary of Effects for Scenarios 5 and 7 – Llandinam connection to Welshpool and (at least) one 132 kV HDWP to Legacy

Note: The following table does not include any environmental information for the effects of constructing any 132kV lines to Legacy.

Topic	Summary of Environmental Effects
Ecology/Biodiversity and Geological Conservation	<p>Birds: There are a number of ornithological 'hot-spots' in proximity to the proposed routes, whereby there is potential for larger species, (such as swans) to collide with overhead lines which presents a long-term permanent hazard to birds, however the use of bird deflectors is likely to reduce this risk.</p> <p>Designated Sites: No designated sites are likely to be directly affected by the proposed grid connections, however there are a number of designated site which lie in proximity to the routes.</p> <p>Habitat Management Plans: Due to the location of the wind farm substations the routes will pass through a number of wind farm HMP areas.</p>

Topic	Summary of Environmental Effects
	<p>Protected Species: Protected species are likely to be located in proximity to the routes. However full compliance with relevant protected species legislation is likely to help to minimise any effects.</p> <p>Peatland Habitats: A number of the routes pass through areas of potential peatland habitat.</p>
Forestry and Woodland	<p>Some trees and hedgerows will be lost to facilitate construction of the grid connection routes. The loss of trees may result in potential habitat loss for bats, although this is expected to be a localised effect.</p> <p>In some locations, mature trees as well as Ancient and Semi-Natural woodland may be affected by construction of the proposed routes. Although this will be avoided where possible at the detailed design stage, limited felling may be required in some locations.</p>
Historic Environment	<p>Two designated features (SAMs) are located within the Llandinam route and one within the SP MWC BNC route. The Llandinam Route and other routes included in this scenario pass within 1-2km of other historic assets, including: SAMs, Conservation Areas, Listed Buildings (primarily lower grade II but also including higher grade), historic landscapes, Registered Historic Parks and Gardens and undesignated below-ground sites/features. Mitigation measures will be deployed to minimise direct effects on features. However, significant effects on the setting of a number of features are predicted.</p> <p>Only the Llandinam route passes through a Registered Historic Landscape resulting in significant effects.</p>
Landscape and Visual Amenity	<p>Landscape and visual effects are likely to arise along the routes of this scenario, however the effects will be localised and will diminish rapidly with distance from the route.</p> <p>Localised significant effects have been identified for visual receptors utilising a proportion of the footpaths, roads and residential properties sited close to the routes of this scenario.</p> <p>Overall, for the SSAC connection, effects are more likely for landscape and visual receptors located close to the southern sections of the proposed route. This is because this is generally a more elevated area with lower levels of vegetation cover consequently there would be greater potential visibility for the routes. In comparison, the central and northern sections of the Llandinam – Welshpool route is routed through more diverse and enclosed landscape character types, although the corollary is that these sections tend to be more populous, therefore a greater number of receptors are likely.</p> <p>Landscape and visual effects are likely along line route section 1 of BNC 3, BNC 4 and BNC5. However, these elements of this scenario will be screened from some receptors and directions and the overhead line may potentially be seen alongside other above ground equipment such the turbines of the planned wind farms.</p>
Water Environment	<p>Flood risk is not expected to be an issue for the routes included in this scenario. The routes will cross many tributaries, including rivers within SSSIs and SACs however these can be spanned by wood pole infrastructure and mitigation measures are likely to ensure their protection during construction.</p>

Table 6: Summary of Effects for Scenario 8b - Llandinam connection to Welshpool, a 132 kV circuit between SSA B and SSA C and National Grid 400kV circuit to Lower Frankton from National Grid 400kV substation at Cefn Coch

Topic	Summary of Environmental Effects
<p>Ecology/Biodiversity and Geological Conservation</p>	<p>Birds: There are a number of ornithological 'hot-spots' in proximity to the proposed routes, whereby there is potential for larger species, (such as swans) to collide with overhead lines which presents a long-term permanent hazard to birds, however the use of bird deflectors is likely to reduce this risk. There is also a concern that the movements and noises associated with the construction of the NG substation may have a detrimental effect upon birds that nest nearby.</p> <p>Designated Sites: The Montgomery / Shropshire Union Canal SAC and Montgomery Canal SSSI are crossed by the 400kV preferred route corridor. No other designated sites are likely to be directly affected by the proposed grid connections, however there are a number of designated sites which lie in close proximity to the routes.</p> <p>Habitat Management Plans: Due to the location of the wind farm substations the routes will pass through a number of wind farm HMP areas.</p> <p>Protected Species: Protected species are likely to be located in proximity to the routes. However full compliance with relevant protected species legislation is likely to help to minimise any effects.</p> <p>Peatland Habitats: A number of the routes pass through areas of potential peatland habitat.</p>
<p>Forestry and Woodland</p>	<p>Some trees and hedgerows will be lost to facilitate construction of the grid connection routes. The loss of trees may result in potential habitat loss for bats, although this is expected to be a localised effect.</p> <p>In some locations, mature trees as well as Ancient and Semi-Natural woodland may be affected by construction of the proposed routes. Although this will be avoided where possible at the detailed design stage, limited felling may be required in some locations.</p>
<p>Historic Environment</p>	<p>Two designated features (SAMs) are located within the Llandinam route and one within the SP MWC BNC route. There are also multiple SAMs located within the 400kV preferred route. The Llandinam Route and other routes included in this scenario pass within 1-2km of other historic assets, including: SAMs, Conservation Areas, Listed Buildings (primarily lower grade II but also including higher grade), historic landscapes, Registered Historic Parks and Gardens and undesignated below-ground sites/features. Mitigation measures will be deployed to minimise direct effects on features. However, significant effects on the setting of a number of features are predicted.</p> <p>Only the Llandinam route passes through a Registered Historic Landscape resulting in significant effects.</p>
<p>Landscape and Visual Amenity</p>	<p>Landscape and visual effects are likely to arise along the routes of this scenario, however the effects will be localised and will diminish rapidly with distance from the route. Views are also variable depending on localised topography and tree cover.</p> <p>Localised significant effects have been identified for visual receptors utilising a proportion of the footpaths, roads and residential properties sited close to the routes of this scenario. In some locations along the 400kV line preferred route, settlements, including a number of large villages are affected. Also, the popular viewpoint of Llanymynech Hill with its Heritage Trail overlooks this section of the preferred route corridor.</p>

Topic	Summary of Environmental Effects
	<p>While the existing 400 kV line is noticeable in locations along the route, it is not a dominant landscape feature, particularly towards the eastern end of the route.</p> <p>Overall, for the SSAC connection to Welshpool, effects are more likely for landscape and visual receptors located close to the southern sections of the proposed route. This is because this is generally a more elevated area with lower levels of vegetation cover consequently there would be greater potential visibility for the routes. In comparison, the central and northern sections of the Llandinam – Welshpool route is routed through more diverse and enclosed landscape character types, although the corollary is that these sections tend to be more populous, therefore a greater number of receptors are likely.</p> <p>The SSAC connection to Cefn Coch will be visible as it crosses roads and within valleys and there are likely to be potential visual effects on a number of residential properties.</p> <p>Landscape and visual effects are likely along line route section 1 of BNC 3, BNC 4 and BNC5. However, these elements of this scenario will be screened from some receptors and directions and the overhead line may potentially be seen alongside other above ground equipment such the turbines of the planned wind farms.</p> <p>Effects are likely for landscape and visual receptors around the substation at Cefn Coch than the SP Manweb Collector Substation: Option A. It is anticipated that there would be unrestricted and filtered views of the substation at Cefn Coch from the surrounding area, and it would potentially be seen alongside above ground equipment such as overhead electricity lines and the turbines of the planned wind farms.</p>
Water Environment	<p>Flood risk is not expected to be an issue for most routes included in this scenario. However, the 400kV line preferred route crosses extensive areas of flood plain, areas of indicative reservoir flood risk and groundwater flows associated with floodplain areas, which all requires consideration.</p> <p>The routes will cross many tributaries, including rivers within SSSIs and SACs however these can be spanned by wood pole infrastructure and mitigation measures are likely to ensure their protection during construction.</p>

**APPENDIX 1: SUMMARY OF
ENVIRONMENTAL INFORMATION
FOR GRID SCENARIOS**