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Scottish Marine Renewables SEA

Environmental Report Section C SEA Assessment: Chapter C20 Onshore Grid Connection

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Table of Contents

C20 Onshore Grid Connection

C20.1 Introduction

This chapter identifies the effects of connecting wave and tidal energy projects to the national electricity grid, specifically, the effects of on-shore sub-stations and transmission lines. The primary aim of the SEA is to assess the effects of wave and tidal technologies in the marine and coastal environments but it is recognised that any wave or tidal project will require additional onshore infrastructure. There are significant limitations to the level of assessment that can be provided at this strategic level and it is not the purpose of this SEA to assess the capacity of the electricity grid in Scotland and opportunities for increasing this capacity. In terms of the grid and electricity transmission, the aim of the SEA is to identify the potential effects associated with the connection of marine and tidal devices to the grid and to identify mitigation measures that can be employed to avoid or reduce adverse effects.

For the purpose of this assessment it is assumed that each array will require a separate connection to the grid. However, the location of infrastructure is not known and only generic effects, and not geographically specific effects, are considered. It should also be noted that this assessment does not include an assessment of sub-sea interconnector cables. The effects of sub-sea cables are considered in other assessment chapters in this report. Whist it is acknowledged that it is not accurate to draw direct comparisons between these and island interconnector cables, it does give an indication, at the strategic level, of the effects of interconnector cables.

C20.2 Network Owners and Operators and their Environmental Obligations

In Scotland the electrical transmission network is owned and maintained under licence by two companies, Scottish Power Transmissions Ltd (SPT) in southern and central Scotland and Scottish Hydro-Electric Transmission Ltd (SHETL) in northern Scotland. National Grid operates the transmission system across Great Britain, balancing supply with demand. Under the terms of their respective licences and the Electricity Act 1989 SHETL and SPT are contractually obliged to provide new connections to the existing grid. The Act makes the following provisions with respect to the grid and the environment:

- “to develop and maintain an efficient, co-ordinated and economical system of electricity transmission”.
- “to have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest”
- “to do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.”

In addition, the requirements of any developments falling under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 would also be considered.

C20.3 Existing Transmission Network

The transmission network in Scotland comprises overhead lines and underground cables with substations at numerous locations used to switch the current between lines. Overhead lines are predominantly used to distribute electricity, however, in some areas where this is not feasible underground cables are used.

The majority of the network comprises 132kV, 275kV and 400kV overhead lines for the bulk transmission of electricity. Lines are supported on either wooden poles (Trident or Portal) or large steel towers (generally for 275kV). The type and height of structures required will vary according to the location in which they area placed. Electrical substations comprise various components including voltage switches, transformers and associated wiring and cabling.

It is recognised that the existing grid is constrained, particularly in geographically remote areas where it lacks the capacity to accept and distribute large amounts of energy. In order to accommodate the increased generating capacity of renewable energy developments upgrades to existing lines and new connections will be required.

C20.4 Baseline Environment

The location of grid infrastructure associated with the future development of wave and tidal energy is unknown at this time. Given the scale of the study area it is not practicable to provide a detailed baseline which would need to encompass a large proportion of the terrestrial environment of Scotland. For the purpose of this study the assessment is restricted to a review of the potential generic effects of transmission lines including the main elements of the environment that could potentially be affected i.e. landscape and visual amenity, ecology, cultural heritage, land use, hydrogeology and hydrology.

C20.5 Components of the Grid Connection

The assessment of potential effects is based upon the following key components of a grid connection:

- Substation – required for switching between marine cables and land cables or overhead lines. Will tend to be located in coastal or near coast location. Access tracks or roads to substations would be required.
- Land cables – these are buried cables which may be used to link the substation to the existing grid network, depending upon distance to grid, location and environmental characteristics
- Overhead transmission lines – these are likely to be used to link the substation to the existing grid network. Depending upon array size and related electricity output the overhead lines will generally comprise either (although it should be noted that this is very site and project specific):

  - 11kV line – supported on wooden poles
  - 33kV line – supported on wooden poles
  - 132kV line – supported on wooden poles (Trident or Portal) or metal towers
  - 275kV line – supported on metal towers
  - 400kV Line - supported on metal towers

There may be a requirement for a substation or tower modifications at the point at which the connection line has to link into the existing grid network.

C20.6 Potential Key Effects

The onshore effects of marine renewable developments will be associated with the construction and operation of the substation and the connection to the electrical grid. The location, scale and physical form that substations and connections to the electrical grid may take is unknown at this stage and consequently project/site specific effects have not been identified. This section outlines generic effects associated with the construction and operation of substations and construction and routeing of transmission lines.

C20.6.1 Potential Environmental Effects of Substations

C20.6.1.1 Landscape and Visual Amenity

The main effect of substations on visual amenity is visual intrusion associated with both the construction and operation of the substation. The magnitude of this effect depends upon the scale and design of the structure, the extent of the structure visible, the percentage of the existing view newly occupied by the structure, the influence of the development within the view and the viewing distance between the viewer (receptor) and the development. The significance of the effect will be influenced by the number of potential receptors and their sensitivity to the change proposed. This is discussed in more detail in the following sub-sections.

The main effects of substations in terms of landscape character depend upon the relationship between the new structure (once operational) and the existing landscape character and the capacity for the local landscape area to accommodate and tolerate the type of development proposed. The significance of the effect on landscape will be influenced by a number of factors including, for example, whether the area is remote or developed, the scale and distinctiveness of the landscape and landscape value.

C20.6.1.2 Ecology

Most effects on ecology will occur during the construction of a substation. These could potentially include damage, loss or disturbance to protected sites (SACs, SPAs, SSSIs), protected species, Habitat Regulations Annex 1 habitats, UK and Local Biodiveristy Action Plan (BAP) species and habitats and habitat fragmentation. The significance of the effects will depend upon the value of the habitats and species in the affected area. This is discussed in the following sections.

C20.6.1.3 Historic Environment

The effects of substation construction on the historic environment relate specifically to the potential for ground excavation and construction activities to lead to the interference, damage or destruction of known and undiscovered archaeological remains/sites.

Depending upon the siting of a substation, its operation/presence could potentially have adverse effects on the setting of archaeological features/sites, listed buildings or conservation areas. The significance of the effects on the historic environment depends upon the value of the archaeological remains. This is discussed in the following section.

C20.6.1.4 Land Use

Construction and operation of a substation will involve land take. This could potentially be agricultural land, recreational land or development land (residential or business).

C20.6.1.5 Hydrology

Activities involved with the construction of a substation could have adverse effects on water quality if located in close proximity to surface water features. Ground excavations can lead to increased sediment loading of surface water runoff and adjacent water courses. There is also potential for water pollution from lubricants, oils and chemicals associated with the heavy plant and machinery required during construction, entering local watercourses.

C20.6.2 Potential Environmental Effects Associated with Land Cables

C20.6.2.1 Landscape and Visual Amenity

There will be no effects on landscape character and visual amenity associated with land cables as they are buried beneath ground. Ground excavations and trenching activities may have an effect on landscape and visual amenity but these will be very short term and small scale.

C20.6.2.2 Ecology

Ground excavations and trenching associated with cable laying will potentially have adverse effects on ecology. These effects may include damage, loss or disturbance to protected sites (SACs, SPAs, SSSIs), protected species, Habitat Regulations Annex 1 habitats, UKBAP and LBAP species and habitats and habitat fragmentation. Most effects will be temporary in nature as all areas affected will be reinstated once cables are installed. However, the effects on habitat and species loss will be permanent. The significance of the effects will depend upon the value of the habitats and species in the affected area.

C20.6.2.3 Historic Environment

Ground excavation and trenching activities will potentially lead to the interference, damage or destruction of known and undiscovered archaeological remains/sites. The significance of the effects on the historic environment depends upon the value of the archaeological remains. This is discussed in the following section.

C20.6.2.4 Land Use

Ground excavation and trenching activities associated with cable laying will have temporary effects on land use. At certain locations along cable routes there may be a requirement for land to be made permanently available for access to cables. This could potentially affect agricultural land, recreational land or development land (residential or business).

C20.6.2.5 Hydrology

Activities involved with the installation of land cables could have adverse effects on water quality if located in close proximity to surface water features. Ground excavations can lead to increased sediment loading of surface water runoff and adjacent water courses. There is also potential for water pollution from lubricants, oils and chemicals associated with the heavy plant and machinery required during the laying of the cables entering local watercourses.

C20.6.3 Potential Environmental Effects of Overhead Transmission Lines

Potential effects resulting from transmission lines are very much dependent on the required capacity of the line, the types and size of towers used to support the lines i.e. wooden poles or steel lattice towers and the footprint associated with the towers.

C20.6.3.1 Landscape and Visual Amenity

Overhead transmission lines will affect landscape character and visual amenity. The magnitude of the impact is dependent on a number of factors including:

- Landscape character (key landscape components and features) e.g. scale, prominent ridges and skylines, woodland cover, topography, settlement;
- Landscape value/importance: National Parks, National Scenic Areas (NSAs), Areas of Great Landscape Value (AGLVs) or Gardens and Designed Landscapes;
- Proximity of receptors to Overhead Lines and the extent to which the support structure and line would intrude into existing views; and
- Types and size of towers used to support transmission lines (wooden pole or steel lattice towers).

C20.6.3.2 Ecology

Excavations for towers could lead to the damage, loss or disturbance to protected sites (SACs, SPAs, SSSIs), protected species, Habitat Regulations Annex 1 habitats, UKBAP and LBAP species and habitats. There is also a potential for bird collisions (overhead lines and towers) particularly swans, geese and birds with aerial display flights e.g. golden plovers. Tower construction could also lead to the loss, damage or disturbance of protected species and LBAP priority habitats. Overhead transmission lines could potentially result in further ecological impacts; primarily bird collisions.

C20.6.3.3 Cultural Heritage

The effects of tower construction on the historic environment relate specifically to the potential for ground excavation and construction activities to lead to the interference, damage or destruction of known and undiscovered archaeological remains/sites. Indirectly, the routeing of an overhead transmission line could have adverse effects on the setting of archaeological features/sites, listed buildings or conservation areas.

C20.6.3.4 Land Use

In terms of land use, the main potential effect is associated with the footprint of the towers used to support the overhead transmission lines, and the effects that this has the land take and field structures. In forested areas the routeing of an overhead could result in the removal or lopping of trees to obtain the necessary safety clearances from electrical infrastructure.

C20.6.3.5 Hydrology

Where towers are sited in close proximity to watercourses, necessary ground excavations and construction activities could potentially lead to water pollution.

Hydrogeology is unlikely to be significantly affected by the routeing of wooden poles as they do not have a large footprint and do not require substantial ground excavation. Steel lattice towers have larger footprints and therefore require large and deeper ground excavations. These ground excavations could potentially affect the hydraulic connectivity of underlying strata. In areas where the permeability of the underlying bedrock is moderate to high there could be negative effects on groundwater.

C20.6.4 Summary of Potential Key Effects

Table C20.1 below provides a summary of the potential effects that onshore grid connections associated with marine devices could have on the environment.

Table C20. 1: Potential Significance of Effects – Onshore Grid Connection

Effect	Development Phase	Direct/Indirect	Duration	Extent
Substation				
Landscape and visual intrusion	Construction and Operation	Direct	Permanent	Determined by Zone of Visual Influence (ZVI) and landscape character
Habitat and species loss/disturbance	Construction	Direct	Permanent	Substation area
Damage/loss of archaeological remains and site	Construction	Direct	Permanent	Substation area
Land Use	Construction and operation	Direct	Permanent	Substation area
Hydrological effects	Construction	Direct	Temporary	Substation area
Cabling (trenching)				
Landscape and visual intrusion	Construction	Direct	Temporary	Determined by ZVI and landscape character
Damage/loss of archaeological remains and site	Construction	Direct	Permanent	Cable route
Land Use	Construction	Direct	Temporary	Cable route
Hydrological effects	Construction	Direct	Temporary	Cable route
Overhead Transmission Lines				
Landscape and visual intrusion	Construction and Operation	Direct	Permanent	Determined by ZVI and landscape character
Habitat and species loss/disturbance	Construction	Direct	Permanent	Tower footprint & transmission length
Damage/loss of archaeological remains and site	Construction	Direct	Permanent	Tower footprint
Land Use	Construction	Direct	Permanent	Tower footprint
Hydrological effects	Construction	Direct	Temporary	Tower footprint

C20.7 Sensitivity of Receptors

Table C20.2 below provides a summary of the sensitivity of key receptors (coastal and inland) to the potential activities associated with connecting marine devices to the Scottish national grid. Measures of sensitivity are based on expert knowledge and experience.

Table C20. 2: Sensitivity of Land Based Receptors to Grid Connection

Receptor	Activities				
	Substation Construction	**Substation Operation**	**Land Cables (Trenching)**	**OHL Construction**	**OHL Operation**
Landscape and Visual					
National Parks/NSAs	Medium	High	Low	High	High
AGLVs	Medium	High	Low	High	High
Remote landscapes	Medium	High	Low	High	High
Recognised viewpoints	Medium	Medium	Low	High	High
Residential Properties	Medium	High	Low	High	High
Ecology					
Protected sites (SACs, SPAs, SSSIs)	High	Low	High	High	Low
Protected species	High	Low	High	Medium	Low
Habitat Regulations (Annex 1) Habitats	High	Low	High	High	Low
UK and Local Biodiversity Action Plan Species and Habitats	Medium	Low	Medium	Low	Low
Birds	Medium	Low	Low	Low	Medium
Historic Environment (direct effects excluding impacts on the setting of scheduled monuments)					
Scheduled Monuments	High	Low	High	High	Low
Recorded Sites (NMRS)	Medium	Low	Medium	Medium	Low
Prehistoric remains	High	Low	High	High	Low
Listed Buildings	Medium	Medium	Low	Medium	High
Conservation Areas	Medium	Medium	Low	Medium	High
Land Use					
Recreational land	Medium	Medium	Low	Medium	Medium
Agricultural land	Medium	Medium	Medium	Medium	Medium
Development land	Low	Low	Low	Low	Low
Hydrology					
Watercourses	Medium	Low	Medium	Low	Low
Ground water	Medium	Low	Medium	Medium	Low

C20.8 Significance

The assessment of effect significance has been undertaken based on the criteria below. These have been developed specifically for the SEA and take into account the information available to inform the assessment of significance. Due to the strategic nature of this assessment it has not been possible to quantify magnitude of effects, and the assessment of significance is therefore based primarily on the sensitivity and importance of receptors, as described in Table C20.3 below.

Table C20. 3: Significance Assessment Criteria– Onshore Grid Connection

Significance Level	Determining Criteria
Major	▪ There would be adverse effects on the character of a National Park, NSA or AGLV (Area of Great Landscape Value) ▪ Development would be at considerable variance with the scale, form and pattern of the landscape ▪ Development would likely degrade, diminish and even destroy the integrity of a range of characteristic features and elements ▪ Development would lead to the loss or damage of protected sites (SACs, SPAs or SSSIs) ▪ Development would lead to the damage or destruction of Scheduled Monuments, undiscovered prehistoric remains or listed buildings ▪ Development would result in the loss of large amounts of agricultural land ▪ Development would lead to the pollution of watercourses that are of high ecological value and high water quality ▪ Development would lead to the pollution of groundwater sources that provide drinking water and support key ecological habitats
Moderate	▪ There would be adverse effects on areas of local landscape importance/ distinctiveness ▪ Development would be out of scale with the landscape, or at odds with the local pattern and form ▪ Development would strongly contrast with or cause loss of characteristic fetures and elements ▪ Development would lead to the disturbance of protected sites (SACs, SPAs or SSSIs) ▪ Development would lead to the loss or damage of LBAP habitats and species ▪ Development would lead to the disturbance/interference of Scheduled Monuments, undiscovered prehistoric remains, Listed Buildings and Conservation Areas ▪ Development would lead to the damage or destruction of sites recorded on the NMRS ▪ Development would result in the loss of some agricultural land and large areas of recreational land ▪ Development would lead to the pollution of watercourses that are of moderate ecological value and moderate water quality ▪ Development would pollute non-drinking water groundwater source
Minor	▪ Development would not quite fir the form and scale of the landscape ▪ Development would result in only small changes to characteristic features and landscape elements ▪ Local residents, tourists and recognised viewpoints would have intermittent, long distance views of the development ▪ Development would lead to the disturbance of LBAP habitats and species ▪ Development would lead to the disturbance/interference of sites recorded on the NMRS ▪ Development would result in the loss of some recreational land ▪ Development would lead to the pollution of watercourses that are of low ecological value and low water quality

C20.8.1 Results of Potential Effect Significance without Mitigation

Table C20.4 below provides a summary of the results of the assessment of POTENTIAL effect significance. Potential effect significance is a measure of the level of significance that the effect would have on a receptor WITHOUT mitigation. The results from this part of the assessment were then used to inform the assessment of RESIDUAL effect significance which measures the significance of an effect following the successful implementation of standard practice mitigation.

Due to the strategic nature of this SEA it has not been appropriate to assess the significance of the effects of grid connections on each of the individual topics identified. The results presented in Table C20.4 are therefore based on a range of potential receptors. Where potential effect significance varies for each of the receptors identified, the highest level of potential effect significance has been attributed.

Table C20. 4: Potential Significance of Effects – Onshore Grid Connection

Potential Effects	Device Characteristics	Development Phase	Receptor	Potential Significance of Effects WITHOUT mitigation	Likely Impact Extent	Source	Confidence
Landscape and visual intrusion from substation and OHL	Substation OHL	CD OD	Designated landscapes Key viewpoints Residential properties	High	Depends on ZVI and landscape character	Expert knowledge and experience	High
Habitat and species loss/disturbance	Substation Cables OHL	CD	Protected sites Protected species LBAP habitats and species	High	Substation and grid connection route	Expert knowledge and experience	High
Damage/loss of archaeological remains and site	Substation Cables OHL	CD	Scheduled Monuments Prehistoric remains Listed buildings NMRS sites	High	Substation and grid connection route	Expert knowledge and experience	High
Land Use (land take)	Substation Cables OHL	CD OD	Agricultural land Recreational land Development land	Moderate	Substation and grid connection route	Expert knowledge and experience	High
Hydrological effects (water pollution)	Substation Cables OHL	CD	Watercourse Groundwater	Moderate	Substation and grid connection route	Expert knowledge and experience	High

C20.9 Mitigation Measures

Where transmission lines, overhead or underground, are required a comprehensive route selection study is typically followed. The process by which transmission lines are developed goes some way to addressing their potential environmental effects by ensuring the route selected causes the least disturbance to people and the environment. This is balanced with technical and economic feasibility.

Within the UK the energy supply industry follows a broad set of principles, the 'Holford Rules' which set out best practice for the routeing of transmission lines. The guidance is primarily concerned with reducing the visual impact of overhead lines by careful routeing. A note produced by National Grid, the network operator in England and Wales, 'Supplementary Notes for the Routeing of New High Voltage Transmission Lines' modernises the guidance contained within the 'Holford Rules'.

In Scotland both SHETL and SPT have adopted their own preferred routeing practice however these are both largely derived from the 'Holford' Rules and the National Grid 'Supplementary Notes for the Routeing of New High Voltage Transmission Lines'. The approach to routeing focuses on establishing a number of potential routes or route corridors and identifying the route that has the least impact.

The following is a summary of the 'Holford Rules' and material considerations made during the route selection process:

- Avoid altogether, if possible, the major areas of highest amenity value i.e. SPAs, SACs, SSSIs, NSAs, SAMs, Gardens and Designed Landscapes.
- Avoid smaller areas of high amenity value or scientific interest by deviation. This includes areas identified on local or structure plans as having high local or regional amenity value.
- All things being equal, choose the most direct line with no sharp changes of direction. Deviations require large angle towers and thus fewer changes of direction will result in fewer large structures. Where such structures are required they should be located as inconspicuously as possible.
- Choose hill and tree backgrounds in preference to sky backgrounds wherever possible. Where the line has to cross a ridge secure the opaque background as long as possible and cross obliquely when a dip in the ridge provides the opportunity. Where it does not, cross directly, preferably between belts of trees.
- Prefer moderately open valleys with woods where the views of line will be broken by trees.
- Utilise the background and foreground features to reduce the apparent height and domination of structures from the main viewpoints.
- Minimise the exposure of the number of towers on prominent ridges and skylines.
- Protect existing vegetation, including woodland and hedgerows and safeguard visual and ecological links with the surrounding landscape.
- Avoid a 'wirescape' situation.
- Approach urban areas through industrial zones where they exist.
- When a line is required to pass through a development area, route it so as to minimise the effect on potential receptors and take into account the amenity of potential receptors.

Table C20.5 below provides a summary of standard practice mitigation measures that could be implemented to reduce, offset or prevent the predicted environmental effects associated with the onshore grid connections, including the Holford Rules. It should be noted that these mitigation measures relate to generic environment effects. In most cases, planning applications for the development of overhead transmission lines will be subject to Environmental Impact Assessment (EIA). This will lead to the development of project and route specific mitigation.

Table C20. 5: Mitigation Measures – Onshore Grid Connection

Potential Effect	Development Phase	Standard Mitigation
Landscape and visual intrusion from substation and OHL	Construction and operation	▪ Apply 'Holford Rules' principles for routeing OHLs ▪ Avoid designated/sensitive landscapes, sensitive receptors (local residents) and key viewpoints ▪ Provide screening (at source or receptor) ▪ Avoid routeing OHLs in elevated/prominent/exposed ridges and skylines ▪ Set OHL routes against backdrops of landform/buildings ▪ Design substation to integrate into surrounding landscape ▪ Avoid historic gardens ▪ Select direct routes for OHLs, avoid sharp deviations in route ▪ Utilise industrial areas when routeing through built up areas
Habitat and species loss/disturbance	Construction	▪ Avoid protected sites and species (and associated habitat) ▪ Avoid LBAP habitats and species ▪ Translocate protected species if no alternative locations available ▪ Ensure native species are used in screening
Damage/loss of archaeological remains and site	Construction	▪ Avoid known areas of archaeological potential/Scheduled Monument sites/NMRS sites ▪ Avoid areas that contribute to the setting of Scheduled Monuments and Listed Buildings ▪ Consult with Historic Scotland and undertake field surveys/geophysical surveys if proposing development in areas identified has having potential for archaeological remains ▪ Investigate ground disturbed during construction
Land Use	Construction and operation	▪ Avoid productive agricultural land ▪ Avoid areas of importance for recreation ▪ Undertake compensatory planting if trees/woodland areas effected
Hydrological effects	Construction	▪ Implement appropriate construction techniques to prevent polluted surface water runoff entering main watercourse e.g. use oil interceptors and silt traps in construction area ▪ Undertake appropriate surveys to determine depth of groundwater aquifers

C20.10 Likelihood of Occurrence

Based on expert knowledge and experience, it is widely accepted that a large number of the potential effects on ecology, historic environment and hydrology can be avoided through careful routeing and substation site selection exercises and implementation of standard construction codes of practice. Whilst it is important to note that there are no guarantees that the mitigation measures identified above will be implemented, current planning controls and increased public awareness of environmental effects places increased pressure upon developers to conform with the requirements for environmental protection.

With regard to land use, the likelihood of land take is high, especially for overhead transmission lines. Depending upon the length of the route the range of landowners, and types of land uses effected is generally quite extensive.

Landscape and visual effects associated with overhead transmission lines are highly likely to occur in any location.

C20.11 Confidence and Data Gaps

C20.11.1 Understanding the Effects of Onshore Grid Connections

With regard to onshore grid connections, there is already a great deal of understanding and knowledge about the likely environment effects that may occur. The confidence in the assessments made on this SEA topic is therefore considered to be high.

C20.11.2 Baseline Data Gaps

Whist at this strategic level of assessment it has not been possible to accurately establish a baseline situation for each of the identified potential receptors, there are established sources of baseline information and methods/approaches for obtaining additional data about the terrestrial environment. Any detailed baseline data that will be required to inform the assessments at the device deployment stage can be collated from recognised site and project specific desk-based and field surveys.

C20.11.3 Grid Capacity and Potential for Future Grid Connections

There are three potential areas of data/knowledge gaps relating to the national grid and grid connections. These include:

- Knowledge on future grid capacity, where capacity will be increased and when capacity will be increased
- Understanding of where connections into the grid can be best accommodated and whether provision will be made in the future to extend the grid network in some areas to increase its accessibility
- Knowledge/understanding on opportunities for developers of marine devices to share grid connections e.g. development of hubs, and what scope there is for developing incentives to encourage developers to share grid connections

The current capacity of the grid, and opportunities for increasing its capacity has been identified as critical to enabling the future development of marine devices. Identification of opportunities to improve accessibility of the grid in certain locations along the Scottish coast is also a high priority.

C20.12 Residual Effects

Table C20.6 below identifies the likely residual effects that onshore grid connections will have on the environment taking into account successful implementation of the mitigation measures identified in Table C20.5. The level of confidence in the assessments made is also provided.

Table C20. 6: Potential and Residual Significance of Effect

Potential Effects	Device Characteristics	Development Phase	Receptor	Potential Significance of Effects WITHOUT mitigation	Industry Good Practice Mitigation	Likelihood of Occurrence	Residual Significance of Effects WITH Mitigation	Confidence
Landscape and visual intrusion from substation and OHL	Substation OHL	CD OD	Designated landscapes Key viewpoints Residential properties	High	See Table C20.5	High	Moderate	High
Habitat and species loss/ disturbance	Substation Cables OHL	CD	Protected sites Protected species LBAP habitats and species	High	See Table C20.5	Medium	Low	High
Damage/ loss of archaeological remains and site	Substation Cables OHL	CD	Scheduled Monuments Prehistoric remains Listed buildings NMRS sites	High	See Table C20.5	Medium	Low	High
Land Use (land take)	Substation Cables OHL	CD OD	Agricultural land Recreational land Development land	Moderate	See Table C20.5	Medium	Low	High
Hydrological effects (water pollution)	Substation Cables OHL	CD	Watercourse Groundwater	Moderate	See Table C20.5	Low	Negligible	High

Due to the highly strategic nature of the assessment of onshore grid connections, it has only been possible to identify generic environmental effect for a wide range of receptors. It has not possible to determine geographically specific effects. Therefore, all of the effects discussed previously should be taken into account when deploying marine devices in any part of the SEA study area.

Future developments will be required to undergo an Environmental Impact Assessment (EIA). Project and site specific mitigation will be developed as part of this to ensure that the residual effects identified in Table C20.6 above are achieved or reduced further (e.g. landscape and visual effects).