machinery does not destroy soil structure and drainage properties. Where sensitive habitats are encountered it is difficult to reinstate the habitat to its original condition. There are also issues with controlling site drainage to ensure sedimentation of watercourses does not occur. Underground cables can also have an impact on the landscape on a short to medium term basis particularly where small holdings and significant hedgerows are encountered which can take several years to reinstate. Construction of underground cables may involve significant direct impacts on archaeological heritage.

8.6.3 Construction of New Substations and Extension of Existing Substations

The construction of new substations can have a significant impact particularly where the area is undeveloped. Site selection needs to ensure sensitive landscapes and habitats are avoided. Opportunities for natural screening from topography and vegetation should be maximised and used wherever possible as this will provide the best opportunity for integrating the facility into the existing landscape.

It will be important to ensure that substations are not located within the floodplain of major watercourses, which could impact on the access and functioning of the substation. It will also be important to ensure the location of any new substation is not within or adjacent to designated conservation sites and that sensitive habitats are avoided.

Where existing substations need to be extended it will be important to ensure the extension does not impact on any nearby built up areas and that the extension is appropriately designed to ensure adequate integration with the existing environment. The scale of the extension should be suited to the surrounding area and should not be inappropriate given the size of the existing facility and its surroundings.

8.7 Strategic Objectives

	Likely to **Improve** status of SEOs	Probable **Conflict** with status of SEOs- unlikely to be mitigated	Potential **Conflict** with status of SEOs- unlikely to be mitigated	**No Likely** interaction with status of SEOs
1. The Grid Development Strategy of Grid25 (pp 21-22) notes that, in consideration of line capacity of new transmission lines, there will be a positive presumption towards building new transmission lines at 400 kV and at 110 kV.	In General: C1 Building at 400 kV rather than 220 kV: **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**		In General: **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1** Building at 400 kV rather than 220 kV: **B1 B2 B3 L1 CH1**	
The building of new transmission lines would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). The building of transmission lines potentially conflicts with the protection of various environmental components (ecology - **B1 B2 B3** -, the landscape - **L1** -, cultural heritage - **CH1** -, human health - **HH1** -, water resources - **W1 W2** - and land resources - **MS1**) however such conflicts would be mitigated by measures which have been integrated into the IP through the SEA (see Section 9). Note that while cutting and maintaining clearways through woodland habitats in particular, can adversely impact upon habitats, ecological connectivity and breeding birds it can also be beneficial for certain species through enhancing the edge effect and providing early successional habitats in the cleared space. Building at 400 kV rather than 220 kV avoids the need for building a multiplicity of 220 kV lines and affects the environment less frequently, at fewer locations (**B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**). The development of 400 kV lines gives rise to marginal increases over 220kV in visual effects and effects on flight paths (**B1 B2 B3 L1 CH1**)				
2. In the longer term, it may be appropriate to upgrade the 220 kV network to 400 kV, for similar reasons of efficiency and capacity. EirGrid will examine each case as the need to upgrade arises, and will consider the option of using a higher capacity conductor at 220 kV or rebuilding at 400 kV.	**C1** **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**		**B1 B2 B3 L1 CH1 HH1 W1 W2**	
Utilising the existing network would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). Utilising the existing network would help prevent the unnecessary development of new lines and would contribute towards the protection of the environment by preventing associated impacts (**B1 B2 B3 L1 CH1 W1 W2 MS1**).				
3. By utilising the existing network where possible to avoid building new overhead circuits. In many cases re-utilising the existing network is more costly than building new circuits but results in less impact on the environment;	**C1** **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**			
Up-rating lines would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). Up-rating lines would help prevent the unnecessary development of new lines and would contribute towards the protection of the environment by preventing associated impacts (**B1 B2 B3 L1 CH1 W1 W2 MS1**).				
4. Seeking to up-rate existing lines by using a higher capacity conductor, where appropriate, to avoid the need for major structural changes and so to minimise security issues;	**C1** **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**			
Up-rating lines would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). Up-rating lines would help prevent the unnecessary development of new lines and would contribute towards the protection of the environment by preventing associated impacts (**B1 B2 B3 L1 CH1 W1 W2 MS1**).				
5. Where the required increase in capacity cannot be achieved through a new conductor, considering upgrading the circuit to a higher voltage;	**C1** **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**			
See comments under **4.** above.				

	Likely to **Improve** status of SEOs	Probable **Conflict** with status of SEOs- unlikely to be mitigated	Potential **Conflict** with status of SEOs- unlikely to be mitigated	**No Likely** interaction with status of SEOs
6. Where appropriate, considering replacing an existing single-circuit line with a double circuit line to provide the required additional capacity; while this is a more costly option, and less reliable than having two separate lines, it avoids building a new line on a separate route;	**C1** **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**			
Providing additional capacity would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). Double circuit lines would help prevent the unnecessary development of an additional line and would contribute towards the protection of the environment by preventing associated impacts (**B1 B2 B3 L1 CH1 W1 W2 MS1**).				
7. In limited circumstances, putting certain 110 kV circuits underground to minimise the impact of new build in a region. This will be considered, for example, in areas where there is congestion of urban development, a multiplicity of overhead lines, a relatively wide expanse of water or an area of unique natural beauty;	**C1 B1 B2 B3 L1 HH1 MS1**		**B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**	
Transmission development would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). Undergrounding cables would be more likely to adversely affect landscape and land use (in the short term), ecology (with the exception of flight paths), cultural heritage – especially archaeology – and water resources (**L1 B1 B2 B3 CH1 W1 W2 HH1 MS1**) than over-grounding, some of these conflicts would be mitigated by measures which have been integrated into the IP through the SEA (see Section 9). Undergrounding cables would minimise effects upon flight paths for wild birds, would be likely to contribute towards the protection of the landscape and land use (in the long term) and could reduce actual and perceived effects on health (**B1 B2 B3 L1 HH1**).				
8. Examining the potential for using HVDC technology for certain applications where appropriate, for example such as transporting high volumes of power over long distances;	**C1 L1**		**B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**	
Transmission development would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). HVDC technology requires fewer conductors than AC technology and therefore its use would result in a reduced extent of visual effects (L1). Potential conflicts would be the same as with AC lines; with the protection of various environmental components (ecology - **B1 B2 B3** -, the landscape - **L1** -, cultural heritage - **CH1** -, human health - HH1 - water resources - **W1 W2** - and land resources - **MS1**); and, such conflicts would be mitigated by measures which have been integrated into the IP through the SEA (see Section 9).				
9. Considering the appropriateness of new tower designs and other mitigating measures outlined in the Government-sponsored report on "The Comparative Merits of Overhead Electricity Transmission Lines Versus Underground Cables" in order to minimise the landscape and visual impact of necessary infrastructure, and taking account of the National Landscape Strategy when published.	**C1 B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**			
The mitigation outlined in the cited document would contribute towards the protection of the various environmental components.				

8.8 Interconnection

	Likely to **Improve** status of SEOs	Probable **Conflict** with status of SEOs- unlikely to be mitigated	Potential **Conflict** with status of SEOs- unlikely to be mitigated	**No Likely** interaction with status of SEOs
1. EirGrid is currently developing the 500MW East-West Interconnector between Ireland and Wales. This has a scheduled completion date of 2012. It is therefore assumed that the island of Ireland will have, as a minimum, some 900MW of interconnection with the United Kingdom.	Direct interaction **C1** By removing the need to develop an extent of power generation capacity **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**	Unavoidable effects on the landscape	Direct interaction **B1 B2 B3 CH1 HH1 W1 W2 MS1** Indirectly, by facilitating the development of renewable energy infrastructure, which are provided for by land use planning policies including those from the NSS, NDP and lower tier Regional and County Plans	
2. EirGrid and Northern Ireland Electricity (NIE) are currently progressing the planning of a second major interconnector between the Republic of Ireland and Northern Ireland.				

Background

In response to the Government White Paper "Delivering a Sustainable Energy Future for Ireland" 2007, EirGrid has carried out an assessment - the findings of which are presented in the Interconnection Economic Feasibility Report [97] - of the costs and benefits of additional interconnection between the island of Ireland and the UK and France (in addition to the existing Moyle Interconnector and the East-West Interconnector currently under construction by EirGrid between Ireland and Wales).

The Interconnection Economic Feasibility Report analyses the feasibility and requirement for additional interconnection from an economic perspective having regard to the environmental related criteria of achieving higher level international and European non-spatial, thematic requirements relating to energy supply and climate change which are the subject of the Governments White Paper, setting out a framework to deliver a sustainable energy future for Ireland.

In carrying out the assessment, EirGrid has examined a broad range of scenarios such as the likely required number of interconnectors, different fuel prices and different generation portfolios. The report concludes that enhanced interconnection between the all-island grid and other grids has the potential to deliver numerous benefits to the island of Ireland.

Key messages to emerge from the assessment in the Interconnection Economic Feasibility Report are:

a) The report reinforces the very strong economic case for the East-West Interconnector, currently under development.

b) A further (third) 500MW interconnector between the All-island system and Great Britain is economically attractive by 2020, and more so in 2025.

c) A fourth 500MW interconnector between the All-island system and Great Britain is economically feasible by 2025 in some scenarios, such as High Renewables.

d) A 500MW and 2 x 500MW interconnection between AI and France was modelled in 2015, 2020, and 2025. These studies indicated high capacity factor for the Ireland-France interconnector, and corresponding reductions in production cost. However, these results need to be corroborated by more detailed modelling before any recommendations could be made on Ireland - France interconnection.

e) In general, interconnection becomes more economically attractive further out in time. A High Renewables scenario improves the case for interconnection.

f) The incremental benefits of interconnection decrease with each subsequent interconnector.

g) The production cost savings that are evaluated in this report are the total benefits to both sides; savings are not apportioned between the parties. EirGrid recommends that there is engagement with responsible agencies on the island of Ireland and abroad to create a framework for funding of new interconnectors.

[97] Interconnection Economic Feasibility Report, EirGrid, November 2009, available at www.eirgrid.com

Likely Significant Effects

Interconnection - as referenced in the IP and provided for by EirGrid's Grid25 Strategy/EirGrid's Transmission Development Plan - would:

- Improve competition – by linking to other European markets;
- Support the development of renewable power generation – by enhancing the flexible exchange of power flows over a large area of the island of Ireland. This would enable the connection and operation of larger volumes of renewable power generation (especially wind powered generation) throughout the island;
- Improve security of supply – by providing a dependable high capacity link between the transmission systems of Ireland and other countries.

By doing this, interconnection would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies including decreasing Ireland's dependence on fossil fuels, improving energy and security and reducing greenhouse gas emissions (C1).

Although interconnectors from Ireland would be likely to result in potential transboundary environmental effects, it is not possible to identify the spatial location of these effects in this assessment due to the strategic nature of the IP and other policy documents.

The development of interconnectors potentially conflicts with the protection of various environmental components (ecology - **B1 B2 B3** -, cultural heritage - **CH1** -, human health - HH1 - water resources - **W1 W2** - and land resources - **MS1**) however such conflicts would be mitigated by measures which have been integrated into the IP through the SEA (see Section 9) e.g. the ongoing co-operation in preparation of Renewable Energy Generation Guidelines and Strategies (see mitigation measure no. 6 in Section 9.7) and the preparation of a high level plan for high level transmission requirements taking into account likely offshore and onshore constraints and corresponding opportunity areas (mitigation measure no. 7 in Section 9.8).

The SEA Directive requires the identification of a range of environmental effects including those which are indirect. The development of any marine interconnector will present a range of potential environmental conflicts; currently available offshore environmental data is not sufficiently complete to facilitate a comprehensive evaluation of likely impacts to the transition zone between terrestrial and marine environments. Mitigation measures contained in Section 9 of this Report provide for the integration of environmental considerations into the development of any marine interconnector in the future; the Environmental Appraisal Report which accompanies the next TDP shall take into account maritime mapping and issues as emerging from the Offshore Renewables SEA (Section 9.6); and, a high level plan shall be prepared for high level transmission requirements taking into account likely offshore and onshore constraints and corresponding opportunity areas (Section 9.8). In considering spatial strategies for connecting terrestrial and marine grids there should be consideration of the likely general compatibility between onshore and offshore environments. Figure 9.1 on Page 143 illustrates a qualitative indication of potential, general locations for land/sea connections where there are less sensitive onshore environments in the vicinity of coasts. This qualitative indication was determined by the sensitivity of onshore environments in the vicinity of coasts, as illustrated by the Overall Development Potential Rating mapping [98] for the various regions [99] to which Grid25 relates (see Figures 4.23 to 4.26) as well as relevant corresponding data - including that relating to landscape and ecological constraints - for Northern Ireland. It would be useful if offshore grids generally aimed to make landfall in these areas and it would be desirable for such decisions to consider comparable, equivalent on-shore and offshore data.

Any consideration of alternative routes/locations for land/sea connections will be required to consider spatial and environmental alternatives at the next level of environmental assessment - i.e. that of lower tier plans, multiple or individual projects - as is required by mitigation measure EMM4 under Section 9.5 which has been integrated into the IP.

Indirectly, the development of interconnectors would be likely to potentially conflict with the various environmental components (**B1 B2 B3 CH1 HH1 W1 W2 MS1**) as it would facilitate the development of renewable energy generation infrastructure, which are provided for by land use planning policies including those from the NSS, NDP and lower tier Regional and County Plans. There would be unavoidable impacts upon the landscape (**L1**) some of which would be mitigated.

Also, the interconnectors identified under 1. and 2. above, and potential future additional interconnectors, could play a significant role in internationalising the Irish energy market, and in facilitating the anticipated high levels of renewable generation on the island, by providing a means to export excess generation when output from renewable generation is high, and to import power when it is low. By allowing the importing of power while renewable generation is low, interconnectors would remove the need to develop an extent of power generation capacity and would therefore prevent certain potential conflicts with various environmental components (**B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**).

[98] The Overall Development Potential Rating combines mapping of environmental constraints associated with the development of the transmission system with opportunity areas which represent potential opportunities to develop transmission infrastructure with a reduced environmental impact.

[99] The Border Region, the Midlands Region, the South-East Region, the West Region, the Mid West Region, the South-West Region and the Dublin and Mid-East Regions.

8.9 Infrastructure Required to strengthen the National Transmission Network

The estimates listed below have been made regarding the provision of infrastructure required to strengthen the National Transmission Network, in accordance with Grid25.

	Likely to **Improve** status of SEOs	Probable **Conflict** with status of SEOs- unlikely to be mitigated	Potential **Conflict** with status of SEOs- unlikely to be mitigated	**No Likely** interaction with status of SEOs
1. Approximately 828 km of new circuits will be required between now and 2025 to meet the needs of consumers and generators. This represents an increase of about 14% on the total length of the existing network. Of this, 568 km will need to be at 400 kV, 92 km will need to be at 220 kV or higher; the remaining 150 km will be at 110 kV. In addition to these circuits, others will be needed to connect many of the new generators to the Grid	**C1**	**C1**	**B1 B2 B3 HH1 CH1 W1 W2 MS1**	
Overall evaluation The development of new circuits would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). The development of new circuits potentially conflicts with the protection of various environmental components (ecology - **B1 B2 B3** -, cultural heritage - **CH1** -, water resources - **W1 W2** - and land resources - **MS1**) however such conflicts would be mitigated by measures which have been integrated into the IP through the SEA (see Section 9). There would be unavoidable impacts upon the landscape (**L1**) some of which would be mitigated.				
2. 2,530 km of the existing transmission network will need to be upgraded between now and 2025 to provide greater capacity. This comprises 740 km, or 29%, of the existing 220 kV network, and 1,790 km of the 110 kV network.	**C1** **B1 B2 B3 L1 CH1 HH1 W1 W2 MS1**		**B1 B2 B3 L1 CH1 HH1 W1 W2**	
Overall evaluation Upgrading lines would help to facilitate the achievement of higher level government targets contained in higher level national and international energy and greenhouse gas emission policies (C1). Upgrading lines would help prevent the unnecessary development of new lines and would contribute towards the protection of the environment by preventing associated impacts (**B1 B2 B3 HH1 L1 CH1 W1 W2 MS1**). Upgrading lines could involve the replacing of existing towers with taller, wider towers and this could potentially result in the disturbance of habitats and waters and in a greater extent of: visual effects; effects on flight paths; and, actual and perceived effects on health (**B1 B2 B3 L1 CH1 HH1 W1 W2**). However, such conflicts would be mitigated by measures which have been integrated into the IP through the SEA (see Section 9).				