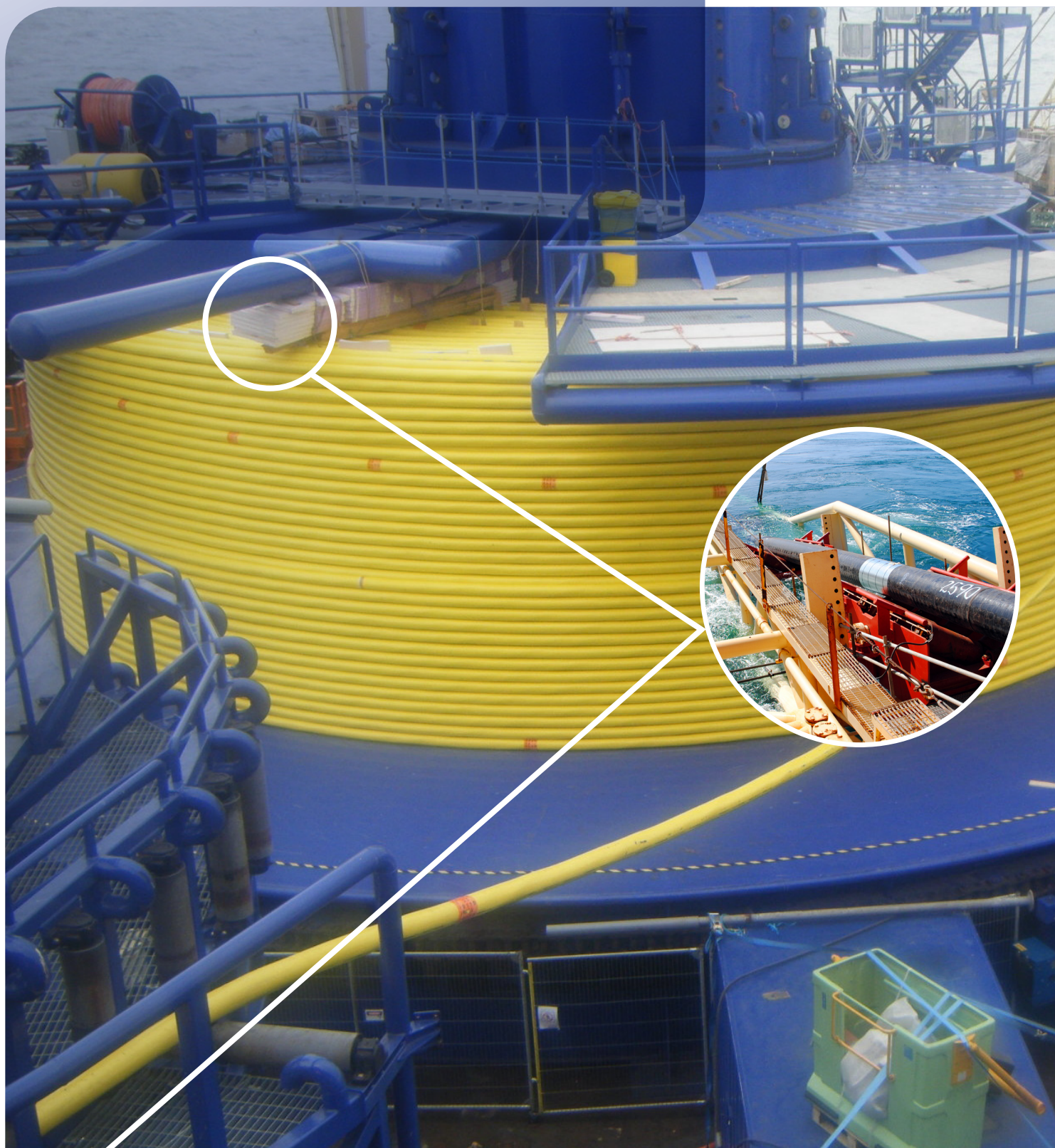
National Grid NSN Link Limited

Norway-UK Interconnector

UK Marine Environmental Statement

Non Technical Summary

March 2014



1 Introduction

National Grid NSN Link Limited (NGNSNLL) and Statnett SF (SSF) are jointly developing an electrical high-voltage direct current (HVDC) interconnector between Norway and the United Kingdom. This is a major international electricity project that will facilitate the cross-border trading of electricity between the two countries and is referred to as the Norway – UK Interconnector project. The proposed route would enable power to flow in either direction at different times, depending on the supply and demand in each country. The proposed route would run from Hylen, in southwest Norway, to the Northumberland coast in northeast England.

Figure 1.1 provides an overview of the location of the proposed marine cable route and the landfall location. This non-technical summary presents the findings of the environmental assessment for the marine cable route within UK waters from the UK/Norway median line to mean high water springs (MHWS) on the Northumberland coast; approximately 340km.

1.1 The need for the project

The European Union (EU) has a target to increase the transmission capacity between its member states, with the stated wish to see each country establish an interconnector capacity of around 10% of its own installed generation capacity.

The reasons for this policy are:

- To allow a more efficient energy market within the EU.
- To facilitate the sustainable development of the electricity sector by increasing opportunities for clean and efficient generation.
- To make it easier to exploit intermittent renewable electricity resources in the UK and Continental Europe.

The key benefits of the Project are:

- To allow energy to flow in either direction between the UK and Norway benefitting both countries by ensuring a secure and affordable energy supply.
- To contribute to managing fluctuations in supply and demand as more power is generated by renewable sources and therefore indirectly providing better opportunities for development of renewable energy projects in both countries.
- To increase the potentials for the UK to trade with the wider power markets.

The interconnector is a cornerstone in the network development plans for the countries surrounding the North Sea basin, and is of high priority. The interconnector will contribute to further integration of North-European power markets, hence buoying the ambitions for increased renewable energy production in the whole region and thereby supporting the EU's 2020 goals.

The Norway-UK interconnector would be the first electrical cable connecting the UK to Norway. The interconnector with a planned capacity of up to 1,400 MW is expected to be completed by 2020. When completed, it will be the world's longest subsea power cable.

1.2 The Proposed Development

1.2.1 The Developer

National Grid NSN Link Ltd is a wholly owned subsidiary of National Grid plc, a major UK company which owns and manages gas and electricity infrastructure in the UK and in the north eastern US.

Statnett SF is responsible for developing and operating the Norwegian power transmission system. It owns and operates several interconnectors to other countries.

1.2.2 The Project

The Project consists of two 714km HVDC marine cables linking southwest Norway to the Northumberland coast, northeast England, UK. Due to the distance of the overall cable length, the use of HVDC provides the most technically efficient and effective means to transport electricity. The high voltage grid systems in the Norway and the UK operate using high voltage alternating current (HVAC). A direct HVAC connection is not feasible due to inefficiencies resulting from the distances involved. To transport electricity from one country to the other first requires the HVAC to be converted to HVDC at the transmitting end and transmitting the power using HVDC cables, before being converted back to HVAC at the receiving end. This conversion process is carried out at converter stations which will be located at Hylen in southwest Norway and Cambois Beach North close to Blyth in the UK.

1.2.3 Scope of UK Marine EIA

This Environmental Report (ER) presents the environmental assessment for the marine cable route within UK waters from the UK/Norway median line to mean high water springs (MHWS) on the Northumberland coast; approximately 340km. It is part of a suite of other environmental documents for the Norway – UK Interconnector Project, which cover the following elements:

- The Norwegian onshore elements
- The Norwegian offshore elements
- The UK onshore elements
- Bridging / Cumulative Report providing an overview of the entire project.

The offshore cable route was selected using desk top study and geographical information to map the constraints and compare alternatives. Actual conditions were then verified by a full seabed environmental, geotechnical and geophysical survey. The survey confirmed the proposed marine cable route and no major modifications were required.

The subsea cable system is jointed to its corresponding land cable in a joint pit located above mean high water mark and does not form part of this

assessment. The consent for this part of the Project will form part of the planning application for the UK onshore elements.

1.3 Environmental Impact Assessment (EIA) Methodology

1.3.1 Description of methodology

Although not statutory, a full Environmental Impact Assessment (EIA) has been carried out for the proposed development in order to allow regulators to satisfy their obligations under European law (in particular in respect of the requirements for Appropriate Assessment under the EC Habitats Directive) to achieve a marine licence. The findings of the EIA are presented in the ER which accompanies the marine licence application.

The EIA has been carried out taking into account The Marine Management Organisation (MMO) guidance notes 1, 2, 8 and 10. As with many large infrastructure projects it is often impractical to provide full details of installation activities at the time of the EIA. The detail of the project is often dependent on procurement of engineering options which will only commence once consent has been granted and contractors appointed.

The approach is based on assessing the potential impacts of a "realistic worst case scenario", under which the assessment of the proposed development is defined by an "envelope" of theoretical constraints. For example, although the burial equipment for cable cannot yet be specified, its "envelope" can be defined by a maximum footprint in respect to disturbance of the seabed (e.g. width of burial machine, width of burial trench and depth of burial). In this way, the design of the proposed development can vary within these maximum parameters without rendering the EIA findings invalid. Any subsequent consent would incorporate these parameters into its conditions, thereby ensuring that the scheme consented is that which has been assessed in the EIA. Where details of the proposed development cannot be finalised ahead of the submission of the ER the Rochdale principle has been applied. This approach allows the need for flexibility in scheme design to be balanced with the need to define design parameters for the purposes of environmental assessment.

The aim of the EIA has been to integrate environmental considerations in to the design process. This has primarily been achieved through the feasibility, desktop and cable route studies which sought to avoid or reduce environmental disturbance in the development of the project through careful site selection and routing.

Consultation with stakeholders and the public have been conducted to provide the scope of the EIA. Communication and consultation is a key element of the EIA process. It allows stakeholders and the public to be fully informed and engaged in the evolution of the development proposal.

This process also ensures that any concerns relating to the Project or ideas on how it should progress are considered. Consultation with stakeholders has been undertaken throughout the route selection and definition process, and comments were received from statutory and key consultees on the scope of EIA required for the proposed development via a Scoping Report.

Consultation activities undertaken include:

- Direct consultation meetings
- Consultations with the fishing industry via an experienced Fisheries Liaison Officer
- Public exhibitions (Blyth)

The scope considers the potential temporary and permanent impacts of installation and operation of the proposed marine cables. Scoping allows the approach to the EIA to be identified and considers the aspects of the environment to be included within the ER.

In conducting the EIA, the determination of the significance of impacts has been assessed by considering the sensitivity and importance of the receptor together with the magnitude of the impact. The magnitude of the impact considers the likelihood of the impact occurring, the spatial extent, the level of change and the duration of the impact. Any impacts considered significant will be mitigated by avoidance of the receptor or applying best practice principles to reduce the impact. Any impacts remaining, after mitigation has been applied, are considered to be the residual impact. No significant residual impacts have been identified for the Norway-UK Interconnector within UK waters.

Impacts have been assessed for the installation and operational phases of the project. The Norway-UK Interconnector has a design life of 40 years and the final requirements and impacts of decommissioning the marine cables would be assessed towards the end of this period.

Cumulative effects may arise, where for example ecological receptors or other marine users are affected by other developments in addition to the Norway-UK Interconnector. The cumulative effects have been considered for the UK section of the project in this ER. The Bridging / Cumulative Report provides an overview of the impacts of the entire project.

1.4 Cable Type / Installation

The sections below give an outline description of the cable system and its installation.

1.4.1 Cable type

Mass impregnated (MI) cable is currently the only type of cable used to date for long (over 50km), high capacity (greater than 1GW HVDC) submarine links. The Norway-UK Interconnector will transmit approximately 1.4Giga watt (GW) using a bipole system (+550 kV and – 550 kV). Each cable is approximately 150mm in diameter, and weighs approximately 60kg/m.

MI cables have a copper core, are insulated by MI paper (or alternatively MI polypropylene paper laminate (PPL)) and are protected by steel cable armoring. The cables will be installed separately (approximately 50m apart) which is intended to offer a degree of protection from both cables being damaged in one incident. In the approach to the landfall the last 200m will be separated by approximately 20m.

1.4.2 Route Preparation

Prior to the marine cable installation the appointed contractor will conduct a pre-installation route survey. This will involve using a range of standard geophysical

survey techniques such as multi-beam echo-sounder, side-scan sonar, sub-bottom profiler and magnetometer. The main objectives of the survey will be to:

- Confirm the results of the proposed marine cable route surveys and ensure that there are no new engineering constraints (e.g. debris).
- Optimise the marine cable route in areas of mobile sediments (i.e. sandwave fields).
- Identify exactly the locations of the engineering constraints and/or safety hazards, such as the cables, wrecks, reefs, unexploded ordnance etc.

Any modifications to the proposed marine cable route will be developed to minimise environmental impacts within the cable route corridor and to optimise cable protection by ensuring adequate burial. The width of the cable corridor will allow for micro-routing while installation is taking place.

1.4.3 Route Clearance

Prior to the start of marine operations it is essential to ensure the marine cable route is clear of obstructions that may hinder the operation. Two significant preparation activities are likely to be undertaken prior to installation of the cable system. These are:

- Clearance of seabed debris, such as scrap trawler warps or ships crane wires, abandoned communications cables.
- Preparation and deposit of bridging and separation structures for crossings over existing cables and pipelines.
- Any debris encountered will be recovered to the deck of the route clearance vessel for appropriate licensed disposal ashore. Should any unexploded ordnance be discovered during this process, a registered Explosives and Ordnance Disposal (EOD) specialist will be available during the installation process to identify any suspicious items and provide advice on appropriate remediation.
- Pre-sweeping may be required in areas of sandwaves to enable burial techniques to be employed effectively. Sandwaves identified along the route, are very small, with a magnitude of 0.75m. This may indicate that pre-sweeping is not necessary. In the event that pre-sweeping is employed this would involve either dredging a passage through the sandwave or ‘clipping’ off a part of it to give a smoother overall profile to allow the installation tool to reach the desired burial depth.

1.4.4 Cable Installation

It is proposed to bury the marine cables to a depth between 1m – 2m by jetting machine for the majority of the marine cable route (80-90%) In the intertidal area the cable will be installed by a mechanical trenching machine. Mechanical trenching may also be used in the very stiff clay or very coarse cobble-rich gravel of firm to stiff clay found along short sections of the route. Where the target burial is not possible, for example at crossings with existing cables or pipelines, cable protection measures will be used (rock placement).

During installation a 500m by 1000m safety zone will be established around the installation vessels and the spread will be assigned guard vessels to reduce any impact on shipping and navigation. A variety of vessels will be deployed:

Cable lay vessels will deposit the cables onto the seabed. The vessel will be equipped with specialised equipment including cable tensioners and turn-tables, a full survey suite is provided to accurately detail the final cable position on the seabed.

- **Cable lay barge** will be used in shallow water to lay and bury the cables at the landing, depending on the installation technique selected by the contractor. The vessel will use anchors for positioning, and be equipped with specialised equipment including cable tensioners, cable burial tools and a full survey suite to provide accurate details on the final cable positions. Burial work may take place simultaneously or a short time after the laying operation.
- **Cable burial vessel** may be used to bury the cables using a variety of equipment depending on the seabed conditions encountered along the route and based on environmental factors. This work may take place simultaneously or a short time after the laying operation. The vessels will use dynamic positioning.
- **Guard vessels** are often local fishing vessels commissioned specifically for the purpose of ensuring cable laying operations occur safely and with minimal interaction with/disruption to local fishing/shipping activity.
- **Supply vessel** one or more local, non-specialised vessels may be used for re-supply of installation vessels and to provide logistical support.

1.4.5 Cable Joints

As a cable lay vessel or barge cannot carry the entire quantity of cable required for the marine cable route, it will be necessary to install the cable in several sections. Joints will be required to join each section of cable. It is expected that up to 5 offshore joints will be required for the proposed development within UK waters. The appointment of an installation contractor will take place once consents for installation and operation of the proposed development have been secured.

The Norway-UK Interconnector project will ensure that, as far as possible, joints are not located in sensitive areas, e.g. shipping channels, anchoring grounds, where the prolonged location of the installation spread is not desirable, however exact joint locations can only be determined once the cable manufacturer and installation contractor have been appointed.

1.4.6 Cable and Pipeline Crossings

The proposed cable will have 14 crossings with existing cables and pipelines. Crossing agreements will be made with parties owning cables and pipelines which the proposed development will cross, in line with UK Cable Protection Committee (UKCPC) guidance. All parties have been informed about the potential for a cable crossing.

1.4.7 Landfall Installation

Marine burial by jetting of the cable will be possible for approximately 80% of the UK route. In the intertidal area out to approximately 200m, the cables will be buried using trenching with tracked excavators. A trench will be constructed using a conventional excavator, and rollers will be used in the base of the trench to pull the cable along it. The trench will be approximately 1 – 2m wide and the cables will be buried at a target depth of 1.5 - 2m. Mechanical excavators will then be used to bury the cable. A temporary working area will be established as a works compound.

The landfall installation work relates to the construction of the transition jointing pit (TJP) and the intertidal cable installation. The TJP will contain the joint between marine and land cables. The terrestrial EIA will cover the installation of the TJP and other elements above MLW. This assessment considers the UK marine area up to MHWS. Therefore there is some project overlap in the intertidal zone between MLW and MHWS.

The TJP, which will be described in detail in the corresponding onshore planning application, will be constructed from reinforced-concrete and will be situated below ground level and located above the high tide mark. It must be completed well in advance of the cable landing to avoid any delays to the landing operation. It will be necessary to agree temporary access routes to areas such as the beach for installation work to be completed.

1.4.8 Programme

Cable installation schedules are dependent on a number of factors such as the delivery of cable, the availability of cable and the other commitments of the installer. The programme for the commencement of installation has not yet been agreed but it is likely that installation will begin between 2016 and 2018. In general, installations in European waters are undertaken in the summer season, broadly between April and October. This period is determined primarily by the high probability of adverse weather occurring outside of this period. Installation in the nearshore area are also restricted overwinter in order to minimise disturbance to protected bird species.

The schedule will also be affected by factors such as the requirement for any ecological mitigation, cable delivery and the availability of vessels. Installation work in the intertidal areas in the UK and Norway is expected to take less than one week. It is expected that up to five marine cable joints will be required on the entire cable system and each jointing operation will take approximately five days.

1.5 Environmental Baseline and Key Findings

1.5.1 Physical Environment

The EIA describes the existing physical baseline along the proposed marine cable route corridor and considers impacts on: geology; bathymetry; seabed processes; and water quality. Depths along the route range from 0m near the coastline to 100m offshore. The slope gradient is gentle throughout the route and is generally flat throughout the offshore route. Features identified across the route include small sand wave formations, sand ripples, outcropping gravel and large areas of potential pockmarks with no visible gas seepage. Seabed

sediments generally consist of a combination of sands and gravels overlying stiff glacial till. There are places mud is present and colliery waste dumped onto the beaches around Lynemouth and Cambois now forms a component of the offshore sediments.

The EIA concluded that the proposed development would have no significant impacts on the physical environment. The route avoids the key sensitive and important geological area identified, Creswell and Newbiggin Shore Site of Special Scientific Interest (SSSI), by using the same area as the Blyth Demonstration Project electricity export cable. Therefore, impacts on geology are minor.

Any impacts construction may have on bathymetry and water quality are judged to be minor and not significant as the area will recover quickly with no lasting impacts anticipated.

1.5.2 Biological Environment

The intertidal area consists of a gently sloping sandy beach, shaped into low banks and troughs by tidal action. The organisms identified are typical of sandy shores, such as amphipods and polychaetes, and are regularly disturbed by tidal and wave action.

Further offshore the seabed is flat with small depth variations consisting of fine sediments such as clay, silt and sand with occasional areas of coarser sediments. Offshore habitat is largely identified as consisting of 'sea pens and burrowing megafauna in circalittoral fine mud' and 'deep circalittoral sand'. The easternmost section of the cable route consists of sand, mixed sediments and mud and was found to be dominated by annelid worms, and juvenile echinoderms (starfish, brittle star, feather stars, sea cucumbers and sea urchins). In order to avoid impacts upon sensitive and important features of benthic ecology, the cable system has been routed to avoid areas of rocky reef aggregations. Contractors will also be advised of the location of these features to ensure that deployment of anchors can be planned accordingly.

The proposed marine cable route intersects four protected areas; possible Marine Protected Area (MPA) East of Gannet and Montrose; Marine Conservation Zone (MCZ) Swallow Sand; recommended Marine Conservation Zone (rMCZ) Coquet to St Marys; and Northumberland Shore Site of Special Scientific Interest (SSSI). The integrity of the features of conservation importance within the sites is not significantly impacted by the installation of the proposed marine cable route.

The cable landfall is within the Northumberland Shore SSSI, which shares conservation objectives with the Northumbria Coast Special Protection Area (SPA) and Ramsar Site in supporting two species of shorebirds that occur in internationally important numbers: EC Directive 2009/147/EC (Birds Directive) Annex I listed little tern during the breeding season; overwintering populations of turnstone and purple sandpiper; and identifies a further four species occurring in nationally important numbers: sanderling; ringed plover; redshank; and golden plover. Impacts upon the Northumberland Shore SSSI and Northumbria Coast SPA and Ramsar Site's ornithology have been limited by avoiding installation during months of greatest sensitivity.

There are several other important conservation sites within the project area, including, Berwickshire and North Northumberland Coast Special Area of Conservation (SAC), Coquet Island SPA, Teesmouth and Cleeveland Coast SPA, and the Farne Islands SPA and Ramsar Site. Impacts upon these designated sites and ornithology are minimal due to the distance of the installation activities offshore and away from colonies and breeding sites.

The cable route lies within the foraging zones of several protected species from the aforementioned SPAs. Therefore, some SPA species may be present feeding in the vicinity of the cable route, during the summer when foraging occurs closer to the shore within range of breeding colonies, and during winter when marine species such as gannet and guillemot overwinter at offshore locations.

Eight marine mammal species occur regularly over large parts of the North Sea. These are harbour seal, grey seal, harbour porpoise, bottlenose dolphin, white-beaked dolphin, Atlantic white-sided dolphin, killer whale and minke whale. Cetacean numbers in the North Sea peak during the summer months, with harbour porpoise and bottlenose dolphin being sighted more frequently in coastal areas between June and September. Both bottlenose dolphin and harbour porpoise are listed on Annex II of the EC Habitats Directive and are designated as Species of Community Interest (SCI), and are listed on the UK Biodiversity Action Plan (UK BAP) as a priority marine species.

All cetaceans are European Protected Species (EPS) protected under Annex IV of the EC Habitats Directive, which lists species of Community Interest in need of strict protection. It is an offence to deliberately capture, kill, injure or deliberately disturb animals classified as EPS.

The UK has two resident species of seal, grey seal and harbour seal. There are occasional sightings of five other seal species in northern UK waters. In the UK seal species are protected under the Conservation of Seals Act (1970). In Scotland the Marine (Scotland) Act 2010 provides the same protection. Both species of seal are listed on Annex II of the EC Habitats Directive to protect breeding colonies and moulting haul out sites. Harbour seals are a UK BAP priority marine species and have been identified as threatened and requiring conservation action.

The proposed route does not pass in close proximity to any breeding seal haul out locations. The Farne Islands are approximately 53km north of the proposed marine cable route corridor and are a particularly important haul out and breeding area for grey seal and fall within the Berwickshire and Northumberland Coast SAC which has cited grey seal as a primary reason for selecting the area as a SAC. Coquet Island, approximately 20km north of the proposed marine cable route corridor, is also an important grey seal haul out site.

A small breeding population of approximately 20 harbour seals are present during the breeding season at Lindisfarne (approximately 59km north of the proposed marine cable route corridor), and a resident group of five to six harbour seals can be found in the Blyth Estuary approximately 4.5km south of the proposed cable landfall. All impacts to marine mammals during installation and operation have been found to be not significant.

The proposed marine cable route corridor passes through the spawning grounds of ten commercially important fish species; cod, lemon sole, herring,

Norway lobster, plaice, sprat, whiting, Norway pout, mackerel and sandeel. The impact assessment has identified a high intensity nursery ground for herring, cod and whiting within 11km (6nm) of the coast. The key spawning period for these species is over winter in to spring. Therefore the existing seasonal restrictions in the nearshore area for ornithology are likely to assist in minimising the impacts to fish spawning activities.

Sea lampreys and salmon are found in the waters surrounding the cable corridor and are listed under Annex II of the EC Habitats Directive and also on the UK BAP list. Additionally, salmon, cod, plaice and ocean quahog are also listed on the UK BAP list, and salmon, cod, sea lamprey and ocean quahog have been listed on the OSPAR list of threatened and declining species. Salmon, trout, and eels migrate between marine and freshwater environments around the UK to spawn and mature, it is therefore possible that they will be located within the nearshore sections of the cable route. All impacts to fish and shellfish during installation and operation have been found to be not significant.

The Norway-UK Interconnector project intends to use rock placement in 14 cable crossing locations and at sections of the cable where adequate cable burial is not achievable. Rock placement will be kept to a minimum, however where used, this protection is likely to have the potential to increase the local abundance and diversity of fauna and fish species. A cable burial assessment conducted for the proposed route does not identify any further requirements for cable protection. If further protection is deemed to be necessary following construction, this will require a separate marine licence application to be submitted which would be accompanied by a full assessment of the likely effects of that rock placement.

1.5.3 Human Environment

Commercial fishing operations in the vicinity of the proposed marine cable route corridor are UK based (96%), with small numbers of Danish, French, Dutch and Norwegian vessels. The main fishing method is found to be potter/whelking activity inshore within 11km (6nm) and trawling offshore. The proposed marine cable route passes through four grounds important to commercial fishing interests: Farne Deep; Middle and East Bank Grounds; The ‘Holes’ (including Swallow Hole and Devils Hole); and Montrose Ground.

Overall, shellfish (Norway Lobster) form the most important component of fisheries landings in the vicinity of the proposed marine cable route, both in volume and value. Increased seasonal effort for this species occurs between September and April indicating the period of greatest importance to the fishing industry falls within the winter months. Other significant fisheries in the vicinity of the proposed marine cable route corridor include trawling and beam trawling for whitefish (demersal fish with fins i.e. cod, whiting and haddock).

During installation a Fisheries Liaison Officer (FLO) will be employed to ensure that interactions between installation activities and fishing interests in the area are managed effectively. The area that the cable occupies within the sea bed is relatively small in comparison to the total trawling area, and cable burial techniques will minimise long term impacts to trawling activity. Additional to this, Notices to Mariners (NtM), will be issued in good time to advise fishermen of where and when the installation spread will be operating, as well as the

expected vessel speed. Local fishing associations will also be contacted directly.

An impact on commercial fishing could arise from the use of rock placement for the proposed development along with other projects that prevent the use of fishing gear at the seabed. Given that rock placement will only be required at 14 crossing locations across the 340km UK route, this impact will be localised.

The area surrounding the proposed marine cable route is not a busy area for shipping, with an average of 36 vessels per day passing within 18.5km (10nm) of the cable route. Two areas of the route have been identified as having reasonably high shipping densities: the inshore section of the route close to the Port of Blyth; and the offshore section of the route in the vicinity of the oil and gas fields located towards the UK/Norway median line.

The Port of Blyth is located approximately 5km south of the Cambois Beach North landfall. At present the Port of Blyth is relatively small, handling an average of 350 vessels per year, although it could become busier in the future with the planned development of a biomass power station in the port.

There are no designated anchorage areas, although vessels do occasionally anchor off the entrance to the port. The main potential impact to shipping and navigation during installation is from the displacement of vessels due to the temporary 500m by 1000m mobile safety zone around the cable installation vessel spread, which may cause disruption to shipping by altering their planned routes.

The main effects on shipping and navigation during operation are as a consequence of the electromagnetic fields (EMF) emanating from the operational cables. EMF fields have the potential to cause compass deviation to ships navigating with magnetic compasses and interfere with inertial navigation systems and global positioning systems (GPS). No significant impacts have been identified.

There are no aggregate extraction areas within the region of the cable route. The route corridor avoids all disposal sites; although passes within 0.86km of the closed site Tyne Industrial site and within 1.2km of the open site Blyth A and B. The route also crosses the northern tip of a spoil ground. Approximately 70% of the route passes through waters designated as military practice and exercise areas.

Safety information, including descriptions of the operation and operating area, will be issued and regularly updated by the installation contractor to reduce the risk of another vessel colliding with an installation or decommissioning vessel. There will also be consultation with local, regional and national organisations and authorities. Vessels will also comply with Collision Regulations lighting and marking requirements.

Assessment of impacts upon shipping and navigation has concluded that there is minimal risk to navigation from vessel anchors snagging the cable system. This can be reduced by the proposed cable burial and ensuring the location of the cable system is marked on navigational charts.

Recreational craft may become displaced from the 500m by 1000m mobile safety zone surrounding the cable laying spread, which may particularly impact

small craft in the near shore area around the cable landfall. However this will be temporary and transient impact.

The proposed development is not expected to have any significant adverse impacts on socio economics offshore beyond those discussed in relation to commercial fisheries, recreation and tourism and other sea users.

No prehistoric, Neolithic or Bronze Age finds have been identified within the proposed marine cable route corridor. There is a large number of identified shipwrecks in the seas around the east coast of England are the result of military activity during World War 1 and 2. All known wrecks have been avoided in the cable route design, however survey data has identified the potential for the presence of palaeochannels, which may hold material of archaeological interest. If archaeological finds are identified during installation, temporary exclusion zones will be placed around important geophysical anomalies during construction where practicable, and buffers with a radius of 100m will be placed around wrecks of archaeological potential. An archaeological reporting protocol will ensure that any material discovered during the development will be reported, recorded, stabilised and conserved.

1.6 Summary of Potential Impacts

The following table provides a summary of the impacts which the EIA identified as of significance prior to mitigation measures being applied.

Table 1.1: Summary of Potential Impacts

Section	Potential Impacts	Significance	Proposed Mitigation	Residual Impact
Physical Environment				
Physical Environment	No significant impacts	None	-	None
Water and Sediment Quality	Accidental hydrocarbon or chemical spill from installation vessel	Moderate	All vessels associated with cable installation will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations. All vessels will have shipboard oil pollution emergency plans (SOPEP) in operation.	Minor
Biological Environment				
Protected Sites and Species	Accidental hydrocarbon or chemical release from installation vessel	Moderate	All vessels associated with cable installation will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations. All vessels will have shipboard oil pollution emergency plans (SOPEP) in operation.	Minor
Benthic Intertidal Ecology	Direct loss/disturbance to rocky reef habitat	Moderate	Any deployment of equipment or vessels onto the seabed (e.g. anchors of cable-lay vessels) will be kept to a minimum. The Annex I habitats of stony reef will be marked as	Minor

Section	Potential Impacts	Significance	Proposed Mitigation	Residual Impact
			exclusion areas, and where possible the installation contractor will be required to avoid these in cable installation and anchor deployment.	
	Smothering from cable protection on rocky reef habitat	Moderate	The Annex I habitats of stony reef will be marked as exclusion areas, and where possible the installation contractor will be required to avoid these in cable installation and anchor deployment.	Minor
Fish and Shellfish	No significant impacts	None	-	None
Ornithology	Accidental oil or chemical spill from cable installation vessels	Moderate	All vessels associated with cable installation will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations. All vessels will have shipboard oil pollution emergency plans (SOPEP) in operation.	Minor
Marine Mammals	Accidental hydrocarbon or chemical release from installation vessels during installation and cable maintenance activities	Moderate	All vessels associated with cable installation will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations. All vessels will have shipboard oil pollution emergency plans (SOPEP) in operation.	None
Human Environment				
Cultural and	No significant	None	-	

Section	Potential Impacts	Significance	Proposed Mitigation	Residual Impact
Archaeology	impacts			
Commercial Fisheries	Seabed obstructions (cables on the sea bed) during installation and operation	Moderate	Guard vessels will be used for any sections of marine cables left temporarily unburied or unprotected during installation operations. A fisheries liaison officer (FLO) will be on board guard vessels for an unburied cable. All vessels (including commercial fishing vessels) will be required to adhere to the safety exclusion zone around the cable lay spread during cable installation.	Minor
	Exposed cable (safety risk) during operation	Moderate	As-laid coordinates of the cable will be issued. A depth of burial survey post installation to ensure adequate burial. Monitoring surveys to check burial depths during the lifespan of the cable. Areas where sediment movement may occur may be surveyed more often. Fishermen will be informed of areas where additional protection using rock placement and / or mattressing will be used. The schedule of repair and maintenance work activities will be published to fishermen in advance.	Minor
	Displacement of fishing activity from repairs/maintenance work	Moderate	As-laid coordinates of the cable will be issued. A depth of burial survey post installation to ensure adequate burial. Monitoring surveys to check burial depths during the lifespan of the cable. Areas where sediment movement may occur may be	Minor

Section	Potential Impacts	Significance	Proposed Mitigation	Residual Impact
			surveyed more often. Fishermen will be informed of areas where additional protection using rock placement and / or mattressing will be used. The schedule of repair and maintenance work activities will be published to fishermen in advance.	
Shipping and Navigation	No significant impacts	None	-	None
Offshore Infrastructure	No significant impacts	None	-	None
Dredging and Disposal Sites and Military Practice Areas	No significant impacts	None	-	None
Recreation and Tourism	Displacement of recreational vessels from the area surrounding the cable laying spread	Moderate	Notification given to shipping in the area via Navtex and NVAAREA warning and broadcasted by the MCA. Notices to mariners issued by UKHO, UKHO has online leisure notices to mariner's service. Guard vessels will be used to protect recreational craft. Cable installation vessel will be appropriately lit and will broadcast sound warning during period of poor visibility.	Minor

1.7 Cumulative Impacts

No significant cumulative impacts are expected from the installation and operation of the proposed marine cable route.

Habitat Disturbance

Sediment suspension during cable installation may temporarily and locally increase the level of habitat disturbance in the area. However in the context of existing fishing activity, habitat disturbance from installation of the proposed marine cables will present a small and localised increase to sediment disturbance against background levels. A negligible cumulative effect to intertidal and benthic ecology is anticipated.

Marine noise

Installation of the proposed marine cables will contribute to marine noise from dynamic positioning thrusters on vessels, the jetting installation tool and vessel noise. Noise levels generated during cable installation will be significantly lower than during wind farm construction.

Any fish species displaced will be able to relocate to a nearby suitable habitat. Installation of the proposed marine cables would therefore only be expected to make a minor contribution to the cumulative effects of noise to fish species.

The effect of construction noise from wind farms is not anticipated to be in the same audible bands for cetaceans and therefore is unlikely to produce a significant cumulative effect to marine mammals during installation.

Commercial Fishing

There are 14 crossings which will be covered with rock berms designed to have an over-trawlable profile to enable the cable to be buried beneath the area penetrated by heavy fishing gear (up to 0.4m). Cable protection is not predicted to be required within the highest intensity fishing grounds, minimising the potential risks to fishing vessels. The as-laid coordinates of the cable will be issued to the UK Hydrographic Office (UKHO) and Kingfisher Information Service for inclusion on admiralty and cable awareness (KISCA) charts. Therefore no cumulative effects are anticipated to commercial fishing activities.

1.8 Conclusions

The routing and siting studies considered a range of environmental, technical and economic constraints influencing the development of the Norway-UK Interconnector. This was a constraints driven option appraisal which included the development and assessment of alternative converter station sites and land and marine cable routes concluding with the identification of a ‘Preferred Option’ with four alternative landfall options. The preferred option has subsequently been surveyed as part of the EIA, and developed into the final proposed marine cable route which is considered, on balance to be the most technically feasible and least environmentally disturbing option.

Based on the environmental assessment of the residual effects to the physical, biological and human environment, the following can be concluded:

- The main impacts associated with the project are predicted to be the minor temporary disturbance to the seabed during the installation, with the resultant minor impacts on benthic and intertidal communities and fish species.
- The presence of the cable installation vessels will cause a temporary disturbance to fishing and shipping in the vicinity of cable installation operations.
- A minor, localised, but long-term effect from electromagnetic fields will be caused during cable operation. This will cause a minor effect on the magnetic compasses of ships, fishing boats and recreational vessels as they pass directly over the marine cables, but will not interfere with navigational safety. Whilst certain fish and mammal species are sensitive to electromagnetic fields no impact on prey location, navigation or migration patterns is expected.
- It is also concluded that there will be no significant cumulative environmental impacts with other existing and proposed marine developments during both the installation and operation of the Norway-UK Interconnector. Landfall installation works and the construction of onshore elements of the cable may have short-term and minor cumulative impacts on recreation and tourism.
- Any impacts from decommissioning activities (marine cable removal) will be broadly similar to those during installation. The effects are predicted to be minor and temporary in nature, and will be considered thoroughly at the time of removal.