What is NorthConnect?

NorthConnect is a commercial Joint Venture (JV) established to develop, build, own and operate a High Voltage Direct Current (HVDC) ‘interconnector’. The interconnector will provide an electricity transmission link between Scotland and Norway. The interconnector will allow electricity to be transmitted in either direction across the North Sea.

The JV partners comprise five owner companies: SSE Interconnector Limited (SSE), Vattenfall UK, Agder Energi, E-CO and Lyse.

Both the UK and Norwegian owners hold 50% of the company, divided as shown in the diagram below.

![Diagram showing ownership structure]

Project Need

The European Union has set a target for 20% of Europe’s energy requirements being met by renewable resources by 2020. The Scottish Government goes further and aims to exceed this target by achieving 100% of the demand within Scotland (gross consumption) for electricity from renewable sources by the same date.

The Scottish Government has published a draft Electricity Generation Policy Statement which states:

‘Scotland’s renewables potential is such that, should the relevant technologies be developed successfully, it could deliver up to £46bn of investment and be much more than enough to meet domestic demand for electricity. The remainder could be exported to the rest of the UK and continental Europe to assist other countries in meeting their binding renewable electricity targets’.

This policy identifies that a key requirement will be increased interconnection and transmission upgrades to deliver this potential.

Wind farms will lead to a rise in demand for reserve generation capacity to supply the grid during periods when the wind farms cannot meet demand. There are various options to meet this reserve capacity, one option being connectivity with the hydro-power generated in Norway.

In parallel with this there is emerging international cooperation in the European energy sector and the clear political goal of linking the European power systems closer together. NorthConnect will be a measure for connecting the two complementary and hitherto disconnected power systems of Scotland and Norway.

This interconnector will therefore serve the dual needs for reserve capacity to help balance the grid and interconnectivity to allow wider trading across Europe.
Project Drivers

The main drivers for this project are:

**Security of supply**: by tapping into the Nordic Region’s hydro-power, the UK will be able to import power when required, during planned shut-downs of generation plant and in emergencies (un-planned shut-downs).

**Green battery**: the south-west area of Norway contains 90% of the hydro-power plants in the country and is known as the green battery. Tapping into this will aid the UK in meeting its renewable energy targets of reducing CO₂. Excess UK wind power can be exported to Norway to facilitate the refilling of their hydro-dam reservoirs and effectively used to “store” power.

**Reduced price fluctuations**: being able to import power during expensive generation times in the UK (wind not blowing, hydropower offline, etc.) will help to reduce the overall price we pay for electricity.

**Reduced risk to consumers**: by being privately owned and operated, NorthConnect reduces the risk to consumers of carrying the burden of a major Interconnector and the need for it to be profitable. If the market differences are not present then the owner companies lose on their investment, this is not borne directly by the bill paying public, unlike the majority of the existing electricity generation in the UK.

**Dominated by thermal power** (24h production -> daily price fluctuations)

**Dominated by hydro-power** (flexible production -> seasonal price fluctuations)

**Dry years are a problem**

50% of European storage

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**Direction of Energy Exports**

- **United Kingdom**: At day → Storage for night time production
- **Nordic**: Clean hydro-power replaces carbon intensive generation

- **Daily**
  - At day
  - During night

- **Seasonal**
  - In dry periods
  - In wet periods

- **Wind / Hydro Interoperability**
  - Windy
  - Calm

- Additional energy will be stored
Project Description

The project comprises the following main components:

- Onshore converter stations located at Peterhead, Aberdeenshire and either Samnanger or Sima in Norway along with associated infrastructure
- Onshore underground cabling requirements from landfall to converter stations
- Landfall sites in Sandford Bay and Norwegian Fjords
- Subsea interconnector between the UK and Norway.

NorthConnect has undertaken a desk top marine survey to refine the subsea cable route corridor from Peterhead to Norway. The diagram below shows the centre lines of the proposed sub-sea survey routes, which will help define the final cable route.
Project Schedule

The project schedule is shown in the diagram below.

The main milestones for the near future are the submission of the outline planning permission (early 2013) and the completion of the subsea survey.

Onshore Construction at Peterhead is unlikely to commence until 2016 at the earliest, although some preliminary investigations (soil surveys, boreholes, etc) will be undertaken during the detailed design phase (2013-2015).

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### Project Schedule Diagram

- **2011**: Business plan, UK Landing
- **2012**: WP1 PreFEED
- **2013**: WP2 Consult
- **2014**:
  - Subsea Survey
  - Detailed Design
  - Procurement
- **2015**:
  - EIA/Surveys
  - Consents
- **2016**:
  - Financial Close, Investment Decision, Contract Awards
  - Execution
- **2017**:
  - Lead Times
- **2018**:
  - Enabling Works
- **2019**:
  - Installation & Construction
- **2020**:
- **2021**:

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Subsea Survey Details

1. GPS positioning
2. Underwater positioning of equipment – USBL (ultra short base line)
3. Multibeam echo sounder (MBES) – uses multiple echo sounding beams to create a topographical map of the seabed
4. Sub bottom profiler (surface towed Sparker system) – Used to chart the layers below the seabed, detects changes in sediment type, rock etc.
5. Inspection ROV – Remotely Operated Vehicle used to take photographs and video of the seabed
6. ROTV – Remotely Operated Towed Vehicle can be programmed to follow the survey lines with high accuracy since it has rudders used for steering. In general mounted with Side Scan Sonar (SSS) and Sub bottom profiler (SBP) normally a Chirp system. The SSS is used to create mosaics (wide images) of the seabed, seabed interpretation i.e. sediment classification and objects identification e.g. boulders, depressions, wrecks etc. The SBP used to chart the layers below the seabed, detects changes in sediment type, rock etc.
7. Magnetometer – used to measure magnetic fields. Identifies magnetic anomalies and metallic objects e.g. wrecks, pipes and cables
8. Work class ROV – can be equipped with instruments for cable detection/tracking, UXO search, etc.
9. Grab sampler – takes samples of sediment from seabed surface for ground truthing
10. Vibrocorer – a 3m – 6m long core supported by a frame to balance on the seabed. An electric motor vibrates the core into the seabed to recover a sample to analyse sediment type and to ground truth the interpretation of MBES, SSS & SBP electronic data. The sample is tested for shear strength (i.e. the suitability of burial methods and the ability of the sediment to support the cable) and thermal resistivity (i.e. the sediments ability to dissipate heat from the cable). The extent of vibro coring will depend on the results of the geophysical survey.
Offshore Works

The main challenge for this project will be the successful installation of the 3 subsea cables. The route corridor selected minimises the impact on the known constraints within the North Sea, e.g. major fishing areas, oil and gas infrastructure, wrecks, environmentally sensitive areas, anchorages, etc. The route, however, still passes over 23 existing pipes/cables, crosses major shipping lanes and cuts across the mouth of Peterhead Harbour. Engineering solutions are required to protect the cable in each of these situations. This will involve burying the pipeline in the sediment at the bottom of the sea or, where required, covering it with rock for protection. As the majority of the cable will be buried, the long term environmental effects will be minimal.

Another engineering challenge is the topography of the sea-bed. This is fairly level from Peterhead to the middle of the North Sea but gets deeper at the Norwegian trench, then very deep once within the Fjord.

The diagram below shows a cross-section of the cable route from Peterhead to Sima in Norway.
Onshore Works Peterhead
Buried cables

The proposed subsea cables will come ashore at Sandford Bay, to the south of Peterhead Harbour. The Direct Current (DC) cables will then follow the A90 down to the proposed Converter Station location, which is currently proposed to be sited to the south of the existing Scottish Hydro Electric Transmission Limited (SHETL) substation.

The cables will be buried in the ground. There will be no above ground features associated with the onshore buried cables to the Converter Station. The exact configuration of the onshore cable routes will however be subject to detailed design. These will predominantly follow land owned by SSE. During installation there will be a temporary working corridor along the route for a temporary haul road, area for spoil storage and the installation trenches themselves.

There will also be a length of AC cable from the Converter Station to a new proposed SHETL substation connecting into the Scottish Grid.

The diagram opposite shows the approximate cable routes for this project.
Onshore Works Peterhead
Converter Station

Scotland generates, transmits and uses electricity in an Alternating Current (AC).

NorthConnect will use Direct Current (DC) technology because it allows electricity to be transmitted from point to point in much larger bulk volumes, over greater distances with fewer transmission losses compared to an equivalent AC system. Converter Stations are required at both ends of the DC cable in order to link into the distribution grid systems in Scotland and Norway. The proposed Converter Station at Peterhead will be to the south of the existing substation.

The Converter Station will be a metal clad building in the order of approximately 260m by 130m by 20m high. This will house all of the electrical components required to convert the DC electricity to usable AC electricity.

The diagram below shows the approximate layout of the Converter Station.

This photograph is taken from the local road network at Stirling. It shows the existing electricity substation (grey building) and the property at Gateside. The converter station would be located in the land to the left of the existing substation and in front of Gateside.
Environmental Impact Assessment (EIA)

NorthConnect has instructed AMEC to undertake the EIA work to accompany the submission of a planning application which will be made next year.

EIA teams are working both in Scotland and Norway. The Scottish EIA team are covering the onshore aspects of NorthConnect in Scotland and the offshore element up to 12 nautical miles from the Norwegian coast.

The EIA will identify, predict and evaluate the environmental effects from NorthConnect. The EIA work will be used to:

- Improve the environmental design of NorthConnect
- Check the environmental acceptability of the project
- Ensure NorthConnect uses resources appropriately and efficiently
- Identify mitigation measures for potential negative environmental effects
- Inform the decision making and permitting process.

The EIA work involves many different surveys, data collection, and consultations.

The EIA work will culminate in a full report and Non Technical Summary. Both will be made available for review by the general public and other stakeholders.
What Next?

There are several tasks that will be undertaken in the forthcoming months:

- NorthConnect will continue with the EIA and undertake various consultation exercises to ascertain the impact the project is going to have on the surrounding area.
- An outline planning application will be submitted early 2013.
- A full subsea survey will be undertaken to confirm the chosen subsea route.
- Further public consultations (like this event) will be scheduled as the project progresses.

Further information on the project can be obtained from our website:

www.northconnect.no

Or by contacting our Communications Liaison Officer:

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