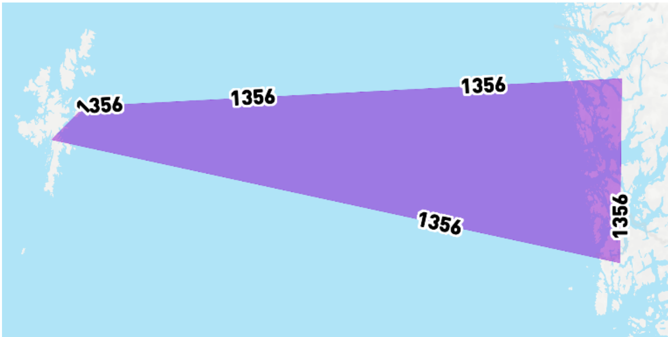
Project 294 - Maali

An interconnector link between Shetland Scotland UK and Norway. Using subsea and onshore underground cables. Connecting Statnett and National Grid networks / systems. Utilising high voltage direct current subsea and onshore cable.

Classification	Future Project
Boundary	GB - NO
PCI label	
Promoted by	Element Power



Investments

Investment ID	Description	GTC Contribution	Substation 1	Substation 2	Present Status	Commissioning Date	Evolution since TYNDP 2014	Evolution Driver
1356	A new 380km 600MW HVDC interconnector connecting Hordaland Norway to Shetland Scotland.	100%	Kergord Shetland tba	tba near Bergen-Mongstad or Karsto-Blafalli	Under consideration	2023		Viking Windfarm Shetland and HVDC to Scotland

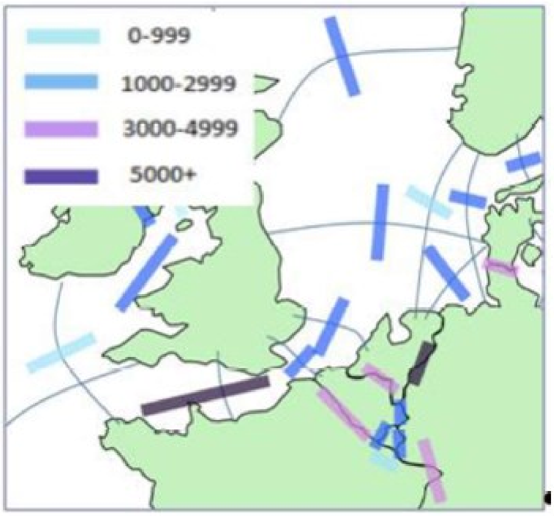
Additional Information

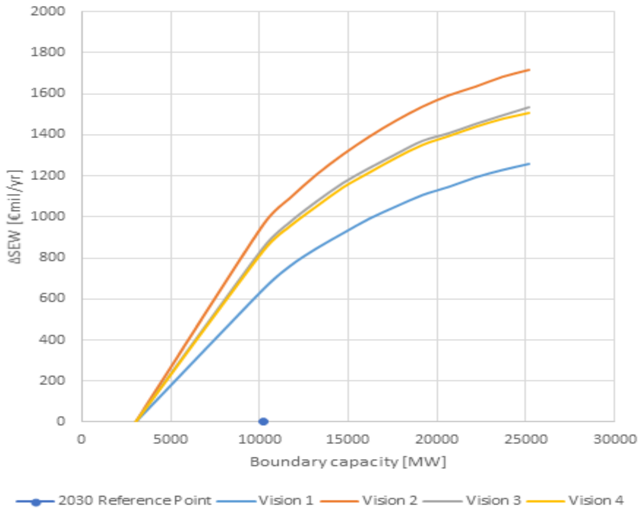
Web site: http://www.elpower.com/expertise/transmission-grid-services

Investment needs

Project promoter states: "*By linking the Shetland Isles with Norway the Maali project will connect Norway to the north of Scotland and the rest of GB via the proposed Shetland to Scottish Mainland HVDC interconenctor. In the process Maali will deliver increased security of supply to Shetland, and provide a means to export surplus wind power in Shetland and Scotland to Norway; reducing north south flows and transmission bottlenecks in Great Britain; and improving sustainability of energy supplies and ecomonic welfare in all these localities*"

Maali builds on the proposal by TSO Scottish Hydro Electric Transmission to connect Shetland to Scotland via a new 600MW HVDC link. That connection will enable the development of more than 600MW of renewable energy resources on Shetland, including the 457MW Viking wind farm, and will play a role in decarbonising the current isolated Shetland Power system, which is currently running substantially on diesel generators. Building on this connection from Shetland to Scotland, Maali will further connect Shetland to Norway, thereby both increasing the value and utilisation of the HVDC Shetland-Scotland link, increasing security of supply on Shetland though two HVDC links and enabling even greater future development of untapped renewable energy resources on Shetland. Shetland has an excellent wind regime with the Burradale turbines regularly exceeding an annual capacity factor of 50% and Viking windfarm modelled with a 44% average capacity factor. Because of its location, 170km north of the Scottish mainland, the wind generation is not highly correlated with other UK wind resources which increases its value. Maali will enable Shetland and Scotland to export wind generation during high wind periods to Norway thereby alleviating several transmission boundary constraints between northern Scotland and southern England. In low wind periods Maali will enable Scotland to import power from Norwegian Hydro as an alternative to imports from England, helping to decarbonise both electricity and the wider economy through use of electric vehicles and electric heat pumps for space heating in commercial and domestic buildings. The proposed connection location in Norway is in the Hordaland region, which is further north than other existing and proposed HVDC links to Denmark, Germany, Netherlands and UK, and therefore helps disperse the HVDC links around the Statnett network aiding system stability.





Project Cost Benefit Analysis

This project has been assessed by ENTSO-E in line with the Cost Benefit Analysis methodology, approved by the EC in February 2015.

The indicators B6/B7 reflect particular technical system aspects of projects based on a summation of qualitative performance indicators, in line with the CBA methodology; these cannot be used as a proxy for the security of supply indicator.

General CBA Indicators	
Delta GTC contribution (2020) [MW]	Delta GTC was not checked for 2020 and the 2030 values were considered for SEW, RES and CO2 assessment.
Delta GTC contribution (2030) [MW]	NO-GB: 600
	GB-NO: 600
Capex Costs 2015 (M€) Source: Project Promoter	500
Cost explanation	
S1	NA
S2	NA
B6	+

B7	++

Scenario specific CBA indicators	EP2020	Vision 1	Vision 2	Vision 3	Vision 4
B1 SoS (MWh/yr)	N/A	N/A	N/A	N/A	N/A
B2 SEW (MEuros/yr)	N/A	60 ±10	80 ±10	60 ±10	50 ±10
B3 RES integration (GWh/yr)	N/A	90 ±10	550 ±110	480 ±100	160 ±10
B4 Losses (GWh/yr)	N/A	N/A	N/A	N/A	N/A
B4 Losses (Meuros/yr)	N/A	N/A	N/A	N/A	N/A
B5 CO2 Emissions (kT/year)	N/A	800 ±100	±100	-400 ±100	-300 ±100

In order to analyse the whole European market in one pan-European market model simplifications are made. Among these is the assumption of modelling the UK-market in one market-node. As no market description of Shetland has been delivered by the project promoter, the assumption is taken that Shetland do have the same market-price as UK. Hence for the CBA-assessment of project 294, the market price of Shetland is the same as London. This is of course a very rough estimation influencing the quality of the CBA-assessment."

Connections to the Nordics can bring potential balancing market benefits in the intraday market which has not been considered in the CBA analysis, the benefits are increased for markets with a lot of wind or hydro as the output can vary a lot from the forecasts.

The Shetland HVDC interconnector is a prerequesite.

The project’s SEW accounts for saving in generation fuel and operating costs. The project could also enable savings avoiding investments in generation capacity, in particular for projects connecting electric peninsulas. The aspect has not been considered in the CBA methodology

As the accurate location and project scope are still under investigation, B4 indicator (impact on losses) was not assessed

Complementary information about the border on which the project is located	Vision 1	Vision 2	Vision 3	Vision 4
Average marginal cost difference in the reference case [€/MWh]	22.55	13.64	13.11	11.69
Standard deviation marginal cost difference in the reference case [€/MWh]	16.66	18.45	24.55	21.62
Reduction of marginal cost difference due to all mid-term and long-term projects [€/MWh]	9.28	18.63	21.88	18.17