Project Sheet

Aminth Energy Ltd

Project type	transmission
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Index

Key Information 3
Description 3
Project Description & Context 5
Project Investments 5
System Needs addressed by the project 5
Interconnection targets 5
Project Assessment 9
Transfer capacity increase (National Trends 2025) 9
Boundary capacity diagram 9
CBA results 9
Central scenario: National Trends 10
Scenarios: Distributed Energy & Global Ambition 12
Sensitivity Study: Current Trends 13
Residual impact 14
Project Costs 15

ENTSO-E

Key Information

Cross Border Project
Offshore DC transmission cable
New

Under Consideration

Description

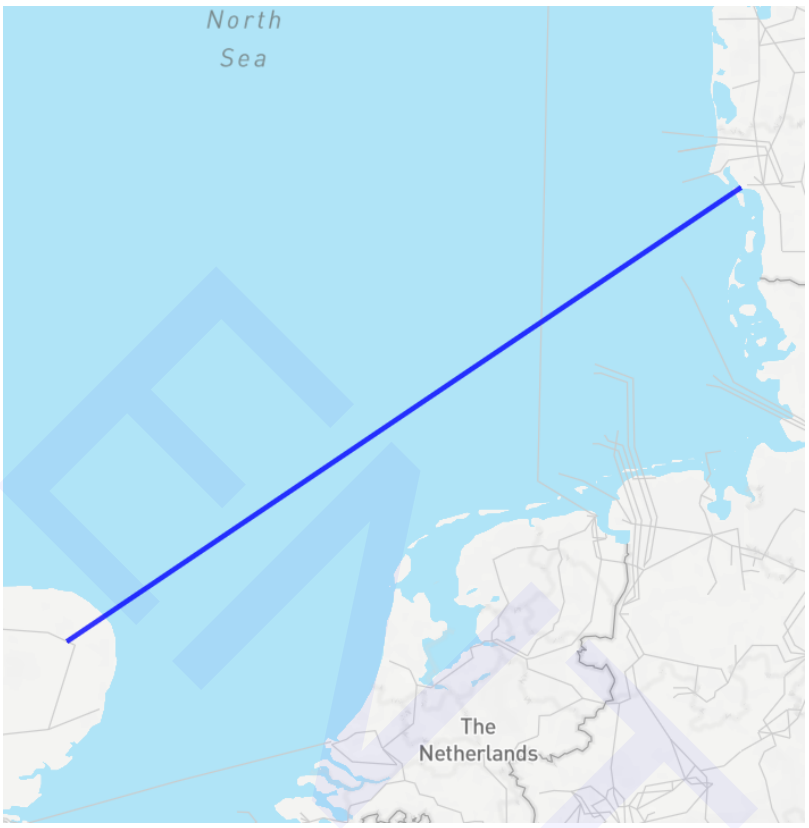
Aminth Energy Ltd ("Aminth") is permitting a 1400MW DC Bipole VSC interconnector between England and Denmark. The project started in 2017 and has obtained a legally binding grid connection agreement with National Grid at Norwich Main in the UK for rights to construct, connect and operate an interconnector. The management team of Aminth has a successful track record in developing and operating interconnectors and transmission projects as well as large-scale grid connected power stations in the UK and Europe and has been involved in over 40GW of transmission power station and interconnector projects in Europe. Our mandated technical advisor for electrical engineering, infrastructure and power systems is WSP Ltd, our mandated financial advisor is EY (Ernst & Young). The interconnector is expected to reach commercial operations in late 2026 and the permitting and construction timetables are attached in Microsoft Excel format. Aminth has commenced the planning and environmental work as well as having undertaken detailed work on the undersea cable route and onshore works. Aminth is committed to the project and has detailed knowledge of interconnector permitting, regulatory regimes, energy contracting, project financing and construction and operations including O&M.

Project promoters

Aminth Energy Ltd

Countries

Denmark
United Kingdom



National development plan(s)

Additional information on the project

Aminth Energy Ltd is happy to supply any further info requested

Project sheet backlog

13 Jan. 2021 - Correction of project promoters

6 Nov. 2020 - Publication as part of the draft TYNDP 2020 package for consultation

Project Description & Context

Project Investments

Main investment(s): 1.4 GW HVDC electricity interconnector between UK and Germany Voltage Source Converter (VSC)/Bipolar Grid connection point (substations name): Norwich Main (UK) and near Revsing (Denmark), exact substation location subject to grid study in Denmark. Total cable length (substation to substation) 610km (35km in UK and 25km in Germany) Two cables (XLPE) laid in a single trench Nominal voltage: ±525 kV Thermal limit (Imax): 1330 A Mvar capability range at terminals: 460 MVAr Bus-bar to bus-bar losses profile over MW range: 2.3% (33 MW) full load; 0% (0 MW) at zero load. The annual Availability is 98.1% availability, with 1.8% planned outages, and 0.1% forced outages. The maximum single failure according to the design is 1.4GW. The project will enable the reduction of CO2 emissions by substituting electricity from fossil fuels by generation from RES and nuclear power. There are no material anticipated environmental impacts during construction and operation.

Type of element	Total route length (km)	From substation 1	To substation 2	Present status	Commissioning year	Progress of the investment	Explanation in case of delay or reclustering
Offshore DC transmission cable	640	Norwich Main	Revsing	Under Consideration	2028	New Investment	

Is the project in the reference grid?

No

System Needs addressed by the project

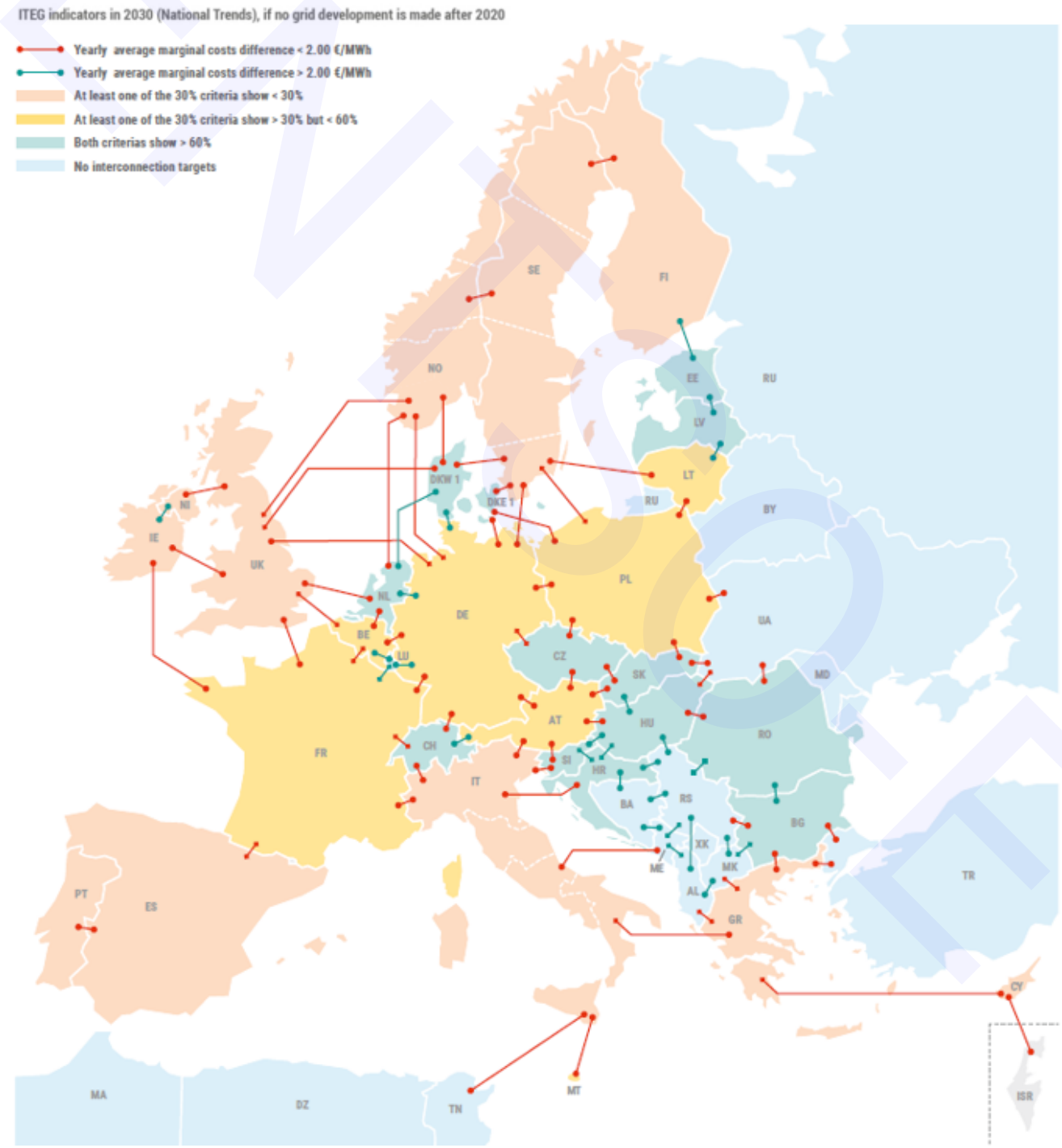
Project promoter(s) selected up to 4 system needs that are addressed by their project in a predefined list. Available needs ranged from reduction of price differentials between countries, improvement of system flexibility and stability, enabling cost-efficient connection of high volumes of RES, improvement of voltage stability...
As part of the TYNDP 2020, ENTSO-E released a study investigating cross-border system needs in the 2030 and 2040 horizons.

The project promoter did not select any need.

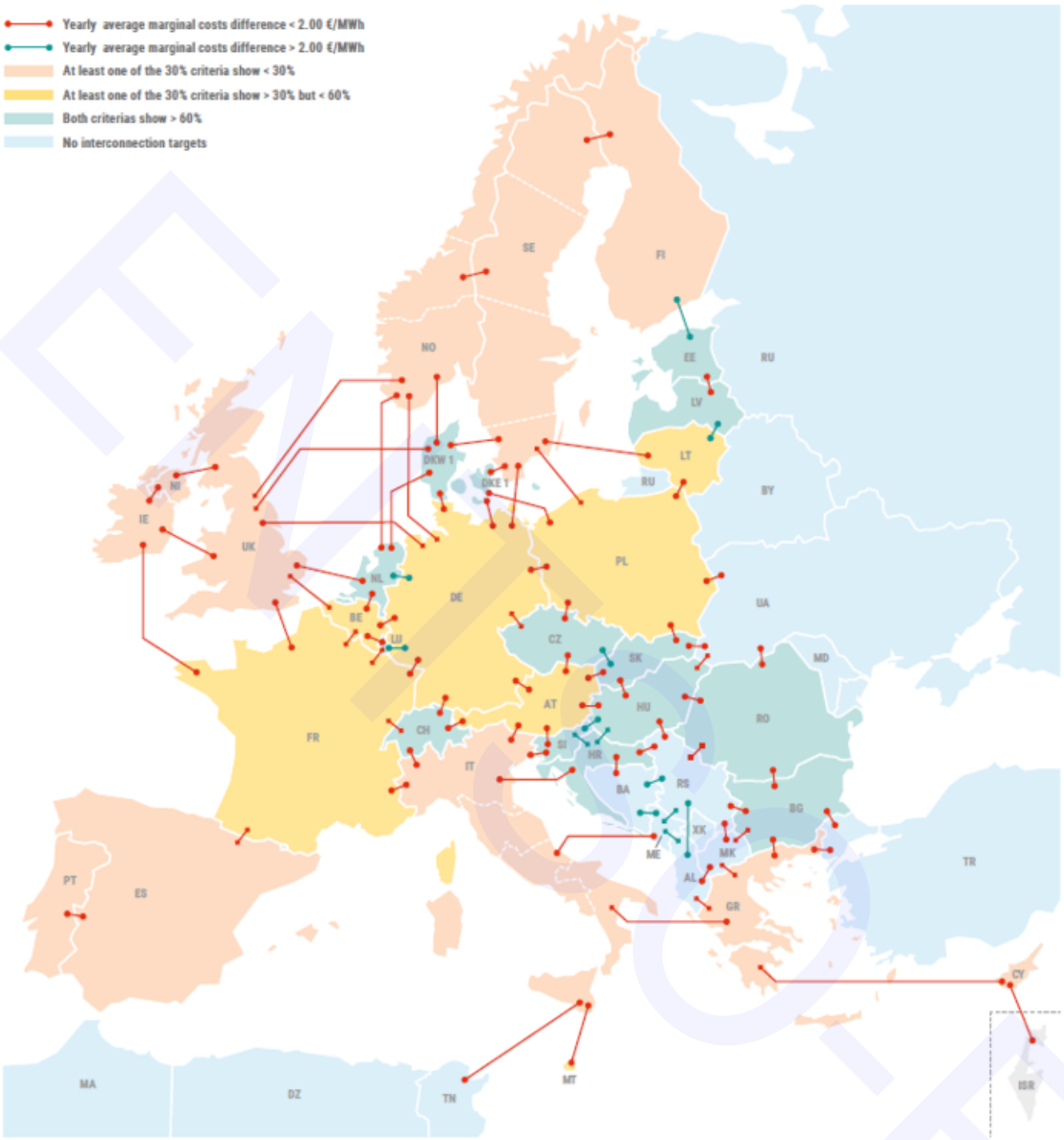
Interconnection targets

In 2017, the Interconnection Target Expert Group proposed alternative indicators to the 15% interconnection criteria for every country and electrified island with a new methodology developed collaboratively between the European Commission, ENTSO-E, ENTSOG, industry, universities and other experts. The methodology is based on three indicators:
1. Price differential between EU countries, with an objective to reduce it below 2 EUR/MWh
2. Ratio between nominal transmission capacity and installed RES capacity, with a target of past 30%
3. Ratio between nominal transmission capacity and peak load, with a target of past 30%

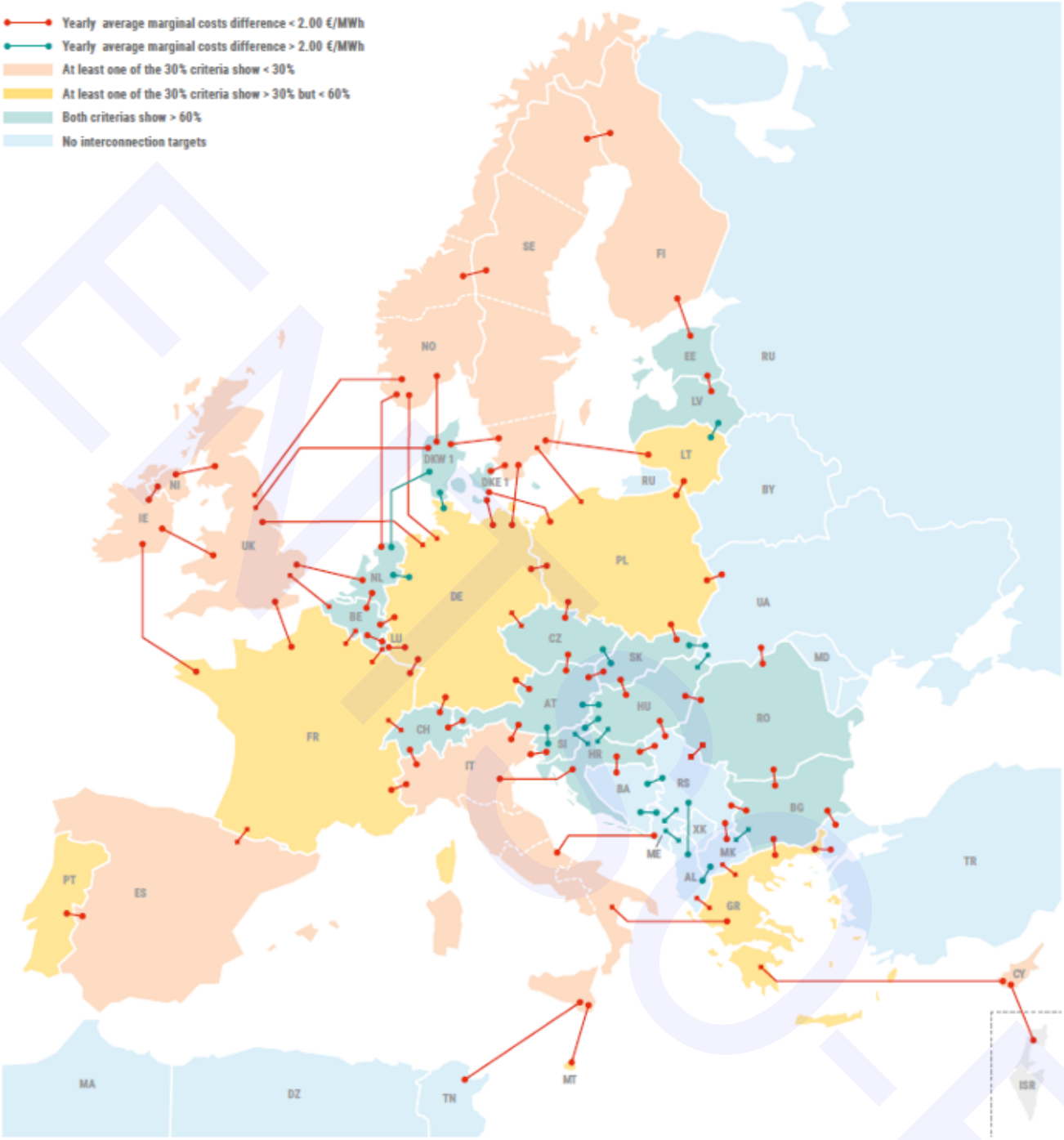
The following maps show the ITEG methodology applied to the TYNDP 2030 scenarios, with the 2020 grid.



ITEG indicators in 2030 (Distributed Energy), if no grid development is made after 2020



ITEG indicators in 2030 (Global Ambition), if no grid development is made after 2020



Project Assessment

Transfer capacity increase (National Trends 2025)

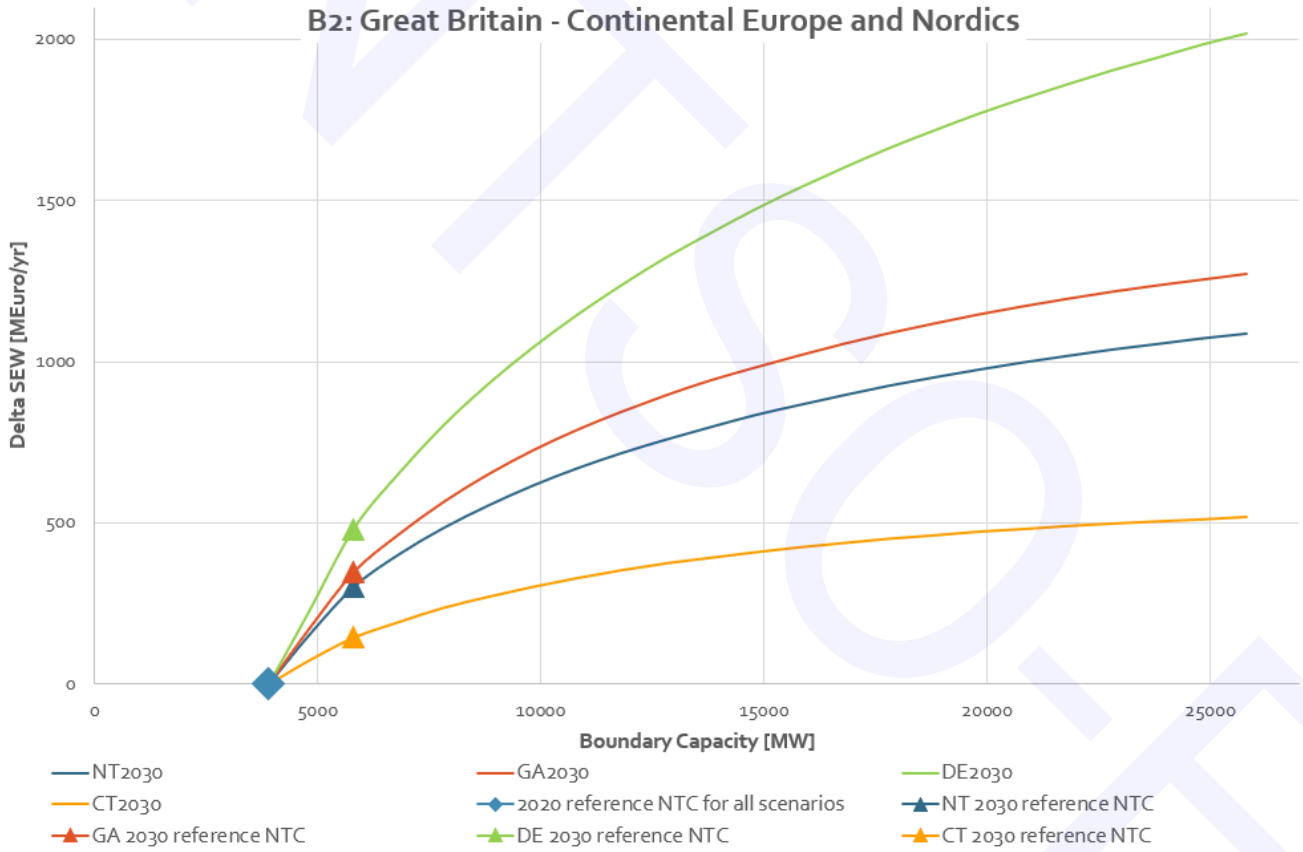
	Border	A B	B A
Transfer capacity increase (in MW)	Denmark - United Kingdom	1400	1400

Boundary capacity diagram

Network boundary the projects helps mitigate

Great Britain – Continental Europe and Nordics

Boundary capacity diagram



CBA results

ENTSO-E has assessed the benefits delivered by each project in 2025 (scenario National Trends 2025) and in 2030 (three scenarios: National Trends, Distributed Energy and Global Ambition). Indicators B1 to B6 were computed by ENTSO-E, while promoters had the possibility to compute and submit so-called project-level benefits (B7 to B10). The benefits must be understood as benefits for Europe as a whole, not for the promoters of the project.
Results are presented per scenario.

Central scenario: National Trends

National Trends is the central policy scenario of the TYNDP2020, designed to reflect EU member state's National Energy and Climate Plans (NECP), in line with the requirement to meet current European 2030 energy strategy targets.

			Comparison of the COP21 scenarios with NT2030 average result		
	NT2025	**NT2030**	**DE2030 is < or > than NT2030**	**GA2030 is < or > than NT2030**	

Increase in socio-economic welfare

B1 Annual Socio-Economic Welfare (SEW) increase (M € / year)	max average min	18 16 13	49 49 49	>	>	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	5 3 0	13 11 10	>	>	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	max average min	15 14 12	33 31 27	<	>	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	-663	-914	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	-19	-21	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	-1007	-1136	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	-1695	-2683	n/a	n/a	ENTSO-E assessment
B4e Particulate		-25	-32	n/a	n/a	ENTSO-E

matter 10	average					assessment
B4f Non-methane volatile organic compounds	average	-1681	-2644	n/a	n/a	ENTSO-E assessment
B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	15 -112 -207	-365 -405 -459	<	>	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market simulation monetised (M € / year)	CO2 price 60€/ ton 100€/ ton 189€/ ton	4 9 19	13 29 65	< > >	< > <	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	32	197	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from CO2 variation from network simulation monetised (M € / year)	CO2 price 60€/ ton 100€/ ton 189€/ ton	0 -2 -5	-6 -14 -32	n/a	n/a	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	max average min	328 285 248	906 821 704	<	>	ENTSO-E assessment
B3a Connected RES (MW)	-			n/a	n/a	ENTSO-E assessment

Impact on grid losses

B5 Variation of network losses (GWh / year)	average	42	1037	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	3	37	n/a	n/a	ENTSO-E assessment

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		1570	n/a	n/a	ENTSO-E assessment
B6_€ Annual Socio-Economic Welfare increase resulting from reduction in Energy Not Served monetised (M€ / year)	average	n/a	15.7	>	n/a	ENTSO-E assessment

Scenarios: Distributed Energy & Global Ambition

DE and GA are two scenarios created in line with the COP21 targets to understand the impact on infrastructure needs agains different pathways reducing EU-28 emissions to net-zero by 2050. For these two scenarios, projects were assessed with a subset of CBA parameters.

		DE2030	GA2030	

Increase in socio-economic welfare

B1 Annual Socio-Economic Welfare (SEW) increase (M€ / year)	average	77	56	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	43	13	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting	average	30	36	ENTSO-E assessment

from RES integration			

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-813	-380	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market simulation monetised (M€ / year)	CO2 price 60€/ ton 100€/ ton 189€/ ton	6 38 111	9 25 58	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	609	843	ENTSO-E assessment
B3a Connected RES (MW)	-			ENTSO-E assessment

Sensitivity Study: Current Trends

'Current Trends' describes a future where the energy transition is slower than planned.

		CT2030	

Increase in socio-economic welfare

B1 Annual Socio-Economic Welfare (SEW) increase (M€ / year)	average	27		ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	8		ENTSO-E assessment

B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	18	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-300	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market simulation monetised (M€ / year)	CO2 price 60€/ ton 100€/ ton 189€/ ton	10 22 48	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	338	ENTSO-E assessment
B3a Connected RES (MW)	-		ENTSO-E assessment

Residual impact

Information on the residual impact of the project was provided by the project promoter(s).

Residual environmental impact

Investment	Investment status	Distance (km)	Type of sensitivity
Converter stations and Subsea cables	Under Consideration	0	Marin Strategy Framework Directive (2008/56/EC)

Note based on CBA Guideline 3.0: Given that the actual route of the project might not be defined due to the low degree of maturity of its investment(s), an environmental assessment is not yet available.

Additional information by the project promoter(s)

The project is to be connected at a coastal site, the coastal sites have been subject to a detailed desktop study and there are no environmentally sensitive areas, eg Local Nature Reserves, European Habitats Directive Protected Areas, SSSI's or equivalents, Special Conservation Areas etc.

The submarine cable route has been subject to a desktop study, detailed Marine Environmental Impact Assessments will be executed for the cable route. Levels of Ordinance (explosives), existing telecoms and electrical cables, sand beds, marine conservation areas, shipping routes and fishing grounds/pelagic areas, there are no protected molluscs/shellfish with any proximity to the likely envelope of feasible submarine cable routes. The cable route is not expected to cross any significant areas of geothermal activity or subsidence. The cable route does not pass through any deep sea trenches.

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity

Note based on CBA Guideline 3.0: Given that the actual route of the project might not be defined yet because of the low degree of maturity of its investment(s), a residual social impact assessment is not yet available.

Project Costs

The project costs were provided by the project promoter(s).

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
1708. Converter stations and Subsea cables	1151	6	28
Total	1151		28

Explanation provided by the project promoter on the CAPEX uncertainty range:

1708