Project Sheet

Celtic Interconnector

Project type	transmission
Project id	107
Created by	
Created on	Feb 8, 2021 3:08:00 PM

Index

Key Information 3
Description 3
Project Description & Context 5
Project Investments 5
System Needs addressed by the project 5
Interconnection targets 6
Project Assessment 10
Transfer capacity increase (National Trends 2025) 10
Boundary capacity diagram 10
CBA results 11
Central scenario: National Trends 11
Scenarios: Distributed Energy & Global Ambition 14
Non scenario-dependent indicator(s) 15
Sensitivity Study: Current Trends 15
Residual impact 17
Project Costs 17

ENTSOE

Key Information

Cross Border Project
Offshore DC transmission cable
New

PCI number 1.6 (4th list, 31 Oct. 2019)
In Permitting

Description

Celtic Interconnector will be the first interconnection between Ireland and France. A survey of the route of the HVDC (VSC) link with 700 MW capacity has been done from the southern coast of Ireland to La Martyre (Finistère) in France.

Motivation for the project :

The CELTIC project will improve security of supply in both Ireland and France. It will facilitate increased electricity trading that will result in increased competition and downward pressure on electricity prices. The CELTIC project will also support the development of renewable sources of energy.

Project promoters

EIRGRID
RTE

Countries

France
Ireland

National development plan(s)

NDP1, Ireland, n°107, 2016, page 92 - NDP2, France, SDDR (Schéma Décennal de Développement du Réseau -Ten Year Network Development Scheme), 2019, project n°437, page 442, https://www.rte-france.com/fr/article/evolution-du-reseau-electrique-francais-l-horizon-2035

Additional information on the project

More information can be found on Project Websites :
https://www.rte-france.com/fr/projet/celtic-interconnector-projet-d-interconnexion-entre-la-france-et-l-irlande
and
http://www.eirgridgroup.com/the-grid/projects/celtic-interconnector/the-project/
.

The project is also part of both RTE and Eirgrid National Development plans.

In addition, CELTIC project has been confirmed on 23 November 2017 as a Project of Common Interest 1.6 in the priority corridor Northern Seas Offshore Grid (NSOG)."

Project sheet backlog

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

ENTSO-E

Project Description & Context

Project Investments

Main investment(s): A new HVDC subsea connection between Ireland and France

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	500	Knockraha (IE)	La Martyre (FR)	In Permitting	2026	Investment on time	

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.

Need		How the project addresses each need (explanation provided by the project promoter(s))
€	Infrastructure to reduce price differentials between EU and/or non-EU countries	Figures 2.12 and 2.13 of IoSN Report show that average marginal price difference would be higher than 10€/MWh between France and Ireland in future scenarios if no investment is done, and only between 5 and 10€/MWh with the investment.
	Infrastructure to improve system flexibility and stability e.g. improve system or local ramp rate, improve transient stability or RoCoF to meet system Needs.	IoSN Report Chapter 5 (Flexibility aspect, Transient and voltage stability related aspects): the ramp increases from NT2025 to NT2040. The project allows Ireland to take benefits from the more stable continental grid, participates in reactive power management and frequency

Need		How the project addresses each need (explanation provided by the project promoter(s))
		management by quickly changing its active power.
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	IoSN report 2020, figures 2.8-2.11: main drivers of NT scenarios are better access to RES generation (avoiding curtailment) which replaces expensive thermal generation. Figures 2.2-2.3: in Ireland, curtailment decreases by half with the IoSN SEW needs in 2030 compared to 2020. Same for 2040 compared to 2025.
ITEG	Infrastructure to tackle a Need identified by one of the European ITEG indicators referring to the 15% interconnection target for 2030:1. Reduce the price differential between EU countries to below 2EUR/MWh.2. Contribute to pushing ratio between nominal transmission capacity and installed RES capacity past 30%.3. Contribute to pushing ratio between nominal transmission capacity and peak load past 30%.	Based on IoSN report, 15% IC-target requires higher cross border transmission capacity. This project P107 contributes to satisfy this need (especially for Ireland, by increasing the transmission capacity while the installed RES generation is going higher too).

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.

ENTSOE

ENTSOE

ENTSOE

Project Assessment

Transfer capacity increase (National Trends 2025)

	Border	A B	B A
Transfer capacity increase (in MW)	France - Ireland	700	700

Boundary capacity diagram

Network boundary the projects helps mitigate

Island of Ireland - Great-Britain and Continental Europe

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	53 51 49	126 124 121	>	>	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	11 10 9	24 23 22	>	>	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	max average min	23 19 16	73 68 66	>	>	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	-1082	-742	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	-44	-81	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	-1415	-58	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	1806	4701	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	-34	-36	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	1830	4736	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)		max average min	-371 -435 -472	-768 -823 -853	< 	>>>>	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	16 34 72	26 59 132	< < >	< < <	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)		average	349	206	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	-5 -27 -58	-7 -21 -33	n/a	n/a	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)		max average min	477 389 311	1934 1808 1683	< < 	<<<<	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	678	684	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ /		average	30	21	n/a	n/a	ENTSO-E assessment

year)					

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		4826	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	48.26	>	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	161	136	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	53	28	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	98	74	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market	average	-998	-792	ENTSO-E assessment

simulation (ktonnes / year)				
B2a_€ Annual Societal cost variation resulting from CO2 variation from market simulation monetised (M€ / year)	CO2 price	60€/ ton 100€/ ton 189€/ ton	7 47 136	20 51 122	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	1786	1706	ENTSO-E assessment
B3a Connected RES (MW)	-			ENTSO-E assessment

Non scenario-dependent indicator(s)

B8.0 Stability (Transient, Voltage and Frequency Stability)	**Transient stability**	**Voltage stability**	**Frequency stability**	
France Ireland Interconnector (New HVDC)	++	++	+ (between sync areas)	Qualitative assessment by ENTSO-E based on information on the project technology provided by the project promoter(s). This indicator is not dependent on scenarios or time horizons.

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€ /	average	63	ENTSO-E assessment

year)			
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	11	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	41	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-395	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	13 28 64	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	782	ENTSO-E assessment
B3a Connected RES (MW)	-		ENTSO-E assessment

Comments on the CBA results by the project promoter(s)

Project benefits mainly come from avoided RES curtailment in Ireland and Northern Ireland replacing conventional generation. This reduction in renewable energy curtailment is facilitated by the new connection with the continent which gives the Irish island system access to the generation mix and the enlarged opportunities of the continental market. Thus, the main drivers of the benefits are the level of installed RES capacity in Ireland and Northern Ireland, and the fuel prices of the replaced generation, including the CO2 price. The project allows for the integration of an additional 400 GWh per year of RES at the commissioning date and an additional 1400

GWh per year in 2030. It also facilitates exports from the continent during periods of low RES generation in Ireland. Depending on the merit order and the generation fleets of each scenario, the technology of conventional generation replaced by Irish RES may vary and the project may also enable some substitutions between the different categories of fuels. This leads to different amounts of reduction of market CO2 emissions: from 400k tons per year in 2030 CT (Current Trend) scenario, up to 1000k tons per year in 2030 DE (Distributed Energy). Those values does not include the increase of the CO2 emissions due to the losses of the project which has only been evaluated for NT scenario (+152 k tons per year). In all the scenarios, the project increases market integration by enabling the reduction of price differentials between Irish and continental systems. It also increases security of supply by offering mutual support between Irish and French systems which will have to face significant changes in their generation mix.

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
France Ireland Interconnector	In Permitting	33.277	offshore and onshore sensitivity

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity
France Ireland Interconnector	In Permitting	10.072	offshore and onshore sensitivity

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
810. France Ireland Interconnector	930	+/- 10%	8.4
Total	930		8.4

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

810 Cost uncertainty range due to uncertainties in market costs at the point of contract agreement.In addition, the final routing is not yet defined.