Project Sheet

MaresConnect

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Index

Key Information 3
Description 3
Project Description & Context 6
Project Investments 6
System Needs addressed by the project 9
Interconnection targets 10
Project Assessment 14
Transfer capacity increase (National Trends 2025) 14
Boundary capacity diagram 14
CBA results 15
Central scenario: National Trends 15
Scenarios: Distributed Energy & Global Ambition 18
Sensitivity Study: Current Trends 19
Residual impact 21
Project Costs 21

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Key Information

Cross Border Project
DC transmission line
New

Planned But Not Yet Permitting

Description

MaresConnect is a 750MW HVDC VSC Interconnector between Great Britain and Ireland with three node connections; (i) Bodelwyddan (Wales), (ii) Maynooth (Dublin area, Ireland) and (iii) Bellacorick new node (Mayo area, Ireland). HVDC transmission will be made directly between Bellacorick and Bodelwyddan with a tapped connection at Maynooth. MaresConnect is an integral part of the MARES project, which aims to integrate 1,750MW of new RES and 6GWh of PHES in Mayo in the west of Ireland to the GB and SEM networks as well as provide increased interconnector capacity and voltage stability.

Project promoters

Mares Interconnector Holdings Limited

Countries

United Kingdom
Ireland

National development plan(s)

Project Ireland 2040 National Development Plan 2018-2027.: Pages 22,28,75, refer to increrased commercial interconnection projects between UK and Ireland. P79 refers to closure of Moneypoint oal Plant, which the MAREX project intends to replace through the interconnector, PHES sorage, and new Wind generation. Classified as a Strategic Development by An Bord Pleanála, The Irish Planning Authority in 2013 as part of the grid connection of the MAREX project, ABP reference 16.PC0093

Additional information on the project

EirGrid's Future Energy Scenarios 2019

Coordinated Action outlines the scenario where sustainability is a core part of decision making and proposes that at least two additional interconnectors to Great Britain are built by 2040 in order to facilitate higher RES-E levels.

Ireland's Climate Action Plan (2030)

Climate disruption is already having diverse and wide-ranging impacts on Ireland's environment, society, economic and natural resources. The Climate Action Plan 2019 'to tackle climate breakdown' published by the Department of Communications, Climate Action and Environment, sets out an ambitious course of action over the coming years to address this issue.

The plan sets out a roadmap to 2030, which in electricity terms, primarily involves an Increased reliance on renewables from 30% to 70% adding 12GW of renewable energy capacity (with peat and coal plants closing) and the utilisation of further interconnection. The MARES project aligns with the plan and will deliver towards the benefits sought.

'Achieving 70% renewables will require us to build out significant infrastructures and the capacity to integrate new technologies. This will be a significant challenge. However, these changes are necessary if Irish society is to avoid having stranded fossil fuel assets as the transition accelerates in the 2030-50 period.

In relation to the MARES Interconnector, Climate Action Plan seeks to enhance interconnection to address security of supply and facilitate the absorption of high levels of wind penetration on the system.

Ireland's National Policy Statement on Interconnection

The MaresConnect further aligns with Ireland's National Policy Statement on Interconnection published in 2018.

Ireland's peripheral location at the edge of mainland Europe means that it is naturally isolated from the wider European electricity grid. This fact, combined with the small size of the market, leads to risks to security of supply and reduced competition. Steps have been taken to address this isolation by building/planning interconnection infrastructure that links Ireland to larger cross border markets and brings direct benefits to Irish consumers through lower energy costs.

EU Policy on Interconnection

The European Commission Expert Group on Electricity Interconnection Targets now recommends an increased threshold target of interconnection capacity of at least 30% of installed renewable generation capacity by 2030. This is designed to ensure adequate export capacity for the continued development of renewable generation in Member States and is of importance for Ireland, with high wind generation capability.

The November 2016 Clean Energy Package for All Europeans, still being negotiated, will likely have further impacts on electricity interconnection across Europe. In particular, some of the provisions of the three proposed Regulations and Directive relating to the internal market for electricity will possibly lead to an increasing focus on interconnection as a means to addressing security of supply considerations.

Related projects

Project 349 is a needed reinforcement to allow another TYNDP project 1030 (Storage) to connect to a network, which will provide 6GWh per cycle, 70% cycle efficient energy storage via PHES

Project sheet backlog

13 Jan 2021 - Correction of project promoters

5 Jan. 2021 - Name of the project changed to MaresConnect. Update of the project description. Update of the field 'Additional information on the project'. Update of the field 'Reasons for investment clustering'. Completion of the field 'Promoter(s) comments on the CBA results.

Update of the project costs for the following investments: Investment 1638 (CAPEX 345 -> 253, OPEX 4 -> 1), investment 1680 (CAPEX 417 -> 186, OPEX 4 -> 1), investment 1641 (CAPEX 265 -> 105, OPEX 1.15 -> 3), investment 1642 (CAPEX 265 -> 105, OPEX 1.15 -> 3), investment 1643 (CAPEX 265 -> 105, OPEX 1.15 -> 3)

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

Project Description & Context

Project Investments

Main investment(s): HVDC 750MW 320kV bipole interconnector between UKNG and EIRGRID

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
DC transmission line	211	Bodelwyddan	Maynooth	Planned But Not Yet Permitting	2025	Rescheduled	

Other investments

Description	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
2 x 400MW 275kV OHL	AC transmission line	160	Bellacorick Replacement	Oldstreet 400kV	Planned But Not Yet Permitting	2025	New Investment	
750MW 320kV VSC HVDC Interconnector	DC transmission line	255	Maynooth	Bellacorick Replacement	Planned But Not Yet Permitting	2025	New Investment	
750MW 320kV VSC HVDC Convertor Station to connect to EIRGRID AC	Onshore substation		Bellacorick replacement	Bellacorick replacement	Planned But Not Yet Permitting	2025	New Investment	
750MW 320kV VSC HVDC	Onshore substa		Maynooth	Maynooth	Planned But Not	2025	New Investment	

Description	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
Convertor Station to connect to EIRGRID AC	tion				Yet Permitting			
750MW 320kV VSC HVDC Convertor Station to connect to UKNG	Onshore substation		Bodelwyddan	Bodelwyddan	Planned But Not Yet Permitting	2025	New Investment	
245kV 400MW AC cable	On-shore AC transmission cable	25	MAREX Wind 1	Bellacorick Replacement	Planned But Not Yet Permitting	2025	New Investment	
245kV 400MW AC cable	On-shore AC transmission cable	25	MAREX Wind 2	Bellacorick Replacement	Planned But Not Yet Permitting	2025	New Investment	
245kV 400MW AC cable	On-shore AC transmission cable	25	Marex Wind 3	Bellacorick Replacement	Planned But Not Yet Permitting	2025	New Investment	
245kV 400MW AC cable	On-shore AC transmission cable	20	MAREX Wind 4	Bellacorick Replacement	Planned But Not Yet Permitting	2025	New Investment	
12 bay 245kV substation	Onshore substation		Bellacorick Replacement	Bellacorick Replacement	Planned But Not Yet Permitting	2025	New Investment	
AC	Onshor		Bodel	Bodel	Planne	2025	New	

Description	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
Connection to UKNG system Bodelwyddan 2 number 245kV bays and associated works	e substation		wyddan	wyddan	d But Not Yet Permitting		Investment	
EIRGRID 2 x 245kV Connection bays at Maynooth and associated works	Onshore substation		Maynooth	Maynooth	Planned But Not Yet Permitting	2025	New Investment	
2 x 245kV Connection bays at Oldstreet and associated works	Onshore substation		Oldstreet 220/400kV	Oldstreet 220/400kV	Planned But Not Yet Permitting	2025	New Investment	
2 x 245/400 transformer at EIRGRID 220/400kV Substation Oldstreet	Phase shifting transformer				Planned But Not Yet Permitting	2025	New Investment	

Reason for investment clustering

MaresConnect is composed of an HVDC transmission system between Bodelwyddan and Bellacorick replacement. This line has been listed in two sections; (i) the cross Irish Sea section from Bodelwyddan to Maynooth in Ireland, and (ii) from Maynooth to Bellacorick replacement. The system consists of three convertor stations; Bodelwyddan in Wales, Maynooth in the Greater Dublin area, and Bellacorick replacement in Mayo. At each of these locations there is an interface with the TSO's 245kV or 400kV AC network with associated infrastructure including connection bays and transformers. Near Glinsk, a new 12 bay 220kV substation "Bellacorick replacement" is required to accommodate 220kV cables from four new wind farms, connection to the Bellacorick convertor station and two 245kV lines to connect a PHES (part of project 1030).

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))
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%.	The European Commission Expert Group on Electricity Interconnection Targets recommends an increased threshold of interconnection capacity of at least 30% of installed renewable generation capacity by 2030 to ensure adequate export capacity for the continued development of renewable generation in Member States and is of particular relevance to IE wind potential
	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 2020 pages 42-44 ; RegIP NS 2020 ; MAF 2019; IoSN report 2020: Appendix Fig 15, 16; Regional Investment Plan: Fig 3.13; Regional Investment Plan CCE 2017: section 5.1; IoSN report 2020: Appendix Fig 15 & 16; IoSN Report 2020 (Appendix); Regional Investment Plan CSE 2020 (Ch. 3); Regional Investment Plan CSE 2017 (Ch. 5);IoSN main report (chapter 5)
	Contribution to the power system's operational flexibility by controlling power flows and optimizing use of existing infrastructure	IoSN report 2020 pages 42-44 ; RegIP NS 2020 ; MAF 2019; IoSN report 2020: Appendix Fig 15, 16; Regional Investment Plan: Fig 3.13; Regional Investment Plan CCE 2017: section 5.1; IoSN report 2020: Appendix Fig 15 & 16; IoSN Report 2020 (Appendix); Regional Investment Plan CSE 2020 (Ch. 3); Regional Investment Plan CSE 2017 (Ch. 5);IoSN main report (chapter 5)
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	The Ireland Climate Action Plan 2019 'to tackle climate breakdown' sets The plan sets out a roadmap to 2030, which in electricity terms, primarily involves an primarily involves an Increased reliance on renewables from 30% to 70% adding

Need		How the project addresses each need (explanation provided by the project promoter(s))
		12GW of renewable energy capacity

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.

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Project Assessment

Transfer capacity increase (National Trends 2025)

	Border	A B	B A
Transfer capacity increase (in MW)	Ireland- United Kingdom	750	750

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	243 238 232	218 217 217	>	>	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	46 45 43	39 33 24	>	>	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	max average min	246 236 226	203 201 198	>	>	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	1217	3134	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	53	115	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	2812	5383	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	-2077	-12917	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	195	283	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	-2123	-13032	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)		max average min	-1885 -1939 -1993	-865 -1173 -1384	< 	< 	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	72 149 322	38 84 189	< < >	< > >	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)		average	164	165	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	-7 -14 -31	-5 -12 -27	n/a	n/a	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)		max average min	4922 4831 4739	5350 5197 5044	< 	> 	ENTSO-E assessment
B3a Connected RES (MW)	-		1800	1800	n/a	n/a	ENTSO-E assessment

Impact on grid losses

B5 Variation of network losses (GWh / year)		average	328	426	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ /		average	16	14	n/a	n/a	ENTSO-E assessment

year)					

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		3091	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	30.91	>	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	283	249	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	87	52	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	204	236	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market	average	-1635	-1474	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	11 77 222	37 96 227	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	4947	5257	ENTSO-E assessment
B3a Connected RES (MW)	-	1800	1800	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	235	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	46	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	260	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-1640	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	52 118 264	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	4832	ENTSO-E assessment
B3a Connected RES (MW)	-	1800	ENTSO-E assessment

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

MARES brings the traditional benefits of interconnection as well as a number of project specific benefits to Ireland's energy network and broader regional economy.

1. Lower projected wholesale prices for electricity in the Irish market through the reduction of RES curtailment during periods of high Irish wind and the ability to import lower priced GB power during periods of low Irish wind.

2. Displacement of CCGT capacity in GB, highly polluting coal and peat in Ireland through RES integration

3. Additional security of supply to both the Irish and GB markets

4. An investment in excess of €750m in Irish and GB transmission infrastructure as well as a large stimulus for €500 million investment in Pumped Heat Electrical Storage (PHES) and a further 2,000 MW wind generation in the west of Ireland

5. Significant employment during construction phase of all projects

6. Long-term export revenues to Ireland

Employment benefits during construction phase of IC and related PHES project, and new critical transmission infrastructure to the Mayo region of Ireland, expected to bring much needed

development to the communities there.

NAME OF STUDY OPIC: GB-Ireland Interconnector Assessment

STUDY CONDUCTED BY Poyry, UK

STUDY YEAR 2017

STUDY HORIZON 2023-2040

STUDY APPROVED No

https://www.dropbox.com/s/tzd0ix5qei745cz/Extract%20-%20Poyry%20OPIC%20GB-Ireland%20Interconnector%20Assessment%20%28Sept%202017%29.pdf?dl=0

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

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)

https://www.dropbox.com/s/tzd0ix5qei745cz/Extract - Poyry OPIC GB-Ireland Interconnector Assessment %28Sept 2017%29.pdf?dl=0

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
1638. Mares Cable 1: Cross Irish Sea Interconnector Cable	253	15%	1
1639. Enabling Works 1: Bellacorick-Oldstreet 2 x 245kV OHL	100		0.5

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
1640. Mares Cable 2: Cross Ireland Interconnector Cable	186	15%	1
1641. Mares Converter Station 3	105		3
1642. Mares Converter Station 2	105		3
1646. Mares Converter Station 1	105		3
1647. MAREX Wind infeed cable 1	25	15%	0.2
1648. MAREX Wind Infeed cable 2	25	15%	0.2
1649. MAREX Wind Infeed cable 3	25	15%	0.2
1650. MAREX Wind Infeed Cable 4	20	15%	0.2
1651. Enabling Works 2: Glinsk Bellacorick Replacement 10 x 245kV bay substation	15	15%	0.04
1652. Enabling Works 3: 2 x 245kV Connection bays UKNG and associated works	5	15%	0.005
1653. Enabling Works 4: EIRGRID 2 x 245kV Connection bays at Maynooth and associated works	5	15%	0.005
1654. Enabling Works 5: EIRGRID 2 x 245kV Connection bays at Oldstreet and associated works	3		0.005
1655. Enabling Works 6: 2 x 245/400 transformer at EIRGRID 220/400kV Substation Oldstreet	15	15	0.02
Total	992		12.374999999999998

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

1638

1639

1640

1641

1642

1646

1647

1648

1649

1650

1651

1652

1653

1654

1655

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