Project Sheet

Interconnection Portugal-Spain

Project type	transmission
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Key Information

Cross Border Project
Onshore substation
New

PCI number 2.17 (4th list, 31 Oct. 2019)
In Permitting

Description

In order to reach a complete operational Iberian Electricity Market (MIBEL), and strengthen the Internal Energy Market (IEM), the increase of the interconnection between Spain and Portugal is needed. A new OHL 400kV interconnection between Fontefría (Spain) and Ponte de Lima (Portugal). Internal reinforcements complement the cross border section, such as the axis in Spain between Fontefría and Beariz, in order to be able to connect the crossborder project to the existing network, and in Portugal between Ponte de Lima (previously Viana do Castelo) and Vila Nova de Famalicão (previously Vila doConde). This project was included in the 2013, 2015, 2017 and 2019 PCI list (PCI 2.17).

Project promoters

Red Eléctrica de España
Rede Elétrica Nacional

Countries

Spain
Portugal

National development plan(s)

Spanish NDP, Spain, 2015-2020, Project Label TI-1 and Project Sheet in Annex III, page 141 & Portuguese NDP, Portugal,Draft NDP 2020-2029, pages 197 (https://www.erse.pt/media/harhy1bu/proposta-de-pdirt-e-2019_relat%C3%B3rio.pdf); Appendix 4 page 3 (https://www.erse.pt/media/1mrlurih/proposta-de-pdirt-e-2019_anexos.pdf), Spanish NDP, Spain, 2015-2020, Project Label TI-1 and Project Sheet in Annex III, page 141

Additional information on the project

Project website

http://www.ree.es/es/actividades/gestor-de-la-red-y-transportista/proyectos-de-interes-comun-europeos-pic
;

https://www.ren.pt/en-GB/o_que_fazemos/projetos_interesse_2017/

PCI page – link to EC platform

https://ec.europa.eu/energy/en/topics/infrastructure/projects-common-interest

Other links:

Spanish National Development Plan:

http://www.mincotur.gob.es/energia/planificacion/Planificacionelectricidadygas/desarrollo2015-2020/Paginas/desarrollo.aspx

Portuguese National Development Plan:

https://www.erse.pt/media/harhy1bu/proposta-de-pdirt-e-2019_relat%C3%B3rio.pdf
;
https://www.erse.pt/media/1mrlurih/proposta-de-pdirt-e-2019_anexos.pdf

Inter-Governmental agreement (Madrid and Lisbon Declarations)

https://ec.europa.eu/energy/sites/ener/files/documents/Madrid%20declaration.pdf
;
https://ec.europa.eu/info/sites/info/files/lisbon_declaration_energyinterconnections_final.pdf

Constitution of the High Level Group on Interconnections for South West Europe

The High Level Group is responsible to prepare a plan to implement the Madrid Declaration and ensure regular monitoring of progress of the projects and provide adequate technical assistance to the Member states. The group will deal with both gas and electricity infrastructure.

http://europa.eu/rapid/press-release_IP-15-5187_en.htm

XXII Portuguese-Spanish Summit (main conclusions)

Main conclusions from the XXII Portuguese-Spanish summit where both governments agreed to continue working on the definition and routes for two new interconnection in order to reach an interconnection capacity of 3000 MW by 2010 between both countries.

https://www.madrid.embaixadaportugal.mne.pt/images/Declara%C3%A7%C3%A3o_XXII_Cimeira_Luso-Espanhola.pdf

Project sheet backlog

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

Project Description & Context

Project Investments

Main investment(s):

New northern interconnection. New double circuit 400kV OHL between Beariz (ES) - Fontefria (ES).

New northern interconnection. New 400kV OHL Fontefria (ES) - Ponte de Lima (PT) - Vila Nova de Famalicão (PT).

New northern interconnection. New 400kV substation Fontefria (ES), previously O Covelo.

New northern interconnection. New 400kV substation Beariz (ES), previously Boboras

New 400/150kV substation Ponte de Lima (PT), previously V. Castelo.

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
AC transmission line	30	Beariz (ES)	Fontefria (ES)	In Permitting	2022	Delayed	Delays due to social and environmental problems (possibility of re-routing and/ or siting or re-siting of facility(ies)). The permitting had to be reinitiated.
AC transmission line	140.21	Fontefria (ES)	Vila Nova de Famalicão (PT) (By Ponte de Lima)	In Permitting	2022	Delayed	Delays due to social and environmental problems (possibility of re-routing and/ or siting or re-siting of facility(ies)). The permitting had to be reinitiated.
Transformer				In Permitting	2022	Delayed	Delays due to social and environmental problems (possibility of re-routing and/ or siting or re-siting of facility(ies)). The permitting had to be reinitiated.
Onshore		Beariz (ES)	Beariz (ES)	In Permitt	2022	Delayed	Delays due to social and environmental problems

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
substation				ing			(possibility of re-routing and/ or siting or re-siting of facility(ies)). The permitting had to be reinitiated.
Onshore substation		Ponte de Lima (PT)	Ponte de Lima (PT)	In Permitting	2022	Delayed	Delays due to social and environmental problems (possibility of re-routing and/ or siting or re-siting of facility(ies)). The permitting had to be reinitiated.

Reason for investment clustering

Clustering: the project consists of a set of investments in the same transmission corridor, based on a 400 kV OHL axis linking the substations of Beariz and Fontefría, in Spain, with P. Lima-V. N. Famalicão, in Portugal. These reinforcements are all needed (as they are in series) to achieve the main objectives of the project: reinforcement of the interconnection capacity between Portugal and Spain having in mind the MIBEL targets agreed by the Portuguese and Spanish governments and also to allow Portugal to achieve the 10% interconnection ratio defined by the EC, both contributing for the IEM.

Is the project in the reference grid?

Yes

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	IoSN report shows that for the 2040NT scenario the yearly average marginal price difference is higher than the 2€/ MWh defined by Interconnection Target Expert Group as threshold for developing new interconnections. In addition, Spanish interconnectors nominal transmission capacity is below 30% of

Need		How the project addresses each need (explanation provided by the project promoter(s))
	pushing ratio between nominal transmission capacity and peak load past 30%.	the national peak load and RES capacity
	Infrastructure to improve system flexibility and stability e.g. improve system or local ramp rate, improve transient stability or RoCoF to meet system Needs.	The increase of interconnection capacity will be essential to cope with the residual load ramps challenge. The increase of interconnection capacity between countries will allow to exchange the power flows from flexibility sources.
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	TYNDP shows a reduction of RES spillage considering the increase of interconnection capacity.
	Infrastructure and/or market design to provide balancing flexibility (e.g. international pooling / sharing of reserves, coordinated development of reserve capacity)	New interconnections with cross border impact can enable the increase of exchange of balancing energy (Welfare savings through exchanging balancing energy and trough imbalance netting). Balancing energy refers to products such as Replacement Reserve (RR), manual and automatic Frequency Regulation Reserve (FRR).

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)	Spain - Portugal	1900	1000

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	25 18 15	29 22 14	>	>	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	4 3 3	6 4 2	>	>	ENTSO-E assessment
B1_RES Annual Socio-Economic	max average	7 6	16 11	>	>	ENTSO-E assessment

Welfare increase resulting from RES integration	min	5	7			

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	40	-77	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	9	-8	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	77	-9	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	3408	-144	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	19	-4	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	3404	-140	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	-110 -128 -178	-79 -150 -203	< <	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	5 10 21	5 11 24	< > >	>> >>	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	24	21	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from	CO2 price	60€/ ton 100€/	-1 -2 -5	-1 -2 -3	n/a	n/a	ENTSO-E assessment

CO2 variation from network simulation monetised (M € / year)	ton 189€/ ton					

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	max average min	159 130 109	436 293 185	>	>	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	37	12	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	2	2	n/a	n/a	ENTSO-E assessment

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		766	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	7.66	>	n/a	ENTSO-E assessment

	NT2025	NT2030	
B7 System Flexibility – Balancing Energy Exchange	+	+	Qualitative assessment by ENTSO-E, based on the study and values provided by the project promoter(s). ENTSO-E confirms the consistency

	NT2025	NT2030	
			of the proposed indicator with the CBA Guideline 3.0. About the computation of this indicator by the project promoter(s)

This indicator was computed based on NT2025 and NT2030, in a study performed by REE-REN in 2020. The promoter(s) stated that the submitted value was computed in accordance with the CBA Guideline and explained it as follows:

The methodology used in the study and results have been computed based on the proposed methodology within the 3rd CBA Guideline to assess the welfare savings through exchanging balancing energy and imbalance netting.

The promoter(s) certified that the values submitted and assessed in the study relate to countries located within the ENTSO-E perimeter only.

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	60	91	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	16	23	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	64	104	ENTSO-E assessment
Reduction of CO2 and GHG emissions				
B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-295	-650	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	2 14 40	16 42 100	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	1305	2400	ENTSO-E assessment
B3a Connected RES (MW)	-			ENTSO-E assessment

Security of supply

Non scenario-dependent indicator(s)

B8.0 Stability (Transient, Voltage and Frequency Stability)	Transient stability	Voltage stability	Frequency stability	
Beariz (ES) - Fontefria (ES) (New AC line)	++	++	0	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.
Fontefria (ES) - Vila Nova de Famalicão (PT) (New AC line)	++	++	0	

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-	average	20	ENTSO-E assessment

Economic Welfare (SEW) increase (M€ / year)			
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	5	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	8	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-191	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 14 31	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	146	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	Distance	Type of sensitivity

	status	(km)	
Fontefria (ES) - Vila Nova de Famalicão (PT)	In Permitting	0.5	Habitats Directive (92/43/EEC)
		29	
		3	Habitats Directive (92/43/EEC)

Additional information by the project promoter(s)

Fontefria (ES) - Vila Nova de Famalicão (PT)
0.5 km: https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=ES1140007
3 km: Programa Man & Biosphere (Biosphere Reserve Gerês-Xurês|Transition area) (https://siaia.apambiente.pt/AIA.aspx?ID=3295)

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity
Fontefria (ES) - Vila Nova de Famalicão (PT)	In Permitting	1	Sensitivity regarding population density - Land that is close to densely populated areas

Additional information by the project promoter(s)

https://www.ree.es/sites/default/files/04_SOSTENIBILIDAD/Documentos/tramitacion_ambiental/EIA/Documento%20S%C3%ADntesis%20SE.%20Beariz%20400%20kV.pdf

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
18. Beariz (ES) - Fontefria (ES)	18.69	10%	0.49
496. Fontefria (ES) - Vila Nova de Famalicão (PT)	63.92	10%	0.208
498. SE Fontefria 400/220kV	13.16	10%	0.17
499. Beariz 400kV (ES)	7.17	10%	0.17
500. Ponte de Lima (PT)	10.5	10%	0.054
Total	113.44		1.092

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

18	Uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process
496	Uncertainty regarding extra costs due to safety, environmental or legal requirements

	imposed during permit grating process
498	Uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process
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