Project Sheet

RES in north of Portugal

Project type	transmission
Project id	1
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Key Information

Internal Project
Onshore substation
New

PCI number 2.16.1 and 2.16.3 (4th list, 31 Oct. 2019)
Planned But Not Yet Permitting

Description

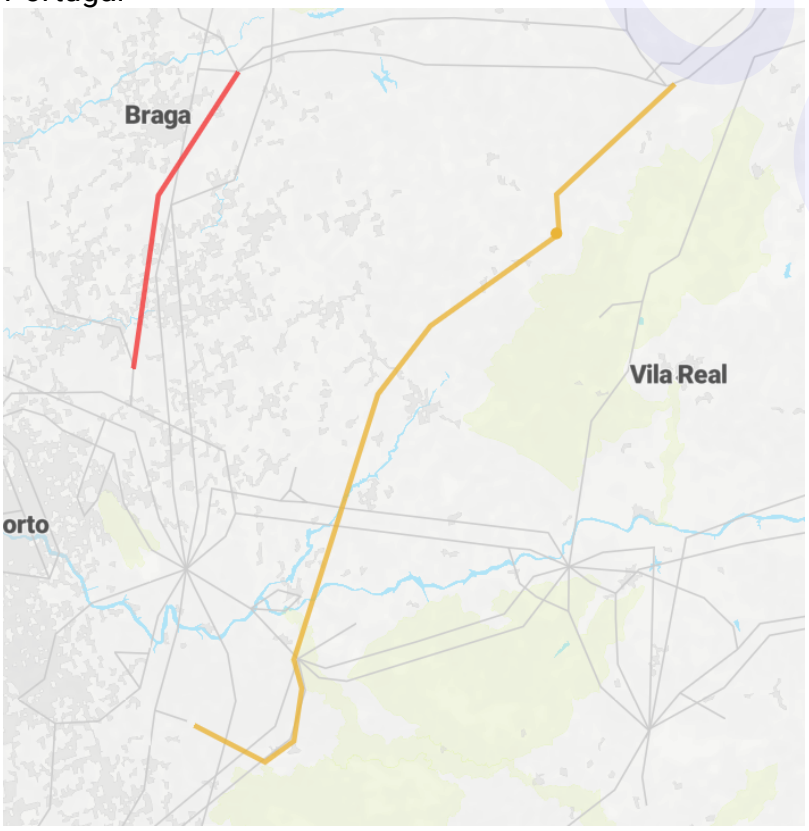
The main objective of this project consists in introducing the network reinforcements that are needed to allow the connection of new RES generation (hydro with pumping and also wind) that is foreseen in the north of Portugal, where the RES potential is high. The project includes a set of new 400 kV OHL that will form a new axis between V. Minho-R. Pena-Feira (PCI 2.16.3). A new 400 kV OHL Pedralva-Sobrado (PCI 2.16.1) is also included in this cluster, in order to ensure the maintenance of the NTC values between PT and ES that were available prior to the connection of these new power plants.

Project promoters

Rede Elétrica Nacional

Countries

Portugal



National development plan(s)

NDP 1, Portugal, Draft NDP 2020-2029, pages 136 (https://www.erse.pt/media/harhy1bu/proposta-de-pdirt-e-2019_relat%C3%B3rio.pdf); Appendix 3, page 1 and Appendix 4 page 3 (https://www.erse.pt/media/1mrlurih/proposta-de-pdirt-e-2019_anexos.pdf)

Additional information on the project

Portuguese National Development Plan:

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

Project website

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

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 double-circuit 400kV OHL Vieira do Minho (PT) - Ribeira de Pena (PT) - Feira (PT).

New 400/60kV substation in Ribeira de Pena.

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	131	V.Minho (by Ribeira de Pena)	Feira (by Ribeira de Pena)	In Permitting	2022	Ahead of time	
Onshore substation		Ribeira de Pena (PT)	-	In Permitting	2021	Ahead of time	

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
New double circuit Pedralva (PT) - Sobrado (PT) 400kV OHL, (only one circuit installed in a first step).	AC transmission line	67	Pedralva (PT)	Sobrado (PT)	Planned But Not Yet Permitting	2024	Rescheduled	Due to the expected delay of the connection of new RES generation, the commissioning date of this investment item was rescheduled

Reason for investment clustering

Clustering: This project includes a set of new 400 kV OHL that will form a new axis between V. Minho-R. Pena-Feira, ensuring the network capacity to evacuate the new amounts of generation,

taking also into consideration the n-1 security criteria. The new substations of R. Pena is also considered in this axis for direct connection of generation.
A new line between Pedralva and Sobrado is also included in this cluster, in order to ensure the maintenance of the NTC values between PT and ES that were available prior to the connection of the new generation.

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))
	Infrastructure to address system adequacy deficiencies and/or mitigate the risk of power failures.	Adequacy needs are identified in Portugal mainly due to the expected decommissioning of old power plants along with increasing levels of variable generation. The integration of Hydro power plants with pumping (included in this project) are necessary in order to comply with national adequacy standards
	Infrastructure to improve system flexibility and stability e.g. improve system or local ramp rate, improve transient stability or RoCoF to meet system Needs.	Flexibility is the ability of a power system to respond to changes in power demand and generation. Storage facilities such as pumped storage and hydro storage schemes with peak generation are one of the solutions to cope with high power ramps
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	Project for integration of Hydro power plants with pumping

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)	Internal (Portugal)	1400	1400

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 24 23	37 27 16	>	<	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	5 4 2	6 4 2	>	<	ENTSO-E assessment
B1_RES Annual Socio-Economic	max average	21 19	45 41	>	<	ENTSO-E assessment

Welfare increase resulting from RES integration	min	17	37			

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	409	566	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	21	30	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	687	868	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	1284	-2122	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	39	51	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	1272	-2140	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	-87 -153 -203	-58 -149 -213	< <	>>	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 12 25	5 11 24	<<<<<<	<<<<<<	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	18	19	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from	CO2 price 60€/ ton 100€/	-1 -2 -3	-1 -1 -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	437 402 353	1210 1102 1017	>	<	ENTSO-E assessment
B3a Connected RES (MW)	-	1154	1154	n/a	n/a	ENTSO-E assessment

Impact on grid losses

B5 Variation of network losses (GWh / year)	average	35	60	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		N/A	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	N/A	>	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	35	18	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	10	4	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	60	31	ENTSO-E assessment
Reduction of CO2 and GHG emissions				
B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-186	-105	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	1 9 25	3 7 16	ENTSO-E assessment
Integration of renewable energy sources				
B3 Annual avoided curtailment (RES integration) (GWh / year)	average	1131	721	ENTSO-E assessment
B3a Connected RES (MW)	-	1154	1154	ENTSO-E assessment

Non scenario-dependent indicator(s)

B8.0 Stability (Transient, Voltage and Frequency Stability)	Transient stability	Voltage stability	Frequency stability	
Pedralva-Sobrado (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.
V.Minho -R.Pena-Feira (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-Economic Welfare (SEW) increase (M€ / year)	average	37	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	7	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	46	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-255	ENTSO-E assessment
B2a_€ Annual Societal cost variation	CO2 price 60€/ ton 100€/	8 18 41	ENTSO-E assessment

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

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	851	ENTSO-E assessment
B3a Connected RES (MW)	-	1154	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
V.Minho -R.Pena-Feira	In Permitting	13	Habitats Directive Birds Directive
		7	Habitats Directive IUCN key biodiversity áreas

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://siaia.apambiente.pt/AIA.aspx?ID=2363
https://siaia.apambiente.pt/AIA.aspx?ID=2621
https://siaia.apambiente.pt/AIA.aspx?ID=3217

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity
V.Minho -R.Pena-Feira	In Permitting	10	Globally Important Agricultural Heritage Systems (GIAHS)

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
2. Pedralva-Sobrado	30.4	±10%	0.066
4. V.Minho -R.Pena-Feira	69	±10%	0.155
474. Substation Ribeira de Pena	7.4	±10%	0.054
Total	106.8		0.275

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

2	Due to uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process
4	Due to uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process
474	Due to uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process