Project Sheet

Integration of RES in Alentejo

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Key Information

Internal Project
Onshore substation
Mostly Upgrade

Planned But Not Yet Permitting

Description

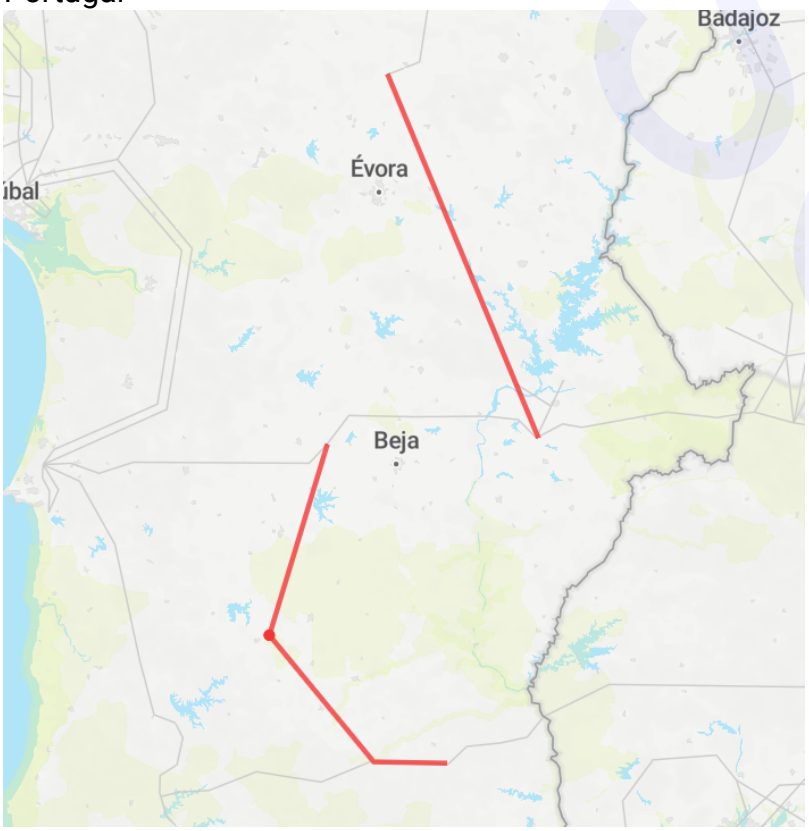
The main objective of this project consists in introducing the network reinforcements that are needed to allow the connection of new RES generation (mostly solar but also some wind) that is foreseen for the south region of Portugal, where the solar potential is considerably high. The project includes two new 400 kV OHL that will constitute a new axis between F. Alentejo-Ourique-Tavira substations. It is also included the expansion of the Ourique substation to include the 400 kV voltage level and a new 400KV OHL Alqueva-Divor.

Project promoters

Rede Elétrica Nacional

Countries

Portugal



National development plan(s)

NDP 1, Portugal, Draft NDP 2020-2029, pages 140 (
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
;
https://www.erse.pt/media/1mrlurih/proposta-de-pdirt-e-2019_anexos.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 double-circuit 400+150 kV OHL F. Alentejo-Ourique-Tavira. The realization of this connection can take advantage of some already existing 150kV single lines, which can be reconstructed as double circuit line 400+150kV.

Extension of existing Ourique substation to include 400 kV facilities.

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	122	F. Alentejo (by Ourique)	Tavira (by Ourique)	Planned But Not Yet Permitting	2023	Ahead of time	
Onshore substation		Ourique (PT)	-	Planned But Not Yet Permitting	2023	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 75 km single-circuit 400 kV OHL Alqueva-Divor.	AC transmission line	75	Alqueva	Divor	Planned But Not Yet Permitting	2023	New Investment	

Reason for investment clustering

Clustering: the project consists of a new axis connecting Ferreira do Alentejo and Tavira substations, passing through an intermediate substation (Ourique) that will need to be expanded to include the 400 kV voltage level. All these investments are in series so a lack of any of them will not allow to get the desired GTC increase of the project. Also a new 400 OHL Alqueva-Divor is

included in this cluster in order to increase and allow the maximum utilization of the potential of the main investment.

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 facilitate and accommodate future scenarios, cross-border flows or loop flows.	TYNDP 2018 and 2020 System Needs study showed high level of congestion in the network resulting from the integration of RES (mainly Solar) congestion in the network in the south of Portugal where the solar potential is considerably high.
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	Project for integration of RES (mainly Solar).

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)	1000	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 22 20	15 14 11	<	<	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	4 4 4	3 2 0	<	>	ENTSO-E assessment
B1_RES Annual Socio-Economic	max average	24 23	28 24	<	<	ENTSO-E assessment

Welfare increase resulting from RES integration	min	22	20			

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	365	1803	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	18	107	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	608	2378	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	-302	-6346	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	35	149	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	-313	-6411	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)		max average min	-155 -167 -176	-5 -60 -103	>	<	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 13 28	2 4 10	< < <	>>>	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)		average	12	29	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from	CO2 price	60€/ ton 100€/	0 -1 -2	-1 -2 -5	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	471 469 466	727 633 538	<	<	ENTSO-E assessment
B3a Connected RES (MW)	-	258	620	n/a	n/a	ENTSO-E assessment

Impact on grid losses

B5 Variation of network losses (GWh / year)	average	17	105	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	1	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	10	14	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	1	4	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	23	23	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-15	-110	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	0 1 2	3 7 17	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	449	529	ENTSO-E assessment
B3a Connected RES (MW)	-	706	494	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	32	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	6	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	39	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-214	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	7 15 34	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	739	ENTSO-E assessment
B3a Connected RES (MW)	-	447	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
F.Alentejo-Ourique-Tavira	Planned But Not Yet Permitting	11	RAMSAR site

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.

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
779. F.Alentejo-Ourique-Tavira	63	±10%	0.094
780. Extension of Ourique substation	4.1	±10%	0.028
1670. Alqueva-Divor	23	±10%	0.07
Total	90.1		0.192

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

779	Due to uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process
780	Due to uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process
1670	Due to uncertainty regarding extra costs due to safety, environmental or legal requirements imposed during permit grating process