Project Sheet

Connection of Aragon Pumping hydro

Project type	transmission
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Key Information

Internal Project
AC transmission line
New

Under Consideration

Description

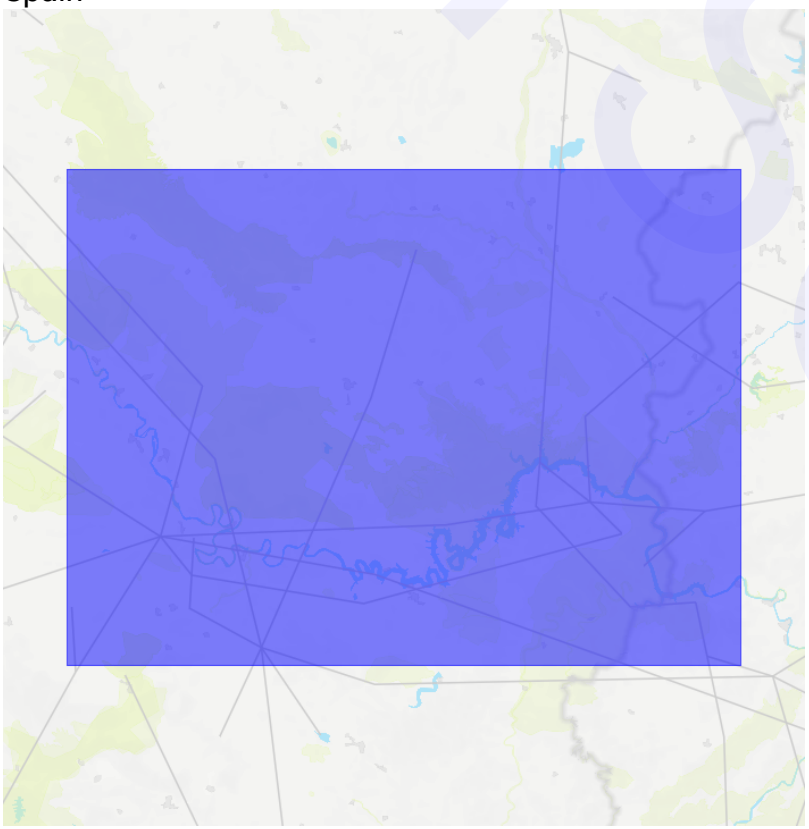
Potential necessary transmission development for the connection of 3rd party storage project (pumping hydro) that has received a PCI label in the 3rd list 2017. No details about the required network are known yet (P1011 and P1019 in this TYNDP; take into consideration that these projects compete with each other as they use the same hydro resources).

Project promoters

Red Eléctrica de España

Countries

Spain



National development plan(s)

This is a conceptual project that has not been defined yet. Only the Nueva Mequinenza subestation that allows to integrate 1100 MW of pumping hydro is included in the Spanish NDP,

Spain, 2015-2020, Page 199

Additional information on the project

Related projects

This project has interdependence with storage projects P1011 and P1019. Project P233 is the necessary transmission development for the connection of one of these 2 storage projects, which competewith each other.

Project sheet backlog

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

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Project Description & Context

Project Investments

Main investment(s): No details about the required network are known yet

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	0	-	-	Under Consideration	2027	Delayed	National Development Plan does not contain yet a solution for the second phase of projects 1011 and 1019, which compete with each other.

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 improve system flexibility and stability e.g. improve system or local ramp rate, improve transient stability or RoCoF to meet system Needs.	This project consists of the transmission network required for the connection of new pumping power plants that would give more flexibility to the system as the new pumping units will do.
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	This project consists of the transmission network required for the connection of new pumping power plants that would allow RES integration

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 (Spain)	3300	3300

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	39 33 28	124 115 105	>	<	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	6 5 4	29 25 17	>	>	ENTSO-E assessment
B1_RES Annual Socio-Economic	max average	23 18	168 130	>	<	ENTSO-E assessment

Welfare increase resulting from RES integration	min	15	90			

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	-2036	-7277	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	-142.5	-403.5	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	-2288.5	-8746	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	5491	-6011.5	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	-156	-550.5	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	5561	-5700.5	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	-190 -226 -271	-618 -884 -1026	 <	 >	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	8 17 37	28 64 142	< < >	< < <	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	0	0	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from	CO2 price 60€/ ton 100€/	0 0 0	0 0 0	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	474 365 301	4122 3320 2475	>	<	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	308	1612.5	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	12.5	26.5	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	193	104	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	61	26	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	278	107	ENTSO-E assessment
Reduction of CO2 and GHG emissions				
B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-1144	-737	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	8 54 156	18 48 114	ENTSO-E assessment
Integration of renewable energy sources				
B3 Annual avoided curtailment (RES integration) (GWh / year)	average	5168	2427	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	
Conceptual project (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.

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	63	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	12	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	47	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-413	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market	CO2 price 60€/ton 100€/ton 189€/	13 30 66	ENTSO-E assessment

simulation monetised (M€ / year)	ton		

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	900	ENTSO-E assessment
B3a Connected RES (MW)	-		ENTSO-E assessment

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

Savings in variable generation costs are the result of the full integration of a new pumping storage power plant in the area of Aragón, without any network restriction. Therefore, thanks to the flexibility that the pumping offers to the network, the values of RES integration, CO2 reduction and savings in variable generation costs are high, especially in the 2030 scenarios and particularly in the 2030 DE scenario. Values in 2025 are lower as the installed RES and the flexibility that the project provides is lower.

This project helps to integrate the high RES potential in the Iberian Peninsula, in particular in an area where the existing transmission network, is not sufficient to accommodate all the expected future RES connection.

Residual impact

Information on the residual impact of the project was provided by the project promoter(s).

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
1235. Conceptual project	75	10%	1.125
Total	75		1.125

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

1235 Cost increase due to time overruns