Project Sheet

BRABO II + III

Project type	transmission
Project id	297
Created by	
Created on	Feb 11, 2021 11:54:17 AM

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Key Information

Internal Project
AC transmission line
New

PCI number 2.23 (4th list, 31 Oct. 2019)
In Permitting

Description

Realization of a new 380 kV corridor between Zandvliet and Mercator consisting of a double-circuit AC overhead line, including a new substation 380kV in Lillo.

Project motivation:

BRABO II and III sustain the development of interconnection capacity on the Belgian North Border towards a broader scenario framework, hereby securing the supply of electricity around the Antwerp harbour area in light of the increasing industrial demand (mainly applicable to BRABO II), as well as developing capacity for the potential integration of new production in the Antwerp area (mainly aplicable to BRABO III).

This project contributes to resolving internal congestions, considering expected high international transit & loop flows. This project increases the degree of interconnectivity between the Belgian and Dutch bidding zone. The possibility of higher market exchanges between these two bidding zones leads to a higher price convergence in more hours of the year and reduces therefore the price differentials.This project allows to deal with the growth in industrial consumption from the Antwerp harbour and to increase the grid hosting capacity for connection of new production capacity, thereby contributing to the overall adequacy of the system, especially relevant considering the nuclear phase out in Belgium.RES integration implies higher flows in the meshed AC-grid and thus increases the need for cross border transmission capacity. This project satisfies this need in a cost-efficient manner.

Project promoters

ELIA

Countries

Belgium

National development plan(s)

NDP1, Belgium, 2020-2030, p.193, ID 29-and 32

Additional information on the project

More information about the project can be found following these links:

-
https://www.elia.be/en/infrastructure-and-projects/infrastructure-projects/brabo

-
https://www.elia.be/en/infrastructure-and-projects/infrastructure-projects/brabo-III

- National Development Plan:
https://www.elia.be/-/media/project/elia/elia-site/infra-and-projects/investment-plans/federal-development-plan-2020-2030/nl/20190516_federaal-ontwikkelingsplan_nl.pdf?la=en

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): The second phase of the BRABO project consists of the construction of a new double circuit 380kV overhead line from Zandvliet via Lillo to Liefkenshoek where the new line will be the temporarily connected to the existing 380kV line Doel-Mercator.This new line will be constructed making use of the corridor of the existing 150kV overhead line Zandvliet-Oorderen-Lillo, which will be undergrounded.

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	18	Zandvliet	Lillo - Liefkenshoek	Under Construction	2020	Investment on 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
The existing 150kV overhead will be upgraded to a single 380kV overhead line between the site Liefkenshoek and the substation Mercator. To facilitate this upgrade, the adjacent 150kV grid will be adapted.	AC transmission line	19	Liefkenshoek (BE)	Mercator (BE)	In Permitting	2025	Investment on time	

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
"This concerns the construction of the 380kV substation Lillo, including a 380/150 kV transformer, as part of the second phase of the BRABO-project."	Onshore substation		Lillo (BE)	Lillo (BE)	Under Construction	2019	Investment on time	

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 reduce price differentials between EU and/or non-EU countries	This project increases the degree of interconnectivity between the Belgian and Dutch bidding zone. The possibility of higher market exchanges between these two bidding zones leads to a higher price convergence in more hours of the year and reduces therefore the price differentials.
	Infrastructure to address system adequacy deficiencies and/or mitigate the risk of power failures.	This project allows to deal with the growth in industrial consumption from the Antwerp harbour and to increase the grid hosting capacity for connection of new production capacity, thereby contributing to the overall adequacy of the system, especially relevant considering the nuclear phase out in Belgium.
	Infrastructure to facilitate and accommodate future scenarios, cross-border flows or loop flows.	This project contributes to resolving internal congestions, considering expected increased market exchanges inducing higher flows.

Need		How the project addresses each need (explanation provided by the project promoter(s))
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	RES integration implies higher flows in the meshed AC-grid and thus increases the need for cross border transmission capacity. This project satisfies this need in a cost-efficient manner.

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)	Belgium - Netherlands	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	7 6 5	19 17 14	>	<	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	0 0 0	3 2 2	>	>	ENTSO-E assessment
B1_RES Annual Socio-Economic	max average	12 11	31 29	<	<	ENTSO-E assessment

Welfare increase resulting from RES integration	min	9	26			

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	-30	78	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	-3	6	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	-60	104	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	-2053	-7433	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	0	11	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	-2056	-7437	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	-15 -15 -17	-74 -85 -96	< 	< 	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 1 3	3 6 14	< > >	< > >	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	34	44	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from	CO2 price 60€/ ton 100€/	-1 -3 -6	-1 -3 -7	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	264 228 187	830 770 670	<	<	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	99	163	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	2	3	n/a	n/a	ENTSO-E assessment

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		1550	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	15.5	>	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	21	15	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	16	4	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	12	13	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-298	-117	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	3 8 18	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	254	297	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	
BRABO II: Zandvliet - Lillo - Liefkenshoek (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.
BRABO III: Liefkenshoek - Mercator (New AC line)	++	++	0	
BRABO II: Lillo 380 (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	9	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	2	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	14	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-75	ENTSO-E assessment
B2a_€ Annual		2	ENTSO-E assessment

Societal cost variation resulting from CO2 variation from market simulation monetised (M€ / year)	CO2 price 60€/ ton 100€/ ton 189€/ ton	5 12	

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	257	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 status	Distance (km)	Type of sensitivity
BRABO II: Zandvliet - Lillo - Liefkenshoek	Under Construction	1.5	Habitats Directive (92/43/EEC)
		1	Birds Directive (2009/147/EC)
BRABO III: Liefkenshoek - Mercator	In Permitting	4	Birds Directive (2009/147/EC)

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity
BRABO II: Lillo 380	Under Construction	15.5	Sensitivity regarding population density - Land that is close to densely populated areas
BRABO III: Liefkenshoek - Mercator	In Permitting	14.7	Sensitivity regarding population density - Land that is close to densely populated areas

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
445. BRABO II: Zandvliet - Lillo - Liefkenshoek	100	5%	0.1
604. BRABO III: Liefkenshoek - Mercator	70	25%	0.1
605. BRABO II: Lillo 380	15	5%	0.1
Total	185		0.30000000000000004

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

445	Uncertainty range is based on provided information in the PCI process
604	Uncertainty range is based on provided information in the PCI process
605	Uncertainty range is based on provided information in the PCI process