Project Sheet

HVDC Line A-North

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Index

Key Information 3
Description 3
Project Description & Context 5
Project Investments 5
System Needs addressed by the project 5
Interconnection targets 6
Project Assessment 10
Transfer capacity increase (National Trends 2025) 10
CBA results 10
Central scenario: National Trends 10
Scenarios: Distributed Energy & Global Ambition 13
Sensitivity Study: Current Trends 15
Residual impact 16
Project Costs 16

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Key Information

Internal Project
DC transmission line
New

In Permitting

Description

Project 132 consists of two new HVDC cable from Emden-East to Osterath. The HVDC has a transfer capacity of 2 GW. The project is a grid expansion project for low-loss transmission of high power over long distances from Northern Germany to the Rhineland. Northern Germany is characterized by a large number of regenerative onshore and offshore energy sources which exceed the demand of Northern German loads. The Rhineland, however, is a high-production region with large conventional generation capacity that has to be substituted by renewable generation capacity due to the German coal phase-out.

Project promoters

AMPRION

Countries

Germany

National development plan(s)

NDP, Germany, Netzentwicklungsplan 2030 Version 2019, Project DC1, p. 360

Additional information on the project

The project was part of the previous TYNDP 2018, Link to the Website:
https://tyndp.entsoe.eu/tyndp2018/projects/projects/132

Further information of the project, its investments and their necessity particularly for the German Energiewende can be found in the German grid development plan (mostly in German):

http://www.netzentwicklungsplan.de/en/front

More detailed information can be found on the project website (in German):

https://www.amprion.net/Netzausbau/Aktuelle-Projekte/A-Nord/

Project sheet backlog

25 Jan. 2021 - Addition of results for indicator B10 for scenarios DE2030 and GA2030

5 Jan. 2021 - Addition of CBA results for the DE2030 scenario

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): New HVDC line from Emden to Osterath to integrate new wind generation especially from North Sea towards Central Germany for consumption.

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
DC transmission line	300	Emden East (DE)	Osterath (DE)	In Permitting	2025	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 improve system flexibility and stability e.g. improve system or local ramp rate, improve transient stability or RoCoF to meet system Needs.	The project contributes significantly to security of supply and grid stability through the widespread integration of renewable energies in northern Germany. In particular, the system flexibility is increased by the use of HVDC converter.
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	The project enables the integration of offshore wind energy and prevents potential bottlenecks in the adjacent 380/220 kV grid.
	Infrastructrure improving voltage stability by offering reactive power controllability of converters by system operator(s)	With long-range energy transport, the use of DC technology reduces the reactive power demand considerably. For this purpose, the HVDC converters additionally provide reactive power. This helps P132 to comply with the AC voltage bands and thus makes an important contribution to the voltage

Need		How the project addresses each need (explanation provided by the project promoter(s))
		stability.

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 (Germany)	2000	2000

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.

This project is assessed with the internal redispatch methodology. Because this project was assessed with only one tool for the NT scenario, there is no variation between min, max and average values.

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	54 54 54	253 253 253	>	>	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2	max average min	-4 -4 -4	46 46 46	>	<	ENTSO-E assessment

emissions reduction						
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	max average min	17 17 17	160 160 160	>	>	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	771367	-2118291	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	-29276	-117187	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	1672888	-554493	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	15040	-243605	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	9948	-164425	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	-6718	-28363	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	152 152 152	-1665 -1665 -1665	< 	 >	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	53 120 268	< > >	< > <	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	-203	-50	n/a	n/a	ENTSO-E assessment

B2b_€ Annual Societal cost variation resulting from CO2 variation from network simulation monetised (M € / year)	CO2 price	60€/ ton 100€/ ton 189€/ ton	8 16 34	2 4 8	n/a	n/a	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	max average min	374 374 374	3691 3691 3691	>	<	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	-406	-96	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	-17	-3	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

B10 Reduction of Necessary Reserve for Redispatch Power Plants	NT2025	NT2030	
In Meuro/year	35	48	This indicator was submitted by the promoter(s). ENTSO-E confirms the consistency of the proposed indicator with the CBA Guideline 3.0. About the computation of this indicator by the project promoter(s)
In MW	1751	2388	

This indicator was computed based on NT2025 and NT2030, in a study performed by 50Hertz, Amprion, TenneT DE, TransnetBW in 2020. The promoter(s) stated that the submitted value was computed in accordance with the CBA Guideline and explained it as follows:

As the assessment described in this document in each step follows the guidance given in the 3rd CBA Guideline the compliance with it is given. Furthermore, as demanded within the Implementation Guideline for Redispatch Assessment, the German TSOs participated within the 'Sanity check for minimum modelling requirements' coordinated by ENTSO-E. The quality of the study carried out using the IAEW Redispatch tool has therefore been ensured.

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	469	259	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	169	40	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting	average	327	170	ENTSO-E assessment

from RES integration			

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-6030	-1406	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	42 283 820	35 91 217	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	4938	3688	ENTSO-E assessment
B3a Connected RES (MW)	-			ENTSO-E assessment

Security of supply

B10 Reduction of Necessary Reserve for Redispatch Power Plants	**DE2030**	**GA2030**	
In Meuro/year	145	64	This indicator was submitted by the promoter(s). ENTSO-E confirms the consistency of the proposed indicator with the CBA Guideline 3.0. About the computation of this indicator by the project promoter(s)
In MW	7231	3185	

This indicator was computed based on DE2030 and GA2030, in a study performed by 50Hertz, Amprion, TenneT DE, TransnetBW in 2020. The promoter(s) stated that the submitted value was computed in accordance with the CBA Guideline and explained it as follows:

As the assessment described in this document in each step follows the guidance given in the 3rd

CBA Guideline the compliance with it is given. Furthermore, as demanded within the Implementation Guideline for Redispatch Assessment, the German TSOs participated within the 'Sanity check for minimum modelling requirements' coordinated by ENTSO-E. The quality of the study carried out using the IAEW Redispatch tool has therefore been ensured.

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

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	226	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	9	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	103	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-318	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	10 23 51	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	2164	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
HVDC Line A-North	In Permitting	3.5	Habitats Directive (92/43/EEC)
		16.1	Birds Directive (2009/147/EC)
		11.0	RAMSAR site
		3.9	IUCN key biodiversity areas
		2.6	Other nature protection areas under national law

Additional information by the project promoter(s)

Due to the current planning stage in which the final routing is not fully known yet, the results must be seen as a result of the preliminary planning. During the planning process the avoidance of passing through such societal or environmentally sensitive areas is the main issue.

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity
HVDC Line A-North	In Permitting	28.6	Sensitivity regarding population density - Land that is close to densely populated areas
		8	Sensitivity regarding landscape - Land with cultural significance

Additional information by the project promoter(s)

Due to the current planning stage in which the final routing is not fully known yet, the results must be seen as a result of the preliminary planning. During the planning process the avoidance of passing through such societal or environmentally sensitive areas is the main issue.

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
661. HVDC Line A-North	2300	10%	18.4
Total	2300		18.4

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

661 These CAPEX are provided as considered within “investment measures“ according to sec. 23 of the German Incentive Regulation Ordinance (Anreizregulierungsverordnung, ARegV). Future variations, also potentially beyond the 20% threshold indicated above at which BNetzA requires the submission of a change-request for the respective investment measure, are possible due to, inter alia, low maturity, new technologies, cable/OHL ratio, tendering results and other unforeseen circumstances.