Project Sheet

Hansa PowerBridge I

Project type	transmission
Project id	176
Created by	Lea Dehaudt
Created on	Feb 8, 2021 3:56:52 PM

Index

Key Information 3
Description 3
Project Description & Context 4
Project Investments 4
System Needs addressed by the project 4
Interconnection targets 5
Project Assessment 9
Transfer capacity increase (National Trends 2025) 9
Boundary capacity diagram 9
CBA results 9
Central scenario: National Trends 10
Scenarios: Distributed Energy & Global Ambition 12
Non scenario-dependent indicator(s) 13
Sensitivity Study: Current Trends 13
Residual impact 14
Project Costs 15

ENTSO-E

Key Information

Cross Border Project
Offshore DC transmission cable
New

In Permitting

Description

New HVDC interconnector between Sweden (SE4) and Germany (50 Hertz, Continental) aiming to enhance the integration of the Nordic and the continental power market. Moreover the interconnector facilitates RES integration and increases the system adequacy in both systems.

Project promoters

Svenska Kraftnät
50HERTZ

Countries

Germany
Sweden

National development plan(s)

NEP2030, Germany, v2019, p.527 , System Development Plan 2018-2027, Sweden, 2017, p.64

Additional information on the project

The German national development plan with the project No. 176 was published in 2017 und is available under the following link:
https://netzentwicklungsplan.de/en/grid-development-plans/grid-de-vel-op-ment-plans-2030-2017
.

Svenska kraftnät has published a national development plan in 2017. The purpose of the plan is to be an investment plan for the following ten years, 2018-2027. The investment plan presents a detailed look of the projects Svenska kraftnät intends to realize under the stated time period. The plan is available in Swedish through the following link:

https://www.svk.se/siteassets/om-oss/rapporter/2017/svenska-kraftnats-systemutvecklingsplan-2018-2027.pdf
(Swedish)

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 HVDC interconnector between Sweden (SE4) and Germany (50 Hertz) aiming to enhance the integration of the Nordic and the continental power market. Moreover the interconnector facilitates RES integration and increases the system adequacy in both systems.

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
Offshore DC transmission cable	300	Hurva (SE4)	Guestrow (DE)	In Permitting	2026	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.

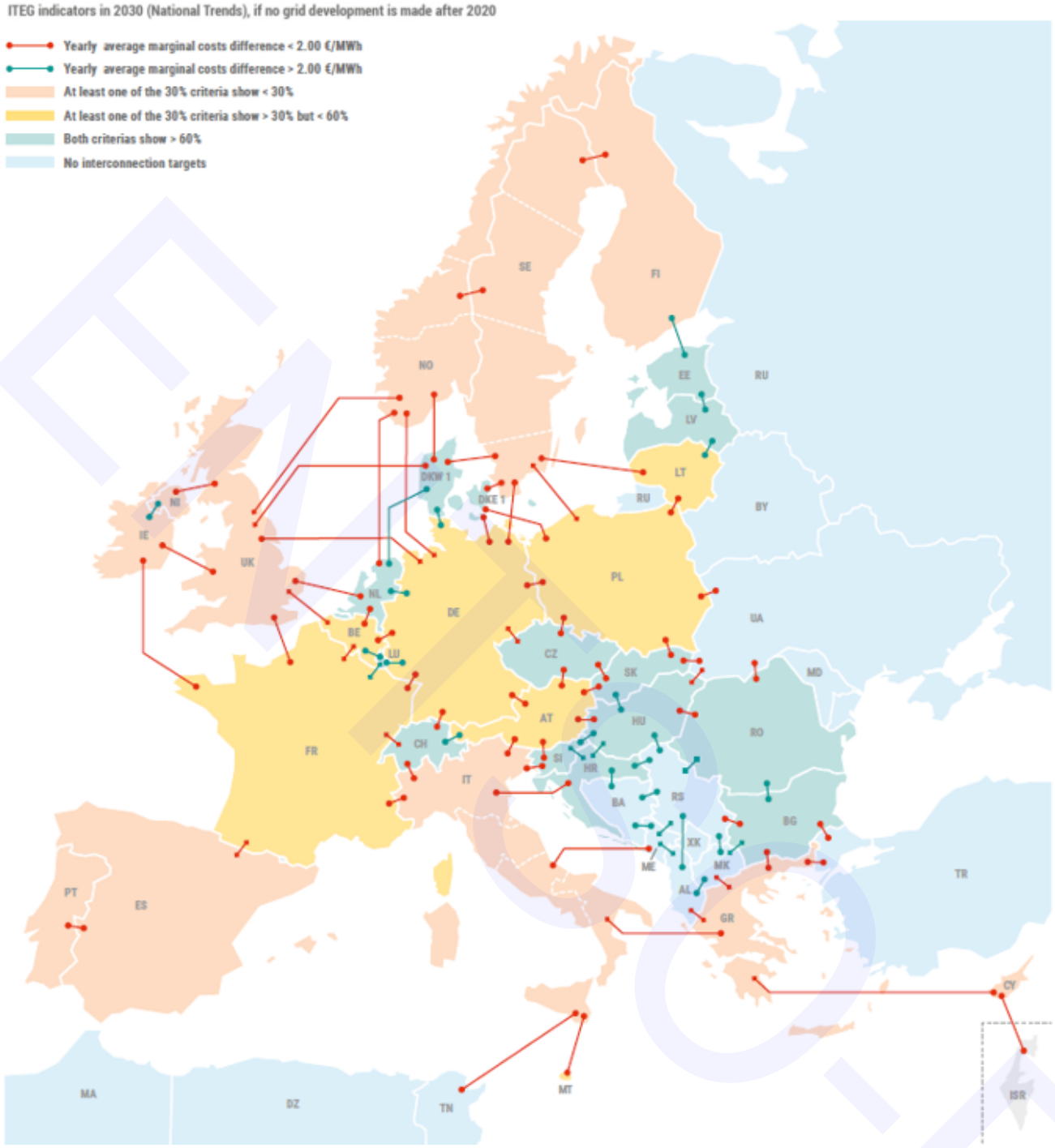
Need		How the project addresses each need (explanation provided by the project promoter(s))
€	Infrastructure to reduce price differentials between EU and/or non-EU countries	The main driver is market integration of the Nordic hydro/nuclear/RES dominated system with the German thermal/RES based system. The infrastructure will reduce price differentials between EU countries.
⚖	Infrastructure to address system adequacy deficiencies and/or mitigate the risk of power failures.	The system adequacy is enhanced in Germany which will increase the import potential in period of low wind and solar generation. Also the system adequacy in southern Sweden is enhanced since it given more import capacity in a future with less available nuclear generation capacity.
	Infrastructure designed to enable cost-efficient grid	Increase of RES in both countries leads to higher need for trade with high surplus during high wind power

Need		How the project addresses each need (explanation provided by the project promoter(s))
	connection of high volumes of RES and/or reduce RES curtailment	production. Flows are to be balanced with southbound flow during peak hours and when hydro inflow in Sweden are high and northbound in periods of high German RES generation by night

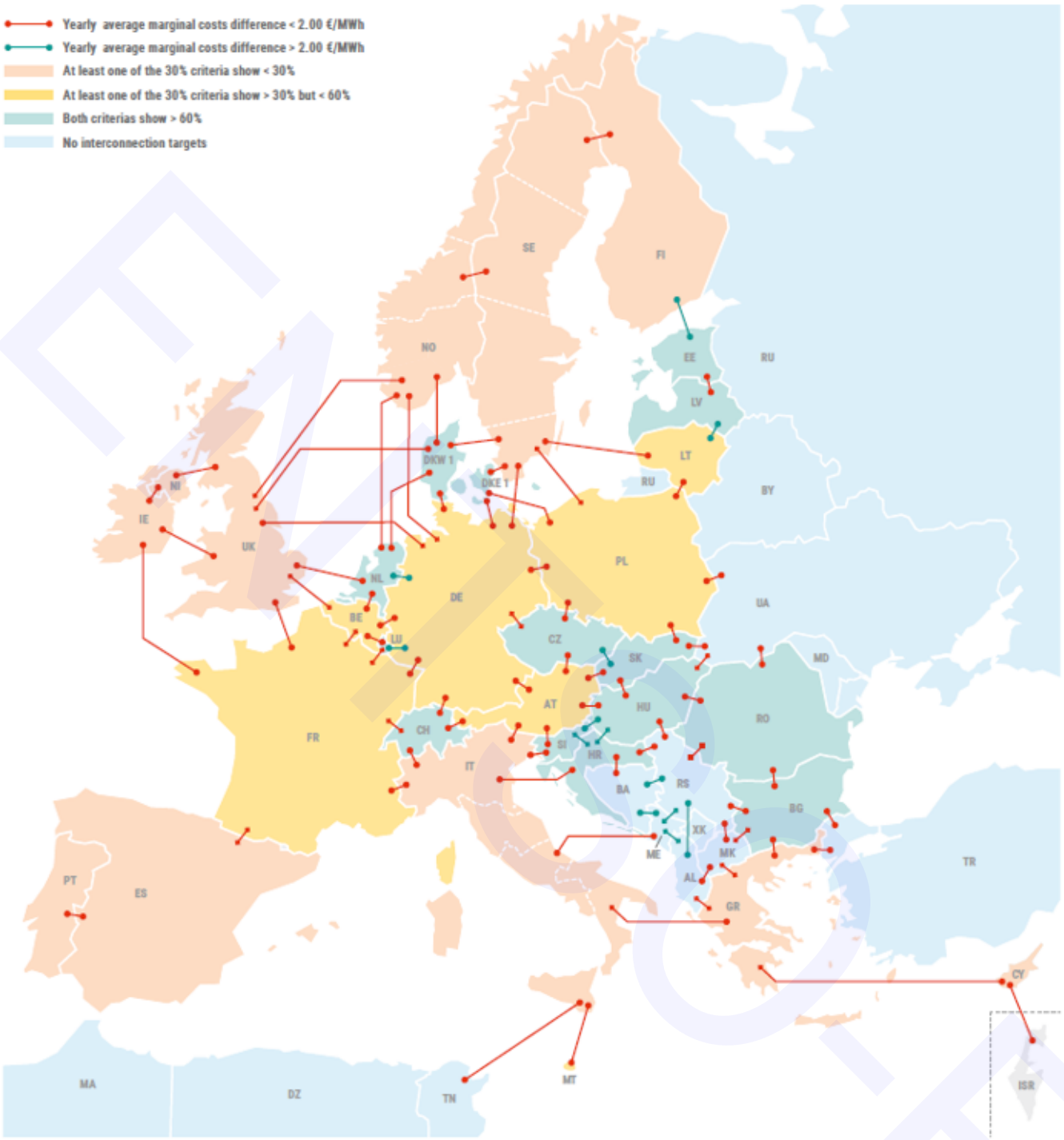
Interconnection targets

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%

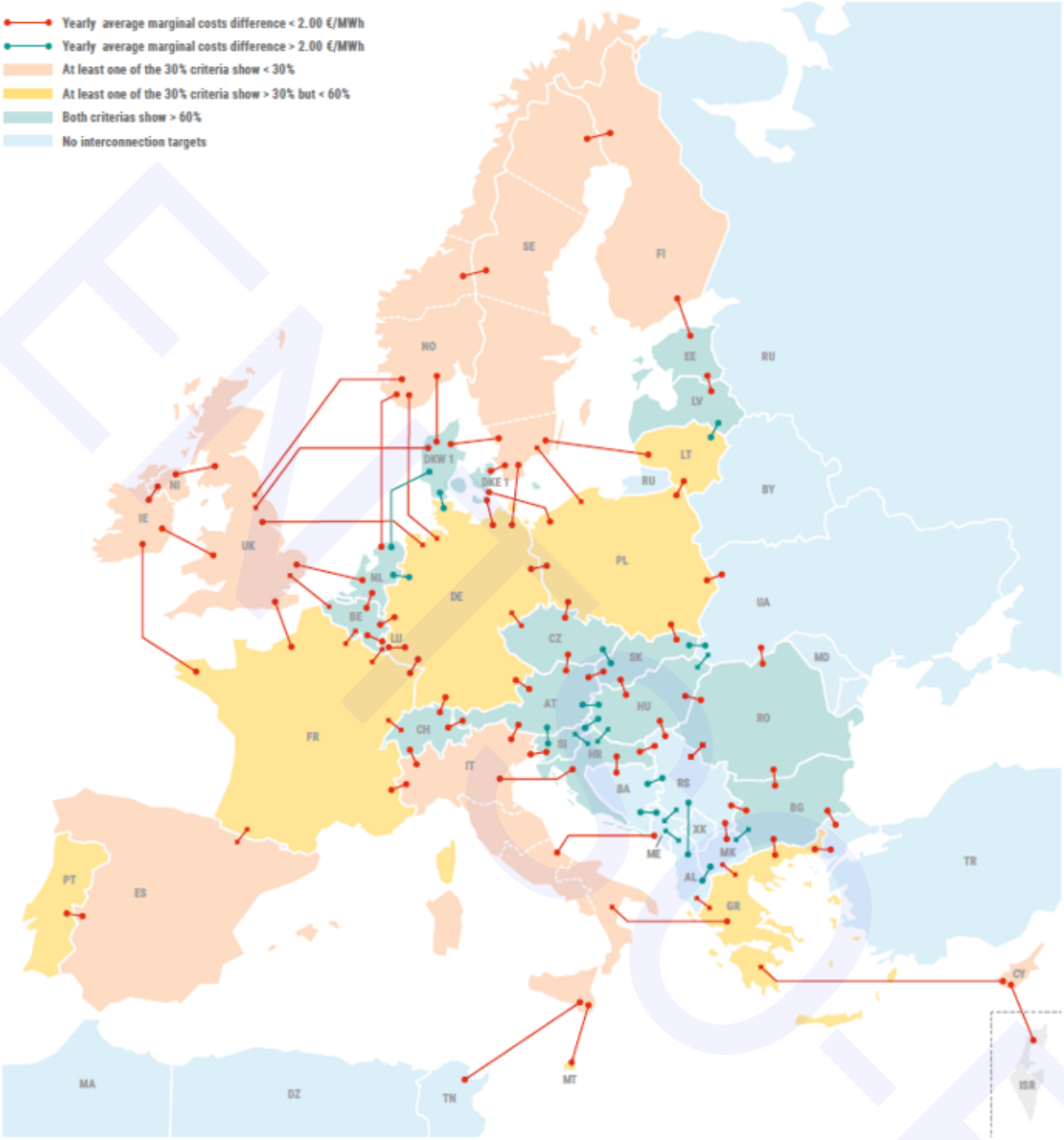
The following maps show the ITEG methodology applied to the TYNDP 2030 scenarios, with the 2020 grid.


ITEG indicators in 2030 (National Trends), if no grid development is made after 2020
Yearly average marginal costs difference < 2.00 €/MWh
Yearly average marginal costs difference > 2.00 €/MWh
At least one of the 30% criteria show < 30%
At least one of the 30% criteria show > 30% but < 60%
Both criterias show > 60%
No interconnection targets
SE
FI
NO
EE
RU
LV
LT
DKW 1
DKE 1
RU
BY
NI
IE
UK
PL
NL
DE
UA
BE
LU
CZ
SK
MD
AT
HU
RO
FR
CH
SI
HR
IT
BA
RS
BG
XK
ME
MK
AL
TR
PT
ES
GR
CY
MA
DZ
TN
MT
ISR

ITEG indicators in 2030 (Distributed Energy), if no grid development is made after 2020



ITEG indicators in 2030 (Global Ambition), if no grid development is made after 2020



Project Assessment

Transfer capacity increase (National Trends 2025)

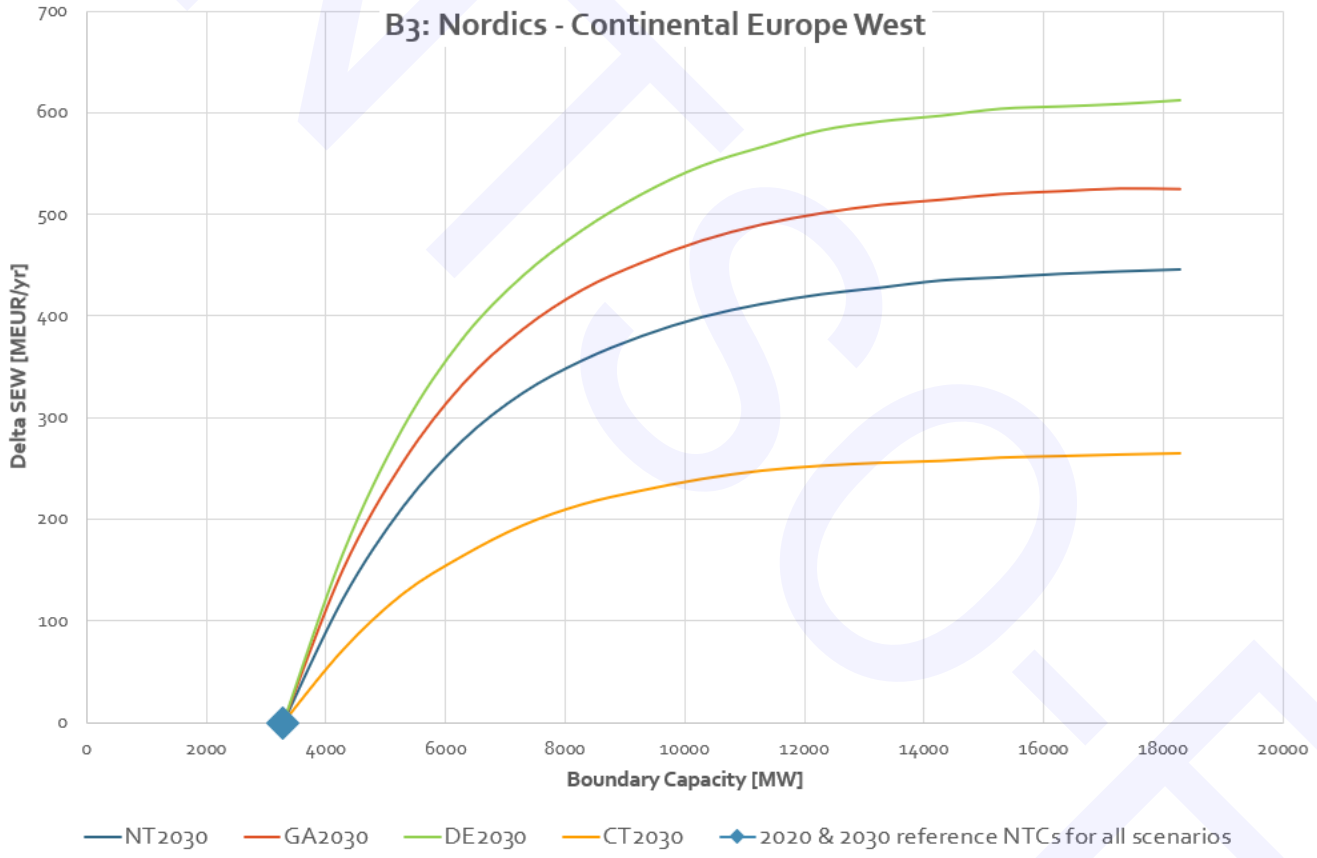
	Border	A B	B A
Transfer capacity increase (in MW)	Germany - Sweden	700	700

Boundary capacity diagram

Network boundary the projects helps mitigate

Nordics - Continental Europe West

Boundary capacity diagram



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 22	73 72 71	<	>	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	8 5 1	29 29 29	<	>	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	max average min	8 5 1	25 23 21	<	<	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	-745	-2070	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	-33	-68	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	-1073	-2207	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	731	12847	n/a	n/a	ENTSO-E assessment
B4e Particulate		-23	-115	n/a	n/a	ENTSO-E

matter 10	average					assessment
B4f Non-methane volatile organic compounds	average	738	12970	n/a	n/a	ENTSO-E assessment
B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	-31 -207 -346	-1022 -1023 -1025	>	<	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 16 34	33 74 165	< < <	< > >	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	23	85	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	-7 -3 -4	-1 -6 -7	n/a	n/a	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	max average min	163 108 19	630 592 554	<	<	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	64	143	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	5	10	n/a	n/a	ENTSO-E assessment

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		336	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	3.36	>	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	70	101	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	28	42	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting	average	14	14	ENTSO-E assessment

from RES integration			

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-530	-1194	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	4 25 72	30 78 184	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	254	312	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	
Hansa PowerBridge I (New HVDC)	++	++	+ (between sync areas)	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	25	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	4	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	8	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-143	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	5 10 23	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	150	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
Hansa PowerBridge I	In Permitting	20	Habitats Directive (92/43/EEC)
		8	Other nature protection areas under national law

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
995. Hansa PowerBridge I	660	+-10 %	1
Total	660		1

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

995 standard uncertainty factor based on similar project