Project Sheet

DKE - DE (Kontek2)

Project type	transmission
Project id	179
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ENTSOE

Key Information

Cross Border Project
Offshore DC transmission cable
New

Under Consideration

Description

This project includes a HVDC subsea interconnector between Denmark-East (DKE) and Germany (DE) and is called Kontek-2. A final grid-connection solution is not prepared yet.

Project promoters

Energinet.dk
50HERTZ

Countries

Germany
Denmark

National development plan(s)

Denmark: Not in NDP, as this project is in a preliminary phase under consideration.

Additional information on the project

The project was also assessed in TYNDP 2018.

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 600 MW HVDC subsea cable connecting DK2 and DE. Also called Kontek 2

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	170	Ørslevvester (DKE)	Bentwisch (DE)	Under Consideration	2030	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.

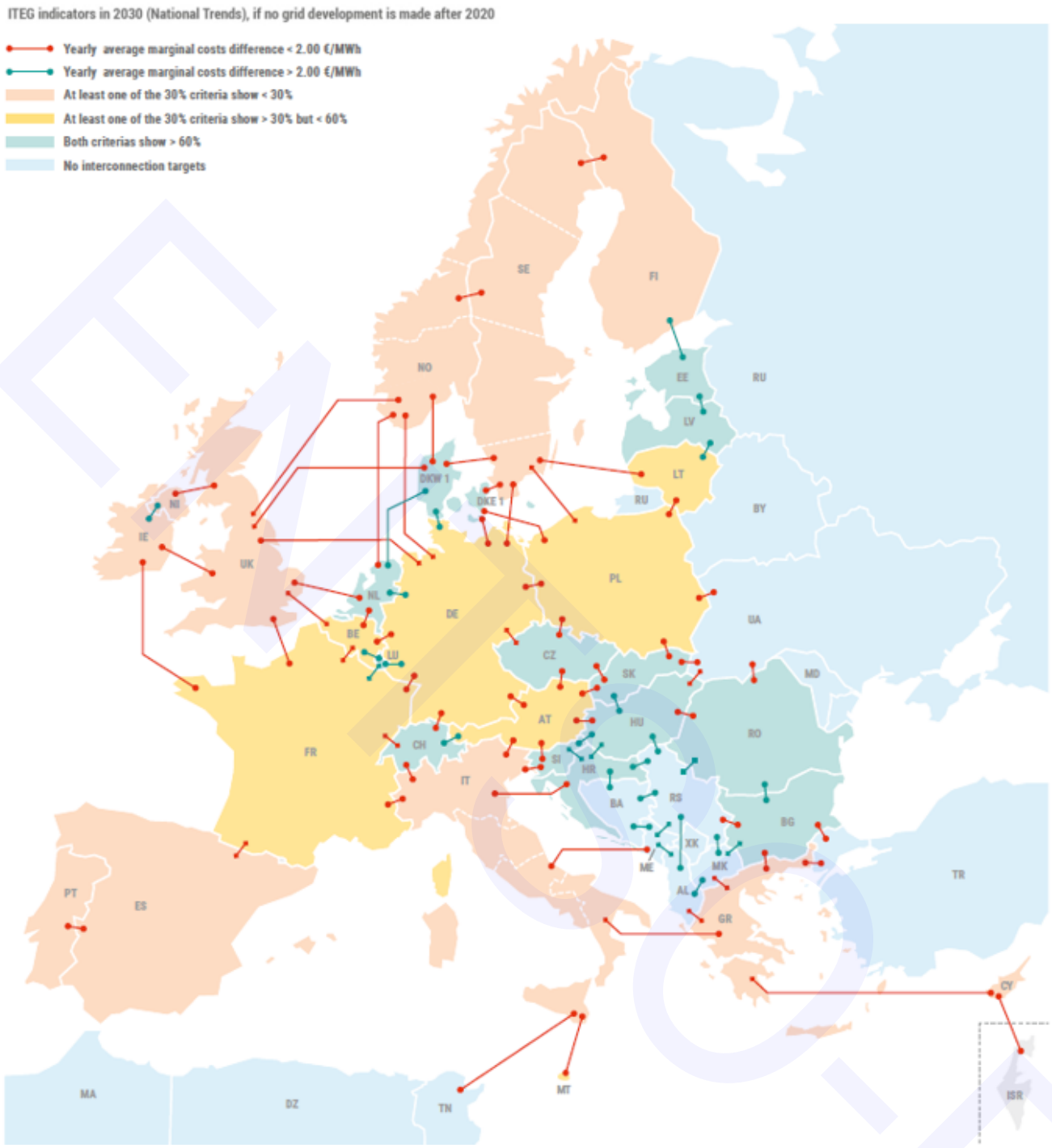
Need		How the project addresses each need (explanation provided by the project promoter(s))
€	Infrastructure to reduce price differentials between EU and/or non-EU countries	The project will serve as connection between the Nordic and central European power systems either transporting hydro power from the Nordic area to continental Europe or transporting wind and thermal power from the continent to the Nordics in times of low hydro levels.
	Infrastructure to address system adequacy deficiencies and/or mitigate the risk of power failures.	The project contributes new interconnection capacity to mitigate challenges in the DKE system.
ITEG	Infrastructure to tackle a Need identified by one of the European ITEG indicators referring to the	The project will enable the reduction of market price differential to below

Need		How the project addresses each need (explanation provided by the project promoter(s))
	15% interconnection target for 2030:1. Reduce the price differential between EU countries to below 2EUR/MWh.2. Contribute to pushing ratio between nominal transmission capacity and installed RES capacity past 30%.3. Contribute to pushing ratio between nominal transmission capacity and peak load past 30%.	2 EUR/MWh.
	Infrastructure designed to enable cost-efficient grid connection of high volumes of RES and/or reduce RES curtailment	The project will enable the integration of RES. More interconnection capacity will improve capability of balancing the system.

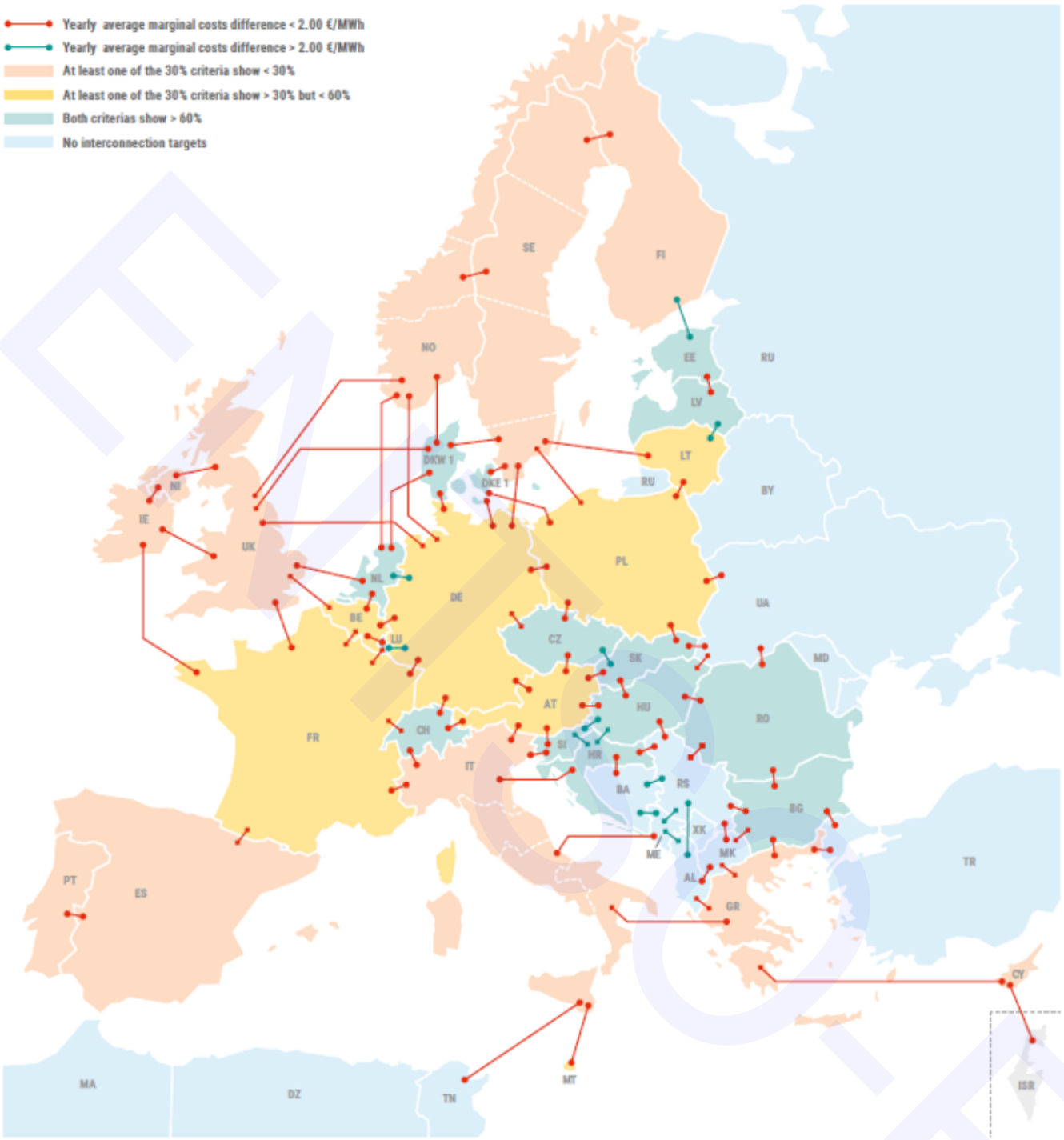
Interconnection targets

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%

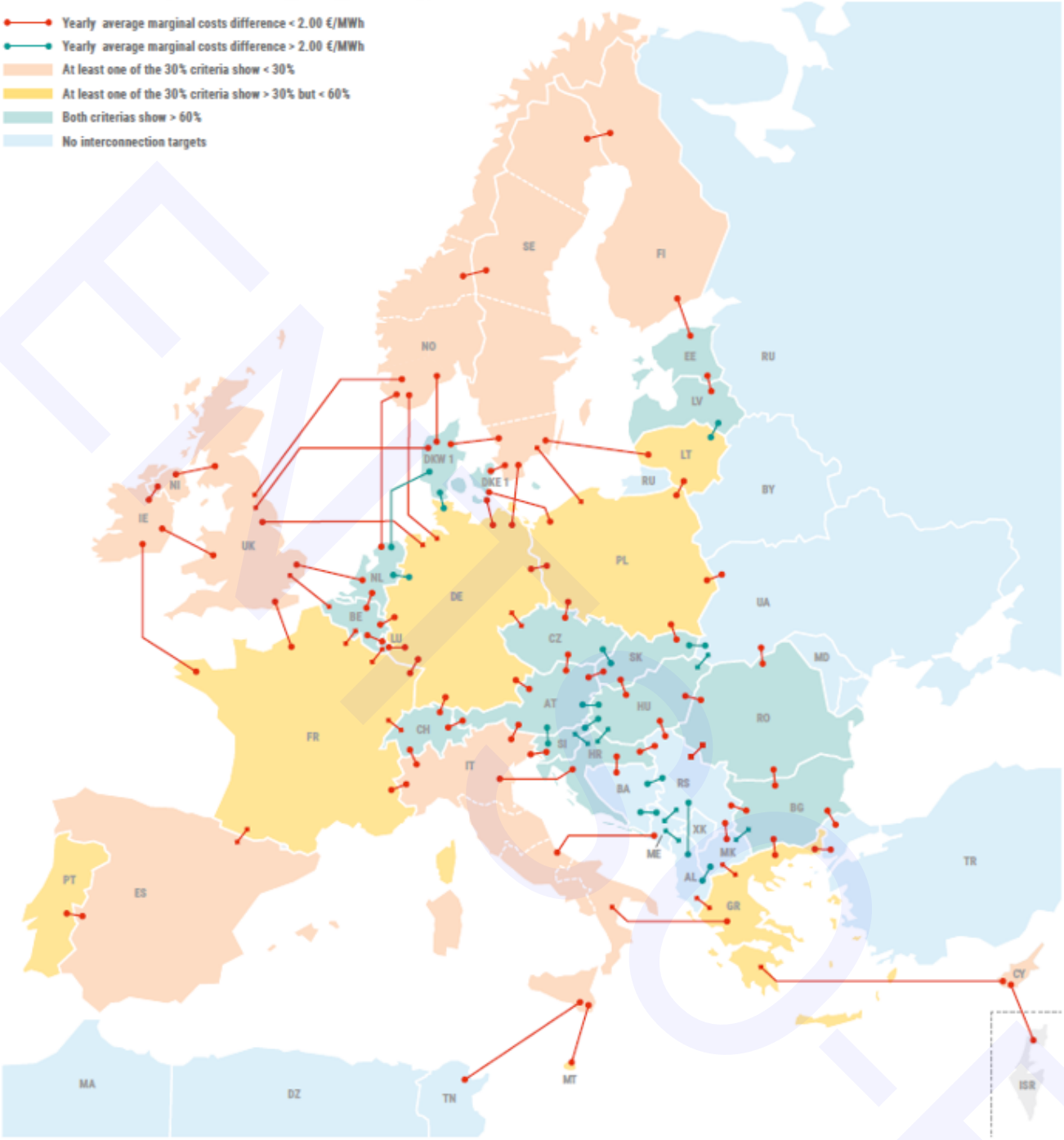
The following maps show the ITEG methodology applied to the TYNDP 2030 scenarios, with the 2020 grid.


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 - Denmark	600	600

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	4 3 2	14 13 10	>	>	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	2 1 1	8 6 3	>	>	ENTSO-E assessment
B1_RES Annual Socio-Economic	max average	0 0	2 2	<	<	ENTSO-E assessment

Welfare increase resulting from RES integration	min	0	0			

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	-131	-1223	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	-10	-54	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	-203	-1577	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	410	3971	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	-5	-82	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	407	4023	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)		max average min	-23 -45 -72	-105 -215 -297	>	<	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 3 7	7 15 35	< < <	>>>	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)		average	-32	19	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from	CO2 price	60€/ ton 100€/	4 2 5	0 -1 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	7 3 0	70 43 0	<	<	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	-59	15	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	-2	1	n/a	n/a	ENTSO-E assessment

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		27	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	0.27	>	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	14	23	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	8	12	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	1	2	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-145	-341	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 7 20	9 22 53	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	23	39	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	
DKE-DE (Kontek 2) (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	6	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	0	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	0	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	5	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market	CO2 price 60€/ton 100€/ton 189€/	0 0 -1	ENTSO-E assessment

simulation monetised (M€ / year)	ton		

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	5	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).

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
1016. DKE-DE (Kontek 2)	460	20 %	9
Total	460		9

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

1016 Project in preliminary phase. No detailed design and choice of technology, yet. Estimate includes reinforcements in AC grids.