HI WEST 25 (Less-Advanced)

Interconnection Norway-Germany

Reasons for grouping [ENTSOG]

The project group aims at interconnecting future hydrogen infrastructure between Norway and Germany to bring hydrogen imports from Norway towards Europe.

The group includes one investment in the North Sea (HYD-N-884). The exact landing point in Germany is not yet defined. Dornum and Wilhelmshaven are currently under consideration as potential options.

Objective of the group [Promoter]

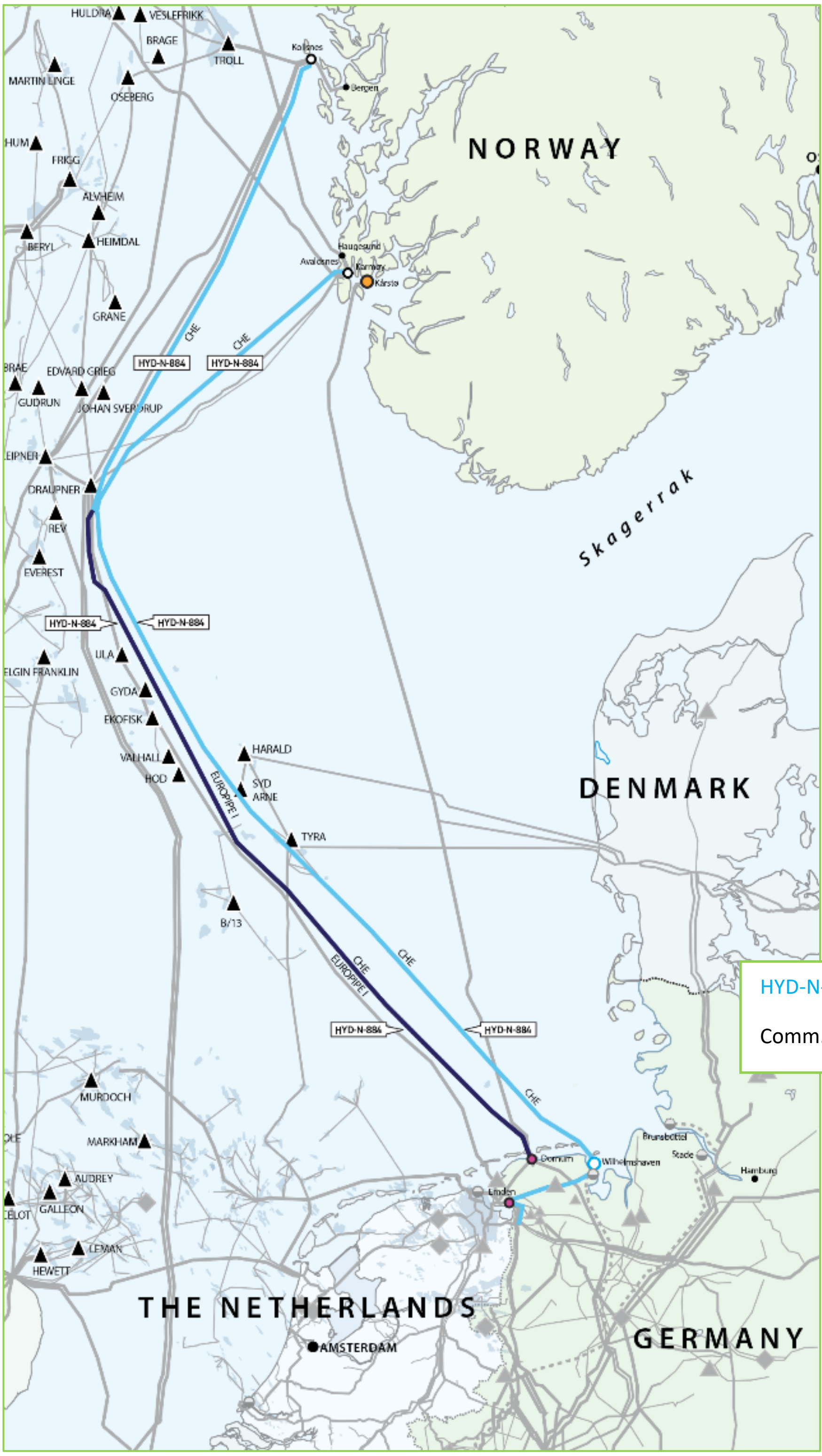
The CHE Pipeline project seeks to build a dedicated open-access high-pressure hydrogen pipeline from the West coast of Norway (Mongstad/Kårstø/Kollsnes) to northern Germany.

The hydrogen transport infrastructure will be based on a completely new or partially new- and-partially repurposed natural gas offshore pipeline. The hydrogen pipeline will be routed via the Draupner platform in the North Sea (newly built pipeline section). Two options are currently under assessment for the pipeline section from Draupner to Germany: (1) repurposed Europipe 1 to Dornum; or (2) new built pipeline to Wilhelmshaven. The project also includes an onshore receiving terminal at the exit point of the pipeline.

The maximum transport capacity of the hydrogen pipeline infrastructure is up to 18 GW (4 million tons) of hydrogen per year. This hydrogen pipeline infrastructure will allow low-carbon and renewable hydrogen produced in the North and Norwegian Sea Basins to directly connect to the transport pipeline and make use of the available transport capacity.

The CHE pipeline project is part of the H2 Offshore Transport (H2T) project. The purpose of the H2T project is to establish an offshore pipeline infrastructure for transport of hydrogen to Germany, which includes both the pipeline in the CHE project as well as the pipeline from the Aukra Hydrogen Hub pipeline. The H2T project is part of the Germany and Norway Energy cooperation – joint feasibility study that has been conducted by Gassco and Dena.

The CHE pipeline project is also part of the CH2-4EU PRJ included in the updated 2022 TYNDP.



HYD-N-884 **CHE Pipeline**

Comm. Year **2030**

A. Project group technical information [Promoter/ ENTSOG]

Project technical information [Promoter]

TYNDP Project code	Section name	New / Repurposing	Nominal Diameter [mm]	Section Length [km]	Compressor power [MW]	Maximum depth [m]
HYD-N-884	**CHE pipeline - West coast of Norway to Draupner** Maximum transport capacity: 3 Mtpa	New	1016 mm (40 inch)	300 km	Information not available	Information not available
HYD-N-884	**CHE pipeline – Draupner to Denmark** Maximum transport capacity: 3 Mtpa	New/ Repurposing	1016 mm (40 inch)	Information not available	Information not available	Information not available
HYD-N-884	**CHE Pipeline- Denmark to Germany** Maximum transport capacity: 4mtpa	New/ Repurposing	1016 mm (40 inch)	Information not available	Information not available	Information not available
HYD-N-884	**CHE Pipeline- Germany to Dornum/ Wilhelmshaven** Equipment for onshore facility: metering, pressure control, safety valves Maximum transport capacity: 4 mtpa	New/ Repurposing	1016 mm (40 inch)	Information not available	Information not available	Information not available

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-884	H2_IP_NO-DE	Gassco AS	Transmission Norway (NO Hydrogen)	Transmission Germany (DE Hydrogen)	414	2030

B. Project Cost Information

During the TYNDP 2022 Project Data Collection, promoters were asked to indicate whether their costs were confidential or not. The following tables display the non-confidential costs provided by the promoters (as of December 2022, end of PCI project collection). The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions.

[ENTSOG]

TYNDP Project code	CAPEX [M€]	CAPEX range [%]	OPEX [M€]	OPEX range [%]
HYD-N-884 Repurposed Europipe 1 to Dornum	1100	40	10.9	40
HYD-N-884 New built pipeline to Wilhelmshaven	2800	40	10.9	40

Description of the cost and range [Promoter]

The two different sets of cost estimates (CAPEX and OPEX) reflect the two different alternatives that are currently under assessment for the section of the pipeline from the Draupner platform to the landfall in Germany: 1) Repurposed Europipe 1 to Dornum; and (2) New built pipeline to Wilhelmshaven. The joint feasibility study jointly conducted by Gassco and Dena evaluates the estimated costs of both options.

The CHE Pipeline project is currently in Feasibility study phase and changes in costs are expected until Concept Select Phase.

C. Project Benefits [ENTSOG]

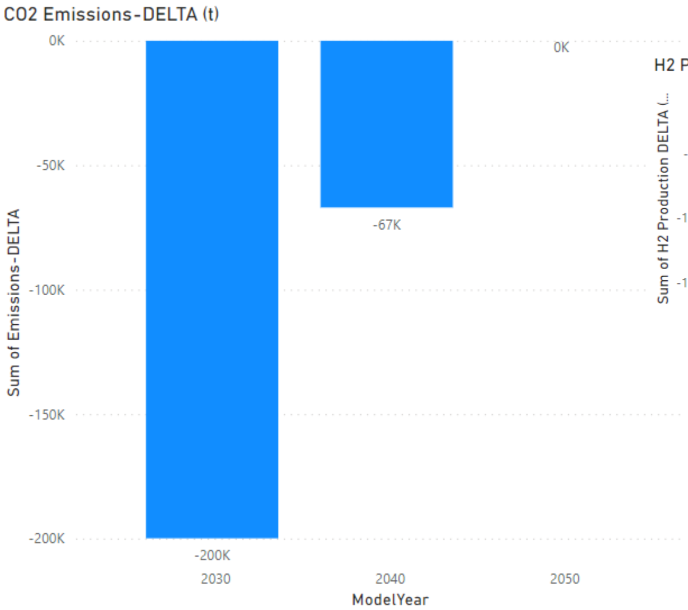
C.1 Summary of benefits

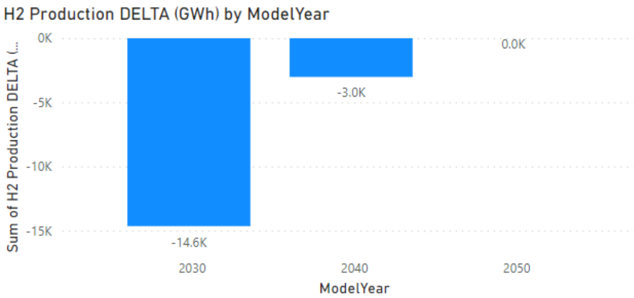
This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group. More details on the indicators are available in Annex D of TYNDP 2022[1].

Distributed Energy

Sustainability benefits

In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 200 kt in 2030 and by 67 kt in 2040. This can be explained as the project aims to replace use of natural gas.

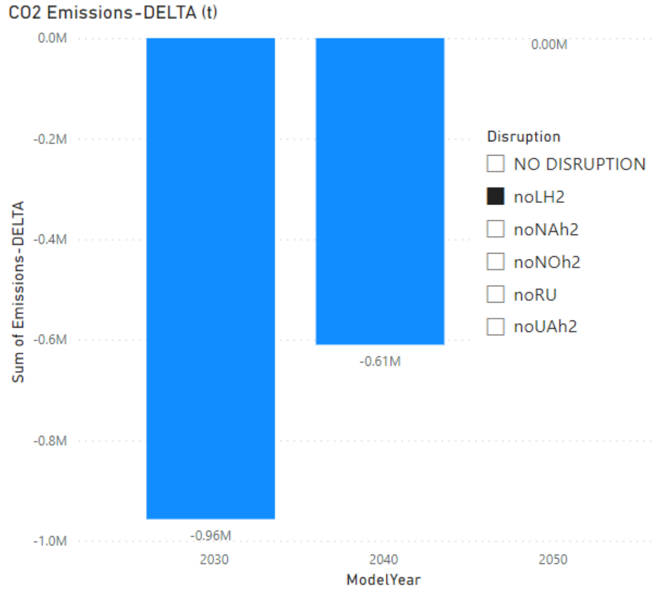


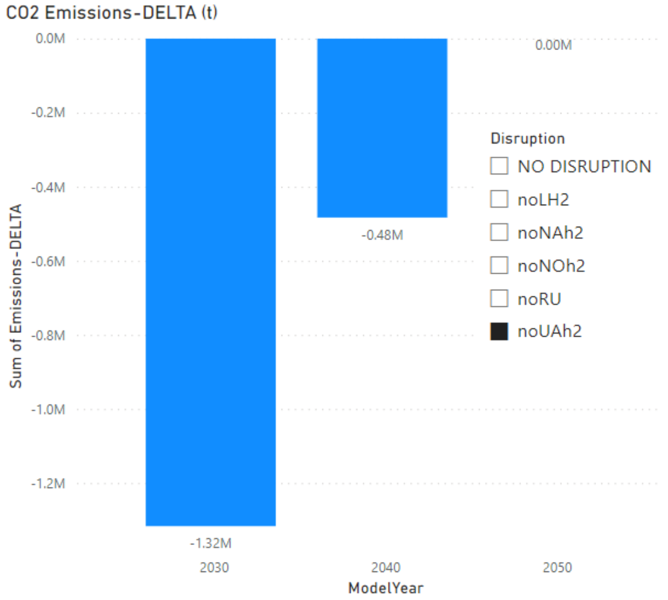


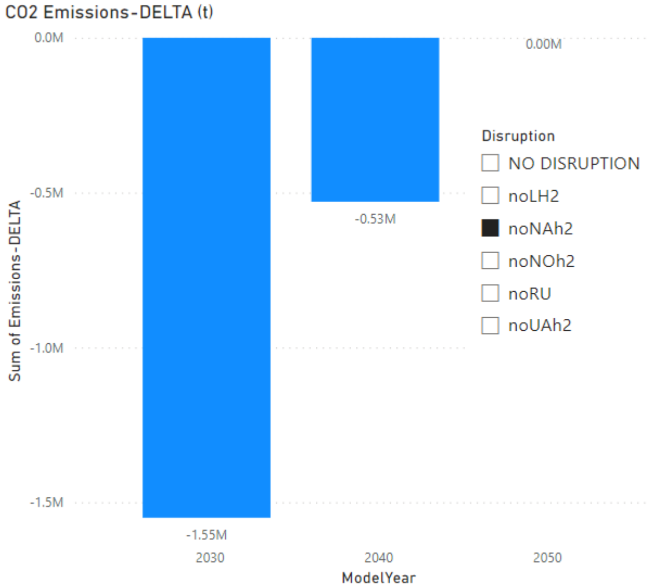
Under supply disruption cases, such as LH2, Ukraine or North Africa disruption, increased sustainability benefits can be expected for 2030 and 2040. For example, in case of Ukraine disruption the project is contributing to sustainability by reducing CO2 emissions by 1320 kt in 2030 and by 480 kt in 2040.

1 noLH2 : LH2 disruption / 2 noUAh2 : Ukraine disruption/ 3 noNAh2 : North Africa disruption

[1] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf


CO2 Emissions-DELTA (t)
0.0M
-0.2M
-0.4M
-0.6M
-0.8M
-1.0M
Sum of Emissions-DELTA
-0.96M
-0.61M
0.00M
2030
2040
2050
ModelYear
Disruption
NO DISRUPTION
noLH2
noNAh2
noNOh2
noRU
noUAh2

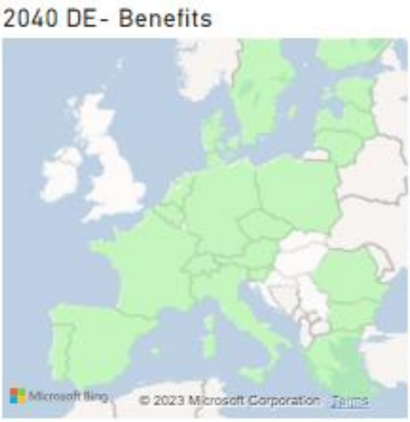

CO2 Emissions-DELTA (t)
0.0M
-0.2M
-0.4M
-0.6M
-0.8M
-1.0M
-1.2M
Sum of Emissions-DELTA
-1.32M
-0.48M
0.00M
2030
2040
2050
ModelYear
Disruption
NO DISRUPTION
noLH2
noNAh2
noNOh2
noRU
noUAh2


CO2 Emissions-DELTA (t)
0.0M
-0.5M
-1.0M
-1.5M
Sum of Emissions-DELTA
-1.55M
-0.53M
0.00M
2030
2040
2050
ModelYear
Disruption
NO DISRUPTION
noLH2
noNAh2
noNOh2
noRU
noUAh2

Security of Supply:[2]

> Reference case

Thanks to the project, hydrogen supply in Europe will be improved and diversified. In the reference case, the project is mitigating hydrogen demand curtailment risk in average summer and average winter for many European countries in 2040 and 2050. Countries such as Germany, Poland, Czech Republic, Belgium, Netherlands, Sweden, Finland, Estonia, Latvia and Lithuania can mitigate the risk of demand curtailment by 5% in 2040 and by 7% in 2050. Other European countries benefitting from this project mitigate the risk of demand curtailment by 1-4% in 2040 and by 2-6% in 2050.



> Climatic stress cases

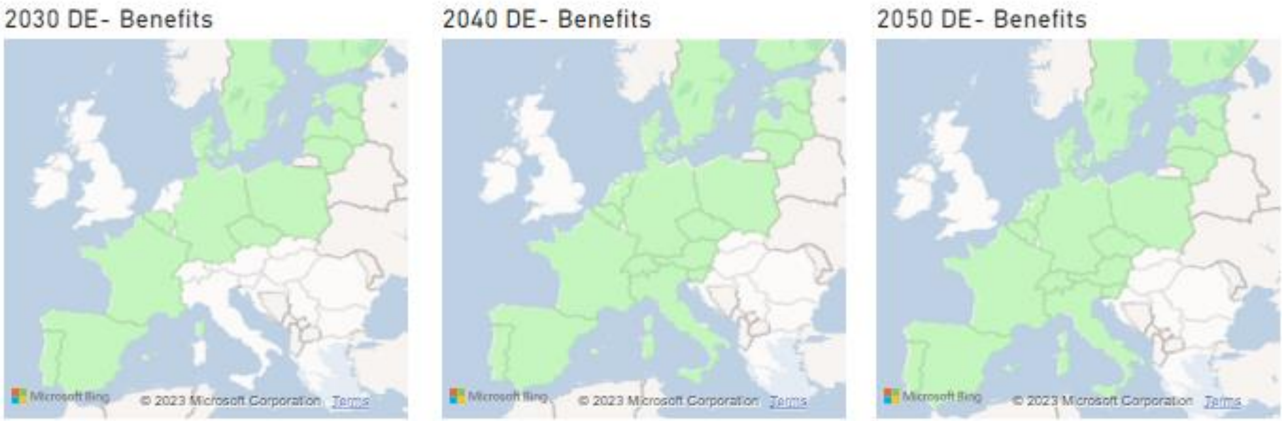
Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project is showing increased security of supply benefits. In 2030 many countries can mitigate the risk of demand curtailment by 9-16%, in 2040 respective countries by 2-6% and in 2050 by 4-5%.

[2] *As for the hydrogen system there is no existing infrastructure level available yet, ENTSOG has identified a possible hydrogen network according to the information provided by promoters in their project submission for the TYNDP/PCI process (i.e., H2 Infrastructure level). Therefore, the System Assessment shows the results that could be reached (for different timestamps) under the hypothesis of a full commissioning of the H2 infrastructure projects that were submitted by project promoters but that are not yet in place. Therefore, even in configurations where no demand curtailment is identified (e.g., average winter in 2030) these results should not be read as an absence of H2 infrastructure needs for the given scenario. On the contrary, the full availability of the planned infrastructures composing the H2 infrastructure level is assumed to avoid the potential demand curtailment.*

> Disruption cases (S-1):

Similar under all supply disruption cases and refence yearly demand, the project group increases mitigation of hydrogen demand curtailment risk for many European countries. For example, under Ukraine supply disruption the project group mitigates the risk of demand curtailment for all European countries by 2-3% in 2040 and by 6-8% in 2050.

1 noLH2: LH2 disruption

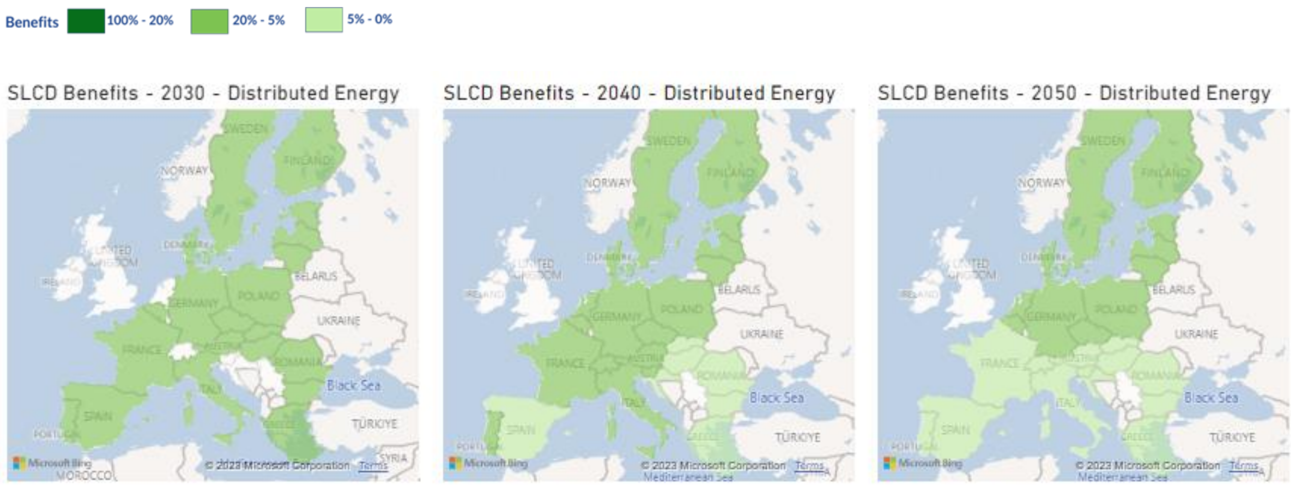


2 noUAh2: Ukraine disruption

3 noNAh2: North Africa disruption

> Single largest capacity disruption (SLCD):

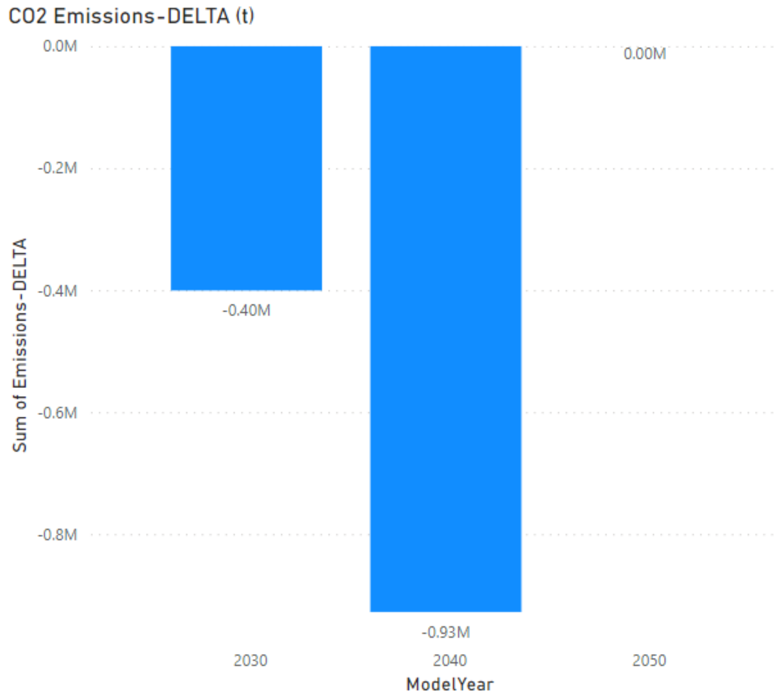
In case of single largest capacity disruption (SLCD), the project group reduces the risk of demand curtailment significantly in almost all European countries. In 2030 respective countries mitigate under SLCD the risk of hydrogen demand curtailment by 13-16%. In 2040 by 5-7 % and in 2050 by 4-6%.

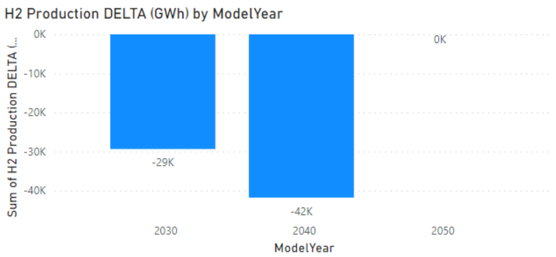


Global Ambition

Sustainability benefits

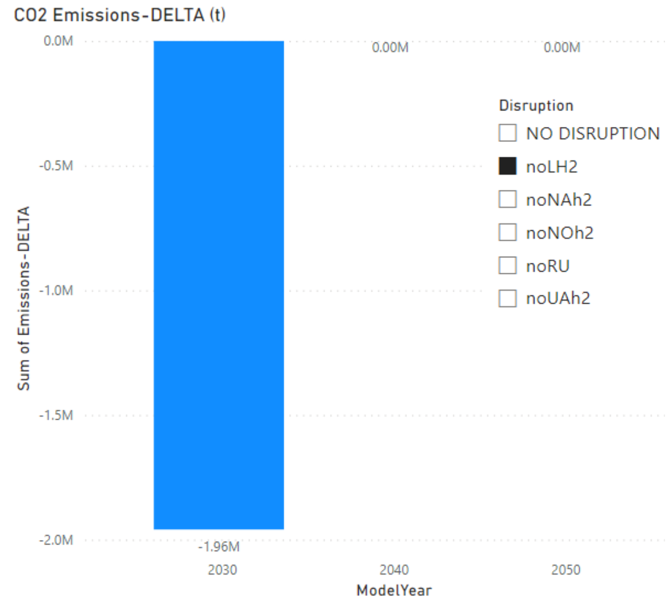
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 400 kt in 2030 and 930 kt in 2040. This can be explained as the project aims to replace use of natural gas. Furthermore in 2040 the share of green hydrogen from Norway will increase.

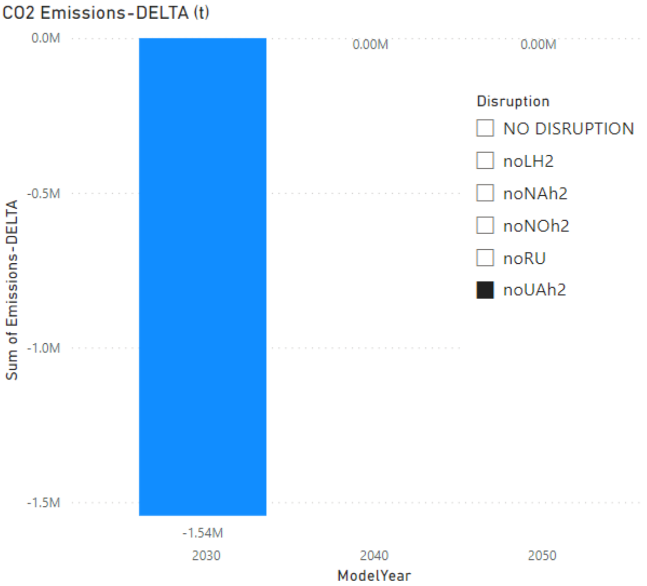


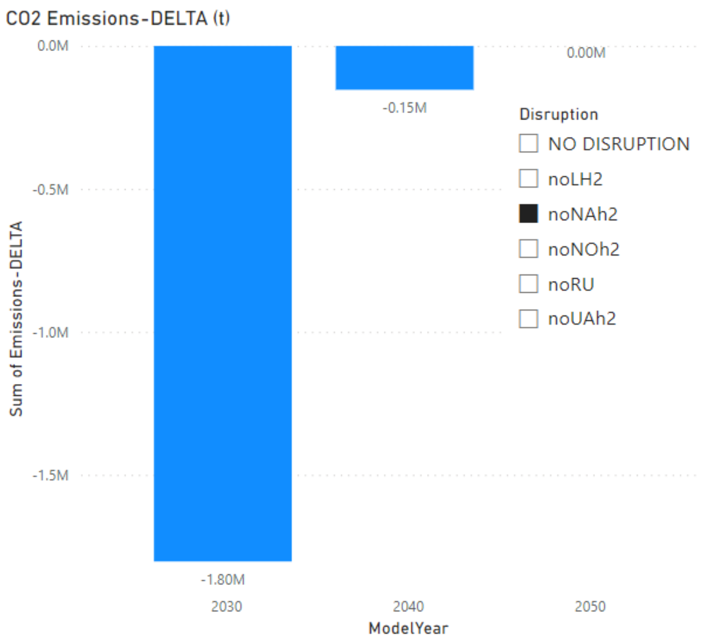


Under supply disruption cases, such as LH2, Ukraine or North Africa supply disruption, increased sustainability benefits can be expected for 2030. For example, in case of North Africa hydrogen disruption, the project reduces CO2 emissions by 1800 kt in 2030.

1 noLH2 : LH2 disruption / 2 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa disruption


CO2 Emissions-DELTA (t)
0.0M
-0.5M
-1.0M
-1.5M
-2.0M
Sum of Emissions-DELTA
-1.96M
0.00M
0.00M
2030
2040
2050
ModelYear
Disruption
NO DISRUPTION
noLH2
noNAh2
noNOh2
noRU
noUAh2

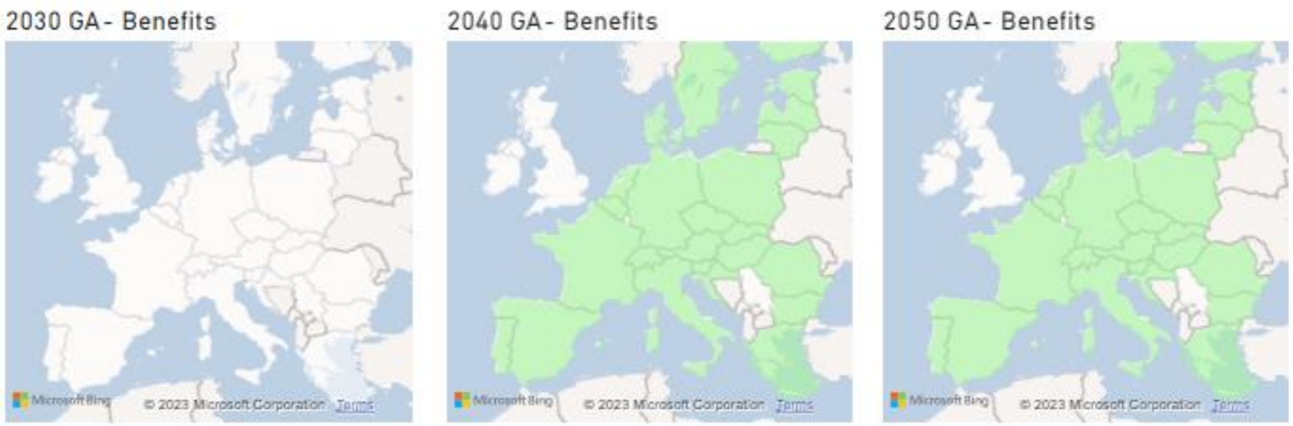

CO2 Emissions-DELTA (t)
0.0M
-0.5M
-1.0M
-1.5M
Sum of Emissions-DELTA
-1.54M
0.00M
0.00M
2030
2040
2050
ModelYear
Disruption
NO DISRUPTION
noLH2
noNAh2
noNOh2
noRU
noUAh2



Security of supply benefits

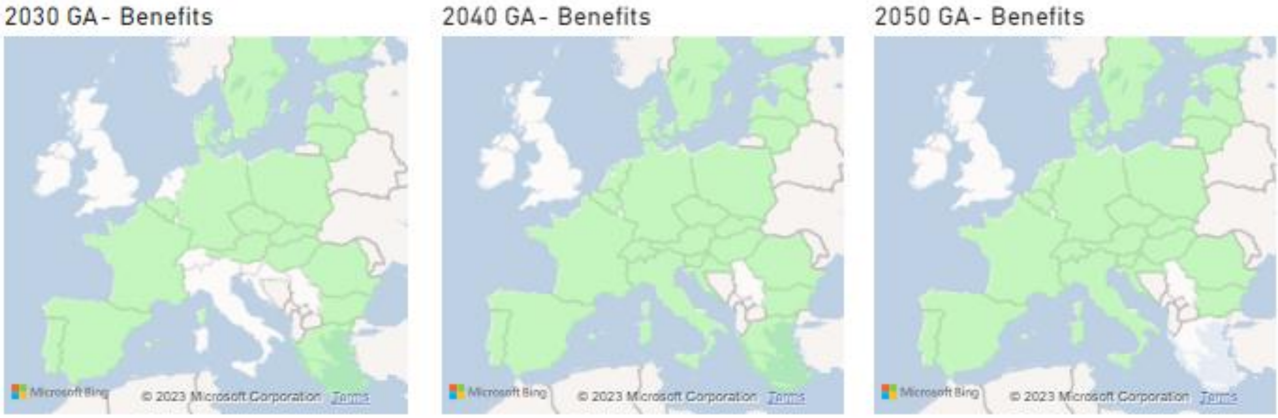
> Reference case

In the reference case, the project is mitigating hydrogen demand curtailment risk in average summer and average winter for almost all European countries in 2040 and 2050. Countries such as Germany, Poland, Czech Republic, Belgium, Netherlands, Finland, Estonia, Latvia and Lithuania can mitigate the risk of demand curtailment by 9% in 2040 and by 6-7% in 2050. Other European countries benefitting from this project mitigates the risk of demand curtailment by 5-8% in 2040 and by 1-5% in 2050.



> Climatic stress cases

Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project is showing increased security of supply benefits. In 2030 many countries can mitigate the risk of demand curtailment by 14-17%, in 2040 respective countries by 4-6% and in 2050 by 2-4%.

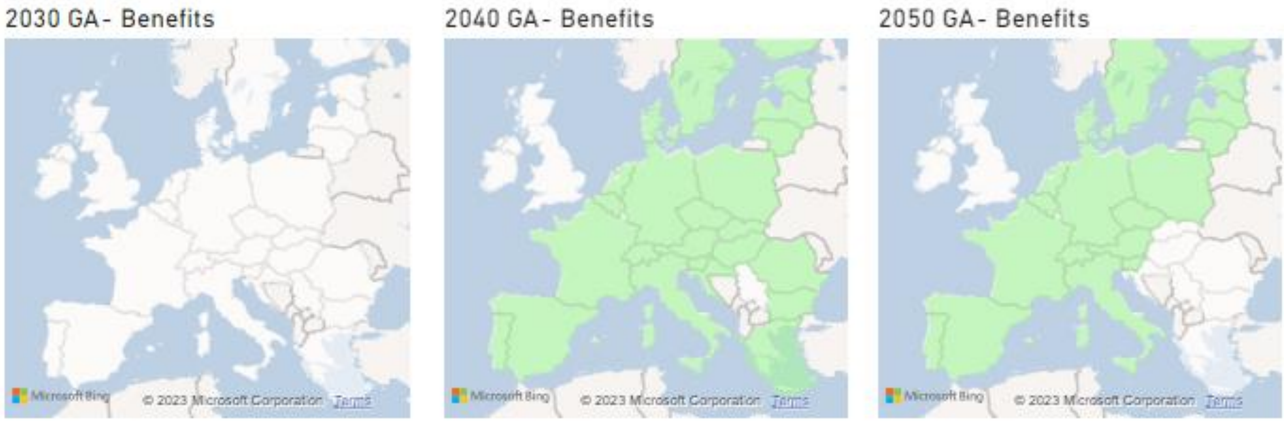


> Disruption cases (S-1):

Under supply disruption cases and refence yearly demand, the project group maintains mitigation of hydrogen demand curtailment risk for many European countries. For example, under Ukraine supply disruption the project group mitigates the risk of demand curtailment for all European countries by 3-9% in 2040 and by 1-8% in 2050.

1 noLH2: LH2 disruption

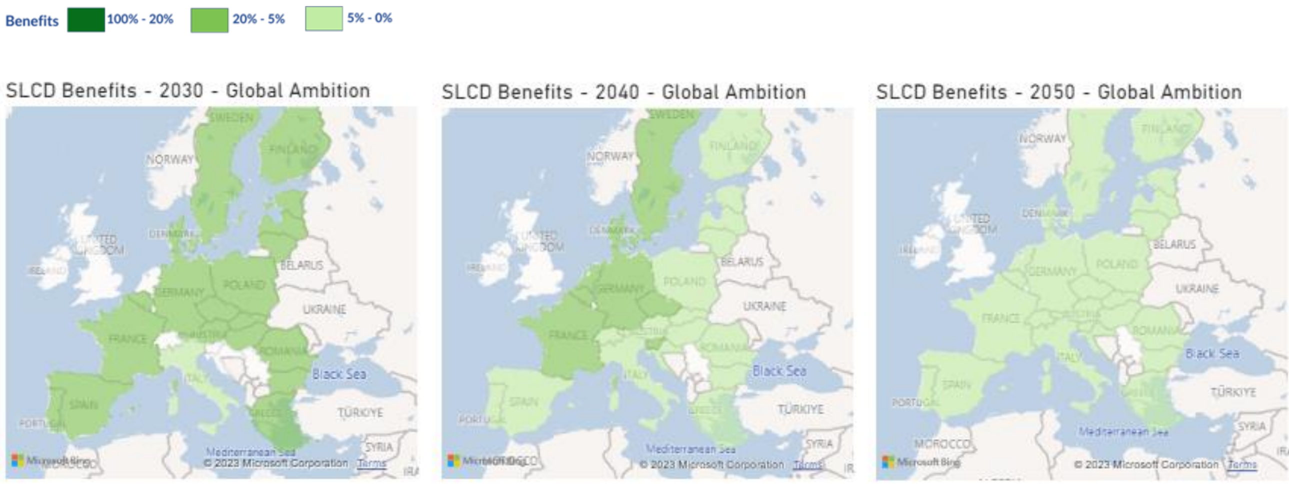
2 noUAh2: Ukraine disruption



3 noNAh2: North Africa disruption

> Single largest capacity disruption *(SLCD):*

In case of single largest capacity disruption (SLCD), the project group reduces significantly the risk of demand curtailment in many countries from 2030 onwards. In 2030 benefitting countries, beside Italy, can mitigate the risk of demand curtailment by 13-16%, Italy by 2%. Furthermore in 2040 France, Belgium, Netherlands, Germany, Denmark, Sweden, Czech Republic and Slovenia can mitigate risk of demand curtailment by 6%.



C.2 Quantitative benefits [ENTSOG]

The following tables display all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group.

CO2 Emissions:

ModelYear	Disruption	Scenario	Unit	Emissions-DELTA	Emissions-PLUS	Emissions-MINUS
2030	NO DISRUPTION	DE	tonne	-199882,76	538677299	538877181,8
2030	noLH2	DE	tonne	-956810,75	540175890,2	541132701
2030	noNAh2	DE	tonne	-1549713,90	539785356,1	541335070
2030	noNOh2	DE	tonne	16,01	538877197,8	538877181,8
2030	noUAh2	DE	tonne	-1316280,31	539378771,9	540695052,2
2030	NO DISRUPTION	GA	tonne	-400545,82	592910448,4	593310994,3
2030	noLH2	GA	tonne	-1958864,35	594817481,2	596776345,5
2030	noNAh2	GA	tonne	-1802853,22	594141433,2	595944286,4
2030	noNOh2	GA	tonne	0,00	593310994,3	593310994,3
2030	noUAh2	GA	tonne	-1543798,57	593627617,9	595171416,5
2040	NO DISRUPTION	DE	tonne	-66978,60	392077044	392144022,6
2040	noLH2	DE	tonne	-609830,94	392213883,4	392823714,3
2040	noNAh2	DE	tonne	-529402,57	392188097,7	392717500,3
2040	noNOh2	DE	tonne	0,00	392144022,6	392144022,6
2040	noUAh2	DE	tonne	-483036,57	392399182,9	392882219,5
2040	NO DISRUPTION	GA	tonne	-927805,50	396523251,6	397451057,1
2040	noLH2	GA	tonne	0,00	397455196,7	397455196,7
2040	noNAh2	GA	tonne	-153220,09	397301976,6	397455196,7
2040	noNOh2	GA	tonne	-59,00	397450977,1	397451036,1
2040	noUAh2	GA	tonne	0,00	397478498,3	397478498,3
2050	NO DISRUPTION	DE	tonne	0,00	232557734,8	232557734,8
2050	noLH2	DE	tonne	0,00	232557734,8	232557734,8
2050	noNAh2	DE	tonne	0,00	232557734,8	232557734,8
2050	noNOh2	DE	tonne	0,00	232557734,8	232557734,8
2050	noRU	DE	tonne	0,00	232557734,8	232557734,8
2050	noUAh2	DE	tonne	0,00	232557734,8	232557734,8
2050	NO DISRUPTION	GA	tonne	0,00	228306706,5	228306706,5
2050	noLH2	GA	tonne	0,00	228306706,5	228306706,5
2050	noNAh2	GA	tonne	0,00	228306706,5	228306706,5
2050	noNOh2	GA	tonne	0,00	228306706,5	228306706,5
2050	noRU	GA	tonne	0,00	228306706,5	228306706,5
2050	noUAh2	GA	tonne	0,00	228306706,5	228306706,5

Curtailment Rate (SLCD):

Country	2030-DE-DELTA	2030-GA-DELTA	2040-DE-DELTA	2040-GA-DELTA	2050-DE-DELTA	2050-GA-DELTA
Czechia	-16%	-15%	-8%	-6%	-7%	-3%
Estonia	-16%	-16%	-8%	-5%	-6%	-3%
Latvia	-16%	-16%	-8%	-5%	-6%	-3%
Lithuania	-16%	-16%	-8%	-5%	-6%	-3%
Poland	-15%	-16%	-8%	-5%	-6%	-3%
Sweden	-16%	-16%	-8%	-6%	-6%	-3%
Germany	-16%	-16%	-7%	-6%	-6%	-3%
Belgium	-15%	-16%	-7%	-6%	-6%	-3%
Denmark	-16%	-16%	-7%	-6%	-6%	-3%
Finland	-16%	-16%	-7%	-5%	-6%	-3%
The Netherlands	0%	0%	-7%	-6%	-6%	-3%
France	-15%	-16%	-7%	-6%	-4%	-3%
Austria	-15%	-14%	-6%	-5%	-5%	-3%
Portugal	-15%	-16%	-6%	-5%	-4%	-3%
Slovenia	0%	0%	-6%	-6%	-4%	-3%
Switzerland	0%	0%	-6%	-4%	-4%	-3%
Italy	-10%	-2%	-6%	-4%	-4%	-3%
Bulgaria	-13%	-13%	-5%	-4%	-4%	-3%
Croatia	0%	0%	-5%	-4%	-4%	-3%
Greece	-13%	-13%	-5%	-4%	-3%	-3%
Hungary	-13%	-14%	-5%	-3%	-3%	-3%
Romania	-13%	-14%	-5%	-4%	-3%	-3%
Slovakia	-15%	-14%	-5%	-4%	-4%	-3%
Spain	-15%	-16%	-5%	-5%	-4%	-2%

Curtailment Rate (Climatic Stress):

SimulationPeriod	Country	2030-DE-DELTA	2030-GA-DELTA	2040-DE-DELTA	2040-GA-DELTA	2050-DE-DELTA	2050-GA-DELTA
Average2W	Austria	-16%	-15%	-6%	-5%	-5%	-3%
Average2W	Belgium	-15%	-16%	-6%	-5%	-4%	-3%
Average2W	Bulgaria	-9%	-14%	-2%	-5%	0%	-2%
Average2W	Croatia	0%	0%	-1%	-5%	0%	-3%
Average2W	Cyprus	0%	0%	0%	0%	0%	0%
Average2W	Czechia	-16%	-16%	-7%	-5%	-5%	-3%
Average2W	Denmark	-15%	-17%	-6%	-5%	-5%	-3%
Average2W	Estonia	-16%	-16%	-6%	-5%	-5%	-3%
Average2W	Finland	-16%	-16%	-6%	-4%	-5%	-3%
Average2W	France	-15%	-16%	-6%	-5%	-5%	-3%
Average2W	Germany	-16%	-17%	-6%	-4%	-4%	-3%
Average2W	Greece	-9%	-14%	-2%	-4%	0%	0%
Average2W	Hungary	-10%	-15%	-1%	-5%	0%	-3%
Average2W	Ireland	0%	0%	0%	0%	0%	0%
Average2W	Italy	-5%	0%	-6%	-4%	-4%	-2%
Average2W	Latvia	-16%	-16%	-6%	-5%	-4%	-3%
Average2W	Lithuania	-16%	-16%	-6%	-5%	-4%	-3%
Average2W	Luxembourg	0%	0%	0%	0%	0%	0%

Average2W	Malta	0%	0%	0%	0%	0%	0%
Average2W	Poland	-16%	-16%	-6%	-5%	-4%	-3%
Average2W	Portugal	-15%	-16%	-6%	-5%	0%	-3%
Average2W	Romania	-10%	-15%	-1%	-5%	0%	-3%
Average2W	Serbia	0%	0%	0%	0%	0%	0%
Average2W	Slovakia	-16%	-15%	-1%	-5%	0%	-2%
Average2W	Slovenia	0%	0%	-6%	-5%	-4%	-3%
Average2W	Spain	-15%	-16%	-6%	-4%	-4%	-3%
Average2W	Sweden	-16%	-17%	-6%	-4%	-5%	-3%
Average2W	Switzerland	0%	0%	-6%	-4%	-4%	-2%
Average2W	The Netherlands	0%	0%	-6%	-5%	-5%	-3%
Average2W	United Kingdom	0%	0%	0%	0%	0%	0%
Average2WDF	Austria	-16%	-15%	-6%	-5%	-5%	-3%
Average2WDF	Belgium	-16%	-16%	-6%	-5%	-4%	-3%
Average2WDF	Bulgaria	-9%	-14%	-2%	-4%	0%	-3%
Average2WDF	Croatia	0%	0%	-2%	-4%	0%	-3%
Average2WDF	Cyprus	0%	0%	0%	0%	0%	0%
Average2WDF	Czechia	-16%	-16%	-6%	-5%	-5%	-3%
Average2WDF	Denmark	-15%	-17%	-6%	-5%	-5%	-4%
Average2WDF	Estonia	-16%	-16%	-6%	-4%	-5%	-3%
Average2WDF	Finland	-16%	-16%	-6%	-5%	-5%	-3%
Average2WDF	France	-15%	-16%	-6%	-5%	-5%	-4%
Average2WDF	Germany	-16%	-17%	-6%	-5%	-4%	-3%
Average2WDF	Greece	-9%	-14%	-2%	-4%	0%	0%
Average2WDF	Hungary	-10%	-15%	-2%	-4%	0%	-3%
Average2WDF	Ireland	0%	0%	0%	0%	0%	0%
Average2WDF	Italy	-5%	0%	-6%	-4%	-4%	-2%
Average2WDF	Latvia	-16%	-16%	-6%	-4%	-4%	-3%
Average2WDF	Lithuania	-16%	-16%	-6%	-4%	-4%	-3%
Average2WDF	Luxembourg	0%	0%	0%	0%	0%	0%
Average2WDF	Malta	0%	0%	0%	0%	0%	0%
Average2WDF	Poland	-16%	-16%	-6%	-4%	-4%	-4%
Average2WDF	Portugal	-15%	-16%	-6%	-4%	0%	-2%
Average2WDF	Romania	-10%	-15%	-1%	-4%	0%	-3%
Average2WDF	Serbia	0%	0%	0%	0%	0%	0%
Average2WDF	Slovakia	-16%	-15%	-2%	-5%	0%	-3%
Average2WDF	Slovenia	0%	0%	-6%	-5%	-4%	-3%
Average2WDF	Spain	-15%	-16%	-6%	-4%	-4%	-2%
Average2WDF	Sweden	-16%	-17%	-6%	-5%	-5%	-3%
Average2WDF	Switzerland	0%	0%	-6%	-4%	-4%	-2%
Average2WDF	The Netherlands	0%	0%	-6%	-5%	-5%	-3%
Average2WDF	United Kingdom	0%	0%	0%	0%	0%	0%
DC	Austria	-12%	-13%	-5%	-4%	-4%	-2%
DC	Belgium	-13%	-13%	-5%	-4%	-3%	-2%
DC	Bulgaria	-6%	-12%	-1%	-2%	0%	-2%

DC	Croatia	0%	0%	-1%	-2%	0%	-2%
DC	Cyprus	0%	0%	0%	0%	0%	0%
DC	Czechia	-13%	-13%	-5%	-4%	-4%	-3%
DC	Denmark	-13%	-13%	-5%	-4%	-4%	-2%
DC	Estonia	-12%	-13%	-5%	-3%	-4%	-3%
DC	Finland	-12%	-13%	-5%	-3%	-4%	-2%
DC	France	-13%	-13%	-6%	-4%	-4%	-2%
DC	Germany	-13%	-13%	-5%	-4%	-4%	-3%
DC	Greece	-6%	-12%	-2%	-3%	0%	-1%
DC	Hungary	-6%	-13%	-1%	-2%	0%	-2%
DC	Ireland	0%	0%	0%	0%	0%	0%
DC	Italy	-6%	-1%	-5%	-3%	-4%	-2%
DC	Latvia	-12%	-13%	-5%	-3%	-4%	-3%
DC	Lithuania	-12%	-13%	-5%	-3%	-4%	-2%
DC	Luxembourg	0%	0%	0%	0%	0%	0%
DC	Malta	0%	0%	0%	0%	0%	0%
DC	Poland	-12%	-13%	-5%	-3%	-4%	-2%
DC	Portugal	-12%	-13%	-5%	-4%	0%	-2%
DC	Romania	-6%	-13%	-1%	-2%	0%	-2%
DC	Serbia	0%	0%	0%	0%	0%	0%
DC	Slovakia	-12%	-13%	-1%	-2%	0%	-2%
DC	Slovenia	0%	0%	-5%	-4%	-4%	-3%
DC	Spain	-13%	-14%	-4%	-4%	-4%	-2%
DC	Sweden	-12%	-13%	-5%	-3%	-4%	-2%
DC	Switzerland	0%	0%	-5%	-3%	-4%	-2%
DC	The Netherlands	0%	0%	-5%	-4%	-4%	-2%
DC	United Kingdom	0%	0%	0%	0%	0%	0%

D. Environmental Impact [Promoter]

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
HYD-N-884	n.a	n.a	n.a

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The potential environmental impact of the CHE Pipeline project is assessed in the feasibility study joint conducted by Gassco and Dena, which looks both at potential landing points for the pipeline in Germany and at the possibility of repurposing an existing pipeline (Europipe 1 from Draupner to Dornum) versus building a new one (from Draupner to Wilhelmshaven).

The design of the completely new or partially new-and-partially repurposed offshore pipeline network will be inspired (and partially follow the route) of existing natural gas infrastructure in the North Sea. Repurposing an existing pipeline would have reduced environmental impact. A newly built pipeline would follow a similar routing trajectory of infrastructure already in place and would, therefore, minimize the surface impact. An environmental impact assessment will be performed as part of the Concept Phase.

Effective Maritime Spatial Planning (MSP) will be decisive to allocate sufficient space for the development of hydrogen corridors in an efficient manner, without negatively affecting the activities of fishermen and other uses of the sea. Dialogue with relevant local and national authorities in Germany has been initiated and working groups have been established. One important scope for these working groups will be further optimisation of pipeline routing and installation methodology to identify the most sustainable solution.

Ensuring hydrogen safety in the value chain is part of the technology assessment included in the Feasibility Study, which identifies any need for technology quantification. A Technical Safety Study is planned for the Concept Phase with the intention to ensure safe design of the pipeline and Receiving Facilities.

The CHE Pipeline project will transport only low-carbon or renewable hydrogen. The project will ensure the production of the hydrogen complies with the life cycle greenhouse gas emissions savings requirement of 70 % relative to a fossil fuel comparator of 94 g CO2eq/MJ as set out in Article 25(2) and Annex V to Directive (EU) 2018/2001. Marginal emissions are expected during construction phase.

E. Other benefits [Promoter]

Missing benefits are all benefits of a project which may be not captured by ENTSOG analysis.

As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Description of Other benefits [Promoter]

The CHE pipeline will ensure the transportation of low- carbon and renewable hydrogen produced in the North Sea and the Norwegian Sea Basin to the North-West German shore, to feed into the emerging hydrogen backbones in North-West Europe. As there is currently no transmission pipeline between Norway and Germany, the existing hydrogen pipeline capacity is increased 100% compared to the situation prior to commissioning of the project. Through future expansions, the project will also contribute to the reduction of transport costs by offering volume and operational efficiency, while also operating at high regularity.

The location of the project is considered as of strategic value for the EU, since the North Sea area is foreseen as one of the three major H2 import corridors in RePowerEU. In this regard, the CHE pipeline will provide security of supply and reduce the dependency on Russian gas supplies over time by securing imports and transport of hydrogen produced in the North Sea and Norwegian Sea Basin to the EU.

The CHE pipeline has the potential to play a key role in kick-starting the European hydrogen market. The CHE pipeline will play a significant role in providing the EU with the necessary hydrogen supplies to satisfy the demand of off takers located onshore in Europe. The project will contribute to market build up by giving end-users confidence that infrastructure with capacity is scheduled to become operational and will de-risk investment decisions for installations in end-use.

The hydrogen supplies transported by the CHE pipeline will support the decarbonisation of hard-to-abate sectors in Europe by enabling fuel switch away from fossil fuels and will decisively contribute to reach the EU climate targets.

F. Useful links [Promoter]

Useful links:

Joint Statement Norway and Germany on closer cooperation to develop green industry, January 2023:

https://www.regjeringen.no/en/whatsnew/dep/smk/press-releases/2023/closer-cooperation-between-norway-and-germany-to-develop-green-industry/joint-statement-germany-norway-hydrogen/id2958105/