HI EAST 12 A (Less-advanced)

H2 Interconnection Austria-Italy

Reasons for grouping [ENTSOG]

The project group aims at interconnecting future hydrogen infrastructure between Austria and Italy by partially repurposing existing natural gas infrastructure.

The group includes investments in Austria (HYD-N-986) and Italy (HYD-N-1205).

Objective of the group [Promoter]

The project group consists of the construction of an H2 corridor involving Italy and Austria and the connection with North Africa, enabling the supply of low-cost renewable hydrogen produced in the South to key European clusters of demand.

HYD-N-986 **H2 Readiness of the TAG pipeline system**

Comm. Year **2029**

Trans Austria Gasleitung

HYD-N-1205 **Italian H2 Backbone**

Comm. Year **2029**

A. Project group technical information [Promoter/ ENTSOG]

Project technical information [Promoter]

Hydrogen Transmission

TYNDP Project code	Section name	New / Repurposing	Nominal Diameter [mm]	Section Length [km]	Compressor power [MW]
HYD-N-986	H2 Readiness of the TAG pipeline system	Repurposing	From 900 to 1050	380	60 (*)
HYD-N-1205	Italian H2 Backbone	Repurposing	From 750 to 1200	1700	Up to 500 (*)
HYD-N-1205	Italian H2 Backbone	New	From 850 to 1200	640	

(*) *depending on the final configuration of the H2 backbone*

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-986	H2_IP_IT-AT	TAG GmbH	Transmission Italy (IT Hydrogen)	Transmission Austria (AT Hydrogen)	168	2029
HYD-N-986	H2_IP_IT-AT	TAG GmbH	Transmission Austria (AT Hydrogen)	Transmission Italy (IT Hydrogen)	126	2029
HYD-N-1205	H2_IP_IT-AT	Snam Rete Gas S.p.A.	Transmission Italy (IT Hydrogen)	Transmission Austria (AT Hydrogen)	168	2029
HYD-N-1205	H2_IP_IT-AT	Snam Rete Gas S.p.A.	Transmission Austria (AT Hydrogen)	Transmission Italy (IT Hydrogen)	126	2029
HYD-N-1205	DZh2 => ITh2	Snam Rete Gas S.p.A.	Transmission North Africa (DZ Hydrogen)	Transmission Italy (IT Hydrogen)	448	2029

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-986	369	50%	5	50%
HYD-N-1205	3200	30%	58	30%

Description of the cost and range [Promoter]

As indicated above, costs reported represent best estimates available to project promoters at the moment of TYNDP 2022 call for projects (as of December 2022, end of PCI project collection): in particular, the CAPEX and OPEX ranges take into account the maturity of the projects and the cost contingencies. Furthermore, the costs are referred to the project configuration submitted as PCI candidatures, and they could change depending on the final configuration of the H2 backbone.

C. Project Benefits [ENTSOG]

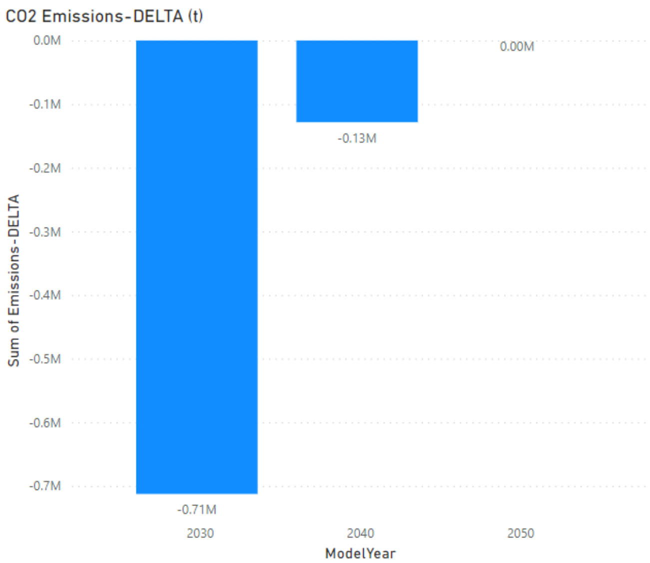
C.1 Summary of benefits

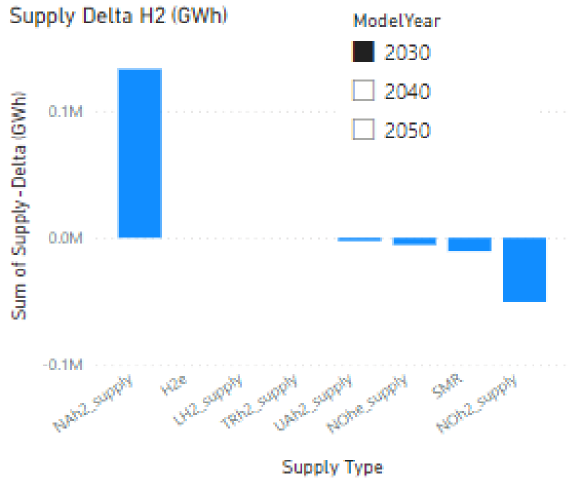
This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group. PS-CBA analysis of project group EAST 17 was performed following TOOT approach on TYNDP 2022 Hydrogen infrastructure level 1[1]. For more details on the indicators are available in Annex D of TYNDP 2022[2].

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 710 kt in 2030 and by 130 kt in 2040. The project group enables the transport of green hydrogen from North Africa via Italy and Austria and replaces Hydrogen produced by SMR in Europe or Norway.



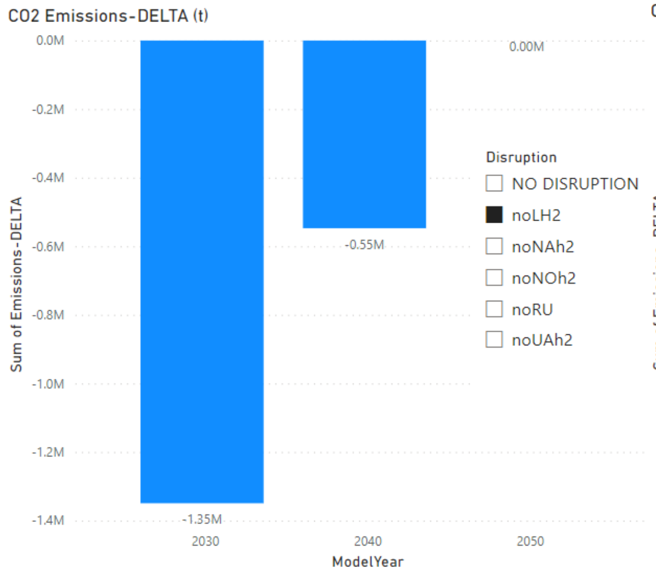


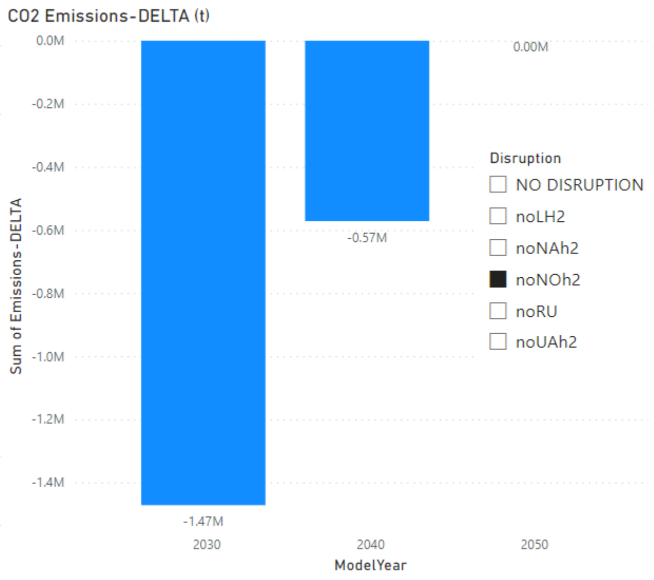
Increased benefits are expected under disruption cases in 2030 and 2040. In case of North Africa disruption, the project group is allowing cooperation between members states, but the intended purpose of the project group and sustainability benefits are limited.

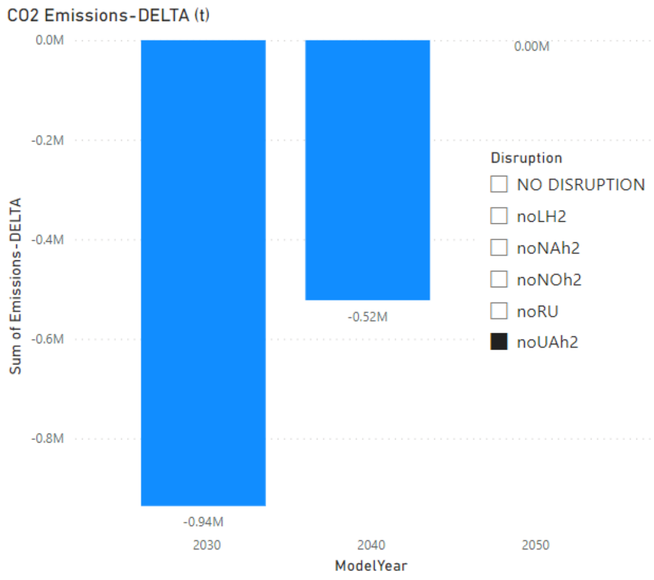
It should be noted that GHG emissions reduction derived in ENTSOG PS-CBA considers DE demand and supply for H2 and NG in all European countries, therefore, sustainability benefits included in section C.1 and C.2 of the project fiche, reflect GHG emissions reduction from the replacement of blue hydrogen supplies by green hydrogen supplies enabled by the project group. Nevertheless, additional GHG and non-GHG emissions reduction could stem from the project group implementation from the replacement of more polluting fuels, as indicated by the project promoter in the section E. Other benefits.

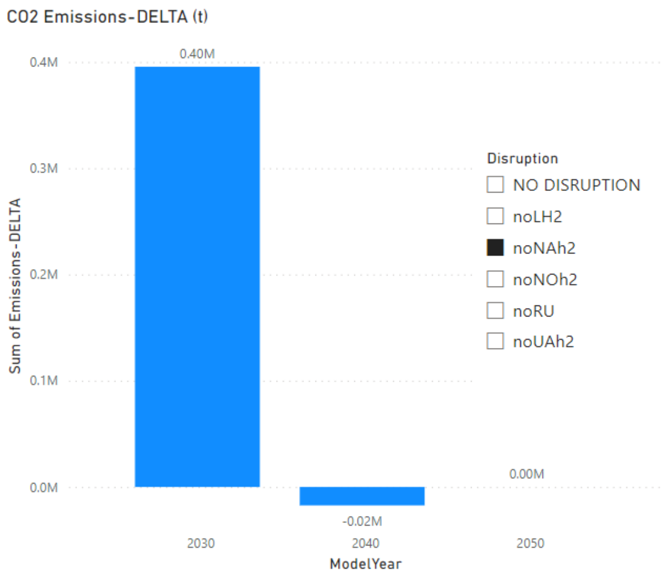
[1] Detail of H2 capacities in TYNDP 2022 Annex C.2 H2 Capacities per country
[2] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf

1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa disruption









Security of Supply:[3]

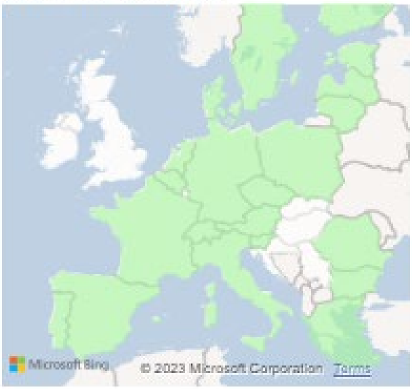
> Reference case:

The conversion of the existing natural gas infrastructure doesn't impact the methane demand and will bring positive security of supply benefits for Italy and almost all European countries.

In the yearly reference case, the project group mitigates the risk of hydrogen demand curtailment In Italy by 65% in 2030 and by 20-25% in 2040 and 2050. In 2040 and 2050 the project group reduces the risk of hydrogen demand curtail by 2-10% in many European countries.

2030 DE- Benefits

2040 DE- Benefits



2050 DE- Benefits

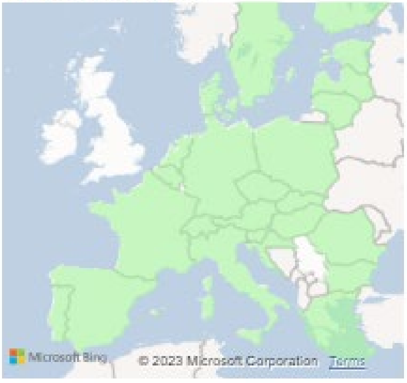
> Climatic stress cases:

Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project group increases mitigation of risk of hydrogen demand curtailment in almost all European countries from 2030 by 2-13%. Italy is benefiting the most by mitigating the risk of demand curtailment by 14-15% in 2040 and 2050 and a maximum of 66% in 2030.

[3] *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.*

2030 DE- Benefits

2040 DE- Benefits



2050 DE- Benefits

> Disruption cases (S-1):

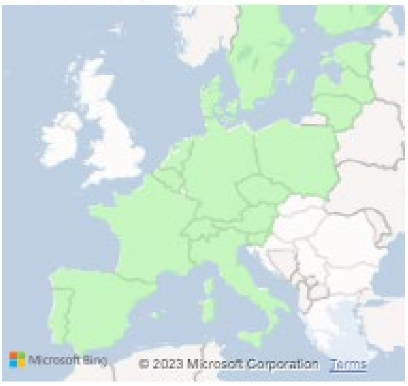
Similarly, under supply disruption cases besides North Africa disruption, the project group shows benefits for mitigating the risk of demand curtailment by 2-10% from 2040 in almost all European countries. In case of north Africa disruption, following the geographical location Italy is mitigating hydrogen demand curtailment in all three time-stamps, with a maximum of 42% in 2030 but also Portugal, Spain and Switzerland mitigating Demand Curtailment in this case in 2040 and 2050. The reduction in the contribution of the project to avoidance of demand curtailment in 2050 compared to 2040 is linked to the saturation of the infrastructure capacity, while further potential supply to cover increased demand can be made available through additional projects.

Maps for specifics disruptions: 1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa disruption

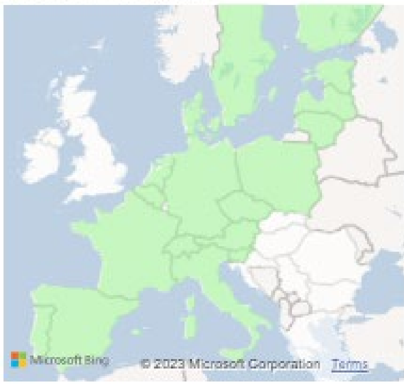
1 noLH2: LH2 disruption

2030 DE- Benefits

2040 DE- Benefits



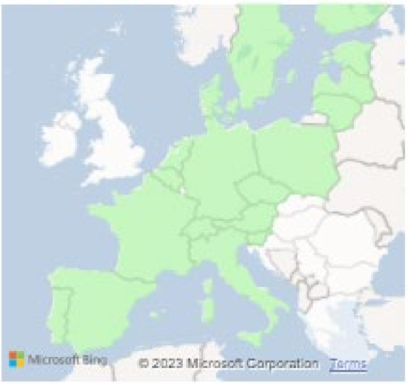
2050 DE- Benefits



2 noNOh2: Norway disruption

2030 DE- Benefits

2040 DE- Benefits

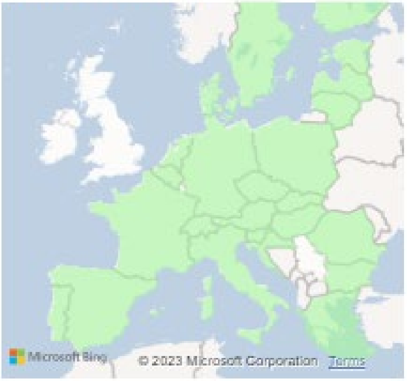


2050 DE- Benefits

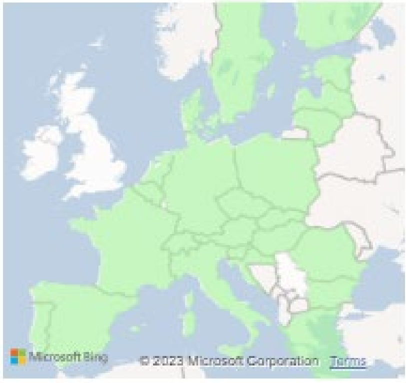
3 noUAh2: Ukraine disruption

2030 DE- Benefits

2040 DE- Benefits



2050 DE- Benefits



4 noNAh2: North Africa disruption

2030 DE- Benefits

2040 DE- Benefits

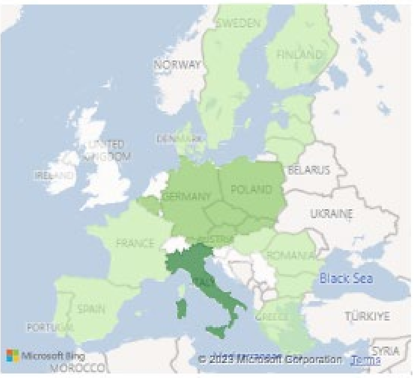
2050 DE- Benefits

> Single largest capacity disruption (SLCD):

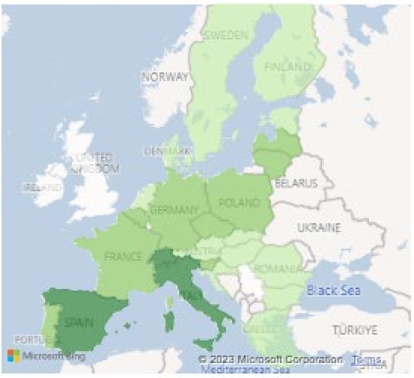
In case of SLCD almost all European countries benefitting from this project group by mitigating the risk of demand curtailment from 2030 onwards. In 2040 the highest benefits are recorded, including 30% for Italy and Switzerland and 21% for Spain but also countries in central Europe are benefiting by 6% in 2030 and 2040.

Benefits 100% - 20% 20% - 5% 5% - 0%

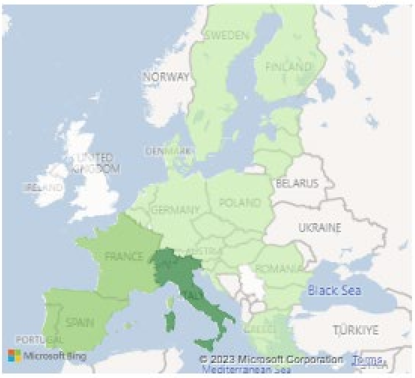
SLCD Benefits - 2030 - Distributed Energy



SLCD Benefits - 2040 - Distributed Energy



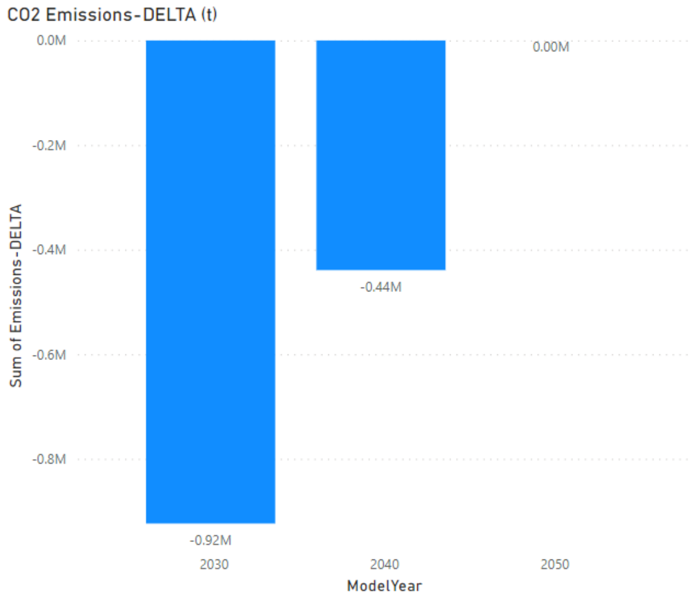
SLCD Benefits - 2050 - Distributed Energy

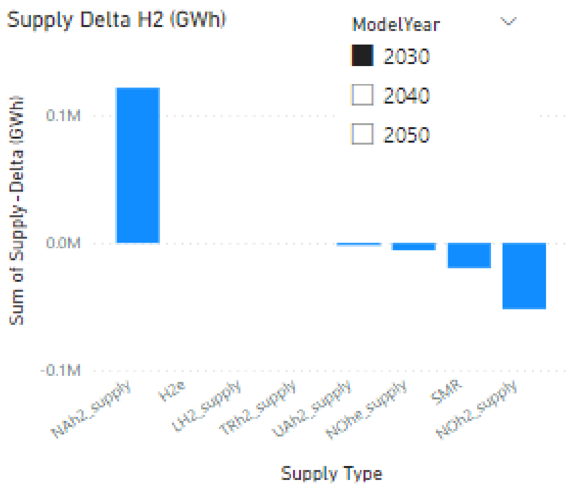


Global Ambition

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 920 kt in 2030 and by 440 kt in 2040. The project group enables the transport of green hydrogen from North Africa via Italy and Austria and replaces blue hydrogen produced by SMR.

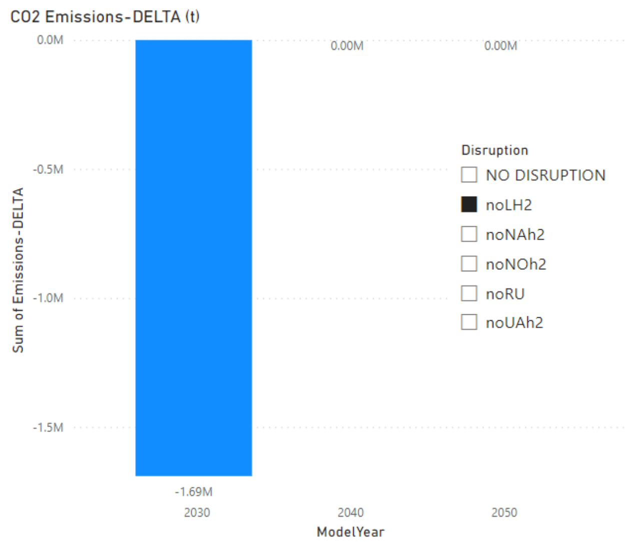


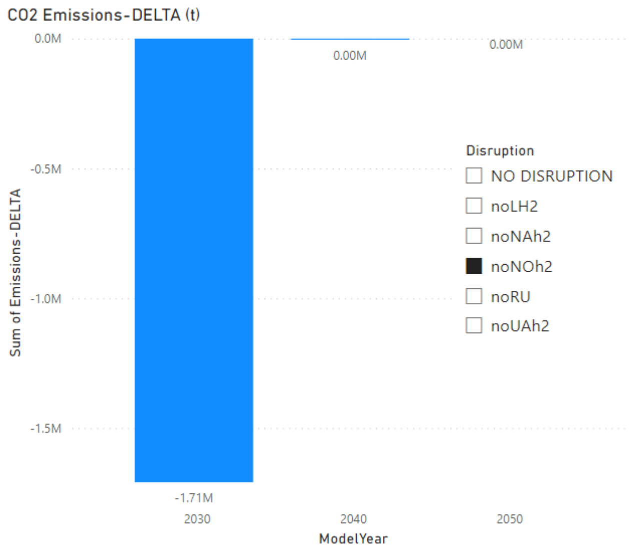


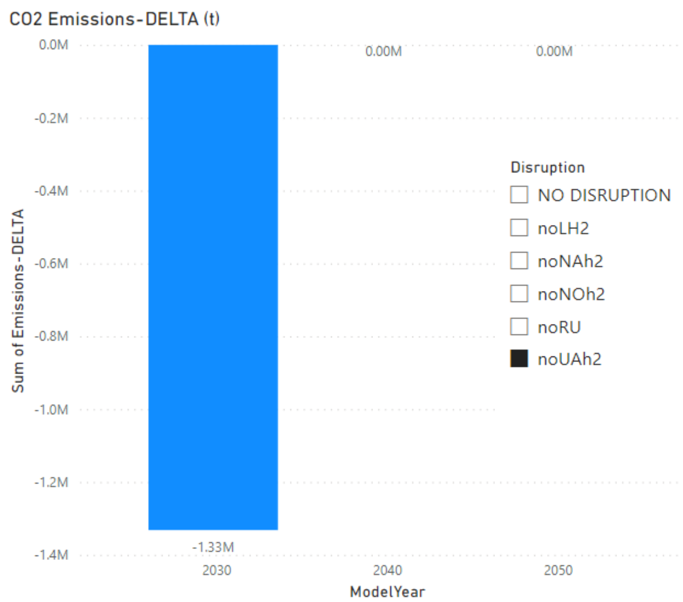
In case of supply disruption, besides North Africa disruption, the project group shows increased sustainability benefits for 2030. In case of North Africa disruption, the project groups enables more cooperation and to mitigate hydrogen demand curtailment is using more blue hydrogen produced by SMR.

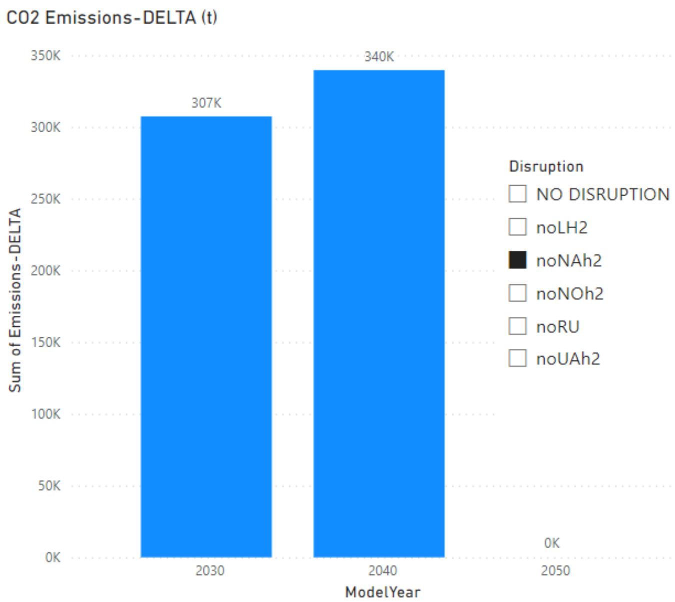
It should be noted that GHG emissions reduction derived in ENTSOG PS-CBA considers GA demand and supply for H2 and NG in all European countries, therefore, sustainability benefits included in section C.1 and C.2 of the project fiche, reflect GHG emissions reduction from the replacement of blue hydrogen supplies by green hydrogen supplies enabled by the project group. Nevertheless, additional GHG and non-GHG emissions reduction could stem from the project group implementation from the replacement of other more polluting fuels, as indicated by the project promoter in the section E. Other benefits.

1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa disruption









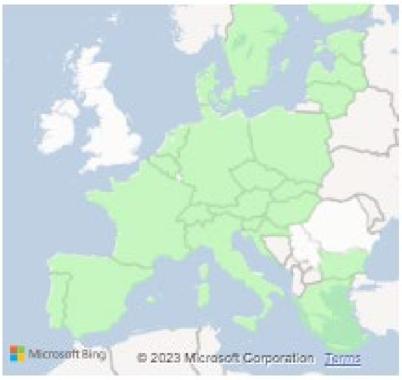
Security of supply:

> Reference case

The conversion of the existing natural gas infrastructure doesn’t impact the methane demand and will bring positive security of supply benefits for Italy for all three time-stamps and almost all European countries in 2040. In 2040 the project group reduces the risk of demand curtailment in Portugal, Spain, Switzerland and Italy by 24-28% and by 1-3% for the other respective Countries in Europa. The reduction in the contribution of the project to avoidance of demand curtailment in 2050 compared to 2040 is linked to the saturation of the infrastructure capacity, while further potential supply to cover increased demand can be made available through additional projects.

2030 GA- Benefits

2040 GA- Benefits



2050 GA- Benefits

> Climatic stress cases

Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project group shows extended benefits in 2030 by mitigating the risk of hydrogen demand curtailment by 5-6% for many countries and a maximum of 58% for Italy. In 2040 and 2050 Portugal, Spain, Switzerland and Spain are benefitting by mitigating demand curtailment by 10-13% in 2040 and by 4-5% for Portugal and Spain and by 14% for Switzerland and Italy in 2050.

The reduction in the contribution of the project to avoidance of demand curtailment in 2040 and 2050 is linked to the saturation of the infrastructure capacity, while further potential supply to cover increased demand can be made available through additional projects.

2030 GA- Benefits

2040 GA- Benefits

2050 GA- Benefits

> Disruption cases (S-1)

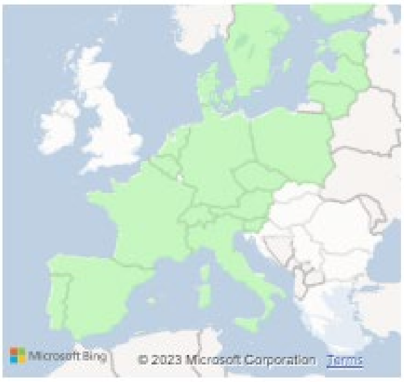
Similarly, under supply disruption cases besides North Africa disruption, the project group shows improved benefits for mitigating the risk of demand curtailment. For example in 2040 the risk of demand curtailment is reduced by 17-21% for Portugal, Spain, Switzerland and Italy and by 5-7% for other respective countries in Europe. In case of North Africa disruption benefits are limited but Italy is benefitting in all three time-stamps and in 2040 the project groups mitigates demand curtailment by 7-9% in Portugal, Spain, Switzerland and Italy

Maps for specifics disruptions: 1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa disruption

1 noLH2: LH2 disruption

2030 GA- Benefits

2040 GA- Benefits

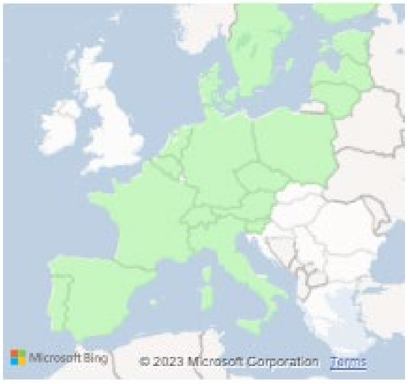


2050 GA- Benefits

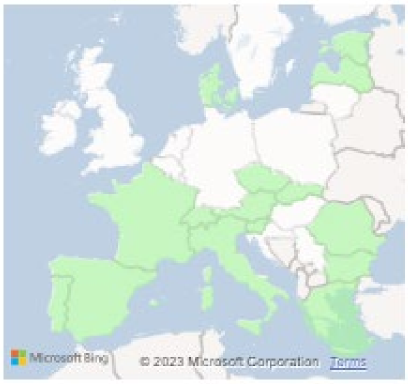
2 noNOh2: Norway disruption

2030 GA- Benefits

2040 GA- Benefits



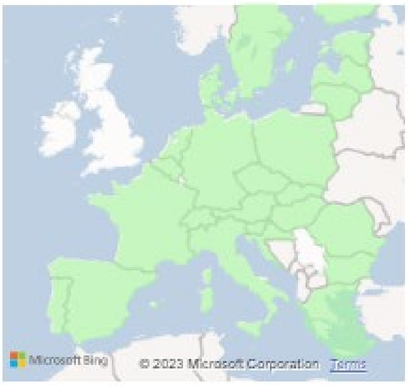
2050 GA- Benefits



3 noUAh2: Ukraine disruption

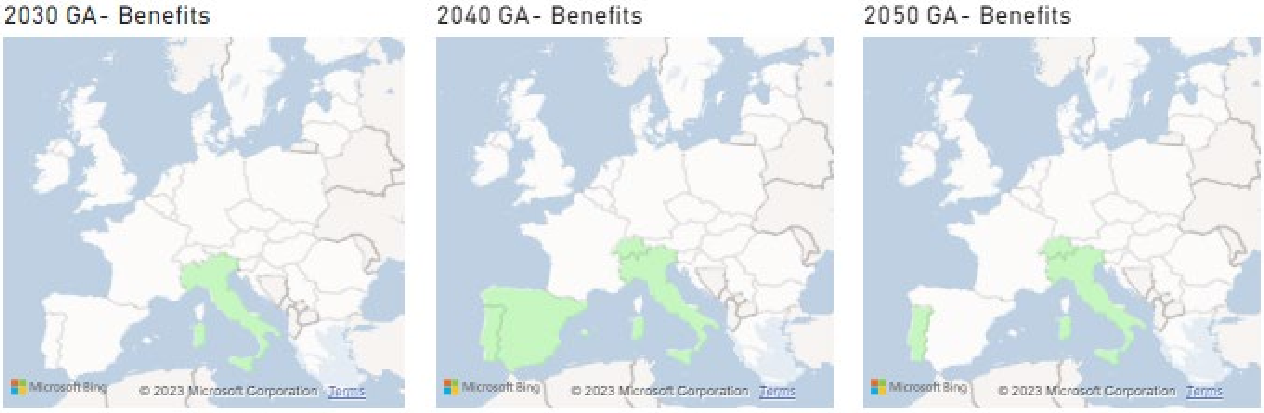
2030 GA- Benefits

2040 GA- Benefits



2050 GA- Benefits

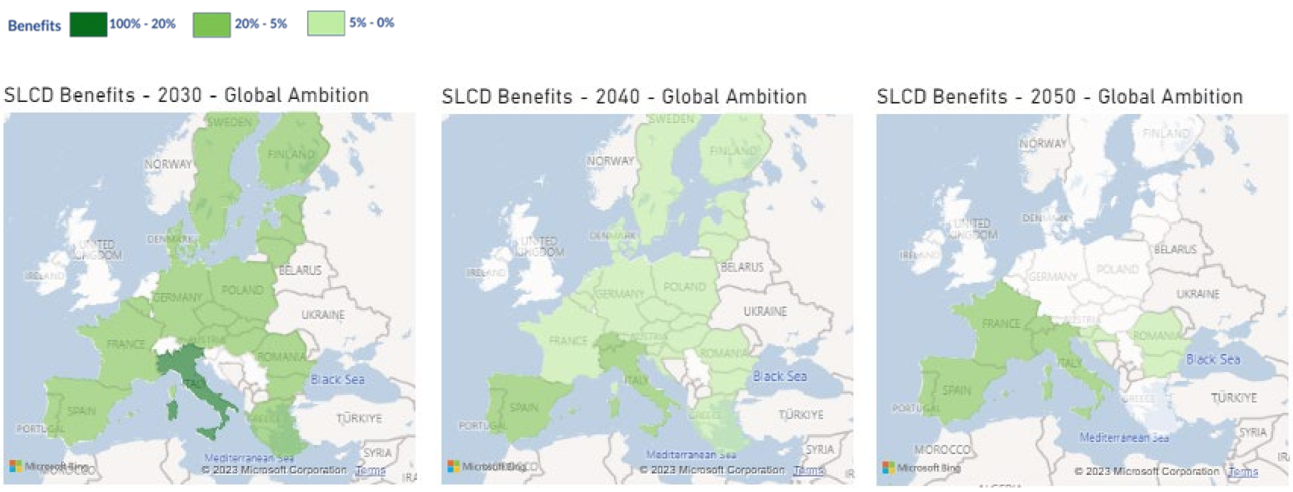
4 noNAh2: North Africa disruption



> Single largest capacity disruption (SLCD):

In case of SLCD almost all European countries benefitting from this project group by mitigating the risk of demand curtailment. The highest benefits are recorded in 2030, including 68% for Italy and around 6% for other respective countries in Europe. In 2040 and 2050 Countries in Southwestern Europe are benefitting by 9-19%.

The reduction in the contribution of the project to avoidance of demand curtailment in 2040 and 2050 is linked to the saturation of the infrastructure capacity, while further potential supply to cover increased demand can be made available through additional projects.



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. Some of those benefits are measured through quantitative indicators (i.e. CO2 emissions, Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

CO2 Emissions:

ModelYear	Disruption	Scenario	Unit	Emission Delta	Emission Plus	Emission Minus
2030	NO DISRUPTION	DE	tonne	-712.494	538.677.299	539.389.793
2030	NO DISRUPTION	GA	tonne	-923.596	592.910.448	593.834.044
2030	noLH2	DE	tonne	-1.349.328	540.175.890	541.525.218
2030	noLH2	GA	tonne	-1.689.986	594.817.481	596.507.468
2030	noNAh2	DE	tonne	395.563	539.785.356	539.389.793
2030	noNAh2	GA	tonne	307.389	594.141.433	593.834.044
2030	noNOh2	DE	tonne	-1.472.102	538.877.198	540.349.300
2030	noNOh2	GA	tonne	-1.708.282	593.310.994	595.019.277
2030	noUAh2	DE	tonne	-935.743	539.378.772	540.314.515
2030	noUAh2	GA	tonne	-1.331.696	593.627.618	594.959.314
2040	NO DISRUPTION	DE	tonne	-128.403	392.077.044	392.205.447
2040	NO DISRUPTION	GA	tonne	-439.090	396.523.252	396.962.341
2040	noLH2	DE	tonne	-547.394	392.213.883	392.761.278
2040	noLH2	GA	tonne	0	397.455.197	397.455.197
2040	noNAh2	DE	tonne	-17.349	392.188.098	392.205.447
2040	noNAh2	GA	tonne	339.635	397.301.977	396.962.341
2040	noNOh2	DE	tonne	-571.684	392.144.023	392.715.707
2040	noNOh2	GA	tonne	-4.220	397.450.977	397.455.197
2040	noUAh2	DE	tonne	-522.380	392.399.183	392.921.563
2040	noUAh2	GA	tonne	0	397.478.498	397.478.498
2050	NO DISRUPTION	DE	tonne	0	232.557.735	232.557.735
2050	NO DISRUPTION	GA	tonne	0	228.306.707	228.306.707
2050	noLH2	DE	tonne	0	232.557.735	232.557.735
2050	noLH2	GA	tonne	0	228.306.707	228.306.707
2050	noNAh2	DE	tonne	0	232.557.735	232.557.735
2050	noNAh2	GA	tonne	0	228.306.707	228.306.707
2050	noNOh2	DE	tonne	0	232.557.735	232.557.735
2050	noNOh2	GA	tonne	0	228.306.707	228.306.707

2050	noRU	DE	tonne	0	232.557.735	232.557.735
2050	noRU	GA	tonne	0	228.306.707	228.306.707
2050	noUAh2	DE	tonne	0	232.557.735	232.557.735
2050	noUAh2	GA	tonne	0	228.306.707	228.306.707

Curtailment Rate (SLCD):

Country	2030-DE-DELTA	2030-GA-DELTA	2040-DE-DELTA	2040-GA-DELTA	2050-DE-DELTA	2050-GA-DELTA
Switzerland	0%	0%	-30%	-19%	-23%	-15%
Italy	-64%	-68%	-30%	-19%	-23%	-14%
Spain	-5%	-6%	-21%	-18%	-12%	-9%
Portugal	-5%	-6%	-13%	-18%	-12%	-9%
Czechia	-6%	-6%	-6%	-3%	-5%	0%
Latvia	-5%	-6%	-6%	-3%	-3%	0%
Lithuania	-5%	-6%	-6%	-2%	-3%	0%
Poland	-6%	-6%	-6%	-2%	-4%	0%
Slovenia	0%	0%	-6%	-2%	-5%	-3%
France	-5%	-6%	-6%	-4%	-7%	-6%
Germany	-6%	-6%	-6%	-3%	-3%	0%
Belgium	-6%	-6%	-5%	-3%	-3%	0%
Austria	-12%	-16%	-5%	-2%	-4%	0%
Denmark	-5%	-6%	-5%	-2%	-4%	0%
Estonia	-5%	-6%	-5%	-3%	-4%	0%
Finland	-5%	-6%	-5%	-2%	-4%	0%
Sweden	-5%	-6%	-5%	-2%	-4%	0%
The Netherlands	0%	0%	-5%	-2%	-4%	0%
Bulgaria	-5%	-6%	-4%	-1%	-2%	-1%
Croatia	0%	0%	-4%	-1%	-2%	-1%
Greece	-5%	-6%	-4%	-1%	-2%	0%
Hungary	-5%	-6%	-4%	-1%	-2%	-1%
Romania	-5%	-6%	-4%	-1%	-2%	-1%
Slovakia	-11%	-15%	-4%	-2%	-2%	0%

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	-6%	-7%	-3%	0%	-2%	0%
Average2W	Belgium	-5%	-6%	-4%	0%	-2%	0%
Average2W	Bulgaria	-1%	-7%	-2%	0%	0%	0%
Average2W	Croatia	0%	0%	-1%	0%	0%	0%
Average2W	Cyprus	0%	0%	0%	0%	0%	0%
Average2W	Czechia	-7%	-7%	-3%	0%	-2%	0%
Average2W	Denmark	-6%	-7%	-3%	0%	-2%	0%
Average2W	Estonia	-6%	-6%	-2%	0%	-2%	0%
Average2W	Finland	-6%	-6%	-3%	0%	-2%	0%

Average2W	France	-6%	-7%	-3%	0%	-2%	0%
Average2W	Germany	-7%	-7%	-3%	0%	-2%	0%
Average2W	Greece	-1%	-7%	-2%	0%	0%	0%
Average2W	Hungary	-1%	-7%	-1%	0%	0%	0%
Average2W	Ireland	0%	0%	0%	0%	0%	0%
Average2W	Italy	-66%	-67%	-15%	-18%	-14%	-14%
Average2W	Latvia	-6%	-6%	-3%	0%	-2%	0%
Average2W	Lithuania	-6%	-6%	-3%	0%	-2%	0%
Average2W	Luxembourg	0%	0%	0%	0%	0%	0%
Average2W	Malta	0%	0%	0%	0%	0%	0%
Average2W	Poland	-6%	-7%	-3%	0%	-2%	0%
Average2W	Portugal	-6%	-6%	-14%	-18%	0%	-13%
Average2W	Romania	-1%	-6%	-1%	0%	0%	0%
Average2W	Serbia	0%	0%	0%	0%	0%	0%
Average2W	Slovakia	-6%	-7%	-1%	0%	0%	0%
Average2W	Slovenia	0%	0%	-3%	-1%	-2%	0%
Average2W	Spain	-6%	-6%	-15%	-17%	-10%	-13%
Average2W	Sweden	-6%	-7%	-3%	0%	-2%	0%
Average2W	Switzerland	0%	0%	-16%	-18%	-15%	-14%
Average2W	The Netherlands	0%	0%	-3%	0%	-2%	0%
Average2W	United Kingdom	0%	0%	0%	0%	0%	0%
Average2WDF	Austria	-6%	-7%	-3%	0%	-2%	0%
Average2WDF	Belgium	-6%	-6%	-3%	0%	-2%	0%
Average2WDF	Bulgaria	-1%	-7%	-2%	0%	0%	0%
Average2WDF	Croatia	0%	0%	-2%	0%	0%	0%
Average2WDF	Cyprus	0%	0%	0%	0%	0%	0%
Average2WDF	Czechia	-6%	-7%	-3%	0%	-2%	0%
Average2WDF	Denmark	-6%	-7%	-3%	0%	-2%	0%
Average2WDF	Estonia	-6%	-6%	-2%	0%	-2%	0%
Average2WDF	Finland	-6%	-6%	-3%	0%	-2%	0%
Average2WDF	France	-6%	-7%	-4%	0%	-2%	0%
Average2WDF	Germany	-7%	-7%	-3%	0%	-2%	0%
Average2WDF	Greece	-1%	-7%	-2%	0%	0%	0%
Average2WDF	Hungary	-1%	-7%	-2%	0%	0%	0%
Average2WDF	Ireland	0%	0%	0%	0%	0%	0%
Average2WDF	Italy	-66%	-67%	-15%	-17%	-14%	-14%
Average2WDF	Latvia	-6%	-6%	-3%	0%	-2%	0%
Average2WDF	Lithuania	-6%	-6%	-3%	0%	-2%	0%
Average2WDF	Luxembourg	0%	0%	0%	0%	0%	0%
Average2WDF	Malta	0%	0%	0%	0%	0%	0%
Average2WDF	Poland	-6%	-7%	-3%	0%	-2%	0%
Average2WDF	Portugal	-6%	-6%	-14%	-18%	0%	-12%
Average2WDF	Romania	-1%	-6%	-1%	0%	0%	0%
Average2WDF	Serbia	0%	0%	0%	0%	0%	0%
Average2WDF	Slovakia	-6%	-7%	-2%	0%	0%	0%
Average2WDF	Slovenia	0%	0%	-3%	0%	-2%	0%
Average2WDF	Spain	-6%	-6%	-15%	-18%	-10%	-12%
Average2WDF	Sweden	-6%	-7%	-3%	0%	-2%	0%

Average2WDF	Switzerland	0%	0%	-16%	-18%	-15%	-15%
Average2WDF	The Netherlands	0%	0%	-3%	0%	-2%	0%
Average2WDF	United Kingdom	0%	0%	0%	0%	0%	0%
DC	Austria	-5%	-6%	-3%	-1%	-2%	0%
DC	Belgium	-5%	-5%	-4%	-1%	-2%	0%
DC	Bulgaria	0%	-5%	-1%	0%	0%	0%
DC	Croatia	0%	0%	-1%	0%	0%	0%
DC	Cyprus	0%	0%	0%	0%	0%	0%
DC	Czechia	-5%	-5%	-3%	-1%	-2%	0%
DC	Denmark	-5%	-5%	-3%	-1%	-2%	0%
DC	Estonia	-4%	-5%	-3%	0%	-2%	0%
DC	Finland	-4%	-5%	-3%	0%	-2%	0%
DC	France	-5%	-5%	-4%	-1%	-2%	0%
DC	Germany	-5%	-5%	-3%	-1%	-2%	0%
DC	Greece	0%	-5%	-2%	-1%	0%	0%
DC	Hungary	0%	-5%	-1%	0%	0%	0%
DC	Ireland	0%	0%	0%	0%	0%	0%
DC	Italy	-57%	-58%	-14%	-13%	-13%	-14%
DC	Latvia	-4%	-5%	-4%	0%	-2%	0%
DC	Lithuania	-4%	-5%	-4%	0%	-2%	0%
DC	Luxembourg	0%	0%	0%	0%	0%	0%
DC	Malta	0%	0%	0%	0%	0%	0%
DC	Poland	-4%	-5%	-4%	0%	-2%	0%
DC	Portugal	-4%	-5%	-5%	-10%	0%	-4%
DC	Romania	0%	-5%	-1%	0%	0%	0%
DC	Serbia	0%	0%	0%	0%	0%	0%
DC	Slovakia	-5%	-6%	-1%	0%	0%	0%
DC	Slovenia	0%	0%	-4%	-1%	-2%	0%
DC	Spain	-5%	-6%	-4%	-11%	-3%	-5%
DC	Sweden	-4%	-5%	-3%	0%	-2%	0%
DC	Switzerland	0%	0%	-14%	-13%	-14%	-14%
DC	The Netherlands	0%	0%	-3%	-1%	-2%	0%
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-986	Pipelines and compressor stations	The project is based on the repurposing of existing infrastructure, thus surface and the environment won't be affected by pipeline routing. Compressor stations are expected to be built at locations of existing ones, leading to no or very limited impact either.	The project will utilize existing pipelines, hence no additional pipelines have to be installed and no new routes developed. The required compressor stations are expected to be built within already developed areas of existing ones, limiting the potential reclamation of additional land and environmental impacts to a minimum. The project implementation will follow best practice, comply with EU and national regulations, and all necessary measures will be taken to mitigate potential impacts on land and environment.
HYD-N-1205	Pipelines and compressor stations	As the project foresees a high level of repurposing and for new built pipelines the same routes of existing pipelines are expected to be exploited (parallel assets), there will be no or minimal impacted surface as well as other environmental impacts.	The project is in feasibility study, but it is foreseen to use 73% of repurposed pipeline: thus, no additional use of land will be necessary, and all environmental impacts will be very minimal since the remaining new pipes are expected to exploit the same routes of existing pipelines. However, in order to tackle even the residual environmental impacts, appropriate restoration activities will be planned, according to best practices developed and applied thanks to competences gained over more than 80 years in building gas pipelines.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
HYD-N-986 will not impact on additional land and the environment by development of new pipeline routes; compressor stations are expected to be built at locations of existing ones.	The project implementation will follow best practice, comply with EU and national regulations, and all necessary measures will be taken to mitigate potential impacts on land and environment.	Related costs have been considered in CAPEX & OPEX estimations (CAPEX & OPEX already reported in the previous sections)	N/A
HYD-N-1205: the environmental impacts will be minimized by a careful evaluation and choice of the possible routes for the projects' layouts. Additionally, mitigation measures and environmental restoration works will ensure that the realization of the projects respects the crossed areas, further minimizing potential impacts.	The project foreseen to use 73% of repurposed pipeline: no additional mitigation measure will be required The new pipelines will be built very close to the existing natural gas pipelines with low impacts on sensitive areas already assessed in the past. Furthermore, the building of new pipelines will foresee, appropriate restoration activities according to best	The additional costs have been already taken into consideration in the relevant cost estimations (CAPEX & OPEX already reported in the previous sections)	N/A

	practices, such as the reintroduction of species of flora and fauna through conservation and naturalization methods and construction works performed outside of the nesting period of the animal species.		

Environmental Impact explained [Promoter]

The infrastructure will be mostly constituted of repurposed pipelines, so no additional use of land will be caused.

Compressor stations are i*n general* expected to be built within the already developed areas of existing compressor stations, avoiding reclamation of new land and environmental impacts.

The implementation and completion of the minority new pipelines in the Group will follow the best practices and all environmental laws and prescriptions. The environmental impacts will be minimized by a careful evaluation and choice of the possible routes for the projects' layouts. Additionally, mitigation measures and environmental restoration works will ensure that the realization of the projects respects the crossed areas, further minimising potential impacts

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]

As detailed in sections C.1 and C.2, ENTSOG PS-CBA analysis considers only direct GHG emissions reduction from the replacement of blue hydrogen supplies with green hydrogen supplies. Considering the above-mentioned assumption, higher sustainability benefits could materialize with the implementation of the project group, as it follows:

Sustainability: all hydrogen supplies (both blue and green H2) enabled by the project group could further reduce GHG emissions due to the replacement of more pollutant fuels, such as grey hydrogen, natural gas, diesel or coal. Moreover, once covered by alternative fuels, also the emissions related to the H2 unserved demand should be taken into account. Both aspects are already under assessment for improvements of CBA Methodology.

The project group will also enable the **reduction of other non-CO2 negative** pollutants (e.g. NOx, SOx, PMx, etc.) with associated benefits stemming from the project, that should be monetised according to their social cost (specific parameters allowing for the monetization of such non-CO2 emissions already exists, e.g. included in the JRC consultation on energy storage as well as in several other CBA methodologies).

Considering all the above reasons, the sustainability benefits reported in this PS-CBA should be intended as conservative, having the proposed projects much higher positive environmental impacts.

Infrastructure Flexibility: H2 projects contribute to improve the flexibility of the system. More in detail:

- Delta Line-Pack: as for natural gas, pipelines themselves can act as temporary storage providing balancing solutions and ensuring flexibility and security of supply to the system.
- Transport and subsequent storage of hydrogen in dedicated underground hydrogen storage would increase flexibility as well security of supply of hydrogen systems, by allowing seasonal modulation with the storage of renewable and low carbon hydrogen, according to the hydrogen production and consumption profiles.

Avoided cost for the energy system: the projects produce additional benefits on other energy systems (e.g. avoided costs on other energy infrastructure, flexibility services, etc.).

Improvement of market integration: A monetization of the indicator assessing, for example, the positive effects in terms of H2 prices alignment across EU, thanks to interconnections across Member States with cost-competitive H2 supplies, such as the renewable sources produced in North Africa and the South.

Competition: it will be important to include indicators that value H2 supply competition developments, facilitating production and demand scaling up as well as H2 diffusion.

F. Useful links [Promoter]

Useful links:

https://www.south2corridor.net/

https://www.snam.it/export/sites/snam-rp/repository-srg/file/it/business-servizi/Processi_Online/Allacciamenti/informazioni/piano-decennale/pd_2022_2031/consultazione/Piano-Decennale-22-31-Documento.pdf#page=94

https://h2-readiness-tag.at/en/
Austrian Coordinated Network Development Plan 2022

https://www.sunshynecorridor.eu/

European Hydrogen Backbone Maps | EHB European Hydrogen Backbone