EAST 32 (Less-Advanced)
Italian Hydrogen backbone

Reasons for grouping [ENTSOG]

The project group consists of the future hydrogen transport infrastructure of Italy (HYD-N-1205 stand-alone). It starts in cross-border point with North Africa, covering the transport along South-North axis in Italy up to the cross-border points with Austria and Switzerland.

Objective of the group [Promoter]

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

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-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	

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-1205	H2_IP_NA-IT	Snam Rete Gas S.p.A.	Hydrogen import North Africa (NA Hydrogen)	Transmission Italy (IT Hydrogen)	448	2029
HYD-N-1205	H2_IP_IT-CH	Snam Rete Gas S.p.A.	Transmission Italy (IT Hydrogen)	Transmission Switzerland (CH Hydrogen)	88	2029
HYD-N-1205	H2_IP_IT-CH	Snam Rete Gas S.p.A.	Transmission Switzerland (CH Hydrogen)	Transmission Italy (IT Hydrogen)	135	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)	219	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€/y]	OPEX range [%]
HYD-N-1205	800	40%	8	40%

Description of the cost and range [Promoter]

As indicated above, costs reported represent best estimates available to the project promoter 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 project and the cost contingencies. Furthermore, the costs are referred to the project configuration submitted as PCI candidature and they could change depending on the final configuration of the H2 backbone.

C. Project Benefits [ENTSOG]

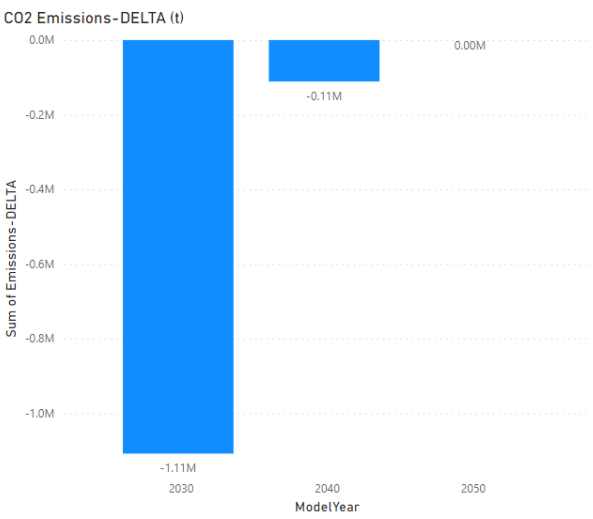
C.1 Summary of benefits

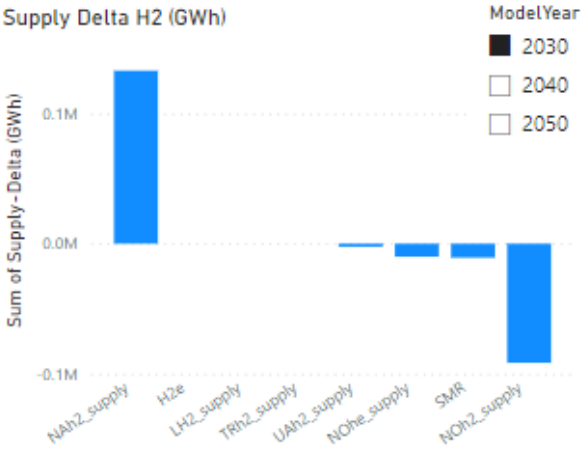
This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group. PS-CBA analysis of project group EAST 17 was performed following TOOT approach on TYNDP 2022 Hydrogen infrastructure level 1[1]. For more details on the indicators are available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

Distributed Energy

Sustainability:

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 1.11 Mt in 2030 and by 110 kt in 2040. This is explained as the project group will enable replacement of blue hydrogen supplies and, therefore, will reduce natural gas imports, through the access to green hydrogen supply sources.





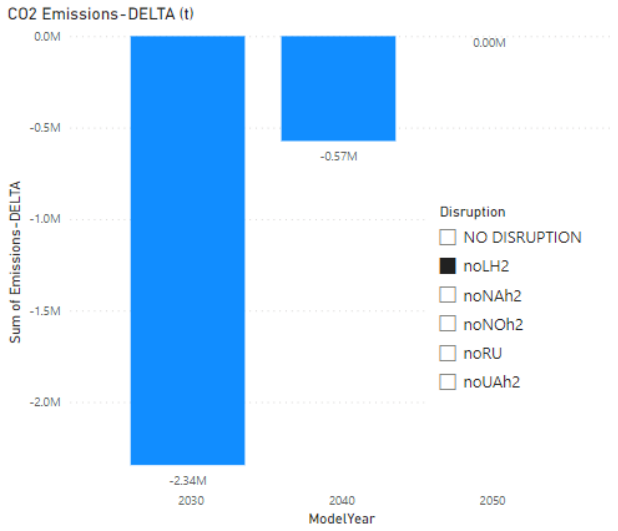
[1] Detail of H2 capacities in TYNDP 2022 Annex C.2 H2 Capacities per country
[2] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf

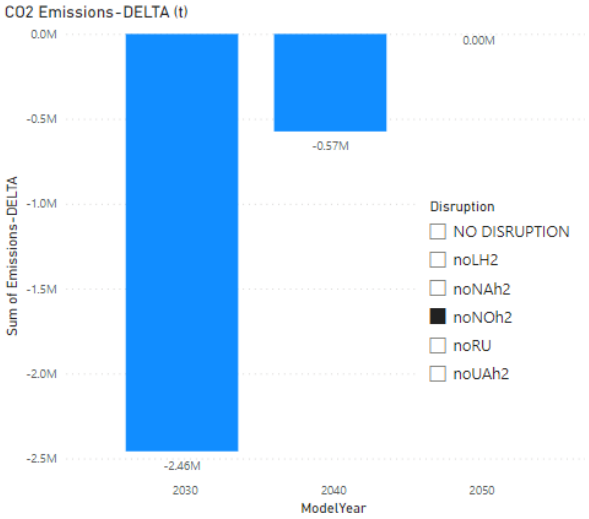
Similarly, when Norwegian, Ukrainian or liquid hydrogen imports are disrupted, the project group also contributes to sustainability by reducing overall CO2 emissions in 2030 and 2040, however, to a higher extent than in the reference case due to the lower availability of hydrogen supplies.

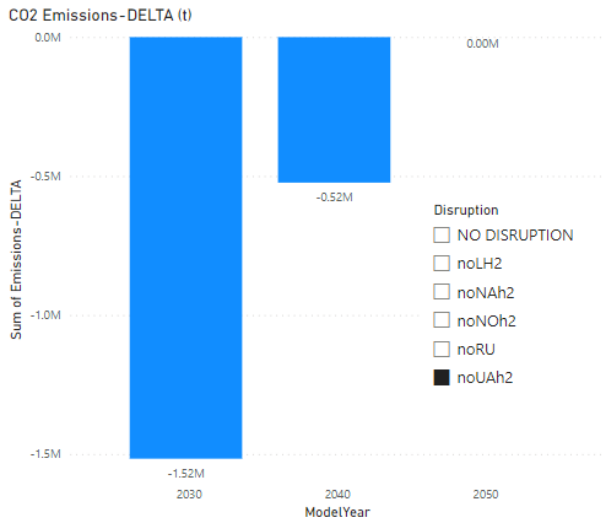
In case of North African disruption, is not considered in this analysis, as this project group enables North African imports, and therefore in case of North African disruption no counterfactual situation is possible.

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 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

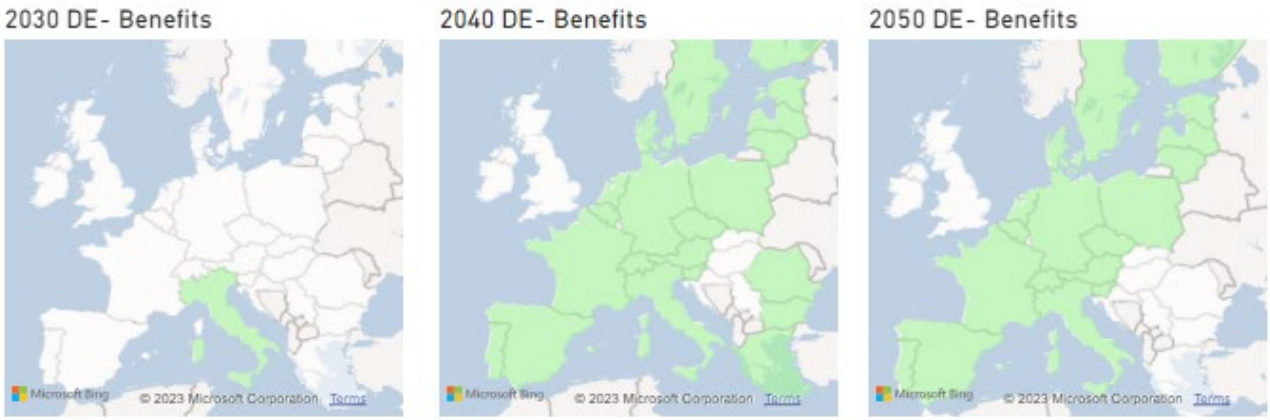






Security of Supply[3]:

> Reference case



Thanks to the implementation of the project group, which will allow transport of North African hydrogen imports, as well as, Italian national production to Europe from 2029.

In the yearly reference case, the project group fully mitigates the risk of hydrogen demand in IT in 2030. In addition, in 2040 and 2050 the project group mitigates the risk of demand curtailment in Italy and most western and central European countries.

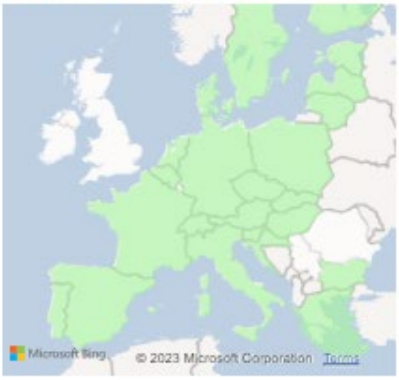
> Climatic stress cases

In addition to the security of supply benefits described for reference cases, additional security of supply benefits are expected under climatic stress cases (2-Week Cold Spell, 2-Week Dunkelflaute and in Peak Day), where due to the higher hydrogen demand the projects group will mitigate risk of demand curtailment in western and central Europe from 2030.

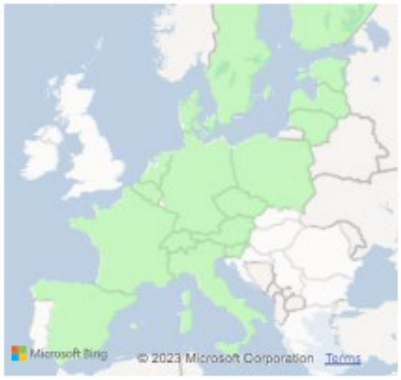
[3] *As for the hydrogen system there is no existing infrastructure level available yet, ENTSOG has identified a possible hydrogen network according to the information provided by promoters in their project submission for the TYNDP/PCI process (i.e., H2 Infrastructure level). Therefore, the System Assessment 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):

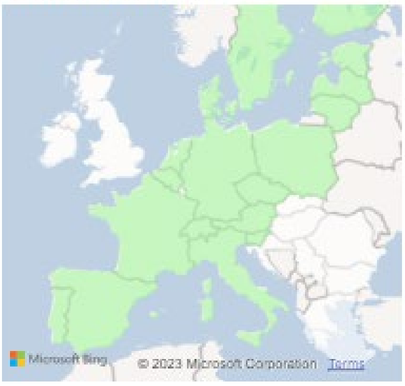
Similarly to the yearly reference case, under Norwegian and liquid imports supply disruption cases, the project group will enable cooperation between Italy and the rest of European countries, allowing green hydrogen supplies to reach western and central Europe. In addition, under Ukrainian supply disruption case, the project group will allow for cooperation with Eastern European countries, mitigating the risk of demand curtailment in these countries.

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

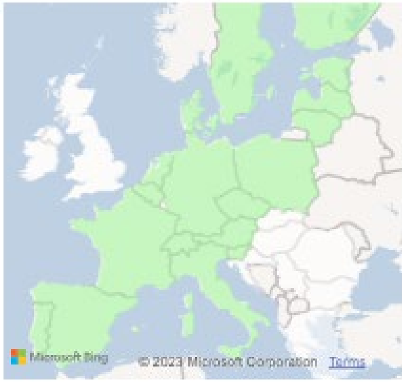
Supply disruption case: ***No LH2/ No NOH2/ No UAH2***

2030 DE- Benefits

2040 DE- Benefits

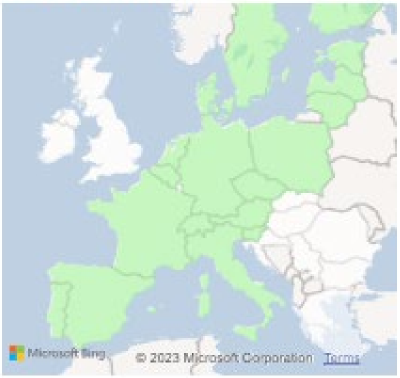


2050 DE- Benefits



2030 DE- Benefits

2040 DE- Benefits

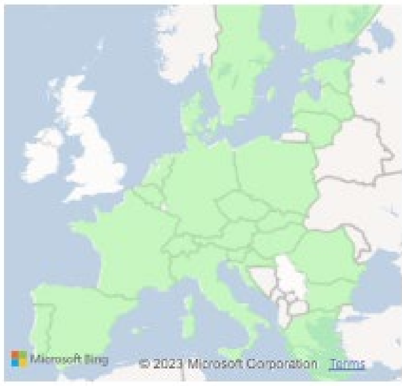


2050 DE- Benefits

2030 DE- Benefits

2040 DE- Benefits

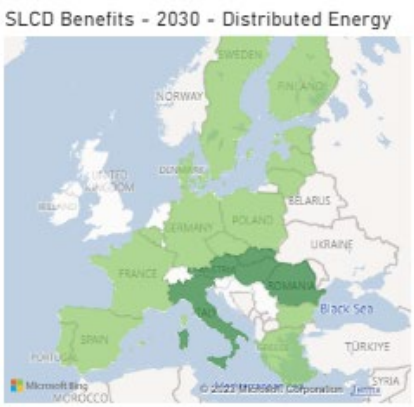
2050 DE- Benefits

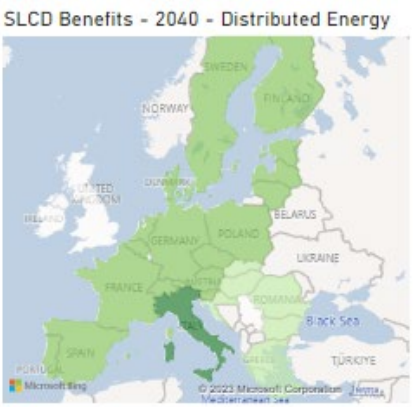


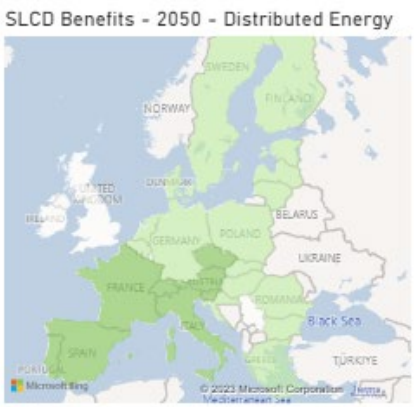
> SLCD:

The project group mitigates risk of demand curtailment in 2030 in Italy 41%, Austria 33%, Slovakia 26%, Hungary 26%, Romania 26%, Bulgaria 15% and Greece 14% and to a lower extent in all European countries (by 10%) except for The Netherlands. In 2040, the project group mitigates demand curtailment in Italy 21%, Switzerland 20%, in the rest of the European countries to a lower extent (by 7%) and Eastern European countries (by 5%). In 2050, the projects group mitigates demand curtailment in Italy by 17%, Switzerland by 17%, Austria and Slovenia by 9%, Spain and Portugal by 8%. In addition, also in 2050 the project group reduces the risk of demand curtailment

in the rest of the European countries by 3-6%. The reduction in the contribution of the project to avoidance of demand curtailment in 2050 and 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.



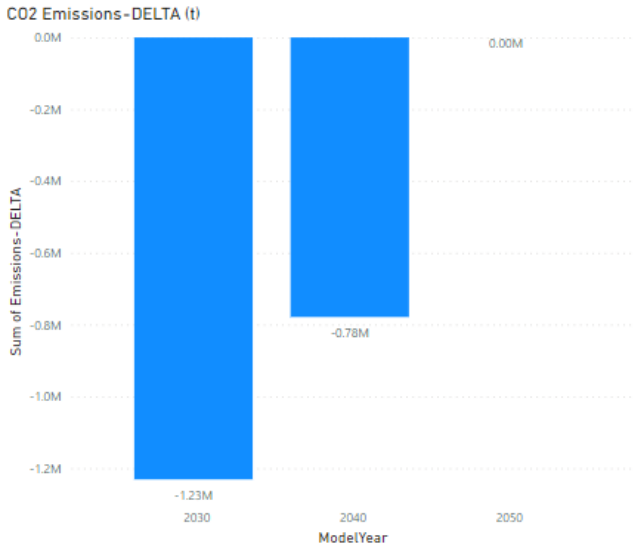


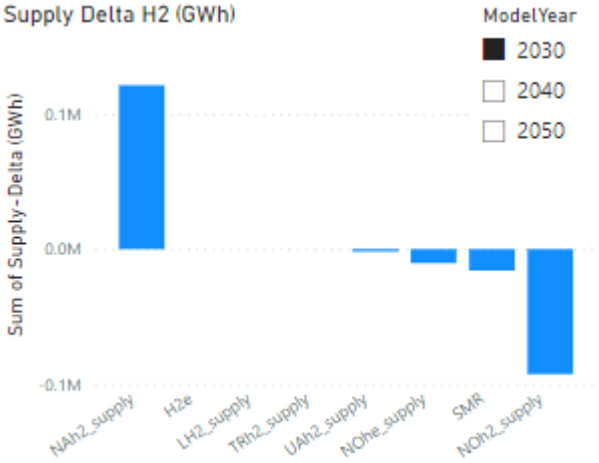


Global Ambition

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 1.23 Mt in 2030 and by 0.78 Mt in 2040. This is explained as the project group will enable replacement of blue hydrogen supplies and, therefore, will reduce natural gas imports, through the access to green hydrogen supply sources. Sustainability benefits are higher in Global Ambition Scenario than Distributed Energy, mainly driven by the higher hydrogen demand overall Europe.





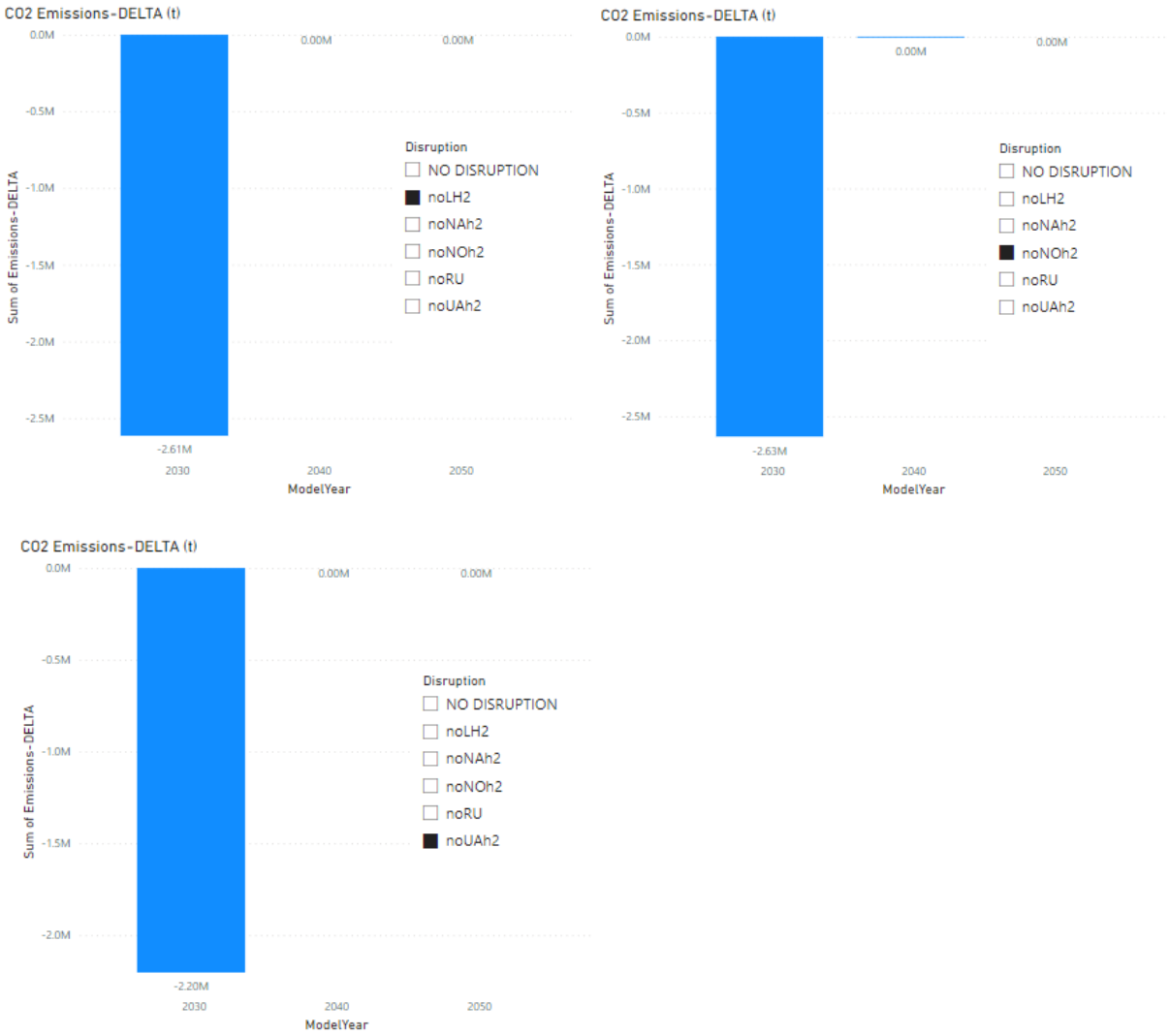
Similarly, when Norwegian, Ukrainian or liquid hydrogen imports are disrupted, the project group also contributes to sustainability by reducing overall CO2 emissions in 2030 and 2040, however, to a higher extent than in the reference case due to the lower availability of hydrogen supplies.

In case of North African disruption, is not considered in this analysis, as this project group enables North African imports, and therefore in case of North African disruption no counterfactual situation is possible.

the H2 unserved demand covered by alternative fuels, in order to properly account for the GHG reduction effect.

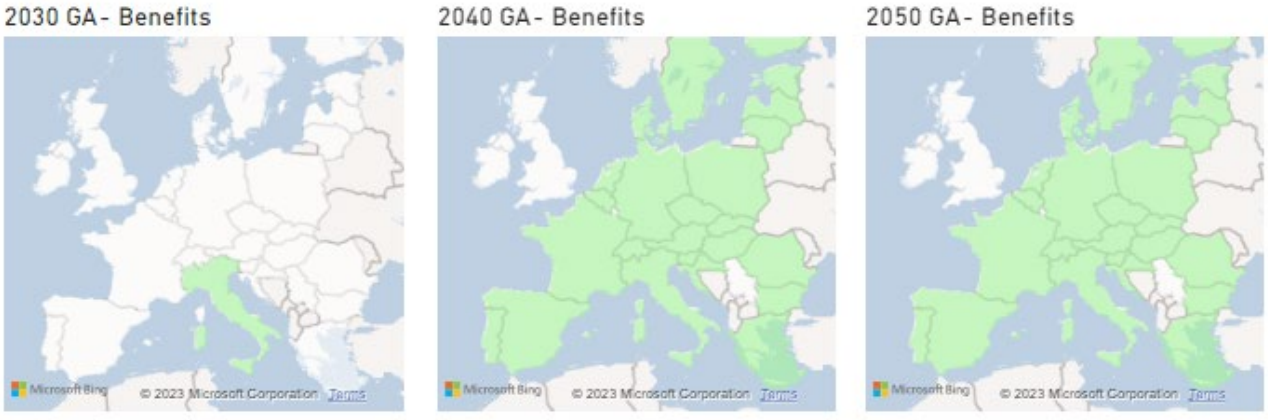
It should be noted that GHG emissions reduction derived in ENTSOG PS-CBA considers GA demand and supply for H2 and NG in all European countries, therefore, sustainability benefits included in section C.1 and C.2 of the project fiche, reflect GHG emissions reduction from the replacement of blue hydrogen 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



Security of supply benefits

> Reference case

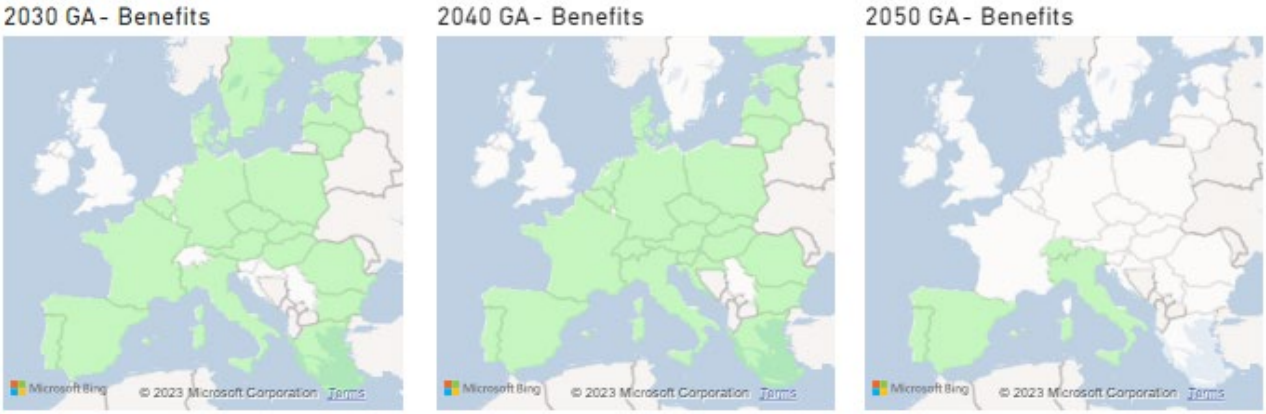


Thanks to the implementation of the project group, which will allow transport of North African hydrogen imports, as well as, Italian national production to Europe from 2029.

In the reference case, the project group fully mitigates the risk of hydrogen demand in IT in 2030. In addition, in 2040 and 2050 the project group mitigates the risk of demand curtailment in Italy and most western and central European countries.

> Climatic Stress cases

In addition to the security of supply benefits described for reference case, additional security of supply benefits are expected under climatic stress cases (2-Week Cold Spell, 2-Week Dunkelflaute and in Peak Day), where due to the higher hydrogen demand expected for these stress cases, specially in 2030. The reduction in the contribution of the project to avoidance of demand curtailment in 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.



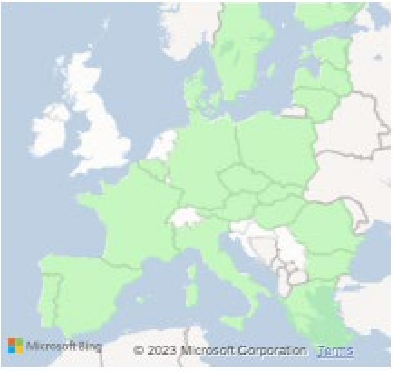
> Disruption cases (S-1)

Similarly to the yearly reference case, under Norwegian and liquid imports supply disruption cases, the project group will enable cooperation between Italy and the rest of European countries, allowing green hydrogen supplies to reach western and central Europe. In addition, under Ukrainian supply disruption case, the project group will allow for cooperation with Eastern European countries, mitigating the risk of demand curtailment in these countries.

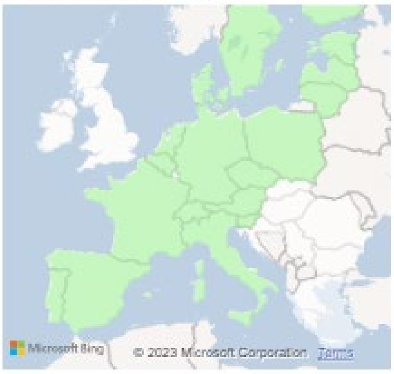
Maps for specifics disruptions: 1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption

Supply disruption case: ***No LH2/ No NOH2/ No UAH2***

2030 GA - Benefits

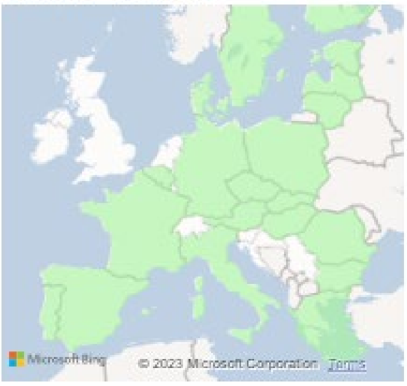


2040 GA - Benefits

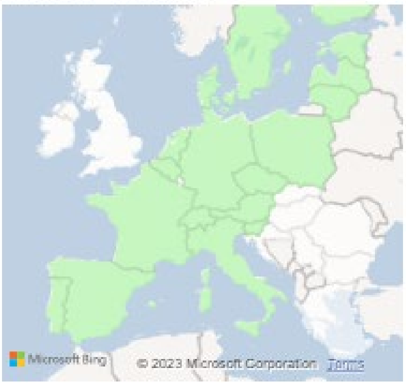


2050 GA - Benefits

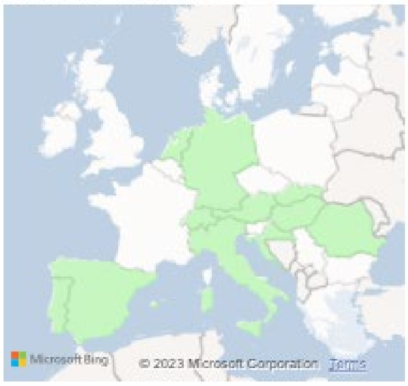
2030 GA - Benefits



2040 GA - Benefits

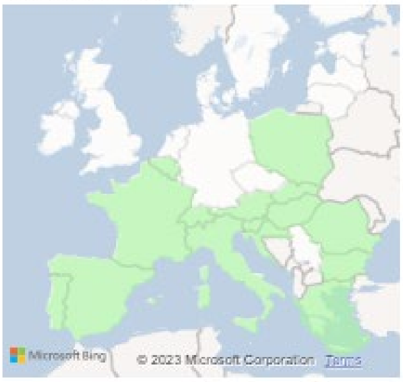


2050 GA - Benefits



2030 GA - Benefits

2040 GA - Benefits



2050 GA - Benefits

> SLCD

The project group mitigates risk of demand curtailment in 2030 in Italy by 42%, Austria by 34%, Slovakia, Hungary and Romania by 26%, Bulgaria by 15% and Greece by 14% and to a lower extent in all European countries (by 10%)

except for The Netherlands. In 2040, the project group mitigates demand curtailment in Italy 14%, Switzerland 13%, Iberian Peninsula (14%) and to a lower extent, in the rest of the western European countries (by 4%) and Eastern European countries (by 2%). In 2050, the projects group mitigates demand curtailment in Italy by 11%, Switzerland by 11%, Austria and Slovenia by 10% and to a lower extent the rest of European countries. 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.

SLCD Benefits - 2030 - Global Ambition

SLCD Benefits - 2040 - Global Ambition

SLCD Benefits - 2050 - Global Ambition

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	-1108057,07	538677299	539785356,1
2030	noLH2	DE	tonne	-2344833,61	540175890,2	542520723,8
2030	noNAh2	DE	tonne	0,00	539785356,1	539785356,1
2030	noNOh2	DE	tonne	-2457872,19	538877197,8	541335070
2030	noUAh2	DE	tonne	-1516588,44	539378771,9	540895360,4
2030	NO DISRUPTION	GA	tonne	-1230984,72	592910448,4	594141433,2
2030	noLH2	GA	tonne	-2614996,09	594817481,2	597432477,3
2030	noNAh2	GA	tonne	0,00	594141433,2	594141433,2
2030	noNOh2	GA	tonne	-2633292,12	593310994,3	595944286,4
2030	noUAh2	GA	tonne	-2202182,45	593627617,9	595829800,4
2040	NO DISRUPTION	DE	tonne	-111053,68	392077044	392188097,7
2040	noLH2	DE	tonne	-573196,64	392213883,4	392787080
2040	noNAh2	DE	tonne	0,00	392188097,7	392188097,7
2040	noNOh2	DE	tonne	-574131,45	392144022,6	392718154,1
2040	noUAh2	DE	tonne	-523547,95	392399182,9	392922730,8
2040	NO DISRUPTION	GA	tonne	-778725,03	396523251,6	397301976,6
2040	noLH2	GA	tonne	0,00	397455196,7	397455196,7
2040	noNAh2	GA	tonne	0,00	397301976,6	397301976,6
2040	noNOh2	GA	tonne	-4219,61	397450977,1	397455196,7
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
Italy	-41%	-42%	-21%	-14%	-17%	-11%
Switzerland	0%	0%	-20%	-13%	-17%	-11%
Spain	-10%	-10%	-15%	-14%	-8%	-8%
Portugal	-10%	-10%	-10%	-14%	-8%	-8%
Slovenia	0%	0%	-8%	-9%	-9%	-11%
France	-11%	-10%	-8%	-4%	-6%	-5%
Austria	-33%	-34%	-7%	-9%	-9%	-10%
Belgium	-10%	-10%	-7%	-4%	-5%	-1%
Czechia	-11%	-11%	-7%	-5%	-6%	-1%
Denmark	-10%	-10%	-7%	-4%	-5%	-1%
Estonia	-10%	-10%	-7%	-4%	-5%	-1%
Finland	-10%	-10%	-7%	-4%	-5%	-1%
Germany	-10%	-10%	-7%	-4%	-4%	-1%
Latvia	-11%	-10%	-7%	-4%	-4%	-1%
Lithuania	-10%	-10%	-7%	-4%	-5%	-1%
Poland	-10%	-10%	-7%	-4%	-5%	-1%
Sweden	-10%	-10%	-7%	-4%	-5%	-1%
The Netherlands	0%	0%	-7%	-4%	-5%	-1%
Bulgaria	-15%	-10%	-5%	-3%	-3%	-6%
Croatia	0%	0%	-5%	-3%	-3%	-6%
Greece	-14%	-10%	-5%	-3%	-3%	-6%
Hungary	-26%	-26%	-5%	-3%	-3%	-5%
Romania	-26%	-26%	-5%	-3%	-3%	-5%
Slovakia	-26%	-26%	-5%	-3%	-4%	-6%

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	-12%	-12%	-7%	-3%	-5%	0%
Average2W	Belgium	-10%	-11%	-6%	-2%	-4%	0%
Average2W	Bulgaria	-5%	-11%	-2%	-2%	0%	0%
Average2W	Croatia	0%	0%	-1%	-2%	0%	0%
Average2W	Cyprus	0%	0%	0%	0%	0%	0%
Average2W	Czechia	-12%	-12%	-6%	-2%	-4%	0%
Average2W	Denmark	-10%	-12%	-6%	-2%	-4%	0%
Average2W	Estonia	-11%	-11%	-5%	-2%	-4%	0%
Average2W	Finland	-11%	-11%	-6%	-2%	-4%	0%
Average2W	France	-10%	-11%	-6%	-2%	-4%	0%
Average2W	Germany	-11%	-12%	-5%	-2%	-3%	0%
Average2W	Greece	-5%	-11%	-2%	-1%	0%	0%
Average2W	Hungary	-6%	-12%	-1%	-2%	0%	0%

Average2W	Ireland	0%	0%	0%	0%	0%	0%
Average2W	Italy	-39%	-36%	-8%	-13%	-8%	-10%
Average2W	Latvia	-11%	-11%	-6%	-2%	-3%	0%
Average2W	Lithuania	-11%	-11%	-6%	-2%	-4%	0%
Average2W	Luxembourg	0%	0%	0%	0%	0%	0%
Average2W	Malta	0%	0%	0%	0%	0%	0%
Average2W	Poland	-11%	-11%	-6%	-2%	-4%	0%
Average2W	Portugal	-10%	-11%	-8%	-13%	0%	-10%
Average2W	Romania	-6%	-11%	-1%	-2%	0%	0%
Average2W	Serbia	0%	0%	0%	0%	0%	0%
Average2W	Slovakia	-11%	-11%	-1%	-2%	0%	0%
Average2W	Slovenia	0%	0%	-7%	-3%	-5%	0%
Average2W	Spain	-10%	-11%	-8%	-12%	-8%	-11%
Average2W	Sweden	-11%	-12%	-6%	-2%	-4%	0%
Average2W	Switzerland	0%	0%	-9%	-13%	-8%	-10%
Average2W	The Netherlands	0%	0%	-6%	-2%	-4%	0%
Average2W	United Kingdom	0%	0%	0%	0%	0%	0%
Average2WDF	Austria	-12%	-12%	-7%	-2%	-5%	0%
Average2WDF	Belgium	-11%	-11%	-6%	-2%	-4%	0%
Average2WDF	Bulgaria	-5%	-11%	-2%	-2%	0%	0%
Average2WDF	Croatia	0%	0%	-2%	-2%	0%	0%
Average2WDF	Cyprus	0%	0%	0%	0%	0%	0%
Average2WDF	Czechia	-12%	-12%	-6%	-2%	-4%	0%
Average2WDF	Denmark	-11%	-12%	-6%	-2%	-4%	0%
Average2WDF	Estonia	-11%	-11%	-5%	-1%	-4%	0%
Average2WDF	Finland	-11%	-11%	-6%	-2%	-4%	0%
Average2WDF	France	-11%	-11%	-6%	-2%	-4%	0%
Average2WDF	Germany	-11%	-12%	-5%	-2%	-3%	0%
Average2WDF	Greece	-5%	-11%	-2%	-2%	0%	0%
Average2WDF	Hungary	-6%	-12%	-2%	-2%	0%	0%
Average2WDF	Ireland	0%	0%	0%	0%	0%	0%
Average2WDF	Italy	-39%	-36%	-8%	-12%	-8%	-10%
Average2WDF	Latvia	-11%	-11%	-6%	-1%	-3%	0%
Average2WDF	Lithuania	-11%	-11%	-6%	-1%	-4%	0%
Average2WDF	Luxembourg	0%	0%	0%	0%	0%	0%
Average2WDF	Malta	0%	0%	0%	0%	0%	0%
Average2WDF	Poland	-11%	-11%	-6%	-2%	-4%	0%
Average2WDF	Portugal	-11%	-11%	-8%	-13%	0%	-10%
Average2WDF	Romania	-6%	-11%	-1%	-2%	0%	0%
Average2WDF	Serbia	0%	0%	0%	0%	0%	0%
Average2WDF	Slovakia	-12%	-11%	-2%	-2%	0%	0%
Average2WDF	Slovenia	0%	0%	-7%	-2%	-5%	0%
Average2WDF	Spain	-11%	-11%	-8%	-13%	-8%	-10%
Average2WDF	Sweden	-11%	-12%	-6%	-2%	-4%	0%
Average2WDF	Switzerland	0%	0%	-9%	-13%	-8%	-10%
Average2WDF	The Netherlands	0%	0%	-6%	-2%	-4%	0%

Average2WDF	United Kingdom	0%	0%	0%	0%	0%	0%
DC	Austria	-9%	-10%	-5%	-3%	-4%	-1%
DC	Belgium	-9%	-9%	-5%	-2%	-3%	0%
DC	Bulgaria	-2%	-9%	-1%	-2%	0%	0%
DC	Croatia	0%	0%	-1%	-2%	0%	-1%
DC	Cyprus	0%	0%	0%	0%	0%	0%
DC	Czechia	-9%	-9%	-5%	-2%	-4%	-1%
DC	Denmark	-9%	-9%	-5%	-2%	-3%	0%
DC	Estonia	-8%	-9%	-5%	-2%	-4%	-1%
DC	Finland	-8%	-9%	-5%	-2%	-3%	0%
DC	France	-9%	-9%	-6%	-2%	-4%	0%
DC	Germany	-9%	-9%	-5%	-2%	-3%	-1%
DC	Greece	-2%	-9%	-2%	-2%	0%	0%
DC	Hungary	-2%	-9%	-1%	-2%	0%	-1%
DC	Ireland	0%	0%	0%	0%	0%	0%
DC	Italy	-34%	-32%	-6%	-8%	-7%	-10%
DC	Latvia	-8%	-9%	-5%	-2%	-3%	-1%
DC	Lithuania	-9%	-9%	-5%	-2%	-3%	0%
DC	Luxembourg	0%	0%	0%	0%	0%	0%
DC	Malta	0%	0%	0%	0%	0%	0%
DC	Poland	-9%	-10%	-6%	-2%	-3%	0%
DC	Portugal	-9%	-9%	-6%	-8%	0%	-4%
DC	Romania	-3%	-9%	-1%	-2%	0%	-1%
DC	Serbia	0%	0%	0%	0%	0%	0%
DC	Slovakia	-9%	-10%	-1%	-2%	0%	-1%
DC	Slovenia	0%	0%	-6%	-2%	-4%	-1%
DC	Spain	-9%	-10%	-6%	-9%	-4%	-5%
DC	Sweden	-8%	-9%	-5%	-1%	-4%	0%
DC	Switzerland	0%	0%	-6%	-8%	-8%	-9%
DC	The Netherlands	0%	0%	-5%	-2%	-4%	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-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-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 minimising 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 practices, such as the reintroduction of species of flora and fauna through conservation and naturalization	The additional costs have been already taken into consideration in the relevant cost estimations (CAPEX & OPEX already reported in the previous sections)	N/A

	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.

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 system 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 Members States with cost-competitive H2 supplies, such 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://ehb.eu/page/european-hydrogen-backbone-maps