HI EAST 31 (Less-advanced)

H2 Interconnection UKR-SK-AT-DE

Reasons for grouping [ENTSOG]

The project group aims at creating a hydrogen corridor including an interconnected hydrogen grid in Ukraine, Slovakia and Austria and Germany by partially repurposing existing natural gas infrastructure.

The group includes investments in Ukraine (HYD-N-1137), Slovakia (HYD-N-772), Austria (HYD-N-757) and Germany (HYD-N-642).

Objective of the group [Promoter]

The corridor aims to create a hydrogen corridor in Central Europe for transporting H2 from major high potential and cost-efficient hydrogen supply areas outside the EU, Ukraine, North Africa and South-East Europe. The corridor will run from Ukraine to Germany through Slovakia and Austria. It will enable supply of expected high demand clusters in the EU, predominantly in South Germany and additionally connection of local suppliers and consumers along the entire corridor.

HYD-N-1137 **Central European Hydrogen Corridor (UKR part)**

Comm. Year **2029**

HYD-N-772 **Infrastructure repurpose for H2**

Comm. Year **2029**

HYD-N-757 **H2 Backbone WAG + Penta West**

Comm. Year **2030**

HYD-N-642 **HyPipe Bavaria – The Hydrogen Hub**

Comm. Year **2027-2030**

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-1137	Bogorodchany to IP Ukraine-Slovakia	Repurposing	1400	43.1	0
HYD-N-772	Infrastructure repurpose for H2	Repurposing	900 1200	45 415	120
HYD-N-757	H2 Backbone WAG + Penta West	Repurposing	1200	140	
HYD-N-757	H2 Backbone WAG + Penta West	New	From 800 to 1200	200	16
HYD-N-642	HyPipe Bavaria – The Hydrogen Hub	Repurposing	From 450 to 700	280	n/a
HYD-N-642	HyPipe Bavaria – The Hydrogen Hub	New	From 700 to 800	14	26

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-1137	H2_IP_SK-UA	LLC Gas TSO of Ukraine	Transmission Ukraine (UA Hydrogen)	Transmission Slovakia (SK Hydrogen)	240	2029
HYD-N-772	H2_IP_SK-UA	eustream, a.s.	Transmission Ukraine (UA Hydrogen)	Transmission Slovakia (SK Hydrogen)	240[1]	2029
HYD-N-772	H2_IP_SK-AT	eustream, a.s.	Transmission Slovakia (SK Hydrogen)	Transmission Austria (AT Hydrogen)	144	2029
HYD-N-772	H2_IP_SK-AT	eustream, a.s.	Transmission Austria (AT Hydrogen)	Transmission Slovakia (SK Hydrogen)	144	2029
HYD-N-757	H2_IP_SK-AT	Gas Connect Austria GmbH	Transmission Austria (AT Hydrogen)	Transmission Slovakia (SK Hydrogen)	144	2030

[1] The capacity increment has been updated to 218 GWh/d. The same update affects the incremental capacity of the HYD-N-1137.

HYD-N-757	H2_IP_SK-AT	Gas Connect Austria GmbH	Transmission Slovakia (SK Hydrogen)	Transmission Austria (AT Hydrogen)	144	2030
HYD-N-642	H2_IP_AT-DE	bayernets	Transmission Germany (DE Hydrogen)	Transmission Austria (AT Hydrogen)	150	2027-2030
HYD-N-642	H2_IP_AT-DE	bayernets	Transmission Austria (AT Hydrogen)	Transmission Germany (DE Hydrogen)	150	2027-2030

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-1137	29.4	100%	0.25	100%
HYD-N-772	700*	30%	90	30%
HYD-N-757	1035	25%	41	50%
HYD-N-642	163	30%	0,761	30%

Description of the cost and range [Promoter]

*SK part – HYD-N-772 - Initially, the hydraulic analysis was focused on a different line in a significantly worse technical condition.
Dramatic change of geopolitical situation was the impetus for market hydrogen demand acceleration which would result in faster implementation pace. This also caused a reassessment of the technical solution, the result of which is the identification of another line for repurposing with significantly lower CAPEX in the estimated amount of 448 M€ and the capacity increment has been updated to 218 GWh/d.
Repurposing of one transmission line for 100% H2 ready line in Slovakia consists of 2 projects. The first one is the project „Infrastructure repurpose for H2 transmission in Slovakia" connecting a non-EU point Veľké

Kapušany with IP Baumgarten. The second one is „CEHC (SK part)" connecting a non-EU point Veľké Kapušany with IP Lanžhot. Both projects complement each other and cannot exist without each other. It means that the projects are technically interconnected but they are administered separately.
It is necessary to note that both projects share CAPEX and OPEX in significant portion (the section from the UA border to the split point in western part of Slovakia).

UA part: HYD-N-1137 - The Ukrainian part of the project involves the gradual repurposing of the gas transport infrastructure from the western border, primarily to the Transcarpathian regions, and extending it to the rest of Ukraine. In the first stage, one thread of the main gas pipeline with a length of 43.1 km from the state border to the connection point with the main pipeline to Hungary will be repurposed. The expected cost for this stage will be approximately EUR 29.4 million.

In the second stage, the 125 km long section of the main gas pipeline from the connection point with the main pipeline to Hungary to the CS Bohorodchany will be repurposed. The expected cost for this stage will be about EUR 60.5 million. It's important to note that the cost of each stage may change after conducting R&D or a feasibility study, which might also involve considering alternative pipeline options.

AT part- the above-indicated costs were calculated based on the unit prices of the EHB study. The National Development Plan 2022 (approved 05/2023) includes updated figures as follows: CAPEX 921 MEUR, OPEX 37 MEUR.

DE part: The reported costs represent the best estimates available now of TYNDP 2022 call for projects (as of December 2022, end of PCI project collection). In particular, the CAPEX and OPEX ranges consider 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

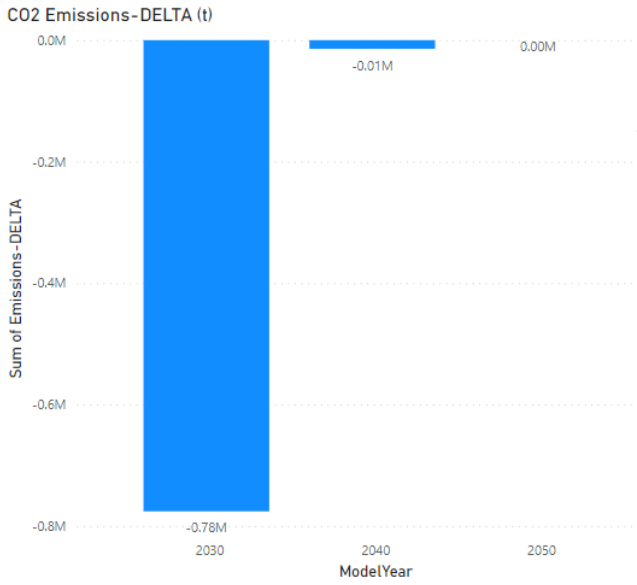
This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group. More details on the indicators are available in Annex D of TYNDP 2022[2].

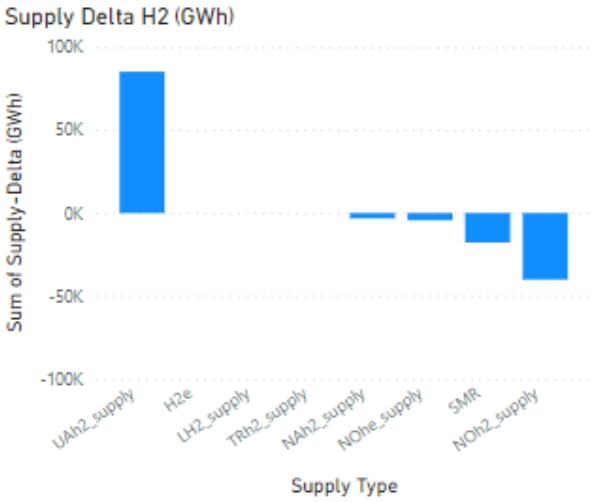
[2] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf

Distributed Energy

Sustainability benefits

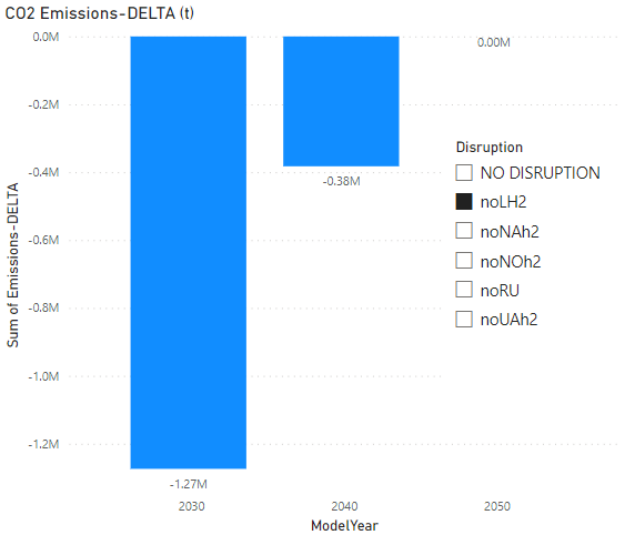
From 2029 onwards the project group brings green hydrogen from Ukraine via Slovakia towards Austria. In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 7*0 kt in 2030. The project group will enable transport of green hydrogen produceded in Ukraine and therefore, will reduce blue hydrogen imports from Norway.

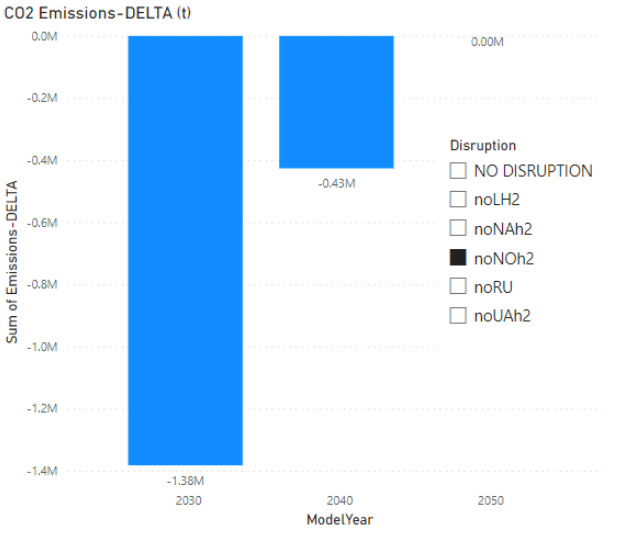


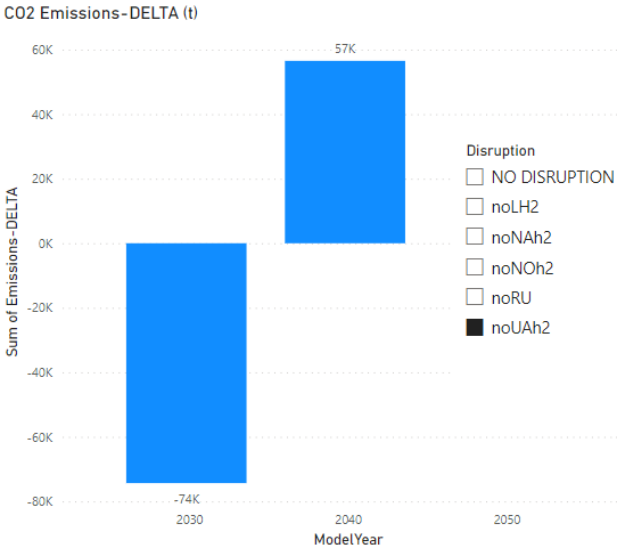


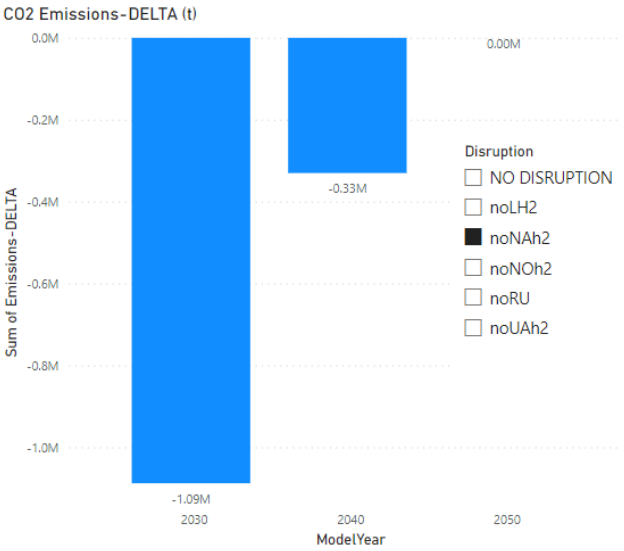
Increased benefits are expected under disruption cases, besides of Ukraine disruption, in 2030 and 2040.

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









Security of Supply:[3]

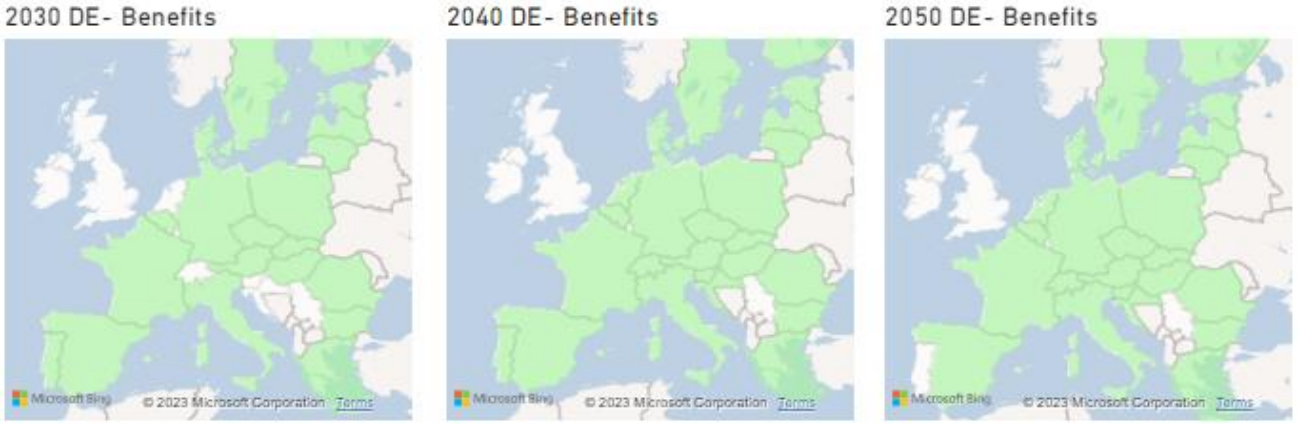
> Reference case:

The conversion of the existing natural gas infrastructure doesn't impact the methane demand and will bring positive security of supply benefits for almost all European countries. The project group mitigates the risk of hydrogen demand curtailment in South-Eastern countries by 24-27% in 2030. Moreover, the project mitigates risks in all European countries in 2040 in average winter by 2-5% and by 2-8% in 2050.

[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)*

> 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 onwards by 3 - 10%.



> Disruption cases (S-1):

Similarly, under supply disruption cases, besides Ukraine disruption, the project group shows improved benefits for mitigating the risk of demand curtailment.

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

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.

2 noNOh2: Norway disruption

3 noUAh2: Ukraine disruption

4 noNAh2: North Africa disruption

2030 DE- Benefits

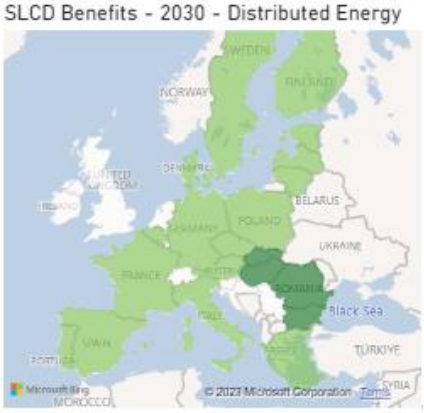
2040 DE- Benefits

2050 DE- Benefits

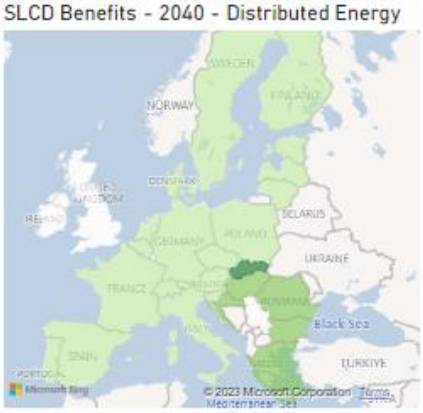
> Single largest capacity disruption (SLCD):

In case of SLCD all European countries benefitting from this project group by mitigating the risk of demand curtailment. The highest benefits are recorded in 2030, including 45% for Slovakia and 30-38% for Hungary, Bulgaria and Romania and around 6-15% for the other European Countries. In 2040 and 2050 Slovakia is reducing the risk by 29-34% and Hungary, Croatia, Romania, Bulgaria, and Greece by 6-15%.

SLCD Benefits - 2030 - Distributed Energy



SLCD Benefits - 2040 - Distributed Energy

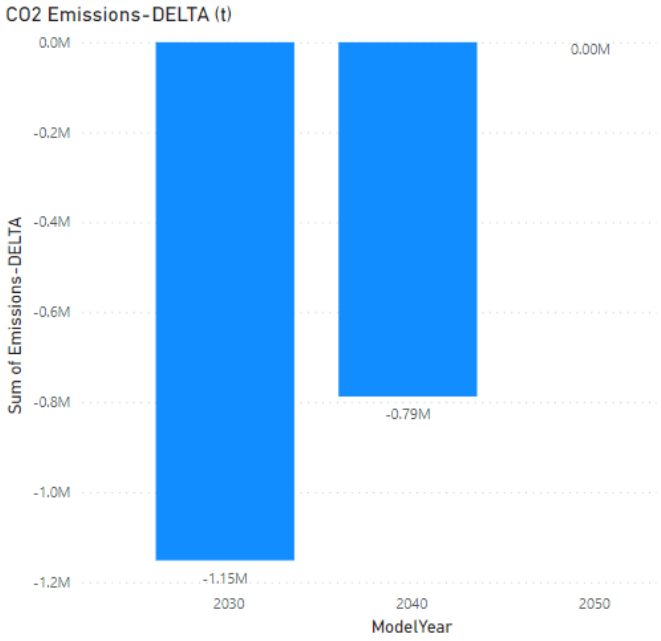


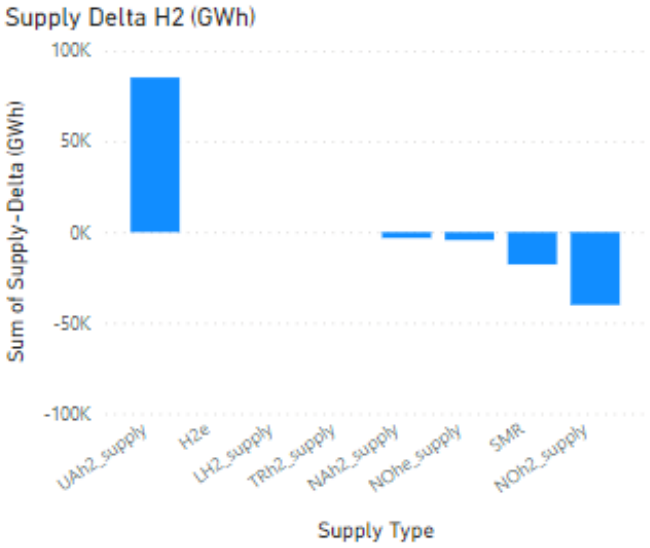
SLCD Benefits - 2050 - Distributed Energy

Global Ambition

Sustainability benefits

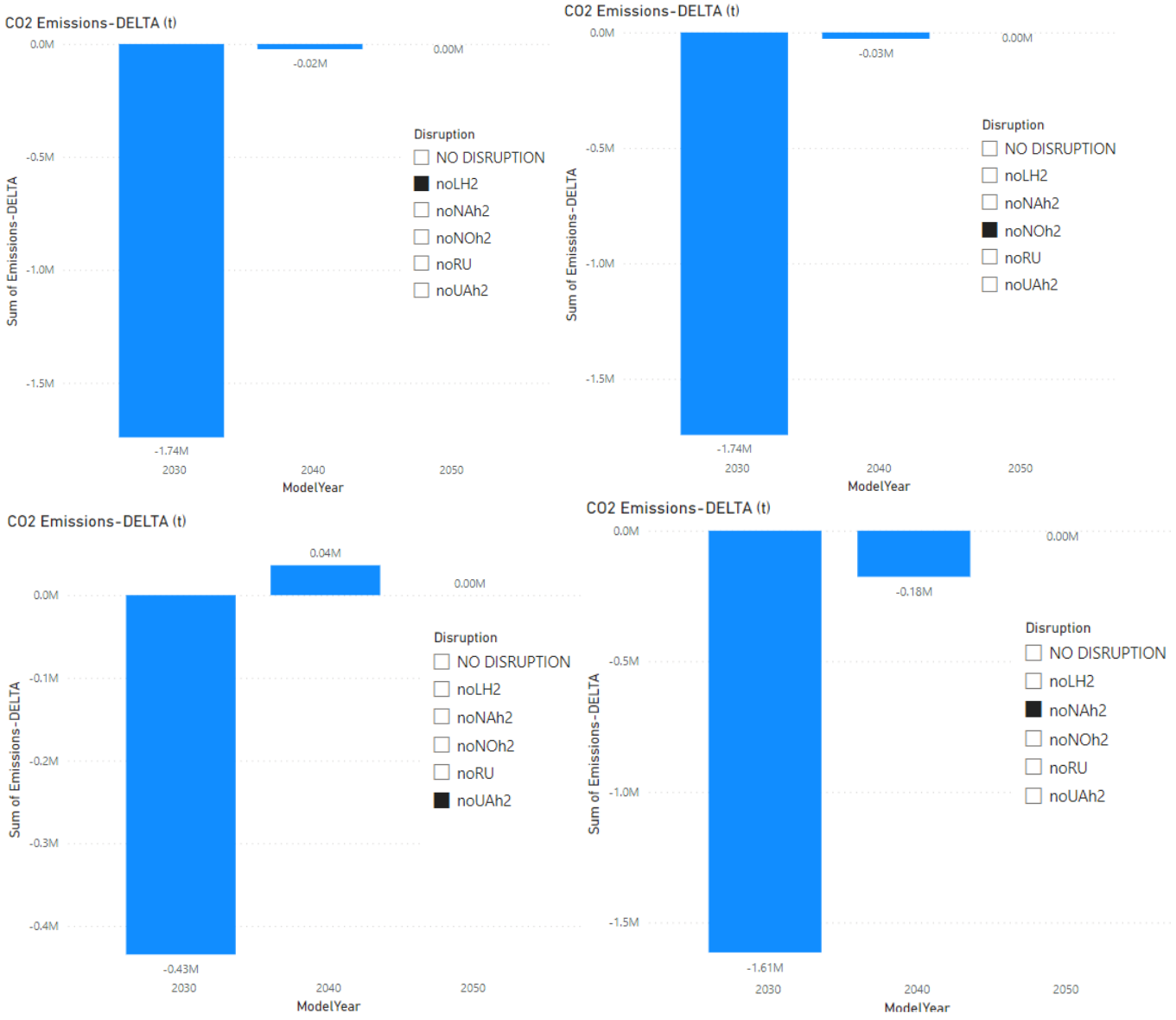
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 1,15 million tons in 2030 and 0,79 million tons in 2040. The project group will enable transport of green hydrogen producted in Ukraine and therefore, will reduce blue hydrogen imports from Norway and SMRs use.





Increased benefits are expected under disruption cases, besides of Ukraine disruption, in 2030.

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 almost all European countries. The project group mitigates the risk of hydrogen demand curtailment in South-Eastern countries by 6-10% in 2030. Moreover, the

project mitigates risks in all European countries in 2040 in average winter by 3-6% and by 2-7% 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 group increases mitigation of risk of hydrogen demand curtailment in almost all European countries in 2030 and 2040 onwards by 2-7%. Moreover, in Slovakia, Hungary and Bulgaria, benefits are more important with a reduction od demand curtailment by 43-44% in 2030.

> Disruption cases (S-1)

Similarly, under supply disruption cases, besides Ukraine disruption, the project group shows improved benefits for mitigating the risk of demand curtailment.

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

2 noNOh2: Norway disruption

3 noUAh2: Ukraine disruption

4 noNAh2: North Africa disruption

Single largest capacity disruption (SLCD)

In case of SLCD all European countries benefitting from this project group by mitigating the risk of demand curtailment. The highest benefits are recorded in 2030, including 49% for Slovakia and 23-40% for Austria, Hungary, Bulgaria and Romania and around 6-15% for the other European Countries. In 2040 and 2050 Slovakia is reducing the risk by 29-34% and Hungary, Croatia, Romania, Bulgaria, and Greece by 6-15%.

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	Emission Delta	Emission Plus	Emission Minus
2030	NO DISRUPTION	DE	tonne	-775.801	538.677.299	539.453.100
2030	NO DISRUPTION	GA	tonne	-1.151.674	592.910.448	594.062.122
2030	noLH2	DE	tonne	-1.273.855	540.175.890	541.449.746
2030	noLH2	GA	tonne	-1.740.891	594.817.481	596.558.373
2030	noNAh2	DE	tonne	-1.087.758	539.785.356	540.873.114
2030	noNAh2	GA	tonne	-1.614.806	594.141.433	595.756.239
2030	noNOh2	DE	tonne	-1.382.458	538.877.198	540.259.656
2030	noNOh2	GA	tonne	-1.742.458	593.310.994	595.053.453
2030	noUAh2	DE	tonne	-74.329	539.378.772	539.453.100
2030	noUAh2	GA	tonne	-434.504	593.627.618	594.062.122
2040	NO DISRUPTION	DE	tonne	-14.284	392.077.044	392.091.328
2040	NO DISRUPTION	GA	tonne	-787.400	396.523.252	397.310.651
2040	noLH2	DE	tonne	-382.530	392.213.883	392.596.414
2040	noLH2	GA	tonne	-23.302	397.455.197	397.478.498
2040	noNAh2	DE	tonne	-330.239	392.188.098	392.518.337
2040	noNAh2	GA	tonne	-176.522	397.301.977	397.478.498
2040	noNOh2	DE	tonne	-426.305	392.144.023	392.570.328
2040	noNOh2	GA	tonne	-27.521	397.450.977	397.478.498
2040	noUAh2	DE	tonne	56.533	392.399.183	392.342.650
2040	noUAh2	GA	tonne	36.135	397.478.498	397.442.364
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
Slovakia	-45%	-49%	-29%	-19%	-34%	-19%
Romania	-30%	-38%	-15%	-5%	-9%	-5%
Croatia	0%	0%	-15%	-5%	-15%	-10%
Hungary	-38%	-40%	-15%	-5%	-15%	-10%
Bulgaria	-30%	-37%	-8%	-4%	-9%	-5%
Greece	-15%	-14%	-6%	-4%	-8%	-4%
Czechia	-7%	-9%	-4%	-3%	-4%	-2%
Latvia	-6%	-7%	-4%	-3%	-3%	-2%
Lithuania	-6%	-7%	-4%	-3%	-3%	-2%
Poland	-6%	-6%	-4%	-3%	-3%	-2%
Portugal	-6%	-7%	-4%	-3%	-2%	-3%
Slovenia	0%	0%	-4%	-7%	-4%	-10%
France	-7%	-7%	-4%	-3%	-3%	-2%
Germany	-7%	-7%	-4%	-3%	-2%	-2%
Austria	-18%	-23%	-3%	-6%	-4%	-10%
Belgium	-7%	-7%	-3%	-3%	-2%	-2%
Denmark	-7%	-7%	-3%	-3%	-3%	-2%
Estonia	-6%	-7%	-3%	-2%	-3%	-2%
Finland	-6%	-7%	-3%	-2%	-3%	-2%
Italy	-10%	-11%	-3%	-2%	-3%	-3%
Spain	-6%	-6%	-3%	-3%	-3%	-3%
Sweden	-6%	-7%	-3%	-3%	-3%	-2%
Switzerland	0%	0%	-3%	-2%	-3%	-3%
The Netherlands	0%	0%	-3%	-3%	-3%	-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	-5%	-6%	-4%	-3%	-3%	-3%
Average2W	Belgium	-4%	-5%	-3%	-3%	-1%	-1%
Average2W	Bulgaria	-20%	-15%	-3%	-3%	-9%	-3%
Average2W	Croatia	0%	0%	-3%	-3%	-10%	-3%
Average2W	Cyprus	0%	0%	0%	0%	0%	0%
Average2W	Czechia	-5%	-7%	-4%	-3%	-2%	-1%
Average2W	Denmark	-4%	-6%	-3%	-3%	-2%	-1%
Average2W	Estonia	-4%	-5%	-3%	-3%	-2%	-1%
Average2W	Finland	-4%	-5%	-3%	-3%	-2%	-1%
Average2W	France	-4%	-6%	-3%	-3%	-2%	-1%
Average2W	Germany	-5%	-6%	-3%	-2%	-1%	-1%
Average2W	Greece	-20%	-15%	-4%	-3%	-9%	0%
Average2W	Hungary	-37%	-44%	-3%	-3%	-10%	-3%
Average2W	Ireland	0%	0%	0%	0%	0%	0%
Average2W	Italy	-5%	0%	-3%	-3%	-1%	-2%
Average2W	Latvia	-4%	-5%	-3%	-3%	-1%	-1%

Average2W	Lithuania	-4%	-5%	-3%	-3%	-2%	-1%
Average2W	Luxembourg	0%	0%	0%	0%	0%	0%
Average2W	Malta	0%	0%	0%	0%	0%	0%
Average2W	Poland	-4%	-6%	-3%	-3%	-2%	-1%
Average2W	Portugal	-4%	-5%	-3%	-3%	0%	-3%
Average2W	Romania	-37%	-43%	-3%	-3%	-10%	-4%
Average2W	Serbia	0%	0%	0%	0%	0%	0%
Average2W	Slovakia	-44%	-44%	-4%	-3%	-10%	-3%
Average2W	Slovenia	0%	0%	-4%	-4%	-2%	-3%
Average2W	Spain	-4%	-5%	-3%	-2%	-2%	-3%
Average2W	Sweden	-4%	-6%	-3%	-2%	-2%	-1%
Average2W	Switzerland	0%	0%	-4%	-3%	-2%	-2%
Average2W	The Netherlands	0%	0%	-3%	-3%	-2%	-1%
Average2W	United Kingdom	0%	0%	0%	0%	0%	0%
Average2WDF	Austria	-5%	-6%	-4%	-3%	-3%	-3%
Average2WDF	Belgium	-5%	-6%	-3%	-3%	-1%	-1%
Average2WDF	Bulgaria	-20%	-15%	-4%	-3%	-9%	-3%
Average2WDF	Croatia	0%	0%	-3%	-3%	-10%	-4%
Average2WDF	Cyprus	0%	0%	0%	0%	0%	0%
Average2WDF	Czechia	-5%	-7%	-4%	-3%	-2%	-1%
Average2WDF	Denmark	-4%	-6%	-3%	-3%	-2%	-1%
Average2WDF	Estonia	-4%	-6%	-3%	-2%	-2%	-1%
Average2WDF	Finland	-4%	-5%	-3%	-3%	-2%	0%
Average2WDF	France	-4%	-6%	-3%	-3%	-2%	-1%
Average2WDF	Germany	-5%	-6%	-3%	-3%	-1%	-1%
Average2WDF	Greece	-20%	-15%	-4%	-3%	-9%	0%
Average2WDF	Hungary	-37%	-44%	-3%	-3%	-10%	-4%
Average2WDF	Ireland	0%	0%	0%	0%	0%	0%
Average2WDF	Italy	-5%	0%	-3%	-2%	-1%	-3%
Average2WDF	Latvia	-4%	-6%	-3%	-2%	-1%	-1%
Average2WDF	Lithuania	-4%	-6%	-3%	-2%	-2%	-1%
Average2WDF	Luxembourg	0%	0%	0%	0%	0%	0%
Average2WDF	Malta	0%	0%	0%	0%	0%	0%
Average2WDF	Poland	-4%	-6%	-3%	-2%	-2%	-1%
Average2WDF	Portugal	-4%	-6%	-3%	-3%	0%	-2%
Average2WDF	Romania	-37%	-43%	-3%	-3%	-10%	-4%
Average2WDF	Serbia	0%	0%	0%	0%	0%	0%
Average2WDF	Slovakia	-44%	-44%	-4%	-3%	-10%	-4%
Average2WDF	Slovenia	0%	0%	-4%	-3%	-2%	-4%
Average2WDF	Spain	-4%	-6%	-3%	-3%	-2%	-2%
Average2WDF	Sweden	-4%	-6%	-3%	-3%	-2%	0%
Average2WDF	Switzerland	0%	0%	-4%	-2%	-2%	-3%
Average2WDF	The Netherlands	0%	0%	-3%	-3%	-2%	-1%
Average2WDF	United Kingdom	0%	0%	0%	0%	0%	0%
DC	Austria	-4%	-4%	-3%	-3%	-2%	-2%
DC	Belgium	-4%	-4%	-2%	-2%	-1%	-1%

DC	Bulgaria	-16%	-14%	-3%	-2%	-8%	-1%
DC	Croatia	0%	0%	-3%	-2%	-8%	-2%
DC	Cyprus	0%	0%	0%	0%	0%	0%
DC	Czechia	-4%	-6%	-3%	-3%	-2%	-2%
DC	Denmark	-4%	-4%	-2%	-2%	-1%	-1%
DC	Estonia	-3%	-4%	-3%	-2%	-2%	-2%
DC	Finland	-3%	-4%	-2%	-2%	-1%	-1%
DC	France	-4%	-4%	-3%	-2%	-1%	-1%
DC	Germany	-4%	-4%	-3%	-2%	-1%	-1%
DC	Greece	-15%	-13%	-4%	-3%	-8%	0%
DC	Hungary	-31%	-38%	-3%	-2%	-8%	-2%
DC	Ireland	0%	0%	0%	0%	0%	0%
DC	Italy	-3%	-1%	-2%	-2%	-2%	-1%
DC	Latvia	-3%	-4%	-3%	-2%	-1%	-2%
DC	Lithuania	-3%	-4%	-3%	-2%	-1%	-1%
DC	Luxembourg	0%	0%	0%	0%	0%	0%
DC	Malta	0%	0%	0%	0%	0%	0%
DC	Poland	-3%	-4%	-3%	-2%	-1%	-1%
DC	Portugal	-3%	-4%	-3%	-2%	0%	-1%
DC	Romania	-30%	-38%	-3%	-2%	-8%	-2%
DC	Serbia	0%	0%	0%	0%	0%	0%
DC	Slovakia	-38%	-39%	-3%	-2%	-8%	-2%
DC	Slovenia	0%	0%	-3%	-2%	-2%	-2%
DC	Spain	-3%	-4%	-2%	-2%	-1%	-2%
DC	Sweden	-3%	-4%	-3%	-1%	-2%	-1%
DC	Switzerland	0%	0%	-3%	-2%	-2%	-1%
DC	The Netherlands	0%	0%	-2%	-2%	-2%	-1%
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-1137	Hydrogen pipelines	Repurpose of existing above-ground objects	Minimal impact is expected on the topsoil.
HYD-N-772	Hydrogen pipelines	Repurpose of existing above-ground objects	Neutral impact on land and protected areas.
HYD-N-757	Pipelines and compressor stations	To minimise the environmental impact, existing pipelines are used or, where new construction is necessary, laid in the same route as an existing pipeline system (parallel). Compressor stations are integrated into existing stations in order to use access routes and the existing infrastructure.	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. State-of-the-art technologies such as fibre sensing, EMAT pigging or laser detection measurements reflect the highest standard of environmentally friendly work management.
HYD-N-642	Pipelines and compressor station	The environmental impact can be reduced to a minimum by mainly using an existing pipeline system. In	The project will be mainly centred on the usage of the existing pipeline system (95%). All appropriate technical safety precautions necessary to ensure safe operation at all times are taken. Mitigation measures and environmental works will follow best practice and will comply with national and EU-regulations.

		order to reduce the impact on the environment and nature as much as possible the principle of pipeline bundling for additional new constructions will be applied.		

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
HYD-N-1137	A minimal impact on the environment is expected, as the implementation of the first and second stages of the project involves the repurposing of existing gas pipelines without the construction of additional large facilities such as a compressor station.	detailed calculation not available yet	detailed calculation not available yet
HYD-N-772	Basis of the project is repurposing of existing methane infrastructure to hydrogen with the neutral impact on the land and protected areas, as there will be no further demands resulting from routing of the project. Existing pipeline has been accepted by the nature, as the pipeline corridor has already existed there for more than 45 years. Mitigation measures in place prove positive impact on the environment. We expect positive impacts on the CO2 emissions, as project foresees two electricity powered compression units on SK territory, which could replace methane powered installed compression power.	Related costs have been considered in CAPEX & OPEX estimations (CAPEX & OPEX already reported in the previous sections)	N/A

HYD-N-757 will not substantially and irreversibly affect the environment.	In order to ensure that environmental assessments are correct, environmental monitoring will be carried out before, during and after the construction of the infrastructure.	Related costs have been considered in CAPEX & OPEX estimations	N/A
HYD-N-642: The environmental impact will be reduced to a minimum by using existing pipeline routes. Additionally, compressor stations are expected to be built at locations of existing ones.	Mitigation measures and environmental works will follow best practice and will comply with national and EU-regulations.	Related costs have been considered in CAPEX & OPEX estimations	N/A

Environmental Impact explained [Promoter]

The infrastructure will be mostly constituted of repurposed pipelines or technology sites, 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.

UA: The first and second stages of the project implementation involve the reconstruction of the existing main gas pipelines, without the construction of a compressor station, which can serve as an additional source of emissions. Currently, Gas TSO of Ukraine expects minimal impact on the environment from the works on the modification of the main gas pipeline. However, the exact impact on the environment will be based on the results of the Environmental Impact Assessment and Biodiversity Assessment (if necessary).

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 project group can make a central contribution to the emergence of a Union-wide network for the transport and storage of hydrogen by connecting renewable sources with end customers.
A resilient hydrogen network that is needed to ensure security of supply. Hence, the project group contributes to achieving the climate goals and the competitiveness of the European Union by delivering affordable and renewable hydrogen which allows the reduction of GHG emissions.

The projects of the group ensure large hydrogen transport capacities. The project group will give positive signals to the future hydrogen market development and can decrease uncertainty of other parts of hydrogen value chain to further invest into the hydrogen industrial technology or final customers' appliances.
The project group contributes to the security of supply of Central Europe as well as of neighbouring regions by diversifying supply sources and increasing transit capacity. Connecting the project to another production area reduces Europe´s dependence on a limited number of hydrogen producers with a positive impact on sustainability, hydrogen availability and affordability.

F. Useful links [Promoter]

Useful links:

H2 Backbone WAG+PW (h2backbone-wag-pw.at)

https://www.gasconnect.at/fileadmin/Fachabteilungen/ST/NEP/02-CNPD_2022-_EN.pdf

HyPipe Bavaria: The Hydrogen Hub (hypipe-bavaria.com)

https://www.cehc.eu/

Related project websites

www.sunshynecorridor.eu
https://www.h2euplusstore.com/