HI EAST 14 (Less-advanced)

H2 Interconnection Bulgaria-Greece

Reasons for grouping [ENTSOG]

The project group aims at interconnecting future hydrogen infrastructure between Bulgaria and Greece.

The group includes investments in Bulgaria (HYD-N-788) and Greece (HYD-N-970).

Objective of the group [Promoter]

The group includes the Greek and Bulgarian hydrogen network projects that aim to create the first interconnection hydrogen point between the two countries. Namely, a new Interconnection Point will be created between DESFA's "Dedicated H2 Pipeline project" (HYD-N-970) and the "H2 Transmission system in Bulgaria" (HYD-N-788) owned and operated by Bulgartransgaz EAD with incremental capacity of 70GWh/d in both directions. The technical possibility for further expansion of the infrastructure in Bulgaria is envisaged both to neighboring countries and the interior of Bulgaria.

The aforementioned interconnection is indispensable as it will enable hydrogen transportation from SE Europe to the North, continuing the efficient interoperability between the two countries.

At the same time, this corridor is an integral part of the European Hydrogen Backbone (EHB) and more specifically of the East and South-East Europe corridor with Greece and Bulgaria being an essential part of it, leveraging on the vast land availability and high-capacity factors for solar and wind renewable energy, connecting high hydrogen supply potential regions with off takers in Central Europe, where the demand is expected to be significant by 2030.

HYD-N-788 **H2 transmission system in Bulgaria**
Comm. Year **2029**

BULGARTRANSGAZ

HYD-N-970 **Dedicated H2 Pipeline**
Comm. Year **2029**

A. Project group technical information [Promoter/ ENTSOG]

Project technical information [Promoter]

DESFA's "Dedicated H2 Pipeline project" (HYD-N-970) consists of a new hydrogen pipeline approx. 540 km long, with a possible branch approx. 250km long, with 2 compressor stations (in Patima and Nea Messimvria); the preliminary design identified a 36'' pipeline, with a routing parallel to the existing HP gas pipeline.

The purpose of the project is to transmit pure hydrogen (H2) mainly from the southern and eastern part of Greece where production of H2 is expected up to the Interconnection with Bulgaria for H2 export and to Kavala area where future storage facility is located. The project will allow the transportation and supply of H2 for local consumption in industrial areas where hydrogen intense areas are located (close to Athens, Thessaloniki etc.)

Bulgartransgaz's EAD "H2 Transmission system in Bulgaria" (HYD-N-788) envisages the construction of a hydrogen pipeline with DN 1000 about 250 km long, together with 2 compressor stations – in the regions of Petrich and Dupnitsa.

The project implementation will ensure a bidirectional cross-border H2 transmission between Bulgaria and Greece at a new H2 connection point in the Kulata/Sidirokastro region. The project is envisaged to be the first phase of the realization of the general concept for the pure hydrogen transmission infrastructure in the Republic of Bulgaria. The plan is the project to be subsequently developed to northern and eastern direction and thus additional cross border connectivity to be ensured at a later stage towards Romania and the countries of the region.

Hydrogen Transmission

TYNDP Project code	Section name	New / Repurposing	Nominal Diameter [mm]	Section Length [km]	Compressor power [MW]
HYD-N-788	Sofia - Kulata (First stage of the BG H2 network)	New	1000	250	48
HYD-N-970	Corinth – Sidirokastro (GR H2 network)	New	915	540	60
HYD-N-970	Karperi- Komotini (GR H2 network)	New	915	250	N/A

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-788	H2_IP_GR-BG	Bulgartransgaz EAD	Transmission Greece (GR Hydrogen)	Transmission Bulgaria (BG Hydrogen)	70	2029
HYD-N-788	H2_IP_GR-BG	Bulgartransgaz EAD	Transmission Bulgaria (BG Hydrogen)	Transmission Greece (GR Hydrogen)	70	2029

HYD-N-970	H2_IP_GR-BG	DESFA S.A.	Transmission Greece (GR Hydrogen)	Transmission Bulgaria (BG Hydrogen)	70	2029
HYD-N-970	H2_IP_GR-BG	DESFA S.A.	Transmission Bulgaria (BG Hydrogen)	Transmission Greece (GR Hydrogen)	70	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-788	860	20%	5	20%
HYD-N-970	1321	25%	26	25%

Description of the cost and range [Promoter]

DESFA's "Dedicated H2 Pipeline project" (**HYD-N-970**) CAPEX is estimated to be 1,321 MEUR and includes maturing studies, land acquisition, right-of-way compensations, EPC cost, supervision and inspection services. The CAPEX range (%) is expected to be 25%. The respective figures for Operating Expenses (OPEX) are 26 MEUR/year and the relevant rate is 25%.

The CAPEX for **HYD-N-788,** promoted by Bulgartransgaz is estimated to be 860 MEUR incl. the costs for feasibility studies, design, permitting, construction, equipment deliveries and installation. The indicative CAPEX is calculated based on the EHB study "How a dedicated hydrogen infrastructure can be created" (July 2020). The expected range of fluctuations in the CAPEX is 20%. Operational and maintenance expenditure (OPEX) represents the costs such as direct operating and maintenance costs, administrative and general expenditures, etc. The amount considered for this project is 5 MEUR per year and the range is around 20%.

C. Project Benefits [ENTSOG]

C.1 Summary of benefits

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

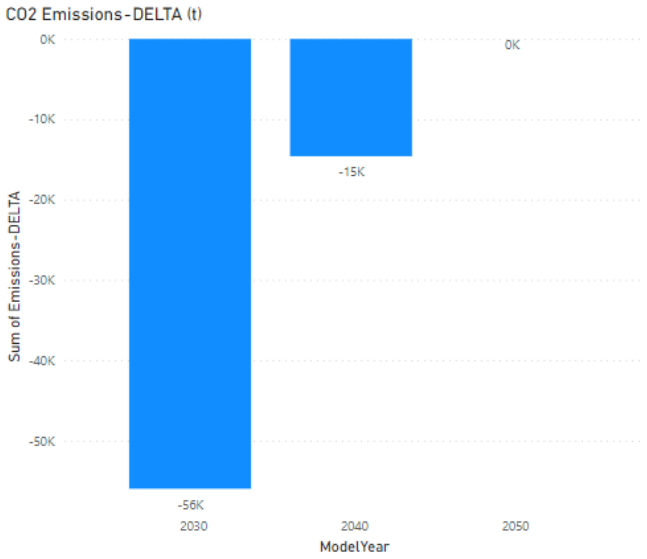
[1] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf

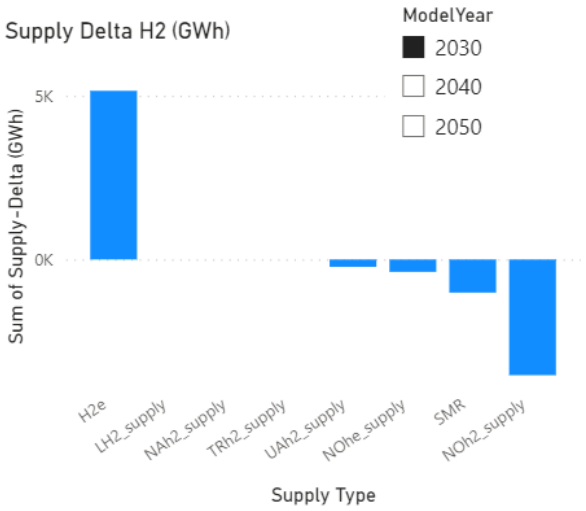
Distributed Energy

Sustainability benefits

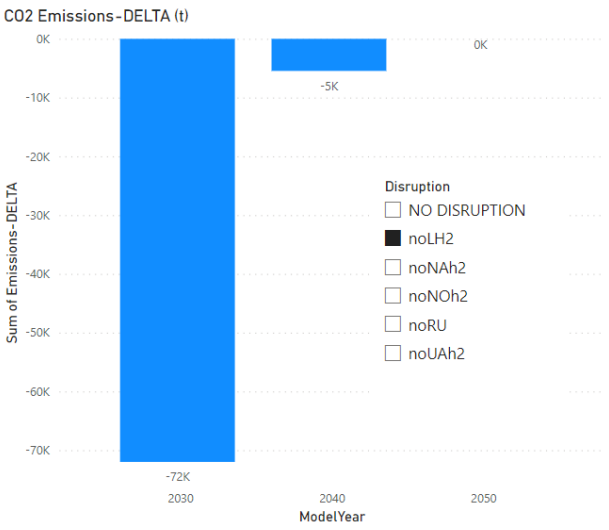
Project group will enable transport of green hydrogen national production in Greece from 2029, and therefore, improving diversification of hydrogen supplies in Eastern Europe and potentially other European countries.

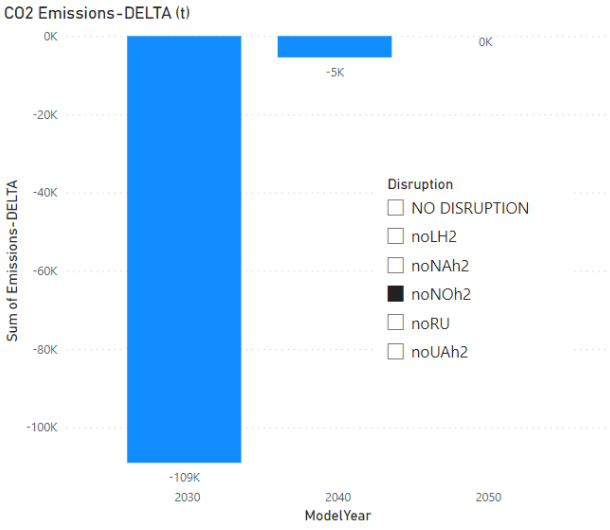
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will significantly contribute to sustainability by reducing overall CO2 emissions by 56 kt in 2030 and 15 kt in 2040. This can be explained as from 2030 the project group will enable the replacement of blue hydrogen imports with green and low-carbon hydrogen production in Greece. Similar trend is observed in 2040, with higher volumes of Greek production will replace Norwegian blue hydrogen imports and SMR.

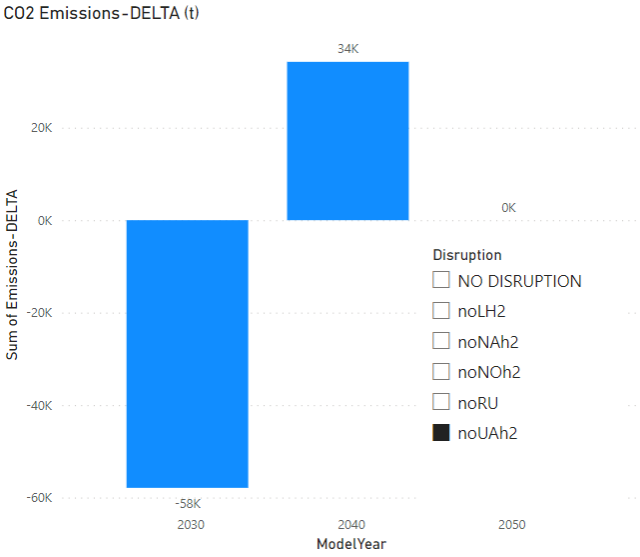


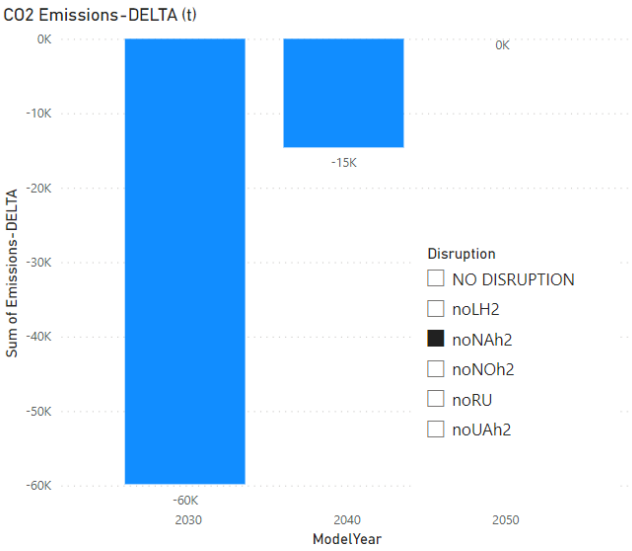


1 noLH2: LH2 disruption / 2 noNOh2: Norway disruption / 3 noUAh2: Ukraine disruption/ 4 noNAh2: North Africa disruption





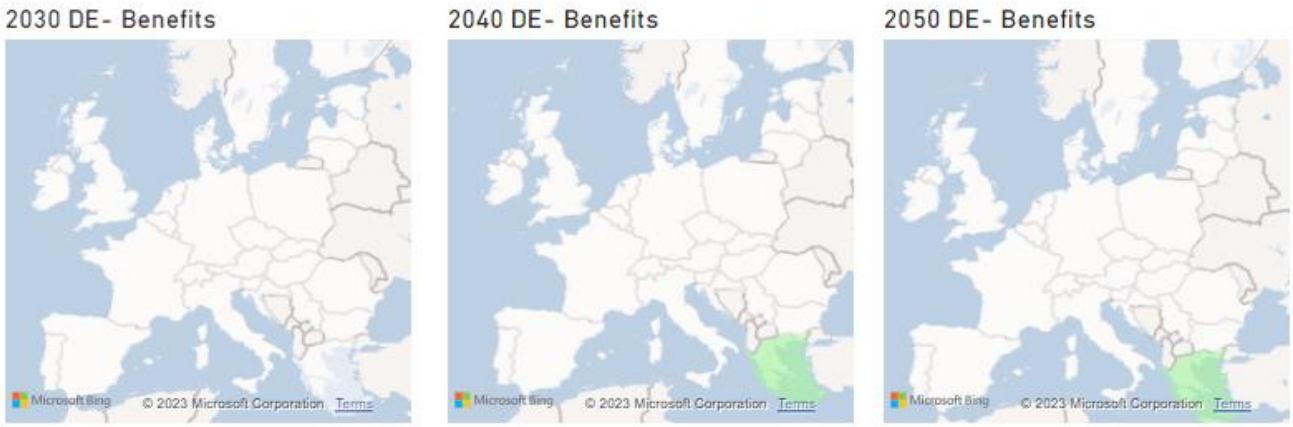




Security of Supply:[2]

> Reference case:

The project group mitigates the risk of hydrogen demand curtailment In Greece by 80% in 2040 and by 89% in 2050.

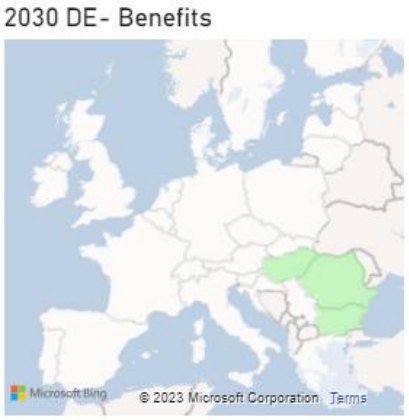


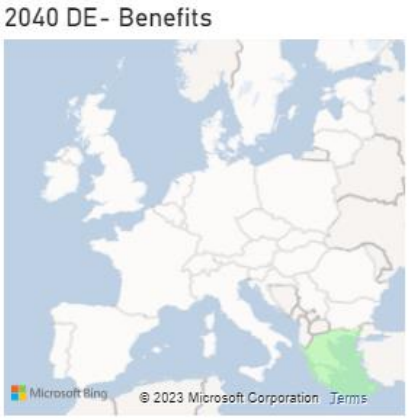
> Climatic stress cases:

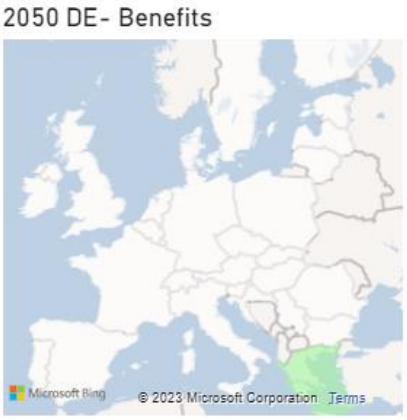
Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project group maintaining mitigation of risk of hydrogen demand curtailment in Greece. Greece is

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

benefiting by mitigating the risk of demand curtailment by 60% in 2040 and by 87% in 2050. In addition, project group is reducing the risk of demand curtailment in Bulgaria by 41% and in Romania and Hungary by 14%.





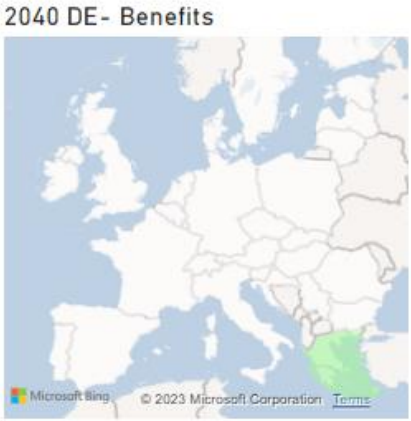


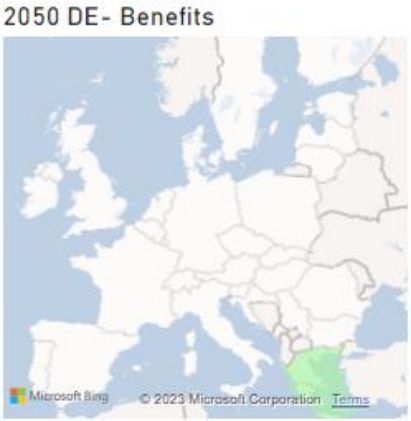
> Disruption cases (S-1):

Similarly, under yearly supply disruption cases, the project group shows benefits for mitigating the risk of demand curtailment in Greece by 80% in 2040 and by 89% in 2050.

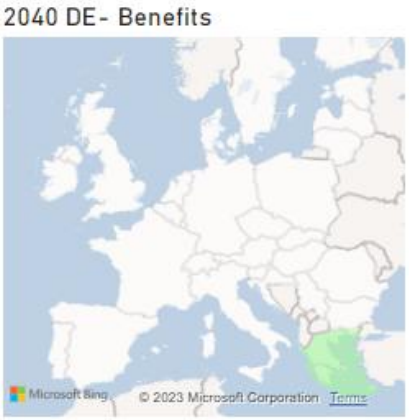
Maps for specifics disruptions: 1 noLH2: LH2 disruption / 2 noNOh2: Norway disruption / 3 noUAh2: Ukraine disruption/ 4 noNAh2: North Africa disruption

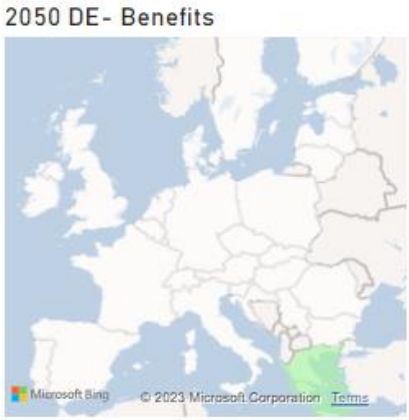
1 noLH2: LH2 disruption



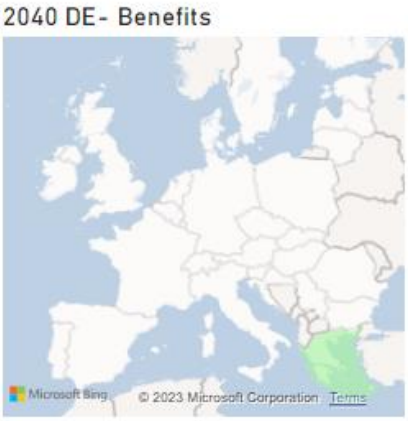


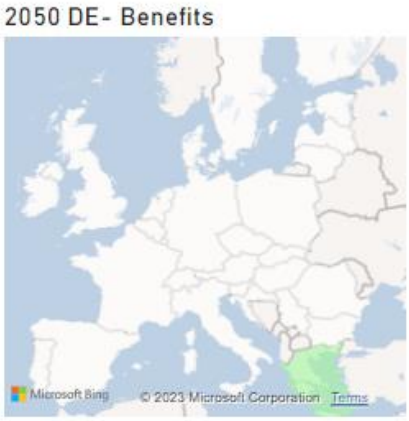
2 noNOh2: Norway disruption



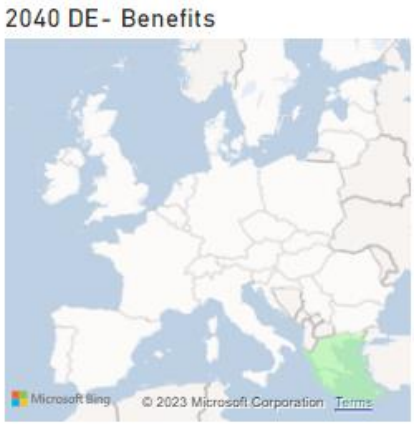


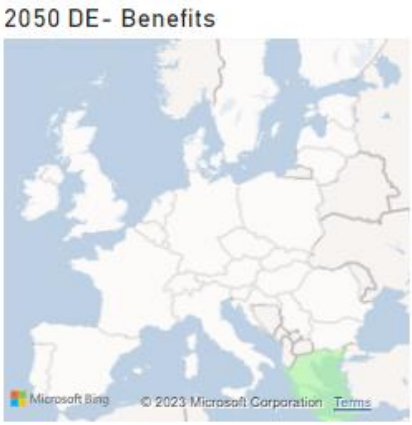
3 noUAh2: Ukraine disruption





4 noNAh2: North Africa disruption



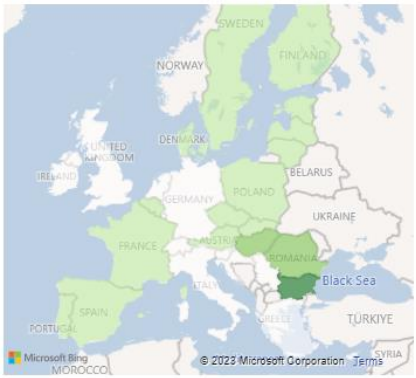


> Single largest capacity disruption (SLCD):

In case of SLCD many European countries benefitting from this project group by mitigating the risk of demand curtailment from 2030 onwards. In 2030 Romania and Hungary can mitigate the risk of demand curtailment by 7% and Bulgaria by 45%. In 2040 and 2050 project group reduces the risk of demand curtailment in Bulgaria and Greece up to 50%.

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

SLCD Benefits - 2030 - Distributed Energy



SLCD Benefits - 2040 - Distributed Energy

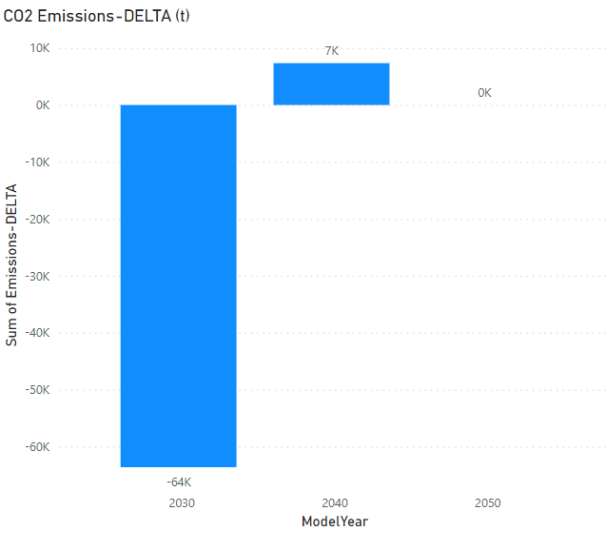
SLCD Benefits - 2050 - Distributed Energy

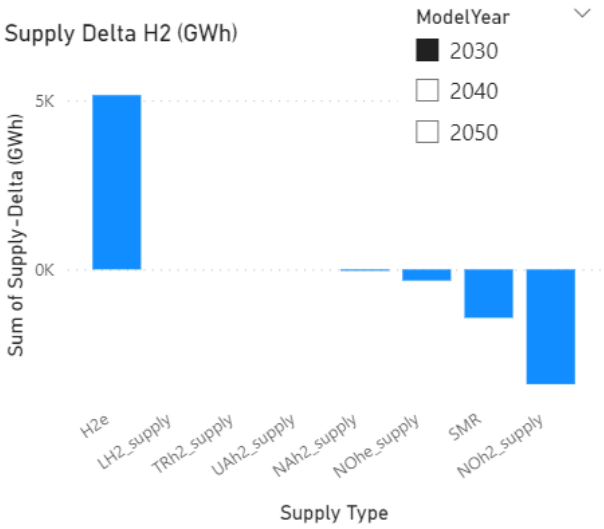
Global Ambition

Sustainability benefits

Project group will enable transport of green hydrogen national production in Greece from 2029, and therefore, improving diversification of hydrogen supplies in Eastern Europe and potentially other European countries.

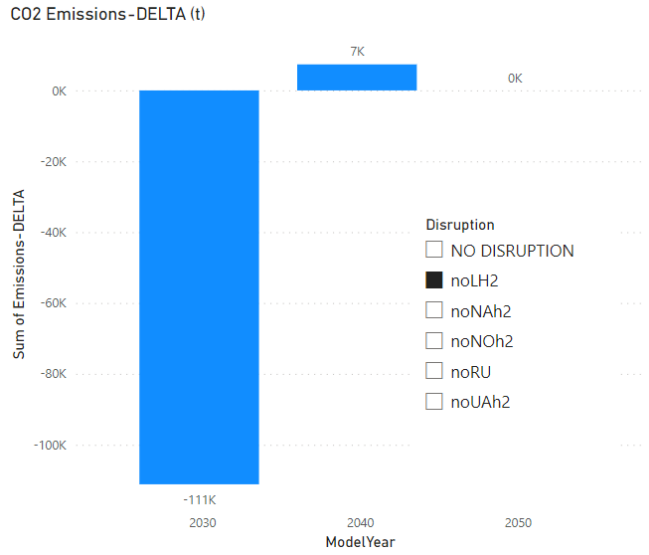
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will significantly contribute to sustainability by reducing overall CO2 emissions by 64 kt in 2030. This can be explained as from 2030 the project group will enable the replacement of blue hydrogen imports with green and low-carbon hydrogen production in Greece. In 2040, project group increase overall CO2 emissions, this is explained by the higher demand in GA2040. Project group enables cooperation between Greece and Bulgaria, increasing SMR production and therefore, reducing demand curtailment.

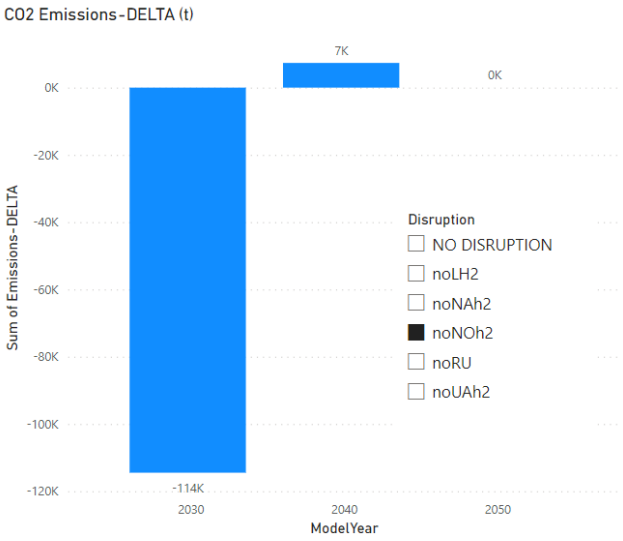


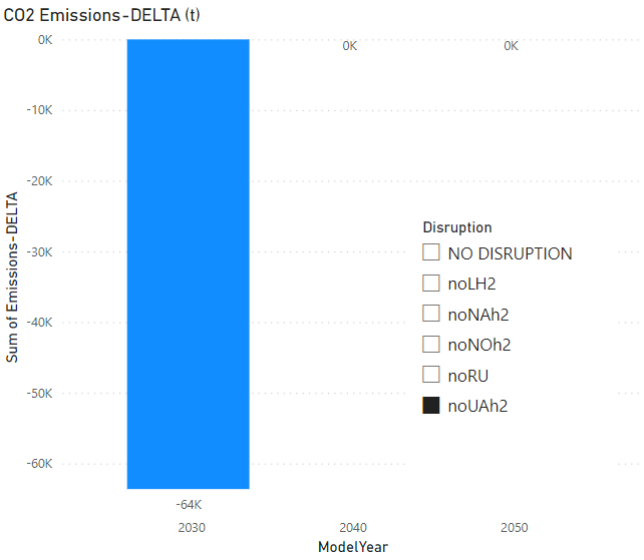


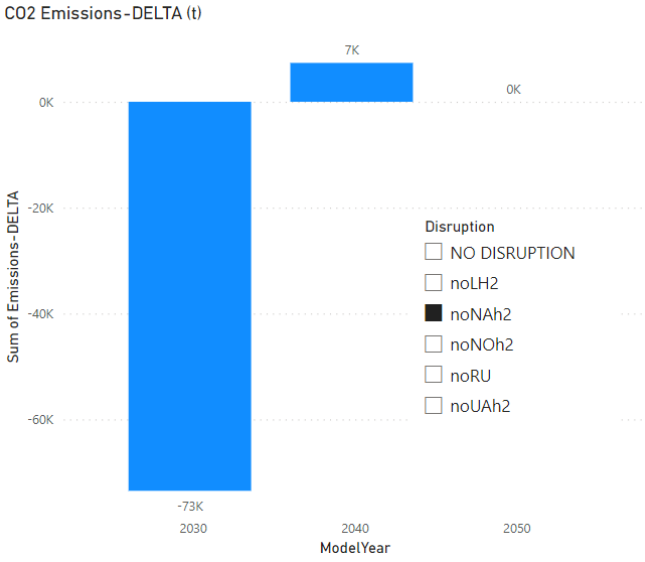
Similar trend with even higher sustainability benefits are expected in 2030 and 2040 under yearly disruption cases, due to the lower availability of supply, higher SMR production is required, and subsequently higher GHG emissions savings are expected.

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









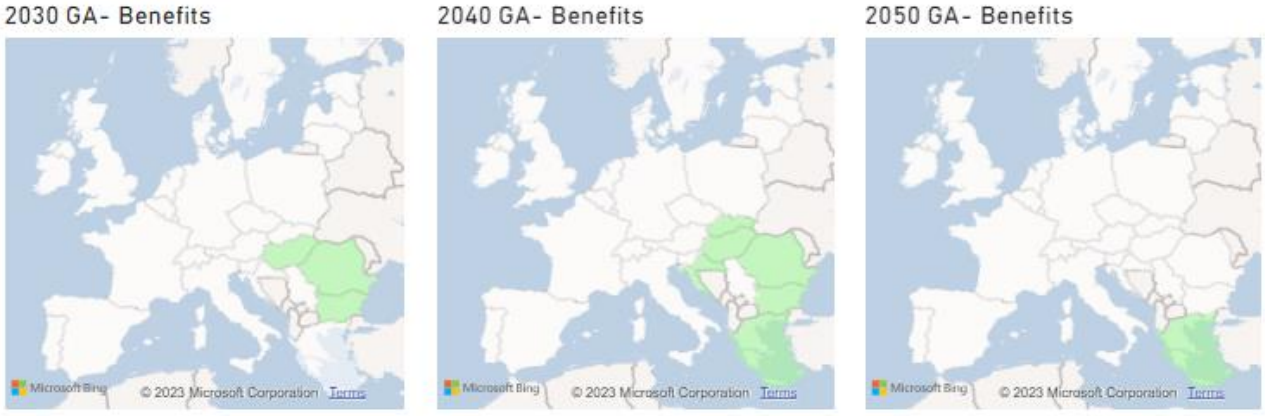
Security of supply:

> Reference case

Thanks to the project group hydrogen can flow in both direction between Greece and Bulgaria and brings positive security of supply benefits for Greece in 2040 and 2050. The project group mitigates the risk of hydrogen demand curtailment by 53% in 2040 and by 49% in 2050. In addition, and to a lower extent, it also mitigates the risk of demand curtailment in Bulgaria, Romania, Hungary, Croatia and Slovakia by 2% in 2040.

> Climatic stress cases

Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project group maintaining mitigation of risk of hydrogen demand curtailment in Greece. Greece is benefiting by mitigating the risk of demand curtailment by 29% in 2040 and by 43% in 2050. In addition, the project group is also reducing the risk of demand curtailment in 2030 in Bulgaria by 34%, and to a lower extent, reducing the risk of demand curtailment in Romania and Hungary in 2030 and 2040.



> Disruption cases (S-1)

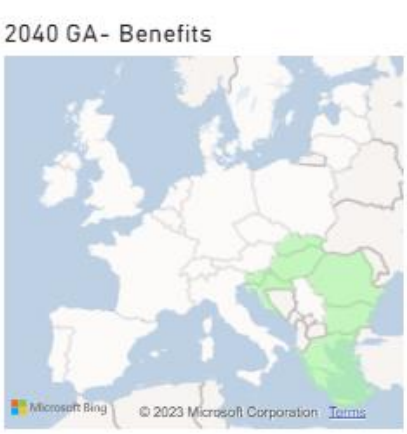
Similarly, under yearly supply disruption cases, the project group shows benefits for mitigating the risk of demand curtailment in Greece by 38-52 % in 2040 and by 34-48% in 2050.

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

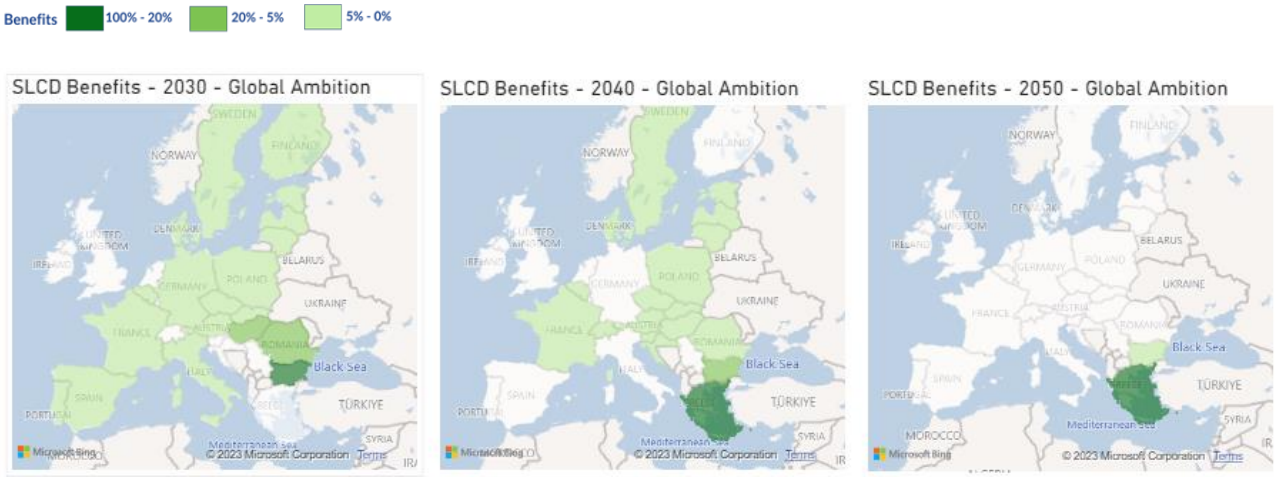
3 noUAh2: Ukraine disruption



4 noNAh2: North Africa disruption

> Single largest capacity disruption (SLCD):

In case of SLCD many European countries benefitting from this project group by mitigating the risk of demand curtailment from 2030 onwards. In 2030 Bulgaria with a mitigation rate of 53% and Romania 8% are benefitting the most. In 2040 almost all countries in Europe are benefiting with highest benefits recorded for Greece, including 27% for 2040.



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	0	538.677.299	538.677.299
2030	NO DISRUPTION	GA	tonne	-1	592.910.448	592.910.449
2030	noLH2	DE	tonne	0	540.175.890	540.175.890
2030	noLH2	GA	tonne	0	594.817.481	594.817.481
2030	noNAh2	DE	tonne	0	539.785.356	539.785.356
2030	noNAh2	GA	tonne	0	594.141.433	594.141.433
2030	noNOh2	DE	tonne	16	538.877.198	538.877.182
2030	noNOh2	GA	tonne	0	593.310.994	593.310.994
2030	noUAh2	DE	tonne	0	539.378.772	539.378.772
2030	noUAh2	GA	tonne	0	593.627.618	593.627.618
2040	NO DISRUPTION	DE	tonne	18.110	392.077.044	392.058.934
2040	NO DISRUPTION	GA	tonne	337.215	396.523.252	396.186.036
2040	noLH2	DE	tonne	27.241	392.213.883	392.186.642
2040	noLH2	GA	tonne	277.316	397.455.197	397.177.880
2040	noNAh2	DE	tonne	18.110	392.188.098	392.169.988
2040	noNAh2	GA	tonne	277.316	397.301.977	397.024.660
2040	noNOh2	DE	tonne	27.241	392.144.023	392.116.782
2040	noNOh2	GA	tonne	277.316	397.450.977	397.173.661
2040	noUAh2	DE	tonne	68.963	392.399.183	392.330.220
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
Greece	-9%	-6%	-21%	-15%	-24%	-16%
Bulgaria	-14%	-23%	-5%	-1%	-20%	-1%
Belgium	0%	-1%	-2%	-1%	-1%	0%
Czechia	0%	-1%	-2%	-2%	-2%	0%
Estonia	-1%	-1%	-2%	-1%	-2%	0%
Finland	-1%	-1%	-2%	-1%	-2%	-1%
Germany	0%	-1%	-2%	-1%	-1%	0%
Latvia	-1%	-1%	-2%	-1%	-1%	0%
Lithuania	0%	-1%	-2%	-1%	-1%	-1%
Poland	0%	-1%	-2%	-1%	-1%	0%
Portugal	0%	-1%	-2%	-1%	0%	0%
Slovenia	0%	0%	-2%	-1%	-1%	0%
Sweden	-1%	-1%	-2%	-1%	-2%	0%
Switzerland	0%	0%	-2%	-1%	-1%	0%
France	0%	-1%	-2%	-1%	-1%	0%
Hungary	-4%	-4%	-1%	-1%	0%	0%
Croatia	0%	0%	-1%	-1%	0%	0%
The Netherlands	0%	0%	-1%	-1%	-2%	0%
Austria	-1%	-1%	-1%	-1%	-2%	0%
Denmark	0%	-1%	-1%	-1%	-1%	0%
Italy	0%	0%	-1%	-1%	-2%	0%
Romania	-6%	-4%	-1%	-1%	0%	0%
Slovakia	0%	0%	-1%	-1%	0%	0%
Spain	0%	-1%	-1%	-1%	-1%	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	0%	0%	0%	0%	0%	0%
Average2W	Belgium	0%	0%	0%	0%	0%	0%
Average2W	Bulgaria	-1%	-1%	0%	0%	0%	0%
Average2W	Croatia	0%	0%	0%	0%	0%	0%
Average2W	Cyprus	0%	0%	0%	0%	0%	0%
Average2W	Czechia	0%	0%	0%	0%	0%	0%
Average2W	Denmark	0%	-1%	0%	0%	0%	0%
Average2W	Estonia	0%	0%	0%	0%	0%	0%
Average2W	Finland	0%	0%	0%	0%	0%	0%
Average2W	France	0%	-1%	0%	0%	0%	0%
Average2W	Germany	0%	0%	0%	0%	0%	0%
Average2W	Greece	0%	0%	-26%	-21%	-9%	-17%
Average2W	Hungary	-1%	-1%	0%	0%	0%	0%
Average2W	Ireland	0%	0%	0%	0%	0%	0%
Average2W	Italy	0%	0%	0%	0%	0%	0%
Average2W	Latvia	0%	0%	0%	0%	0%	0%

Average2W	Lithuania	0%	0%	0%	0%	0%	0%
Average2W	Luxembourg	0%	0%	0%	0%	0%	0%
Average2W	Malta	0%	0%	0%	0%	0%	0%
Average2W	Poland	0%	0%	0%	0%	0%	0%
Average2W	Portugal	0%	0%	0%	0%	0%	0%
Average2W	Romania	-1%	0%	0%	0%	0%	0%
Average2W	Serbia	0%	0%	0%	0%	0%	0%
Average2W	Slovakia	0%	0%	0%	0%	0%	0%
Average2W	Slovenia	0%	0%	0%	0%	0%	0%
Average2W	Spain	0%	0%	0%	0%	0%	0%
Average2W	Sweden	0%	-1%	0%	0%	0%	0%
Average2W	Switzerland	0%	0%	0%	0%	0%	0%
Average2W	The Netherlands	0%	0%	0%	0%	0%	0%
Average2W	United Kingdom	0%	0%	0%	0%	0%	0%
Average2WDF	Austria	0%	0%	0%	0%	0%	0%
Average2WDF	Belgium	0%	0%	0%	0%	0%	0%
Average2WDF	Bulgaria	-1%	-1%	0%	0%	0%	0%
Average2WDF	Croatia	0%	0%	0%	0%	0%	0%
Average2WDF	Cyprus	0%	0%	0%	0%	0%	0%
Average2WDF	Czechia	0%	0%	0%	0%	0%	0%
Average2WDF	Denmark	0%	-1%	0%	0%	0%	0%
Average2WDF	Estonia	0%	0%	0%	0%	0%	0%
Average2WDF	Finland	0%	0%	0%	0%	0%	0%
Average2WDF	France	0%	-1%	0%	0%	0%	0%
Average2WDF	Germany	0%	0%	0%	0%	0%	0%
Average2WDF	Greece	0%	0%	-26%	-20%	-9%	-17%
Average2WDF	Hungary	-1%	-1%	0%	0%	0%	0%
Average2WDF	Ireland	0%	0%	0%	0%	0%	0%
Average2WDF	Italy	0%	0%	0%	0%	0%	0%
Average2WDF	Latvia	0%	0%	0%	0%	0%	0%
Average2WDF	Lithuania	0%	0%	0%	0%	0%	0%
Average2WDF	Luxembourg	0%	0%	0%	0%	0%	0%
Average2WDF	Malta	0%	0%	0%	0%	0%	0%
Average2WDF	Poland	0%	0%	0%	0%	0%	0%
Average2WDF	Portugal	0%	0%	0%	0%	0%	0%
Average2WDF	Romania	-1%	0%	0%	0%	0%	0%
Average2WDF	Serbia	0%	0%	0%	0%	0%	0%
Average2WDF	Slovakia	0%	0%	0%	0%	0%	0%
Average2WDF	Slovenia	0%	0%	0%	0%	0%	0%
Average2WDF	Spain	0%	0%	0%	0%	0%	0%
Average2WDF	Sweden	0%	-1%	0%	0%	0%	0%
Average2WDF	Switzerland	0%	0%	0%	0%	0%	-1%
Average2WDF	The Netherlands	0%	0%	0%	0%	0%	0%
Average2WDF	United Kingdom	0%	0%	0%	0%	0%	0%
DC	Austria	0%	-1%	0%	0%	0%	0%

DC	Belgium	0%	0%	0%	0%	0%	0%
DC	Bulgaria	-1%	-1%	0%	0%	0%	0%
DC	Croatia	0%	0%	0%	0%	0%	0%
DC	Cyprus	0%	0%	0%	0%	0%	0%
DC	Czechia	0%	0%	0%	0%	0%	0%
DC	Denmark	0%	0%	0%	0%	0%	0%
DC	Estonia	0%	0%	0%	0%	0%	0%
DC	Finland	0%	0%	0%	0%	0%	0%
DC	France	0%	0%	0%	0%	0%	0%
DC	Germany	0%	0%	0%	0%	0%	0%
DC	Greece	0%	0%	-20%	-14%	-5%	-16%
DC	Hungary	-1%	-1%	0%	0%	0%	0%
DC	Ireland	0%	0%	0%	0%	0%	0%
DC	Italy	0%	0%	0%	0%	0%	0%
DC	Latvia	0%	0%	0%	0%	0%	0%
DC	Lithuania	0%	0%	0%	0%	0%	0%
DC	Luxembourg	0%	0%	0%	0%	0%	0%
DC	Malta	0%	0%	0%	0%	0%	0%
DC	Poland	0%	0%	0%	0%	0%	0%
DC	Portugal	0%	0%	0%	0%	0%	0%
DC	Romania	-1%	-1%	0%	0%	0%	0%
DC	Serbia	0%	0%	0%	0%	0%	0%
DC	Slovakia	0%	0%	0%	0%	0%	0%
DC	Slovenia	0%	0%	0%	0%	0%	0%
DC	Spain	0%	-1%	0%	0%	0%	0%
DC	Sweden	0%	0%	0%	0%	0%	0%
DC	Switzerland	0%	0%	0%	0%	-1%	0%
DC	The Netherlands	0%	0%	0%	0%	0%	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-788	Pipeline; Compressor Stations	New H2 pipeline with DN 1000, about 250km long; 2 compressor stations	Environmentally sensitive area of concern would be in particular - protected territories (national parks, natural parks and phenomena etc.), protected Natura 2000 areas, water/wet/water bodies protection zones. Those of the above which would be impacted by the project and the potential scale/significance of the impact would be a particular subject of assessment during the applicable environmental procedures, as described underneath.
HYD-N-970	Pipeline; Compressor Stations	New H2 pipeline 36'', about 540km long; 2 compressor stations	Sensitive areas are considered the following: A. **Environmental hotspots** including: A.1 areas under national legislation (mainly national parks and wildlife refuges) and European legislation (i.e. Natura 2000 areas); A.2 Biodiversity hotspots such as water bodies (surface and underground), transitional and forest ecosystems, important habitats (outside protected areas, but suspected of supporting species/ habitats of conservation interest, based on literature review); A.3 Landscapes and natural areas of pristine conditions. B. **Social hotspots**, including: B.1 Residential development areas (designated or not); B.2 Complex cultivation patterns and Tree crops; C. **Cultural Heritage hotspots**, including: C.1 Declared cultural heritage resources (tangible and intangible); C.2 Areas of high archaeological potential. Impact significance will be assessed in full compliance to national and European legislation.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
The potential impact could be realized through physical crossing of the areas/zones (if allowed at all) and/or through emission of substances or energies, generated by the project. The assessment of the impact on the sensitive areas in the vicinity of the project is indispensable part of the	Mitigation measures are intrinsic part of the Environmental Impact Assessment procedures (under Directive 2011/92/EU, amended) – the proponent (BTG) is required to conceive and propose such measures in the required EIA report, and in the EIA Decision the competent authority stipulates mitigation measures as well, incl. those proposed by the proponent (BTG).		

overall environmental assessment and is required by the environmental legislation. Major part of it is the Appropriate assessment of the impact on the Natura 2000 protected areas. The above assessments will be carried out by the Ministry of Environment and Water at a project design stage, which allows all required technical and environmental information to be presented to the Ministry as part of the applicable procedures.	The implementation of the mitigation measures is a must for the development of the project and is closely and strictly enforced by the environmental authorities. The particular and commensurate to the project mitigation measures will be conceived at the upcoming design stages and proposed as described above.		
Potential impacts may incur either direct through (i) mechanical interaction between project elements and EIA baseline parameters (e.g. vegetation clearance along the working strip) or (ii) other physical interface (e.g. nuisance due to noise from construction activities which may lead to area abandonment from a protected species) or indirect (e.g. habitat deterioration due to increase accessibility from possible newly constructed roads). It must be highlighted that impacts may be negative but also positive (compliance with national and European goals mitigating climate crises) The EIA shall clearly identify methodology of impacts assessment, taking into consideration the criteria defined in national legislation (e.g. likelihood, size, scale, duration, reversibility, cumulative and transboundary character). Baseline examination in the compressor stations parcels to document abiotic and biotic parameters, prior to project implementation is to be performed	Mitigation measures will be implemented, if and as applicable, to address negative impacts and enhance any positive ones. The hierarchy in impacts mitigation sets as priority an avoidance and/ or prevention strategy. If this is not adequate, complementary measures to minimize impacts shall be presented. Offset/ compensatory measures may be also proposed during EIA preparation, by the group of experts that will prepare the EIA. Additional to mitigation measures foreseen, topic-specific management plans, providing guidelines for the Environmental and Social Management and Monitoring Plan, will be included in the EIA. It is envisaged that consultation with local authorities will provide additional insight on the needs and concerns of local community and EIA issues (mainly impacts and mitigation measures) to be addressed.		

(depending on the final capacity of the stations). Focusing on Natura 2000 sites, Appropriate Assessments shall be elaborated. In major water bodies, sampling according to WFD shall be performed. The EIA shall be developed and compiled in compliance with national and European legislation as well as ESG framework implemented by DESFA.			

Environmental Impact explained [Promoter]

HYD-N-788:The base-line parameters of the project imply it will be a subject of Environmental impact assessment under Directive 2011/92/EU (amended) and of Appropriate assessment under the Habitats directive (Directive 92/43/EEC). According to Bulgarian legislation the requirements of the two directives are implemented in combined manner – one procedure, embracing the two assessments and ensuring consented conclusion and decision.
Where applicable Water abstraction and Effluent discharge permits will be granted prior to the commencement of the activity by the relevant Basin Directorates (responsible for the water management, under the umbrella of the Ministry of Environment and Water), waste management registration and permission documents will be granted by the relevant regional inspectorate of Environment and Water/ Ministry of Environment and Water.
In case the compressors are designed as a fuel driven - It is possible, dependent on the combined thermal capacity of the compressors (not clarified yet) that an integrated permit (under the Industrial Emissions Directive 2010/75/EU) would be required for the construction and operation of the compressor stations – this will be clear before the beginning of the EIA procedure.

HYD-N-970: The proposed project is designed to be constructed in parallel with the existing gas pipeline. Special consideration should be given regarding any possible cumulative impacts. Habitats fragmentation is another key potential impact, augmented by the construction of a new pipeline parallel to the existing one, whilst wildfires is another red flag, which although is generally all-over Greek jurisdiction.

National legislation regarding environmental permitting fully incorporates European Directives regarding EIA (namely Directive 2011/92/EU as amended) and Nature and Biodiversity protection (mainly Habitats Directive 92/43/EEC and Birds Directive 79/409/EEC). As such, L. 4014/2011 (HGG A' 209) as applied and in force, which defines the environmental permitting procedure and MD 177025/2014 (HGG B' 135) which determines the Table of Contents of the EIA, depending on the size of the project, provide the main regulatory and legal framework for EIA. Consecutive permits (e.g. Forest Intervention Protocol, Installation Act & Permit, Building Permit, Operation Permit, etc.) may include additional terms to the Environmental Terms Approval; nevertheless, the main commitments will be disclosed, based on MD 1649/2014 (HGG B' 45), and defined during the issuance of the ETA. Finally, depending on the thermal capacity of the compressors if fuel driven, the appropriate Directive regarding air emissions, will apply.

E. Other benefits [Promoter]

Missing benefits are all benefits of a project which may not be 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]

Project group is envisaged to be enabler of the wide and large-scale deployment of hydrogen for entire SEE region as the planned infrastructure is projected to drive the process of the further dynamic development of the H2 network in GR, BG and the region as a whole. The projects included in the group represent a suitable primary part of a future hydrogen route from Southeast to Central Europe. The plan is the project group to be subsequently developed to northern and eastern direction and thus additional cross border connectivity to be projected at a later stage towards Romania and the countries of the region.

Project group is planned to enable the cross-border transport of hydrogen between Greece and Bulgaria and will ensure interoperability and open and non-discriminatory access to an emission free energy source for all market players.

The planned H2 infrastructure is expected to make an important contribution to sustainable economic growth, employment (creation of new employment and upskilling of existing personnel) and competitiveness of industry and the economy both in the two countries involved and in the region as a whole.

F. Useful links [Promoter]

Useful links:

HYD-N-788:

Bulgartransgaz`s TYNDP: https://www.bulgartransgaz.bg/en/pages/desetgodishni-planove-za-razvitie-na-mrejite-na-bulgartransg-142.html