BEMIP HYD 10 (Less-Advanced)

Doing hydrogen

ONTRAS

Reasons for grouping [ENTSOG]

The project group is a stand-alone transmission project HYD-N-989 in eastern Germany.

This project brings together different hydrogen producers and consumers and hence establishing a hydrogen hub in East Germany.

Objective of the group [Promoter]

The **doing hydrogen** project brings together innovative producers, gas network operators and consumers with the aim of establishing a European hydrogen hub in eastern Germany from 2026 and, in the medium term, a hydrogen system with links to Poland, the Czech Republic, Denmark and Western Germany.

HYD-N-989 **Doing hydrogen**

Comm. Year **2026**

ONTRAS

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-989	Pipeline Berlin to Leipzig	Repurposing	800	115	
HYD-N-989	Pipeline Berlin to Rüdersdorf	New	800	80	
HYD-N-989	Pipeline Güstrow to Berlin	Repurposing	600	220	
HYD-N-989	Pipeline Rostock to Güstrow	New	800	50	
HYD-N-989	Pipeline Rüdersdorf to Eisenhüttenstadt	New	800	85	

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-989	NPcDEh2	Ontras	NPcDEh2	DE	99	2030
HYD-N-989	NPcDEh2	Ontras	NPcDEh2	DE	2	2040

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-989	419.5		3.78	

Description of the cost and range [Promoter]

The cost figures reflect initial estimations for the mentioned pipeline sections.

C. Project Benefits [ENTSOG]

C.1 Summary of benefits

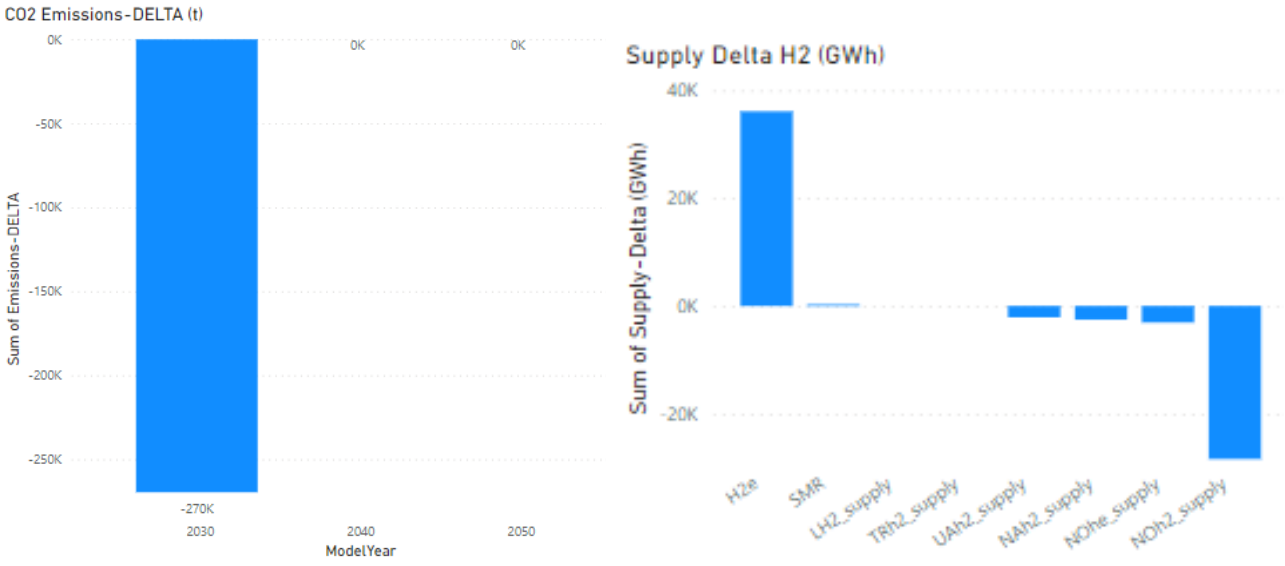
This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group. More details on the indicators are available in Annex D of TYNDP 2022[1].

Distributed Energy

Thanks to the project group, from 2026 the hydrogen production in Germany will increase hydrogen supply in Germany and enables at the same time possible cross-border flows to neighboring countries.

Sustainability

In reference case, the project is enabling connection between green H2 producers and consumers, it is contributing to sustainability by replacing blue hydrogen from Norway and hence saving 270 kt CO2 emissions in 2030. The projects group increases also national hydrogen production and hence less hydrogen import supplies from external sources respectively from SMR are needed.

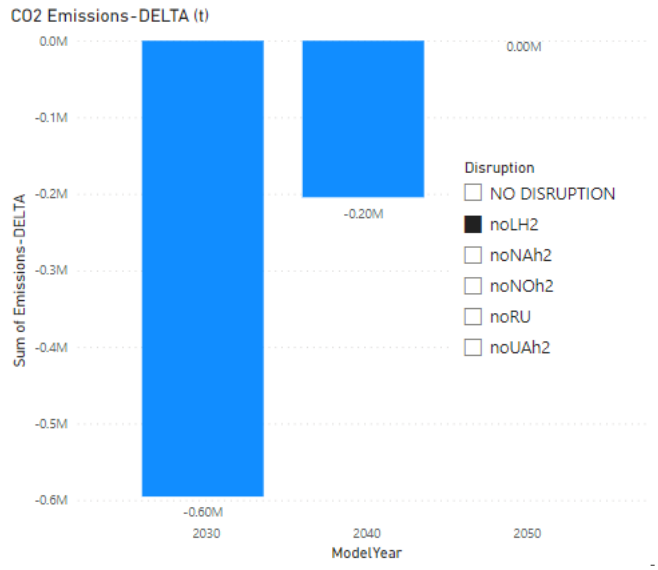


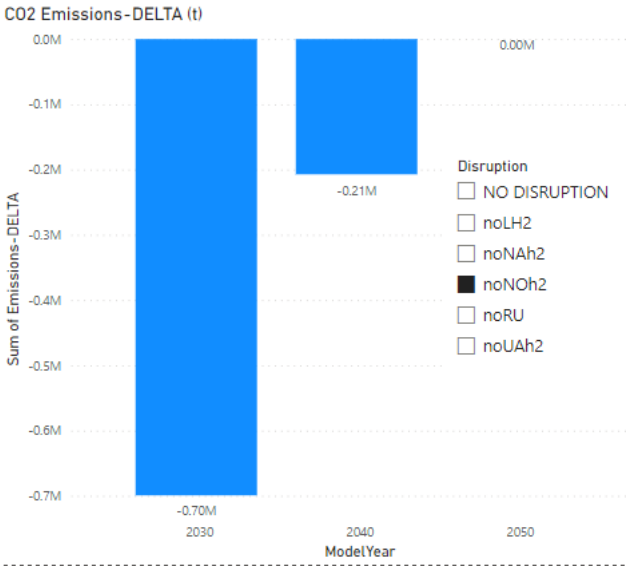
Sustainability benefits are increased under all supply disruption cases from 2030 onwards. The project group will reduce CO2 emissions by 595 kt in case of LH2 disruption, 423 kt for North Africa disruption, 699 kt for Norway

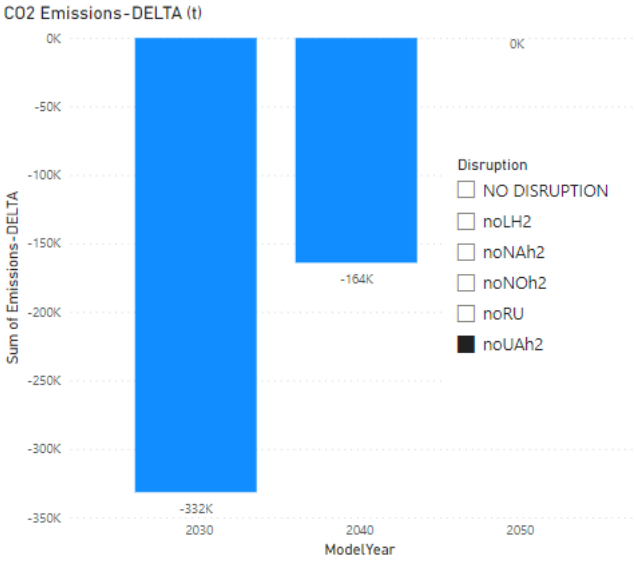
[1] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf

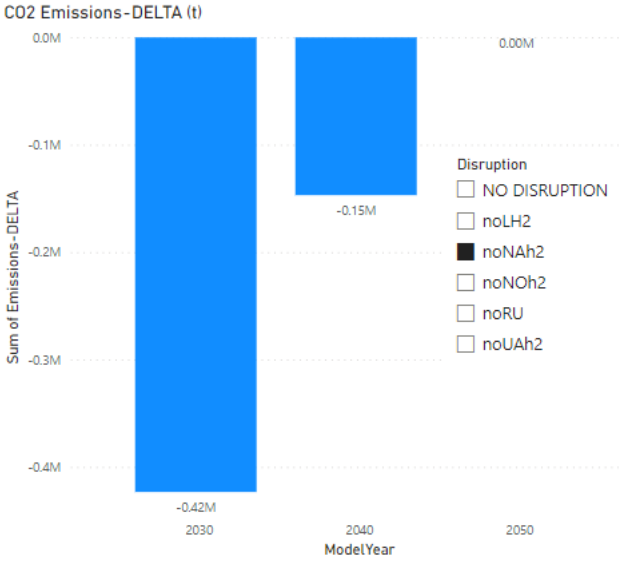
disruption and 332 kt for Ukrainian disruption in 2030. These positive impacts on the CO2 emission can be generally found also in 2040.

noNOh2 : Norway disruption / noLH2 : LH2 disruption / noNAh2 : North Africa disruption / noUAh2 : Ukraine disruption









Security of Supply:[2]

> Reference case:

[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.*

In the reference case, the project group mitigates the risk of hydrogen demand curtailment in almost all European countries from 2040 onwards under average winter condition by 1-2%. The project group improves cooperation between eastern and western countries.

> 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 2040 by at least 2-3%. More benefits are even expected in 2030, where demand curtailment is mitigated by 7-8% in almost all European countries.

> Disruption cases (S-1):

Similarly, under supply disruption cases, the project group mitigates in the same way as climatic stress cases the risk of demand curtailment by 1-3% from in many European countries.

noNOh2 : Norway disruption / noLH2 : LH2 disruption / noNAh2 : North Africa disruption / noUAh2 : Ukraine disruption

1 noLH2 : LH2 disruption

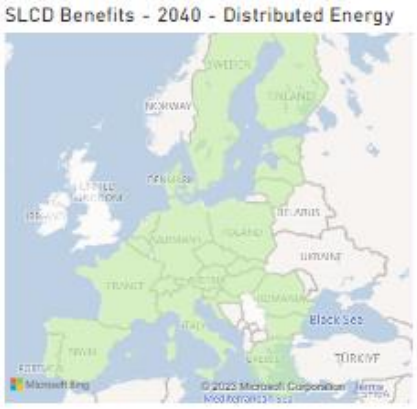
2 noNOh2 : Norway disruption

3 noUAh2 : Ukraine disruption

4 noNAh2 : North Africa disruption

> Single largest capacity disruption (SLCD):

In case of single largest capacity disruption (SLCD), the projects group reduces (2-4%) the risk of demand curtailment in all European countries from 2030 onwards.

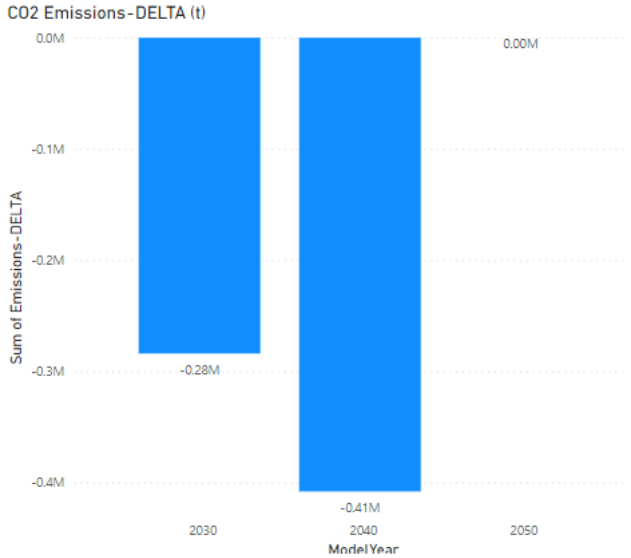


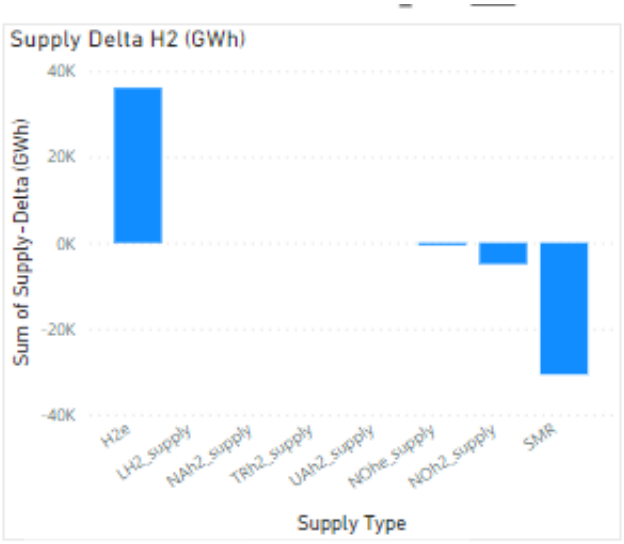
Global Ambition

Thanks to the projects group, from 2026, the hydrogen production in Germany will increase and brings hydrogen supply to consumers in Germany.

Sustainability

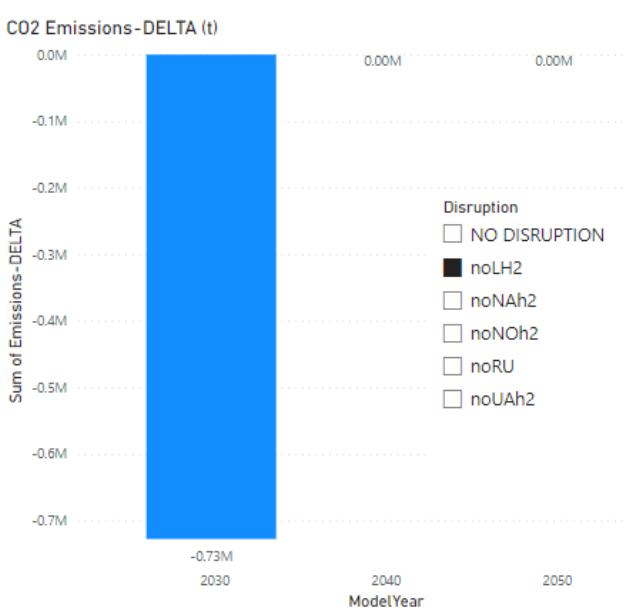
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 283 kt in 2030 and 407kt in 2040. The projects group increases also national hydrogen production and hence less hydrogen import supplies from external sources respectively from SMR are needed.

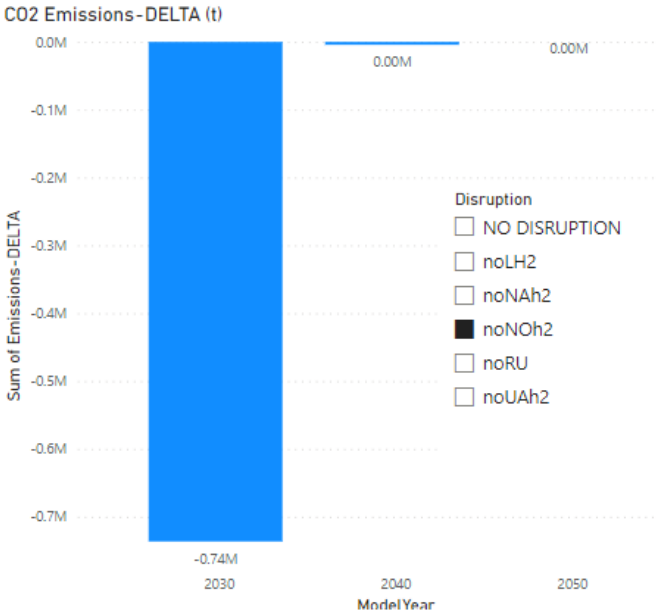


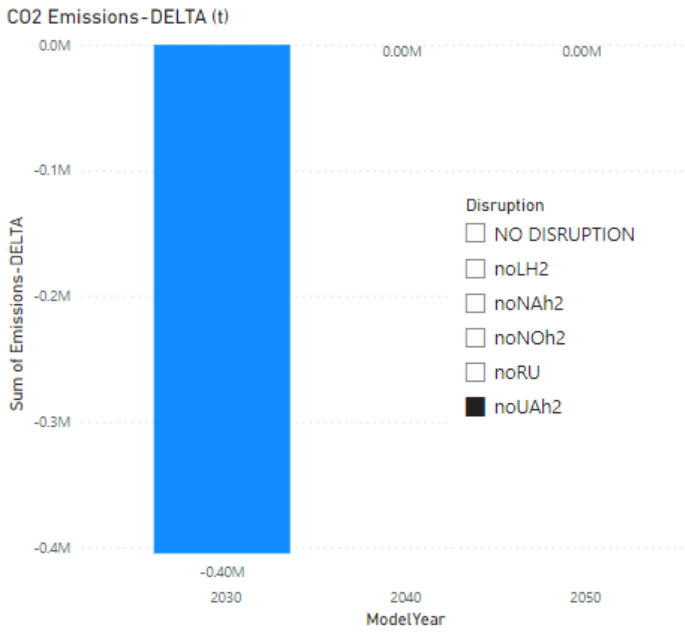


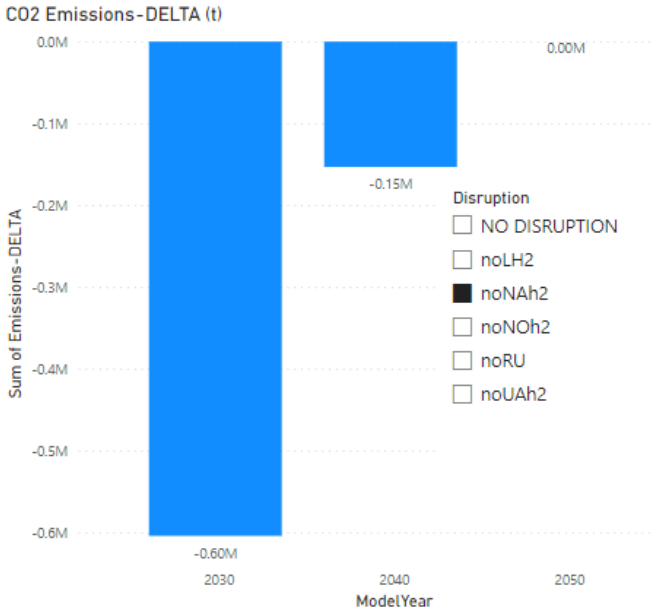
More sustainability benefits are observed under different supply disruption cases, including up to 736 kt CO2 emissions savings in case of Norwegian disruption in 2030.

noNOh2 : Norway disruption / noLH2 : LH2 disruption / noNAh2 : North Africa disruption / noUAh2 : Ukraine disruption









Security of supply :

> Reference case

In the reference case, the project mitigates the risk of hydrogen demand curtailment in almost all European countries in 2040 in average winter by 1-2%. The project group improves cooperation between eastern and western European countries.

> 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 2040 by at least 2-3%. More benefits are even expected in 2030, where demand curtailment is mitigated by 7-8%.

> Disruption cases (S-1)

Similar to the reference case and climatic stress cases the project is also mitigating the risk of hydrogen demand curtailment under supply disruption cases in many European countries by 1-2% from 2040 onwards.

noNOh2 : Norway disruption / noLH2 : LH2 disruption / noNAh2 : North Africa disruption / noUAh2 : Ukraine 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 single largest capacity disruption (SLCD), the projects group reduces the risk of demand curtailment (1-4%) in all European countries from 2030 onwards.

C.2 Quantitative benefits [ENTSOG]

The following tables display all the benefits quantified by ENTSOG through specific security of supply and sustainability indicators.

CO2 Emissions:

ModelYear	Disruption	Scenario	Unit	Emissions-DELTA	Emissions-PLUS	Emissions-MINUS
2030	NO DISRUPTION	DE	tonne	-269588,65	538677299	538946887,7
2030	noLH2	DE	tonne	-595308,58	540175890,2	540771198,8
2030	noNAh2	DE	tonne	-423250,75	539785356,1	540208606,9
2030	noNOh2	DE	tonne	-699234,73	538877197,8	539576432,5
2030	noUAh2	DE	tonne	-331607,01	539378771,9	539710378,9
2030	NO DISRUPTION	GA	tonne	-283875,13	592910448,4	593194323,6
2030	noLH2	GA	tonne	-727663,69	594817481,2	595545144,9
2030	noNAh2	GA	tonne	-604051,59	594141433,2	594745484,8
2030	noNOh2	GA	tonne	-736463,99	593310994,3	594047458,3
2030	noUAh2	GA	tonne	-404609,39	593627617,9	594032227,3
2040	NO DISRUPTION	DE	tonne	0,00	392077044	392077044
2040	noLH2	DE	tonne	-204485,79	392213883,4	392418369,2
2040	noNAh2	DE	tonne	-146885,26	392188097,7	392334982,9
2040	noNOh2	DE	tonne	-207254,26	392144022,6	392351276,9
2040	noUAh2	DE	tonne	-164016,09	392399182,9	392563199
2040	NO DISRUPTION	GA	tonne	-407918,13	396523251,6	396931169,7
2040	noLH2	GA	tonne	0,00	397455196,7	397455196,7
2040	noNAh2	GA	tonne	-153220,09	397301976,6	397455196,7
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
France	-4%	-4%	-4%	-2%	-2%	-1%
Austria	-4%	-4%	-3%	-2%	-2%	-1%
Belgium	-4%	-4%	-3%	-2%	-2%	-1%
Czechia	-4%	-3%	-3%	-3%	-3%	-1%
Denmark	-4%	-4%	-3%	-2%	-2%	-1%
Estonia	-4%	-4%	-3%	-2%	-3%	-1%
Finland	-4%	-4%	-3%	-2%	-2%	-1%
Germany	-4%	-4%	-3%	-3%	-2%	-1%
Latvia	-4%	-4%	-3%	-2%	-2%	-1%
Lithuania	-4%	-4%	-3%	-2%	-2%	-1%
Poland	-3%	-4%	-3%	-2%	-2%	-1%
Portugal	-4%	-4%	-3%	-2%	-1%	-1%
Slovenia	0%	0%	-3%	-2%	-2%	-1%
Sweden	-4%	-4%	-3%	-2%	-3%	-1%
Switzerland	0%	0%	-3%	-1%	-2%	-1%
The Netherlands	0%	0%	-3%	-2%	-3%	-1%
Italy	-4%	-2%	-3%	-1%	-2%	-1%
Bulgaria	-4%	-3%	-2%	-1%	-1%	-1%
Croatia	0%	0%	-2%	-2%	-1%	-1%
Hungary	-4%	-3%	-2%	-2%	-1%	-1%
Romania	-3%	-4%	-2%	-2%	-1%	-1%
Slovakia	-4%	-4%	-2%	-1%	-1%	-1%
Spain	-4%	-4%	-2%	-2%	-2%	-1%
Greece	-3%	-3%	-2%	-1%	-1%	-1%

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	-4%	-4%	-2%	-1%	-1%	-1%
Average2W	Belgium	-3%	-4%	-2%	-1%	-1%	-1%
Average2W	Bulgaria	0%	-4%	-1%	-2%	0%	0%
Average2W	Croatia	0%	0%	-1%	-2%	0%	-1%
Average2W	Cyprus	0%	0%	0%	0%	0%	0%
Average2W	Czechia	-4%	-4%	-2%	-1%	-1%	-1%
Average2W	Denmark	-3%	-4%	-1%	-2%	-1%	-1%
Average2W	Estonia	-4%	-4%	-1%	-1%	-1%	-1%
Average2W	Finland	-4%	-4%	-1%	-1%	-1%	-1%
Average2W	France	-3%	-4%	-1%	-2%	-1%	-1%
Average2W	Germany	-4%	-4%	-1%	-1%	-1%	-1%

Average2W	Greece	0%	-4%	-1%	-1%	0%	0%
Average2W	Hungary	0%	-4%	-1%	-1%	0%	-1%
Average2W	Ireland	0%	0%	0%	0%	0%	0%
Average2W	Italy	-4%	0%	-1%	-1%	-1%	0%
Average2W	Latvia	-4%	-4%	-1%	-1%	-1%	-1%
Average2W	Lithuania	-4%	-4%	-1%	-1%	-1%	-1%
Average2W	Luxembourg	0%	0%	0%	0%	0%	0%
Average2W	Malta	0%	0%	0%	0%	0%	0%
Average2W	Poland	-4%	-4%	-1%	-1%	-1%	-1%
Average2W	Portugal	-4%	-4%	-1%	-1%	0%	-1%
Average2W	Romania	0%	-4%	-1%	-1%	0%	-1%
Average2W	Serbia	0%	0%	0%	0%	0%	0%
Average2W	Slovakia	-4%	-4%	-1%	-2%	0%	-1%
Average2W	Slovenia	0%	0%	-1%	-2%	-1%	-1%
Average2W	Spain	-4%	-4%	-1%	-1%	-1%	-1%
Average2W	Sweden	-4%	-4%	-2%	-1%	-1%	-1%
Average2W	Switzerland	0%	0%	-2%	-1%	-1%	0%
Average2W	The Netherlands	0%	0%	-2%	-2%	-1%	0%
Average2W	United Kingdom	0%	0%	0%	0%	0%	0%
Average2WDF	Austria	-4%	-4%	-2%	-1%	-1%	-1%
Average2WDF	Belgium	-4%	-4%	-1%	-2%	-1%	-1%
Average2WDF	Bulgaria	0%	-4%	-1%	-1%	0%	0%
Average2WDF	Croatia	0%	0%	-1%	-1%	0%	-1%
Average2WDF	Cyprus	0%	0%	0%	0%	0%	0%
Average2WDF	Czechia	-4%	-4%	-2%	-1%	-2%	-1%
Average2WDF	Denmark	-3%	-4%	-1%	-1%	-1%	-2%
Average2WDF	Estonia	-4%	-4%	-1%	-1%	-1%	-1%
Average2WDF	Finland	-4%	-4%	-2%	-2%	-1%	-1%
Average2WDF	France	-3%	-4%	-2%	-1%	-1%	-1%
Average2WDF	Germany	-4%	-4%	-1%	-1%	-1%	-1%
Average2WDF	Greece	0%	-4%	-1%	-1%	0%	0%
Average2WDF	Hungary	0%	-4%	-1%	-1%	0%	-1%
Average2WDF	Ireland	0%	0%	0%	0%	0%	0%
Average2WDF	Italy	-4%	0%	-2%	-1%	-1%	0%
Average2WDF	Latvia	-4%	-4%	-1%	-1%	-1%	-1%
Average2WDF	Lithuania	-4%	-4%	-1%	-1%	-1%	-1%
Average2WDF	Luxembourg	0%	0%	0%	0%	0%	0%
Average2WDF	Malta	0%	0%	0%	0%	0%	0%
Average2WDF	Poland	-4%	-4%	-1%	-1%	-1%	-1%
Average2WDF	Portugal	-3%	-4%	-1%	-1%	0%	0%
Average2WDF	Romania	0%	-4%	-1%	-1%	0%	-1%
Average2WDF	Serbia	0%	0%	0%	0%	0%	0%
Average2WDF	Slovakia	-4%	-4%	-1%	-1%	0%	-1%
Average2WDF	Slovenia	0%	0%	-1%	-1%	-1%	-1%
Average2WDF	Spain	-3%	-4%	-1%	-1%	-1%	0%
Average2WDF	Sweden	-3%	-4%	-2%	-1%	-2%	-1%

Average2WDF	Switzerland	0%	0%	-2%	-1%	-1%	0%
Average2WDF	The Netherlands	0%	0%	-2%	-1%	-1%	-1%
Average2WDF	United Kingdom	0%	0%	0%	0%	0%	0%
DC	Austria	-3%	-3%	-1%	-1%	-1%	-1%
DC	Belgium	-3%	-3%	-1%	-1%	-1%	0%
DC	Bulgaria	0%	-3%	-1%	-1%	0%	0%
DC	Croatia	0%	0%	-1%	-1%	0%	-1%
DC	Cyprus	0%	0%	0%	0%	0%	0%
DC	Czechia	-3%	-2%	-1%	-1%	-1%	-1%
DC	Denmark	-3%	-3%	-1%	-1%	-1%	0%
DC	Estonia	-3%	-3%	-1%	-1%	-1%	-1%
DC	Finland	-3%	-3%	-1%	-1%	-1%	0%
DC	France	-3%	-3%	-2%	-1%	-1%	0%
DC	Germany	-3%	-3%	-1%	-1%	-1%	-1%
DC	Greece	0%	-2%	-2%	-1%	0%	0%
DC	Hungary	0%	-3%	-1%	-1%	0%	-1%
DC	Ireland	0%	0%	0%	0%	0%	0%
DC	Italy	-3%	-1%	-1%	0%	-1%	0%
DC	Latvia	-3%	-3%	-1%	-1%	-1%	-1%
DC	Lithuania	-3%	-3%	-1%	-1%	-1%	0%
DC	Luxembourg	0%	0%	0%	0%	0%	0%
DC	Malta	0%	0%	0%	0%	0%	0%
DC	Poland	-3%	-3%	-2%	-1%	-1%	0%
DC	Portugal	-3%	-3%	-2%	-1%	0%	0%
DC	Romania	0%	-3%	-1%	-1%	0%	-1%
DC	Serbia	0%	0%	0%	0%	0%	0%
DC	Slovakia	-3%	-3%	-1%	-1%	0%	0%
DC	Slovenia	0%	0%	-2%	-1%	-1%	-1%
DC	Spain	-3%	-3%	-1%	-1%	-1%	-1%
DC	Sweden	-2%	-3%	-1%	0%	-1%	0%
DC	Switzerland	0%	0%	-1%	-1%	-1%	0%
DC	The Netherlands	0%	0%	-1%	-1%	-1%	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-989	Hydrogen infrastructure	The whole pipeline section in Germany estimated initially at the level of approx. 550 km.	To be specifically determined at a later stage.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Germany. To be specifically determined at a later stage.	To be specifically determined at a later stage. To ensure appropriate protection of environmentally sensitive areas the following (i. a.) mitigation measures are expected to be applied: > Consideration of different public interests (e.g. impact on climate, conservation, water resources, soil, noise etc.) during the plan approval; > Close coordination with the nature conservation authorities for the implementation of any protective and compensatory measures; > Execution of feasibility studies (prior to the actual planning phase) to identify protected areas (nature reserves, bird sanctuaries, etc.) and	To be specifically determined at a later stage.	N/A

	corresponding assessment of the preferred route; > Early investigation of flora, fauna and nature already in the first planning stages with the aim of being able to estimate and minimize the impact as early as possible, if necessary also rerouting; > Waste will only incur in the construction phase of the project, will be eliminated immediately and will therefore not significantly harm the environment in the long-term; > Use of trenchless installation methods to protect/minimize the impact on sensitive areas; > Use of biodiesel wherever possible; > Extensive recultivation measures of the construction areas; > Shortened construction phases, in particular to keep the impact on nature to a minimum in terms of time;		

Environmental Impact explained [Promoter]

Hydrogen is an integral part of the **German** energy transition and contribute to its success. Some sectors in which process-related emissions are unavoidable will be impossible or very difficult to electrify, even in the long term. This applies to aviation, parts of heavy-duty transport, specific industries like chemical and steel production and the maritime transport, where many routes and applications cannot be operated using electricity alone. This is why the fossil input needs to be replaced by renewables-based alternatives like hydrogen. The project doing hydrogen can be considered as a hydrogen hub providing the needed infrastructure connecting different hydrogen suppliers and hydrogen consumers in eastern Germany.

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]

SoS:

- The project doing hydrogen creates an opportunity for hydrogen consumers to get their energy from multiple suppliers in eastern Germany. This will mitigate the SoS concerns from the start of an emerging hydrogen market.

Market Integration:

- The project doing is expected to be a part of the future pan-European hydrogen network connection hydrogen supplies from East Europe through its connection with the Nordic-Baltic Hydrogen Corridor (HYD-N-1310)) with supplies from West Europe (i. a. Norwegian hydrogen) through its connection with the infrastructure of Green Octopus Mitteldeutschland (HYD-A-996).

Competition:

- Doing hydrogen will trigger investments in hydrogen production capacities and in facilities on the side of hydrogen end users by providing access to the national hydrogen transport network and hence fostering competition in the market.

F. Useful links [Promoter]

Useful links:

https://www.doinghydrogen.com/en/