HI WEST 35 (Less-Advanced)

Interconnection Netherlands Germany Oude

Reasons for grouping [ENTSOG]

The project group aims at interconnecting threw a future hydrogen infrastructure, producers and consumers between the Netherlands and Germany.

The group includes investments in the Netherlands (HYD-N-468) and Germany (HYD-N-1037).

Objective of the group [Promoter]

The TSOs Gasunie and OGE are members of the European Hydrogen Backbone (EHB) initiative which provides a future vision of a fully connected European pipeline infrastructure to transport hydrogen from supply to demand centres. HNS and OGE are aiming to realize several GW cross border hydrogen transport capacity between both countries. To make this cross-border transport possible OGE and HNS are now working on the proper bilateral agreements. The network National H2 Backbone (HNS) - H2ercules Network (OGE) can establish a connection to five European countries (Norway, Netherlands, Belgium, France and Czech Republic) via pipeline. This project group is focusing on the hydrogen transport for the cross-border point Oude statenzijl.

HYD-N-468 **National H2 Backbone (Part)**

Comm. Year **2026**

HYD-N-1037 **H2ercules Network North**

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-1037	Wilhelmshaven/Dornum – Wettringen (H2ercules Network North)	New	1000	240	36 MW in Dornum and additional 16 MW in Oude
HYD-N-1037	Wettringen – Werne (H2ercules Network North)	Repurposing	800 - 1000	74	No compression planned
HYD-N-1037	Hamm/Werne – Krefeld (H2ercules Network North)	New	600	120	No compression planned
HYD-N-468	Section Scheemda-Oude Statenzijl.	Repurposing	600-900	21	-

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-468	H2_IP_DE-NL	Gasunie	Transmission Netherlands (NL Hydrogen)	Transmission Germany (DE Hydrogen)	22,5	2027
HYD-N-468	H2_IP_DE-NL	Gasunie	Transmission Netherlands (NL Hydrogen)	Transmission Germany (DE Hydrogen)	30,3	2029
HYD-N-1037	H2_IP_DE-NL	OGE	Transmission Netherlands (NL Hydrogen)	Transmission Germany (DE Hydrogen)	22,5	2027
HYD-N-1037	H2_IP_DE-NL	OGE	Transmission Netherlands (NL Hydrogen)	Transmission Germany (DE Hydrogen)	30,3	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-468	48	40%	1	40%
HYD-N-1037	1690	30%	20	30%

Description of the cost and range [Promoter]

DE (OGE): CAPEX and OPEX are based on best estimates at the time of project submission in December 2022 and might be subject to changes, e.g. due to supplier price adjustments or concretization of project scope. Cost deviations are already considered in both CAPEX and OPEX cost ranges.

NL (Gasunie): Supported by the conclusions of HyWay27, Gasunie continued with the preparations for the development of the national hydrogen network, “the hydrogen backbone”. The input in the template is based on figures from Hyway27. Since the publiciation of Hyway27, there are new developments around the backbone. The latest information, scope and timing can be found on our website: https://www.hynetwork.nl/

C. Project Benefits [ENTSOG]

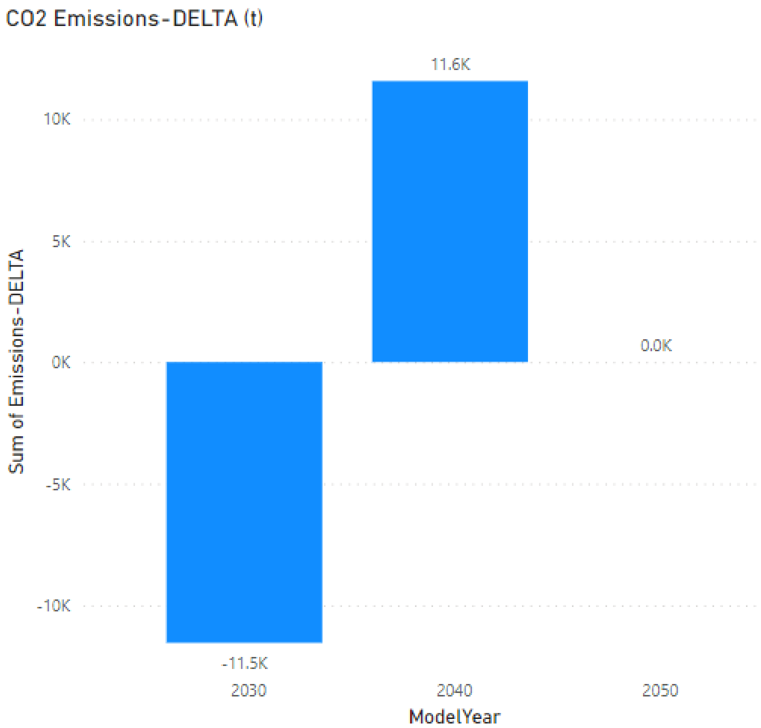
C.1 Summary of benefits

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

Sustainability benefits

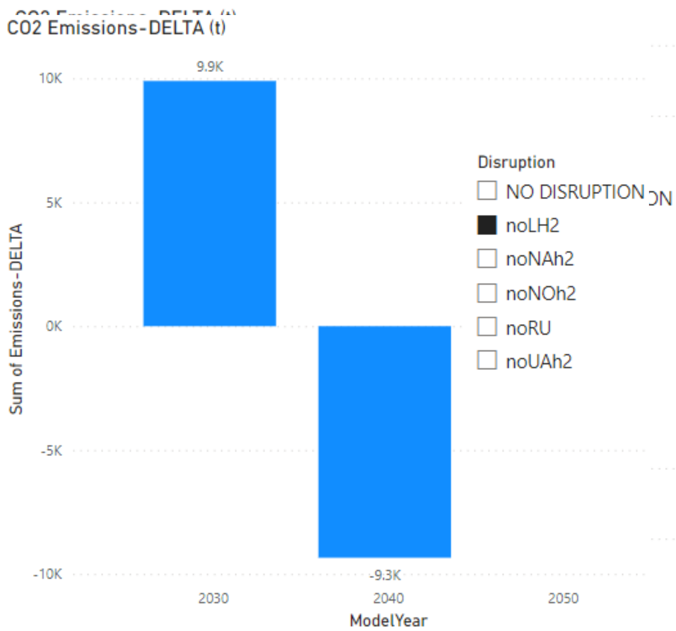
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 11,5 kt in 2030. The project group enables the transport of green hydrogen and so then replacing use of SMR's. However, in 2040, triggered by the higher hydrogen demand project group will increase overall CO2 emissions by using more SMRs and hence reduce demand curtailment.

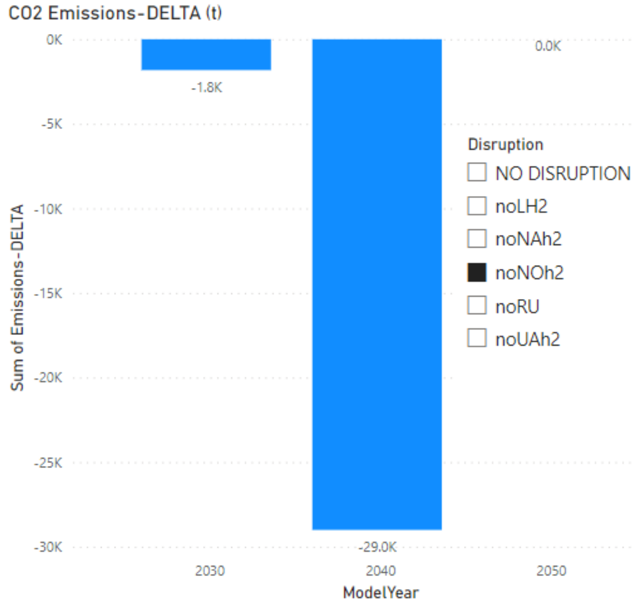


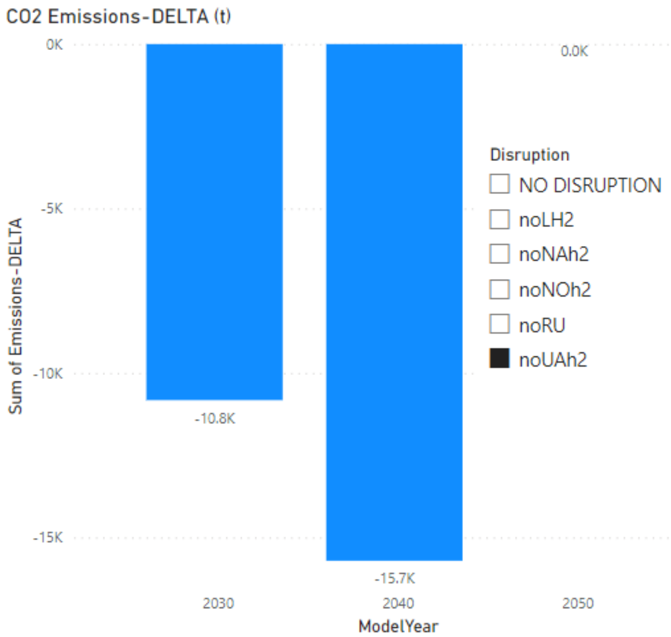
Similar trend is expected under any supply disruption.

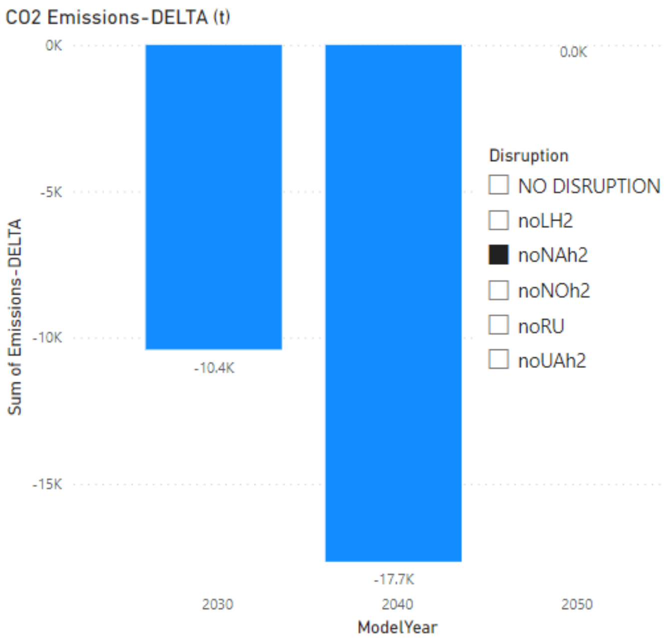
1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa disruption

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









Security of Supply:[2]

Because of competing projects groups, between the Netherlands and Germany, benefits could be limited.

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[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.*

> Reference case:

In the reference case, the project is not further mitigating hydrogen demand curtailment risk in average summer and average winter for European countries.

> Climatic stress cases:

Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the projects group is contributing to mitigate demand curtailment in the Netherlands in 2030. Moreover, in 2040, group mitigates demand curtailment in almost all the European countries.

> Disruption cases (S-1):

Similarly, under disruptions cases, projects group is mitigating demand curtailment. First in case of noLH2, group is mitigating demand curtailment in the Netherlands in 2030, then under other supplies disruptions in different countries in 2040, depending on the case.

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

1 noLH2 : LH2 disruption

2030 DE- Benefits

2040 DE- Benefits

2050 DE- Benefits

2 noNOh2 : Norway

2030 DE- Benefits

2040 DE- Benefits

2050 DE- Benefits

3 noUAh2 : Ukraine disruption

2030 DE- Benefits

2040 DE- Benefits

2050 DE- Benefits

4 noNAh2 : North Africa disruption

2030 DE- Benefits

2040 DE- Benefits

2050 DE- Benefits

> Single largest capacity disruption (SLCD):

In case of SLCD many European countries benefitting on small scale from this project group by mitigating the risk of demand curtailment from 2040 by 1-2%.

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

SLCD Benefits - 2030 - Distributed Energy

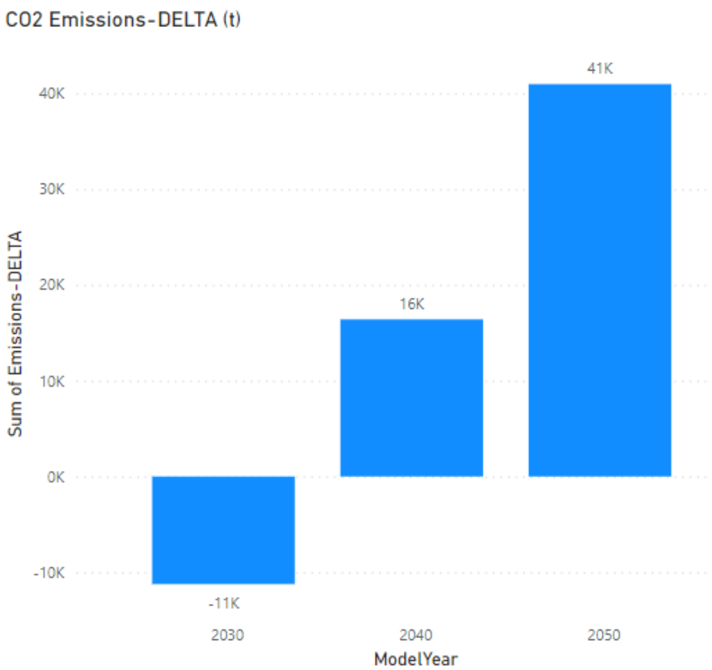
SLCD Benefits - 2040 - Distributed Energy

SLCD Benefits - 2050 - Distributed Energy

Global Ambition

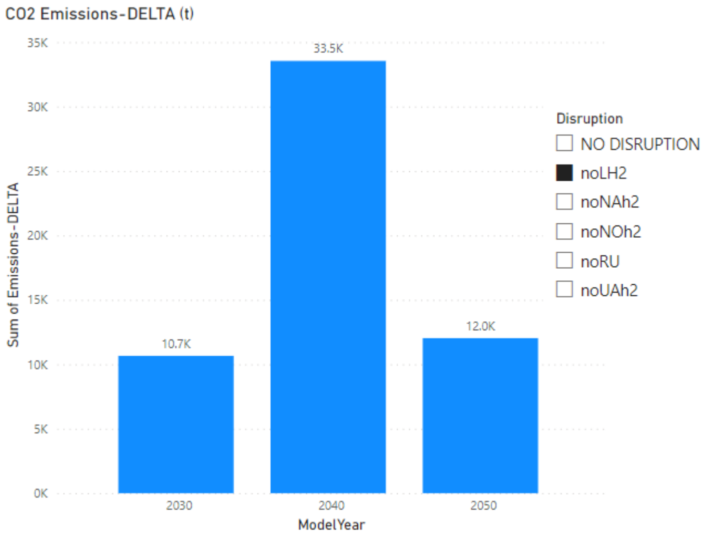
Sustainability benefits

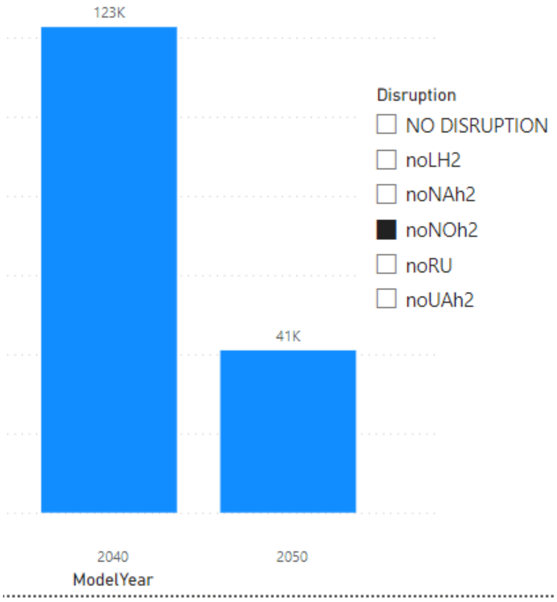
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 28 kt in 2030. The project group enables the transport of green hydrogen and so then replacing use of SMR's. However, in 2040 and 2050, triggered by the higher hydrogen demand project group will increase overall CO2 emissions by using more SMRs and hence reduce demand curtailment.

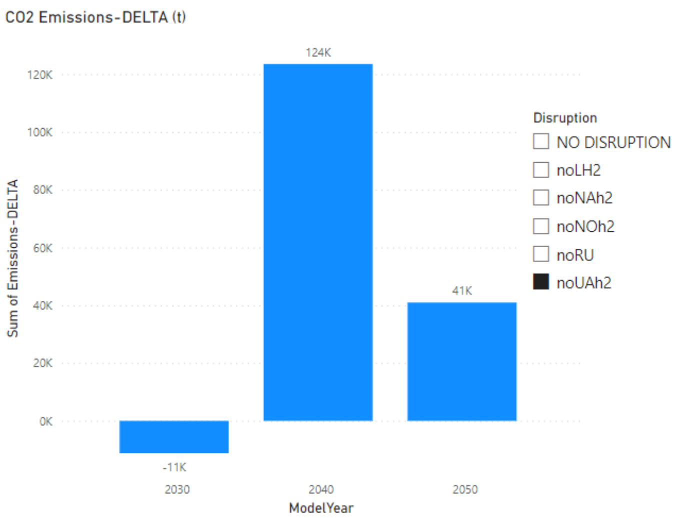


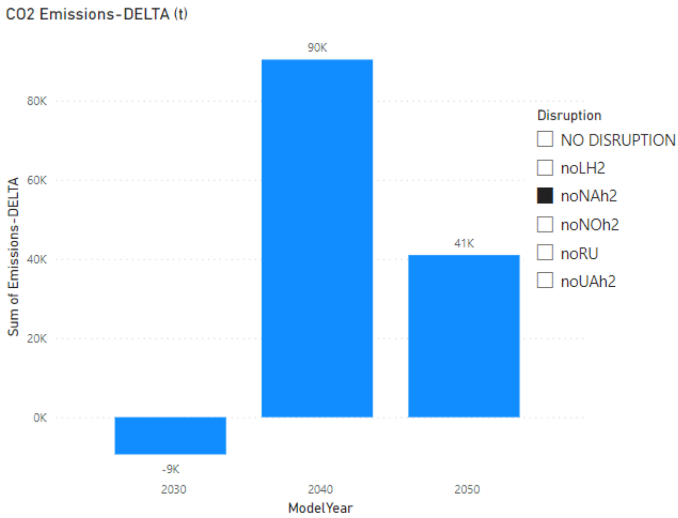
Sustainability benefits are increased under supply disruption cases, such as Norway, Ukraine, or North Africa Disruption for 2030. For example, in case of North Africa disruption the project group will reduce CO2 emissions by 100 kt in 2030.

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









Security of supply benefits

> Reference case

In the reference case, the projects group is contributing to mitigate demand curtailment in almost all European countries in 2040.

2030 GA- Benefits

2040 GA- Benefits

2050 GA- Benefits

> Climatic stress cases

Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the projects group is contributing to mitigate demand curtailment in the Netherlands in 2030. Moreover, in 2040, group mitigates demand curtailment in Denmark, Czechia and Slovenia.

2030 GA- Benefits

2040 GA- Benefits

2050 GA- Benefits

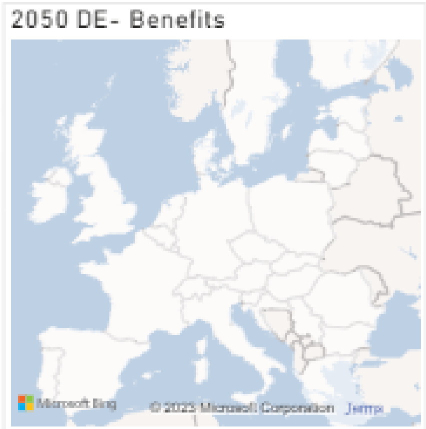
> Disruption cases (S-1)

Similarly under disruptions cases, projects group is mitigating demand curtailment. First in case of noLH2, group is mitigating demand curtailment in the Netherlands in 2030, then under other supplies disruptions in different countries in 2040, depending on the case.

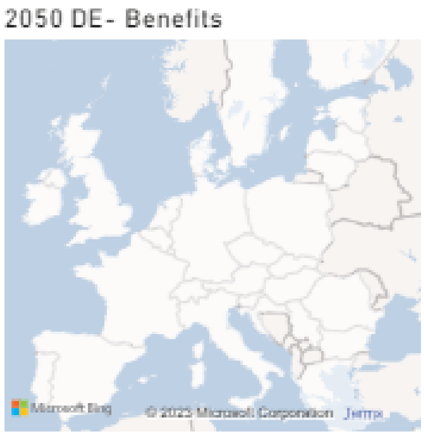
1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa disruption

1 noLH2 : LH2 disruption

2 noNOh2 : Norway



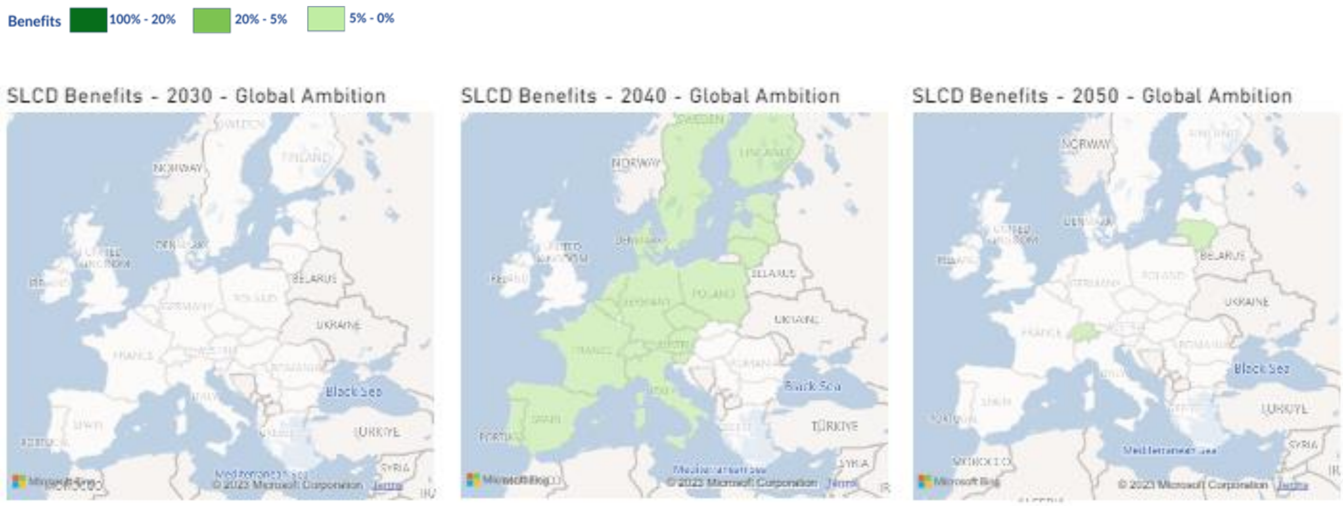
3 noUAh2 : Ukraine disruption



4 noNAh2 : North Africa disruption

> Single largest capacity disruption (SLCD):

In case of SLCD many European countries benefitting on small scale from this project group by mitigating the risk of demand curtailment in 2040 by 1-2%.



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	-11532,83	538677299	538665766,2
2030	noLH2	DE	tonne	9895,02	540175890,2	540185785,2
2030	noNAh2	DE	tonne	-10407,94	539785356,1	539774948,2
2030	noNOh2	DE	tonne	-1823,10	538877197,8	538875374,7
2030	noUAh2	DE	tonne	-10823,30	539378771,9	539367948,6
2030	NO DISRUPTION	GA	tonne	-11182,29	592910448,4	592899266,2
2030	noLH2	GA	tonne	10660,11	594817481,2	594828141,3
2030	noNAh2	GA	tonne	-9405,96	594141433,2	594132027,2
2030	noNOh2	GA	tonne	0,00	593310994,3	593310994,3
2030	noUAh2	GA	tonne	-11182,09	593627617,9	593616435,8
2040	NO DISRUPTION	DE	tonne	11564,78	392077044	392088608,8
2040	noLH2	DE	tonne	-9343,22	392213883,4	392204540,1
2040	noNAh2	DE	tonne	-17655,12	392188097,7	392170442,6
2040	noNOh2	DE	tonne	-29005,98	392144022,6	392115016,6
2040	noUAh2	DE	tonne	-15705,03	392399182,9	392383477,9
2040	NO DISRUPTION	GA	tonne	16407,77	396523251,6	396539659,4
2040	noLH2	GA	tonne	33544,67	397455196,7	397488741,4
2040	noNAh2	GA	tonne	90382,97	397301976,6	397392359,6
2040	noNOh2	GA	tonne	122625,70	397450977,1	397573602,8
2040	noUAh2	GA	tonne	123538,79	397478498,3	397602037,1
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	40975,07	228306706,5	228347681,6
2050	noLH2	GA	tonne	12033,67	228306706,5	228318740,2
2050	noNAh2	GA	tonne	40975,07	228306706,5	228347681,6
2050	noNOh2	GA	tonne	40975,07	228306706,5	228347681,6
2050	noRU	GA	tonne	40975,07	228306706,5	228347681,6
2050	noUAh2	GA	tonne	40975,07	228306706,5	228347681,6

Curtailment Rate (SLCD):

Country	2030-DE-DELTA	2030-GA-DELTA	2040-DE-DELTA	2040-GA-DELTA	2050-DE-DELTA	2050-GA-DELTA
Belgium	0%	0%	-2%	-1%	-1%	0%
Czechia	0%	0%	-2%	-2%	-2%	0%
Estonia	0%	0%	-2%	-1%	-2%	0%
Finland	0%	0%	-2%	-1%	-2%	0%
Germany	0%	0%	-2%	-1%	-1%	0%
Latvia	0%	0%	-2%	-1%	-1%	0%
Lithuania	0%	0%	-2%	-1%	-1%	-1%
Poland	0%	0%	-2%	-1%	-1%	0%
Portugal	0%	-1%	-2%	-1%	0%	0%
Slovenia	0%	0%	-2%	-1%	-1%	0%
Sweden	0%	0%	-2%	-1%	-2%	0%
Switzerland	0%	0%	-2%	-1%	-1%	-1%
France	0%	0%	-2%	-1%	-1%	0%
The Netherlands	0%	0%	-1%	-1%	-2%	0%
Austria	0%	0%	-1%	-1%	-2%	0%
Denmark	0%	0%	-1%	-1%	-1%	0%
Italy	0%	0%	-1%	-1%	-2%	0%
Spain	0%	0%	-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	0%	0%	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%	0%	0%	0%	0%	0%
Average2W	Estonia	0%	0%	0%	0%	0%	0%
Average2W	Finland	0%	0%	0%	0%	0%	0%
Average2W	France	0%	0%	0%	0%	0%	0%
Average2W	Germany	0%	0%	0%	0%	0%	0%
Average2W	Greece	0%	0%	0%	0%	0%	0%
Average2W	Hungary	0%	0%	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	0%	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%	0%	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	0%	0%	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%	0%	0%	0%	0%	0%
Average2WDF	Estonia	0%	0%	0%	0%	0%	0%
Average2WDF	Finland	0%	0%	0%	0%	0%	0%
Average2WDF	France	0%	0%	0%	0%	0%	0%
Average2WDF	Germany	0%	0%	0%	0%	0%	0%
Average2WDF	Greece	0%	0%	0%	0%	0%	0%
Average2WDF	Hungary	0%	0%	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	0%	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%	0%	0%	0%	0%	0%
Average2WDF	Switzerland	0%	0%	0%	0%	0%	0%
Average2WDF	The Netherlands	0%	0%	0%	0%	0%	0%
Average2WDF	United Kingdom	0%	0%	0%	0%	0%	0%
DC	Austria	0%	0%	0%	0%	0%	0%
DC	Belgium	0%	0%	0%	0%	0%	0%
DC	Bulgaria	0%	0%	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%	0%	0%	0%	0%
DC	Hungary	0%	0%	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	0%	0%	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%	0%	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-1037	Hydrogen pipelines (Repurposed part)	Reconstruction of existing above-ground objects or locally limited interferences	Minimal environmental impacts expected due to repurposing of pipeline or locally limited interferences.
HYD-N-1037	Hydrogen pipelines (New built part)	New construction of underground pipelines and associated above-ground facilities	The official procedures (regional planning and planning approval) are used to weigh up the environmental aspects very carefully. For this purpose, the developer prepares a spatial resistance analysis so that the potential sensitive areas (natural areas, forest, water, people, etc.) are ideally not affected at all or, if so, only minimally. In an iterative process, the environmental expert ensures that environmental concerns are always heard and taken into account during the technical planning phase.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
HYD-N-1037	Minimal environmental impacts expected due to repurposing of pipeline and or locally limited interferences and as much reduced environmental impact as possible for new built parts in accordance with applicable regulations.	detailed calculation not available yet	Not expected
HYD-N-468		detailed calculation not available yet	Not expected

Environmental Impact explained [Promoter]

DE, OGE: Within the proposed project an economically, technical, legal approval and environmentally optimal connection of hydrogen producers, storage operators, importers and consumers is achieved by converting natural gas pipelines to allow for the transport of hydrogen minimizing the environmental impact caused by the establishment of the hydrogen grid. Pipeline conversion minimizes the environmental impact of the establishment of a hydrogen grid by requiring only highly localized earth and construction works. Evidently, converting natural gas pipelines for the transport of hydrogen also significantly reduces the consumption of natural resources, providing a sustainable option for grid development making optimal use of existing infrastructure.
The necessary technical conversion of the existing natural gas infrastructure to hydrogen reduces the impact on the environment to a minimum. There will only be targeted intervention in the ground where it is absolutely necessary. In particular, sensitive areas such as Natura2000 areas, bird sanctuaries, water protection areas, landscape and nature conservation areas, nature parks and also forest areas will be protected. Sensitive soils, such as moors, are also spared as far as possible. The necessary working area is adapted according to the local environmental situation found and, for example, the construction area is placed outside sensitive areas. In addition, it can be emphasized that the small local measures can also be better timed to take into account breeding times of birds.
Pipeline projects requiring the construction of new pipelines will follow the best practices established for the construction of new gas pipelines, e.g. utilizing optimized widths of working strips in order to minimize the impact of the construction process on soil properties, flora and fauna. After completion of construction the pipeline route will be recultivated, e.g. restoring agricultural properties. Where required non-local compensation will be realized, e.g. by planting new trees if local compensation is unfeasible.

NL, Gasunie: The project will follow the strict EIA regulatory framework as required by the Dutch Ministry for Economic Affairs and Climate and will consider all environmental impact aspect during the permitting procedures. No significant harm to the environment or any negative effect on climate change will be created by the project.

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]

H2ercules Network North

Sustainability benefits:

A faster ramp-up of the hydrogen economy in Germany is more important than ever in order to drive forward the decarbonization program, put the German energy system on a more robust footing, and thus contribute towards a decarbonized security of supply. This is where the H2ercules can make a significant contribution, as it overcomes many challenges on a large scale. The ramp-up of the hydrogen market can thus reduce the use of conventional energy sources. This helps to reduce GHG emissions and to use more and more decarbonized energy. This grouping enables the transmission of hydrogen across the borders of Germany and the Netherlands. Since no hydrogen is transported on this route via pipeline today, this will be a significant increase compared to the situation prior to the commissioning of the project.

Competition, market integration, security of supply and flexibility benefits:

The project's main impact is to create new hydrogen capacities at cross-border points. The H2ercules Network North is designed to connect Norway, the Netherlands, the import terminal in Wilhelmshaven and German H2 production to the center of consumption in the Ruhr area. Additionally, it connects to H2ercules North-West and H2ercules West for onward transport to other consumption clusters in the west and south of Germany. By exchanging with the adjacent TSOs and projects, interoperability is ensured. This linkage has a positive impact on system flexibility and security of supply as well. A non-discriminatory network is established which impacts competition between market participants.

The overall H2ercules establishes direct cross-border connections to five European countries (Norway, the Netherlands, Belgium, France and the Czech Republic). In addition, the import corridors also indirectly impact the countries not directly bordering with Germany but being part of the same supply corridors.

The H2ercules Network contributes to the connection of different value chains (production, storage, demand centres). The H2ercules pipeline network will enable the connection of domestic green hydrogen production and thus connects new sources to the existing pipeline network. The H2ercules network reaches demand centres in Germany with a total demand of about 90 TWh in 2030 - that is nearly 2/3 of Germany's hydrogen demand. Furthermore, several storage facilities in the north of Germany can be connected. The H2ercules network thus makes a significant contribution to European supply security and facilitates the development of a European Hydrogen Backbone.

The H2ercules project received several Letters of Support from political stakeholders, among others:

- Federal Ministry for Economic Affairs and Climate Action
- The Ministry for the Environment, Energy and Climate Protection of the State of Lower Saxony
- Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia

Gasunie: Hydrogen is expected to make up 20-25% of the total energy demand of the EU and the UK by 2050 but infrastructure connecting H2 producers and consumers is lacking. The objective of the H2 Backbone project is to create an open access non-discriminatory national and cross-border network for hydrogen transportation. The existing natural gas network will be repurposed for H2-transport (85% of the network), with the addition of new pipes in areas where connections are not yet available. Once complete, the Dutch H2 Backbone will connect on- and off-shore H2 sources with consumers in the Netherlands, Germany and Belgium. As such, the H2 Backbone will form a vital part of the European Hydrogen Backbone and help kickstart the shift towards carbon-neutral energy in Europe.

F. Useful links [Promoter]

Useful links:

[H_2ercules (h2ercules.com)]

https://www.hynetwork.nl/

https://www.hyway27.nl/