HI WEST 16 B (Less-Advanced)

Fluxys Antwerp Ammonia Terminal

Reasons for grouping [ENTSOG]

The project group is a stand-alone terminal in Belgium. This project will enable imports of hydrogen to Belgium in 2027 (HYD-N-664).

Objective of the group [Promoter]

Antwerp being the second largest port in North-Western Europe and one of the largest chemical hubs in the world, Fluxys and Advario decided to jointly develop a first of a kind low-carbon open-access ammonia import terminal in Europe. With existing ammonia activities, Antwerp is ideally located to quickly expand its ammonia footprint and create and ammonia for H2 ecosystem enabling the market kick-start. Having such a low-carbon open-access ammonia terminal in Antwerp will accelerate the decarbonization of the local and European industrial clusters.

In addition, Fluxys has the ambition to accommodate reliable flows of hydrogen (H2) and hydrogen derivatives such as ammonia (NH3) at scale from ports to industrial hubs across Europe. Imported hydrogen (via NH3) via the terminal in Antwerp will enter the European market, leveraged by the hydrogen network of Fluxys. Through this network, imported hydrogen can be used in local Belgian demand clusters and be exported towards neighbouring countries such as Germany, The Netherlands and France.

HYD-N-664 **Antwerp NH3 Import Terminal**

Comm. Year **2027**

A. Project group technical information [Promoter/ ENTSOG]

Project technical information [Promoter]

Liquified Hydrogen Terminal

TYNDP Project code	Hydrogen carrier	H_2 Import capacity [GWh/d]	Injection capacity [GWh/d]	Storage capacity [m^3]
HYD-N-664	Fluxys Belgium	2 mtpa of NH3 / year	16.2	200000

Capacity increment [ENTSOG]

TYNDP Project code	Point name	Operator	From system	To system	Capacity increment [GWh/d]	Comm. year
HYD-N-664	LH2_Tk_BE	Fluxys Belgium and Advario	Terminal Belgium (LH2_Tk_FR)	Transmission Belgium (BE Hydrogen)	16,2	2027

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-664	300	50%	10	50%

Description of the cost and range [Promoter]

The financial assumptions and business plan build-up is driven by standard ammonia terminal projects and specific in-house knowledge. The financial numbers are subject to market conditions and commercial commitments.

C. Project Benefits [ENTSOG]

C.1 Summary of benefits

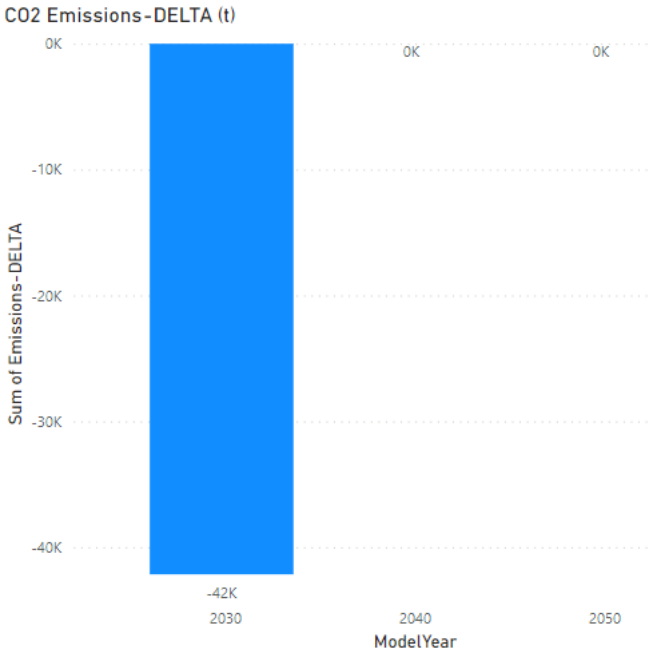
This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group. More details on the indicators are available in Annex D of TYNDP 2022[1].

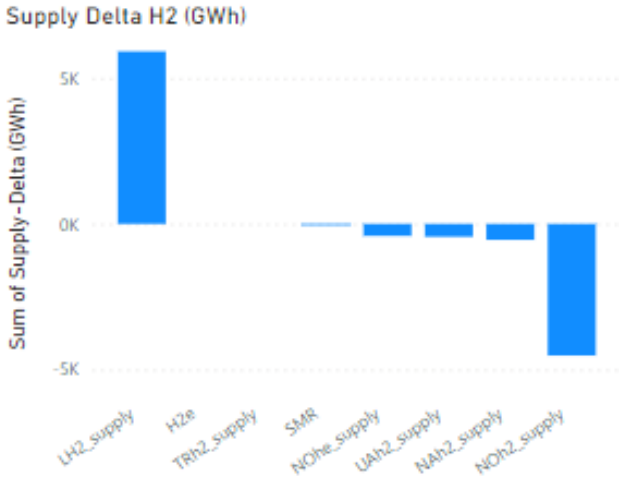
[1] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf

Distributed Energy

Sustainability benefits

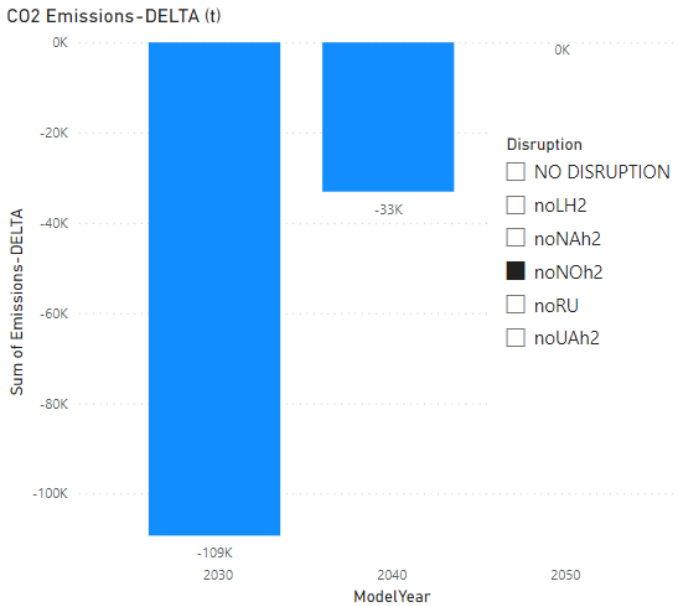
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 42 kt in 2030. The project group enables imports of green hydrogen and so then replacing use of Norwegian supply which is considered as blue hydrogen in 2030.

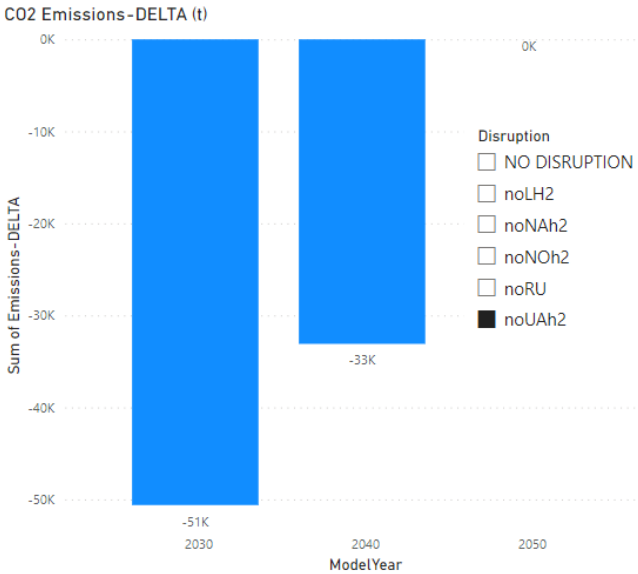


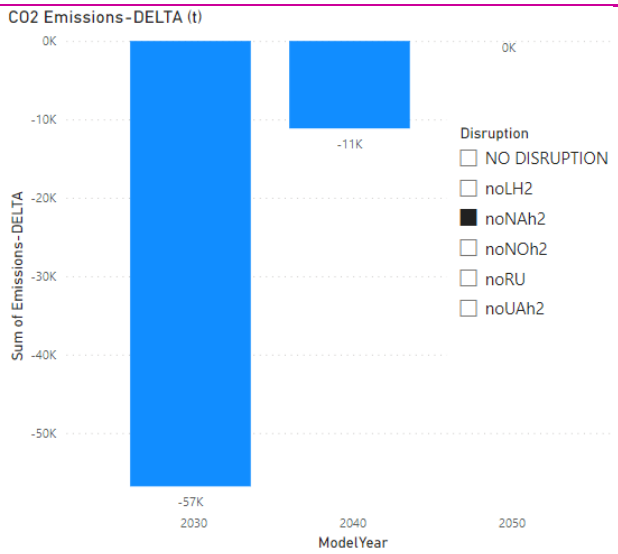


Similar trend is expected under any supply disruption in 2030 with even more benefits, up to 109 kt. In 2040, has some more sustainability by reducing the use of SMRs.

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







Security of Supply:[2]

> Reference case

In the reference case, the project is n*ot* contributing to further mitigation of hydrogen demand curtailment risk in average summer and average winter.

> Climatic stress cases

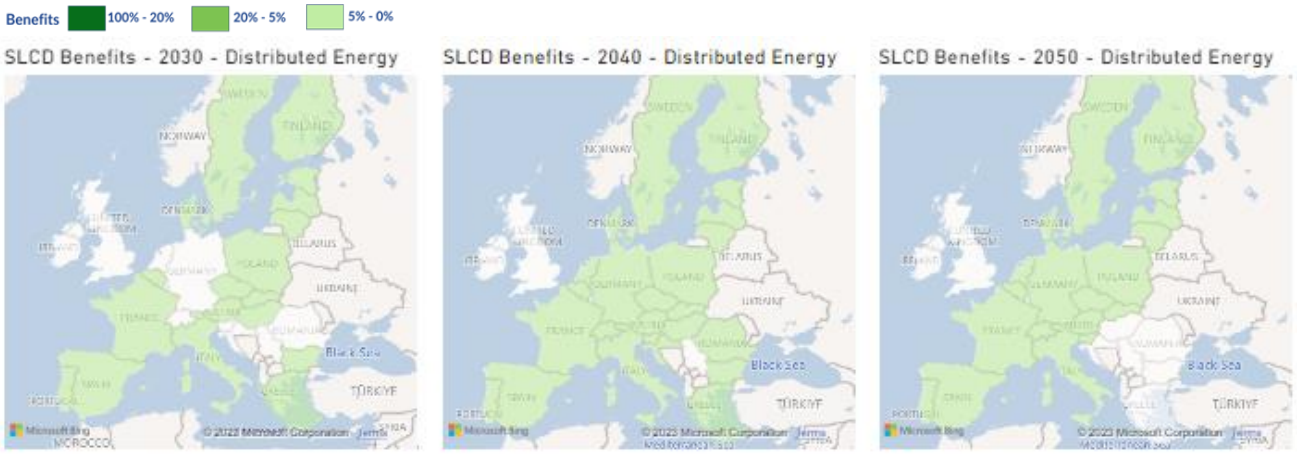
Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project group is not mitigating demand curtailment.

> Disruption cases (S-1):

Similarly, under supply disruption cases, the project group is not mitigating demand curtailment .

[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.*

> Single largest capacity disruption (SLCD):

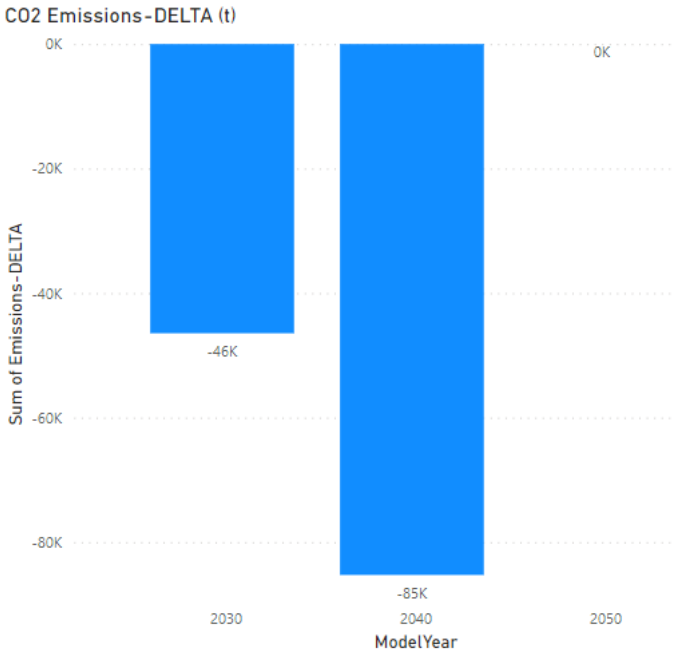


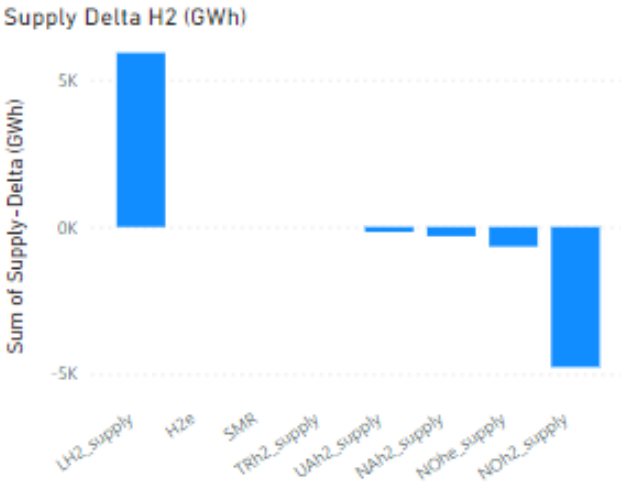
In case of single largest capacity disruption (SLCD), the project group reduces the risk of demand curtailment in almost all Europe in 2030, by 1 %. From 2040, the project has more effect on demand curtailment and reduces risk by 1-3% in all Europe.

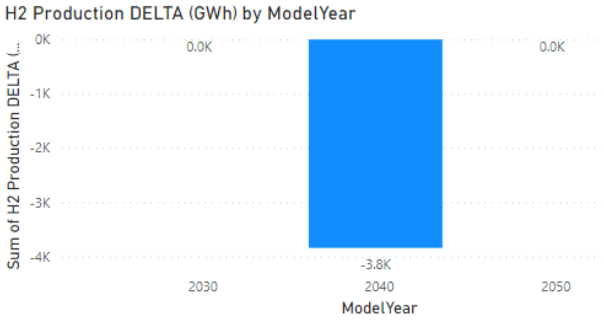
Global Ambition

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 46 kt in 2030. The project group enables the transport of green hydrogen and so then replacing use of Norwegian supply which is considered as blue hydrogen in 2030. Moreover, in 2040, as the hydrogen demand is higher, the terminal will decrease overall CO2 emissions by using less SMRs.

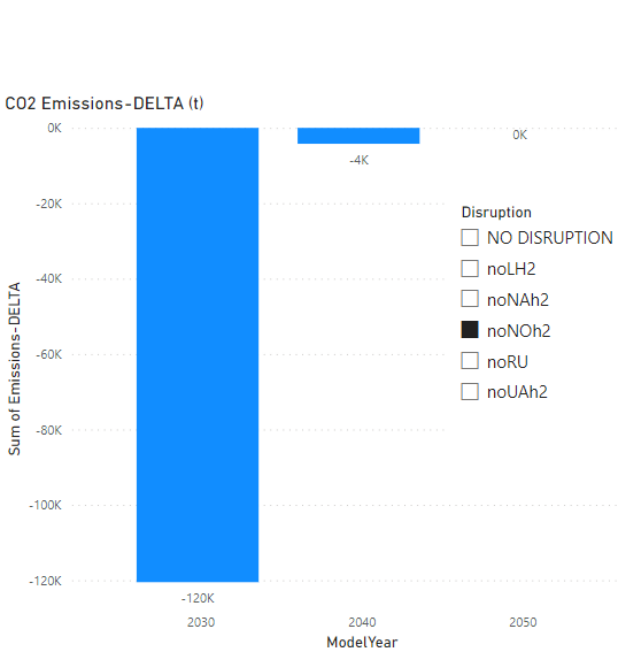


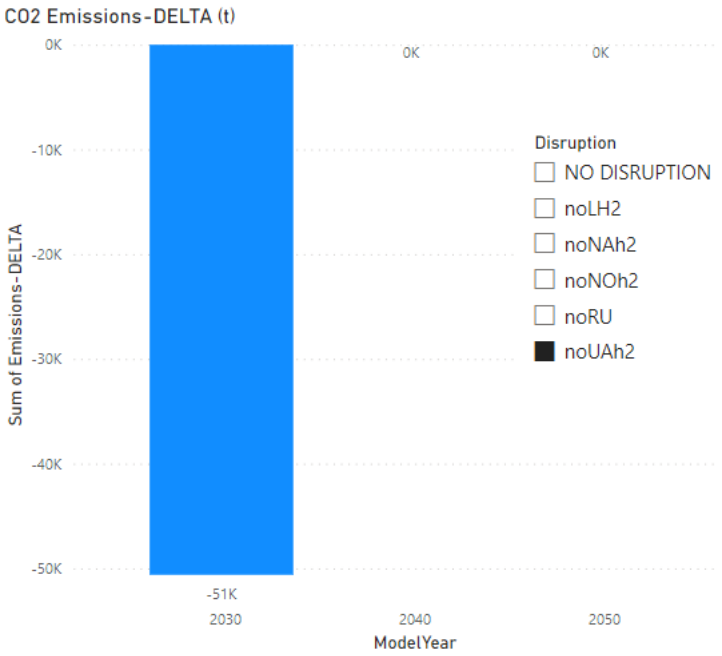


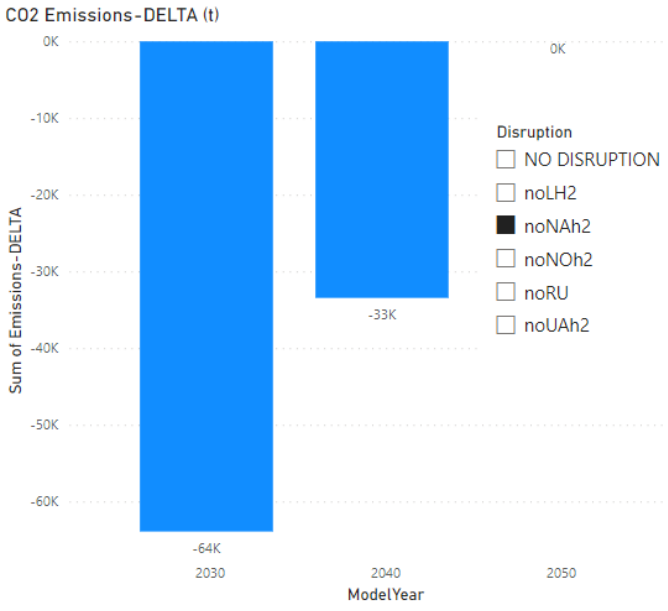


Similar trend is expected under supply disruptions.

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







Security of supply benefits

> Reference case

In the reference case, the project is n*ot* contributing to further mitigation of hydrogen demand curtailment risk in average summer and average winter.

> Climatic stress cases

Under 2 -week and 2-week dunkelflaute climatic stress case, as well as under peak day climatic case the project group is not mitigating demand curtailment.

> Disruption cases (S-1):

Similarly, under supply disruption cases, the project group is not mitigating demand curtailment .

> *Single* largest capacity disruption *(SLCD):*

In case of single largest capacity disruption (SLCD), the project group reduces the risk of demand curtailment in almost all of Europe in 2030 and 2040, by 1 %.

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	-42152,95	538677299	538719452
2030	noLH2	DE	tonne	0,00	540175890,2	540175890,2
2030	noNAh2	DE	tonne	-56802,62	539785356,1	539842158,7
2030	noNOh2	DE	tonne	-109331,24	538877197,8	538986529,1
2030	noUAh2	DE	tonne	-50611,27	539378771,9	539429383,2
2030	NO DISRUPTION	GA	tonne	-46452,32	592910448,4	592956900,8
2030	noLH2	GA	tonne	-163,10	594817481,2	594817644,3
2030	noNAh2	GA	tonne	-63920,66	594141433,2	594205353,8
2030	noNOh2	GA	tonne	-120497,80	593310994,3	593431492,1
2030	noUAh2	GA	tonne	-50611,27	593627617,9	593678229,2
2040	NO DISRUPTION	DE	tonne	0,00	392077044	392077044
2040	noLH2	DE	tonne	-1564,91	392213883,4	392215448,3
2040	noNAh2	DE	tonne	-11150,54	392188097,7	392199248,2
2040	noNOh2	DE	tonne	-33091,93	392144022,6	392177114,5
2040	noUAh2	DE	tonne	-33091,93	392399182,9	392432274,8
2040	NO DISRUPTION	GA	tonne	-85271,82	396523251,6	396608523,4
2040	noLH2	GA	tonne	0,00	397455196,7	397455196,7
2040	noNAh2	GA	tonne	-33454,71	397301976,6	397335431,4
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
Austria	-1%	-1%	-2%	-1%	-2%	-1%
Belgium	-1%	-5%	-2%	-1%	-3%	-1%
Czechia	-1%	-1%	-2%	-2%	-2%	-1%
Denmark	-1%	-1%	-2%	-1%	-1%	0%
Estonia	-1%	-1%	-2%	-1%	-2%	-1%
Finland	-1%	-1%	-2%	-1%	-2%	-1%
Germany	-1%	-1%	-2%	-2%	-1%	0%
Latvia	-1%	-1%	-2%	-1%	-1%	-1%
Lithuania	-1%	-1%	-2%	-1%	-1%	-1%
Poland	-1%	-1%	-2%	-1%	-1%	-1%
Portugal	-1%	-1%	-2%	-1%	-1%	-1%
Slovenia	0%	0%	-2%	-1%	-1%	-1%
Sweden	-1%	-1%	-2%	-1%	-2%	-1%
Switzerland	0%	0%	-2%	-1%	-1%	-1%
The Netherlands	0%	0%	-2%	-1%	-2%	-1%
France	-1%	-1%	-2%	-1%	-2%	-1%
Italy	-1%	-1%	-2%	-1%	-2%	0%
Bulgaria	-1%	-1%	-1%	0%	0%	-1%
Croatia	0%	0%	-1%	-1%	0%	-1%
Greece	-1%	-1%	-1%	0%	0%	0%
Hungary	-1%	-1%	-1%	-1%	0%	-1%
Romania	0%	-1%	-1%	-1%	0%	-1%
Slovakia	-1%	-1%	-1%	0%	-1%	-1%
Spain	-1%	-1%	-1%	-1%	-2%	0%

Curtailment Rate (Climatic Stress):

Country	2030-DE-DELTA	2030-GA-DELTA	2040-DE-DELTA	2040-GA-DELTA	2050-DE-DELTA	2050-GA-DELTA
Austria	-1%	-1%	-1%	-1%	-1%	0%
Belgium	0%	-1%	-1%	-1%	0%	0%
Bulgaria	0%	-1%	0%	-1%	0%	0%
Croatia	0%	0%	0%	0%	0%	0%
Cyprus	0%	0%	0%	0%	0%	0%
Czechia	-1%	-1%	-1%	-1%	-1%	0%
Denmark	0%	-1%	0%	-1%	0%	-1%
Estonia	-1%	0%	0%	0%	0%	0%
Finland	0%	0%	0%	0%	-1%	-1%
France	0%	-1%	0%	0%	-1%	-1%
Germany	-1%	-1%	0%	0%	0%	0%
Greece	0%	-1%	-1%	0%	0%	0%
Hungary	0%	-1%	0%	0%	0%	0%
Ireland	0%	0%	0%	0%	0%	0%
Italy	-1%	0%	0%	0%	0%	0%
Latvia	-1%	0%	0%	0%	0%	0%

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

Czechia	-1%	0%	0%	0%	0%	0%
Denmark	-1%	0%	0%	0%	0%	0%
Estonia	0%	-1%	0%	0%	0%	0%
Finland	0%	-1%	0%	0%	0%	0%
France	0%	0%	-1%	0%	0%	0%
Germany	-1%	0%	0%	-1%	0%	0%
Greece	0%	0%	-1%	0%	0%	0%
Hungary	0%	0%	-1%	0%	0%	0%
Ireland	0%	0%	0%	0%	0%	0%
Italy	0%	-1%	0%	0%	-1%	0%
Latvia	0%	-1%	0%	0%	0%	-1%
Lithuania	0%	-1%	0%	0%	0%	0%
Luxembourg	0%	0%	0%	0%	0%	0%
Malta	0%	0%	0%	0%	0%	0%
Poland	0%	-1%	0%	0%	0%	0%
Portugal	0%	0%	-1%	0%	0%	0%
Romania	0%	-1%	-1%	0%	0%	-1%
Serbia	0%	0%	0%	0%	0%	0%
Slovakia	0%	-1%	-1%	0%	0%	0%
Slovenia	0%	0%	-1%	0%	0%	-1%
Spain	0%	-1%	0%	0%	0%	0%
Sweden	0%	0%	0%	0%	0%	0%
Switzerland	0%	0%	0%	0%	-1%	0%
The Netherlands	0%	0%	0%	0%	-1%	0%
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-664	n.a	n.a	n.a

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The infrastructure project is not expected to lead to a significant increase in the emissions of pollutants into air, water or land. The NOx concerns about cracking will be kept at minimum level imposed by the Flanders region and the European Commission.
Advario and Fluxys both have extensive experience with Terminal management (LNG and Chemicals) and Advario is already managing Ammonia terminalling with best-in-class safety and environmental protection means. The terminal will be built in the Port Area of Antwerp on the location of an existing terminal with existing infrastructure limiting the environmental footprint of the project.
For the terminal will in line with the EIA Directive an environmental impact assessment or environmental screening be executed and mitigating measures will be foreseen when needed.

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]

F. Useful links [Promoter]

Useful links: