# BEMIP HYD 5 (Less-Advanced)
# Polish Hydrogen Backbone Infrastructure

## Reasons for grouping [ENTSOG]

The project group is a stand-alone transmission project, divided into two sections (HYD-N-983):

- northern and western section (2029)
- southern and eastern section (2039)

## Objective of the group [Promoter]

The project involves a nation-wide H2 grid that connects supply sources (e.g. wind farms in northern Poland and on the Baltic Sea) with industrial clusters located across the country (e.g. hard-to-abate industries). The hydrogen backbone is expected to be developed first in northern and western Poland around RES generation projects and perspective customers. The north-western section and a connection with the German H2 system is planned by 2029 to create an integrated H2 network in Central Europe. The project aimed at: unlocking the potential of renewable H2 generation in the Baltic Sea region, decarbonising industries and ensuring security of supply in an emerging market.


HYD-N-983 **Polish Hydrogen Backbone Infrastructure**

Comm. Year **2039**

# 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-983 | Polish Hydrogen Backbone Infrastructure | New and repurposed | | 2500 km | |

## Capacity increment [ENTSOG]

| TYNDP Project code | Point name | Operator | From system | To system | Capacity increment [GWh/d] | Comm. year |
|---|---|---|---|---|---|---|
| HYD-N-983 | NPcPLh2 | GAZ-SYSTEM | NPcPLh2 | PL | 5,1 | 2029 |
| HYD-N-983 | NPcPLh2 | GAZ-SYSTEM | NPcPLh2 | PL | 57,2 | 2030 |
| HYD-N-983 | NPcPLh2 | GAZ-SYSTEM | NPcPLh2 | PL | 39 | 2035 |
| HYD-N-983 | NPcPLh2 | GAZ-SYSTEM | NPcPLh2 | PL | 70,9 | 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-983 | 7623 | 80% | 152 | 80% |

### Description of the cost and range [Promoter]

The cost figures reflect initial estimation for the whole backbone in Poland of over 2500 km. CAPEX and OPEX figures were calculated based on preliminary coefficients.

The project is planned to be implemented in a step-by-step approach following market signals. Therefore, the expenditures will be spread over time and their amount will be estimated in more detail at a later stage, i.e. during feasibility studies and FEED.

# C. Project Benefits [ENTSOG]

## C.1 Summary of benefits

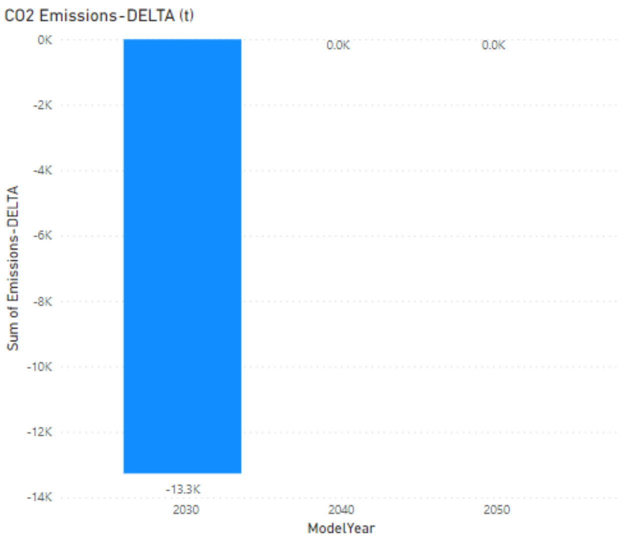
This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group. More details on the indicators are available in Annex D of TYNDP 2022[1].

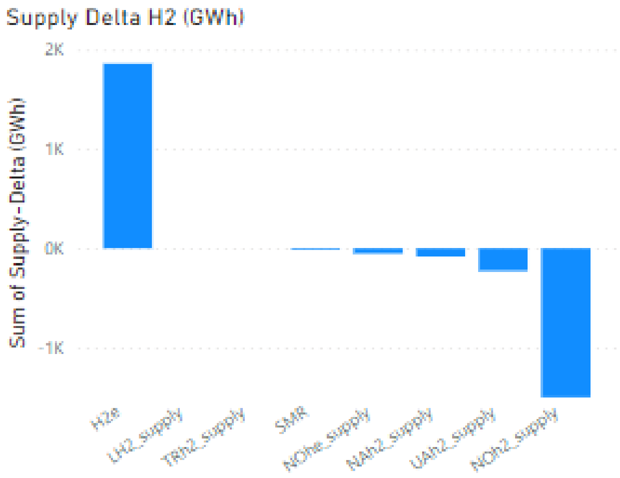
### Distributed Energy

Thanks to the project group, from 2029 and 2039, the hydrogen production in Poland will increase hydrogen supply in Poland and in the rest of the European countries. The first capacity increment to be commissioned in 2029 shows some benefits. However remaining capacity increments will be operational after 2030 and therefore will show benefits in this assessment in 2040.

### 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 13,3kt kt in 2030. Project group will enable transport of national production and therefore, will reduce blue hydrogen imports from Norway.

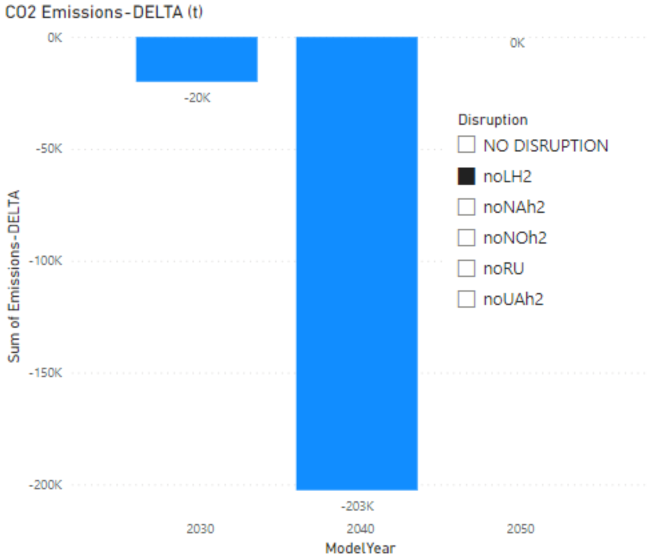


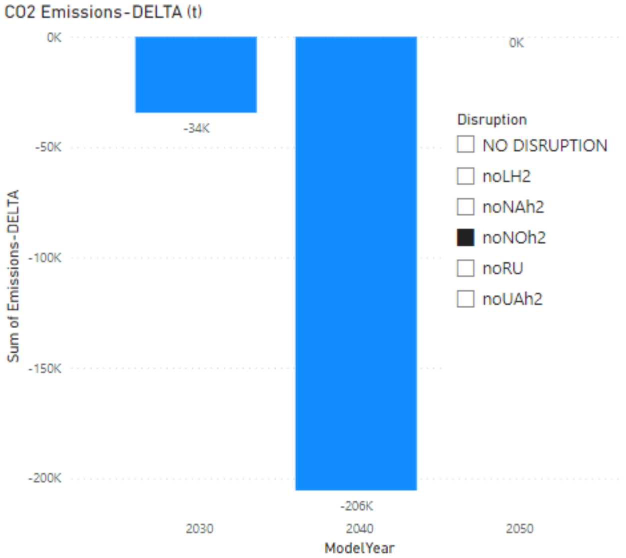



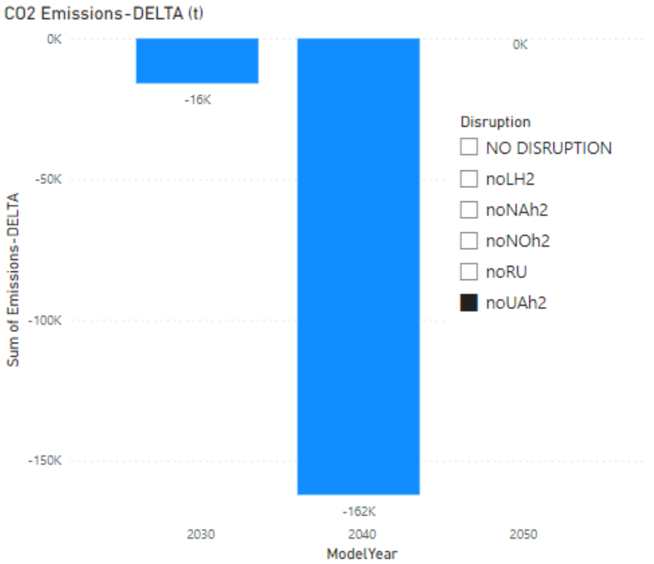

Similar benefits are expected under any disruption cases in 2030. However, more benefits are expected in 2040 up to 206kt CO2 reductions in case of Norway disruption.

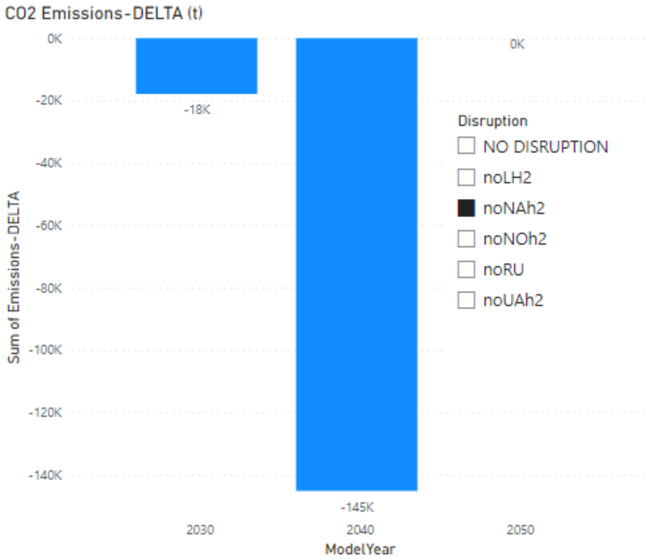
[1] https://www.entsog.eu/sites/default/files/2023-04/ENTSOG_TYNDP_2022_Annex_D_Methodology_230411.pdf

*1 noLH2 : LH2 disruption / 2 noNOh2 : Norway disruption / 3 noUAh2 : Ukraine disruption/ 4 noNAh2 : North Africa 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 mitigates the risk of hydrogen demand curtailment in almost all European countries in 2040 in average winter by 1-2% and by 2-3% in 2050. 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%. This can go up to 5% in Sweden and Finland in 2050.



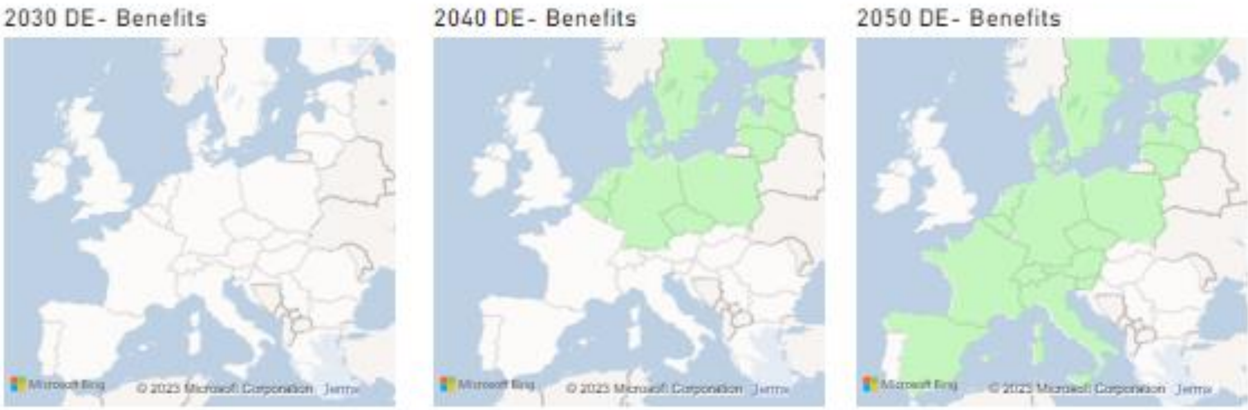

> Disruption cases (S-1):

Similarly, under supply disruption cases, the project group mitigates in the same way as climatic stress cases the risk of demand curtailment by 2-3% from 2040 and up to 5% in Sweden in 2050.

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

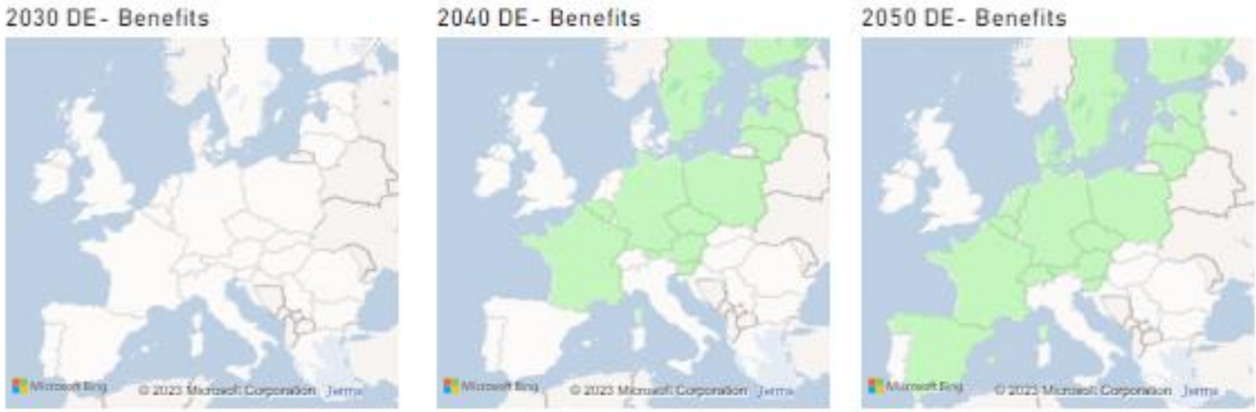
*1 noLH2 : LH2 disruption*


*2 noNOh2 : Norway disruption*




*3 noUAh2 : Ukraine disruption*

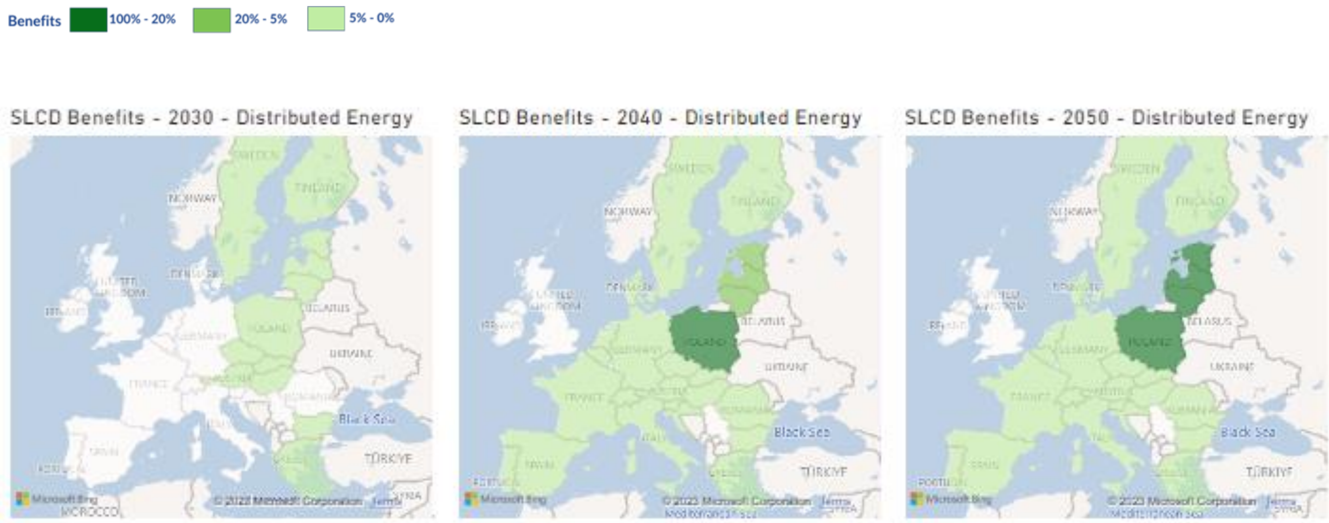

*4 noNAh2 : North Africa disruption*




> Single largest capacity disruption (SLCD):

In 2030, the projects group mitigates risk of demand curtailment in Poland, Baltic states, Finland, Sweden, Czech Republic, Slovakia, Austria, Hungary, Bulgaria and Greece.

From 2040, more benefits are expected. Indeed the projects group mitigates risk of demand curtailment in Poland by 20%, in Baltic States by 17% and in the rest of the European countries by 1%-3%. In 2050, the projects group has more benefits, mitigating risk of demand curtailment in Poland by 27% and Baltic states by 23%.

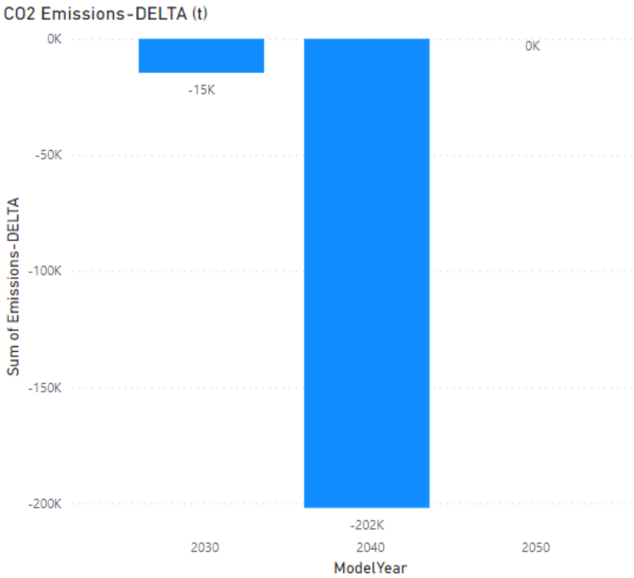


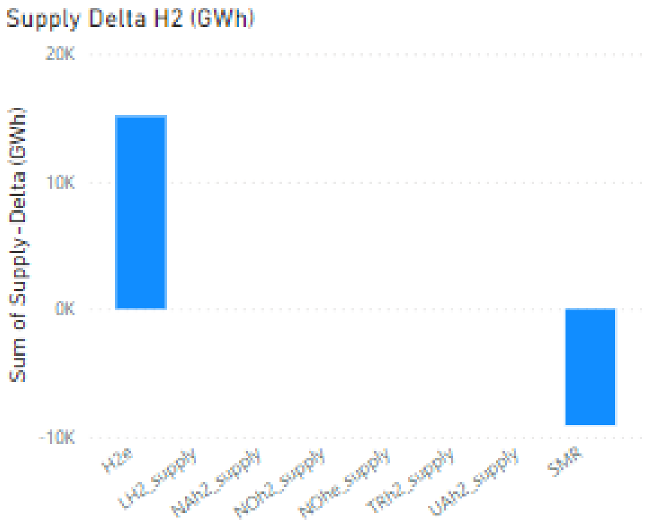
## Global Ambition

Thanks to the projects group, from 2029 and 2039, the hydrogen production in Poland will increase hydrogen supply in Poland and in the rest of the European countries.

## Sustainability

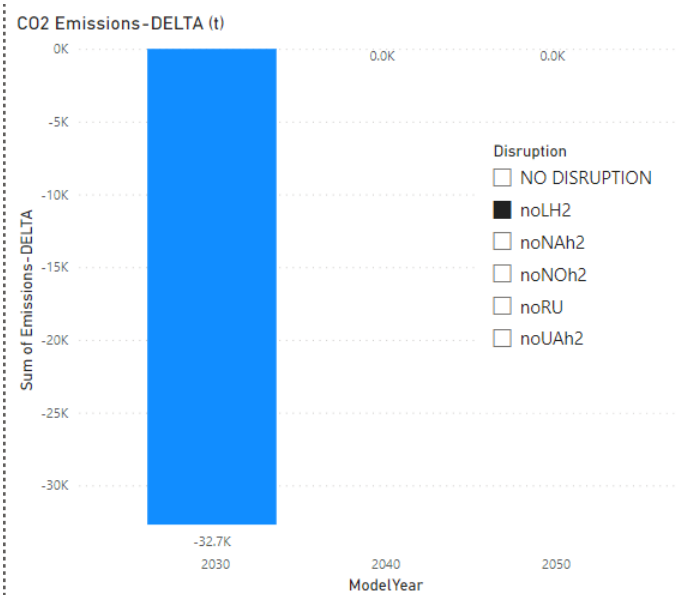
In the reference case, which analyses yearly demand in two periods (average winter and average summer), the project group will contribute to sustainability by reducing overall CO2 emissions by 15 kt in 2030. Indeed the local productions of the project will allow reductions of blue hydrogen from Norway. More benefits are expected in 2040, 202 kt of CO2 reduction by replacing use of SMR.

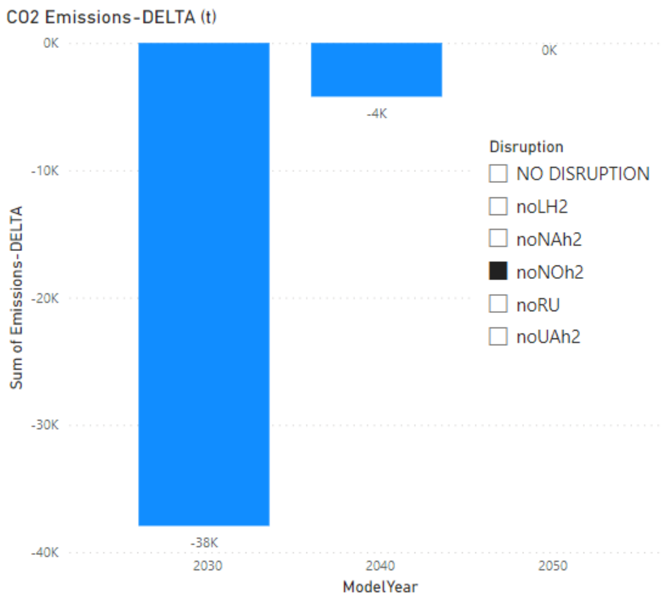


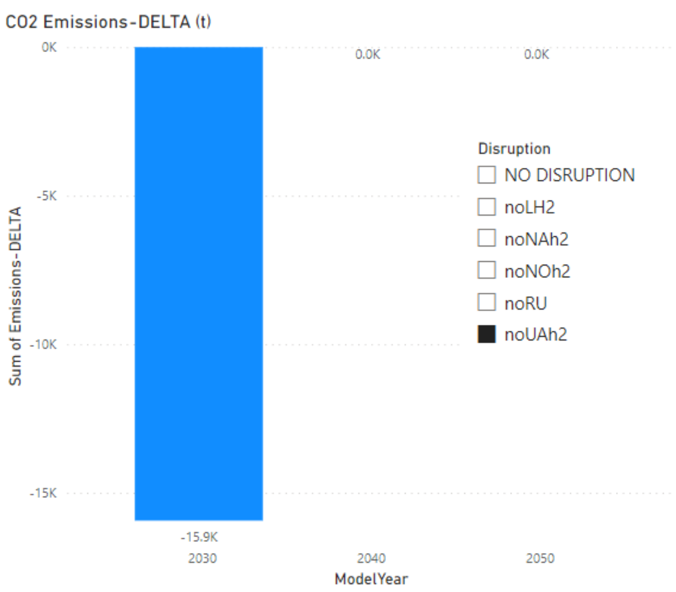



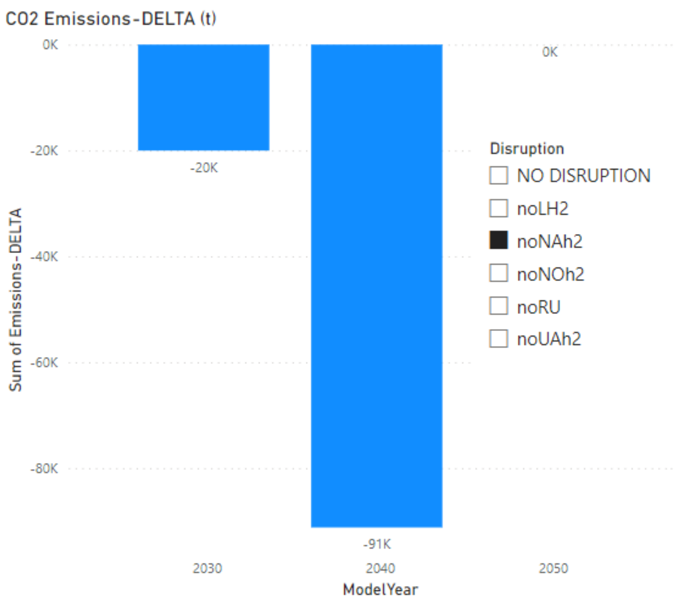

Morover project is reducing in case of any diruptions CO2 emissions.

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


### > 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 from 2040 by 1-2%.


### > 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% in 2040 and by 1-2% 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*

2030 GA- Benefits

2040 GA- Benefits

2050 GA- Benefits

*2 noNOh2 : Norway disruption*

2030 GA- Benefits

2040 GA- Benefits

2050 GA- Benefits

*3 noUAh2 : Ukraine disruption*

2030 GA- Benefits

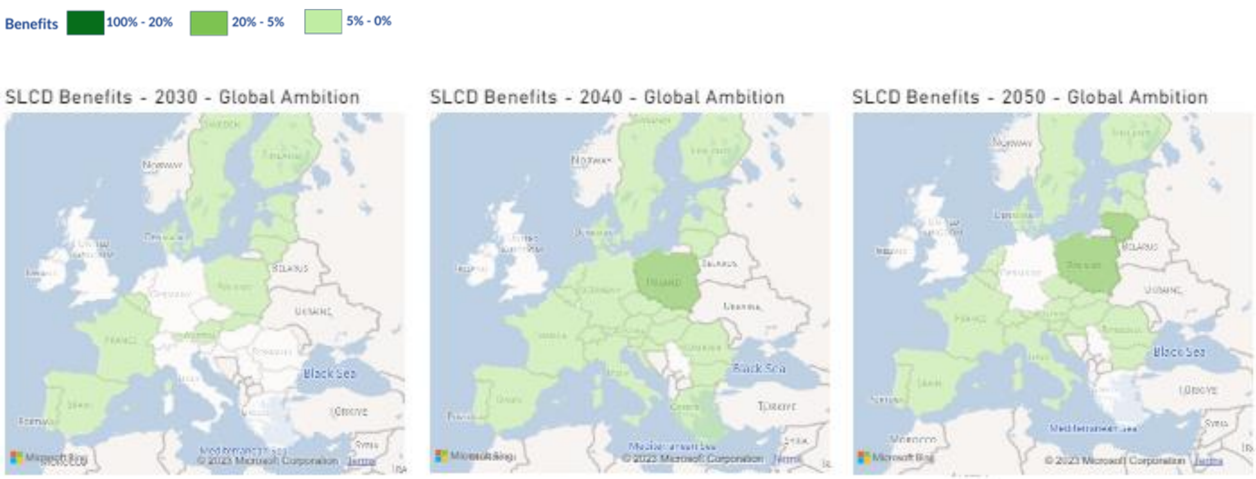
2040 GA- Benefits

2050 GA- Benefits

*4 noNAh2 : North Africa disruption*


> Single largest capacity disruption (SLCD)

In 2030, the projects group mitigates risk of demand curtailment in some countries by 1% - 2% and in 2040 in all European countries by 1% - 3% and in Poland 5% and Baltic states 4%. In 2050, the projects group mitigates risk of demand curtailment in all European countries (1%) and in Poland and Baltic states by 6%.



## 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 | -13270,37 | 538677299 | 538690569,4 |
| 2030 | noLH2 | DE | tonne | -20011,09 | 540175890,2 | 540195901,3 |
| 2030 | noNAh2 | DE | tonne | -17881,55 | 539785356,1 | 539803237,7 |
| 2030 | noNOh2 | DE | tonne | -34408,12 | 538877197,8 | 538911605,9 |
| 2030 | noUAh2 | DE | tonne | -15933,18 | 539378771,9 | 539394705,1 |
| 2030 | NO DISRUPTION | GA | tonne | -14628,82 | 592910448,4 | 592925077,3 |
| 2030 | noLH2 | GA | tonne | -32696,02 | 594817481,2 | 594850177,2 |
| 2030 | noNAh2 | GA | tonne | -20012,48 | 594141433,2 | 594161445,6 |
| 2030 | noNOh2 | GA | tonne | -37934,49 | 593310994,3 | 593348928,8 |
| 2030 | noUAh2 | GA | tonne | -15933,18 | 593627617,9 | 593643551,1 |
| 2040 | NO DISRUPTION | DE | tonne | 0,00 | 392077044 | 392077044 |
| 2040 | noLH2 | DE | tonne | -202569,67 | 392213883,4 | 392416453 |
| 2040 | noNAh2 | DE | tonne | -145175,62 | 392188097,7 | 392333273,3 |
| 2040 | noNOh2 | DE | tonne | -205544,63 | 392144022,6 | 392349567,2 |
| 2040 | noUAh2 | DE | tonne | -162099,97 | 392399182,9 | 392561282,9 |
| 2040 | NO DISRUPTION | GA | tonne | -202027,42 | 396523251,6 | 396725279 |
| 2040 | noLH2 | GA | tonne | 0,00 | 397455196,7 | 397455196,7 |
| 2040 | noNAh2 | GA | tonne | -91197,51 | 397301976,6 | 397393174,2 |
| 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 |
|---|---|---|---|---|---|---|
| Poland | -1% | -2% | -20% | -5% | -27% | -6% |
| Lithuania | -1% | -1% | -17% | -4% | -23% | -6% |
| Estonia | -1% | -1% | -16% | -4% | -22% | -5% |
| Latvia | -1% | -1% | -16% | -3% | -22% | -5% |
| France | 0% | -1% | -4% | -1% | -3% | -1% |
| Austria | -1% | -1% | -3% | -1% | -3% | -1% |
| Belgium | -1% | -1% | -3% | -1% | -3% | -1% |
| Czechia | -1% | -1% | -3% | -2% | -4% | -1% |
| Denmark | 0% | -1% | -3% | -2% | -3% | -1% |
| Finland | -1% | -1% | -3% | -1% | -4% | -1% |
| Germany | 0% | 0% | -3% | -2% | -3% | -1% |
| Portugal | 0% | -1% | -3% | -1% | -2% | -1% |
| Slovenia | 0% | 0% | -3% | -1% | -3% | -1% |
| Sweden | -1% | -1% | -3% | -1% | -4% | -1% |
| Switzerland | 0% | 0% | -3% | -1% | -2% | -1% |
| The Netherlands | 0% | 0% | -3% | -2% | -3% | -1% |
| Italy | 0% | -1% | -3% | -1% | -3% | -1% |
| Spain | 0% | -1% | -2% | -2% | -3% | -1% |
| Greece | -1% | 0% | -2% | -1% | -1% | -1% |
| Bulgaria | -1% | 0% | -1% | -1% | -1% | -1% |
| Croatia | 0% | 0% | -1% | -1% | -2% | -1% |
| Hungary | -1% | -1% | -1% | -1% | -1% | -1% |
| Romania | 0% | -1% | -1% | -1% | -1% | -1% |
| Slovakia | -1% | -1% | -1% | -1% | -2% | -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 | -1% | 0% | -2% | -1% | -2% | -1% |
| Average2W | Belgium | 0% | 0% | -2% | -1% | -2% | 0% |
| Average2W | Bulgaria | 0% | 0% | -1% | -1% | 0% | 0% |
| Average2W | Croatia | 0% | 0% | -1% | -1% | 0% | -1% |
| Average2W | Cyprus | 0% | 0% | 0% | 0% | 0% | 0% |
| Average2W | Czechia | -1% | 0% | -2% | -1% | -2% | -1% |
| Average2W | Denmark | 0% | -1% | -1% | -1% | -2% | -1% |
| Average2W | Estonia | 0% | 0% | -1% | -1% | -3% | -1% |
| Average2W | Finland | 0% | 0% | -2% | -1% | -3% | -1% |
| Average2W | France | 0% | -1% | -1% | -1% | -2% | -1% |
| Average2W | Germany | 0% | 0% | -1% | 0% | -2% | 0% |
| Average2W | Greece | 0% | 0% | -1% | 0% | 0% | 0% |
| Average2W | Hungary | 0% | 0% | -1% | -1% | 0% | -1% |
| Average2W | Ireland | 0% | 0% | 0% | 0% | 0% | 0% |

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

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

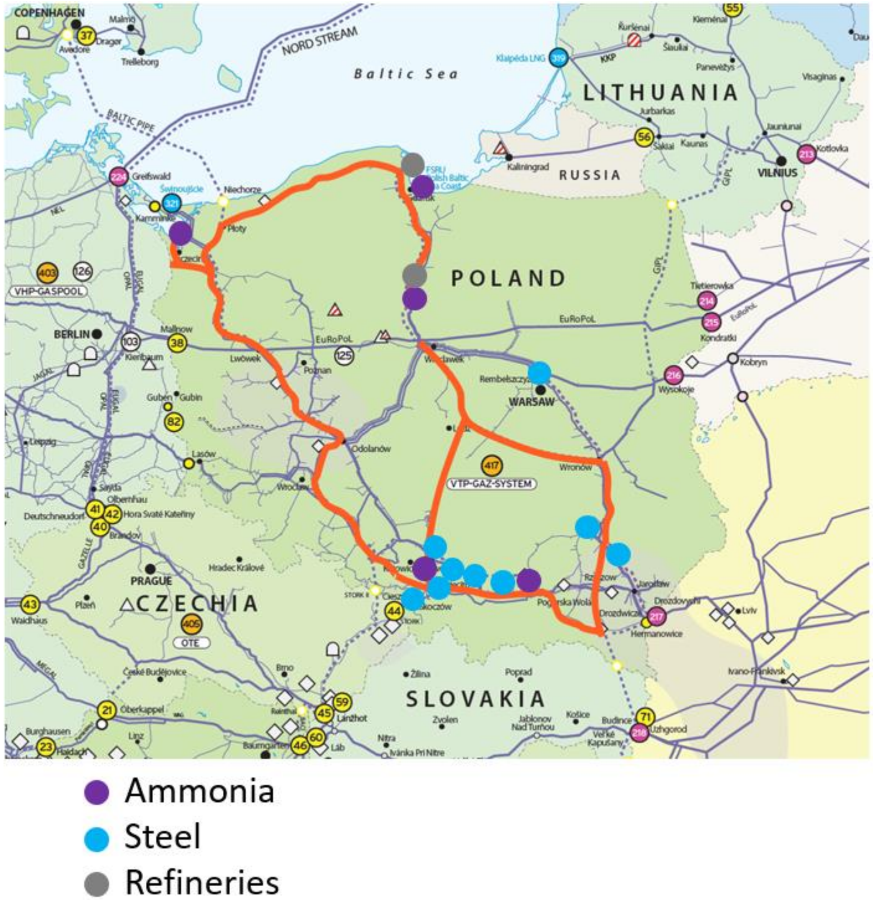
| TYNDP Code | Type of infrastructure | Surface of impact | Environmentally sensitive area |
|---|---|---|---|
| HYD-N-983 | Hydrogen infrastructure | The whole backbone in Poland estimated at the level of approx. 2500 km | To be determined at a later stage, i.e. during feasibility studies and FEED. |

| Potential impact | Mitigation measures | Related costs included in project CAPEX and OPEX | Additional expected costs |
|---|---|---|---|
| To be determined at a later stage, i.e. during feasibility studies and FEED.<br>Due to type of infrastructure all impacts are expected to occur at the construction stage as a result of: cutting down shrubs and trees, dewatering of trenches, emission of noise, air pollutions, sewages and wastes. Range of impacts will be limited to the construction site. | To be determined at a later stage, i.e. during feasibility studies, FEED, permitting process.<br>To ensure appropriate protection of environmentally sensitive areas during the construction works the following mitigation measures are expected to be applied:<br>> narrowed width of construction site in particularly valuable areas;<br>> transplantation of habitats and re-transplantation on the surface after the construction;<br>> preparing a site for construction, e.g. cutting down shrubs and trees, removing swards, beyond breeding season to protect birds; | To be determined at a later stage, i.e. during feasibility studies and FEED. | N/A |

| | | | |
|---|---|---|---|
| | > protecting the construction site with a temporary sheet piles in places, where increased amphibians' migration may occur;<br>> construction beyond 15/03 – 15/10 in breeding and wintering areas of amphibians;<br>> construction beyond breeding season of birds in a selected area;<br>> technical facilities' and storages' location i.a. out of rivers' valleys, flood areas, natural habitats, habitats of protected species, breeding and wintering areas of amphibians etc.;<br>> crossing selected habitats (i.a. rivers' valleys, forests) with a trenchless technology (e.g. HDD);<br>> construction in a wet trenches, in trenches with a sheet piles or during winter to avoid dewatering;<br>> works that cause high level of noise emission (apart from trenchless technology HDD) nearby areas requiring protection against noise will be carried out during 6am – 22 pm;<br>> supervision of hydrologist during dewatering, crossing rivers, construction nearby water intakes, reservoirs, marshy areas;<br>> environmental supervision during pipeline's construction. | | |

**Environmental Impact explained** [Promoter]

Poland is ranked in the third place in Europe in terms of hydrogen production that was at the level of approx. 1 million tonnes per year. The production was entirely allocated to cover domestic needs. Hydrogen is currently produced mostly for the purpose of fertiliser, chemical, petrochemical and coking plants. This is grey hydrogen produced mostly by using steam reforming and coal gasification.




On top of the current hydrogen consumers there is also a large industrial base in Poland that may be decarbonised using hydrogen. This concerns sectors that are considered as hard-to-abate including steel, ammonia, chemical, industries requiring high temperatures, maritime and heavy transport and district heating systems.

The map on the right-hand side illustrates the location of key hard-to-abate sectors in Poland.

The Polish section of the Baltic Sea with shallow water and very good wind conditions and inland Poland (especially the Northern part) with very good wind conditions and good insolation provides adequate conditions to generate renewable hydrogen. Based on market signals renewable hydrogen generation in Poland may increase up to approx. 62 GWh/d, thus reaching the level of the current natural gas production injected to the transmission system in Poland. Hydrogen production is expected to further rise and exceed 100 GWh/d by mid-2030 and reach the level of approx. 172 GWh/d in the perspective of 2040.

The domestically produced hydrogen, however, will be cover the demand for hydrogen in Poland. Thus, integrated hydrogen infrastructure, allowing the access to sources produced in other EU countries will be key to meet the growing needs from hard-to-abate industries in Poland.

The Polish Hydrogen Backbone Infrastructure will be connected to the Nordic-Baltic Hydrogen Corridor and the German hydrogen grid via a cross-border connection located in North-West Poland. This will allow the Polish and Central European hydrogen market players to get access to hydrogen generated in the Baltic Sea region that has the renewable potential of more than 200 GW enabling production of 470 TWh (15 590 kT/y) of renewable hydrogen.

Against this background, the Polish Hydrogen Backbone Infrastructure will be instrumental to connect domestic hydrogen producers with hydrogen offtakes, adjacent systems via the Nordic-Baltic Hydrogen Corridor and PL-DE interconnection and thus deliver required volumes of hydrogen industries present in Poland. As a result, the Polish Hydrogen backbone Infrastructure will support:

- decarbonisation of Polish industries – existing and perspective consumers of hydrogen (fertilizers and chemicals, petrochemical, steel, heavy duty transport, e-fuels, high temperature heat)
- unlocking the full potential of renewable hydrogen generation in Poland and the Baltic Sea region.

The specificity of the hydrogen infrastructure is that it must ensure stable (continuous) supplies to customers, while dependent on variable production, so the hydrogen infrastructure needs to be designed to accumulate the commodity during unfavourable weather conditions (i.e. dunkelflaute conditions) and be capable of transporting large volumes of hydrogen during production peaks (e.g. windy conditions). The shape of the Polish Hydrogen Backbone Infrastructure meets this requirement, e.g. via interoperability with German H2 grid and large transit across the Nordic-Baltic Hydrogen Corridor, as well as by providing opportunity to make full use of the storage potential of hydrogen that is particularly beneficial for power grids as it allows for renewable energy to be kept not only in large quantities, but also for long periods of time. In such perspective the Polish Hydrogen Backbone Infrastructure will help to improve the flexibility of energy systems on a regional level (Germany, Poland, the Nordic and Baltic regions) by balancing out supply and demand when there is either too much or not enough power being generated, contributing to energy efficiency improvement throughout the BEMIP region and at the EU level (as shown by the ENTSOG analyses results).

## 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 creates an opportunity for hydrogen consumers to get their energy from multiple suppliers and directions (onshore and offshore domestic producers, Finnish/Baltic Sea hydrogen and hydrogen available on the German market). This will mitigate the SoS concerns from the start of an emerging market.
- The project will support the ramp-up of the hydrogen market based on renewable sources available in the EU by unlocking the potential for intra-EU production of hydrogen. This is extremally important under the current geopolitical situation, i.e. the Russian war in Ukraine and the use of energy supplies by Russia as a measure of coercion, while the EU energy independence is in the spotlight of the EU energy policy (e.g. goals set by REPowerEU).

Market Integration:

- The Polish Hydrogen Backbone Infrastructure will contribute towards creating an integrated infrastructure in the BEMIP region/Central Europe as the scope of the project includes PL-DE interconnection in North-West Poland and it is planned to be connected to the Nordic-Baltic Hydrogen Corridor.
- Ramp-up of domestic H2 markets based on the supply potential generated by the Backbone project itself and the Nordic-Baltic Hydrogen Corridor.
- The project is expected to be a part of the future pan-European hydrogen network and particularly aims at unlocking the potential for production and use of hydrogen in the BEMIP region by enabling the transport of hydrogen to supply consumption points and industrial clusters especially in Poland, but also in Germany. The project will make a key contribution to spreading out the penetration of hydrogen in the industrial sector and integrating multiple and competitive hydrogen suppliers with consumers, what in consequence will positively affect the development of the integrated, liquid, secure and competitive hydrogen market.

Competition:

- The Polish Hydrogen Backbone Infrastructure will allow the access to multiple supply sources covering onshore and offshore domestic producers, Finnish/Baltic Sea hydrogen and hydrogen available on the German market

## F. Useful links [Promoter]

**Useful links:**

https://www.gaz-system.pl/

https://www.gaz-system.pl/en/for-media/press-releases/2023/april/03-04-2023-market-screening-procedure-for-hydrogen-ammonia-and-biomethane-projects-extended-deadline-for-questionnaire-submission-.html