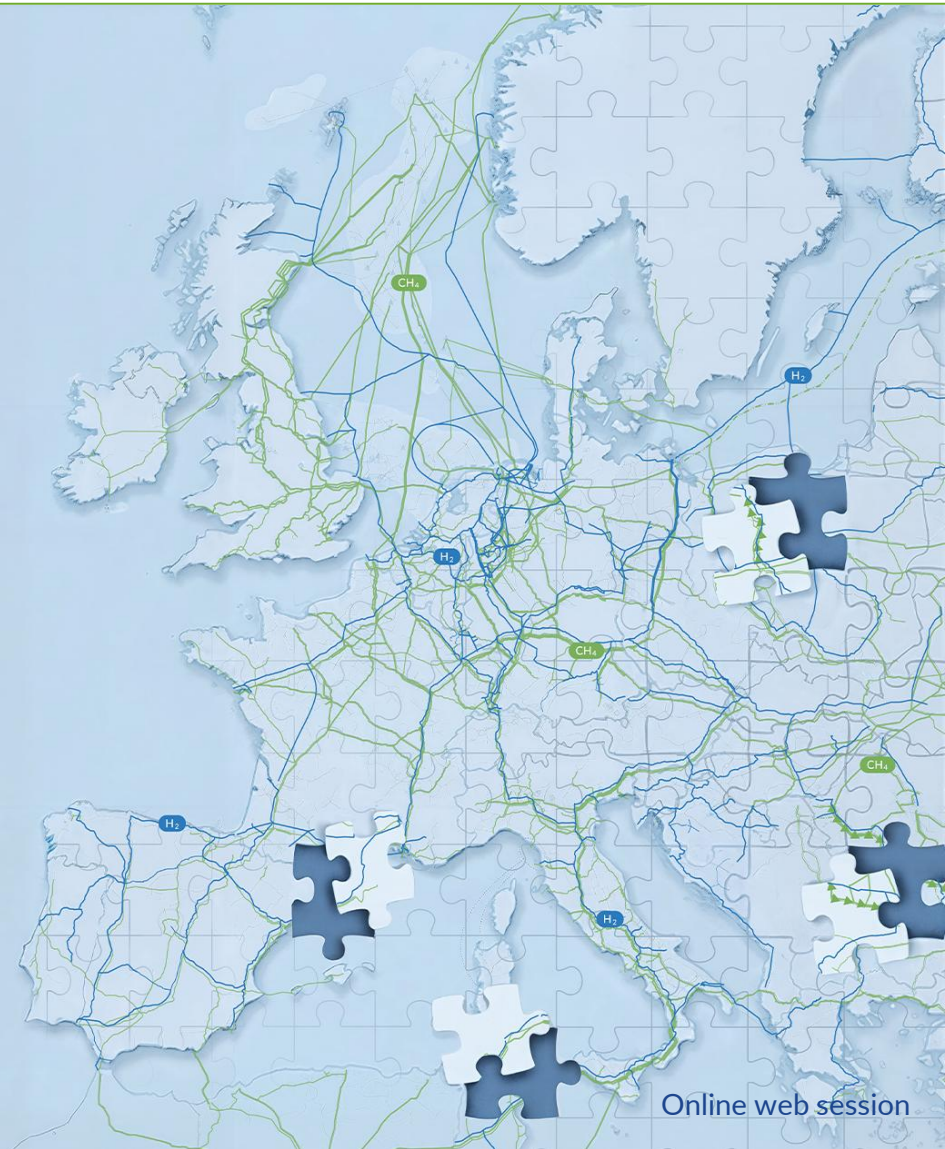
TYNDP 2026
Draft Hydrogen Infrastructure Gaps Identification report & supporting documents

Starting at **14:05**

Click here to join Slido #H2IGI
→ passcode: **gasforgood**



19 October 2026 | ENTSOG - System Development team

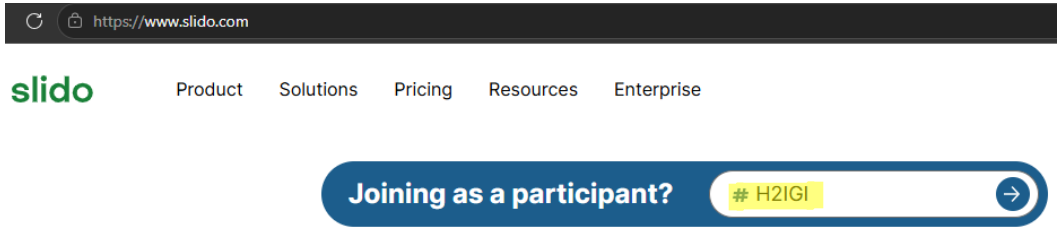
Online web session

Hybrid event house rules & agenda

For **questions**, please **ask by raising a (virtual) hand**
or write it though Slido



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The **recording** and **slides** will be made available.

Microphones are muted.
Please unmute to intervene.

Thank you!

Agenda

Topic	Presenter	Time
Introduction	Kacper Żeromski Director System Development	14:05
H2IGI context, TYNDP 2026 timeline, consulted documents & questions	Simona Marcu TYNDP PM	14:10
H2IGI: report highlights	Maria Castro Subject Manager Investment	14:20
Break	Rafail Tsalikoglou Investment Adviser	15:00
H2IGI: continuation report highlights & visualization tool	Pierre Marani Investment Adviser	15:05
Infrastructure report & visualization tool	Rafail Tsalikoglou Investment Adviser Pierre Marani Investment Adviser	15:25
Closing	Simona Marcu TYNDP PM	15:45

Please use Slido or raise your virtual hand for Q&A at the end of each session
Slido #**H2IGI** → passcode: **gasforgood**

ENTSOG's TYNDP abbreviations

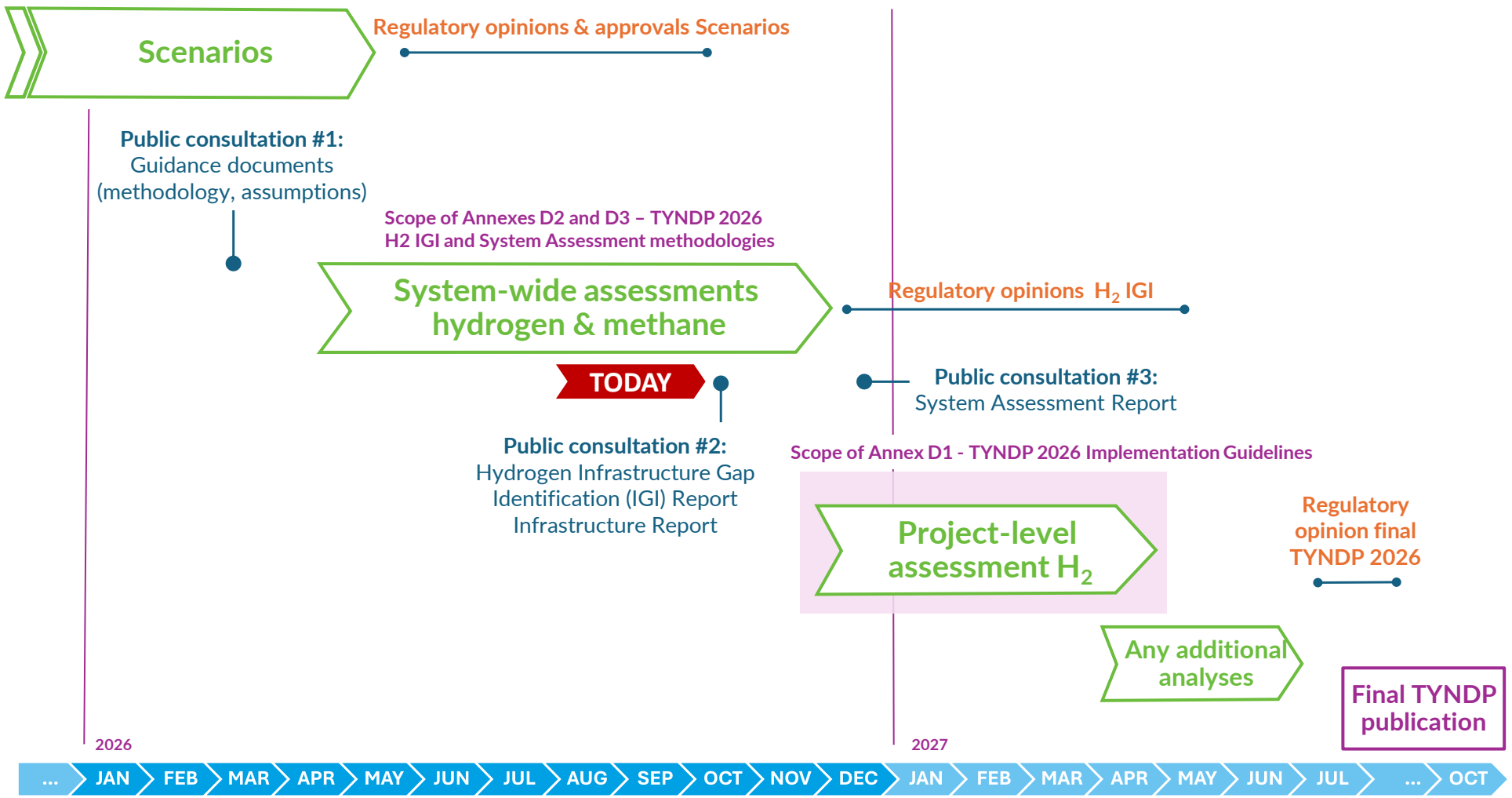

Picture courtesy of Gaz System

CD – Curtailed Demand
CDF –2 Week Cold Dunkelflaute
CODH – Cost of Disrupted Hydrogen
DC – Disruption Case
DGM – Dual Gas Model (H_2-NG)
DHEM – Dual Hydrogen Electricity Model
HDC – Hydrogen Disruption Case
IG – Implementation Guidelines
IGI – Infrastructure Gaps Identification
IL – Infrastructure Level
NECP – National Energy and Climate Plan
NG – Natural Gas
PCI – Project of Common Interest
PMI – Project of Mutual Interest
PS-CBA – Project-Specific Cost-Benefit Analysis
SA – System Assessment
SCN – Scenario(s)
SMR – Steam Methane Reformer
SLID – Single Largest Infrastructure Disruption
SSO – Storage System Operator
TEN-E – Regulation (EU) 2022/869
TSO – Transmission System Operator
WGV – Working Gas Volume
WTP – Willingness To Pay


Picture courtesy of Gaz System

H2IGI context, TYNDP 2026 timeline, consulted documents & questions

High-level TYNDP timeline, in line with the TEN-E* regulation



*Reg. (EU) 2022/869

Hydrogen Infrastructure Gaps Identification in the ENTSOG TYNDP context

Infrastructure project implemented

PCI/PMI list

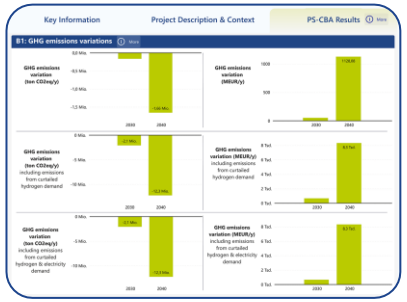
Project assessment (PS-CBA) H2 & ELY

System-level assessments: **H2 IGI** and NG SA

TYNDP Scenarios

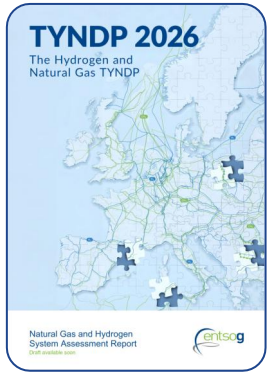


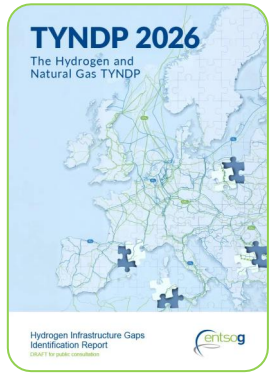
National Energy and Climate Plans (NECPs)





Under consultation
12-30 October 2026





Under consultation
12-30 October 2026

The Hydrogen Infrastructure Gaps Identification report is one of the two ENTSOG TYNDP 2026 system-level assessments

ENTSOG's TYNDP 2026 package

The TYNDP 2026 is composed of:

- **4 main reports:**



(1). Scenarios +Annexes & Methodology



(2). Infrastructure



(3). System-level assessments



- **5 annexes:**

Consultation supporting materials

  - **Annex A** – Project details
  - **Annex B** – Infrastructure Maps
  - **Annex C** – Topology & Capacities
  - **Annex D** – Guidance documents



  - **Annex E** – Analysis tables

- **Project fiches** (project assessment)

Consultation supporting materials

- **Visualisation platforms**

Available on https://tyndp2026.entsog.eu/ (TYNDP 2026), https://www.entsog.eu/tyndp (all TYNDP editions) and https://2026.entsos-tyndp-scenarios.eu/

Public consultation questions

Please reply via the online form until **Friday, 30 October**.

The form includes **4 identification** questions +

+ 8 questions on **IGI & IR** content

+ 2 questions on **gas quality**

5. What is the primary use of the H2 IGI report for your organisation? *

Enter your answer

6. Do the IGI indicators provide clarity regarding the state and possible evolution of the EU hydrogen market? Do you have any comments regarding their presentation and analysis? *

Enter your answer

7. The infrastructure level refers to a list of specific assets, assumed to be built and operating during the time horizon of the analysis. Do you find the infrastructure level considered – PCI and PMI projects – as appropriate for H2 Infrastructure gaps identification? If not, please explain why and describe which alternative infrastructure set-up would be more suitable in your view. *

Enter your answer

8. The H2 IGI report assesses hydrogen infrastructure gaps in 2030, 2035, 2040 and 2050. Does the analysis provide sufficient data to inform upcoming hydrogen-related policy decisions and investment planning by both private and public actors? Do you have suggestions for improvement? *

Enter your answer

9. The H2 IGI incudes a sensitivity analysis for the case of lower electrolyser and dedicated renewable energy production. Do you consider the choice of sensitivity adequate for perspective on long-term energy system planning? Please justify your answer. *

Enter your answer

10. Do you have any further comments on the quality, clarity and length of the materials? Do you have suggestions to improve? *

Enter your answer

11. Which, if any, changes would you make to the structure of the H2 IGI report or the Infrastructure report?

Enter your answer

12. Do you have any other remark regarding the H2 IGI Report, the Infrastructure report or the supporting documents? If yes, please specify.

Enter your answer

13. Do you expect the Wobbe Index (WI) and Gross Calorific Value (GCV) of gas supply sources to Europe to evolve significantly in the upcoming years? If yes, please describe the expected trends and the main drivers. *

Enter your answer

14. Besides WI and GCV, are there any other gas quality parameters that ENTSOG should consider assessing in future editions of the Gas Quality Outlook? Please indicate the parameters and explain their relevance. *

Enter your answer

Your feedback: from TYNDP 2024 to 2026

TYNDP cycles

TYNDP 2026
JOINT H_2 & NG

- **Selection of target-years**
- **Curtailment emission factors** – updated for both H2 and electricity
- Refined **disruption cost assumptions**
- **Unlimited infrastructure sensitivity assumptions** – assess storage and transport infrastructure separately, instead of sequentially
- **Scenario sensitivities:** lower renewable-electricity supply also included in IGI
- **Electrolysed with dedicated RES** expanded to several countries

TYNDP 2028
NG

- **Carry over** and adapt all applicable feedback from H2 simulations
- **Biomethane :** examine supply potential in greater detail
- **Climate assumptions**: explore further refinements + broaden pathways

Sources:
Public consultation report on ENTSOG's guidance documents for TYNDP 2026
Public consultation report of ENTSOG's draft Hydrogen Infrastructure Gaps Identification Report for TYNDP 2024

H2IGI report – results & analysis



Context

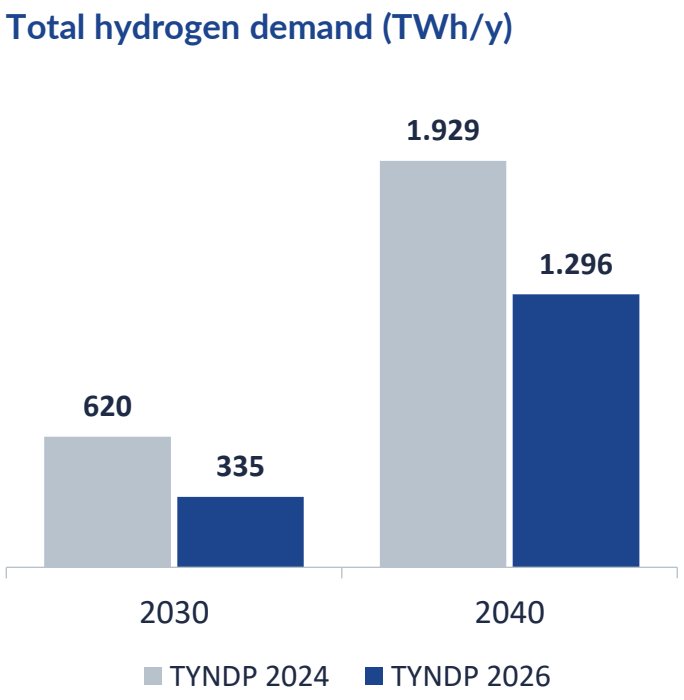
- → Infrastructure Gap Identification is developed under requirement of **article 13 TEN-E Regulation**
- → Developed within the framework of **ENTSOG TYNDP 2026**
- → Based on the **National Trends+ Scenario** (TYNDP 2026 Draft Scenario Report)
- → the Hydrogen TYNDP shall identify cross-border hydrogen infrastructure gaps to implement the TEN-E priority corridors for hydrogen and electrolysers
- → Infrastructure gaps potentially affecting the fulfilment of the Union's 2030 climate and energy targets and its 2050 climate neutrality objective
- → Stakeholder consultation (12-30 Oct)
- → Follows **Annex D2 Hydrogen IGI Methodology** (TYNDP 20226)

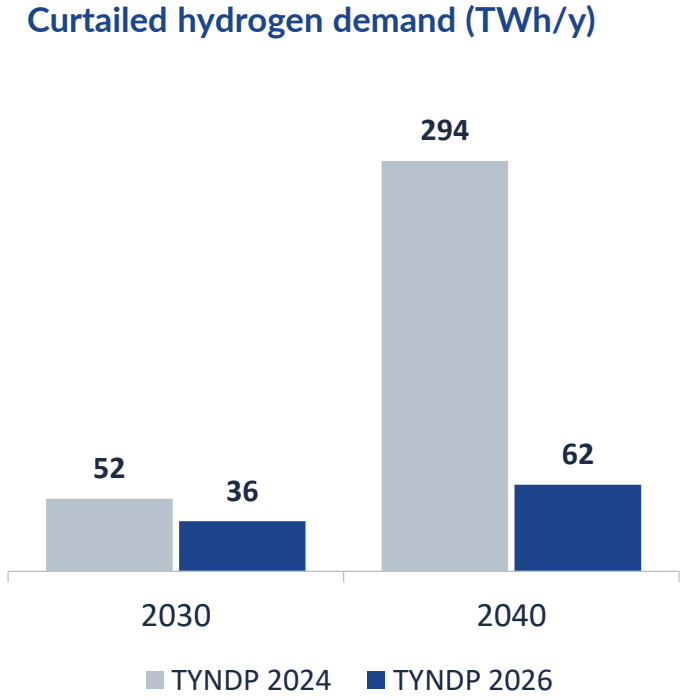
Context

What changed?

- → **More target-years:** 2030, 2035, 2040 and 2050 (compared to 2030 and 2040 in TYNDP 2024)
- → **Narrower scope:** PCI/PMI level only
- → **No stress weather year:** indicator 2.2 removed, (based on ACER and the EC suggestions)
- → **Lower demand:** coming from SCNs

IGI TYNDP 2024 vs TYNDP 2026



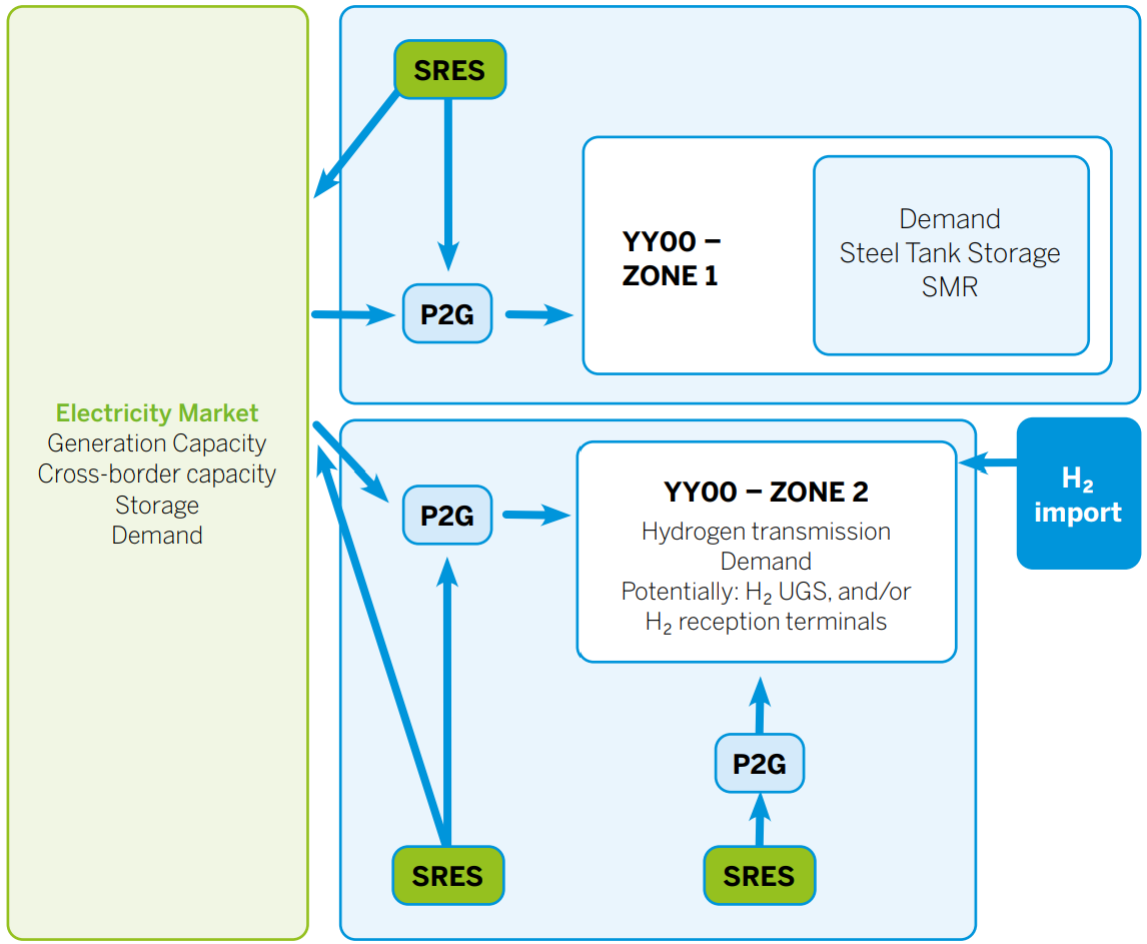


Different assumptions but same structural findings:

Germany as main demand and transit hub, supply from Iberia, the Nordics, North Africa and Ukraine, and Central and South-Eastern Europe as vulnerable regions

Modelling in the IGI

Dual Hydrogen-Electricity Model (DHEM)



Electricity and Hydrogen systems in the DHEM

- **Hydrogen Zone 1**

  Hydrogen supply, demand and storage that can be linked without requiring connection to the main hydrogen transmission infrastructure

- **Hydrogen Zone 2**

  Represents the main hydrogen transmission infrastructure

Installed P2X and SMR capacities

Inelastic hydrogen demand

Hydrogen-based power plant capacities

All information about the electricity system

Sourced from TYNDP 2026 NT+ scenario

Assumptions applied to Low P2X and RES sensitivity

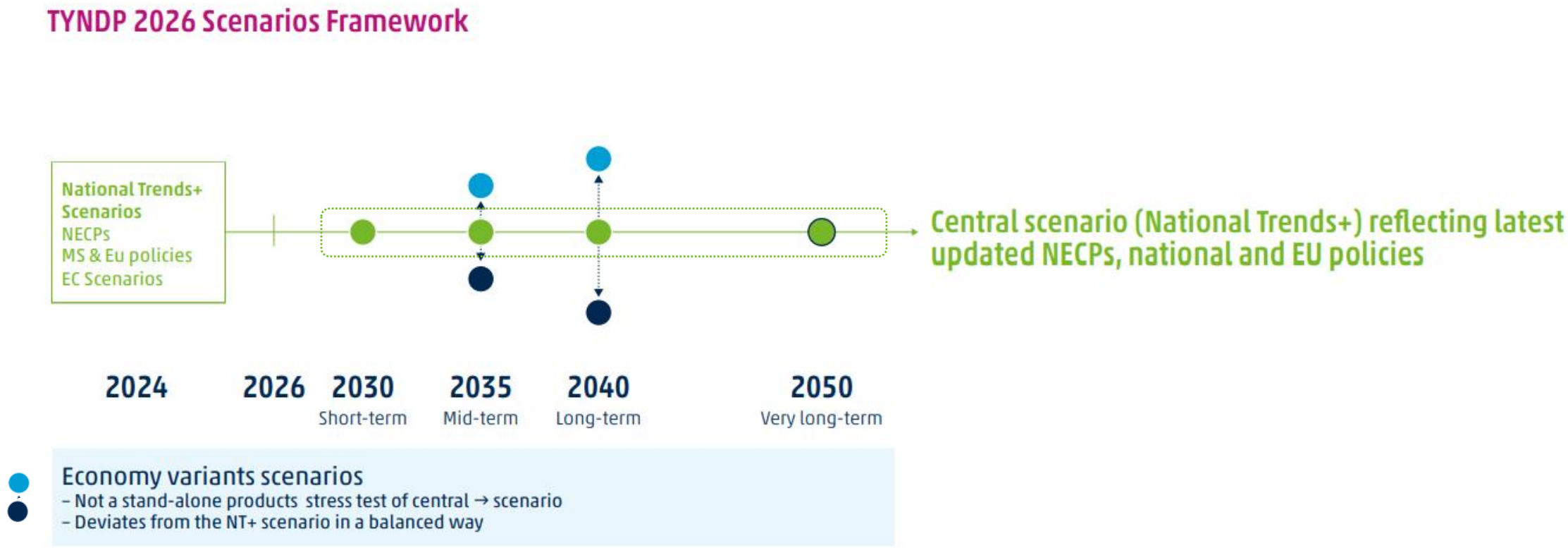
Sourced IGI 2026

Modelling: merit order in the IGI

Market assumptions		2030	2035	2040	2050	Description
Hydrogen production prices (unit: €/MWh H_2 GCV)	Hydrogen production from renewables	0.28	0.28	0.28	0.28	
	Hydrogen production from nuclear	19.55	19.27	19.00	18.24	Hydrogen produced by water electrolysis using electricity from nuclear energy. If the electricity price is higher in the relevant bidding zone, also the hydrogen production cost will be higher.
	Hydrogen production from natural gas with CCS	49.44	50.32	61.94	70.41	Hydrogen produced by SMR or ATR with CCS to capture and store 90% of the CO_2. Prices include CO2 emission cost (ETS) Zone 2 production in the following countries: BE, DE, FI, FR, IT, NL and UK.
	Hydrogen production from natural gas without CCS	63.83	80.81	100.92	–	Hydrogen produced by SMR or ATR without CCS Zone 1 production in the following countries DE, LT and PT
	Pyrolysis	70.08	67.59	82.45	96.03	Hydrogen produced by methane pyrolisis Zone 2 production in FI
Hydrogen import prices (unit: €/MWh H_2 GCV)	North Africa (Algeria/ Tunisia)	90.90	87.33	84.78	81.21	Estimated base price per import source
	Ukraine	209.18	157.99	139.80	121.51	Estimated base price per import source
	Liquid imports	191.58	178.57	167.01	153.83	Assumed liquid imports in form of ammonia

Market assumptions considered in the IGI are **based on TYNDP 2026 Draft Scenario Report**

TYNDP 2026 Scenario horizon and framework



The IGI 2026 is based on the Central scenario National Trends (+)

IGI: base case & sensitivities

→ **Base case:** assessment PCI/PMI IL from 2030 to 2050

→ Includes **two sensitivity analysis:**

Unlimited infrastructure



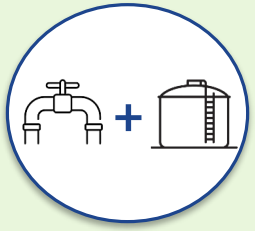
Cross-border capacities (UP)



Storages (US)



Import capacities and supply (UI)



Cross-border capacities & Storages (UPS)

NEW

Low P2X & Res

→ **P2X capacity** reduced by 10%

→ **Efficiency P2X** reduced by 10%

→ **RES associated with P2X production** reduced proportionally:

- **Dedicated RES and shared RES:** 10% capacity reduction in the hourly rating
- **E-market RES:** volatile RES per-country reduction

Two complementary IGI Indicators

→ **Indicator 1: Hydrogen demand curtailment**

Identifies countries where hydrogen demand cannot be fully satisfied.

- Threshold: Yearly average hydrogen demand curtailment rate above 0%

→ **Indicator 2: Market-clearing price spreads**

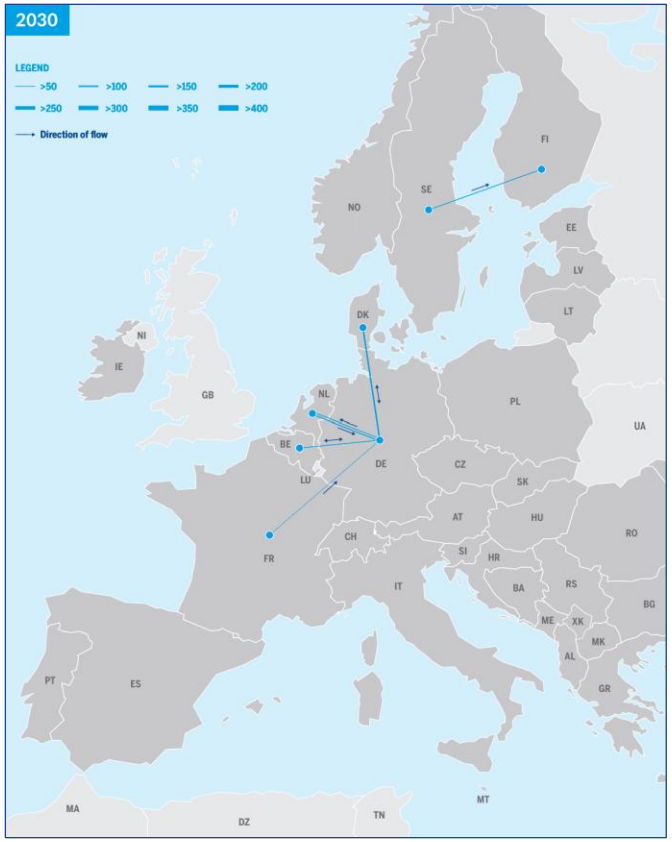
Identifies persistent price separation between Zone 2 nodes in different countries.

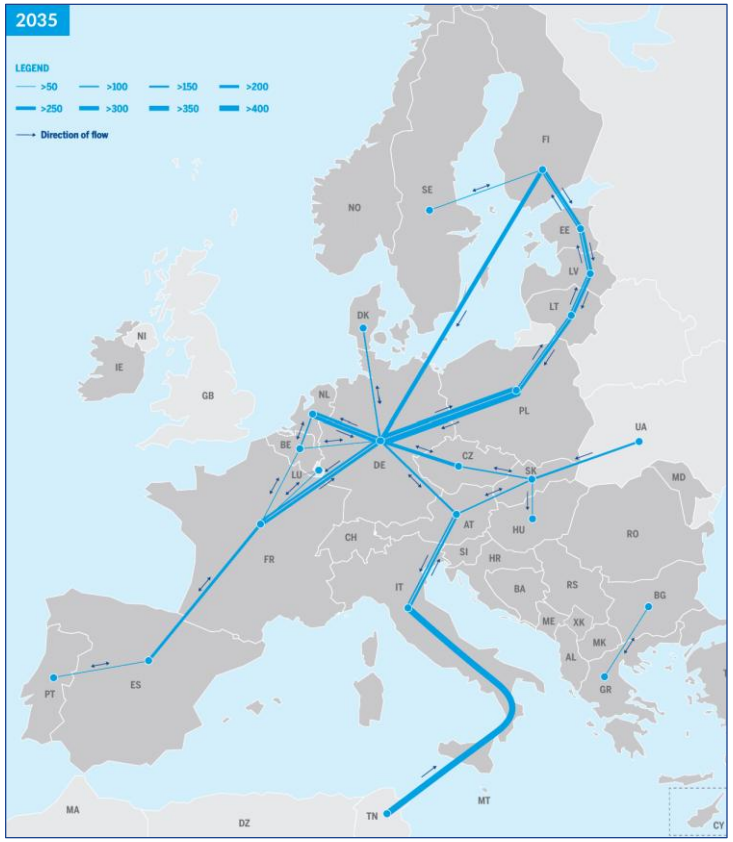
- Threshold 1: Annual average absolute hourly price spread above €2/MWh
- Threshold 2: Absolute average daily price spread above €20/MWh for more than 40 days per year

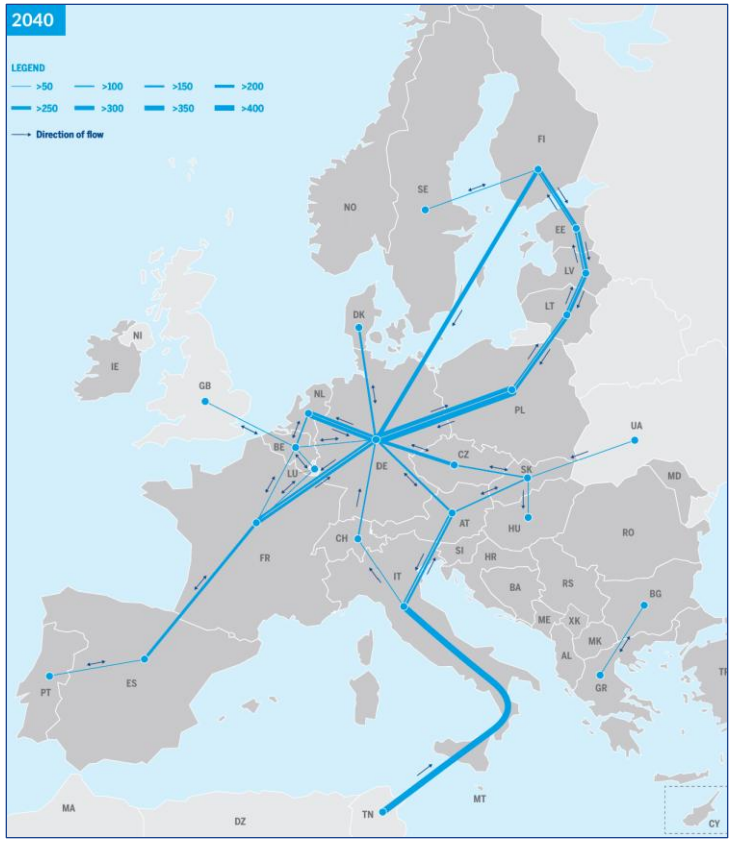


The indicators **must be interpreted together**

Hydrogen infrastructure in the IGI







Development of hydrogen cross-border and import capacities in the PCI/PMI IL: **2035 EU-backbone emerges**

Or click here to join

or

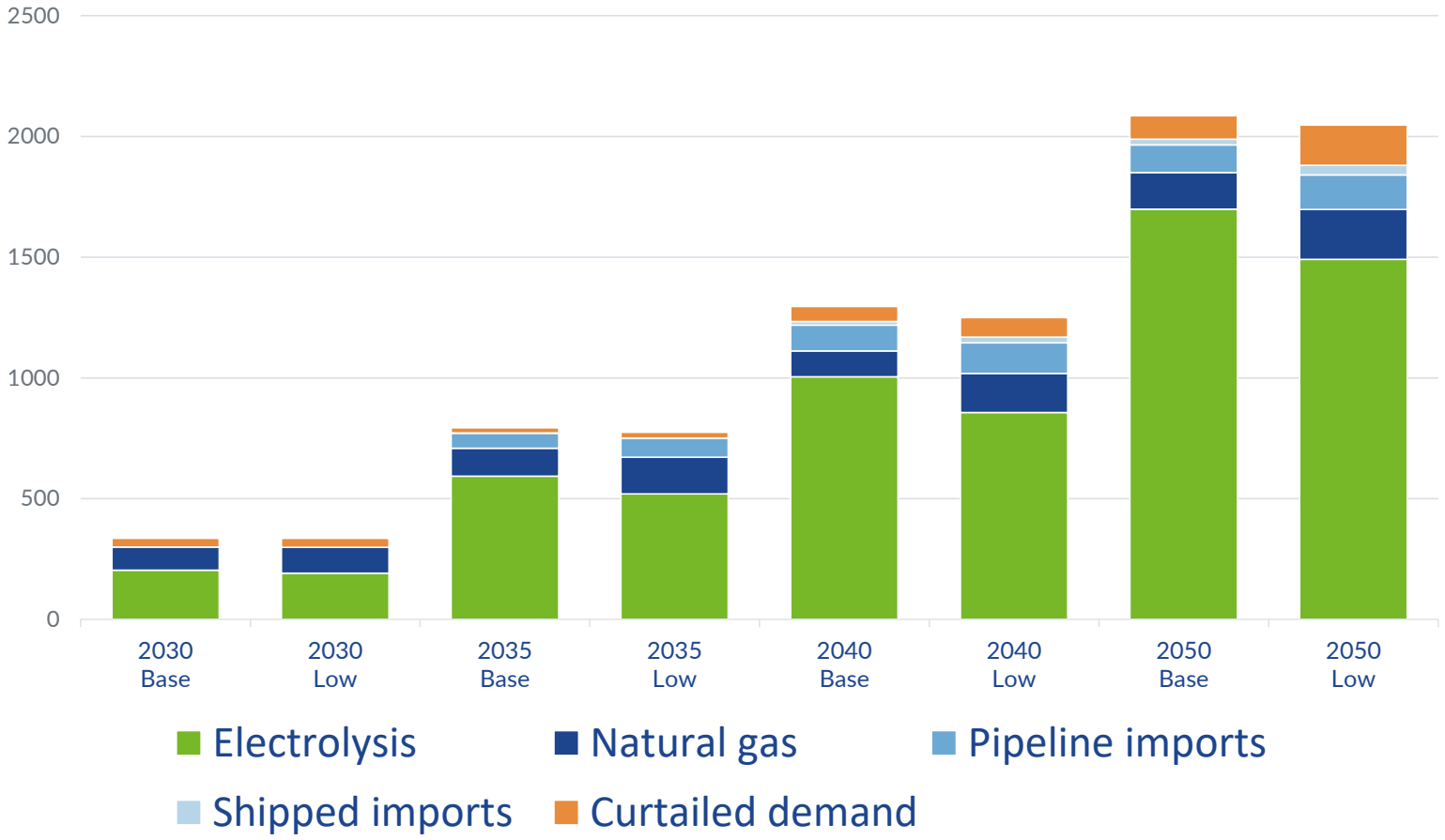
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Development of hydrogen supply and demand in the IGI

Supply mix and curtailed native demand • Base vs Low P2X & RES



60% (2030) → 81% (2050)

Electrolytic production main supply source

1,698 of 2,087

–12%

electrolysis in the low case versus base

1,698 → 1,491 (2050)

11%	3%	5%	5%
11%	3%	7%	8%

curtailed-demand increases with lower availability of electrolytic supply

Base
Low P2X & RES

Gas and imports partly offset lower electrolysis, but do not prevent a larger demand gap.

Unit: TWh (GCV). Orange = curtailed native demand; rate shown for EU27 native demand.

IGI Indicator results

Key findings across the assessment years

2030

- Limited cross-border transport and import availability
- Strong reliance on domestic hydrogen production
- High curtailment in isolated or weakly connected markets
- Significant price separation on several borders

2035

- Expansion of PCI/PMI transmission, storage and import infrastructure
- Strong reduction in EU-level curtailment
- Wider cross-border hydrogen flows
- Greater price convergence across interconnected markets

2040 & 2050

- Hydrogen demand grows substantially
- Production and imports also increase, but regional shortages persist
- Price differences reappear or increase in several regions
- Storage and flexibility become increasingly important

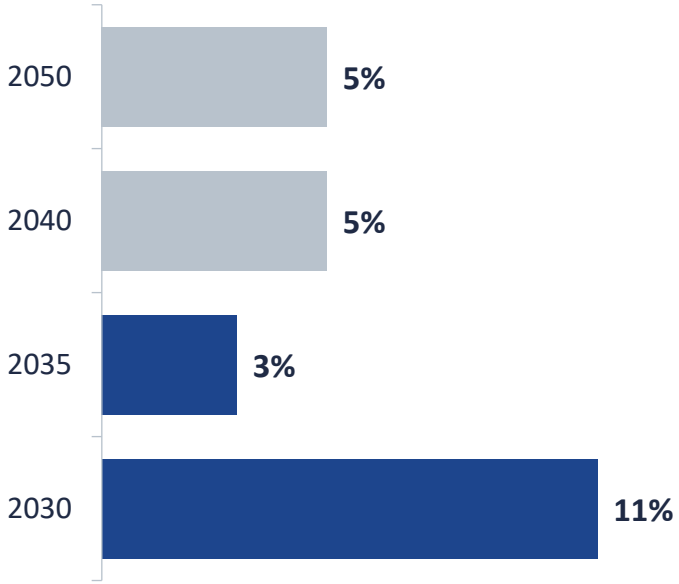
Transport corridors: from limited flows to five corridors

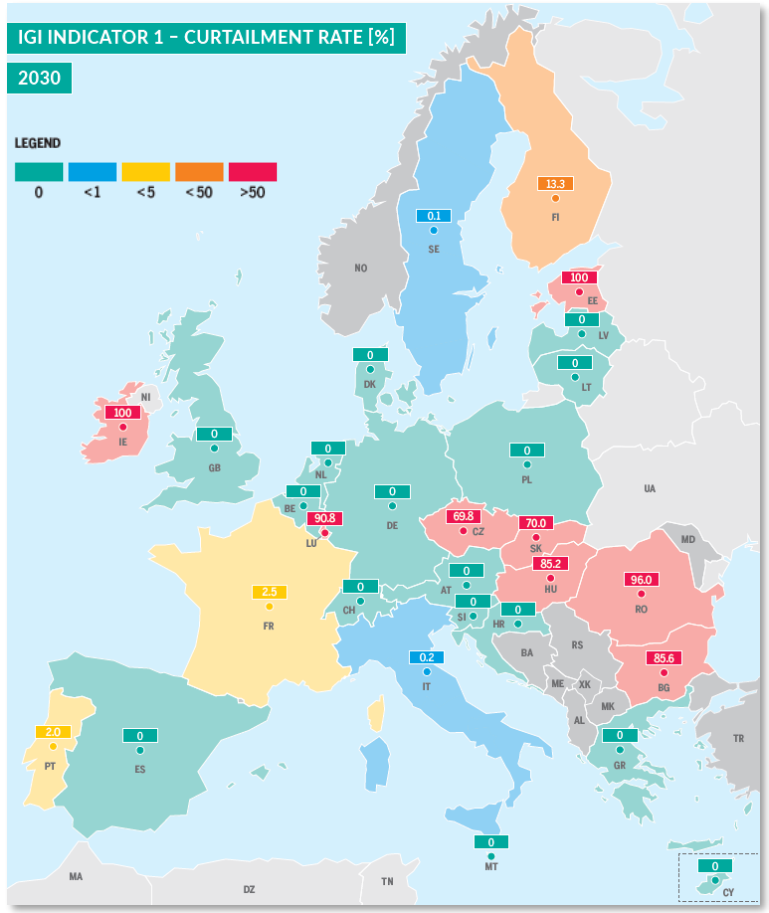
Corridor	Supply	Via	Demand	Year
Iberian corridor	Iberian Peninsula	France	Germany	from 2035
Nordic corridor	Nordic region	On-shore via Baltic countries Off-shore via Baltic sea	Germany	from 2035
Ukrainian corridor	Ukraine	Slovakia	Czechia, Hungary	from 2035
North African corridor	Algeria (via Tunisia)	Italy	Austria, Germany	from 2035; extra route via Switzerland from 2040
UK interconnection	United Kingdom	Belgium	Continental Europe	from 2040

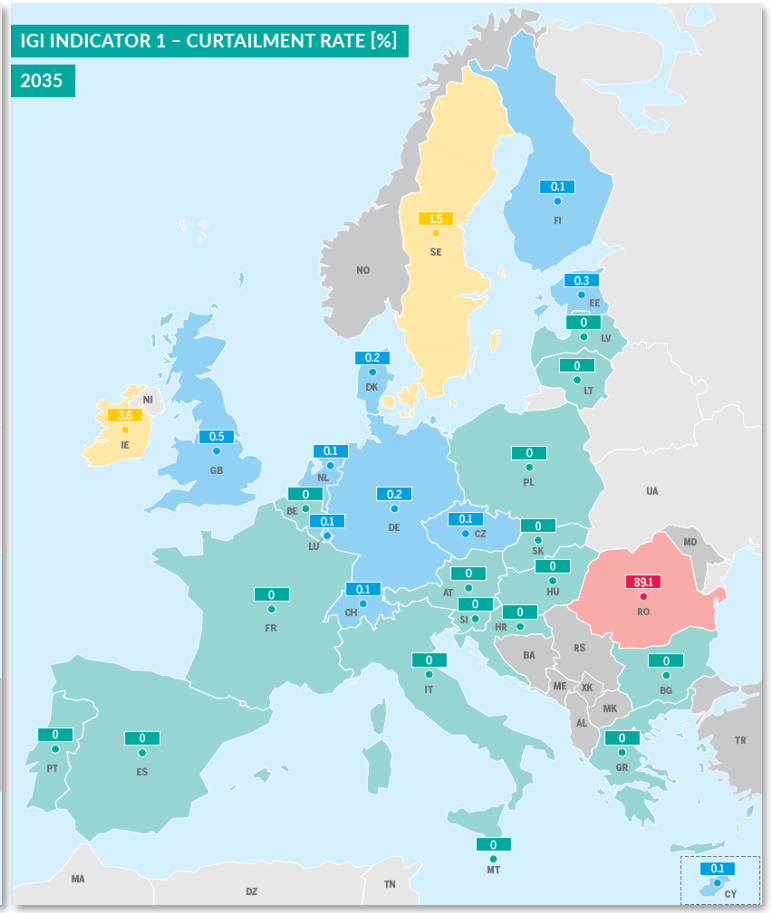
Green: European supply regions. Blue: import corridors from outside the EU. In 2030 flows are limited; Germany is the central hub from 2035.

IGI Indicator 1: Hydrogen Demand Curtailment (HDC) 2030–2035

EU curtailment rate by year







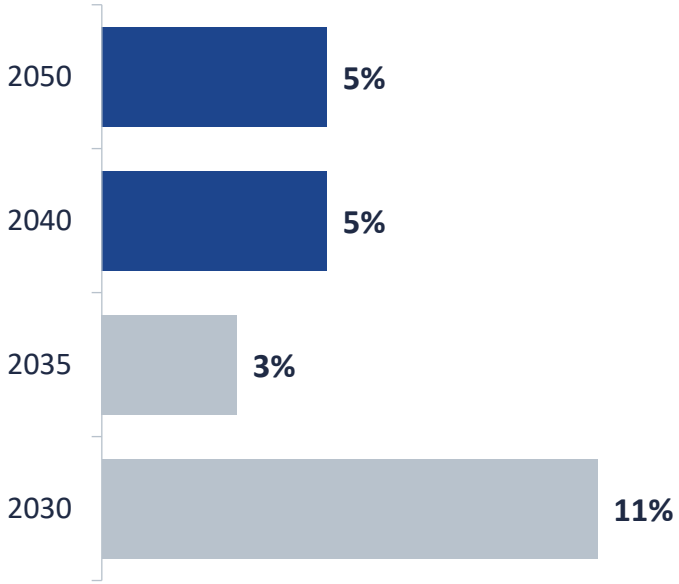
From isolated markets to PCI/PMI infrastructure development

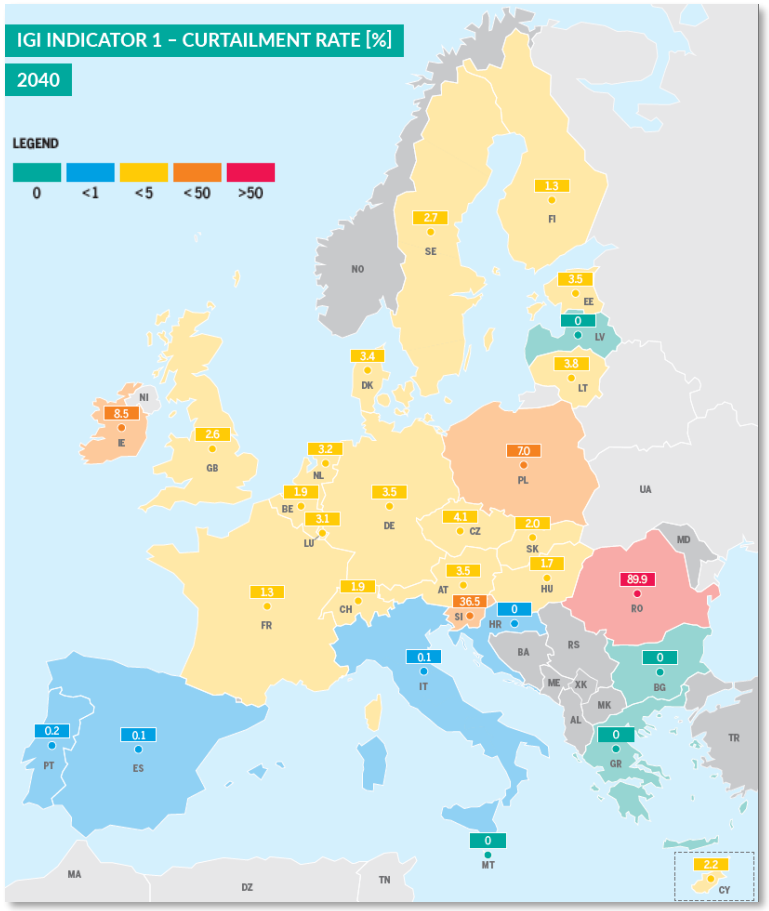
— In 2030, the highest curtailment occurs in isolated and weakly connected markets

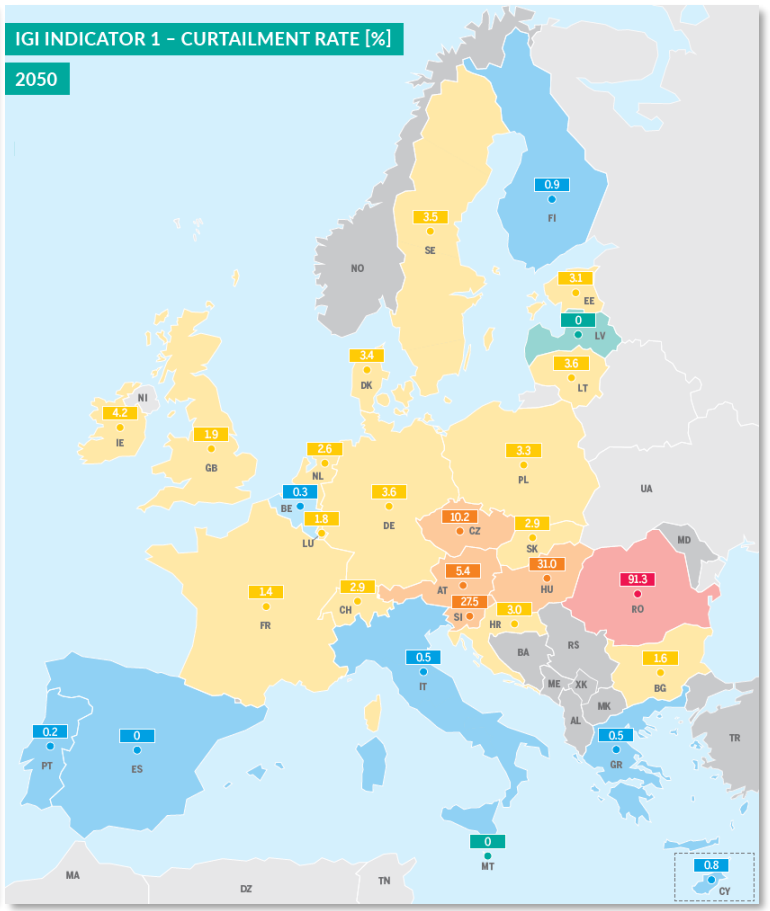
— Infrastructure expansion substantially reduces curtailment by 2035

IGI Indicator 1: Hydrogen Demand Curtailment (HDC) 2040–2050

EU curtailment rate by year







Demand growth increases curtailment

— By 2040 and 2050, curtailment becomes more geographically widespread

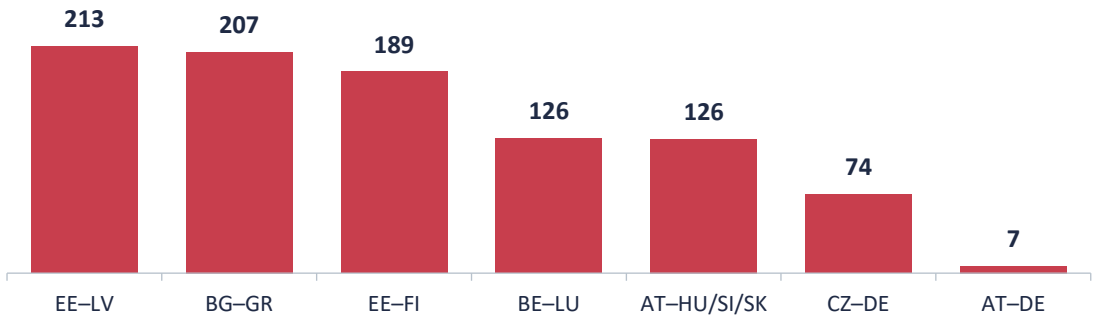
— Romania remains particularly constrained

— Slovenia, Hungary and parts of South-Eastern Europe show significant exposure in later years

IGI Indicator 2: Market Integration and Price Spreads 2030-2035

2030 High and dispersed prices

Average spread by border (€/MWh); 365 days except CZ–DE (225) and AT–DE (37)



- Scarcity pricing in BG, CZ, EE, HU, IE, LU, RO, SK; moderate in BE, NL, SE, ES

→ Zero spread is not integration: BG–RO, HU–RO, HU–SK share the curtailment price

2035 Lower and more convergent prices

~€105

/MWh: level around which many prices converge

0

€/MWh spread on AT–DE, AT–HU/SK, BG–GR, CZ–DE, EE–FI and EE–LV

- Clusters: Iberia–France–Germany–Nordics–Italy corridors
- BG–RO stays high from 2035; South-Eastern Europe stays apart

→ Price differences alone are not a gap!

IGI Indicator 2: Market Integration and Price Spreads 2040-2050

2040 Price spreads reappear or increase on several borders

Demand growth outpaces infrastructure in some areas, so spreads return where interconnections are weak or absent.

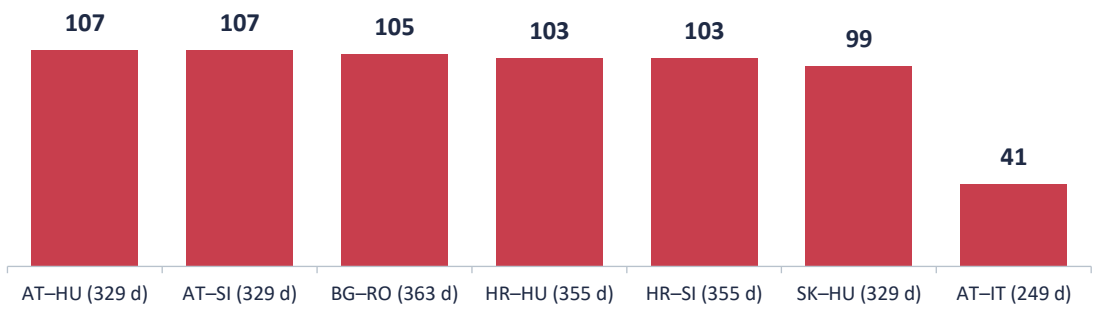
€122–135

Average price range for most interconnected countries (€/MWh)

- Demand up more than 60%: prices rise again despite more supply
- Aligned: DE, CZ, SE, FI, Baltics; detached: AT, BE, IT, SI, HR
- Most pronounced for weakly connected Hungary, isolated Slovenia and Romania

2050 Persistent price pressure

Average spread by border (€/MWh); days above 20 €/MWh in brackets



- Prices stay elevated in SE, SI, HR, RO, BG, GR
- Spreads above €100/MWh on 329 to 363 days around Hungary, Slovenia, Romania
- Regional bottlenecks also at Italy, Slovakia and Austria

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IGI Indicator results: Sensitivities

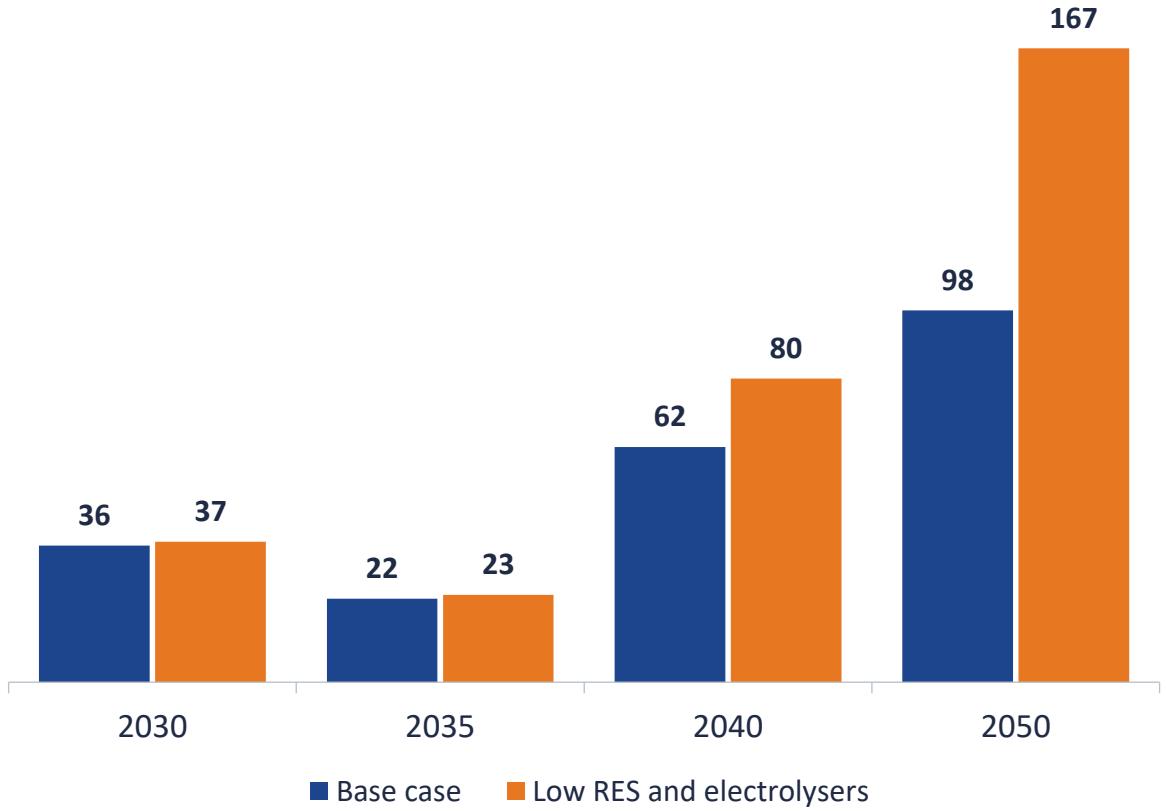
Sensitivity: Unlimited infrastructure

Hypothetical set-up	2030 and 2035	2040 and 2050
Unlimited pipelines	Curtailment fully removed in 2030 and nearly removed by 2035	Not enough on its own
Unlimited storage	Does not remove curtailment	Shortages remain; cuts liquid hydrogen imports by about 100% (2040) and 75% (2050)
Unlimited imports	Does not remove curtailment	Second-best performing option, reducing hydrogen curtailment more than all other cases; lack of flexibility offset by almost three times more imports via pipelines and LH_2
Unlimited pipelines and storage	Not needed	The only case that removes curtailment; shortages limited to winter and covered by storage

What the results mean: In the early years (2030 and 2035), the limit is transport capacity, not supply. Later, storage and flexibility become as important as pipelines.

Sensitivity: Low P2X and RES - IGI indicator 1

Curtailed hydrogen demand, base vs Low RES (TWh/y)

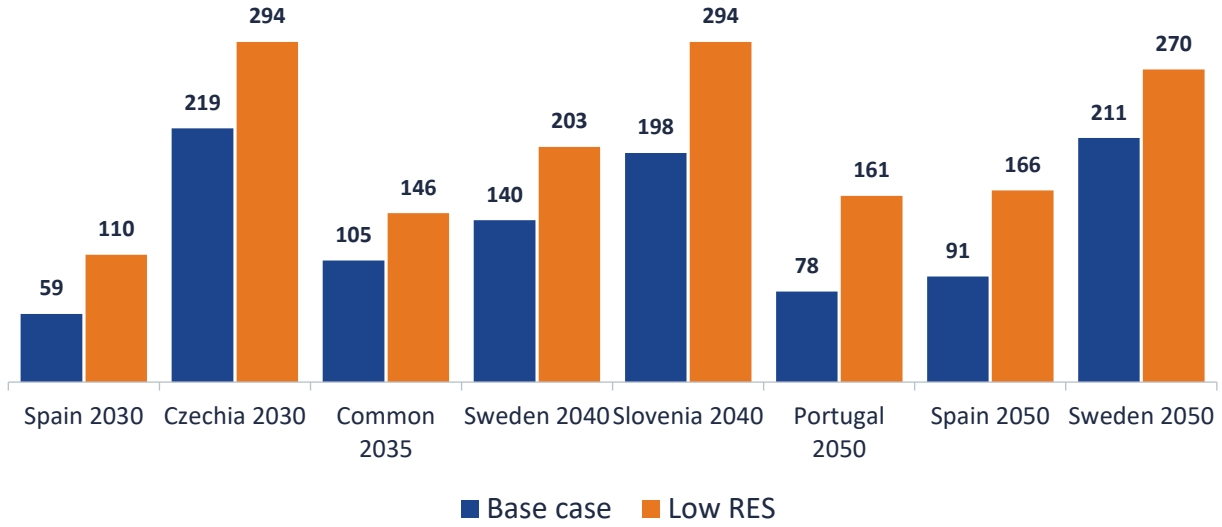


Electrolysers and renewables 10% lower

- **More countries affected but pattern stays the same:** 16, 21, 24 and 25 of 27 with curtailment, against 13, 14, 23 and 25.
- **Higher EU curtailment** in 2040 (7%) and 2050 (8%), against 5%.
- **Electrolytic-based hydrogen supply** reduction is compensated by an increase in NG-based production and imports (DZ, UA and liquid imports)

Sensitivity: Low P2X and RES - IGI indicator 2

Average price, base vs Low RES (€/MWh)



Priced spreads

- **2030:** wide spreads persist (BG–GR €205, EE–LV €213, CZ–PL €209, IE–UK €163/MWh).
- **2035:** most spreads still disappear;
- **2040–2050:** spreads re-open on weak borders, but a few narrow compared to the base case: BG–RO 135 → 106, AT–HU 107 → 63, AT–IT 41 → 27 €/MWh.

What the results mean: market-clearing prices rise almost everywhere, but narrower price spreads are observed. Neighboring countries rise together, so price spreads do not necessarily become wider.

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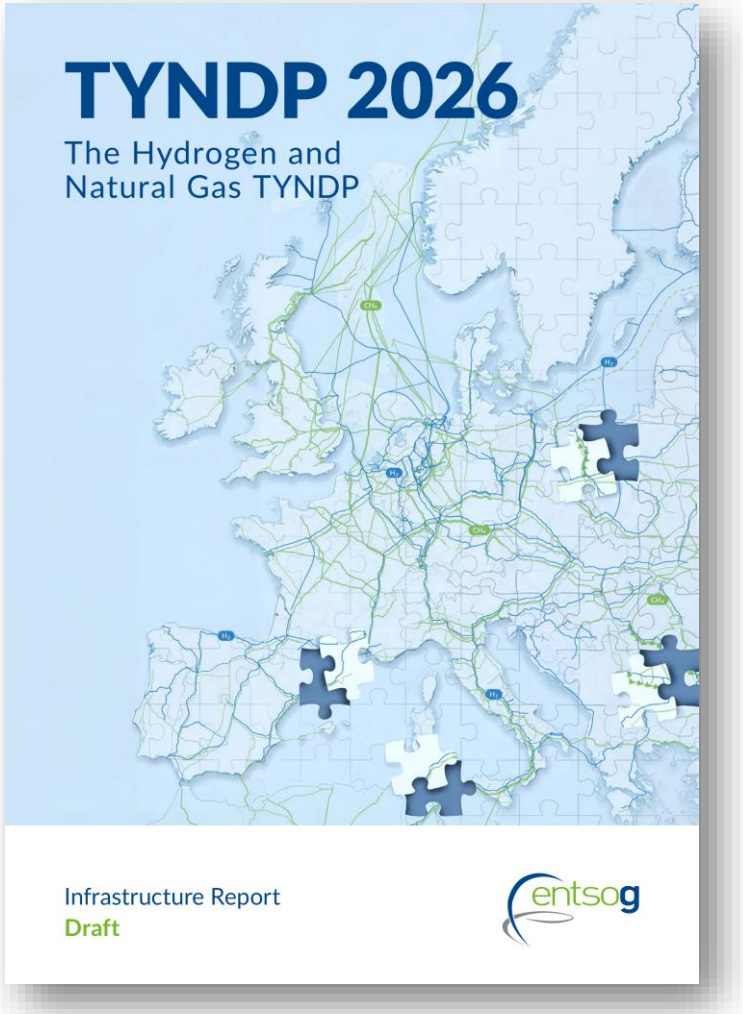
Infrastructure report

Introduction

"The Infrastructure Report, one of the main TYNDP documents, provides a detailed overview of the future network, starting from its current configuration."

- **What it covers:** hydrogen (transmission, storage, reception, electrolysers), natural gas (transmission, storage, LNG) and smart gas grid and other projects (retrofit, biomethane, synthetic methane, CO_2, other).

- **Who submitted:** more than 65 promoters, TSOs and third parties, for 347 investments in total.



How projects were collected for TYNDP 2026

1. PREPARATION phase

Jul. – Aug. 2025

- Publication of the final Guidelines for Project Inclusion (GPI) for TYNDP 2026
- Project Submission Handbook, plus a documentation kit and webinars for promoters

2. SUBMISSION phase

29 Sep. – 26 Oct. 2025

- Submission window for TYNDP 2026 applicants
- Projects submitted through ENTSOG's Project Data Portal

3. CHECK AND VALIDATION phase

27 Oct. – 14 Dec. 2025

ENTSOG compliance check with the GPI

- **Input check:** ENTSOG and promoters check the submissions
- **Correction**: correction window for promoters



Why this process: a single portal and common rules ensure transparency and equal treatment of all promoters, through the administrative and technical criteria of the TYNDP 2026 Guidelines for Project Inclusion.

TYNDP 2026 project submissions at a glance

347

investments submitted

up from 326 in TYNDP 2024, from 76 new submissions

70%

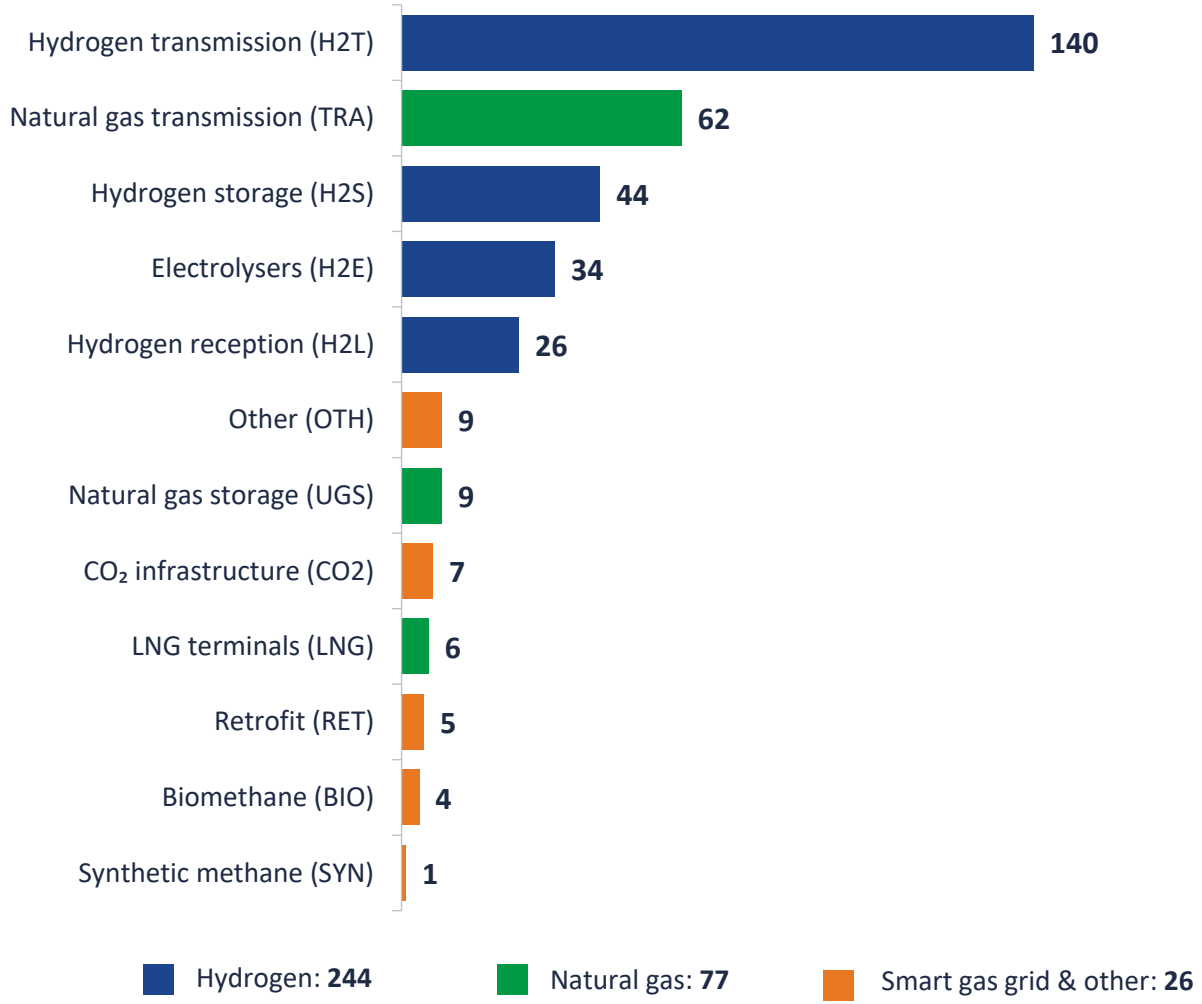
are hydrogen projects

244 of 347, versus 62% in TYNDP 2024

~€237bn

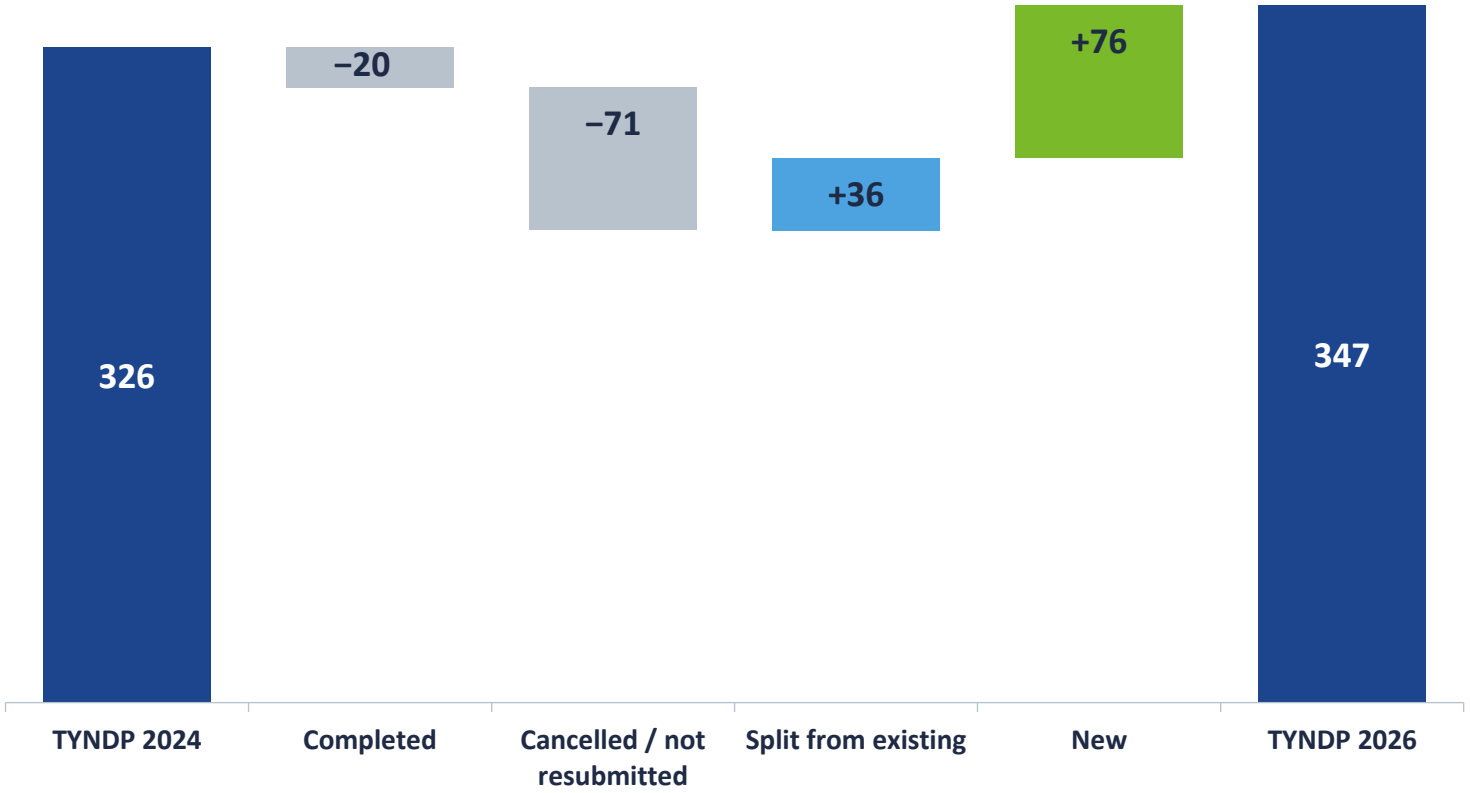
Total CAPEX

against ~€209bn in TYNDP 2024

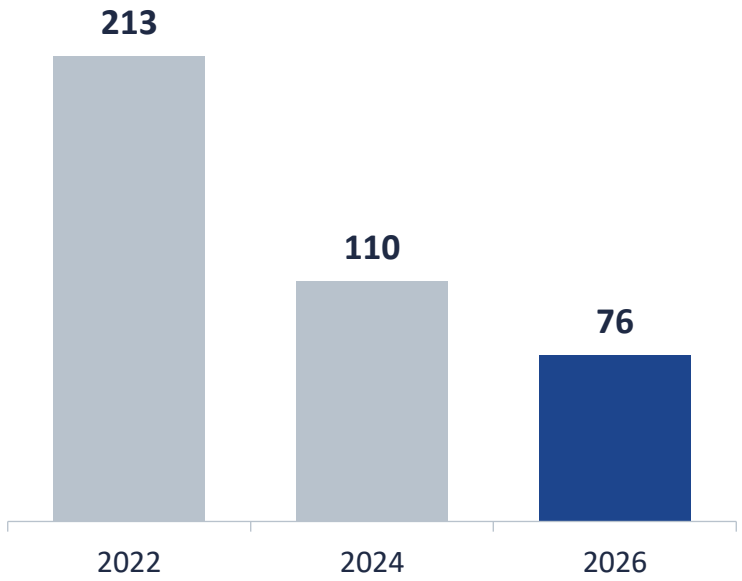


TYNDP 2026 growth reflects continuity

From TYNDP 2024 to TYNDP 2026 (number of investments)



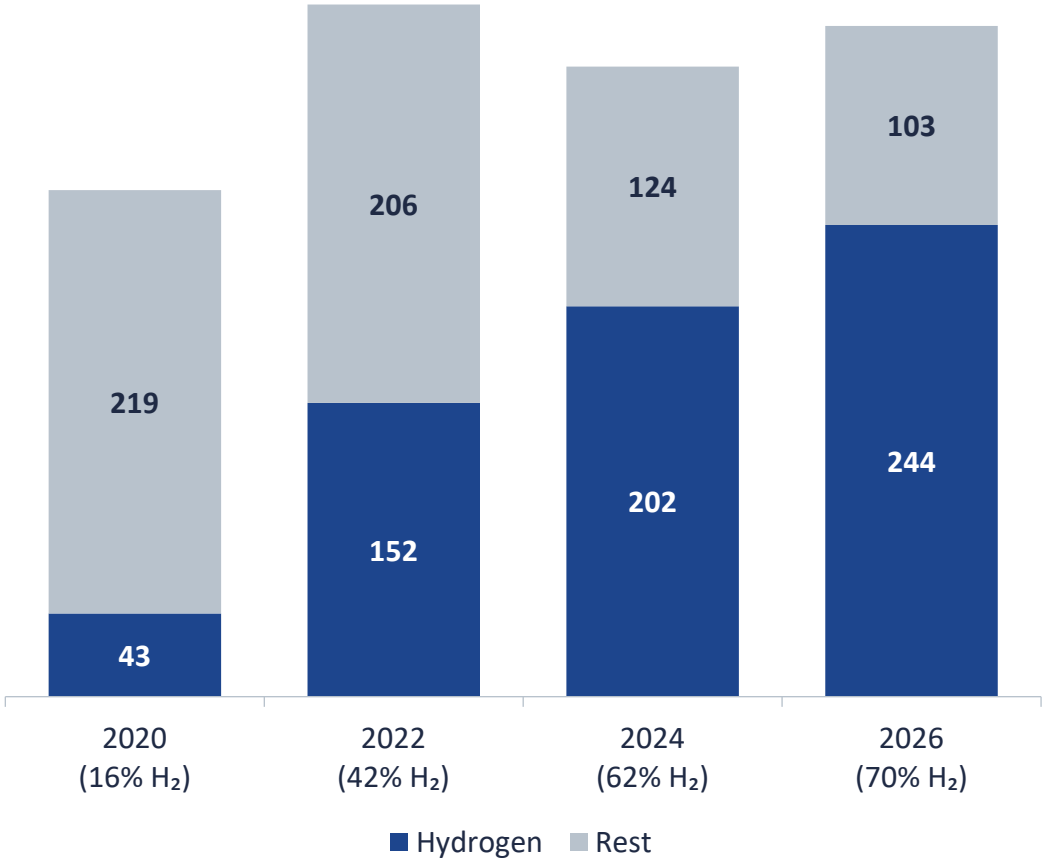
New investments per TYNDP edition

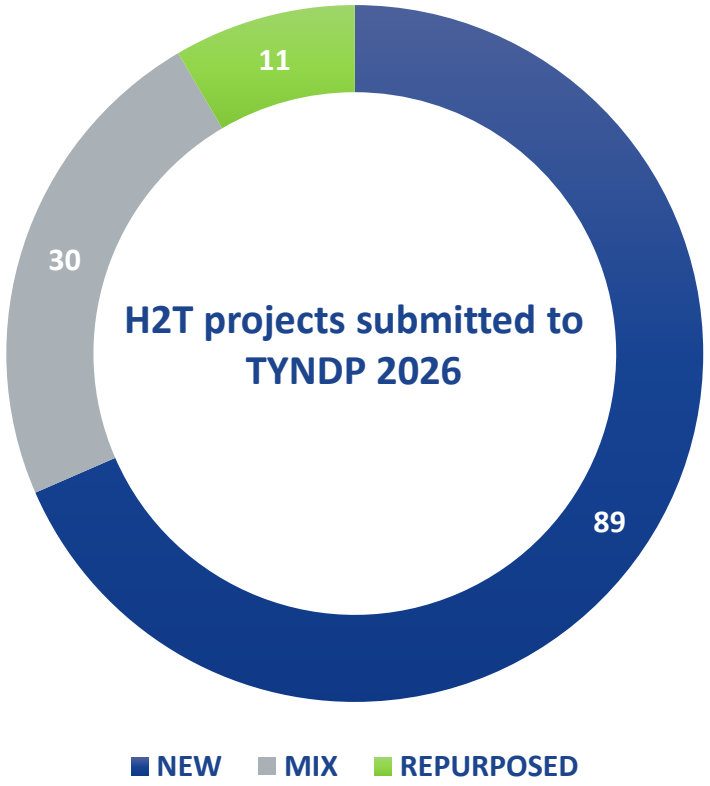


Carry-over dominates: 235 investments were resubmitted, and 36 more come from splitting large projects into phases.

Evolution of Hydrogen Projects in TYNDP

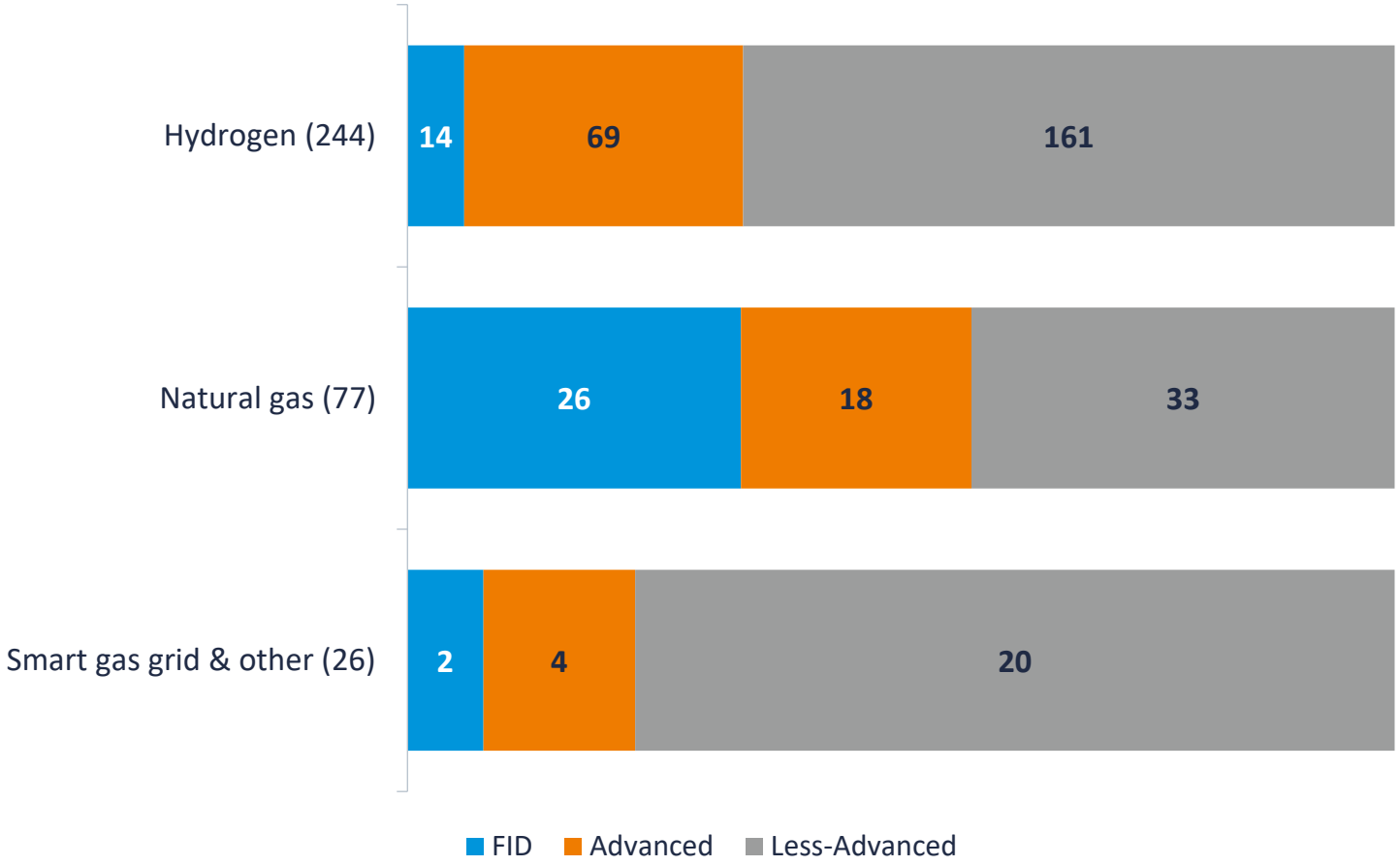
Evolution of total amount of projects and hydrogen projects by TYNDP





Project maturity and commissioning

Investments by maturity status (number of projects)



86%

of hydrogen projects expected to be commissioned by 2035

80%

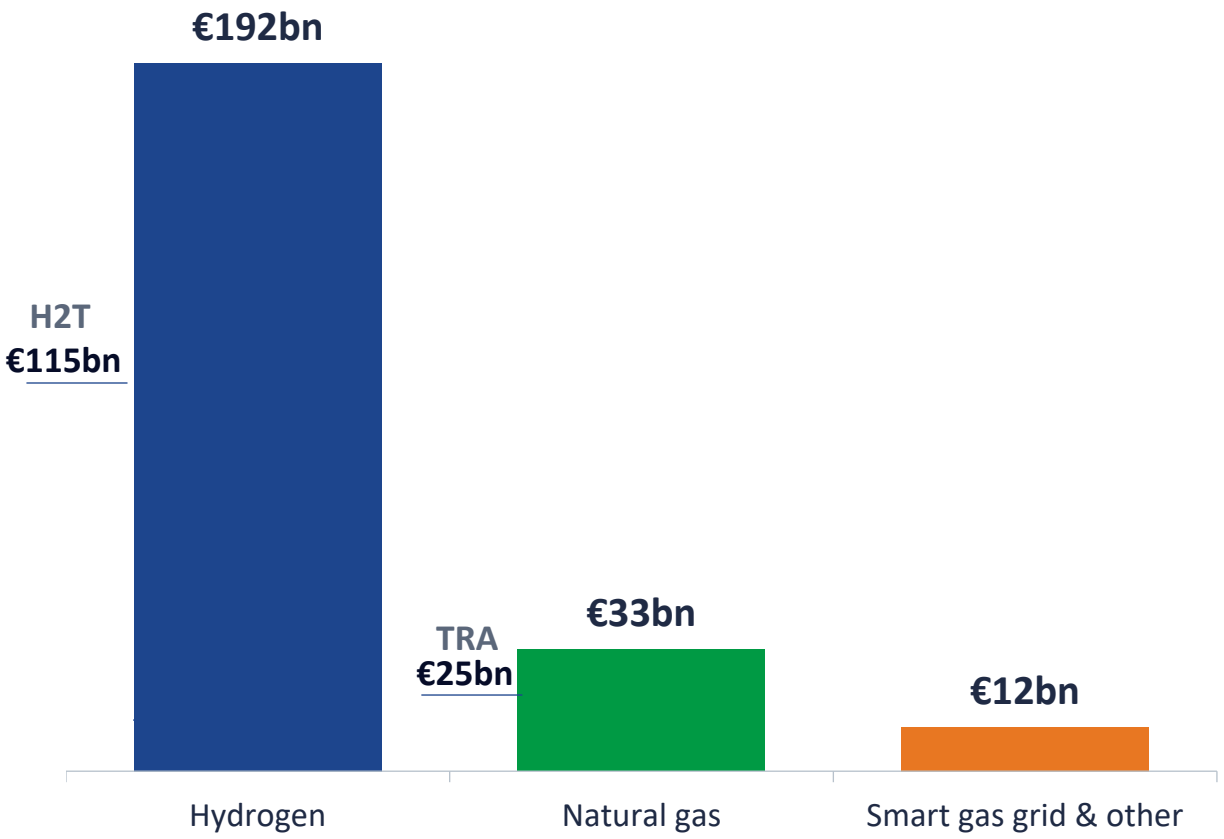
of NG projects expected to be commissioned within the next 4 years

~73%

of SGG & Other projects expected to be commissioned within the next 7 years

Project investment costs insights

Overview of total capital expenditure by project category (€ billion)



~€237bn

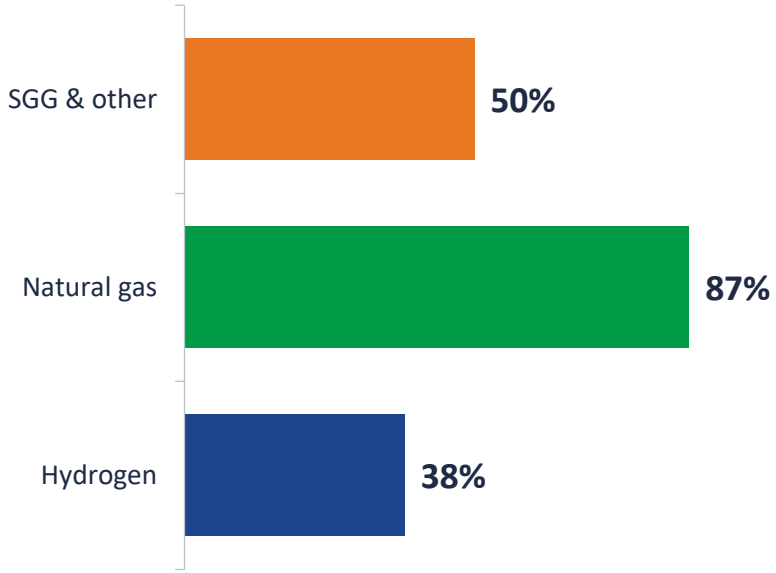
combined total CAPEX

Specifics

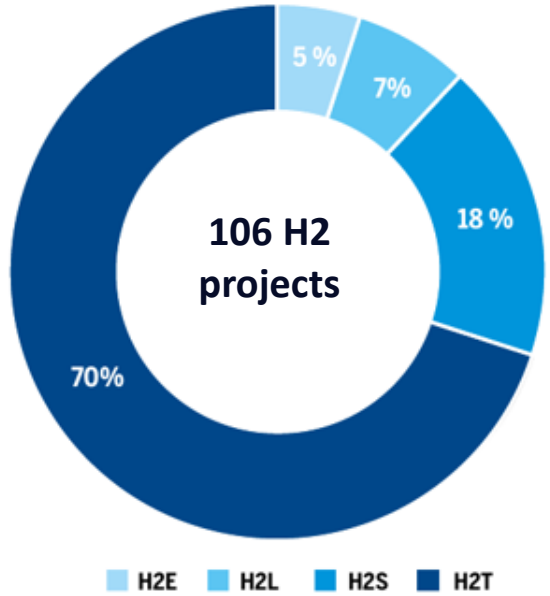
- **Hydrogen:** H2T pipelines are about 60% of hydrogen CAPEX; more than half of the spending (58%) falls before 2034.
- **Natural gas:** transmission (TRA) accounts for 76% of the ~€33bn; almost half of the total costs for natural gas investments will take place until 2029 (58 %)
- **Smart gas grid & other:** about 5% of the total, with OTH and CO_2 projects making up almost 88%.

NDP inclusion and PCI/PMI status

NDP inclusion by category, TYNDP 2026



Projects with PCI status in the 2nd PCI/PMI list by project type



Leading countries in NDPs:

Germany (32) for hydrogen; Italy and Romania (13 each) for natural gas; Slovakia (4) and Portugal (3) for SGG

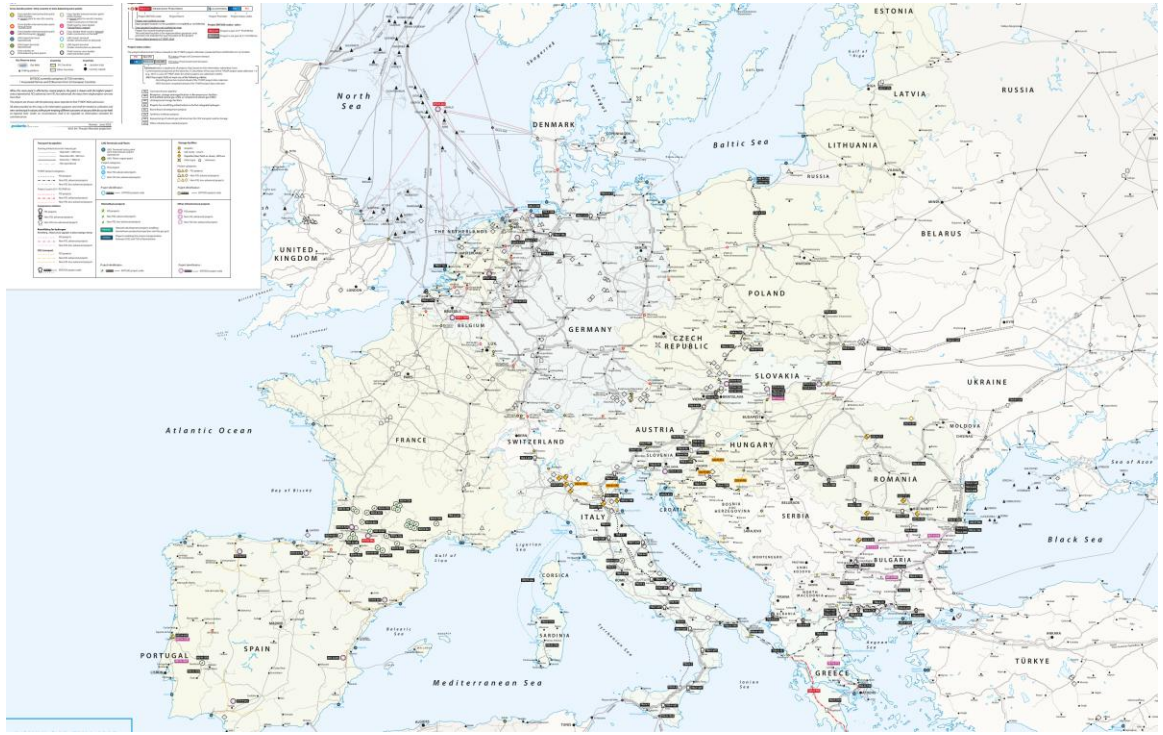
PCI status for two natural gas projects:

EastMed pipeline and the Malta connection

Appendix: hydrogen and gas infrastructure maps



Map of hydrogen infrastructure in TYNDP 2026



Map of NG transmission, storage, LNG, biomethane and other infrastructure in TYNDP 2026

Full-size maps: www.entsog.eu/tyndp

Agenda

Topic	Presenter	Time
Introduction	Kacper Żeromski Director System Development	14:05
H2IGI context, TYNDP 2026 timeline, consulted documents & questions	Simona Marcu TYNDP PM	14:10
H2IGI: report highlights	Maria Castro Subject Manager Investment Rafail Tsalikoglou Investment Adviser Pierre Marani Investment Adviser	14:20
Break		15:00
H2IGI: continuation report highlights & visualisation tool		15:05
Infrastructure report & visualisation tool	Rafail Tsalikoglou Investment Adviser Pierre Marani Investment Adviser	15:25
Closing	Simona Marcu TYNDP PM	15:45

Please use Slido or raise your virtual hand for Q&A at the end of each session
Slido code **H2IGI** - passcode: **gasforgood**

Thank you for your attention