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ACER Webinar on a consultancy study on hydrogen networks

Webinar

13 April 2023, 10.00 – 11.30 CET

PUBLIC

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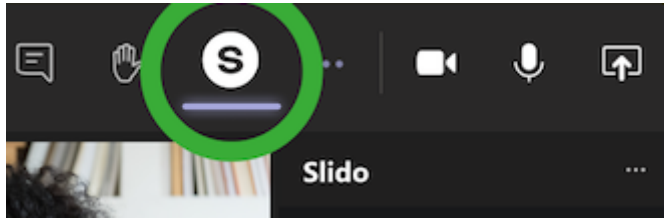

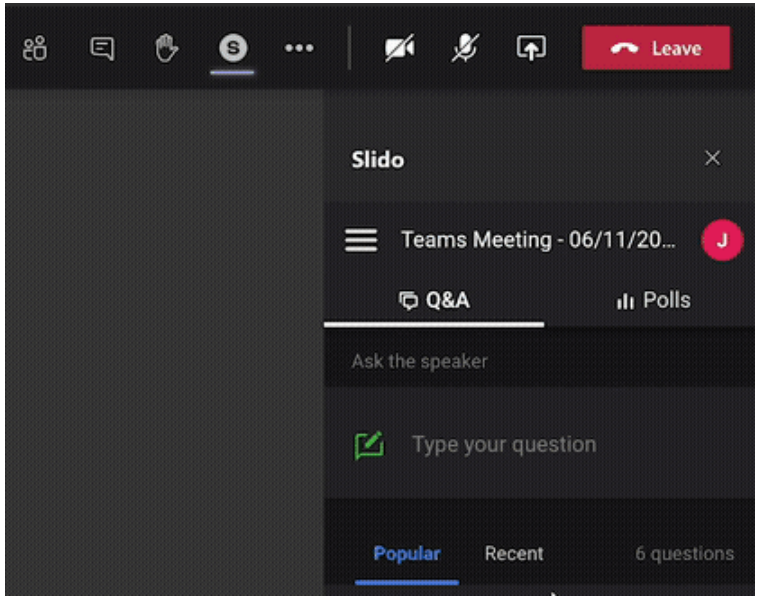

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ACER Webinar on a consultancy study on hydrogen networks

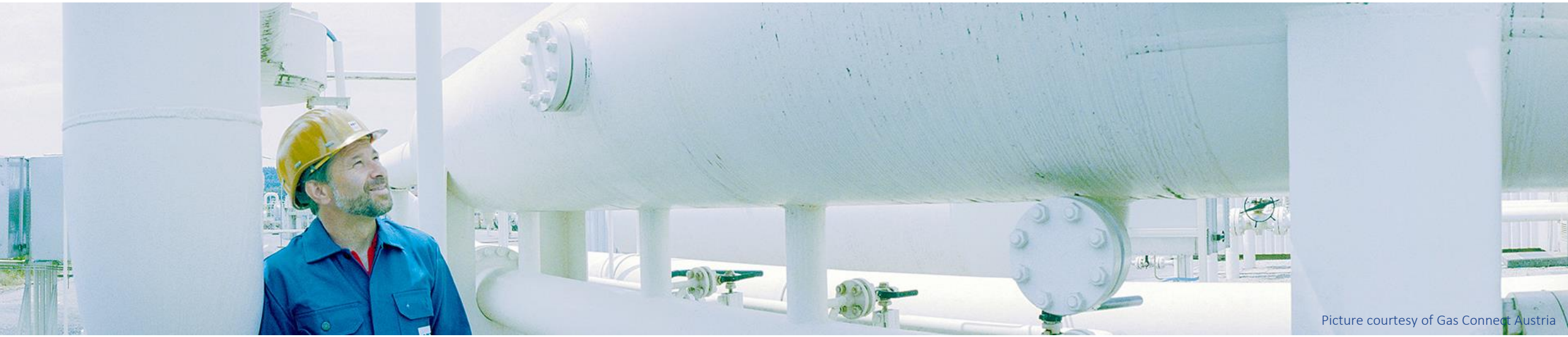
Thursday, 13 April 2023 | 10.00 - 11.30 CET

Online, MS Teams platform

AGENDA		
09.55 - 10:00	**Webinar open for log-in**	Starts promptly at 10.00
10.00 - 10.10	**Introductory Remarks** Juan LOPEZ VAQUERO, ACER	
10.10 - 10.20	**Preliminary draft cost-benefit analysis methodology - process and timeline** Maria CASTRO, ENTSOG	
10.20 - 10.30	**Hydrogen transportation plans and supply/demand targets in selected EU Member States** George SEFERIADIS, VIS	
10.30 - 10.40	**Market and network conditions justifying building hydrogen infrastructure** George SEFERIADIS, VIS	
10.40 - 11.05	**Recommendations to ENTSOG for a cost-benefit analysis methodology for hydrogen infrastructure** Fotis THOMAIDIS, VIS	
11.05 - 11.25	**Q&A** (Slido, MS Teams)	
11.25 - 11.30	**Closing Remarks** Stefano ASTORRI, ACER	

Webinar Objective: ACER has contracted VIS Economic & Energy Consultants to conduct a study to identify recommendations for a cost-benefit analysis (CBA) methodology for hydrogen infrastructure that the European Network of Transmission System Operators for Gas' (ENTSOG's) is developing.

07/04/2023



Picture courtesy of Gas Connect Austria

CBA Methodology context and timeline

ENTSOG

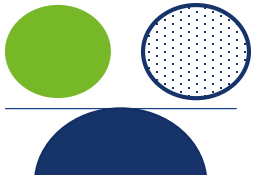
Maria Castro, Investment Subject Manager

Brussels

Context: revised TEN-E Regulation

Revised TEN-E Regulation (Art. 11) obliges ENTSOG and ENTSO-E to:

- ✓ **2023:** Develop consistent **single sector draft methodologies** for a harmonized energy system-wide cost-benefit analysis at Union level for hydrogen (ENTSOG) and electricity (ENTSO-E) infrastructure
- ✓ **2025:** Jointly submit to EC and ACER **progressively integrated model** including electricity, gas and hydrogen transmission



Consistent and uniform CBA methodologies across different energy infrastructure categories

Should be based on common assumptions and should consider sectorial specificities

Consistent with EU's 2030 targets for energy and climate and 2050 climate neutrality objective

ENTSOG is currently developing its single sector cost-benefit analysis methodology (link)

Context: TEN-E criteria for Hydrogen infrastructure

Measure as **contribution GHG emissions reductions** in various end-use applications like industry and transport

Flexibility and **seasonal storage options** for **RES energy generation**

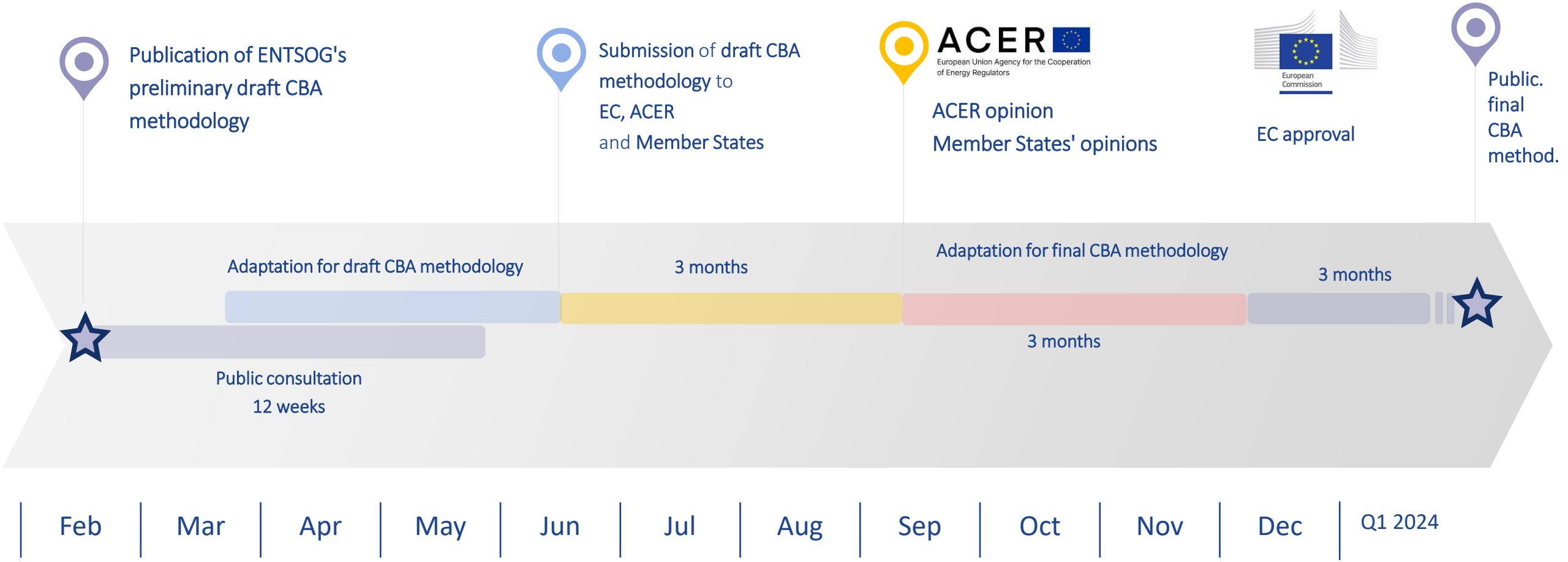
Integration of renewable and **low-carbon hydrogen**

Contribution to supply diversification

Additional value of the project to the **integration** of **market areas** and **price convergence**

Additional value of the project to the **resilience, diversity** and **flexibility** of **hydrogen supply**

Timeline of CBA Methodology process



Following the public consultation and ACER/MS opinions, ENTSOG will adapt the CBA methodology

Thank you for your attention

ENTSOG - European Network of Transmission System Operators for Gas
Avenue de Cortenbergh 100, 1000 Bruxelles

www.entsog.eu | info@entsog.eu

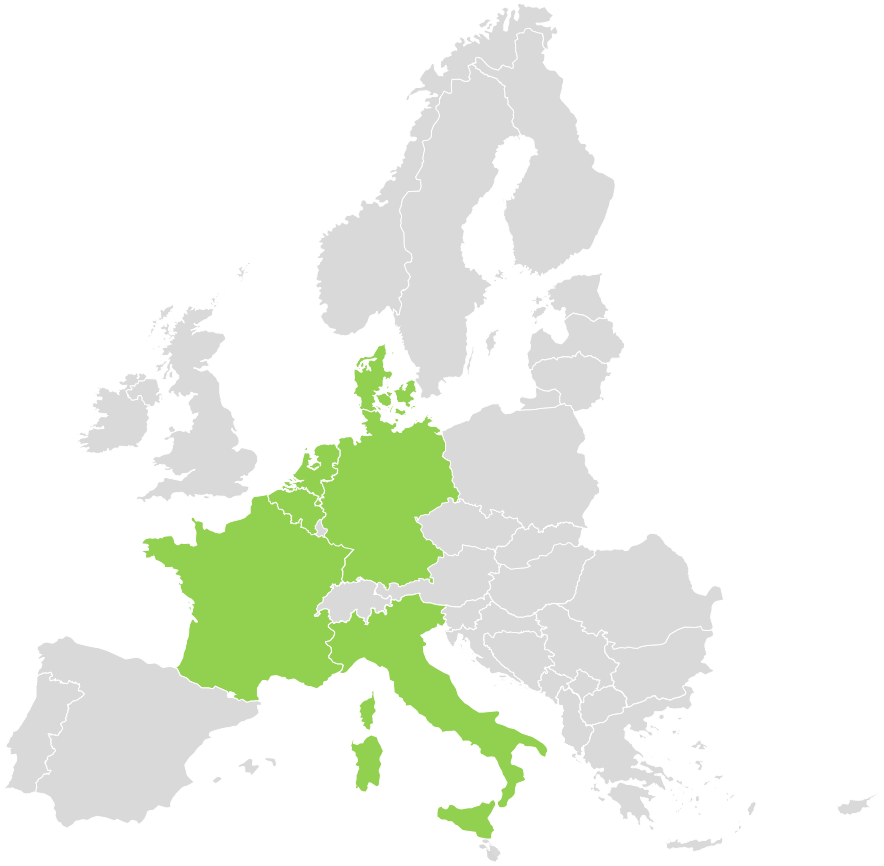
Study on requirements and implementation of ENTSOG'S Cost Benefit Analysis for hydrogen infrastructure for ACER

13/04/2023

Hydrogen transportation plans and supply/demand targets in selected EU Member States

George SEFERIADIS

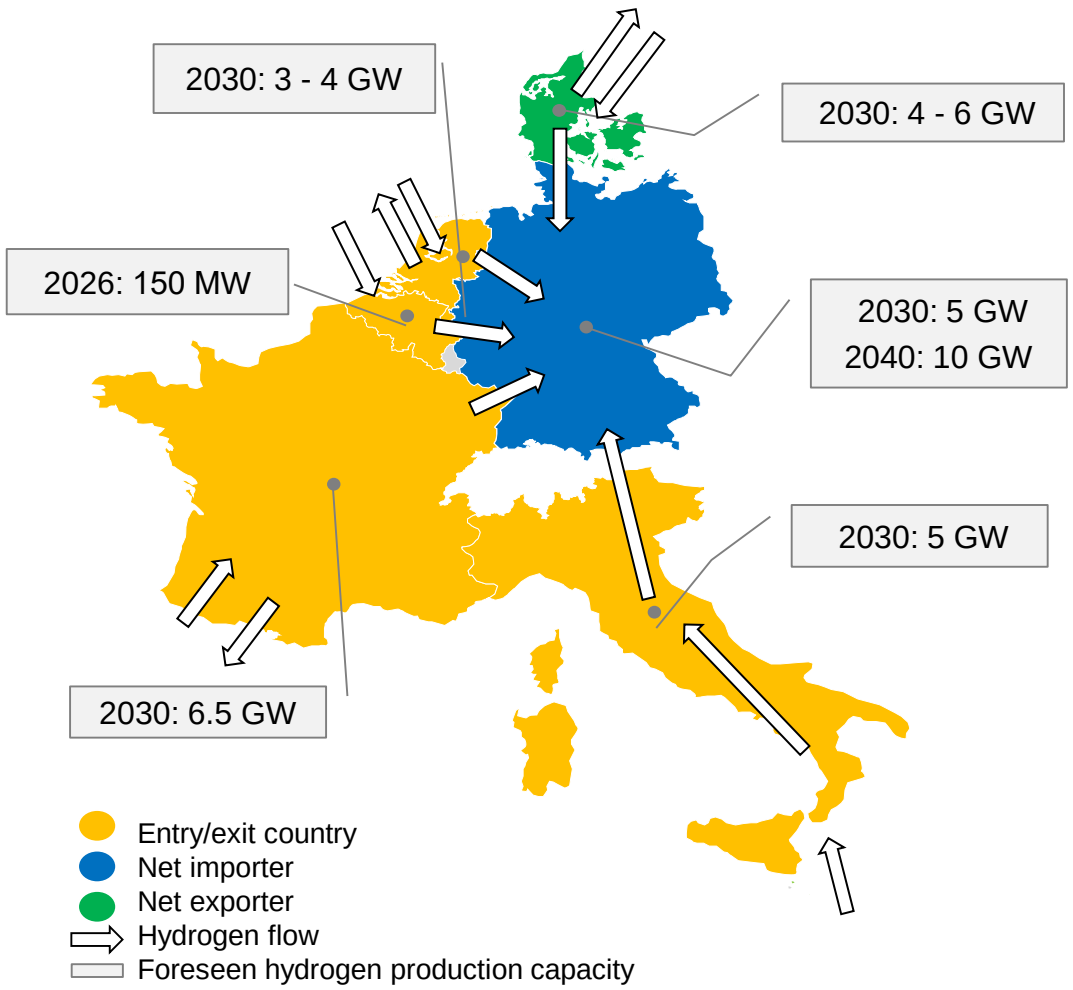
Hydrogen sector development via national planning



- Part of the Study was to assess the market and network conditions which can justify building hydrogen infrastructure. As the basis of this assessment, the Study analyzes the **plans of selected Member States (MSs)** to establish hydrogen markets and develop the required infrastructure
- The assessment of market and infrastructure conditions focuses on the main elements that impact the **main blocks of the hydrogen supply chain** (supply, demand and transportation)

Hydrogen supply and demand in selected EU MSs

Country	Hydrogen demand targets	
	2030	2050
	20 TWh/yr (domestic & transit)	200 – 350 TWh/yr (~50% transit)
	avoided 0.5 – 1.9 Mton CO2/yr	avoided 1.1 – 3.5 Mton CO2/yr
	20-40% of H2 from low-carbon & renewable H2	
	90 – 110 TWh/yr	
	23 TWh/yr	220 TWh/yr
	16-38 TWh/yr	
	330 TWh/yr of clean H2	1650 TWh/yr of clean H2



Hydrogen demand per end-use sector

	Germany	France	Netherlands	Denmark	Italy	Belgium	U.S.
Industry*							
feedstock	✓	✓	✓	✓	✓	✓	✓
heat processes	✓	-	✓	✓	✓	✓	✓
Refining	✓	✓	✓	✓	✓	-	✓
Transportation							
heavy duty	✓	✓	✓	✓	✓	✓	✓
public passenger transport (buses, trains, ferries)	✓	✓	✓	-	✓	-	✓
commercial vehicles	✓	-	✓	-	-	-	-
civil vehicles	-	-	✓	-	✓	-	-
maritime transportation, including inland navigation	✓	-	✓	✓	✓	✓	✓
air transportation	✓	-	✓	✓	✓	✓	-
Power sector	-	✓	✓	-	✓	✓	✓
Heating sector	✓	-	✓	✓	✓		✓

✓ : *Short-term demand*

✓ : *Long-term demand*

**Chemicals industry, steel, cement, aluminium, ceramics and glass*

Hydrogen transportation plans in selected EU MSs

- 2026: 100 – 160 km of additional H2 pipelines (new and/or repurposed), taking maximum advantage of existing pipelines
- 2028: Interconnections with at least Germany, France and the Netherlands
- 2030: An open access H2 backbone will be established connecting the ports to the industrial zones and with neighboring countries

- Most of the gas grid will be reserved for transporting and storing biogas and commitments in the NG Baltic Pipe already reserve capacity at least up to 2038
- Energinet and Gasunie are exploring the establishment of a pure H2 cross-border interconnection. Energinet is also investigating the possible routing of the Danish H2 backbone

Progressive build-up: initially within local ecosystems (production close to consumption), then H2 valleys (interlinking local ecosystems via a regional grid), integrating H2 storage infrastructures, and interconnecting ultimately the French network with neighboring EU MSs

- 2027: Subnetworks will be in place to serve local demand
- 2032: The H2 network will consist of approx. 67% repurposed pipelines

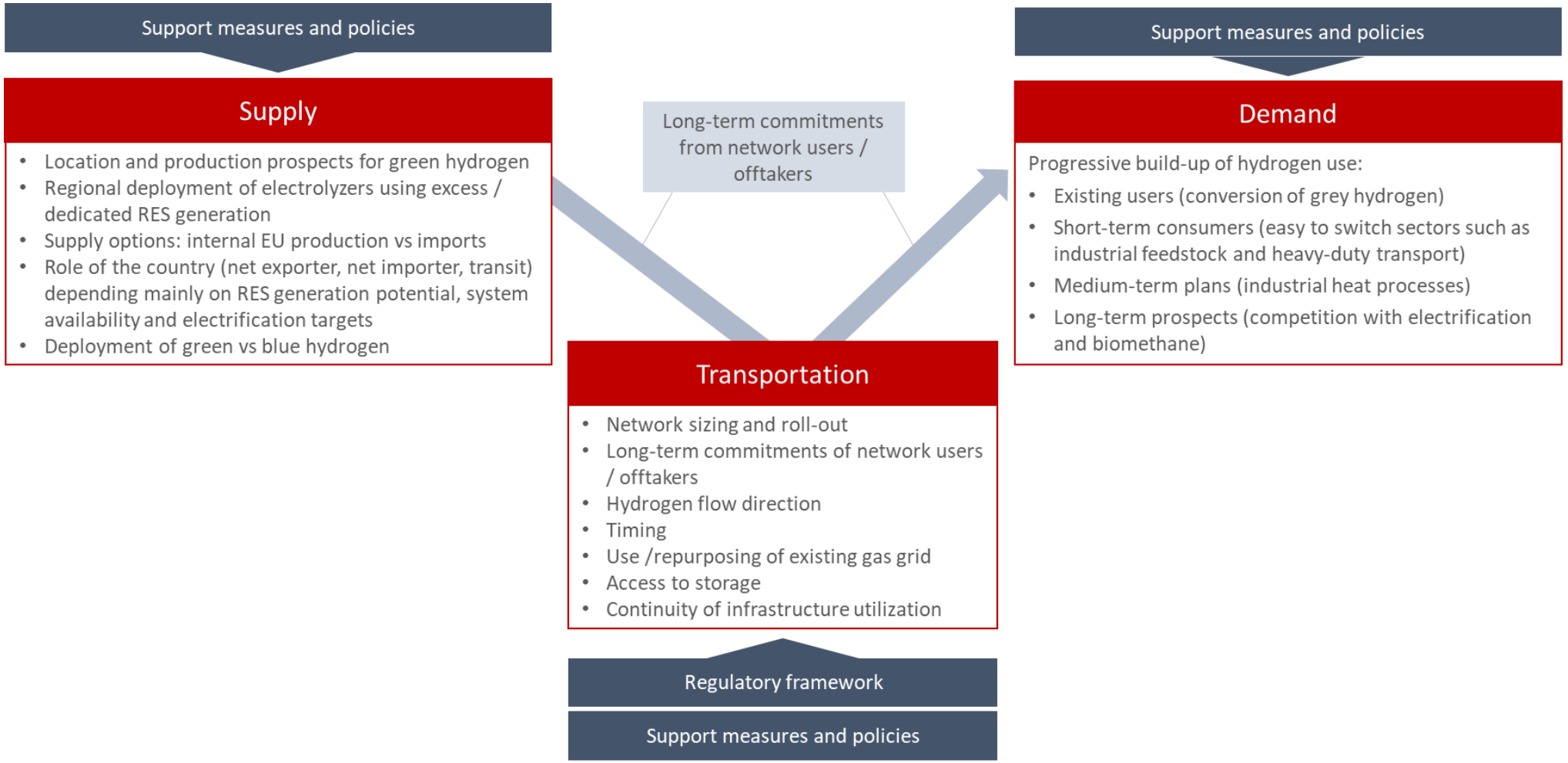
2032: Development of H2 network (70% repurposed) to transport production from north Africa and Southern Italy domestically and to neighbors. The first tranche of the Italian H2 backbone will connect Italy to countries with higher demand (Germany)

Progressively, industrial clusters will be connected via pipelines to each other, to other countries and to H2 storage and import locations. 85% of the infrastructure will be developed by repurposing existing natural gas pipelines. The whole network will be in place by 2030

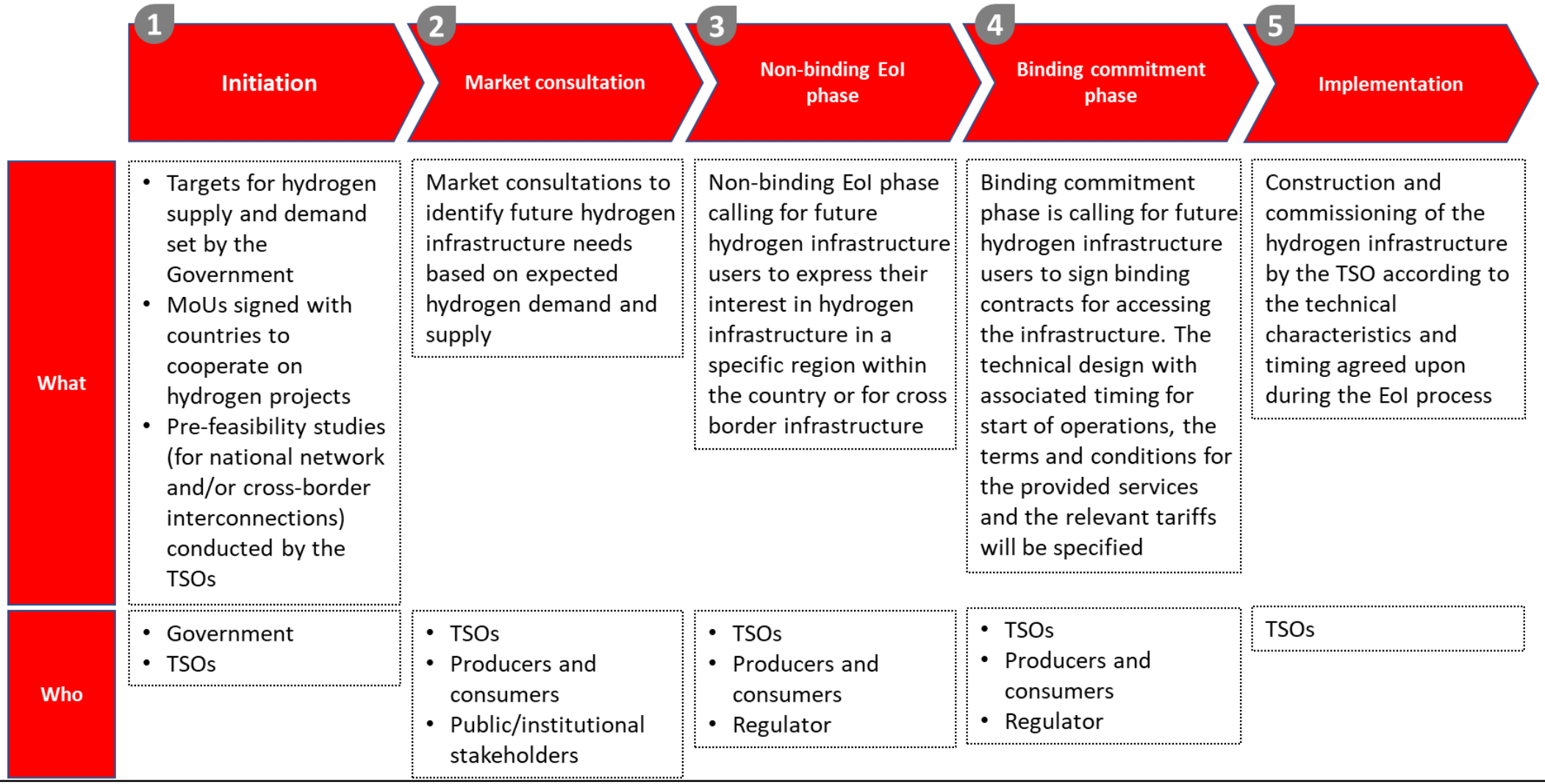
Market and network conditions justifying building hydrogen infrastructure

George SEFERIADIS

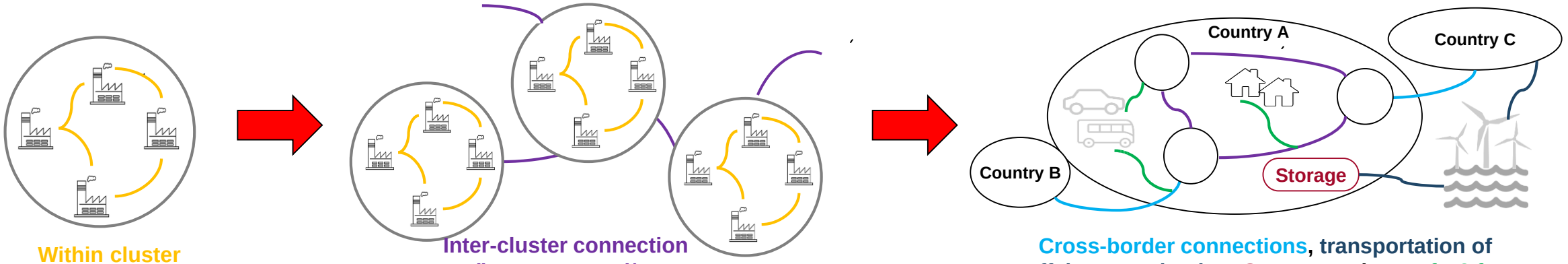
Conditions for hydrogen market - infrastructure development



Matching market needs with infrastructure development



Gradual build-out of hydrogen infrastructure

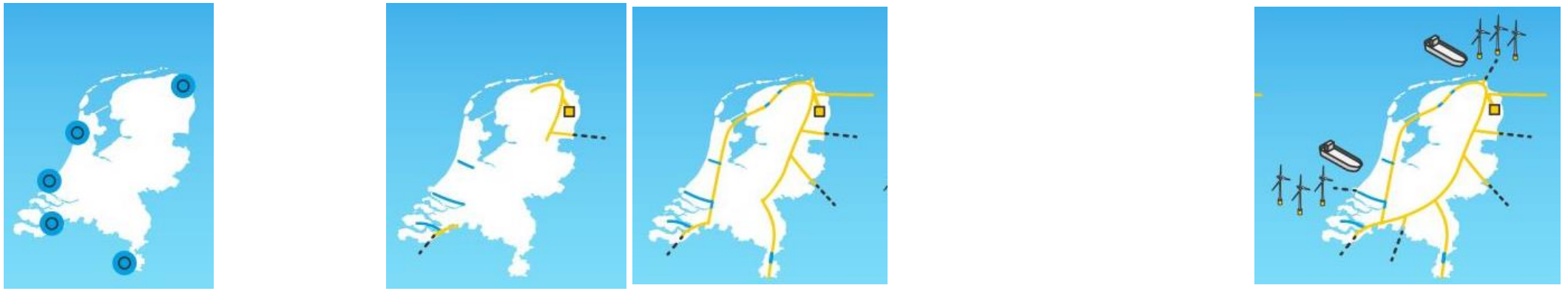


Within cluster connection

Inter-cluster connection (in-country and/or neighbors)

Cross-border connections, transportation of offshore production, Storage and use of H2 for other end-uses than for industrial purposes

Planned evolution of the Dutch hydrogen grid*



*Source: https://www.gasuniereport2020.nl/en/accelerating-the-energy-transition#we-lead-the-way-in-hydrogen-and-green-gas

Recommendations to ENTSOG for a cost-benefit analysis methodology for hydrogen infrastructure

Fotis THOMAIDIS

Formulation of recommendations

- Recommendations were developed following review of ENTSOG's "Preliminary Draft Single-Sector Cost-Benefit Analysis (CBA) Methodology" of 28th February 2023 (the CBA methodology)
- Elements taken into consideration:
  - Compliance with **recast TEN-E Regulation**
  - **Consistency** of the methodological approach, with the ENTSO-E CBA Guidelines
  - Sufficient coverage of hydrogen infrastructure **key costs and benefits**
  - Relevance to the **gradual evolution** of the European hydrogen market and infrastructure
  - Treatment of **uncertainties** related to the hydrogen supply chain
  - **Clarity and transparency** in the application of the methodology and interpretation of its outputs

Overview of recommendations

I. CBAM approach consistent with ENTSO-E

- I.1 Application of common key CBA elements
- I.2 Application of common rules for clustering
- I.3 Consistency of interlinked assessment
- I.4 Consistency in the CBA methodologies' documents

II. Assessment of costs & benefits

- II.1 Inclusion of all costs associated with hydrogen infrastructure development
- II.2 Assessment of benefits in line with the hydrogen sector development
- II.3 Avoidance of correlation between indicators

III. Baseline and assumptions of the analysis

- III.1 Reference grid in line with development of hydrogen infrastructure
- III.2 Sensitivity analysis on uncertainty parameters
- III.3 Validation of project commissioning
- III.4 Setting of commissioning year in clusters
- III.5 Use of long-term shipper commitments in modelling

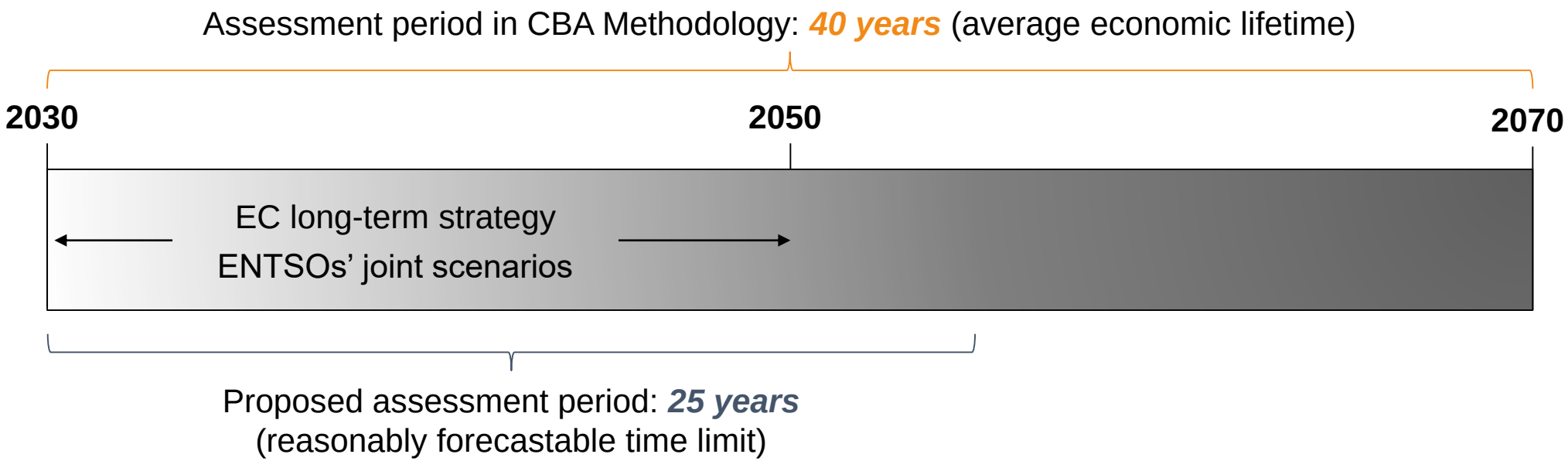
IV. Clarity of implementation and results

- IV.1 Clarity on the application of the methodology
- IV.2 Application span of the CBA methodology
- IV.3 Transparency of project information and analysis assumptions
- IV.4 Transparency of the model features

VIS ECONOMIC & ENERGY CONSULTANTS

: Priority recommendations (high impact / implementation in current CBA Methodology)

Use of assessment period reducing uncertainty

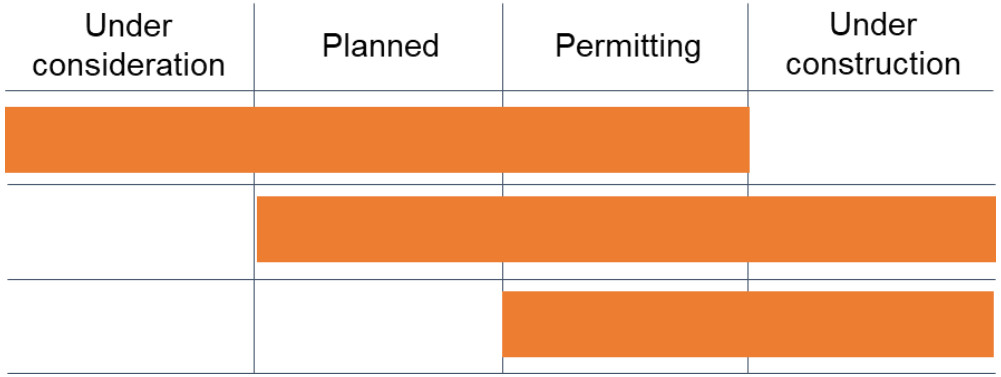


- The assessment period may **differ** from the economic lifetime of a project (practice in electricity and gas assessment)
- Its length must be based on a timeframe where uncertainty is **reasonably acceptable**
- Covering a 40-year assessment period would require scenario building **up to 2070** increasing uncertainty

Consistent clustering of projects

Clustering rules in CBA Methodology

Grouping of projects with commissioning up to ***10 years apart***

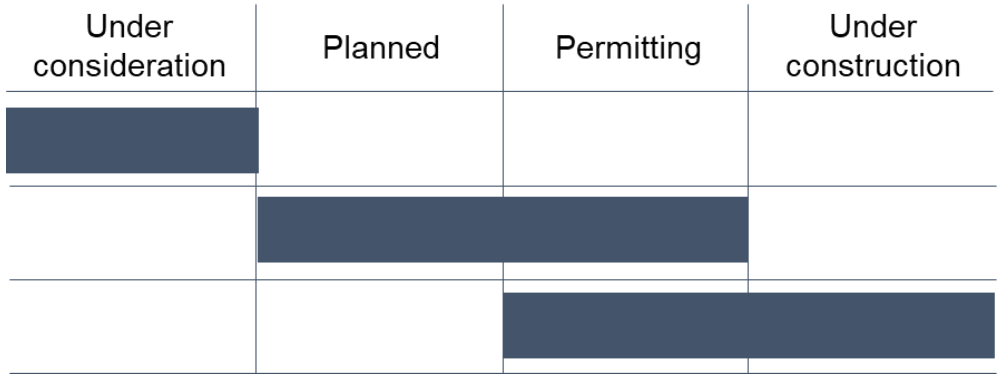


Starting **from the next** (2024) TYNDP

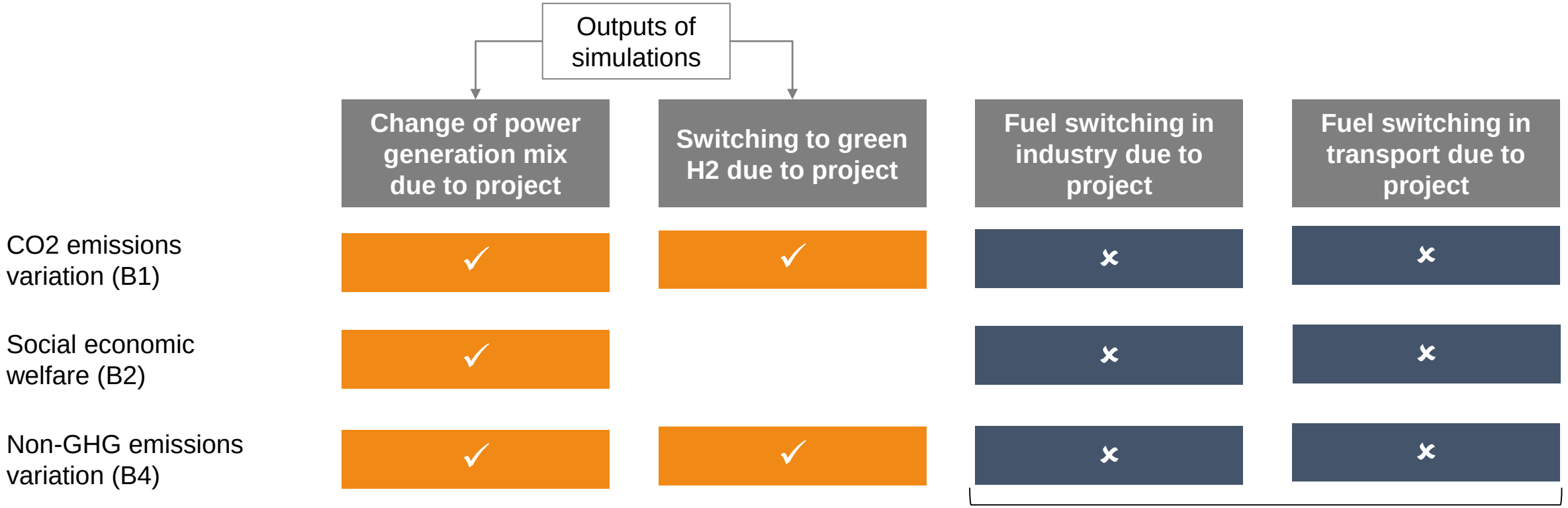
Starting **after the next** TYNDP (2026)

Proposed changes in clustering rules

Grouping of projects with commissioning up to ***5 years apart***



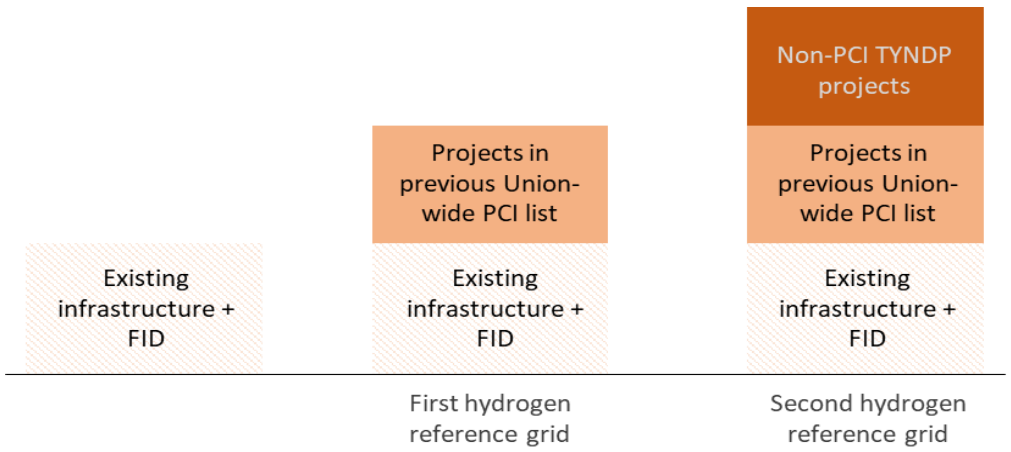
Monetization of impact on hard-to-abate sectors



- Proposed monetization within the indicators
- Update of the model or use simulation outputs for secondary analysis
- If it is not possible to revise any of the indicators in the current CBA Methodology, the limitations of existing indicators should be clarified

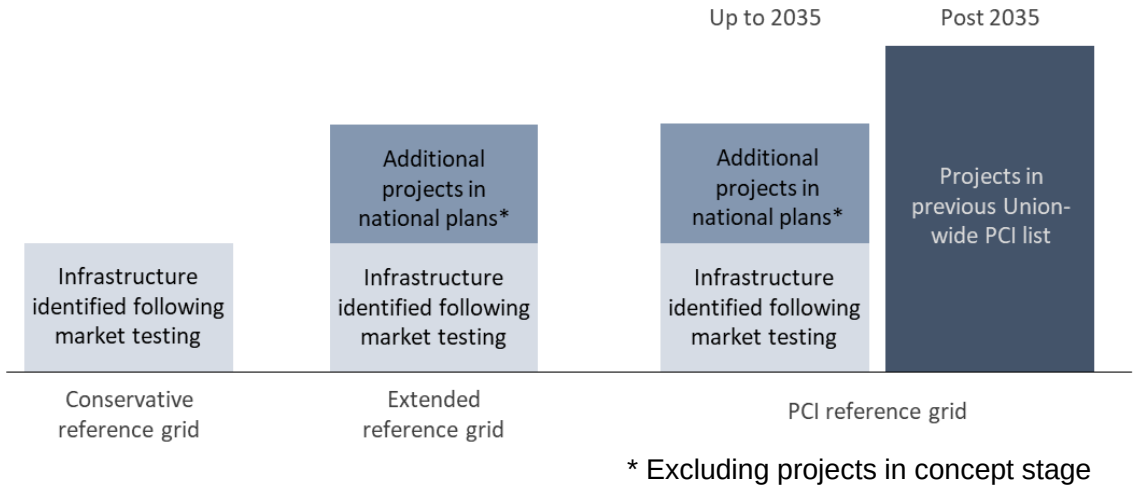
Modelling of hydrogen networks' gradual development

Reference grid in CBA Methodology



Reference grid not taking into consideration the gradual development of hydrogen networks, starting from point-to-point

Proposed changes in reference grid



* Excluding projects in concept stage

- Reference grid **balancing conservative and optimistic view** of hydrogen network development
- Increase of the **hydrogen model granularity** to represent hydrogen clusters instead of countries

Other proposed changes in the CBA Methodology

- Coordination with ENTSO-E to use a **common social discount rate**
- **Consistent interlinked assessment** of hydrogen – electricity – gas infrastructure
- Definition of **cost items for repurposing** natural gas infrastructure
- **Security of supply** indicator assessing projects' impact **on hydrogen cluster** and not country-wide level
- Inclusion of indicator assessing **impact on market integration**
- Sensitivity analysis only on **selected parameters** which reflect uncertainty
- **Clarity** on the calculation of benefits' indicators

Thank you for your attention

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Polls and Q&A

11.05 – 11.25

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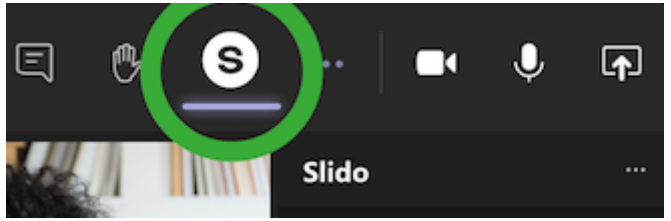

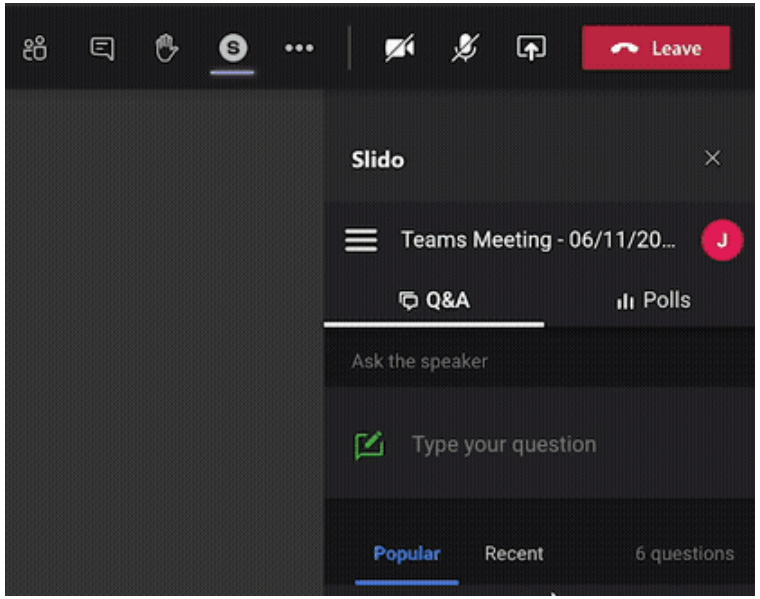

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Closing Remarks

Thank you!
Any questions?

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