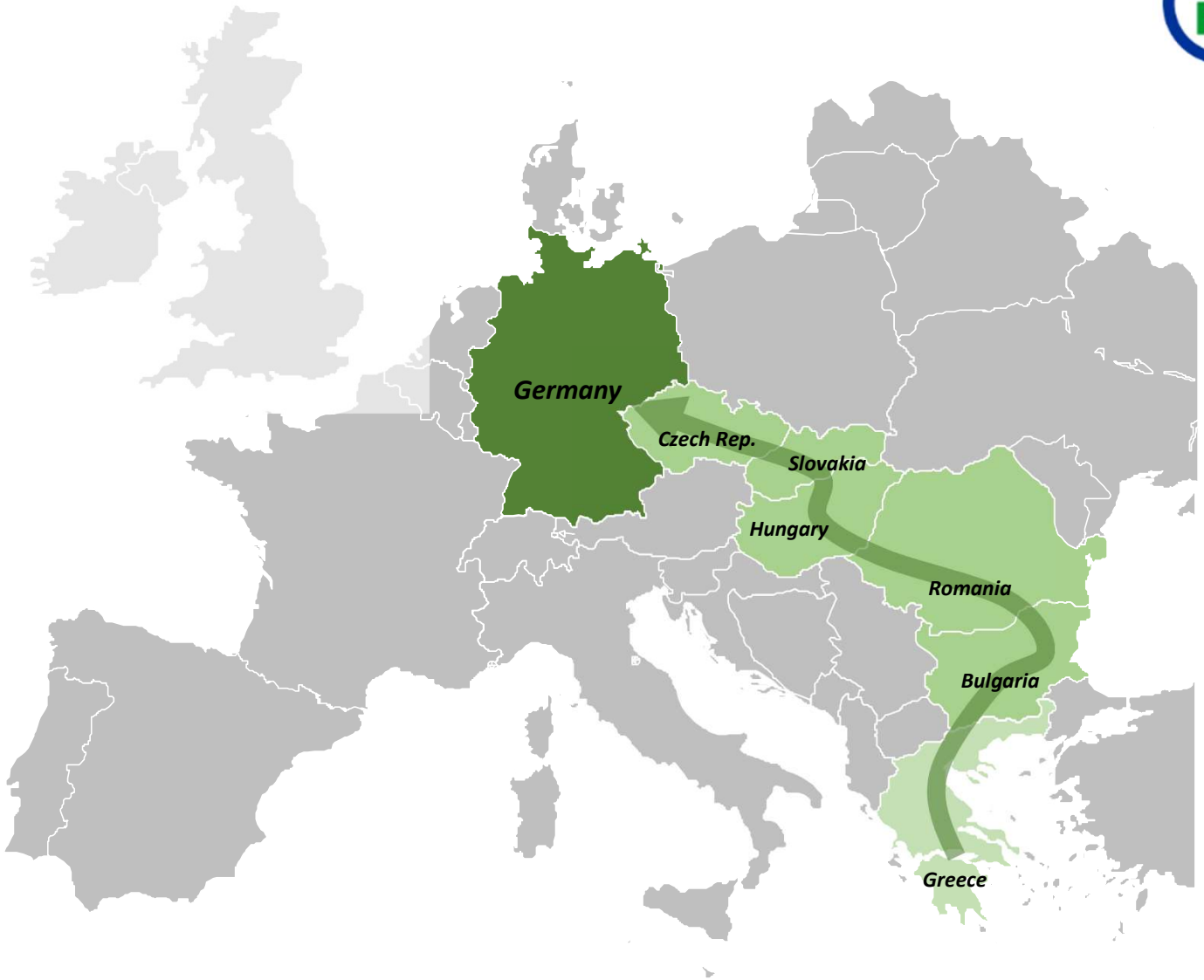
South-East European Hydrogen Corridor : A H2 supply route from the South-East

Czech Hydrogen Backbone Dialogue

November 5th, 2024



South Eastern European Hydrogen Corridor

(SEEHyC)

is a cooperation of

7 European gas TSOs

driven by the vision to secure **green hydrogen** supply to

South-East and Central Europe

Corridor overview

The 7 European gas TSOs **have already signed a MoU** to explore the feasibility of creating a hydrogen transport corridor from the hydrogen production areas in **Greece** & **Bulgaria** going through **Romania, Hungary, Slovakia**, and **Czechia** to **Germany**.

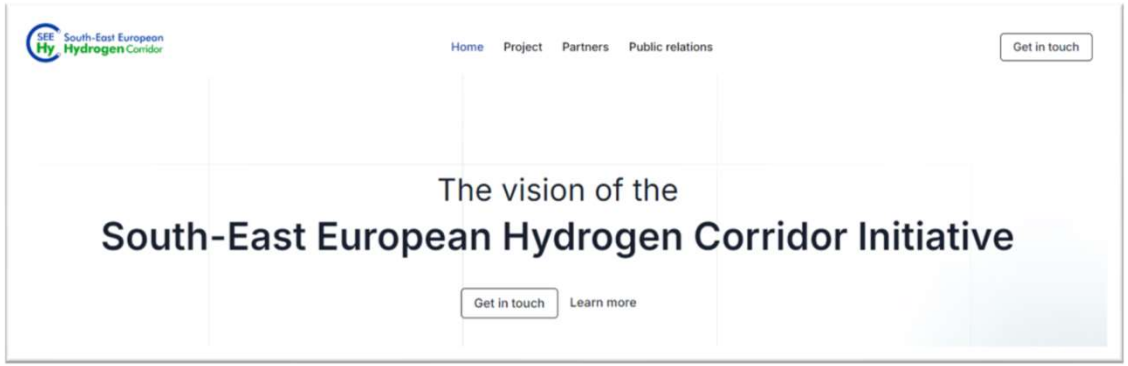
Key parameters of SEEHyC	
Total length	**3129.5 km**
Repurposed pipeline share	**25%**
Initial transport capacity	**80 GWh/d**
Total compression capacity	**312 MW**
CAPEX	**6912.3 mil. €**
OPEX	**189.2 mil. €/a**
Expected commissioning date	**2029**

Already achieved..

1. Close cooperation of the TSOs with frequent WG meetings and exchange of information

2. Already 3 projects promoted by partner TSOs are included in the 1st PCI/PMI list, while coordinated PCI applications are being prepared and will be submitted in the current evaluation process of the European Commission.

For more information please visit: https://www.seehyc.eu



Next Steps..

1. A **pre-feasibility study** is under prepared to further explore the **technical and commercial parameters**, along with the key challenges and possible funding options for the Corridor.

2. The possibility of signing an **Intergovernmental Agreement** among the countries of the partner TSOs is being explored.

3. Common effort to promote the Corridor to institutional, commercial and technical shareholders is goal for all parties.

4. Become Project Supporter: An invitation for the expression of interest in the South-East European Hydrogen Corridor initiative to become an official Project Supporter will be sent to companies of the energy sector in the region.

DESFA's H2 PCI/PMI project – H2DRIA

H2DRIA aims to transmit pure H2 mainly **from the southern part of Greece, up to the Interconnection with Bulgaria,** connecting producers with hydrogen supply points in **South, Central and North Greece and further to Bulgaria and to Central Europe** where potential hydrogen consumers are located.

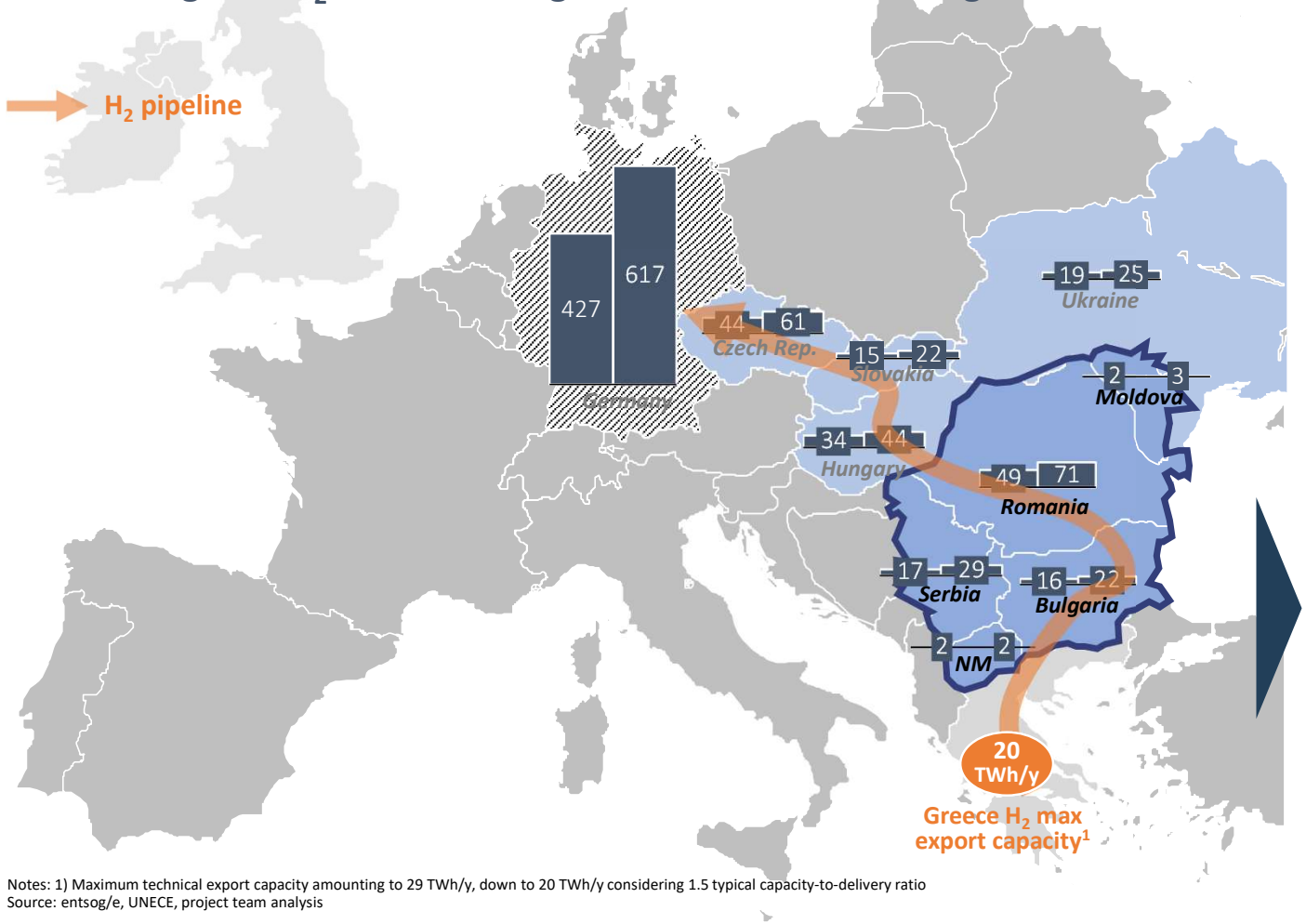
The project has already been **included in the 1st PCI/PMI** *(PCI 10.3.1 Internal hydrogen infrastructure in Greece towards the Bulgarian border)* by the EC and will strengthen Greece's domestic hydrogen production capacity and export activities to Central Europe.

The project will connect to **Bulgartransgaz's dedicated H2 pipeline**, which also qualified and is included in the PCI list.

Key parameters of H2DRIA Project	
Total length	**570 km**
Initial transport capacity	**80 GWh/d**
Total compression capacity	**60 MW**
CAPEX	**1000 mil. €**
OPEX	**26 mil. €/a**
Expected commissioning date	**2029**

Germany and the SEE region appears attractive for Greek H_2 exports, with a total demand significantly higher than the 20 TWh/y Greek maximum export capacity

Focus on regional H_2 demand along the SEE corridor – entsog/e Global Ambition 2022 (TWh)



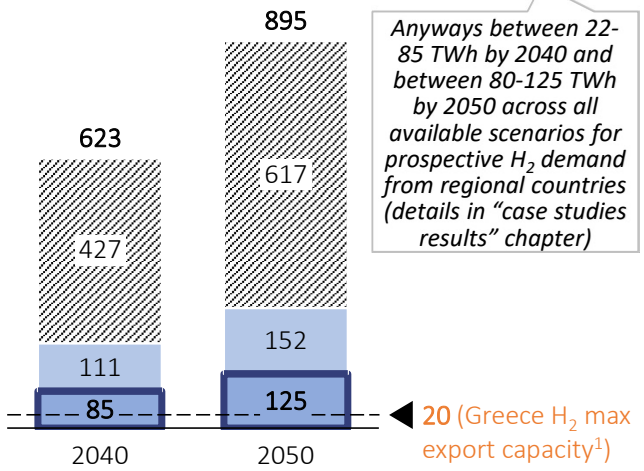
H_2 demand 2040 and 2050 (TWh), *entsog/e – Global Ambition, 2022*

Closer countries

Other regional countries

End target market in H_2 competitiveness analysis

Combined H_2 demand by area (TWh)

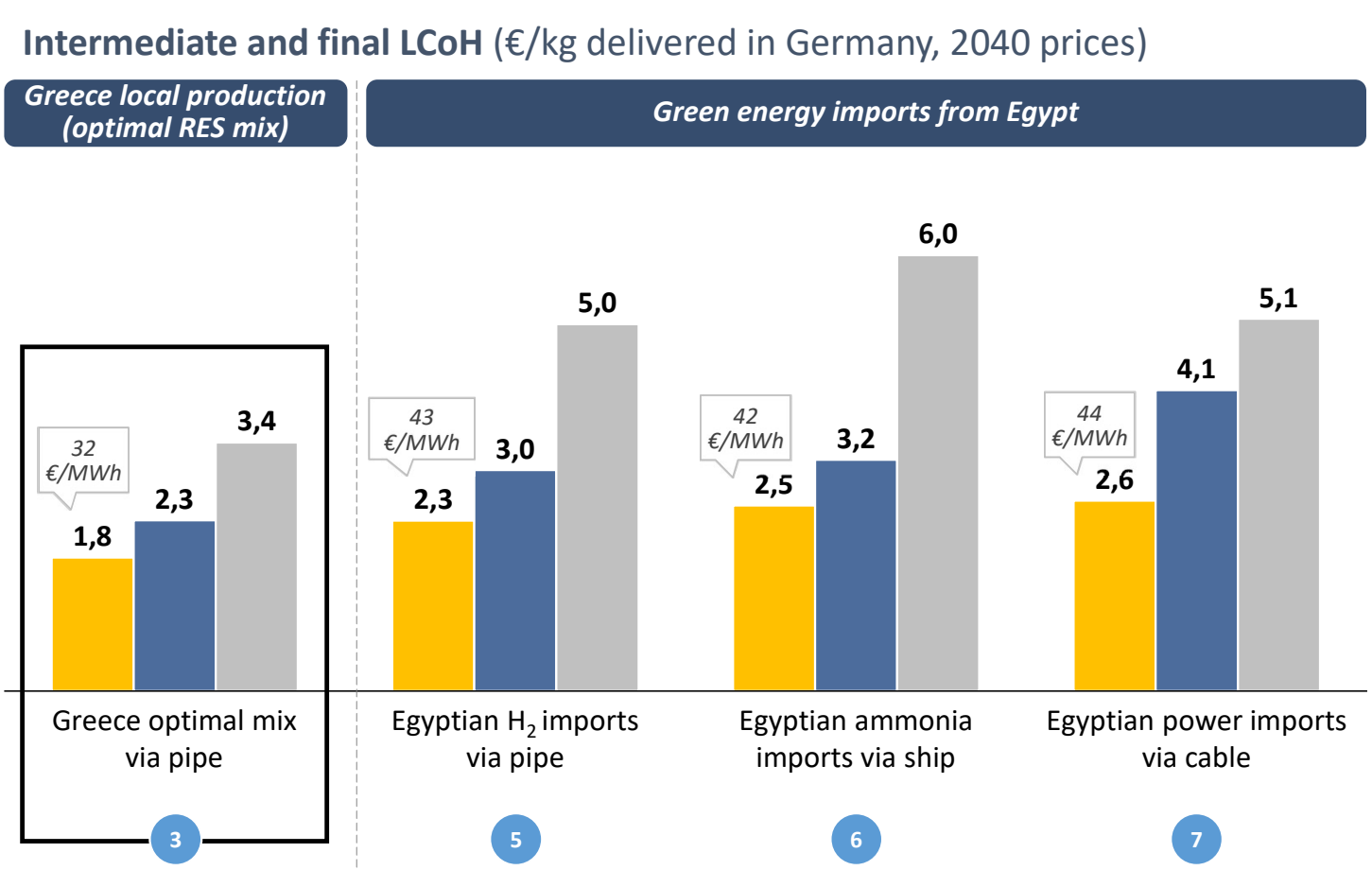


Anyways between 22-85 TWh by 2040 and between 80-125 TWh by 2050 across all available scenarios for prospective H_2 demand from regional countries (details in "case studies results" chapter)

Notes: 1) Maximum technical export capacity amounting to 29 TWh/y, down to 20 TWh/y considering 1.5 typical capacity-to-delivery ratio
Source: entsog/e, UNECE, project team analysis

For export to Germany, H_2 locally produced with an optimal RES mix in Greece remains competitive vs. alternative green energy imports to Greece

Intermediate and final LCoH (€/kg delivered in Germany, 2040 prices)



Comments

Rationale for results:

- Green energy imports from **Egypt less competitive** than local production overall due to **higher country risk** (12% WACC vs. 6%) applied to H_2 infrastructure
- **H_2 pipe** transportation **comparable to power cable** considering **100% new offshore pipe** and lower cable cost based on **GREGY estimate** (3.1 vs. 5.4 M€/km Aegean Interconnector)

Key assumptions:

- **Cable capacity** 5.2 GWe
- All **H_2 pipe sections costs** considered for **3.3 GW_{H2} capacity** (higher existing capacities assumed as absorbed on additional volumes)[2,3]

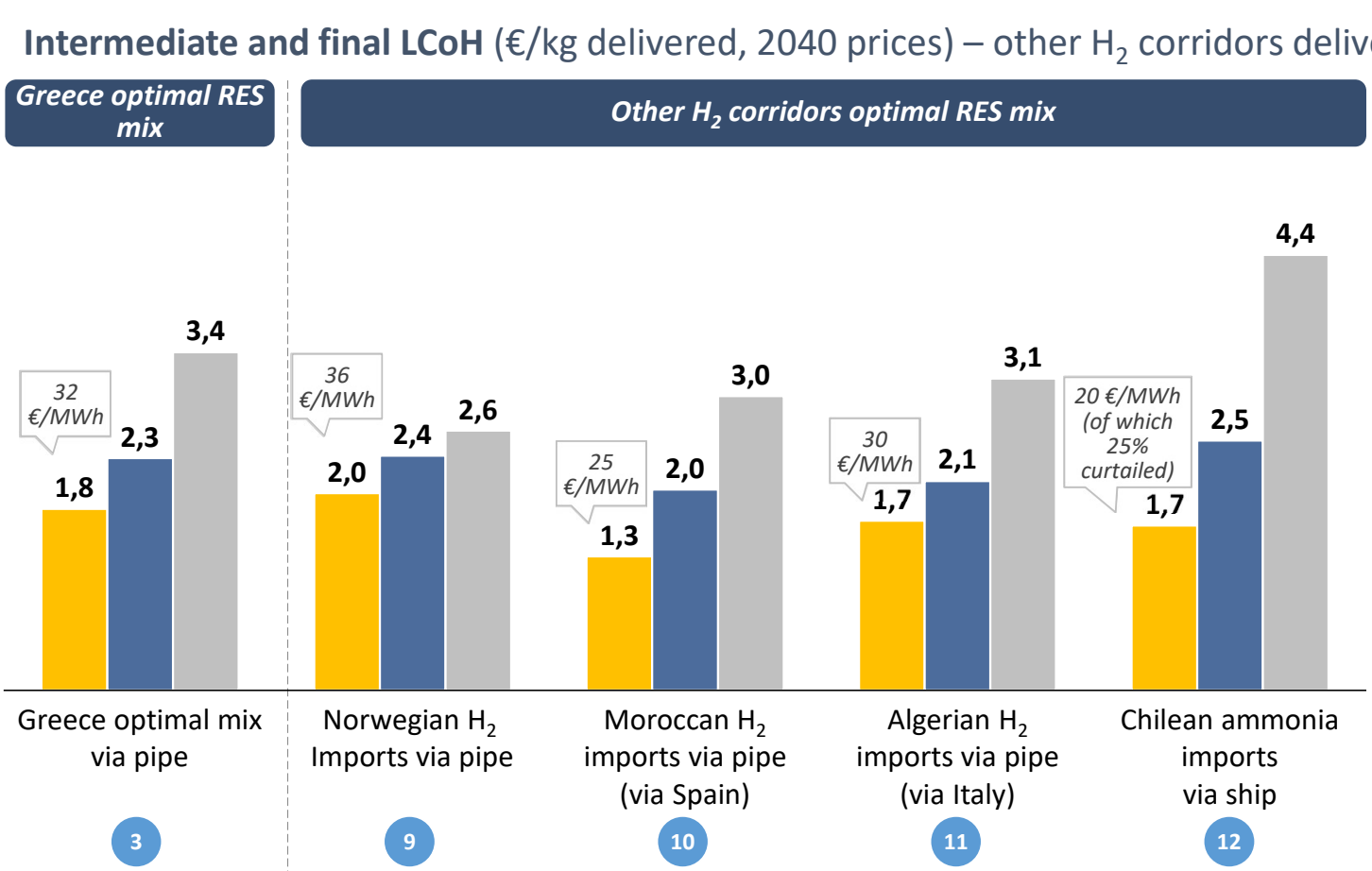
Other considerations:

- Local production in Greece allows to concentrate investments within EU vs. diverging **60-70% of CapEx outside Europe** for green energy **imports from Egypt**
- Imports from Egypt may still be attractive for Greece to **complement local production** with **programmable** flows, contribute to EU **supply diversification**, and limit **financing / subsidies need**

Notes: 1) Including H_2 storage (in tanks, geological sites, or ammonia depending on the case study); 2) H_2 pipeline cost for Greek corridor to Germany considers different shares for each section depending on project capacity: 100% Greek backbone, 100% Bulgaria backbone, 80% Romania backbone, 80% Hungary backbone, 56% Slovakia backbone, 56% Czech Republic backbone; 3) H_2 pipeline cost for Egypt to Greece route (e.g., EastMed) considers different shares for each section depending on project capacity: 100% Egypt to EastMed (ad-hoc), 73% EastMed, 100% EastMed to Greece (ad-hoc); Source: project team

Considering German import needs, the Greek option is comparable with Norwegian, Moroccan, and Algerian H_2 corridors, with the advantage of domestic EU H2 production

Intermediate and final LCoH (€/kg delivered, 2040 prices) – other H_2 corridors delivering in Germany



Comments

Rationale for results:

- Other corridors lay on **countries with lower WACC** vs. 6% avg. Greek corridor (3% NO-DE, 4% ES-FR)
- **Morocco and Algeria** corridors competitiveness also driven by **high share of repurposed sections** (50% and 70% of total pipe length, respectively), allowing for **60-80% saving** on avg. cost per km
- **Norwegian** corridor covers **lower distance** despite requiring new offshore pipe (**30% of Greek** length)
- **Attractive capacity factors** across source countries, leveraging **polarization** on most efficient RES (70-80% wind on-shore in NO/DZ, ~100% PV in MO/CL)
- Pipes with **larger capacities** (e.g., Norway, France, Italy) also benefit from **economies of scale**

Key assumptions:

- All **H_2 pipe sections costs** considered for **3.3 GW_{H2} capacity** (higher existing capacities assumed as absorbed on additional volumes)[3,4]

Other considerations:

- Despite cost competitiveness, EU may need the **contribution of all corridors** to satisfy total demand and ensure **diversification** of supply

Notes: 1) Including H_2 storage (in tanks, geological sites, or ammonia depending on the case study); 3) H_2 pipeline cost for Greek corridor to Germany considers different shares for each section depending on project capacity: 100% Greek backbone, 100% Bulgaria backbone, 80% Romania backbone, 80% Hungary backbone, 56% Slovakia backbone, 56% Czech Republic backbone; 4) H_2 pipeline cost for other corridors to Germany considers different shares for each section depending on project capacity: 30% Norway – Germany offshore pipe; 100% Morocco to BarMar pipe; 37% BarMar offshore pipe; 40% French backbone (HyFen); 100% Algeria to Italy pipe; 40% Italian backbone; 100% Swiss backbone; Source: project team

SEEHyC creates new opportunities

A Offers an additional area of cooperation with Germany for supply of H2

The SEEHyC is fully compatible with the recently (July 24) announced German strategy for green Hydrogen

B Facilitates penetration of renewables and import of foreign investments for H_2 production

It offers an invaluable way out for the enhancement of the introduction of renewables in the Greek energy mix;

Promotes H2 production through foreign investments

C Offers synergies for connection to other Balkan and other Eastern European Counties

SEEHyC creates synergies for connecting Balkan and Eastern European countries to a shared hydrogen network, enhancing regional energy security and integration. By linking potential hydrogen producers and consumers, the corridor facilitates market access, fosters cross-border trade, and strengthens the energy transition across the Balkans and Eastern Europe.

SEE Hy South-East European Hydrogen Corridor

Thank you!