Snam and the hydrogen opportunity

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Snam is one of the main global energy infrastructure company

Key figures

€ 22.6 bn RAB + affiliates ('19)	**€ 28 bn** Enterprise Value	**1.1%** Debt cost
€ 1.093 m Net Profit Adj ('19)	**~ € 15 bn** Market Cap	**BBB+** Rating

30.3%
cdp CDP Reti

69.7%
Free float
~80K investors

International associates

Trans Austria Gasleitung · TERĒGA · Trans Adriatic Pipeline · GAS CONNECT AUSTRIA · Interconnector · DESFA · albgaz · Snam Beijing Gas & Energy Services · ADNOC

Natural gas[1]

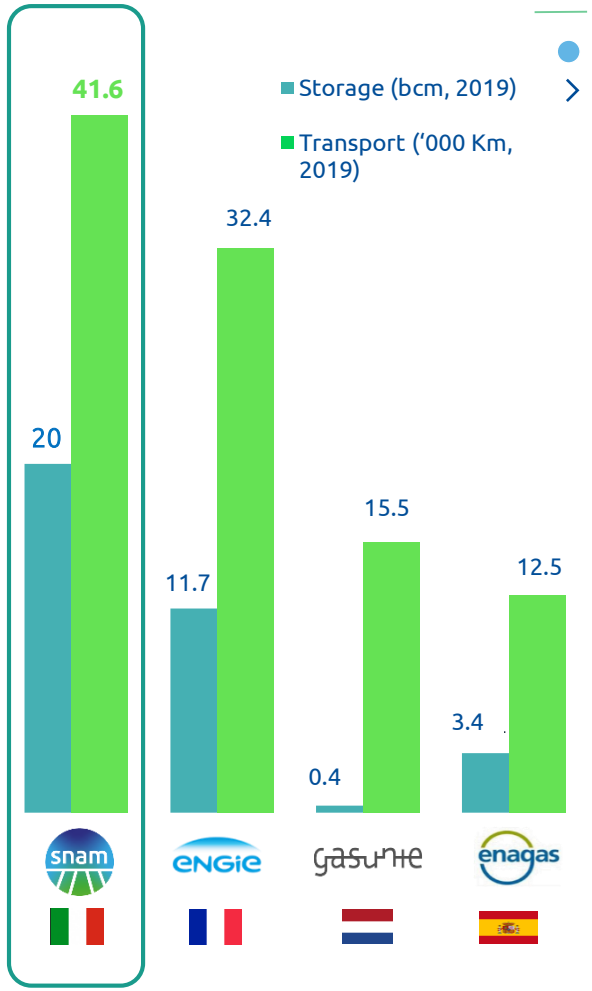
~41,700 km	~20 bcm capacity	~20 bcm/y capacity
Transport	Storage	Regasification

New companies for energy transition

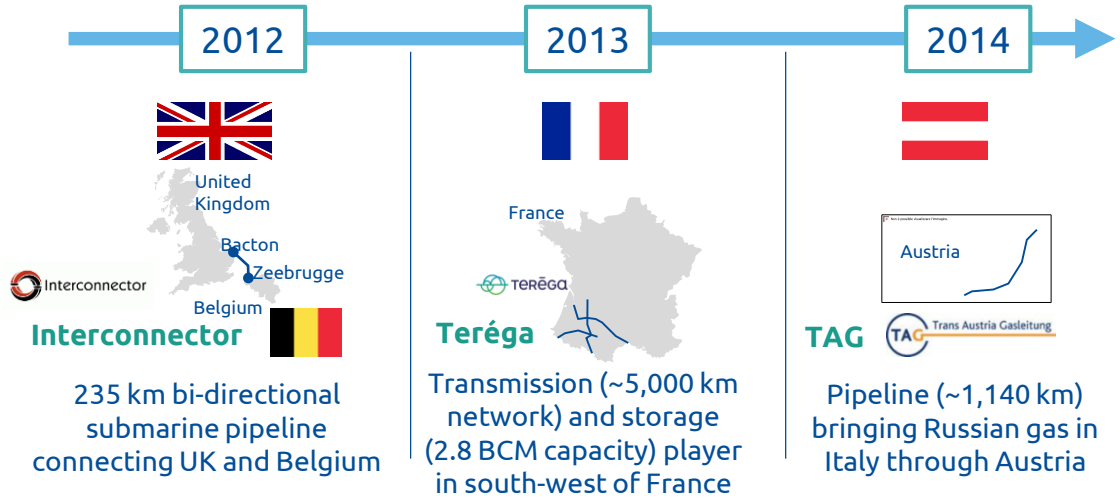
- BU Hydrogen
- Snam4 Mobility
- Snam4 Environment
- Snam4 Efficiency
- ARBOLIA

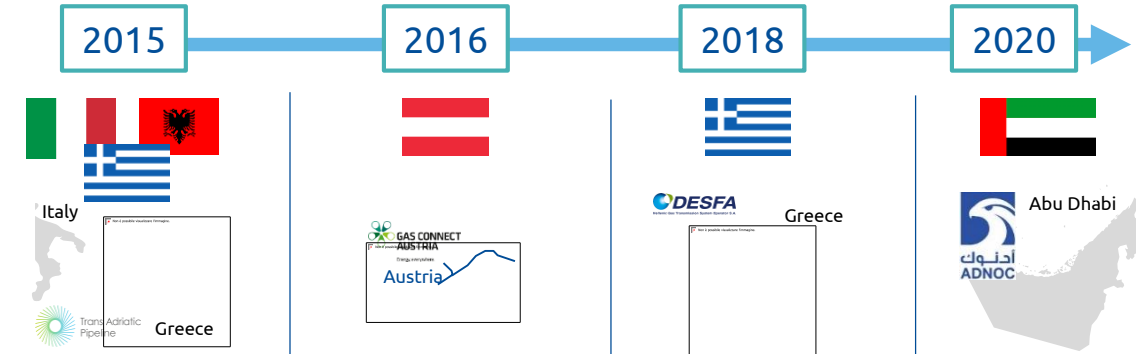
[1]Italy and international associates

Undisputed leader in the natural gas infrastructure



3/3 Our regasification terminals in Italy





NOTE:
Data referred to Snam and its subsidiaries (Teréga, TAP, IUK, TAG, Desfa). Countries are France, Austria, Belgium, UK, Greece, Italy.
Snam owns 100% of Panigaglia LNG terminal, 7.3% of Adriatic LNG and 49.07% of OLT Offshore LNG Toscana S.p.A.

The role of hydrogen in the decarbonization

The «colours» of hydrogen

«Grey» Hydrogen	«Blue» Hydrogen	«Green» Hydrogen
Natural gas is separated into hydrogen and carbon dioxide (CO2)	*Natural gas is separated into hydrogen and carbon dioxide (CO2). The carbon dioxide is stored and reused*	*Water is separated into hydrogen and oxygen molecules thanks to the use of electricity from renewable sources*
CO_2 emitted into the atmosphere	CO_2 captured and reused	No CO_2 emitted

Why hydrogen?

- ✓ It can be produced **carbon-neutrally** through RES and can **support the development of a decarbonised economy**
- ✓ It can be used **to transport and store energy**, but also in **end uses**. Will enable **sector coupling**
- ✓ Can be used in **existing infrastructure**

BU Hydrogen

Created in 2019, Snam BUH2 is focused on different kind of activities: **scouting of hydrogen-related technologies**, **designing of innovative business models** and **definition of business cases** for the utilization of hydrogen in different sectors: mobility, industry, energy, services

H2 for Sector coupling and RES integration

Solutions for innovative utilities and sector coupling

H2 for Industry

Supply for green industrial processes

H2 for Transportation

Solutions for sustainable mobility systems

H2 for Commercial Use

Fuel Cells for business continuity and heating

Snam and the hydrogen opportunity: 3 streams of action

1. Asset Readiness

- **Pipelines:** network is largely hydrogen ready, key reason to underpin replacement
- **Components**: gas chromatographs and other minor instruments would need replacing (<1% RAB)
- **Gas compressor units**: testing the impact of a 5-10% blend.
- **Geological storage sites:** ongoing analysis and research
- Ongoing assessment of use of **membranes to separate NG and H2** out of NGH2 blend

Negligible investment to reach 5-10% NGH2 readiness
Ongoing investment in the grid «Hy-ready»

2. System design

- **Long-term scenarios:** Expected key role of hydrogen in the energy mix
- **Grid evolution:** Development of pathway analyses with increasing share of green gasses
- **Technical standards:** involvement in focus groups to develop common rules on H2 in Italy and Europe

Ongoing work
to support
long-term grid planning

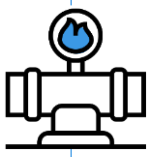
3. Value chain development

- Evaluating potential opportunities/pilot projects to scale up clean H2 production and use
- **Potential partnership** with other operators of the value chain
- Scouting for promising **technologies**

Scouting the market
for investment opportunities and partnership

Snam as an Enabler; Hydrogen BU created

Snam is assessing H2 readiness on its infrastructure through a variety of actions



On pipelines :

- **injection tests** of a mixture of H_2NG up to 10 % of volume in the network (to check compatibility of current infrastructure) have been successfully carried out
- new SNAM's **internal standards** for 100% Hydrogen compliant Piping and Pipeline have been issued
- studies are going on existing pipelines to **validate H_2 readiness**, and confidence has been reached that only a small portion (10-15%) of the existing network needs to be replaced

On compressing stations :

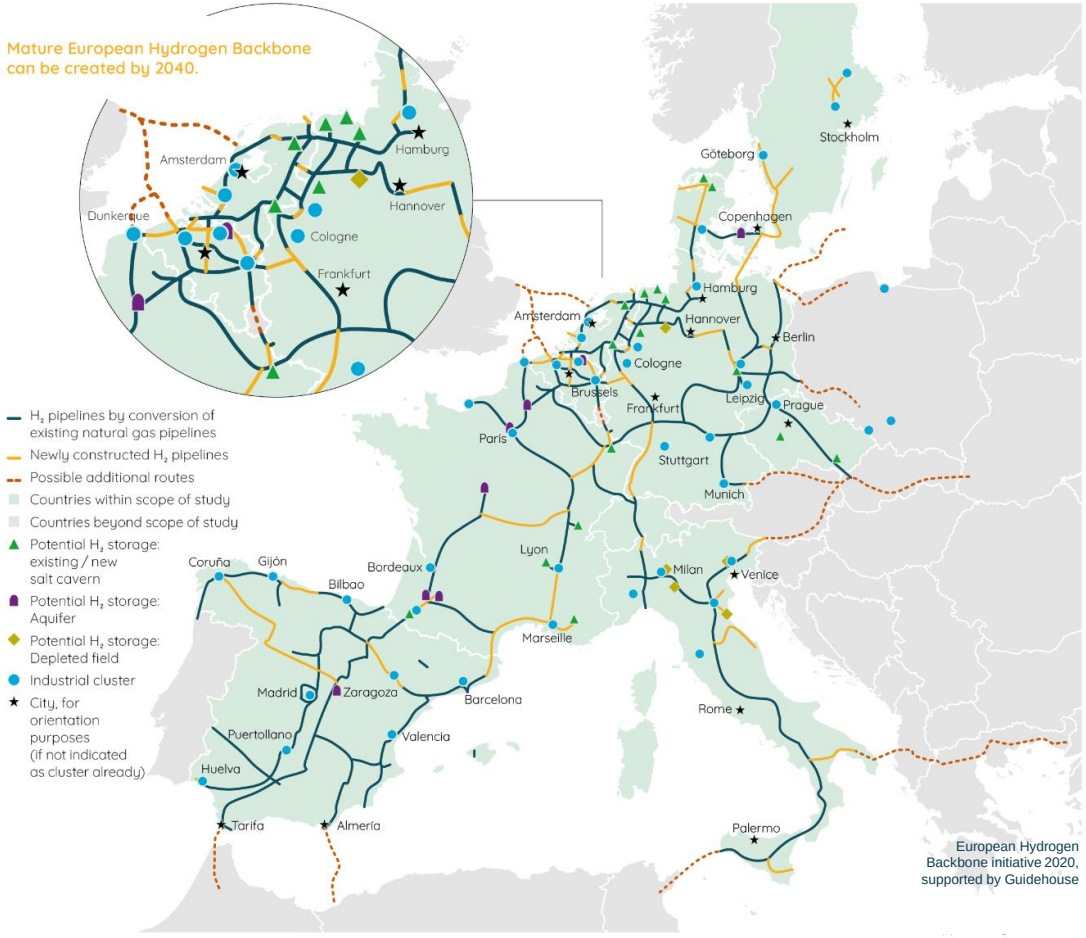
- collaboration with gas turbine suppliers is ongoing to assess (i) the **maximum H_2 percentage** that can be mixed without major modifications and (ii) the extent of the modifications in case of higher percentages
- tests are planned to verify **readiness to accept 5% (potentially up to 10%) H_2NG mixtures** without changes

On underground storage :

- feasibility study has been launched to **investigate and simulate** physical, chemical and microbiological phenomena associated with H2NG storage
- The study will last two years but we do not expect major constraints to the use of H2NG mixtures

The European Hydrogen Backbone (“EHB”)

The EHB is a shared vision from eleven TSOs1 to engage in a truly European undertaking.



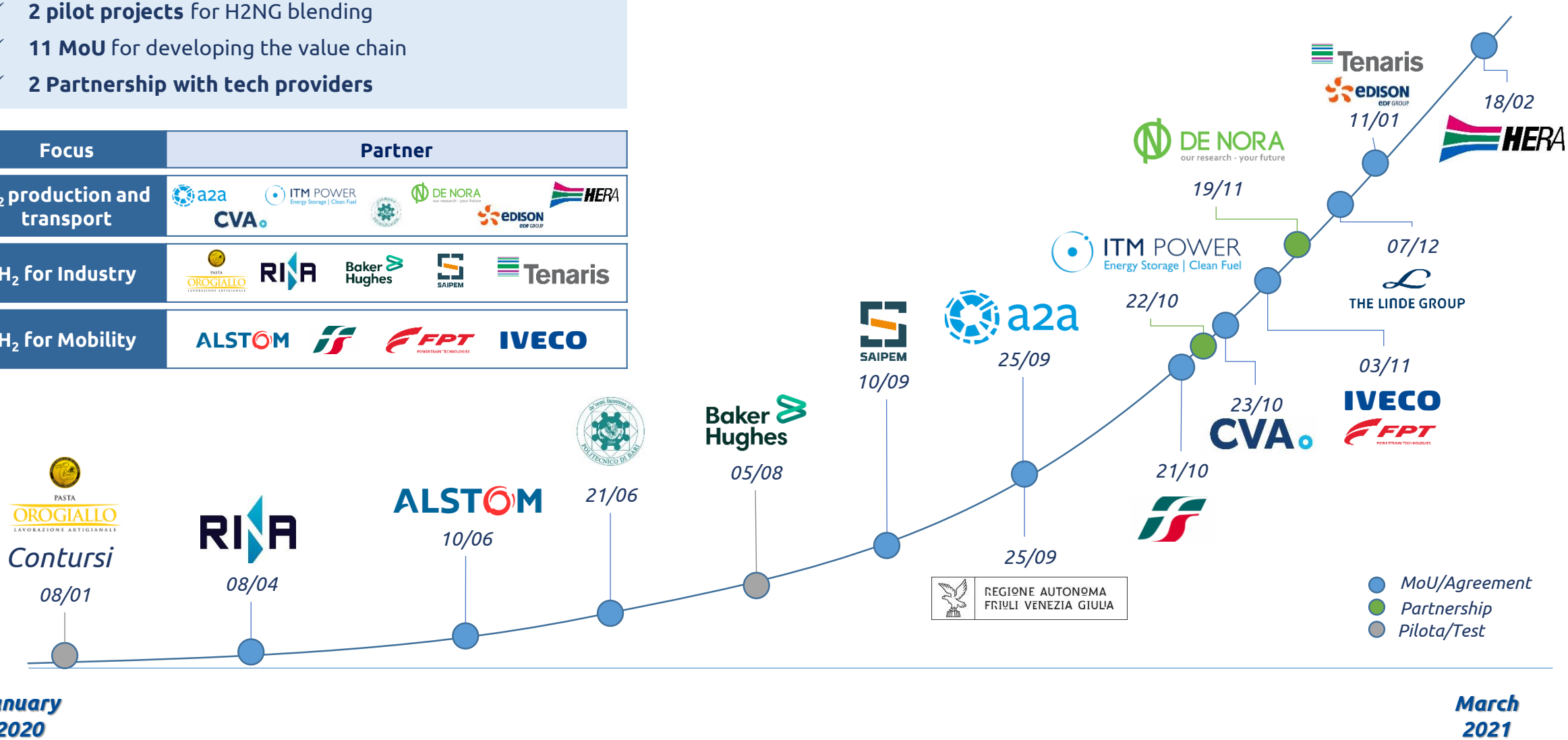
- A proposal for a **dedicated hydrogen transport infrastructure**, connecting supply and demand from north to south and west to east.
- Starting with an emerging 6,800 km pipeline network connecting hydrogen valleys by 2030; then stretching into all directions with a length of about **23,000 km by 2040**, with expected further expansion up to 2050.
- Converted 36- and 48-inch hydrogen pipelines, commonly used for long-distance gas transport in the EU, can provide **7 and 13 GW** (at LHV[2]) of hydrogen capacity per pipeline, respectively.
- The proposed backbone requires an estimated total investment cost of **€27-64 billion by 2040**, based on using 75% repurposed natural gas pipelines connected to 25% newly built dedicated hydrogen pipelines.
- Levelised transport costs amount to 0.09-0.17 €/kg per 1000 km, enabling **cost-effective long-distance transport** across Europe.
- The EHB is an **open initiative** – all European gas infrastructure companies and associations GIE and ENTSOG are encouraged to join in the thinking, to further develop this pan-European undertaking.

1. Includes Enagás, Energinet, Fluxys Belgium, Gasunie, GRTgaz, NET4GAS, OGE, ONTRAS, Teréga, Snam, Swedegas; covering Germany, France, Italy, Spain, the Netherlands, Belgium, Czech Republic, Denmark, Sweden, and Switzerland (indirectly through Fluxys Belgium); 2. LHV: Lower heating value, the energetic value of a gas, after subtracting the heat of vaporisation from the higher heating value.

A growing ecosystem

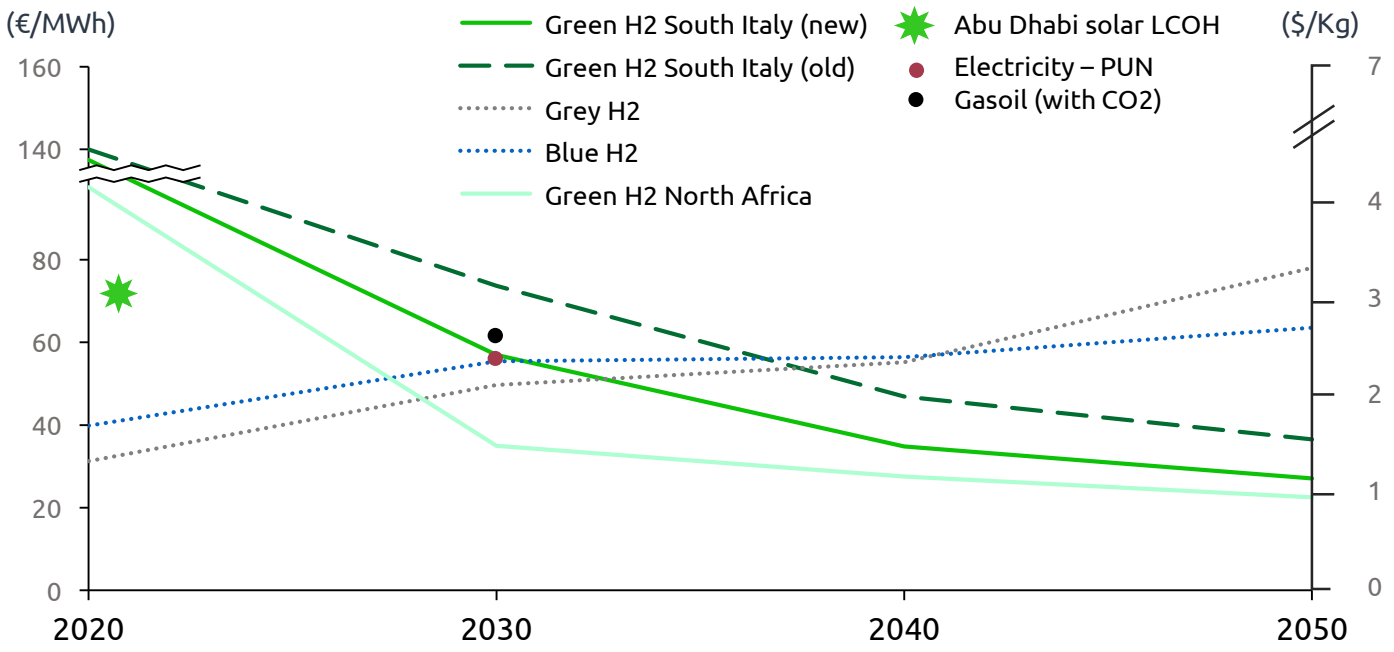
- ✓ **2 pilot projects** for H2NG blending
- ✓ **11 MoU** for developing the value chain
- ✓ **2 Partnership with tech providers**

Focus	Partner
H_2 production and transport	a2a, CVA, ITM POWER, DE NORA, EDISON, HERA
H_2 for Industry	OROGIALLO, RINA, Baker Hughes, SAIPEM, Tenaris
H_2 for Mobility	ALSTOM, FPT, IVECO



H2 production costs are falling even faster than expected

Levelized production cost of hydrogen evolution



15% lower than previous year

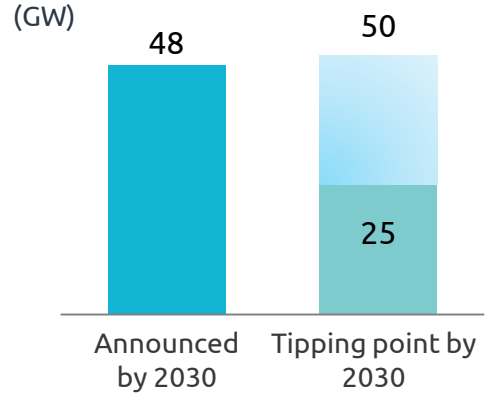
Electrolyser Capex (large scale) €/kW

890 | 243 … large-scale adoption | 157

44 | 24 … large-scale adoption | 11

Solar cost (large scale - south Italy) €/MWh

Announced H2 projects already reach demand tipping point



- **25GW** of electrolyzes capacity worldwide required for H2 costs around $2/kg in favorable areas for renewable production
- **Ca. 50GW** by 2030 «tipping point»

Value-chain cooperation to create scale

Source Snam internal analysis, Hy challenge, CO2 assumptions: 24.5 €/ton (2020), 38.0 €/ton (2030), 58.4 €/ton (2040)

Hydrogen to become competitive quickly in a number of sectors

Mobility

Trains

Break-even <7-5$/kg

Long-haul trucks

Feedstock and industrial applications

Steel (DRI)

Break-even < 4 $/kg

Refinery Green H2

Growing role in industrial applications

Industrial uses

Chemicals

Break-even <2 $/kg

Today — 2030 — 2040

Source: Snam elaboration on IEA, Hy Challenge, Hydrogen Europe, Lazard

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