THE RENEWABLE GAS IN THE STRATEGY OF SNAM

Milano, 5 dicembre 2019

Introduction

SNAM in Italy and Europe

Our business into the entire supply chain

(subsidiary companies included)

TRASPORT/DISPATCHING

STORAGE

REGASIFICATION

~40.000 km

~20 bcm capacity

16 bcm/y capacity

sn4m mobility

CNG/LNG STATIONS

SMALL SCALE LNG

BIOMETHANE

cuboGas

IESBIOGAS a Snam company

ENERGY EFFICIENCY

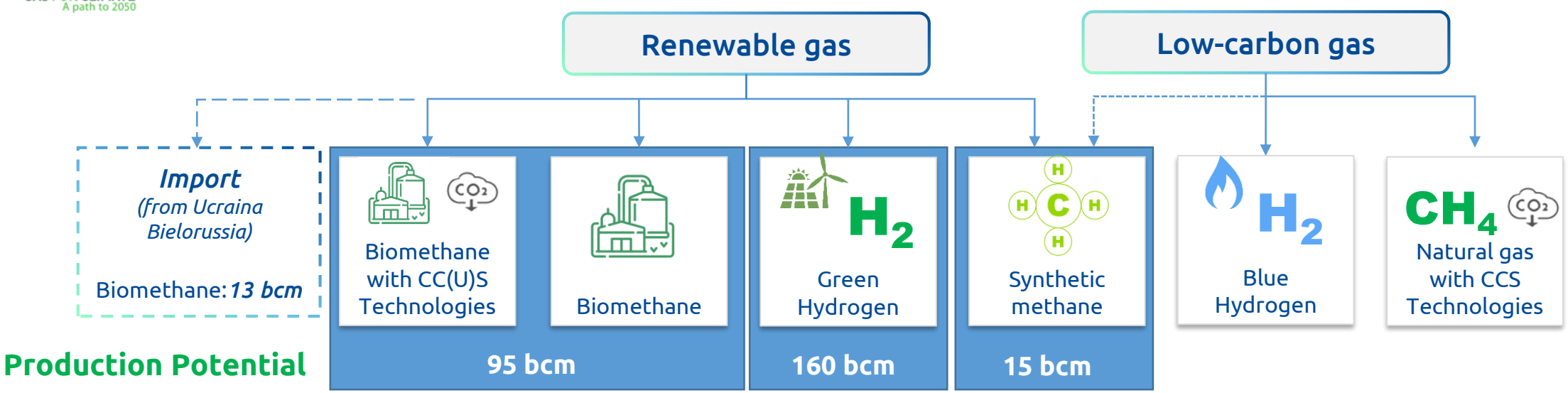
ENERGY SOLUTION TEP a Snam company

Hydrogen

The role of the green gas in the energy transition pathway

GAS FOR CLIMATE
A path to 2050

European Energy System at 2050 – pathway towards Net zero Emissions



Green Gas Potential @ 2050: 270 bcm

Solutions for hard- to-decarbonize sectors

Combinations of CCS technologies to provide negative emissions

Savings up to 217 billion €/year compared with a fully electric scenario

Source: «Gas for Climate 2019»

Biomethane Production costs

GAS FOR CLIMATE
A path to 2050

Technologies

Anaerobic Digestion

@2018:
70-90 €/MWh

@2050:
57 €/MWh

25€/ MWh

Solid biomass gasification

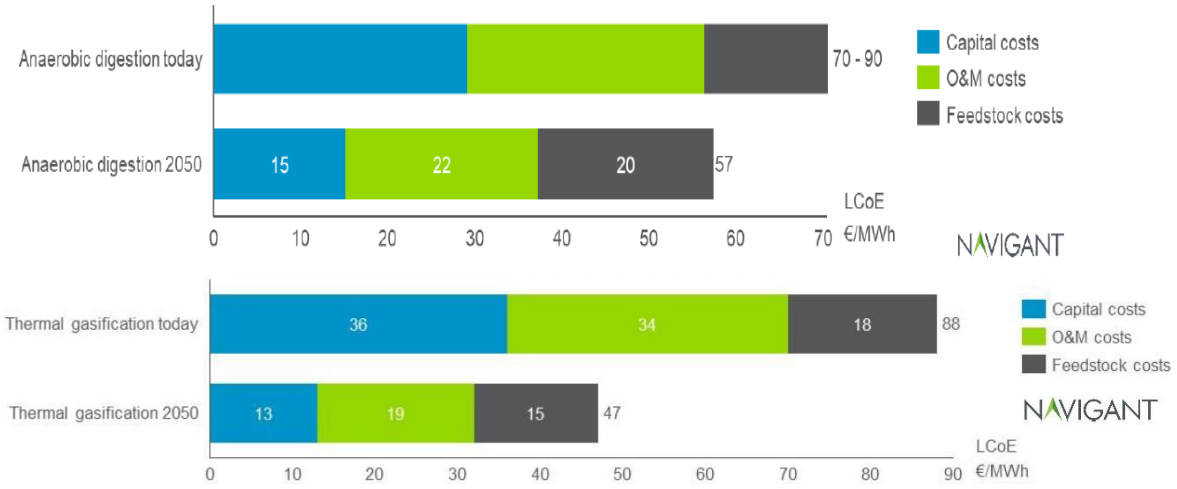
@2018:
88 €/MWh

@2050:
47 €/MWh

40€/ MWh

Drivers to enable the reduction of the costs

- Increase in the installed capacity
- Use of new innovative agricultural practices
- Increase in conversion from biomass to biomethane
- construction of multi- plants on a commercial scale
- scale up plants' size to enable economies of scale and to increase conversion energy efficiency



Italian Legislative Framework

- **2018, 2nd March, Decree**
  - Incentive scheme to use biomethane in transport (up to 1,1 bcm/year by 2022)
  - Guarantees of origin to use biomethane in all other sectors

- **PNIEC ***

2030 IT - Target for the transport sector

GHG Emissions Reduction (MtCO2eq):
-46 (vs 2005)

Renewable gases share with reference to the gross final consumption :
21,6%

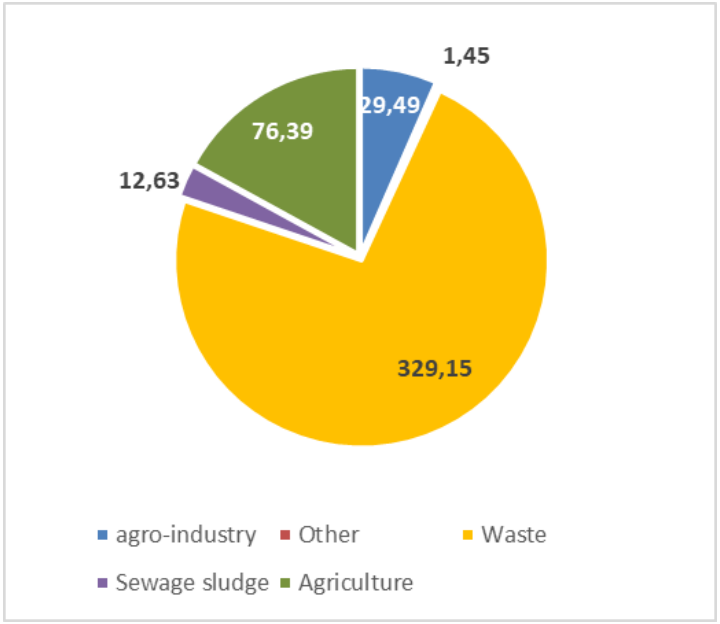
(*) Proposta Piano Nazionale Integrato Energia Clima

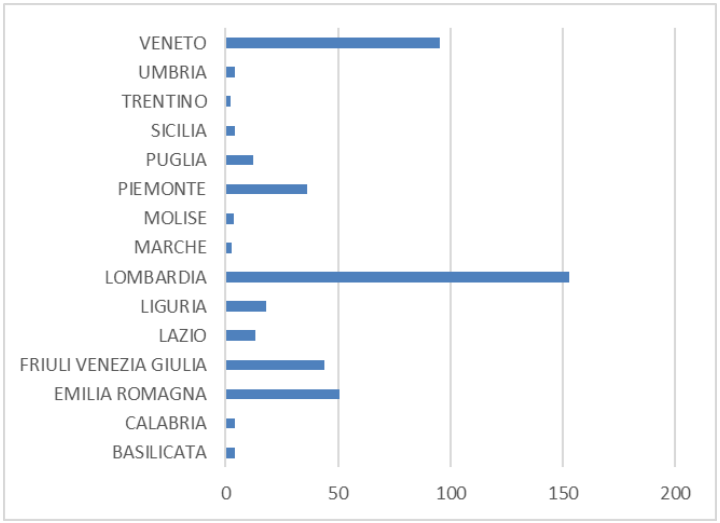
Biomethane injetion into the italian gas network

To date…

- 53 connection requests accepted (1)
- 16 biomethane plants already in operation
- Over 450 million cubic meter biomethane injected into the gas networks for transport sector by 2021

Total capacity - *biomethane plants in operation/under construction [mln smc/year]*





(1) 49 requests to inject biomethane into the transmission network; 4 requests to inject biomethane into the distribution network

** of which one plant connected with the distribution network*

Decarbonization of the Energy System (1/2)

State of Art

•Over 1700 Biogas plants in operation
Combined heat and power (CHP)
is produced only from biogas

(~ 2,5 bcm biomethane equivalent)

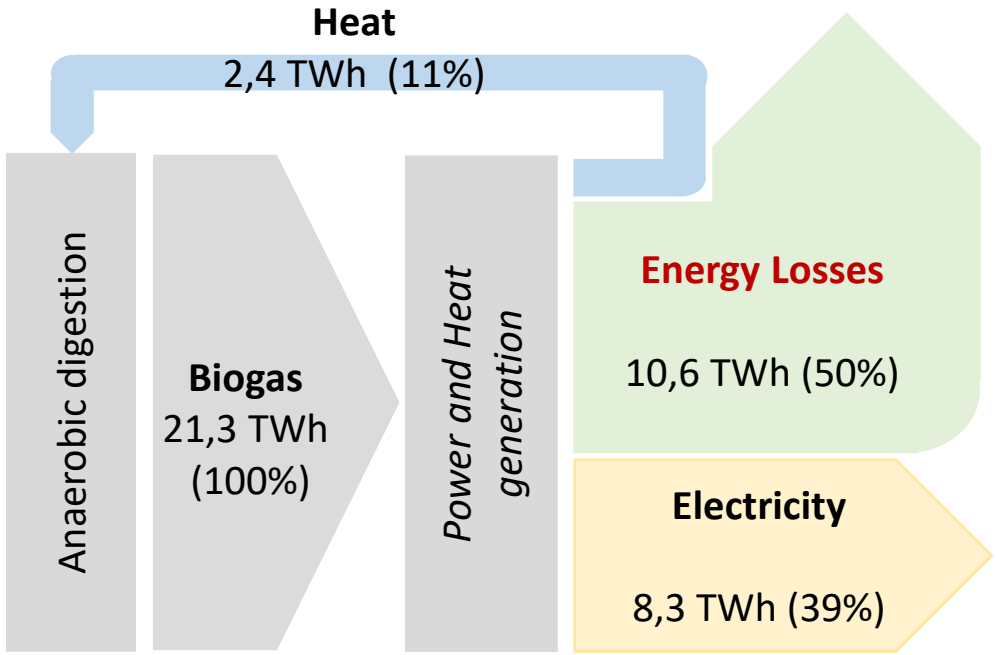
- Government incentives to gas mobility: biomethane: (up to) 1,1 bcm/year (equival to the actual gas consumption for mobility)
- only a small share of plants is reconverting into biomethane
- at least **1,4 bcm biomethane right now** potential available (2,5 - 1,1) to use in other sectors different from mobility

Medium Term production (2030)

- **8 bcm renewable methane** foreseen from agricoltural biomass, agro-industrial and the Organic Fraction Municipal Solid Waste (OFMSW)

- **almost 7 bcm biomethane** (8 - 1,1) available to use in other sectors different from mobility

Decarbonization of the Energy System (2/2)



Source: Eurostat 2016

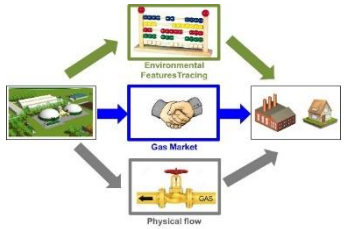
- Currently, biogas plants are mainly **used for the cogeneration** of electricity and heat
- Biogas cogeneration plants are located in sites that **do not have a significant heat requirement**, thus making it impossible to achieve high efficiencies.
- About **half of the total biogas production in 2016 was lost** (10,6 TWh equal to 1,1 billion m3 equivalent of biomethane),

- **low global efficiency** : only 39% efficiency (final energy vs primary energy)

  and consequent
- **high costs of electricity generation**

2018, 2nd March, Decree: Guarantees of origin in Italy…

- For biomethane injected into the natural gas network without specific destination of use
- The guarantee of origin has the purpose of providing the consumer with a mean to prove the renewable origin of the gas withdrawn from the network and can be used, even by the stakeholders under ETS system (Directive 2003/87/EC)



Guarantees of origin in Europe …

Preparation of Recommendations for a European system of certificates and guarantees of origin for renewable gases and low-carbon gases

Gas industry's recommendations for an EU-wide system of certification and Guarantees of Origin for renewable and (non-renewable) low-carbon gases

Need for standardised GOs for renewable and non-renewable low-carbon gases

Need for interoperable GO schemes to support trade and sector coupling

Compatibility and use of GOs in other legislation should be ensured

Biomethane in the medium to long term

What development?

Further **transport** development extended to the maritime sector

Solution for the decarbonization of **power generation** and **heating & cooling** as it allows:

- to avoid system integration costs unlike intermittent renewable sources
- to increase the overall energy efficiency of the system
- to improve environmental sustainability and generate the agricultural supply chain by increasing value
- to enable existing high-performance gas technologies
- to improve the profitability of investments

Potential development in the **industrial sector**, particularly in high-temperature production processes

The Hydrogen opportunity

1. Asset Readiness

- **Pipelines:** network is largely hydrogen ready, key reason to underpin replacement
- **Component**s: 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

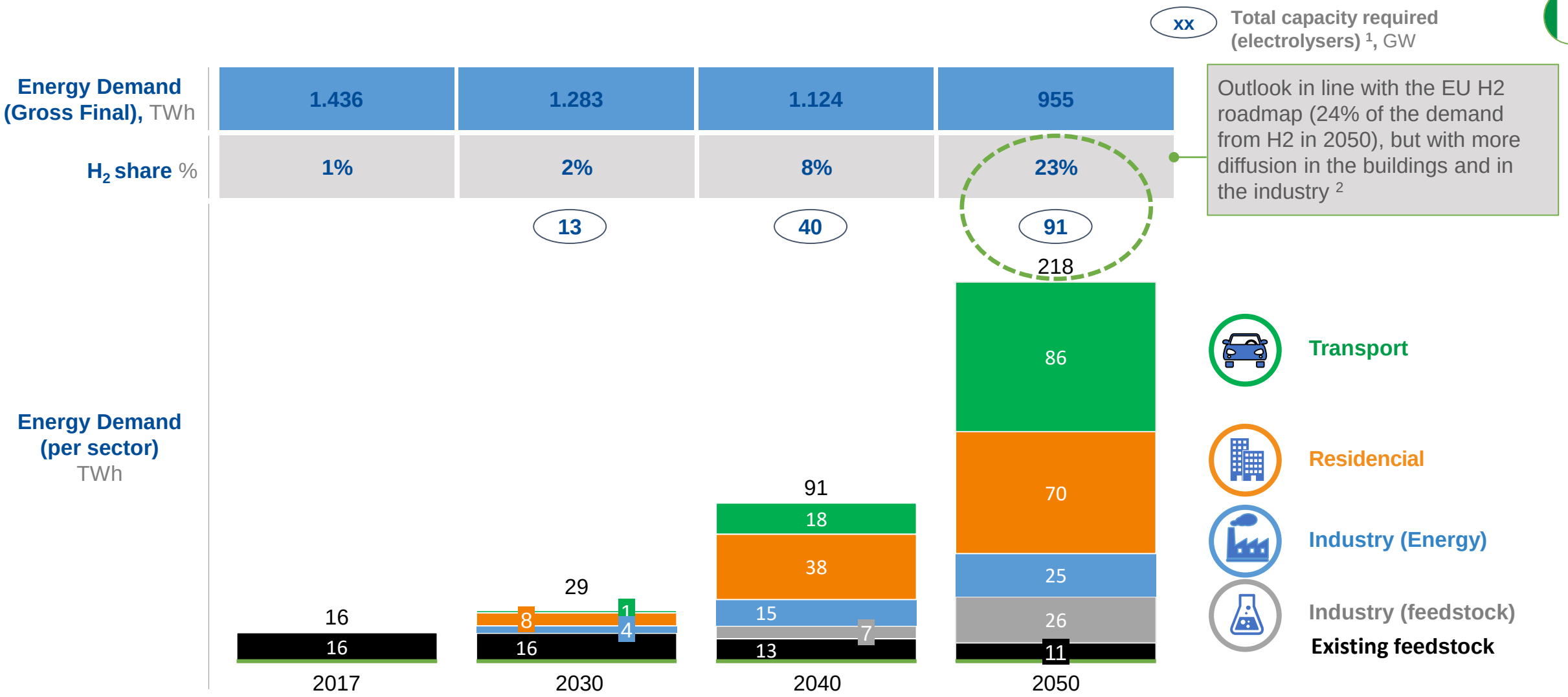
3. Value chain development

- 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

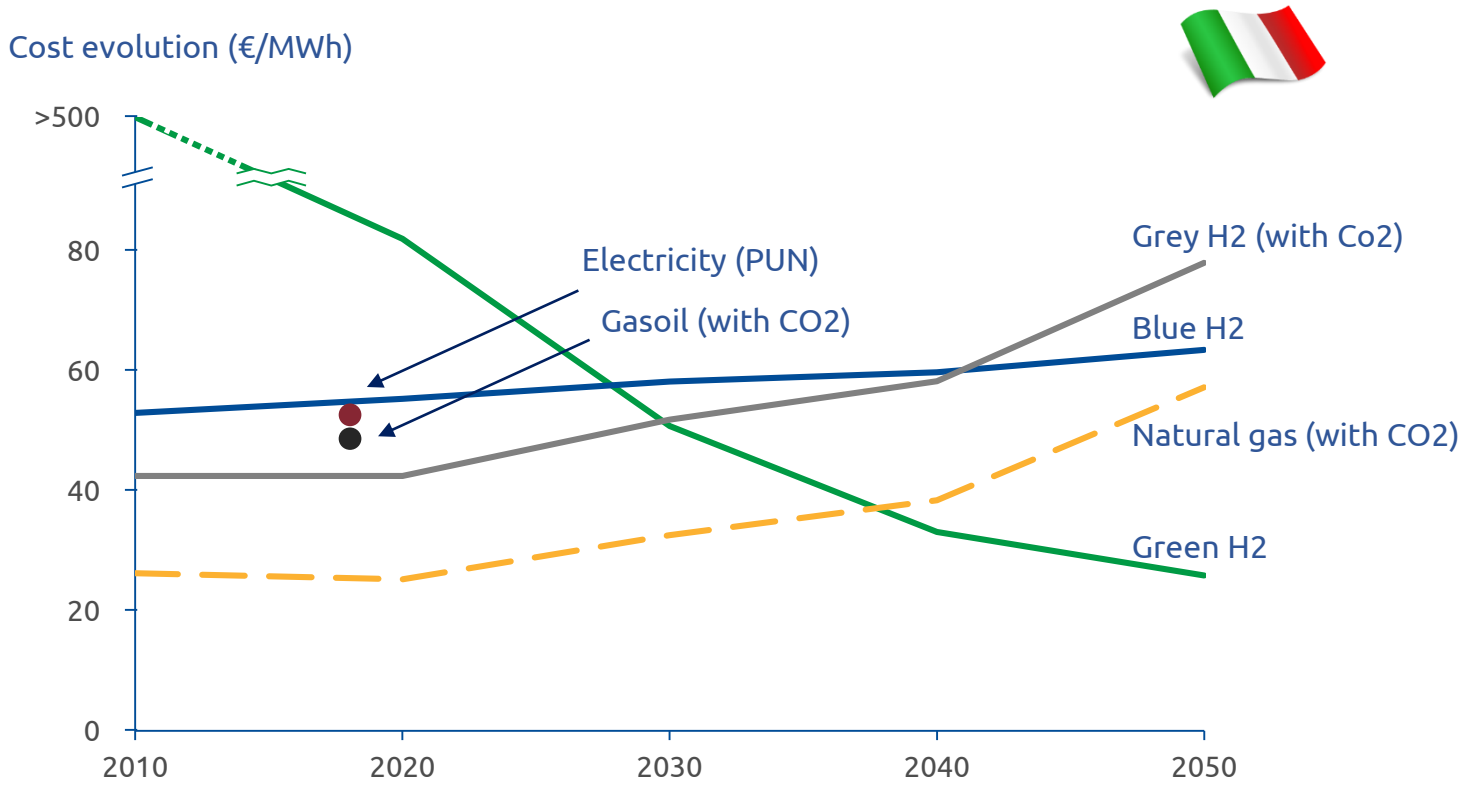
H2 demand in Italy



1. Assuming an electrolyzer efficiency of 75% with a 35% load factor
2. Less industry demand as existing H2 demand in Italy is lower vs the rest of Europe (as gas prices are high in Italy, SMR is less competitive); More buildings uptake as green H2 costs decline faster in Italy than in the rest of Europe (due to cheap solar) and hence become competitive for heating (primarily in buildings) heating

SOURCE: https://www.snam.it/it/hydrogen_challenge/repository_hy/file/The-H2-challenge-Position-Paper.pdf

Evolution of the H2 production cost in Italy



Electrolyser Capex €/kW

1,800	1080	350 … large-scale adoption	162

324	48	21	12

Solar/Wind cost €/MWh

- Green hydrogen may develop particularly rapidly in Italy owing to solar resource
- Cost decline, driven by cost of solar and wind, and electrolyzers
- Breakeven between blue and green hydrogen expected before 2030
- First two H2 uses to become competitive will be «grey» hydrogen and long-distance heavy transport, also owing to fuel cell efficiency
- Internalisation of rising CO2 costs necessary to make H2 competitive with natural gas

Source: Thomson Reuters, Snam Terna scenarios, GME, ICIS, analysis on market estimates


Thank you