Paola Brunetto, Head of Hydrogen Business Unit, Enel Green Power

We are a part of enel Group

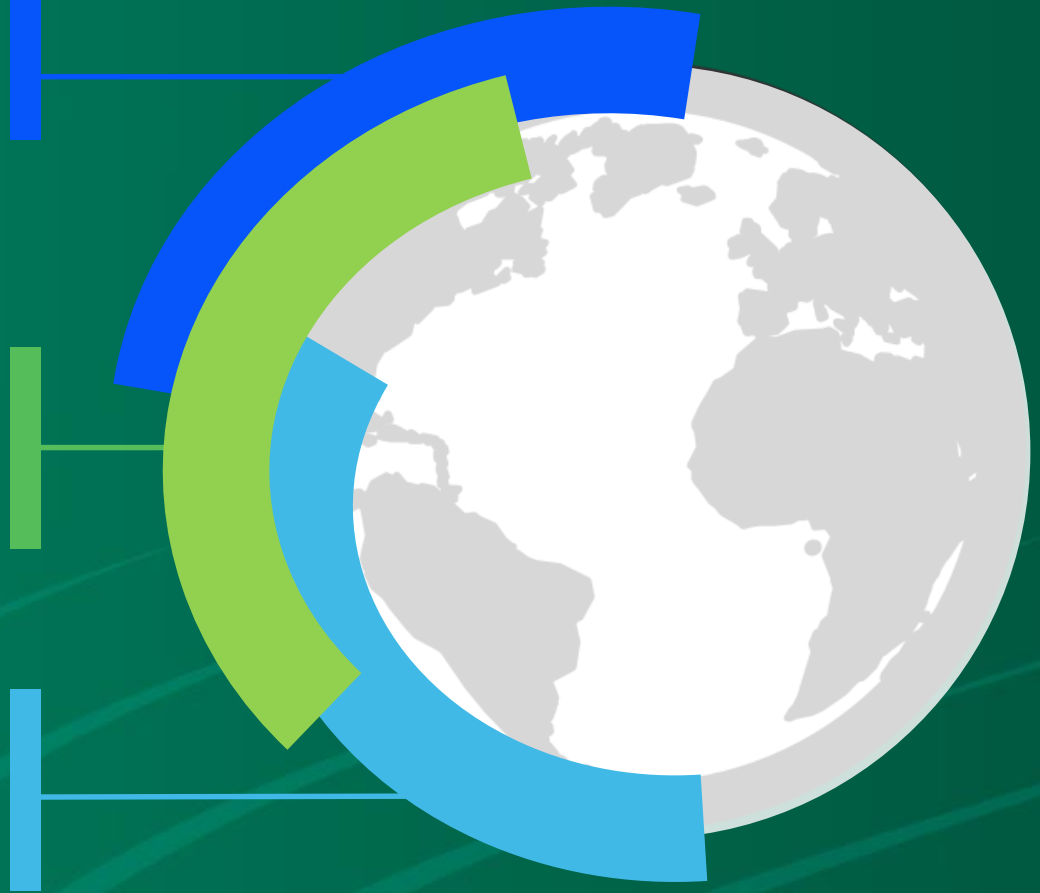
enel Green Power

Multinational integrated group leading in all segments of the energy sector focusing on sustainable growth

1st network operator[1]

World's largest private player[2] in renewables

Largest retail customer base worldwide[3]



73 mn end users

46 GW capacity

70 mn customers

Active in 5 continents

32 countries

Total Managed Capacity
85 GW

Total production
213 TWh

Does not include nuclear (~3.3GW capacity; production of 26 TWh in FY2019)

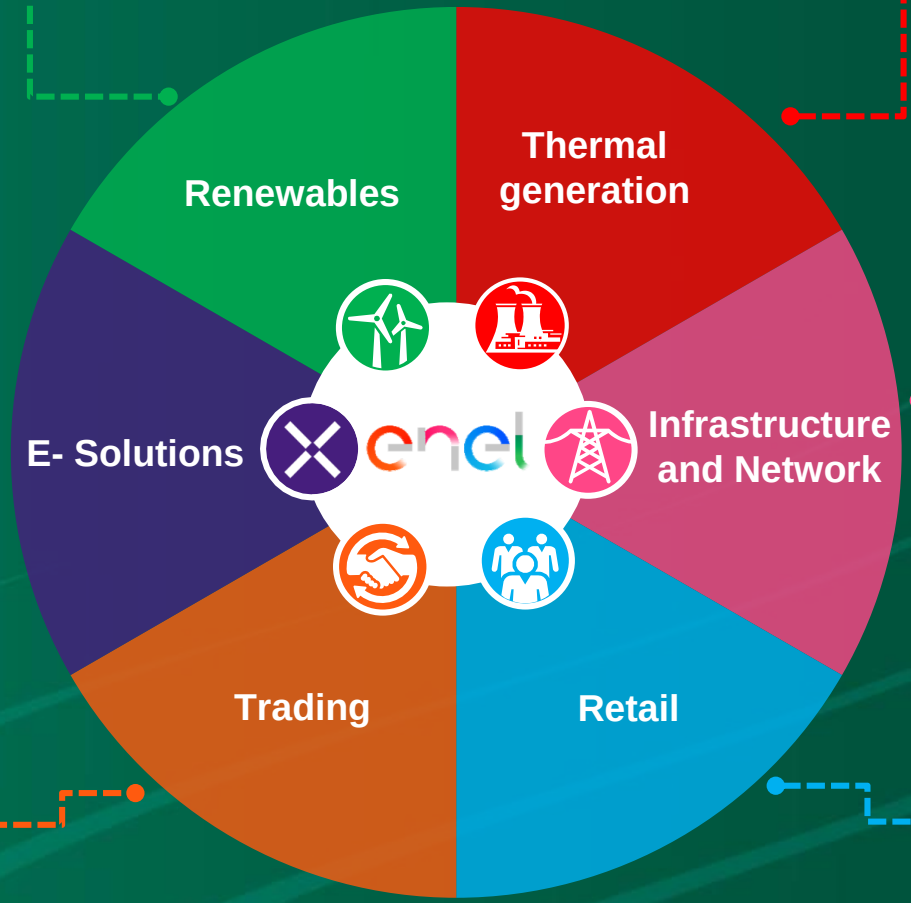
1. By number of end user. Publicly owned operators not included
2. By installed capacity. Includes managed capacity for 3,7 GW
3. Including customers of free and regulated power and gas markets

A simple and effective organization

Manage renewable generation fleet, maximizing global footprint of the Group in the renewable space

Global Power Generation
Accelerate decarbonization
Enhance transition technologies
Optimize workforce skillset

Manage the conventional generation, reduce emissions and improve performances through digitization and flexible assets



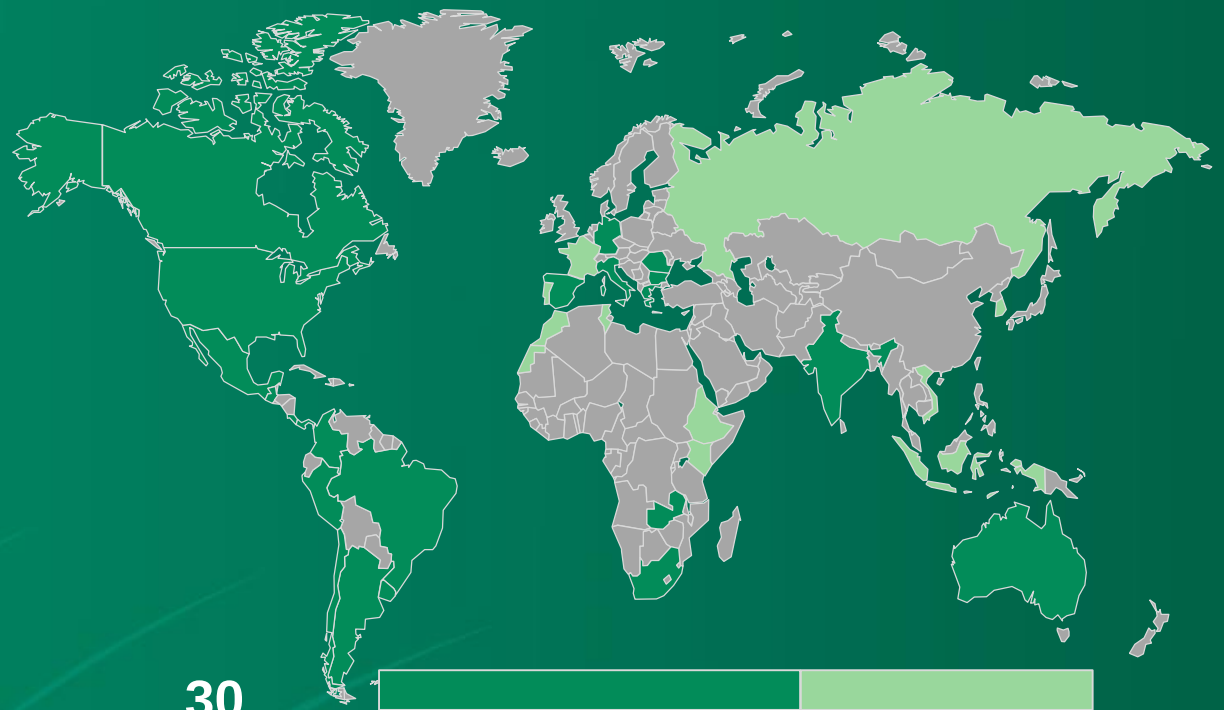
Downstream positioning of the Group as leader in the energy transition; customer side innovation and digital proposition

Manage the Group energy distribution assets, improving customers' reach also enhanced by digital platform infrastructures

Overall Group portfolio optimization, integrated margin management, capacity strategy supervision

Energy commodities sales to end-user, maximize customer reach and improve customer journey

Enel Green Power



30 countries

21 Operating Capacity

9 Countries with advanced stage of development

~1,300 plants

more than **7,600** employees

2019 Key Figures

46 GW managed

42.6 GW consolidated

10.8 GW WIND

28 GW HYDRO

2.9 GW SOLAR

0.9 GW GEO

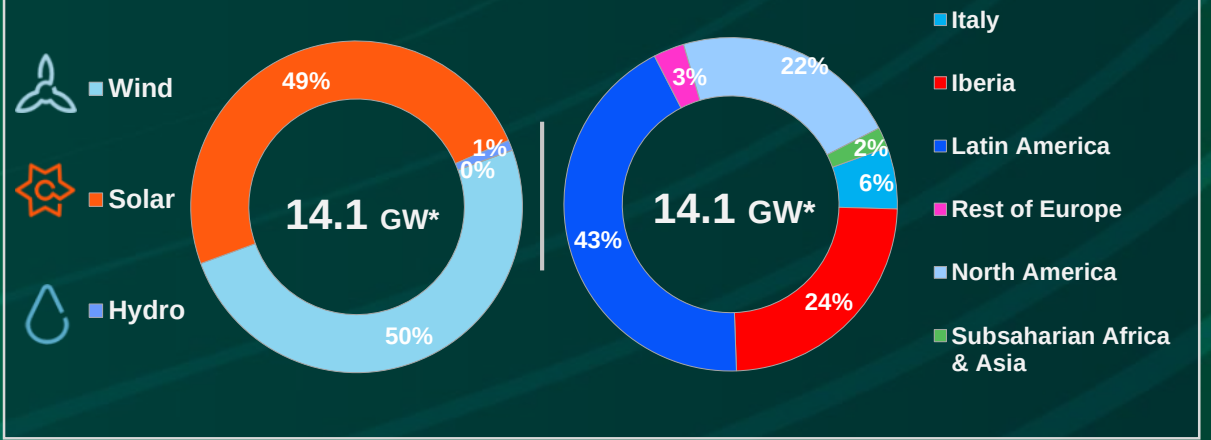
100+ TWh managed

89 TWh consolidated

EBITDA 2019E
4.6 BILLION EUROS

DECARBONIZATION CAPEX
14.4 BILLION EUROS

2020-2022 Industrial Growth Plan



* Including Joint Venture Projects of 2.5 GW

Hydrogen, the basics

- **You can find hydrogen everywhere in nature but is always bound to other elements**
- **It's an energy carrier, not an energy source**
- **It has an exceptional energy density more than twice that of natural gas**

Key figures

- **1kg of hydrogen contains 33,3 kWh** of energy and occupies **11 cubic meters** *(in standard conditions – STP of 0°C and 1 atm)*

<u>vs other fuels</u>

- 1 kg of Hydrogen contains **the same energy of 3,77 liters of gasoline**
- 1 cubic meter of hydrogen in STP contains the same energy of 0,37 liter of gasoline

Hydrogen is not appealing per se: it's all about how it is produced

Hydrogen production today

Around **70 Mt/year of dedicated hydrogen**[1] are produced today:

76% from natural gas	22% from coal	2% from electricity
Steam Reforming	**Gasification**	**Electrolysis**
		1 kg of Hydrogen requires 11 liters of water

Annual **hydrogen production** consumes:

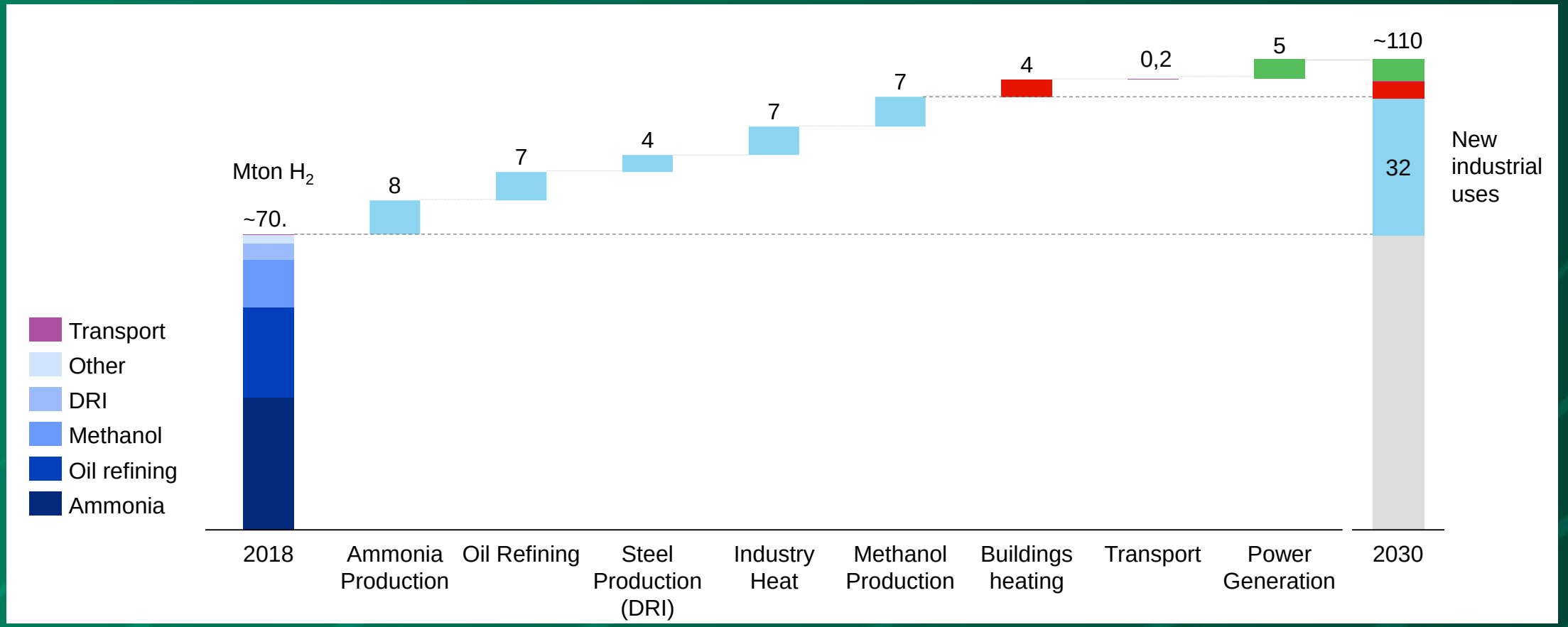
- **205 Bn m^3 of natural gas**
- **107 Mt of coal**

…and is **responsible for 830 Mt CO_2 yearly emissions, comparable** to those of **Indonesia and UK combined**

Only hydrogen produced from electrolyzers powered by 100% renewable electricity is CO2 free

1. ~70 MtH_2/yr are used today in pure form, mostly for oil refining and ammonia manufacture for fertilizers; a further 42 MtH_2/yr are used in industry without prior separation from other gases (Tot: 115 MtH_2/yr)

Hydrogen consumption in 2030

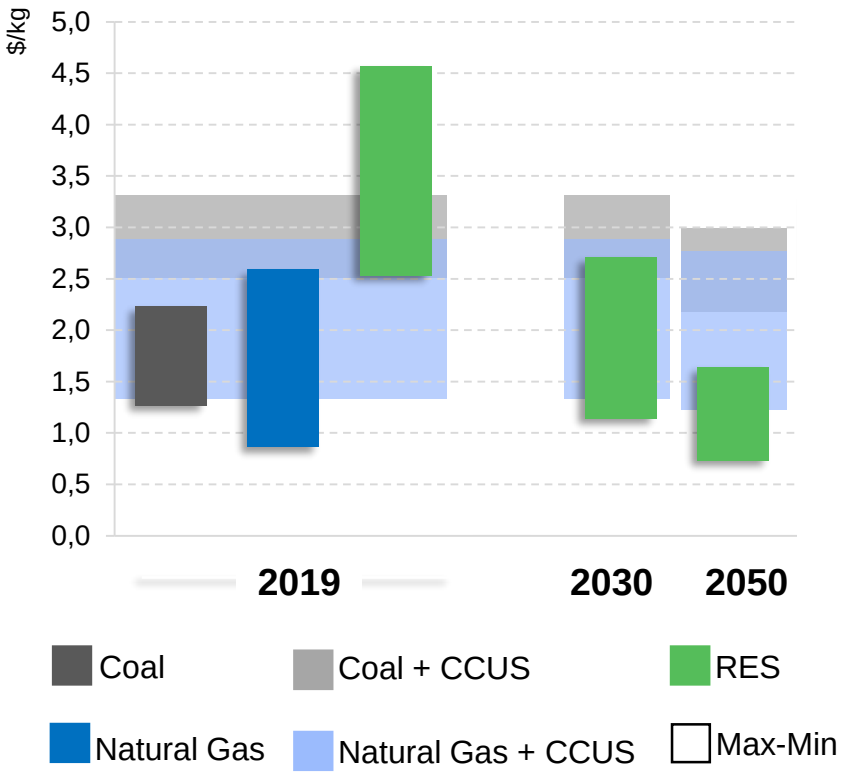


Most of the growth in dedicated H_2 production to 2030 is expected in industrial sectors

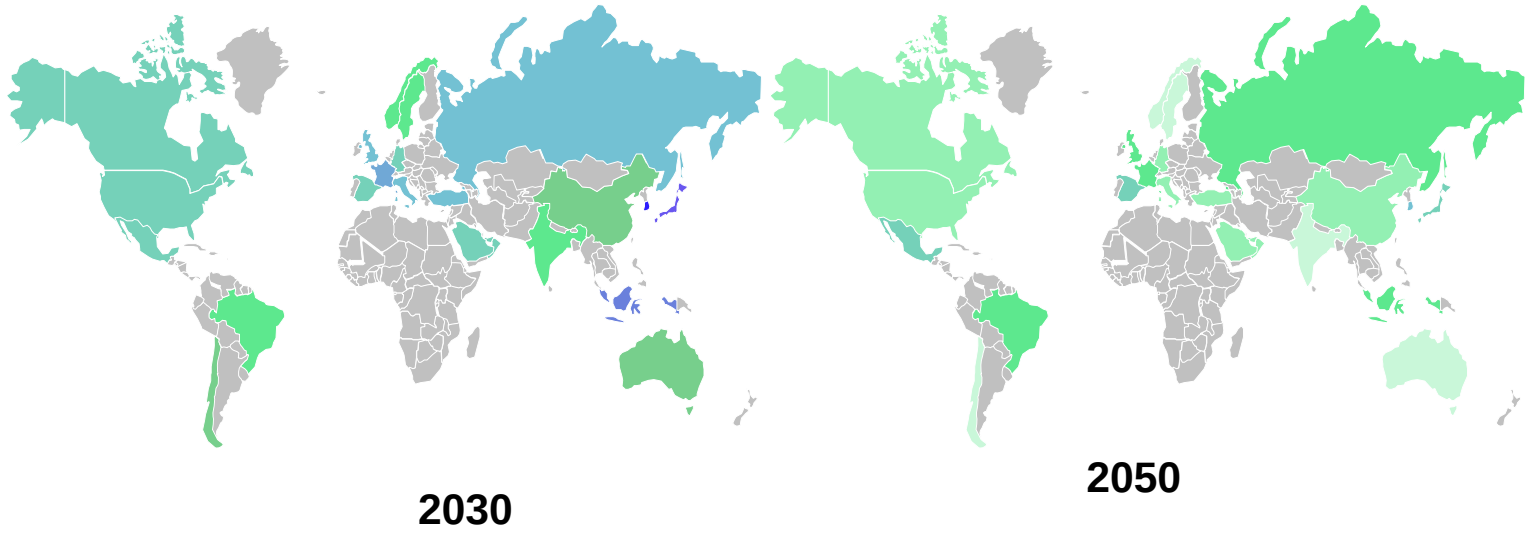
Source: Enel analysis on IEA, Hydrogen Council and BNEF
DRI: Direct Reduced Iron

Renewable hydrogen is currently expensive, but costs will decrease

LCOH



LCOH of hydrogen production from renewables



In regions where renewable electricity is cheap, electrolyzers are expected to be able to compete with fossil-based H2 already in 2025-2030

1) Renewable hydrogen costs based on large projects with optimistic projections for capex. Natural gas prices range from $1.1-10.3/MMBtu, coal from $30-116/t
2) LCOH assuming optimistic projection for alkaline electrolyzer costs. Costs would be 6% higher in 2030 and 18% higher in 2050 if the conservative projection for electrolyzer costs is used instead.

Sources: BNEF - Hydrogen Economy Outlook (Mar 2020)

Enel vision on hydrogen

Electrification offers the cheapest and simplest route to decarbonize large portions of total final energy uses

Hydrogen's best use is as a complement to electrification, and not a competitor, to decarbonize hard-to-abate sectors

Hydrogen needs to be powered by 100% renewable electricity: it is the only truly sustainable production pathway

A domestic production of renewable hydrogen can lower dependency on fossil fuel imports and strengthen security of supply

The integrated configuration RES+H2, using the electrolyzer as a variable load, will enhance ancillary services, making the renewable plant more flexible.

Enel focus mainly on the industrial segment for renewable hydrogen application

Main applications per sector

Industry

Enel main focus

Power-to-chemical

- Decarbonization of feedstock (e.g. H_2 for ammonia, refineries, methanol, steel)

Power-to-heat

- Decarbonization of processes requiring high grade heat (e.g. cement)

Transport

Focus on selected segments

Power-to-mobility (fuel cell)

- Suitable for heavy duty vehicles, especially multi-shaft long haul trucks

Power-to-electro fuels

- Decarbonization of maritime and aviation (high energy density power sources)

Buildings

Power-to-gas (also blended with natural gas or methanized)

- Leveraging existing gas networks can help decarbonizing energy uses in buildings (space & water heating and cooking)

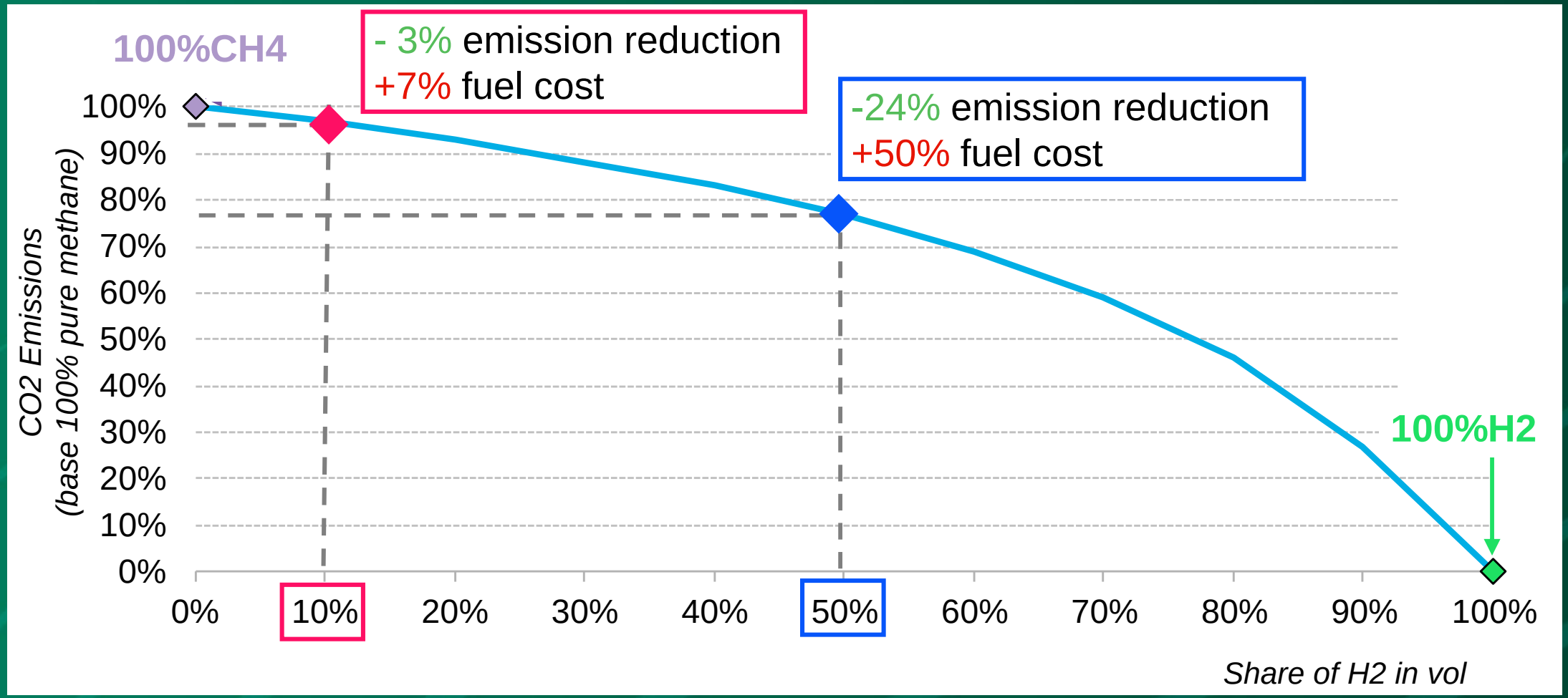
Power

Power-to-power (fuel cells & combustion turbines)

- Helps integrating variable RES, providing long-duration storage. It can become necessary for very high variable RES penetration levels

The effect on emission reductions (and costs) with the introduction of renewable hydrogen in the fuel blend

Prices	€/kg	€/MWh thermal	€/MMBTU
Hydrogen	2	60,06	
Methane	0,25	19,49	5,8



Enel preferred business model for hydrogen production

Hybridization RES + electrolyzer

Value proposition

Competitive full decarbonization offer bundling RES electricity and green H_2 supply

Target customers

- **Industrial offtakers in the proximity of hydrogen production**

Pool of qualified partners

- **Prequalified Electrolyzers suppliers**
- **EPCs**, **BOPs** and **providers of storage and transport solutions**

Main value drivers

- **RES plant optimization** and (enhanced) **flexibility services**
- **Savings** on Capex, Opex and system charges arising from synergies with RES plant

The hybridization solution is expected to generate greater value

Enel approach to hydrogen development activities

Green Power

Origination Source

- **Host renewable plants/projects**
- **Potential offtakers**
- **Water availability**

- Remuneration analysis
- CAPEX/OPEX structure
- Physical distance from potential clients

Spain

Italy

The USA and Canada

Chile

- Focus on plants in operation/execution for scouting activities in start-up phase → 5 Countries
- Origination on projects in different development phases: potential opportunities in → 12 Countries

Conclusions

In a few years the production costs of renewable hydrogen **will become competitive** due to the **cost reduction of electrolyzers and increased efficiency**.

As part of the European Strategy, the development of renewable hydrogen would allow the Countries with better renewable resource, a position of advantage in the field of hydrogen production. **Italy has excellent potential for renewable capacity**.

In Italy it is necessary to provide concrete measures to improve the efficiency of the Authorization Process for the construction of new renewable plants and the repowering of existing plants. **The authorization timeline for renewable plants could constitute the bottleneck for the development of renewable hydrogen.**

A certification of the origin of the hydrogen is required, distinguishing among renewable and low carbon.

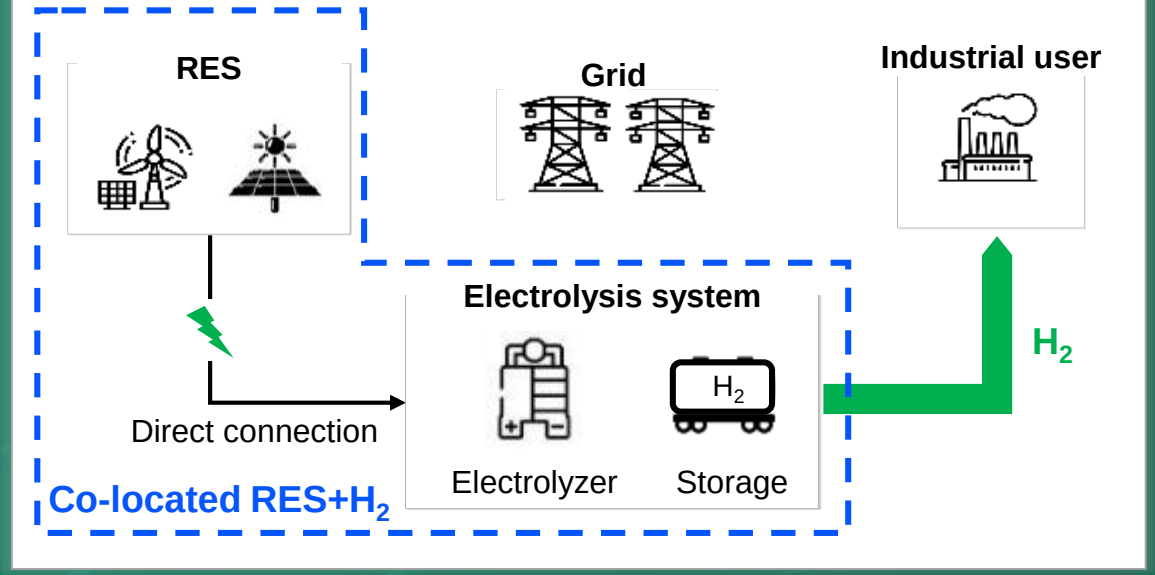
THANK YOU

BACKUP

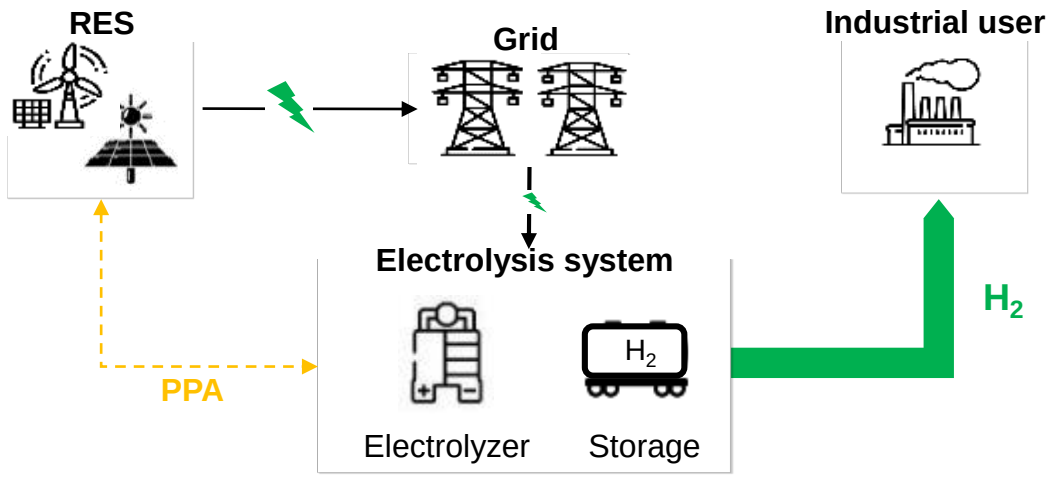
On top to our preferred model, the stand-alone configuration may be an additional option

Physical flow
Commercial flow

Co-located RES+H2



Stand-alone



Main value drivers / potential issues

- ⊕ **RES plant optimization** and (enhanced) **flexibility services**
- ⊕ **Ancillary services** as a further revenue stream
- ⊕ **Grid charges** avoidance
- ⊖ **Transport** costs (pipeline or trucks)
- ⊖ **Proximity** of H_2 off-taker required

- ⊕ Possibility to **locate the electrolyzer at the offtaker plant**
- ⊕ **No proximity** to RES plant constraint (higher number of opportunities)
- ⊖ **No co-location** synergies
- ⊖ **Grid charges** costs
- ⊖ **No unique selling proposition** (if buying electricity from the grid)