CNR, an actor in the **renewable hydrogen** sector

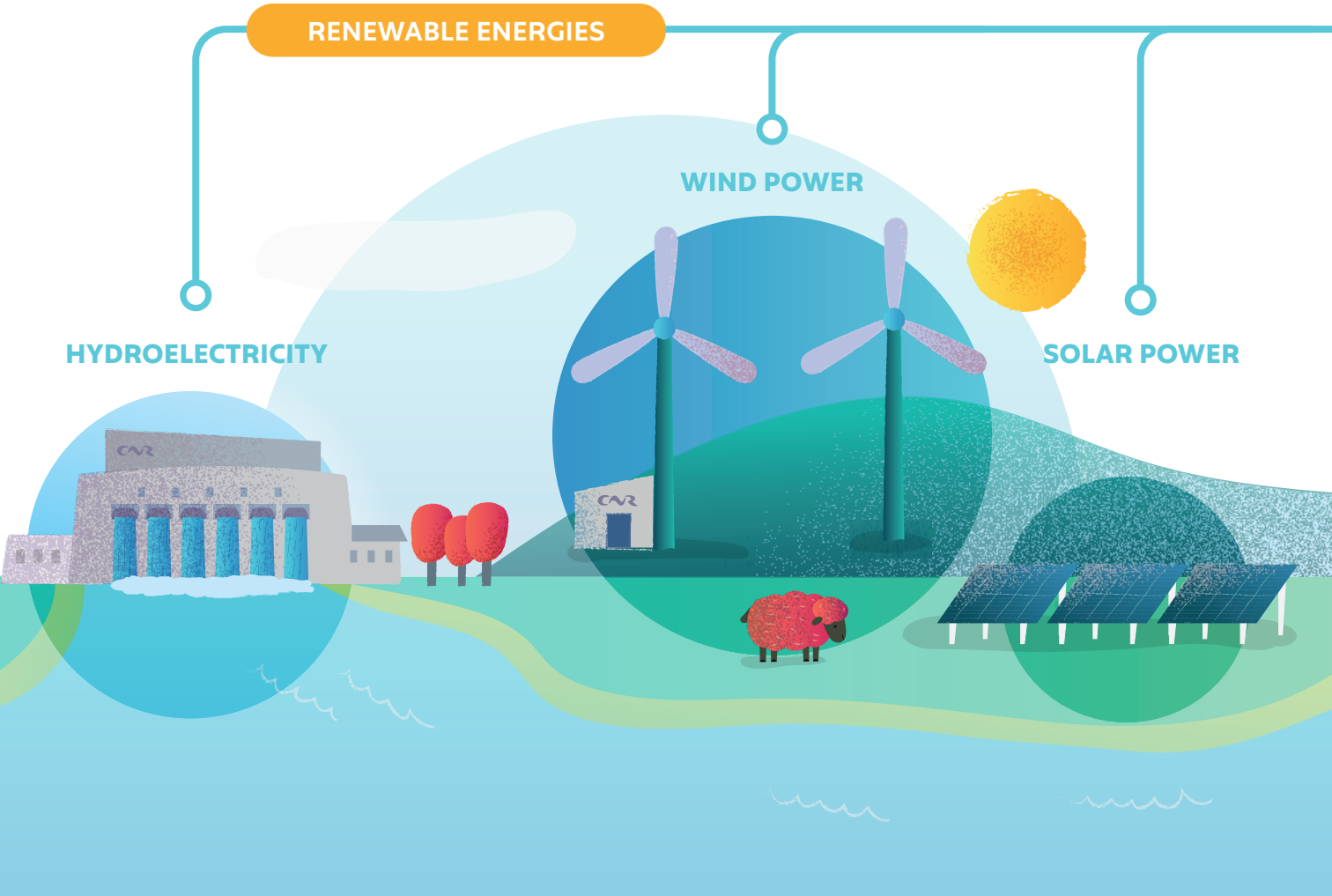
Producing and using renewable **hydrogen**

Renewable hydrogen is a gas that can be produced by the electrolysis of water and which can be stored, contrary to electricity. This process is powered by electricity obtained from renewable sources, in a reversible reaction that produces very little carbon dioxide responsible for climate change.

This energy vector combines the electricity and gas networks and generates major synergies. Once transformed into hydrogen, electricity can be stored. The hydrogen can then be converted into electricity or be used directly, pure or mixed with natural gas, or converted into synthetic methane for types of utilisation.

Its **extras** thanks to storage

- It can respond to the variability of renewable energies by permitting the storage of surpluses.
- Stored hydrogen can be reconverted into electricity during periods of low renewable energy production.
- This transformation permits better integration of renewable energies in the electricity network to respond to demand and thus improve their exploitation.



Its environmental **extras**

Renewable hydrogen has ecological advantages compared to "grey" hydrogen obtained by refining fossil fuels (coal and natural gas).

Grey H2
produced from fossil fuels[1]

H_2 **1 kg**

11.1 kg CO_2

Renewable H2
from hydraulic sources

H_2 **1 kg**

0.45 kg CO_2

Its **extras** for sustainable mobility

VS

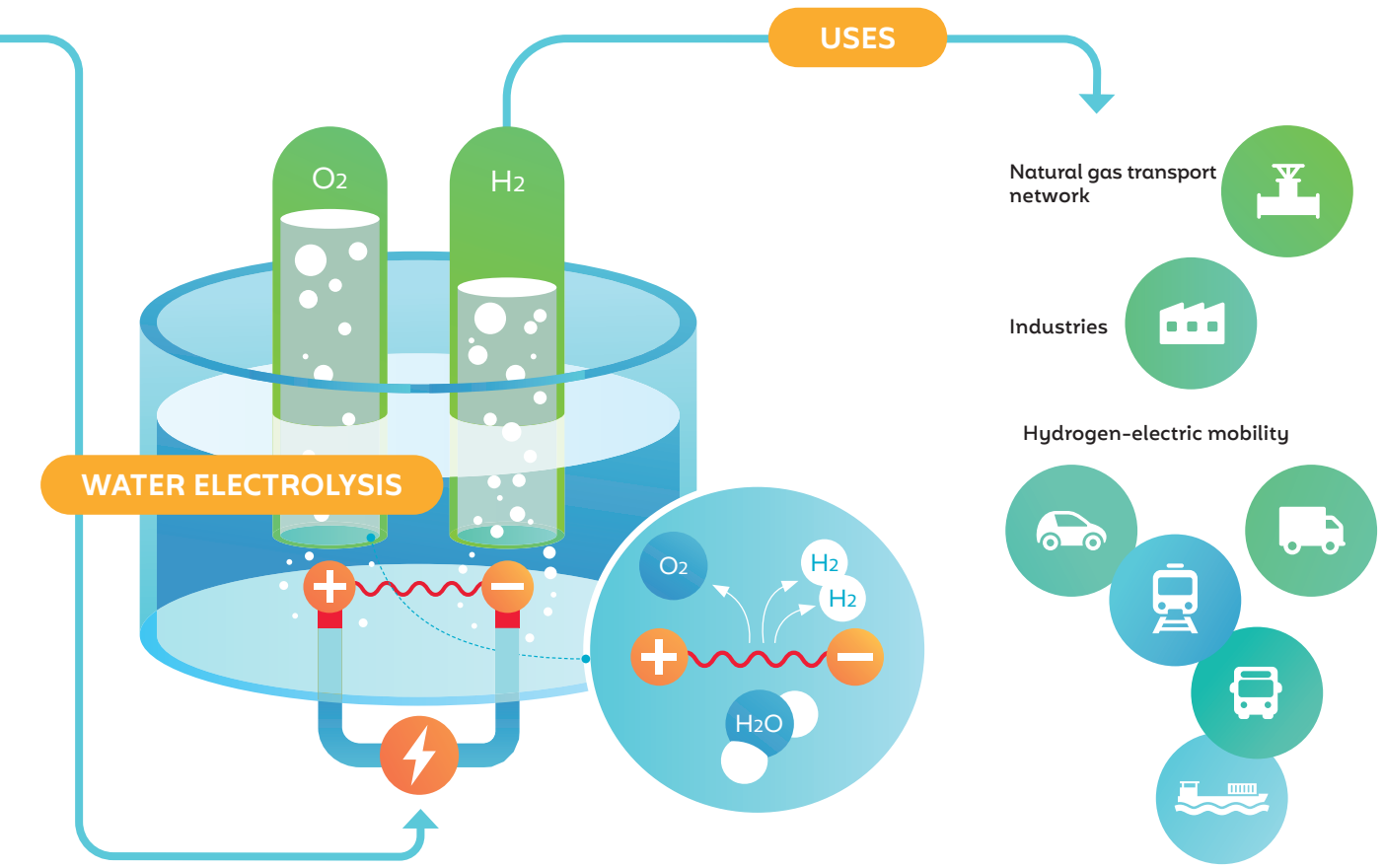
132 g/km of CO_2
emitted by a combustion engine

neutral malus 2021

0,45 g/km of CO_2
emitted by a hydrogen engine

H2 produced with hydroelectricity, compression[2] and storage at the gas station.

1. By steam reforming natural gas
2. Hydrogen compressed at 200 bar
Data from a cradle to gate life cycle analysis of the ADEME's carbon base.



Innovating **collectively**

JUPITER 1000

This preindustrial demonstrator which is in operational testing phase, produces renewable hydrogen by electrolysing water that is either injected directly into the gas network, or combined via methanation with CO_2 captured from industry to form synthetic natural gas. The project has been developed by GRT Gaz, in partnership with CNR, Atmostat, the CEA, the Grand Port Maritime de Marseille, Leroux & Lotz, McPhy, Téréga and RTE.

THE QUAI DES ÉNERGIES

CNR developed a multi-energy refuelling station (renewable hydrogen produced on site, renewable electricity produced by CNR, natural compressed CNG/Bio Gas), which is installed at Port de Lyon. This station dedicated to clean vehicles meets the challenges of sustainable land transport. It has been developed in partnership with Engie Solutions and Mc Phy and has won the Open Innovation Challenge organised by the European Federation of Inland Ports and the Think Tank Vienna whose theme was "inland ports, facilitators of sustainability and green logistics".

The station has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under Grant Agreement No 671438 & No 700350. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation programme, Hydrogen Europe and Hydrogen Europe Research."

Committed to the **future**

CNR, a catalyst for the territories, is deploying its capacities for innovation and investment in the renewable hydrogen sector, with its potential of offering a carbon-free future. In the framework of its CNR 2030 strategy, it will develop projects designed with and for the territories that host them, in harmony with their needs for greening mobility and industry.

OUR AMBITION

Install **2 to 25 MW** electrolysers near our hydroelectric plants along the Rhône.

Deploy capacities to produce from **1 to 10 tonnes** of renewable hydrogen a day.

OUR OBJECTIVES

60 MW: the renewable hydrogen production capacity to be installed from now to 2030.

€100 M: to be invested in the hydrogen sector over 10 years.

2 PROJECTS ALREADY UNDER STUDY

OH2 Port de Lyon

A renewable hydrogen production plant has been installed at Port of Lyon to satisfy the needs of the territory for the greening of river and port mobility.

OH2 Pierre-Bénite

A production unit installed next to CNR's hydropower plant of Pierre Bénite designed to supply renewable hydrogen to the industrial sites of the Chemical Valley by hydrogen pipeline.

CNR and aggregation

With its future renewable hydrogen production installations, CNR aims to increase its portfolio of assets and strengthen its capacity to integrate its own energy in the electricity market as well as that of third parties.

Accelerating the ecological transition of the territories thanks to renewable hydrogen

Renewable hydrogen is a energy vector key destined to play a central role in ecological transition. Its development contributes to meeting the challenges of storing renewable electricity, sustainable mobility and decarbonisation of industry, while allowing the territories to develop an innovative sector that creates jobs.

THE GOALS OF THE FRENCH GOVERNMENT (FRANCE 2030)

To become the leader in green hydrogen in 2030

Structuring the sector, supporting hydrogen production projects, developing an offer of industrial solutions, developing ecosystems in the territories.

€ 8,9 billion

of public investment until 2030.

CNR, France's leading producer of 100% renewable electricity and an actor in sustainable development participates in this quest by placing hydrogen at the heart of its innovation strategy.

CNR IN BRIEF

The Compagnie Nationale du Rhône, now called CNR, was founded in 1933, and inspired by the visionary idea of entrusting three indissociable missions for the community to a single operator to manage the Rhône to produce electricity, develop river transport, and ensure irrigation for agriculture. A unique industrial model in which energy production finances the development of the river, harmonises uses and preserves ecosystems. Local authorities are associated in the company's capital to share the governance of the value generated so that the energy returns to the territories. This redistributive model results in a unique status in France, that of a joint stock company in the general interest.

For more than a century, CNR has innovated to transform energy from water, then the sun and the wind, to contribute to an ever greener, decentralised and nature friendly energy mix. CNR is now the leading producer of 100% renewable electricity in France thanks to an installed energy mix (Water-Wind-Solar) capacity of about 4,000 MW, which will almost double in the next ten years. The company manages these three natural resources as common goods, uses their energy as a lever to accelerate the ecological transition of the territories, and develops expertise in assembling innovative energy and ecological solutions everywhere in France.

The Rhone Valley is its open-air laboratory for developing tomorrow's energies (renewable hydrogen, floating and linear solar power, agrivoltaics, etc.), accelerating new uses (electrical mobility, agricultural transition), optimising river transport (greening port mobility, multimodal rail-river transport, circular economy, etc.) and preserving the biodiversity of the river's ecosystem.

CNR transforms energy from water, wind and sun to accelerate the ecological transition of the territories.

A FEW **KEY FIGURES**

1,400
employees

4,000 MW
of installed capacity and more than 15 TW of mixed electricity production

19
hydropower plants along the Rhone

57
windfarms in France

49
solar power plants everywhere in France

2 rue André Bonin
69316 LYON CEDEX 04
FRANCE
t. + 33(0) 4 72 00 69 69

cnr.tm.fr

Energy is our future, save it!

Energy at the heart of the territories