



**SMART  
HY AWARE**  
Interreg Europe



European Union  
European Regional  
Development Fund

**Smart Hy Aware**  
Smart solutions for HYdrogen  
potential AWAReness Enhancing



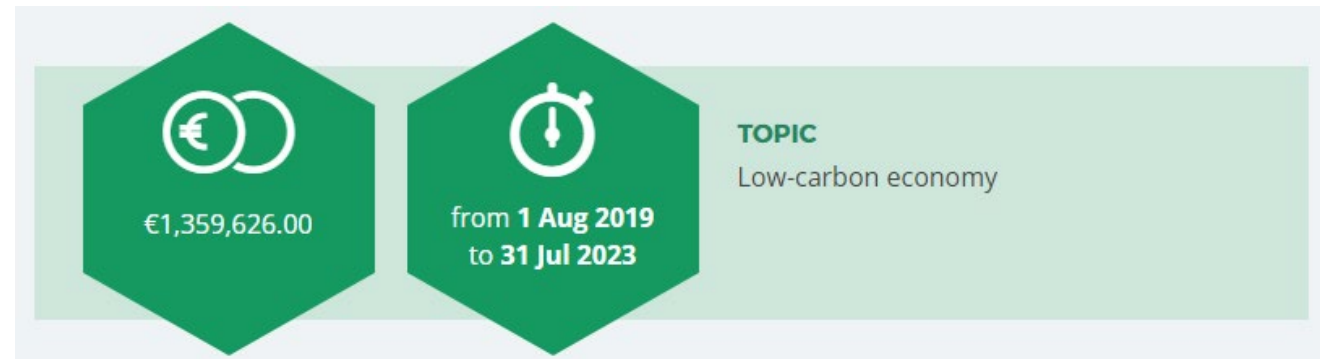
**REGIONE  
LAZIO**

# Agenda

- 1. Introduction**
- 2. Results expected for the region**
- 3. Method follow up and results achieved**
- 4. The next ones steps : the Hydrogen Valleys**

# 1. Introduction

- The SMART HY AWARE - Smart solutions for HYdrogen potential AWARe ness Enhancing Project aims to promote hydrogen-electric mobility by addressing the main infrastructural, technological and market barriers related to hydrogen for mobility, through the improvement of the Policy Instruments linked to the Structural Funds in Europe, addressing the transition to a low-carbon economy, as clearly required by objective 3.1 of the INTERREG EUROPE program



## Sub-goals of the project

- Exploiting the potential of hydrogen technologies for mobility involving the entire supply chain;
- Improve regional and local strategies focused on real implementation needs, for example by boosting new fuel cell integration models;
- Increase the efficiency of green propulsion in transportation;
- Improve renewable energy networks to reduce electrolysis costs and IT applications to enable advanced planning of short-medium term energy productions and promote the use of hydrogen in distributed networks
- Increase diffusion and accessibility to public and private refueling infrastructures in urban and rural areas;
- Support the diffusion of public transport with alternative fuel vehicles through regional financial support;
- Promote and evaluate new public-private partnership (PPP) measures in the electric mobility sector, with suitable PPP schemes to trigger hydrogen mobility;
- Improve the ability of the PA to develop effective policies to reduce the carbon footprint of transport activities.

## Fuel Cells and Hydrogen Joint Undertaking (FCH JU) and Clean Hydrogen Partnership

The unique public-private partnership FCH JU supported research, development and demonstration activities in fuel cell and hydrogen energy technologies in Europe, to accelerate their market introduction.

**Clean Hydrogen Partnership** was established which took over its portfolio and continues to develop the European value chain for safe and clean hydrogen technologies.

### ERDF Lazio Regional Operational Program 2014-2020

Objective 4: Sustainable energy and mobility. Action 4.6.2  
"Interventions for sustainable urban mobility, also by encouraging the use of low-impact transport systems"



Policy Instrument (PI) insufficiently detailed regarding alternative fuels for mobility



Attempt to integrate it with measures to stimulate electric and hydrogen mobility in the Region, as part of the 3Emotion project (Environmentally Friendly Efficient Electric Motion, promoted by FCH JU)



Due to bureaucratic and administrative difficulties, the Region was unable to proceed with the purchase of the 5 hydrogen buses, envisaged by the project



**Lessons Learned:** - realistic and time-related goals  
- Work on a long-term PI

## 2. Expected results for the Region

### Regional Energy Plan (PER)

The Regional Energy Plan (PER-Lazio) is the tool with which the regional competences in the field of energy planning are implemented, as regards the rational use of energy, energy saving and the use of renewable sources.

It is the result of the shared and transparent consultation with public and private stakeholders and incorporates both the results of this consultation and the regional strategic guidelines

- First version of the REP approved with DGR n. 45/2001, in an international context very different from the current one
- Launch of the process of building a new PER, adopted with Regional Decree no. 98/2020
- **new update** is underway to align it with recent and ambitious European policies (Europe's "carbon neutral " target by 2050)

Application in Smart Hy Aware of Lessons Learned:

- choice of a very long-term **Policy Instrument** , the **Lazio Regional Energy Plan (PER) to improve it with the project** (strategic objectives of the REP to be implemented by 2050)
- Action Plan of the Region to **improve** Chapter 3 - Policies and Programming of the **new version of the REP** with the inclusion of priority guidelines, objectives and interventions concerning hydrogen **that** are influenced by the **results** and **Best Practices** of the Smart Hy Aware Project

## The sources of the PER

- Paris Agreement
- Dynamics of global energy trends
- European objectives for 2020, 2030 and 2050 on climate and energy
- European Green Deal (COM/2019/640 final) and consequent "Fit for 55" legislative reform package
- PNRR
- New National Energy Strategy (SEN 2017)
- Integrated national plan for energy and climate (PNIEC) approved in 2019

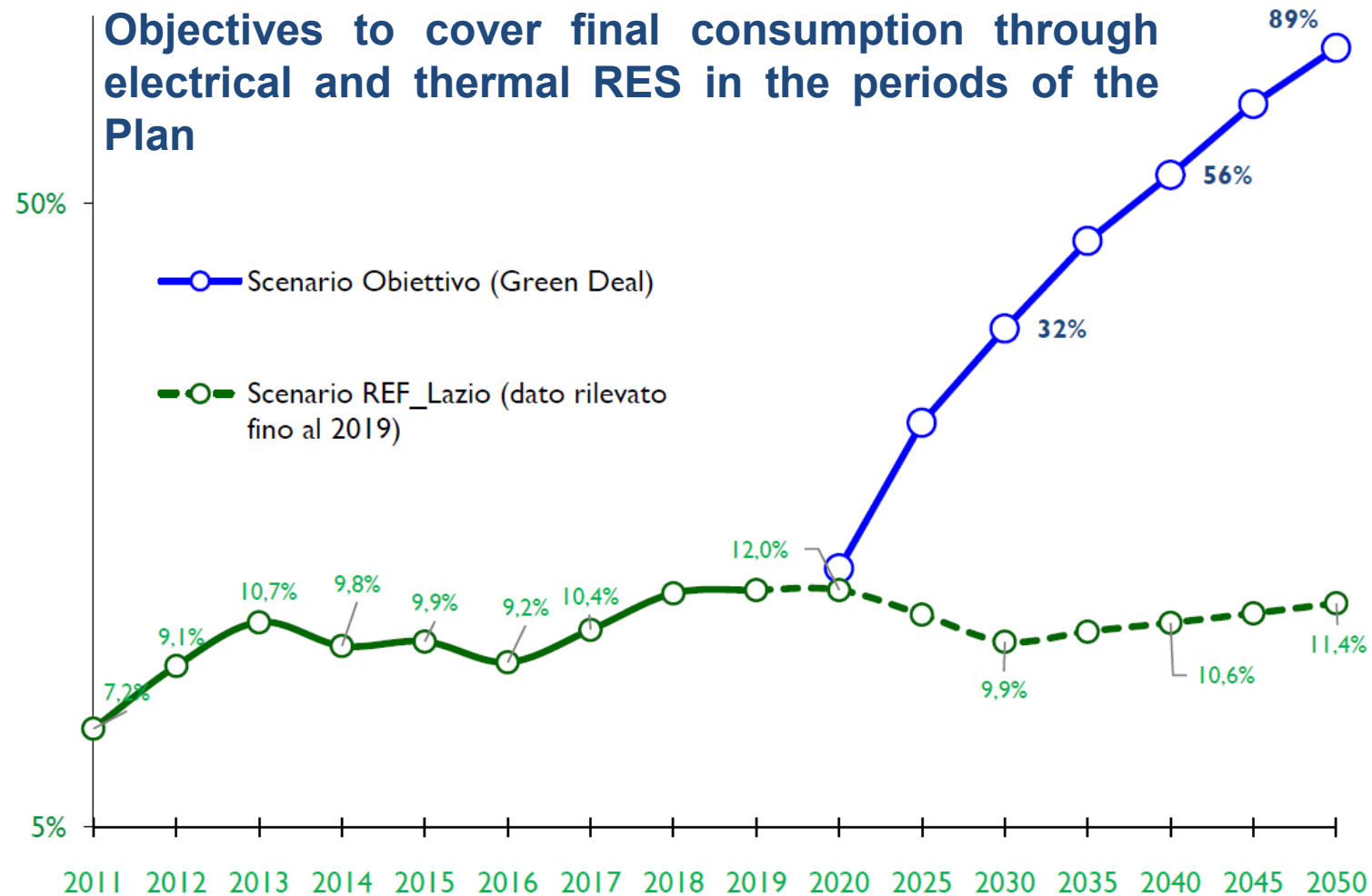
### (Ambitious) objectives of the Region contained in the PER:

- support the transition of Lazio towards a climate-neutral economy in 2050 and fight climate change through the diffusion of the green economy
- promote adaptation to climate change and risk prevention and management.

The European objectives underlying the REP have also been adopted by Italy through the **National Recovery and Resilience Plan (NRRP)**.

NRRP has assumed the centrality of the ecological transition, of the increase in energy efficiency and the development of renewable energies functional to the pursuit of decarbonisation objectives.

# The scenarios described in the REP Lazio





## The structure of the REP

INTERVENTION AREA  
of the Smart Hy Aware project



The new version of the REP is organized in 5 parts:

- Part I "Reference Context" analyzes the Regional Energy Balance, the state of the art of electricity and gas infrastructures in Lazio and the potential for development in the production of energy from renewable sources (RES) and in increasing efficiency energy
- Part II "Strategic Objectives and Scenarios" describes the general strategic objectives of the Lazio Region in the energy field and identifies the 2030/50 scenarios for increasing energy efficiency and renewable sources.
- Part III "Policies and Programming" illustrates the intervention policies which, to pursue the strategic objectives, will be introduced for the development of RES and for the improvement of energy efficiency in each area of use
- Part IV "Monitoring and periodic updating of the REP" describes mechanisms and tools identified for the periodic and systematic monitoring and updating of the REP
- Part V "Technical Implementation Standards" contains a summary of the national and regional regulations for obtaining authorizations for the construction and operation of RES plants.

# 3. Method followed and results achieved

Actions envisaged for the Lazio Region in Smart Hy Aware:  
Learning process



On 19 January 2022, the Lazio Region organized a meeting with local stakeholders. Part of the workshop was dedicated to providing participants with an overview of partner Best Practices

# The BEST PRACTICES of the Smart Hy Aware project

The Smart Hy Aware project, funded by the Interreg Europe Program and of which the Regional Directorate for Housing Policies and Territorial, Landscape and Urban Planning is a partner, aims to strengthen and improve regional policy tools in the public and private hydrogen mobility sector - electricity through the circulation and adoption of one or more **Best Practices (European Good Practices)** .

( <https://www.interregeurope.eu/smarthyaware/good-practices/> ) were presented on the following specific topics related to the hydrogen-electric mobility sector.

|                     |                         |                    |                           |                                    |                                |
|---------------------|-------------------------|--------------------|---------------------------|------------------------------------|--------------------------------|
| PROGRAMMING TOOLS   | STAKEHOLDER PLATFORMS   | HYDROGEN VALLEYS   | GREEN HYDROGEN PRODUCTION | FLEET MONITORING & HYDROGEN DEMAND | DISSEMINATION                  |
| FCH JU BUS PROJECTS | HYDROGEN BUS GOVERNANCE | REFUELLING STATION | MARKET CONSULTATION       | LESSONS LEARN                      | OTHER HYDROGEN TRANSPORT MEANS |

## Actions envisaged for the Lazio Region in Smart Hy Aware:

### Update Chapter 3 of the REP

The Smart-Hy-Aware Best Practices cannot be concretely applied in the Region through the REP, but can simply be taken as a general reference and inspiration for developing strategic objectives, guidelines and contained suggestions to be implemented.

This is precisely because REP is a long-term strategic plan and not an operational plan.

The strategic objectives, guidelines and general suggestions contained in the REP will be implemented and implemented by 2050, through more operational and short-term European programs and regional laws.

The Best Practices could be taken into account in the coming years by short-term European projects/programmes and regional laws on hydrogen-electric mobility.

This is why it is very important to include the complete list of Smart Hy Aware Best Practices in Chapter 3 of the PER

**1) More inspiring Project Best Practices for defining strategic objectives, guidelines and general suggestions added to Chapter 3 of the REP**

- **Aberdeen Hydrogen Hub**
- **Project «Hydrogen Corridor for the Pyrenees Region (H2piyr)» - Regional Government of Aragon**
- **Supply Infrastructure - Aberdeen City Council**
- **Tender procedure for a Hydrogen Refueling Station (HRS) for hydrogen buses - Province of South Holland**
- **Lessons learned from HRS operations - Province of South Holland**
- **North East Scotland Fleet Review (Hydrogen Demand) - Aberdeen City Council**

**2) More inspiring Project Best Practices for the definition of strategic objectives, guidelines and general suggestions added to Chapter 3 of the REP**

- **FCH JU H2 bus projects: HighV.LO -City / Hytransit / Jive (Aberdeen City Council ), 3Emotion / Jive 2 (Province of South Holland)**
- **Governance models Public transport authorities / operators for hydrogen buses - Province of South Holland**
- **Financial feasibility of implementing hydrogen buses - Province of South Holland**
- **Joint purchase of hydrogen buses: model spv - Province of South Holland**
- **Collaboration between contracting entities in a joint procurement - Province of South Holland**
- **Lessons learned from the operation of hydrogen buses - Province of South Holland**

## 1) Content of some paragraphs relating to H2 included in Chapter 3 of the REP thanks to the Aberdeen Hydrogen Hub Best Practice

### Scenarios and intervention policies for the development of energy production from RES

#### Policies related to energy sources (production)

PER-Lazio aims to reduce the use of fossil fuels and achieve climate neutrality in terms of CO2 emissions by 2050, in particular 100% in the civil sector, 96% in the production of electricity, 95% in the transport sector and 89% in the industrial sector.

As regards the development strategy of RES-Electrical (RES-E), constant growth is expected at regional level in the short, medium and long term of:

- photovoltaic also through support for the creation of energy communities, self-consumption of self-produced energy, agro-voltaics;
- offshore wind
- other RES and green hydrogen. In particular, green hydrogen is expected to play an important role in the decarbonisation of "hard to kill" sectors (port areas, heavy transport, paper, glass, ceramics and concrete production )

## 2) Content of some paragraphs relating to H2 included in Chapter 3 of the REP thanks to the Aberdeen Hydrogen Hub Best Practice

### **Role of green hydrogen in the regional energy plan**

The Regional Energy Plan considers hydrogen a central resource to make the decarbonisation process more efficient and economical and to achieve the regional objectives by 2030.

The Region therefore intends to promote the production of green hydrogen by creating opportunities to encourage the creation of new businesses and the development of new production activities in a rapidly growing sector with a high level of technological innovation.

### **Where electrification is not possible, promote the use of hydrogen to replace fossil fuels in heavy transport systems**

As far as the transport sector is concerned, it is appropriate to envisage the possibility of creating plants for the production of hydrogen from renewable sources dedicated to heavy transport, both by road and by rail.



### 3) Content of some paragraphs relating to H2 inserted in Chapter 3 of the REP thanks to various Best Practices of the project

#### **Scenarios and intervention policies on energy efficiency in end-use networks and sectors - Transport sector - Green mobility with hydrogen and biomethane**

The use of green hydrogen and biomethane to replace fossil fuels requires the modernization and conversion of the storage and distribution network, with related terminals for supply by end users.

For biomethane, since the chemical composition is the same as methane, interventions are minimal, while more significant interventions are required for hydrogen.

#### 4) Content of some paragraphs relating to H2 inserted in Chapter 3 of the REP thanks to various Best Practices of the project

### Scenarios and intervention policies on energy efficiency in end-use networks and sectors - Transport sector - Green mobility with hydrogen and biomethane

Main action proposals and recommendations:

It is believed that the objectives of the Scenario for the reduction of final consumption in road transport indicated in Part 2 can also be achieved thanks to the development of a refueling infrastructure that supports the circulation of biomethane and green hydrogen vehicles through the continuation of the following policies:

- Urban planning simplification for road distribution systems that install electricity, biomethane or green hydrogen refueling points
- Support for research and innovation for the green economy

## 5) Content of some paragraphs relating to H2 inserted in Chapter 3 of the REP thanks to various Best Practices of the project

### Use of green hydrogen in heavy road transport and in ports

Green hydrogen also fits within the context of Directive 2014/94/EU (DAFI) and the National Strategic Framework, as this energy carrier can constitute a sustainable technology to allow heavy vehicles to comply with the strict limits on polluting emissions in line with what is indicated in the Next Generation EU and in the PNRR. In this sense, the PNRR provides for the construction of at least 100 experimental hydrogen recharging stations for cars and trucks by 2026.

However, the diffusion of the end uses of green hydrogen in Italy requires overcoming the infrastructural gap in the first ring of the distribution chain, with possible interventions at the existing terminals and the creation of an intermediate coastal storage network. The achievement of these objectives implies the development of an adequate infrastructural endowment of a widespread nature linked to the methods of transport, distribution and final use of green hydrogen. **From this point of view, maritime transport and the port sector also play an important role in the reduction of greenhouse gases and polluting loads.**

## 6) Content of some paragraphs relating to H2 inserted in Chapter 3 of the REP thanks to various Best Practices of the project

### Use of green hydrogen in heavy road transport and in ports

Ports represent in particular an important case study to accelerate the adoption of alternative fuels to decarbonise «hard to abate» sectors and trigger the "scale-up" in the use of green hydrogen, e.g. produced by offshore wind, but also to demonstrate the use of hydrogen to replace fossil fuels in port activities such as heavy transport and logistics machinery.

Main action proposals and recommendations:

- Promote and encourage the creation of refueling points for green hydrogen
- To guarantee the circulation of heavy vehicles powered by green hydrogen, an adequate number of refueling points will be created by 2026 in the port areas and in the municipalities belonging to Class 1 and located along the Lazio sections of the "Scandinavian - Mediterranean Corridor" of the TEN network -T.

**7) Content of some paragraphs relating to H2 inserted in Chapter 3 of the REP thanks to various Best Practices of the project**

## **Renewal of the public transport fleet**

The regional administration, the local authorities and the institutions controlled by them must respect the art. 10 of the DAFI Decree which provides for the obligation, in the event of replacement of the respective fleet of cars, buses and public utility vehicles, including those for the collection of urban waste, to purchase at least 25% of green hydrogen or electric motor vehicles.

## Procedural activities for the adoption of the Regional Energy Plan

**Currently the new version of the PER, as updated by the project, is being approved by the new Regional Council**

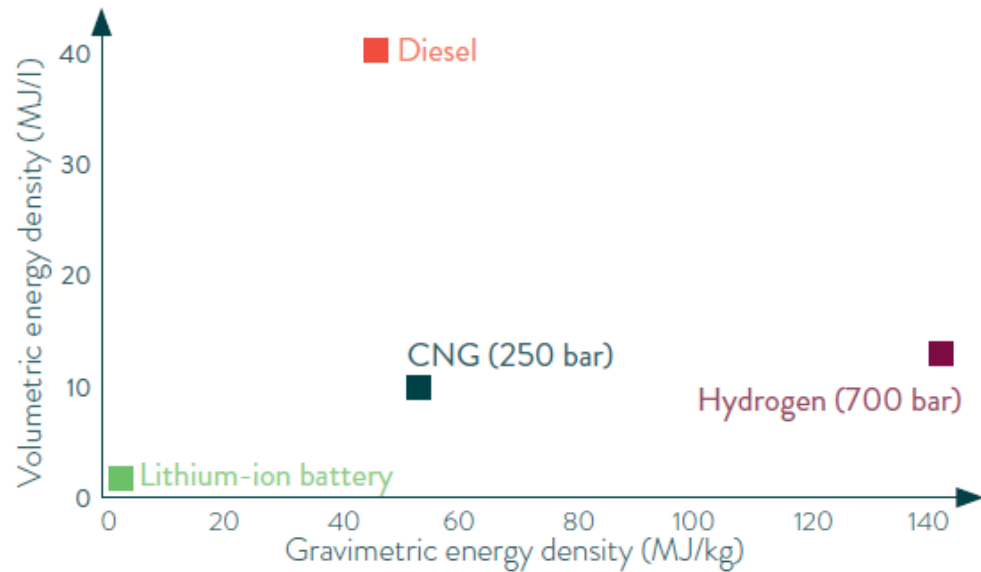
**At the same time REP itself passed the VAS screening**

# 4. Next steps: the Hydrogen Valleys

Hydrogen BUS

Fuel Cell Bus FCB

An FCB bus is an electric bus that features both a fuel cell and a battery. This hybrid system uses the fuel cell to provide most of the energy required to operate the vehicle, while the battery provides support during peak power demands, e.g. for fast acceleration or uphill. The fuel cell consumes hydrogen to generate electricity through an electrochemical reaction, releasing only water and heat as byproducts. Electricity is used to power the electric motors and keep the battery charged.



## Hydrogen TRAINS (Fuel Cell)

Manufactured by Alstom in Germany, the Coradia iLint is the world's first hydrogen (fuel cell) powered passenger train. Developed starting from the previous diesel train projects, it is 54 meters long, made up of two crates, has a weight of about 120 tons distributed on 4 2-axle bogies, 150 seats, as many standing, an autonomy of 1000 km and can reach 140km/h. On each of the two crates, iLint has a fuel cell that supplies 200 kW (with a tank made up of 12 cylinders, positioned on the roof), and an engine trolley. The total 12+12 cylinders correspond to 188 kg of fuel, equivalent to about 624 liters of diesel.





PNRR  
Measure 2  
Component 2



**M2C2 - RENEWABLE ENERGY, HYDROGEN, NETWORKS,  
SUSTAINABLE MOBILITY**

- **increase in the share of energy produced from renewable sources**
- **upgrade and digitize network infrastructures**
- **promote the production, distribution and end uses of hydrogen**
- **develop more sustainable local transport**
- **promote the development of competitive supply chains in Italy**

PNRR  
Measure 2  
Component 2  
Investment 3.1

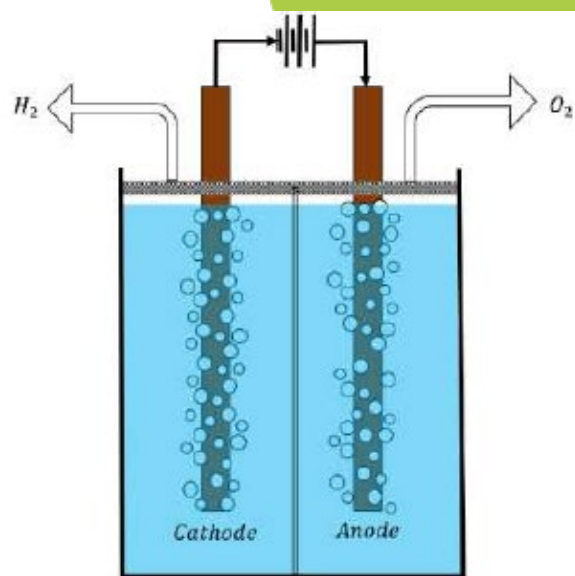
PNRR M2C2 I3.1 Production in abandoned industrial areas

Redevelopment of abandoned industrial areas for the production of hydrogen, to be used for local transport and industry

Investment objective

Create **10 hydrogen valleys**, i.e. industrial areas with an economy partly based on hydrogen, to locally promote the production and use of H<sub>2</sub> in industry and transport. To contain costs, brownfield sites already connected to the electricity grid will be used: electrolyzers will be installed there for the production of hydrogen by means of RES over-generation or dedicated RES production in the area.

The total area of industrial areas in Italy, in 2011, was about 9,000 km<sup>2</sup>: almost as much as Umbria. Most are strategically located to help build a widespread hydrogen production and distribution network to nearby SMEs.



# Towards an EU Roadmap for Hydrogen Valleys – Regional actors and their role



PNRR  
Measure 2  
Component 2  
Investment 3.1

The objective of the M2C2 3.1 Investment, also known as Hydrogen Valleys, consists in the completion of at least **10 renewable hydrogen production projects in abandoned industrial areas, for a total capacity of at least 10-50 MW.**

The investment envisages that the Ministry of the Environment and Energy Security (MASE) delegates the Regions as implementing bodies for the publication of regional calls for tenders aimed at companies and dedicated to the selection of projects and the subsequent assignment of subsidies.

In particular, **450 million euros** were distributed by MASE among the Regions and autonomous Provinces, for the implementation of projects aimed at achieving the targets connected to the Investment.

PNRR  
Measure 2  
Component 2  
Investment 3.1

Activities carried out and planned by MASE and the Lazio Region (Infrastructure and Mobility Department - Energy Transition Area) for the implementation of the Investment:

- MiTE decree n. 463 dated 21/10/2022: methods and general criteria for granting the benefits envisaged under the Investment 3.1. **Allocates 17 million euros to Lazio for implementation.**
- Directorial Decree of MASE n. 427 of 12/23/2022: divides tasks between the Ministry and the Regions and provides a "standard notice"
- Management determination n. G00121 dated 10/01/23 (BURL n. 4/2023) of publication of the Regional Public Notice, with the simultaneous opening of the terms to participate
- Approval with Executive Resolution n. G04363 of 03/31/2023 of the **ranking** of project proposals, hitting the milestone envisaged by the PNRR for this investment

PNRR  
Measure 2  
Component 2  
Investment 3.1

Based on the ranking, the projects to be financed with the available resources are:

- “ **H2-Civitavecchia** ”, presented by CFFT - Civitavecchia Fruit & Forest Terminal Spa for the Civitavecchia area and totally eligible for financing
- “ **Helios** ” presented by Engie Servizi Spa – Società Gasdotti Italia Spa – Industrial Consortium of Lazio for the Patrica area (FR) and partially financeable due to depletion of resources.

PNRR  
Measure 2  
Component 2  
Investment 3.1  
Project H2 Civitavecchia

Usage of the H2 product:

- Cold ironing (electrification of the docks at the Port through the supply of hydrogen to compensate for an electricity generation of 3 MW and to store 30 MWh necessary for power supply and balancing)
- Heavy goods and people mobility (tank capacity 35 kg; travel distance 400 km)
- Medium mobility of goods and people (tank capacity 10 kg; travel distance 300 km)

Impianto da 3 MW

|                          |          |                         |
|--------------------------|----------|-------------------------|
| Potenza totale impianto  | 3,02     | [MW]                    |
| Energia annua prodotta   | 7.767,11 | [MWh/year]              |
| Produzione per 3.024 MW  | 144,77   | [t <sub>H2</sub> /anno] |
| Ore equivalenti annue    | 2.446,18 | h <sub>eq</sub>         |
| Efficienza               | 53,65    | [MWh/t <sub>H2</sub> ]  |
| Consumo H <sub>2</sub> O | 190      | [l/h]                   |



## Cold Ironing at the docks of the ports



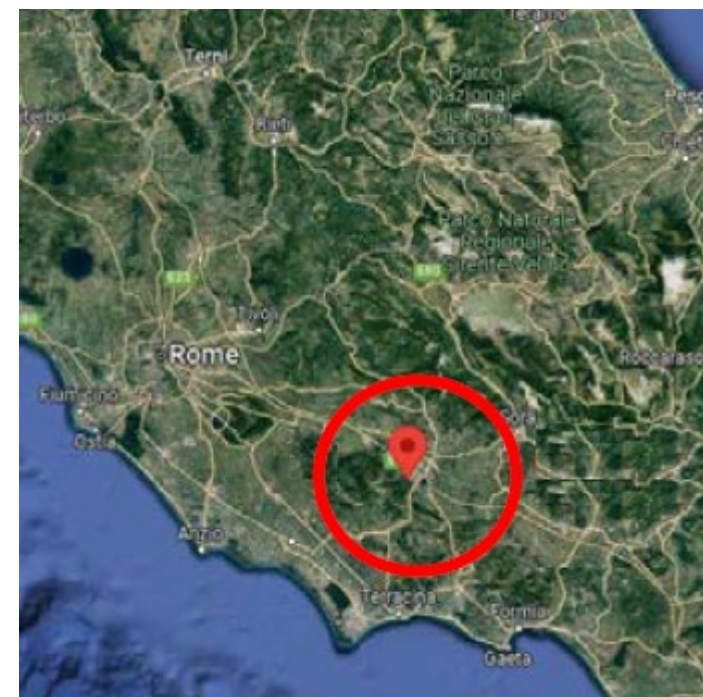


PNRR  
Measure 2  
Component 2  
Investment 3.1  
Helios Project

Usage of the H2 product:

- initial phase with the involvement of the pilot users of the project (Novamont SpA), currently connected to the DX-Sacco pipeline, intending to use hydromethane blends in concentrations up to 20%. Supply with a new “hydrogen ready” gas pipeline approximately 1.5 km long.
- extension of the use of hydrogen blends to all companies currently connected to the DX-Sacco pipeline (6 in total in addition to the pilot company).

PV system power 6,962.55 kWp  
 Electricity produced by FER subservient 10,057.52 MWh  
 of which consumed by the H2 plant 9,720.3 MWh  
 PV production hours per year 4254 h  
 4.5 MW electrolysis unit  
 Electrolyser unit efficiency 54.7 kWh/kg H2  
 Electrolyser H2 production capacity = 83 kg/h  
 Actual water consumption 850 l/h (full load) or 10.2 l/kg H2  
 Total H2 production: 290,649 tons/year





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European Union  
European Regional  
Development Fund

Thank you!