ASSOLOMBARDA

Hydrogen Joint Research Platform

La filiera per le applicazioni della risorsa chiave per il futuro

Speaker

Gianluca Valenti, Politecnico di Milano

25.10.2022

POLITECNICO MILANO 1863

Fondazione Politecnico di Milano

POLITECNICO
MILANO 1863

OUR MISSION:

We shall be a "**European Leading University**", capable of **guiding research and scientific and technological innovation** to improve human life in a sustainable and responsible way.

Hydrogen JRP
JOINT RESEARCH PLATFORM

QS WORLD UNIVERSITY RANKINGS

The prestigious QS World University Rankings continues to reward Politecnico di Milano's policy in terms of excellence in training, competitive research and special attention to the labour market needs.

In 2020, the ranking "by Subject" listed Politecnico di Milano among the **world top 20 in all three specific areas**: 20th in Engineering, 7th in Architecture and 6th in Design. In the Italian panorama, the university confirms its position as the absolute first.

Politecnico di Milano, together with its departments, is the **centre of excellence for the Hydrogen JRP.**

ABOUT US

Fondazione Politecnico di Milano was established in **2003** on the behest of **Politecnico di Milano**, our city's main institutions and the regional government of Lombardy, with the support of several important business companies.

The Foundation **contributes towards innovating and developing Italy's economic and productive landscape**, operating to improve the efficiency of relationships between **Politecnico di Milano** and companies, institutions and public authorities.

The Foundation will be the **operational and network centre for the Hydrogen JRP.**

Hydrogen JPR
JOINT RESEARCH PLATFORM

MISSION

1. **Strengthen and promote high quality research**, transfer of knowledge and education/training in Italy and internationally.

2. Encompass a multi-disciplinary focus on **ethics, sustainability and social responsibility.**

3. Encourage the creation and growth of **innovative technological enterprises.**

4. **Increase our international perspective** to establish **world level alliances** and share our values, strategies and actions.

WHY

- Hydrogen, in next decades, will be **the vector** which will support renewable electricity in the transition **to a zero-emission economy.**

- To create a place for discussion, to create opportunities, to construct a development environment **for all the potential players in this supply chain.**

- **To create a gateway to the Next Generation EU Plan in view of the deployment of hydrogen technologies, infrastructures and R&D expected by the PNRR - *Piano Nazionale di Ripresa e Resilienza.***

HOW

- Establishing a **physical (laboratories and mini-factories)** and **virtual (knowledge sharing)** place where companies together with Politecnico can develop and test **evolutionary strategies and products** able to lead them to be **competitive** on the **energy transition** market linked to hydrogen.

- **The *Hydrogen Joint Research Platform* (JRP) is an information- and activity-sharing tool to conduct joint research on hydrogen strategies and technologies for the whole supply chain.**

WHAT

The platform functions executing **projects**, which are of two kinds

- **Horizontal projects**

  If project results are shared with all JRP Members. Horizontal Projects explore macro-themes such as *Multi-sector forecasting models and scenarios of production, storage, distribution and possible end uses of hydrogen, LCA evaluation of hydrogen production* and *Supply chain development strategies*.

- **Vertical projects**

  If project results are share only a group of JRP Members. Vertical Projects explore, for instance, *development of products, definition of business models, verification of best practices, etc.*

WHO

The Founders are the main actors in the strategic guidance and in the definition of projects, via a Steering Committee. They are**:**

- **Politecnico di Milano**
- **Fondazione Politecnico di Milano**
- **EDISON**
- **ENI**
- **SNAM**
- **A2A**
- **NEXT CHEM**

Platinum associate companies: actors in strategic projects, they can propose horizontal and vertical projects to carry out in the medium-term together with Founders and Partners.

Gold associate companies: participants in the projects, benefit from the results of all horizontal projects and can be invited to participate to vertical projects.

Institutional stakeholders: strategic consulting bodies, via Advisory Board.

GOVERNANCE MODEL

Advisory Board

- Includes institutional stakeholders (Ministry of University and Research, Ministry of Ecological Transition, Ministry of Industry; RSE ; ISPRA ; Sector associations; Hydrogen Europe ; selected international Research Centres)
- Is an advisory body with collaborative tasks in the definition of the annual program of activities

Steering Committee

- Includes Politecnico, Fondazione and Founders
- Identifies development ways, defines budget for annual projects, establishes operating and dissemination methods for shared activities, designates members of the Advisory Board

Project Committee (for each Single Project)

- Includes companies of the project, Politecnico and FPM
- Coordinates the Project and is responsible for achieving results
- Defines the project budget annually

Project B committee

Project C committee

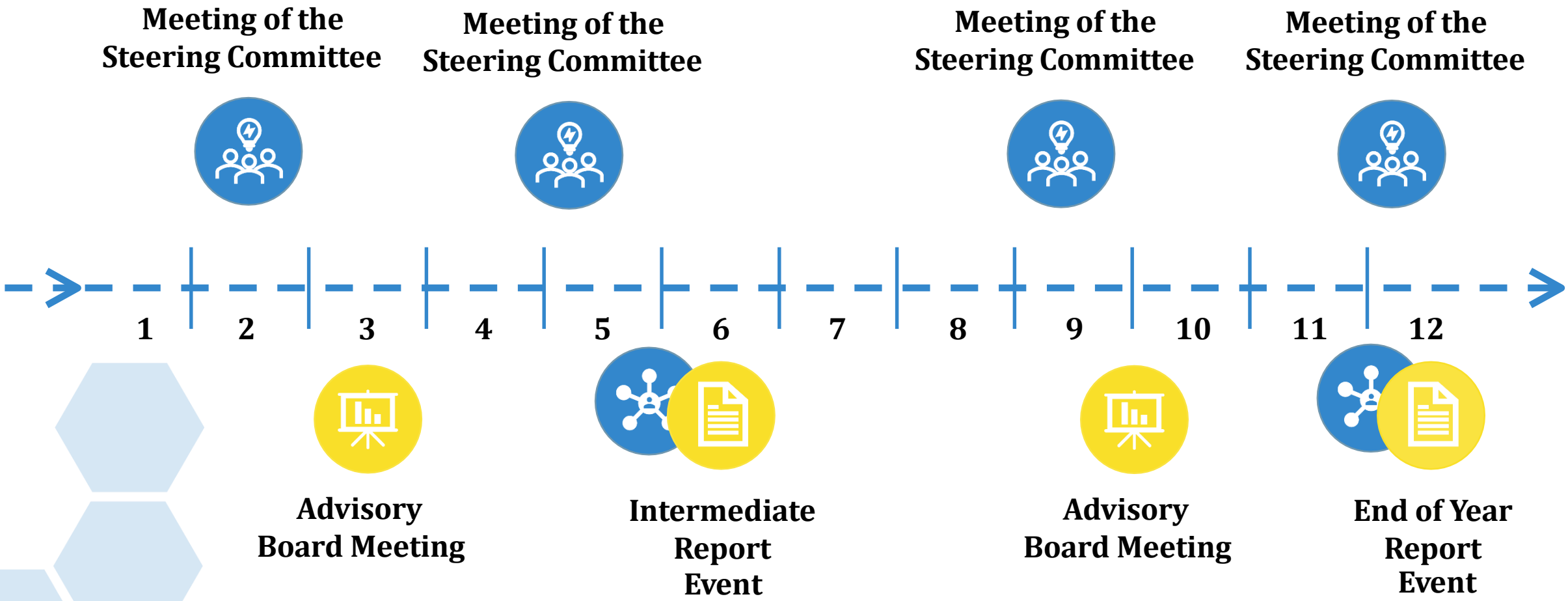
...

Project Z committee

JRP IN SHORT

- The JRP is a **complementary tool** to the individual framework and JRC agreements stipulated by companies with Politecnico and/or Fondazione
- The JRP enables **research on major transversal MULTI-COMPANY issues** and supports the evolution of a hydrogen supply chain
- Thanks to the JRP it will be possible to **share research of interest**, increasing its value and decreasing the impact of costs on the company

ANNUAL TIMELINE PROPOSAL



Research Topics

Horizontal projects - overview

1. *Integrated Energy System Modeling and H2 Role*
2. *LCA of Hydrogen Production Pathways*
3. *H2 Supply Chain*

(specific presentations)

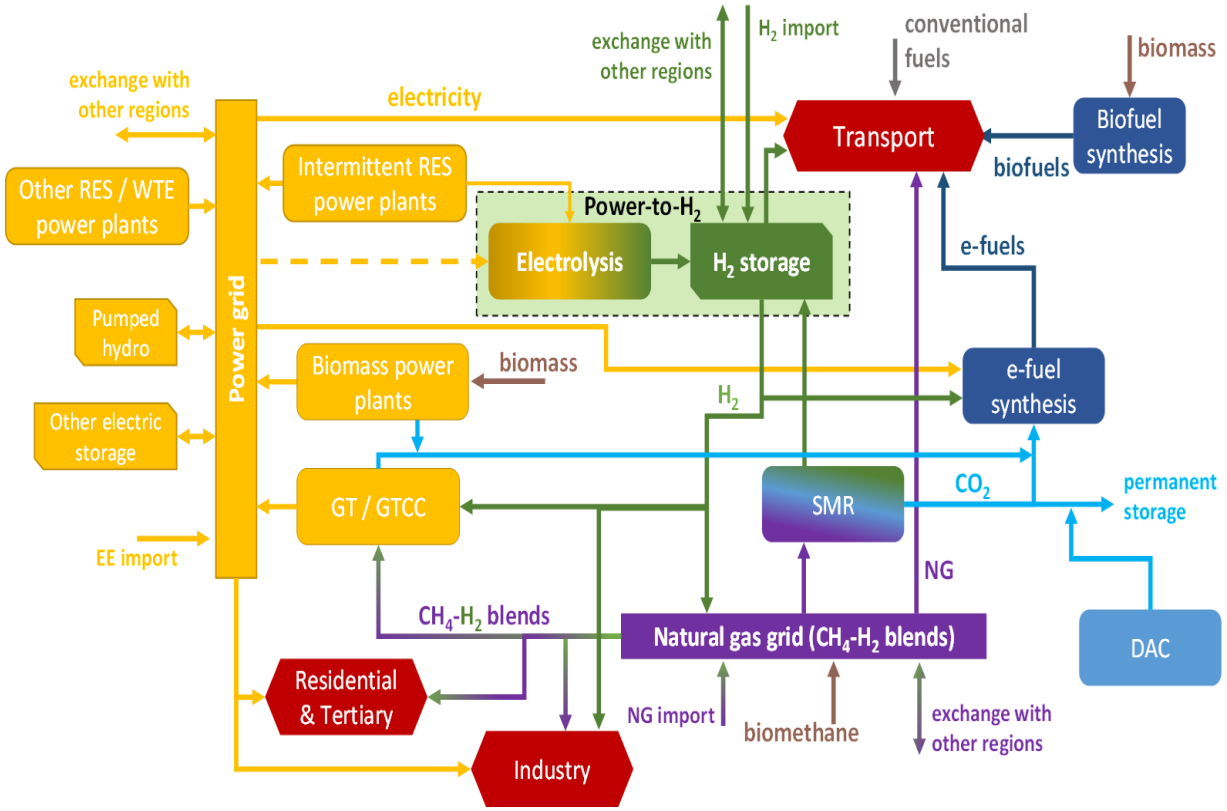
Integrated energy system modeling for net zero CO2 and hydrogen role

Scope:

- Phase 1: preliminary simulation of **future scenarios** of the energy system, able to define the **role of hydrogen** and related **infrastructures.**
- Phase 2: Evolutionary analysis of the integrated energy system in the transition up to long term.

Objectives:

- In-depth study on hydrogen zonal exchange and storage needs, role of natural gas- H_2 blend networks.
- Assessment of installed capacities and operational strategies, role hydrogen and electricity, blue hydrogen and carbon capture possibilities/needs.
- Identification of progressivity (transition) strategies.
- Update of optimal structure of the final system.
- Hydrogen role analysis (e.g., green/blue and domestic/import) in Italy as hub.
- **Minimum total cost + decarbonization target**.

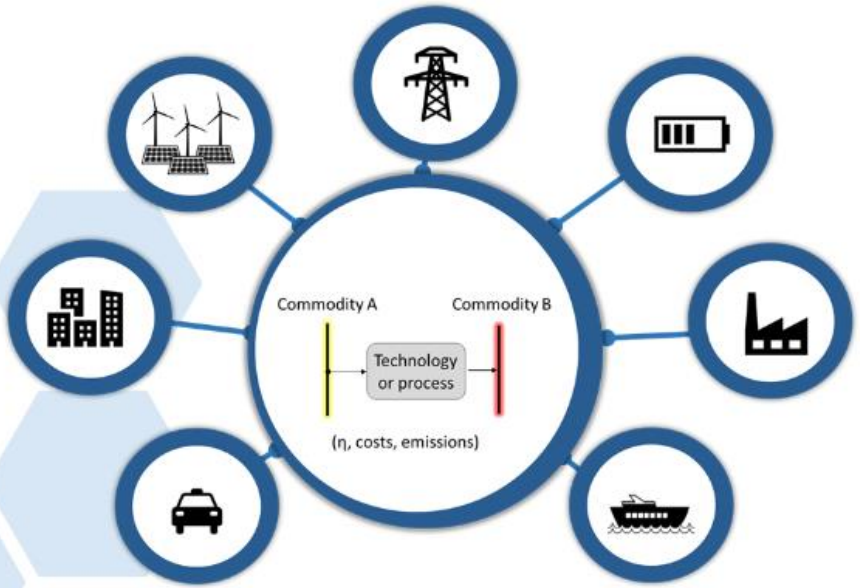


Integrated energy system modeling for net zero CO2 and hydrogen role

Time horizon: 2 years

Phase 1 (1 y - 2022)

Phase 2 (2 y – 2023)



Environmental LCA of H2 renewable/blue production options

Scope:

Development of a coherent and systematic analysis, using the Environmental Life Cycle Assessment (E-LCA) process-based modeling, of **different hydrogen production pathways** including green and blue hydrogen.

Objectives:

Assessment of potential impacts of the entire value chain (**Carbon footprint and CO2eq index**) with production from renewables or production from fossil fuel with capture and storage system.

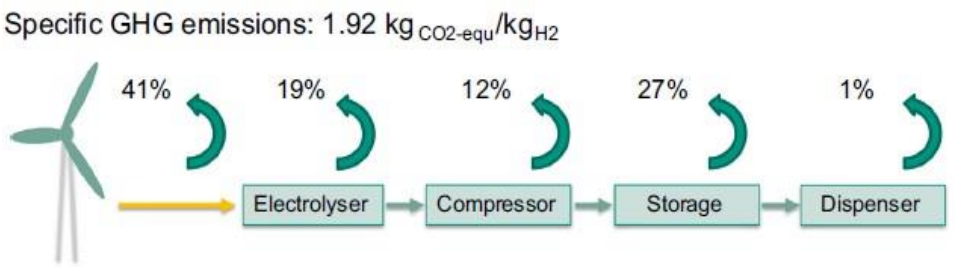


Fig. 6. GHG emissions, whole system.

(J. Burkhardt et al. / Applied Energy 181, 2016)

Environmental LCA of H2 renewable/blue production options

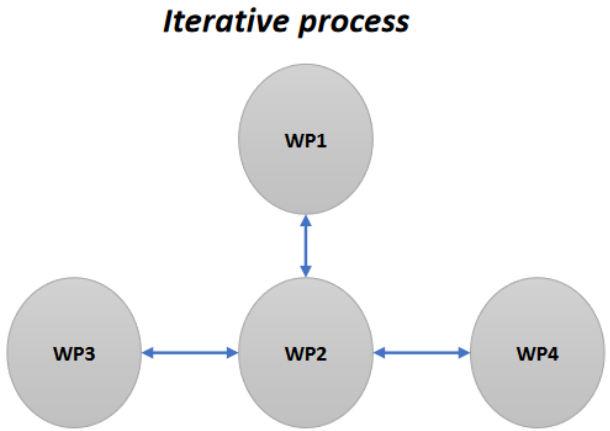
Time horizon: 18 months

WP1: Definition of hydrogen production technologies (Months 1-9)

WP2: Definition of goals and scope of the study (Months 4-18)

WP3: Assessment of potential impacts, production from renewables (Months 7-18)

WP4: Assessment of potential impacts, production from fossil fuel with CCS (Months 7-18)



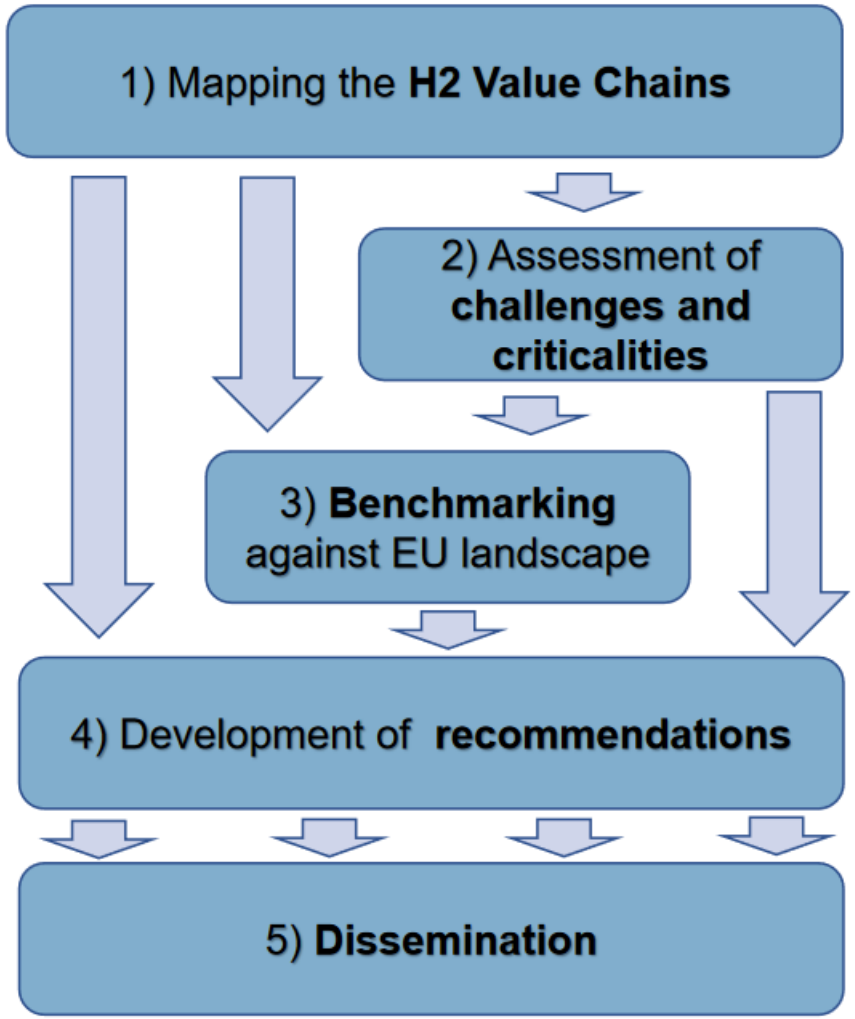
A capability mapping of the Italian Hydrogen Supply Chain

Scope:

Recommendations for the development of an Italian H2 supply chain. These recommendations are targeted to companies, research centers, policy-makers and HEIs; they will focus on the current areas of criticality of the Italian H2 industry and will suggest development priorities and viable strategies.

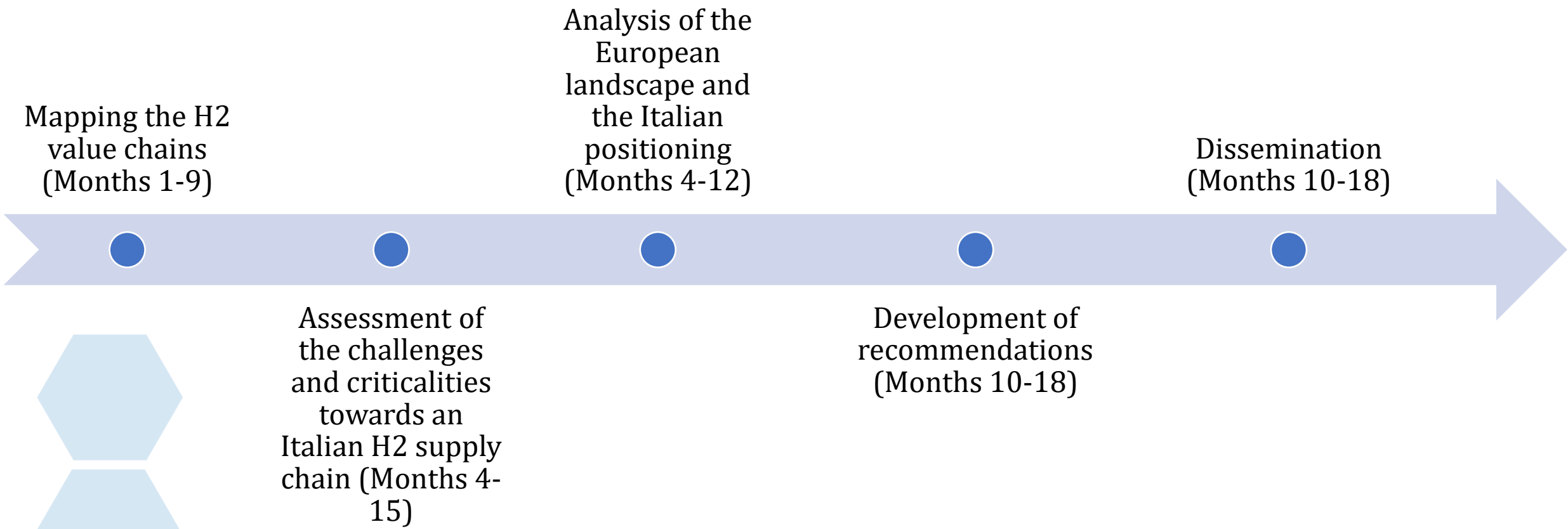
Objectives:

- Mapping the hydrogen value chains.
- Assessment of challenges and criticalities towards an Italian hydrogen supply chain.
- Analysis of the European landscape and the Italian positioning.
- Development of recommendations.
- Dissemination.



A capability mapping of the Italian Hydrogen Supply Chain

Time Horizon: 18 Months



Vertical projects proposals - Overview

1. *Innovative experimentation to test hydrogen steel embrittlement*
2. *Setup of a high-pressure hydrogen chamber for of polymeric materials*
3. *Development of an accurate H2 mass flow rate measurement system*
4. *Porous framework materials for hydrogen storage (H2-POFs)*
5. *Analysis of the state of the art in hydrogen compression technology*
6. *Experimental assessment of electric input-controlled PEM electrolysis*
7. *Novel concepts in energy storage overlapping with hydrogen*
8. *Safety of hydrogen-methane blends in pipelines in case of explosions*
9. *Simulation of hydrogen leakage from equipment*

Vertical projects: other proposals

Ongoing definition of other project proposals

1. *Development of a liquid hydrogen lab facility (synergy with recently awarded EU projects)*
2. *Analysis of hydrogen perspectives in emerging countries of the Mediterranean area (cooperation with UNIDO)*
3. *Liquid organic hydrogen carriers – State of the art and innovative routes*

Hydrogen JRP Members

Founders

Fondazione Politecnico di Milano

POLITECNICO MILANO 1863

eni

EDISON

snam

a2a

NextChem
Maire Tecnimont for Energy Transition

Platinum Members

ansaldo energia

Gold Members

Swiss Re Corporate Solutions

AGRATI
World Fastener Solutions

Polynt Group

SigmaTre Lab

SIAD

2G®

TÜVRheinland®
Precisely Right.

Pietro Fiorentini

Contacts

Fondazione Politecnico di Milano

P.zza Leonardo da Vinci, 32 - 20133 Milano

email: *jrphydrogen@fondazione.polimi.it*

www.fondazionepolitecnico.it

ASSOLOMBARDA

www.assolombarda.it
www.genioeimpresa.it
Seguici su