

# ESTEP 2025 Annual Event

28-30 October 2025  
Udine (ITALY)

How decarbonisation, digitisation  
and circular solutions forge the  
sustainable European steel future?

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Managing Director

# **LIFE H2REUSE**

## **Efficient and sustainable bright annealing process through hydrogen recovery and reuse**

**101156487 — LIFE23-CCM-IT-LIFE H2Reuse**



Co-funded by  
the European Union

Funded by The European Union under Grant Agreement No.  
101156487 - LIFE23-CCM-IT-LIFE H2reuse



**DIGIMET**



**DANIEMI AUTOMATION**



**UNIVERSITÀ  
DEGLI STUDI  
DI UDINE**  
HIC SUNT FUTURA

## CONSORTIUM

### Coordinator:

- DMV Italia s.r.l.

### Beneficiaries:

- LOI THERMOPROCESS GMBH (Germany)
- TENOVA SPA (Italy) – Affiliated entity

**Project location:** Costa Volpino (BG, Italy)

### Budget info:

- Total amount: € 3,370,350.20
- %EC Co-founding: 60%

**Duration:** 30 months



Produce Seamless and Nickel Alloy Stainless Tubes

Part of group Cogne Acciai Speciali and Walsin Lihwa Corp.



Sustainable solutions for the metallurgical industry and – also through the well-known brands TAKRAF and DELKOR – the mining industry

Part of the Techint Group

## THE CHALLENGE

Bright annealing is a heat treatment performed on Stainless Steel in a controlled atmosphere with reactive gas, typically, 100% hydrogen.

This process minimizes surface oxidation, resulting in a bright finish and a reduced oxide layer, contributing to enhanced corrosion resistance.

In continuous production lines, however, the hydrogen used is often released after a single use, leading to significant inefficiencies and waste.

**Addressing this issue is the main objective of the LIFE H2Reuse project.**

DMV, tubes manufacturer, and Tenova LOI, heat treatment equipment supplier, developed the innovative concept & successfully submitted the idea to EU LIFE for funding.



LIFE Program is a European funding instrument dedicated to environmental and climate action.

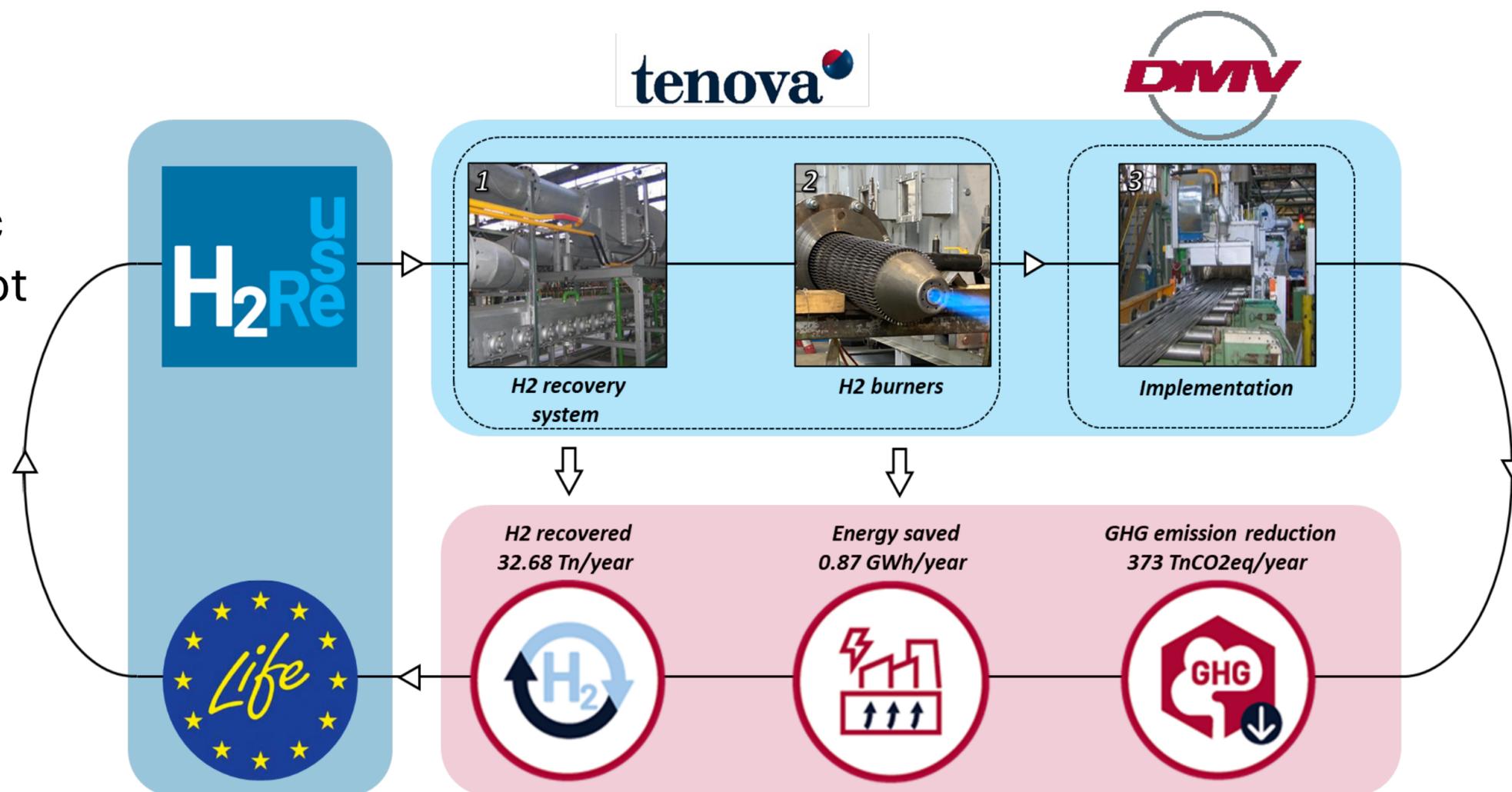
Supported by:  PNO INNOVATION

## PROJECT

Recycle of **H2** as fuel for the same heat treatment process

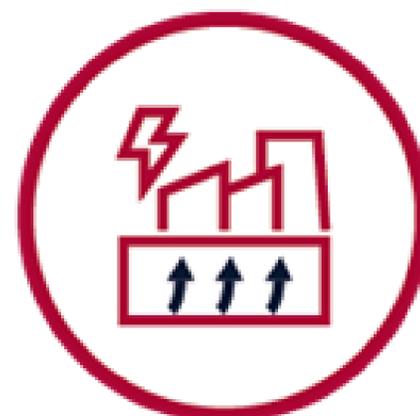
The **reuse** of bright-annealing atmospheric gas as fuel is an innovative idea that has not yet been introduced to the market:

1. Development of H<sub>2</sub> capturing technology
2. Development of H<sub>2</sub> burners for SiC tubes
3. Implementation and adaptation of the existing furnace @DMV
4. Demonstration activities / Results exploitation



## OUR TARGET

**CO<sub>2</sub> Emissions Reduction:**  
**-373 CO<sub>2</sub>\_eq\_ton/year**  
*From 990 to 617 CO<sub>2</sub>\_eq\_ton/year*



**Energy efficiency gains**  
**-0.87 GWh/year,**  
*From 1.85 to 0.98 GWh/year*

**Hydrogen recovery:**  
**≈450,000 Sm<sup>3</sup>\_H<sub>2</sub>/year**



**Cost savings:**  
**≈125 k€/year energy savings**

*\*Values evaluated considering 140 €/MWh*

## THE BRIGHT ANNEALING FURNACE

Roller hearth furnace @DMV:

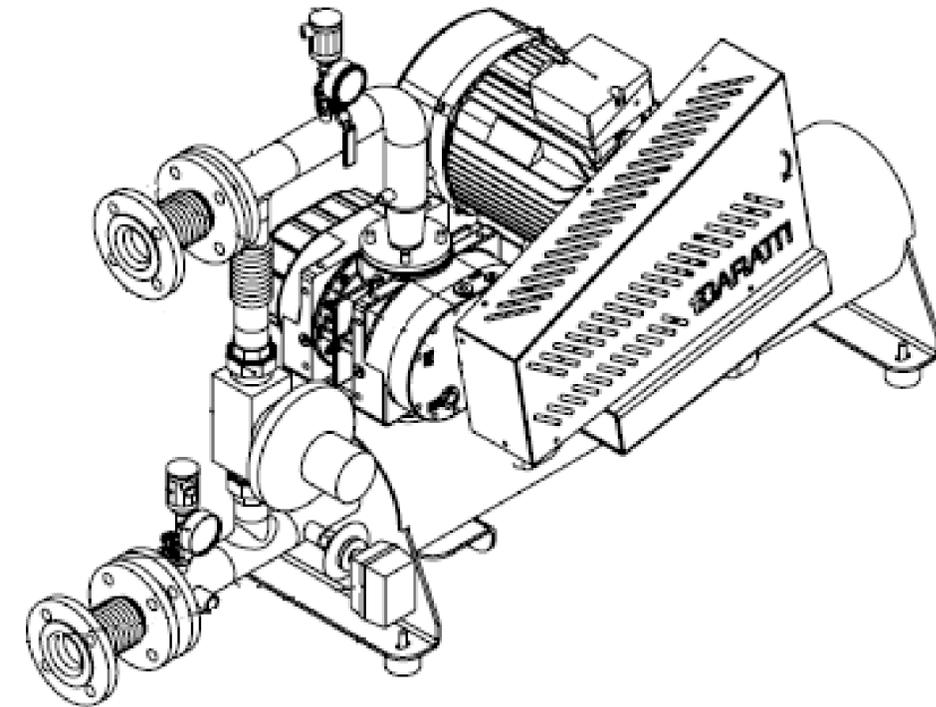
- Electrically heated  
(36x 10 kW HE in SiC radiant tubes)
- Operating temperature: up to 1200°C
- 99% H<sub>2</sub> protective atmosphere
- Furnace pressure: 5-20 Pa
- H<sub>2</sub>-flow: ~90 Nm<sup>3</sup>/h
- H<sub>2</sub> flared off/lost in atmosphere



*Bright annealing furnace (left) and wasted H<sub>2</sub> flare (right)  
@DMV facilities in Costa Volpino.*

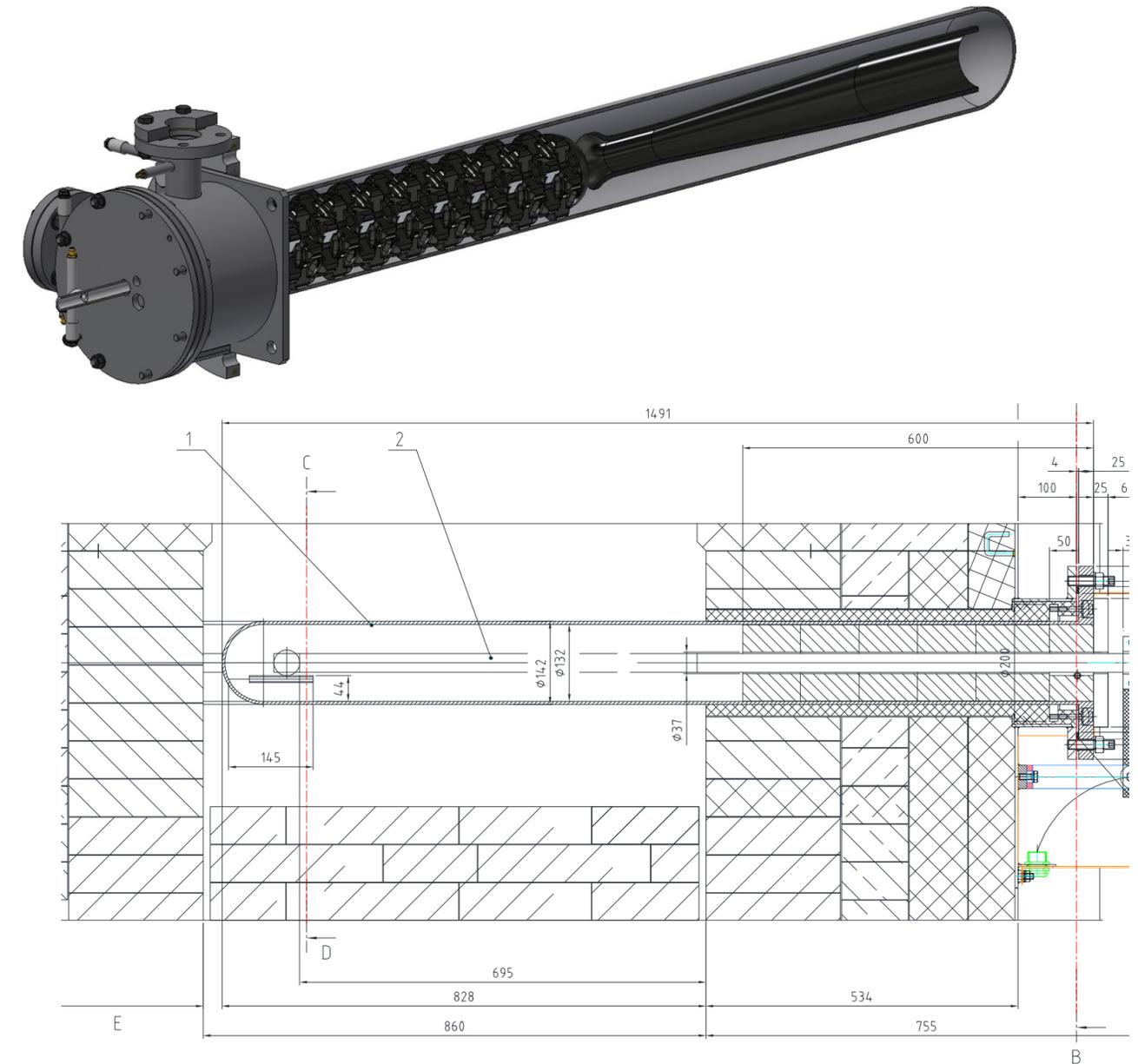
## H<sub>2</sub> CAPTURING TECHNOLOGY

- Chemin H<sub>2</sub> capture, target ~70% of recovery
- pressure increase of ~200 mbar, low flow rate (~60 Nm<sup>3</sup>/h) of hydrogen
- Solution: roots pumps
- Small storage (a few m<sup>3</sup>) to decouple extraction/compression from the usage at the burner



## H<sub>2</sub> BURNER DEVELOPMENT

- Flameless burner in SiC
- Geometry constraint given by existent radiant tube design
- Inner tube diameter: 132 mm
- Tube length (inside furnace): 830 mm
- Burner power: max. 30 kW
- Flame tube, recuperator: SiC
- NO<sub>x</sub> (goal): ≤ 250 mg/Nm<sup>3</sup> @ 3% O<sub>2</sub>
- Efficiency: > 70 %
- Metallic Prototype running at Tenova LAB



# LIFE23 Climate Action H<sub>2</sub> BURNER DEVELOPMENT

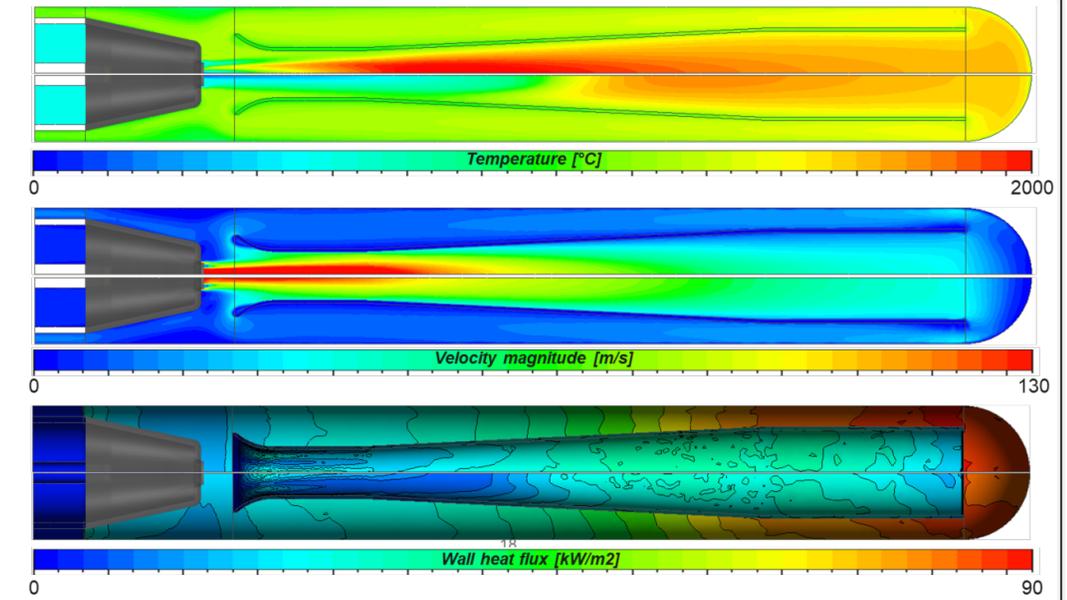


**Design engineering** ↔ **CFD Modelling**

**Conceptual design:**  
simulation of different configurations before the prototype stage

**Optimization:**  
Find the best geometry configuration against target values

**Process knowledge:**  
Build up a deeper understanding of the phenomena



**Industrial tests**

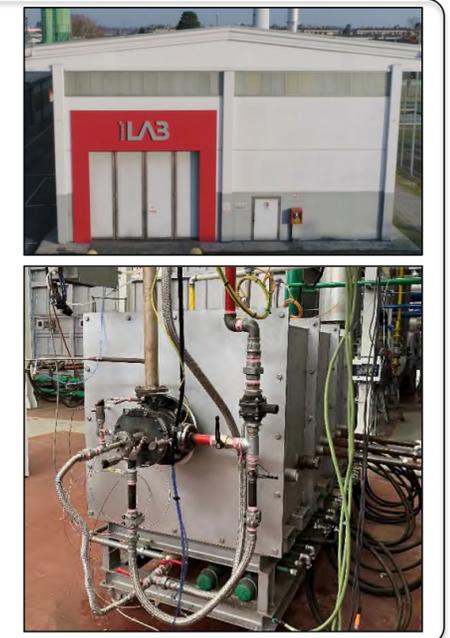
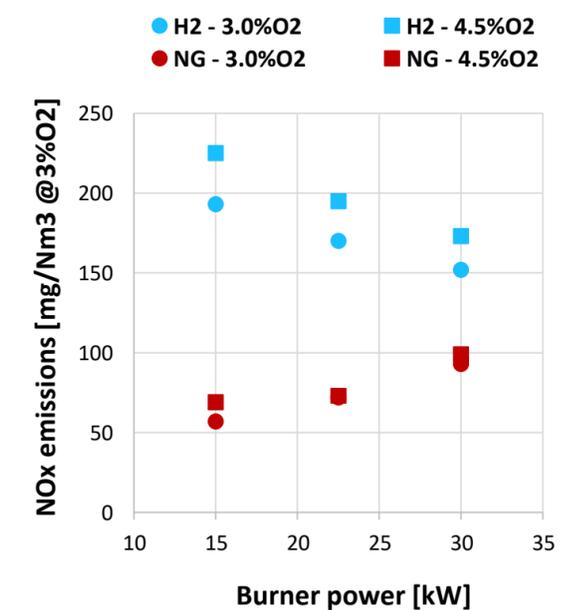
**Installation on industrial furnace:**  
for long duration run to test the life time of the component and system integration

**LAB Tests**

**Industrial scale lab tests:**  
burner tests to deep understanding of combustion phenomena and effect on products

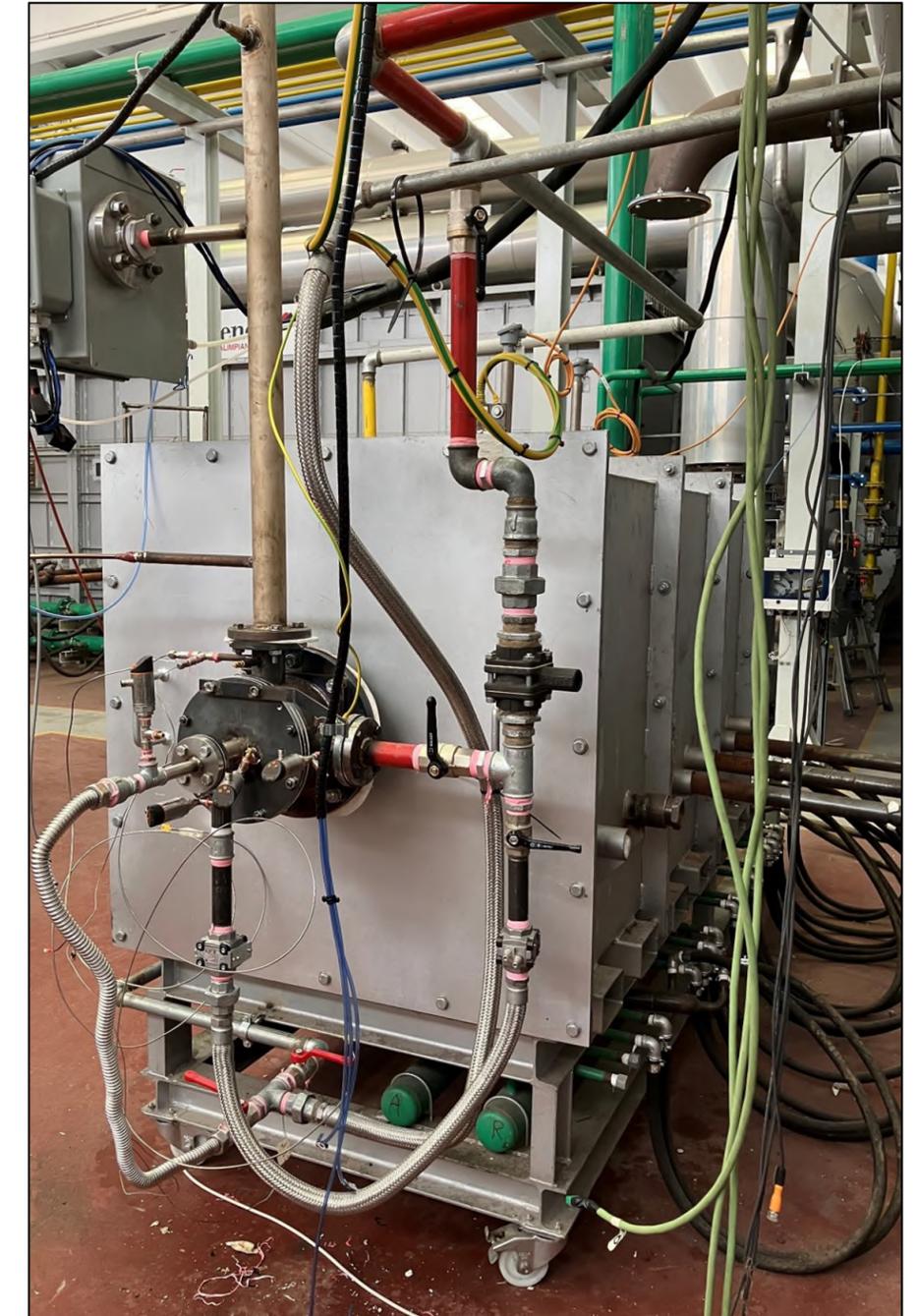
**#4 Furnaces:**  
From 3MW to 30kW, furnaces simulating industrial operative conditions and sections of real furnaces.

**Reference data:**  
Obtain reference data for CFD modelling update



## PROJECT STATUS

- |  |       |
|--|-------|
| ■ Burner prototype tests                             | Done  |
| ■ BA Furnace new electrical cabinet and logic update | Done  |
| ■ BA Furnace adaptation for new radiant tubes        | Done  |
| ■ BA Furnace Capturing and Services Adaptation       | Q4-25 |
| ■ Burners installation and testing                   | Q1-26 |
| ■ Demonstration and Exploitation Activity            | Q1-26 |



## POLICY & REGULATION

Regulatory frameworks have not fully adapted to accommodate H<sub>2</sub> as an industrial fuel.

Country	Specific NO <sub>x</sub> limits for H <sub>2</sub>	Key Points
Italy	No (flexibility via IEP*)	<i>Case-by-case adjustments</i>
Germany	No (temporary limits in IEPs*)	<i>Enhanced monitoring required</i>
Sweden	No	<i>Flexible limits allowed</i>
France	No	<i>Limits adapted in projects</i>
EU-wide	No (not specified in BREFs*)	<i>BATs acknowledge technical challenges</i>

### Conclusion:

- No European regulatory NO<sub>x</sub> emission limits specifically for H<sub>2</sub> combustion in steel industry furnaces have been fixed.
- Authorities acknowledge the higher NO<sub>x</sub> emissions from H<sub>2</sub> combustion.
- Limits are temporarily adapted in pilot and demonstration plants.
- Italy: H<sub>2</sub> is not listed as fuel in the Testo Unico Ambientale Dlgs 152 del 3 Aprile 2006, all. X parte V



# H2Reuse



Web page



LinkedIn page

# QUESTIONS & ANSWERS