Diesel Trains and H2iseO Hydrogen Valley: Advancing the Decarbonization of Railway Transport

RINA today

5,300 colleagues

200 offices

70 countries

Our people

More than **90 nationalities**

80%+
educated to degree level

42
average age

Who we are

Energy
Energy solutions from O&G to renewables, taking care of sustainability and environmental impacts

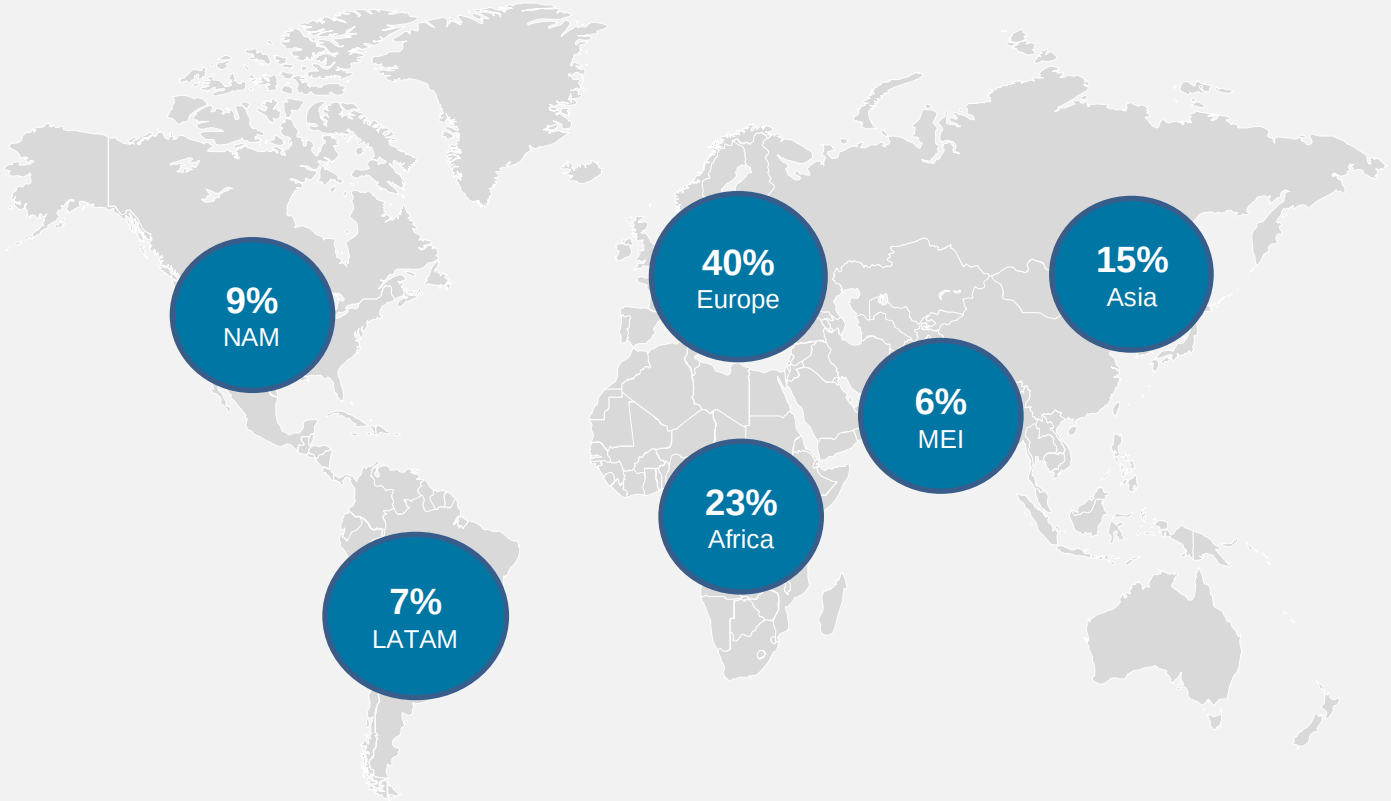
Marine
Rules, technologies and innovative services to manage transport and pleasure vessels

Certification
Solutions to support products, people and processes on their way to excellence

Infrastructure & Mobility
The path to the next generation of infrastructure and buildings by ensuring their safety and efficiency

Industry
Industry 4.0, innovation & research, Space & Defence, Cyber Security

Geographical Coverage

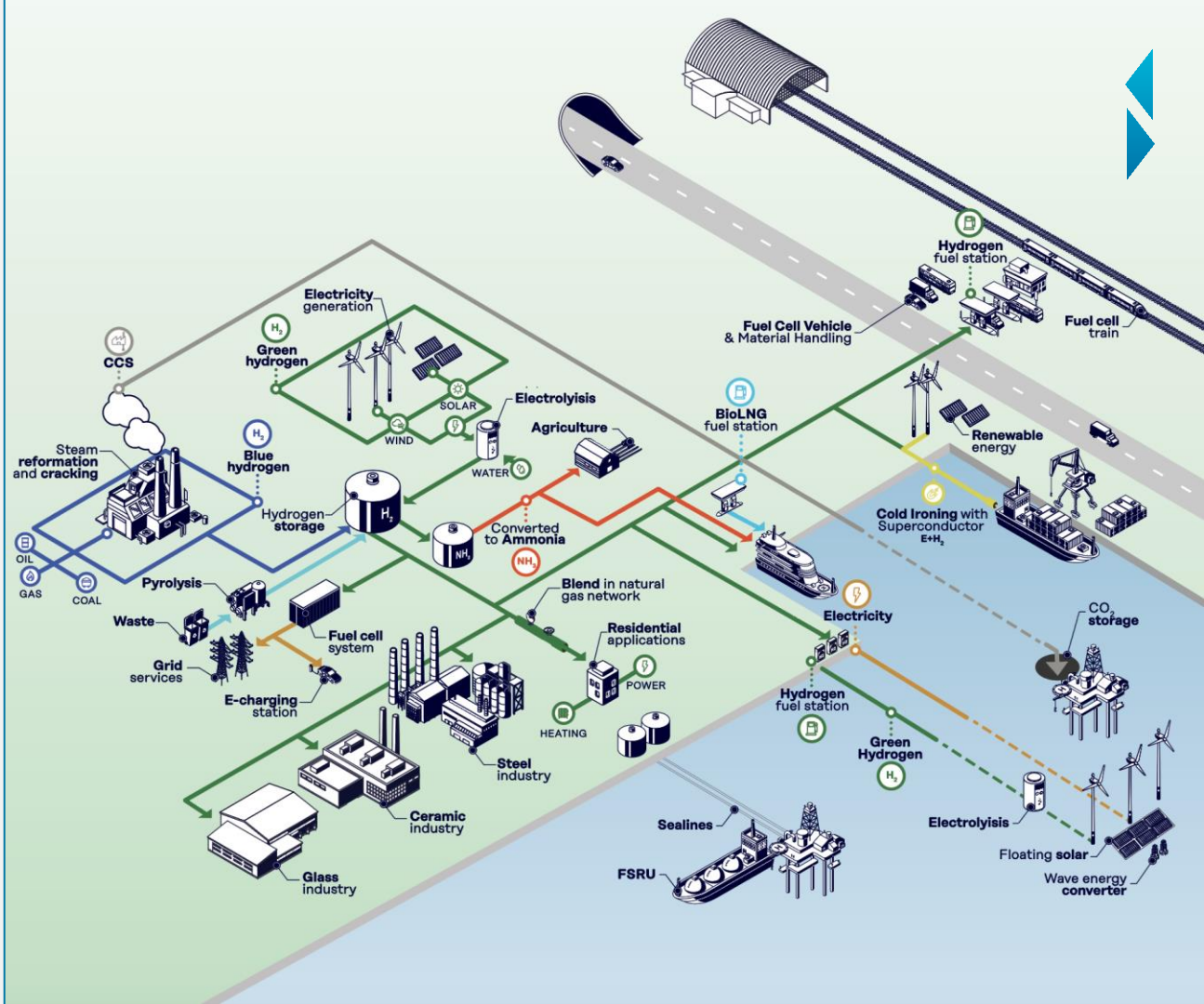


- **Projects in >130 countries**
- **30+ offices worldwide**

Energy experience

A **global team** of engineers and experts supporting the development of **energy infrastructures worldwide**, from early project development phases all the way down to engineering, procurement, construction, commissioning, operations, and decommissioning.

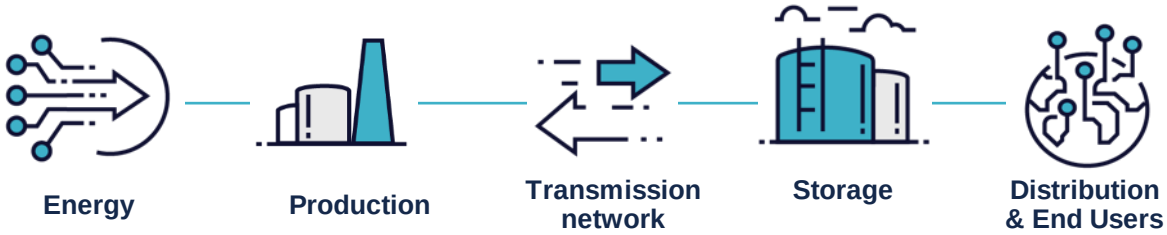
We offer **site characterization**, **advisory services**, **engineering**, **inspections** and **site supervision services** to key operators, contractors, vendors, banks & financial institutions, and other public and private stakeholders.



Focus on HYDROGEN

Map of Services

Supporting the entire value chain from CapEx to OpEx as System Integrator



- ✓ Green Finance
- ✓ Technological scouting and monitoring
- ✓ Technology Analysis and Market opportunities scenario
- ✓ Conceptual, Feasibility Studies & FEED
- ✓ Technical and Financial Due Diligence
- ✓ Evaluation of investments plan
- ✓ HSE studies, Loss prevention & Risk Analysis
- ✓ Permitting
- ✓ Research & Development
- ✓ Project Validation & Asset Certification
- ✓ Development of guidelines for material use
- ✓ Materials, components and burners H_2 Readiness
- ✓ Approval In Principle of novel technologies
- ✓ Material and Equipment Qualification and Certification
- ✓ Asset Repurposing for H_2
- ✓ Asset integrity and Operability Assurance
- ✓ H_2 Readiness
- ✓ Testing for H_2

Roadmap to Decarbonization

1 IDENTIFY TARGETS

- Normative framework
- Environment and context
- Identify priorities

2 EXECUTE FEASIBILITY STUDY

- Identify alternatives
- Develop concepts
- Perform CBA

3 DEFINE ROADMAP

- Identify constraints
- Check timelines
- Scale-up needs

4 PERFORM DESIGN

- Renewable energies
- Production & distribution
- End users

Italy's recovery and resilience plan (PNRR)

- Transportation makes up almost 25% of carbon emissions in the EU
- Investment plan following COVID
- Designed to ensure Italy become more sustainable, resilient and better prepared to face the challenges and seize the opportunities of the green and digital transitions.
- 132 investments and 58 reforms in the EU to be supported with **grants of €68.9 billion and loans of €122.6 billion**
- Expected GDP impact of 1.5-2.5% up to 2026
- 24k jobs expected to be created by 2026
- Almost 50% of total funds to be allocated to mobility solutions
- Italy has one of the highest share of funds for H_2 projects across the value chain in the EU
- Construction of 10 H_2 refuelling stations for 6 railway lines to be completed by mid 2026 assuming a three year build programme

The use of H_2 in rail transportation in Italy has a total budget of EUR300m

- **Decree 346 – issued November 2022 / deadline January 2023**
- **300m Euro budget**
- At least 40% to projects located in Southern Italy (Abruzzo, Basilicata, Calabria, Campania, Molise, Puglia, Sardegna e Sicilia).
- At least six projects to be sponsored

Railway diesel lines in Italy in numbers

17,000 km of railway line (RFI)

+

3,000 km of railway line (secondary lines)

4,700 km diesel

1,467 km of High Speed

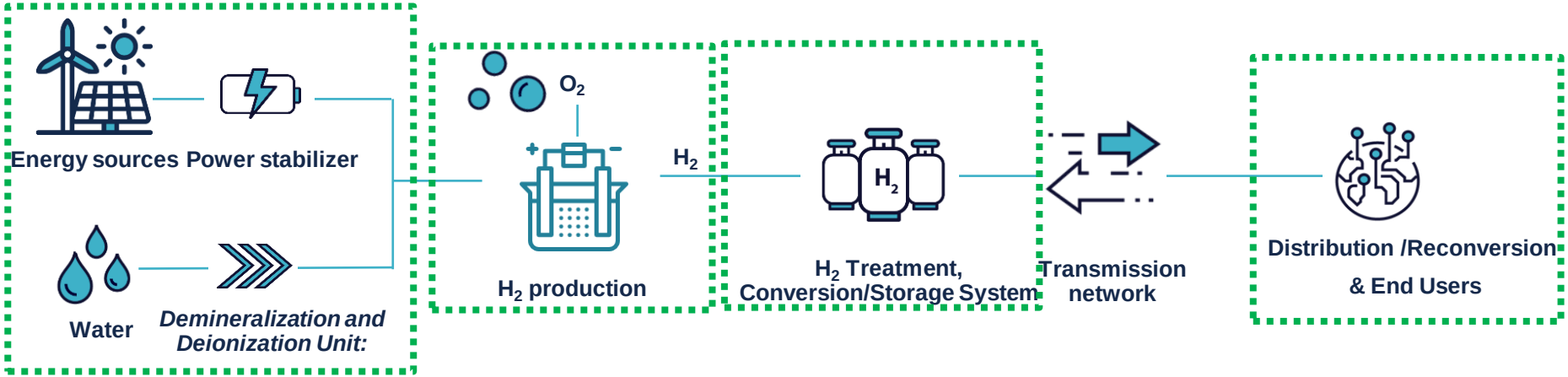
Cost benefit analysis shows that electrification may not be the best solution for all of these lines

Financed projects

1. Regione Lombardia; Ferrovienord S.p.A.; linea Brescia-Iseo-Edolo; 97,2 milioni
2. Regione Campania; Ente Autonomo Volturno s.r.l.; linea SMCV Piedimonte; 29 milioni
3. Regione Puglia; Ferrovie del Sud Est e Servizi Automobilistici s.r.l.; linee Lecce-Gallipoli, Novoli-Gagliano e Casarano-Gallipoli; 13,4 milioni
4. Gestione Governativa Ferrovia Circumetnea; Gestione Governativa Ferrovia Circumetnea; linea Circumetnea; 15,4 milioni
5. Regione Calabria; Ferrovie della Calabria; linea Cosenza-Catanzaro 45,1 milioni
6. Regione Autonoma della Sardegna; ARST Spa; linee Sassari-Alghero (30 milioni), Macomer-Nuoro (30,3 milioni) e Monserrato-Isili (14,4 milioni)

RINA is involved in 2 of the 6 financed projects
- H2iseO project
- HRS study

Project description: Decarbonization of railway transport



RINA working across the building blocks of the value chain

H2iseO Project description (Val Camonica)

PHASE 1 : 2024

- Iseo hydrogen production & storage plant: renewable hydrogen from biomethane reforming with CO_2 capture
- New depot in Rovato for train parking and maintenance
- Railway systems upgrade
- 6 trains supplied by ALSTOM

PHASE 2 : 2025

- Brescia production plant, powered by green hydrogen produced at the Brescia waste-to-energy plant
- Edolo / Brescia BSG refueling stations: green hydrogen produced at the Brescia waste-to-energy plant
- 8 trains supplied by ALSTOM

PHASE 3 : 2026

- Commissioning of 40 hydrogen-powered buses
- Possible opening to passenger and freight transport

H2iseO Project – RINA activities

Project Management

- Supervision of the execution according to the agreed programme,
- Project risk management
- Participation in internal meetings and with the various stakeholders, with a view to the correct management of project timing and activities from a Project management perspective,
- Management of the interfaces and relationships of the train operator with the different project partners as well as between different internal divisions,
- Support in the management of the actions necessary to obtain the various authorizations both in the construction phase and in support of commissioning,
- Activation of timely specialist support for technical opinions and comments on the completeness of the processes and related documentation produced by the various stakeholders

Project Design

- Preliminary and detailed design of the Brescia production plant (waste-to-energy plant)
- Preliminary design of the storage and distribution station for railway application (Borgo San Giovanni)

Technical assistance - other

- Validation (Independent engineering) of the final design of the Iseo Hydrogen production plant
- Independent Safety Assessment (ISA) activity for the hydrogen propulsion system of trains (Customer Alstom)
- Analysis of the materials related to the hydrogen systems on the trains

HRS feasibility study – railway transport

Location and period: Italy, 2022

Client: Ferrovie Sud Est

Service: Feasibility study (submitted for PNRR financing) for 1 hydrogen refuelling station for railway application

Activities:

- ✓ the definition of the land requirements
- ✓ verification of the reference urban context
- ✓ the analysis of the hydrogen supply chain for the specific design
- ✓ sizing of the refueling station based on the estimated volumes of hydrogen demand for the rolling stock (1.300.000 km per year)
- ✓ production of the layout for the plant, in line with the Italian regulatory framework for design
- ✓ the preparation of the initial report relating to the DNSH principle (Do Not Significant Harm)
- ✓ the bill of quantities for the works to be carried out
- ✓ the preparation of the Economic and Financial Plan for the project

RINA

Make it sure, make it simple.