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GIORNATA DI STUDIO

**Idrogeno e tecnologie per
la generazione energetica
e la propulsione nei
trasporti green**

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RINA



Hydrogen and technologies for energy generation and propulsion in green transport

- **RINA BRIEF INTRODUCTION**
- **ROLE OF HYDROGEN**
- **THE CHALLENGE OF RAW MATERIALS**
- **WHAT ABOUT QUANTITY?**
- **HYDROGEN FOR MOBILITY AND FLAGSHIP PROJECTS**



**Net
ZERO**

Who we are



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



Energy

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



Infrastructure & Mobility

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



Industry

Accelerating clients' success with technology-driven strategies and solutions



Real Estate

Innovative value proposition of integrated services: Rina Prime Value Services is able to cover all the real estate lifecycle

Energy transition & Decarbonization

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Differentiating the Energy Strategy



Renewables

Hydrogen

Ammonia

**Carbon Capture
Utilization &
Storage**

**Alternative
Fuels
(Bio & Syn)**

Nuclear

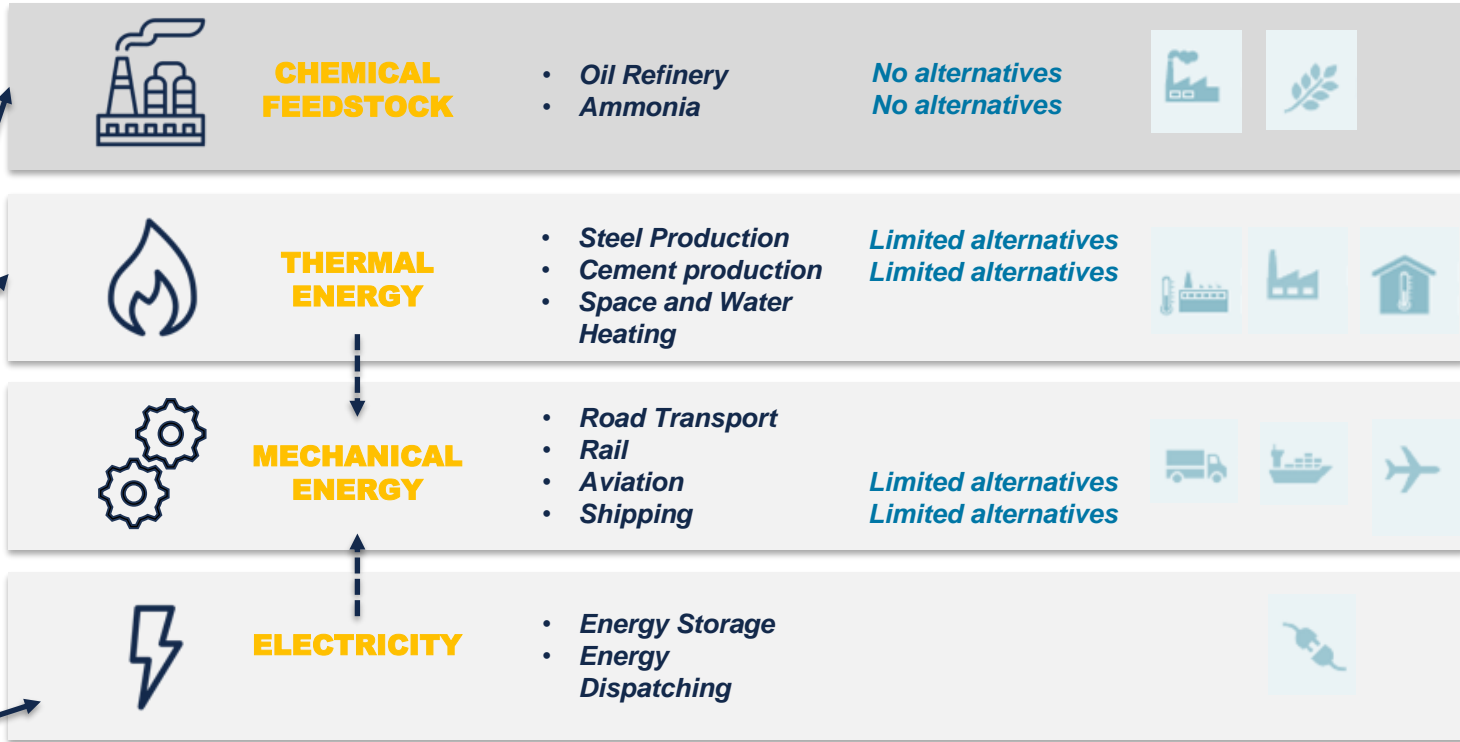
Hydrogen value chain

Where to use it



H₂

1010
1010
Fuel Cells



Hydrogen will be part of the energy mix



Refinery sector: **substituting grey H₂ with low carbon H₂**



High temperature industrial processes (Cement, Glass, Ceramic, Steel..)



H₂ as a fuel for **heavy trucks**

H₂ + CO₂

Synthetic fuel production

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Critical Raw Materials

The global market for key mass-manufactured net-zero technologies will triple by 2030 with an annual value of around 600 billion €



MULTI-SECTOR: Net-zero industry, Digital, Aerospace and Defense compete for the same pool of raw materials



GLOBAL



The **EU** is heavily **DEPENDENT** on third countries, in a constantly changing geopolitical context



TIME is needed to fill the gap between demand and supply

The Critical Raw Materials (CRM) supply is a huge challenge for Europe

The CRMs in the fuel cells

According to the European Commission study, **18** materials of the **24** raw materials used in **PEM** and **SO** fuel cells are flagged as **critical** for the EU economy.



PGM

x 30 EU @2030
x 200 EU @2050

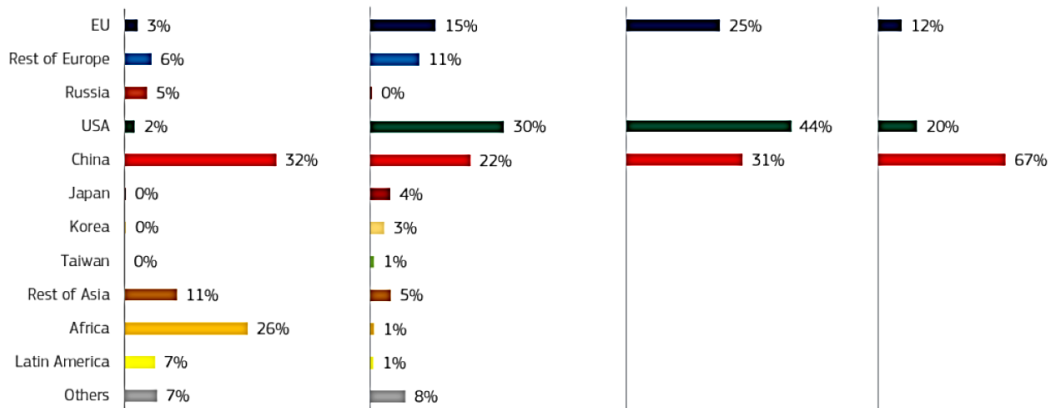


Raw materials

Processed materials

Components

Assemblies



x 970 global @2050

Overview of supply risks, bottlenecks and key players along the supply chain of fuel cells

Source: European Commission - Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU – A foresight study

The Critical Raw Materials Act

Towards more CRM and Strategic Raw Materials (SRM) supply security

- EU's extraction capacity cover at least **10%** of the EU's CRM and SRM consumption
- EU's processing capacity cover at least **40%** of the EU's CRM and SRM consumption
- EU's recycling capacity cover at least **15%** of the EU's CRM and SRM consumption

Towards more diversification of supply

- Not more than **65%** of EU consumption should come from a single third country

Creating secure and resilient EU critical raw materials supply chains

Improve EU capacity to monitor and mitigate risks of disruption to CRM supply

Investing in research, innovation and skills

Improve CRM circularity and sustainability of critical raw materials



Reduction of Pt and Pgm use



Substitution of Pt and Pgm



Recycling



A more secure and resilient supply chain

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What about H₂ quantity?

Centralized production of H₂



Large demand of hydrogen for industrial uses

Large scale projects for H₂ production for industrial uses

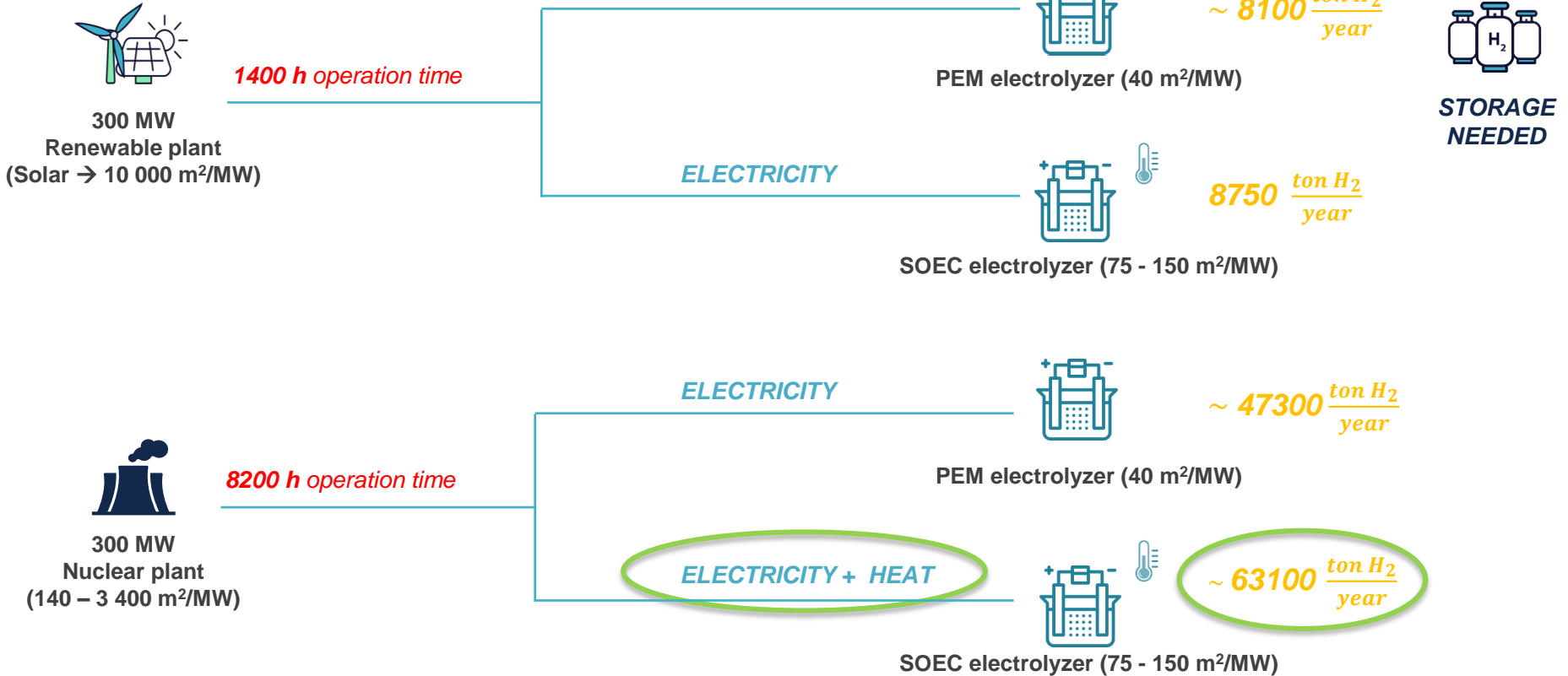
Localized production of H₂



Small scale hydrogen valley Mobility focused

Local hydrogen production projects aggregating local demand of H₂ volumes developing infrastructures for multiple off-takers

Comparing H₂ production from different sources



Gulf-to-Europe Hydrogen Pipeline

A study points to feasibility and attractiveness



An initial study of how the Gulf region and Europe could be linked directly with a pipeline to transport low-carbon hydrogen

The concept of a hydrogen pipeline connecting Qatar, Saudi Arabia, Egypt, and traversing the Mediterranean Sea to Europe may seem ambitious, but initial assessment indicates its feasibility. The analysis shows that a suitable pipeline configuration could transport 100 TWh or approximately 2.5 million tonnes of hydrogen annually.

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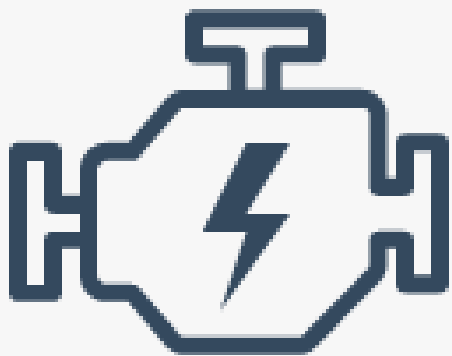
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Transport & Logistic

Disruption & Opportunity for Road Transport and ICE supply chain



*Across Europe, more than **17,000 SMEs** are actively working in vehicle manufacture with a special focus on **transmission** and **internal combustion engine (ICE)** component production.*



- **Electric motor** around 20 moving parts
- **Internal Combustion Engine** → over 2000 moving parts
- Consequences also in reduced servicing, negatively impacting the SMEs in the aftersales market.
- Combining the European know-how in ICE and clean fuel (H₂) is an option to be evaluated

RINA experience in supporting H₂ project



H2ISEO *The second European project and the first Italian H₂ Rail Mobility project*

OLGA *57 partners and 34M€ aiming to decarbonise airports for the Paris 2024 and Milan 2026 Olympics*



BZERO *Green H₂ Production on board and onshore*



TECBIA ZEUS *the first RINA Classed Ship capable to be propelled by hydrogen*



The goal is **HYDROGEN** to become a
GLOBAL COMMODITY

We must work on all the
CHALLENGES to create the right
ecosystem



**ROLE OF H₂
IN THE
ENERGY
VALUE CHAIN**



**TECHNOLOGIES
FOR HYDROGEN**



**CRITICAL
RAW
MATERIALS**



**ENABLERS &
BUSINESS
MODELS**



**Net
ZERO**



2050



**Thank you for
your attention**