GREEN HYSLAND

Deployment of a Hydrogen Ecosystem on the Island of Mallorca

Status and perspectives of hydrogen technologies in EU and in Croatia

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First Green Hyslands Workshop – Island of Cres (HR), 26. April 2022.

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under Grant Agreement No 101007201. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation programme, Hydrogen Europe and Hydrogen Europe Research.

From a presentation to United Nations Economic and Social Council, New York, July 2008

Worldwide Islands Hydrogen Initiative

Islands – ideal polygons for demonstration of hydrogen energy technologies and entire hydrogen economy

- Supply and price of conventional energy
- Renewable energy sources
- Scale
- Energy autonomy
- Pristine environment
- Example of Iceland
- Demonstration projects on islands (Bozcada, Aitutaki)
- Thousands of islands worldwide – thousands of opportunities

International Centre for Hydrogen Energy Technologies

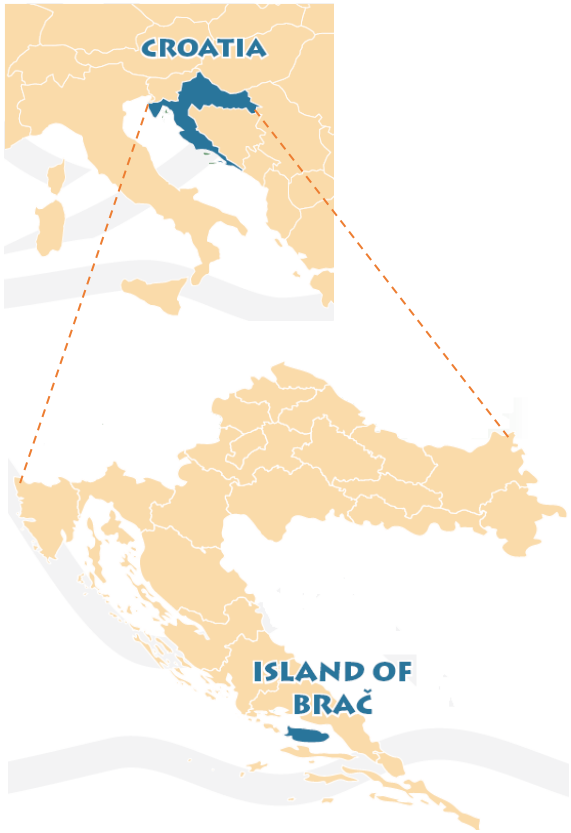
www.unido-ichet.org

International Conference

Hydrogen on Islands

Bol, Island of Brač, Croatia, October 22-25, 2008





International Centre for Hydrogen Energy Technologies

www.unido-ichet.org

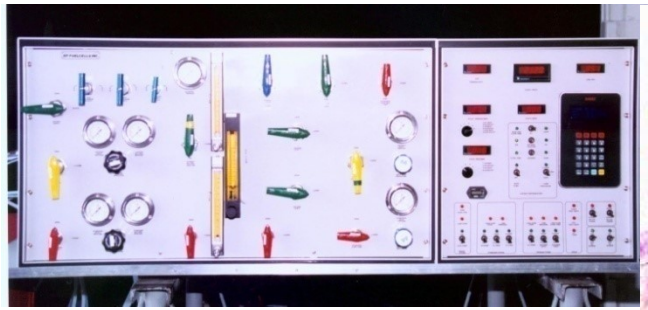
www.em.com.hr/hydrogenislands

ENERGETIKA MARKETING

Prof. Emeritus Frano Barbir – 30 years of hydrogen technologies R&D 1992-2022

energy partners

1992-2001




PROTON ENERGY SYSTEMS

2001-2003



ICHET UNIDO

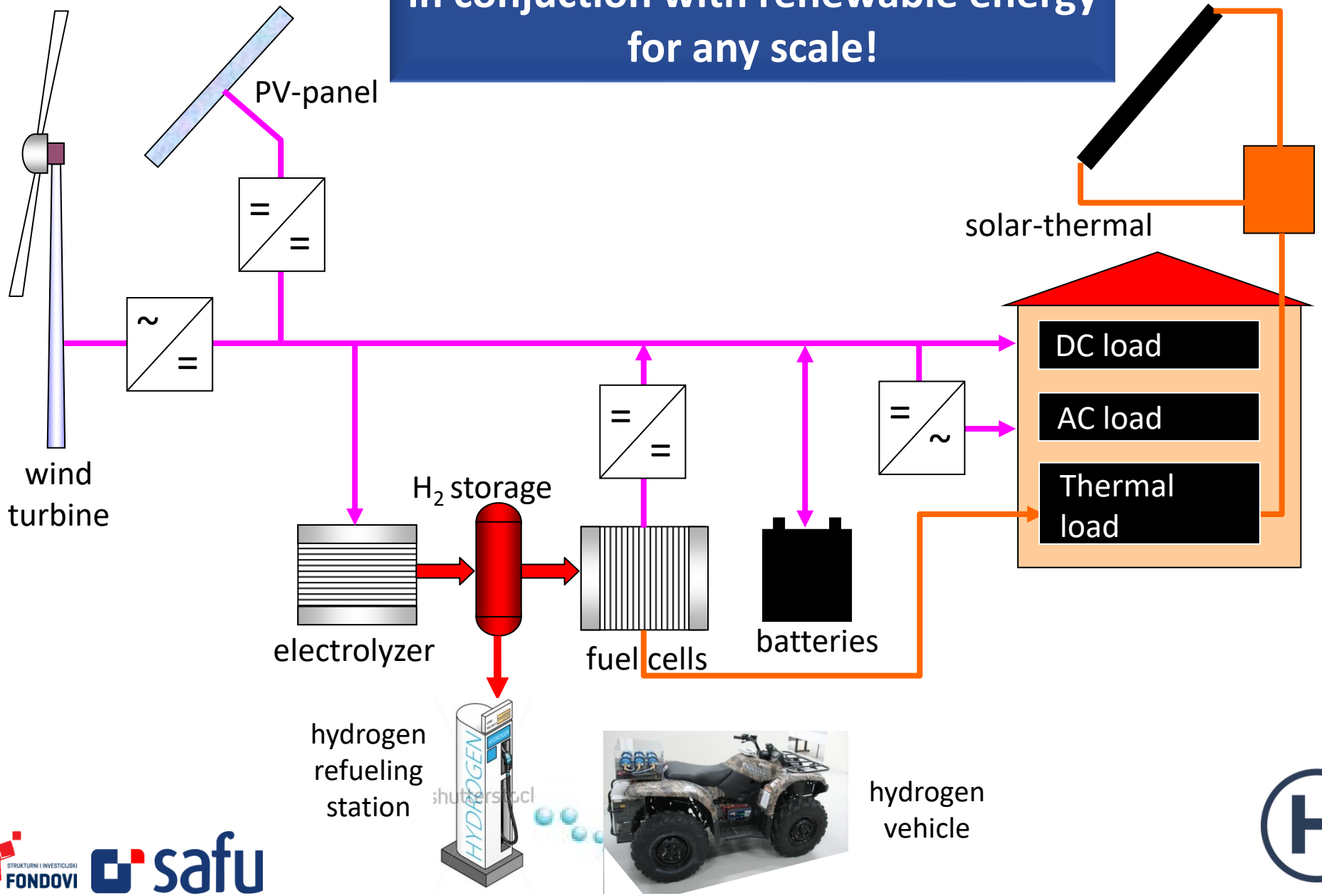
2005-2008

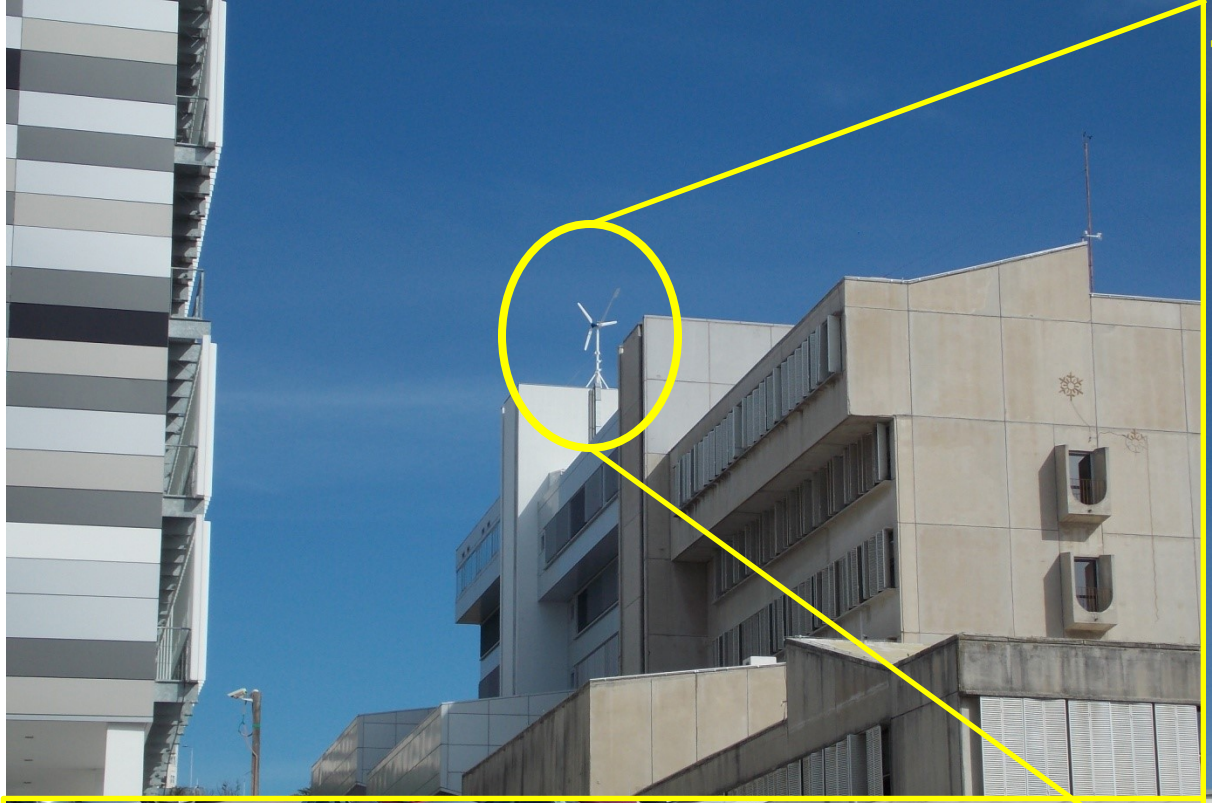

HySA Hydrogen South Africa

2013-2019




Hydrogen energy system in conjuction with renewable energy for any scale!





Connected to the lab

H2 system in the Lab

Fuel cell stack 1.2 kW

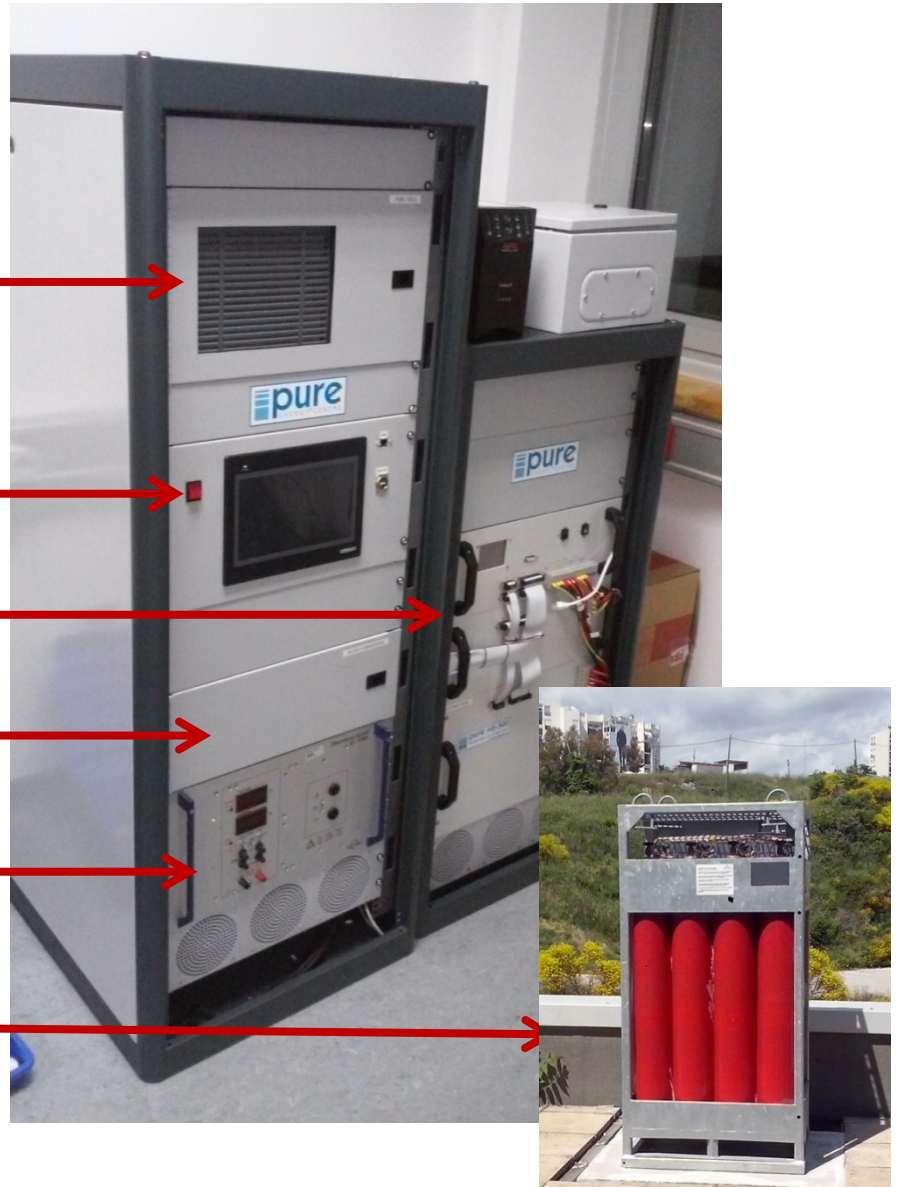
Control unit

Electrolyzer (2.6 kW)

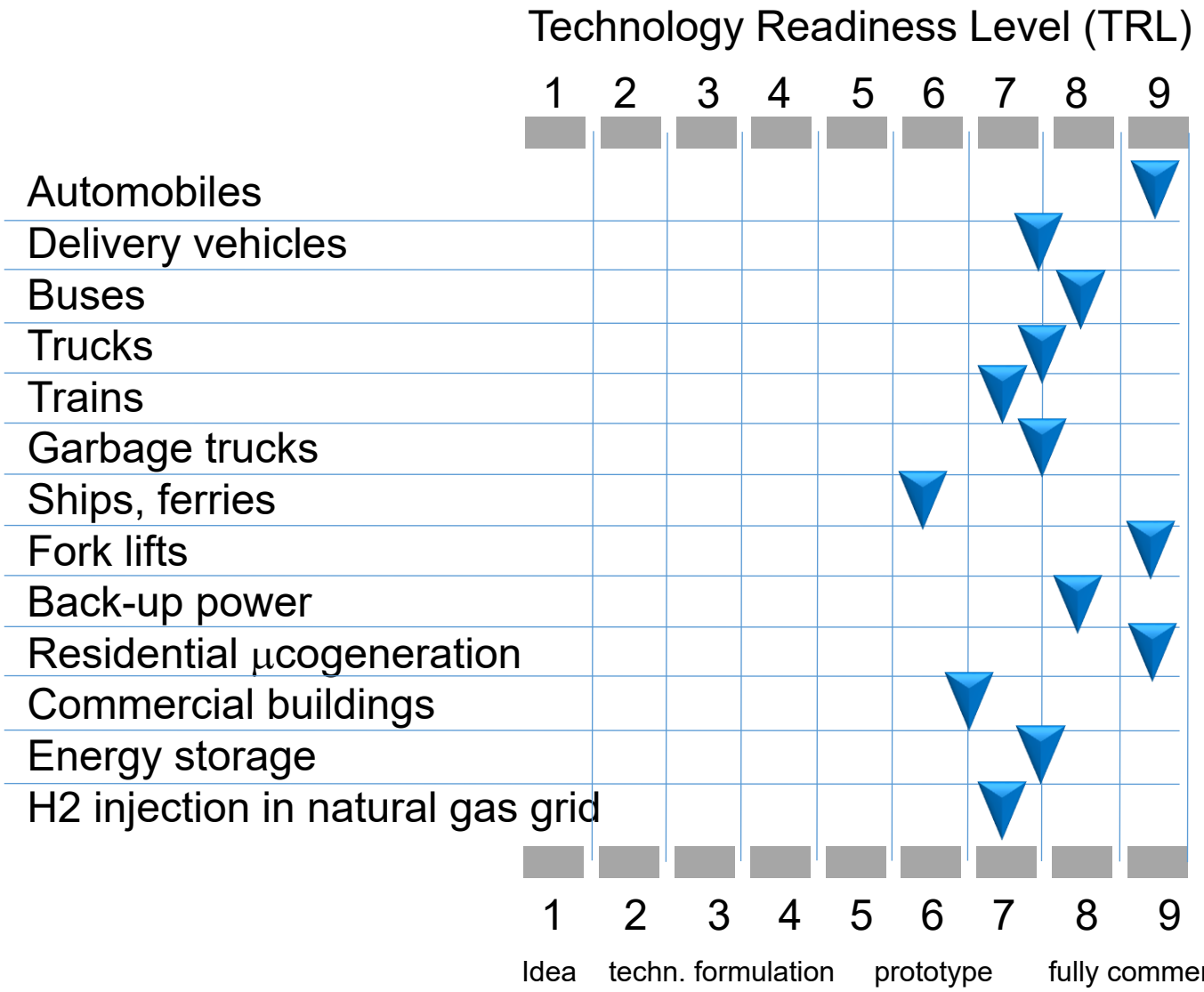
DC/DC converter

Electronic load 1.5 kW

Hydrogen storage



Status of hydrogen and fuel cell technologies



Adapted and updated from: Study for Hydrogen Cities and Regions Initiative by RolandBerger funded by FCH JU, Sep 2017

Hydrogen technologies are already being deployed

cars

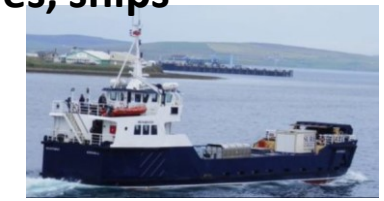
forklifts

buses

trucks

trains

ferries, ships



airplane

electrolyzers

hydrogen delivery

hydrogen refueling stations

hydrogen storage

hydrogen production from renewable energy sources

Hydrogen Projects in EU

https://h2-project-visualisation-platform.entsog.eu/

entsog
european network of transmission system operators for gas

Start date

Project promoter

Search

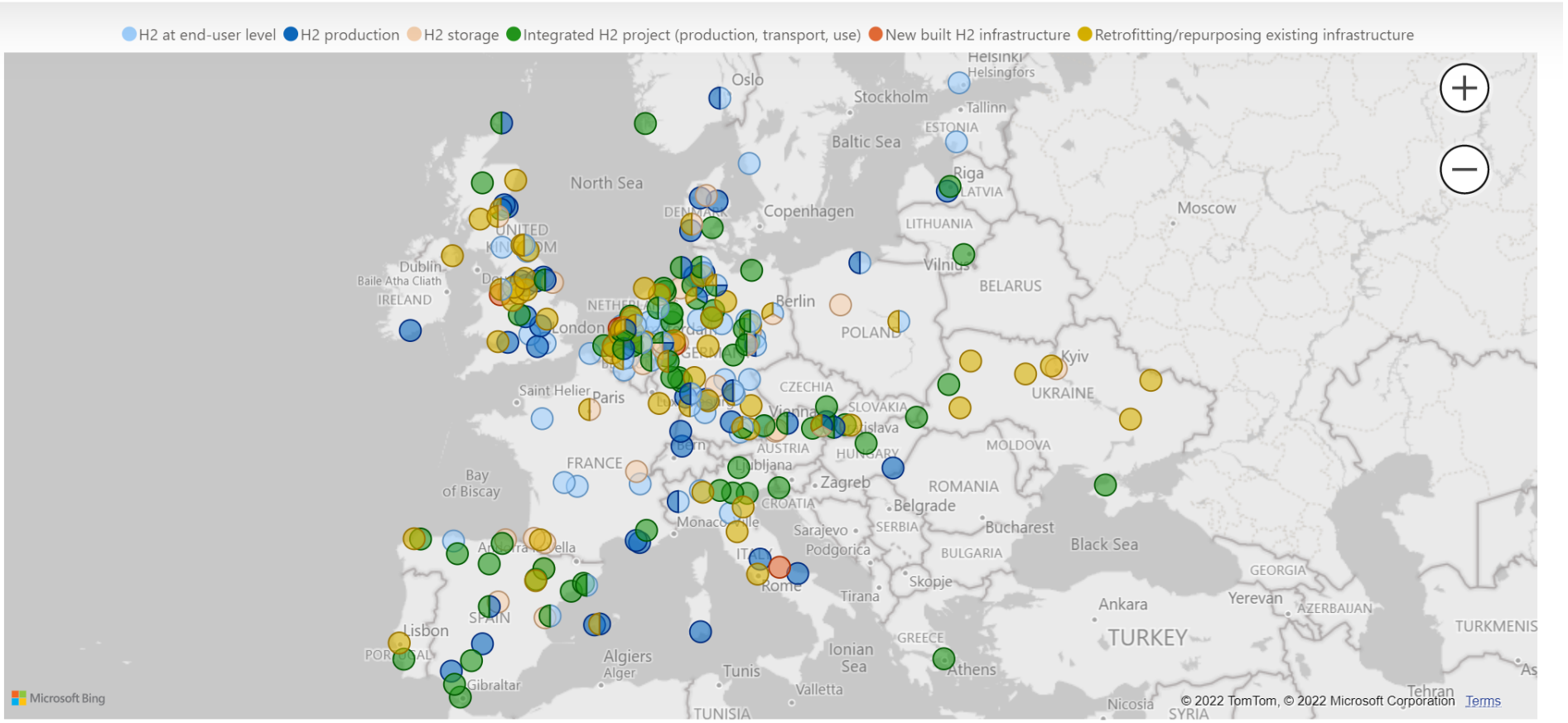
Filters

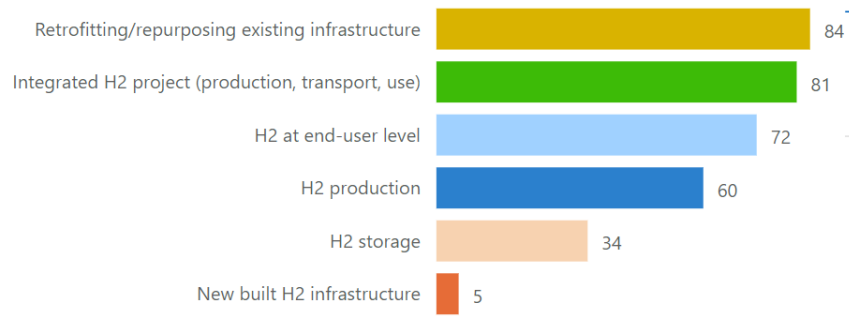
Country

Type of project

Project maturity

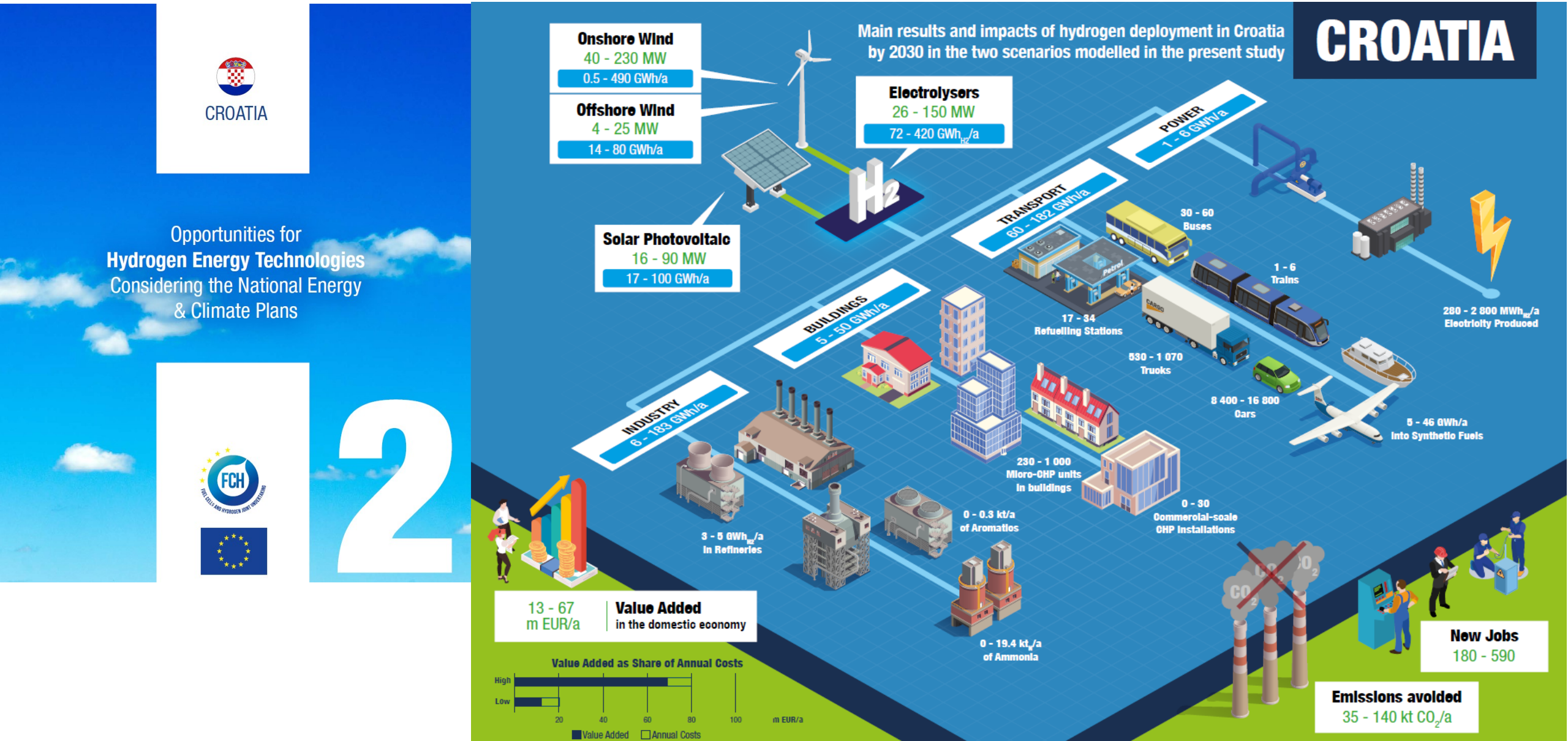
Start date





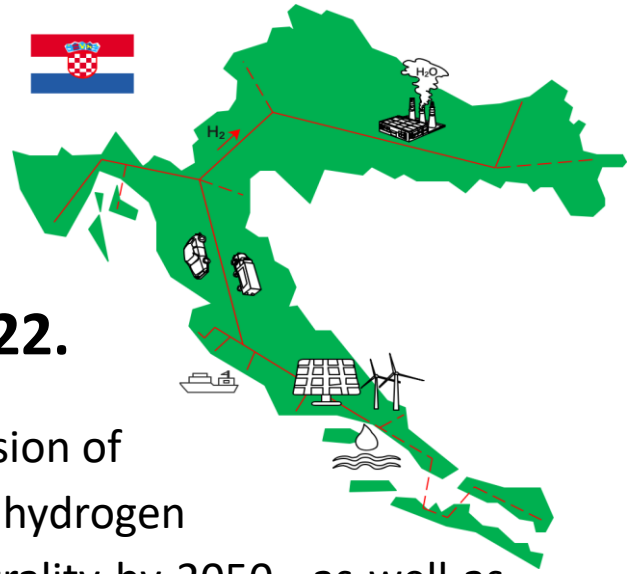
Project name	Project promoters	Country	Timeline	Project maturity	Scope & goal
2G's CHP fleet retrofit	2G Energy AG	Germany	NA-NA	Project	Existing natural gas CHP plants can be easily retrofitted for the operation with hydrogen by moderate costs; by this means millions of tons of CO2 can be saved each year
Aberdeen Vision Project	SGN / NG / PBDE / DNVGL	United Kingdom	NA-NA	Project	The focus for the Aberdeen Vision project is the transport and use of hydrogen produced from reformed natural gas from StFergus in North East Scotland. Outline the possibility of using advanced hydrogen production at St Fergus. And to discuss the technology and safety requirements for the transportation and storage of CO2

Opportunities for hydrogen energy technologies in Croatia



Croatian Hydrogen Strategy

2021. – 2050.



Adopted by Croatian Parliament on 25.03.2022.

Croatian Hydrogen Strategy 2021.-2050. provides national vision of research, development, production, infratructure and use of hydrogen technologies, which will contribute to achiving climate neutrality by 2050., as well as fulfilling national goals related to development of alternative fuels infrastructure.

The objectives of the strategy is decarbonization of hydrogen production, use of green hydrogen as a replacement for fossil fuels, and for increasing stability of the power system based on intermitent renewable energy sources.

Hydrogen potential in Croatia is in power generation from renewable energy sources which can provide adequate and long term supply of renewable (green) hydrogen.

But, for widespread use of hydrogen, besides production of green hydrogen, it is necessary to create adequate hydrogen demand and the supply infrastructure system.

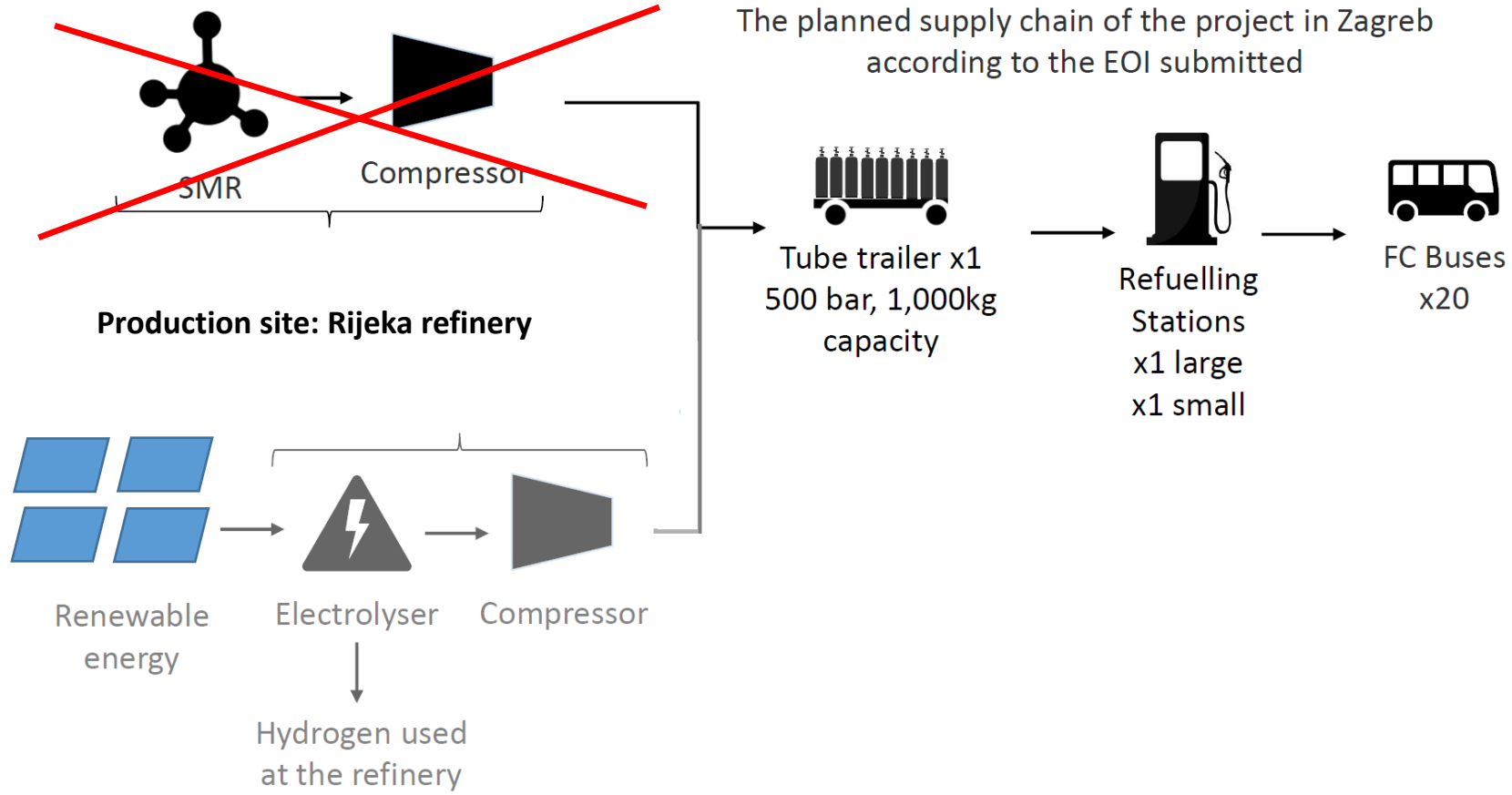
Ongoing Hydrogen Projects in Croatia

at different stages of development

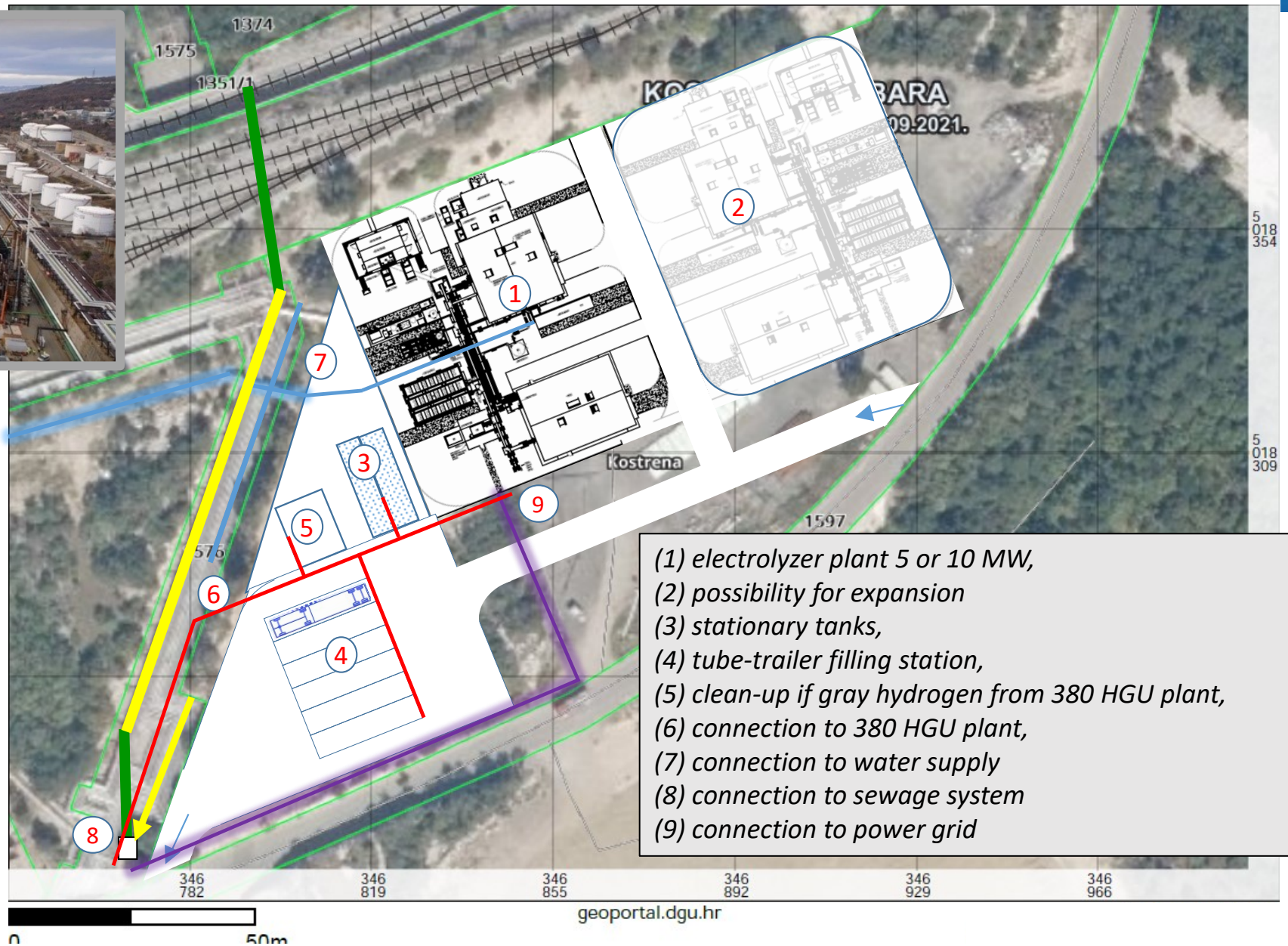
- **Complete autonomous hydrogen system at FESB, Split**
- Hydrogen Refueling Station (for bicycle) at FSB, Zagreb
- Hydrogen buses for the City of Zagreb
- INA – Prefeasibility study for electrolyzer installation in oil refinery
- HEP – Prefeasibility study for battery system and electrolyzer installation in KTE Jertovec
- Island of Vis – Prefeasibility study for hydrogen production and use
- Hydrogen fuel cell catamaran in Split
- North Adriatic Cross Border Hydrogen Valley

FCH PROJECT DEVELOPMENT ASSISTANCE FOR REGIONS

City of Zagreb, Office for economy, energy and environmental protection in collaboration with ZET, INA, Office of city planning, Ministry of economy and sustainable development, Ministry of sea, transport and infrastructure, and FSB University of Zagreb received PDA (Project Development Assistance) from FCHJU for obtaining 20 hydrogen fuel cell buses and hydrogen refueling infrastructure (2 HRS)



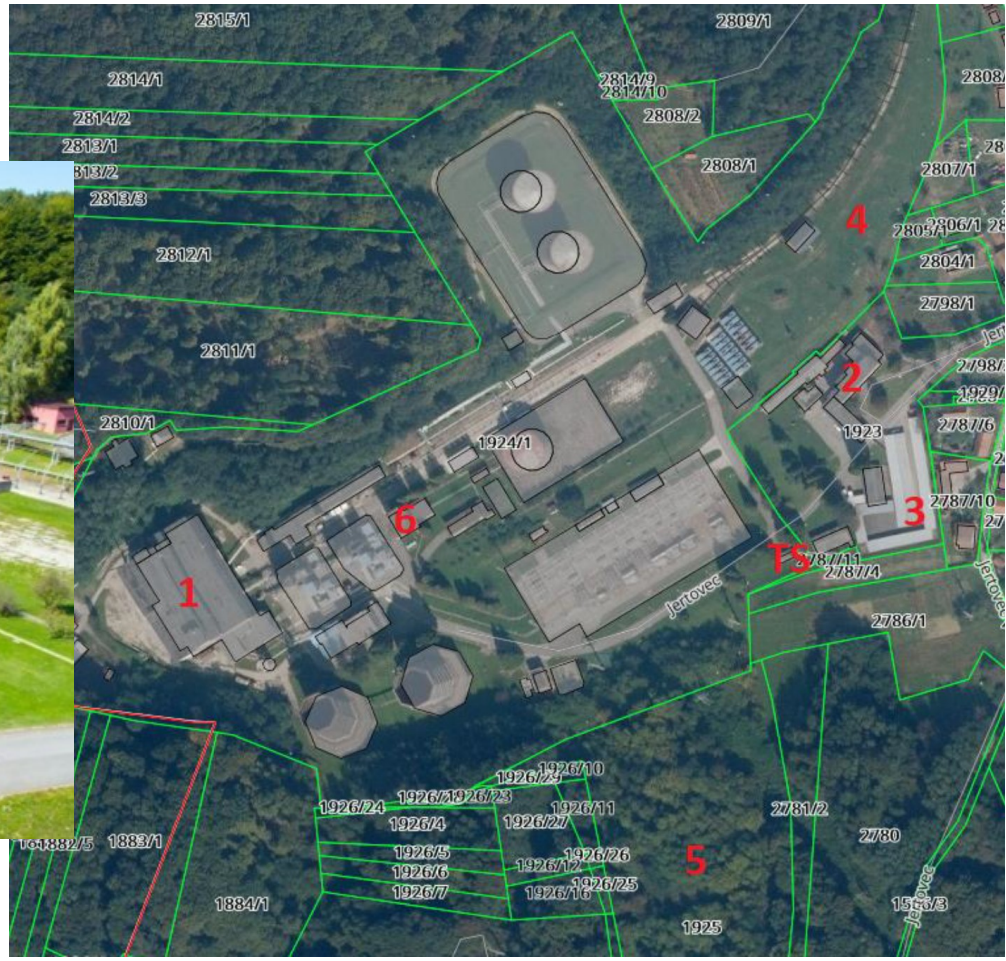
Prefeasibility Study of Electrolyzer Installation in Oil Refinery Rijeka



(1) electrolyzer plant 5 or 10 MW,
(2) possibility for expansion
(3) stationary tanks,
(4) tube-trailer filling station,
(5) clean-up if gray hydrogen from 380 HGU plant,
(6) connection to 380 HGU plant,
(7) connection to water supply
(8) connection to sewage system
(9) connection to power grid

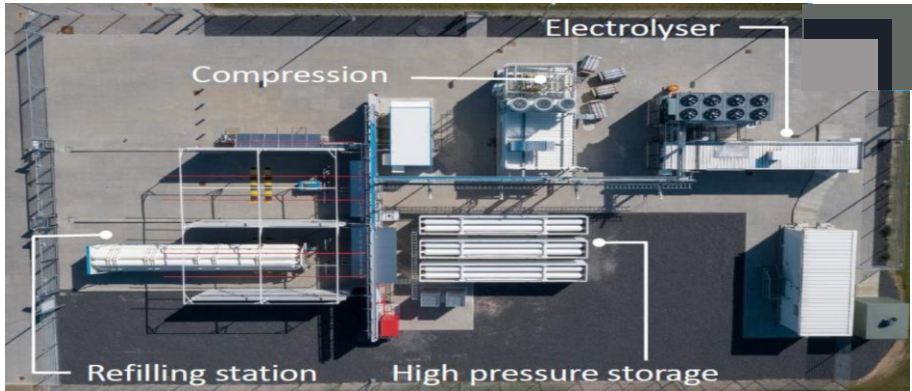
HEP
Više od struje

KTE Jertovec



Installation of a battery system and an electrolyzer at KTE Jertovec

- Basic layout and techno-economic data input
- Analysis of possible hydrogen injection in natural gas pipeline
- Analysis of required changes in legislation
- Estimate of feasibility and justification of investment

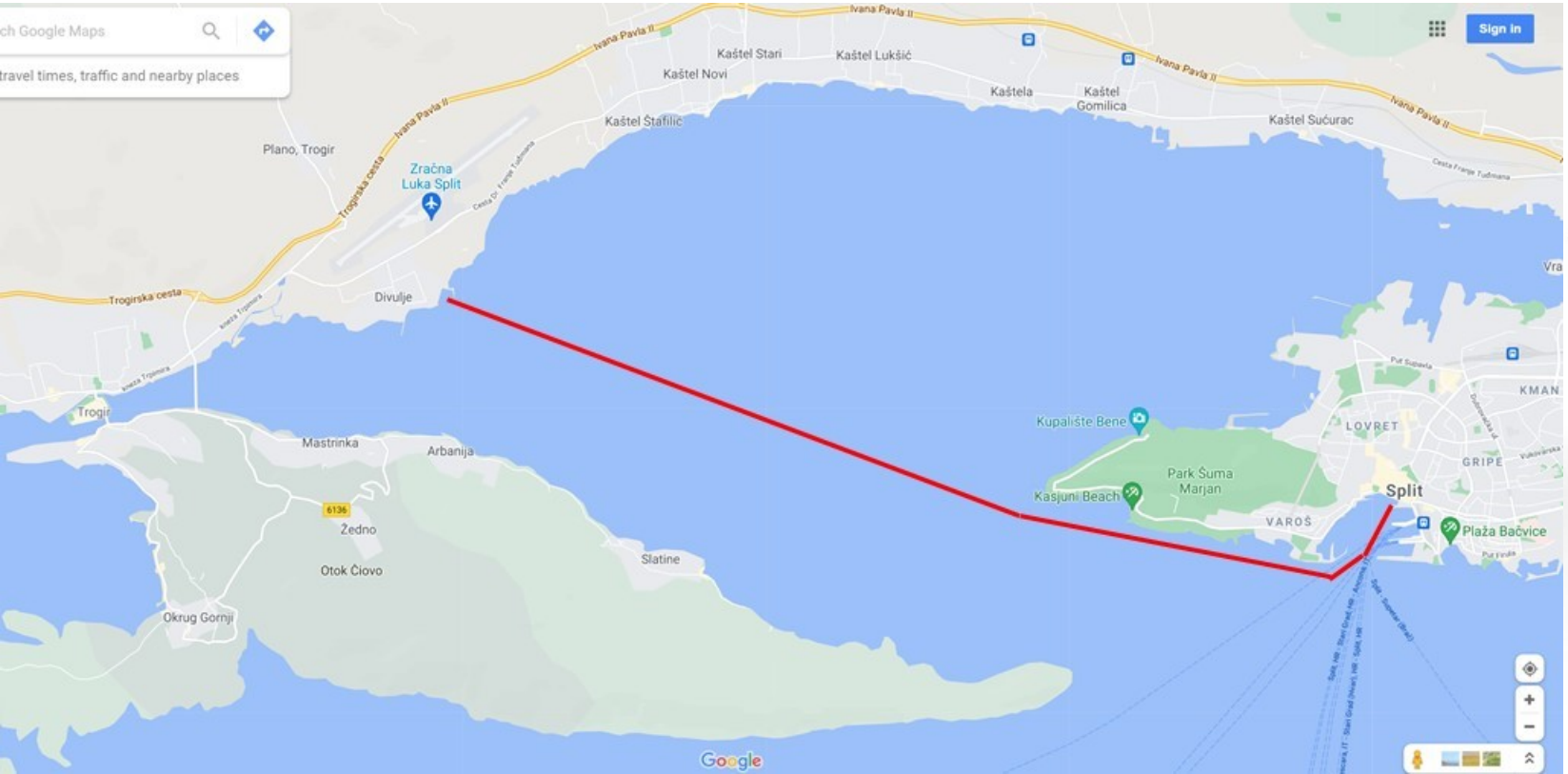


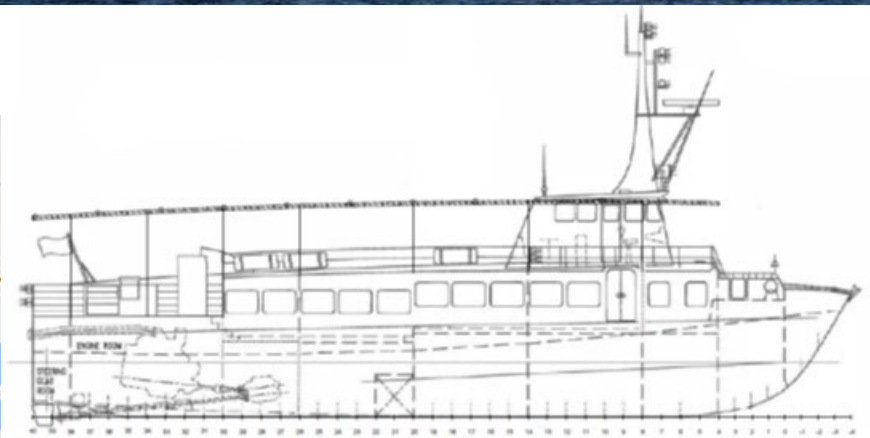
CATAMARAN LINE
d.o.o. Split

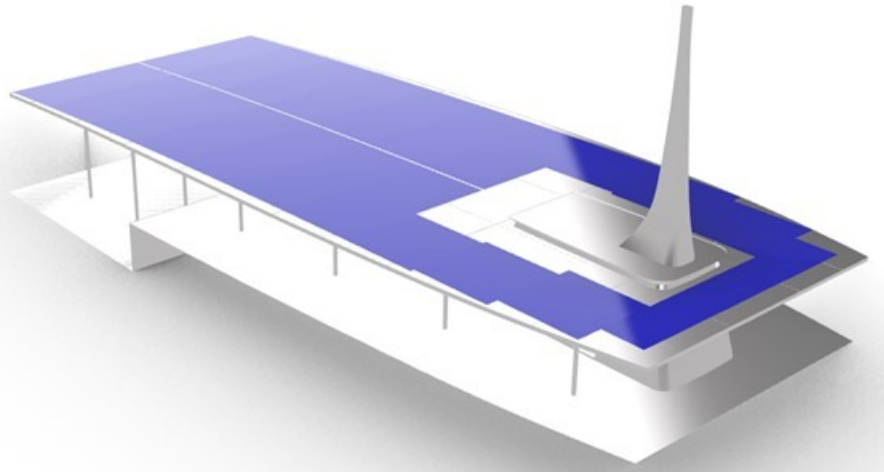
Catamaran Komiza Split Port – Split Airport – Split Port

- 6 times a day, 4 months
- 160 passengers
- 20.7 m
- 6.4 Nm
- 12 knots

- 2x300 kW EM
- 2x200 kW FC
- 210 kg H2
- 400 kWh batteries
- 80 m2 PVs







North Adriatic Cross-Border H2 Valley

Italy (Friuli Venezia Giulia)

Slovenia

Croatia

Officials from Slovenia, Croatia and Italy signed a letter of intent to establish cooperation in building a cross-border hydrogen valley

The three countries will cooperate to promote the development of hydrogen technologies, prepare a set of projects and find sources for their financing.

The establishment of cross-border hydrogen valleys will make transitions to an integrated hydrogen energy ecosystem that includes the energy, industry and transport sectors.

Cooperation on innovation and joint projects will be established by accelerating the development of hydrogen-based energy solutions and thus establishing value chains.

Inter-state cooperation will also take place in the field of scientific research and training.

Joint expert working group has been established with representatives from government, industry and academia.

Clean Hydrogen Partnership

ECUBES Hydrogen & Flexibility

REPUBLIC OF SLOVENIA
MINISTRY OF INFRASTRUCTURE

REPUBLIC of CROATIA
Ministry of Economy and Sustainable Development

REGIONE AUTONOMA FRIULI VENEZIA GIULIA

Conclusions: hydrogen on islands

GREEN HYSLAND

- Hydrogen technologies are being deployed all over Europe
- Hydrogen is unavoidable part of a future energy system 100% based on renewable energy
- Islands may become energy independent much sooner
- Hydrogen perspectives for the islands:
  - Energy management – using excess, make up for shortages, seasonal storage,
  - Sectors integration
  - Transportation on islands, ships, ferries,
- Opportunities for Croatian islands

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