



**THE POWER OF ISLANDS: BUILDING
RESILIENCE THROUGH RENEWABLES**

*Opportunities for grid balancing and
stabilisation from sector coupling*

14 May 2024

CE4EU Islands Forum, Pantelleria, IT

SUMMARY

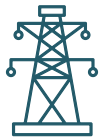
1. HDF Energy quick introduction
2. HDF Energy's solution for islands: The Renewstable
3. Example of possible power decarbonising of an island
4. HDF Energy's relation with the UE

HDF ENERGY, A GLOBAL PURE PLAYER IN HYDROGEN

H2 INFRASTRUCTURE



Development, operation & ownership of large-scale hydrogen infrastructure



Electricity production



Green hydrogen production

MULTI-MW FUEL CELL TECHNOLOGY



Design and mass production of high-power fuel cells



Power supply

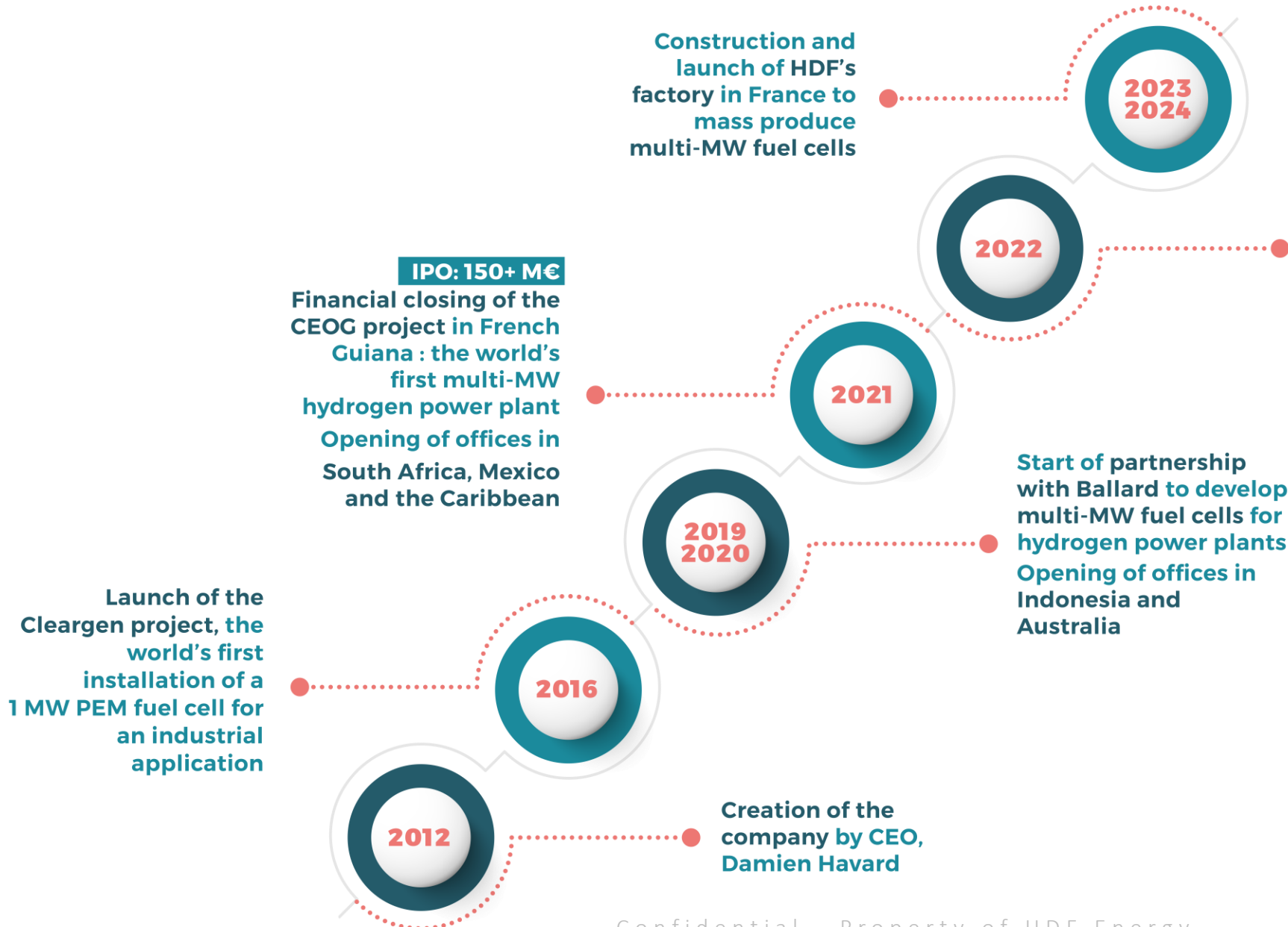


Marine

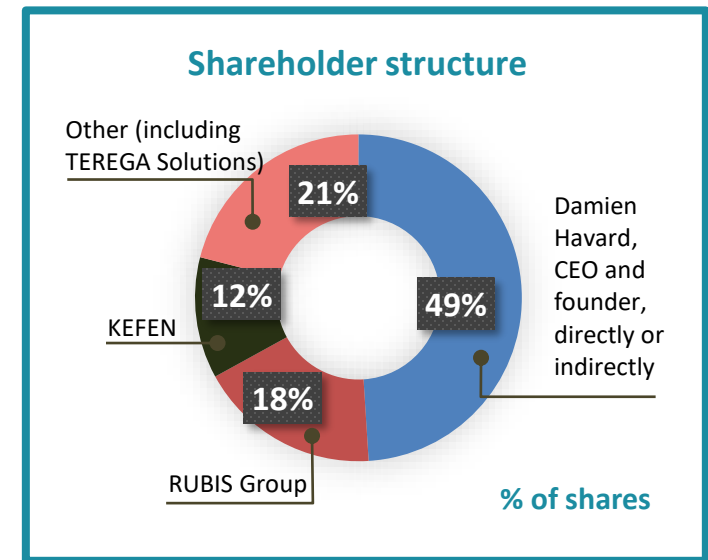


Rail

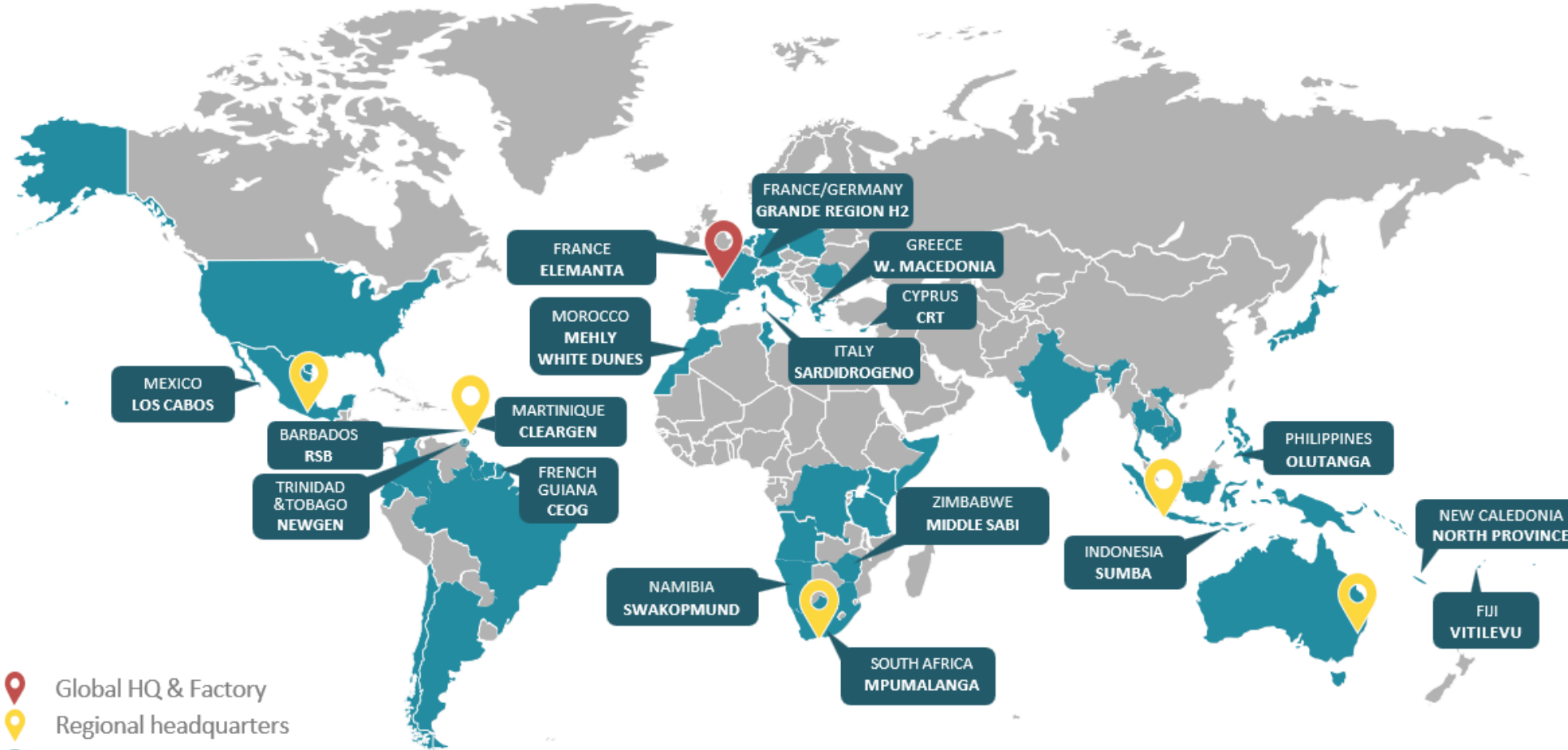
ESTABLISHING A SOLID INTERNATIONAL COMPANY



Renewstable® Barbados project: Rubis acquires 51% of the project's shares



GLOBAL LEADER IN HYDROGEN INFRASTRUCTURE WITH STRONG LOCAL PRESENCE



- Global HQ & Factory
- Regional headquarters
- Local presence
- Main projects



Present in **30+ countries, 5 continents**



€ 5 billion projects under development



30+ different nationalities among staff

TECHNICAL AND PROJECT EXPERTISE ACROSS THE ENTIRE H₂ VALUE CHAIN



POWER PLANT DESIGN

Feasibility studies, power plant modelling, site selection



PROJECT & TECHNICAL LEAD

Basic and FEED engineering capabilities, project management consulting, permitting management, grid connection



PROJECT FINANCING

Financial modeling, project finance and equity investment, project structuring, asset management, contract negotiation / management, M&A, CSR (ESG) management



OPERATIONS

Testing & commissioning, remote control, EMS, supplier qualification, maintenance and operation, optimization of performance, asset management



MULTI-MW FUEL CELLS

R&D and innovation, modular product development, advanced manufacturing processes, supply chain management & optimization, certification



HYDROGEN PROCESSES

production, clearing, transport, storage & use

A TEAM OF HYDROGEN INFRASTRUCTURE EXPERTS

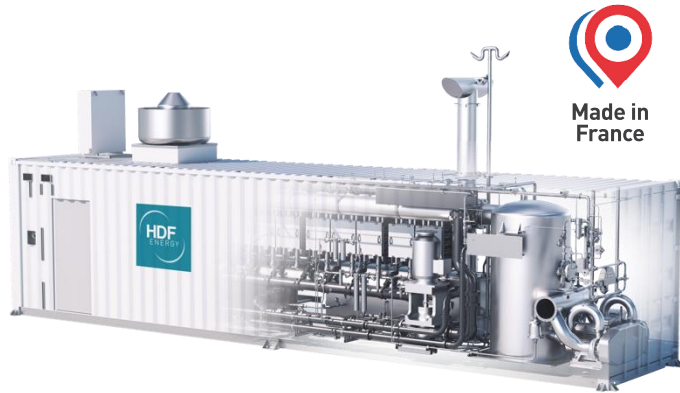
100+

multicultural, global and local talents

having amassed extensive experience gained at key companies from the oil&gas and renewables industries

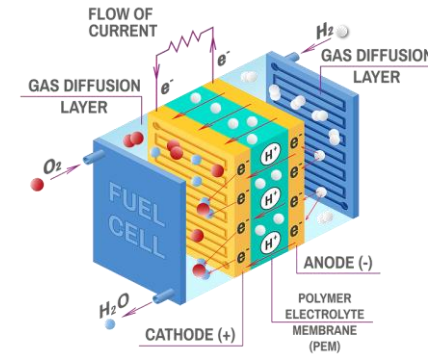
THE WORLD'S LARGEST FUEL CELL SYSTEM DESIGNED FOR ENERGY INTENSIVE APPLICATIONS

HDF'S FUEL CELL SYSTEM



- ✓ 1 to 10 MW unit capacity
- ✓ PEM Technology
- ✓ Modular design
- ✓ Emission free
- ✓ 25+ years lifetime
- ✓ Quick start-up and immediate response to fluctuations in power demand
- ✓ Easy maintenance
- ✓ Low operating costs
- ✓ Safety and CE certified

PEM* TECHNOLOGY



- ✓ High power density
- ✓ Mature technology
- ✓ High efficiency (> 50%)
- ✓ Long durability (> 30 000h)

* Proton Exchange Membrane

KEY MILESTONES – FUEL CELL DEVELOPMENT



OUR GIGA FACTORY IN FRANCE: THE WORLD'S FIRST MASS PRODUCTION PLANT FOR MULTI-MW PEM FUEL CELLS



Annual production capacity
1 GW by 2030



Employees
+500 by 2030



Location
Bordeaux, France



Factory size
7 000 m²
(phase 1)



Operational
In 2024



Environmental certification

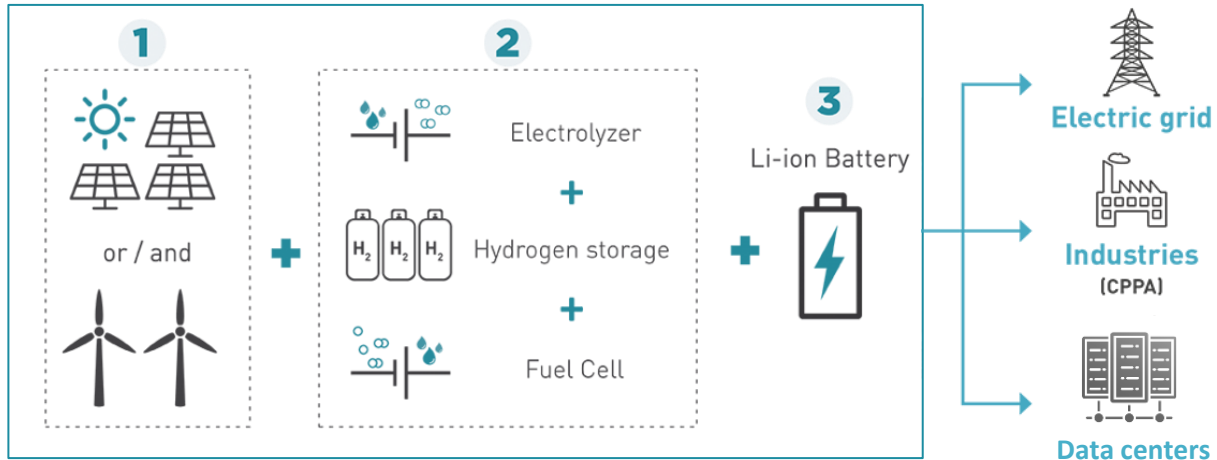
SUMMARY

1. HDF Energy quick introduction
2. **HDF Energy's solution for islands: The Renewstable**
3. Example of possible power decarbonising of an island
4. HDF Energy's relation with the UE

HDF ENERGY SOLUTIONS

RENEWSTABLE®

POWER TO POWER



Key benefits for the Greek Non Interconnected Islands:

- Enabling 100% renewable energy penetration in the island energy mix
- No need for a fuel supply chain
- Dispatchable power plant
- Reduce the need for new lines or substations on the island

HYPOWER

H2 TO POWER



- Long-term potential for greening peak-shaving power (replacing CCGTs).
- The development of hydrogen pipelines and large-scale storage infrastructure is required.

RENEWSTABLE®, A STRONG TRACK RECORD IN PROJECT DEVELOPMENT

IN ADVANCED DEVELOPMENT STAGES

RSWK – Namibia



Solar PV
85 MWp

Storage Capacity
230 MWh

Power Generation
142 GWh/year
baseload

LOS CABOS – Mexico



Solar PV
152 MWp

Storage Capacity
280 MWh

Power Generation
189 GWh/year
Baseload

SUMBA - Indonesia

First project
to be duplicated in +20 locations
across the country



Solar PV
30 MWp

Storage Capacity
67 MWh

Power Generation
47 GWh/year
Baseload

RSB – Barbados



Solar PV
50 MWp

Storage Capacity
120 MWh

Power Generation
60 GWh/year
baseload

UNDER CONSTRUCTION

CEOG, the world's first MULTI-MW hydrogen power plant



KEY FIGURES

Solar PV
55 MWp

Storage Capacity
128 MWh

Power Generation
50 GWh/year
Baseload

Electrolysers
16 MW
World's 2nd
largest capacity

Power Supply
for 50 000
inhabitants

Power Purchase Agreement
25 years

Total Investment: 170M€

Commissioning: 2026

OFFTAKER



EQUITY INVESTORS



LENDERS

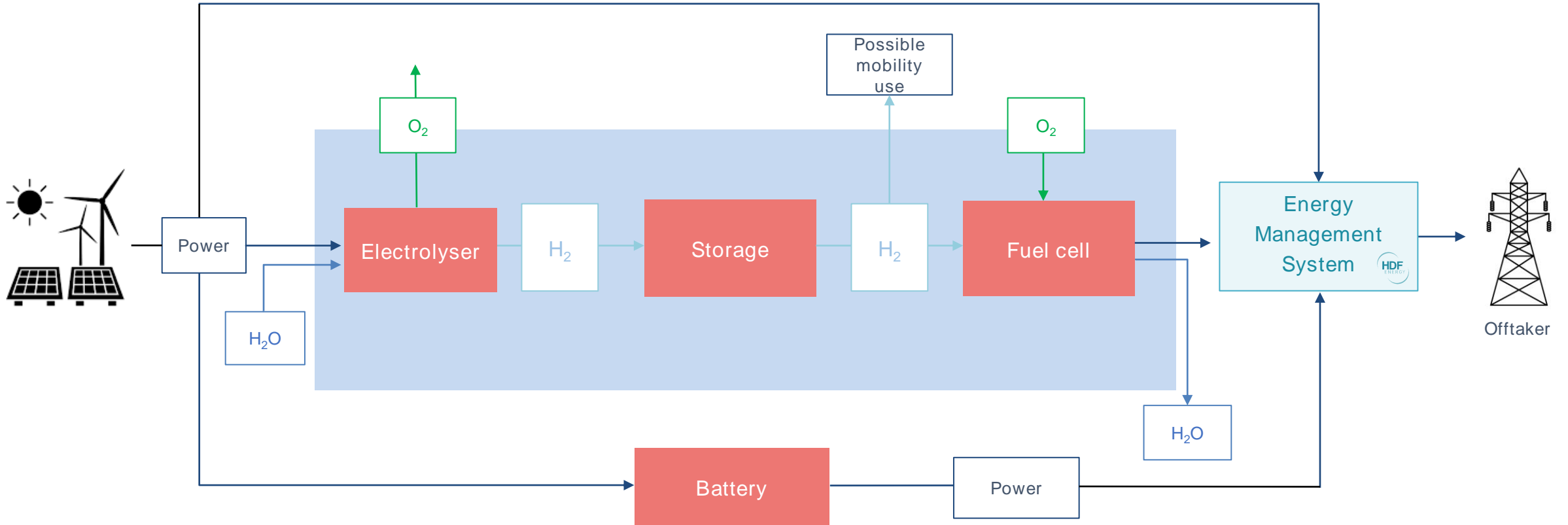


EPC
SIEMENS energy

LENDERS



Plant main characteristics



NON-INTERMITTENT RENEWABLE ENERGY SUPPLY

KEY FEATURES

Power flexibility and adaptability:

- Adaptive output without altering power characteristics.
- Adaptive reactive power capability: beyond 0,8 lag/lead supply or consume reactive power -compared to 0,9 lag/lead grid.
- Quickness of output adjustment (faster than diesel).
- Short circuit management: capable of operating for some time during a grid fault to allow tripping.

Low frequency grid status:

- Maintain its power output constant even in case of lower frequency on the grid, supporting it (better than what diesel does - no need for inertia wheels).

Resilience to bad weather:

- Through long-term H₂ storage, the Renewstable ® can guarantee its production profile even when its green energy production is worse than its 20-year average.

No long maintenance on subcomponents:

- Modular, made of aggregation of small units The plant is never completely off and doesn't need to be stopped for sustained period of maintenance.

DURING PLANT OPERATION

Islanding mode:

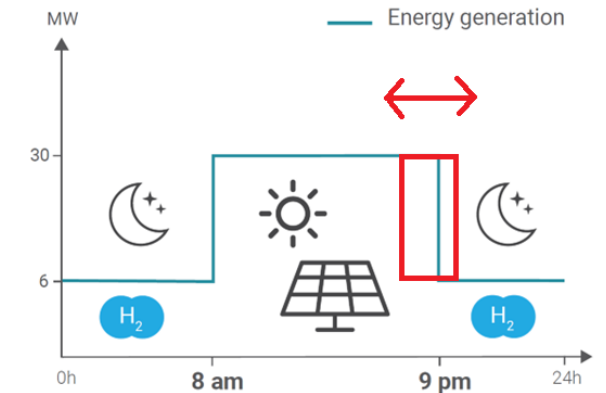
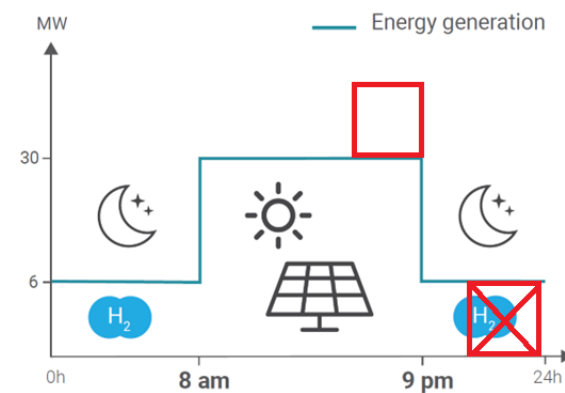
- Islanding mode is possible.
- Possible to maintain critical services powered (e.g. hospitals)

Black start capability:

- Can kick start the grid alone (in island mode).

Flexible operation patterns:

- Flexible operation patterns, without modifying the injection point.
- Possible to daily or seasonally adjust the evening/ morning peak power.



SUMMARY

1. HDF Energy quick introduction
2. HDF Energy's solution for islands: The Renewstable
3. **Example of possible power decarbonising of an island**
4. HDF Energy's relation with the UE

Project assumptions for a project in a Non-Interconnected Island ("N.I.I.-RS Project")

(data from April 2023)



Electric system	Insalled thermal capacity (MW)	Maximum annual demand peak (MW)	Renewable energy sources power (April 2023, MWh)	Thermal Power (April 2023, MWh)	Average Full Cost of Production of Conventional Units (€/MWh)	Average Variable Cost of Conventional Units (€/MWh)	Participation of Renewable Energy Sources in the power generation mix (%)
Non-interconnected island	12,73	6,64	232,49	1.142,75	783,53	499,96	16.19%

N.I.I. RENEWSTABLE® POWER PLANT SOLUTION

NOMINAL CAPACITY

6 MW wind farm & 2 MW PV

STORAGE

500 MWh H₂ + 2 MWh Li-Ion

PRODUCTION PROFILE

Winter: 2 MW 24H/24,

Summer: 6 MW day time, 2 MW night time

INVESTMENT

60 M€

ENERGY COST

OF PRODUCTION

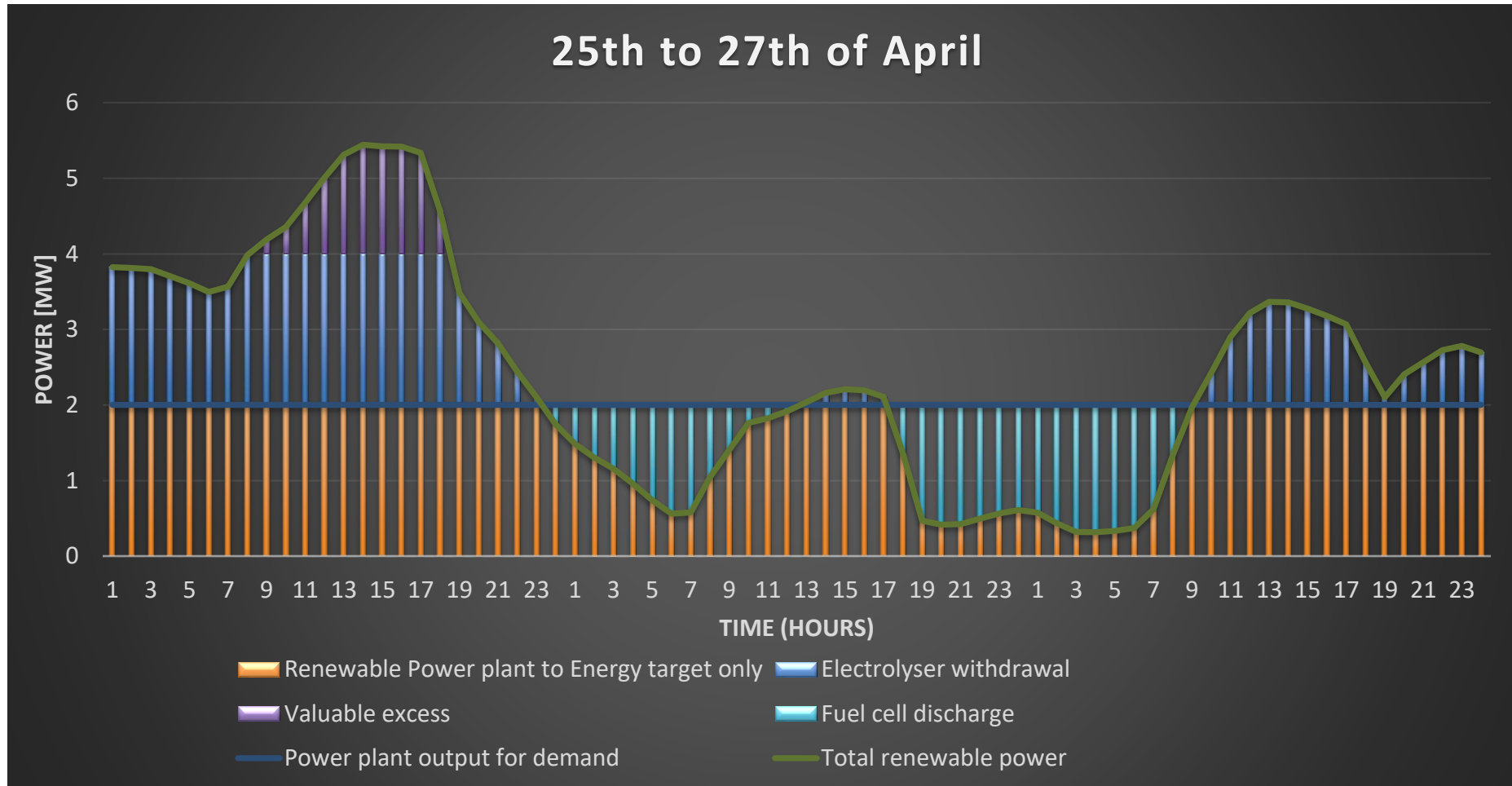
200€/MWh

NUMBER OF BOAT

1 round trip per week
(76 nautical miles or 141 km)



N.I.I. RENEWSTABLE[®] OUTPUT PROFILE



Typical days

Confidential - Property of HDF Energy

ENVIRONMENTAL AND SOCIAL OUTCOMES



100 % local and renewable source of Energy reduce fossil fuel dependence



Competitive energy



Zero CO₂ emissions, carbon free solution



A sustainable Generator supplying Base Load



Important diesel savings



H₂ Mobility development

N.I.I. Project data and outcomes

5 Million
of liters of Diesel saved/year



60 Millions €
Investment



10 Jobs
&
50
Construction JOBS



17K
tons of CO₂ saved Year



Competitive cost of Electricity for

25
years



SUMMARY

1. HDF Energy quick introduction
2. HDF Energy's solution for islands: The Renewstable
3. Example of possible power decarbonising of an island
4. **HDF Energy's relation with the EU**

HDF Energy's Engagement with the European Commission



Globally

Engaging with **DG INTPA**

Presence in three key regions: Latam, Africa Middle East, and Asia Pacific.

Global Gateway Label



Africa: Namibia (Swakopmund)
Caribbean Islands: Barbados(RSB)

European Investment Bank (EIB)



LOI signed, participation in Namibia (Swakopmund Project)
Ongoing discussion for other projects

Europe

Engaging with **DG ENER**

HDF Energy has initiated contact with DG ENER, aiming to establish a more fluent relationship in the future.

Engaging with **DG GROW**

HDF Energy has been prenotified for IPCEI support for HDF industrial plant

IPCEI

Important Projects of
Common European
Interest

Engaging with **DG MOVE**

Pilot Project (Elemanta): Cold Ironing in Port of Rouen, France

LET'S MAKE YOUR ISLAND PROJECT HAPPEN

Contact



GEORGIOS EXARCHOU

Business Development Manager Greece

georgios.exarchou@hdf-energy.com

+30 69 47 22 4912



CHARLIE VRIGNON

International Business Development Manager EMEA

charlie.vrignon@hdf-energy.com

+33(0)643165060

www.hdf-energy.com