

Efficient and reliable production of hydrogen in off-grid installations. ELY4OFF Project

Hydrogen Innovation Festival

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The background of the image is a clear blue sky. At the very bottom, there is a thin layer of white clouds, suggesting a horizon or a distant landscape.

WHO ARE
WE?

Fundación Hidrógeno Aragón

- It is a **private, non-profit** organization, created to promote the use of hydrogen as an energy vector.
- Promoted by the Government of Aragon it was **founded in 2003** with the support of the administration, industry and the main society actors from different sectors of activity.
- **70 members** of key importance for the Aragonese economy



Installations

Main building: 1200 m², with offices, labs and warehouse.

Integrated in the IThER project, which is a **demonstration project** with a renewable energy infrastructure based on a wind farm 635 kW and a 100 kW photovoltaic system with different technologies linked to a hydrogen production facility compression (up to 350 bar) and dispensing hydrogen.





Human team

multidisciplinary research
team

Areas of work



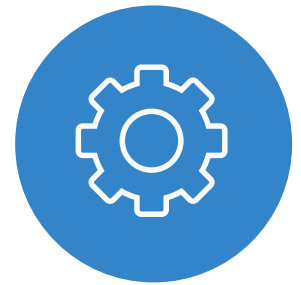
Research &
Development



Innovation



Consultancy and
training



Business
development

Background on Fuel Cell & H₂

BIG HIT



Official Website



DEMO4GRID



Official Website



QUALYGRIDS



Official Website



HYLAW



Official Website



HYTECHCYCLING



Official Website



ELY4OFF



Official Website



ELYINTEGRATION



Official Website



ELYGRID

FLUMABACK

Purpose: the **development** and **demonstration** of an autonomous **off-grid** electrolysis system linked to **renewable energy sources**.

The **PEMWE** (Polymer Electrolyte Membrane Water Electrolyser) **industrial prototype** (50 kW) will be **directly linked** to track the solar **photovoltaic** power source producing over 1.5 tonnes of hydrogen per year and ensuring cold start and rapid response to changes

The **demonstration period** in a relevant environment (TRL 6) will last **8 months** and will take place in Huesca, Spain.

Supported by:

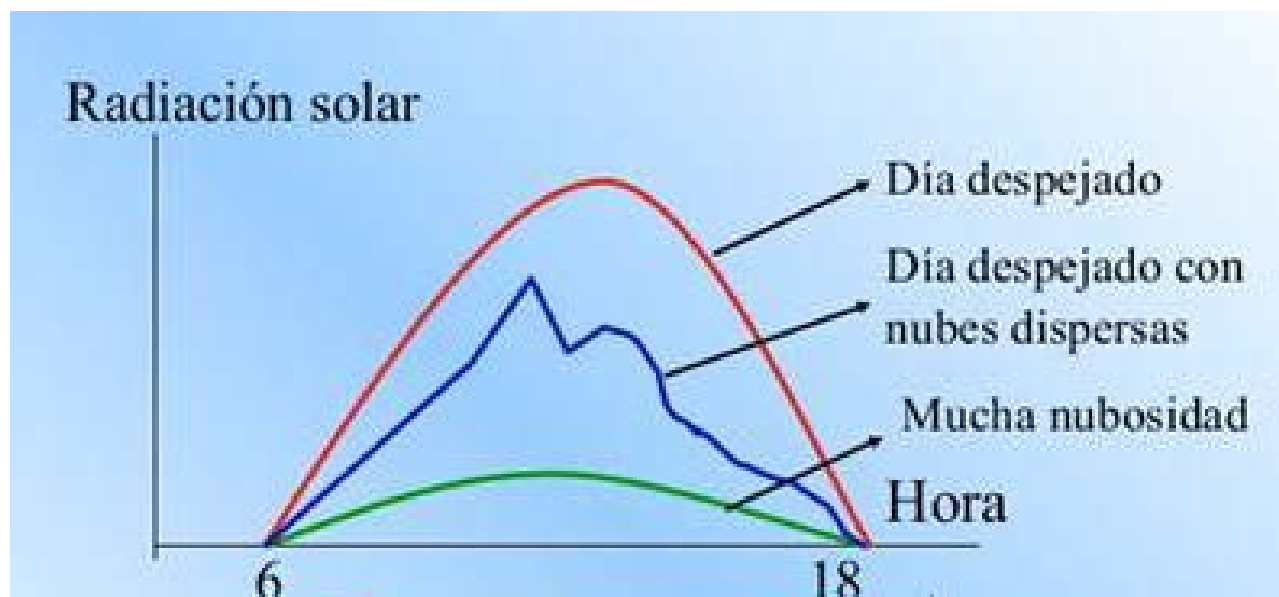


European
Commission

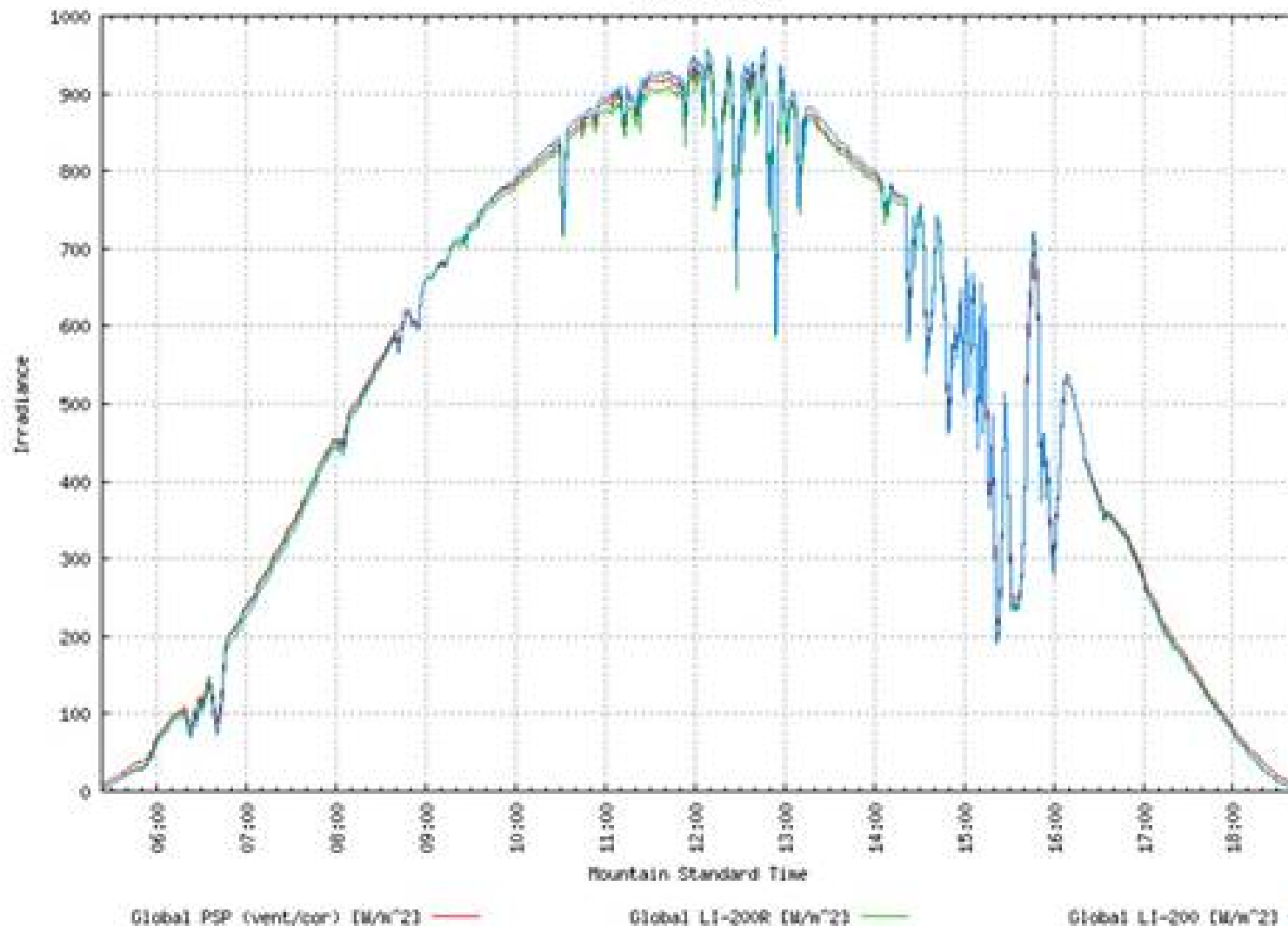


The research leading to these results has received funding from the European Union's H2020 Program for the Fuel Cells and Hydrogen Joint Technology Initiative (FCH2JU) under grant agreement n° 700359

Grand total: 2.315.217,50 €



NREL Solar Radiation Research Laboratory (BMS)
August 23, 2015





Precipitaciones: 90%

Humedad: 79%

Viento: 16 km/h

Temperatura

Precipitaciones

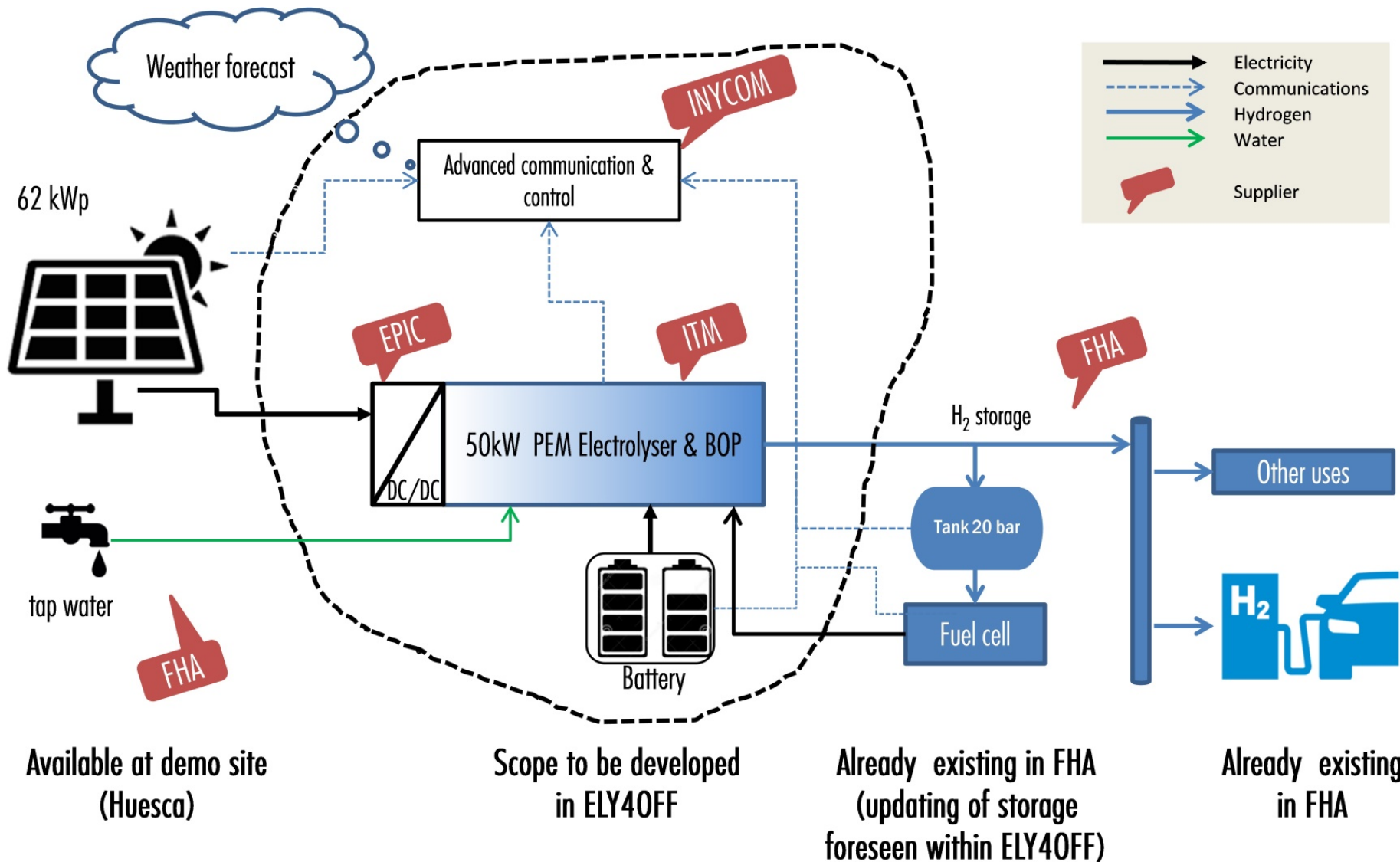
Viento

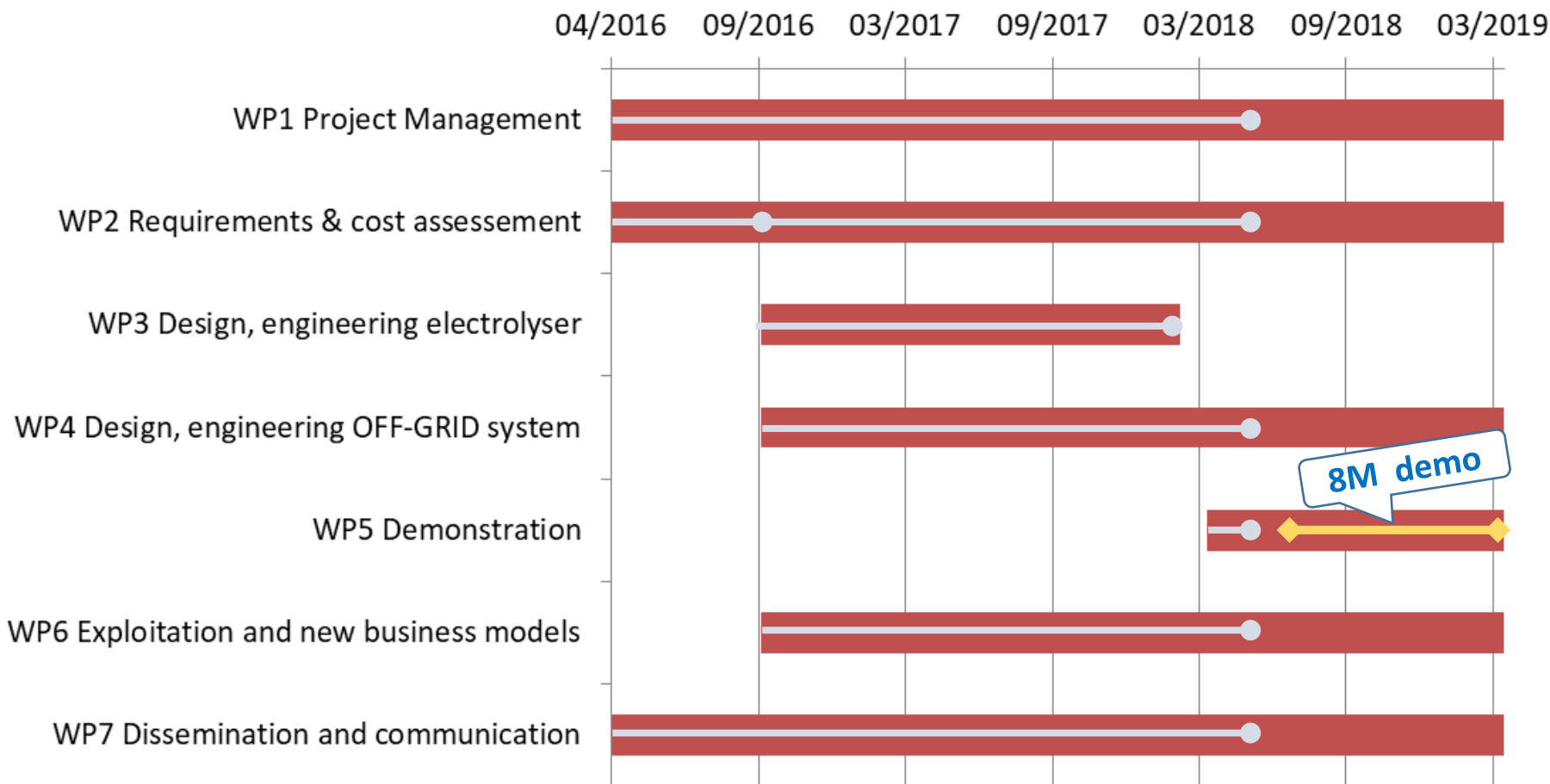


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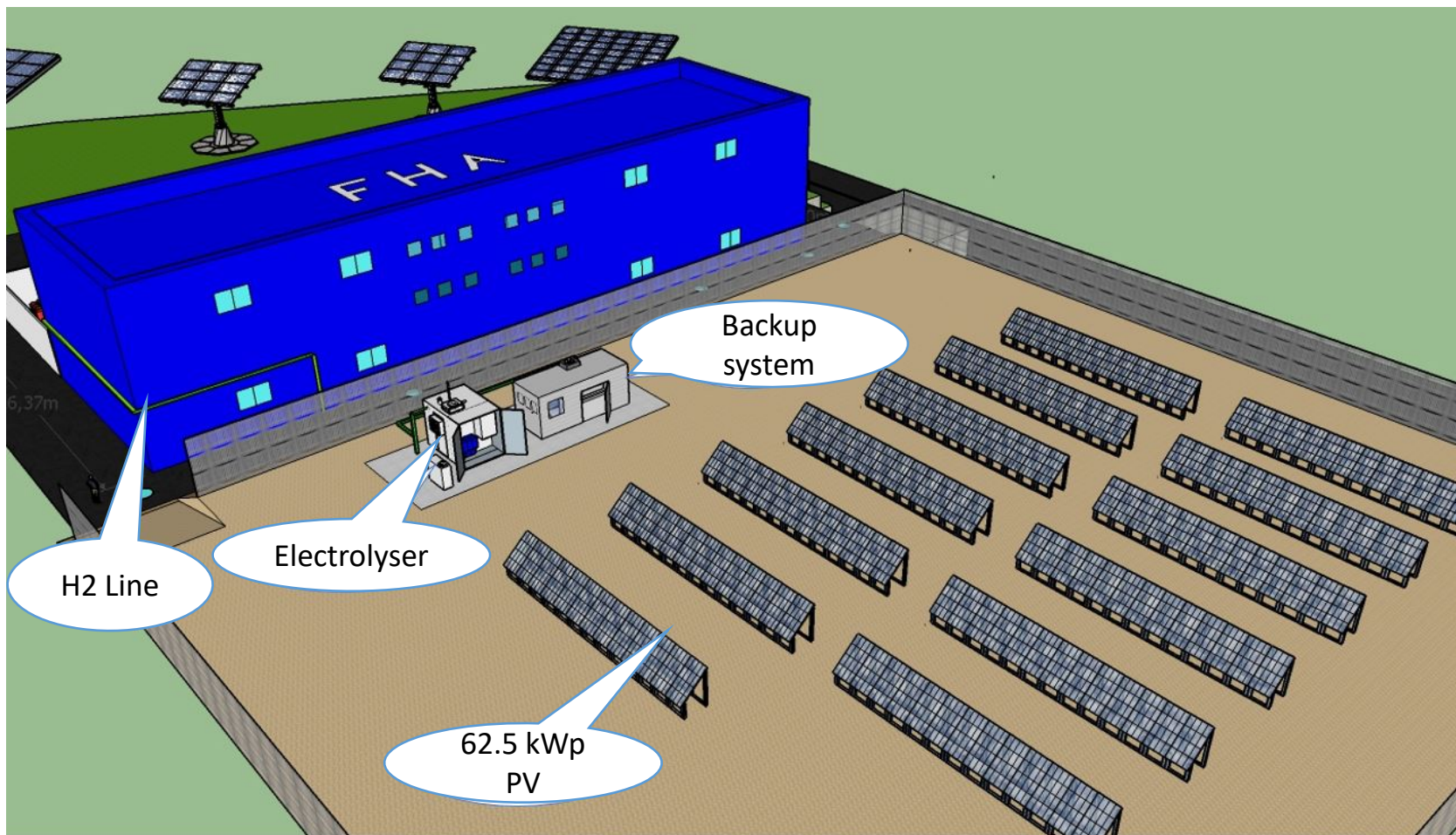


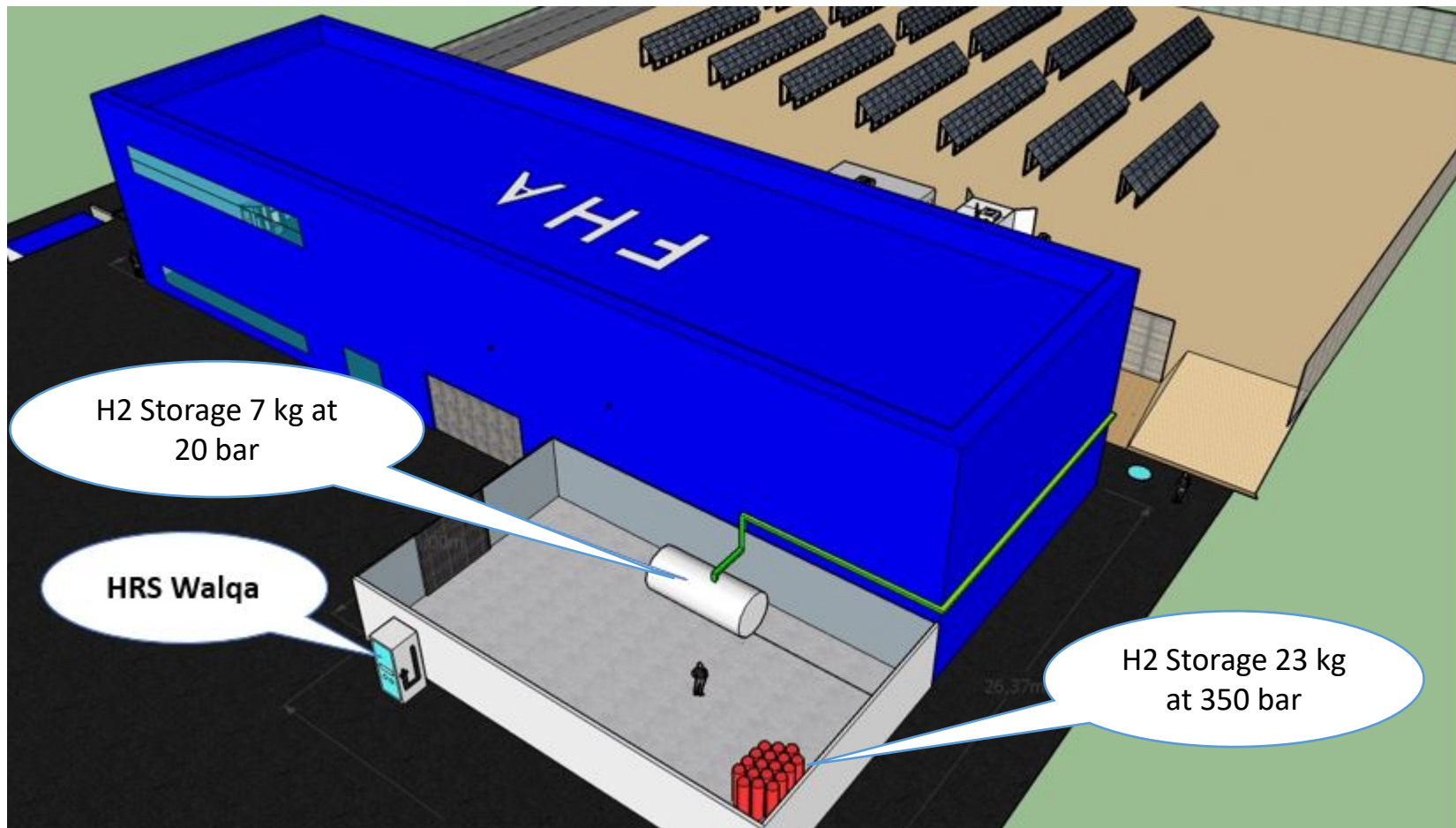
PEM ElectroLYsers FOR operation with OFFgrid renewable installations





- ✓ An in-depth **assessment of the best options** available **for the DC/DC conversion** linking the PV plant with the stack has been conducted. One prototype module has been built for testing.
- ✓ A large-scale **reduction** of kWh required for **frost protection** has been achieved in the BoP
- ✓ Several **energy storage architectures** have been assessed → finally the backup system will allow **5 days without solar source**.
- ✓ One specific business case related to "**electrification of isolated areas**" has been evaluated through time-step simulations.
- ✓ **Exploitation strategy** has been defined





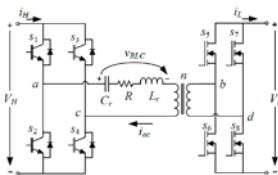
62.5 kWp in 13 strings
450 - 800 V
4.8 kWp per string
Eurener Modules 320 W





Purpose:

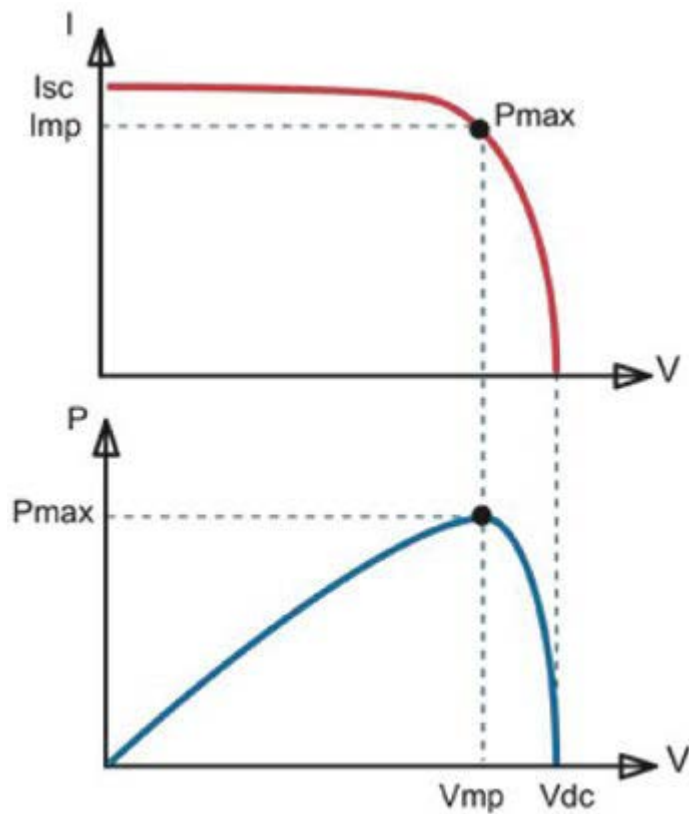
- To adapt the voltage produced by the photovoltaic field to the required voltage of the stack with MPPT (Maximum Power Point Tracking)



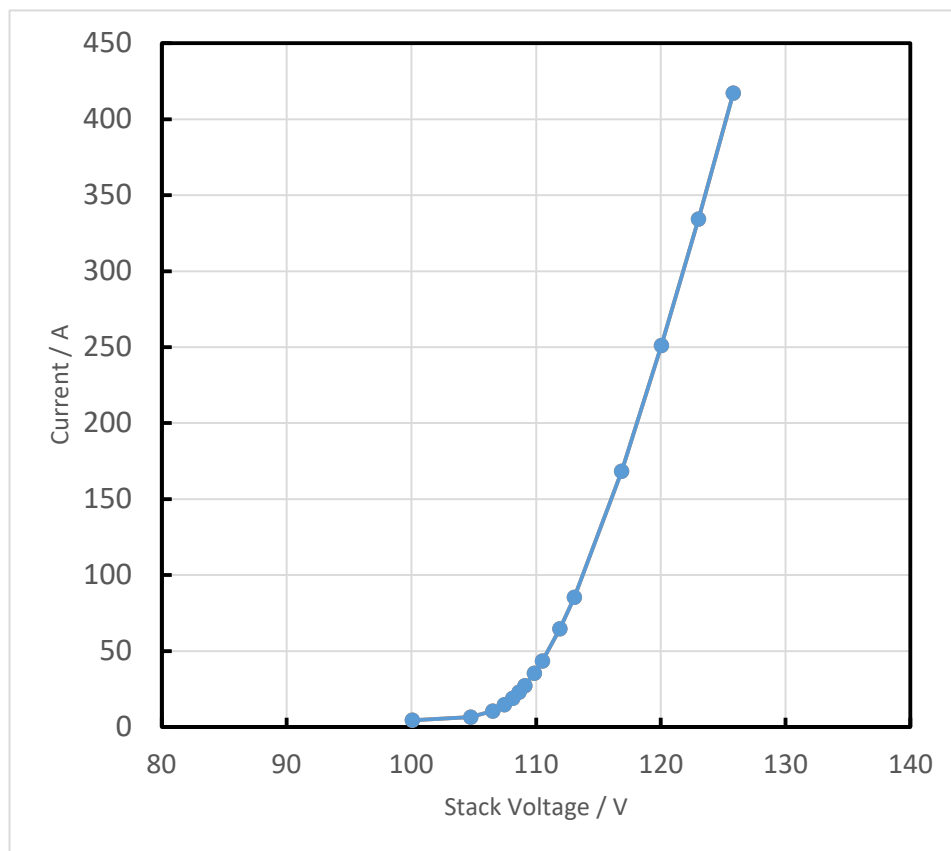
Innovation

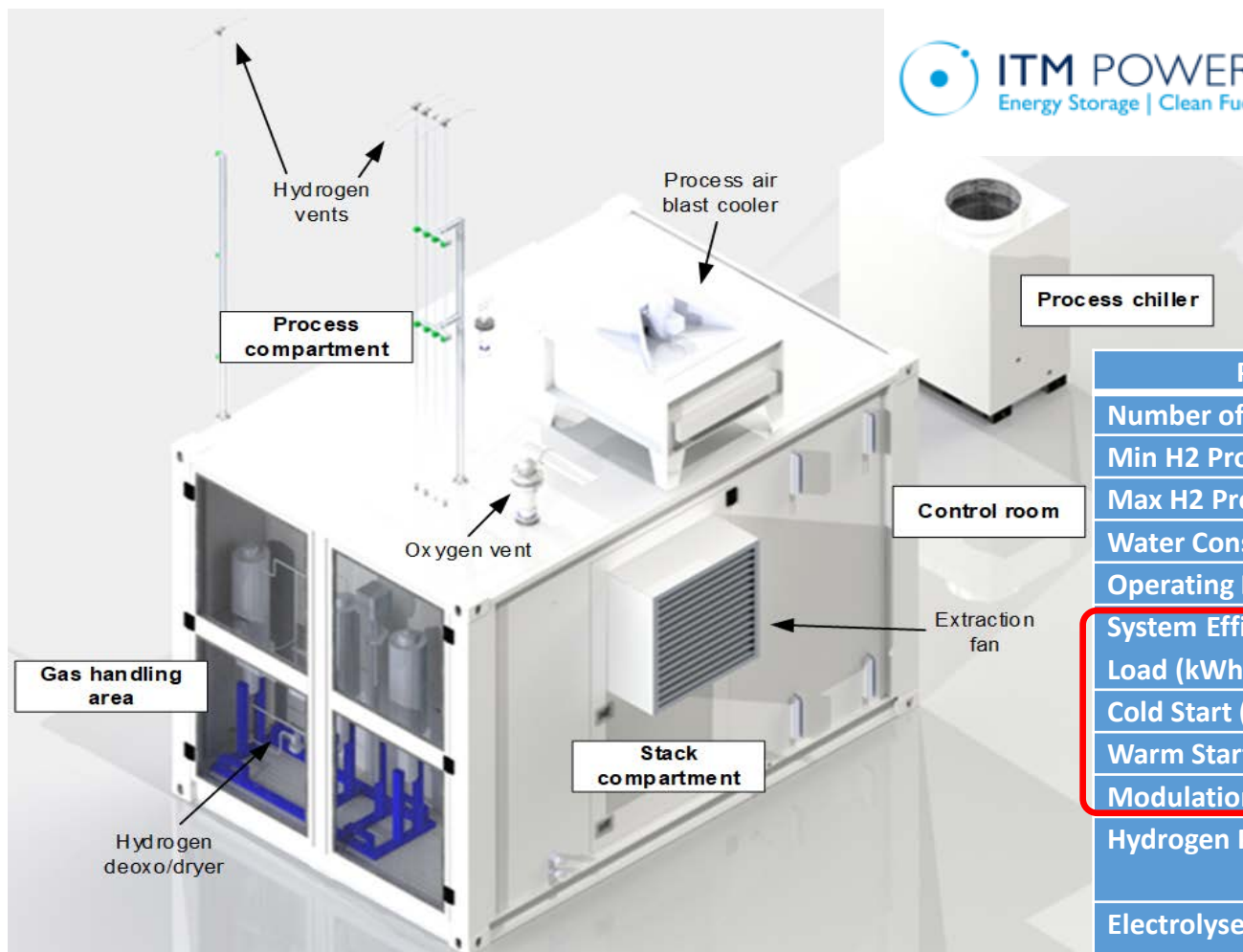
- Capable of following RES variability
- Quick answer
- Very High Efficiencies > 92% along all the operating conditions

PV field output: 450 – 800 V

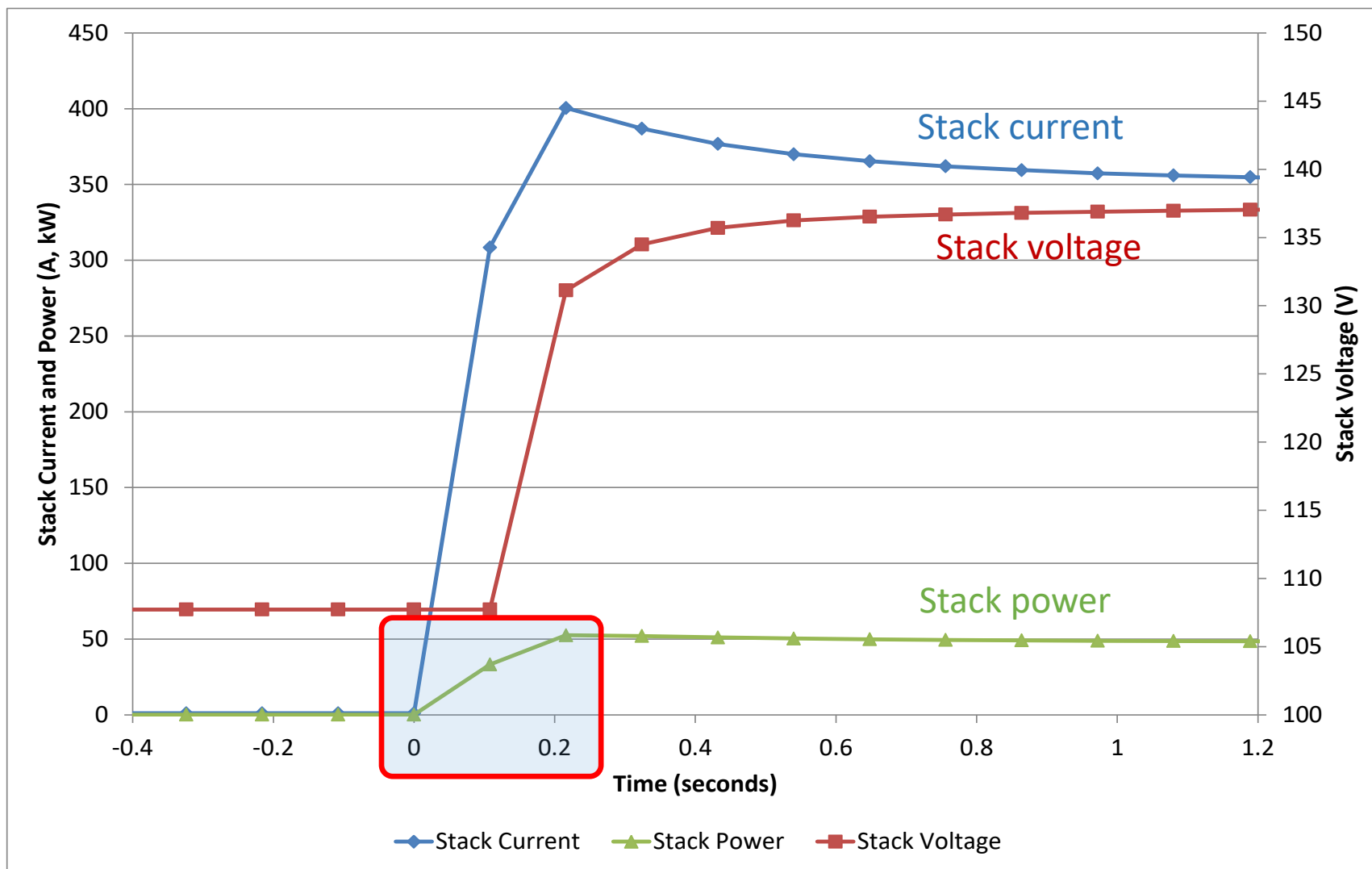


Stack requirements: 110 – 160 V





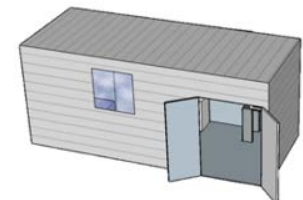
Parameter	HGas
Number of Stacks	1
Min H2 Prod (kg/24hrs)	3
Max H2 Prod (kg/24hrs)	28
Water Consump. (l/kg H ₂)	15
Operating Pressure (bar)	20
System Efficiency at Maximum Load (kWh/kg)	62
Cold Start (sec)	300
Warm Start (sec)	30
Modulation (sec)	2
Hydrogen Purity	99.999% - ISO 14687-2:2012
Electrolyser Packaging	13' ISO Container
Temperature Range (°C) ²	-15 to + 40
Water Quality	Drinking Water
Certification	CE



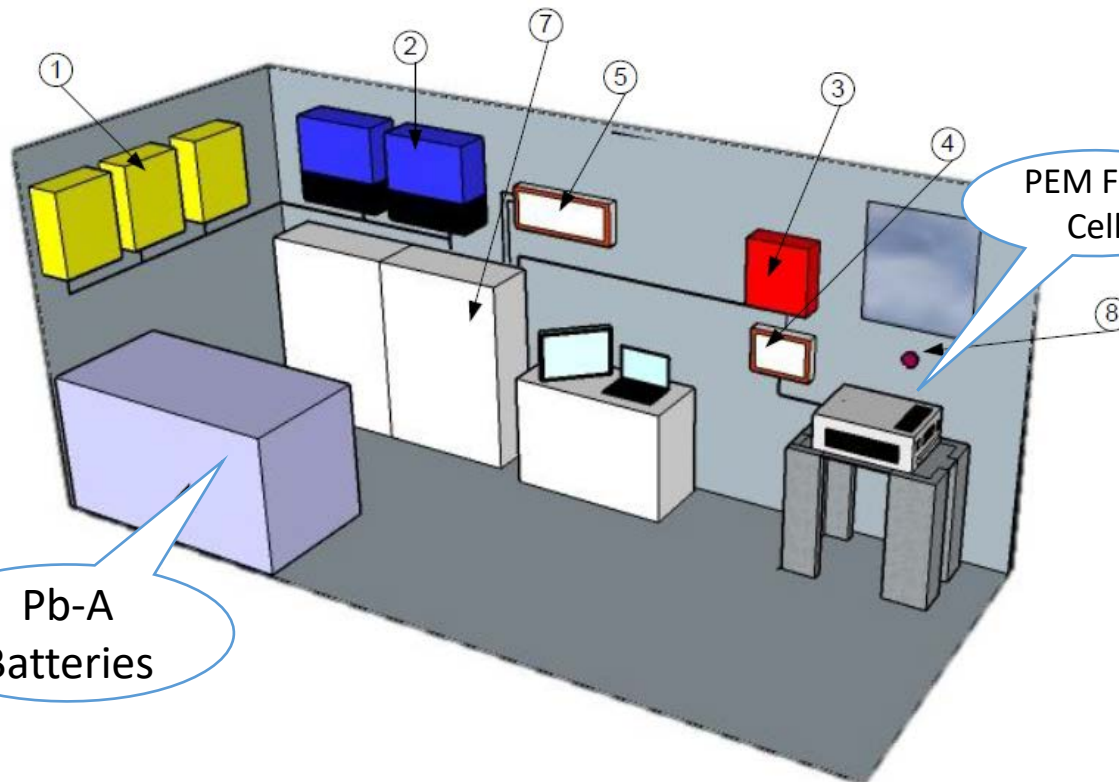
96 kWh batteries capacity → during nights

4.5 kW Hydrogenics FC → several days without sun

**Up to 5 days of
autonomy!**

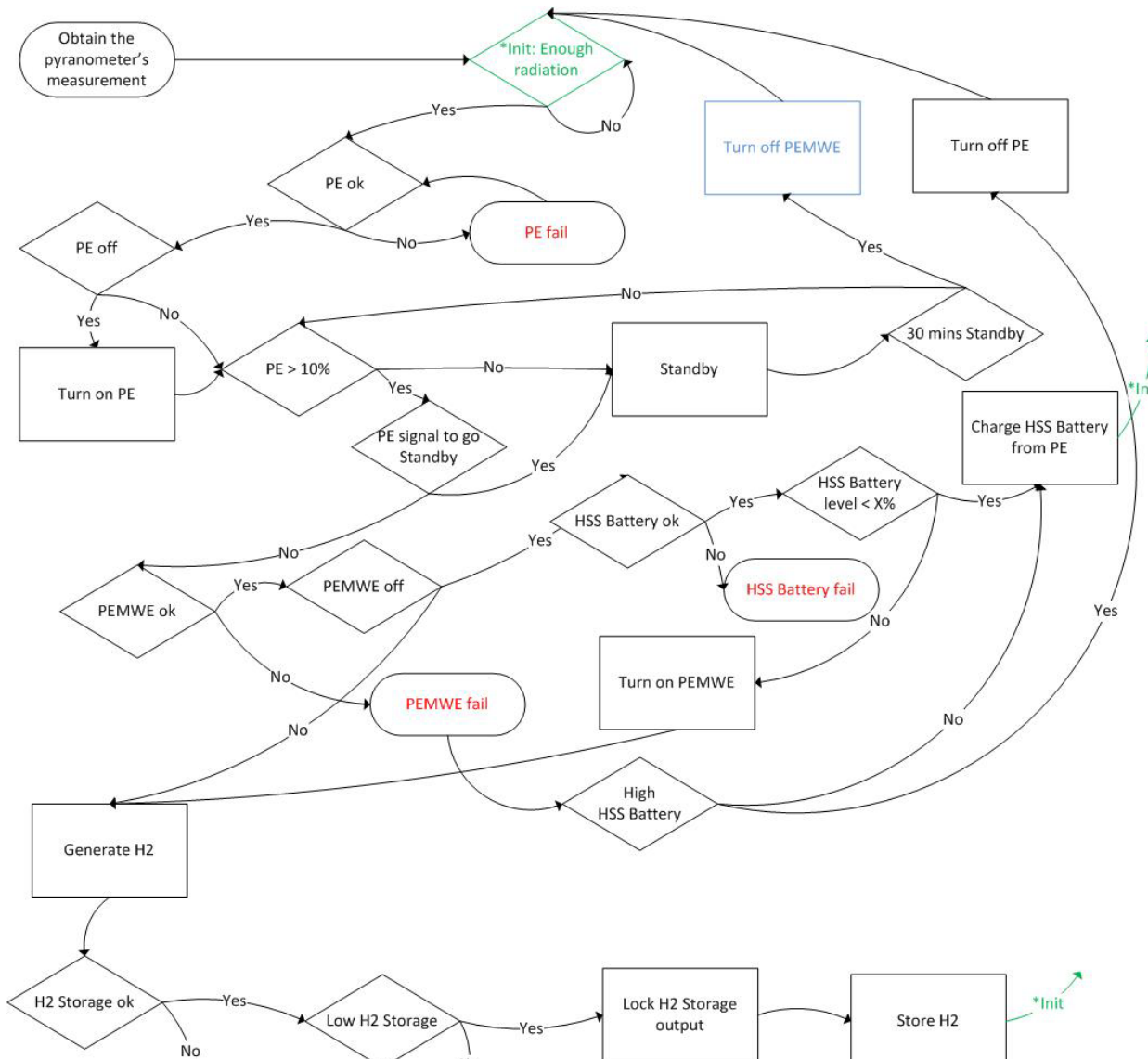


Microgrid Module



Pb-A
Batteries

PEM Fuel
Cell



Generation. The PEMWE's stack is generating hydrogen, being the BOP consumptions also covered.

High System Efficiency

through improved PEMWE and direct DC/DC



Reliable

Hybrid Storage System with enhanced autonomy





European
Commission



Many tanks for your attention,

Pedro Casero

Project Coordinator

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