Elygrid Project

(Grant Agreement nº 278824)

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- **Elygrid**, Improvements to Integrate High Pressure Alkaline Electrolysers for Electricity/H_2 production from Renewable Energies to Balance the Grid (**www.elygrid.com**)
- Duration 36 months, from 01/11/2011 to 30/10/2014
- Budget: 3.752.760,80 € / Funding: 2.105.017,00 €
- 10 project partners from 5 countries (D, F, ES, CH, B): 4 large industry partners, 1 SME, 5 Research Centres. 4 members of N.ERGHY.

COORDINATOR:

ELYGRID project aims at contributing to the **reduction of the total cost** of hydrogen produced via electrolysis coupled to renewable energy sources (mainly wind turbines), and focusing on **mega watt size electrolyzers** (from 0,5 MW and up).

MAIN DRIVERS:

-Big size alkaline electrolyzers (cell area = 18'000 cm^2)

-Leitmotiv: reduction of Total Cost of Ownership (TCO)

-Prototyping and testing with intermittent feeding

-Industrialization and market oriented approach

IHT electrolyser – 3.5MW – 760Nm^3/h H_2

- **Correlation to MAIP (AA2):**
  - ***Quantitative targets in MAIP***

AA2 - Production: Distributed production of hydrogen by water electrolysis	2010 baseline	2015 mid-term	2020 long-term	ELYGRID goals 1st 2015
Unit capacity (Ton/d)	1,5	1,5	3	3,5 - 4
Efficiency (%)	65	68	70	>70% stack efficiency
Cost (M€/(t/d))	3,1	2,8	1,9	< 1.9 / in progress

  - ***Priorities of the MAIP application areas – Hydrogen Production & Distribution***
    - *"Main emphasis […] on research and development of mature production and storage technologies […] cost-efficient low-temperature electrolysers adapted for the large-scale use of carbon free electricity"*
  - ***Long term vision***
    - *"In the 2050 vision, […] hydrogen will be used as an "energy buffer" to balance the production and demand cycles of intermittent power sources integrating large volumes of renewable energy in the energy system."*
  - ***One of the priority topics for the FCH JU:*** *namely H01*

S/T Goals

Double current density + lower cell voltage

Redesign and optimize AC/DC converter

Optimize stack components, BOP, control

Test and validate

Detect cost improvements and adapt manufacturing

“Smell” the future market and communicate

Avoid future stoppers (RCS, LCA)

WP 2 - Cell Improvement: Advanced materials development and characterization

Goal: Develop materials for increased KOH temperature and concentration and increase current density (-> decrease cell voltage and increase efficiency). Identification of the critical factors for the membrane efficiency.

Progress:

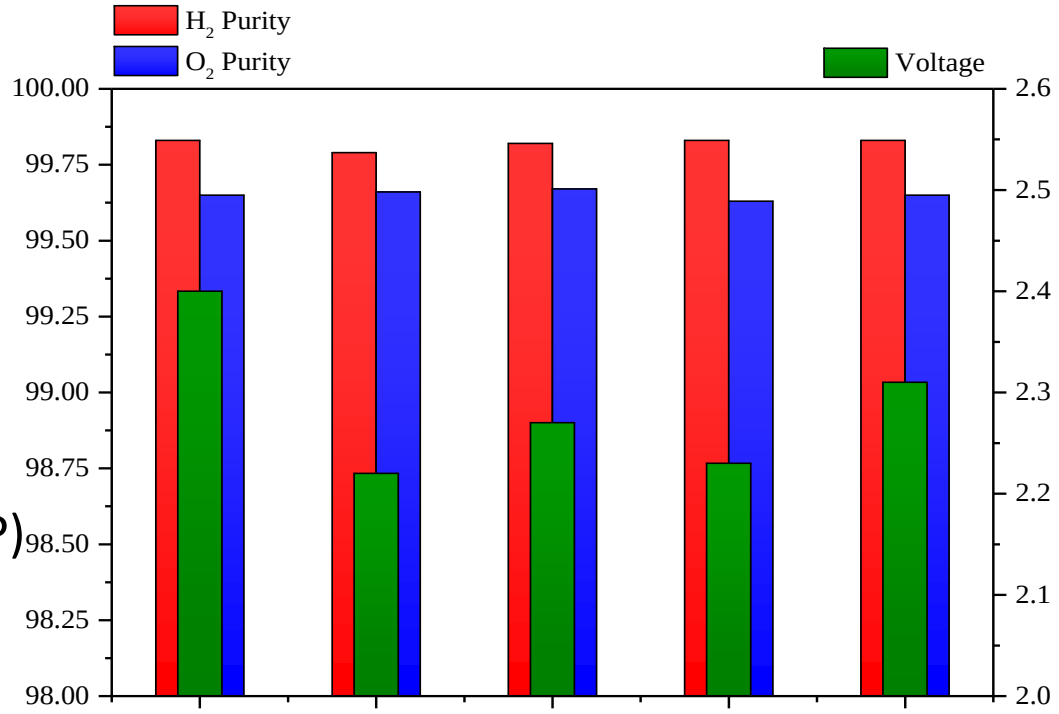
-Down selection on materials. Cost and manufacturability assessment.

-First tests successful at 1600 mm diameter (1:1 scale asbestos-free).

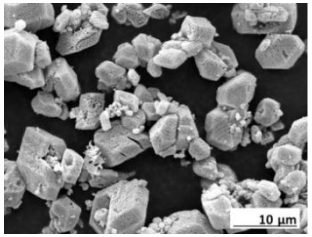
Next Steps:

-Further experiments (corrosion and electrochemical at operation T and P) in 130 and 1600 mm.

-Membrane modelling.



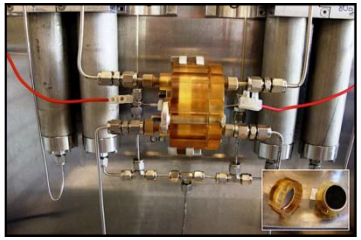
Validation Strategy (WP2 + WP5) and bottlenecks



Materials

Test bench130 mm
(real conditions)

Concept validation 1:1
(real size – except power)



Functionality
(lab conditions)

Demo trials
(outside Elygrid)

Market

WP 3 – Power Electronics

Goal: Study the effect of the electric power supply topology on the electrolyzer efficiency at full and partial loads. Analysis of different topologies of power supplies. Technical requirements to build an electrolyzer power supply emulator/prototype able to match renewable energy electricity

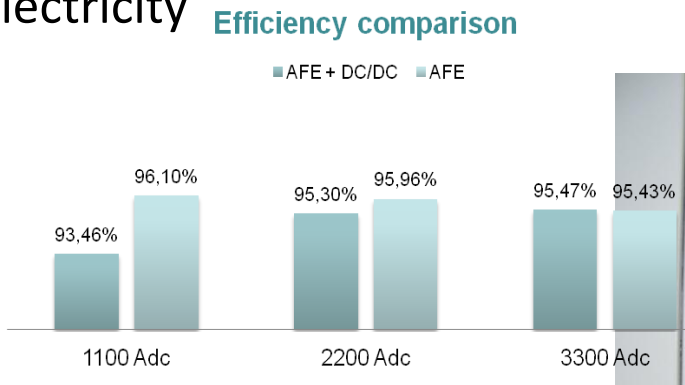
Progress:

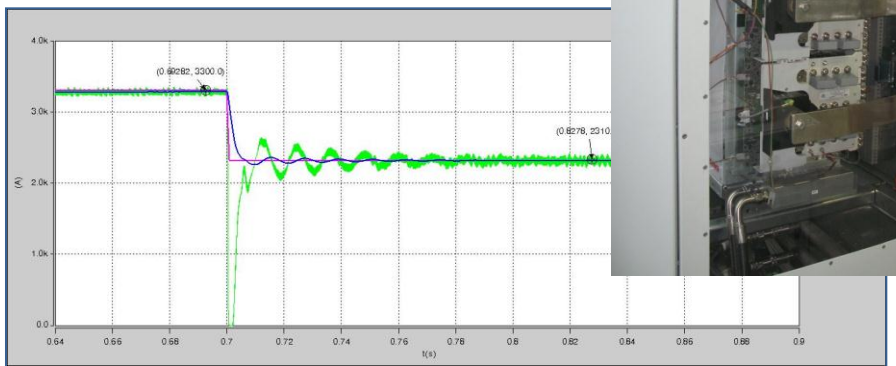
-Definition, analysis and simulation of eight different power electronic configurations. Three retained, one selected.

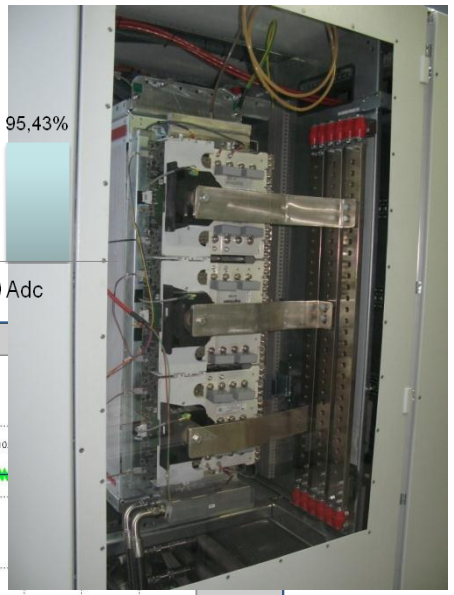
-Prototyping completed.

Next Steps:

-Full scale (MW) validation in lab conditions.

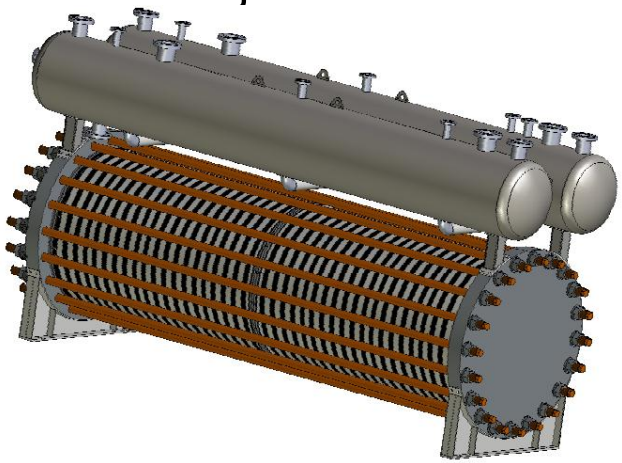






WP 4 – O&M and BOP optimization

Goal: Identify technical improvements related to Balance of Plant (BOP). Improvements on regular O&M actions. Re-design BOP with the objective to reduce the total cost with better functionality.



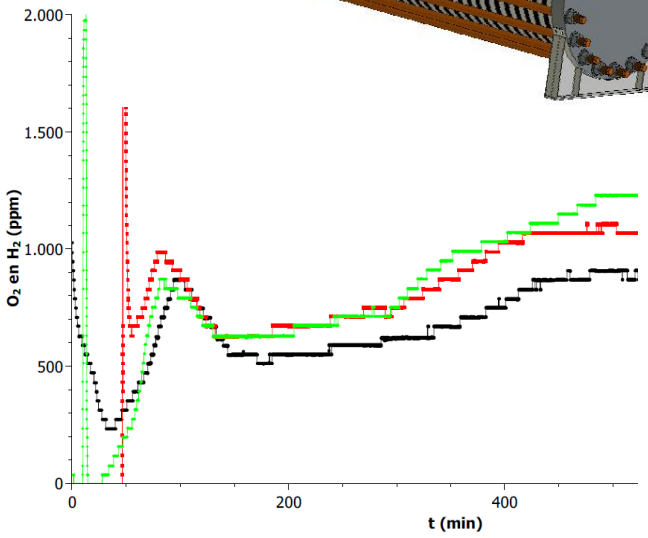
Progress:

-Tests in different operating conditions. Qualitative Risk Analysis.

-Individual numerical models (to be completed).

-Redesign of main components. Dimensioning and pre-design of modular design.

-New control system.



Next Steps:

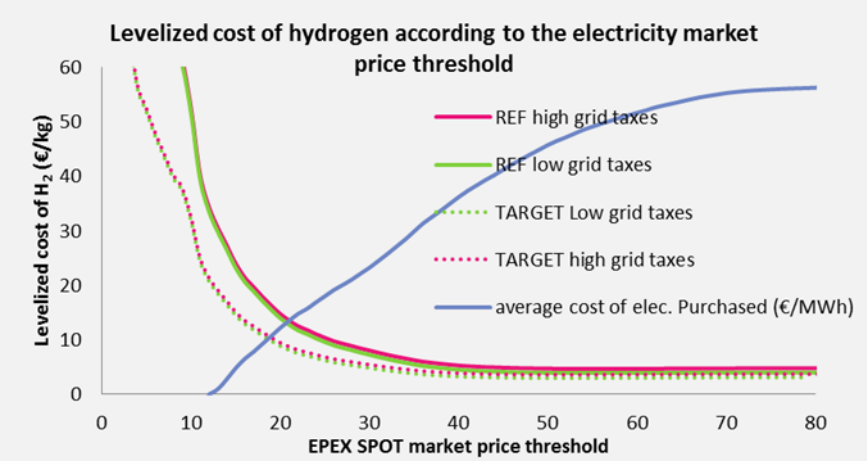
-Test new control system in real operation.

-Complete redesign of modular multi-MW electrolyser.

WP 6 – Market preparation and dissemination

Goal

- Development of business cases
- Identification of potential uses and specifications
- Standardization and identification of barriers to commercialization
- LCA, RCS and homologation
- Cost reduction potential and industrialization.
- General dissemination and conveying the marketing message to the potential users.



- **Contribution to Cross-cutting issues**

  - ***Work Package 6 considers many items typical for Cross-cutting, as market analyses, RCS, or communication and outreach.***
    - RCS activities explore specifically the need (or not) of new codes.
    - LAC/LCI analysis points out the weight of the electricity consumption.
    - Techno-economic and market studies (the “crystal ball”).
  - ***Communication:***
    - Several Papers, Oral and Poster presentations.
    - Initial Press Release to the media. Broad outreach even in international specialized media (Fuel Cell Today, EHA newsletter).
    - Two workshops during next year: preparation of the first one in Q2 in cooperation with FCH JU and other projects.

- **Project Future Perspectives**
  - Relationship to other projects: expectation to cooperate with RESelyser in common dissemination and in coming together.
  - Exploitation and Post-Project Activities: already exploring possibilities for a full scale demo (several MW).
  - Recommendations towards the Programme: carefully align technical progress at project level with stakeholders expectations, within the framework of sound techno-economic and market assumptions, as it is being done at the Electrolyser Study.

Expected status of the technology at project's end

"go-to-market"

-> Target: validation of improved (asbestos-free) technology

-> Full scale demo as next step

…with a several MW electrolyser unit size

-> Target: double current density, achievable

…at an attractive level of price

-> Target: reducing of CAPEX (-25% according to DoW), achievable

…offering a competitive level of OPEX

-> Target: reducing energy consumption (-20% according to DoW)

-> TCO as tool to solve the trade-offs between CAPEX/OPEX

-> Operation pattern highly influences potential to reduce consumption

To know more…

ELYGRID

http://www.elygrid.com/

http://www.hidrogenoaragon.org

COORDINATOR: