ELYntegration
Grid Integrated Multi Megawatt High Pressure Alkaline Electrolysers for Energy Applications

elyntegration

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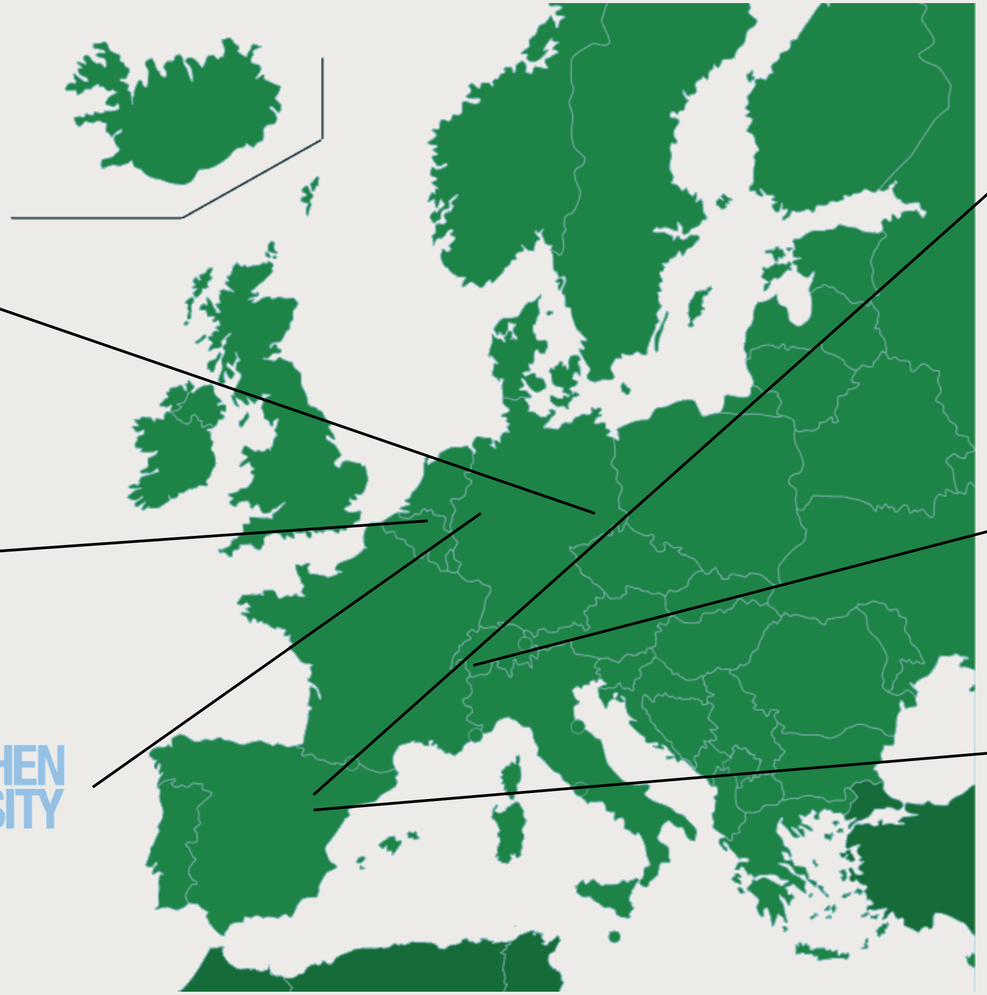
Programme Review Days 2019

Brussels, 19-20 November 2019

PROJECT OVERIVEW

- **Call year:** 2014
- **Call topic:** FCH-02.8-2014 Improvement of electrolyser design for grid integration
- **Project dates:** 01/09/2015-31/05/2019
- **% stage of implementation 01/11/2019:** 100%
- **Total project budget:** 3.301.391,25 €
- **FCH JU max. contribution:** 1.864.557.50 €
- **Other financial contribution:** 1.436.833,75 €
- **Partners:** Vlaamse Instelling Voor Technologisch Onderzoek N.V. **(VITO)**, Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.V. **(IFAM)**, Rheinisch-Westfaelische Technische Hochschule Aachen **(RWTH AACHEN)**, Industrie Haute Technologies S.A. **(IHT)**, Instrumentatcion y Componentes S.A. **(INYCOM)**,Aragon Hydrogen Foundation **(FHA)**

Partners



Fraunhofer IFAM

vito

IAEW Institute of Power Systems and Power Economics

RWTH AACHEN UNIVERSITY

Ha FOUNDATION FOR THE DEVOLOPMENT OF NEW HYDROGEN TECHNOLOGIES IN ARAGON

iht INDUSTRIE HAUTE TECHNOLOGIE

Inycom innovation technologies

PROJECT SUMMARY

Grid Integrated Multi Megawatt High Pressure Alkaline Electrolysers (MW HP AWE) for Energy Applications

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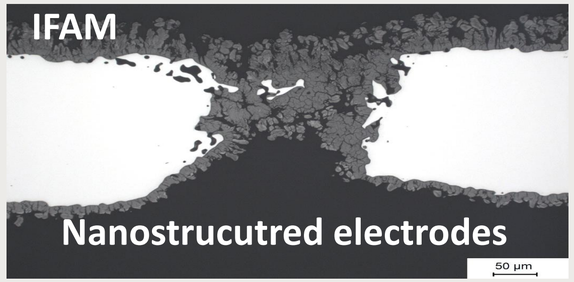
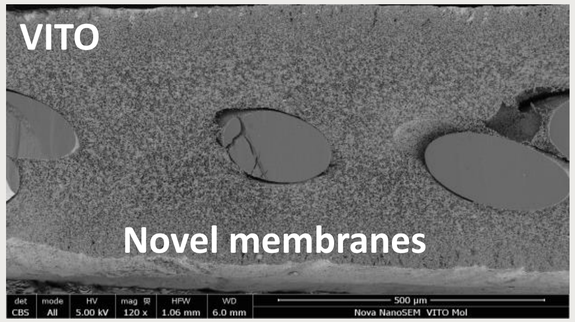
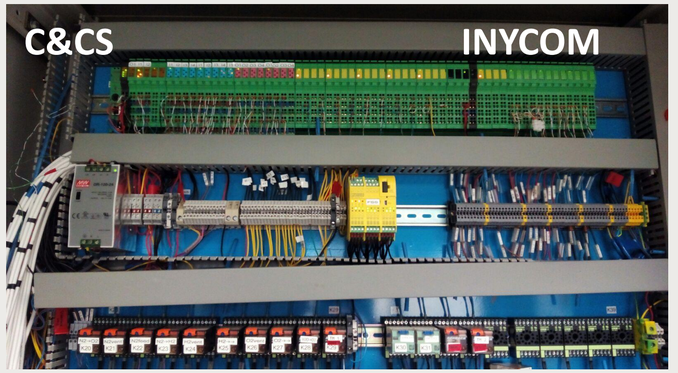
FCH FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

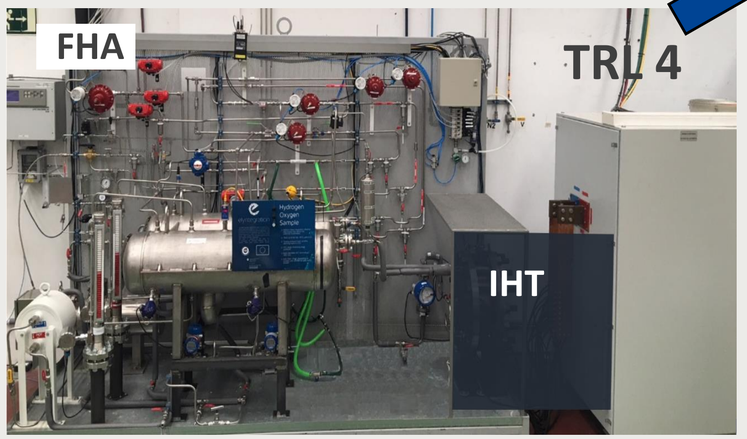
Objective

Design and engineering of a **robust, flexible, efficient and cost competitive** MW HP AWE capable to provide cutting-edge **operational capabilities under highly dynamic power supplies.**









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Positioning vs SoA

PARAMETER	Unit	ELYntegration	SoA 2012	SoA 2014	SoA 2017
Current density	A cm^{-2}	**0.5-(0.7)**	0.3	------	0.5
Efficiency degradation	%	**1.5 /year**	2 @8000 h	---	0.13 @1000 h
Energy consumption	kWh/kg H_2	**52**	57	54	51
CAPEX	EUR/kW	**<600**	-----	1,100	750
Stack capacity	t/d H_2	**4.5**	---	----	----
H_2 production flexibility	load spanning range (%)	**15-130**	5-100	----	5-150

Application and market area

- Countries with big H_2 demand or FCEV deployment strategies (Germany, Netherlands, UK, Scandinavian countries, etc..)
- Countries that show large amount of potential industry customers, ammonia production and crude refining

Addendum to the FCH2 Annual Work Plan (2014-2020)
FCH2 Multi Annual Work Plan (2014.-2020)
Electrolysis Study FCHJU edited 2014

PROJECT PROGRESS/ACTIONS – System Energy Consumption (Efficiency)

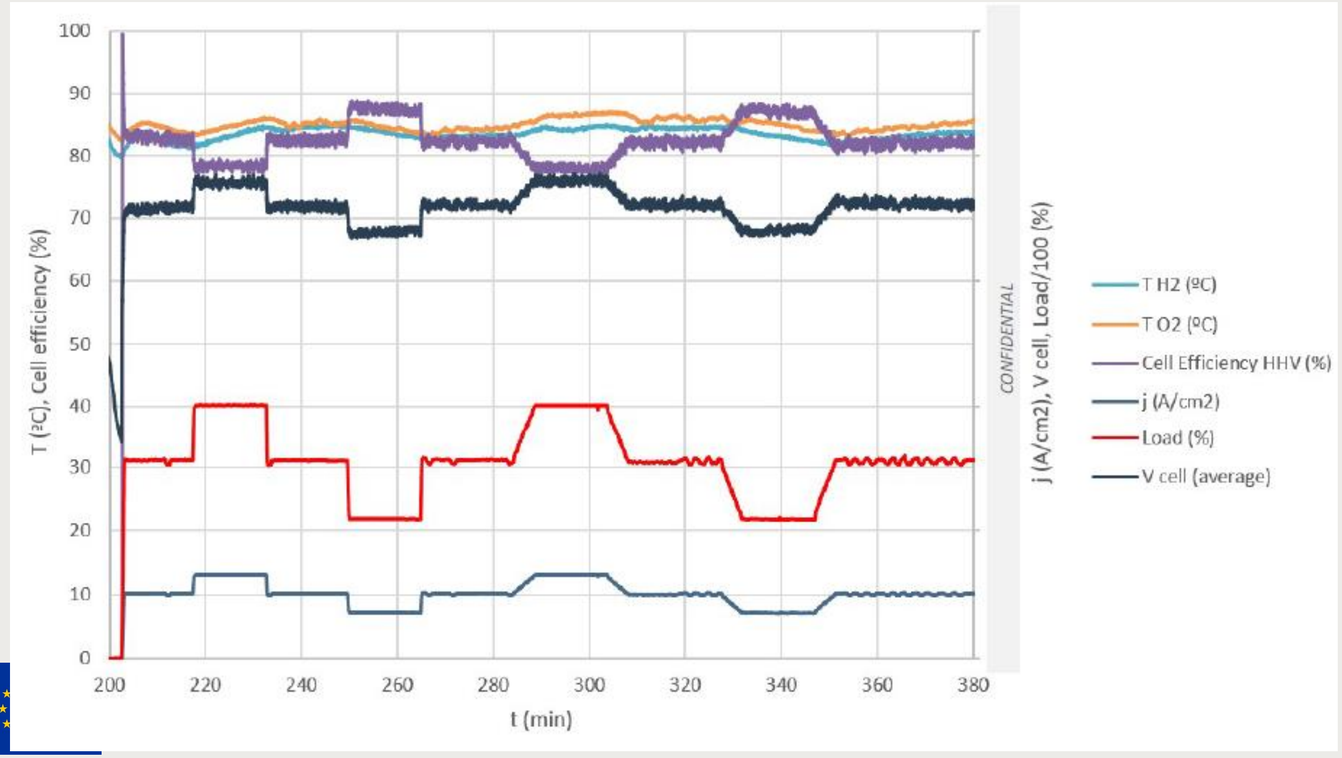
56.2-52.5 kWh/kg

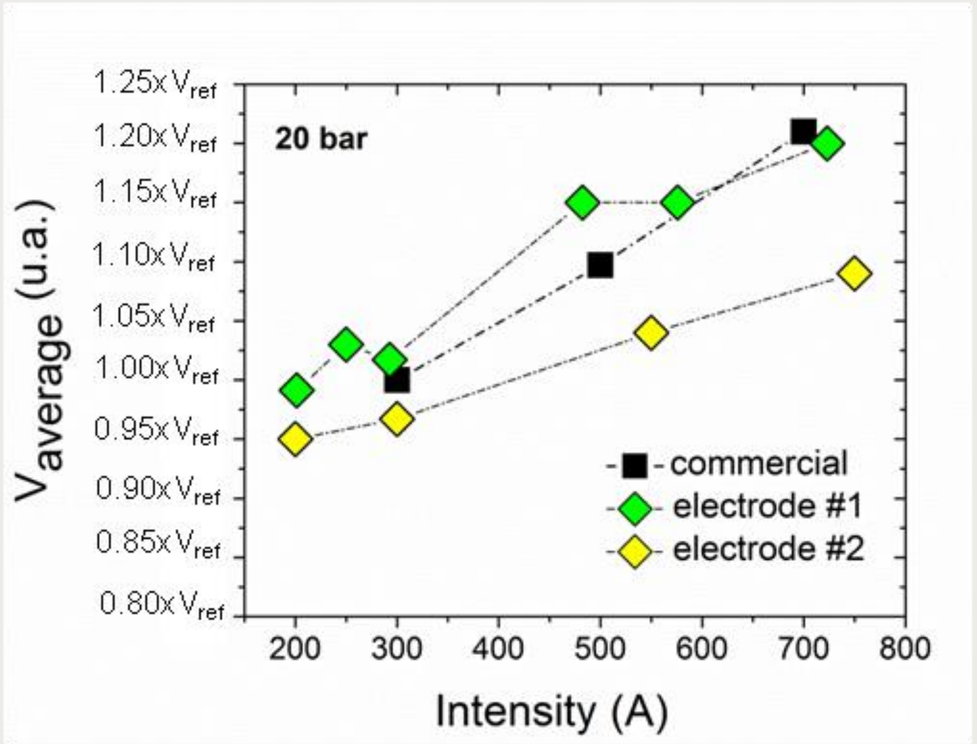
Achievement to-date

PROJECT START
54 kWh/kg

25% 50% 75%

TARGET
52 kWh/kg





PROJECT PROGRESS/ACTIONS – Capital cost (CAPEX)

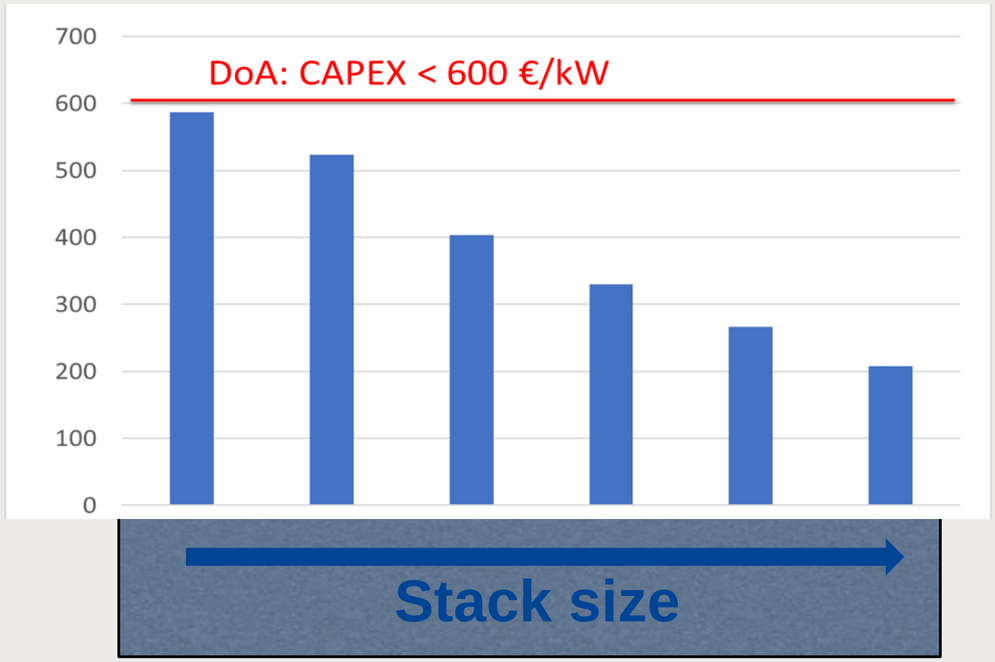
Achievement to-date

PROJECT START
1100 EUR/kW

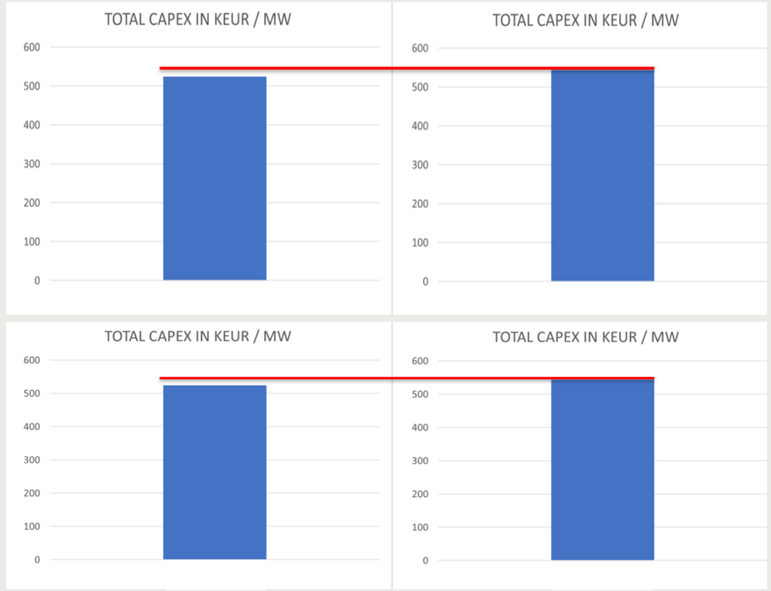
< 600 EUR/kW

TARGET
< 600 EUR/kW

25% 50% 75%



New cell assembly, BOP and electrodes account a CAPEX increase of 4, 8 and 7% respectively.



Novel membranes
(20% improvement at 30 barg)

New cell assembly
(65% improvement at 30 barg)

PROJECT PROGRESS/ACTIONS – Dynamic and flexible operation

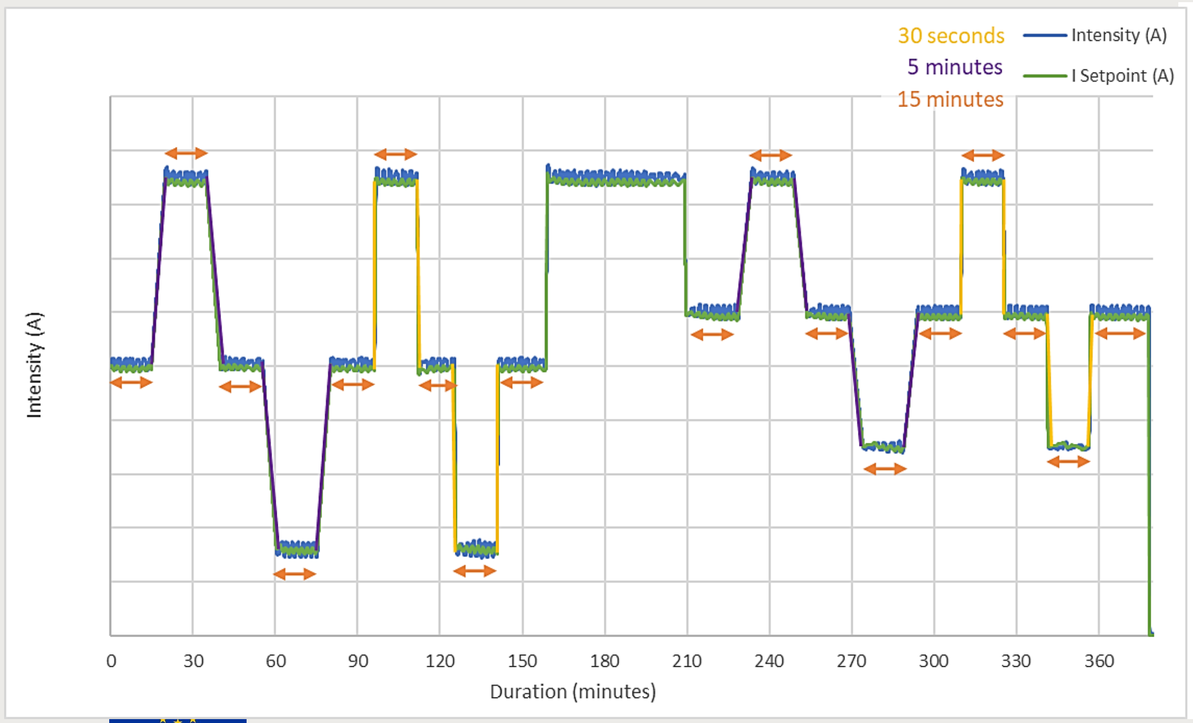
Achievement to-date

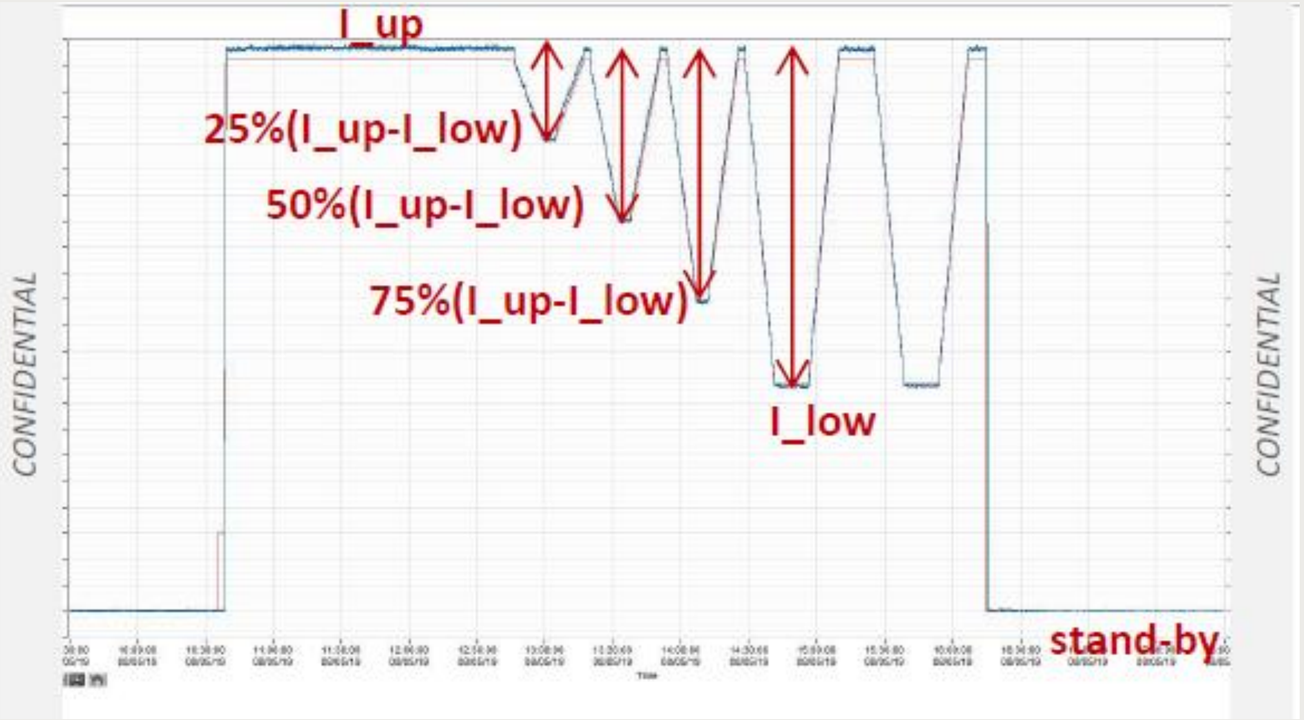
PROJECT START
24% minimum part load

15 %

TARGET
15% minimum part load

25% 50% 75%





Risks and Challenges

New materials development and testing at micropilot scale → Task extended

- Not affecting the planning, selection of the membranes was decided from the first test campaigns.

Test bench → test campaigns re-scheduled

1. Comissioning delayed due to difficulties getting the required components (up to 60 bar), in special customized gas separators. (Pilot scale)
2. Malfunctioning of two BOP components (level switch and electrical heater) (Pilot and Industrial Scale)

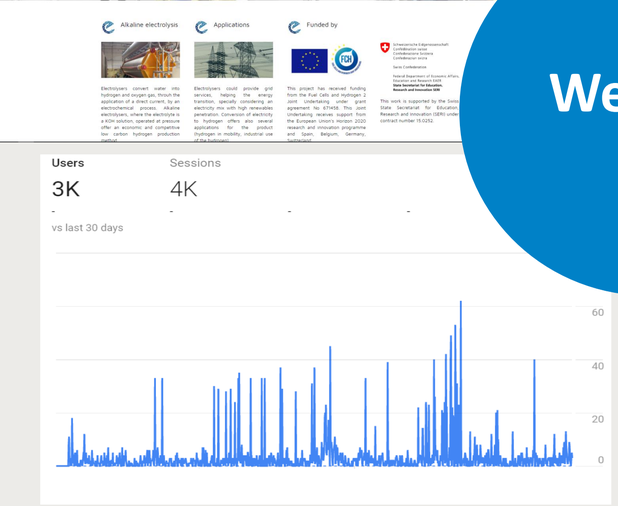
Information from pilot scale not retrieved on time

- A baseline stack chosen as the first 1600 advanced stack to test C&CS according to plan.

Novel electrodes assembling

- Highly promising electrodes → testing at Pilot Scale, issues identified (affecting gas purities) → flow channel modifications→ meanwhile industrial size tests carried out on novel membranes

Communications Activities



Website

Graphic material

Communication and Dissemination

21
Conferences
Plenary/Keynote: 1
Invited: 3
Oral: 15
Poster: 2

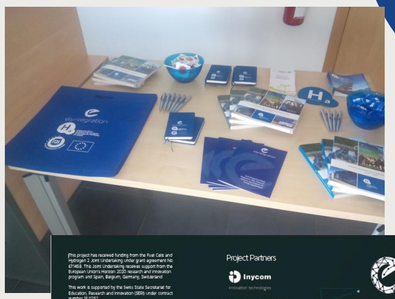
13
Fairs & Workshops

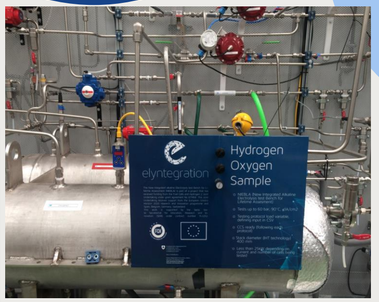
3
Public Workshops organized

1
Video

15
Public deliverables

6+3
Publications
Scientific (3)
Proceedings (3)
Papers to be submitted (3)





EXPLOITATION PLAN/EXPECTED IMPACT

Exploitation

Service offered by EC: Exploitation Strategy Seminar (ESS) provided in March 2017

Exploitation strategy:

- **Stack developments**

(electrodes, membranes, cell assembly) to be further validated at industrial and commercial scale

- **R&D and commercial agreements have been defined between some consortium partners**

Impact

- **Development of new electrodes aiming to increase performance and current density**
- **AST developed to reduce testing time**
- **Optimization of a BOP compromising a single stack for 4,5 t H_2/day**
- **Novel cell assembly able to broaden load flexibility at higher pressures**
- **Analysis on market assessment and grid services provision**

FHa team in PRD2019

FUNDACIÓN PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGÍAS DEL HIDRÓGENO EN ARAGÓN

15 ANIVERSARIO FUNDACIÓN PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGÍAS DEL HIDRÓGENO EN ARAGÓN

100 CENTENARIO PARQUE NACIONAL DE ORDESA Y MONTE PERDIDO

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