



FOUNDATION FOR THE
DEVELOPMENT OF NEW
HYDROGEN TECHNOLOGIES
IN ARAGON

HISTORY AND STRATEGIC OBJECTIVES OF ARAGON HYDROGEN FOUNDATION

www.hidrogenoaragon.org



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Foundation for the development of New Hydrogen Technologies in Aragón

WHY HYDROGEN IN ARAGON?

- First Wind Farm in Spain installed near Zaragoza
- 2003: Great energy change approaching
- Reasons to support new hydrogen technologies:
 1. To take advantage of the renewable energy potential
 2. To take advantage of the region's strategic situation
 3. Existence of a high level of involvement in research groups
 4. A consolidated industry with sectors that could apply and develop new products
- 2003: Workshop organized by Government of Aragon
 - Objectives:
 - To learn and to discuss about hydrogen as energy vector
 - Results:
 - **Strategy to develop Hydrogen technologies in Aragon**
 - **Foundation for the Development of New Hydrogen Technologies in Aragon**



Hydrogen Master Plans in Aragon



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AIMS OF THE PLAN:

• GENERALS

- To have a tool for the identification of opportunities of hydrogen technologies
- To identify strategic lines for the region and to define actions plans

• SPECIFICS

- To review the state of technology and market opportunities.
- To identify specific projects and actions.
- To set across-the-board actions

Hydrogen
Master Plan in Aragon

- 2010)



(2011 – 2015)



(2016 – 2020)

Board of Trustees



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We are located in the **Walqa Technology Park situated in Huesca**. Our facilities are comprised of some 1,200 square metres between offices, laboratories and a workshop.

Our unit is unique in Spain, and with 8.5 metres in height, safety measures (ATEX), gas detection equipment and ventilation, represents a suitable installation to work with large scale hydrogen equipment.

The building is part of the project call: **Technology Infrastructure for Hydrogen and Renewable Energies, ITHER**, conceived and carried out by the Foundation.



1. Hydrogen Production and Purification Technologies
2. Hydrogen Storage Systems
3. Fuel Cell Solutions/Applications
4. Systems integration
5. Sustainable Mobility Solutions
6. Energy Efficiency
7. Training

MARKET ORIENTATION!!!



National Participation



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AeH₂, Spanish Hydrogen Association

- **Board Members**



APPICE, Spanish Association of Fuel Cells

- Secretary
- **Board Members**



PTE HPC, Spanish Platform of Hydrogen and Fuel Cells

- **Board Members**



AENOR

- Comité AEN/CTN 181: Tecnologías del Hidrógeno



Clúster de la Energía de Aragón

- Founder Members

International Participation



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HER, Hydrogen Europe Research (former Nerghy)

- **Board Members**



HyER, Hydrogen Fuel Cells and Electro-mobility in European Regions

- Goverment of Aragon
- Founder Member
- Board Member



CENELEC (Comité Europeo para la estandarización sector eléctrico)

- Working Gorups:
 - Hydrogen Production
 - RCS



IEA, International Energy Agency

- TASKs Participation
- Working Group Leader TASK 24
 - Integration of wind power and hydrogen
 - Participation of 9 countries

Training and Dissemination activities



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Conferences:

Participation in the organization of Conferences, seminars and days of scientific and technical support:

II European Hydrogen Energy Conference, EHEC 2005, Zaragoza 2005



III Congreso Nacional de Pilas de Combustible, Zaragoza 2008



III European Hydrogen Energy Conference, EHEC 2014, Sevilla 2014



Promotion of WHEC 2016 in WHEC 2012 y 2014



XX World Hydrogen Energy Conference, WHEC 2016, Zaragoza 2016



III Congreso Iberconappice 2017, Huesca 2017



IV European Hydrogen Energy Conference, EHEC 2018, Málaga 2018



Colaboratives Initiatives



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1. Private R&D&i Partnerships
2. Public R&D&i Partnerships
3. Public-Private R&D&i Partnerships
4. Collaboration Agreements
5. Training
6. Technology Transfer Agreements



Grupo Investigación reconocido
H2+I: Hidrógeno para la Investigación

PLAN ESTATAL DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA Y
DE INNOVACIÓN 2013-2016



Experience in collaborative projects



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BIG HIT	DEMO4GRID	VERTEGAS	H2PIYR
 Web oficial 	 Web oficial 	 Web oficial 	 Web oficial
ELYPLUS	SOFT-CDC 4.0	INSTUNH2	HYLAW
 Web oficial 	 Web oficial 	 Web oficial 	 Web oficial
QUALYGRIDS	VUELTAH	15NRM03 HYDROGEN	ELYNTEGRATION
 Web oficial 	 Web oficial 	 Web oficial 	 Web oficial
METROHYVE	SUSTAINHUTS	HYTECHCYCLING	ELY4OFF
 Web oficial 	 Web oficial 	 Web oficial 	 Web oficial

Experience in collaborative projects



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H2PiR (POCTEFA – INTERREG)

Hydrogen corridor for the Pirineos / Pyrénées France – Andorra – Spain



ELY4OFF (FCH JU) <http://ely4off.eu/>

PEM ElectroLYsers FOR operation with OFFgrid renewable installation



BIG HIT (FCH JU) <https://www.bighit.eu/>

Building Innovative Green Hydrogen systems in an Isolated Territory. A pilot for Europe



ELYNTEGRATION (FCH JU) www.elynegration.eu

Grid Integrated Multi MegaWatt High Pressure Alkaline Electrolysers for Energy Applications



SUSTAIN HUTS (LIFE+) <http://sustainhuts.eu/>

Sustainable Mountain Huts In Europe



HYTECHCYCLING (FCH JU) <http://hytechcycling.eu/>

New technologies and strategies for fuel cells and hydrogen technologies in the phase of recycling and dismantling

ELY4OFF

PEM ELECTROLYSERS FOR OPERATION WITH OFFGRID RENEWABLE INSTALLATIONS



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Available at demo site
(Huesca)

Scope to be developed
in ELY4OFF

Already existing in FHA
(updating of storage
foreseen within ELY4OFF)

Already existing
in FHA



This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 700359. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Hydrogen Europe and N.ERGHY. The budget of the project is 2.315.217€

More Info: www.fch.europa.eu
<http://ely4off.eu>

SUSTAINHUTS

HYDROGEN



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Lizara	Bachimaña	Estós	La renclusa	Cap de Llauset	Doftana Valley	Rifugio di Torino	Pogačniko v dom	Kocbekov dom
1540 m	2200 m	1890 m	2140 m	2450 m	800 m	3375 m	2050 m	1808 m
ES	ES	ES	ES	ES	RO	IT	SI	SI

21% t/y and hut of CO₂ avoided
0,5 t/y and hut of NOx avoided
20% energy reduction in each hut
3 helicopter trips per year reduced
1 t/y and hut of kerosene avoided

4 workshops in different EU countries
2 networking events
Guided visits to demo huts
4 brochures to raise awareness
4 general and 3 technical guidelines
1 recommendation guideline for authorities



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BIG HIT

A new concept, hydrogen Territories

www.bighit.eu



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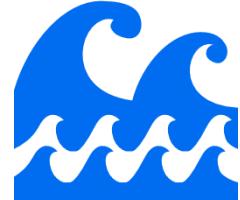
RATIONALE: ORKNEY ISLANDS



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20 islands
~20.000 inhabitants

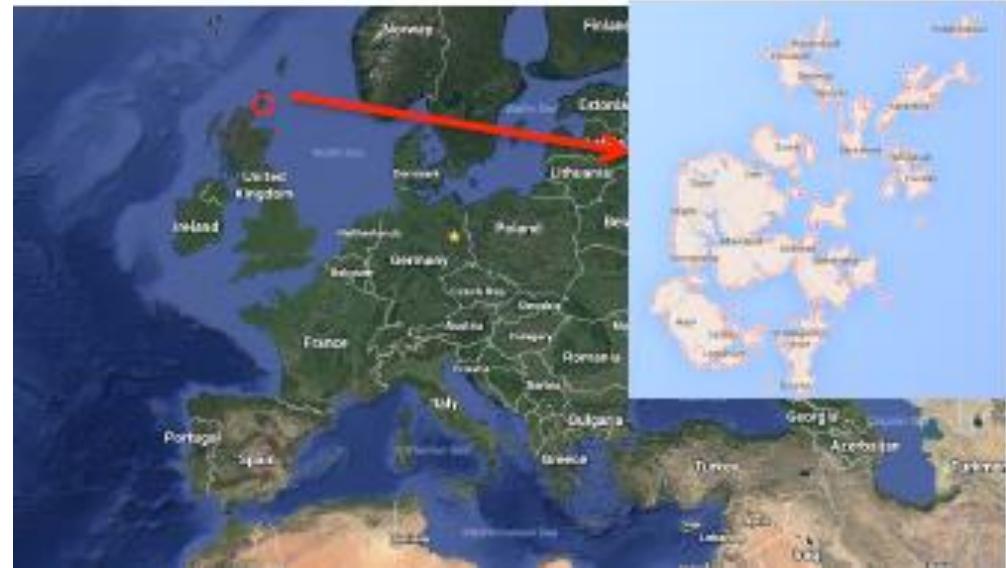
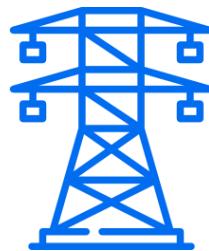


58MW RES
47MW wind+ 11MW wave/tidal

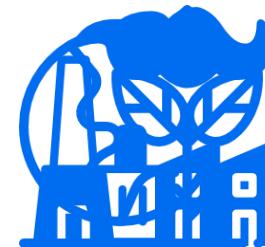
Orkney-UK interconnector
30MW capacity

Electricity grid overloaded

30% curtailment



**Transition to low carbon economy,
meeting electricity, transport and heat
via hydrogen**



BIG HIT

How did we land there?



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Memorandum of Understanding SHFCA – FHa

September 2015



BIG Hit Project
FCH JU Call 2015



Trade Mission SHFCA – FHa in Aragon
February 2017
Participation Scottish and Aragonese Governments



BIG HIT

12 PARTNERS FROM EUROPE



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1) Industry + 2) Research & Education + 3) Public Administration + 4)Civil Society



CALVERA



ITM POWER
Energy Storage | Clean Fuel



SYMBIO

ZERO EMISSION MOBILITY
SOLUTIONS



GIACOMINI
WATER E-MOTION



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



**ORKNEY
ISLANDS COUNCIL**



**Community
Energy
Scotland**
Empowering Communities



Innovate UK



Highlands and Islands Enterprise
Iomairt na Gàidhealtachd's nan Eilean



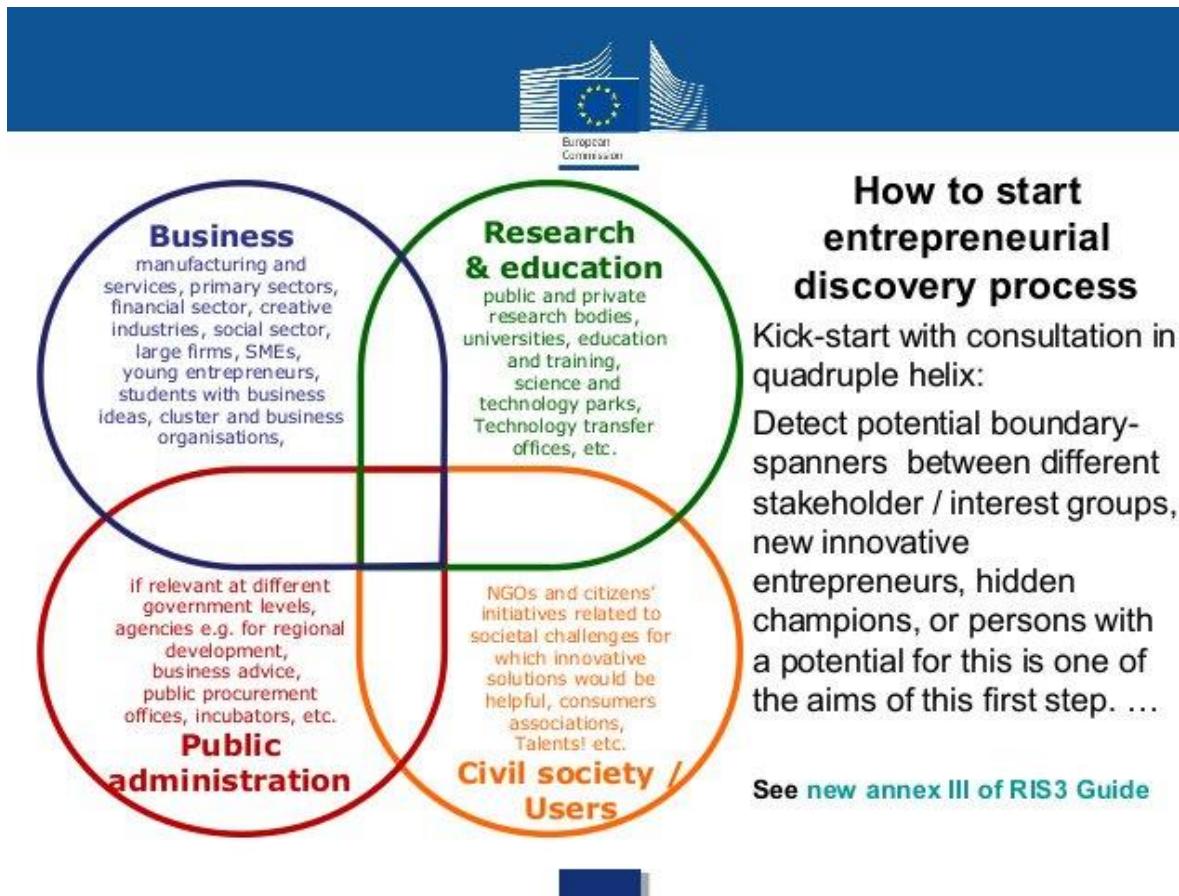
BIG HIT QUADRUPLE HELIX



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Committee of the Regions. European Union, 2016.

Using the Quadruple Helix Approach to Accelerate the Transfer of Research and Innovation Results to Regional Growth



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BIG HIT PROJECT STATUS



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- **Commissioned first H2 production site - Green H2 being produced from tidal & wind electricity on Eday**
- **Second production site ongoing installation**
- **Trial runs for transportation of H2 on the ferries ongoing**

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- Five EV/H2 vehicles already in Orkney – first refilled with local green hydrogen completed!)
- CHP unit at the harbour commissioned and providing auxiliary power to ferries (fuelled by local green hydrogen!)
- Developing replication, social studies & business models (added value!)



BIG HIT

LOCAL & WIDER BENEFITS – IMPACT



- Pioneer pilot project – first in Europe as validated by EC (visibility, exposure & public awareness of potential of H₂ as energy vector)
- Validates commercial/ownership models for integration of RES locally via local hydrogen (H₂ Valleys case study)
- Delivery of local & national Low Carbon Economic & Energy Strategy
- Boosts local economy including development of local skills & qualified jobs in emerging technologies
- Overcomes grid constraints and harness local (otherwise curtailed) renewable resources (wind & marine)
- Reduces (grid) investment & improves grid load management (optimizes use of electricity assets and local grid)

BIG HIT LESSONS LEARNT



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Project development

- Co-funding complexity
- Adequate budget & contingency
- Management of community expectations (don't overpromise!)
- Consider local & national strategy/policy background



Project delivery

- Financial flexibility (prioritize)
- Technical complexity (flexible timescales)
- Account for complexity of logistics & impact on local community
- Management of stakeholders & public perception

BIG HIT

BUILDING INNOVATIVE GREEN HYDROGEN SYSTEMS IN ISOLATED TERRITORIES



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The BIG HIT project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 700092. The Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme.

More Info: www.fch.europa.eu

<https://www.bighit.eu>



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THANK YOU VERY MUCH FOR YOUR ATTENTION
