



BIG HIT



Hydrogen Territories / Valleys: a pilot for Europe BIG HIT Project

Dr E. Troncoso, Aragon Hydrogen Foundation
Mission Innovation H2 Valleys Workshop
Antwerp, 26-27th March 2019



FOUNDATION FOR THE
DEVELOPMENT OF NEW
HYDROGEN TECHNOLOGIES
IN ARAGON



CALVERA



Technical University of Denmark



ITM POWER
Energy Storage | Clean Fuel

Symbio FCell



GIACOMINI
WATER E-MOTION



BIG HIT
Grant Agreement no.: 700092

AGENDA

- 1) Hydrogen in the Energy Transition:
Locally-Integrated Energy Systems (H₂ Territories/Valleys)
- 2) Case study: the BIG HIT project
- 3) Lessons learnt & next steps

Energy Transition & Local Energy Systems



Next steps:

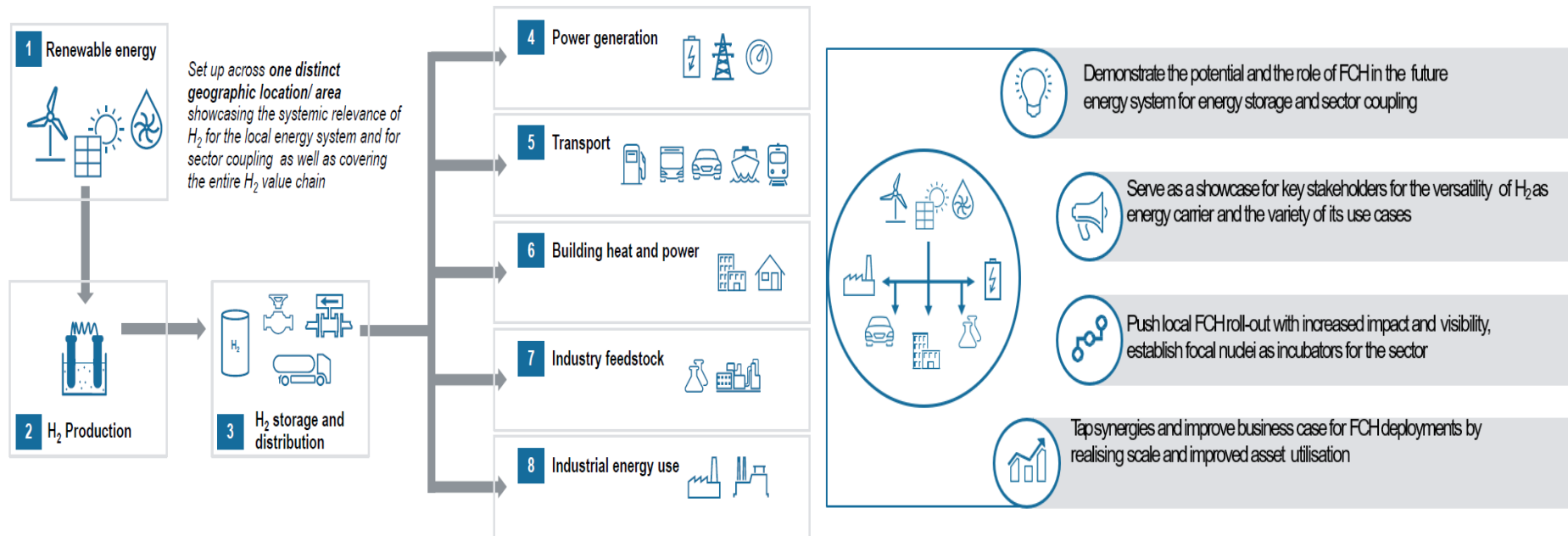
- 1) Integration of heat & power, transport, industrial low carbon end-uses
- 2) Energy vectors (electricity, hydrogen, biogas)
- 3) Development of integrated RES-based energy systems



Requires integrated supply/demand infrastructure

Hydrogen Territories/Valleys concept

Conceptual overview of a H₂ Valley



[Credit/REF: FCH JU study by Roland Berger 2018]



PROJECT SUMMARY

- Project topic: Hydrogen Territories, H2020 FCH JU & Scottish Gvmt co-funded
- 12 partners from across EU + project supporters
- Main goal: demonstration of an integrated energy system based on hydrogen
- Project dates: 2016-2021
- % stage of implementation 01/02/2019: [50%]
- Total project budget: [circa. 13m€]
- EU/FCH JU grant contribution: [5m€]



Technical University of Denmark

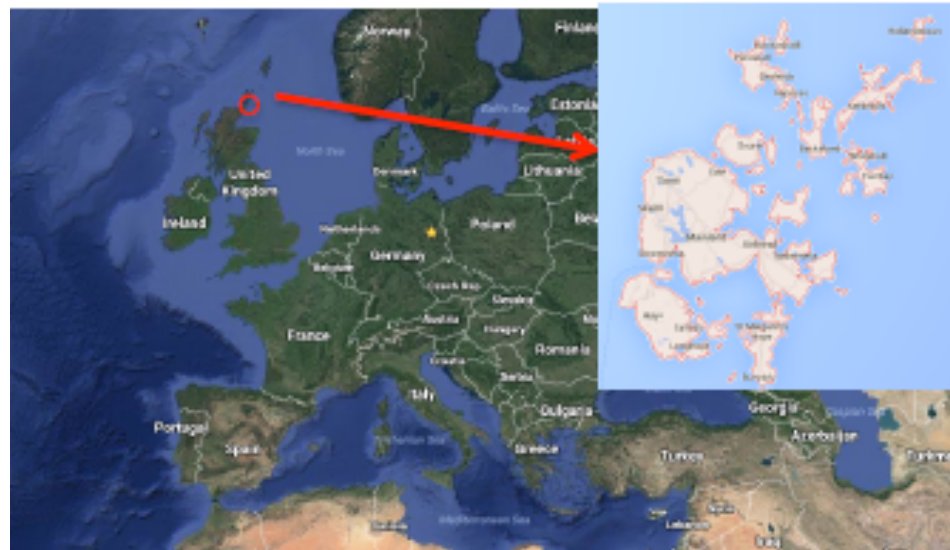




PROJECT RATIONALE

Orkney Islands

- ✓ 20 islands, population 21 000
- ✓ 58 MW of RES (wave/tidal + wind)
- ✓ Orkney-UK interconnector 30MW capacity



Electricity grid overloaded (> 100% of demand from RES) = Significant curtailment



Transition to low C economy, meeting electricity, transport and heat locally via hydrogen

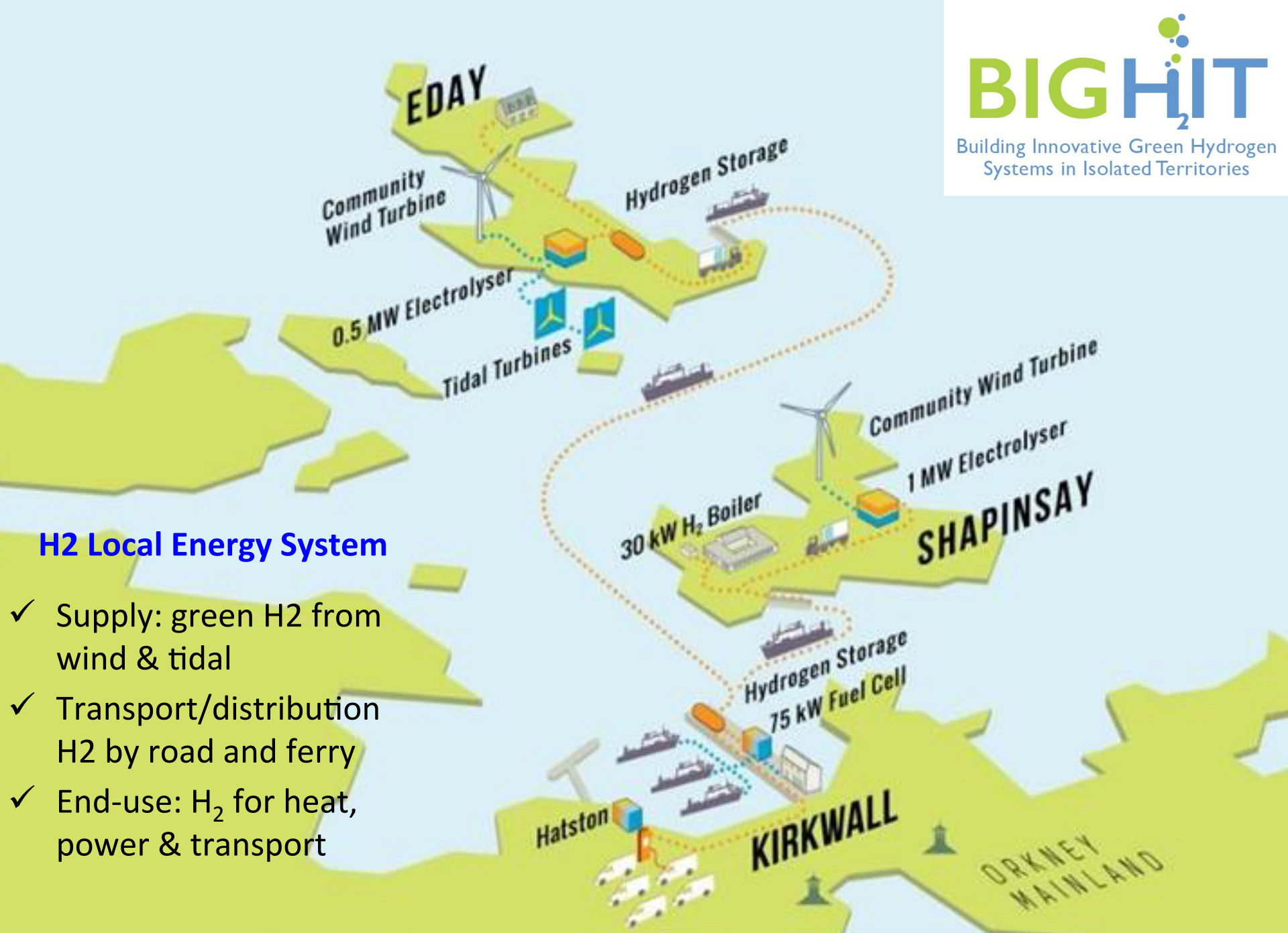


OUTCOMES & WIDER IMPACTS

- ✓ Pioneer pilot project – first in Europe as validated by EC (visibility, exposure & **public awareness** of potential of H2 as energy vector)
- ✓ **Validates commercial/business models** for integration of RES locally via local hydrogen (H2 Valleys case study)
- ✓ Delivers local & national Low C Economic Strategy
- ✓ **Socio-economic benefits**: 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 load management (optimizes use of electricity assets and local grid)

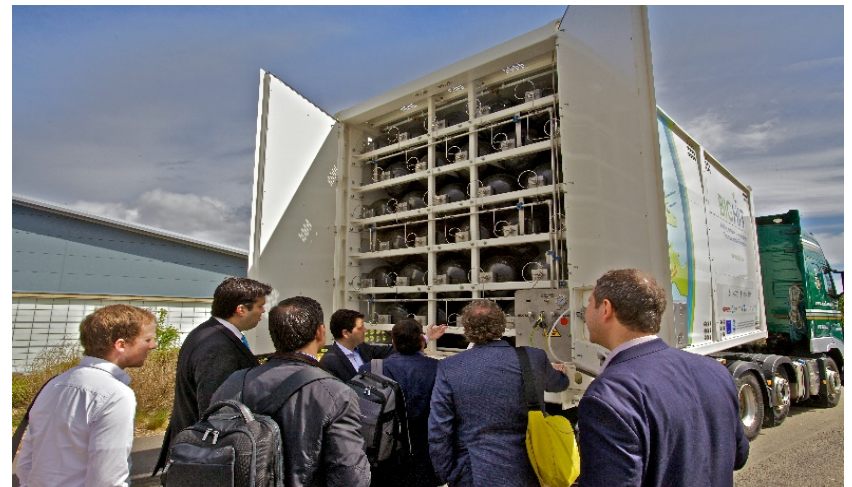
H2 Local Energy System

- ✓ Supply: green H₂ from wind & tidal
- ✓ Transport/distribution H₂ by road and ferry
- ✓ End-use: H₂ for heat, power & transport





BIGHIT₂





LOGISTICS: Transportation of Hydrogen Across Islands



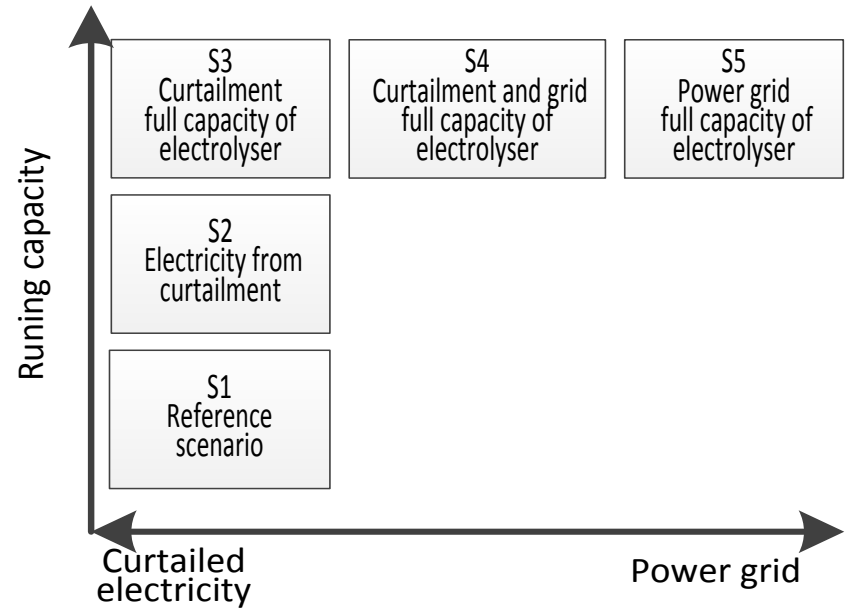
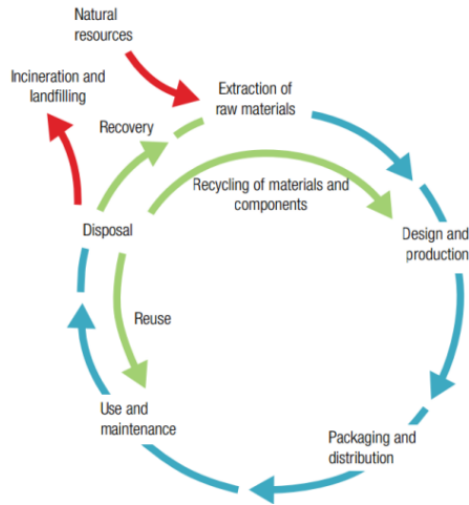
- ADR & Maritime certification – new legislation/standards being created!
- Weight, space & safety restrictions
- Training - ferry crews and emergency services

Lessons learnt replicable to other demo projects & regions!



BIG HIT

SOCIO-ECONOMIC IMPACT ANALYSIS COMMERCIAL & LOCAL BUSINESS MODELS



Social impact survey to partners / suppliers of BIG HIT project
 (Some of the questions are mandatory, some are optional for full answers. All are optional.)

1. Which company/organisation are you? (Name of the company/organisation, location (country and city))

2. How many employees are engaged in the BIG HIT project in your company/organisation? (Just full-time and part-time)

3. What are the nationalities of the engaged employees? Please provide nationalities and number

4. What is the age of the engaged employees?

5. Which type of employment do the employees involved in BIG HIT have? (Full-time contract, Part-time contract, No)

6. Usually, what are the average working hours per week at your company? (Please provide the number)

8. How long has your company had contracts with materials/components suppliers for the BIG HIT project? (Contract type, No. of contracts, Long-term contracts, Short-term contracts)

9. How long has your company had contracts with non-material product suppliers (e.g. services, construction) for the BIG HIT project? (Contract type, No. of contracts, Long-term contracts, Short-term contracts)

10. Do you have any other cultural heritage because of BIG HIT in the ordinary business? (Yes, please specify - what kind of cultural heritage?)

11. Do you think the BIG HIT project can help with the technological innovation in your company? (Yes, slightly, Yes, very much, No, strong contribution)

12. Does your company take part in community engagement activities regarding this project? (Yes/No, if yes, what was the first one, how often?)

Other kind of engagement activities: (Involvement in networks, Information bulletin from website, Information bulletin at a central point, Information meetings, Consultation meetings, Other)

Hydrogen Fuel Cell Technology in the Local Community Heat and Power

Demographic
 This section is correct for the sole purposes of defining different companies and areas.

Sex
 Male
 Female
 Other

What age are you?
 0-10
 Male (10-19)
 Male (20-29)
 30-39
 40-49
 50-59
 60-69
 70-79
 80-89
 90-99

Where is your current home?
 Mainland (UK/Spain)
 Mainland (Other)
 City
 Shipshape

Where were you raised?
 1-10



Lessons learnt - Project Risks and Challenges

Financial & Regulatory challenges

- ✓ Co-funding complexity
- ✓ Contingency in budget & timescales

Technical & Operational risks

- ✓ Allowances for complex Project Management, Engineering & Integration
- ✓ Operational competence: local training & up-skilling
- ✓ Logistical challenges (geography, materials, climate)

Stakeholder Engagement

- ✓ Manage stakeholder expectations (don't overpromise)
- ✓ Ongoing local community involvement

The screenshot shows a risk management dashboard with a navigation bar at the top containing icons for various project areas: Summary for publication, Publications, Milestones, Critical Risk (highlighted), Publications, Operational, Policy (PI), Innovation, SME Impact, Gender, and ESI Regulation. Below the navigation bar, there are two main tables: 'Critical Risks' and 'Unforeseen Risks'.

Critical Risks (Annex 4)

Number	Description	Work Package No.	Risk Mitigation Measures	Date of the Last Reference Reporting Period	Date of the Last Mitigation Measures Applied	Date of the Last Risk Materialized	Date of the Last Comments	Actions
1	The catalytic boilers only output 50C heat, which is insufficient for space heating	3	The boilers will be used as a pre-heat, and the existing diesel boilers will be used to	1	No	Yes		X
2	Electrolyser unable to cope with direct connection to wind turbine	3	PEM technology is more suited to the varying input that alkaline. A grid connection	1	No	No		X
3	A failure of the hydrogen supply chain will result in a lack of heating in 2 schools, ha	4	The schools will retain their existing diesel boilers and the harbour will keep its exis	1	No	No		X
4	Hydrogen production varies seasonally in response to the availability of curtailed vie	4	The inclusion of the H2 turbines helps smooth the seasonal wind variability the de	2	No	No		X

Unforeseen Risks

Number	Date the Risk was added	Description	Work Package No.	Risk Mitigation Measures	Date of the Last Reference Reporting Period	Date of the Last Mitigation Measures Applied	Date of the Last Risk Materialized	Date of the Last Comments	Actions
U1	29 Jun 2017	High cost of the civil works in an isolated territory like the Orkney islands	3	PIK as coordinator, with the support of the UK partners, is seeking for additi	2	Yes	Yes		X
U2	29 Jun 2017	5 units of the RE-FCV (PEM from SymbolFC) already in Orkney but without 1	3	The FC can be damaged if the H2 tank is empty for months, not being able to s	2	Yes	Yes		X
U3	03 Sep 2018	Water connection to the hydrogen production site in Shapinsay not available	4	Use water bring to the place using different sources to maintain the electrolyz	2	Yes	Yes		X
U4	03 Sep 2018	Safety Review of the Shapinsay school takes longer than planned adding delay		Safety will be the first priority always in the project. To avoid delays or safety	2	No	No		X
U5	03 Sep 2018	Inclusion of contingency plan and updated risk register		The project Management Implementation Risk Analysis & Contingency Plan ha	2	No	No		X

COMPLEX BUT IT IS POSSIBLE, HAPPENING AND IT IS REPLICABLE!



Building upon BIG HIT – Next Steps

- ✓ 2018: > 45m€ investment in place for hydrogen deployment in Orkney
- ✓ Next: replication & co-operation with other EU regions



Ongoing

- FC-H2 Ferry demo H2020 HYSEAS III Project
- H2-ICE ferry feasibility HyDIME project
- Grid load management Interreg ITEG Project
- Industrial H2/O2 applications study

Under planning/assessment

- Mobility: HGVs, mini-buses
- Commercial & domestic/community heating
- FCH-based port equipment & onshore power

**Hydrogen Local Energy System
Development**



THANKS FOR YOUR ATTENTION – QUESTIONS?



Contact:

Project coordination:

Dr Enrique Troncoso

etroncoso@systemgconsulting.co.uk

Jesus Simon

jsimon@hidrogenoaragon.org

Dissemination & communication:

Dr Nigel Holmes

Nigel.holmes@shfca.org.uk