



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

EVERYWH2ERE

Making Hydrogen affordable to
sustainably operate Everywhere in
European Cities



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Programme Review Days 2019

Brussels, 19-20 November 2019

PROJECT OVERVIEW



- **Call year:** 2017
- **Call topic:** FCH-02-10-2017 - Transportable FC gensets for temporary power supply in urban applications
- **Project dates:** 1/2/2018 – 31/1/2023
- **% stage of implementation 01/11/2019:** 25 %
- **Total project budget:** 6 762 324,46 €
- **FCH JU max. contribution:** 4 999 945,76 €
- **Other financial contribution:** - €
- **Partners:** VTT, PCS, FHA, GENPORT, ENVI PARK, THT Control, MAHYTEC, LINDE Gas Italia, D1, ICLEI ES, ACCIONA, FRIEM



PROJECT SUMMARY



MISSION

Temporary diesel gensets are used everywhere in our cities (fairs, markets, construction sites, temporary events and concerts...) and Non-road diesel engines account for 5-10% of fine-particle pollution in urban environment. **Fuel cell (FC) can easily replace these technologies promoting 0 noise, 0 emission temporary generation.** The main objective of EVERYWH2ERE project is to demonstrate at TRL8 easy to transport “plug and play” FC gensets. Demonstration results will be capitalized for replication, business model, environmental and logistic analysis.

PROJECT SUMMARY



TRL 8 – Plug and Play – Reliable

0 emission – 0 Noise

Interesting for Cities and Events' Organizers

A DEMONSTRATION TO MARKET PROJECT!

PROJECT PROGRESS/ACTIONS


Project Main Objectives

MO1: Capitalize EU FC industry expertise and close to market products in automotive/backup power communication sectors, towards the design of reliable, easy to use transportable FC gensets (**WP1**) – **DONE!**  **BOP** 

MO2: Realization and demonstration of eight PEMFC transportable gensets (4x25 kW and 4x100 kW) integrated with pressurized H₂ storage (**WP2-3-4**) – **in progress**  

MO3: Leverage demonstration campaign for the future techno-economical replicability of the FC gensets (**WP5-6**) – Realization of a Logistic Decision Support tool – **capitalizing demo results**     

MO4: Demonstration of economic viability, safety and environmental sustainability of the novel solutions (**WP5-6**) – Realization of replication feasibility studies and an E-Handbook for replication – **First LCA analysis, first cost evaluation and suitable costs for market launch**

MO5: Communication, dissemination and preparation of the future deployment of the new EVERYWH2ERE gensets through public and private stakeholders engagement (**WP7**) – Stakeholders and City Groups - **on-going: strong interest even from new markets (Film commission) and energy utilities** 

PROJECT PROGRESS/ACTIONS – Design and Realization of the Prototypes

WP1 (completed) – WP2 – WP3 – WP4 (on going)



CAPEX: project quite aligned with the target value. Potential scale up costs can achieve up to 1500-2000 €/kW (without storage)

Efficiency - Lifetime: first FC SuSy validation test currently on going – PCS will send the SuSy to the integrator within end of November

Lifetime: up to 2000 hrs could be achieved (To be evaluated the aspects related to the part load how much affect this KPI)

Storage: MAHY bottles designed and TPED tested and certified

Hydrogen conditioning and management: use of standard components, not large effect

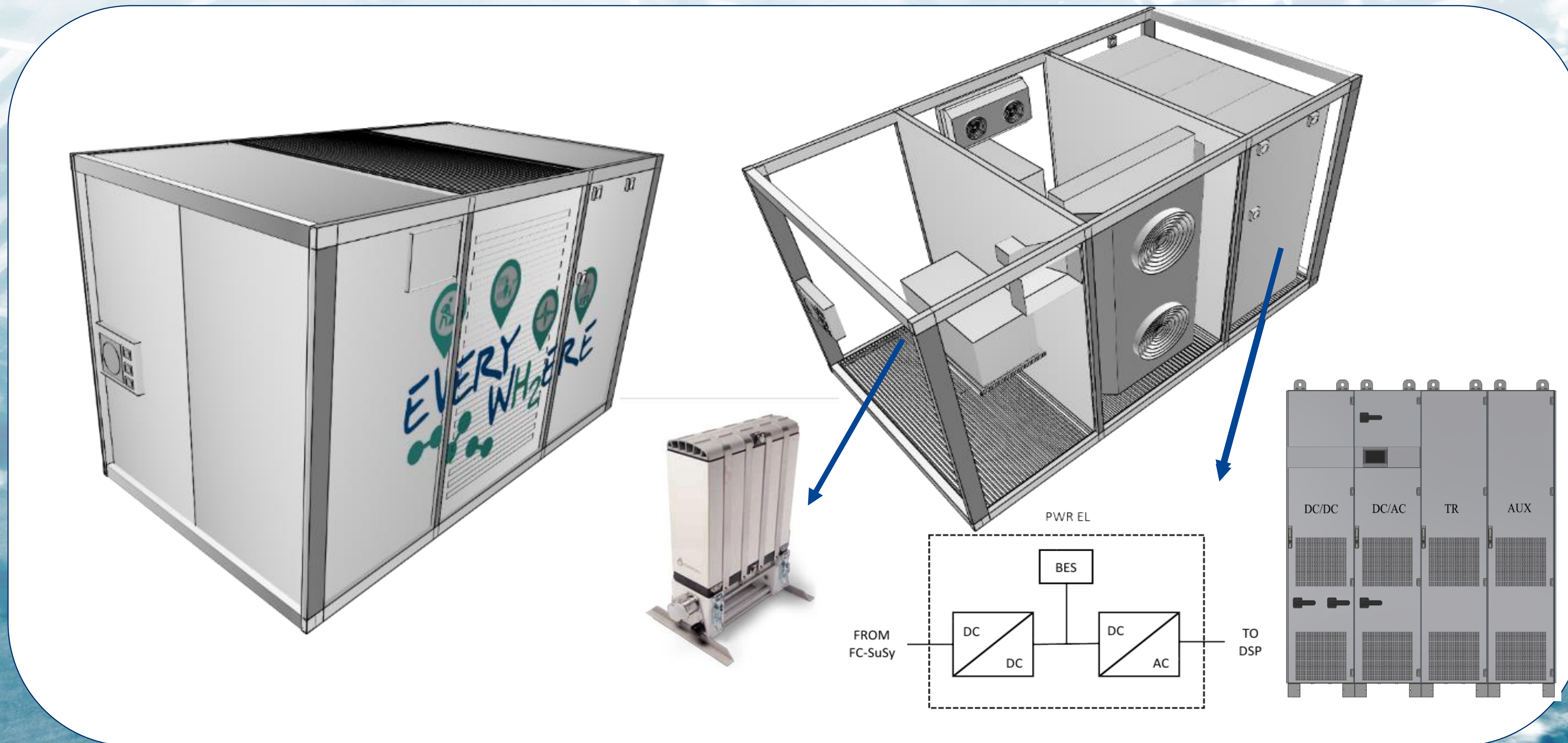
• CHALLENGES:

1. identify suitable power converters/battery integration to guarantee a “grid operation” with Diesel genset/Grid connection



2. cold storage and functioning

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SPECIFICS	25 kW GENSET	100 kW GENSET
Rated kVA	25	100
Electric out	230/400 Vac 50Hz	230/400 Vac
DC net out at max cont power	234 A ; 153 V (from the stack)	450 A/300 V
Voltage Regulation Method	Off grid inverter	Off grid inverter
Fuel	Pure Hydrogen (10 bar)	Pure Hydrogen (10 bar)
Fuel Cell System @POWERCELL	PCS MS-25 SuSy, S2 stack with 264 cells	PCS MS-100 SuSy, S3 stack with 455 cells
Maximum Gross Weight of the FCS container/part (kg)	Ca. 1800	Ca. 1800
Dimensions L x W x H (mm) of the FCS container/part	10ft container (3050 x 2440 x 2590), about half of space occupied by FCS	10ft container (3050 x 2440 x 2590), about half of space occupied by FCS

H2 STORAGE SPECIFICS@MAHYTEC and LINDE integration	25 kW GENSET	100 kW GENSET
Number of tanks in the system	3	9
Total volume of the tank	660L (3 x 220L)	1980 L (9x220 L)
Mass of H2 stored (at 350bar)	15,6kg (3 x 5,2kg) at 15°C	
Maximum refilling pressure	525bar	
Temperature of use	-20°C to +65°C	
Certification	TPED	
Dimensions (single tank)	L 2200mm / diam 488 at the largest	

PROJECT PROGRESS/ACTIONS – Design and Realization of the Prototypes

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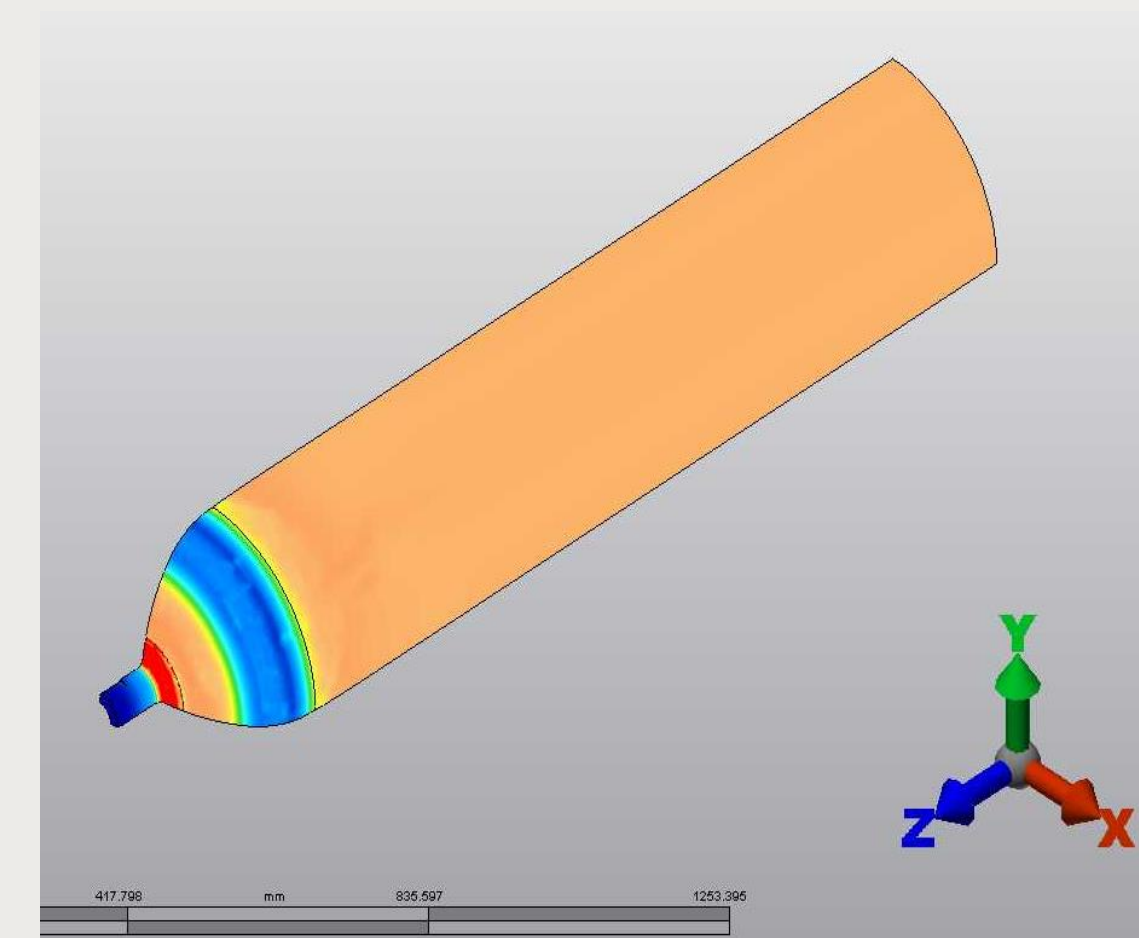
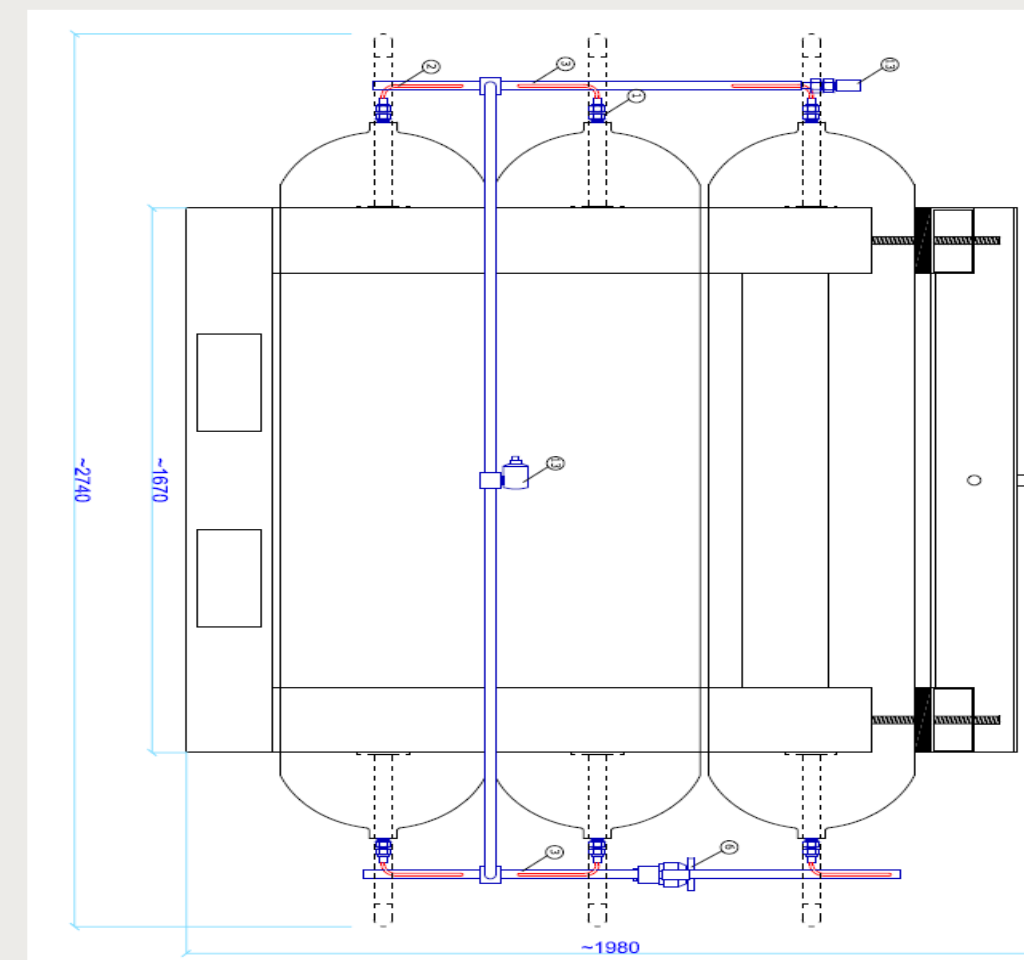
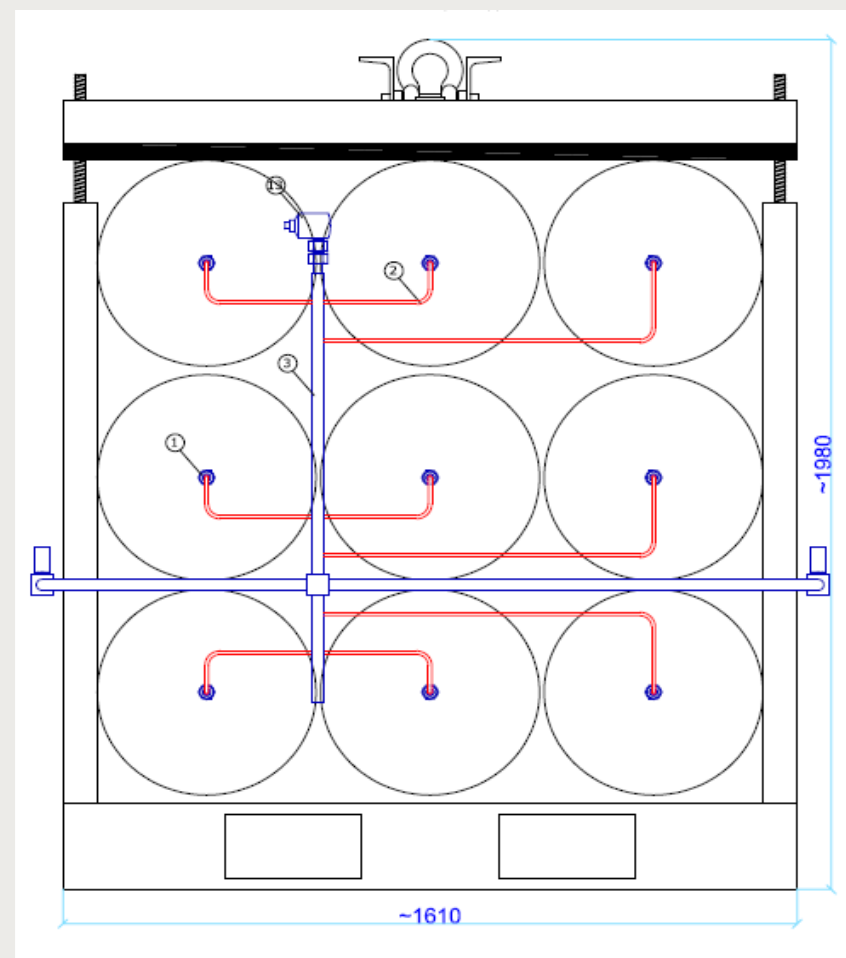
Achievement to-date

First of its kind FC
based genset



CAPEX: up to 5500 €/kW
Efficiency >50%
Lifetime up to 2000 hrs

Storage: MAHY bottles designed and TPED tested and certified

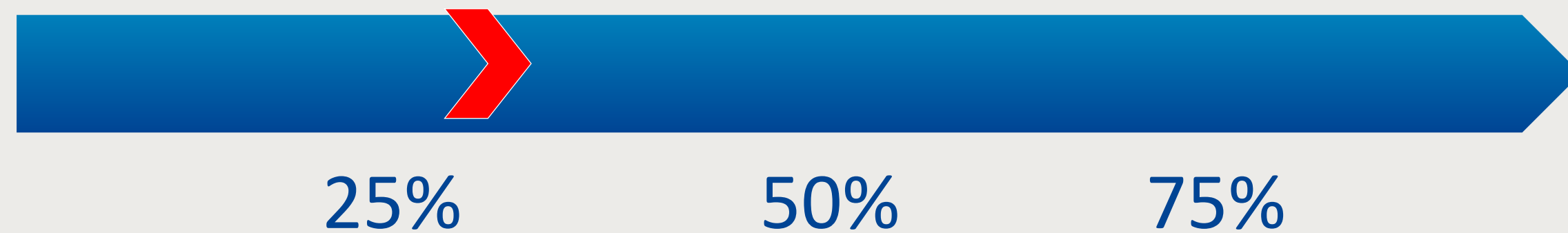


PROJECT PROGRESS/ACTIONS – Demonstration Campaign – WP4



Achievement to-date

Demonstrate
FC Gensets in
festivals and
construction sites



Two years of
events and
operations

Analysis of permitting and regulatory aspects: RISK!

Demo engagement phase on-going (realization of a Demonstration kit including a mini-HSE analysis and other relevant documents to study the permitting at local level)

Genset validation campaign in March 2020 in FRIEM Lab

First demonstration (1x25 kW + 1 x100 kW) to be started in summer: Wacken Festival in Germany and SlowFood Events in Italy engaged

Interaction on-going with some relevant stakeholders (Energy utility and Rental companies) also for contractual aspects

- **CHALLENGES:**

1. **PERMITTING ASPECTS:** every demosite is affected by local Fire Department acceptance (same procedure of ICE, but....)
2. **Demonstration management:** we have to work like a “rental company”, but none of the partners is a rental company!
3. **Hydrogen storage re-fill issue**

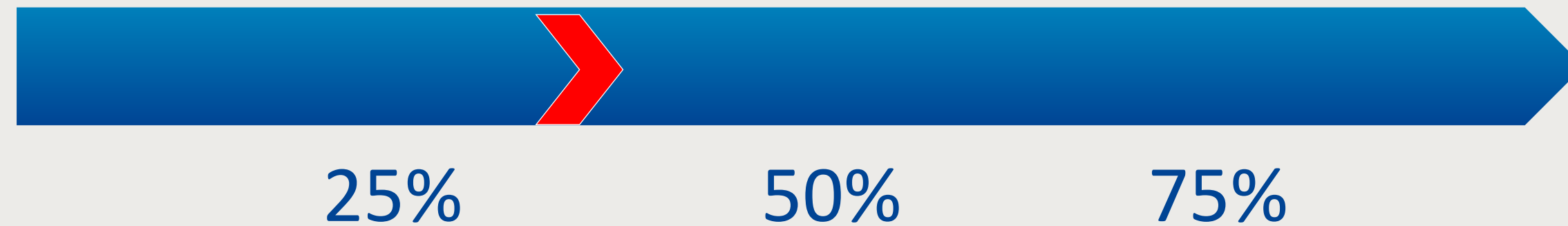


PROJECT PROGRESS/ACTIONS – Economic and Environmental Impact Assessment – WP5 – WP6



Achievement to-date

Evaluate techno-economic viability and environmental friendliness



Full LCA/LCC
Logistic analysis
Business models

LCA: first LCA realized by VTT on the 25 kW genset (Aspects related to Hydrogen origin are crucial)

Short term rental is the market! (>40% of cost is logistic/shipping whose costs are equal in case of hydrogen or diesel!)

Importance of Green Hydrogen for short term business models

BUSINESS MODELS: one more rental company oriented (who will purchase Hydrogen externally), one more energy utility oriented (own hydrogen)

• CHALLENGES:

1. LCOE is not a problem (currently up to 1€/kWh is acceptable somewhere), but Rental companies cannot accept to purchase a genset that cost more than 1000-1200 €/kW as CAPEX
2. Short term rental is techno-economically viable (different drivers than cost-only), but what about long term (i.e. construction)

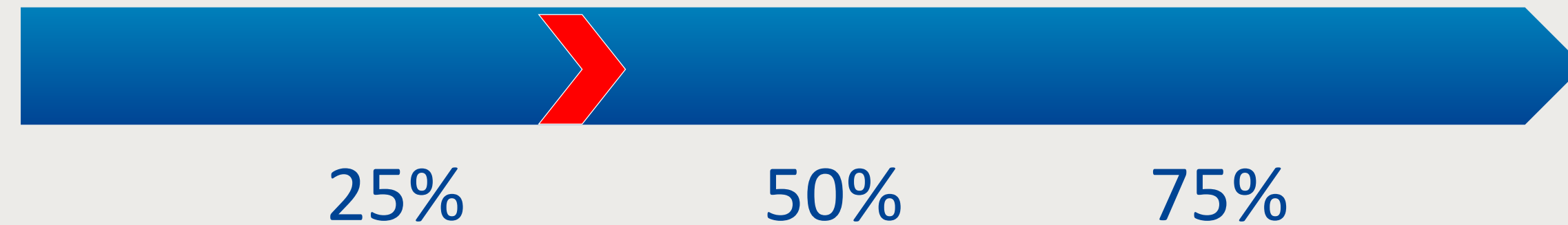


PROJECT PROGRESS/ACTIONS – Economic and Environmental Impact Assessment – WP5 – WP6



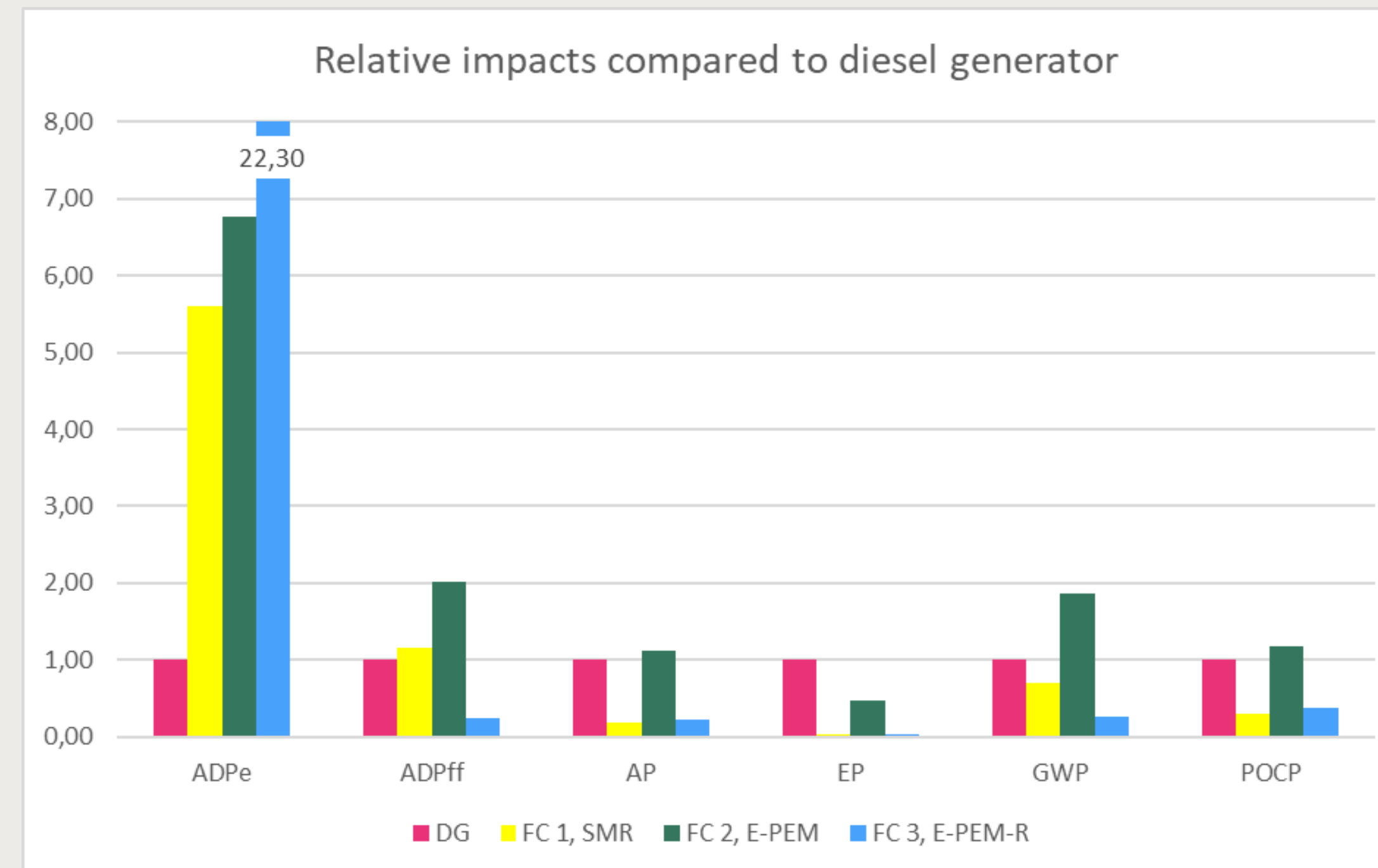
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Achievement to-date

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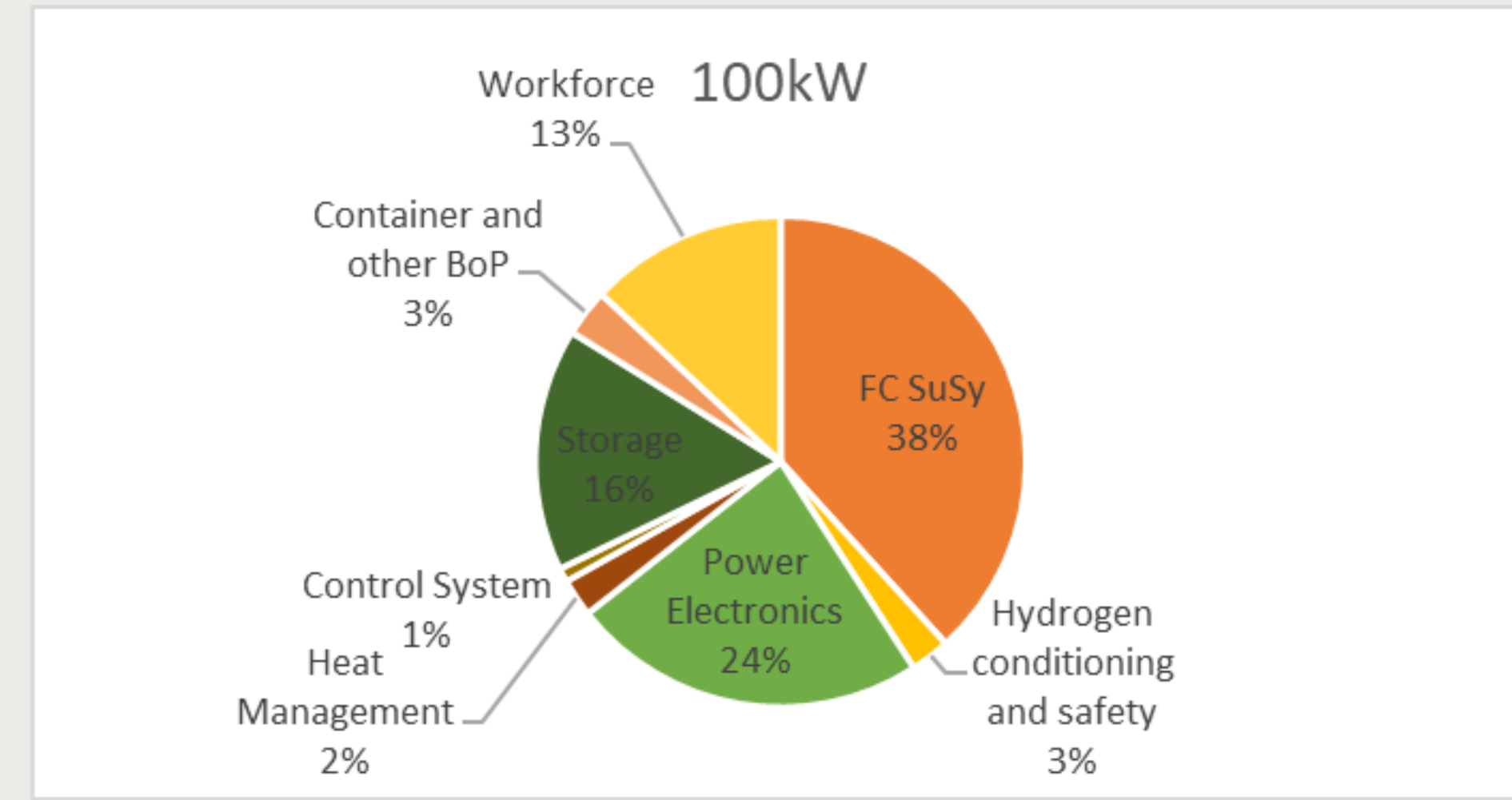
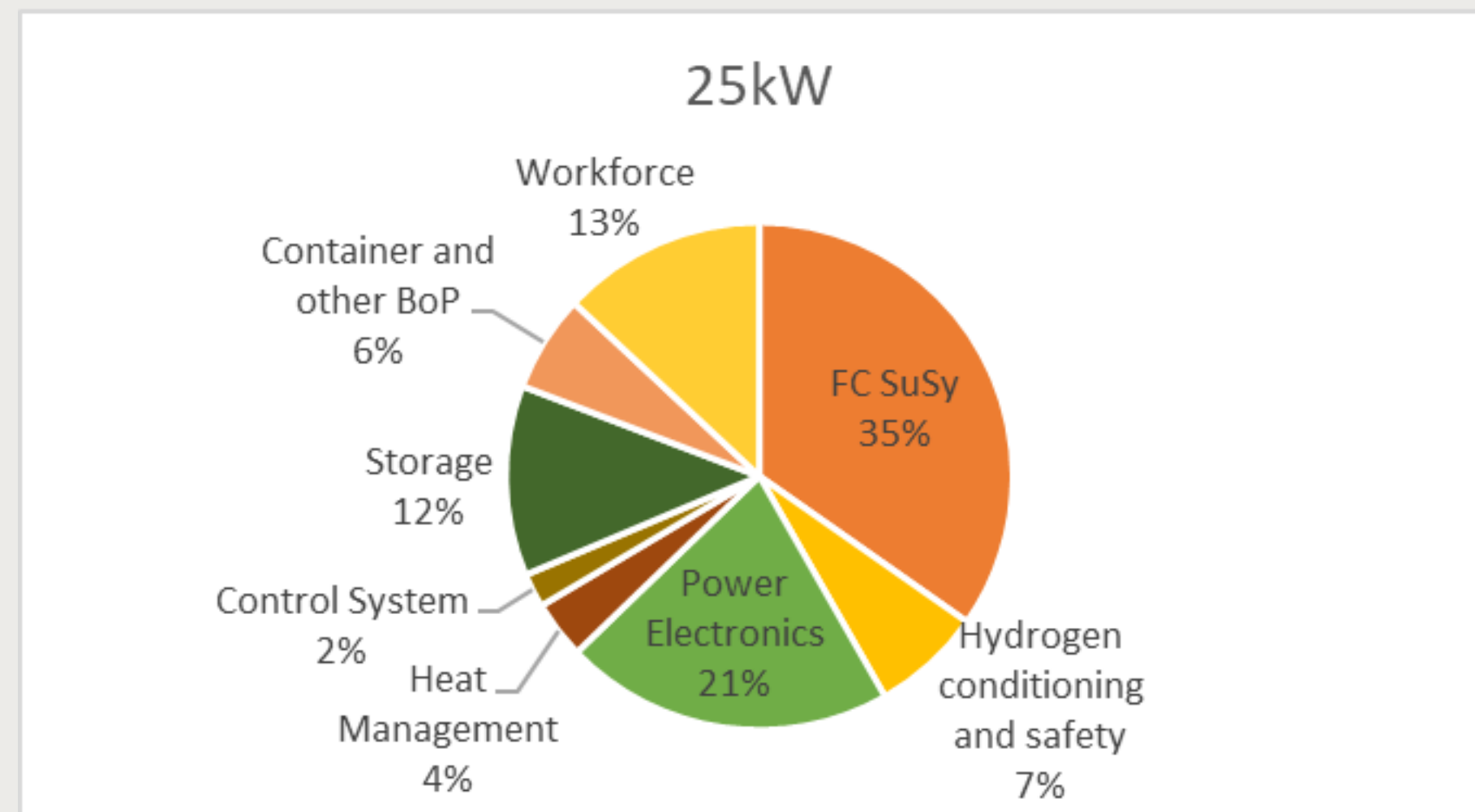
25%

50%

75%

Full LCA/LCC
Logistic analysis
Business models

CAPEX: project quite aligned with the target value. Potential scale up costs can achieve up to 1500-2000 €/kW (without storage)



Risks and Challenges



The technical more difficult aspect to compete with diesel genset is storage size and handling!

Hybrid Diesel+battery are the competitors! (CAPEX around 500€/kW)

Events are asking GREEN HYDROGEN: how to bring it to them?

Permitting aspects: absence of regulation is a big issue, as all gensets (also ICE ones) have to be allowed time by time by local fire department for temporary events. For construction sites, aspects related to pressurized storage on site is not trivial!

Stakeholders are super interested to FC gensets and are ready to pay more for short term rental, but... who will take care of CAPEX?

Policy to promote 0 emissions gensets in urban areas: this could facilitate FC genset penetration



Communications Activities



Strong Dissemination and Communication Potential also to explain FCH technologies to new sector and wide audience

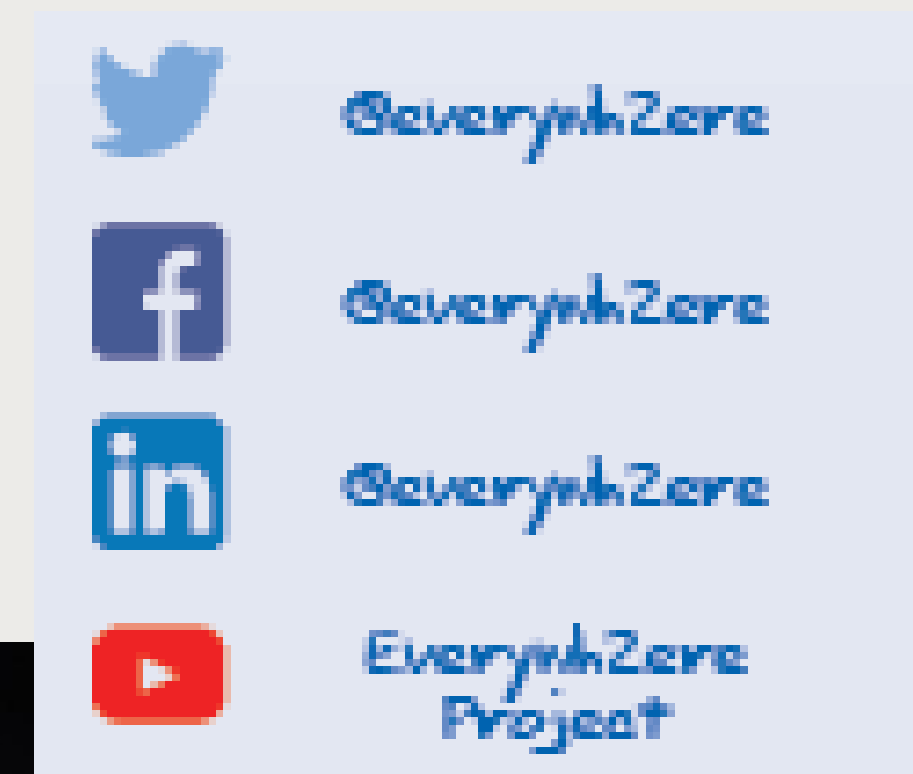
HOW TO CAPITALIZE SUCH POTENTIAL?

Continuously Updated website: www.everywh2ere.eu

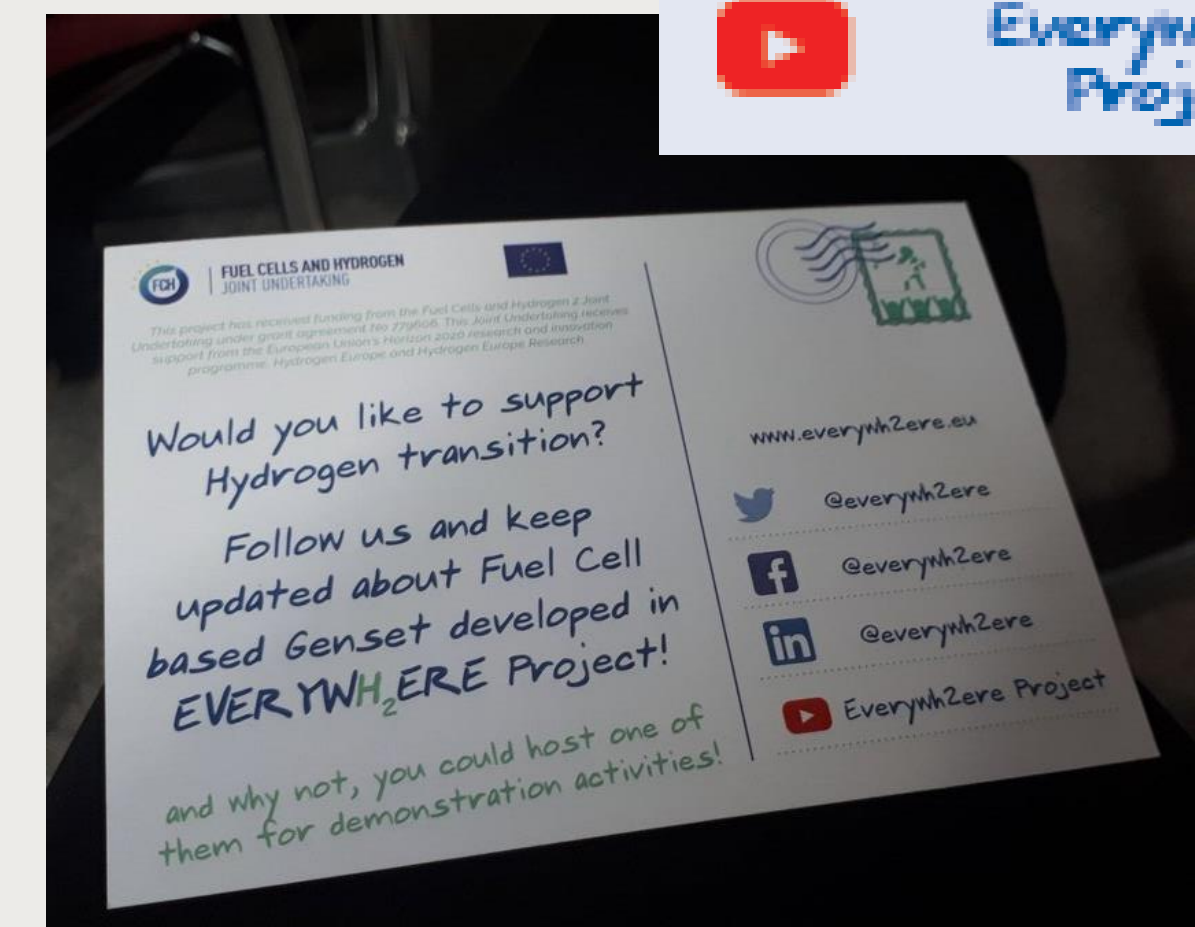
Quite good interaction in social media

New and dedicated dissemination/communication material
(i.e. Project Video, DEMO KIT, Demonstration postcard, H2Corner etc.)

Participation to several events particularly for engaging demosites and stakeholders



A NICE AND MOTIVATED CONSORTIUM!



Dissemination Activities

- Engagement of Music Sector thanks to D1: EU Music sector wants sustainability and talks about hydrogen now!
- New sectors and market discovered: we even participated to Cannes Festival!
- EUSEW 2019 Dedicated Stand also to connect to city oriented projects
- Strong interest from Cities and Regions: a super crowded workshop thanks to ICLEI
- No scientific publication so far





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