H2REF

DEVELOPMENT OF A COST EFFECTIVE AND RELIABLE FUEL CELL VEHICLE REFUELLING SYSTEM

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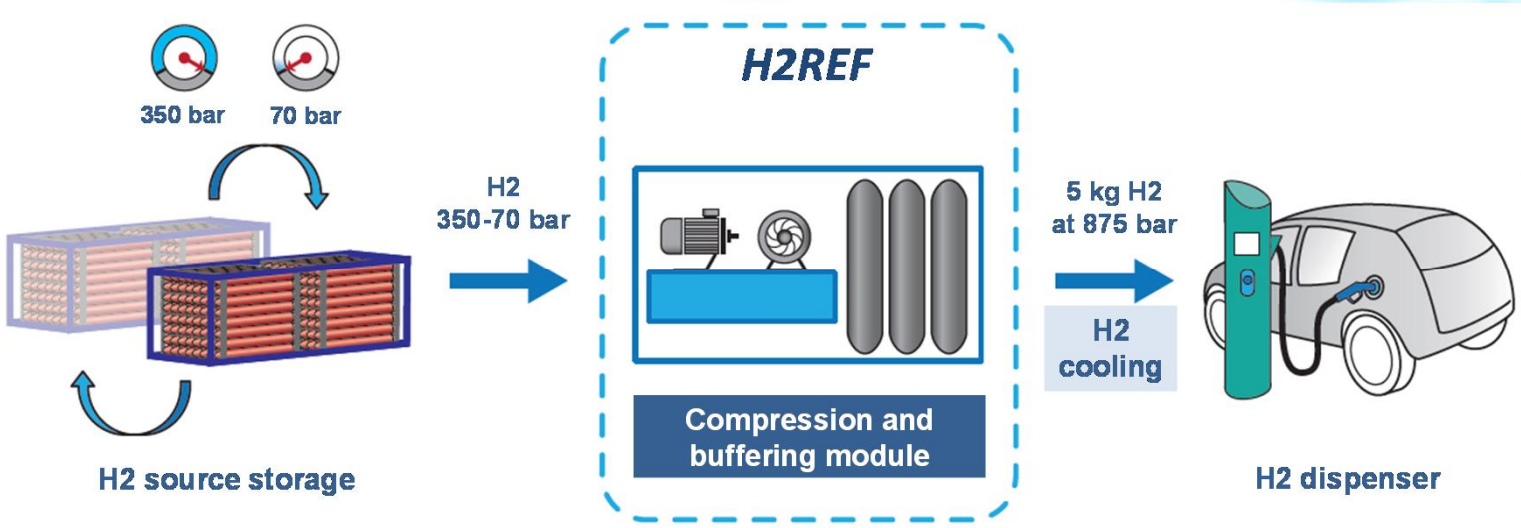
PROJECT OVERVIEW

Project Information	
Call topic	FCH-01.5-2014 Development of cost effective and reliable hydrogen refuelling station components and systems for fuel cell vehicles
Grant agreement number	671463
Pillar (Horizon 2020)	Transport
Start date	01/09/2015
End date	31/08/2018
Total budget (€)	6 453 859
FCH JU contribution (€)	5 968 554
Other contribution (€, source)	-
Stage of implementation	39% project months elapsed vs total project duration, at date of November 1, 2016
Partners	CETIM (w/ UTC); H2Nova; Haskel; Hexagon; CCS; LBST

PROJECT SUMMARY

Focus : HRS compression and buffering function



Objective: Advance a novel hydraulics-based compression and buffering system that is very cost effective and reliable from TRL 3 to TRL 6, thereby proving highly improved performance and reliability

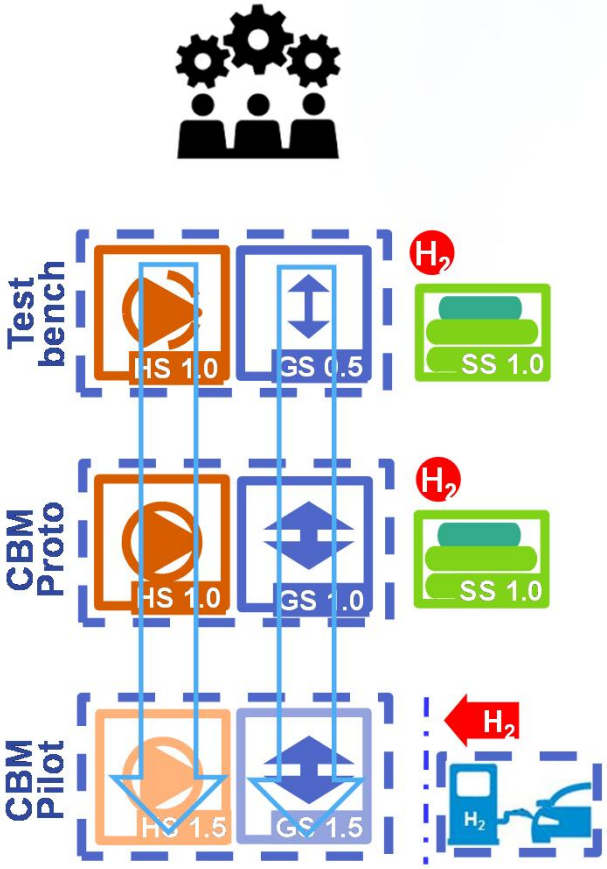
MAIN STEPS

1 CBM process design and construction

2 Gas Compression Device & Process functions testing

3 CBM Prototype testing

4 CBM Pilot field testing



Main challenges

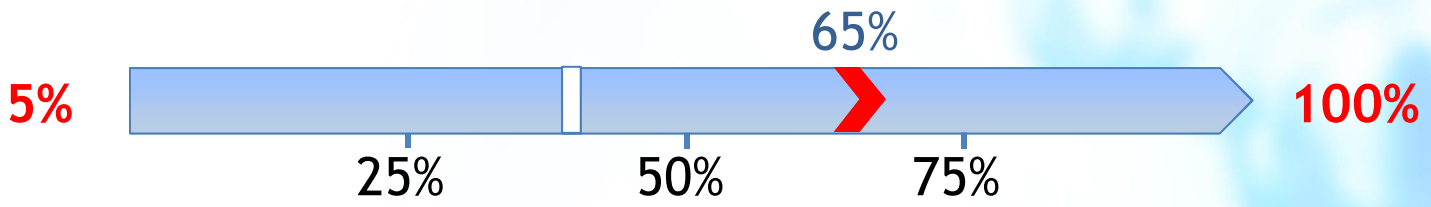
- Development of a new Gas Compression Device (GCD)
- GCD materials testing and selection
- Handling of new phenomena (e.g. H2 in the hydraulic fluid)
- Design of new process functions
- Development of the compression/dispensing cycle

HS: Hydraulic skid
GS: Gas skid
SS: Storage system

PROJECT PROGRESS/ACTIONS
- CBM System design and construction

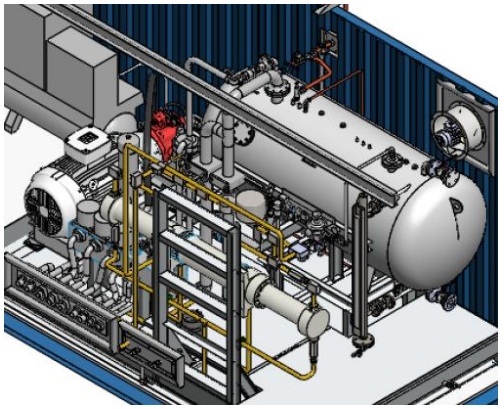
Achievement to-date

% stage of implement.



Achievements:

- Process fully defined and modelled
- Solutions found & System engineered
- Safety analysis (FMEA) performed
- System construction started



Hydraulic skid

Storage System

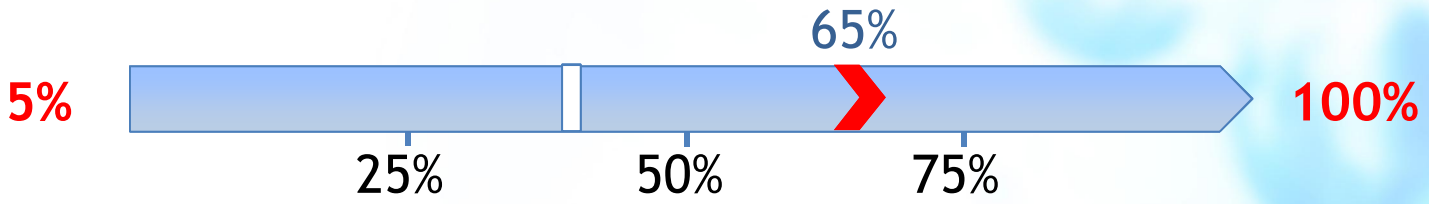
Future steps:

- Finalize design of process control
- Finalize system construction

PROJECT PROGRESS/ACTIONS
- Gas compression device development

Achievement to-date

% stage of implement.



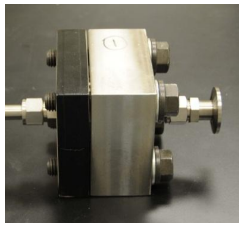
Achievements:

- GCD definition and basic design
- GCD material testing up-and-running and candidate materials identified

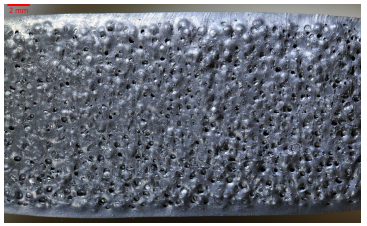
95 MPa
Gas Compression Device

Future steps:

- Finalize GCD development and qualification
- Finalize evaluation and selection of materials



Measurement of permeation



Resistance to gas decompression

Materials screening and evaluation

PROJECT PROGRESS/ACTIONS
- Maximisation of throughput

Target : "Round-the-clock" 30 - 75 kg/h capacity from a 70-350 bar source with a 75 kW power supply

Achievement to-date

% stage of implement.

Small HRS
30 kg/h
210 kg/d

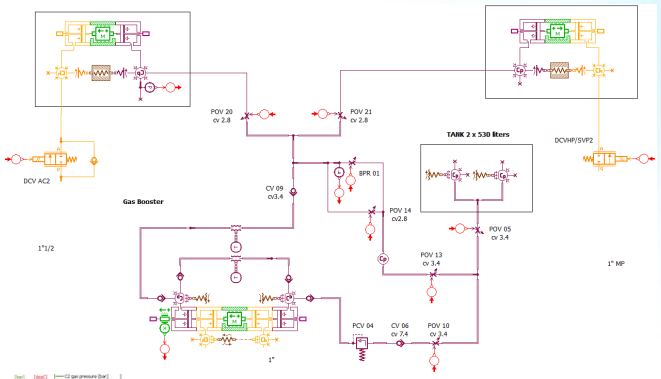
25% 50% 75%

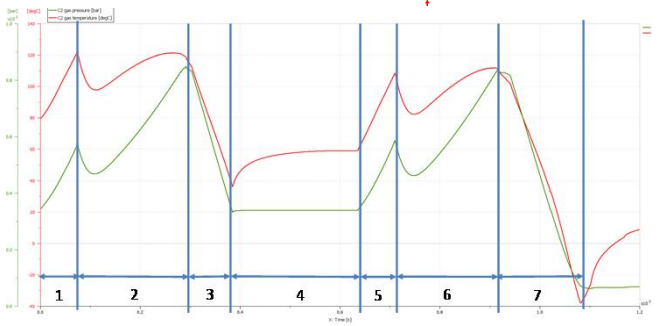
CBM Proto Simulation
625 kg/d

>30 kg/h
x 24 h/d =
>720 kg/d
w/ 75 kW

Achievement

- Multi physical (hydraulic, thermal, thermodynamic) model of the Test bench and CBM prototype – (AMESIM)





Future steps:

- Further optimisation of process cycle
- Real-life testing of CBM Prototype
- Further optimisation and real-life testing of CBM Pilot

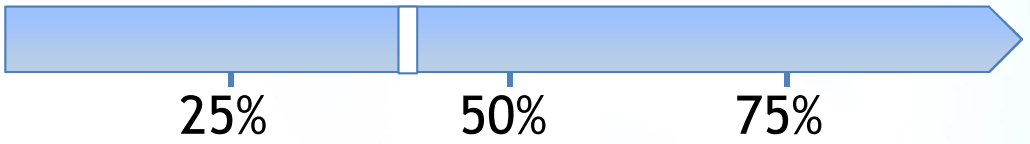
PROJECT PROGRESS/ACTIONS
- Endurance testing

Target: Simulate 10 years of operation

Achievement to-date

% stage of implement.

CBM Prototype endurance tests not yet started



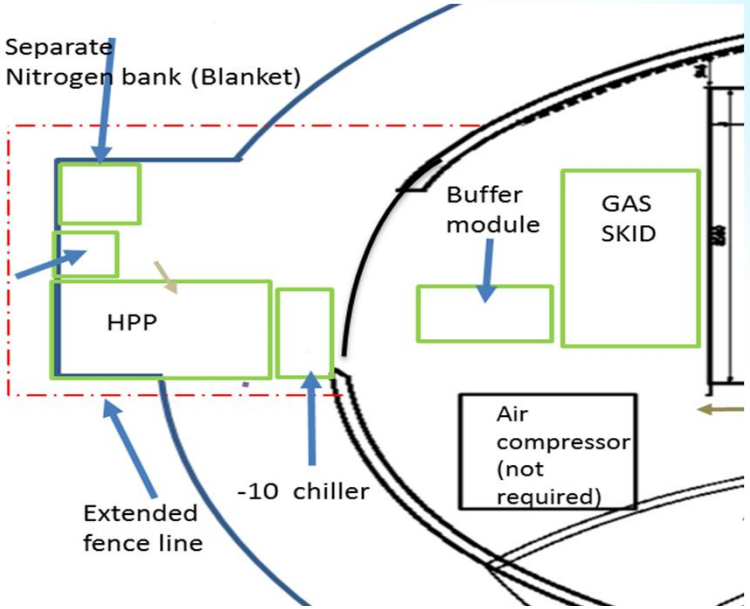
72 000 cycles

Achievement

- Solution found for accelerated endurance testing in H2 rather than N2

Future steps:

- CBM Prototype installation real-life testing in H2



Test facility

PROJECT PROGRESS/ACTIONS
- Other targets

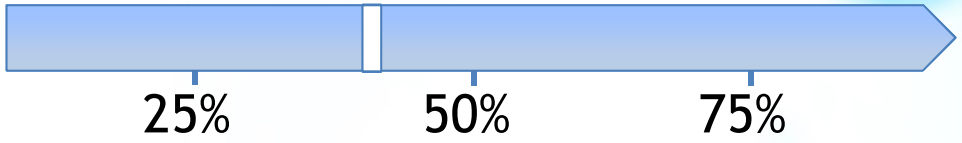
Target : Average consumption of 1.5 kWh/kg

Achievement to-date

% stage of implement.

No yet measured

3 kWh/kg



1.5 kWh/kg average

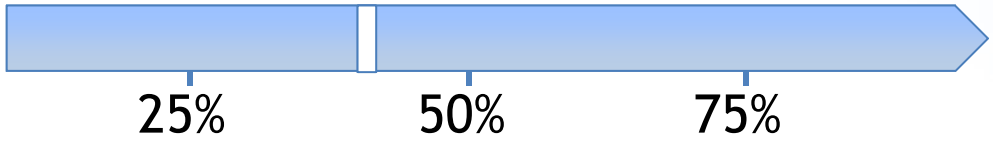
Target: CBM cost of 300 k€ assuming serial production of 50 units/yr

Achievement to-date

% stage of implement.

Cost projection not yet started

Compressor + buffers: ~600 k€



CBM: 300 k€

Aspect addressed	Parameter (KPI)	Unit	SoA 2016	FCH JU Targets		
				Call topic	2017	2020
HRS Cost	CAPEX	M€	1.5	1.0	0.8	0.6

Future steps:

- Cost projection and techno-economic after CBM prototype testing

HORIZONTAL ACTIVITIES

Particular focus on RCS (Regulations, Codes and Standards)

Objective: To define and prioritize recommendations to support RCS initiatives at the international level, with the aim of being able to market the same design in Europe, US, and Japan

In parallel to product development:

- Identify the gaps in the RCS framework ✓
- Approach CEN TC 54 when the system is further developed
- Develop a roadmap and action plan for closing the RCS gaps

SYNERGIES WITH OTHER PROJECTS AND PROGRAMMES

Interactions with projects funded under EU programmes	
HyTransfer (FP7)	Addresses the optimization of cooling requirements for H2 vehicle refuelling. HEXAGON, H2Nova, CCS, and LBST participate both to H2REF and HyTransfer. The combination of HyTransfer and H2REF results should bring substantial HRS cost reduction.

DISSEMINATION ACTIVITIES

Web publications (ex.)

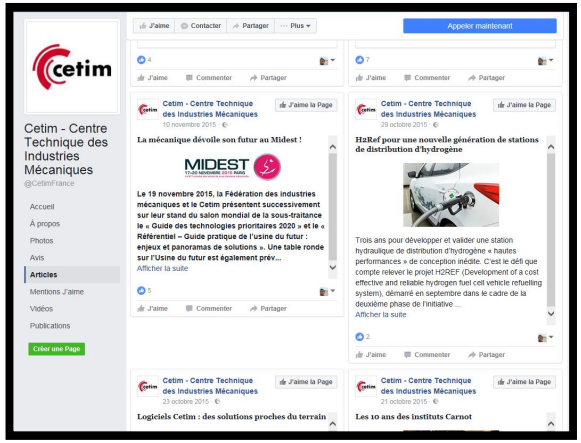
http://energie2007.fr/actualites/fiche/5714

http://hydrogentoday.info/news/2048

CETIM 50 years event at hosted by Ministry of Economy and Finance

Social media

Facebook



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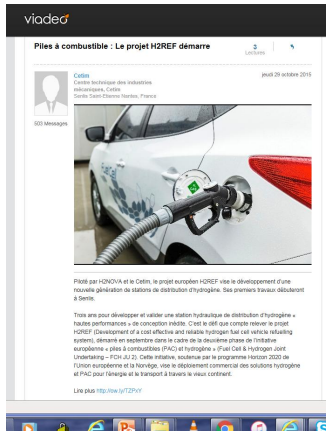

https://fabricationmecanique.files.wordpress.com/2016/04/dp-cetim-5-0-50-ans-16-fc3a9vrier-2016.pdf

Thank You!

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