TAHYA

TAnk HYdrogen Automotive

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Programme Review Days 2019

Brussels, 19-20 November 2019

PROJECT OVERIVEW

- **Call year:** 2017
- **Call topic:** FCH-01-3-2017 - Improvement of compressed storage systems in the perspective of high volume automotive application
- **Project dates:** January 1, 2018 – December 31, 2020
- **% stage of implementation 01/11/2019:** 65%
- **Total project budget:** € 3,996,943.75
- **FCH JU max. contribution :** € 3,996,943.75
- **Other financial contribution:** none
- **Partners:** Optimum CPV (BE), ANLEG (DE), RAIGI (FR), Volkswagen (DE), TU Chemnitz (DE), Absiskey (FR), Bundesanstalt für Materialforschung und Prüfung (DE), Polarixpartner (DE)

PROJECT SUMMARY (1/2)

TAHYA - TAnk HYdrogen Automotive

The key objectives of the TAHYA project are:

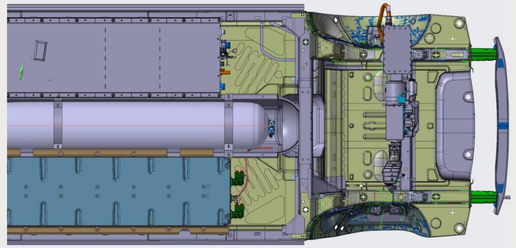
- Preparatory work to provide a compatible H2 storage system with high performances and improved safety which is Health-Safety-Environment responsible.
- Provide a compatible H2 storage system with mass production and cost competitive according to the specifications of an OEM.
- Regulation Codes and Standards (RCS) activities to propose updates on GTR13 and EC79 according to tests results obtained over the duration of the project.

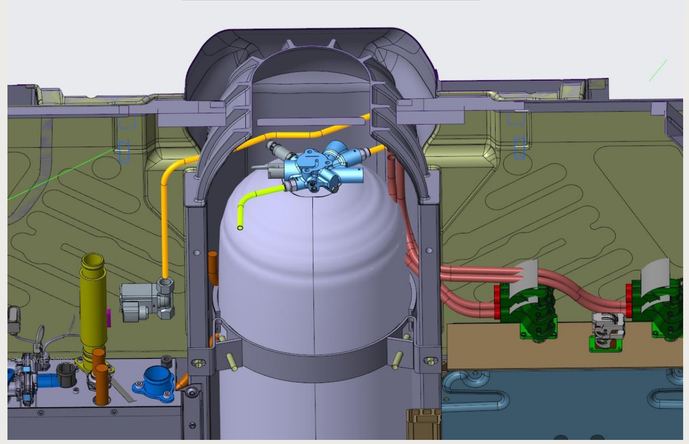
PROJECT SUMMARY (2/2)

SoA H2-Storage System Specification (by VW):

- Single tank architecture, integrated in longitudinal direction between the axles
- Storage system includes on-tank valve (OTV), gas handling unit (GHU), tubing and tank fasteners
- Storage of 5.3kg H2, compressed at 700bar
- Gravimetric efficiency* of 6.5%
- Annual production of 20.000 systems per year
- Targeted system costs of less than €500 per kg H2

*mass of hydrogen / weight of tank system





PROJECT PROGRESS/ACTIONS – Gravimetric efficiency

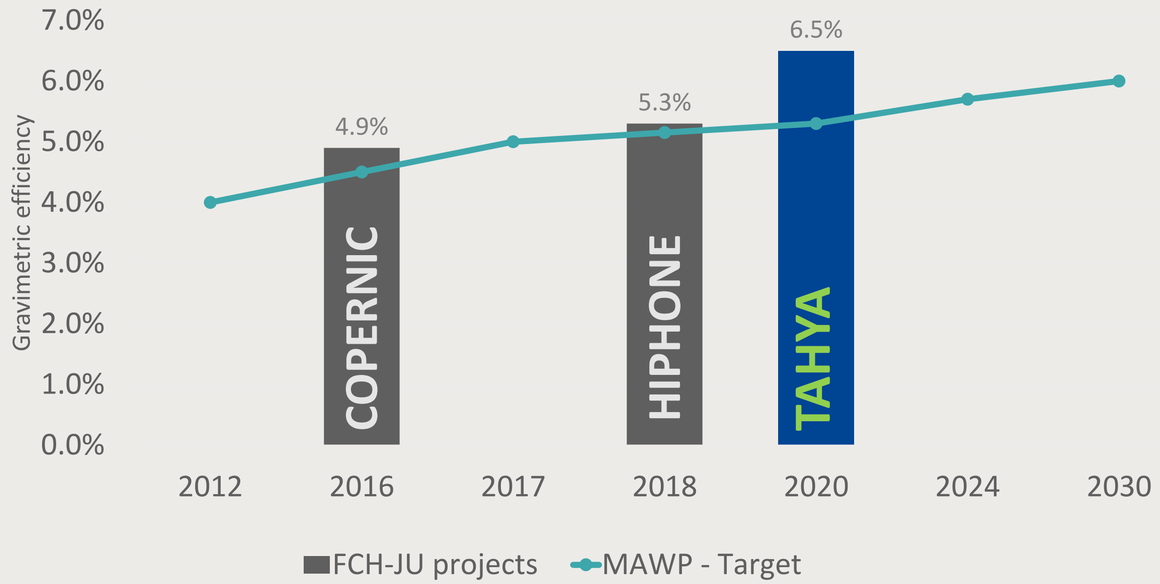
Achievement to-date

5.3 %

6.5 %

25% 50% 75%

Status at month 22 of a 36 months project at date 01/11/2019



% stage of implementation is the % of project *duration* (months) elapsed on 01/11/2019

PROJECT PROGRESS/ACTIONS – Storage Costs per kg H2

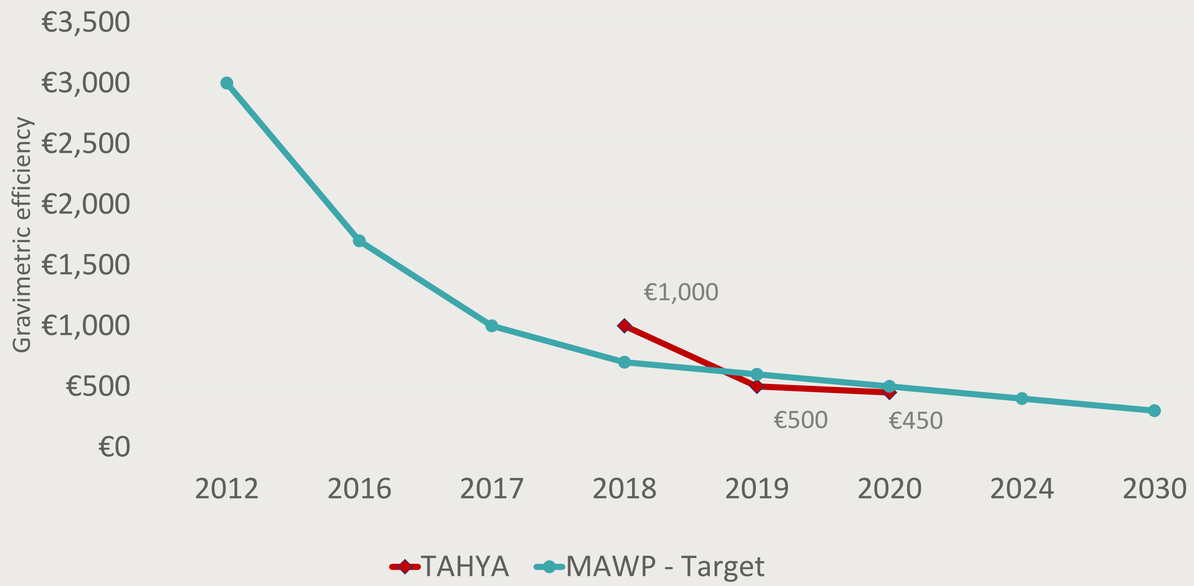
Achievement to-date

€1,000

€450

25% 50% 75%

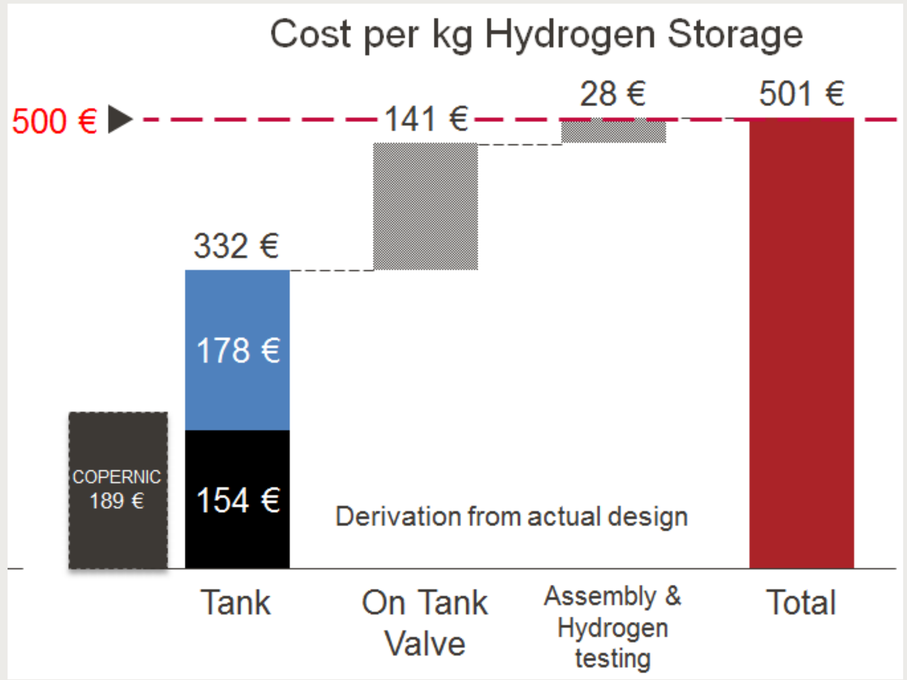
Status at month 22 of a 36 months project at date 01/11/2019



% stage of implementation is the % of project *duration* (months) elapsed on 01/11/2019

Risks and Challenges

- The main risk is the availability and cost of carbon fiber, which is the main cost driver of the entire storage system.
- Today, the annual world-wide production of carbon fiber is around 80,000 tons
- About 70% of the available carbon fiber is used for wind turbine blades and aerospace/aircraft applications
- To produce 100,000 FCEV's per year, about 5,000 tons are needed
- The suitable grade of carbon fiber is mainly produced outside of Europe (Japan, USA, Korea)

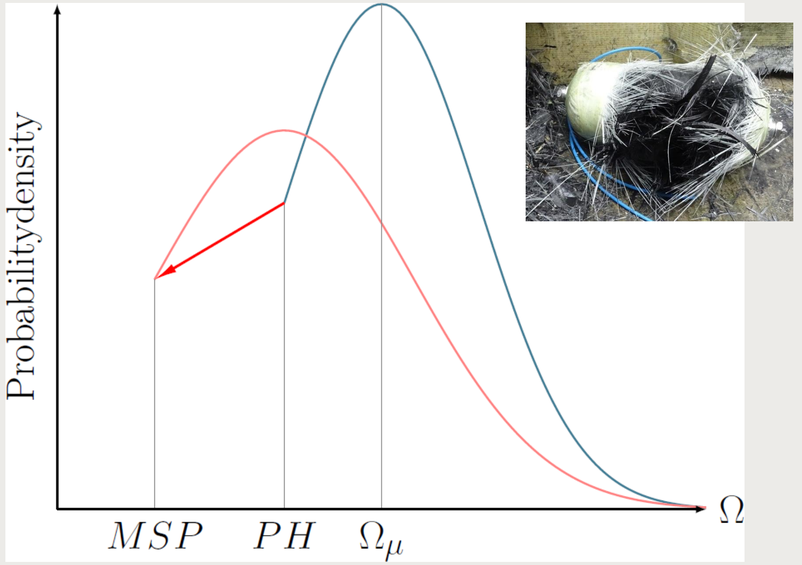


Communications Activities

Description: title of the Event	Address	Dates and Place	Booth, oral presentation, paper…….	Who	Status
ESK Fachtagung für Energiespeicherung	https://iam.innogy.com/esk-projects/veranstaltungen	08.03.2018, Dresden	TAHYA project mentioned in presentation	TUC	☺
20. Bayreuther 3D-Konstruktionstag	http://www.konstrukteurstag.de/	20.09.2018, Bayreuth	Oral presentation	TUC	☺
FCH JU Review Days 2018	https://www.fch.europa.eu/page/programme-review-days-2018	14-15.11.2018, Brussels	Flyer, poster, discussion	OCPV	☺
HZwo Technologieforum	https://www.energy-saxony.net/veranstaltungen/hzwo-technologieforum-29112018.html	29.11.2018, Chemnitz	Flyer	TUC	☺
Fuel Cell EXPO 2019	http://www.fcexpo.jp/en	27.02.2019 Tokyo, Japan	Booth, flyer	OCPV, TUC	☺
Hydrogen Days Prague 2019	https://www.hydrogendays.cz/2019/	27.29.03.2019, Prague	Flyer	TUC	☺
Hannover fair	http://www.h2fc-fair.com/	April 2019 Hannover, Germany	Booth/flyer	OCPV, ANLEG	☺
VDI Technische Zuverlässigkeit	https://www.vdi-wissensforum.de/weiterbildung-maschinenbau/technische-zuverlaessigkeit/	May 2019 Stuttgart, Germany	Oral presentation + conference paper	BAM	☺
Electric & hybrid	http://www.evtechexpo.eu/ev-tech-expo-europe-auf-deutsch	7-9 May 2019 Stuttgart, Germany	Flyer	Polarix	☺
GTR13 IWG (informal working group)	NA	18.06.2019, Tianjin, China	Presentation	BAM, OCPV	☺
RTS2019 (Rotomolding, Thermoforming and Blow-molding)	https://www.rts2019.com/	July 2019, Paris, France	Sponsor of the event; Oral presentation	RAIGI	☺
ICHS 2019	https://hysafe.info/ichs2019/	August 2019 Adelaide, Australia	Oral presentation + conference paper	BAM	☺
E-Move 360°	https://www.emove360.com/de/	15-17 Oct 2019 Munich, Germany	Oral, flyer, paper (tbc)	Polarix	
FC³ Fuel Cell Conference	https://www.iwu.fraunhofer.de/en/trade-fairs-and-events/fc3-fuel-cell-conference-chemnitz.html	26.-27.11.2019, Chemnitz	Flyers, Poster, presentation	TUC	
FCH JU Review days 2019	https://www.fch.europa.eu/event/programme-review-days-2019	19-20.11.2019, Brussels	Flyer, Poster, discussion	OCVP/ANLEG	

Communications Activities

- Participation of BAM and OCPV at the GTR13 working group meetings to decide on the text of the new world-wide regulation
- Initiation of discussion regarding the durability and safety of pressure tanks depending on quality and variability of production
- Interesting discussion with existing tank manufacturers from USA, Japan and Korea regarding the reduction of the safety factor
- Today, the type certification is grated based on destructive testing of new tanks only



EXPLOITATION PLAN/EXPECTED IMPACT

Exploitation

	Key Exploitable Results (KERs)	Partner owner
1	Development of a complete H2 storage system for automotive application under consideration of an innovative car package.	OCPV/RAIGI/ANLEG
2	Cylinder	OCPV
3	Liner	RAIGI
4	Boss	OCPV
5	On-Tank Valve and Gas Handle Unit (OTV & GHU)	ANLEG
6	Continuous Orbital Wrapping (COW) machine	TUC
7	Simplified numerical tools	TUC
8	Improvement on RCS by developing probabilistic approach	BAM

Impact

- The TAHYA project will provide strong market opportunities for the 4 industrial partners in the consortium where the generated innovations will positively impact their commercial position
- RAIGI and ANLEG as SMEs will greatly benefit from the knowledge gained through the consortium and the visibility of such an EU
- OPTIMUM CPV as part of PLASTIC OMNIUM will become European leader with a market share of 30-50%
- VOLKSWAGEN will gain in-depth expertise to develop platforms with a FC-powertrain
- The COW technology will allow to further increase the productivity, reduce costs and enhance quality