



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

HyBalance

HyBalance

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**Programme Review Days
2019**

Brussels, 19-20 November 2019

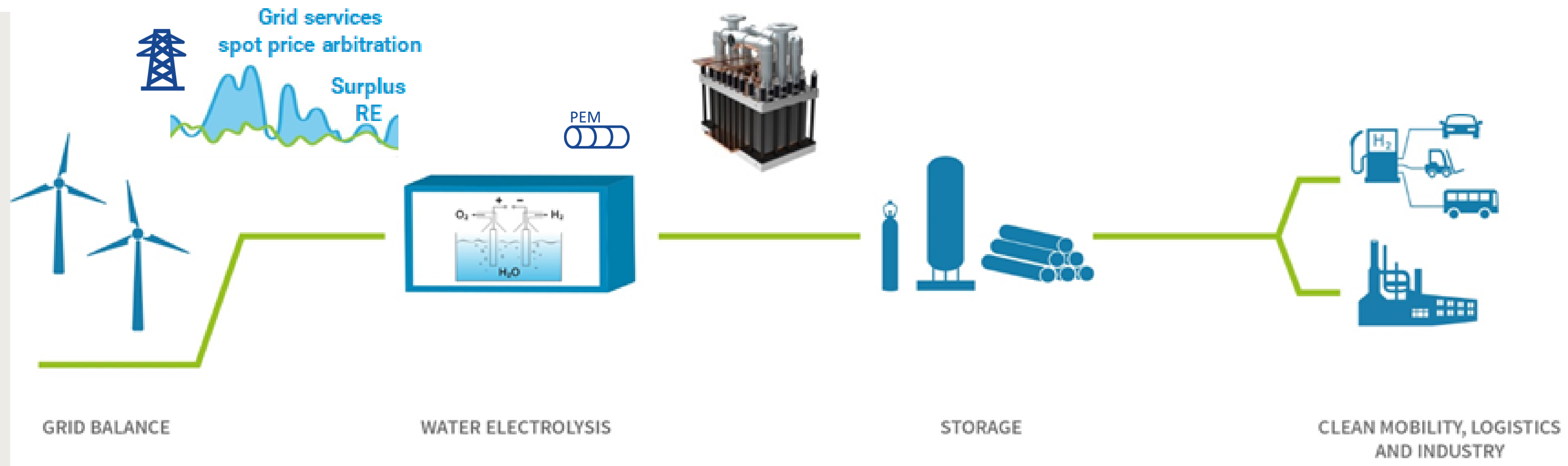
PROJECT OVERVIEW



- **Call year:** 2014
- **Call topic:** FCH-02.10-2014 - Demonstrating the feasibility of central large scale electrolyzers in providing grid services and hydrogen distribution and supply to multiple high value markets
- **Project dates:** 01/10/2015 – 30/09/2020
- **% stage of implementation 01/11/2019:** 80%
- **Total project budget:** 15 M€
- **FCH JU max. contribution:** 8 M€
- **Other financial contribution:** 2,6M€
- **Partners:**



PROJECT SUMMARY



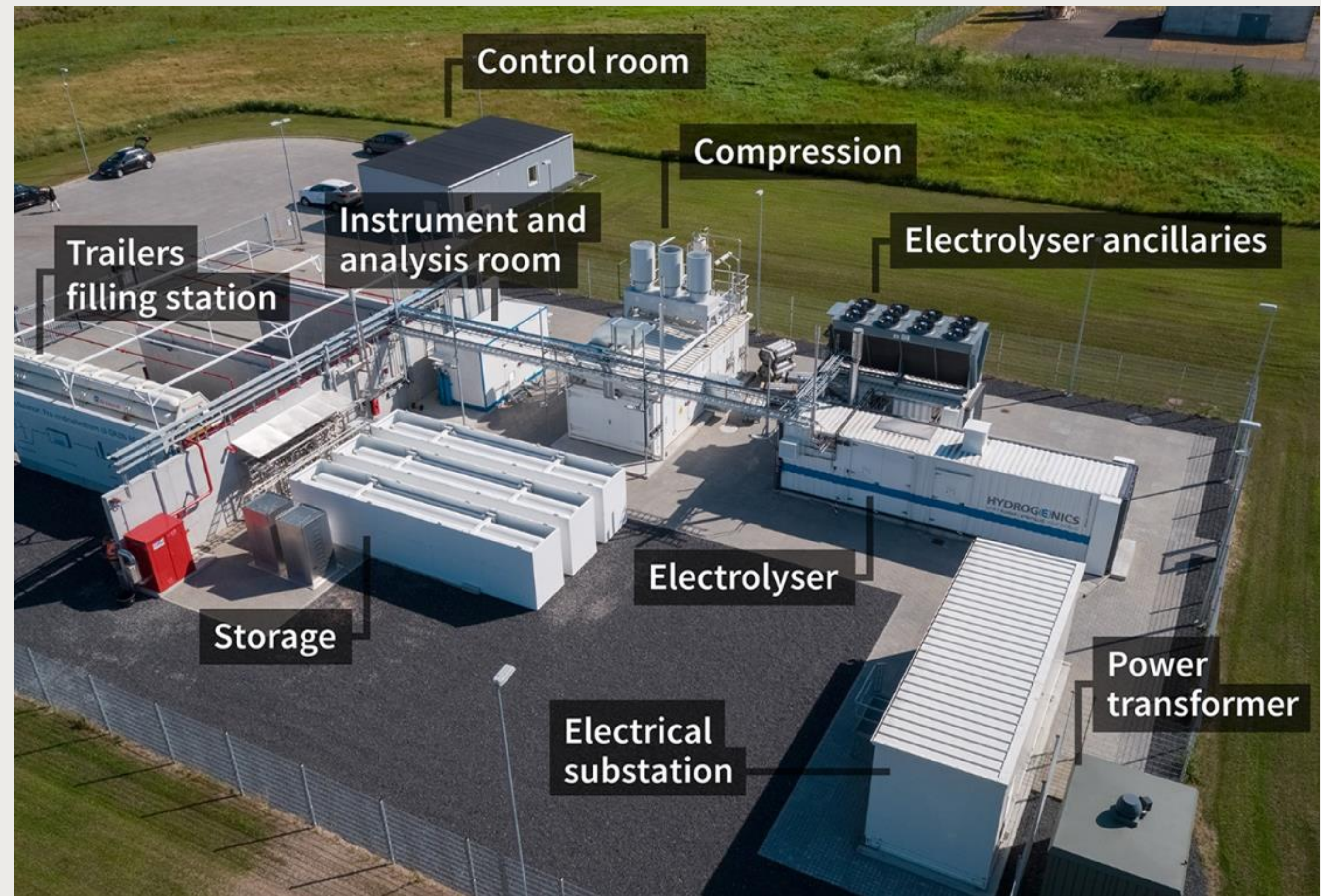
- Demonstrate the production and supply chain of decarbonized H₂ from renewable sources in an industrial environment
- Validate highly dynamic PEM electrolysis technology
- Help balancing the grid with the storage of wind energy in the form of hydrogen

PLANT OVERVIEW

HyBalance start-up : February 2018

Few figures

- 40 orders for equipment
- 230 m³ of concrete 69 tons of reinforcing steel
4500 man-hours
- Mechanical erection: 185 tons, 400 m of pipe
and 3000 man-hours
- Electrical/instrumentation erection: 18 km of
cables, 5 tons of material and 4200 man-hours
- HP hydrogen piping (1000 bars) : 120 m



PROJECT ACHIEVEMENTS

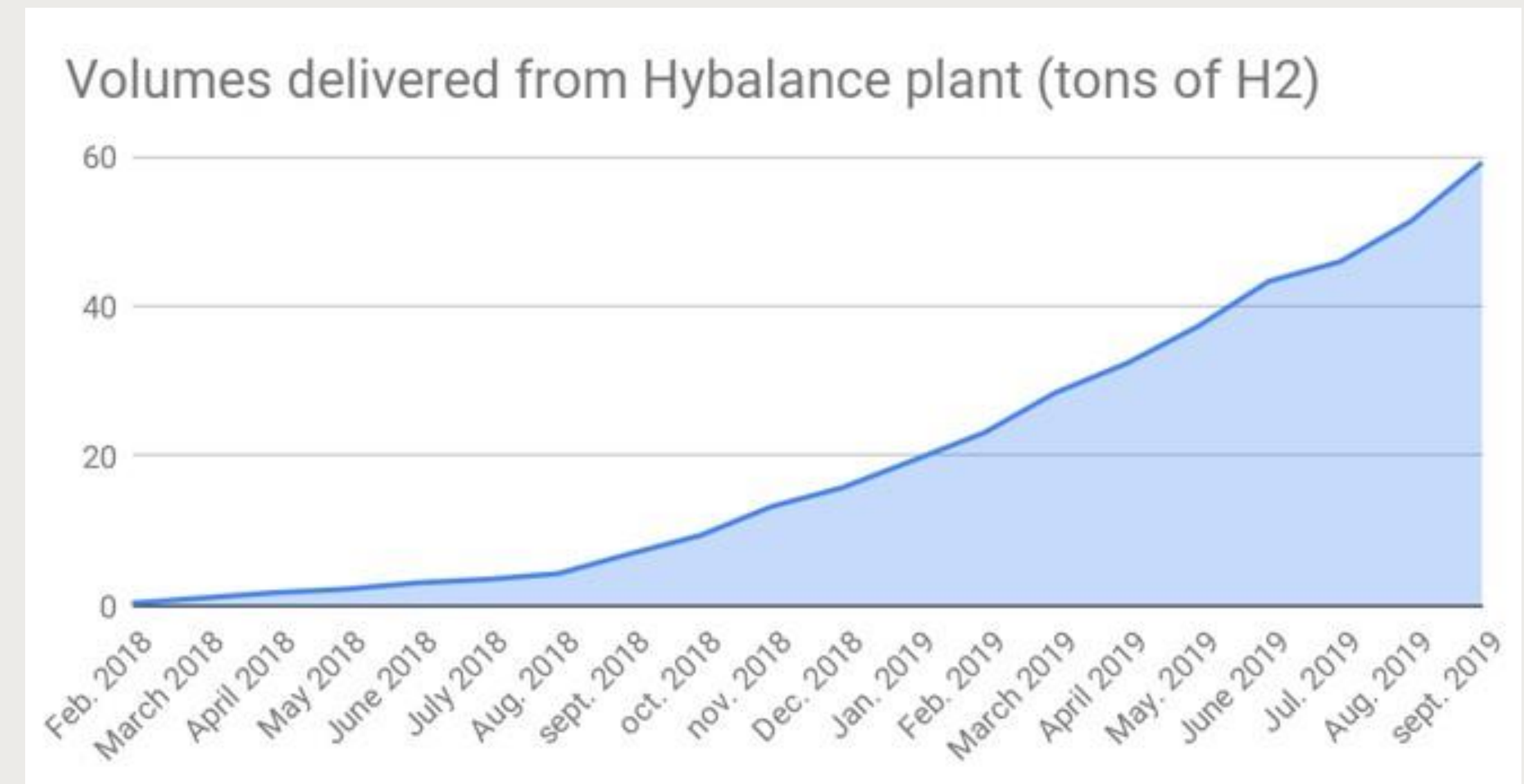


From the start-up S1 2018 ...

- Tests
- Approval process of H₂ quality
- Design adaptations
- Direct customer connection through pipeline

... a gradual ramp-up ...

- Reliability improvements
- Operational organisation : training
- Certification of the grid balancing hardware



... **with more than 60 tons of Hydrogen produced and 120 trailers filled !**



PROJECT PROGRESS/ACTIONS - Cost Goal



Estimated during the investment part of the project - no improvements foreseen during operation



Parameter	Unit	Achieved by the project	FCH JU project Call topic	SoA 2019	MAWP 2020 Objectives
Electrolyser cost	€/kW	1810 ⁽¹⁾	<1570	1200	900 ⁽²⁾

(1)Cost objective for the electrolyzer at HyBalance could not be achieved due to the rather small scale and pilot nature of the project.

(1)Costs below 1000 €/kW can be achieved today for systems above 3 MW power input.



PROJECT PROGRESS/ACTIONS - Durability/Service lifetime



Status at month 48 of a 60 months project



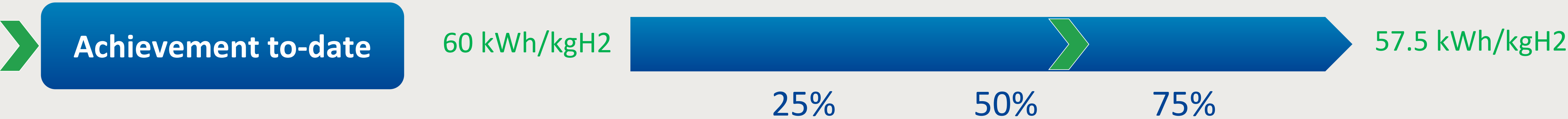
Parameter	Unit	Achieved by the project	FCH JU project Call topic
Electrolyser operating hours	hours	7000	>20000



PROJECT PROGRESS/ACTIONS - Energy Efficiency



Status at month 42 of a 60 months project



Parameter	Unit	Achieved by the project	FCH JU project Call topic	SoA 2019	MAWP 2020 Objectives
Electrolyser efficiency	kWh/kgH2	58.6	55 to 60	52.2	55



Risks and Challenges



More teething problems than expected on new technologies implemented in this project as the plant operates in real industrial conditions:

- large amount of hardware and software improvements due to pilot design
- many lessons learned on the dual stack operation and maintenance.

The plant is fully operational since mid-2019.

Challenge for 2020

- Improve the grid balancing strategy while carry-on fulfilling customer requirements



Communications Activities



- Inauguration Event at the HyBalance plant, September 3rd 2018



- Local and foreign delegations visited the plant (schools, authorities, industry...)
- Brochures and posters

- HyBalance mid-term dissemination workshop
“Hydrogen, key enabler of wind power & industry leadership in Europe”
October 8th, 2019 at FCHJU offices, Brussels

- Participation in 2 conferences
- Media coverage:
 - Featured on danish TV
 - Website www.hybalance.eu
 - Linkedin account :  HyBalance



EXPLOITATION PLAN/EXPECTED IMPACT



Exploitation

Hybalance is a key pilot demonstrator....

- to operate the electrolyser under industrial constraints
- to capture the operation challenges of H2 production with PEM technology
- to assess the technical as well as environmental and economic performance

Impact

... enabler of power scale-up !

- to design higher power PEM electrolyser
- to anticipate good practices for the plant process definition, equipment manufacturing and installation
- to model the business case

