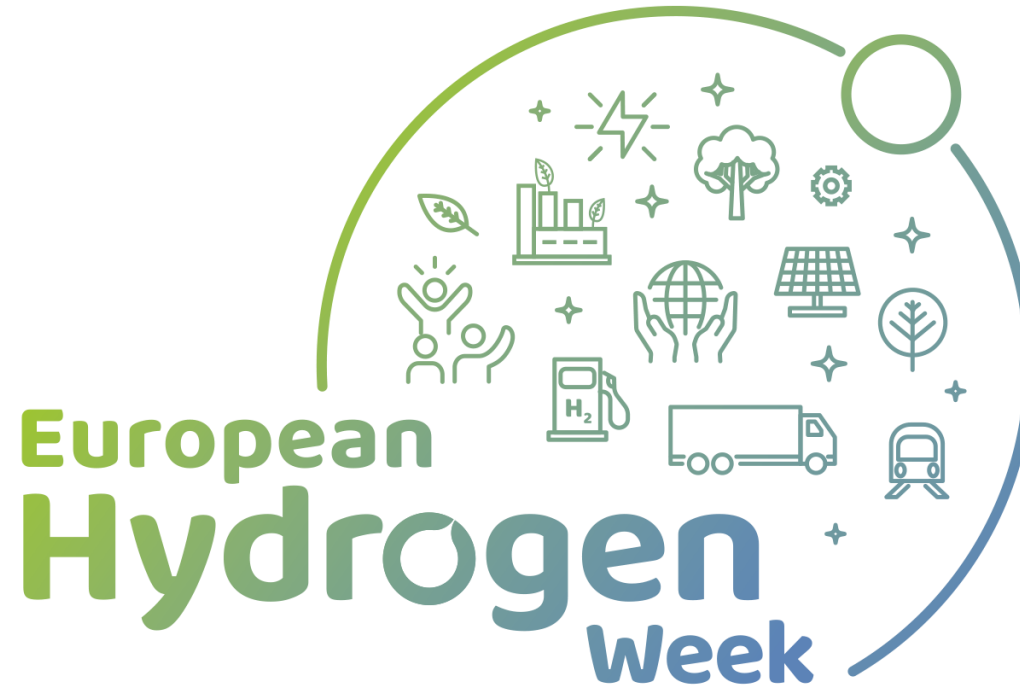
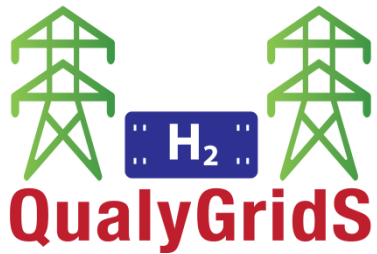


QualyGridS

Standardized
qualifying tests of
electrolysers for grid
services



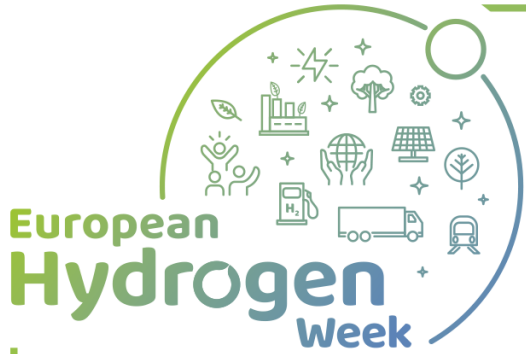
Regine Reissner

DLR German Aerospace
Center

www.qualygrids.eu
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Project overview



- Call year: 2016
- Call topic: FCH-02-1-2016: Establishing testing protocols for electrolysers performing grid services
- Project dates: 01/2017-06/2020
- % stage of implementation 01/11/2020: 100 %
- Total project budget: 2,811.262 €
- FCH JU max. contribution: 1,996,795 €
- Other financial contribution: 814 467 €

Partners:



Technical University of Denmark



FUNDACIÓN PARA EL DESARROLLO DE NUEVAS TECNOLOGÍAS DEL HIDRÓGENO EN ARAGÓN

Lucerne University of Applied Sciences and Arts
HOCHSCHULE LUZERN



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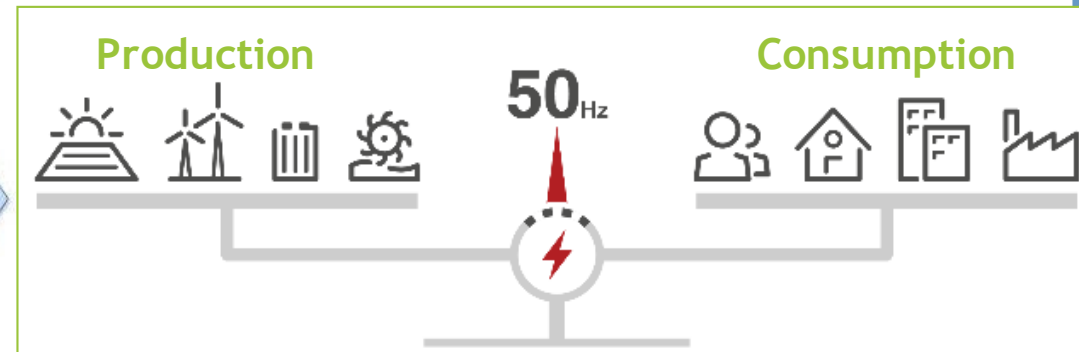
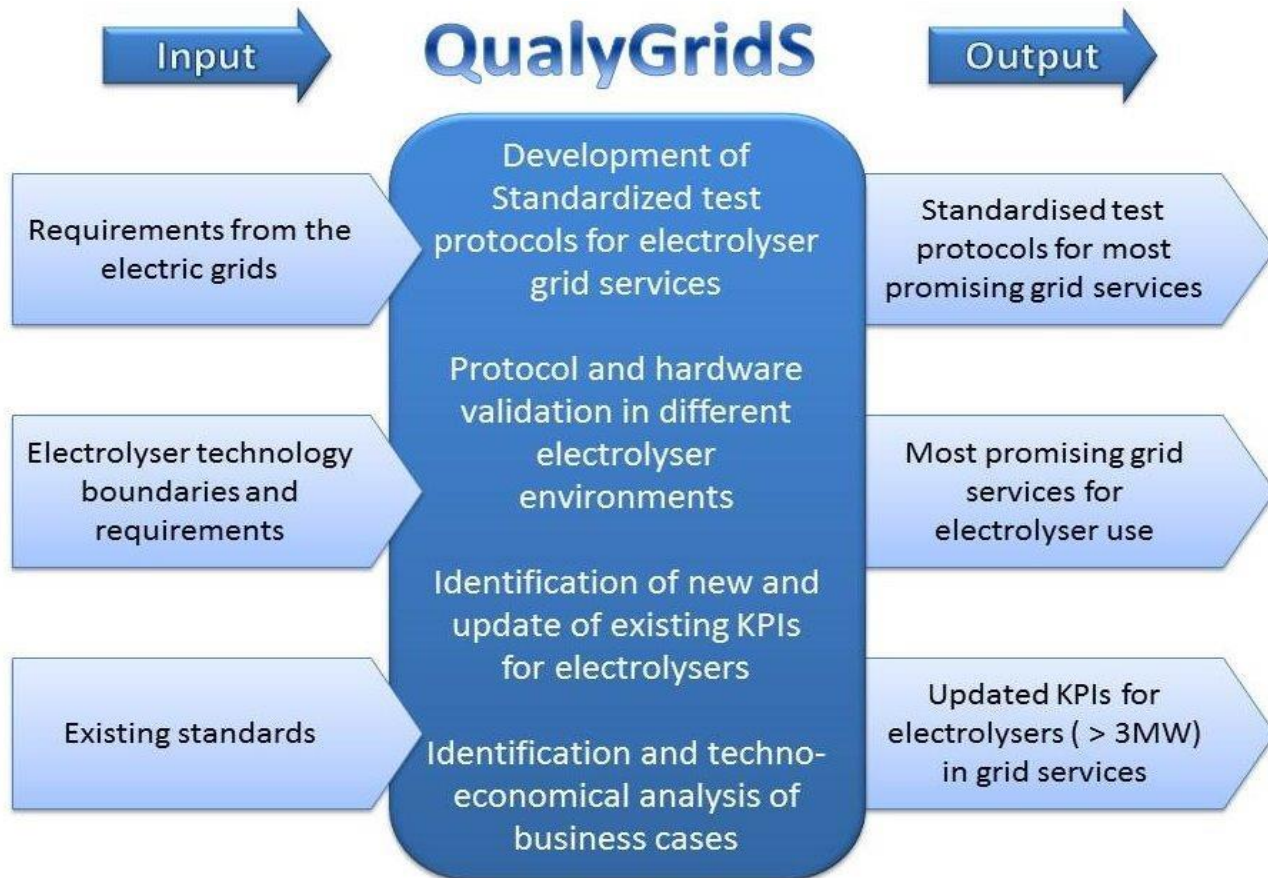
Introduction

Strong market entry of electrolyzers today still limited by costs

Performing electricity grid services → improving revenues for electrolyzers

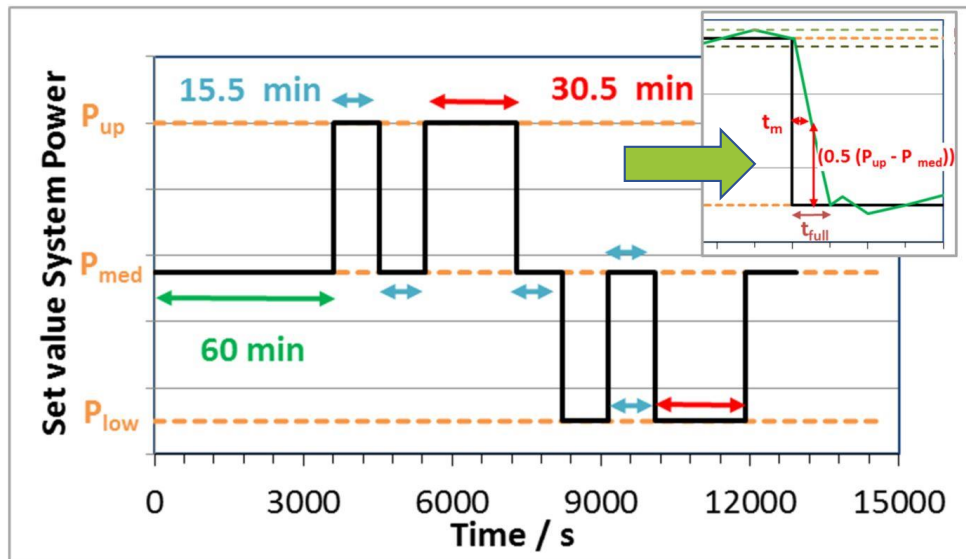
Approved and standardised electrolyser tests to verify which service an electrolyzer can perform → help OEMs and customers

Market analysis for electrolyzers and grid services → identify business models

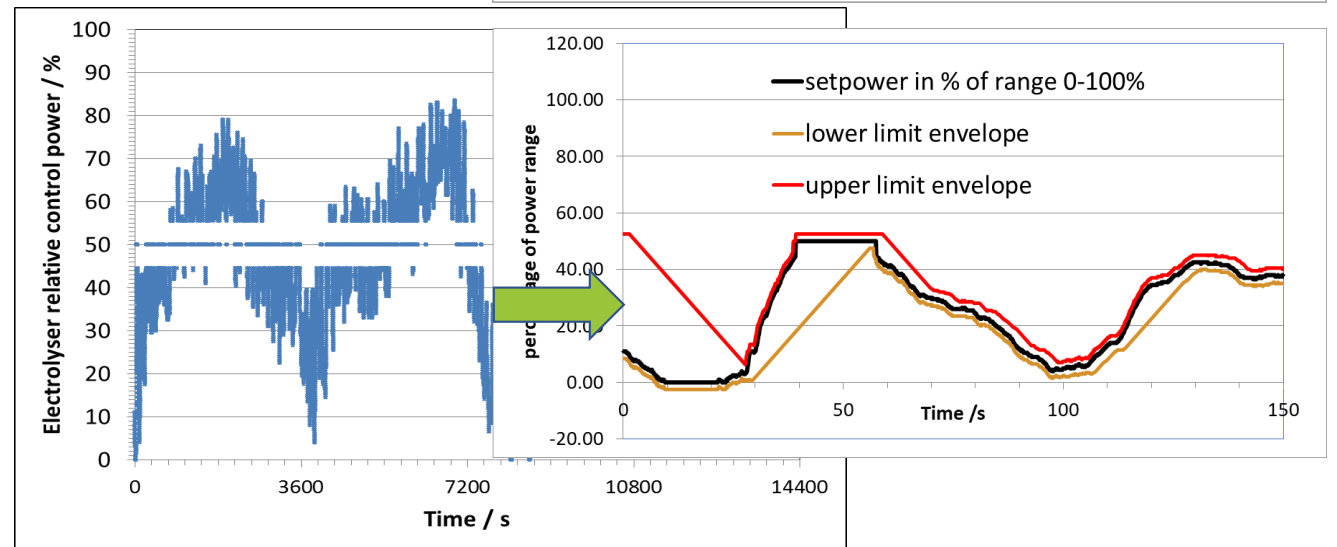
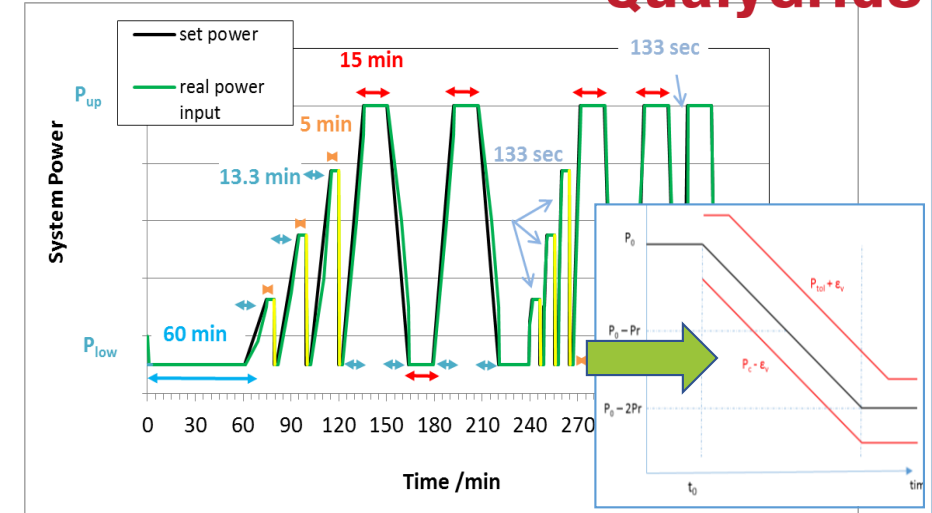


Testing protocols

- Electricity grid services identified, requirements, prequalification
- Testing protocols trying to cover the European countries' specifics
- Testing protocols set up



All protocols download DOI: <https://doi.org/10.5281/zenodo.3912063>



Testing protocols

Performance indicators:

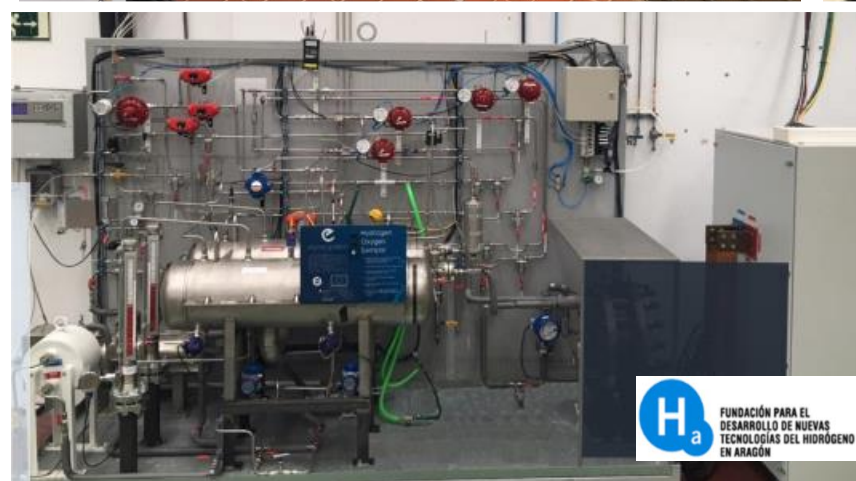
PPI	Description	Target value	Related FCH-JU KPI
1	Dynamics: Ramp duration for step power change t_{full}	10 (30) sec	KPI 5: H ₂ production electrolysis, hot start from min to max power. Target 2 sec
2a	Stability in constant power sections in %:	<5%	No corresponding KPI
2b	Ramp precision: percentage of data points outside the defined range	0-5%	No corresponding KPI
3	Reliability	>99%	No corresponding KPI

Outlook:

- Technical requirements, prequalification, market structure (bidding, ...) need to be harmonized
- Data base being continuously updated required
- More clear and harmonized definition of other grid services, e.g. DSO services and market conditions

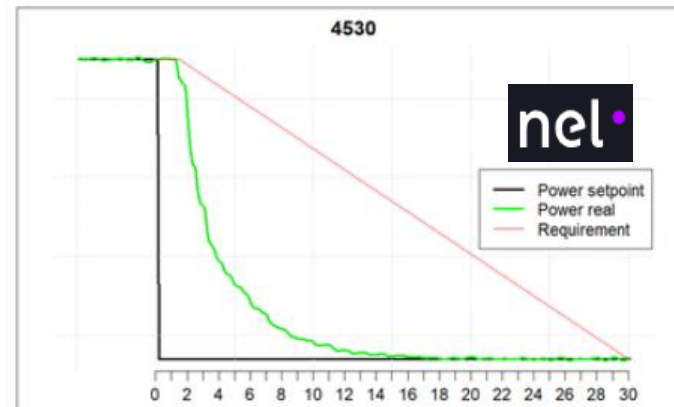
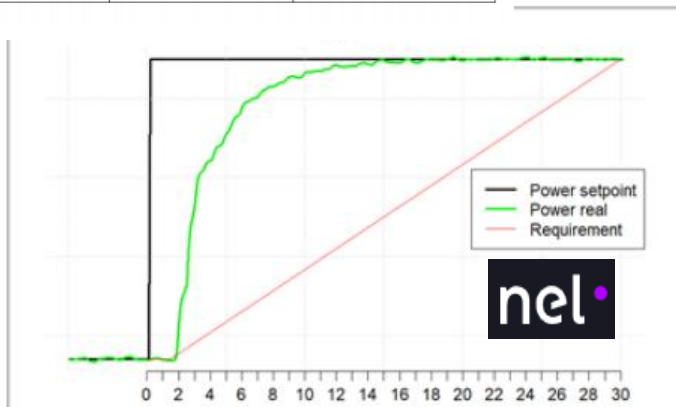
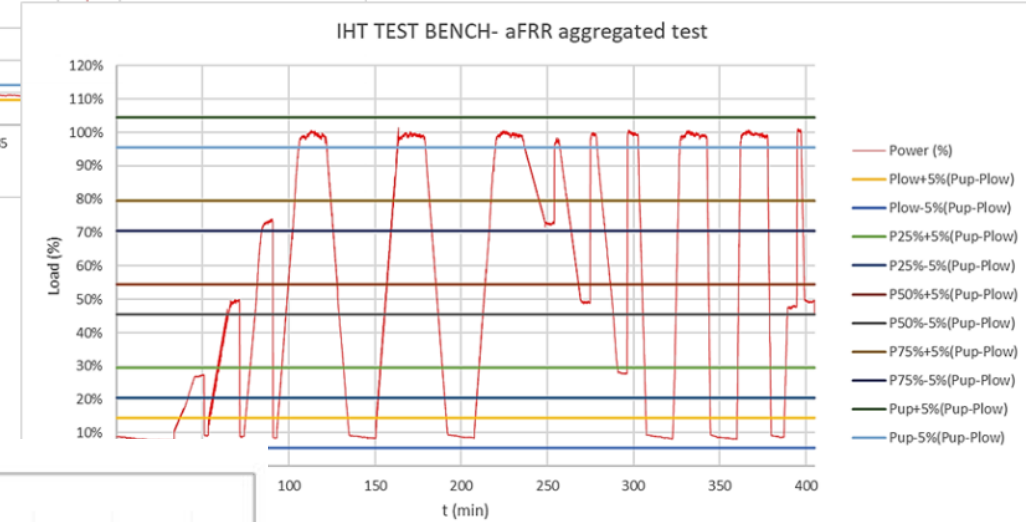
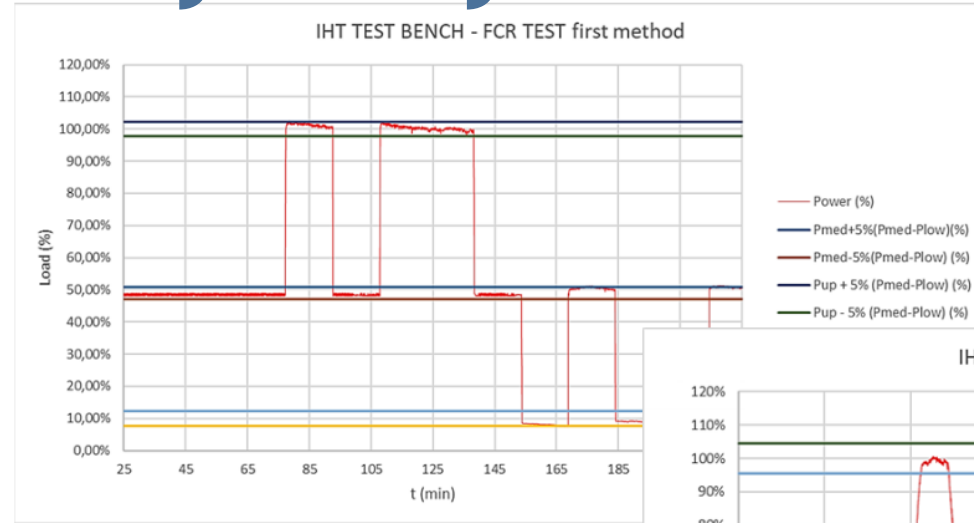
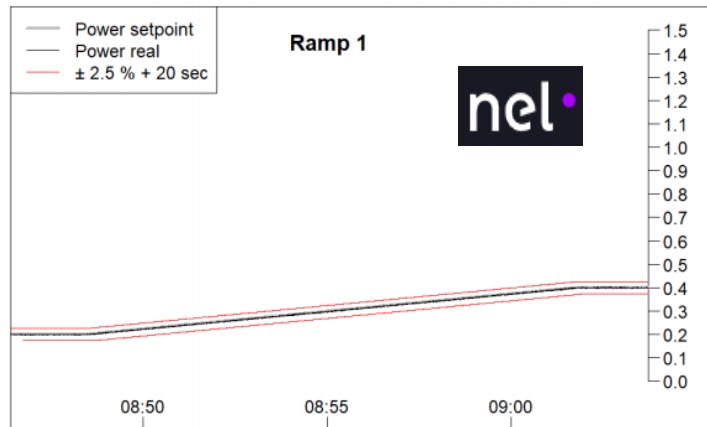
Electrolyser system tests

- 6 systems alkaline and PEM, 10-300 kW
- Analysis performance 1 MW PEMWE

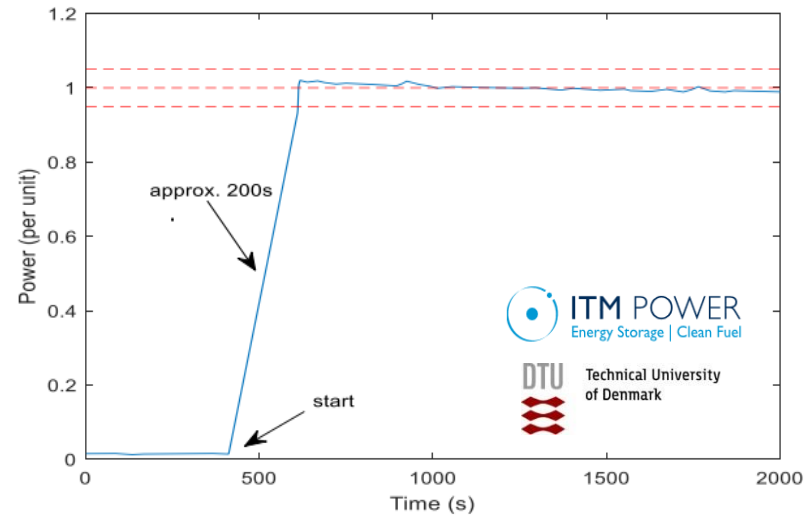
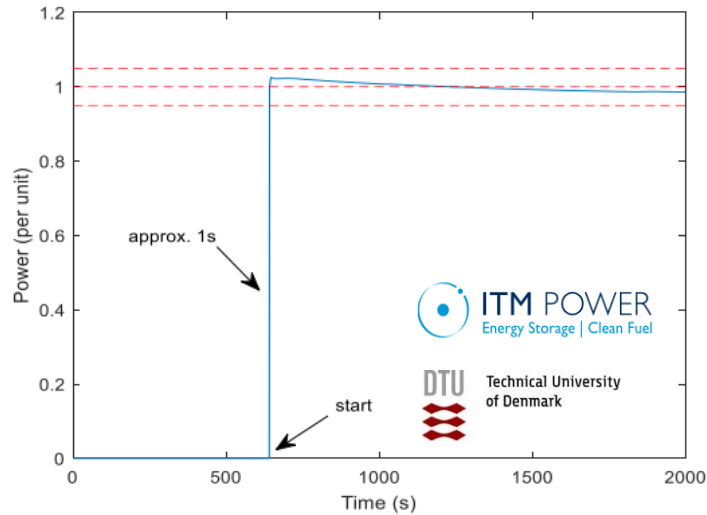


Electrolyser system tests

➤ Alkaline water electrolyser systems:



Electrolyser system tests



➤ PEM water electrolyser systems:

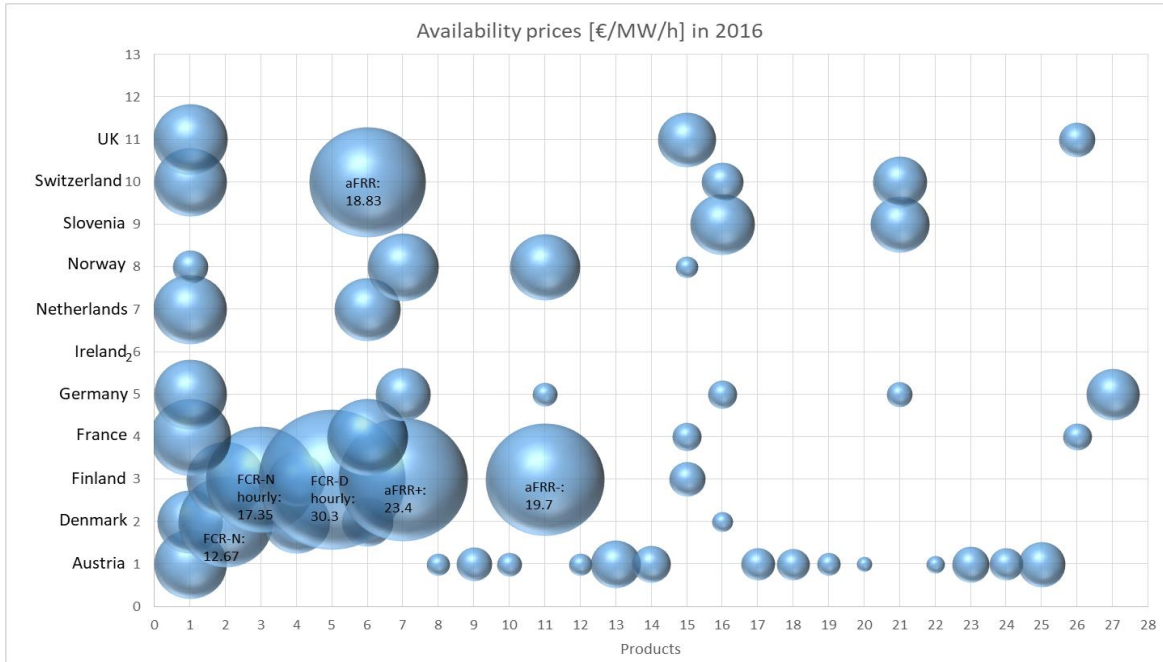
Findings:

- Systems should have power control
- With some feasible adaptations in control and communication system PEMWE and AWE are able to perform all the grid services

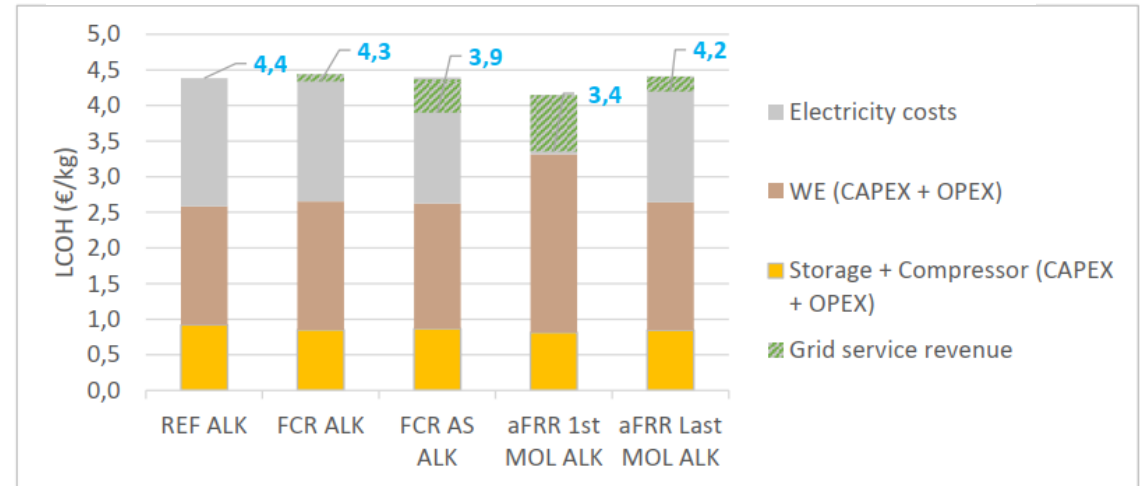
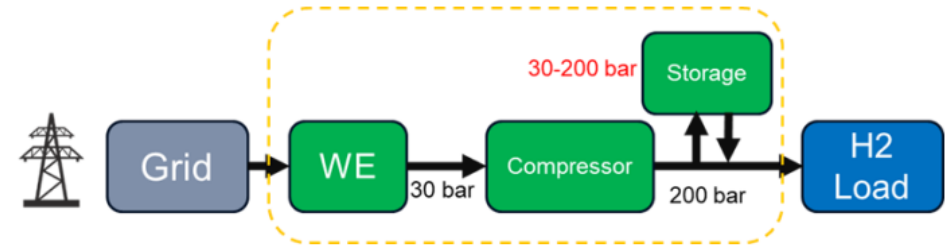
Test results in <https://DOI.org/10.51/zenodo.3999607> and doi: 10.1093/ce/zkaa01528

1 MW system Hydrogenics/Uniper Hamburg Reitbrook	System power	Stack power
Duration ramps up t_m	10 sec	10 sec
Duration ramps up t_{full}	18 sec	18 sec
Duration ramps down t_m	7 sec	7 sec
Duration ramps down t_{full}	11 sec	11 sec

Techno-economic analysis



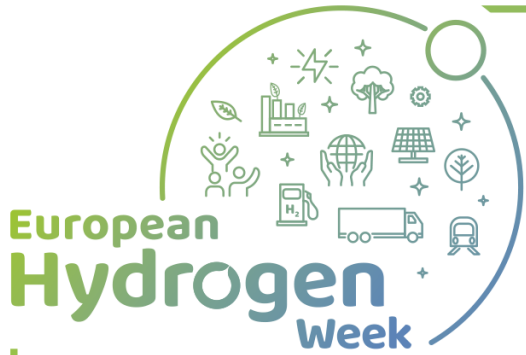
Germany, 2017, FCR & aFRR



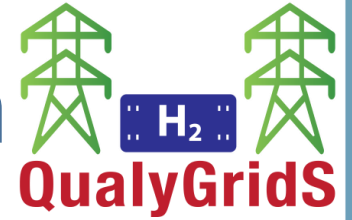
- Primary business case: produce hydrogen for a given application
- Secondary revenue stream grid service can reduce hydrogen costs

- Grid fees and renewable energy fees (EEG) not included

For more details: V. Klemenz, T. M. Mbavarira, C. Imboden in <https://zenodo.org/record/3355399>; S. Crevon, V. Seguin in GSM2020Proceedings www.dropbox.com/s/wyjtisprcr402t4/GSM-2020_Proceedings_finalDraft.pdf?dl=0



Dissemination and exploitation

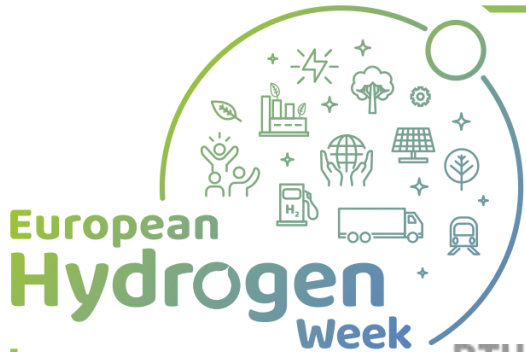


- Grid Service Market Symposium established as successful annual event in Lucerne
- Successful final workshop with 80 attendants
- Standardisation: QualyGridS testing protocols as basis for ISO Technical Report with DLR + CEA leadership



ISO/AWI TR 22734-2 ed.1 - id.81869 ISO/TC 197/WG 32				
Title				
en Hydrogen generators using water electrolysis — Part 2: Testing guidance for performing electricity grid service				
fr Titre manque — Partie 2: Titre manque				
Timeline				
REGISTRATION DATE	TIMEFRAME	TIME SINCE REGISTRATION	IN STAGE	
2020-10-02	24 months	18 days	20.00	





Thank you for your attention



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Project web page www.qualygrids.eu



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