

The European Commission's science and knowledge service

Directorate-General
Joint Research Centre (JRC)



EU harmonisation activities on low- and high-temperature electrolysis in energy storage applications

Thomas MALKOW, Alberto PILENGA, Darina BLAGOEVA, Georgios TSOTRIDIS, Pietro MORETTO
European Commission, Joint Research Centre (JRC), 1755 LE Petten, The Netherlands

QualyGrids Workshop
29 June 2020, online

JRC - what we do for standardisation and harmonisation

- ❑ Execution of Pre-Normative research (PNR) and Co-Normative Research (CNR)
- ❑ Input to
 - Measurement standards and quality assurance tools
 - Harmonised testing methodologies
- ❑ Foresight studies on standardisation needs

JRC provides policy and expert advice

EU harmonisation for water electrolysis – objectives

- Creating a commonly accepted set of EU wide testing protocols and procedures (operating conditions & test methods) for assessing performance and durability of water electrolysis devices (low and high temperature) in energy storage applications (grid-services and off-grid)
- Not intended to replace existing testing practices available in various industries and research establishments but to allow for an objective comparison of results emanating from different projects and research efforts

JRC support to Fuel Cells and Hydrogen Second Joint Undertaking (FCH2JU)

JRC deliverables are specified in FCH2JU Annual Work Program

- Contributes to formulation and implementation of research strategy and programme in the areas of
 - Regulation, Codes & Standards (RCS) & safety and
 - Technology monitoring and assessment (TMA)
- Complementing activities of FCH2JU funded projects

EU harmonisation electrolysis activities 2016-2019

- **Low-temperature water electrolysis (LTWE) documents for energy storage applications**
- Drafting of terminology, testing procedures and protocols in collaboration with partners from FCH2JU funded projects
- *Public stakeholder consultation on FCH2JU website at <https://www.fch.europa.eu>*
- Online publication on EU bookshop at <https://publications.europa.eu>
 - *Freely available and free to use, feedback is always welcome*

EU harmonisation activities – published JRC deliverables: LTWE documents



- **EU harmonised terminology for low-temperature water electrolysis for energy-storage applications – published**

Also input to WG1 "Terms and Definitions" of CEN/CLC/JTC6 "Hydrogen in energy systems"



EU harmonisation activities – published JRC deliverables: LTWE documents

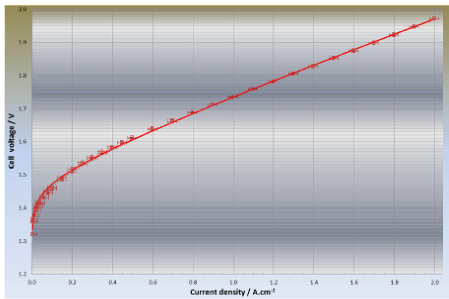


JRC VALIDATED METHODS, REFERENCE METHODS AND MEASUREMENTS REPORT

EU harmonised polarisation curve test method for low-temperature water electrolysis

Malkov T., Pilega A., Tsoitridis G., De Marco G.

2018



EUR 29182 EN



JRC VALIDATED METHODS, REFERENCE METHODS AND MEASUREMENTS REPORT

EU harmonised cyclic voltammetry test method for low-temperature water electrolysis single cells

Malkov, T., De Marco, G., Tsoitridis, G.

2018



EUR 29285 EN

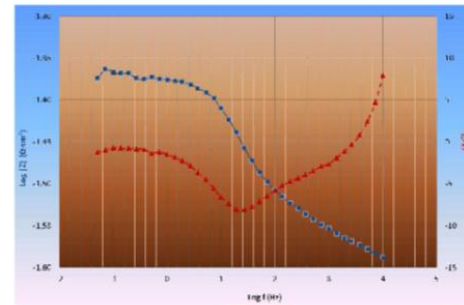


JRC VALIDATED METHODS, REFERENCE METHODS AND MEASUREMENTS REPORT

EU harmonised test procedure: electrochemical impedance spectroscopy for water electrolysis cells

Malkov, T., Pilega, A., Tsoitridis, G.

2018



EUR 29267 EN



Also input to WG13 (now WG15) "Energy storage systems using fuel cell modules in reverse mode" of IEC/TC105 "Fuel Cell Technologies"



EU harmonisation activities – JRC deliverables in progress: LTWE documents

EU HARMONISED PROTOCOLS FOR TESTING OF LOW TEMPERATURE WATER ELECTROLYSIS

Current status (June 2020):

- comments by EU experts from industry and academia received on second version
- contribution from FCH2JU funded project on testing protocols for electrolysers performing grid services (QualityGrids, <https://www.qualitygrids.eu>) incorporated
- Final document in preparation, expected release for revision by July 2020
- Possible contribution to ISO TR from JRC via Liaison status in ISO TC 197 and IEC TC 105 through the Commission

LTWE harmonisation - Testing protocols for PEMWE, AWE & AEMWE technologies - Scope

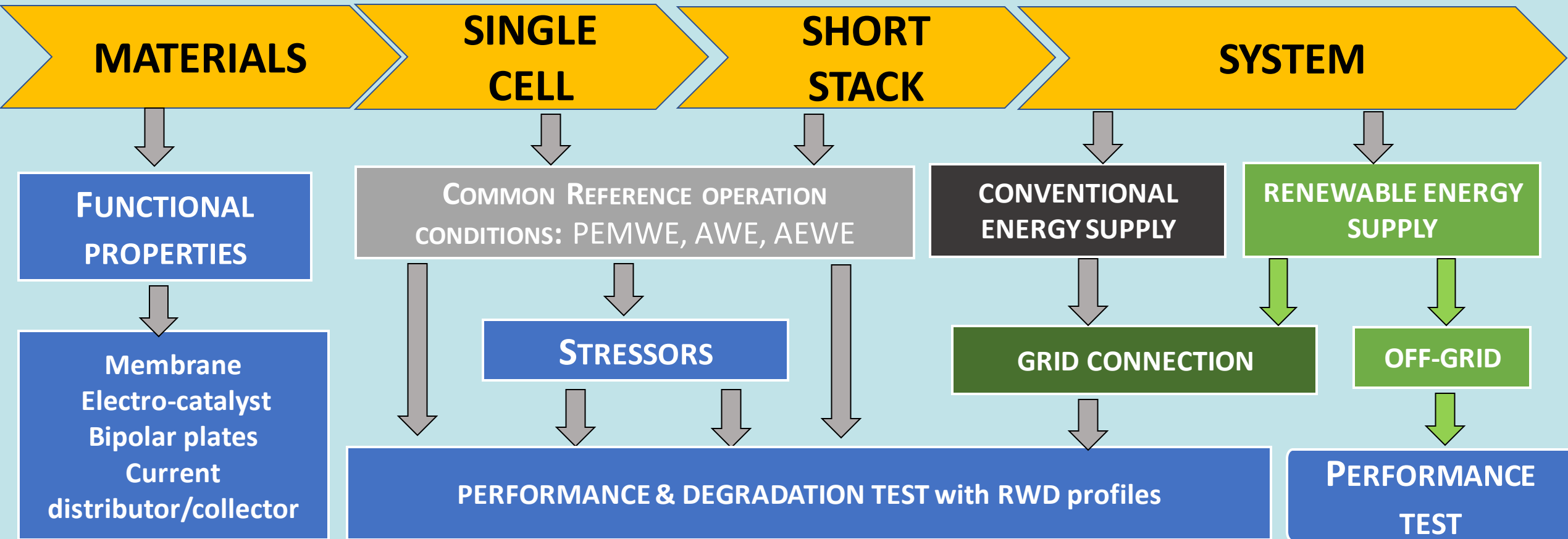
Define EU harmonised testing protocols for performance and degradation assessment of electrolysis technologies in energy storage applications (e.g. grid balancing)

- Materials testing
- Single cells testing
- Stack testing
- System testing

LTWE harmonisation - Testing protocols for PEMWE, AWE & AEMWE technologies - Contents

- Single cells & short stacks testing
 - Common reference operating conditions
 - Stressor conditions
 - Performance testing
 - Degradation / durability testing
 - steady-state,
 - transient/dynamic loads using **Real World Degradation profiles (based on system testing protocols developed by QalyGrids)**
 - AST (proposals)

LTWE harmonisation - Testing protocols for PEMWE, AWE & AEMWE technologies - Contents

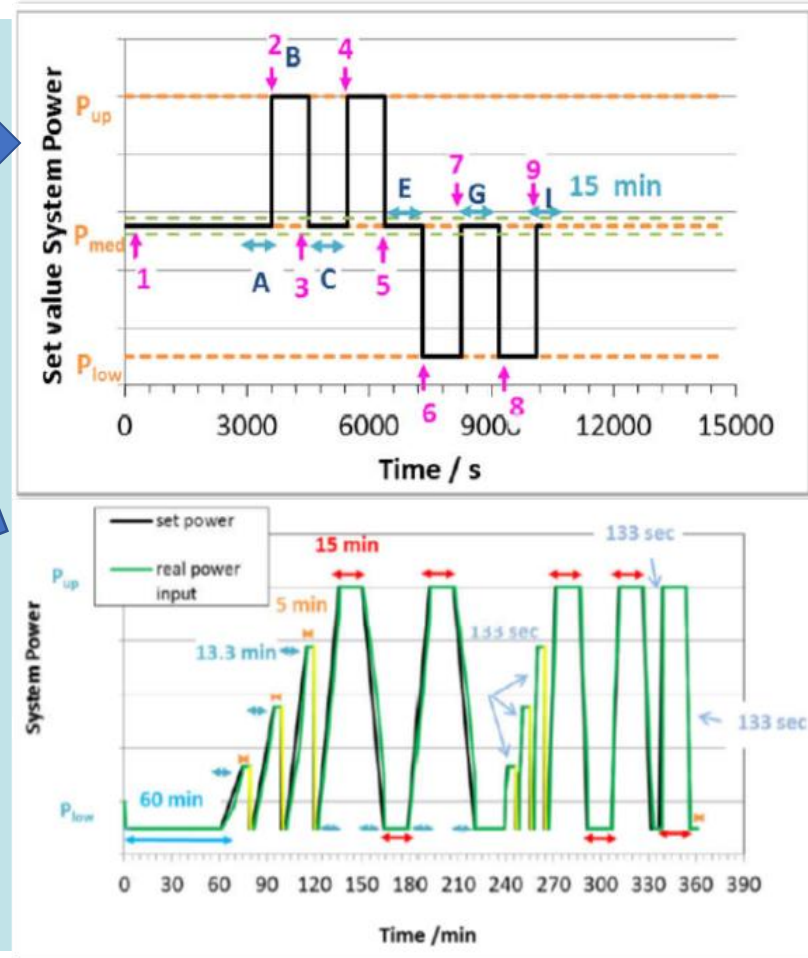


LTWE harmonisation - Testing protocols for PEMWE, AWE & AEMWE technologies -

Real World Degradation profiles

TEST PROFILES FROM QUALYGRIDS

1	FREQUENCY CONTAINMENT RESERVE FCR
	AUTOMATED FREQUENCY RESTORATION RESERVE aFRR
2	• aFRR Negative Power Control
3	• aFRR Positive power control
	MANUAL FREQUENCY RESTORATION RESERVE mFRR
4	• mFRR Negative Power Control
5	• mFRR Postive Power Control
	REPLACEMENT RESERVES RR
6	• RR Upward Power Control
7	• RR Downward Power Control



EU harmonisation activities – started October 2019

- **High-temperature electrolysis (HTE) harmonisation documents for energy storage applications**
 - Drafting of terminology document for high and low temp. electrolysis by Q4 2020
 - 1st version sent for expert panel review, mid May 2020
 - Need for testing procedures and protocols identified in collaboration with partners from FCH2JU funded projects
 - *Planned public stakeholder consultation on FCH2JU website at <https://www.fch.europa.eu>*
 - When finalized, documents will be available online on EU bookshop at <https://publications.europa.eu>

Collaboration with JRC pathways

- Collaborative Doctoral Partnership programme (see at <https://ec.europa.eu/jrc/en/working-with-us/collaborative-doctoral-partnerships>),
- Open access to JRC Research Infrastructures (see at <https://ec.europa.eu/jrc/en/research-facility/open-access>),
- Open access to JRC Research Infrastructures for Training and Capacity Building for Enlargement and Integration Countries (see at <https://ec.europa.eu/jrc/en/research-facility/open-access/training>),
- Selected support to future projects (including potential FCH2JU successor) through an appropriate mechanism which is yet in the making.

Thanks to our partners for their contributions to documents and FCH2JU for financial support from the Union budget



Any questions?

You can email:

alberto.pilenga@ec.europa.eu

thomas.malkow@ec.europa.eu



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Stay in touch!



ec.europa.eu/jrc



@EU_ScienceHub



EU Science Hub - Joint Research Centre



Joint Research Centre



EU Science Hub