



Solid Oxide Cell and Stack Testing, Safety and Quality Assurance

Collaborative Project - FCH JU GRANT AGREEMENT N° 621245

THEME [SP1-JTI-FCH.2013.5.4]

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Project Coordinator: M. Lang – DLR

DELIVERABLE REPORT

D.7.2 – INTERIM REPORT ON LIAISON AND DISSEMINATION ACTIVITIES		
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DISSEMINATION LEVEL		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
C O	Confidential, only for members of the consortium (including the Commission Services)	
NATURE OF THE DELIVERABLE		
R	Report	X
P	Prototype	
D	Demonstrator	
O	Other	

SUMMARY	
Keywords	<i>Liaison, standards, industry needs, dissemination</i>
Abstract	<p>In the first reporting period the industrial advisory board has been established and technical feedback gained. The project has entered into liaison with the main standards developing organizations in the field: IEC, ISO and CENELEC. Impact has already been gained thanks to the initiation of a dedicated working group within IEC which will incorporate experience from SOCTESQA in new standards to be developed for fuel cells operating in reversing mode. Several dissemination activities were carried out by the SOCTESQA partners, e.g. project website, posters presentations at European and International conferences, presentations at other European funded projects, newsletters, project flyers and presentations at key international assemblies of the IEC.</p>

D.7.2 – INTERIM REPORT ON LIAISON AND DISSEMINATION ACTIVITIES

1 Objectives of liaison and dissemination in SOCTESQA

Work package 7 is dedicated to dissemination of the project results and to interaction with standards developing organizations (SDO) and with relevant industrial stakeholders. The ultimate objective of the project is to come up at the end with procedures that are not only validated inside the laboratory, but are already shaped towards the requirements of regulations codes and standards as well as industrial productivity and reliability. The test procedures should incorporate the inputs from both entities and should foster worldwide discussion and awareness of the topic. In this way the maximum exploitation of the project outcome can be achieved.

2 The Industrial Advisory Board

Table 1: Industrial advisory board of the SOCTESQA project

	Industry	Contact
	Bosch – Germany	Raphaëlle Satet
	CeramTec – Germany	Michael Scharrer
	Ceres Power – UK	Chris Evans
	Elcogen – Finland	Matti Noponen
	ElringKlinger – Germany	Thomas Kiefer
	FuelCon – Germany	Mathias Rachau
	H.C. Starck – Germany	Michael Fooker
	HyGear – Netherlands	Robert Makkus
	ICI Caldaie – Italy	Carlo Tregambe
	Kerafol – Germany	Andreas Glauche
	Hexis – Switzerland	Andreas Schuler
	Saint Gobain – France	Nathalie Petigny
	Schott – Germany	Jens Suffner
	Solid Power – Italy	Stefano Modena
	Sunfire – Germany	Mario Heinrich
	Zahner – Germany	Carl Albrecht Schiller

Interaction with industry has been part of SOCTESQA since the time of writing the project proposal: a number of letters were gained at that time where key industrial player manifested their interest in following the project's activities and achievements. These industries were chosen to constitute the project's industrial advisory board (IAB).

In the beginning of operations, fact sheets were compiled by SOCTESQA partners to send out to the IAB for gaining technical input as to the operating conditions of SOC systems in the applications targeted: systems for combined heat and power generation (μ -CHP), auxiliary power units (APU) and electrolysis systems mainly.

Feedback and filled in fact sheets were obtained from several IAB partners, e.g. ElringKlinger, SOLIDpower, Elcogen, HyGear and ICI Caldaie. This provided sufficient information to decide on the stack size to be tested within the project and to assess the involvement of industry. The Elcogen fact sheet is attached as an example in the appendix (see Chapter 6).

3 Liaisons with Standards Developing Organizations

SOCTESQA has carried out a comprehensive survey of ongoing standardization activities in the field (see Deliverable D2.2) and has entered into contact and liaison with the main bodies currently working on regulations for hydrogen and fuel cell technologies. Essentially, these are grouped under the international bodies of the ISO Technical Committee 197 on hydrogen technologies – which looks mainly at safety issues of electrolyzers and hydrogen handling – and the IEC TC105 on fuel cell technologies. The latter is much more focused on the technology and the definition of practical guidelines in terms of system performance, installation and characterization.

3.1 Liaisons with IEC and ISO

In this respect, the work in SOCTESQA is considered more in line with IEC, and in fact the Technical Specification on Solid oxide fuel cell and stack test procedures (issued in 2014 as IEC TS 62282-7-2) has been a fundamental seed document for further elaboration. However, SOCTESQA is exploring new terrain in the assessment of test procedures for the recently emerging applications of high-temperature electrolysis. Solid oxide cells show tremendous potential as reversing power generator-storage devices, since the materials of the stack can remain unvaried when switching polarity and the high operating temperature is beneficial for electric efficiency in both modalities. In fact, compared to PEM and Alkaline electrolyzers producing hydrogen at around 40-60 kWh/kg H₂, the solid oxide technology effectively turns part of the heat into hydrogen, allowing it to reach hydrogen yields of 30-40 kWh/kg H₂. This is particularly interesting in view of the increasing penetration of renewables in the electric grid, which already leads to frequent curtailment of renewable power. SOC electrolysis can thus store excess power more efficiently, and the potential for re-electrification is enhanced as well, thanks to the high power generation efficiency and the capability to dimension systems to localized needs.

Thus, it is considered a crucial task within SOCTESQA to lead international activities in standardization of solid oxide cells used in this way by example. To this effect, SOCTESQA was presented at the IEC TC105 plenary meeting in Tokyo in October 2014, and the proposal was submitted to initiate a dedicated working group on procedures for testing fuel cells in reversing mode (including PEM and Alkaline to be technology neutral). This was preliminarily accepted by the IEC, after which a technical meeting followed hosted by ENEA in Rome, and the drafting of a New Work Item Proposal (NWIP) for the production of 3 International Standards by 2019:

- 62282-8-101: Solid oxide single cell and stack performance including reversing operation

- 62282-8-102: PEM single cell and stack performance including reversing operation
- 62282-8-201: Power-to-power systems performance

This activity will be undertaken by Ad Hoc Group 6 (AHG6) in the TC105, and Stephen McPhail, leader of this Work Package 7 in SOCTESQA, will act as project leader for the first standard, and as convener for the entire AHG6. Thus, first-hand involvement is guaranteed and the best possible output pathway for SOCTESQA activities is enabled.

Through the IEC TC105 committee, liaison is also ensured with ISO's TC197 on hydrogen technologies, which will be monitored through the former activity.

3.2 Liaisons with CEN-CENELEC

Simultaneously, CENELEC, the European technical standardization body, has also initiated a new working group on Hydrogen. The scope of the working group covers the production of hydrogen through electrolysis and the transportation, distribution and usage of that hydrogen in pure form or as a natural gas dominant mixture (H₂NG). In addition, actions in cross-cutting fields such as safety and training of personnel are identified. The final objective of this working group is to set a long term collaborative framework (liaison) with major bodies for strengthening cooperation between regulatory work, standardization work and RDI programs (e.g. European Commission, JRC, FCH2 JU, IEA, ISO, IEC). DLR has joined this working group, namely task force 2: electrolysers, and participated at several meetings with the background of transferring the results and experience so far achieved in SOCTESQA. Moreover, DLR has entered into a formal liaison with CENELEC to monitor the progress in this working group on behalf of the SOCTESQA consortium. The corresponding liaison agreement between DLR and CENELEC was signed in Sept. 2015.

4 Dissemination activities

The basic tool for dissemination, namely the project website with a “corporate” identity, was developed early in the project and went on line as planned (see also Deliverable 7.1). In addition to this, a project flyer was developed, for distribution at exhibitions and conferences (see appendix).

In the first reporting period the SOCTESQA project was intensively promoted, with a number of local news items, 6 posters at high-profile conferences, 2 newsletters and presentations at key international assemblies of the IEC. Especially the latter events are considered impactful, since the objective of the project is to generate reliable and topical procedures for solid oxide cell and stack testing that can become internationally applicable standards, for the benefit of industrial production.

A crucial dissemination event that is going to catalyse the interaction with industry and standardization, and important Milestone within SOCTESQA, is the workshop that is being organized on 15.12.2015 in the frame of the 2015 European Fuel Cell “Piero Lunghi” conference in Naples/Italy. Keynote speakers from standardization bodies and collaborating projects such as STACKTEST (FCH-JU) will interact with industry and academia to demonstrate achievements so far, identifying gaps and bottlenecks and ways forward in a lively debate.

A list of dissemination activities carried out by SOCTESQA partners is given in the table below, with details regarding dates, presentation types and titles, and outcome where relevant.

Table 2: Dissemination activities within SOCTESQA during first 18 month

Date	Event	Location	Presentation type	Title	Presented by (partner)	Audience	Comments
12.12.2013	EFC13	Rome, Italy	POSTER	Solid Oxide Cell & Stack Testing, Safety and Quality Assurance (SOCTESQA)	ENEA, DLR	scientific	
15.04.2014	Kick-off meeting EU-project "ENDURANCE"	Genova, Italy	Presentation	FCH-JU project "SOCTESQA" (Solid Oxide Cell & Stack Testing, Safety and Quality Assurance)	DLR	scientific	
29.04.2014	n.a.	ENEA website	News item	L'ENEA nei progetti europei per le celle a combustibile	ENEA	generic	
03.06.2015	Workshop EU-project "STACKTEST"	Stuttgart, Germany	Poster	Collaborative project: Solid Oxide Cell & Stack Testing, Safety and Quality Assurance (SOCTESQA)	DLR	scientific	
15.06.2014	WHEC 2014	Gwangju, S. Korea	POSTER	Solid Oxide Cell & Stack Testing, Safety and Quality Assurance (SOCTESQA)	ENEA	scientific	
01.07.2014	EFCF 2014	Luzern, Switzerland	POSTER	SOCTESQA - Solid Oxide Cell and Stack Testing, Safety and Quality Assurance	DLR	scientific	
31.07.2014	n.a.	Internet	Project website	www.SOCTESQA.eu	ENEA	generic	
02.10.2014	n.a.	DTU website	News item	Research in hydrogen and fuel cell energy systems to be accelerated through standardization	DTU	generic	
21.10.2014	Putting science into standards workshop	Petten, Netherlands	Participation	n.a.	DLR, DTU	SDO	initiated liaison procedure with CENELEC
28.10.2014	Asia Clean Energy Summit	Singapore	Presentation	Electrolyzer/Fuel Cell --- A bridge towards a more sustainable future	NTU		
01.11.2014	n.a.	Denmark	Newsletter	DTU skal være med til atstandardisere brændselsceller	DTU	generic	
08.11.2014	TC105 General Assembly	Tokyo, Japan	Presentation	Future perspectives of SOFC/SOEC applications and the role of standardization	ENEA	SDO	initiated ad-hoc group (AHG6) within IEC
10.11.2014	FCH JU Programme Review Days	Brussels, Belgium	Poster	SOCTESQA - Solid Oxide Cell and Stack Testing, Safety and Quality Assurance	DLR	FCH JU	
07.01.2015	Fuel Cell and Electrolyzer – towards Power to Gas Application	Hongkong, China	Presentation	2nd International Conference on Sustainable Urbanization (ICSU 2015)	NTU	Scientific	
05.02.2015	n.a.	Internet	Newsletter	#1	ENEA	generic	
13.04.2015	Hannover Messe	Hannover, Germany	Flyer	SOCTESQA - Solid Oxide Cell and Stack Testing, Safety and Quality Assurance	ENEA, DTU, DLR	generic	
22.05.2015	ENERGY, SCIENCE & TECHNOLOGY – International Conference and Exhibition, EST 2015	Karlsruhe, Germany	Flyer	Project "SOCTESQA"	EIFER	scientific	
22.07.2015	IEC TC105 AHG meeting	Rome, Italy	Participation	n.a.	ENEA, JRC	SDO	defined scope and preliminary plan for AHG6 activity
27.07.2015	SOFC XIV	Glasgow, Scotland	Poster	SOCTESQA - Solid Oxide Cell and Stack Testing, Safety and Quality Assurance	DLR	scientific	
22-23.09.2015	IEC TC105 International FC Conference	Beijing, China	presentation	"Test procedures for a quality-assured supply chain – SOCTESQA"	ENEA	SDO, scientific	
21,24-25.09.2015	IEC TC105 AHG and Plenary meeting	Beijing, China	participation	"Energy storage systems using fuel cell modules in reverse mode"	ENEA	SDO	consolidated New Work Item Proposal within IEC
19.10.2015	Mid-Term-Review of Spurc project	Singapore	Presentation	Solid Oxide Cell Stack Test Station	NTU	Review panel members	

5 Plan for the second reporting period

For the final 18 months, further effort will be dedicated to the liaison with CENELEC and IEC, since these bodies are currently active in defining regulations that are in line with what SOCTESQA is carrying out in practice. Also, with the validation loops of the test procedures developed starting to be completed, highly interesting technical results will be generated that can give radically new insights into the repeatability and reliability of test results published worldwide. Apart from providing full-range and in-depth characterization of the ElringKlinger stacks that are the test objects within this project, this meta-level testing should be the key to a robust framework for SOC technology to develop in. A stronger interaction with European industry is therefore envisaged, besides maintaining the leading positions of SOCTESQA partners in the standardization process to balance the strong presence of east Asian players there.

6 Appendices

- 1) Fact sheet filled in by Elcogen
- 2) NWIP of the AHG6
- 3) SOCTESQA project flyer
- 4) Announcement of the SOCTESQA Workshop