PURPOSE

The Task is focused on H_2 applications in energy communities and distributed systems, mostly involving stationary applications but also looking at potential benefits for transportation. An energy community is defined as a group of people with shared energy needs living and interacting in a common geographic location. Communities considered for inclusion in this task have populations up to 1000 people and a total installed power capacity of hydrogen energy technologies (both producing and consuming hydrogen) not to exceed 500 kW. In this task, objective hydrogen systems have been categorized into rural/island, urban, and industrial community types based on system location.

STATUS OF THE TECHNOLOGY

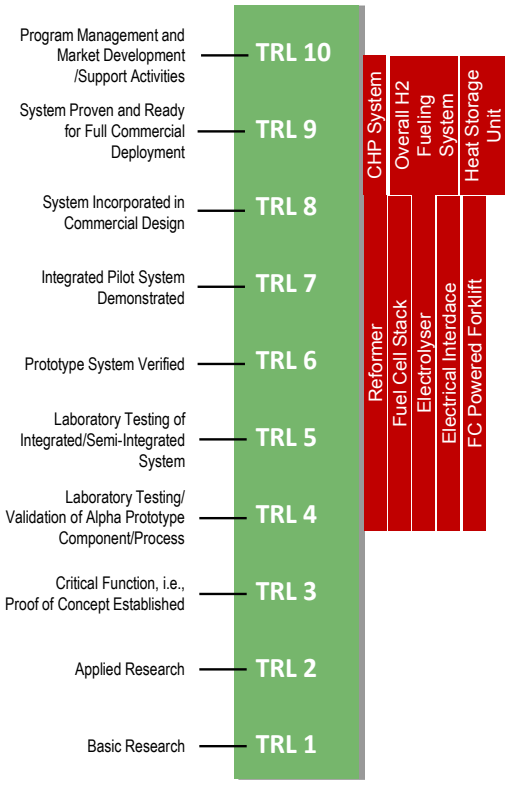
In terms of technology status, hydrogen systems studied here have been classified according to system configuration. There are three technology system configurations:

- Combined heat and power (CHP) technology based on fuel cells
- Renewable energy storage technology using hydrogen
- FC based fleet forklift technology

COMBINED HEAT POWER (CHP) TECHNOLOGY BASED ON FUEL CELLS

Status of the Technology

This system is based on fuel cells (FCs) using hydrogen obtained from the reformation of grid natural gas. The FC can supply electric and thermal energy simultaneously. The technology has been well developed on a scale ranging from from small (~1kWe) to large (~500kWe). Two examples in this task are small scale CHP in Japan and the Octagon House in the US.



Status of the Technology in Each Component

Reformer: TRL 8 - Commercial component verified

FC stack: TRL 8 - Commercial component verified

Heat storage unit: TRL 9 – Commercial component matured

Electrical interface (DC/AC converter): TRL 8 - Commercial component verified

TASK 29

DISTRIBUTED COMMUNITY HYDROGEN (DISCO H2)

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VITAL STATISTICS

Term

2011-2014

Members

France, Greece, UK, USA, New Zealand, Japan

Expert Participants

Hiroshi Ito (AIST, Japan)
Aline Rastetter (Alphea, France)
Emmanuel Stamatakis (CRES, Greece)
Nasrine Winther (AREVA, France)
Raymond Schmid (Hydrogenics, Canada)
Marieke Reijalt (HyER, France)
Alister Gardiner (Callaghan Innovation, New Zealand)
Robert Friedland (Proton Onsite, USA)
Daniel Aklil (Pure Energy, UK)

Expert Participants 9

2013 Meetings

1st : 13-14 June, Edinburgh, UK
2nd : 20-21 November, New York, USA

Technology Readiness Level (TRL)

As a whole system,

TRL 8-9: Commercial system verified

RENEWABLE ENERGY STORAGE TECHNOLOGY USING HYDROGEN

Status of the Technology

Unstable electrical output from renewable energy sources (PV, Wind) can be converted into hydrogen, which can act as an energy storage carrier, and be reconverted to electricity on demand. Examples in this task are: Hydrogen Office in UK, Lolland CHP in Denmark, and Myrte in France.

Status of the Technology in each Component

Electrolyzer: TRL 8 - Commercial component verified

Fuel cell stack: TRL 8 - Commercial component verified

Hydrogen storage unit: TRL 8 - Commercial component verified

Electrical interface (DC/AC converter): TRL 8 - Commercial component verified

Technology Readiness Level (TRL)

As a whole system

TRL 6-7: Prototype system verified

FC BASED FLEET (FORKLIFT) TECHNOLOGY

Status of the Technology

A fuel cell (FC) powered forklift has been developed and demonstrated in real sites as an alternative to conventional propane engine powered forklifts. FC forklifts feature a short refueling time (~3 min), are emission free and extremely quiet in operation.

Status of the Technology in each Component

Hydrogen fueling facility: TRL.7- 8 - Commercial component verified

Fuel Cell powered forklift: TRL 8 - Commercial component verified

Technology Readiness Level (TRL)

As a whole system,

TRL 8-9: Commercial system verified

FRAMEWORK SUMMARY

Subtask Table

ST	SUBTASK NAME	ST LEADER	COUNTRY & INSTITUTION
1	Management	Hiroshi Ito	AIST, Japan
2	Selection and Analysis	Manolis Stamatakis	CRES, Greece
3	Model Concept Development	Hiroshi Ito	AIST, Japan
4	Concept Replicability	Alister Gardiner	Callaghan Innovation, NZ
5	Dissemination	Hiroshi Ito	AIST, Japan

MEMBERS

Task Member and Expert Table

COUNTRY		EXPERT NAME (INDICATE IF SUBTASK LEADER)	INSTITUTION NAME
1	Japan	Hiroshi Ito (HI) (ST3 lead)	AIST - National Institute of Advanced Industrial Science and Technology
2	France	Aline Rastetter (AR)	Alphea
3	Greece	Emmanuel Stamatakis (ES) (ST2 lead)	CRES - Centre for Renewable Energy Sources
4	France	Nasrine Winther (NW)	AREVA Renewables
5	Canada	Raymond Shmid (RS)	Hydrogenics
6	France	Marieke Reijalt (MR)	HyER
7	New Zealand	Alister Gardiner (AG) (ST4 lead)	Callaghan Innovation
8	USA	Robert Friedland (RF)	Proton On Site
9	UK	Daniel Aklil (DA)	Pure Energy

ACTIVITIES AND RESULTS IN 2013

PROGRESS AND ACCOMPLISHMENTS

ST1 Management

Owing to the change of OA and the resulting delay in ST3, the task will not be completed by the end of 2013. Operating Agent Hiroshi Ito proposed a one-year extension through 2014 at the ExCo meeting in Dec. 2013. The extension was approved at the ExCo meeting.

ST2 Analysis and Selection

The task was completed by the end of 2012. Over 50 hydrogen projects were reviewed, and 6 projects were selected for model concept development (ST3).

ST3 Model Concept Development:

OA Ito has followed the work frame prepared by ex-OA Dr. Federico Villatico. First, a SWOT analysis for selected 6 projects was performed as per ST2, 2-1. Second, a software (HOMER) analysis was performed for technical and economical aspects according to 2-2., which also featured an analysis of social aspects (community and RCS) via

questionnaires. Third, a model concept development for each categories (rural/island, urban, and industrial) was undertaken.

The SWOT analysis has been completed. In terms of the software analysis, 3 of the 6 selected projects have been completed, and the questionnaires were delivered to each project manager.

ST4 Concept Replicability:

Subtask Leader Gardiner introduced the framework of ST4. Market readiness matrix will be created for the selected DISCO-H2 projects. In addition to TRA (Technology Readiness Assessment)/SRA (System Readiness Assessment), Market Readiness will be assessed with dimensions relevant to commercial replication of the hydrogen technologies deployed, such as integration of components, system economic validation, availability maintenance and serving support and accessibility, safety standards, regulatory, and permissions, etc.

Milestones and their Status

MILESTONE N.	ST N.	MILESTONE NAME	TIME
M1	3	Data inputs	End of Jan., 2014
M2	3	Models definition & Draft of subtask report	End of Apr., 2014
M3	4	Market Readiness analysis & Draft of subtask report	End of Jun., 2014
M4		Draft of final report	End of Dec., 2014

OUTREACH AND COMMUNICATION

Summary of Strategy and Activities

In addition to the final report, it may be possible to develop a "How to guidelines" for communities. The purposes of these guidelines would be intended to inform interested stakeholders about integration of hydrogen technology systems in their communities. This effort would require community planning expertise. The University of Maryland School of Architecture and Planning has agreed to endorse an internship for purposes of developing these guidelines.

The first meeting of this year (2013) was linked with the international conference (HYPOTESIS2013) in Edinburgh (Scotland) on 11-12 June. The overall activity and some detailed activities of this task were presented at the conference.

Task Communication and Outreach Table appears below.

ENTRY #	PUBLICATION / PRESENTATION NAME	PUBS	PRES	EVENT	LOCATION	AUTHOR
1	Participation aux travaux du groupe DISCO-H2 de l'IEA/HIA	1		Alphea hydrogen newsletter		A. Rastetter
2	Renewables and Hydrogen: an opportunity for Communities		1	II annual meeting of Task 29 at City Council of Edinburgh with the presence of the Scottish Energy Minister and the CEO of the City Council	Edinburgh, Scotland	F. Villatico
3	Distributed and Community Hydrogen (DISCO-H2)	1	1	WHTC	Glasgow, Scotland	D. Aklil
4			1	Low Carbon Earth Summit-2011 (LCES-2011)	Dalian, China	R. Friedland; M-R. de Valladares
5	What is the International Energy Agency - Hydrogen Implementing Agreement (IEA - HIA)		1	HYPOTHESIS 2013	Edinburgh, Scotland	M-R. de Valladares
6	International Energy Agency Hydrogen Implementing Agreement (IEA-HIA) Task 29 overview - Distributed and Community Hydrogen (DISCO-H2)		1	HYPOTHESIS 2013	Edinburgh, Scotland	H. Ito
7	HOMER Analysis Of The Octagon Project		1	HYPOTHESIS 2013	Edinburgh, Scotland	H. Ito
8	Next Task 29 Output - Concept Replicability		1	HYPOTHESIS 2013	Edinburgh, Scotland	A. Gardiner
9	Modeling For Japanese Cobined Heat and power system		1	HYPOTHESIS 2013	Edinburgh, Scotland	H. Ito
	SUB-TOTAL	2	8			

FUTURE WORK HEADING LEVEL 1

ACTIVITIES AND /OR TARGETS FOR 2014

For 2014, the task will focus on finalizing its activities and publishing the final report.

ACTIVITIES AND/OR TARGETS BEYOND 2014

Beyond 2014, the task will look to publication of "How to guidelines" that would inform key stakeholder audiences about how to integrate hydrogen in their community.

The task also expects to publish an article related to model developments for an academic journal.