PURPOSE

Task 29 is focused on hydrogen applications in energy communities and distributed systems mostly involving stationary applications, but also considering potential benefits for transportation. Energy communities are defined as groups of interacting people who share both geographical location and energy needs.

In terms of population, communities are defined as less than 1000 people total. The total installed power capacity of the hydrogen energy technologies (both producing and consuming hydrogen) in these communities cannot exceed 500 kW.

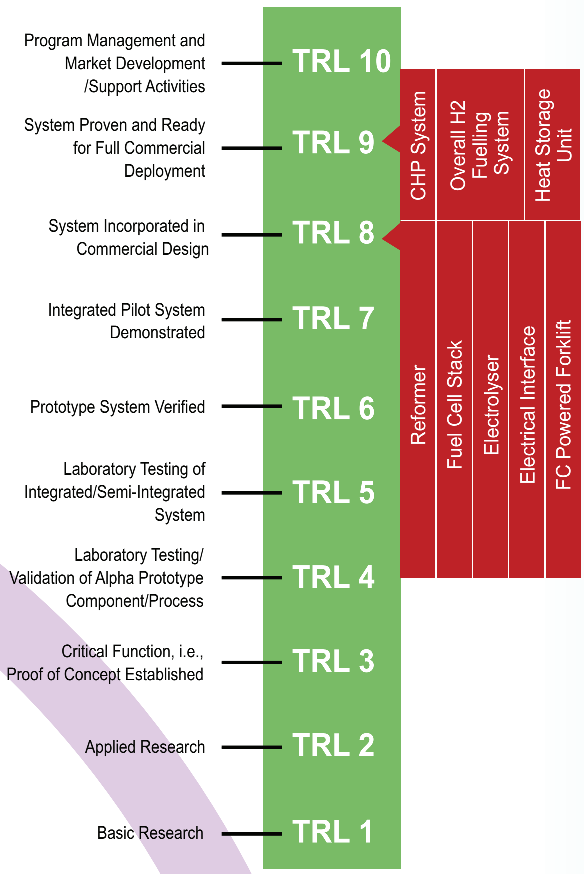
STATUS OF THE TECHNOLOGY

For this task each hydrogen system is characterized by the community location where the system is installed. Categories include rural/island, urban and industrial applications. At the present time, hydrogen systems studied here have also been categorized by the following system configurations:

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 in the wide range of scale from small (~1kWe) to large (~500kWe). For example, small scale CHP in Japan and Octagon in 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

Technology Readiness Level (TRL)

As a whole system, TRL 8–9: Commercial system verified

TASK 29

DISTRIBUTED COMMUNITY HYDROGEN (DISCOH2)

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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)
Olivier Verdu (AREVA, France)
Raymond Shmid (Hydrogenics, Canada)
Marieke Reijalt (HyER, France)
Alister Gardiner (Callaghan Innovation, New Zealand)
Robert Friedland (Proton Onsite, USA)
Daniel Aklil (Pure Energy, UK)

2014 Meetings

1st : 19–20 May, Ajaccio, France
2nd : 18–20 November, Wellington, New Zealand

RENEWABLE ENERGY STORAGE TECHNOLOGY USING HYDROGEN

Status of the Technology

Unstable electrical output from renewable energy sources (PV, Wind) can be transferred into hydrogen, which can be act as an energy storage carrier and transferred to electricity on demand. Project examples include the 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

Instead of a conventional propane engine powered forklift, the fuel cell (FC) powered forklift has been developed and demonstrated in real sites. FC forklifts charge quickly (~3 min). Extremely quiet in operation, they are emission free.

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 I (SUBTASK LEADER: HIROSHI ITO, AIST, JAPAN)

Management

SUBTASK 2 (SUBTASK LEADER: MANOLIS STAMATAKIS, CRES, GREECE)

Analysis and Selection

SUBTASK 3 (SUBTASK LEADER: HIROSHI ITO)

Model Concept Development

SUBTASK 4 (SUBTASK LEADER: ALISTER GARDINER, CALLAGHAN INNOVATION, NEW ZEALAND)

Concept Replicability

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	Olivier Verdu (OV)	Areva Energy Storage
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 2014

PROGRESS AND ACCOMPLISHMENTS

ST1 Management:

- Hiroshi Ito led two meetings in 2014. The first 2014 meeting was held on 19–20 May in Corsica Island, France, with a site-tour to the MYRTE platform. The second meeting was on 18–20 November in Wellington, New Zealand, where Callaghan Innovation hosted a networking event in conjunction with the DISCOH2 meeting.

ST2 Analysis and selection:

- This subtask was completed at the end of 2012. Over 50 hydrogen projects were reviewed and six projects have been selected for ST3 (model concept development).

ST3 Model concept development:

- The SWOT analysis is complete. In terms of the software analysis, three of six selected projects are complete. Questionnaires were delivered to each project manager.
- Data collection of detailed model analysis from each project manager is almost complete. Based on this data, HI has been vigorously engaged with the analysis.

ST4 Concept replicability:

- AG prepared a draft of subtask report of ST4. We will create a market readiness matrix for the selected DISCOH2 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

MILESTONE N.	ST N.	MILESTONE NAME	TIME
M1	3	Complete subtask report	End of Jun., 2015
M2	4	Complete subtask report	Early 2016
M3		Draft of final report	Mid 2016

OUTREACH AND COMMUNICATION

Dr. Hiroshi speaking at meeting in Wellington, New Zealand

Summary of Strategy and Activities

The main body of the final report will consist of the subtask report of ST3 and ST4. Unfortunately it has proven difficult to develop "how-to guidelines" that provide guidance on design and installation of community hydrogen systems.

Task Communication and Outreach Table

The second meeting of this year (2014) was linked with the Hydrogen Energy Research Event at Wellington (New Zealand) on 19–20 November, which was hosted by Callaghan Innovation and open to the public. The overall activity and some detailed activities of this task were presented at the conference.

TASK 29	ENTRY #	PUBLICATION / PRESENTATION NAME	PUBS	PRES	OTHER	EVENT	LOCATION	AUTHOR
	1	Overview of the Hydrogen Implementation Agreement and current research activities		1		Hydrogen Energy Research Event	Wellington, New Zealand	M-R. de Valladares
	2	Overview of the IEA HIA Annex 29 research project DISCO–H2		1		Hydrogen Energy Research Event	Wellington, New Zealand	H. Ito
	3	Strategic hydrogen energy opportunities for NZ and wrap up		1		Hydrogen Energy Research Event	Wellington, New Zealand	Gardiner
		SUB-TOTAL		3				

FUTURE WORK

ACTIVITIES AND /OR TARGETS FOR 2015

Finalize the task and publish the final report.

ACTIVITIES AND/OR TARGETS BEYOND 2015

Publish "how-to guidelines" for communities that offer instructions on design and installation of community hydrogen system.

R&D CHALLENGES

Publish an article(s) related to model developments for an academic journal.