IEA H2 TODAY

Strategy Matters
We are pleased to announce a name change to the IEA Hydrogen Technology Collaboration Programme (TCP). Legally, we remain an “Implementing Agreement,” but going forward we’ll be known as IEA Hydrogen or IEA H2. You can find us at either ieahydrogen.org or ieahia.org.

IEA Hydrogen is also pleased to announce the recently elected members of our new leadership team. The incoming Chairman is Paul Lucchese of Capenergies and CEA. The two Vice Chairs are Dr. Jonathan Leaver of Unitec in New Zealand and Mr. Eiji Ohira of NEDO in Japan.

We would also like to express our appreciation to the outgoing leadership team: Chairman Stefan Oberholzer of Switzerland; Vice-Chair Yong-Gun Shul of Korea; and Vice-Chair Eric Miller of the U.S.

ExCo Meetings
The 75th IEA Hydrogen ExCo Meeting was held by Global Webinar in four sessions on 1, 5, 7 and 12 December 2016. The 76th IEA Hydrogen ExCo Meeting was held 14-16 February in Oslo, Norway. The 77th ExCo Meeting will be held in mid-December alongside the European Fuel Cell Conference & Exhibition (12-15 December) in Naples, Italy.

IEA Hydrogen Tasks
Task 39 held a major workshop in Oslo, Norway just before the 76th ExCo Meeting. Task 38 – Power-to-Hydrogen and Hydrogen-to-X also held a major workshop on “Energy system models and the role of hydrogen” in May at the University of Bath in the UK.

See Task Ink for latest news on the entire IEA Hydrogen portfolio.

IEA Hydrogen Promotion and Outreach
IEA Hydrogen will deliver an overview presentation entitled “IEA Hydrogen: Technology diplomacy in practice” on 12 July 2017 at the July World Hydrogen Technology Conference (WHTC) in Prague, Czech Republic (http://www.whtcprague2017.cz/). We will also have an exhibit booth. As well, Javier Dufour, Operating Agent for Task 36 – Life Cycle Sustainability Analysis (LCSA), will give a presentation entitled “Identification of effective trends towards low-carbon hydrogen production based on harmonized carbon footprints.” For a long time, IEA Hydrogen has participated in major hydrogen conferences to support our community. We hope you will be able to join all of us at WHTC.

Task 37 – Hydrogen Safety will hold a public workshop on its activities on 14 September alongside the International Conference on Hydrogen Safety (ICHS 2017), which will take place 11-13 September 2017 in Hamburg, Germany. IEA Hydrogen is a proud sponsor of ICHS (https://www.hysafe.info/ichs2017/).

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Task 29 - Distributed and Community Hydrogen (DISCO H2) released its final report for Subtask 4: *Replicability and Market Readiness of the Six Case Study Technologies*. The report was prepared by Alister Gardiner, Subtask 4 Leader, formerly with Callaghan Innovation.

Task 29 – DISCO H2 focused on hydrogen applications for distributed energy systems in community types: rural/island, urban and industrial/commercial. Communities were defined as less than 1000 in population and 500kW of installed hydrogen capacity.

![FIGURE 1 - AT A GLANCE SCORECARD AND COLOUR CODE](image)

Subtask 4 drew on the work of earlier subtasks to analyze six projects for market readiness. For each project, a SWOT analysis had been performed in Subtask 2, followed by a techno-economic analysis in Subtask 3. Subtask 4 then developed a market readiness tool based on the Technology Readiness Assessment (TRA) approach that uses Technology Readiness Levels (TRL). Five dimensions are included in the new market readiness framework tool: 1) Technical Readiness Level; 2) Environmental Benefit; 3) Economics; 4) Community/User; and 5) Regulatory Matters (RCS, policy and law). Post-project commercialization progress was considered as well. See "At a glance" matrix in Figure 1 above.

The technology learning potential for system cost reduction was also estimated for each project as part of the Technology Learning Assessment (TLA). More precisely, the sub-systems used in each project were assessed using a spreadsheet calculator to provide a basis for examining technology learning cost trends.
Technology learning is characterized by a constant percentage cost reduction for every doubling of cumulative production. The technology learning rate can be measured in a Progress Ratio (PR).

An “at-a-glance matrix” using color coding was devised to convey the market readiness assessment results for each project. The matrix includes a 1-9 index scorecard. Relevant criteria were then associated with each dimension and a scale reference was provided for each criterion.

Table 1 summarizes the market readiness features for all six projects.

### TABLE 1: COMPARISON OF THE MAIN MARKET READINESS FEATURES ACROSS THE SIX PROJECTS.

<table>
<thead>
<tr>
<th>Project</th>
<th>Market Readiness Dimension*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Octagon Apartments</td>
<td>++</td>
</tr>
<tr>
<td>Enefarm Residential CHP</td>
<td>+++</td>
</tr>
<tr>
<td>MYRTE</td>
<td>--</td>
</tr>
<tr>
<td>Lolland Residential CHP</td>
<td>---</td>
</tr>
<tr>
<td>Fedex Distribution Centre</td>
<td>+</td>
</tr>
<tr>
<td>Hydrogen Office</td>
<td>-</td>
</tr>
</tbody>
</table>

* Key to Market Readiness Dimensions: Strength is indicated by +; Weakness is indicated by -

No project was highly rated on all market readiness dimensions. Further, projects that offer good economic value are less positive in environmental benefit, and vice-versa: projects with good environmental benefits are less positive in economic value. If more financial emphasis were placed on environmental benefits, particularly to mitigate climate change, hydrogen energy technologies would become more competitive. Notably, commercially advanced projects do not necessarily demonstrate a positive economic profile as they may benefit from subsidies and/or government policy. On a positive note, the Residential CHP systems (EneFarm) and Fedex Distribution Centre are making significant ongoing commercialization progress. See Technology Spotlight on page 6 for an overview of Task 29 - DISCO H2.

**ALSO PUBLISHED**

**Task 29 - DISCO H2**

**Task 32 - Storage**
Mark Paskevicius (a), Lars H. Jepsen (a), Pascal Schouwink (b), Radovan Cerny (b), Drothe b. Ravnshaek (c), Yaroslav Filinchuk (d), Martin Dornheim (e), Flemming Besenbacher (f) and Torben R. Jensen(a), “Metal Borohydrides and derivatives – synthesis, structures and properties,” Chem Soc Rev: DOI: 10.1039/c6cs00705h.

**Task 36 - LCSA**
At the January 2017 World Economic Forum in Davos, Switzerland, 13 Global industry leaders joined together to create the Hydrogen Council; members include Air Liquide, Alstom, Anglo American, BMW Group, Daimler, Engie, Honda, Hyundai, Kawasaki, Shell, The Linde Groupe, Total and Toyota.

Nel Hydrogen has acquired Proton on Site; creates world's largest electrolyser company. The purchase price corresponds to an enterprise value of USD 70 million.

The Global Automobile Executive Survey 2017, published by KPMG, found that 78% of automotive executives surveyed absolutely or partly agree that hydrogen fuel cell vehicles will be the real breakthrough for electric mobility.

Shell and Toyota have partnered to build seven hydrogen fueling stations (HRS) for hydrogen cars in California. The stations will nudge the state closer to its goal of having 100 retail sites by 2024 where hydrogen fuel-cell vehicles can refuel. Toyota is also working with Air Liquide to build a hydrogen refueling station at a New Jersey Shell very close to NYC.

ITM Power and Shell opened their first hydrogen fueling station in the UK. The hydrogen refueling station is located at Cobham services on the M25, the nation's busiest refueling station. The station is ITM Power's fourth public hydrogen refueling station to be opened in the UK. The joint venture between H2 Mobility Deutschland and its partners Air Liquide, Daimler, Linde and Shell has officially opened two new hydrogen refueling stations in June 2017 in Frankfurt and Wiesbaden, Germany.

This spring 11 Japanese firms a signed a Memorandum of Understanding to build a network of HRS in Japan. The firms include: Toyota, Nissan, Honda, XTG Nippon Oil & Energy, Idemitsu Kosan, Iwatani Corporation, Tokyo Gas, Toho Gas, Air Liquide Japan, Toyota Tsusho Corporation, and the Development Bank of Japan Inc.

CRRC Qingdao Sifang will supply eight hydrogen fuel cell trams or Hydrail for a route being developed in Foshan, China. Each tram will have capacity for 285 passengers and a maximum speed of 70 km/h.

Alstom has successfully performed the first test run at 80 km/h of the world’s only fuel cell passenger train, Coradia iLint, on its own test track in Salzgitter, Lower Saxony (Germany). The Coradia iLint is the first low floor passenger train worldwide powered by a hydrogen fuel cell, which produces electrical power for the traction. This zero-emission train is silent and only emits steam and condensed water.

Nippon Steel and Sumitomo Metal have cut the cost of hydrogen fuel tanks used for refueling stations by 30%. There are 80 hydrogen stations for fuel-cell vehicles in Japan, and the government plans to increase the number to about 320 by fiscal 2025.

General Motors Co. (GM) and Honda have announced their recently established joint venture company, Fuel Cell System Manufacturing LLC (FCSM), which will develop hydrogen fuel cell propulsion systems. According to the companies, Suheb Haq of GM will serve as the first president of FCSM, and Tomomi Kosaka of Honda will be the new company’s vice president.

UK Government launched £23 million backing for hydrogen infrastructure. Both fuel providers and vehicle manufacturers will be able to bid for funding to help build refueling infrastructure, including new fuel stations.
Toyota Motor Corporation has started using **two fuel cell forklifts at its Motomachi Plant** located in Toyota City, Aichi Prefecture, since January 31, 2017. This will be followed by about 20 units in 2018, and eventually reach the goal of 170 to 180 forklift units by around 2020.

Elon Musk may think hydrogen-powered vehicles are rubbish, but Toyota Motor Corp, and a cadre of Japan’s leading manufacturers are betting otherwise -- and not just on cars. Beyond production of the Mirai and other hydrogen projects, **the Japanese government is targeting 1.4 million installations of “ene-farm” residential fuel-cells** by 2020 and 5.3 million by 2030.

The ene-farm cogeneration systems are intended to power entire city blocks. In the intermediate term, ene-farms **will convert natural gas to hydrogen on-site**. But long term, as demand grows, Japan envisions **replacing its infrastructure of natural gas pipelines with hydrogen pipelines**. That would feed hydrogen directly into homes and businesses.

In a deal with **Plug Power, Amazon** will replace some of its **battery forklifts with hydrogen fuel cell ones** at 11 of its fulfillment centers.

In Japan, energy group **Iwatani is building a hydrogen fueling infrastructure**. It is worth noting that Japanese regulations classify hydrogen as an industrial gas. Consequently, Iwatani spends about **500 million Japanese yen (roughly $4.5 million)** to build each station, according to the Financial Times, which is more than twice the cost of an equivalent site in the United States.

In April 2017, **Toshiba announced that its first commercial scale 100kW pure hydrogen fuel cell system** is now in operation. It supplies electricity to refrigerators and hot water to heat system at municipal wholesale market in Yamaguchi prefecture, delivering CO2-free electricity generation.

SunLine Transit, a public agency providing bus service throughout California’s Coachella Valley, will receive a **$12.5 million grant from the state to fund five new zero-emission hydrogen fuel cell buses** and upgrades to the agency’s existing hydrogen production plant.

BMW displayed a 5-Series GT hydrogen fuel cell prototype at 2017 Hannover Messe Trade fair that uses H2 produced from solar-powered electrolysis.

UPS is launching the world’s first hydrogen fuel cell electric class 6 delivery van. The van, developed as part of a $10 million federal Department of Energy program, is the first of 17 hydrogen fuel cell vans the parcel delivery giant will be deploying in the U.S. by the end of 2018.

FuelCell Energy recently announced it will **build two power plants at the US Navy submarine base** in Groton, CT USA. The site will include two of FuelCell Energy’s SureSource 4000 plants with a total output of 7.4 megawatts.

Scania Group has partnered with Norwegian goods wholesaler **Asko to test hydrogen gas propulsion** in their delivery trucks.

Doosan Corporation completes construction of Korea’s largest fuel cell plant. The completion of the Ilsan plant earned Doosan Corporation the largest domestic fuel cell production base with a total of **144 units of 440 kW** per year (total of 63 MW) and is able to respond quickly to domestic and overseas fuel cell demand along with a fuel cell plant in Connecticut, the US.

Panasonic Corp. will begin **selling its residential fuel-cell systems** in the U.K. and Austria this year as it seeks to solidify its lead in a product category that some see as a stepping stone to harnessing hydrogen as the fuel of the future.
Technology Spotlight · Task 29 DISCO H2

Task 29 – DISCO H2 at a Glance

Task 29 – Distributed and Community Hydrogen (DISCO H2) is focused on hydrogen applications in energy communities integrating hydrogen systems with electricity and other energy and mobility networks and in distributed systems. DISCO H2 sought to advance the optimization and replication of “green” hydrogen in distributed and community energy systems. In 2011, the Operating Agent for Task 29 was Dr. Federico Villatico Campbell of UNICO ICHET. Later, Dr. Hiroshi Ito of AIST took over as Operating Agent while also functioning as Subtask Leader for Subtask 3 – Model Concept Development. Final Reports for Subtasks 2, 3 and 4, as well as the Final Task report may be found on IEA Hydrogen.

The target size of communities was up to 1000 people and the total installed power capacity of hydrogen energy technologies (both consuming and producing hydrogen) was not more than 500 kW. The community types were: rural/island; urban; and industrial/commercial. There were four other subtasks in addition to the Management subtask (ST 1). They were: ST2 – Analysis and Selection; ST3 – Model Concept Development; ST4 – Concept Replicability; and ST5 – Information Dissemination. See Figure 1 below for the Subtask flow chart. See Table 1 for the task participants.

ST2 collected data from which six projects were selected for analysis.

ST3 developed and defined three main concept models, one per category. A SWOT analysis was performed for each of the six projects. This was followed by a software simulation (Homer analysis) of the economic and techno-environmental characteristics. A questionnaire was developed and administered to elicit feedback from project organizers on community and regulatory issues and, to a lesser extent, economics and environmental/technical aspects of each project.

ST4 analyzed all six projects from the standpoint of readiness for market application.
Having worked on Task 18 – Integrated Systems Evaluation from 2004-2009, Dr. Hiroshi Ito was already an experienced IEA Hydrogen expert when he became the Leader of Task 29 – DISCO H2 Subtask 3 Model Concept Development. Then, when he took over as Task 29 Operating Agent he was well prepared to tackle the challenges associated with managing an international research task whose projects and participants are dispersed throughout the world.

DISCO H2 was a great match for Hiroshi’s engineering and analytic skill sets. He holds a BA in Mechanical Engineering, an MEng in Nuclear Engineering, and a PhD in Fundamental Energy Science. Since 2001, he has been a Researcher at the National Institute of Advanced Industrial Science and Technology (AIST) in the Research Institute of Energy Conservation (IECO). IECO focuses on improving energy efficiency in order to promote sustainability and reduction of greenhouse gas emissions. AIST’s vision is to create and realize adoption of technologies that are useful to Japanese industry and society. Hiroshi’s research specifically addresses polymer electrolyte based fuel cells (PEFC) and electrolyzers (PEEL), as well as hydrogen system evaluation. DISCO H2, of course, dealt with analysis of fuel cells, electrolysis, and various hydrogen storage and delivery systems, as well as fossil and renewable sources of hydrogen. The task evaluated projects in urban, rural, industrial and commercial communities around the world.

Hiroshi’s “word of wisdom for hydrogen” is to appreciate how important hydrogen is as a partner

General Findings (from soon-to-be published Final Task 29 Report)

- Two projects, Residential CHP (Japanese Enefarm) and fuel cell powered Forklift Trucks (USA FedEx) are successful commercially and production is expanding quite rapidly.
- One project, MYRTE (Corsica) is ongoing as a platform for continuing research into hydrogen energy storage system technologies.
- One project, Octagon Apartments, is operating commercially, although replication to other sites is slow which indicates either marginal economics or limited market acceptability.
- Two projects, Lolland (Denmark) and Hydrogen Office (UK) have been terminated as planned following several years of operational study and assessment.
- These two projects that advanced to volume production have had consistent long-term government support of one form or another, coupled with well set up market supply and service chains.
- Performance of the technologies in all the projects ranged from very good to adequate (i.e., met operational expectations relative to the maturity of the technology), but some projects showed low technology maturity due to high costs for installation and ongoing maintenance.
- While these hydrogen technologies offer environmental benefits, they struggle to compete with existing solutions on present day economic basis, i.e., where little account is taken of the environmental effects of incumbent technologies.
- If more financial emphasis were placed on environmental benefits, particularly to mitigate climate change, than hydrogen energy solutions will become more competitive.
- CHP fuel cell systems that offer higher efficiency but still consume fossil fuels are the most economically viable, but achieve the least specific CO2-e reduction benefits (/kWh). However, large scale uptake will still produce substantial overall GHG reductions.

Subtask 3 - Model concept development Overview

<table>
<thead>
<tr>
<th>Project name</th>
<th>AC grid</th>
<th>DC bus</th>
<th>Natural gas grid</th>
<th>Renewable energy sources</th>
<th>Hydrogen storage</th>
<th>Hydrogen usage with</th>
<th>Thermal storage</th>
<th>Other H2 components</th>
<th>Electricity usage</th>
<th>Heat usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lolland residential CHP</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Wind</td>
<td>Pressurized tank (2.3 kg at 6 bar) PEMFC (1.5 kW×10)</td>
<td>Hot water tank (200 L)</td>
<td>Hydrogen pipeline</td>
<td>Residential</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Myte</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>PEM electrolyzer</td>
<td>Pressurized tank (125 kg at 35 bar) PEMFC (100×30 kW)</td>
<td>–</td>
<td>–</td>
<td>Grid</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Japanese residential CHP</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>Reforming</td>
<td>PEMFC (1 kW×3.3) PEMFC (2 kW×4)</td>
<td>Hot water tank (150 L)</td>
<td>Residential</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Octagon Apartments</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>Reforming</td>
<td>Liquid-H2 tank (1.600 kg) PEMFC (2 kW×4)</td>
<td>–</td>
<td>–</td>
<td>Forklift</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>FedEx Forklift</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
<td>Reforming</td>
<td>Liquid-H2 tank (1.600 kg) PEMFC (2 kW×4)</td>
<td>–</td>
<td>–</td>
<td>Forklift</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Hydrogen Office</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Reforming</td>
<td>Pressurized tank (10 kg at 12 bar) PEMFC (50 kW)</td>
<td>–</td>
<td>–</td>
<td>Hydrogen barrier</td>
<td>Office building</td>
<td>–</td>
</tr>
</tbody>
</table>

A thermal management system using water is deployed for fundamental testing.

Tech Talk

See Table 2 below for an overview of system components for the six projects in three community types.
IEA H2 NEWS

for renewable energies. As Subtask 3 Leader, Hiroshi demonstrated hydrogen’s importance is in his Homer modeling simulation and Subtask 3 report on the six DISCO H2 projects. As Operating Agent, Hiroshi managed the expert task members and pulled the work of all subtasks together in the (soon to be published) DISCO H2 final report. Hiroshi is quick to acknowledge and thank DISCO H2’s other Subtask and Activity Leaders:

Emmanuel Stamatakis (CRES, Greece) ST2 – Analysis and Selection.
- Aline Rastetter (ALPHEA, France) ST2 – Activity 2.1.
- Emmanuel Stamatakis (CRES, Greece) – Activity 2.2.
- Jean-Christophe Huguet (Helion-Area) – Activity 2.3.

Alister Gardiner (Callaghan Innovation) ST4 – Concept Replicability.

Hiroshi also recognizes the seminal role played by Dr. Federico Villatico Campbell, his predecessor as Task 29 Operating Agent. Dr. Villatico Campbell successfully launched DISCO H2.

For Hiroshi and his family – his wife, Yumiko, and their children, 14 year old daughter Risako and 12 year old son Koji – home is in Tsukuba. Hiroshi and his wife enjoy travelling. One of his favorite activities is walking in the morning with his son, Koji, and Pokemon-GO. His daughter, Risako, is an avid tennis player. For fun and sport, Hiroshi plays baseball: he is an infielder (shortstop or second base).

At the end of the day, says Hiroshi, not only is IEA Hydrogen work valuable to the world, but it is also a great way to make friends!

- The three renewable hydrogen projects all utilized hydrogen storage in some form. Round trip electricity to electricity conversion efficiency was therefore low, which makes competing with modern batteries challenging.
- Cost effective and convenient hydrogen storage for stationary applications is still a major challenge, as is the round trip efficiency of conversion. To maximize the value of the stored hydrogen, applications that use hydrogen for CHP or thermal uses may become more attractive due to the higher efficiency achieved over purely electrical loads.
- All projects required substantial government capital contributions and support, and at present technology costs still need this investment to varying degrees. However, technology learning cost reduction projections are promising, particularly for the small fuel cell based projects. Large cumulative sales volumes are required to bring costs down to a point where assistance is not required.
- At present the common benefit from the uptake of distributed hydrogen in the six projects is the mitigation of greenhouse gas emissions, rather than a clear economic benefit. This may change with some of the technologies, as market volumes increase and cost is reduced through economies of scale and production learning.
- The ability to monetize the environmental benefits of hydrogen energy depends on the application, and on the value placed on GHG and pollution reduction in the relevant jurisdiction. The fossil energy based systems do not show high GHG savings per unit, but may have greater overall impact than renewable energy based systems if the uptake is substantially higher.
- In three of the projects (Lolland, MYTRTE, Hydrogen Office), we consider that some technologies were introduced to operational field trials before they were technically ready (as viewed under the TRL R&D maturity scale). This is attributed to overly optimistic demands from the funding agencies, and corresponding promises by developers to protect their funding opportunity, which resulted in delays and additional costs. Problems were often discovered or rectified at the sharp end of these projects, when the full scale project was already delivered or installed. More realistic technical expectations and targeted funding based on application of TRL qualification levels may have avoided substantial costs. Both funders and developers need to commit to TRL advancement principles.
- Market networks to grow and support sales and operations are very costly, and the timeframe to set up and achieve brand goodwill is often long. It is much easier to form alliances with incumbents who have the experience and infrastructure already set up. This is particularly evident in the successful Japanese residential CHP project.
- Renewable energy based projects (offering hydrogen storage) need more pilot and demonstration scale funding for these technologies to be proven, costs reduced and the products to become market ready.

Spin Off Benefits

The “At a Glance” Market Readiness Assessment matrix developed in Subtask 4 is expected to enjoy wide application in future analysis and cross-cutting IEA Hydrogen activities.

IEA Hydrogen will explore the application of Technology Learning Assessment (TLA) to its current and future research activities.
Current

Task 32  2013-2018
Hydrogen-based Energy Storage

Task 33  2013-2016
Local Hydrogen Supply for Energy Applications

Task 34  2014-2017
Biological Hydrogen for Energy and Environment

Task 35  2014-2017
Renewable Hydrogen Production

Task 36  2014-2017
Life-Cycle Sustainability Assessment (LCSA)

Task 37  2015-2018
Hydrogen Safety

Task 38
P2H and Hydrogen-to-X

Task 39
Hydrogen In Maritime Transport

Task INK

Collaborative R,D&D Theme

Hydrogen Production, Integrated Hydrogen Systems, and Infrastructure Portfolios

Task 33  Local Hydrogen Supply for Energy Applications
Operating Agent: Dr. Øystein Ulleberg

• An additional seminar/workshop on water electrolysis took place in Oslo, Norway 20-21 October 2016.
• The final report is expected to be concluded in mid 2017. It will cover: Technology Assessment; New Concepts; and Barriers & Opportunities.
• Development of a successor task is underway.

Task 34  Biological H2 for Energy and Environment
Co-Operating Agents: Dr. Jun Miyake and Professor Alan Guwy

• Subtask 1 on fundamental research continues work on the NERC Programme (Project - NE/L014106/1) on resource recovery from waste (RRfW).
• Subtask 2 on applied research continues work on HyTime led by the Netherlands, Hyperfermentan led by Norway, and FLEXIS. FLEXIS is a £24m 5 year EU-backed investment and integrated energy research project funded in South Wales. FLEXIS is a partnership of Cardiff University, University of South Wales, and Swansea University.

Task 35  Renewable Hydrogen Production (Super Task)
Leader: Dr. Wilson Smith, Subtask 2

• Planning for preparation of technical summaries of subtask activities and results suitable for widespread dissemination.
• Organization of key technical meetings and publication opportunities for 2017 in each Subtask.
• Continued work in technology-specific projects initiated in each of the three current Subtasks, including with work with new HydroGEN and the FCHJU projects: Electrolysis Metrics Standardization and Renewable Integration; PEC Materials and Interfaces, and Benchmarking Protocols; and STCH Materials and Interfaces, and Benchmarking Protocols.
• Strengthen international ties to the HydroGEN Advanced Water Splitting Materials RD&D Consortium (e.g., with Helmholtz, Fraunhofer, EPFL, I2CNER, KCAP, Mission Innovation, etc.).

Task 39  Marine Sector
Operating Agent: Dr. Ingrid Schjølberg

• The first full workshop was held 13-14 February in Oslo, Norway. The overall goal is to provide know-how on the use of hydrogen and fuel cells in the maritime environment by evaluating concepts, and initiating research and demonstration projects.
• Representation at the Oslo meeting included: Norway, Denmark, Sweden, Finland, Netherlands, Italy, Spain, Germany, France, UK, and New Zealand.
• The new task consists of the following subtasks – (1) investigate possibilities for the use of hydrogen in the maritime environment; (2) Contribute to new concepts, technologies and components; (3)
contribute to safety and risk management; and (4) support provide input to, evaluate and link international demonstration projects.

Closing

Task 29 Distributed and Community Hydrogen (DISCO H2)
Operating Agent: Dr. Hiroshi Ito

- Subtask 3 - the final report for subtask 3 – Model Concept Development is available at ieahydrogen.org; and one journal article has been published (Int. J. Hydrogen Energy).
- Subtask 4 - concept replicability (A. Gardiner): final report was submitted to ExCo members.

Hydrogen Storage Portfolio

Task 32 Hydrogen Based Energy Storage
Operating Agent: Dr. Michael Hirscher

- The last task meeting was held 3-4 March 2017 in Waikoloa Village in conjunction with the 11th International Symposium on Hydrogen and Energy.
- Task 32 Experts will start defining a new task on “Hydrogen storage” and will submit a proposal to ExCo in spring 2018.
- Initial Task 32 results on hydrogen storage in nanoscale carbon and metals were published early in 2016 in the journal Applied Physics A, by guest editors Craig Buckley, Ping Chen, Bart van Hassel and Michael Hirscher. This includes a foreword plus 21 papers.
- Task 32 results show that modified NaH are shown to be reversible for the first time.
- The next task meeting will be held in conjunction with the GRC Hydrogen-Metal systems at Stone Hill College, in Easton, Massachusetts.

Analysis Theme

Closing

Task 30 Global Hydrogen Systems Analysis
Operating Agent: Mr. Jochen Linssen

- Integration of Task 36 LCA work into the “living” Hydrogen Production database is planned and will be supported by ongoing verification of data with literature.
- Handover of database and handbook to Task 38 – web meeting with Paul Lucchese (CEA, operating agent), Alain Le Duigou (CEA) and Laurence Grand-Clement (PersEE, Subtask-Leader) on 10 October 2016 – Task 38 is planning to develop the database further and enlarge the data regarding PtX technologies.

Task 36 Life Cycle Sustainability Analysis (LCSA) of Hydrogen Energy Systems
Operating Agent: Dr. Javier Dufour

- The last task meeting was held on 16-17 February 2017 as part of a global webinar.
- Further progress in the harmonization of life-cycle impacts of hydrogen by addressing the non-renewable cumulative energy demand of hydrogen energy systems (submission of conference contribution; 7th WHTC contribution, 9-12 July 2017, Prague).
- Major Accomplishments by Subtask.
* Subtask A: completed review of LCA studies and completed formulation and application of a harmonization protocol.
* Subtask B: review of LCC scientific literature in the field of hydrogen energy and distinction between conventional LCC and calculation of externalities.
* Subtask C: review of SLCA/LCSA scientific literature in the field of hydrogen energy, analysis of the social acceptance of hydrogen (Int J Hydrogen Energy; 41: 5203-8), and advances in the formulation of a harmonized framework.
* Subtask D: peer review of ETP 2016, which was officially released in June 2016.

• The next activities will include: advances in underdeveloped stages of the life cycle of hydrogen energy systems; definition of LCC and SLCA indicators; further integration of sustainability indicators into the harmonization protocol; and to further advances in the preparation of an “IEA HIA Task 36 Technical Report on the path towards LCSA of hydrogen energy systems”.

Task 38  Power to Hydrogen (P2H) and Hydrogen-to-X: System Analysis of techno-economic, legal and regulatory conditions
Task Organizer: Paul Lucchese

• The last meeting (2nd meeting) took place on 20-21 September 2016 at Forschungzentrum Jülich attended by 18 participants from 11 countries.
• Priorities over the next 6 months:
  * Following of the interfacing activities (FCH JU, CEN CENELEC, IEA) and make the collaboration effective and efficient.
  * Organizing two important workshop – one on demo projects followed by a first IEA demoP2Hroad map AND one on energy system modeling!
• Subtask 5: An external collaboration has been established with CEN/CENELEC SFEM WG Hydrogen1 via Francesco Dolci and Paul Lucchese, who is a contributor to both WG Hydrogen and Task 38.
  * Participation of both SFEM WG and TC6 meeting.
  * Inclusion of TD definition in the loop for definitions.
• An extended abstract for a proposed conference paper, co-authored by all 12 Definitions Task Force contributors, was submitted on 14 Dec 2016, to European Energy Markets 2017, Dresden. If accepted, it is quite likely that Pier Luigi Mancarell will contribute significantly to the full length paper and presentation content, and will have his name and affiliations added to the co-author list.

Awareness, Understanding and Acceptance Theme

Task 37 – Hydrogen Safety
Operating Agent: Dr. Y. John Khalil

• The last task meeting was held November 28-29, 2016 at IEA HIA in Bethesda, MD.
• Task 37 has identified September 2017 following the ICHS meeting in Hamburg, Germany as the likely place and time for the end of Task 31 workshop.
**DIPLOTECH**

In **BELGIUM**, the Energy Strategy 2020 (agreed upon after Paris COP21) aims to reduce CO2 emissions by 15% vs 2005 levels and raise renewable production by 13% in 2020. Walloon Energy Strategy 2020 (policy directive Plan Marshall 4.0) is well on its way to meet COP21 objectives and will focus on Power-to-Gas to accommodate the increase in renewables. The Wallonia Transport Strategy 2020 includes: the Benelux agreement of intent signed October 2015 to develop infrastructure for alternative fuels (electrical, CNG and H2); a policy agreement signed by Ministry of Transport September 2016 for the integration of 20 H2 buses by 2020 (as part of the National Implementation Plan for H2 mobility); and the September strategic mobility symposium.

Recently, the Walloon Government approved four R&D pilot (> 5M €) in support of innovation policy priorities set forward by Plan Marshall 4.0: Project “WallonHY”; Project “HYSTACK”; Project “INTERESTS”; and Project “LOOP-FC”. Further, Belgium participated as Benelux Cluster in FCH-JU bus demonstration project “JIVE-2” and TEN-T project “H2Benelux”, as well as a roadmap study on Belgian Federal Level in order to negotiate upfront tariffication for 2MW demo project on P2H grid balancing services. WaterstofNet reports that the HRS at Colruyt, located in Halle, has recorded 4,000 forklift refuelings since 2012. A Power-to-Gas demonstration project has opened in Flanders where there is a Power-to-Gas demonstration cluster.

In **CHINA**, LH2 has been used as fuel for the Hydrogen/oxygen engine Changzheng series rocket in China. In 2000, the first Ni-MH EV (range of 225 Km) was developed in China. In 2010, a 30kw PEMFC demonstration power station was built in Guanzhou. In 2009, China became the world’s largest H2 producer at 10 million tons. The H2 is mainly used as the raw material for chemical plant and industry, rather than as an energy carrier that can be used in many applications. H2 storage alloy output in China is over 10,000 tons (ranked number one in 2005), which is mainly used as the cathode of Ni/MH battery.

There are a number of local government projects underway, including: the Beijing Municipal Science and Technology Commission “research and demonstration of key technologies of the hydrogen supply chain of fuel cell vehicles”; and Global Environment Fund(GEF) & United Nations Development Program (UNDP) “Promote the development of China’s fuel cell vehicle commercialization” in Beijing, Shanghai, Henan, Guangdong and Jiangsu.

Demonstration highlights include 2022 Winter Olympic Games, the H2 energy demo city in Zhangjiakou and the Hebei “demonstration project of comprehensive utilization of hydrogen from wind power”. Beijing Future Science & Technology Park will set up an H2 energy research community with 5 central government research institutes.

China’s automobile project MOST (20 participants, including DICP) aims to develop key materials and process mechanism of fuel cells. MOST is researching key aspects of high performance & low cost fuel cell stack and related materials. Participants include Dalian Sunrise Power Corp and 12 other participants.

From 2007 to 2010, over 200 fuel cell cars and buses had been put into demonstration in China. Currently, companies like SAIC, BAC, Yutong, FAW and Dongfeng Motor are manufacturing FVEBs in the Chinese market. HRS have been opened in Beijing, Shanghai, Zhengzhou, Guangdong, and Dalian.

The **EUROPEAN COMMISSION (EC)** has a number of relevant directives that fall under the energy package “Clean Energy for all Europeans” COM (2016) 860. The three leading principles of this package are: put energy efficiency first; achieve global leadership in renewable energies; and provide a fair deal for customers. Electricity Market Design Directive COM(2016) 864 focuses on flexibility options, including storage. New Renewable Energy Directive (RED II) COM(2016) 767 seeks to achieve a binding target of 27% RES by 2030; it is germane to Power-to-X and covers electricity, transport, and heating & cooling sectors. Accelerating Clean Energy Innovation COM(2016) 763 has identified two technology focus areas relevant to H2. Finally, the European Strategy for Low-Emission Mobility COM(2016) 501 focuses on post-2020 CO2 standards for cars and vans, especially zero-emission vehicles. Evaluation and implementation of the Alternative Fuels Infrastructure (AFI) by the Member States is ongoing.

The JRC (+FCH2JU) has been involved in IEA Hydrogen Tasks 37 (safety) and 38 (P2H and H2x), participating in the following meetings: 5th Plenary meeting of CEN-CENELEC Strategic Forum for Energy Management (SFEM) Working Group H2 (Oct. 2016); 4th International Workshop on H2 and Transportation (EC, DoE, NEDO, NOW) May 2016; H2 Safety Priority Workshop (IA HySafe, US-DoE, JRC, Sept. 2016); and a Strategic planning meeting ISO-JRC (Dec.2016).
Recent in-country developments in **DENMARK** include a change in policy: the PSO fee (a fee on energy consumption used to finance the transition from fossil fuels to renewable energy) has been replaced with an EU compatible solution. Denmark has also considered banning fossil fueled vehicles starting 2030. Research Planning and Programs like the EUDP (National energy research program) will include more focus on commercialization.

Currently, there are a number of H2 projects ongoing in Denmark. Future Gas is an R&D project (with DGC and technical universities) aiming at optimizing the future use of the gas network, including how injection of green gases can take place in a safe way. Green Lab Skive is a regional R&D facility focused on green energy and P2G technologies. They have obtained -9 million DKK in support from the government. H2Cost-2 (with NEL Hydrogen and Green Hydrogen) is focused on developing cheaper and faster Hydrogen re-fueling stations. The Hyboost-2 Project features compacting and increasing capacity to enable H2 filling units to fit in with standard size at normal gasoline stations.

There are currently 68 registered FCEVs and 10 HRS open.

In **FRANCE**, Areva H2 Gen has developed the first French manufacturing PEM Electrolyser factory in Les Ulis near Paris. Engie has invested a few million € in Symbio fuelcell Capital, with Michelin and CEA.

Other current projects include operation of 150 forklifts at retailer CARREFOUR’s distribution center. A new world record was established by CETUP during electromobility days in Grenoble (23/9/2016) for the longest drive with a Kangoo ZE H2 equipped with 22kWh batteries, 1.8 Kg H2, and a 367 km range. A call for proposals on “H2 Territories” has yielded 31 meta projects with 101 projects in 49 territories.

Air Liquide brought the first Toyota Mirai vehicles to France in September 2016. In December 2015 a startup Company, STEP, launched the first taxi fleet of hydrogen cars in Paris center. Currently there are 12 ix35 FC Hyundai on the road, with an anticipated 75 end of 2017. Air Liquide provides the HRS.

Deployment of captive fleets are still on-going, as well as Big demo projects on Power To gas including GRYDH Project in the north and JUPITER 1000 (Fos harbor near Marseille). France has many H2 vehicles in operation, including: 21 Buses, 948 Cars, 18 Commercial Vehicles and about 100 other.

Recent **HySafe** developments include a research priorities workshop that took place on 27-28 September 2016 in Petten, The Netherlands (in close cooperation with US DoE and EC JRC). On 28-29 November 2016 Task 37 coordinated a presentation and conference at the IEA HIA headquarters in Bethesda.

The International Conference on Hydrogen Safety (ICHS) is a unique event dedicated to Hydrogen Safety. The event will take place in Hamburg, Germany on 11-13 September 2017. For more information and to register for the conference navigate to www. ichs2017.com or www.hysafe.info.

On December 14, 2016 in **ITALY**, the government approved the National Plan for the implementation of alternative fuels (including H2) as requested by the European Directive issued on October 2014 (AFI). A decree on support measures for energy efficiency of FC systems had been published on June 24, 2014. The Governmental strategy paper on sustainable transport to 2030 and vision to 2050 is in the works.

There are several ongoing in-country developments in the Bolzano, Liguria, Lazio, Sicily, Veneto, Puglia and Campania regions. In these regions CHIC and H2Work EU projects and the 3-E-Motion Project feature transport activities (buses, cars, HRS). As well, there is the H2 HEPIC (vaporetto) boat project, and the completed IN-Grid project. In the Campania Region, H2 electric bikes have been introduced.

An H2&FC project for transport is in progress with in buses, minibuses and HRS in some regions (Campania Region, Bolzano region) and some cities (Florence and Roverto). Other projects include H2 and FC drones, H2 and FC for marine applications and H2 Train for Trento Autonomous Province.

There is renewed interest from investors and stakeholders in H2 technology and products. **JAPAN**’s “Strategic Road Map for Hydrogen and Fuel Cells” provides a step by step approach to realizing a Hydrogen Society. Phase 1 focuses on fuel cell installation. Phase 2 focuses on H2 power plant and mass supply chain development. Phase 3 is focused on CO2-free Hydrogen. NEDO’s budget for H2 R&D budget in 2016 was JPY 3.7 (about €30 Million). The current direction of their fuel cell programs is focused on PEFC (for transportation use) and SOFC (for Industry / Commercial Use). By 2020, NEDO anticipates a cost reduction of 1/2 for all HRS. Further activities include developing a hydrogen demand & supply chain (H2 Gas Turbine, Power to Gas, etc.).

As well, NEDO is focused on power-to-power projects that will enhance the renewable potential for hydrogen. As opposed to the current electric grid, which is primarily for real time use, hydrogen allows for better storage and “time shifting” (the ability to store energy produced for peak periods).

Currently there are 80 stations open in Japan as of Dec 2016, with 12 stations planned for the future. As of 2016 there were approximately 2,000 FCEVS.

In December 2016 **THE NETHERLANDS** Ministry of Economic Affairs published the Energy Agenda which defines long-term ambitions (2050), focus and a way forward. It also includes references to H2 as fuel for transport and mobility; sustainable chemical industry (power-to-chemical and high-grade process heat); large-scale/seasonal storage of renewable energy; and use of renewable gas. As of 2035, only sustainable cars – including H2 FCEVs and BEVs – may be sold in the Netherlands.
A new H2 innovation program called the Part Top Consortium Knowledge and Innovation on Gas (TKI Gas) has begun with a start-up budget in 2017 of 0.9 M€. A multi-year program to support deployment of alternative fuels infrastructure was launched in the first half of 2017, with an expected total 2017 budget of 15-20 M€ (for all fuels).

R&D highlights include the use of formic acid as fuel for H2 fuel cell buses (TuE/VDL), as well as a National project ELECTRE on lowering electrolyzer costs (Hydron Energy, ECN). Various transportation demonstrations have also taken place, including national bus demonstration projects (Groningen, Eindhoven and Arnhem) and an FCH-JU project 3Emotion (2 of 6 buses total) in Rotterdam in 2017. Transport projects include ‘Interreg project Waterstofregio 2.0’, involving development and demonstration of a 40 ton truck and deployment of 2 more garbage trucks. FCH JU project H2FUTURE is testing 6MW (Siemens) PEM electrolyser, at steel plant voestalpine in Linz, Austria. ECN is performing project analysis and impact assessments for this project.

**NEW ZEALAND** has made a number of changes to its energy strategy. First they have made a commitment of 5 per cent below 1990 levels by 2020; as well, they are targeting the Paris COP21 commitment of 30 per cent below 2005 levels by 2030 equivalent to 11 per cent below 1990 levels by 2030. The government is striving to achieve 90% renewable electricity generation by 2025 and may add new targets. Potential measures include a target based on total primary energy or energy intensity. In addition, they have conducted a review of tax depreciation rates and the methodology for calculating fringe benefit taxes to ensure electric vehicles are not unfairly disadvantaged. They have also established an electric vehicles leadership group across business, local and central government. Unitec Institute of Technology and Callaghan Innovation are examining options for the installation of the first HRS by 2018.

R&D highlights include the UniQuad (a fuel cell farm bike), scheduled for completion in 2017. It has a Li-FeYPO4 12kWh battery; 3 kW PEM fuel cell; 1 kg H2 fuel tank. In other news, HyLink is working on low cost, 2.5 kg/day H2 production and storage consisting of an alkaline electrolyzer, operating with 76% efficiency at 4 bar and HDPE storage (www.hylink.nz). Feasibility studies on export of renewable H2 from New Zealand are ongoing. Currently, one H2 refueling station is projected for 2018.

**NORWAY** has pledged to increase their renewable energy from 60% to 67.5 % and increase renewable fuel by 10% by 2020. In the recently published Energy White Paper, the Parliament states that the Government will establish a strategy for the introduction of H2 into the Norwegian market. It has been determined that Enova will support the establishment of HRS throughout the country. Their target is 100 HRS and 50,000 H2-cars. They have plans for H2-ferries from Road transport Directorate and will assess the use of H2 in trains (on non-electrified routes).

Recently, Norway opened eight new centers for energy research (CEER). MOZEES (Mobility Zero Emission Energy Systems) focuses on batteries and H2 and is led by Oystein Ulleberg. New R&D projects within water electrolysis have started. The HYPER project at SINTEF studies H2 production from wind and natural gas with liquefaction and transport in ships, in collaboration with Japan, etc. The “PILOT-E” project to Firskerstrand will demonstrate an H2/Fuel cell ferry in 2020.

In other news ASKO (food distributor) will start running 4 trucks and 10 forklifts on self-produced H2 in Trondheim, starting in 2018. NEL will reestablish H2 production in Glom fjord (electrolysis) for ferries. NEL Hydrogen and UNO-X will establish 20 HRS in Norway by 2020. The first one is based on surplus solar power from Power House and opened in November 2016. HYOP is building 2 HRS outside Oslo.

Currently Norway has 5 fuel cell buses and ~ 40 passenger cars (23 new in 2016). Their current H2 infrastructure consists of 1 HRS @ 350 bar (for buses), 6 HRS @ 700 bar and plans for 20 more.

**SWEDEN** has set a target for a fossil fuel-independent vehicle fleet by 2030 and zero net GHG emissions by 2050. Fuel cells can help to achieve these goals. The primary areas of focus areas for the Swedish Energy Agency’s 2 million € program include: basic research on development of materials for fuels cells (non-platinum group metal catalysts, novel polymer electrolytes, and metal coating for bipolar plates); demonstration in niche areas; APUs; and trucks. Recent R&D highlights include: Chalmers- Improving Lifetime and Performance of SOFC for Truck APUs; Chalmers- New non-PGM PEMFC ORR catalyst and MEA; and the Royal Institute of Technology- New components for polymer fuel cells.

There are five HRS currently in operation (4 are open for public and 1 for demonstration in Arjeplog winter test center in Northern Sweden). Sweden anticipates 14 HRS in 2020. Two new HRS under construction in Stockholm center and in Malmö City will be operational later in 2017. There are 10 passenger FCEVs (Hyundai and Toyota) and 3 FCV taxis in Stockholm.
Energy strategy in Spain is aligned with EU 2020 targets. In compliance with the European Directive 2014/94, on the deployment of alternative fuels, Spain has published “Marco de Acción Nacional de Energías Alternativas en el Transporte a la Comisión Europea” or “National Action Framework for Alternative Energies in Transport to the European Commission.” Due to its great potential, H2 is included in this National Action Framework according to the Ministry of Industry representative.

Spain has a number of ongoing national research projects. The ENHIGMA PEM project calls for electrolyzer cells optimization. PLUS H2-BOAT project at Catalunya University aims to use a FC system to power a conventional ICE boat. The HYACINTH project calls for H2 acceptance in Transition Phase. First results on social acceptance questionnaires have been published in Spain. Meanwhile, RENFE (a state-owned company which operates freight and passenger trains) participates in a EU proposal to LIFE call to test the viability of H2 trains (FEVE 3100 model) in the national railway infrastructure.

Currently, there are six HRS open for private research lab and/or company site. There are 4 early market stations open to the public planned and 11 projected. The EU Interreg – POCTEFA: “H2plyR” foresees the operation of 10 HRS along Spain (6), Andorra and France regions. The Impulse of Alternative Energy Vehicles National Strategy (VEA) 2014 – 2020 foresees 21 HRS and 500 FCV in Spain in 2020.

Established by Switzerland’s federal council, Energy Strategy 2050 calls for a gradual fadeout of nuclear power production (40%), a 33% reduction of end use energy consumption by 2050 and an increased share of renewable power production. A plan has been established for coordinated energy research with eight new competence centers on energy research, including storage & mobility with H2 and FC activities.

Recent highlights include the opening of a Public HRS at Coop in Aarau. A river power plant will produce H2 from electrolysis. This very “clean” H2 will have a large impact on CO2 reduction. The H2 will be delivered by truck to station (10 km) in both 70 MPa and 35 MPa grades. The Swiss Fuel Cell truck has progressed with development by Esoro and SwissHydrogen. SwissHydrogen SA (PEM-fuel cell) recently announced a strong collaboration with PowerCell (Sweden) and Swiss company Celeroton announced new development of very efficient turbo compressors for PEM-fuel cell system.

Currently Switzerland has 5 fuel cell buses and more than 20 Hyundais FCEVs, 2 Kangoo (range extender), and one (1) 38t-H2-truck. H2 infrastructure wise, they currently have 2-4 HRS @ 300 bar (non-public) and 2 HRS @ 700 bar (one public, one R&D, semipublic).

Recently, the United Kingdom Department of Energy and Climate Change (DECC) was merged with the Department of Business, Innovation and Skills (BIS) to create a new Department of Business, Energy and Industrial Strategy (BEIS). An industrial strategy green paper was published, outlining the UK commitment to affordable energy and clean growth. The government views decarbonization of energy use at the heart of the Industrial Strategy. It is also exploring potential H2 fuel technology opportunities across multiple applications, including heating, energy storage and transportation.

The Office for Low Emission Vehicles announced £30m of funding to bring 326 Low-Emission busses to the UK, including 62 HFC buses, as well as £2m funding for businesses to buy or lease Hydrogen fuel cell vehicles, bringing an additional 50 on the road in 2017.

The Leeds H21 project has shown that it appears feasible to convert the Leeds natural gas distribution network (57 bar) to supply 100% H2. Enough H2 could be generated using Steam Methane Reforming, coupled with Carbon Capture and Storage (CCS) and balanced using underground storage to provide a near zero carbon heating solution. In addition to the Leeds H2 Appliances study, other projects include: the H2 Appliances study (DECC funded); H2Roadmap (Innovate UK/D ECC funded); Next Steps for UK Heat Policy (Committee on Climate Change); Potential Role of H2 in the UK Energy System (Energy Research Partnership); and Low-Carbon Town Heating (DECC funded).

In other news, The H2 and Fuel Cell Supergen Hub represents the UK academic community. The Hub will shortly release three comprehensive White Papers on the implications of H2 and fuel cells for: energy systems, energy security, and economic development. Paul Dodds, an academic at University College London and a member of the Hub, will be the alternative IEA HIA UK Delegate.

In the United States, there are currently 25 retail stations open in California and approximately 50 are underway. Funding is available for 100 total. AC transit fleet, located in CA, is the largest fleet of fuel cell electric buses in North America. They’ve driven approximately 1.8M miles and carried more than 15 million passengers.

In the northeast, there are 12-25 planned retail HRS in the following states: Connecticut, Massachusetts, Maryland, New York, Rhode Island and Vermont.

In other news, SimpleFuel was awarded the $1 Million USD prize competition for on-site H2 fueling.

Budget deliberations are underway in the U.S., with the President’s proposed budget for Hydrogen and Fuel Cells set at $45 million, while the House and Senate Appropriations Committee recommendations are, respectively, $97,000,000 and $92,000,000.
MESSAGE FROM THE CHAIR

As I assume the duties of the Chairmanship, I would like to thank my predecessor, Dr. Stefan Oberholzer of Switzerland, along with Vice-Chairs Dr. Yong-Gun Shul of Korea and Dr. Eric Miller of the U.S., for their service to IEA Hydrogen over the past three years.

During this three year period, the world situation changed. The adoption of the Paris Climate Accord at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) 21 in December 2015 was a global benchmark. Ratification of this accord by 148 nations reinforced the importance of limiting global temperature rise at or below 2°C. These developments amplify the potential use of hydrogen as a tool in a future multi-sectoral energy system – not only to mitigate CO2 emissions but also for use as storage and sector coupling to enhance the security of energy supply.

Over the past few years, IEA Hydrogen has worked to strengthen its cooperation with IEA analysis. This ongoing effort is expected to accelerate in order to deepen and broaden the role hydrogen analysis plays – not only in IEA energy scenarios, but in other prominent energy scenarios.

Meanwhile, our core research business continues unabated to address pre-competitive R,D&D. Likewise, our efforts to build hydrogen awareness, understanding and acceptance go forward.

The new IEA Hydrogen leadership team – which also includes Vice-Chair Jonathan Leaver of New Zealand and Vice-Chair Eiji Ohira of Japan – is committed to the IEA Hydrogen vision of a hydrogen future based on a clean, sustainable energy supply of global proportions that plays a key role in all sectors of the economy.

Paul Lucchese
IEA Hydrogen Chairman
Cap Energies/CEA