

PURPOSE

To undertake hydrogen analysis that represents the expertise of the Hydrogen Implementing Agreement with respect to future hydrogen supply, demand and utilization.

FRAMEWORK SUMMARY

Subtask A: Global Hydrogen Resources Study

Subtask B: Hydrogen Technology Database

Subtask C: Liaison with IEA Analysis of WEO/ ETP

Subtask D: Hydrogen for Smart Grid Options

MEMBERS

Task Member and Expert Table

COUNTRY	EXPERT	INSTITUTION
Country	Name	Affiliation
France	Alain le Duigou; Marie-Marguerite Quemere	CEA; EdF
Sweden	Bengt Ridell	Grontmij AB / E.ON
Germany	Jochen Linssen	Forschungszentrum Jülich
USA	Susan Schoenung; Thomas Drennen	Longitude 122 West; Sandia National Laboratories
Japan	Isamu Yasuda/ Yuki Ishimoto	Tokyo Gas Co., Ltd. /
Spain	Maria del Pilar Argumosa/ Javier Dufour/ Diego Iribarren	INTA/ IMDEA Energy
United Kingdom	Rupert Gammon	DeMontfort University
Norway	Kari Espegren	Institute for Energy Technology
Italy	Marco Brocco, Eugenio Calo	ENEA

ACTIVITIES AND RESULTS IN 2013

PROGRESS AND ACCOMPLISHMENTS

The Spring 2013 experts meeting of Task 30 took place in Paris. The meeting was a joint meeting between HIA ExCo, IEA analysts and Task 30 experts. The experts exchanged information about their current analysis work and the role of hydrogen in future energy systems with higher shares of renewable energies. Task 30 made progress on all subtasks underway.

The Fall 2013 experts meeting for Task 30 took place in Spain, hosted by IMDEA. During the two day experts meeting, the experts finalized the data input to subtask A, and discussed the results of the hydrogen production cost analysis and the sensitivity of results. They also discussed first results on a case study from France about hydrogen production in combination with electricity/ grid services. The experts joined a laboratory tour at the IMDEA research institute on the second day.

TASK 30

GLOBAL HYDROGEN SYSTEMS ANALYSIS

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VITAL STATISTICS

Term: 2010 – 2014 (short extension)

Members

France

Germany

Italy

Japan

Norway

Spain

Sweden

United Kingdom

United States





Expert Participants (#) 14

Accomplishments during 2013 included finalizing the Subtask A resource study, in which the analysis looks at potential hydrogen resources in each country to meet potential long term demand for hydrogen vehicles. Some successful outcomes from this study include:

- Completion of the model, which runs in PowerSim
- Finalizing the dataset from each participating country
- Results that show adequate supply of hydrogen for the participating countries and some opportunities for trade
- Sensitivities to cost assumptions, green house gas policies and other mandates
- Lessons learned with respect to competing uses of resources and assumptions about long term trends and policies

2013 Meetings

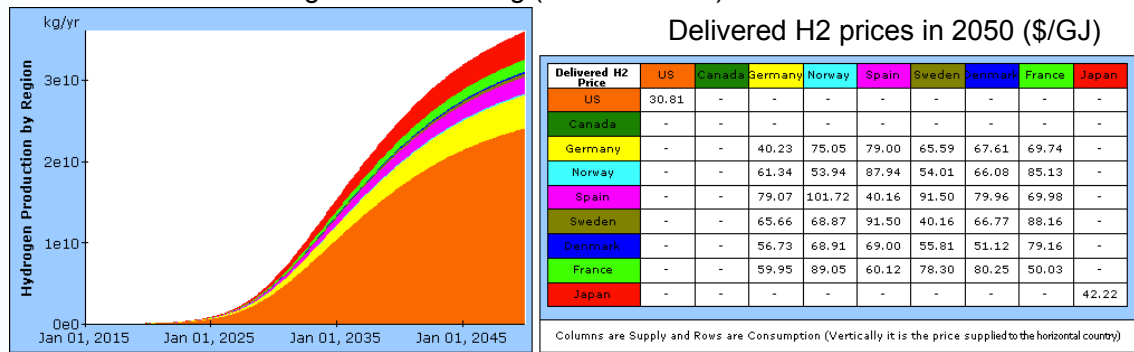
11 – 12 March, 2013

Paris, France

16 – 17 October 2013

Madrid, Spain

Case 1: No Interregional H2 Trading (Global results)



Result pages show:

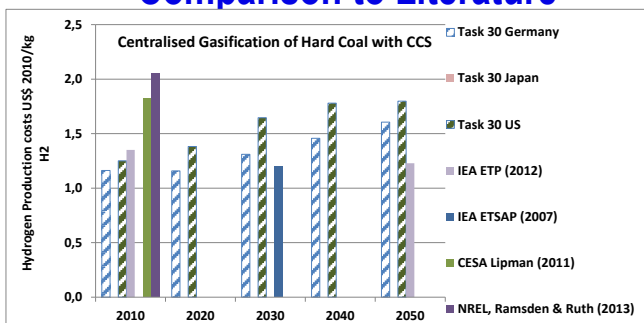
- **Hydrogen production (above left) and consumption by region (production = consumption for Case 1)**
- **Total delivered costs (above right) and in stacked bar format by country**
- **Production pathways**
- **CO2 emissions from vehicles**
- **Comparison of increased feedstock demand due to H2 production compared to 2009 primary energy demand.**

Figure 1: Example Results of Subtask A work

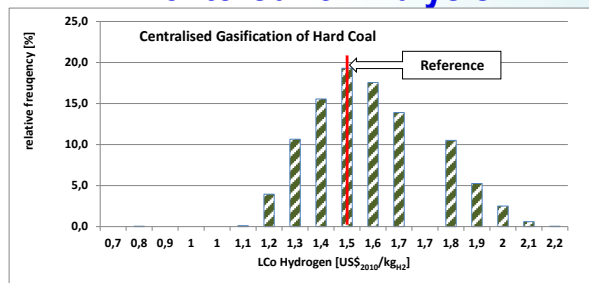
For Subtask B, the data structure of the hydrogen technology database and the data input was completed. First results and the analysis of sensitivity / uncertainty of input parameters were discussed with the experts. A first draft of the Handbook to describe the database and calculation schemes was sent out for comments to Task 30 experts.



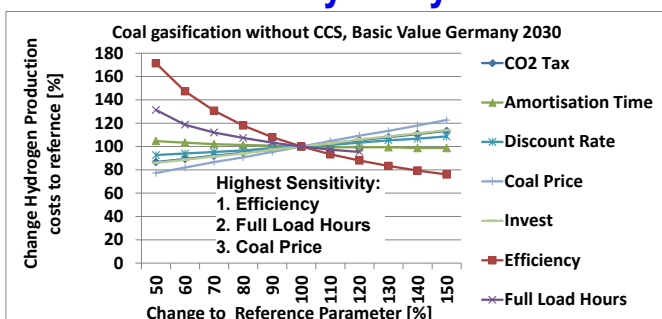
Comparison to Literature



Monte-Carlo-Analysis



Sensitivity Analysis



H ₂ Production Technology
Biomass gasification
Electrolysis alkaline with grid power
Electrolysis alkaline with intermittent energy
Electrolysis HT-SOEC with grid power
Electrolysis PEM with grid power
Electrolysis PEM with intermittent energy
Hard Coal Gasification with CCS
Hard Coal Gasification w/o CCS
Lignite Gasification with CCS
Lignite Gasification w/o CCS
SMR large scale with CCS
SMR large scale w/o CCS
SMR small scale w/o CCS
Photochemical water splitting

Figure 2: Example Results of Subtask B analysis

In Subtask D, on hydrogen for the smart grid, first results about cost of hydrogen production in combination with electricity and grid services were generated and discussed. The focus of the work is a case study for France as a starting point to think about the possible role of hydrogen in future energy systems around the world.

A private website is used for exchanging working materials and preparing for expert meetings and web conference calls. To support collaboration, 6 web conferences took place over the year 2013. An exchange of knowledge and data with other Tasks took place. Numerous one-on-one web conferences also occurred.

OUTREACH AND COMMUNICATION

Under the umbrella of Hydrogen Implementing Agreement Task 30 was involved in the review process of the IEA ETP 2014 and of the WEO 2013. The hydrogen technology database will be available for countries participating in Task 30. A first draft of the final Subtask A report have been circulated with Task 30 and will be published externally in 2014.

The reporting to the HIA ExCo will be done by semi-annual reports, presentations, and annual reports. The experts will prepare an end of task report in late 2014 to be published at the HIA website.



FUTURE WORK

ACTIVITIES AND /OR TARGETS FOR 2013

The last experts meeting will be in May 2014 in Paris, and will include a day session with IEA analysts from World Energy Outlook and Energy Technology Perspectives.

The products/activities planned for 2014 included:

- Presentation of Task 30 work at the conferences EHEC 2014, WHEC 2014
- Publication of Subtask A resource study results in an International Journal
- Completion of Handbook for data management and analysis to accompany the database
- Finalization of work on the French case study in Subtask D hydrogen energy storage analysis
- Task definition of “Hydrogen to X” and Task proposal for “Life Cycle Sustainability Analysis for hydrogen Energy Systems”

ACTIVITIES AND/OR TARGETS BEYOND 2013

Task 30 will end in June 2014. The experts have agreed on the structure and key messages of the final report. The liaison function with the IEA will be handed over to a follow up task and ExCo. The web site will be moved to the HIA web site.

R&D CHALLENGES

Challenges include finding consistent data for performance coefficients, resources, costs, and scaling projections.

REFERENCES

Selected key publications:

AUTHOR(S)	TYPE	TITLE	JOURNAL/ CONFERENCE/ ETC.
Susan Schoenung	Poster	IEA HIA Global Hydrogen Systems Analysis	Zing Hydrogen and Fuel Cells Conference, Silverado, California, July 2013
Jochen Linssen et al.	Book section	Worldwide Hydrogen R,D&D Activities	Chapter in a Wiley-VCH Book "Hydrogen Science and Engineering" in preparation