PURPOSE

Hydrogen production by on-site reforming is an important stepping stone towards the development of a hydrogen infrastructure for the transport sector. Today, on-site production units can be developed in any required size and capacity. It is important for vendors that norms for size, capacity and footprint exist to enable mass production and reduce costs. Therefore a harmonization of the technology is essential and this is one of the main goals of Task 23.

Hydrogen by on-site production cannot be provided at a reasonable cost when including CO2 capture and storage. However, choice of feedstock and improved energy efficiency can contribute to a reduction of the emissions and thereby enabling hydrogen production from small scale reforming.

Establishment of a market for hydrogen is a challenge as the number of cars and service stations is highly coupled and depending on a strong collaboration between car producers and gas suppliers. Task 23 constitutes a unique group of experts addressing the challenges of harmonization, emissions handling and market development. The experts represent international gas suppliers, technology suppliers and research institutes. This type of international collaboration across disciplines and industrial segments is essential to facilitate industrialization and hydrogen infrastructure development.

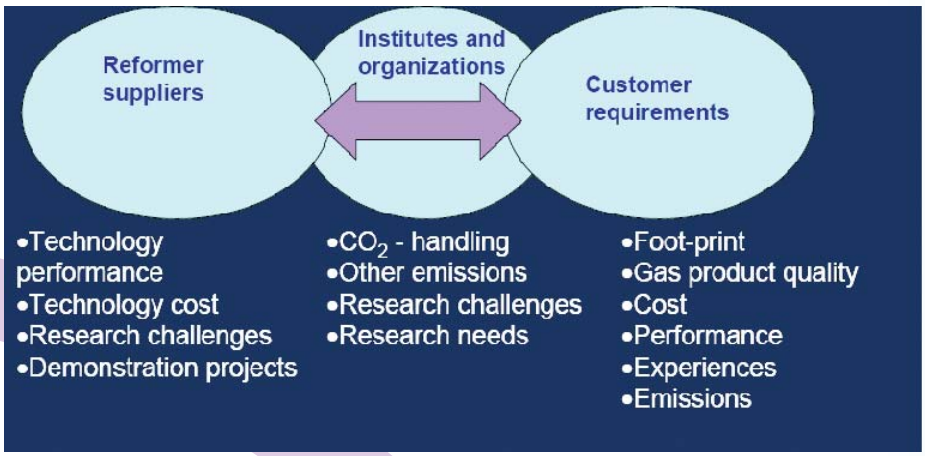

Figure 1: Approach illustration

TASK 23

SMALL SCALE REFORMERS FOR ON-SITE HYDROGEN SUPPLY

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VITAL STATISTICS

Term

Phase 1: 2006-2009

Phase 2: 2010-2011

Members

Norway

Sweden

Denmark

Netherlands

Germany

France

Turkey

Italy

US

Japan

Expert Participants

(14)

2011 Meetings

May

Trondheim, Norway

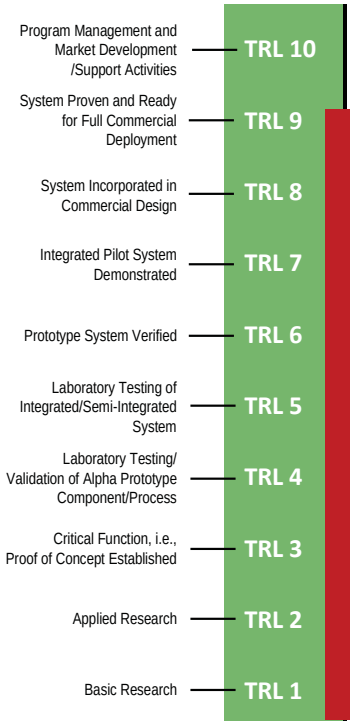
September

Stuttgart, Germany

STATUS OF THE TECHNOLOGY

STATUS OF THE TECHNOLOGY

Hydrogen production by on-site reforming is an important stepping stone in the development of a hydrogen refuelling infrastructure for the transport sector. Reforming of natural gas is a well-proven technology and has been performed in large scale for decades.



TECHNOLOGY READINESS LEVEL (TRL)

Currently on-site small scale reformer units can be developed in any required size and capacity. It is important for vendors that norms for size, capacity and footprint exist to enable mass production of components and thereby reduce the cost of the on-site units. This can only be achieved through harmonization of technology. Harmonization requires close interaction between suppliers and end-users. Several companies supply on-site hydrogen generators based on harmonized capacities and footprints. The technology readiness level for small scale reformers at 50 Nm^3/hr and above is high. Fully commercial systems exist and are being used at demonstrations cites for refueling. In addition, commercial systems are operating in other industrial sectors.

FRAMEWORK SUMMARY

The main objective of Task 23 is to provide a basis for harmonization of technology for on-site hydrogen production from hydrocarbons–fossil and renewable. The four sub-objectives are:

Develop a basis for harmonized capacities for the on-site hydrogen reformer unit.

Identify and examine issues related to the promotion of widespread use of on-site hydrogen reformer units.

Develop a global market guide for the use of on-site hydrogen reformers.

Describe the technology link to renewable sources

Task 23 is organized in three subtasks linked as illustrated in the figure below.

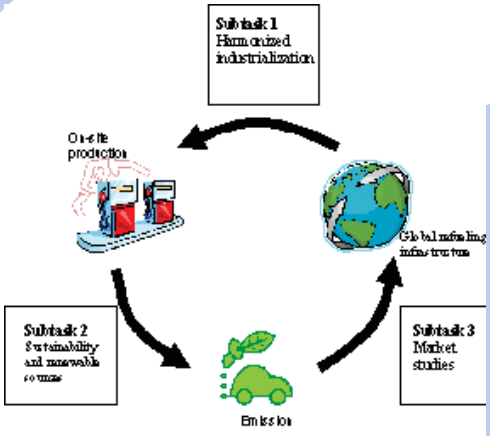


Figure 2 Relations between subtasks

Subtask 1: Harmonized industrialization

The leader of Subtask 1 is Dr. Esther-Ochoa Fernandez (Statoil, Norway).

The overall objective is to develop a harmonized approach related to reformer capacity. This can facilitate industrialisation and cost reduction. There is a need for a framework for design of refuelling stations and harmonisation of technology.

Subtask 2: Sustainability and renewable sources

The leader of Subtask 2 is Mr. Corfitz Nelsson (SGC, Sweden).

The overall objective is to develop systems for fuel diversification and the use of renewable sources, and furthermore to study on-site emissions and how to handle these.

Subtask 3: Market studies

The leader of Subtask 3 is Dr. Isamu Yasuda (Tokyo Gas, Japan).

The overall objective is to facilitate and support market development by dissemination of technology information. The market will be studied with respect to quality and quantity. Three cases will be used as basis for a market study. The cases are Japan, Northern Europe, and California. These cases will represent markets with different characteristics.

MEMBERS

TASK MEMBER AND EXPERT TABLE 2011

COUNTRY	ORGANIZATION	EXPERT
Denmark	Haldor Topsoe	J.B. Hansen
Germany	Mahler AGS	R. Stauss
Japan	Tokyo Gas	I. Yasuda
Norway	Statoil	B.T. Børresen
Norway	Statoil	E. Ochoa-Fernández
Norway	SINTEF	I. Schjølberg
Netherlands	HyGear	D. Lieftink
Netherlands	JRC	G. Tsotridis
Sweden	SGC	C. Nelsson
Sweden	Catator	F. Silversand
Sweden	Hulteberg Consulting	C. Hulteberg
Italy	ENEA	E. Calo
Turkey	TÜBITAK	A. Ersoz
France	GDF Suez	J. Saint-Just

COMMENTS ON GROWTH/CHANGES IN MEMBER AND/OR EXPERT PARTICIPANT COMPOSITION

The expert table shows the experts attending the meetings in 2011. The number of participants is reduced compared to 2010, as several companies reduced their hydrogen activities due to the economic situation in Europe.

ACTIVITIES AND RESULTS IN 2011

PROGRESS AND ACCOMPLISHMENTS (BY SUBTASK OR OTHER ORDER PREVIOUSLY SET FORTH)

Develop a basis for harmonized capacities for the on-site hydrogen reformer unit.

A recommendation on three capacities has been given. These are capacities of 100 Nm3/h, 300 Nm3/h and 500 Nm3/h.

Identify and examine issues related to the promotion of widespread use of on-site hydrogen reformer units.

Suggestions for harmonization and standardisation of reformer units have been presented, as well as available technology worldwide.

Develop a global market guide for the use of on-site hydrogen reformers.

The cost of producing hydrogen by reforming has been analysed and compared to available cost data presented in other international projects. Moreover, market descriptions for the countries participating in Task 23 have been developed.

Describe the technology link to renewable sources.

A number of fuel paths have been developed as well as detailed analysis of small scale CO2 capture technology.

FUTURE WORK

Task 23 ended in December 2011. The final report will be delivered to the Executive Committee in 2012.

REFERENCES

WHEC 2008 (Brisbane, Australia)
'IEA-HIA Activities on Small Scale Reformers for On-site Hydrogen Supply'

WHEC 2010 (Essen, Germany)
'IEA-HIA Activities on Small Scale Reformers for On-site Hydrogen Supply'