Task 23 Small scale reformers for on-site hydrogen supply

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ExCo meeting
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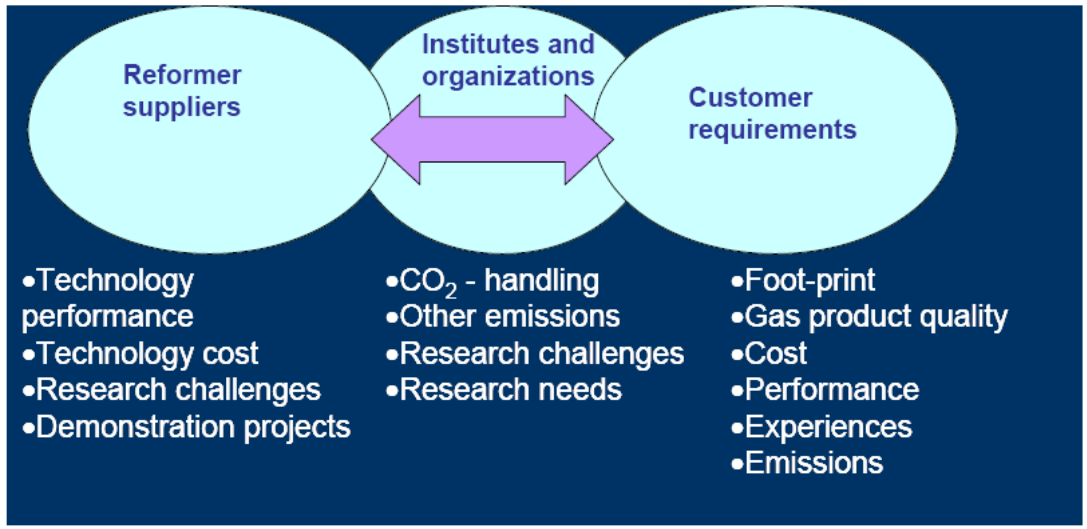
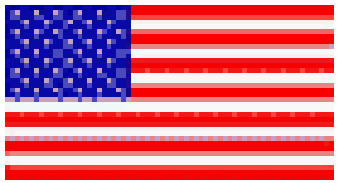
Objectives

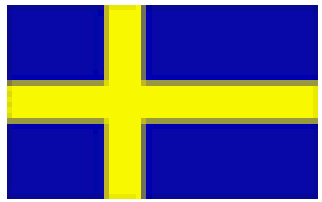
- The overall objectives of the task are:
  - Develop a basis for harmonized capacities for the on-site hydrogen reformer unit
  - Identify and examine issues related to the promotion of widespread use of on-site hydrogen reformer units
  - Develop a global market guide for the use of on-site hydrogen reformers
  - Describe the technology link to renewable sources



Member countries

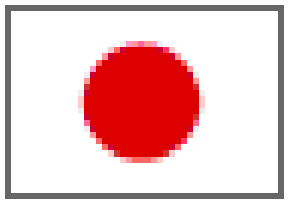


US

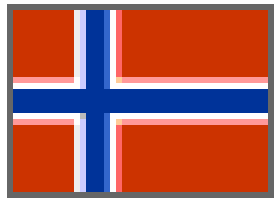


Sweden

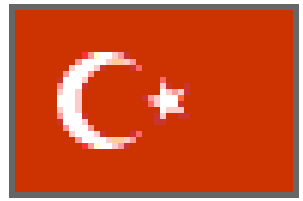
Netherlands



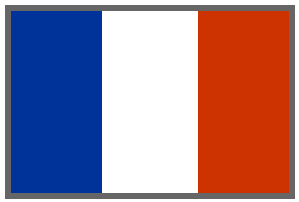
Japan



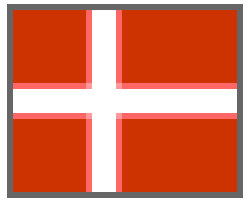
Norway



Turkey



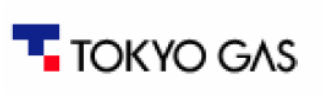
France



Denmark

Germany

Task 23 experts



Task organization

- Subtask 1: Industrialised harmonisation (Norway)
  - Develop a harmonized approach related to reformer capacity. This to facilitate industrialisation and cost reduction
- Subtask 2: Sustainability and renewable sources (Sweden)
  - Develop systems for fuel diversification
  - Study on-site emissions
- Subtask 3: Market studies (Japan)
  - Facilitate and support market development

Subtask 1 Industrialised harmonisation

- State of art:
  - Taylor made
  - Any size
  - Any capacity
  - Few SSR
- Challenges:
  - Mass production
  - Costs
  - Footprint
  - Design
  - Capacities
  - CO2 capture

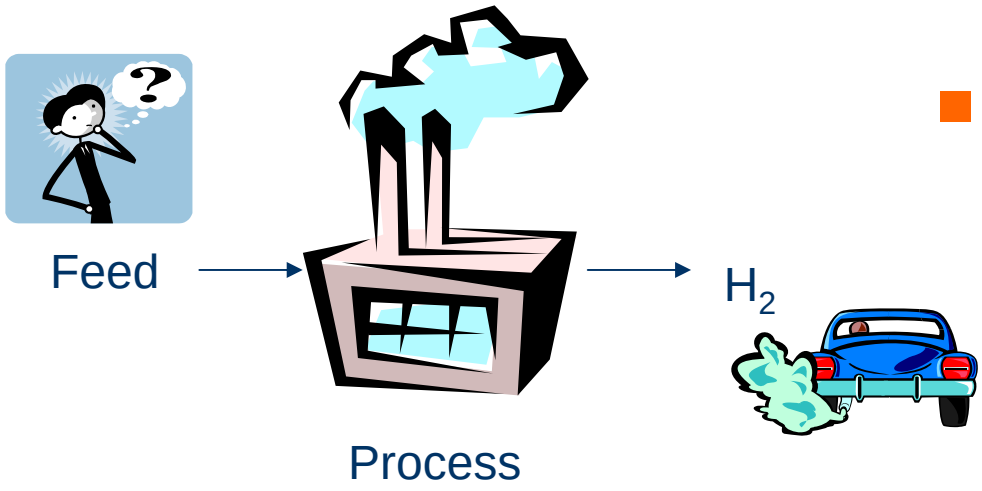
Preliminary results

- It is important for suppliers and end-users that norms and standards for size, footprint and capacity exist.
- For the end-user a standardisation facilitates planning of installation and simplifies maintenance of the systems.
- For the developer and suppliers, standardization could lead to reduced costs for vital components like compressors, valves, as well as design costs.
- A list identifying suppliers of reformer technology and components is under development. The main goal is to be able to give a recommendation on the best available small scale reformer technology.

Subtask 1 workplan 2008

- Complete the list of suppliers of reformer technology
- Compare the s-o-a reformer technology according to a set of parameters
- Compare availability and reliability of JHFC stations to the results presented in CUTE

Subtask 2 Sustainability and renewable sources



- State of art
  - Demonstration projects
  - WTW analysis
- Challenges
  - CO2, NOx, noise
  - High cost on small scale capture
  - Technology depends on reformer technology
  - What to do with the captured CO2
  - Given a feedstock: Reform or not

Fuel diversification

- Feedstock
  - NG
  - Ethanol
  - DME
  - Bio diesel
  - Glyserin
  - Ammonia
  - Sugars
  - Alcohols
  - Bio-oil

- Multifuel reformer
  - CO2 emmission cost
  - Fuel availability

Low pressure
Multi-fuel reformer
(N-GHY)

Preliminary results

- Small scale CCS is mainly on a research level. The choice of capture technology depends on the reformer technology.

- Small scale CCS is an alternative if you have a demand for Co2 in the nearby area.

Subtask 2 workplan 2008

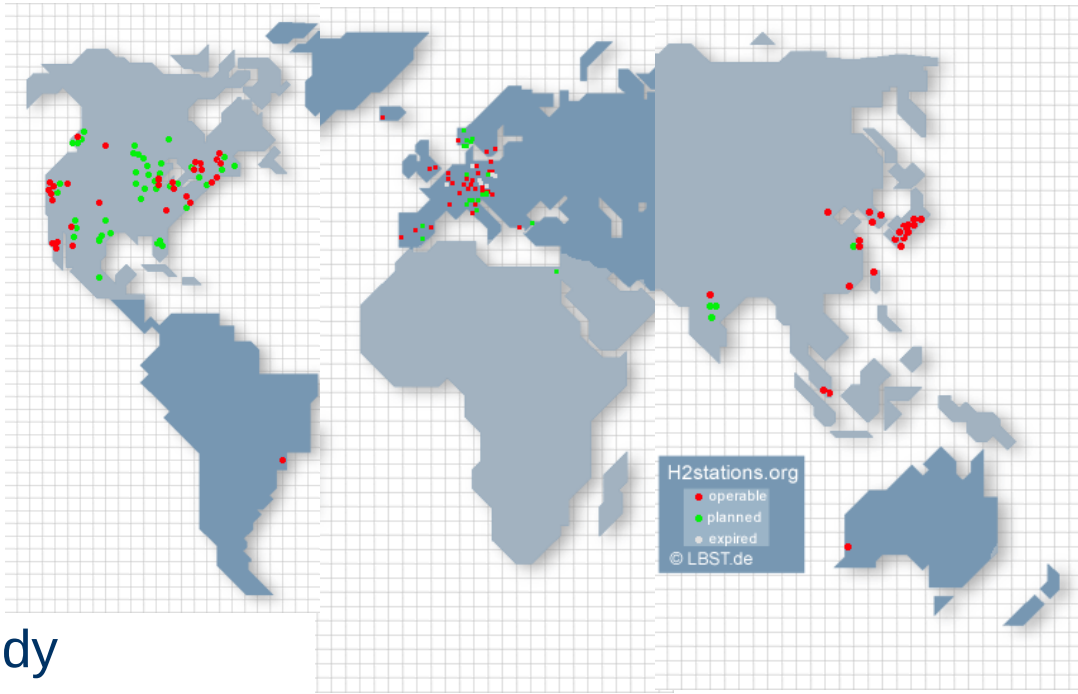
- Best use of biofuels, reforming possibilities and availability
- Presentation of the CCS research at ECN
- Presentation on the s-o-a on the use of biomass in Japan

Subtask 3 Market studies

- State of art
  - Demonstration projects
  - Vision: Hydrogen society (Japan, Iceland, California,…)
- Challenges
  - No cars, no infrastructure
  - No infrastructure, no cars
  - Cheaper reformers
  - Feedstock
- Treats
  - Natural gas prize
  - H2 politics
  - H2 (from large plants)
  - CO2 emissions

Market studies

- Markets
  - Japan (Asia)
  - North America (US)
  - North-Europe



- Output from the market study
  - Hydrogen supply costs
  - Energy efficient and CO2 emissions on WTT basis
  - Advantages of small-scale reformers over
    - GH2 transport and supply
    - LH2 transport and supply
    - On-site water electrolysis
  - Analysis: Comparing the markets

Input parameters

- Capital costs / capital charge
- Cost reduction by volume production
- Feedstock cost
- Feedstock consumption
- Cost of consumables
- Utility cost
- Energy efficiency
- CO2 emissions/ political costs
- Transportation costs
- Currency exchange rate
- Regulations, codes and standards

Subtask 3 workplan 2008

- Collecting data on US and North European market
- Task 23 experts have discussed the results from the EC project HyWays and forwarded comments to the project coordinator

Activities 2006-2007

- Hamburg, October 2006
  - Hosts: StatoilHydro
- Berlin, May 2007
  - Hosts: StatoilHydro
- Malmo, October 2007
  - Hosts: EON, SGC

Activities 2008-2009

- Tokyo meeting, April 2008
  - Hosts: NEDO, ENAA, Tokyo Gas
- Paris, October 2008
  - Host: Gaz de France
- Norway, Mai 2009 (EVS symposium)
  - Host: StatoilHydro

Concluding remarks

- SSR is very important for early market development, to push the H2 society
- Local solutions gives flexibility
- Parameters defining a harmonized system are crucial
- Small scale CCS mainly on a research level
- Market analysis in progress