The importance of collaborative R&D in the hydrogen sector

Erik Busche
Executive Committee Representative for Germany
Outline

- The Hydrogen TCP
- Activities: current and planned
- Hydrogen value chain challenges
- Benefits of joining the Hydrogen TCP – Member perspective
The Hydrogen TCP

- The Hydrogen Technology Collaboration Programme was established in 1977 under the auspices of the International Energy Agency to pursue international collaborative research in the hydrogen field.

- It carries out R,D&D activities through projects focused on specific topics called Tasks.

- Its Executive Committee is formed by representatives and alternates of its 24 Member Countries, the European Commission, UNIDO and 6 Sponsors.
The Hydrogen TCP

Members
- 24 Member Countries
- 6 Sponsors
- European Commission + UNIDO

Tasks
- 4 Ongoing
- 37 Finished
- ≥ 10 in definition

Experts involved
In collaborative research on hydrogen and hydrogen technologies

Experts involved
- 250+

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Hydrogen Technology Expo Europe
### Activities - 2021

#### Task 37 Hydrogen Safety
- **Challenges:**
  - H₂ Safety Concerns
- **Task Goals:**
  - Develop H₂ safety integration models and tools
  - Management strategies to ensure safe deployment
  - Quantitative Risk Assessment
  - Consequence analysis

**Successor Task in 2022!**

#### Task 38 Power-to-Hydrogen and Hydrogen-to-X
- **Challenges:**
  - Increasing interest on PtX, lack of consistent information
- **Task Goals:**
  - Techno-economic analysis of PtX pathways
  - Database of demonstration projects
  - Assessment of existing legal frameworks
  - Guidelines and recommendations for business developers and policy makers

**Closed in July 2021**

Joint Workshop with IEA
[Check our Blog!]

#### Task 39 Hydrogen in Marine Applications
- **Challenges:**
  - Need for greener shipping
  - Lack of information on the use of H₂ for marine applications
- **Task Goals:**
  - Provide knowhow on the use of H₂ in different marine vessels
  - Monitor, review and contribute to new concepts, technologies and components
  - Network of international experts

**Final Report to be released soon**

Keep posted!

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Hydrogen TCP
Activities - 2021

Task 40
Energy storage and conversion based on hydrogen

Challenges:
- Energy storage
- $\text{H}_2$ storage Optimization of materials (solid and liquid)

Task Goals:
- Develop materials and systems for energy storage and conversion based on $\text{H}_2$
- Develop reversible or regenerative $\text{H}_2$ storage materials

New papers to be published in Spring 2022
("Progress in Energy" Journal, IOP Publishing)

Task 41
Data and Modelling

Challenges:
- Lack of consensus on $\text{H}_2$ data and how to represent $\text{H}_2$ in Energy models

Task Goals:
- Data consolidation by developing a robust and updatable database on $\text{H}_2$ parameters
- Develop knowledge of how to best model $\text{H}_2$ in the value chain

New paper “A taxonomy of models for investigating hydrogen energy systems” to be published on “Renewable and Sustainable Energy Reviews” Journal
Activities – planned

- New challenges
- New topics of interests for our members

Tasks in Definition

- Renewable Hydrogen Production
- Underground Hydrogen Storage
- Offshore Hydrogen Production
- Hydrogen from Nuclear Energy
- Hydrogen in the Mining, Mineral Processing, and Resource Sectors
- Hydrogen Export Value Chains

Did you know...?
Experts from member and non-member countries are welcome to participate in the definition process.
Hydrogen Value Chain Challenges

Cross-cutting challenges:
- Legal framework
- Standardization
- Scale-up
- Improve process efficiencies
- Reduce costs (CAPEX, OPEX...)
- Available data, success-stories...

Specific technical challenges:
- Addressed by international collaborative R&D through Hydrogen TCP Tasks
Benefits of joining the Hydrogen TCP – Member perspective

Stay updated of hydrogen developments around the world

Increase and share hydrogen expertise

Identify countries/entities with similar priorities and challenges and collaborate to solve them

Connect with scientists, and national leaders committed to reliable, sustainable, and clean energy

Did you know...?

When a country joins the Hydrogen TCP all the country’s experts and institutions can participate in Tasks

A German success story...

German-led Task 32 (Task 40 is now its successor) achieved “Highly cited paper” (top 1%) and “Hot paper” (top 0.1%) on their Final Report

Task Manager: Michael Hirscher Max Planck Institute for Intelligent Systems

Materials for hydrogen-based energy storage – Past, recent progress and future outlook

Highlights
- A comprehensive review of materials, techniques and methods for hydrogen storage.
- Hydrogen storage in porous materials, metal and complex hydrides.
- Applications of metal hydrides for H2 compression, thermal and electrochemical storage.
- Hydrogen energy systems using metal hydrides.

Citation Network
In Web of Science Core Collection

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Thank you!

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