

Final report

1. Project details

Project title	IEA Hydrogen TCP 2021-2022
File no.	64020-1103
Name of the funding scheme	EUDP
Project managing company / institution	DGC
CVR number (central business register)	12105045
Project partners	DGC
Submission date	08 June 2023

2. Summary

IEA Hydrogen TCP (Technology Collaboration Programme)

The aim of the project is to participate in the Hydrogen TCP, to stimulate hydrogen R&D activities in Denmark and to co-ordinate Danish and international scientific work on hydrogen and related subjects. At the end of 2022 IEA Hydrogen TCP had 33 members from countries, international organisations, and industrial sponsors. An increase of 2 in memberships compared to 2020 and several new countries are in the accession process.

DGC's tasks in the IEA Hydrogen TCP includes:

- Participation in IEA Hydrogen TCP Executive Committee
- Facilitate Danish participation from Industry and Academia in IEA Hydrogen tasks (Projects)
- Communication and outreach on IEA Hydrogen activities and task results via web, papers, workshops, and conferences

Furthermore, to coordinate the Danish Hydrogen TCP participation with the Danish Energy Agency, who is the formal Danish representative in the Hydrogen TCP.

2021-2022: Main activities and results

Hydrogen, Power to Gas and Energy Storage has been at the very top of Energy agenda during the last years and both IEA and other international organisations, nations and leading energy companies have pointed out hydrogen as a key component in the CO₂ neutral energy system.

IEA Hydrogen TCP has during this period collaborated with the IEA on technical hydrogen issues and supported the IEA with input to IEA publications and IEA analyses, been in the International Hydrogen Coordination Group (Irina, IEA, Hydrogen Council, IPHE, CEM, Hydrogen TCP, Advanced Fuel Cell TCP). The Hydrogen TCP and IAEA have signed a MoU and the Hydrogen TCP and Mission Innovation have signed a Lol.

Regarding strategic activities first phase of the TRL Assessment activity is completed (IEA wants to update the IEA Clean Energy Technology Guide). ExCo has given priority to 12 technical topics and top priority are given to: Renewable hydrogen; Hydrogen and Hydrogen-based fuels production from wind and Hydrogen Safety. A Hydrogen TCP Award of Excellence has been introduced by the TCP. (First Award Ceremony at GCEAF CEM13 – MI 7, 22nd September 2022, Pittsburgh).

During 2021-2022 three tasks are finalized, three new tasks are approved, and six tasks are in the definition phase or in preparation. Most of the tasks have Danish participation.

The Hydrogen TCP has maintained a high level of activity during the last two years, but due to COVID-19 many meetings and workshops have been executed as on-line events.

Dansk sammenfatning

IEA Hydrogen TCP (Technology Collaboration Programme)

Formålet med projektet er at deltage i IEA Hydrogen TCP, stimulere brint FUD-aktiviteter i Danmark og koordinere dansk og internationalt videnskabeligt arbejde om brintrelaterede emner via:

- Deltagelse i IEA Hydrogen Executive Committee
- Fremme dansk deltagelse i IEA-brintprojekter
- Kommunikation om resultater og aktiviteter

Desuden at koordinere den danske TCP-deltagelse med Energistyrelsen, som er den formelle danske repræsentant i Hydrogen TCP.

2021-2022: Aktiviteter og resultater

Brint, Power-to-Gas og Energilagring har været øverst på energidagsordenen i de seneste år, hvor både IEA og andre internationale organisationer, nationer og energiselskaber har udpeget brint som en nøglekomponent i det CO₂-neutrale energisystem.

Formålet med dansk deltagelse i IEA Hydrogen TCP er at facilitere dansk deltagelse i internationalt videnskabeligt samarbejde at koordinere den danske deltagelse med Energistyrelsen, som er den formelle danske repræsentant i Hydrogen TCP. Endvidere at informere om resultaterne af samarbejdet og dansk deltagelse.

IEA Hydrogen TCP giver input til IEA's publikationer og analyser og har gennemført første fase af TRL vurdering ifm. opdatering af IEA Clean Energy Technology Guide. TCP'en deltager i International Hydrogen Coordination Group og har i perioden indgået en MoU med IAEA og en Lol med Mission Innovation.

I løbet af 2021-2022 er tre tasks (samarbejdsprojekter) afsluttet, tre nye tasks er igangsat og seks tasks er under forberedelse. Nye tasks:

- Underground Hydrogen Storage
- Safety and RCS of large-scale hydrogen energy Applications
- Hydrogen from Nuclear Energy

Der er god dansk deltagelse i taskarbejdet og i perioden har følgende danske virksomheder deltaget: i-NANO, DTU, Ballard-Europe, Energinet, Salt Power, Gas Storage Denmark og DGC.

Både sekretariatet for Hydrogen TCP og DGC udsender nyhedsbreve til energibranchen og orienterer om resultater via artikler og konferencer.

Hjemmeside for Hydrogen TCP: <https://www.ieahydrogen.org/>

3. Project objectives

The main objectives (for DGC) have been an active Danish participation in the relevant Hydrogen TCP tasks, contact to the IEA Hydrogen Secretariat and information dissemination and outreach.

Most of the DGC resources are dedicated to:

- Regular contact to the TCP secretariat
- Preparation in Executive Committee meetings
- Ensure progress in the task work.
- Recruitment of Danish task members to new tasks
- Represent TCP at relevant workshops and conferences.
- Follow up on the Hydrogen TCP Strategic plan 2020-25 (ExCo)
- Input to Hydrogen TCP annual report and TCP newsletters
- DGC newsletters on IEA Hydrogen and progress reports to the Danish Energy Agency

DGC has during the last 2 years been involved in the modernisation of the TCP (new TCP secretariat in 2020) and input to design and content at the new TCP website.

The work on hydrogen energy technology has been developed by the following Hydrogen TCP tasks during 2021–2021:

Finalized tasks:

- Task 37 – Hydrogen Safety (DK deltagelse)
- Task 38 – Power to Hydrogen and Hydrogen to X (DK deltagelse)
- Task 39 – Hydrogen in Marine Transport (DK deltagelse)

Open tasks:

- Task 41: Analysis and Modelling of Hydrogen Technologies
- Task 40: Energy Storage and Conversion Based on Hydrogen (DK deltagelse)

New tasks:

- Task 42 Underground Hydrogen Storage (DK deltagelse)
- Task 43 Safety and RCS of large-scale hydrogen energy Applications (DK deltagelse)
- Task 44 Hydrogen from Nuclear Energy

Tasks in definition:

- Renewable Hydrogen
- Offshore Hydrogen Production
- Hydrogen in the Mining, Mineral Processing, and Resource Sectors
- Hydrogen Export Value Chains
- Natural Hydrogen
- Hydrogen Certification

4. Project conclusion and perspective

During the last years there has been an increasing global interest for hydrogen as an enabler for a carbon free energy system – and an increasing interest and number of members in both the IEA Hydrogen TCP and in the tasks.

Hydrogen is being internationally recognized as one of the main pillars for a future clean energy system, as it will play a key role in meeting long-term climate change mitigation and renewable energy goals set by countries all over the world. As an energy vector capable of storing large quantities of energy for long periods it is the perfect match for intermittent renewable power.

Task participation offers a great opportunity for international collaboration on the challenges on the future energy systems. More than 250 hydrogen experts participate in the Hydrogen TCP tasks making the IEA Hydrogen TCP to a unique platform for hydrogen knowledge exchange. This has also been discovered by the IEA HQ in Paris and a close cooperation between the IEA and the Hydrogen TCP has been ongoing during the last years.

The Hydrogen TCP main subjects - Hydrogen production, Hydrogen storage, Hydrogen infrastructure systems and hydrogen safety - are all issues of great importance for the future energy systems, why they also are the main issues in the actual Hydrogen TCP Strategic Plan 2020-2025.

The Strategic plan 2020-2025 has a commercial orientation in task issues, like: PtX-technology, Hydrogen safety, Standardisation and Hydrogen certificates. Industrial use of Hydrogen and hydrogen-based fuels are examples of break-through hydrogen technologies, which will also be subjects for future task collaborations within the Hydrogen TCP.

Danish energy companies and researchers participate in the execution of the IEA Hydrogen Tasks, which offers an excellent opportunity for international collaboration, creation of project consortia's and exchange of scientific results.

Most of the tasks in the Hydrogen TCP have Danish participants and during the last years Danish experts from i-NANO, DTU, Ballard-Europe, Energinet, Salt Power, Gas Storage Denmark and DGC have participated in the Hydrogen TCP tasks. And several Danish companies have expressed an interest for the task in definition.

The Hydrogen TCP has received great attention during the last years and in 2022 Keynotes has been given by the TCP at:

- European Hydrogen Energy Conference 2022
- Hydrogen 2022 – Reuters
- World Hydrogen Energy Conference

- Hydrogen Economy Europe

The Hydrogen TCP has maintained a high level of activity during the last two years and ExCo has executed a number of meetings:

Hydrogen projects database (ExCo): On-line, 7th April 2021 (Asger Myken)

85th ExCo meeting: On-line, 19th-20th-21st April 2021 (Asger Myken)

86th ExCo meeting: On-line, 25th and 28th June 2021 (Asger Myken)

87th ExCo meeting: On-line, 27th-28th-29th September 2021 (Asger Myken)

88th ExCo meeting: On-line, 13th-14th-15th December 2021 (Asger Myken)

89th ExCo meeting: Madrid / On-line, 15th-16th May 2022 (Jan Jensen)

90th ExCo meeting: On-line, 27th-28th-29th September 2022 (Jan Jensen)

91st ExCo meeting. Paris / On-line, 16th-17th December 2022 (Mads Lyngby Petersen)

5. Appendices

Strategic Plan 2020-2025: <https://www.ieahydrogen.org/vision-and-targets-2/>

End-of-Term Report 2015-2020: <https://www.ieahydrogen.org/vision-and-targets-2/>

Annual reports

2020: <https://www.ieahydrogen.org/annual-reports/>

2021: <https://www.ieahydrogen.org/annual-reports/>

IEA Hydrogen End of task reports: <https://www.ieahydrogen.org/tasks-reports/>

- Task 37 – Hydrogen Safety
- Task 38 – Power to Hydrogen and Hydrogen to X
- Task 39 – Hydrogen in Marine Transport

Newsletters from Hydrogen TCP

<https://www.ieahydrogen.org/newsleter-and-press-releases/>

July 2022 – Hydrogen TCP Newsletter S1

December 2021 – Hydrogen TCP Newsletter Q4

September 2021- Hydrogen TCP Newsletter Q3

June 2021 – Hydrogen TCP Newsletter Q2

March 2021 – Hydrogen TCP Newsletter Q1

DGC news on IEA Hydrogen TCP

August 2022: <https://www.dgc.dk/nyhed/2022/08/nyt-fra-iea-hydrogen>

April 2022: <https://www.dgc.dk/nyhed/2022/04/stor-tilslutning-til-nye-iea-brintprojekter>

Marts 2022: <https://www.dgc.dk/nyhed/2022/03/2021-aarsrapport-fra-iea-hydrogen>

Juni 2021: <https://www.dgc.dk/nyhed/2021/06/iea-workshop-om-power-x>

Marts 2021: <https://www.dgc.dk/nyhed/2021/03/aarsrapport-fra-iea-hydrogen-technology-collaboration-programme>

Januar 2021: <https://www.dgc.dk/nyhed/2021/01/ny-p2g-rapport-fra-iea-hydrogen-ny-hjemmeside-og-nye-arbejdsgrupper>

Furthermore, there is many scientific articles and conference presentations from the task members on task findings and results.