# Main challenges for rapid hydrogen deployment

Clean Hydrogen Mission Workshop

R&I: Opportunities, Challenges and Way Ahead

4th August 2022

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# The Hydrogen TCP in a nutshell

*Established in **1977** under the auspices of the **IEA** to pursue international collaborative research in hydrogen*

HYCHICO

एनटीपीसी NTPC

Southern Company

Hydrogen Council

NOW NOW-GMBH.DE

Reliance Industries Limited

**33**

## Members

**24** Member Countries
**7** Sponsors
European Commission + UNIDO

**40+**

## Tasks

**4** Ongoing
**39** Finished
≅ **6** in definition

**250+**

## Experts involved

In collaborative research on hydrogen and hydrogen technologies

# The immense challenge of scaling up $H_2$ production

### *Our goals…*

- NZE 2050 scenarios (1,5°C) estimate clean hydrogen production 400 - 800 Mt/year *(IRENA, IEA, ETC, BNEF, Hydrogen Council…)*
- Need to install 4000-5000 GW electrolysis by 2050
- That means 160 GW/year!

### *Vs Where we are…*

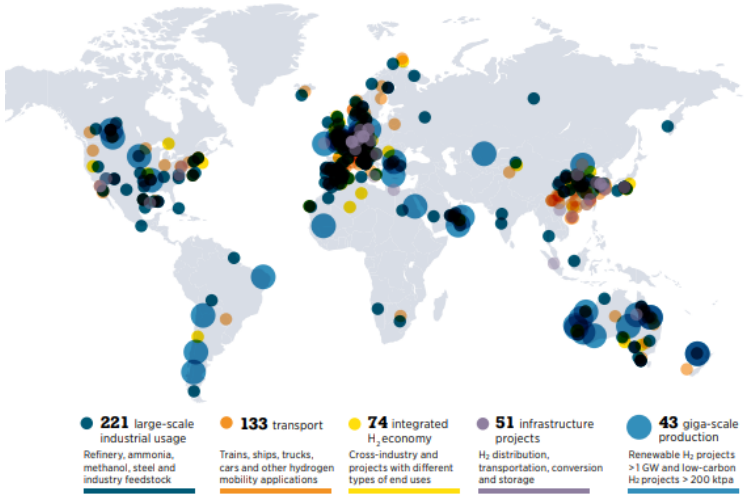
- The current portfolio of projects is around 280 GW to become in operation in the next decade (that means around 30 GW/year)
- To be on track we would need to launch every year for the next 30 years…

  2,5x “HyDeals” (67GW)

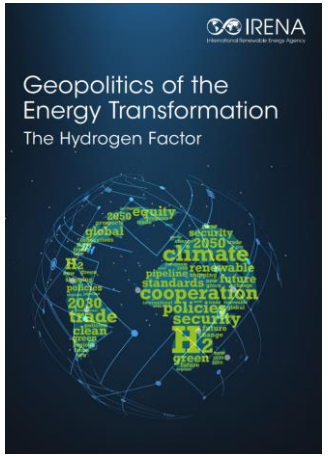
  or 11x “Asian Renewable/Oman Green Energy Hubs” (14 GW)

***Despite an impressive portfolio of projects…***
***our pace is still too slow and subject to many hurdles***

Figure 3.3 **Clean hydrogen projects and investment as of November 2021**




Source: Hydrogen Council (2021). Map source: Natural Earth, 2021
Note: The figure describes large-scale projects only, including commissioning after 2030. It does not include more than 1 000 small-scale projects and project proposals. GW = gigawatt; $H_2$ = hydrogen; ktpa = kilotonnes per annum.




|ects

| | | |
|---|---|---|
| 1 | **HyDeal Ambition (67GW)** | Western Europe |
| 2 | **Unnamed (30GW)** | Kazakhstan |
| 3 | **Western Green Energy Hub (28GW)** | Australia |
| 4 | **AMAN (16GW)[a]** | Mauritania |
| 5 | **Asian Renewable Energy Hub (14GW)** | Australia |
| 6 | **Oman Green Energy Hub (14GW)[a]** | Oman |
| 7 | **AquaVentus (10GW)** | Germany |
| 8 | **NortH2 (10GW)** | Netherlands |
| 9 | **H2 Magallanes (8GW)** | Chile |
| 10 | **Beijing Jingneng (5GW)** | China |
| 11 | **Project Nour (5GW)[a]** | Mauritania |
| 12 | **HyEnergy Zero Carbon Hydrogen (4GW)[a]** | Australia |
| 13 | **Pacific solar Hydrogen (3.6GW)** | Australia |
| 14 | **Green Marlin (3.2GW)** | Ireland |
| 15 | **H2-Hub Gladstone (3GW)** | Australia |
| 16 | **Moolawatana Renewable Hydrogen Project (3GW)[a]** – Australia | |
| 17 | **Murchison Renewable Hydrogen Project (3GW)** – Australia | |
| 18 | **Unnamed (3GW)** | Namibia |
| 19 | **Base One (2GW)[a]** | Brazil |
| 20 | **Helios green Fuels Project (2GW)** | Saudi Arabia |

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# Main challenges for rapid $H_2$ deployment

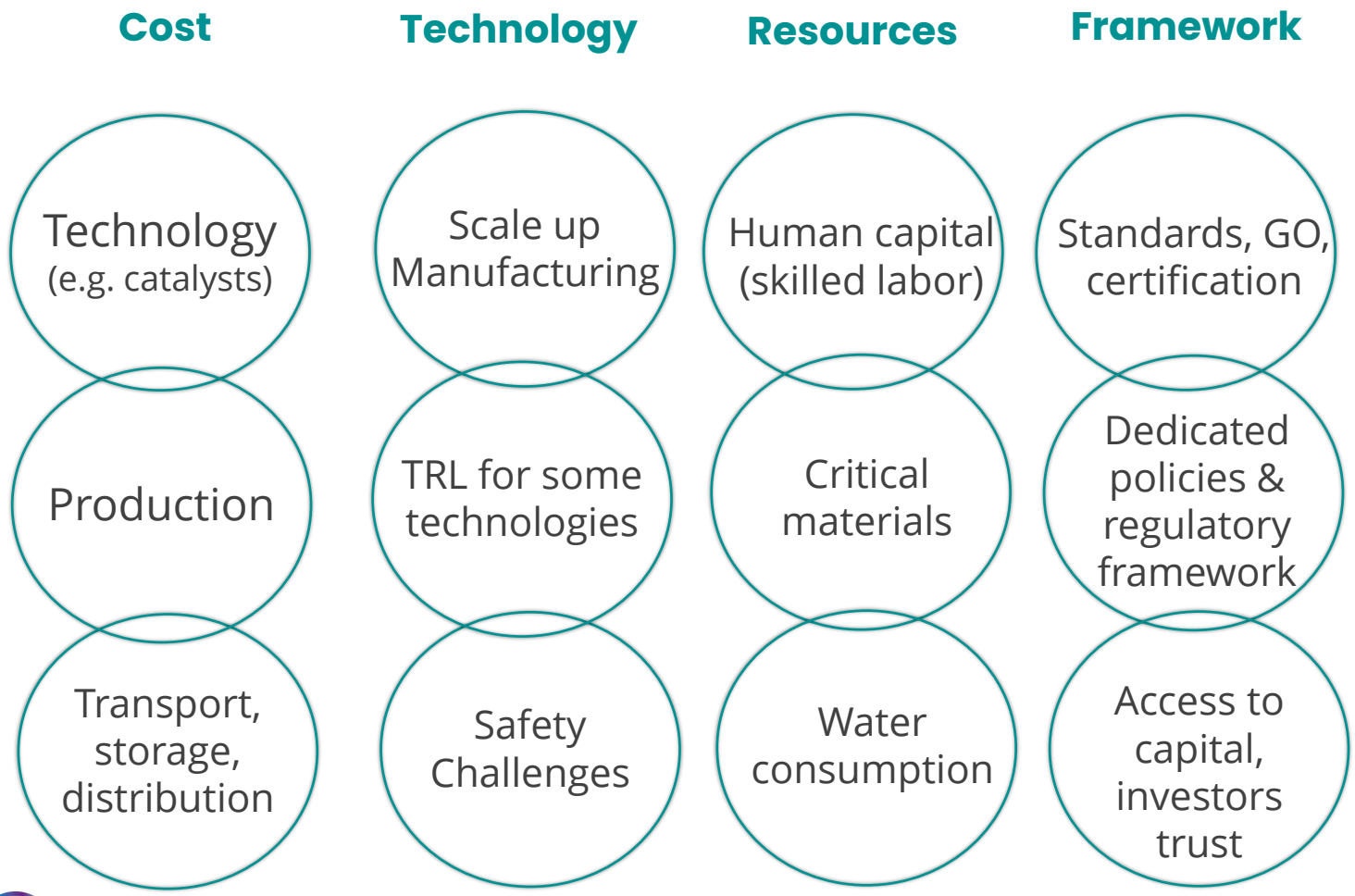
**We are in a race against the clock, but some things just require time…**

- R&D cycles, including “pilots” + learning by doing (demos)
- Scale-up
- Overcome cost barrier incumbent option and vested interests

- Aligning value chains
- Required “human capital”
- Rate of replacement

- Adjusting / new regulations
- Gaining social acceptance

# Main challenges for rapid $H_2$ deployment




## What do we need?

- National strategies and **Action Plans**
- Public support, specially in **early years**
- R & D & **Innovation**
- **International collaboration**

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# Main challenges for rapid $H_2$ deployment

## R&D is needed at all stages of development

**R&D in lower TRL:** alternative technologies that could be complementary in the future to our current technological landscape or even outperform some mature technologies. E.g. production pathways, alternatives for storage…

**R&D in higher TRL:** towards optimization, changes in materials, processes… that may result in improved efficiency and/or reduced costs. E.g. testing different catalysts or different quantities of catalyst under different conditions, new materials for the cells in the stacks or new material treatments that result in overall efficiency…

## Why is R&D key for rapid / large –scale hydrogen deployment?

While we focus on implementing already proven and mature technology as soon and as quickly as possible we will need continuous work on **optimizing costs, reliability, durability, energy efficiency and flexibility, as well as scaling-up challenges**, that can only be faced with R&D and alternative thinking.

Additionally, studies to support policy making are important (choice/design policy instruments for effective support; market structure and development etc.) and R&D on cross-cutting issues such as development of safety standards.

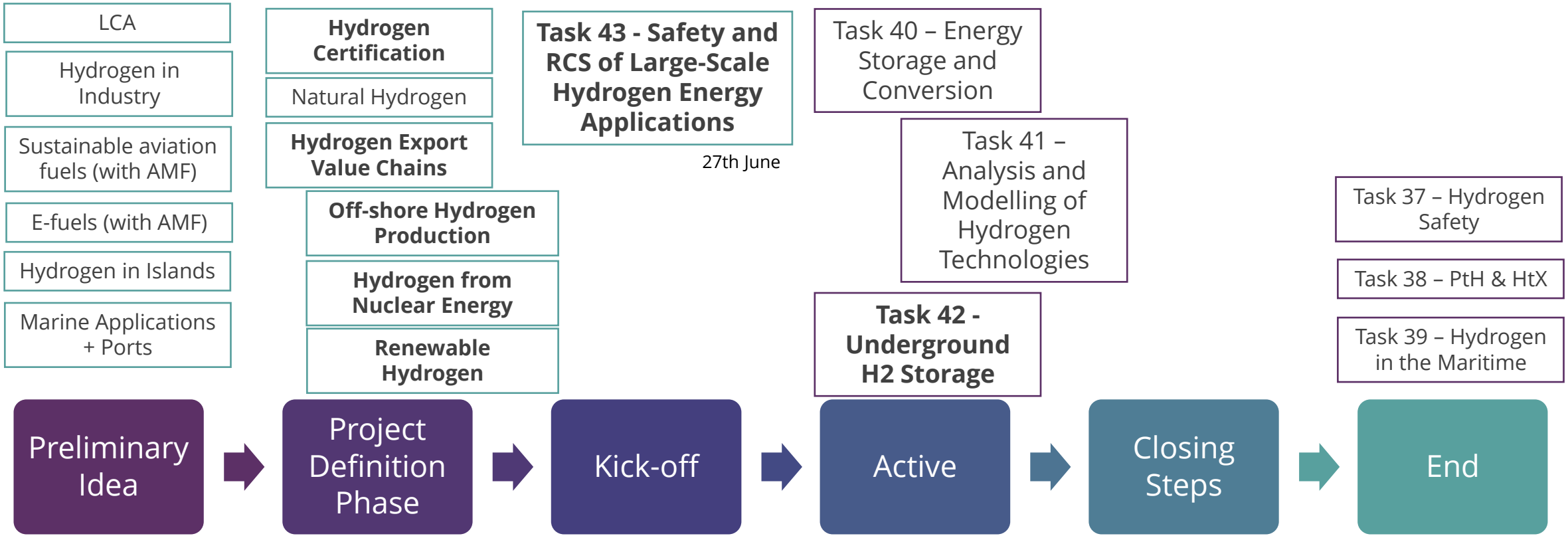
# Why the Hydrogen TCP will play a key role?

- ✓ 40+ years of delivering high-value technical results to the hydrogen community
- ✓ 40+ successful Tasks
- ✓ Historical focus on R&D needs
- ✓ Results and findings publicly available on the Hydrogen TCP website
- ✓ Network of proactive Member States on hydrogen with the capability to mobilize hundreds of experts from around the world for a permanent effort over 3-4 years at a time
- ✓ The Hydrogen TCP covers the whole hydrogen value chain, when not alone in collaboration with…

IEA Technology Collaboration Programme Advanced Fuel Cells
etsap
COMBUSTION TCP
IEA-AMF Technology Collaboration Programme on Advanced Motor Fuels
energy storage
IEA Bioenergy
iea wind
International Energy Agency Photovoltaic Power Systems Programme
Industrial Energy-Related Technologies and Systems iets
ISGAN INTERNATIONAL SMART GRID ACTION NETWORK
ieaghg

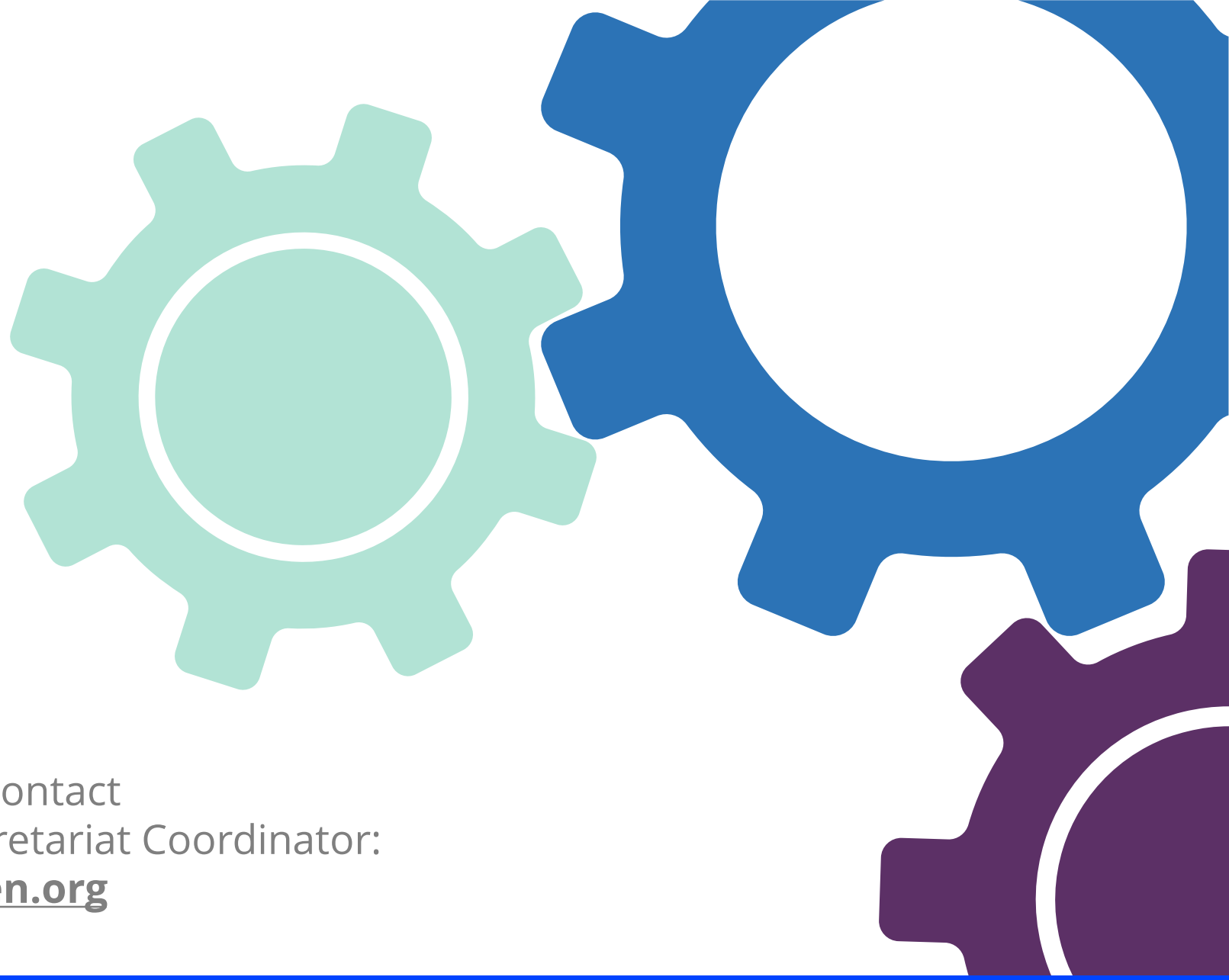
- ✓ 2022 strategic activity on TRL Assessment
- ✓ The Hydrogen TCP can be the technical/operational branch to other international initiatives who could propose new topics for Tasks for ExCo consideration

# Task portfolio status (July 2022)




- Document review for other organizations (IEA, other TCPs, international groups…)
- Strategic activities: TRL Assessment, Hydrogen TCP Awards

# Thank You!



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