



Clean Hydrogen Mission

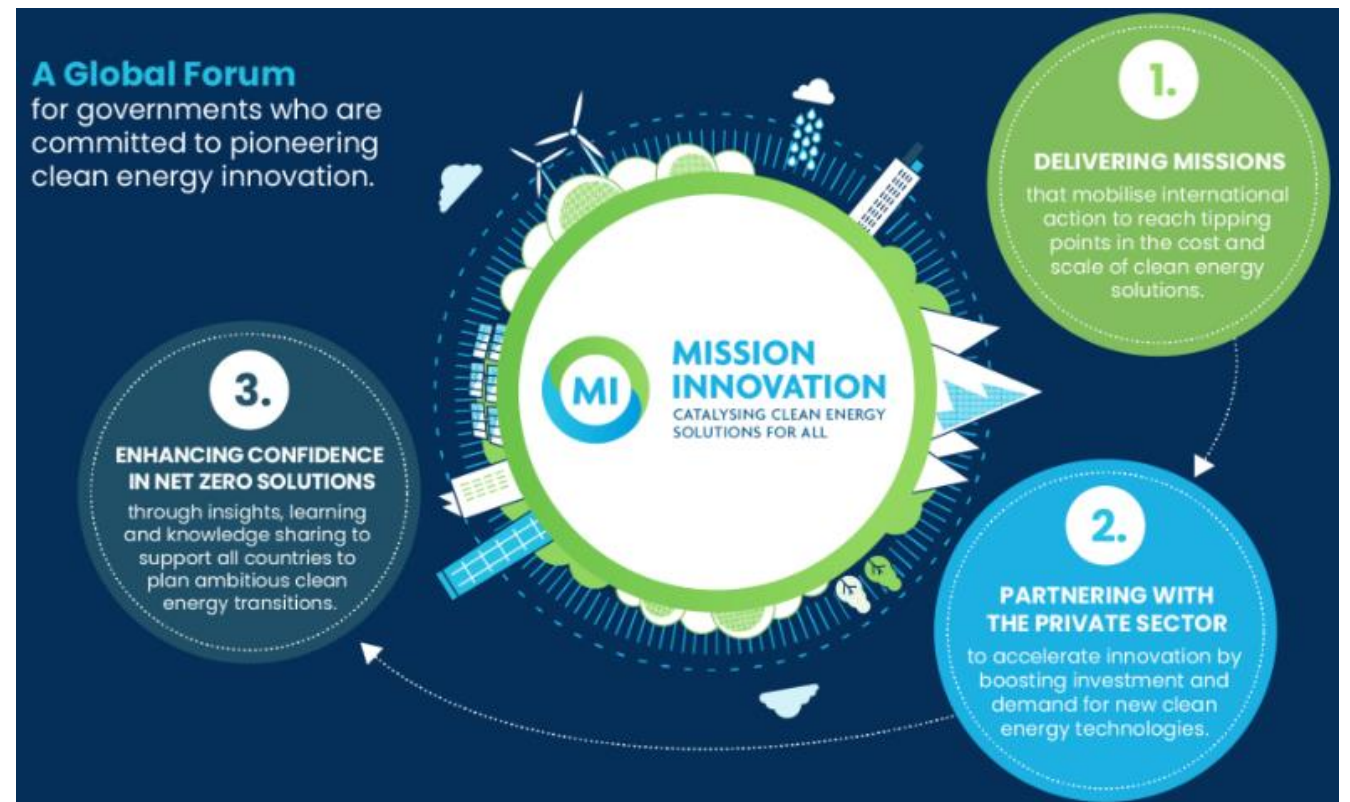


Table of content

1. Mission Innovation
2. Clean Hydrogen Mission
3. Members and partnerships
4. Three pillars
5. Selected outputs
6. Next steps, 2025-2026

1. Mission Innovation (MI)

- A **global initiative** to catalyse action and investment in R&D and demonstration for affordable, attractive **clean energy**, accessible to all
- **Goal:** to accelerate progress towards Paris Agreement goals & pathways to net zero
- 7 Missions: Zero-emission shipping, **Clean Hydrogen**, Green powered future, Carbon dioxide removal, Urban transitions, Net-zero industries, Integrated biorefineries



2. Clean Hydrogen Mission (CHM)

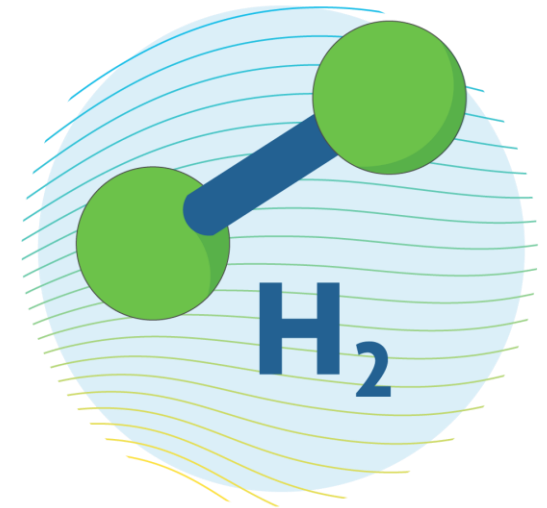
- Clean Hydrogen Mission launched in June 2021
- **Challenges:**
 - Clean hydrogen currently three times more expensive to produce than hydrogen produced from fossil fuels!
 - BUT: high potential to decarbonise hard to abate sectors, responsible for two thirds of global emissions.
- **Goal:** increase cost-competitiveness of clean hydrogen by reducing **end-to-end costs to \$2 USD per kg by 2030**



**CLEAN
HYDROGEN**
MISSION

3. Members and partnerships

- **Mission Director:** Dr. Piero Venturi, European Commission on behalf of the EU & **5 Co-leads:** Australia, Chile, European Union, UK, USA
- **Members (15):** Austria, Canada, China, Finland, Germany, India, Italy, Japan, Republic of Korea, Morocco, Norway, Netherlands, Saudi Arabia, Spain, United Arab Emirates
- **Partner organisations:**
 - Clean Energy Ministerial Hydrogen Initiative
 - International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE)
 - United Nations Framework Convention on Climate Change (UNFCCC)
 - World Bank Group, World Economic Forum, IEA Hydrogen's TCP



**CLEAN HYDROGEN
MISSION**

4. Three pillars

1. Stimulating **Research, Development and Innovation**
2. Integration of Production, Storage, Distribution and End-Use Applications in **Hydrogen Valleys**
3. Preparing the ground for the **Scale-Up** of the Hydrogen Economy



4.1 Stimulating **Research, Development and Innovation**

- **Scope:**

- Reducing hydrogen production costs
- Large-scale storage and compression technologies
- End-use technologies in different sectors
- Environmental aspects & enabling technologies (e.g. hydrogen detection technologies, new materials, recycling)

- **Activities:**

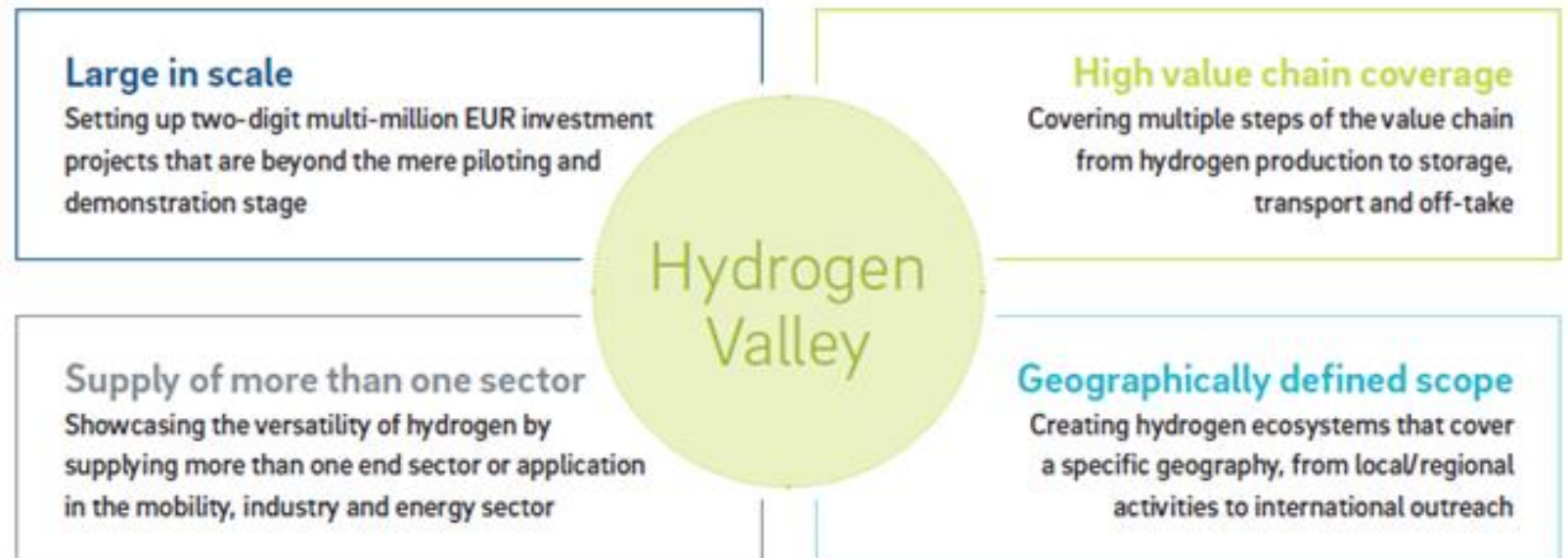
- Workshops on production, transport/distribution, storage, end uses
- Identify key R&I priorities for clean hydrogen at global scale



Research and Development

4.2 Integration of Production, Storage, Distribution and End-Use Applications in **Hydrogen Valleys**

- **Scope: Hydrogen Valleys** for demonstrating production, storage, distribution, and end-uses in a defined area bringing supply and demand together
- **Activities:**
 - Map Hydrogen Valleys/hubs regions & showcase best practices
 - Support deployment of Hydrogen Valleys in developing countries



4.3 Preparing the Ground for the **Scale-Up** of the Hydrogen Economy

- **Scope:** Stimulating an enabling environment :
 - Identify efforts to stimulate demand, and deploy emerging solutions
 - Facilitate creation & diffusion of non-technological knowledge
 - Generate positive engagement from local stakeholders in Hydrogen Valleys
- **Activities:**
 - Identify cross-cutting issues to be addressed to facilitate the implementation of Hydrogen Valleys
 - Collaborate with other initiatives to align efforts to accelerate the uptake of clean hydrogen



5. Selected outputs

1. Workings group on distribution and end-use and workshops
2. Survey on key research and innovation priorities for clean hydrogen
3. Mission Innovation Hydrogen Valley platform
4. Brochure on Hydrogen Valleys

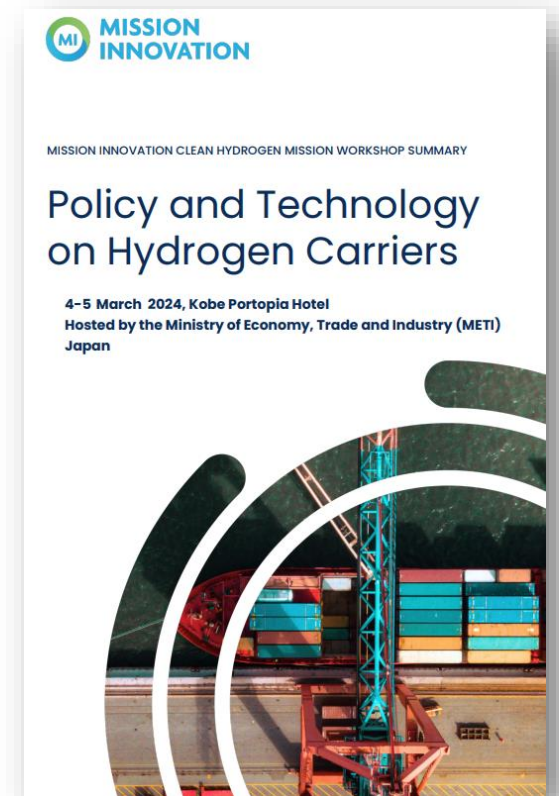


Research and Development



5.1 Working groups and workshops

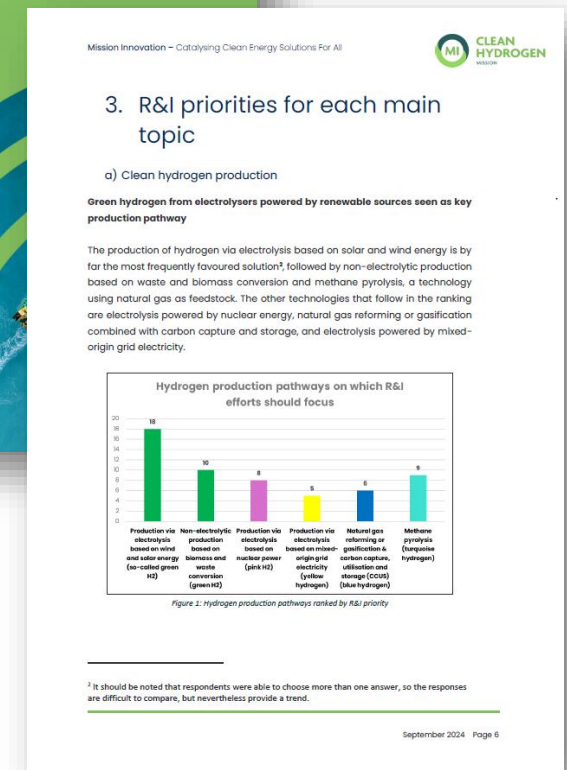
- **CHM Off-Road Safety Task Team** led by USA meets every month.
 - FC equipment for cargo handling in ports
 - Hydrogen for mining, construction and agriculture applications
 - Hydrogen onsite production and refuelling
- **CHM Storage & Distribution working group** led by Australia. –> hydrogen & blended hydrogen pipeline distribution
- Workshops organised by Japan on different topics:
 - Policy and Technology on Hydrogen Carriers, March 2024
 - Hydrogen Production Innovation, October 2024





5.2 Survey on key R&I priorities for clean hydrogen (1/2)

- **Survey in July 2024 to identify immediate and urgent research priorities related to clean hydrogen ([link](#)).**
Covered topics:
 - Clean hydrogen production
 - Transport, storage and supply
 - End-use
 - Hydrogen valleys & Cross-cutting issues
- Responses from 21 countries collected and analysed, paper issued in September 2024
- Align national hydrogen strategies and drive down the costs of hydrogen and FC technologies





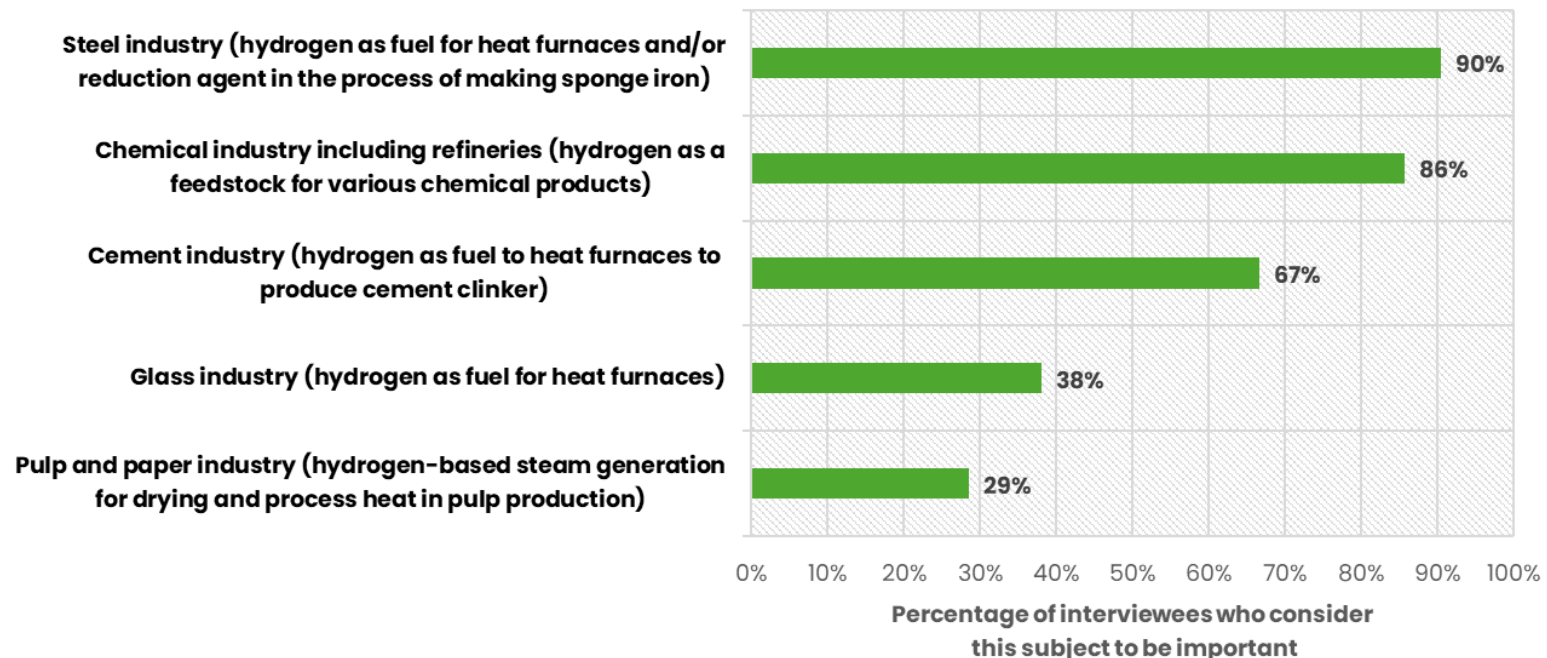
Research and Development



5.2 Survey on key R&I priorities for clean hydrogen (2/2)

- Electrolysers powered by renewable sources as key **production** pathway
- **Transport and supply:** pipelines (new and rehabilitated), and solutions for conversion of hydrogen to carriers
- Chemical and steel industries as major **industrial end-use applications**
- **Hydrogen Valleys:** skilled workforce, permitting & rapid deployment of renewable sources

Industrial end-use applications ranked by order of R&I priority





5.3 Mission Innovation Hydrogen Valley platform

- **A joint initiative of the Clean Hydrogen Joint Undertaking and Mission Innovation**, supported by Roland Berger & Inycom
- h2v.eu a website for collaboration, best practice sharing and visibility
 - World map of Hydrogen Valleys (98 valleys, 09.2024)
 - Individual Hydrogen Valley profiles
 - Data, analysis, visualization
 - Resources centre (links to other platforms, reports)

Clean Hydrogen Partnership MI MISSION INNOVATION

HYDROGEN VALLEYS ANALYSIS TOOLBOX MATCHMAKING JOIN ABOUT US

Mission Innovation Hydrogen Valley Platform

Showcasing hydrogen flagship projects around the world. A platform for project developers

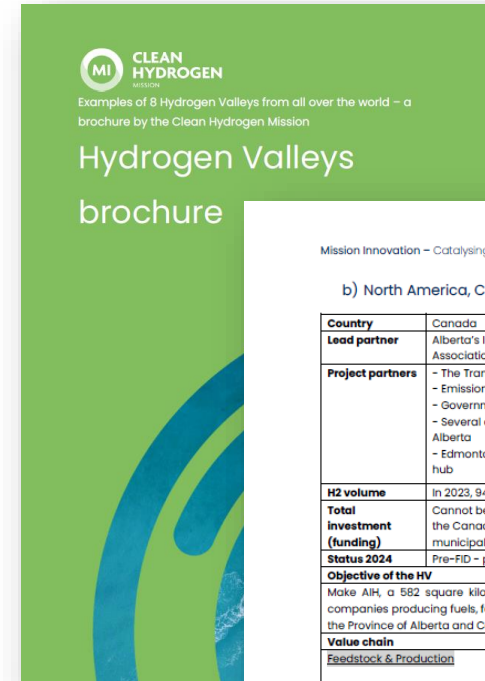
LEARN MORE Join The Hydrogen Valley Members Area Join The Hydrogen Valley Platform

98 Hydrogen Valleys 36 Countries 173,429 Total investment (M€)


5.4 Brochure on Hydrogen Valleys

- Published in September 2024
- Showcase Hydrogen Valleys from around the world, featuring the descriptions of 8 Valleys ([link](#)):

-  • North America, USA – Port of Los Angeles – Shore to Store demonstration project
-  • North America, Canada – Alberta Industrial Heartland (AIH)
-  • Latin America, Chile – Volta project: Green Ammonia and Hydrogen Plant (part of Antofagasta Hydrogen Valley)
-  • South Pacific, Australia – Central Queensland Hydrogen Hub (CQ-H2)
-  • East Asia, Japan – Fukushima Hydrogen Energy Research Field (FH2R)
-  • Middle East, Saudi Arabia – NEOM Green Hydrogen Company (NGHC)
-  • Europe, Spain – Basque Hydrogen Corridor (BH2C)
-  • Europe, United Kingdom – BIG HIT




Mission Innovation – Catalysing Clean Energy Solutions For All



b) North America, Canada – Alberta Industrial Heartland (AIH)

Country	Canada	
Lead partner	Alberta's Industrial Heartland Association	
Project partners	<ul style="list-style-type: none"> - The Transition Accelerator - Emissions Reduction Alberta - Government of Alberta - Several counties and cities in Alberta - Edmonton region hydrogen hub 	
H2 volume	In 2023, 940 t/day of hydrogen is produced in AIH	
Total investment (funding)	Cannot be estimated as not all projects have been confirmed (support from the Canadian federal government, Alberta's provincial government and municipal government)	
Status 2024	Pre-FID - projects not yet implemented	
Objective of the HV		
Make AIH, a 582 square kilometre industrial energy cluster, home to over 40 CAPEX-intensive companies producing fuels, fertilizers, power, petrochemicals a key hydrogen production cluster in the Province of Alberta and Canada		
Value chain		
Feedstock & Production	Transport, storage and distribution	End-use
SMR-based hydrogen production including CO2 sequestration and transformation into derivatives (ammonia, LOHC)	2 railroads connect AIH with main markets in North America and with Port of Prince Rupert for export to Asian markets	Potential regional hydrogen market (H2 as industrial feedstock, H2 as fuel for heavy-duty transport and as fuel for heat and power in the Edmonton region)
Main achievements		
AIH designated as <u>Designated Industrial Zone</u> ; it aims to make industry operating in AIH more competitive by addressing application backlogs, increasing efficiency and transparency, and supporting economic development ; <u>Supportive community</u> Launch of "Life in the Heartland" in 2009, a collaborative communications initiative working to increase resident awareness of industrial projects and development in Alberta's Industrial Heartland region ; <u>New partnerships and projects</u> MoU between Pembina Pipeline and Marubeni to develop a low-carbon hydrogen and ammonia facility to supply the Japanese market. Dow selected Linde as its industrial gas partner for the supply of clean hydrogen and nitrogen for its ethylene cracker & derivatives site		
Main lessons learnt / challenges to be addressed / next steps		
<u>Next steps/ challenges to be addressed</u> implementing projects and ensuring that partners' commitments are translated into concrete projects		
Main contact & useful links		
Website of Alberta's Industrial Heartland association, link David B. Layzell et al., "Building a transition pathway to a vibrant hydrogen economy in the Alberta Industrial Heartland" 2020, link		

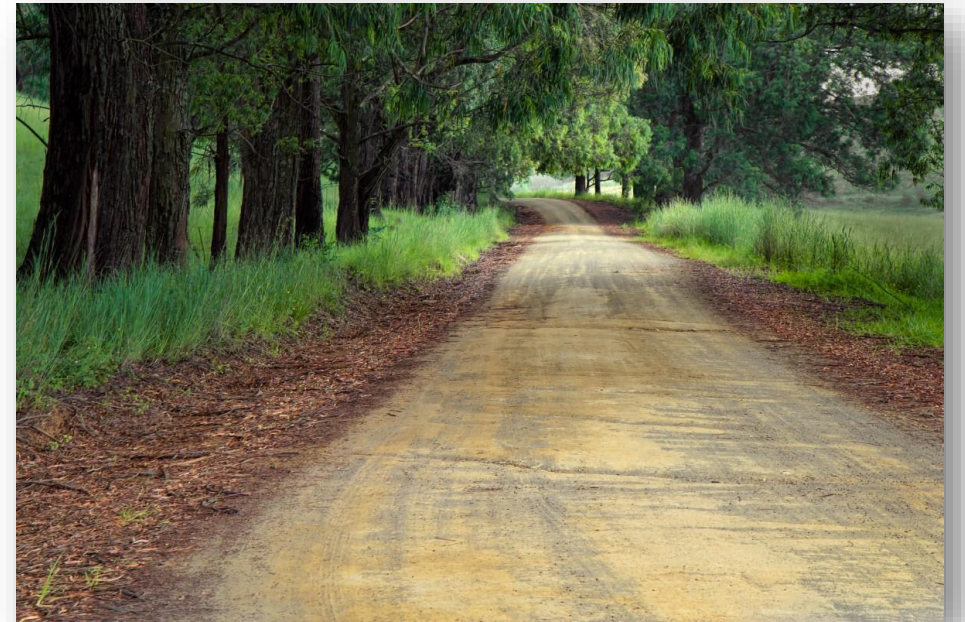


Source: St. Albert Gazette

September 2024 Page 7

6. Goal update and new action plan 25–26

- **CHM goal update** to better reflect the Mission's focus on the role of R&D in making hydrogen technologies more affordable
- **Focus of future action plan:**
 - Reinforce collaboration with international organisations and other Missions
 - More actions targeting students/professionals
 - Assistance for project development, specifically in developing countries



Upcoming webinars in 2024

- **Webinar series “Hydrogen in cities” with Urban Transitions Mission**
 - 4 virtual sessions (Oct.-Dec. 2024, organised by CHM & UTM): knowledge-exchange program focusing on clean hydrogen in cities, for building capacity and evaluating opportunities of hydrogen solutions in urban energy systems
- **Webinar on “Hydrogen in industries” with Net-Zero Industries Mission**
 - Use of clean hydrogen for decarbonising energy intensive and hard to abate industries (early Nov. 2024, organised by CHM & NIM)



More information will be posted soon on our LinkedIn channel!

Thank you for your attention!



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