6th WORLD HYDROGEN EXPO 2025

Conference

Program Book

Dec 4(Thu) – Dec 7(Sun), 2025
Kintex, S. Korea

Hydrogen Pioneers :
Innovate, Unite, and Accelerate

HYUNDAI MOTOR GROUP

Lead Sponsor
the official host of
the Hydrogen Council CEO Summit 2025

K-CONVENTION
In partnership with
Korea Tourism Organization

HTWO

HYUNDAI MOTOR GROUP

Hydrogen, Beyond Mobility, New Energy for Society

현대자동차그룹은 글로벌 에너지 전환을 선도하며 인류를 위한 지속 가능한 에너지를 제공합니다.

세계 최초로 수소전기차의 상용화를 실현한 현대차그룹은 수소에 대한 굳은 신념 아래
지난 30여 년간 기술 투자를 이어오며, 이동수단을 넘어 수소의 생산, 저장, 운송, 활용까지
전 과정을 포괄하는 종합적인 밸류체인을 구축해 나가고 있습니다.

현대차그룹은 그룹의 역량을 결집해 수소사업 브랜드이자 비즈니스 플랫폼인
'HTWO'를 선보였으며, 수소 밸류체인 전 과정을 아우르는 통합 솔루션을 제공합니다.
HTWO는 협업과 파트너십, 투자를 위한 오픈 플랫폼으로서 끊임없이 진화하고 성장하며
수소사회로의 가속화를 앞당기고 있습니다.

www.htwo.hyundai.com

HTWO

HYUNDAI MOTOR GROUP

Hydrogen, Beyond Mobility, New Energy for Society

Hyundai Motor Group is committed to leading the global energy transition, mobilizing sustainable energy for humanity.

As the world's first to commercialize hydrogen fuel cell vehicles, Hyundai Motor Group has continued investing in hydrogen technologies for almost three decades, built on a steadfast belief in hydrogen. Going beyond mobility, Hyundai Motor Group is building a comprehensive hydrogen value chain that encompasses production, storage, transportation, and utilization.

By integrating its capabilities, Hyundai Motor Group introduced HTWO, its hydrogen business brand and business platform, to deliver end-to-end solutions across the entire hydrogen value chain. HTWO serves as an open platform for collaboration, partnership, and investment, continuously evolving and growing to drive the acceleration of a sustainable hydrogen society.

www.htwo.hyundai.com

3M Advanced Materials for the Hydrogen Value Chain

SK이노베이션 E&S는 답을 찾습니다

가스가 나지 않는 나라라면
(세계 각지에서 직접 도입해 온다는 답)

매연도 소음도 없는 에너지가 필요하다면
(다양한 방식으로 전기를 만든다는 답)

AI시대, 필요한 에너지가 다 다르다면
(누구에게나 꼭 맞는 다양한 해법을 준비한다는 답)

세상이 에너지를 물을 때

이노베이션으로 답하다

SK 이노베이션 E&S

How to light up the world?

Ask HYOSUNG

세상에 힘이 되는 전력기술로 온 세상을 밝히고 있습니다.

효성은 전 세계를 무대로 다양한 에너지 분야에서 고품질의 제품과 서비스를 통해 고객 여러분을 만나고 있습니다. 변압기, 차단기 등 최고 품질의 전력설비와 HVDC, STATCOM, ESS 등 스마트 그리드 솔루션을 통해 전력 전송 기술의 첨단화를 이끌고 있습니다.
'Global No. 1'을 모토로 글로벌 환경과 미래까지 생각하는 효성은 끊임없는 도전과 혁신을 통해 글로벌 시장을 이끌어 나가고 있습니다.

HYOSUNG HEAVY INDUSTRIES

CONTENTS

Leadership & Market Insight

Keynote 19p

- Korea's Hydrogen Economy: Current Status and Policy Direction
- Clean Hydrogen Standardization Strategy and Recommendations

Leadership Insight 30p

- Germany's Hydrogen Economy: Current Status and Policy Direction (EU RED III implementation, national hydrogen strategy)
- Japan's Hydrogen Economy: Current Status and Policy Direction (national hydrogen strategy, industry initiatives)
- Canada's Hydrogen Economy: Current Status and Policy Direction (Hydrogen Strategy for Canada)
- Fueling the transition to a Net Zero future - New South Wales Government investment in clean energy

Market Insight 43p

- Helping Accelerate the Hydrogen Economy: Scaling Innovation Through Materials Science
- Hydrogen mobility activation: lessons learnt from Europe and Korea
- Latin America's Clean Hydrogen Ecosystem and Business Development Trends
- Northeast Asia's Clean Hydrogen Ecosystem and Business Development Trends

Timetable

Leadership & Market Insight

December 4 (THU), 13:30-16:05 **Venue : Hall 6C, KINTEX II**

Time		Program	Title / Speaker
Keynote			
13:30-13:40	10'	Speech	Korea's Hydrogen Economy: Current Status and Policy Direction **Deokyeol Park** (Director General, Ministry of Climate, Energy and Environment)
13:40-13:50	10'		Clean Hydrogen Standardization Strategy and Recommendations **Sunghwan Cho** (President, International Organization for Standardization (ISO))
Leadership Insight			
13:50-14:05	15'	Speech	Germany's Hydrogen Economy: Current Status and Policy Direction (EU RED III implementation, national hydrogen strategy) **Axel Bree** (Deputy Director General for Hydrogen Ramp-up and Energy Research, Federal Ministry for Economic Affairs and Energy
14:05-14:20	15'		Japan's Hydrogen Economy: Current Status and Policy Direction (national hydrogen strategy, industry initiatives) **Masahiro Tachibana** (Counsellor, Embassy of Japan In the Republic of Korea)
14:20-14:35	15'		Canada's Hydrogen Economy: Current Status and Policy Direction (Hydrogen Strategy for Canada) **Sunny Park** (Senior Economic Officer, Embassy of Canada to the Republic of Korea)
14:35-14:50	15'		Fueling the transition to a Net Zero future - New South Wales Government investment in clean energy **Penny Sharpe** (Minister for Energy, NSW Geovernment)
14:50-15:05	15'	**Break Time**	
Market Insight			
15:05-15:20	15'	Speech	Helping Accelerate the Hydrogen Economy: Scaling Innovation Through Materials Science **Mark Copman** (President – New Growth Ventures, 3M)
15:20-15:35	15'		Hydrogen mobility activation: lessons learnt from Europe and Korea **Erwin Penfornis** (Vice President, Air Liquide)
15:35-15:50	15'		Latin America's Clean Hydrogen Ecosystem and Business Development Trends **Juan Antonio Gutierrez** (Technical Advisor, H2PERU)
15:50-16:05	15'		Northeast Asia's Clean Hydrogen Ecosystem and Business Development Trends **Audrey MA** (Vice President, Refire)

WORLD HYDROGEN EXPO 2025 6th
Conference

Leadership & Market Insight

WORLD HYDROGEN EXPO 2025 6th Conference

Keynote

Keynote 1

Korea's Hydrogen Economy: Current Status and Policy Direction

Deokyeol Park
Director General, Ministry of Climate, Energy and Environment

Education

· B.A. in Economics, Korea University
· Current: Director General, Hydrogen and Heat Industry Policy Bureau, Ministry of Climate, Energy and Environment (MCEE)
· Former: Director, Petroleum Industry Division, Ministry of Trade, Industry and Energy (MOTIE)
· Former: Director, Gas Industry Division, Ministry of Trade, Industry and Energy (MOTIE)

WORLD HYDROGEN EXPO 2025 6th Conference

Keynote 2

Clean Hydrogen Standardization Strategy and Recommendations

Sunghwan Cho

President, International Organization for Standardization (ISO)

Education

· 1993 — Stanford University, Ph.D., Mechanical Engineering
· 1986 — Seoul National University, M.S., Mechanical Engineering
· 1984 — Seoul National University, B.S., Mechanical Engineering

Professional Career

· 2024 – Present — President, ISO
· 2020 – 2023 — President & CEO, Hyundai Mobis
· 2019 – 2020 — Executive Vice President, Head of R&D Division, Hyundai Mobis
· 2018 – 2019 — Executive Vice President, Head of R&D Division, Hyundai Motor Company
· 2017 – 2018 — CEO & Executive Vice President, Hyundai Autron
· 2015 – 2017 — Senior Vice President, Head of R&D Planning & Coordination, Hyundai Motor Company
· 2012 – 2015 — Senior Vice President, Head of Hyundai America Technical Center, Hyundai Motor Company
· 1994 – Senior Researcher, Hyundai Motor Company

Company Introduction

The International Organization for Standardization (ISO) is an independent, non-governmental global organization that brings together national standards bodies from 170 countries. ISO develops voluntary, consensus-based international standards created by experts from industry, government, academia, and civil society. These standards provide solutions to real-world challenges by supporting quality, safety, efficiency, and sustainability across sectors. Through globally recognized standards, ISO enables smoother international trade, strengthens consumer trust, and helps organizations innovate responsibly. By connecting global expertise and building common frameworks, ISO contributes to a safer, more reliable, and more resilient world.

WORLD HYDROGEN EXPO 2025 6th Conference

Leadership Insight

WORLD HYDROGEN EXPO 2025 6th Conference

Leadership Insight 2

Germany's Hydrogen Economy: Current Status and Policy Direction

(EU RED III implementation, national hydrogen strategy)

Axel Bree

Deputy Director General for Hydrogen Ramp-up and Energy Research, Federal Ministry for Economic Affairs and Energy

Education

1996-1997, Ph.D., Law, Georg-August-Universität, Göttingen, Germany
1998, Master of Laws - LLM, International Law, American University, Washington DC, United States
1987-1993, Law, State Exam, Universität zu Köln, Köln, Germany

Professional Career

After several years in a private law firm, Axel Bree joined the German Federal Ministry for Economic Affairs in 2002. Between 2005 and 2011, he worked in the Federal Chancellery, at the German Embassy in Washington DC (US) and for the World Future Council in London (UK). Since 2011, he held various positions at the Federal Ministry for Economic Affairs, among others being responsible for mining law, industry aspects of energy policy, the hydrogen ramp-up and energy research. Since October 2025, he is in charge of the Sub-Directorate for "International Energy Policy, Federal-State Coordination and Energy Efficiency"

Research Interest

Hydrogen: Global ramp-up, infrastructure, regulation, etc.
International Energy Policy
Energy Efficiency

Speech Summary

Germany's Hydrogen Economy: Current Status and Policy Direction (EU RED III implementation, national hydrogen strategy)
##The speech is currently under preparation. Summary and presentation will be forwarded as soon they are fully prepared.

Company Introduction

The Federal Ministry for Economic Affairs and Energy (BMWE) is a German ministry responsible for economic affairs and energy.

Federal Ministry for Economic Affairs and Energy

H_2 in Germany: Current Status and Policies

World Hydrogen Expo, 04 December 2025

Dr. Axel Bree, Deputy Director General

Marius Strotjohann, Energy Partnership Division

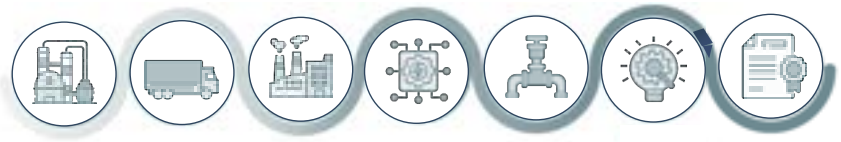
Germany's hydrogen strategy covers a number of sectors and fields of action

Hydrogen (H_2) production & imports
Total demand is currently re-evaluated

Industry
Funding within IPCEI projects and Carbon Contracts for Difference

Infrastructure & supply
European Hydrogen Backbone
Shipping

Certification & approval
Simplification and acceleration in H_2 generation, transport and infrastructure



Transport Sector
H_2 applications stimulated in heavy vehicles
E-fuels as an alternative with focus on maritime and aviation

Electricity
Grid-bound H_2 for energy storage and transport

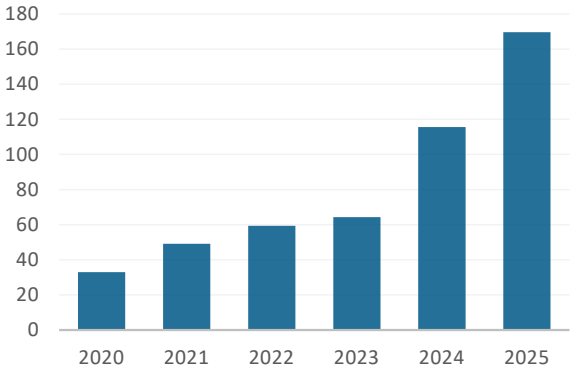
Research, education and innovation
Promotion of R&D and training of specialists
Technology and innovation roadmap

Source: Guidehouse, September 2023 based on BMWK 2023; Icons from flaticon.com

Federal Ministry for Economic Affairs and Energy

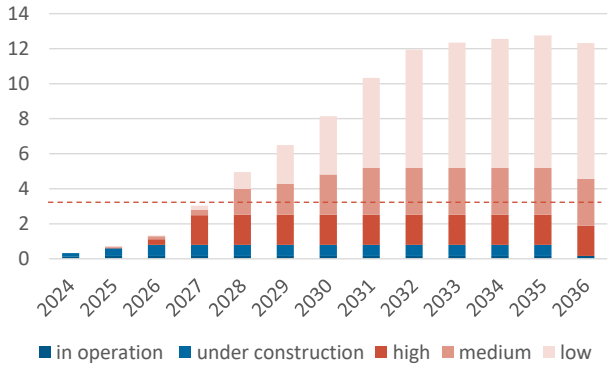
The H2 ramp-up is taking up pace, but many projects fail due to high costs and missing offtake

Electrolysis capacity in MW



Capacity of electrolysis projects in GW

Project status and **probability of realisation**



Source: dena, 25.11.2025

Federal Ministry for Economic Affairs and Energy

The new German government is committed to a pragmatic and flexible H2 ramp-up

Measures derived from the German Energy Transition monitoring

- Flexible and technology-neutral ramp-up
- Concentrate on markets with **high willingness to pay**
- **Production** will be scaled up with clear demand signals
- **Infrastructure** will be developed step by step in close coordination with the demand side
- **More flexible rules** and definition can bring down production costs significantly

Source: BMWE, 25.11.2025

Federal Ministry for Economic Affairs and Energy

The hydrogen core network is the backbone of Germany's H_2 infrastructure

- **Objective of the core network:** To connect key hydrogen locations across Germany (production, storage, import, demand centers).
- According to the approval by BNetzA, **9,040 km of hydrogen pipelines** are planned to go operational between 2025 and 2032, **~60% repurposing** of existing natural gas pipelines, total CAPEX 18.9 bn EUR.
- **Planned capacity for the target year 2032:** entry capacity of approx. 101 GW_{th}, exit capacity approx. 87 GW_{th}.
- **Amortization account** established as financing tool (Inter-Temporal Cost Allocation Mechanism). In July 2025, BNetzA set a **ramp-up fee of 25 EUR/kWh/h/a** for the hydrogen core network.

Source: FNB Gas e.V.

Instruments of the EU / GER to support the H2 ramp-up

- **IPCEI:** Support for projects along the European value chain.
- **European Hydrogen Bank (EHB)**: Financing hydrogen production in the EU through an auction-based mechanism
- **H2Global:** Double-sided auction mechanism matching global supply with EU demand
- **Carbon Contracts for Difference (CCfDs):** Supporting industrial companies in investing in CO_2-neutral production facilities in Germany.
- **Lead markets:** Strengthening demand for climate-friendly basic materials such as steel through public procurement and potentially quotas

Source: BMWE, 25.11.2025

Federal Ministry for Economic Affairs and Energy

Lead markets strengthen demand for climate-friendly materials such as cement and steel

Why?

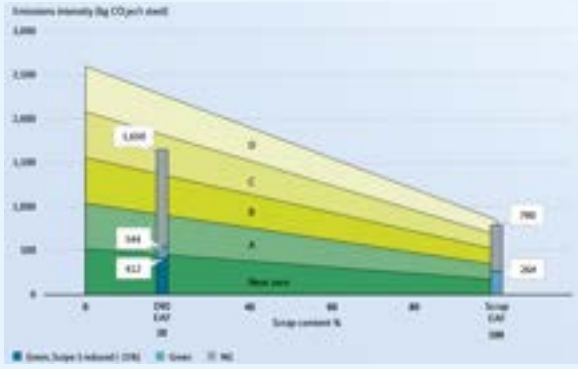
- To incentive investments additionally and increase planning security
- To reduce the need for state funding in the long run and strengthen the effect of carbon pricing
- To support the competitiveness of the new products until they are the "standard" in 2045/ 2050

How?

- Information and labelling requirements regarding the CO2 emissions
- Sustainable public procurement
- Environmental requirements in terms of CO2 emission intensity for the materials put on the market (producers and importers)
- Pricing of scope 3 emission, e.g. from the extraction of raw materials or/and fuels

Climate-friendly steel as example

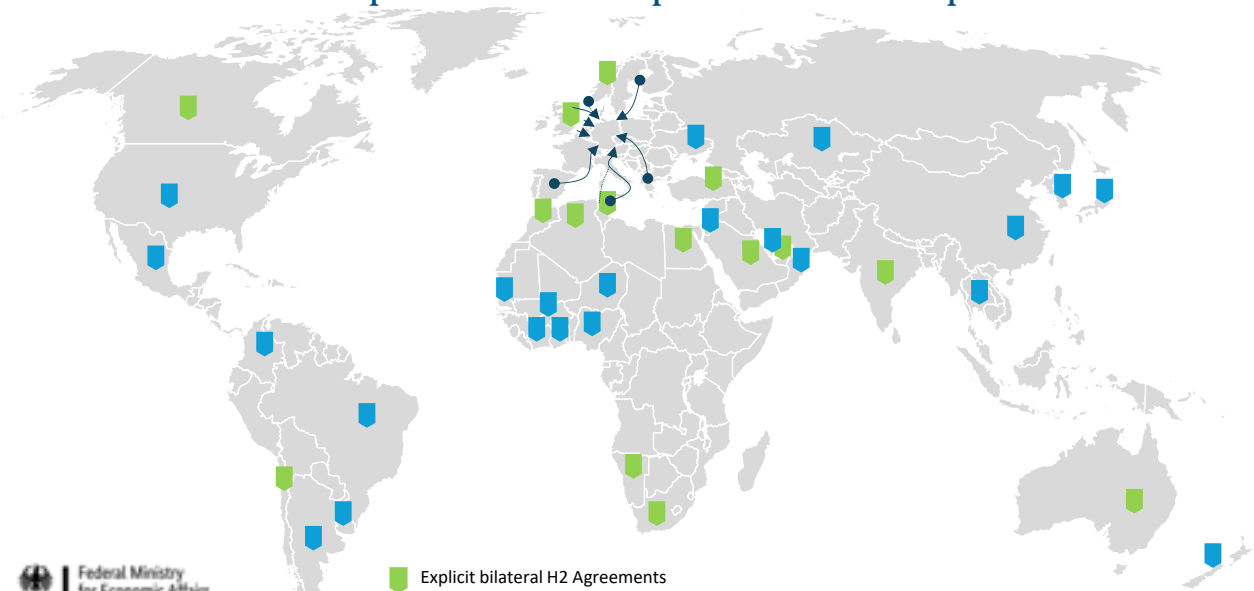
Threshold values for climate-friendly high-grade steel and classification of selected reference plants



Source: Guidehouse, Fraunhofer ISI, Wuppertal Institut (2024)

Federal Ministry for Economic Affairs and Energy

Bilateral H2-Cooperation and Pipeline-based import corridors



Federal Ministry for Economic Affairs and Energy

Explicit bilateral H2 Agreements

Other types of H2-Cooperation (e.g. electrolysis projects, joint research projects, exchange on H2 strategies)

Federal Ministry for Economic Affairs and Energy

Thank you for your attention!

Contact details
Bundesministerium für Wirtschaft und Energie
Scharnhorststr. 34-37
10115 Berlin

Dr. Axel Bree,
Deputy Director General
www.bundeswirtschaftsministerium.de

The import strategy is an integral part of Germany's H2 market development

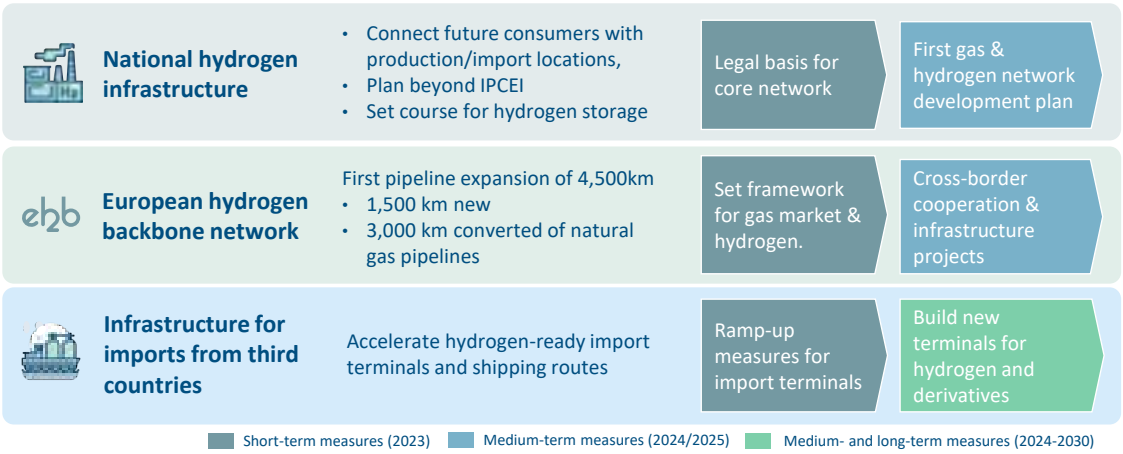
Goals:

- Ensuring a **reliable supply** of hydrogen and ist derivatives.
- **Informing market participants and partners** about objectives and framework conditions for H2 imports to Germany.
- **Increasing investment security** for H2 production import infrastructure

Measures:

- Strengthening **reliable demand** in Germany, complemented by supply-side support
- **Accelerating infrastructure development** in Germany and the EU
- Establishing of **harmonised certification and product requirements**
- **Deepening EU and international cooperation** on hydrogen
- Supporting the international market ramp-up through targeted R&D policy

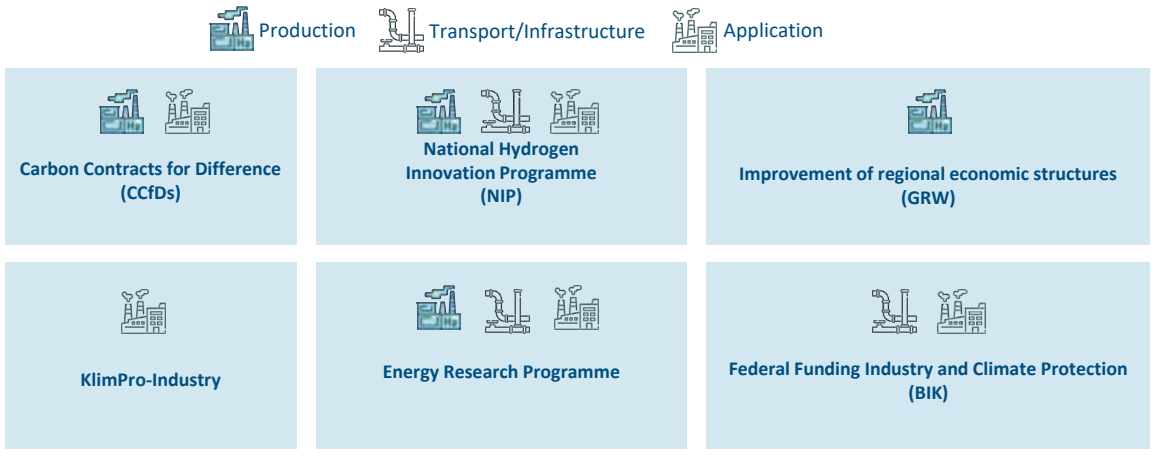
Roadmap to Germany's hydrogen core network



Source: Guidehouse based on BMWK 2023; Graphic: flaticon.com

Federal Ministry for Economic Affairs and Energy | Slide Deck: Energy Transition | 10.10.2025 | Slide 11

Germany supports the H_2-ramp-up as a funder, insurer, and an enabler for innovation



Source: GIZ based on Federal Government 2025 & BMWK 2024; Graphic: flaticon.com

Germany and EU's targeted funding instruments to support green hydrogen projects worldwide

Germany's H_2 funding schemes

- PtX Development Fund
- H2Global
- H2Uppp
- National Funding Guideline

EU's H_2 funding schemes

- European Hydrogen Bank
- Connecting Europe Facility Programme
- Clean Hydrogen Partnership
- IPCEI Hydrogen

Source: GIZ based on BMWE 2025 & European Commission 2025

Leadership Insight

Japan's Hydrogen Economy: Current Status and Policy Direction
(national hydrogen strategy, industry initiatives)

Masahiro Tachibana
Counsellor, Embassy of Japan In the Republic of Korea

Mr Masahiro Tachibana has been Counsellor at Embassy of Japan in ROK since July 2024. Being seconded from Japan's Ministry of Economy, Trade and Industry (METI), he also has been serving as a commercial attache at the Embassy. The scope of his responsibility at the Embassy is essentially encompassed by that of METI, covering a range of topics such as trade, investment, energy, minerals, economic security, SME, start-up and so on.

Mr Tachibana has served as a government official for over 20 years with a wide range of mandates and responsibilities at METI. During his carrier to date, he also served at the government-related organization and the international organization.

Recently, Mr Tachibana assumed Director of International Investment Control Office where he led several significant works in the area of FDI screening, leading both screening individual cases and inter-governmental discussions towards updating the screening policy and mechanism. He also served as a team leader in charge of different areas within METI, including trade negotiators for market access of goods, negotiations and designs of rules of origin applicable to FTAs, bilateral trade relationship with Canada and Mexico, and international cooperation in the power sector before taking over the current position. He also worked for the International Atomic Energy Agency (IAEA) for 3 years as Public Communication Specialist until July 2020 where he led several important projects with tangible outcomes.

WORLD HYDROGEN EXPO 2025 6th Conference

Leadership Insight 4

Canada's Hydrogen Economy: Current Status and Policy Direction
(Hydrogen Strategy for Canada)

Sunny Park
Senior Economic Officer,
Embassy of Canada to the Republic of Korea

Education
1997 – 2001, Korea University, B.A. in Mass Communication and Journalism

Professional Career
Currently serving as a Senior Economic Officer at the Embassy of Canada in Seoul, representing Natural Resources Canada, her focus is on policy monitoring and investment promotion within the dynamic Korean energy and natural resources sectors. This current role builds upon nearly a decade of impactful public service, which included her tenure as a Commercial Specialist for the U.S. Department of Commerce at the U.S. Embassy in Seoul, where she specialized in commercial diplomacy, trade advocacy, and market access for U.S. firms in the Energy, Aerospace, and Defense industries. This extensive track record is grounded in over ten years of diverse professional experience across major multinational companies, including Bloom Energy , DNV , British American Tobacco , Unilever Korea , and AC Nielsen Korea , where she developed expertise in strategy, marketing, and external affairs.

Speech Summary
Canada is positioning itself as a clean energy and mineral security supplier for the Indo-Pacific region. The Hydrogen Strategy for Canada is driving significant growth in low-carbon hydrogen projects. Western Canada offers advantages like cost-friendly feedstock, high ESG standards, and shorter shipping times to Asia. Canada is supporting this through investment tax credits and financing (Canada Growth Fund, EDC, CIB) to establish international hydrogen corridors.

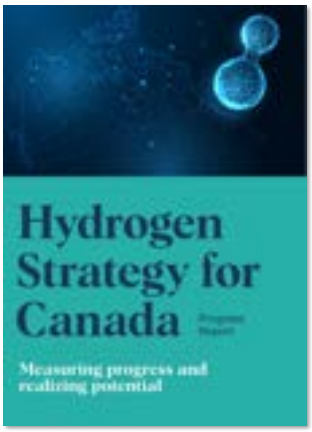
Company Introduction
The Embassy of Canada fosters Canada-Korea relations. Natural Resources Canada (NRCan) promotes the sustainable development of Canada's natural resources, energy, and minerals.


Canada's Hydrogen Opportunity
World Hydrogen Expo 2025
Natural Resources Canada
Ressources naturelles Canada
Canada


UNCLASSIFIED | NON CLASSIFIÉ
2
Geopolitical Context
Current geopolitical context places energy and mineral security as a top priority for government and business leaders.
Need to secure reliable supplies of energy and minerals
Need to pursue action to meet net zero goals
Canada is positioning itself to support the Indo-Pacific region in its transition to a low-carbon footprint using clean energy.
Geopolitical Context
Energy & Mineral Security
Climate Change
Natural Resources Canada
Ressources naturelles Canada
Canada

UNCLASSIFIED | NON CLASSIFIÉ
3

Hydrogen Strategy Progress Report

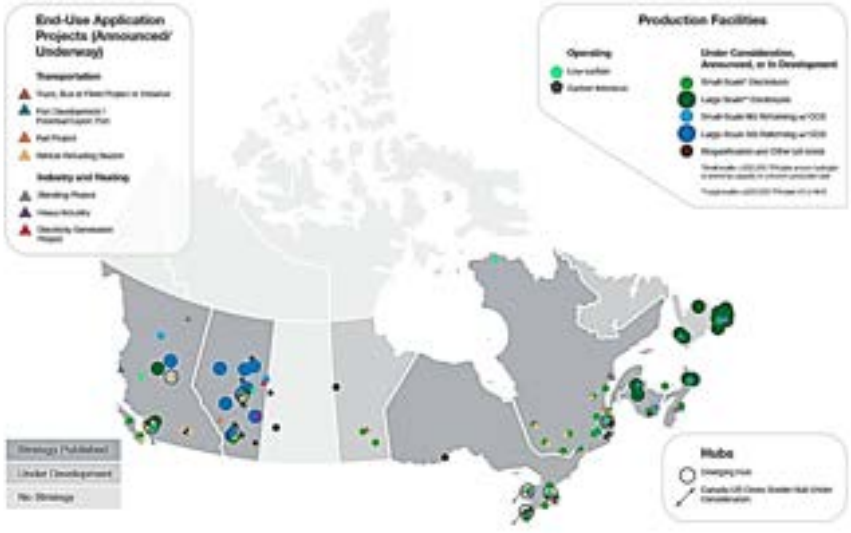


- Canada's first Progress Report on the *Hydrogen Strategy for Canada (December 2020)*
- Highlights major project and policy developments
- Describes key market developments across the hydrogen value chain
- Forecasts hydrogen's role in Canada's net-zero objectives by 2050
- Provides a roadmap of next steps

Natural Resources Canada | Ressources naturelles Canada
Canada

UNCLASSIFIED | NON CLASSIFIÉ
4

Significant growth across Canada's value chain



Natural Resources Canada | Ressources naturelles Canada
Canada

UNCLASSIFIED | NON CLASSIFIÉ

Western Canadian Hydrogen Value Proposition

Western Canada offers advantages as a supplier of world-leading hydrogen and fuel cell sector expertise

- Cost friendly natural gas/electricity feedstock
- High ESG standards and regulatory credibility
- Robust federal and provincial support for hydrogen industry
- Shorter shipping times to Asian markets than US/Qatar
- A full value proposition beyond production, including technology, services, R&D, and IP
- Established fuel cell leadership, testing capacity, and a skilled workforce with decades of sector experience

Low-carbon hydrogen export production from Alberta

- There are currently 2 active low-carbon ammonia projects in Alberta representing over C$8B of potential investment; however, there is currently no clear path forward to transport production from inland to the coast

Natural Resources Canada | Ressources naturelles Canada
Canada

UNCLASSIFIED | NON CLASSIFIÉ
6

Canada is Supporting Competitiveness

- ✓ Clean Hydrogen and Clean Technology Investment Tax Credits (ITCs) – Budget 2025 expands availability of CH ITC to include methane pyrolysis
- ✓ Canada Growth Fund – potential equity financing and investments to support domestic end-use development
- ✓ Export Development Canada – able to provided credit and debt financing for export projects to help de-risk their development
- ✓ Canada Infrastructure Bank – potential debt financing and may provide support for FEEDs (Project Acceleration), expanded under Budget 2025
- ✓ Alignment of production and demand incentives to establish international hydrogen corridors

Natural Resources Canada | Ressources naturelles Canada
Canada

UNCLASSIFIED | NON CLASSIFIÉ 7

Recent Initiatives between Canada and South Korea

British Columbia and Alberta are advancing heavy-duty transportation solutions, collaborating with Hyundai for deploying its XCIENT fuel cell trucks with HTEC, Innovate B.C., and Edmonton Global

In 2024, Ulsan Free Economic Zone Authority signed two MOUs in Alberta, with Alberta's Industrial Heartland Association and Edmonton Global for collaboration on hydrogen.

In 2025, Trigon Pacific Terminals at the Port of Prince Rupert, BC, and Ulsan Free Economic Zone Authority signed an MoU to expand collaboration on hydrogen-as-ammonia exports from Canada to South Korea.

Natural Resources Canada | Ressources naturelles Canada

Canada

UNCLASSIFIED | NON CLASSIFIÉ 8

Thank you!

감사합니다

Natural Resources Canada | Ressources naturelles Canada

Canada

Leadership Insight

Fueling the transition to a Net Zero future - New South Wales Government investment in clean energy

Penny Sharpe
Minister for Energy, NSW Geovernment

Professional Career

Penny Sharpe is the Leader of the Government in the Legislative Council, Minister for Climate Change, Minister for Energy, Minister for the Environment and Minister for Heritage. First elected to NSW Legislative Council in 2005, Penny has held a variety of Government and Opposition portfolios including Heritage, Transport and Planning, Family and Community Services, as well as Disability Inclusion. Penny is passionate about the care of our environment and making sure that NSW takes serious action to tackle climate change.

Speech Summary

The NSW Government is leading the charge to net zero and building a reliable energy system. Leveraging partnerships and expertise our strategies are designed to drive investment in projects that deliver reliable power, cut emissions, create jobs, and unlock global export opportunities - positioning NSW as a clean energy leader.

Company Introduction

NSW has the largest economy of any Australian state and makes up about a third of Australia's total economy. NSW has a globally connected and investment-ready economy, well positioned to seize new opportunities in a rapidly changing world. As industries transform and global markets shift, NSW must diversify its economy through trade partnerships and by attracting strategic investment especially for the energy transition.
Source: https://www.nsw.gov.au/departments-and-agencies/investment-nsw/resources/nsw-trade-and-investment-strategy

Department of Climate Change, Energy, Environment and Water (DCCEEW)

Clean Energy in NSW

Penny Sharpe MLC
Minister for Climate Change, Minister for Energy
Minister for the Environment, Minister for Heritage

World Hydrogen Expo

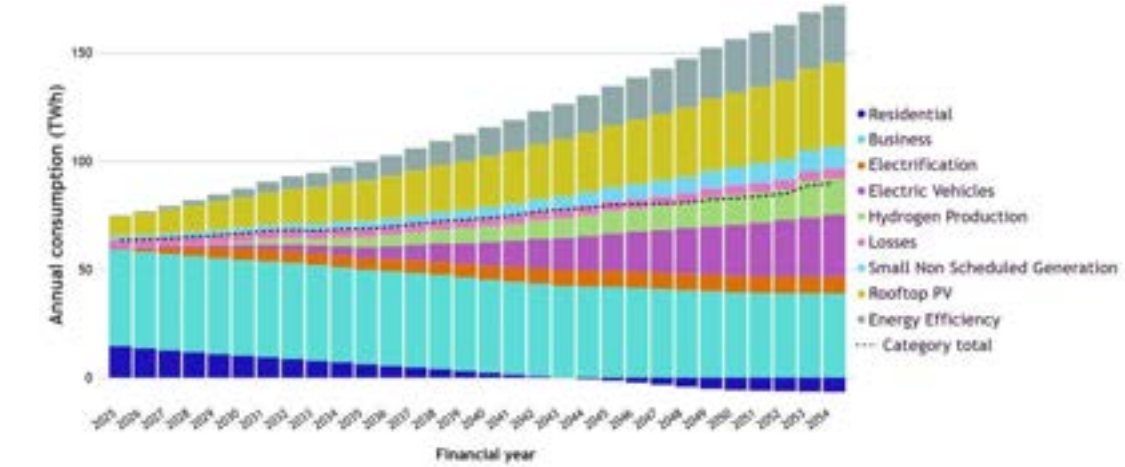
December 2025

NSW GOVERNMENT

OFFICIAL

NSW energy demand forecast

Ready to support green hydrogen production



Source: Australian Energy Market Operator (AEMO) 2024 Electricity Statement of Opportunities

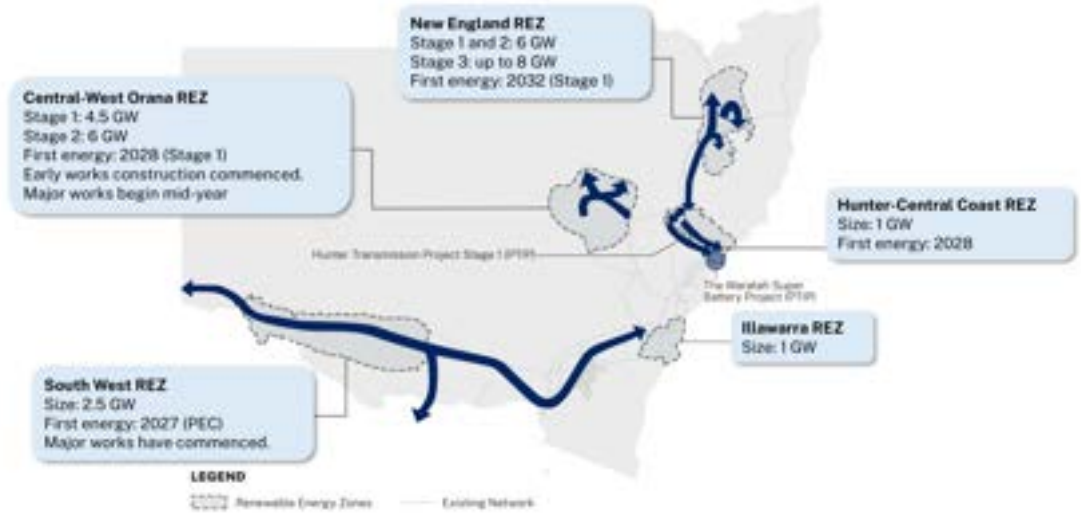
OFFICIAL

OFFICIAL

Renewable electricity in NSW

Leading Australia's first declared Renewable Energy Zones

NSW GOVERNMENT



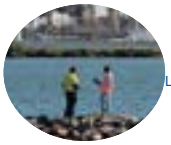
OFFICIAL

OFFICIAL

Hydrogen in NSW

Combining natural strengths with world-leading policy

NSW GOVERNMENT



PEOPLE

Largest economy & skilled workforce

INFRASTRUCTURE

Extensive road, rail, port and grid infrastructure

ENERGY

World-leading renewable energy development

NSW-UNIQUE INCENTIVES

Totalling up to $4 per kilo

ENERGY DISCOUNTS

Up to 90% discounts on network charges

SPURRING DEMAND

Australia's first legislated hydrogen target

OFFICIAL

OFFICIAL

5

WORLD HYDROGEN EXPO 2025 6th Conference

Market Insight

WORLD HYDROGEN EXPO 2025 6th Conference

Market Insight 1

Helping Accelerate the Hydrogen Economy: Scaling Innovation Through Materials Science

Mark Copman
President – New Growth Ventures, 3M

Education
Mark holds B.S. degrees in Mechanical Engineering and Political Science from MIT and an M.B.A. from Harvard University.

Professional Career
Mark Copman leads the New Growth Ventures (NGV) organization at 3M. NGV is responsible for internal and external venture investments. Mark joined 3M in 2003 and has held various senior leadership roles throughout the company. Prior to 3M, Mark served in the US Navy and was an investment banker. Outside of 3M, Mark is on the board of directors for Twin Cities Habitat for Humanity and the Minnesota Orchestra.

Research Interests
Advanced materials (technical ceramics, glass bubbles, thermal insulation, catalysts, stable isotopes, polymers, coating, adhesives, etc.) for a variety of energy and automotive applications. Segments of interest within energy include, upstream exploration & production, midstream pipelines, downstream chemicals, carbon capture, geothermal, hydrogen, nuclear, and renewables (wind, battery storage, direct lithium extraction)

Speech Summary
The global H2 market is evolving from an existing 150+ billion$ fossil-based industry to a lower carbon future. However, significant cost reductions in low carbon alternatives are needed to accelerate this transition. In this talk, we will highlight how 3M is leveraging its 49 technology platforms and materials science expertise to develop innovative products that address critical pain points across the production, storage & transportation, as well as end use of low carbon H2. We will also highlight how we are working across the value chain with OEMs, government agencies, etc. to advance the different building blocks needed for a hydrogen economy

Company Introduction
3M is a diversified global technology company with a core expertise in materials science, delivering innovative products for almost any industry you can imagine e.g., auto, consumer, electronics, energy, etc.

"More with less" driving overall energy investments today

Need for more energy and energy derivatives... → ... with less CO_2e and waste

Electricity	Oil & Gas	Petrochemicals	Decarbonization	Waste mgmt.
Demand to nearly double by 2050[1]	Demand stays strong through 2050[1, 2]	Demand to nearly double by 2050[3]	CO_2e to peak by 2030; <2 °C requires action	Bringing MSW[4] under control requires action
~$2.5 T/y Investment thru 2035	**~$0.7 T/y** Investment thru 2035	**~$0.3 T/y** Investment thru 2035	**~$2.5 T/y** Investment thru 2035	**~$0.1 T/y** Investment thru 2035[5]

1. Based on the conservative IEA Stated Policies (STEPS) Scenario 2. Maintaining current levels of O&G production will require continuous capital investments to explore and develop new reserves 3. Includes ethylene, propylene, methanol, ammonia, benzene, toluene, and xylene 4. MSW refers to municipal solid waste 5. Represents capex investments for new recycling, landfill, waste to energy, collection, and dumping facilities
Source: IEA World Energy Investment 2025; Cefic Chemdata International; UNEP

3M
2

Where hydrogen matters the most

Chemical Production
(e.g., Ammonia, Methanol)

Refining

Iron & Steel Production

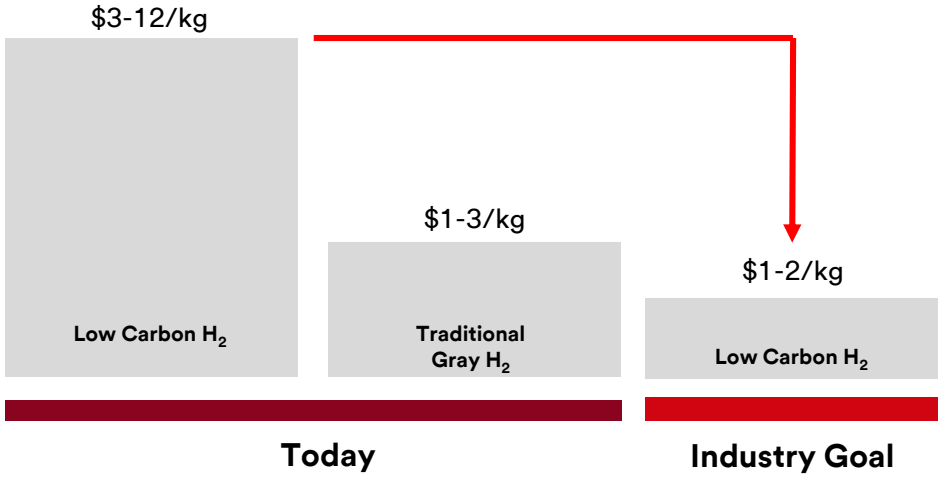
Heavy-Duty Transport
(e.g., Bus, Truck, Train)

~23%
of global carbon emissions represented by these sectors

Source: IEA

3M

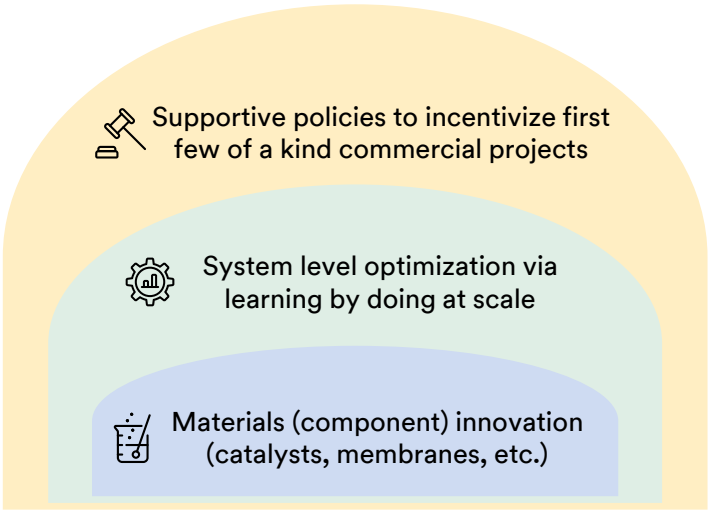
However, cost-out is essential to scale low-carbon hydrogen



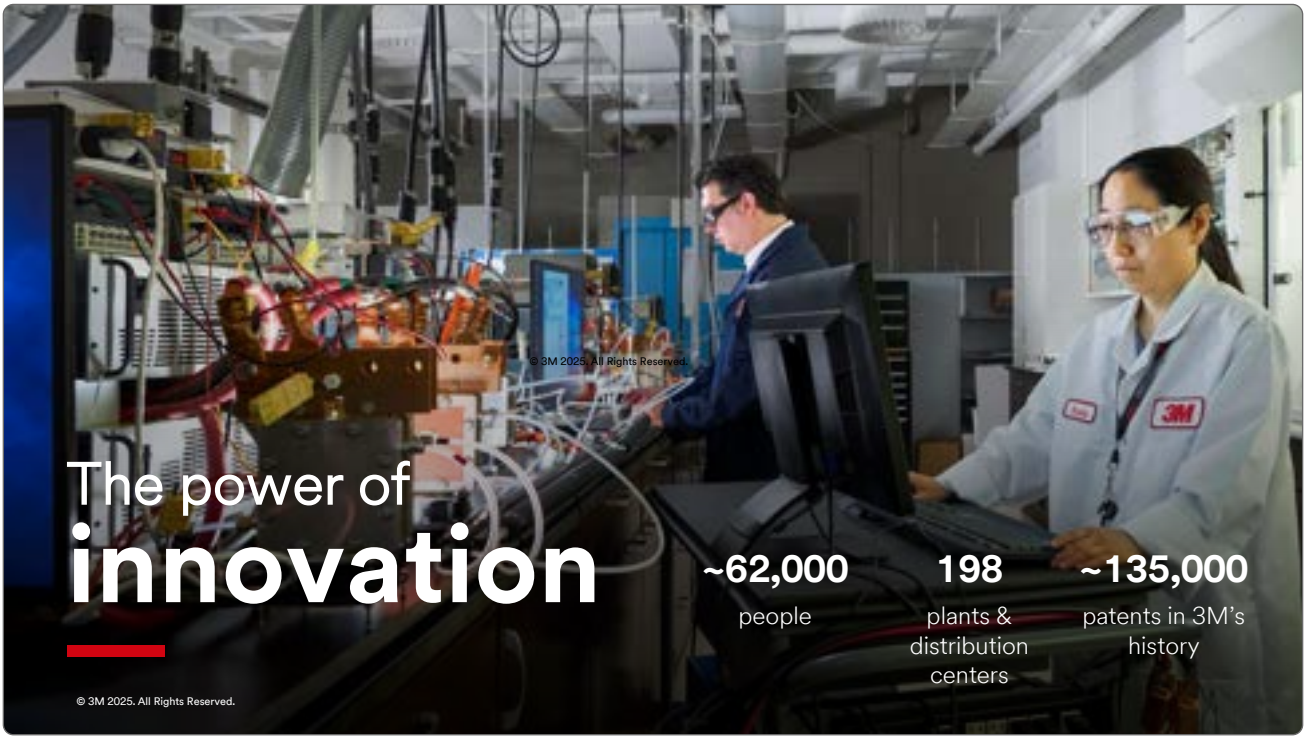
Source: BNEF, S&P, US Dept. of Energy

3M

The future of hydrogen will be built together



At 3M, we believe that materials science can help customers unlock the scalability, reliability, affordability, and resilience the hydrogen economy needs to thrive



Working to advance a thriving energy system

As energy demand evolves, 3M is uniquely positioned to deliver a portfolio of solutions that **help customers improve safety and reliability, drive productivity, reduce costs, increase efficiencies, and deliver stability to the energy infrastructure.**

Generation

- Hydrogen production & storage
- Nuclear generation
- Solar & wind generation
- Geothermal
- Oil & Gas production (incl. carbon capture to mitigate emissions)

Transmission

- Hydrogen transport
- Conduction efficiency

Distribution

- Smart grid sensing
- Resilient cable accessories
- Grid stability for RE transition

Consumption

- Data centers
- Electronics & appliance
- Built environment – commercial & homes
- Agriculture
- EVs

3M

Engineered solutions that span the value chain

	Generation (upstream)		Storage and transportation (midstream)		
Topic	**Electrolyzers**	**Nat gas reformers, SOEC/SOFCs**	**Pumps and compressors**	**Liquid H_2 supply chain**	**Compressed H_2 (Type IV) tanks**
Materials science challenge	 Iridium scarcity and durability; Adhesives and sealant durability	 Durable materials that withstand >850 °C and harsh environments	 Materials to handle scavenging, leakage, high stress, etc.	 Durable insulation materials that help minimize boiloff losses	 Materials to light-weight and reduce thickness of tanks
Potential 3M solution	**3M™ Nano-structured Iridium Catalyst Powder*, 3M™ Adhesives & Sealants**	**3M™ Nextel™ Fibers and Fabrics**	**3M™ Silicon Carbide Gas Seal Rings, 3M™ Silicon Carbide Mechanical Seal Rings, 3M™ Silicon Carbide Sliding Bearings**	**3M™ Glass Bubbles**	**3M™ Matrix Resins***

3M

**Developmental product. Available for sampling under CDAs*

WORLD HYDROGEN EXPO 2025 6th Conference

Market Insight 2

Hydrogen mobility activation: lessons learnt from Europe and Korea

Erwin Penfornis
Vice President, Air Liquide

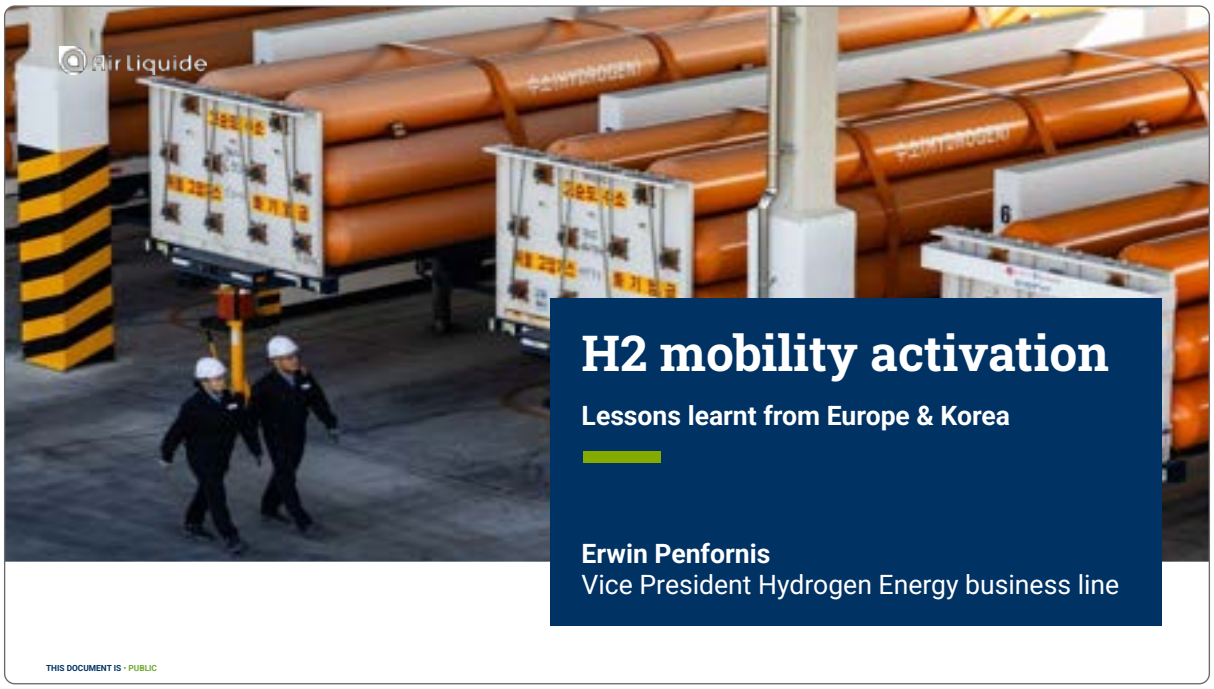
Education
1997-2000 Ecole Centrale - Engineering Master Degree

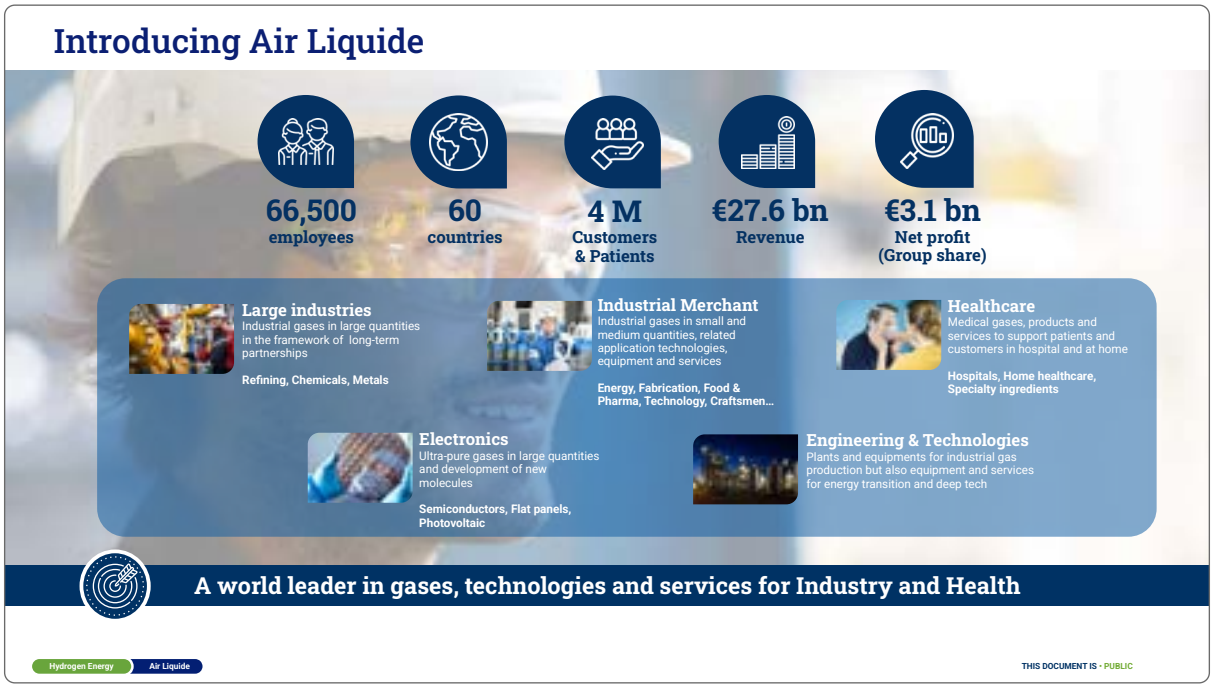
Professional Career
2021-Present Vice President, Hydrogen Energy World Business Line, Air Liquide
2019-2021 Vice President, Hydrogen Energy, Asia Pacific, Air Liquide
2018-2019 Vice President Hydrogen Energy world business unit, Air Liquide
2015-2018 Vice President Hydrogen Energy Market, Air Liquide
2013-2015 Business Development Director, Air Liquide
2010-2013 Business Development Manager, Air Liquide
2009-2010 Operations Control Manager, Air Liquide
2006-2009 Project Development Manager, Air Liquide
2000-2006 R&D Project Manager, Air Liquide

Research Interest
Development of hydrogen mobility
Hydrogen technologies
Standards
Required policie

Speech Summary
While Europe has established world-leading regulatory frameworks like AFIR, the race is now on to convert policy into steel and wheels. This session explores how Europe is moving from ambition to market activation, focusing on synchronizing infrastructure with vehicle rollout. Drawing parallels with Korea's dynamic ecosystem, we discuss how government-industry pragmatism can bridge the TCO gap and accelerate the heavy-duty transport transition.

Company Introduction
Air Liquide is a world leader in gases, technologies and services for industry and healthcare. Present in 60 countries with approximately 66,500 employees, the Group serves more than 4 million customers and patients.


Air Liquide
H2 mobility activation
Lessons learnt from Europe & Korea
Erwin Penfornis
Vice President Hydrogen Energy business line
THIS DOCUMENT IS • PUBLIC


Introducing Air Liquide
66,500 employees
60 countries
4 M Customers & Patients
€27.6 bn Revenue
€3.1 bn Net profit (Group share)
Large industries
Industrial gases in large quantities in the framework of long-term partnerships
Refining, Chemicals, Metals
Industrial Merchant
Industrial gases in small and medium quantities, related application technologies, equipment and services
Energy, Fabrication, Food & Pharma, Technology, Craftsmen...
Healthcare
Medical gases, products and services to support patients and customers in hospital and at home
Hospitals, Home healthcare, Specialty ingredients
Electronics
Ultra-pure gases in large quantities and development of new molecules
Semiconductors, Flat panels, Photovoltaic
Engineering & Technologies
Plants and equipments for industrial gas production but also equipment and services for energy transition and deep tech
A world leader in gases, technologies and services for Industry and Health
Hydrogen Energy
Air Liquide
THIS DOCUMENT IS • PUBLIC

Air Liquide and hydrogen in a nutshell

60+ years of expertise

1.2 Mt annual production

€2.2 bn annual sales

~1,000 employees in hydrogen

240+ stations delivered

HARD-TO-ABATE INDUSTRIES

Hydrogen to decarbonize Refining, Metals, Chemicals

HEAVY-DUTY MOBILITY

Hydrogen for sustainable transport

Hydrogen Energy Air Liquide

THIS DOCUMENT IS - PUBLIC 3

H2 is a key fuel for the future of zero-emission transport

Trucks & Buses

Maritime

H_2

As a complement to BEV

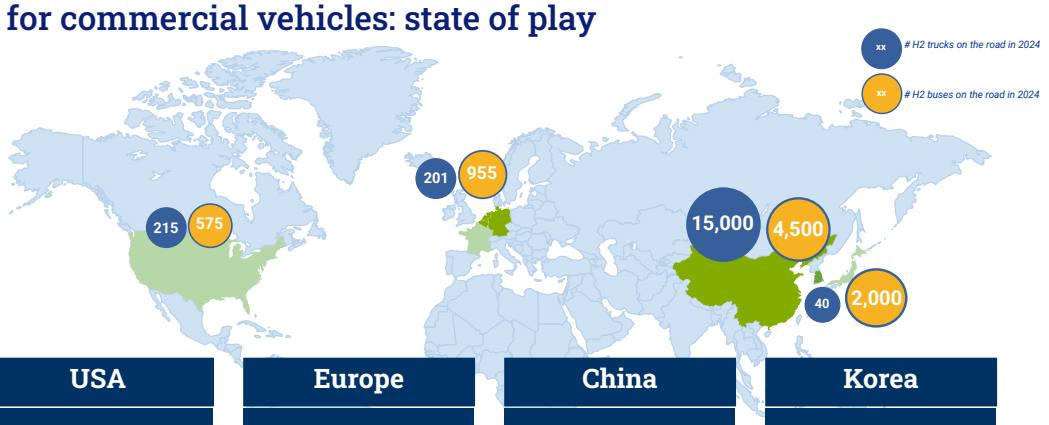
Intensive fleets

Aviation

Hydrogen Energy Air Liquide

THIS DOCUMENT IS - PUBLIC 4

H2 for commercial vehicles: state of play



USA	Europe	China	Korea
Uncertain environment State of California remains committed Transit market preparing the ground for HD trucks	Key OEM's lined up and some infrastructure initiatives but complex policy landscape Pivotal moment in terms of public support	Strong momentum with government support Thousands of H2 HD trucks in targeted clusters Rapid infrastructure growth	Synchronized action between government and industry Rapid infrastructure growth around main metropolitan areas

Hydrogen Energy | Air Liquide

THIS DOCUMENT IS - PUBLIC 5

Europe: Air Liquide's drive to activate the market

Production

The Group operates a first 20 MW electrolyzer in Germany...

And we're scaling-up!

200 MW

In France In the Netherlands

Gigafactory with SIEMENS energy

Retail infrastructure

JV with TotalEnergies developing and operating a European HRS network, primarily for heavy-duty trucks

Building and operating a public HRS network for passenger cars and commercial vehicles across Germany

A pioneering French hydrogen mobility company that offers an integrated "Mobility as a Service" solution: (700+ taxis on the road)

Supply

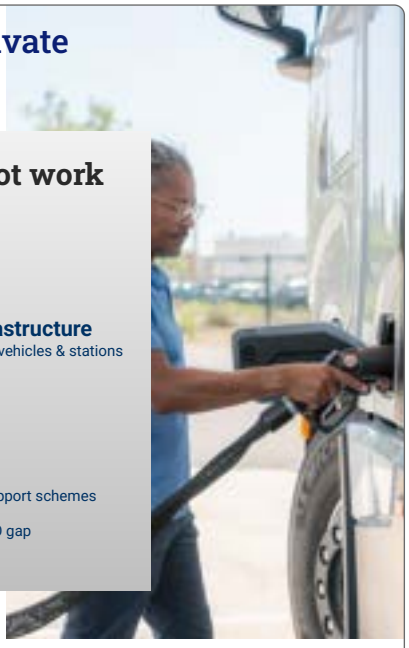
Extensive fleet of state-of-the-art high pressure trailers

INTRODUCING OUR FIRST HYDROGEN POWERED TRUCKS IN OUR LOGISTICS STARTING 2026!

Hydrogen Energy | Air Liquide

THIS DOCUMENT IS - PUBLIC 6

Europe: a strong potential but still failing to activate



What works

Decarbonization mandates & systems
Emission reduction standards, ETS2, Road toll exemption

OEM's lined up
VOLVO TOYOTA DAIMLER TRUCK MAN

Technology ready
Molecule: Electrolysis, Low-carbon H2
Supply: High-pressure GH2, LH2
Infrastructure: First ecosystems, Standardization
Vehicles: FCEV, H2 ICE

Opportunities for the energy system
Import, storage, grid balancing

What does not work

Uncompetitive TCO
Expensive vehicles, High H2 price

Insufficient refueling infrastructure
"chicken-and-egg" deadlock between vehicles & stations

Vehicles
Limited availability

Inefficient policy support
Complex, unstable & inconsistent support schemes across EU countries
Not properly adressing the initial TCO gap

Hydrogen Energy Air Liquide
THIS DOCUMENT IS - PUBLIC 7

Stronger together: the Global Hydrogen Mobility Alliance

Global Hydrogen Mobility Alliance

July 2025
official launch with Europe focus

CEO led
all signing the "call to action letter

40+
participating companies

Hydrogen Energy Air Liquide
THIS DOCUMENT IS - PUBLIC 8

Korea: Multiple best practices from the Korean strategy & policy

What works

- Comprehensive support schemes fully bridging the initial cost gap
- Proper sizing of public support (~800M€ in 2025)
- Maximum agility and pragmatism with annual revision of funding priorities & schemes
- Market activation synchronized ecosystem partnerships

What 's next

- Refuelling network extension
- Heavy duty trucks acceleration

H2 mobility in Korea today

250 HRS
35,000 cars
2,000 buses
First trucks

F/C CAPEX support	HRS CAPEX support	H2 OPEX subsidy	FCEV subsidy
~ 40% of CAPEX / site	50~70% of CAPEX / site Opex Subsidy/site (80% of annual deficit)	35 ~ 50 % of fuel cost No constraint on H2 origin At parity with diesel	70 % of FCEV purchase At parity with diesel vehicles

Hydrogen Energy | Air Liquide

THIS DOCUMENT IS - PUBLIC

Lotte-Air Liquide Ener'Hy

17 tpd capacity, 10 loading bays

New high-pressure trailers

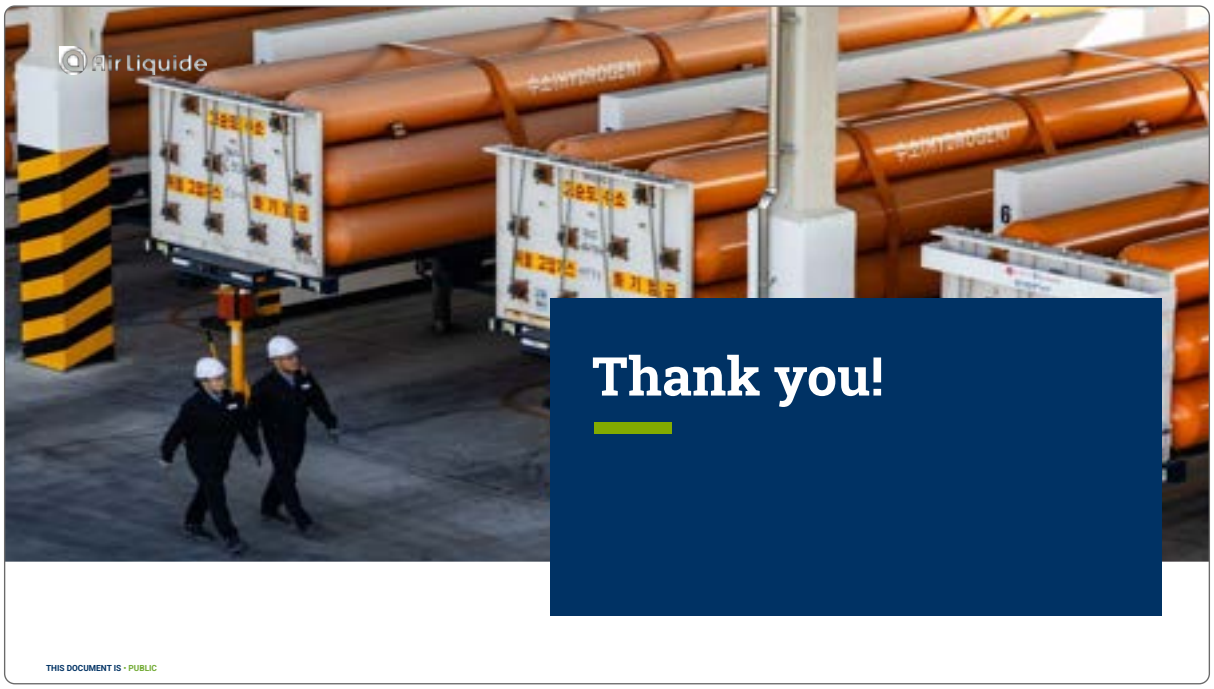
LOTTE | Air Liquide
ENER°HY

Stable supply in the Greater Seoul area

Supporting the momentum in Korea

Hydrogen Energy | Air Liquide

THIS DOCUMENT IS - PUBLIC 10



This is the time to prove hydrogen mobility works – leveraging current molecule flexibility to unlock economics and future network scaling

Current phase

1 Activation price & molecule flexibility

ALL COLOURS WELCOME TO KICK-START

Today

2030

- Geographical focus to **drive local infrastructure development**
- **viable ecosystems with well-loaded HRS in high traffic areas**
- **Derisked economics** and supply enabled by molecule flexibility
- **Activation cost** of €8/kg supported by targeted policies
- HD (truck, bus, coach) unlock other applications (e.g., LCV, cars, maritime)

2 Connect ecosystems

CREATE CORE NETWORKS

Mid-2030s

- Expand geographical coverage by connecting HRS ecosystems to create core transport routes (e.g., TEN-T)
- **Decarbonize H2** in line with other industries and with BEV charging
- Capacity payments for infrastructure decarbonization
- **Fleet demand** and **vehicle OEMs driving commercial scale**
- **Shift towards low-carbon and renewable hydrogen**, including from imports

3 Full deployment

COMPREHENSIVE NETWORKS

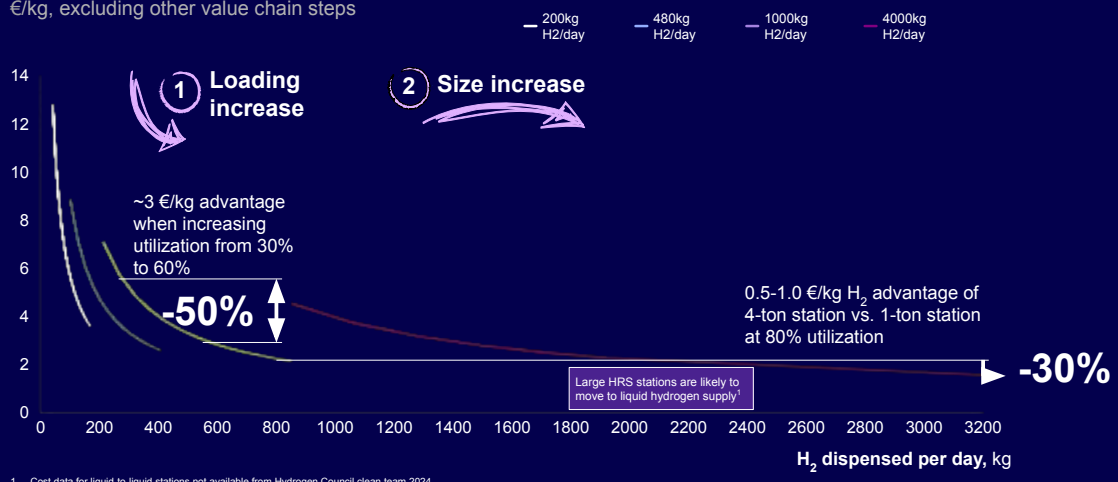
2040

- **Comprehensive HRS network** matching today's usability
- **Scaling H2 adoption** across relevant use cases
- **Focus on renewable or low-carbon hydrogen,** at scale

Global Hydrogen Mobility Alliance 12

HRS | Scale and utilization are essential to reduce H_2 cost at the pump, with most competitive cost position reached above 2t per day

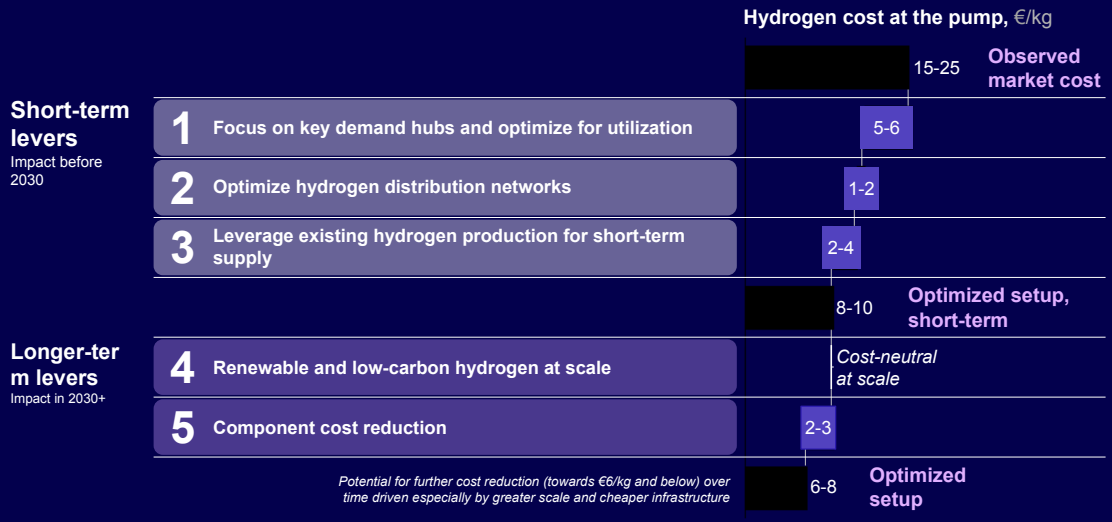
Hydrogen Refueling Station cost per H_2 dispensed
€/kg, excluding other value chain steps



1. Cost data for liquid-to-liquid stations not available from Hydrogen Council clean team 2024

Source: Hydrogen Council clean team (2024)

An optimized hydrogen supply chain can already achieve meaningful cost reductions already in the short-term



Note: Excluding subsidies, incentives and credits by 2030

Source: Hydrogen Council clean team (2024)

If the specific tipping points of scale and demand certainty are met, hydrogen in road transport can already be competitive today

H2 Mobility Setup, H2 cost at the pump[2]		Production	Conversion / Storage / Distribution	HRS[1]	Vehicle
Step 0: Today		15-25 €/kg — Local sources	300 kg	250-500 kg / day, 10-20%	~100 units/y
Step 1: Activation price & molecule flexibility	5-10 ecosystems of 10 HRS with 100-300 trucks around existing H2 sources	8-12 €/kg — Mix of sources	950+ kg	1,000+ kg / day, 50-60%	100-500 units/y
Step 2: Connect ecosystems	Linked ecosystems of 100-200 HRS with 5k-10k trucks and decarbonizing H2 sources	7-9 €/kg — Shift to low-carbon & renewables	Shift to LH2: 4,000 kg	2,000+ kg / day, 60-70%	~5,000 units/y
Step 3: Full deployment	Comprehensive network of 1,000+ HRS with 100k+ trucks using low-carbon / renewable H2 sources	6-8 €/kg (*further improvements may be possible in long-term*) — Low carbon & renewable	4,000 kg, Pipelines	4,000+ kg / day, 60-80%	10,000+ units/y

1. Hydrogen Refueling Stations
2. Without incentives or credits

Source: Hydrogen Council clean team (2024)

Key policy asks

Enabling conditions BEV = H2

Recognise the complementarity of BEV and H2 mobility

Level playing field for BEV and H2 on the upcoming EU policy from the Automotive Action Plan

- Eurovignette amendment
- Transport corridors
- Greening of corporate fleets

Flexibility to use whatever H2 is available to kickstart H2 mobility

Independent measures to activate H2 mobility and decarbonize H2 (BEV approach)

- The target is to meet 8€ per kg at the nozzle (and below)
- Gradual adoption of low-carbon and renewable H2

Bridge the cost gap

SWiM type of funding for HRS and vehicles

Specific program for H2 mobility & flexible granting conditions

- "Consortias" HRS + Fleets
- Secure 50% min loading (coupled with capacity payment for HRS in corridors)
- Techno neutral approach H2, HRS and vehicles

Swift implementation of ETS and Eurovignette

Swift Implementation of existing EU policy and extended longevity

- Eurovignette free tolls for ZEV
- ETS2 fossil fuel tax for road transport and ETD exemption for H2 ICE
- Other enabling elements: clean ports and public procurement

Introducing Air Liquide

Present in **60 countries** with **66,500 employees**, the Group serves more than 4 million customers and patients.

Oxygen, nitrogen and hydrogen are **essential small molecules** for life, matter and energy. They embody Air Liquide's scientific territory and have been at the core of the company's activities since its creation in **1902**.

A WORLD LEADER IN GASES, TECHNOLOGIES AND SERVICES FOR INDUSTRY AND HEALTH

Hydrogen Energy Air Liquide

THIS DOCUMENT IS - PUBLIC 17

Market Insight 3

Latin America's Clean Hydrogen Ecosystem and Business Development Trends

Juan Antonio Gutierrez
Technical Advisor, H2PERU

Education

- B.Sc. in Chemical Engineering, National Autonomous University of Mexico (UNAM), Faculty of Chemistry, Mexico City, Mexico (2010–2015).
- European Energy Manager (EUREM), AHK – Mexico-Germany Chamber of Commerce (2019)
- Renewable Energy Co-Benefits Specialist, Renewable Energy Academy (RENAC), Berlin (online, 2020–2021)
- Certificate of Knowledge in Hydrogen & Fuel Cells for Transport Applications, Universidad San Jorge – KnowHy, Spain (2017)

Professional Career

- Energy Transition Solutions Manager – Fotowatio Renewable Ventures (FRV)
  Madrid, Spain – Nov 2023 – Present
- Senior Technical Advisor – Peruvian Hydrogen Association (H2 Perú)
  Lima, Peru – Oct 2022 – Present
- Business Strategy Associate – NTT DATA
  Mexico City, Mexico – Feb 2022 – Sep 2023
- Hydrogen Consultant – Hinicio
  Mexico City, Mexico – Nov 2019 – Jan 2022
- Product Specialist – PEM Electrolysis, Leman Instruments
  Mexico City, Mexico – Apr 2014 – Nov 2019

Research Interest

- Renewable hydrogen and Power-to-X (PtX): Green hydrogen production, derivatives such as green ammonia and e-fuels, and their deployment in industry, mobility and power systems.
- Energy systems and multi-energy integration: Modeling off-grid and grid-connected systems (PV, batteries, thermal generation, hydrogen) for industrial sites and data centers; energy storage and multifluid systems.
- Techno-economics and project development: LCOH/LCOE/LCOA modelling, investment cases, and project structuring from concept and pre-FEED through tenders and basic engineering.
- Energy transition policy and roadmaps: National and regional hydrogen strategies, regulatory frameworks and just-transition aspects in Latin America and the Caribbean.

Speech Summary

This talk explores how Latin America is building a competitive clean hydrogen ecosystem: emerging hubs, policy and financing shifts, landmark projects, regional value chains, and what developers and investors must do now to turn today's opportunities into bankable businesses.

Company Introduction

H2 Perú, the Peruvian Hydrogen Association, is a non-profit industry association created in 2020 and formally registered in early 2021. It acts as a collaborative platform to accelerate the decarbonization of Peru's economy through renewable and low-emission hydrogen.

The association brings together more than 70 members, including companies, professionals, academic institutions and strategic partners, who share a long-term vision of a green-hydrogen-based, resilient and sustainable economy for Peru.

Latin America: Clean Hydrogen Ecosystem Development and Business Growth Trends

Juan Antonio Gutierrez
Senior Technical Advisor
4 december 2025

H2 PERÚ Asociación Peruana de Hidrógeno

75
Associates and Allies

We have a strong network of corporate and strategic partners who share our vision of a decarbonized economy. Additionally, we actively collaborate with international associations and promote platforms for exchange to share visions, knowledge, and experiences.

Corporate Associates

Energía

Industria, minería y transporte

Ingeniería y servicios de tecnología

Allies

Strategic Partners

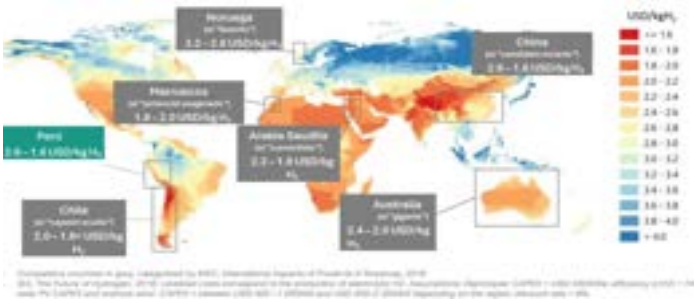
Media Allies

Professional Partners

15

Peru's Potential to Offer Competitive LCOH

Levelized Cost of Hydrogen for the Second Half of the Year from Photovoltaic and Onshore Wind Systems up to 2050



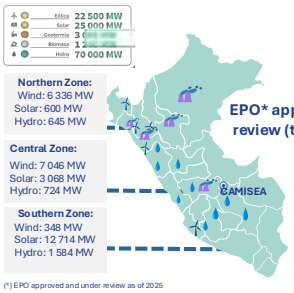
Renewable potential of 125.5 GW, **which represents 9 times the current installed capacity in the country (13.8 GW).**

Peru is well-positioned globally to develop a low-cost hydrogen economy, with production costs identified among the top 10 worldwide.

By 2040, renewable and low-emission hydrogen is expected to be the most competitive option, driven by lower electricity prices, Peru's strong renewable potential and falling technology costs.

High Renewable

Renewable Potential



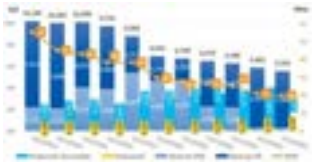
(*) EPO approved and under review as of 2025

Peru's total electricity demand reached approximately **64 TWh in 2024**.

EPO* approved and under review (total): 33 067 MW

In **combination, natural gas** and **renewables** could contribute to the production of renewable and low-emission hydrogen to **boost Peru's energy transition**.

Natural Gas



According to OSINERGMIN, Lot 88 has a reserves-to-production (R/P) ratio of **20 years**. If **Lot 58** enters commercial operation and is directed to the domestic market, it would extend supply. Together, Camisea could secure Peru's natural gas supply for **around 30 years.**

Regulatory and Strategic Landscape of Hydrogen in Latin America

Brazil
- Strategy: National Hydrogen Program (PNH2, 2022).
- Laws: Law No. 14.990/2024
- Incentives: Tax credits, financial support, and direct incentives for low-emission hydrogen projects.

Colombia
- Strategy: Hydrogen Roadmap of Colombia (2021).
- Laws: Law 2099 of 2021 (extends Law 1715)
- Incentives: Through Laws 2099/1715 (processed via UPME) (february 2025)

Chile
- Strategy: National Green Hydrogen Strategy (2020).
- Framework Law and broader energy regulations.
- Incentives: CORFO instruments and R&D/investment funds applicable to hydrogen projects.

Uruguay
- Strategy: Green Hydrogen Roadmap of Uruguay and H2U Program (2022)
- Incentives: General Investment Promotion Regime (Law 16,906, COMAP): exemptions from Corporate Income Tax (IRAE), VAT (refund/credit)

Peru
- Laws: Law No. 31992; Draft Regulation
- Incentives: Enables future promotional and tax mechanisms; details to be defined in the upcoming regulation.

Ecuador
- Strategy: Green Hydrogen Roadmap of Ecuador (2023).

Paraguay
- Strategy: National Strategy for the Hydrogen Economy (2025).
- Incentives: Carbon credits Law No. 7190/23 and its Regulatory Decree No. 3369/25

Argentina:
- Strategy: National Strategy for the Development of the Hydrogen Economy (ENH, 2023).
- Laws: Draft Law for the Promotion of Low-Emission Hydrogen (2024).

Panama
- Strategy: National Strategy for Green Hydrogen and Derivatives (ENHIVE) (draft 2023).
- Incentives: Linked to the country's green hub and logistics role; still being consolidated.

Costa Rica
- Strategy: National Green Hydrogen Strategy of Costa Rica (2023)
- Laws: Draft Law for the Promotion and Implementation of a Green Hydrogen Economy (Bill No. 22.392).

México
Strategy: Clean Hydrogen Industrial Strategy of Mexico 2024 (led by AMH2/private sector).
- Laws: No federal hydrogen law yet

Hydrogen & Derivatives Project Pipeline in Latin America

Country	Project / Hub	Companies/ Promoters	Reference scale (electrolysis ≥100 MW)	Highest public milestone achieved
Argentina	Patagonia H_2 projects (e.g., FFI Río Negro)	Fortescue and others	Multi-GW (≥100 MW)	Prefeasibility / framework agreements
Brazil	Pecém H_2V Hub	Various (FRV, Fortescue, AES, etc.)	Blocks ≥100 MW	Pre-FEED / studies; MoUs, port agreements
	Suape / NE Brazil Hubs	Various	≥100 MW	Pre-FEED
Chile	H_2 Green Mining – Calama	Susterra / H_2 Green Mining	~200 MW	EIA approved (RCA); awaiting FID
	H_2 Magallanes	TE H_2 / TotalEnergies	Multi-GW (≥100 MW in 1st phase)	Pre-FEED/FEED; EIA submitted; partial concessions
	HNH Energy – Magallanes	HNH Energy	>100 MW	Pre-FEED/FEED; EIA under evaluation
Mexico	Sonora projects / industrial hubs	Various	≥100 MW	Pre-FEED
Peru	Horizonte de Verano Green H2 & NH3, Arequipa	Verano Energy / Grenergy	>100 MW (project includes up to 5.85 GWp PV)	**EIA-d approved in 2025** by the Ministry of Production : "Environmental Authorization" granted; pre-FID
	Hub H2 Arequipa	Arequipa Goverment	>100 MW	Prefeasibility Study
Uruguay	Tambor Green Hydrogen Hub	Enertrag / partners	~150 MW	Pre-FEED / studies

Key barriers to hydrogen project development in Latin America

01 Lack of market demand and bankable contracts

There are still few industrial or energy off-takers willing to sign long-term hydrogen or ammonia purchase agreements (HPAs/PPAs), making financing and FID difficult.

02 Regulatory gaps and institutional delays

Many countries have hydrogen laws or strategies but lack clear regulations on certification, incentives, grid access, or permitting, creating legal uncertainty.

03 Infrastructure and grid limitations

Regions with the best renewable resources often lack adequate transmission lines, port facilities, and logistics for large-scale hydrogen export.

04 High costs and competitiveness gap

Green hydrogen remains more expensive than fossil alternatives, and without carbon pricing or subsidies, cost parity is still out of reach.

05 Technical and social challenges

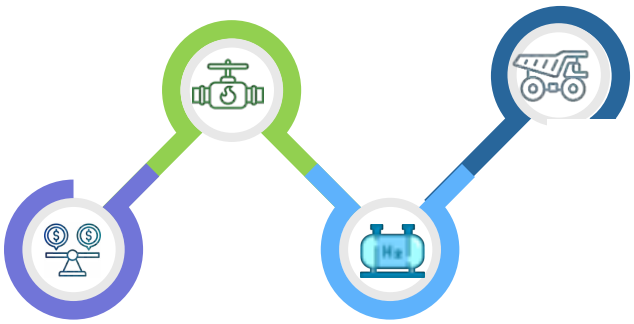
Limited local expertise in large-scale hydrogen projects and social concerns over water use and community engagement often delay approvals and project execution.

Asociación Peruana de Hidrógeno

STRENGTHS FOR THE DEVELOPMENT OF A HYDROGEN INDUSTRY IN PERU

02 EXPERIENCE IN NATURAL GAS EXPORTATION

04 MINING SECTOR WITH DECARBONIZATION OBJECTIVES



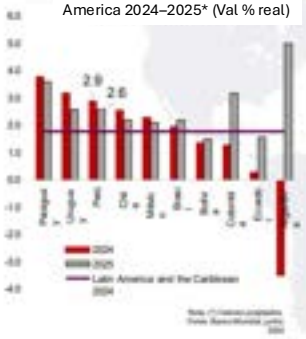
01 MACROECONOMIC STABILITY

03 EXPERIENCE WITH RENEWABLE HYDROGEN PRODUCTION

01 MACROECONOMIC STABILITY

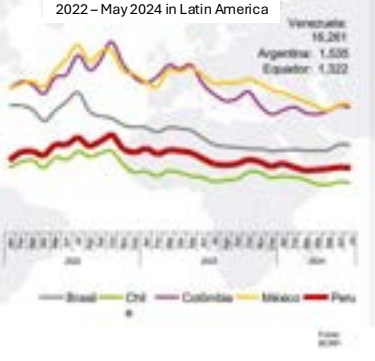
Leadership in economic growth for 2024 and 2025

Economic growth in Latin America 2024–2025* (Val % real)



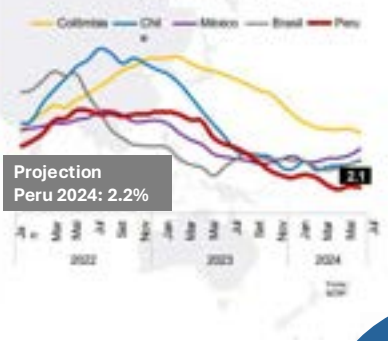
2nd best country risk in the region

Interest rates: EMBIG (variation in bps) Spread, 2022 – May 2024 in Latin America



The lowest inflation rate in the region

Inflation in Latin America 2022 – May 2024 (annual % change)

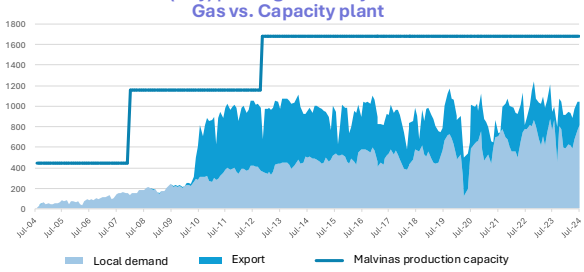


Projection Peru 2024: 2.2%

Peru is a macroeconomically resilient country

02 EXPERIENCE IN NATURAL GAS EXPORTATION

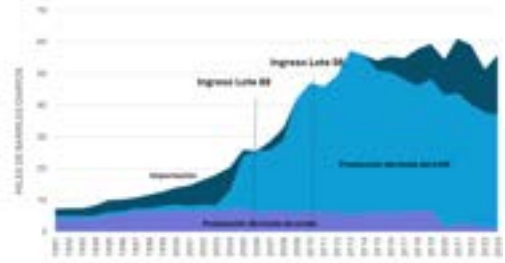
2004 – 2024 (July) | Average monthly sales of Natural Gas vs. Capacity plant



Production capacity: 1,680 MMPCD	Reinjection: 250 – 350 MMPCD
Average local market: 550 – 750 MMPCD	Average LNG production (L88): 50 MBbl/d
Average export: 650 – 800 MMPCD	Average LPG production (L56 & L57): 28 MBbl/d

Fuente: Hunt Oil 2024. Demanda local, capacidad de producción y exportación

LPG Supply in Peru



NG | MMPCD

Malvinas production capacity

03 EXPERIENCE WITH RENEWABLE HYDROGEN PRODUCTION

- **Location:** Cusco, Peru
- **In operation since:** 1965
- **Technology:** 7 alkaline electrolyzers (23 MW)
- **Production:** 8.6 tons of renewable hydrogen per day for ammonium nitrate, used in the production of mining explosives
- **Energy source:** powered by 100% certified renewable energy (in partnership with Engie Energía Perú)

SOURCE: ENAEX

Renewable Hydrogen Pioneers in Peru: Industrias Cachimayo Leading Since 60 Years Ago

04 MINING SECTOR WITH DECARBONIZATION OBJECTIVES

Portfolio of mining investment projects planned until 2034

Source: Mining Investment Project Portfolio 2024.

The mining sector in Peru is one of **the largest energy consumers** in the country, accounting for approximately **30% of total electricity demand**, with an average annual consumption of 17 terawatt-hours (TWh).

Hydrogen can decarbonize **various mining processes**. In the country, mineral transportation alone could **require between 5GW and 7GW** of new renewable capacity.

Hydrogen is crucial for reducing emissions and driving the transition to a more sustainable economy in industries such as cement, steel, fertilizers, and transportation.

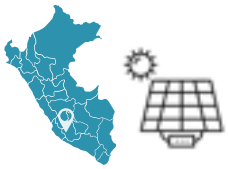
Arequipa: The Future Gateway for Green Hydrogen and Derivatives from Peru to Asia

Economic Profile
Arequipa contributes approximately **5–5.5% of Peru's national GDP (2023)** and is the **second-largest regional economy** in the country.

World-class mining hub
Arequipa hosts Sociedad **Minera Cerro Verde**, one of the largest **copper complexes in the world**, positioning the region as a strategic anchor for Peru's copper exports.

Diversified industrial base
Beyond mining, Arequipa has a **solid industrial ecosystem:** Cement (Yura), Steel (Aceros Arequipa), food processing, and light chemicals.

Strategic Export Gateway for Green Molecules
Corio is a planned deep-water, multi-purpose megaport in Arequipa. **Matarani and rail links** to the Interoceanic Highway and the Southern Railway, it forms a strategic logistics corridor for southern Peru.



Solar potential
Arequipa has **exceptional solar radiation**, averaging **~6.0–6.5 kWh/m²/day**, among the best in the world for photovoltaics, with more than **300 clear days per year**.

Natural gas and associated infrastructure
Transportadora de Gas del Perú (TGP) has proposed a **coastal gas pipeline** running from **Humay (Ica)** to **Mollendo, Arequipa, and Ilo (Moquegua)** to reinforce natural gas supply in the southern region.

Arequipa: The Emerging Hub for Hydrogen and Green Molecules in Latin America

Cooperation Agreement between H2 Peru and the Regional Government of Arequipa

MoU with the British Embassy in Lima: Joint efforts to develop regulatory frameworks, promote investment, and foster pilot projects, including support for regional hydrogen hubs.

• Led to the *Proposed Regulation of the Green Hydrogen Promotion Law* (2025), covering certification, safety, and export frameworks.
• Currently supports the governance study and stakeholder mapping for the **Arequipa Hydrogen Hub**, in collaboration with the Regional Government.

Main objectives of the agreement:

•Conduct baseline studies, including stakeholder mapping and governance analysis to enable the hub.

•Develop a roadmap to guide the progressive implementation of the hydrogen ecosystem in Arequipa.

•Promote pilot projects and investments that bring together industry, academia, the public sector, and international cooperation.

Arequipa brings together the perfect mix of resources, industry, and infrastructure to lead Peru's transition into a green export economy. The Arequipa Green Molecules Hub is not just a project it's a vision to turn the region's mining and energy strengths into a global gateway for clean molecules.

Peru's H_2 vision moves ahead with regulatory clarity, safety standards, and an integrated national ecosystem

Strategy & roadmap

According to H2 Peru's roadmap, this is how the country's hydrogen industry is expected to develop in the coming years. These are the key milestones.

2030
- **1 GW** of installed electrolyzers
- **$20 M** for replicable pilot projects
- **$3 B** in private investment
- **≥ 40 %** participation of local talent
- Sustainable transport with fuel-cell vehicles and H_2-V fleets

2040
- **6GW** of electrolyzer cap acity
- H_2V cost **< 5.15 USD/kg**
- **75 %** fossil fuel reduction
- **80 %** less imports of H_2-derived fuels

Harmonise policies & safety standards

Technical Committee for Hydrogen Technology Standardization (CTN 175)

H2 Perú, as technical secretariat, is leading the adaptation of ISO 19870 and ISO 15916 in Peru, bringing together public sector, private sector, and academia to align feedback and ensure the standards are legitimate and practical for national use.

01 03 02 04

Building a Legal Framework to Power the Hydrogen Economy

Key Aspects

Policy and Planning · Tax Incentives · Origin Certification · Scientific Research

Hydrogen Promotion Law and its Regulation under Review

The regulation is developed based on four fundamental principles:
•Full Integration of the Hydrogen Value Chain
• Enabling Criteria for the Operation of Plants
•Hydrogen Certification and Export
•General and Specific Safety Aspects for Hydrogen

Connect supply chains & infrastructure

Arequipa and H2 Perú have joined forces to promote the **first Hydrogen and Derivatives Hub**, starting with a **key study on stakeholder mapping and governance.** This will then feed into **Arequipa's Hydrogen Hub Roadmap and Macroeconomic Impact Study.**

WHY IN AREQUIPA?

- **Outstanding renewable potential**
- **Existing strategic infrastructure: 14,000 ha of available land.**
- **Concentration of mining and energy-intensive industries**
- **Arequipa has formally declared hydrogen a regional priority**

h2.pe
H2 Perú, Asociación Peruana de Hidrógeno
@h2_pe
contacto@h2.pe
Calle German Schreiber 276, San Isidro, Lima

Latin America: Clean Hydrogen Ecosystem Development and Business Growth Trends

WORLD HYDROGEN EXPO 2025 6th Conference

Market Insight 4

Northeast Asia's Clean Hydrogen Ecosystem and Business Development Trends

Audrey MA
Vice President, Refire

Education
2008-2012, M.S., Urban Design, University of Hong Kong., Hong Kong, China
2004-2008, B.S., Architecture, Carleton University, Ottawa, Canada

Professional Career
2020-Present, Executive Director of the Board, Vice President of International Business, Shanghai REFIRE Group Limited, Shanghai, China
2017-2020, Director of Marketing and Business Development, Shanghai REFIRE Technology Co., Ltd, Shanghai, China
2015-2017, Vice President, SINOSYNERGY Hong Kong Limited, Hong Kong, China

Research Interests
Next-Generation Electrolysis Technologies for Green Hydrogen Production
Hydrogen-Powered Heavy-Duty Truck Commercialization
Strategic Expansion in Overseas Hydrogen Markets

Speech Summary
1. Opening Remarks: The Strategic Significance of Northeast Asia
   - Regional Leadership: Northeast Asia (China, Japan, South Korea) accounts for 40%+ of global hydrogen investments, positioning it as the "epicenter of clean energy transition".
   - REFIRE's Vision: As a pioneer in fuel cell technology, REFIRE is committed to accelerating cross-border collaboration to build interconnected hydrogen ecosystems.

2. Market Status: Growth Drivers and Regional Dynamics
   2.1 Key Market Indicators-China
   2.2 REFIRE's Market Impact

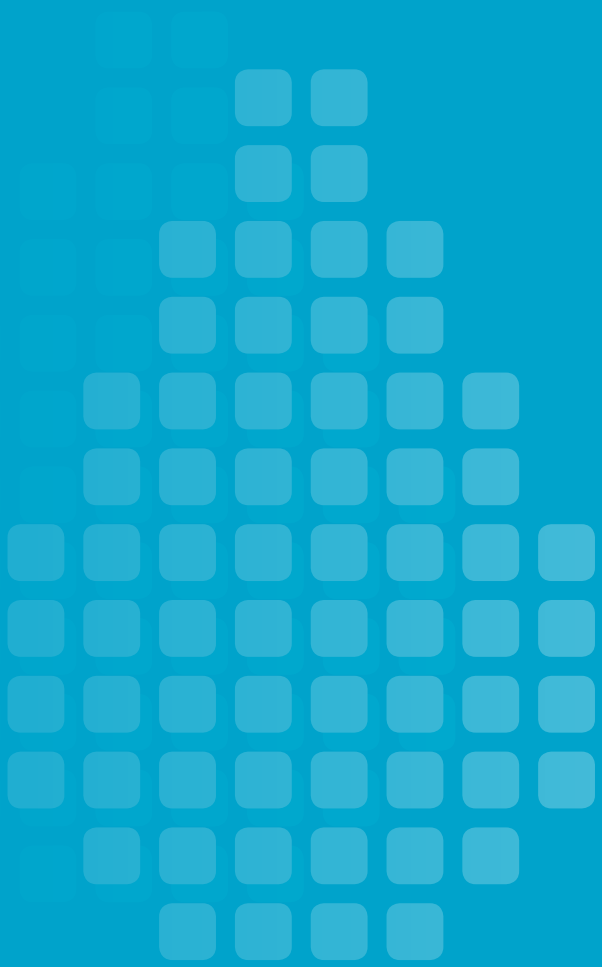
3. Regional Cooperation: Case Studies in Ecosystem Integration
   3.1 Cross-Border Infrastructure
   3.2 REFIRE's Flagship Projects
   - Taiyangshan, Ningxia
   - Megawatt-Level Power Generation

4. Technology Innovation: Advancing the Hydrogen Value Chain
   4.1 Breakthroughs in Fuel Cell Systems
   - Cost Reduction
   - Durability
   4.2 Ecosystem Integration
   - Wind-Solar-Hydrogen Storage
   - Solid-State Storage

5. Policy Environment: Catalysts for Growth
   5.1 Regional Policy Landscapes
   - China
   - EU-Asia Synergies
   5.2 Regulatory Challenges
   - Standardization Gaps

6. Closing: Toward a Decarbonized Northeast Asia
   - Shared Vision: "Hydrogen is not just an energy carrier but a bridge to regional prosperity and climate security."
   - Next Steps

Company Introduction
Shanghai REFIRE Group Limited (HKEX Code: 02570, referred to as "REFIRE ") is a global leader in the hydrogen technology sector, dedicated to the R&D of hydrogen solutions, establishment of industrial ecosystems, and the promotion of hydrogen commercial applications. Founded in 2015 and headquartered in Shanghai, the company operates with a market-oriented approach and a global perspective. REFIRE's business encompasses the holistic hydrogen industry chain, from upstream hydrogen production equipment to downstream fuel cell systems, providing solutions for diverse application scenarios such as road transportation, rail transit, construction machinery, power generation, off-grid supercharging, and green hydrogen production. The company has also pioneered the innovative "electricity-hydrogen-electricity" business model.



6th WORLD HYDROGEN EXPO 2025

Conference