



Pathway to **ASEAN Hydrogen Economy Transformation**

21 - 23 June 2022
2:00pm - 5:00pm (GMT+8)



Co-Organised by:



Transforming ASEAN Hydrogen Future

In the Hydrogen Insights Report 2021, governments across the globe have pledged over USD 70 billion spending on more than 200 projects and have committed to over 30 roadmaps and policies. Global demand of hydrogen energy has seen a trajectory growth and is targeted to reach 530 million tonnes per annum by 2050. What does the future hold for the South-east-Asia countries? And, what are the impacts of not having hydrogen strategy in their nation's growth targets?

Hydrogen has a long shared history – powering the first internal combustion engines over 200 years ago to becoming an integral part of the modern oil-refining industry. Due to its versatility and environmental friendly nature, hydrogen is making a significant in-road into clean energy transition as a net-zero emissions fuel in transport, building and power generation sectors.

Advancements in carbon capture, usage and storage technologies, and the continued reduction in production costs together with decarbonize policies worldwide, has resulted in a major uptake in clean hydrogen feedstock in the mining and industrial sectors.

Supplying hydrogen to industrial users is now a major business around the world. Competition on supply is likely to stiffen with developments of passenger and heavy-duty fuel-cell vehicles, which is expected to hit 5 million by 2030. The aviation, rail and shipping industries are also gearing up to embrace hydrogen energy, as a zero-emission fuel of the future. Hydrogen applications in the iron and steel industry, power generation, off-grid and power-backup, and a blending agent for natural gas are equally gaining momentum.

The time is right for Southeast-Asia countries to tap into hydrogen's potential to play a key role as an environmental friendly, safe and affordable energy to unlock new opportunities in power, transportation, mining and industrial sectors.

This summit is geared to increase greater understanding and know-how for policymakers when establishing frameworks and roadmaps; guiding industries to unlock opportunities, develop business plans and strategies; and for funding agencies and financial services industry to drive clean hydrogen projects through green financing instruments and funding mechanism.

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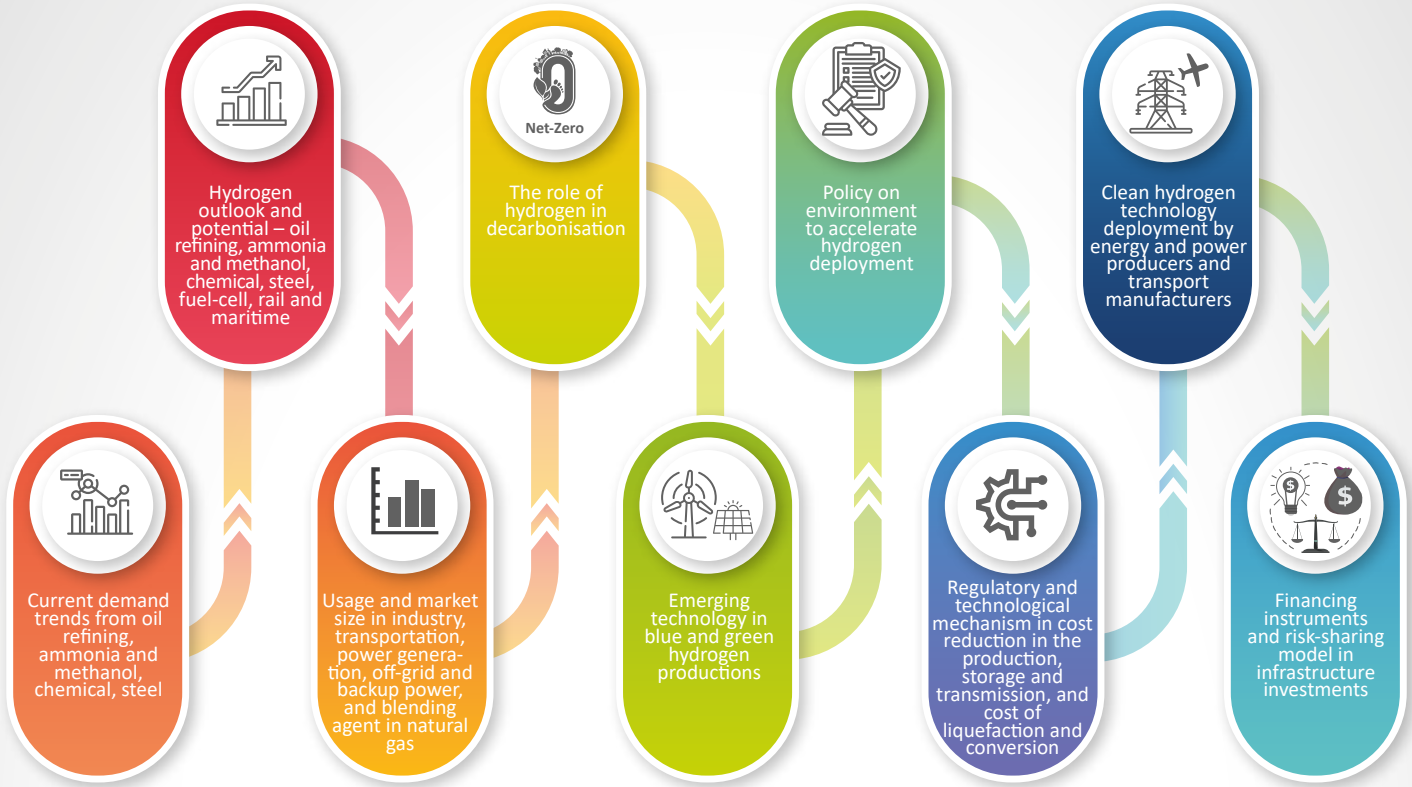


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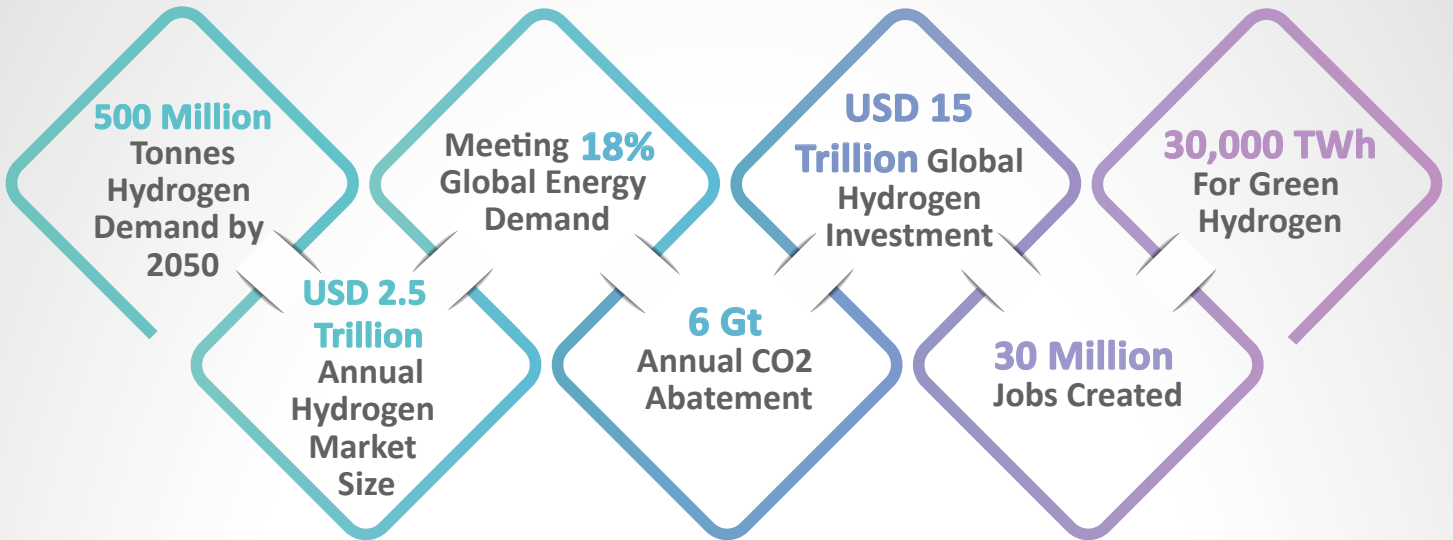
THE KEY TAKEAWAYS OF THE SUMMIT:



WHO SHOULD ATTEND



HYDROGEN MARKET AT A GLANCE



HYDROGEN, VECTOR OF CARBON-FREE ENERGY



HYDROGEN APPLICATIONS WITH DECARBONIZATION STRATEGY



Fuel-Cell Electric Vehicle (FCEV)

Hydrogen-Powered FCEV will drastically reduce air pollution with zero tailpipe emissions and CO2 free



Maritime, Rail & Aviation

Hydrogen-based fuels could reduce emissions significantly in aviation and maritime transport sectors by around 5% of global fossil fuel demand



Buildings

Blending hydrogen into natural gas networks in cities for cooling and heating can reduce approximately a third of global energy use



Carbon Capture, Utilization and Storage (CCUS)

Usage of hydrogen in energy to decarbonisation to capture, store and utilize carbon



Power Generation

Blue and green hydrogens to replace coal-fired power plants to reduce CO2 emissions



Energy-Intensive Industries

Usage of hydrogen as feedstock to produce high-temperature heat in energy-intensive industries, such as iron, steel, cement, aluminium, refining, ceramics, pulp and paper

SOURCES OF HYDROGEN PRODUCTION

Color	GREY HYDROGEN	BLUE HYDROGEN	TURQUOISE HYDROGEN	GREEN HYDROGEN
Process	SMR or gasification	SMR or gasification with carbon capture (85-95%)	Pyrolysis	Electrolysis
Source	Methane or coal 	Methane or coal 	Methane 	Renewable electricity

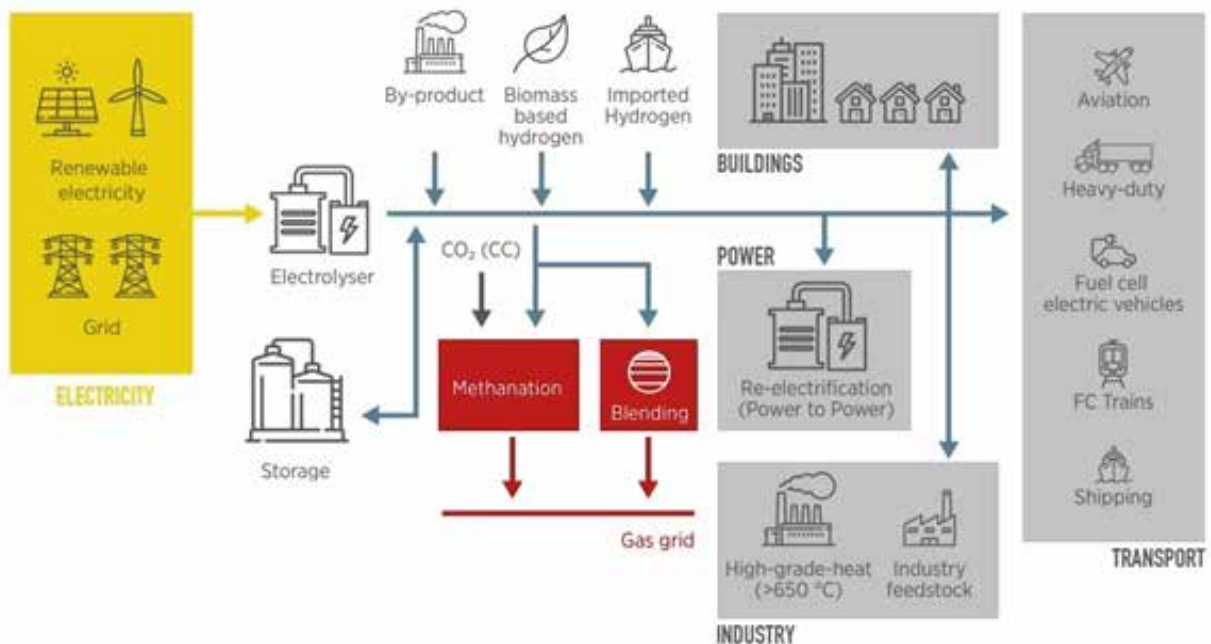
Source: IRENA (2020), Green Hydrogen: A guide to policy making, International Renewable Energy Agency, Abu Dhabi.

GLOBAL HYDROGEN DEMAND AND PRODUCTION SOURCES

PERCENTAGE OF GLOBAL H ₂ DEMAND	HYDROGEN SOURCES	INDUSTRY SECTOR	KEY APPLICATIONS
	<ul style="list-style-type: none"> ■ Natural Gas ■ Oil ■ Coal ■ Electrolysis 	CHEMICAL	<ul style="list-style-type: none"> - Ammonia - Polymers - Resins
		REFINING	<ul style="list-style-type: none"> - Hydrocracking - Hydrotreating
		IRON & STEEL	<ul style="list-style-type: none"> - Annealing - Blanketing gas - Forming gas
		GENERAL INDUSTRY	<ul style="list-style-type: none"> - Semiconductor - Propellant fuel - Glass production - Hydrogenation of fats - Cooling of generators

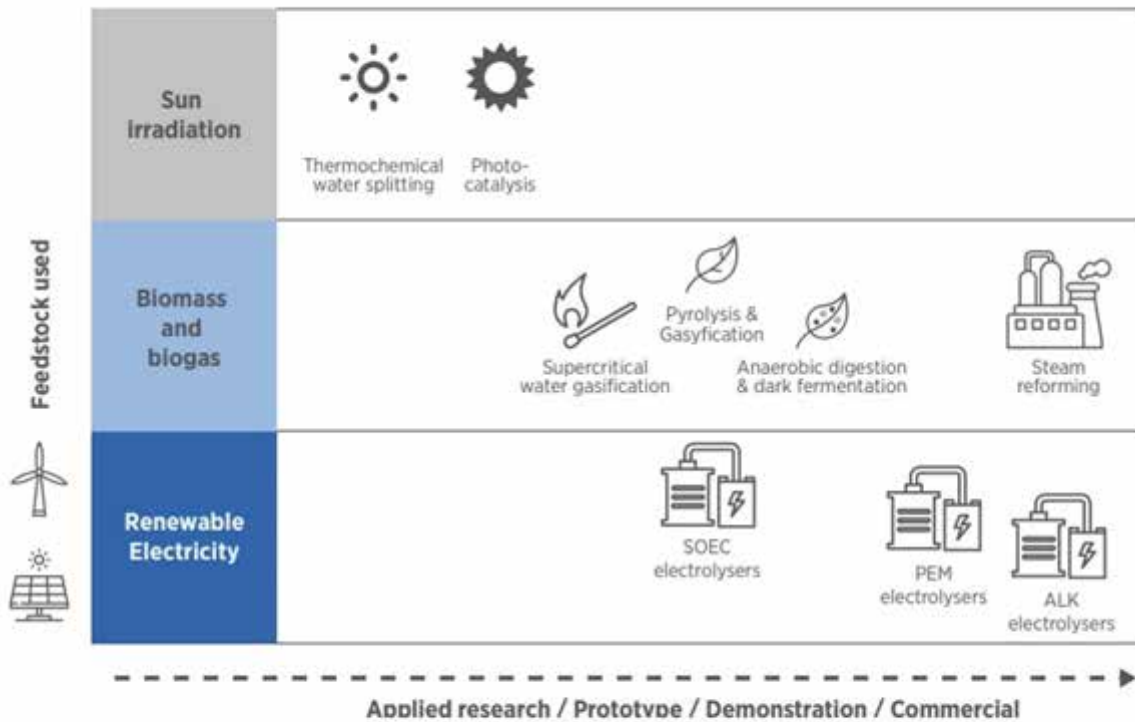
Source: IRENA (2018), Hydrogen from renewable power. Technology outlook for the energy transition, International Renewable Energy Agency, Abu Dhabi.

GLOBAL HYDROGEN PRODUCTION AND APPLICATIONS



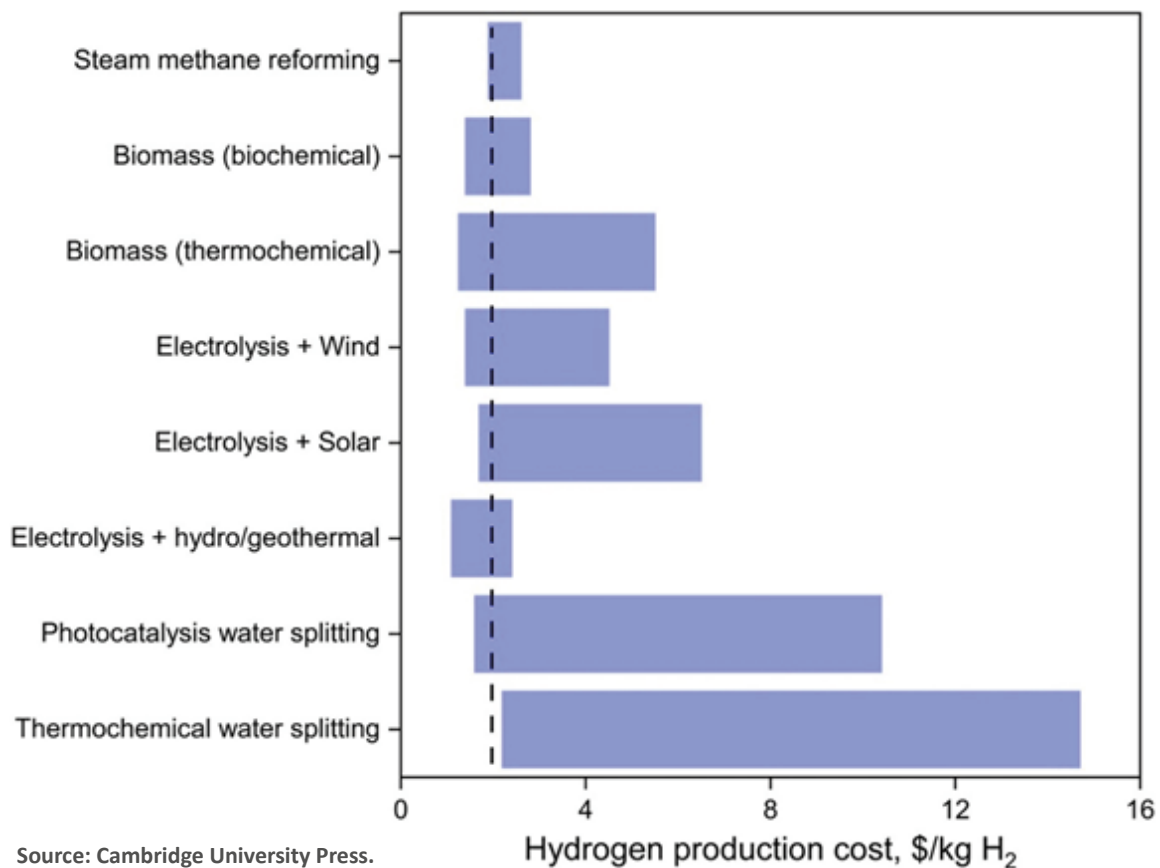
Source: IRENA (2018), Hydrogen from renewable power. Technology outlook for the energy transition, International Renewable Energy Agency, Abu Dhabi.

GREEN HYDROGEN PRODUCTION PATHWAYS AND MATURITY



Source: IRENA (2018), Hydrogen from renewable power. Technology outlook for the energy transition, International Renewable Energy Agency, Abu Dhabi.

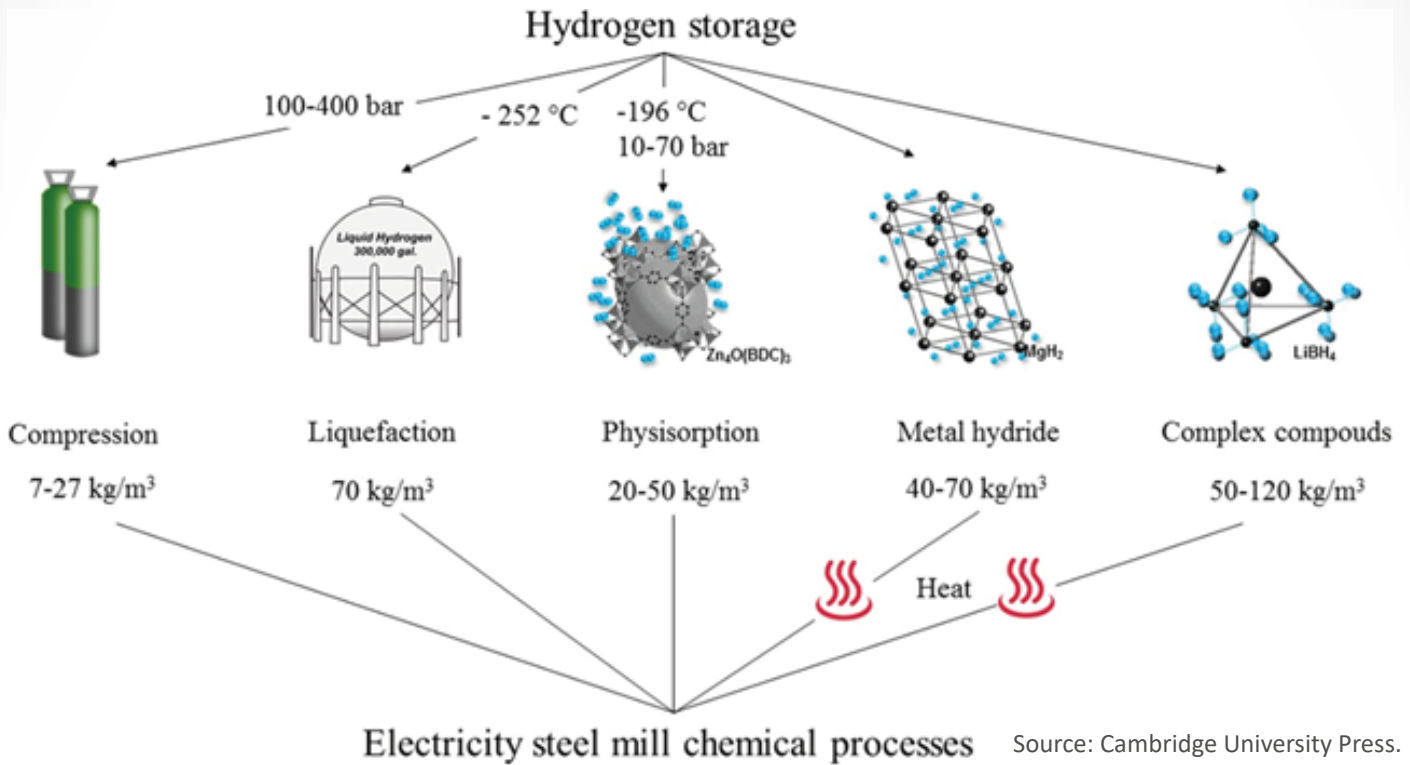
HYDROGEN PRODUCTION COST



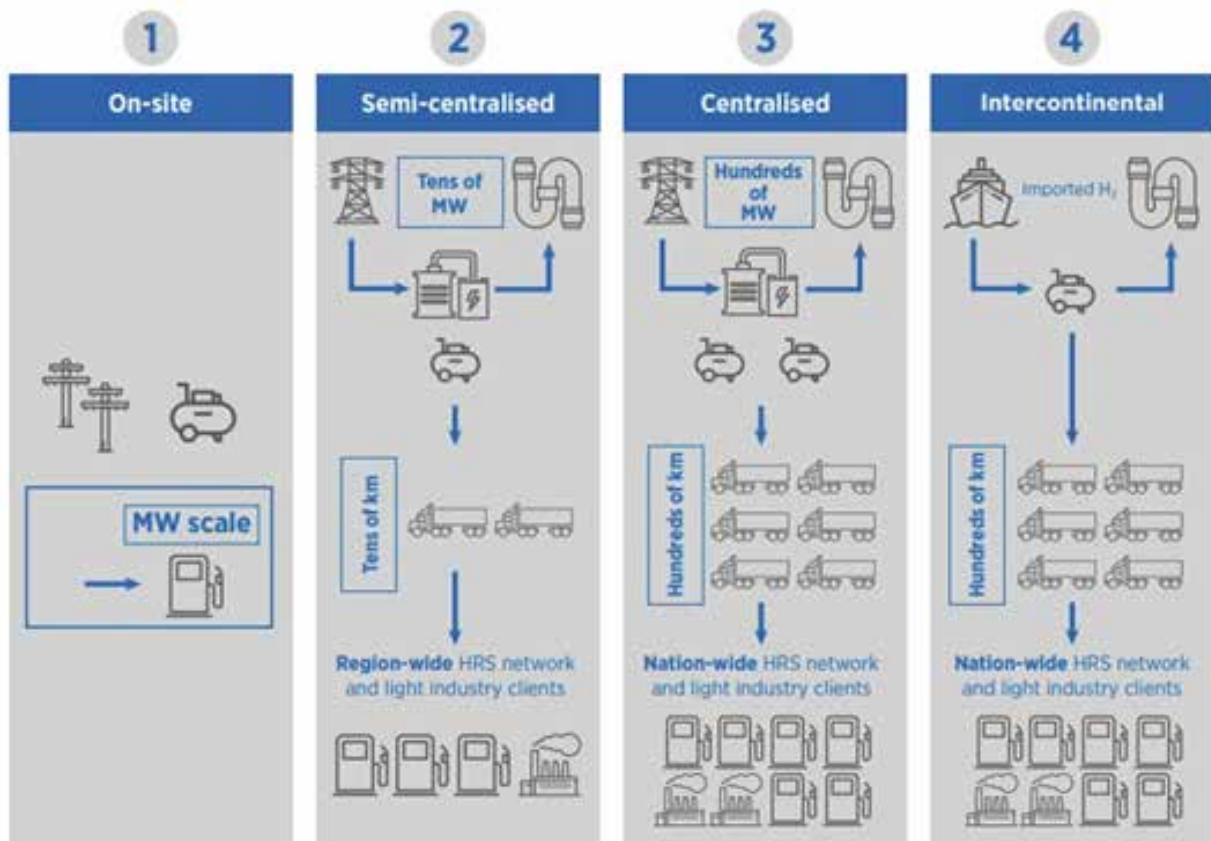
Source: Cambridge University Press.

Average hydrogen production cost from various production sources. The dotted line represents the 2020 DOE target of USD 2/kg H₂.

HYDROGEN STORAGE METHOD AND VOLUMETRIC DENSITY

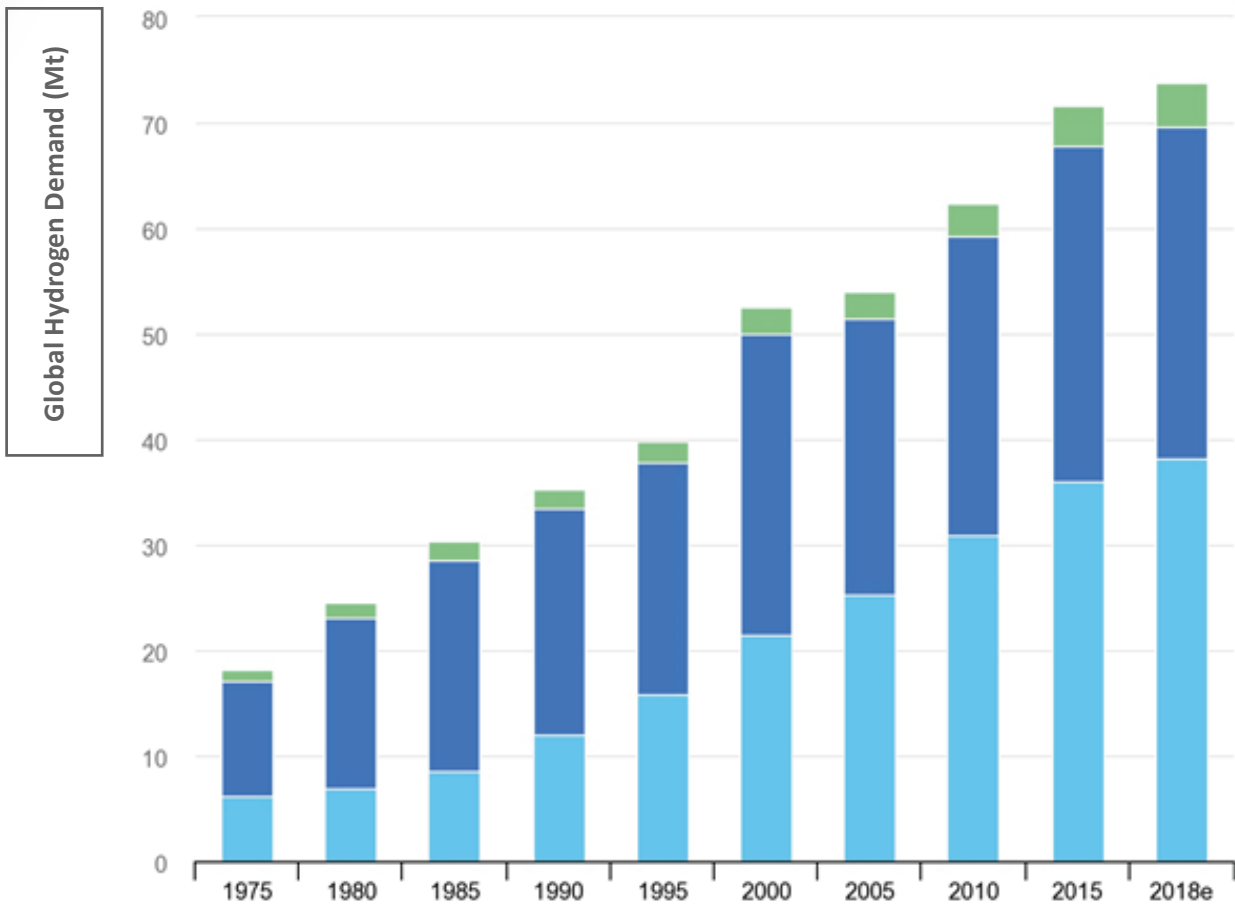


FUTURE MODELS OF THE HYDROGEN SUPPLY-CHAIN



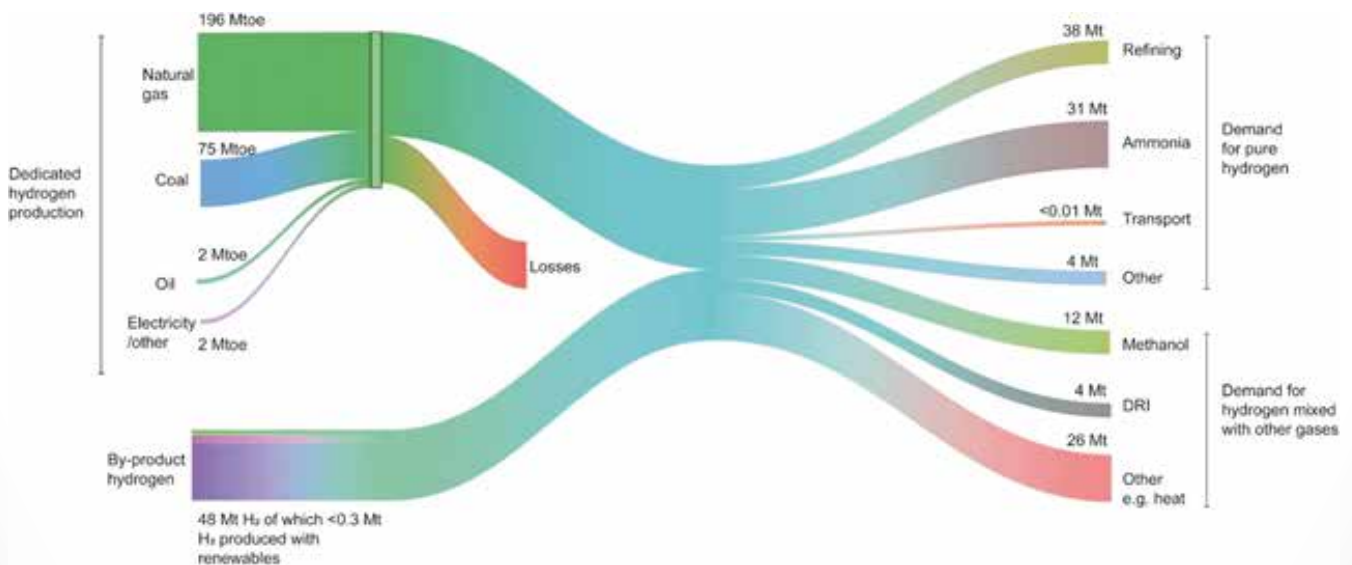
Source: IRENA (2018), Hydrogen from renewable power. Technology outlook for the energy transition, International Renewable Energy Agency, Abu Dhabi.

GLOBAL DEMAND TREND FOR HYDROGEN 1975 - 2018



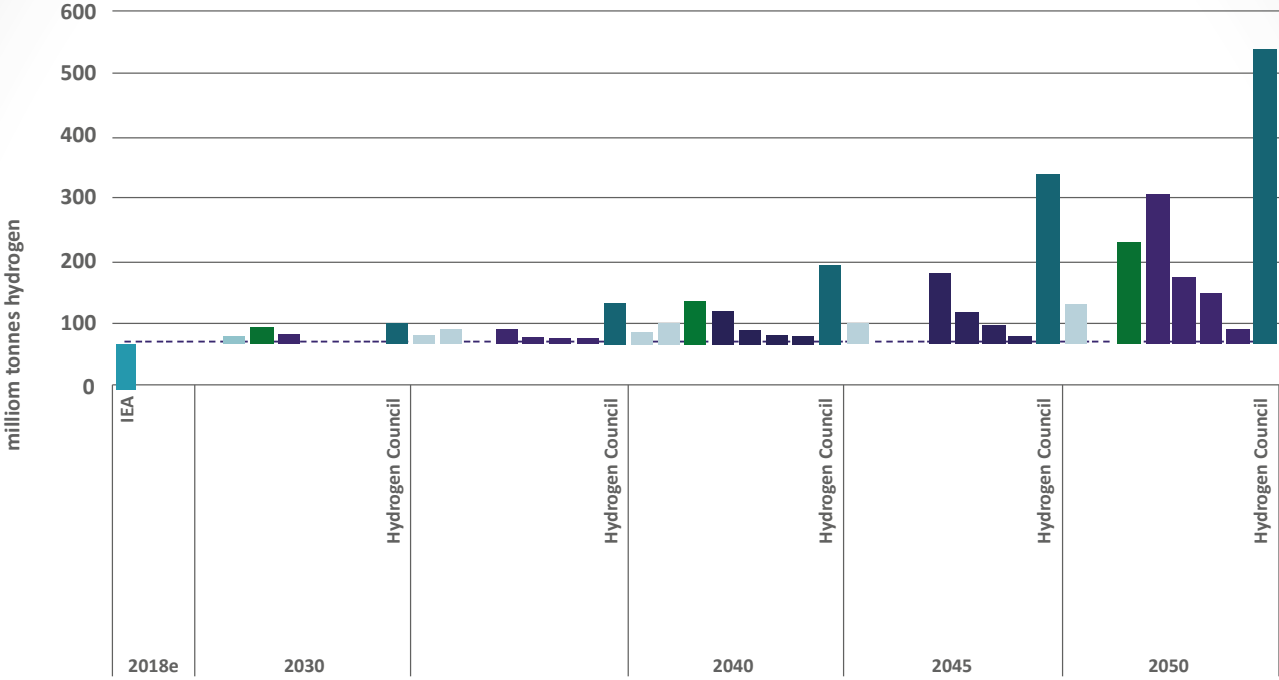
Source: IEA. All Rights Reserved.

GLOBAL HYDROGEN PRODUCTION AND SUPPLY BY SECTOR IN 2018



Source: IEA. All Rights Reserved.

GLOBAL DEMAND FORECAST FOR HYDROGEN



Source: Hydrogen Council

HYDROGEN PROJECTS GAINING TRACTION GLOBALLY

P1 | South Korea Plans to Develop Three Hydrogen-Powered Cities by 2022



Source: Fuel Cells Works

- The pilot cities will use hydrogen as the fuel for cooling, heating, electricity and transportation.
- By December 2022, three to ten square kilometres of each city will adopt hydrogen utilization technology comprising 9.9 megawatt fuel cells, 670 hydrogen fuel-cell electric passenger vehicles and 20 hydrogen buses.
- Hydrogen fuelling stations will be installed across the pilot cities to fuel the FCEVs.
- The pilot cities are part of South Korea's energy masterplan to transform 10% of its cities to hydrogen-powered cities by 2030, and 30% by 2040, and to accommodate 825,000 hydrogen passenger cars and 12,000 hydrogen buses by 2040.

P2 | Airbus Unveils Hydrogen-Powered, Zero-Emission Aircrafts



Source: airbus.com

- The aviation industry emits a billion metric tons of CO₂ to the atmosphere each year.
- Airbus unveils three designs of hydrogen-powered aircrafts, a classic commercial aircraft, a turboprop plane and a new model that blends the wing into the body of the jet to cut the aviation industry's emissions.
- All 3 designs will use hydrogen in modified gas turbines to propel the engines, and in fuel cells to create electrical power.

P3 | London Launches First Hydrogen Double Decker Buses



Source: BBC News

- London launches first double-decker hydrogen bus fleet, comprises of 20 new hydrogen fuel-cell electric buses which will reduce carbon footprint and harmful emissions to help Londoners breathe cleaner air.
- The Hydrogen buses are part of London's commitment to go net-zero by 2030.

P4 | Hydrogen Fuel Cell Maker on USD 1.6 billion Investment to Expand into Asia



Source: The Korea Herald

- South Korea's SK Group has invested USD1.5 billion in US-based hydrogen fuel cell maker Plug Power to expand into Asia with direct operations in China, South Korea and Vietnam to produce fuel cells and electrolyzers to produce green hydrogen, at the back of confirmed revenue of USD1.7 billion by 2024, from the USD337 million gross order book in 2020.
- Future revenue forecasts up-to 2040 will include powering 6.2 million hydrogen vehicles, establishing 1,200 hydrogen charging stations and planned roll-out of 80,000 hydrogen taxis, 40,000 hydrogen buses and 30,000 hydrogen trucks in South Korea.

P5 | Japan Launches World's First Liquefied Hydrogen Carrier for the Global Hydrogen Supply-Chain Network



Source: Kawasaki Heavy Industries

- Kawasaki Heavy Industries debuted the world's first liquefied hydrogen marine carrier aimed at establishing an international hydrogen energy supply-chain in which liquefied hydrogen produced regionally can be shipped to Japan and globally.
- Designed and built with a 1,250 cubic metre vacuum-insulated, double-shell-structure liquefied hydrogen storage tank, which is cooled to minus 253 degrees celsius, the liquefied hydrogen cargo can be compressed to one-800th of its original gas-state volume and transported in large quantities safely over long distances by sea.
- The carrier will transport its first shipment in March 2021 from the USD387 million Japanese-Australian hydrogen production facility in state of Victoria, Australia to Japan.

▶ PROGRAM

DAY ONE: 21 JUNE 2022, TUESDAY

OPENING CEREMONY

2:00PM **INTRODUCTORY REMARKS**
Datuk Dr. Abdul Aziz S.A. Kadir, Chairman, Confexhub Group

2:05PM **SPECIAL ADDRESS**

2:10PM **INAUGURAL ADDRESS AND LAUNCH OF HYDROGEN ASEAN 2022 CONFERENCE AND EXHIBITION**

PLENARY SESSION

2:35PM **Plenary Address 1: An Overview of Hydrogen Market and Global Outlook**

3:00PM **Plenary Address 2: Green Hydrogen Economy 2030 Strategy**

3:25PM **Plenary Address 3: Green Hydrogen for Southeast Asia's Clean Energy Transformation**

3:50PM **SOUTHEAST-ASIAN NATIONS DIALOGUE: HYDROGEN INDUSTRY AND DECARBONISATION ROADMAP**

5:00PM End of Session

*This Program is subjected to change and for updated program,
Program @ 2 December 2021

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DAY TWO: 22 JUNE 2022, WEDNESDAY

SESSION ONE: THE HYDROGEN FUTURE IS HERE - INEXPENSIVE, NET-ZERO AND SAFE

- 1:30PM** Paper 1: The Game Changer in Hydrogen Production: From Green Production to Cost Competitive Perspectives
-
- 1:55PM** Paper 2: A Novel and Cost-Efficient Approach for Hydrogen Transportation and Storage
-
- 2:20PM** Paper 3: Development of Carbon Capture Usage and Storage Technologies in Blue Hydrogen Production
-
- 2:45PM** Paper 4: Waste-to-Hydrogen Thermochemical Processes: Cost Analysis and Market Potential
-
- 3:10PM** Open Forum: Questions and Answers
-
- 3:30PM** End of Session

SESSION TWO: HYDROGEN IN THE POWER UTILITY SECTOR

- 3:35PM** Paper 5: Hydrogen in ASEAN's Energy Mix and Power Generation
-
- 4:00PM** Paper 6: Renewables Potential in Green Hydrogen Production for Electricity Generation
-
- 4:25PM** Paper 7: Decarbonizing Thermal Power Plant with Hydrogen: The Technological and Economic Perspective
-
- 4:50PM** Paper 8: Hydrogen and Natural Gas Blend for Power Generation: Viability and Prospects
-
- 5:15PM** Open Forum: Questions and Answers
-
- 5:30PM** End of Session

*This Program is subjected to change and for updated program, Program @ 2 December 2021

▶ PROGRAM

DAY THREE: 23 JUNE 2022, THURSDAY

SESSION THREE: HYDROGEN AND FUEL-CELL IN MOBILITY

- 1:30PM** Paper 9: Fuel Cells and Hydrogen Technology Mobility Blueprint
-
- 1:55PM** Paper 10: Hydrogen Purification and Fuel Quality in Fuel Cell Usage
-
- 2:20PM** Paper 11: Hydrogen-Powered Aviation: Innovation, Economic and Climate Perspectives
-
- 2:45PM** Paper 12: Renewables Connected Electrolyser in Green Hydrogen Production for Fuelling Stations
-
- 3:10PM** Open Forum: Questions and Answers
-
- 3:30PM** End of Session

SESSION FOUR: GREEN HYDROGEN TRAJECTORY IN INDUSTRIAL APPLICATIONS

- 3:35PM** Paper 13: Industrial Capacity Green and Blue Hydrogen Production Blueprint
-
- 4:00PM** Paper 14: The Potential of Hydrogen through Electrolysis in Ammonia Production: A Cost-Parity Perspective
-
- 4:25PM** Paper 15: Green Steel Production: Prospects and Technological Challenges
-
- 4:50PM** Paper 16: Liquid Organic Hydrogen Carrier Technology and Prospects in Fuelling the Global Supply-Chain
-
- 5:15PM** Open Forum: Questions and Answers
-
- 5:30PM** End of Session

*This Program is subjected to change and for updated program, Program @ 2 December 2021

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