Australian Academy of Technological Sciences & Engineering
1975-2025

REPORT SUMMARY

公益社団法人 日本工学アカデミー
THE ENGINEERING ACADEMY OF JAPAN

The Australia-Japan renewable hydrogen value chain

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Australian Academy of Technological Sciences & Engineering

Executive Summary

Renewable hydrogen has tremendous potential to support new and established industries in Australia and Japan. This report highlights key areas of interest for both countries, particularly for sectors such as chemical production (ammonia and methanol), steel manufacturing and fertiliser production. Despite strong market potential, significant investment is needed to develop large-scale production, overcome high capital costs, and build the necessary infrastructure for storage and transport. Crucially, industry growth will require closing the skills gap and establishing innovative financing models.

To capitalise on these market opportunities and address the identified challenges, experts from both Australia and Japan recommend leveraging Australia's renewable energy resources and Japan's technological expertise through joint research and development, technology sharing, and harmonised regulatory frameworks. Strengthened collaboration between governments, industry and research institutions is vital for creating a sustainable, integrated hydrogen supply chain and positioning the partnership as a global leader in clean energy.

These initiatives, aligned with Japan's Hydrogen Society Promotion Act 2024 and Australia's revised National Hydrogen Strategy (2024), underscore a mutual commitment to positioning hydrogen as a critical enabler of a sustainable, low-carbon future.

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The Australian Academy of Technological Sciences and Engineering (ATSE) is led by a diverse Fellowship of more than 900 leading Australian applied scientists, technologists and engineers.

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The Engineering Academy of Japan Inc. (EAJ) is composed of leading experts from academia, industry, and government institutions who possess a wide range of knowledge and have made outstanding contributions in engineering and technological sciences, and closely related fields.

Policies in the two countries

Japan's policy framework

In 2017, Japan released its "Basic Hydrogen Strategy" announcing an aim to become a "world-leading hydrogen-based society". The strategy emphasised collaboration with Australia to develop hydrogen technologies to demonstrate a "liquified hydrogen supply chain" and drive commercialisation. In June 2023, the Japanese government revised its Basic Hydrogen Strategy to support such initiatives. This updated strategy identifies nine key technologies, including fuel cells and water electrolysis devices, and commits over JPY 15 trillion (US $98.8 billion) in investment over the next 15 years (Government of Japan 2023) . The strategy also aims to increase hydrogen usage to 12 million tons annually by 2040.

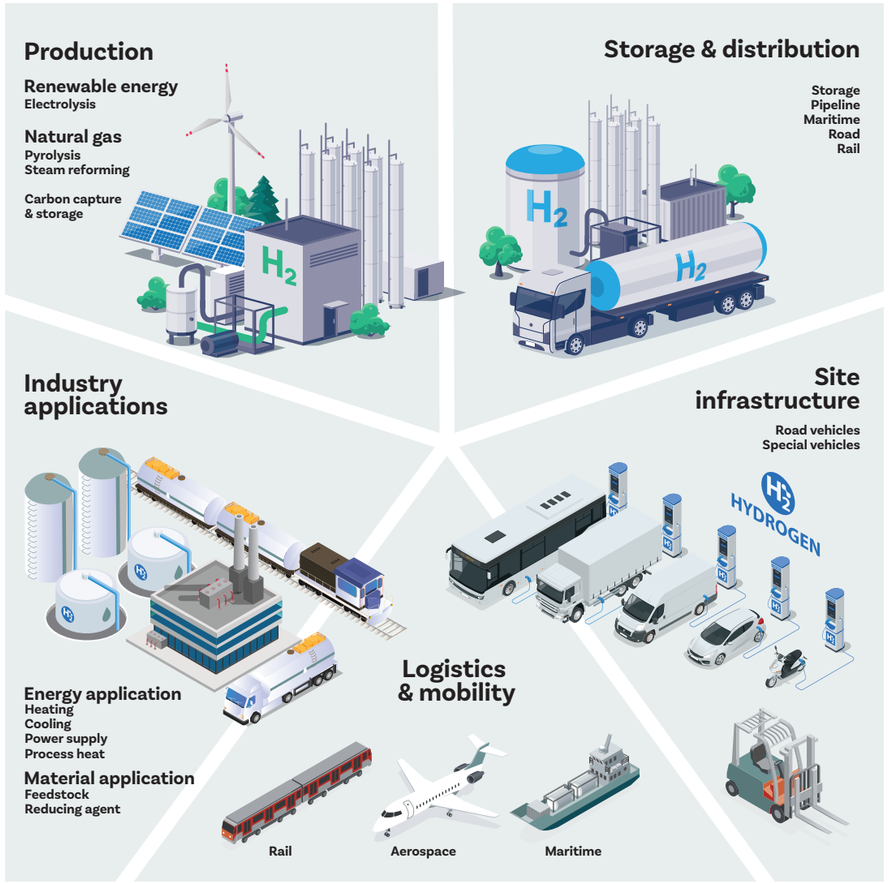
Australia's renewable hydrogen strategy

Australia established its National Hydrogen Strategy in 2019, which was updated in 2024 to focus on large-scale green hydrogen production for decarbonising key industries like fertiliser and steel manufacturing. The strategy sets a target of 15 million tonnes of renewable hydrogen annually by 2050, with interim export goals such as 200,000 tonnes by 2030. Several initiatives support this vision, including the Hydrogen Production Tax Incentive, Hydrogen Head Start, and the Clean Hydrogen Trade Programme, with a strong emphasis on exports to Japan. However, uncertainty around long-term policy support continues to challenge investment and industry confidence.

A convergence of priorities

The green hydrogen space relies on low-cost clean electricity and technology. Currently, the levelised cost of green hydrogen in Japan is two to three times higher than that of the global leader, China. Japan's limited capacity for renewable energy means that it will likely remain expensive, and clean electricity remain a significant challenge. The challenge escalates with the significant cost advantage of Chinese electrolysers, which provide strong competition in the global market for technological leadership.

The converging policy priorities in Japan and Australia underscore the need for terawatts of new renewable power and hundreds of billions of dollars in investment, not only in production facilities but also in the supporting infrastructure required to transport, store and use hydrogen effectively. Alignment through bilateral agreements is critical – for example, Australia's Guarantee of Origin framework for green hydrogen explicitly integrates with the EU's established green hydrogen certification system. Similar frameworks are needed with other trading partners, such as Japan.



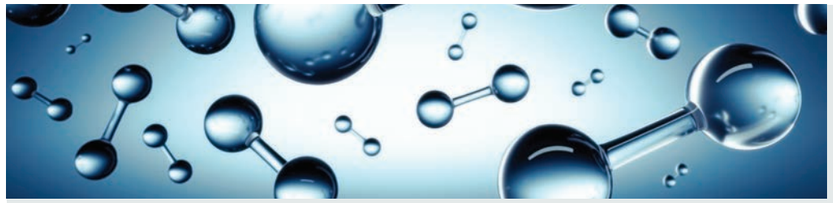
The renewable hydrogen value chain

Experts consulted by ATSE highlighted that an Australia and Japan partnership is strategically important for both nations, focusing on two areas: midstream transport and end-use technologies.

Chemical production, including ammonia and methanol, was seen as having the highest potential for hydrogen use (66%), followed by steel and fertiliser (54%), transport (48%), energy storage (34%), and residential power (32%).

Innovative business models, including government-led infrastructure investments, are needed to attract further industry investment. Emphasis on lifecycle resource recovery, such as designing systems for reuse and adopting models such as equipment rental, could further enhance economic sustainability.
The complex nature of hydrogen technologies requires a collaborative approach that spans domains including energy conversion, storage, transport and related business models.

This report provides recommendations including on joint R&D projects knowledge sharing through cross-border educational exchanges, and infrastructure development for hydrogen supply chains.



Technology readiness assessment

SCALE	NOT READY	A LOT OF WORK REQUIRED	MODERATE WORK REQUIRED	SOME WORK REQUIRED	READY
READINESS INDICATOR	○	◔	◑	◕	●

ASSESSMENT					
	Production infrastructure capacity	Storage & distribution infrastructure	Transportation infrastructure	Skills availability	Financing availability
READINESS	◔	◔	◔	◑	◔

Experts evaluated the technological readiness of the green hydrogen value chain between Australia and Japan. Five key dimensions of the value chain were assessed.

1. Production infrastructure capacity

High production costs and limited large-scale capacity hinder hydrogen industry growth. Reducing the cost of electrolysers and renewable energy technology is essential for making green hydrogen more competitive.

The limited availability of renewable energy sources co-located with production plants or sustainable water supply is also an issue. Ensuring the reliability of supply production sites requires new and augmented water infrastructure, such as desalination and water purification plants, dams and pipelines.

These challenges are compounded by evolving energy policy and slow progress in developing necessary production infrastructure capacity. While there has been some investment in research and pilot projects the transition from conceptual work to practical, large-scale implementation of production capacity remains slow.

2. Storage and distribution infrastructure

Storage infrastructure is one of the least-developed parts of the hydrogen supply chain, with current solutions not meeting the scale required.

Existing gas pipelines can only handle up to 10% hydrogen due to the limitations of steel pipeline materials. This restricts the potential for using existing infrastructure for hydrogen transport. Research is needed to develop new approaches for the pipeline transportation of 100% hydrogen.

High storage and distribution costs are a barrier to the uptake of hydrogen. This highlights the need for shared, integrated infrastructure to lower costs and improve efficiency.

3. Transportation Infrastructure

Another key challenge is the distance between production sources and hydrogen demand centres. Shipping hydrogen over long distances is a major technological and economic challenge. It is more cost-effective and efficient to produce the final products at the demand site, bypassing transportation issues.

The Hydrogen Energy Supply Chain project is an example of a potential hydrogen transport solution. The flagship project was designed to overcome the technical challenges in the maritime transport of liquified hydrogen between Australia and Japan. The initiative resulted in collaboration between both nations on the Suiso Frontier, a liquefied hydrogen carrier ship. Despite advancements, scaling such transportation projects to a commercial level remains costly. The slow progress in developing port and terminal infrastructure, is also a key readiness gap.

4. Skills availability

Respondents highlighted that hydrogen-specific skills could be achieved by retraining personnel from traditional energy sectors. While there is potential to repurpose these existing skills and supplement them with expertise from pilot-scale hydrogen projects, significant effort is still required to build a workforce capable of supporting the hydrogen economy at scale.

The skills gap poses a barrier not only to infrastructure development but also to the overall scalability and sustainability of the hydrogen value chain.

Australia is investing in education and training programs to build a skilled workforce for the hydrogen industry through programs like the ARC Training Centre for the Global Hydrogen Economy. This includes partnerships between industry, government and educational institutions to develop specialised training courses and apprenticeships.

5. Financing availability

Innovative, low-carbon projects in Australia are not financially supported to the extent necessary to reach viability. The absence of a bankable offtake scheme further complicates financing.

The importance of strengthening the introduction and formation of a market for hydrogen was also highlighted. This would enable the development of economies of scale and could aid in addressing the price challenge. A transition to a green and competitive energy structure will require cross-sector collaboration and stronger public-private partnerships.

Recommendations for an Australia-Japan hydrogen partnership

Japan's Hydrogen Society Promotion Act and Australia's revised 2024 National Hydrogen Strategy highlight both nations' shared commitment to low-carbon hydrogen.

However, high energy costs, regulatory delays and technological uncertainties have impeded progress in establishing a bilateral value chain.

Globally major hydrogen energy operators have been confronted with the problem of rising energy costs and investment risks in the development of hydrogen and ammonia businesses, and in the creation of hydrogen energy supply chains. Despite setbacks, there is potential for revitalising bilateral collaboration through targeted policy initiatives.

While stakeholders consulted see long-term potential, 65% expect the market to underperform without addressing key barriers. New collaborative models must be developed to address these unique challenges. Given the complexity of certifying and ensuring the environmental integrity of hydrogen supply chains, policy and regulatory alignment, experts advise that more dedicated government-led action and investment is needed to scale the value chain.

Partnerships between government, industry and research institutions are essential for creating sustainable business models. NGOs also play a key role in managing land use, cultural heritage and environmental impacts. By addressing regulatory gaps, advancing R&D and fostering collaboration through targeted initiatives, the Australia-Japan hydrogen value chain could be a global leader in the clean energy transition.

RECOMMENDATION 1

Support for collaborative innovation

Introduce incentives to encourage technological advancements and cost efficiencies in hydrogen production to improve cost competitiveness in global hydrogen markets.

Establish support for resource and technology sharing initiatives between Australian and Japanese researchers and industry.

Foster bilateral projects that integrate renewable resources and advanced hydrogen technologies to drive industry growth.

RECOMMENDATION 2

Policy and regulatory alignment

Harmonise regulatory frameworks and certification standards to streamline trade and cooperation.

Ensure mutual recognition between Japanese and Australian regulators of quality and safety standards in hydrogen production and distribution.

RECOMMENDATION 3

Skills development

Launch joint training programs to leverage technological expertise and share best practices to address skill gaps in the hydrogen workforce.

Invest in proven approaches to developing a skilled workforce to sustain industry growth and innovation.

This summary version of *The Australia-Japan renewable hydrogen value chain* report provides an overview of key recommendations and context for the broader hydrogen transport, manufacture and distribution industries across the two countries.

To read the full report, please follow the QR Code or visit the ATSE website.

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