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Key Policy Challenges for Hydrogen and Its Derivatives and CCS in 2026

－Efforts and Issues Toward Full-Scale Societal Deployment－

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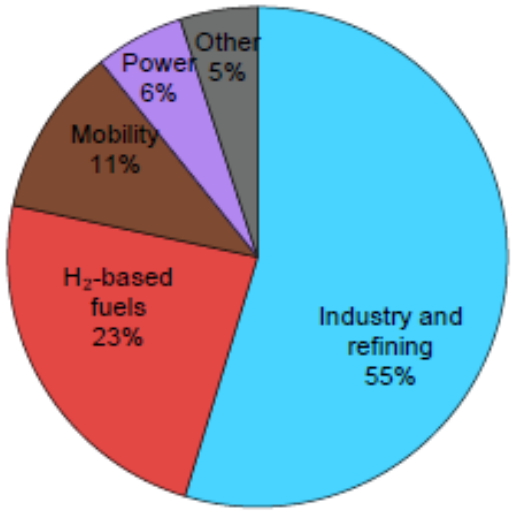
The Role and Current Status of Hydrogen and Its Derivatives in Achieving Carbon Neutrality

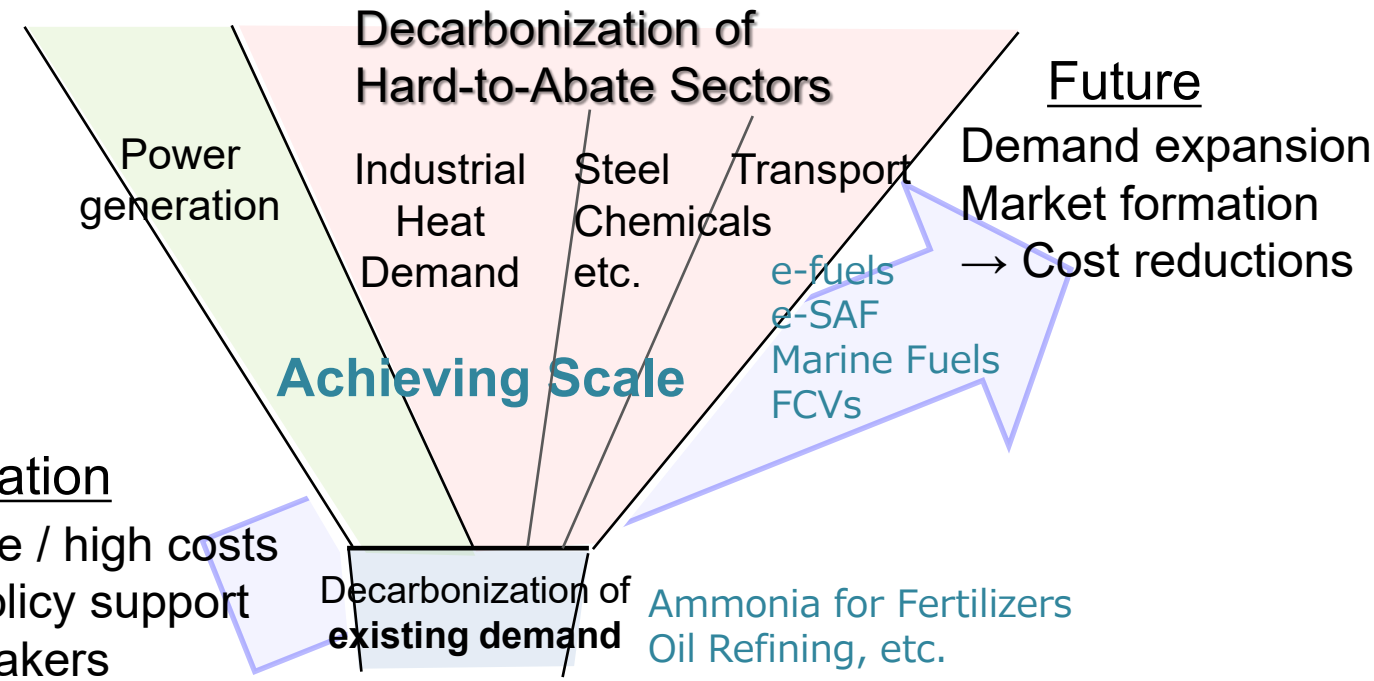
- At present, the use of hydrogen and its derivatives is primarily focused on substituting existing demand. In the longer term, their application is expected to expand to hard-to-abate sectors.
- There remains a substantial gap between the current situation and a society in which hydrogen and its derivatives are effectively utilized. Advancing the transition toward a hydrogen-based society requires appropriate policy support and market design.

Investment in Hydrogen and Its Derivatives[1)]

Annual investment by end-use in low-carbon hydrogen and derivative production in 2024 (USD 7.9 billion)



Significance and Roles of Hydrogen and Its Derivatives



1) Source: IEA, Global Hydrogen Review 2025; partially translated and edited by the presenter

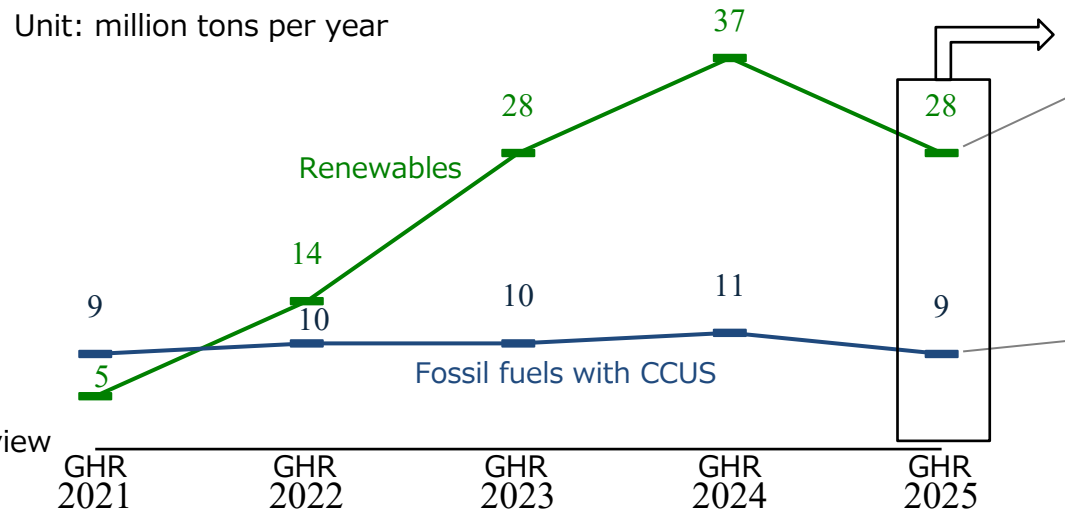
Global Development of Hydrogen and Hydrogen Derivative Production Projects

- Cancellations and delays in hydrogen production projects have become increasingly common, reducing the scale of potential supply. Even if all feasibility-stage projects proceed, supply would only meet the IEA APS (2024), while FID projects remain limited.
- Meanwhile, support measures and regulatory frameworks—particularly in Europe—are advancing, and global hydrogen production and committed investments continue to increase.

⇒ Hydrogen remains essential for decarbonization. Despite challenges along the pathway, progress toward deployment is underway globally.

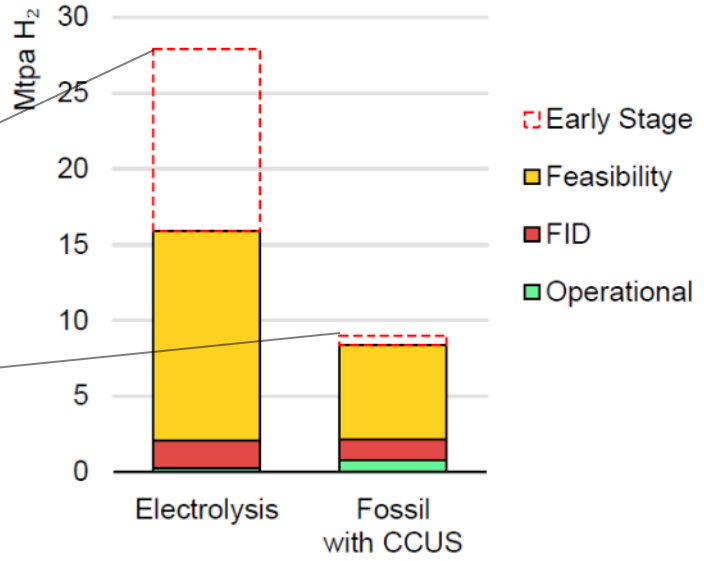
Hydrogen and Hydrogen Derivative Projects by 2030 (Cumulative Production Capacity)

Production Project Capacity in IEA Annual Reports



※GHR：
Global Hydrogen Review

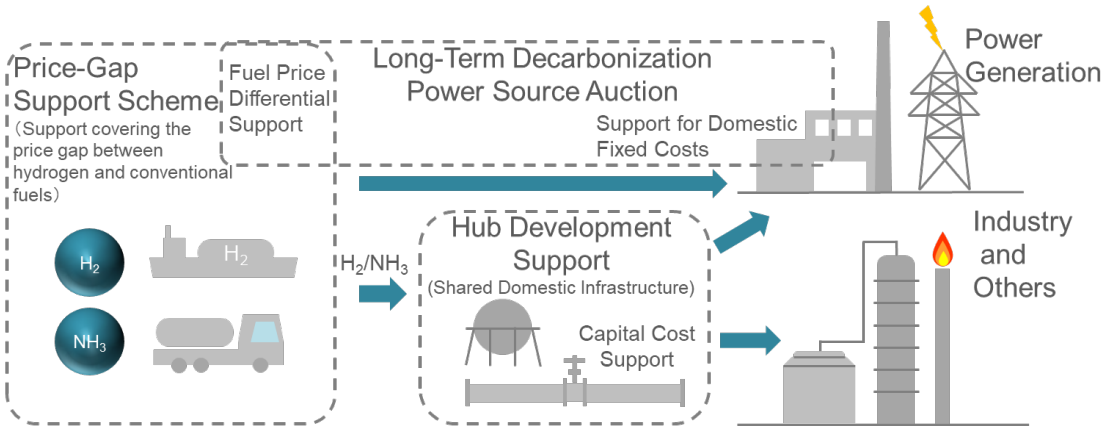
Breakdown by Project Development Status



Source: IEA, Global Hydrogen Review 2025; partially edited and reorganized by the presenter

Progress in Japan's Hydrogen-Related Policies in 2025

- Price-Gap Support Scheme (CfD-Type)
  - Two domestic projects have been selected, with evaluation ongoing. (In addition, two overseas projects were newly selected in December 2025.)
- Long-Term Decarbonized Power Source Auction (3rd Round)
  - The upper price cap was raised to a level that enables project deployment.
  - Variable costs, including fuel costs, can now be included in bid prices.
  - 100% hydrogen- and 100% ammonia-fired generation are also eligible.



Price-Gap Support Scheme (CfD-Type): Two Selected Domestic Projects

Project developer	Overview	Hydrogen/Ammonia Supply Volume	
Toyota Tsusho/ Aichi Steel/ others	Hydrogen produced via water electrolysis using electricity from onshore wind power. The hydrogen will be used as fuel for steel reheating furnaces.	1,600 tH_2/year	⇐ Hard to Abate sectors
Resonac / Nippon Catalyst	Hydrogen obtained through gasification of waste plastics and waste clothing is used as feedstock to produce ammonia. Ammonia derivatives for fiber materials will be manufactured and sold.	20,815 tNH_3/year ＝3,234 tH_2/year	⇐ Substitution of existing demand

Upper Price Caps in the Long-Term Decarbonized Power Source Auction

Unit: JPY 10,000 per kW per year

		2nd Round	3rd Round
New build	Hydrogen co-firing (≥10%)	10	13.4
	100% hydrogen firing	-	79.5
	100% ammonia firing	-	30.3
Retro fit	Hydrogen co-firing (≥10%)*	10	76.2
	Ammonia co-firing (≥20%)*	-	37.8

2nd round: Domestic fixed costs + variable fixed costs
3rd round: Domestic fixed costs + fuel price gap; capacity factor set at 40%.
*The 3rd round includes 100% firing.

Source: Agency for Natural Resources and Energy; company press releases, https://www.aichi-steel.co.jp/news/mt-assets/docs/20250930_news2.pdf

Key Focus Areas in Japan's Hydrogen-Related Policies for 2026

- Selection and Progress of Hydrogen-Related Support Projects
  - Selection of projects under Price-Gap Support Scheme
    - As one of the world's largest support programs, it has a significant impact on hydrogen projects both in Japan and abroad.
    - Progress and outcomes of the selection of large-scale projects, including those involving imported hydrogen and its derivatives.
  - Outcomes of the third round of the Long-Term Decarbonization Power Source Auction.
  - Selection and progress of hub development support for building large-scale supply chains.

- Enabling conditions for strategic investment and market design to expand hydrogen use
  - Market and incentive design that allows hydrogen and its derivatives to generate economic value.

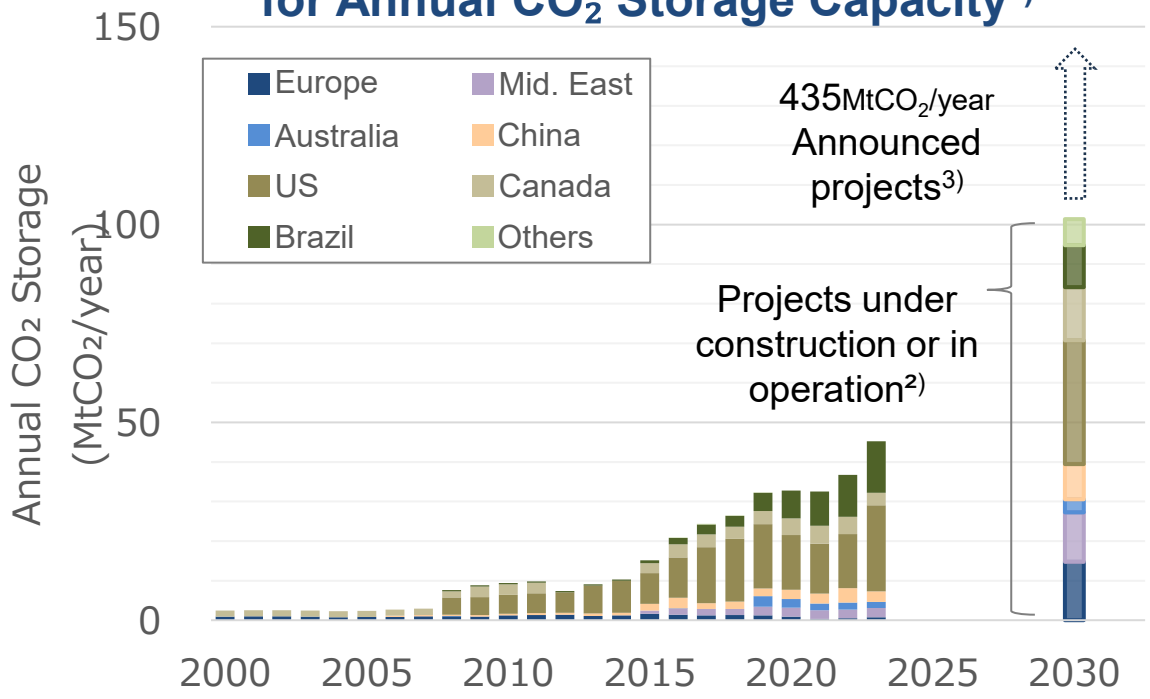
- Long-term strategies and support looking beyond 2030
  - Support and policy design for the commercialization of hydrogen-based fuels, including synthetic fuels (e-methane, e-fuels) and ammonia for maritime use.

Trends and Outlook for CCS Projects Worldwide

- CO_2 storage volumes are expected to continue increasing, with cumulative capacity of operating and under-construction projects reaching around 100 million ton-CO_2/year.
- Concrete progress in CCS projects is being observed, particularly in Europe.
- While tax credits under the U.S. IRA have been maintained, developments regarding the proposed repeal of EPA GHG emissions reporting requirements warrant close attention.

※Note: EPA = U.S. Environmental Protection Agency

Historical Trends and Outlook for Annual CO_2 Storage Capacity[1)]



Examples of CCS Projects Worldwide

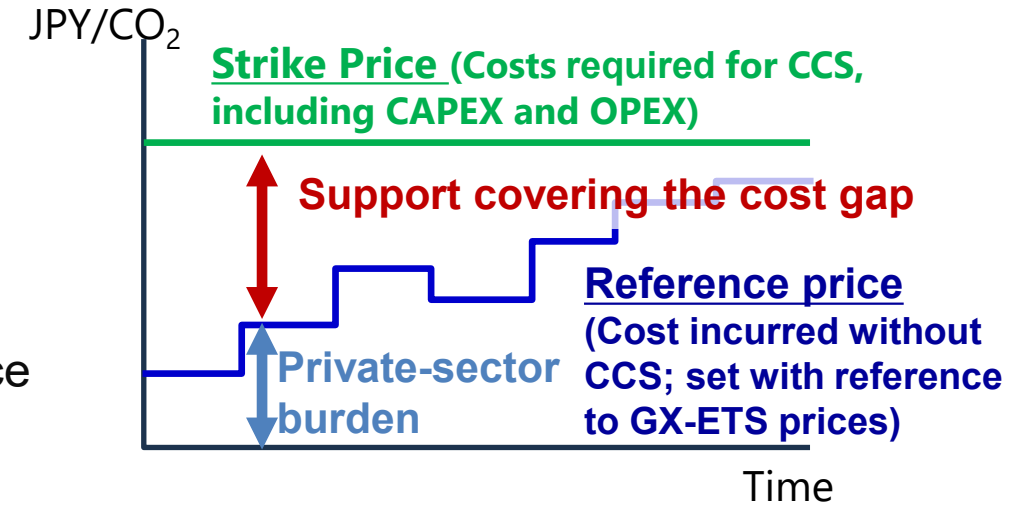
Country / Project	Annual Storage Capacity	Start of Operation	Remarks
Norway Northern Lights	1.5Mt-CO_2 +3.5Mt-CO_2 (Phase 2)	In operation (Phase 2, FID approved)	CO_2 injection commenced in August 2025
Danmark Greensand	0.4Mt-CO_2～ expandable up to 800Mt-CO_2	2026 (FID approved)	
UK Northern Endurance partnership	4Mt-CO_2～ expansion potential	2028 (FID approved)	
US Blue point	230万t-CO_2	2029 (FID approved)	Large-scale blue ammonia project

Sources:
1) Historical annual CO_2 storage up to 2023, compiled by the author based on the database below: Gao, X., & Krevor, S. "The London Register of Subsurface CO_2 Storage" (2025.11), Imperial College London, https://zenodo.org/records/17604565
2) CO_2 storage capacity of projects with Final Investment Decision (FID), compiled by the author based on: IEA, "CCUS Projects Database" (2025.4), https://www.iea.org/data-and-statistics/data-product/ccus-projects-database
3) IEA, "Carbon Capture Utilization and Storage", https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage
Based on various media reports and press releases

Progress in Japan's CCS Policies in 2025

- CfD-type support for CCS
  - Bridging the gap between the Strike Price (CCS cost) and the Reference Price (CO_2 cost)
  - Applicable to domestic pipeline-based projects
  - Targeting FID around 2026 and commercial operation from the early 2030s
- Eligible for bidding under the long-term decarbonized power source auction
  - Thermal power with CCS added; retrofit projects eligible
  - Minimum capture rate of 20% required (comparable to minimum hydrogen/ammonia co-firing rates)
- Progress in CCS project studies and detailed regulatory design under the CCS Business Act
  - Two designated areas selected for exploratory drilling
  - Regulatory design for monitoring, leakage prevention, future site closure, and cost allocation

Support through CfD settlement



3rd Long-term Decarbonized Power Source Auction: Price Caps for Thermal Power with CCS

		Price Cap
Retrofit projects	≥20% CCS (coal-fired)	JPY 137,000 /kW/year
	≥20% CCS (LNG-fired)	JPY 137,000 /kW/year

Source: Agency for Natural Resources and Energy (ANRE)

Key Focus Areas in Japan's CCS Policies for 2026

- Advancement of detailed support rules and selection of eligible projects
  - Development of detailed ordinances and technical standards for operations (e.g., post-closure monitoring periods, levy schemes, and safety standards)
  - Implementation and evaluation of exploratory drilling for domestic storage sites
  - Selection of CfD-type support for CCS
  - Allocation of a portion of the JPY 20 trillion GX funding to CCS
- Consideration of CCS support schemes using ship-based transport
  - Design of policy frameworks and cost-reduction measures for ship transport and overseas storage
  - For advanced CCS support projects involving ship transport, support may include component-by-component support across the value chain.
  - For cross-border CCS, intergovernmental coordination is proceeding in line with the London Protocol (a memorandum of cooperation was signed with Malaysia in October)
  - Efforts toward developing international frameworks for CO_2 accounting, including ISO standards
- Initiatives aimed at overall cost reduction
  - Standardization of loading/unloading and transport infrastructure
  - Optimization of the entire capture–transport–storage value chain