HYDROGEN FINANCING FOR CLEANER ENERGY

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CLEAN HYDROGEN POWER GENERATION

Clean hydrogen Power Generation uses hydrogen produced via renewable powered electrolysis (green hydrogen) or low-carbon methods to generate electricity, emitting only water vapor. Key technologies include hydrogen fuel cells and turbines, acting as a flexible, dispatchable, and storable energy source to decarbonize power grids and replace fossil fuels.

Key Aspects of Clean Hydrogen Power

Production Methods:

- Green Hydrogen: Produced by splitting water (H2O) into hydrogen and oxygen using renewable electricity (solar, wind, hydro) via electrolyzers.
- Low-Emission Methods: Nuclear energy or fossil fuels combined with Carbon Capture and Storage (CCS) are also used to produce clean hydrogen.

Generation Technologies:

- Fuel Cells: Electrochemical devices that convert hydrogen directly into electricity with high efficiency (50%-60%), producing only water vapor.
- Gas Turbines: Existing power plants can be retrofitted to burn hydrogen or a hydrogen-natural gas blend to generate electricity, with goals of 100% hydrogen operation.

Role in Energy Systems:

- Storage & Dispatchability: Hydrogen acts as a long-duration energy storage solution, allowing surplus renewable energy to be stored for weeks or months.
- Decarbonization: It is essential for decarbonizing heavy industry and high-demand, hard-to-abate sectors.

Challenges:

- Cost: Green hydrogen remains expensive ($2.28–7.39/kg) compared to gray hydrogen ($0.67–1.31/kg).
- Infrastructure: Limited, specialized infrastructure is needed for transport and storage, as hydrogen is low-density and requires high pressure or extreme cold (- 423 Degrees Fahrenheit).

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CLEAN HYDROGEN - A CORNERSTONE OF THE GLOBAL ENERGY TRANSITION

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Clean hydrogen has emerged as a cornerstone of the global energy transition, particularly for sectors that are difficult or impossible to decarbonize through direct electrification. These include steelmaking, long-haul transport, chemicals, shipping, and aviation. The clean hydrogen positions not merely as a climate solution, but as a Development Enabler.

From a development perspective, hydrogen acts as an energy carrier that can convert abundant renewable resources—especially solar and wind—into exportable, storable, and dispatchable energy.

This feature makes hydrogen uniquely valuable for EMDCs with strong renewable endowments but limited domestic demand or grid capacity.

Countries in the Middle East, Latin America, Africa, and parts of Asia could leverage hydrogen to move up global value chains rather than remaining raw energy exporters.

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MARKET STATUS, PATHWAYS AND GLOBAL OUTLOOK

The global hydrogen market today is dominated by fossil-based production, primarily for oil refining and fertilizer manufacturing. Roughly 100 million tons of hydrogen are produced annually, generating nearly 1 Giga tons of CO_2 emissions. Clean hydrogen, both renewable (green) and low-carbon (blue) remains marginal, despite decades of technological readiness.

Emerging markets are expected to contribute around half of global clean hydrogen supply by 2030, amounting to approximately 20 million tons annually.

This projection is driven by superior renewable resource availability and lower land and labor costs.

However, current project pipelines reveal a mismatch: while 39 percent of announced projects are in EMDCs, very few have progressed to final investment decision (FID).

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INVESTMENT NEEDS AND THE SCALE OF THE FINANCING CHALLENGE

The estimated global investment needs of nearly USD 3 trillion by 2030, including production facilities, transport infrastructure, and end-use applications. Of this, EMDCs alone will require approximately USD 100 billion per year throughout the decade. Achieving projected hydrogen deployment levels requires unprecedented capital mobilization.

Despite these needs, actual financing flows remain modest. Only a small fraction of announced projects have secured funding, and less than 10 percent of global hydrogen projects have reached FID. This gap highlights not a lack of interest, but a lack of bankability.

Cost Structure and Economic Viability of Clean Hydrogen

The cost of clean hydrogen is highly variable and context dependent. Best-in-class renewable hydrogen projects today achieve costs of USD 3 per kilogram, while less favorable conditions can push costs above USD 10 per kilogram. In contrast, conventional hydrogen remains significantly cheaper, creating a persistent competitiveness gap

- Financing gap
- Renewable power generation
- Market Trends and Consumption Habits
- Blended instruments

Investment Needed to Develop Announced Projects Covering the Hydrogen Value Chain Through 2030 (billions of U.S. Dollars), and Project Investment Volume Growth 2020–23

Source: The figure was adapted from Hydrogen Council 2022.

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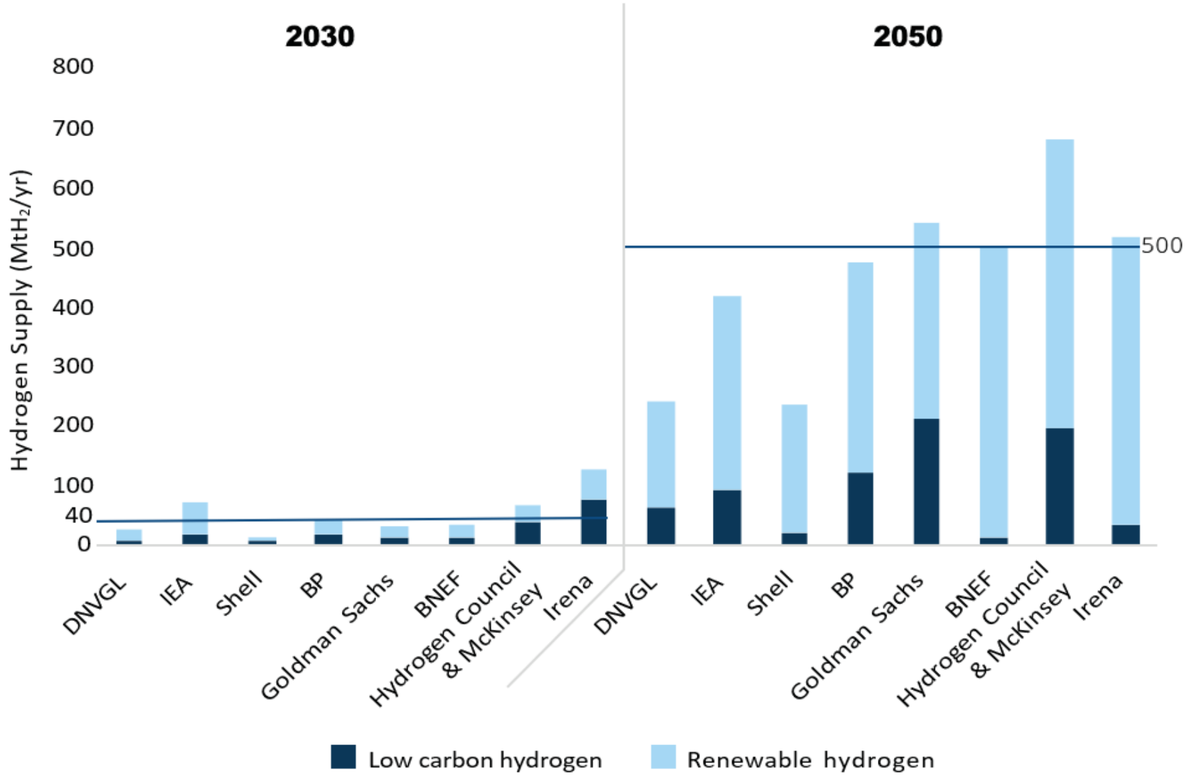
HYDROGEN IN THE GLOBAL ENERGY TRANSITION AND CURRENT PROJECTS

Hydrogen in the Global Energy Transition and Decarbonization Scenarios



Clean Hydrogen Projects with a Final Investment Decision in EMDCs (excl. China), as of January 2023

NAME	COUNTRY	COMMISSIONING	APPLICATION	ELECTROLYZER CAPACITY (MW)
Power-to-Gas Coquimbo	Chile	2022	Grid injection	0.15
NTPC-Technip-L&T MeOH Project, Vindhyachal	India	2022	Methanol	5
Simhadri Microgrid	India	2022	Power	0.24
GAIL Vijaipur Project	India	2023	Other industry	10
Unigel, Phase I (Camacari)	Brazil	2023	Ammonia	60
Renewable Falcon, Phase I	Argentina	2024	Synfuels	6.7
Haru Oni	Chile	2022	Synfuels	1.2
Egypt Renewable OCI/Fertiglobe/Scatec	Egypt	2022/2024	Ammonia	10 (phase 1)/100
NEOM	Saudi Arabia	2026	Ammonia	2,000

Source: IEA 2022 and World Bank Data.

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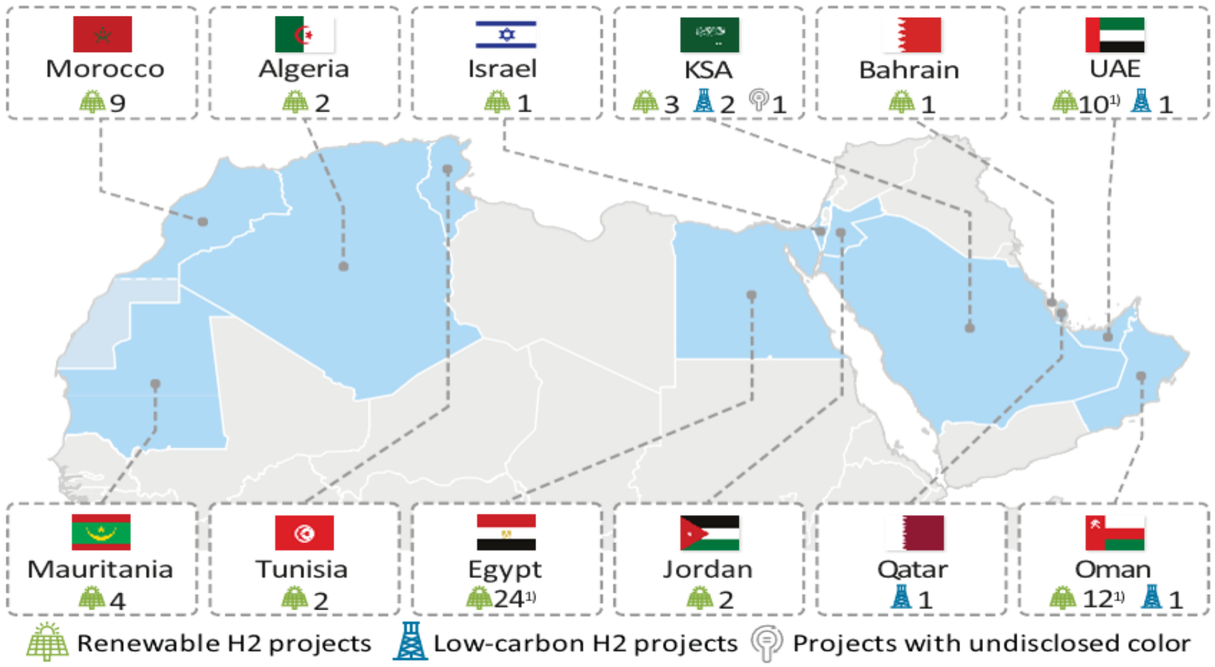
GREEN HYDROGEN PROJECTS IN MENA

Total of 76 projects across MENA with >85% projects geared towards producing renewable hydrogen



1) Includes some yellow H2 projects

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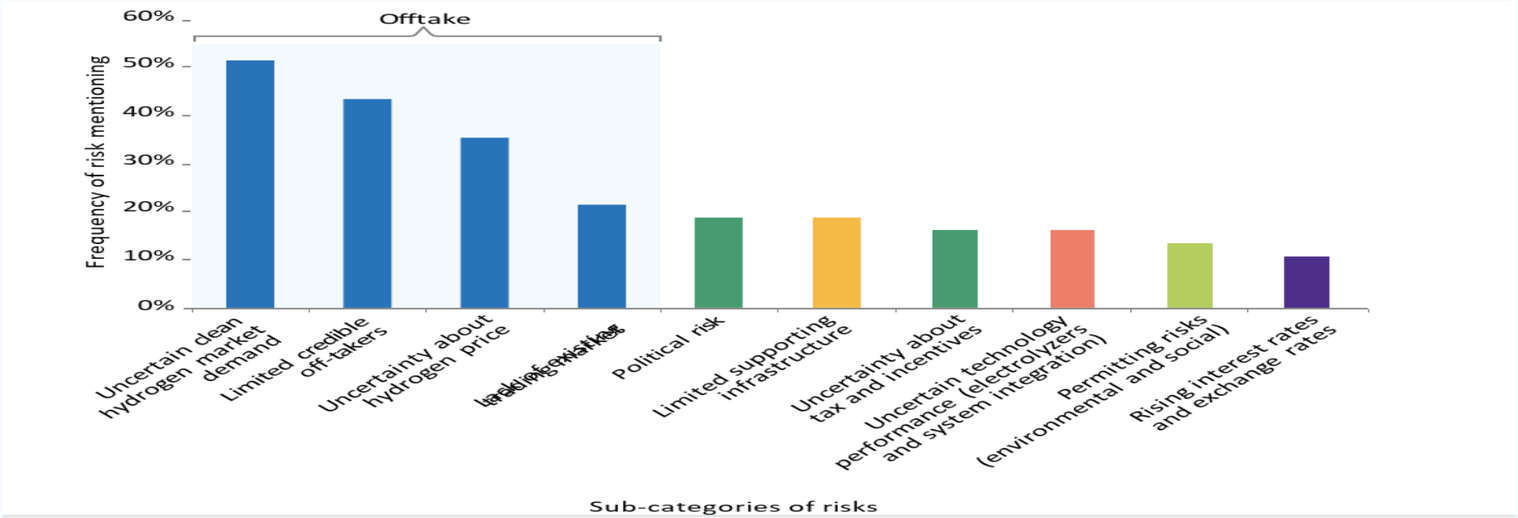
RISK LANDSCAPE AND BARRIERS TO FINANCING

Political and regulatory risks follow closely, particularly in EMDCs where policy continuity, permitting processes, and currency stability can be uncertain. Infrastructure risks—such as access to ports, pipelines, water, and power—also loom large

Technology risks, while declining, remain relevant due to limited operational experience at scale. Electrolyzer performance, system integration, and long-term durability still concern lenders

Macroeconomic risks, including interest rate volatility and foreign exchange exposure, further elevate financing costs. Even well-structured projects may face double-digit weighted average cost of capital.

Top 10 Identified Risks for Clean Hydrogen Projects in EMDCs



Financial and Policy De-risking

MDBs can play a decisive role by offering partial risk guarantees, currency hedging mechanisms, and concessional tranches that absorb early losses. These instruments reduce perceived risk and crowd in private lenders.

These include sovereign guarantees, political risk insurance, offtake guarantees, carbon pricing mechanism, blended finance structures, and results-based subsidies.

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CONCLUSION AND STRATEGIC TAKEAWAYS

Clean hydrogen represents one of the most capital-intensive yet transformative opportunities in the global energy transition. For emerging markets and developing countries, it offers a pathway to industrialization, export diversification, and long-term energy security—provided financing barriers can be taken care of.

Scaling hydrogen financing is not only a climate imperative—it is a development opportunity of historic scale. Success will depend on coordinated action, disciplined risk management, and a clear vision that aligns clean energy with inclusive growth by:

- Leveraging digital platforms for greater reach and engagement.
- Lighthouse project approach
- Targeting a portfolio of large-scale
- Diverse projects across EMDCs

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