

The Emerging Hydrogen Economy



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Key Takeaways

- Hydrogen is key to fighting climate change because it can be produced with near zero greenhouse gas emissions and can be used as a power source for both vehicles and industry.
- The hydrogen economy is beginning to emerge as both public and private companies are investing in hydrogen and fuel cell technology to accelerate the move away from fossil fuels.
- Hydrogen and fuel cell-related revenues remain a small part of the overall economy and typically represent tertiary product lines within larger companies with minimal associated revenues.
- The emerging hydrogen economy is dynamic and will grow quickly over the upcoming years. This paper introduces some of the product lines, technology, and companies driving the hydrogen ecosystem forward.

Introduction

One of the takeaways from Bill Gates and the team at Breakthrough Energy in their report *State of the Transition 2023 - Accelerating the Clean Industrial Revolution* was the importance of hydrogen-related technologies in the efforts to decarbonize energy. In our paper *The Journey to Carbon Neutral*, which reviewed the Breakthrough Energy report, we noted:

“The key for increasing renewables is tied to batteries being able to store the energy for use when needed. Long-duration energy storage technologies (LDES) provide the ability to use hydrogen fuel cells to both store and move energy to where it is needed.”

LDES was referred to as the holy grail in the Breakthrough Energy report. Per Bill Gates:

“Hydrogen could be a keyway to store renewable energy that powers cities where the sun isn’t shining or the wind isn’t blowing. That’s because hydrogen is the key ingredient in fuel cell batteries, and these batteries, unlike wind or sunlight, can be boxed up and shipped and stored for years before they’re converted back into energy.”¹

Hydrogen technologies will support the transition to renewable energy. While many of these technologies are early in their development as illustrated by the present size of the investable universe of companies with hydrogen related businesses, the growth outlook is favorable. The global hydrogen market revenue is estimated to grow from \$206.6 billion in 2022 to \$761.3 billion by 2040 at a CAGR of 7.5% during the forecast period.²

Syntax’s Hydrogen and Fuel Cell Lens

We analyzed the exposure of the MSCI All Country World Index (ACWI) to Syntax’s Hydrogen and Fuel Cell Lens and identified 54 companies that report hydrogen-related product lines. Of these 54 companies, seven have multiple product lines within this lens, indicating that they do more than one thing in the hydrogen ecosystem.

Interestingly, most of these companies do not attribute any revenue to these product lines, highlighting the R&D and emerging nature of these businesses. As an example, “green” hydrogen, produced via the electrolysis of water, is not yet competitive with the cost-effectiveness of “gray” hydrogen, produced from methane and natural gas, which, based on 2021 data, represented 95% of the world’s hydrogen supply.³

However, given the level of research and capital being allocated to hydrogen R&D in both public and private markets, this is likely to change in the coming years. Working with Preqin, a leader in private market company data, we identified 35 investible US private firms with hydrogen-related product lines. Some of these companies will make their way to the public markets either through IPOs or acquisition. Additionally, we expect firms will begin to provide increasingly granular reporting of their hydrogen-related business lines with the goal of demonstrating their presence in this space to investors .

Our Hydrogen and Fuel Cell lens has six components, two related to hydrogen and four related to fuel cells, as shown in Exhibit 1.

Exhibit 1: Syntax Hydrogen and Fuel Cell Lens

HYDROGEN	Gas
	Equipment
FUEL CELLS	Industrial Use
	Power Generator
	Vehicles
	Materials & Components

Hydrogen Gas

Hydrogen gas is the largest of the six segments, with 30 companies reporting hydrogen gas product lines. These companies are involved in the end-to-end ecosystem of hydrogen gas, including production, terminals, and utilities. The product lines in this group include providing hydrogen gas for retail use, operating hydrogen pipelines, hydrogen research and development, and one firm characterized as a hydrogen utility for home heating.

Two notable companies in the space include:



Air Products is the world's leading producer of hydrogen. The company presently has \$15 billion committed globally to energy transition projects including green and blue hydrogen products. ⁴

Engie builds hydrogen pipelines and recently announced the first link in a cross-border hydrogen transport network in Europe, building a pipeline between France and Germany. ⁵

Hydrogen Equipment

Companies in this segment are involved in electrolysis design, and in the production

and maintenance of equipment used to generate hydrogen. There are 11 companies engaged in product lines related to hydrogen electrolysis equipment, equipment used in the hydrogen fueling process, tanks for storage, catalyst for hydrogen production, and the design of electrolysis equipment.

Two notable companies in the space include:



'TORAY'

Innovation by Chemistry

Air Liquide SA is a French company that produces hydrogen electrolysis equipment. It has entered a joint venture with Siemens Energy to develop large capacity electrolyzers to drive hydrogen applications in Europe.⁶

Toray Industries, Inc. is a Japanese based company focused on research and development of power generation and battery-related materials, and technologies making use of hydrogen, including electrolytes with catalyst coated membranes (CCM) – a key component for electrolyzers used in green hydrogen production.⁷

Fuel Cells – Industrial Use

This universe presently includes four companies, which service commercial, industrial and military entities utilizing fuel cells for power generation and storage. The German company profiled below, MTU Aero Engines, is focused on commercial aerospace solutions.

Two notable companies in the space include:



In June 2023 the company announced they are developing a complete liquid hydrogen fuel system for commercial aviation. The first application will be **MTU's** Flying Fuel Cell[™].⁸

Fuel Cells – Power Generators

Companies in this group generate electricity using fuel cells. This classification presently has just three companies, highlighting it is largely in its R&D phase. Below we profile the Southern Company, which is a utility engaged in the generation,

transmission, and distribution of electricity.



Southern Company

Southern Company is a utility that is evaluating a wide range of applications for hydrogen, including using hydrogen as fuel, as well as for distributed generation and long-duration energy storage.⁹

Fuel Cells - Vehicles

Companies in this group are end users of fuel cell power generation such as commercial vehicles, forklifts, and mass transit trains. Companies in this component include well known auto manufacturers such as General Motors, Honda, Mercedes Benz, and Stellantis. This group also includes Cummins, Inc., which has multiple

hydrogen related businesses.



Cummins is focused on three areas of hydrogen: the production of green hydrogen, the management and transportation of hydrogen, and the application of hydrogen in engines and fuel cells.¹⁰

Fuel Cells - Materials & Components

The seven companies in MSCI ACWI involved in this space provide platinum / platinum

concentrate which serve as catalysts in fuel cells to convert hydrogen and oxygen into electricity, heat, and water. Additional product lines include the production of fuel cell membranes and systems for fuel cell power generation. This group includes Anglo American and Fortescue.



Anglo American mines 40% of the world's platinum group metals which serve as catalysts for the production of hydrogen.¹¹

This Australian based company offers a diverse array of electrolyzer products, systems, and services including membranes to support green hydrogen production solutions.

Closing Comments

The nascent hydrogen economy is poised for future expansion. Numerous companies are developing technology to take advantage of the potential of hydrogen and fuel cells to reduce the use of fossil fuels. To assess the state of the investment opportunity in this space, we analyzed the product lines of the companies in MSCI ACWI using our Hydrogen and Fuel Cell lens. We found:

- While this industry is emerging, there are very few companies that receive most of their revenue from hydrogen and fuel cell-related activities.
- Most companies do not yet attribute any revenue to hydrogen related activities, as many product lines are in their research and development phase.
- Creating a diversified portfolio focused on this area at the present time is not practical as hydrogen is often a small component of most companies' revenue.
- As investors consider opportunities in this space, they need to think globally as many European companies, supported by government policies and regulations, have made significant investments in both hydrogen and fuel cell technology.

The focus on hydrogen and fuel cells is likely to intensify going forward as momentum builds around the potential associated with these technologies. As it does, we will be monitoring and capturing these changes and providing investors with the transparency needed to understand what they own, and to support their investment decision making.

To learn more, please visit syntaxdata.com.

¹ 2023 Breakthrough Energy Transition Report

² Hydrogen Market - Industry Dynamics, Market Size and Opportunity Forecast to 2040 (astuteanalytica.com)

³ IRENA - Green Hydrogen Supply, A Guide To Policy Making .pdf

⁴ Air Products Energy Transition

⁵ MosaHYc, the first link in a cross-border hydrogen transport network in Europe

⁶ Air Liquide.com building-future-renewable-hydrogen in Normand'Hy

⁷ To realize a Sustainable Society | Research and Development | TORAY

⁸ MTU Aero Engines and-MT Aerospace develop fuel system for liquidhydrogen

⁹ Southern Company 2023-esg-hydrogen fact sheet

¹⁰ cummins-fuels-hydrogen-commitment-agritechnica

¹¹ <https://www.angloamerican.com/products/platinum>

About Syntax

Syntax LLC is a financial data and technology company that codifies business models into a relational system we call Affinity Data™. Syntax operates through three segments: Affinity Data™, Syntax Direct™, and Syntax Indices™. Using its patented FIS® technology inspired by systems sciences, the Affinity Data™ segment offers the most comprehensive, granular, and accurate product line revenue data available on the market. The Syntax Direct™ segment then uses this abundance of data to facilitate the near instantaneous creation and ongoing management of boundless direct indexing solutions and rules-based equity portfolios through a fully automated platform. The Syntax Indices™ segment offers customized and proprietary indices, including core global benchmarks and micro- and macro-thematic, smart beta, defined outcome, and target volatility indices. These indices are foundational for a range of financial products, such as ETFs, UITs, and structured products.