



Graforce awarded DARCY 2024 TOP INNOVATORS: HYDROGEN!

January 20, 2025

We are pleased to announce that Graforce has been recognized as a TOP INNOVATOR 2024: HYDROGEN!

This award is presented by Darcy Partners, a leading U.S. technology scouting firm that identifies and recognizes companies making groundbreaking contributions to the hydrogen industry. The selection is based on customer feedback from pilot projects and commercial deployments, as well as industry interest gathered through the Darcy Connect platform.

Our plasma technology enables hydrogen production from various waste and feedstock sources, including natural gas, biogas, industrial wastewater and ammonia, and offers a sustainable way to decarbonize energy-intensive industries.

A big thank you to our dedicated team, partners and customers who have supported us along the way. Together we are shaping the future of clean hydrogen!

Hydrogen Production

Methane Pyrolysis

- **Graforce**: Graforce GmbH, founded in 2012 by Dr. Jens Hanke in Berlin, is a pioneering technology company. Their Plasmalyzer® systems uniquely convert high-energy chemical compounds from streams like natural gas, biogas, industrial water, and ammonia into CO₂-free hydrogen, solid carbon, nitrogen, etc. With partnerships including RAG Austria AG, Kawasaki Turbine Europe, and GASNET, the company offers modular plasma electrolysis systems (Plasmalysis) that can be integrated into existing infrastructure, producing valuable byproducts like solid carbon for industrial applications such as steel, concrete, and electrode materials. Graforce's technology addresses decarbonization challenges across multiple sectors including energy, transportation, and industry, with the ability to generate hydrogen at a cost of €1.5-3 per kg. Graforce was a featured speaker in the [Hydrogen Innovation Forum](#) hosted in June, and will share the results of their CHP deployment with Kawasaki Turbine at our [State of Innovation: Hydrogen](#) event on January 21, 2025.

Electrolysis

- **Electric Hydrogen**: Electric Hydrogen is focused on large-scale, low-cost green hydrogen production utilizing advanced electrolyzer technology. The company operates multiple facilities, including an R&D Center in Natick, MA, and a Giga-Factory in Devens, MA, set to begin operations in early 2024 with a capacity of 1.2 GW. Recently securing \$380 million in Series C funding, part of over \$600 million raised since 2020, Electric Hydrogen aims to provide affordable green hydrogen through 100 MW electrolyzer systems tailored for industries such as ammonia and steel production. Their technology features advanced Proton Exchange Membrane (PEM) systems that enhance efficiency and reduce costs by producing high hydrogen



output with fewer stacks. The company also offers specialized analytics tools to help clients understand the economics of green hydrogen production.

- [Enapter](#): Enapter specializes in the design and manufacturing of Anion Exchange Membrane (AEM) Electrolyzer, which convert renewable electricity and water into green hydrogen. Their AEM technology combines the cost-effectiveness of alkaline electrolyzers with the operational flexibility of Proton Exchange Membrane (PEM) systems, enabling efficient adaptation to variable outputs from renewable energy sources like wind and solar. Enapter's product lineup includes the AEM EL 4 electrolyzer for smaller hydrogen needs, the AEM Flex 120 for applications up to 480 kW, and the AEM Nexus 1000 for megawatt-scale projects. With over 5,000 units deployed globally across more than 55 countries, Enapter's modular systems are designed for scalability and ease of integration, supported by their Energy Management System Toolkit that facilitates energy management.

Carriers Cracking and Membranes

- [H2Site](#): H2SITE is a technology company specializing in membrane reactor systems that produce and separate high-purity hydrogen from various feedstocks including ammonia, methanol, natural gas, and syngas using advanced palladium-alloy membranes. They have solutions including membrane separation of hydrogen-methane blends and membrane reactors for "cracking" hydrogen from various carriers. Their technology enables hydrogen production and separation in a single step, offering high efficiency, reduced footprint, low emissions, and high flexibility across multiple applications including maritime, natural gas infrastructure, and hydrogen storage. The company provides two business models - turnkey solutions for smaller-scale systems (up to 20 tons H₂/day) and membrane reactors for large-scale installations. H2Site was a featured speaker in the [Hydrogen Innovation Forum](#) hosted in June.

Geologic Hydrogen

- [Koloma](#): Koloma, a geologic hydrogen startup, is dedicated to extracting carbon-free hydrogen from natural underground deposits using a data-driven approach. The company has established strong partnerships with prominent clean energy investment funds, including Breakthrough Energy Ventures and Amazon's Climate Pledge Fund, raising \$245 million in its Series B funding round in 2024, following an earlier \$91 million in 2023. Koloma has drilled seven exploratory wells across the U.S. since 2022 and is focused on leveraging advanced analytical tools and geochemical research at its Ohio State University lab to enhance hydrogen production processes. With plans to supply clean hydrogen to key sectors like transportation and industrial manufacturing, Koloma aims to position itself as a leader in the emerging geologic hydrogen market.



Hydrogen Enabling Technology

Pipeline Coating

- **Arculus Solutions**: Bulk transportation of CO₂ and hydrogen is a crucial development in our efforts to reach net zero by 2050. While using the extensive US 320,000-mile grid of natural gas transmission pipelines seems the simplest, fastest and most cost-effective solution, those pipes suffer (i) strong corrosion from carbonic acid in the case of CO₂, and (ii) hydrogen embrittlement leading to high leak rates and catastrophic failures when blending even small percentages of hydrogen with natural gas. Arculus brings to market an autonomous robot (the SputterPig™) able to travel inside natural gas pipelines while applying a patent-pending coating developed at MIT. This coating, made of alternating layers of aluminum and aluminum oxide, is inert to carbonic acid and impermeable to hydrogen. Arculus aims to commercialize this solution through partnerships and pilot tests in Europe, North America, and Australia. The coating creates a physical barrier to hydrogen making it a cost-effective alternative to pipeline replacement. Additionally, Arculus has patented technology for actively removing diffused hydrogen from steel substrates, enhancing the longevity and safety of existing pipeline networks while facilitating the transition to hydrogen as a clean energy source.

Sensors

- **Insplorion**: Insplorion is a technology company specializing in innovative hydrogen detection solutions utilizing nanoplasmonic sensing technology with Pd-alloy nano-discs, capable of providing highly specific and rapid hydrogen detection across various industries including ammonia production, aviation, maritime, and chemical sectors. Their cutting-edge detectors offer sub-second response times, can function in oxygen-free or inert environments, and leverage unique optical technologies like fiber optic remote detection, with the ability to detect hydrogen through concentration-dependent color changes when hydrogen is absorbed. With a strategic roadmap focused on commercial deliveries, field testing, and plans to launch an ATEX-certified Hydrogen Leak Detector in Q1 2025, Insplorion aims to offer sensors with long operational lifespans. Insplorion was a key speaker in the **Hydrogen Engineering Challenges VI: Sensors** event hosted in September.

Software

- **Blackcurrant**: Blackcurrant, founded by Akshay Thakur and Yaroslav Kharkov as part of the New Venture Challenge at the University of Chicago Booth School of Business, is a B2B marketplace designed to accelerate hydrogen project commercialization and streamline hydrogen procurement and trading. Launched in August 2023, the platform addresses the complexities and high costs associated with hydrogen transactions by leveraging advanced market intelligence and a proprietary AI engine, potentially reducing transaction costs from over 20% to 3% and closing times from several months to as little as one day. Blackcurrant connects various stakeholders in the hydrogen ecosystem, including producers, consumers, and



distributors, while providing transparency in pricing and supply through its data-driven approach. The company aims to enhance market efficiency and accessibility for both established players and new entrants in the hydrogen market. Blackcurrant was a key speaker in the [Hydrogen Engineering Challenges V: Digital Solutions](#) event hosted in August and presented at Darcy Partner's [H2 Innovation Forum](#).

Hydrogen Integrated System

Green Steel Production

- [Stegra](#): Stegra, formerly known as H₂ Green Steel, is a pioneering Swedish company dedicated to decarbonizing heavy industry, starting on green steel production. The company has secured €6.5 billion in a combination of debt and equity funding. Their flagship facility in Boden, Sweden, set to start production in 2026, represents a groundbreaking 3-in-1 solution that integrates hydrogen production, iron reduction, and steel manufacturing using entirely renewable energy sources. Utilizing a 700 MW electrolyzer powered by wind and hydropower, the company will produce green hydrogen to reduce iron ore without carbon, enabling the production of 2.5 million tons of green steel annually, with plans to scale to 5 million tons by 2030.

Transportation

Aviation Fuel

- [ZeroAvia](#): ZeroAvia is leading the transition to a clean future of flight by developing electric propulsion technologies for aviation to unlock lower costs and emissions, cleaner air, reduced noise, energy independence and increased connectivity. The company is developing hydrogen-electric (fuel cell-powered) engines for existing commercial aircraft segments and also supplying hydrogen and electric propulsion component technologies for novel electric air transport applications. ZeroAvia has submitted its first full engine for up to 20-seat planes for certification and is working on a larger powertrain for 40–80-seat aircraft, with significant flight test and regulatory milestones achieved with the U.S. FAA and UK CAA. The company has signed a number of key engineering partnerships with major aircraft OEMs and has more than 2,000 pre-orders for its engines and component systems from a number of the major global airlines (American, United, Alaska), lessors, and OEMs, with future revenue potential over \$10bn. In addition to this, they have developed a powerful project planning and LCOH calculation software for green Hydrogen production projects, SHAIPS.

Source: <https://darcypartners.com/research/darcy-insights-2024-review-top-innovators-in-hydrogen>