

December 2023

Hydrogen Summary – 2023

Hydrogen developments were the most prevalent during 2023 with over 140 projects or initiatives recorded. These projects are summarised below.

Octopus Hydrogen and Greenergy Flexigrid Partnership, UK: Octopus Hydrogen and Greenergy Flexigrid formed a logistics partnership in the UK to distribute green hydrogen. Greenergy will transport NanoSUN mobile refueling units, facilitating on-site delivery, storage, and dispensing of green hydrogen for Octopus Hydrogen customers. The inaugural delivery occurred last month, with more planned throughout 2023.

Topsoe and Fidelis New Energy Alliance, Denmark: Danish companies Topsoe and Fidelis New Energy have formed a global alliance to employ technology for carbon-neutral hydrogen production. The partnership combines Topsoe's hydrogen process portfolio with FidelisH2 technology to produce hydrogen from natural gas, achieving a lifecycle carbon intensity of 0 kgCO₂e/kgH₂.

Raven SR, Chevron New Energies, and Hyzon Motors Collaboration, California: In California, Raven SR, Chevron New Energies, and Hyzon Motors are collaborating to launch a green waste-to-hydrogen production facility in Richmond, targeting Northern California's transportation markets. Owned by Raven SR S1 and operated by Raven SR, the facility aims to commence in early 2024, with Chevron holding a 50% equity stake.

EPBR, Brazil-German Hydrogen Project: EPBR, Brazil-German Cooperation for Sustainable Development, and the German group Mele have partnered with Brazilian cooperatives to develop a green hydrogen pilot plant from animal waste. The plant, aiming to produce 88,000 tons/year of sustainable fuels, is financed by the German H2Uppp program and should complete by year-end.

Fusion Fuel and Dourogás Offtake Agreement, Portugal: Fusion Fuel, in Portugal, signed an offtake agreement with Dourogás for green hydrogen from its projects. This is the first contract in Portugal for blending green hydrogen into the natural gas grid, supporting the government's decarbonization goals and hydrogen strategy.

TotalEnergies and Air Liquide Joint Venture, France: TotalEnergies and Air Liquide in France are creating a joint venture to develop a network of hydrogen stations for heavy-duty vehicles across major European roads, facilitating hydrogen access and supporting goods transportation decarbonization.

Australia-Germany Renewable Hydrogen Research, UK Report: The UK's Innovation News Network reported a joint \$100 million Australia-Germany renewable hydrogen research initiative, including

projects like the EGH2, which combines a Siemens Energy electrolyser with solar PV for green hydrogen production.

Fabrum's \$23M Series A Financing, New Zealand: Fabrum, a leader in zero-emission technologies, announced a \$23M Series A funding led by AP Ventures, with participation from Fortescue Future Industries, Obayashi Corporation, and K1W1.

Enagás Renewable and Naturgy's Hydrogen Plant, Spain: In Spain, Enagás Renewable and Naturgy are developing a 280 MW renewable hydrogen plant at Naturgy's decommissioned thermal power site. Scheduled for 2026, the \$518.5 million project aims to bolster Spain's hydrogen economy.

Vertex Hydrogen Supply Agreements, India: India's Mint reported that Vertex Hydrogen will supply over 1,000MW of low carbon hydrogen to regional industries, capturing 1.8 million tons of CO2 annually, significantly reducing industrial emissions in the area.

Nikola Corporation's Hyla Hydrogen Station, California: Nikola Corporation's Hyla brand announced its fourth hydrogen station in California, supporting Nikola's truck demand and other heavy-duty hydrogen electric vehicles. By 2026, Hyla plans to have 60 stations operational.

bp's HyVal Green Hydrogen Cluster, Spain: In Spain, bp launched the HyVal green hydrogen cluster at its Castellón refinery, focusing on developing up to 2GW of electrolysis capacity by 2030 for green hydrogen production.

First Mode's Ballard Hydrogen Fuel Cell Order, Washington: First Mode in Washington ordered 30 hydrogen fuel cell modules (3 megawatts) from Ballard Power Systems for hybrid hydrogen and battery mining trucks, advancing clean energy powerplants for heavy-duty vehicles.

Gevo's Hydrogen Development with Zero6 Energy, Colorado: Gevo in Colorado finalized an agreement with Zero6 Energy for a 20-megawatt hydrogen production facility in South Dakota, contributing to Gevo's Net-Zero 1 renewable hydrocarbon plant.

Universal Hydrogen's Historic Flight, Washington: Universal Hydrogen Co. conducted a historic flight of a hydrogen fuel cell-propelled 40-passenger regional airliner in Washington, marking a milestone in hydrogen aviation with plans for passenger service by 2025.

Power-to-X Hydrogen Valuation Routes: The Power-to-X concept outlines various routes for hydrogen utilization, including power-to-power, power-to-gas, power-to-industry, and power-to-

mobility. This versatile approach enables large-scale integration of renewable energies and decarbonization across primary economic sectors.

Conjuncta's Green Hydrogen Project in Mauritania,: Germany's Conjuncta signed an MOU for a \$34 billion green hydrogen project in Mauritania, aiming for an 8 million tons annual production capacity of green hydrogen or derivatives.

Japanese Investment in HESC Project, Australia: Japan's Green Innovation Fund committed \$1.55 billion to the Hydrogen Energy Supply Chain (HESC) project in Victoria, Australia, demonstrating clean liquid hydrogen production from coal and biomass.

Uniper's Electrolyzer Technology at Maasvlakte, Germany: Uniper in Germany selected Plug Power for electrolyzer technology at its Maasvlakte site, planning to produce green hydrogen by 2026 and expanding to 500 MW by 2030.

thyssenkrupp nucera and Unigel's MOU, Germany: thyssenkrupp nucera and Unigel signed an MOU to expand a green hydrogen plant in Bahia, Brazil, from 60 MW to 240 MW, marking Brazil's first industrial-scale green hydrogen facility.

Blue Hydrogen Production Innovations: Blue hydrogen combines traditional production methods with carbon capture technology, offering various carbon capture options based on the reforming process to reduce CO2 emissions.

Accelera by Cummins' Electrolyzer System, Canada: Accelera by Cummins will supply a 90-megawatt electrolyzer system for Varennes Carbon Recycling's plant in Quebec, Canada, advancing North America's green hydrogen economy.

Marubeni's Green Hydrogen Project, Portugal: In Portugal, Marubeni Corporation launched a green hydrogen injection demonstration project in the natural gas distribution network, holding a 22.5% stake in Floene Energias.

Dutch Government's Offshore Hydrogen Production, Netherlands: The Dutch government designated an area for the world's largest offshore hydrogen production project, with plans for 500 MW of electrolysis capacity and hydrogen transport to land.

McPhy Energy's Pilot Electrolysis Plant, France: McPhy Energy, ArcelorMittal, and VEO will build a pilot electrolysis plant and a hydrogen filling station at ArcelorMittal's Eisenhüttenstadt site in Germany.

Ethical Power Ltd's Whites Pit Solar Farm, UK: Ethical Power Ltd commissioned the Whites Pit solar farm in Wimborne, UK, for Canford Renewable Energy, feeding into a green hydrogen electrolyzer as part of the Dorset Green H2 project.

NACFE and RMI's Hydrogen Trucks Report, Indiana: The North American Council for Freight Efficiency (NACFE) and RMI released a report in Indiana, "Hydrogen Trucks: Long Haul's Future?", exploring hydrogen's role in long-haul trucking.

Sunfire's High-Temperature Electrolyzer, Netherlands: Sunfire installed a multi-megawatt high-temperature electrolyzer for green hydrogen production at Neste's refinery in Rotterdam, Netherlands, using efficient SOEC technology.

Amp Energy's Green Hydrogen Development, Australia: Amp Energy in Australia signed an agreement with Iron Road to develop green hydrogen at the Cape Hardy Port Precinct, focusing on 20 GW of electrolyzer capacity for green ammonia production.

Construction of Lhyfe Occitanie Plant, France: Lhyfe, a green and renewable hydrogen firm, and AREC Occitanie started constructing the Lhyfe Occitanie production facility in France, aiming to produce two tons of green hydrogen daily.

Hyphen Hydrogen Energy's Namibia Project, UAE: Hyphen Hydrogen Energy and Namibia plan to sign a \$10 billion green hydrogen project deal, expecting to produce 300,000 metric tons of green hydrogen annually from a large-scale renewable energy and electrolyser facility.

Ohmium International's Series C Funding, California: Ohmium International closed a \$250 million Series C growth equity financing, led by TPG Rise Climate, to advance green hydrogen production technologies.

Gasification for Hydrogen Production from Wood Residues, New Zealand: This process involves heating wood residues in an oxygen-free environment, resulting in a mixture of methane and hydrogen. The hydrogen is then extracted, and the methane can be used to fuel the process or converted into biodiesel.

Green Hydrogen Project in Morocco: Energy China International Construction Group, in partnership with Saudi Ajlan Bros and Morocco's Gaia Energy, plans to develop a significant green hydrogen project in southern Morocco, following the signing of a Memorandum of Understanding.

Air Products' Hydrogen Refueling Station in Canada: Air Products announced the construction of its first Canadian hydrogen refueling station in Edmonton, Alberta. This station, part of a net-zero hydrogen energy complex, represents Alberta's first commercial-scale hydrogen refueling station.

Mytilneos Energy's Stake in Australian Hydrogen Project: Mytilneos Energy & Metals acquired a 15% equity in CLARA Energy's Rosedale Green Hydrogen project in Australia, planning to develop a significant solar farm and hydrogen plant for hydrogen production.

Neste's Electrolyzer Project in Finland: Neste is advancing a 120 MW electrolyzer project at its Porvoo refinery for renewable hydrogen production. The project is moving to the basic engineering phase, with investment decision readiness anticipated in early 2024 and potential production start in 2026.

HDF's Renewable Energy Power Plant in the Philippines: Hydrogène de France (HDF) plans to construct a renewable-energy power plant in Zamboanga Sibugay, Philippines, focusing on generating power from water and including storage capabilities.

Australian Government Investment in Renewable Hydrogen: The Australian government is investing \$1.4 billion to expand its domestic renewable hydrogen industry under the "Hydrogen Headstart" program, supporting large-scale renewable hydrogen projects.

Ford's Hydrogen Research for E-Transit Van in the UK: Ford is exploring the use of hydrogen as an onboard energy source for the E-Transit van, aiming to increase zero-emission range for heavy-use customers.

Global Hydrogen Investment Trends: Bloomberg reported a significant increase in investment in the energy transition, with \$1.1 trillion invested in 2022, reflecting the industrial policy race and market expansion in the hydrogen sector.

Green Hydrogen Production in New Zealand: HW Richardson is progressing with New Zealand's first green hydrogen production and refueling station in Gore, Southland, expected to be operational by September.

Development of Hydrogen Station in New Zealand: HW Richardson's pilot hydrogen station in Gore, Southland, advanced with the arrival of a 1.1 MW hydrogen electrolyser and storage unit in Christchurch.

Syntex Hydrogen Power Plant in Arkansas: Syntex Industries, part of SyntexNRG, plans to build the Syntex Hydrogen power plant in Clarksville, Arkansas, with initial power generation expected in 2025 and completion in 2026.

Nel Hydrogen's Electrolyser Plant in Michigan: Nel Hydrogen announced plans for a \$400 million automated gigawatt electrolyser manufacturing facility in Michigan, poised to be among the world's largest.

Alkaline Thermal Treatment (ATT) for Hydrogen Production: ATT technology involves pyrolysis for hydrogen production, offering potential for negative carbon emissions and fossil fuel substitution.

Raven SR's Bioenergy Project in California: Raven SR received approval for its organic waste-to-hydrogen bioenergy project in Richmond, California, using Steam/CO₂ Reforming technology.

ABB's Role in Texas Green Hydrogen Facility: ABB will provide automation, electrification, and digitalization solutions for the Clear Fork Texas facility as part of the Bair Energy Green Hydrogen and Technology Alliance.

Cepsa's Renewable Electricity Supply Agreement in Spain: Cepsa and Grupo Ibereólica Renovables signed an agreement for renewable electricity supply, supporting Cepsa's green hydrogen generation plants and service stations in Andalusia.

Ohmium International's PEM Electrolyzer Partnership in India: Ohmium International's India-based subsidiary partnered with NTPC Renewable Energy Limited for PEM electrolyzer technology.

Green Methanol and Hydrogen Plant in Tasmania: The Tasmanian Government supports a proposal to convert the Bell Bay Power Station into a green methanol and hydrogen plant.

PCC Hydrogen's Patented Technology in Kentucky: PCC Hydrogen announced a patented technology for hydrogen production by coupling an electrolyzer with a catalytic adiabatic reactor to convert ethanol into hydrogen.

Plug Power's Fuel Cell Power Supply in California: Plug Power will supply Energy Vault Holdings with 8 MW of hydrogen fuel cell power for clean energy delivery in Calistoga, California, during emergencies.

Lhyfe's Offshore Green Hydrogen Production, Spain and Portugal: Lhyfe's agreement with Capital Energy focuses on large-scale offshore green hydrogen production using electrolysis and wind energy, aimed at reducing fossil fuel dependence and enhancing energy security.

Hydrogen Production Variants: Blue hydrogen involves natural gas reforming with CO₂ capture; green hydrogen uses electrolysis powered by renewables; turquoise hydrogen is generated via methane pyrolysis, producing hydrogen and solid carbon without direct CO₂ emissions.

HydGene's Organic Waste-to-Hydrogen Technology: HydGene uses novel biocatalysts to convert organic waste, in particular sugars, into hydrogen, enabling localized production in rural and remote areas.

Industrial Hydrogen Valley Development in Finland: Neste Corporation, Gasgrid Finland, Helen Ltd, and Vantaa Energy Ltd collaborate to develop an industrial hydrogen valley in Uusimaa, Finland, supporting carbon neutrality goals.

Namibia's Green Hydrogen Project with GRN and Hyphen: This partnership aims to establish Namibia as a leading green hydrogen hub, leveraging its natural resources and investment climate for sustainable and inclusive energy development.

SunHydrogen's Project NanoPEC in California: SunHydrogen announced Project NanoPEC, a 3-year initiative for commercializing its technology for renewable hydrogen production using sunlight and water.

HOPE Consortium's Grant in Belgium: The HOPE project consortium received a \$21.8 million grant from the European Commission for offshore hydrogen production.

Chart Industries' Compressors for California Hydrogen Plant: Chart Industries will supply Howden compressors for Avina Clean Hydrogen's facility in Southern California, facilitating compressed hydrogen transportation for heavy-duty trucks.

Natural Hydrogen Discovery in France: La Française d'Énergie (FDE) discovered a significant natural hydrogen deposit in the Lorraine region's abandoned mines, potentially impacting Europe's energy transition.

Tallgrass and KOWEPO's Agreement in South Korea: Tallgrass and Korea Western Power announced a cooperation agreement for developing large-scale green hydrogen and ammonia production.

Rio Tinto and Sumitomo's Hydrogen Plant in Gladstone, Australia: They plan to build a hydrogen plant as part of a decarbonization initiative for alumina refining.

BoschPowerUnits Project in Germany: The Bosch PowerUnits project received federal approval for initial industrialization of stationary fuel cell systems, with funding contributions from both federal and state governments.

Plug Power's 100 MW PEM Electrolyzers in New Jersey: Plug Power secured an order for 100 MW of PEM electrolyzers, powered by 100% renewable energy. These will produce around 43 tons of green hydrogen daily for oil refining, replacing grey hydrogen and reducing about 516 tons of CO₂ emissions per day.

Mercury Renewables' Wind Farm and Hydrogen Project in Ireland: Mercury Renewables has applied for a \$224 million utility-scale integrated wind farm and green hydrogen project in Ireland, aiming to leverage renewable energy for hydrogen production.

Ohmium International and Aquastill Collaboration: Ohmium International, specializing in PEM electrolyzers, collaborates with Aquastill, a leader in membrane distillation technology. This partnership will enable Ohmium to utilize desalinated seawater in green hydrogen production.

SFC Energy's Hydrogen and Methanol Fuel Cells in India: SFC Energy AG has commenced the manufacturing of hydrogen and methanol fuel cells at its New Delhi/Gurgaon site in India, catering to stationary and mobile hybrid power solutions.

Tecnicas Reunidas and RWE's Hydrogen-Ready Power Plant in Spain: Tecnicas Reunidas and Ansaldo Energia, forming a consortium, have contracted with RWE to develop a hydrogen-ready combined cycle power plant in Spain, supporting RWE's decarbonization and energy transition plan.

Smartenergy's Green Hydrogen Project in Egypt: Swiss company Smartenergy plans a roughly \$1 billion project in Egypt, focusing on producing green hydrogen as part of its expansion in the region.

Honeywell and ZFRT's Reactor Testing in Belgium: Honeywell and ZoneFlow Reactor Technologies conducted pilot plant testing in Belgium, validating a 15% increase in steam reforming capacity for hydrogen production, without increasing methane slip or pressure drop.

Germany's Hydrogen Power Plant Expansion: The German government is increasing its hydrogen power plant fleet to decarbonize the power sector and provide climate-friendly energy, especially during low wind and solar power periods.

Green Hydrogen Plant Discussions in UAE: Egypt's Prime Minister discussed with officials a proposal from a foreign firm to establish a large-scale green hydrogen plant in Egypt, involving direct foreign investments.

Topsoe's Agreement for Canada's Hydrogen Project: Topsoe will provide its dynamic ammonia loop technology to World Energy GH2 for the Nujio'qonik renewable hydrogen project in Canada, which aims to produce 250,000 metric tons of renewable hydrogen annually using wind energy.

Hydrogen Roadmaps Overview: Different countries have developed hydrogen roadmaps to guide the integration of hydrogen technology in their energy sectors, focusing on production, usage, and infrastructural development.

B&W's BrightLoop Hydrogen Production Process: B&W's BrightLoop technology produces hydrogen from various feedstocks, including biomass, and captures CO₂ and nitrogen, which can be used for ammonia production.

Coregas' Hydrogen Refueling Station in Australia: Coregas installed a hydrogen refueling station for heavy trucks in Port Kembla, NSW, Australia's first heavy vehicle hydrogen station, currently serving one fuel cell truck.

Lone Cypress Energy's Hydrogen Project in California: Lone Cypress Energy completed the Front-End Engineering Design study for its hydrogen project in Kern County, California, encompassing a steam methane reformation plant with carbon capture, hydrogen liquefaction, and related infrastructure.

Lummus Technology and Biohydrogen's Blue Hydrogen Initiative: Lummus Technology and Biohydrogen Technologies announced an agreement to develop advanced synthesis gas reactor technology primarily for blue hydrogen production.

Monarch Energy's Facility in Louisiana: Louisiana Economic Development reported Monarch Energy's exploration of a \$426 million facility in Ascension Parish, Louisiana, employing a carbon capture approach for hydrogen production.

NewHydrogen's Thermochemical Hydrogen Production in California: NewHydrogen entered a research agreement with UC Santa Barbara to develop a thermochemical method for splitting water

into hydrogen, employing a novel Molten Catalytic Liquid under industrial temperatures for cost-effective green hydrogen production.

Technip Energies' Contract for bp's Hydrogen Unit in Australia: Technip Energies received a contract worth €50-€250 million from bp for a hydrogen production unit at its Kwinana biorefinery in Western Australia, supporting sustainable aviation fuel production.

SVE and STARS' Collaboration in California: Sugar Valley Energy and STARS Technology Corporation collaborate to deploy innovative hydrogen production technology at SVE's sugarcane ethanol biorefinery in Imperial Valley, California.

Groupe E's Green Hydrogen Plant in Switzerland: Groupe E has commissioned its green hydrogen production plant near the Schiffenen dam in Switzerland.

Vale and H2 Green Steel's Green Industrial Hubs: Vale and H2 Green Steel signed an agreement to study the feasibility of developing green industrial hubs in Brazil and North America for sustainable steel production using renewable electricity and green hydrogen.

New Zealand Hydrogen Aviation Consortium: The consortium, including Airbus, Air New Zealand, and others, proposed liquid hydrogen-fueled aircraft for New Zealand's domestic routes, aiming to cut 900,000 tonnes of carbon emissions annually by 2050.

Hyundai's Clean Hydrogen Production in South Korea: Hyundai Motor Group will produce clean hydrogen using biogas from food waste treatment. A MoU with various Hyundai entities and SL Corp aims to produce 216 kilograms of green hydrogen daily for two years.

UK's Hydrogen in Aviation Alliance: Leading UK aviation and renewable energy companies, including easyJet and Rolls-Royce, formed the Hydrogen in Aviation alliance to expedite zero carbon aviation using hydrogen technology.

FuelCell Energy and Toyota's Tri-gen System in California: FuelCell Energy and Toyota completed the Tri-gen system at Toyota's Long Beach operations, producing renewable electricity, hydrogen, and water from biogas under a 20-year agreement.

Hydrogen Refueling Infrastructure Report in Australia: The report discusses the development of hydrogen refueling infrastructure in Australia, comparing storage and dispensing options and evaluating refueling infrastructure based on fuel demand and hydrogen source proximity.

TotalEnergies' Green Hydrogen Tender in France: TotalEnergies announced a tender for the annual production of 500,000 tons of green hydrogen, aimed at decarbonizing its European refineries.

OCI Global's Green Hydrogen Offtake in Texas: OCI Global agreed to offtake green hydrogen from New Fortress Energy's ZeroParks, allowing OCI to expand green ammonia production capacity to approximately 160,000 tons per year in Beaumont, Texas, starting in 2025.

TotalEnergies and Air Liquide's Agreement in France: TotalEnergies and Air Liquide signed an agreement for the long-term supply of green and low carbon hydrogen to TotalEnergies' refinery in Normandy, aiming to reduce CO2 emissions by up to 150,000 tons per year.

Mitsubishi Power's Takasago Hydrogen Park in Japan: Mitsubishi Power announced full-scale operation of Takasago Hydrogen Park, the world's first integrated hydrogen validation facility, aiming to improve hydrogen co-firing and 100% hydrogen firing of gas turbines.

Andritz's Electrolysis Plant in Germany: Andritz will build a 100 MW electrolysis plant at Salzgitter Flachstahl GmbH site, producing approximately 9,000 tons of green hydrogen per year for green steel production, starting in 2026.

ANGI Energy Systems and Nikola Corporation Collaboration: ANGI Energy Systems, a Vontier company, announced a strategic collaboration with Nikola Corporation to support hydrogen-powered trucks, focusing on developing a robust hydrogen network for sustainable transportation.

Indian Oil's Green Hydrogen Fuel Cell Bus in India: Indian Oil launched India's first green hydrogen fuel cell bus, emitting only water vapor. IOC's R&D Center is producing the fuel, enabling the bus to travel 350km on a 10-12 minute refueling.

Fabrum's Electrolyser Hydrogen Refuelling Station in New Zealand: New Zealand's Fabrum will supply a 1MW electrolyser Hydrogen Refuelling Station package for Auckland, featuring a double pressure system for cars and trucks, a first in the country.

Essar Energy Transition Hydrogen's Plant in the UK: Essar Energy Transition Hydrogen has begun construction of its second hydrogen plant in the UK, with a 1,000 MW capacity and projected to produce 230,000 tons of low-carbon hydrogen.

Global Hydrogen Market Forecast: Research and Markets forecasts the global hydrogen market to grow from \$242.7 billion in 2023 to \$410.6 billion by 2030, with a 7.8% CAGR during the forecast period.

Mitsui O.S.K. Lines and EDF Renewables in Japan: Mitsui O.S.K. Lines and EDF Renewables signed an MoU to accelerate offshore wind development and green hydrogen production, contributing to Japan's energy transition.

thyssenkrupp nucera and Neste's Collaboration in Finland: thyssenkrupp nucera and Neste plan to integrate a 120 MW water electrolyzer into Neste's Porvoo refinery in Finland, using standardized scalum® modules for hydrogen production.

Ballard's Hydrogen Engine Orders: Ballard Power Systems received orders for 177 hydrogen fuel cell engines from Solaris Bus & Coach, marking a significant step in European sustainable transport with initial deliveries starting in 2023.

U.S. Regional Clean Hydrogen Hubs: The U.S. Department of Energy announced a \$7 billion investment to establish seven Regional Clean Hydrogen Hubs, accelerating the production and use of low-cost, clean hydrogen in line with President Biden's climate goals.

Topsoe-Aramco Hydrogen Collaboration: In Denmark, Topsoe and Aramco's collaboration focuses on using eREACT technology for low-carbon hydrogen production, promising near-zero carbon emissions.

Repsol's Renewable Hydrogen Production: Spain's Repsol began producing renewable hydrogen at its Petronor industrial center, using a 2.5 MW electrolyzer for industrial applications, advancing its net-zero emissions commitment.

Sunlight-Driven Hydrogen Production Device: A new device uses sunlight for hydrogen production and hydrogenates biomass-derived feedstock, offering valuable chemicals for industry and adjustable hydrogen use for energy applications.

Lhyfe's Green Hydrogen Plant in Germany: Lhyfe announced plans to build Germany's largest commercial green hydrogen production plant, set to be operational by 2024, utilizing renewable energy sources.

Phelan Green Energy's Hydrogen Investment: Phelan Green Energy plans a \$2.5 billion investment in South Africa for a green hydrogen and ammonia production plant, reflecting growing sustainable energy interests.

Anglo American Platinum's Hydrogen Project: Anglo American Platinum, BMW Group South Africa, and Sasol collaborate on a hydrogen initiative in South Africa, focusing on sustainable hydrogen production and use.

ANGI's Hydrogen Refueling Station in California: Vontier Corporation and ANGI Energy Systems, in collaboration with Trillium, are set to install a Hydrogen Refueling Station at Santa Clarita Transit, California, promoting sustainable transportation solutions.

JCB's Hydrogen Internal Combustion Engines: JCB has produced over 70 hydrogen internal combustion engines, used in prototype vehicles, demonstrating hydrogen's potential in reducing global CO2 emissions.

Jeju Green Hydrogen Plant in Korea: Doosan Enerbility launched Korea's largest green hydrogen production plant in Jeju, using wind energy and focusing on efficient hydrogen management.

Lhyfe-AVIA Hydrogen Production in Paris: Lhyfe and Thevenin & Ducrot (AVIA) plan to build a green hydrogen production site and multi-energy filling station in Greater Paris, France, expanding Europe's hydrogen infrastructure.

White Hydrogen in France's Lorraine Region: Scientists estimate the Lorraine region in France could hold one of the world's largest white hydrogen deposits, potentially impacting global energy resources.

Australia's Hydrogen Refueling Infrastructure MoU: Ampol, Hyundai Australia, Pacific Energy, and Toyota Australia signed a MoU to develop hydrogen refueling infrastructure, supporting fuel cell electric vehicles in Australia.

Åland Energy Island Project in Denmark: CIP, Copenhagen Energy Islands, Lhyfe, and Flexens launched the Åland Energy Island project in Denmark, integrating offshore wind generation with hydrogen production for regional and EU energy goals.

SoHyCal: North America's Largest Green Hydrogen Plant: H2B2 Electrolysis Technologies unveiled SoHyCal in California, the largest operational green hydrogen production plant in North America, powered by renewable energy.

BayoTech's Sustainable Hydrogen Hub in Missouri: BayoTech Inc. announced its new hydrogen hub in Wentzville, Missouri, producing 350 tons of hydrogen annually for various zero-emission and industrial applications.

Ceres' Solid Oxide Electrolyzer in Germany: Germany's Ceres is producing hydrogen at AVL's site with its solid oxide electrolyzer, nearing completion and factory acceptance testing stages.

Solar Thermochemical Hydrogen Production System: Engineers proposed a solar thermochemical system for efficient hydrogen production, using solar heat to split water, offering a clean fuel alternative for transportation.

Lhyfe's Green Hydrogen Expansion in Sheffield, UK: Lhyfe expanded its UK operation to Sheffield, aiming to accelerate green hydrogen deployment and contribute to the UK's hydrogen economy development.

Green Hydrogen Plant Project in Morocco: Falcon Capital Dakhla and HDF Energy plan a \$2 billion green hydrogen plant in Morocco, named White Dunes, aiming for substantial renewable energy generation and hydrogen production.

Caterpillar's Hydrogen-Hybrid Power Program: Caterpillar in Illinois launched a three-year program demonstrating an advanced hydrogen-hybrid power solution, highlighting hydrogen's potential in engine platforms.

Siemens Energy's Electrolyzer Mass Production: Siemens Energy's new factory aims to mass-produce electrolyzers, crucial for scaling up the hydrogen economy and achieving a climate-neutral future.

Japan's Green Hydrogen Production Feasibility Study: Asahi Kasei, Gentari Hydrogen, and JGC completed a feasibility study in Japan for large-scale green hydrogen production, supported by NEDO, planning for 8,000 metric tons/year production.

H2SITE's Ammonia Cracker on BERTHA B Ship: H2SITE successfully validated an ammonia cracker for high-purity hydrogen production aboard the BERTHA B supply ship in Spain, enhancing onboard power generation capabilities.

GreenGo Energy's Megaton Moon Project in Mauritania: GreenGo Energy in Mauritania filed for the development of Megaton Moon, aiming for large-scale solar and wind generation and green hydrogen production for transformative regional development.

Brazil's Green Hydrogen Project with Grupo Jepri: The state of Ceará, Brazil, and Spain's Grupo Jepri signed a \$3.6B agreement to develop a green hydrogen project, targeting 1.2 million tons/year production by 2026-2027.

Air Liquide-ENEOS Partnership in Japan: Air Liquide and ENEOS are partnering to develop low-carbon hydrogen and advance Japan's energy transition, exploring CCUS, electrolysis technologies, and an international hydrogen supply chain.

BASF's Proton Exchange Membrane Electrolyzer Project: BASF, with German federal support, is progressing in building a proton exchange membrane electrolyzer in collaboration with Siemens Energy at the Ludwigshafen site.

SK E&S's Low-Carbon Hydrogen Plant in Korea: SK E&S, part of SK Group, has partnered with various entities for a low-carbon hydrogen plant in Korea, aiming for mass production and contributing to the domestic hydrogen ecosystem.

HYDEA Project in Atlantic Area Ports: An eleven-partner consortium launched the HYDEA project in the Netherlands, focusing on hydrogen and methanol as energy alternatives in Atlantic Area ports, promoting green hydrogen technologies.

Greenhill Energy's Integrated Processing Facility in Australia: Greenhill Energy announced plans for Australia's first full integrated processing facility, converting waste into products like fertilizers, synthetic fuels, and low-cost clean hydrogen.

Eneos-Sumitomo Green Hydrogen Production in Malaysia: Eneos and Sumitomo Corp. will produce green hydrogen in Malaysia, exporting to Japan, and using hydroelectric power for carbon dioxide-free production, aiming for 90,000 tons/year by 2030.

ACWA Power's Green Hydrogen Project in Egypt: Saudi Arabia's ACWA Power signed a \$4 billion agreement to develop a green hydrogen project in Egypt, with a first phase producing 600,000 metric tons of green ammonia annually.

Mitsubishi-Amogy Strategic Partnership: Mitsubishi Corporation and Amogy announced a partnership to accelerate ammonia-to-power technology in East Asia, focusing on large-scale hydrogen carrier applications and exploring market expansion opportunities.