Electrochaea Press Kit

10/2019

Electrochaea Fact Sheet

Name & Address

Electrochaea GmbH
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Germany
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Industry

Power-to-gas, energy storage, CO_2 recycling, renewable fuel, renewable methane, green methane, clean methane, renewable energy, green gas, biotechnology, cleantech, RNG, SNG

About Electrochaea

Electrochaea is commercializing a grid-scale energy storage solution. Our proprietary power-to-gas (P2G) process converts renewable energy and carbon dioxide into grid-quality renewable methane for storage and distribution. Operating plants are injecting renewable methane into commercial gas grids in Switzerland and Denmark.

Electrochaea provides a technology based on biological methanation that makes it possible to store renewable energy and recycle CO_2 in a cost-effective way. This technology eliminates the temporal link between energy supply and demand, allowing efficient energy and CO_2 storage as renewable methane. When renewable power is available but not immediately used, renewable methane can be stored in the gas grid, thereby enabling a growing market for renewable electric power and creating a growing source of renewable gas. The more intermittent renewable energy we generate, the more valuable this technology becomes.

Following our lessons in decarbonizing the electrical power network for the past decades, we can now turn the gas network into a renewable source of energy. This can ensure carbon-neutral energy gas supply for households, industry, transportation as well as the power grid. Electrochaea's biomethanation technology provides a solution to decarbonize both the electricity and gas network.

Technology

- Renewable methane is synthesized from CO_2 and H_2 by our patented biocatalyst
- Pipe-line-grade methane is produced in our scalable and robust methanation system for injection into the gas grid or immediate use

Commercial Applications

- CO_2 can be used from any source such as anaerobic digestors, landfills, dairies, fermentation facilities or industrial processes
- Renewable H_2 can be generated from renewable electricity by electrolysis, or from other renewable sources

Unique Features

- Electrochaea is the first company to deploy and successfully operate a commercial 1 MW plant using biological-methanation-based power-to-gas technology
- Electrochaea's BioCat system is the first power-to-gas application to inject biomethane into national gas grids
- Unlike previous thermochemical methanation methods, Electrochaea relies on a specially developed microorganism (archaea) that produces biomethane efficiently, quickly and with a high degree of dependability
- Electrochaea has the world's most efficient pure strain of archaea developed at the University of Chicago; it is protected by patents in major markets
- Large-scale production and use of biological methanation allows grid scale energy and carbon storage
- The gas network's existing storage capacity is already ample for future energy-storage needs; reducing the need for investments in storage infrastructure
- The process developed by Electrochaea can store large quantities of renewable electricity over the long term
- The technology is scalable and provides the solution for decarbonization of the gas grid
- The use of methane-powered green peaker plants in combination with Electrochaea´s biomethanation technology provides stabilization of renewable electricity availability

Market Drivers for a Power-to-Gas Solution

- Growing demand for seasonal energy storage
- Incentives for renewable transportation fuels
- Increasing renewable power curtailment
- Decarbonizing the natural gas grid and large-scale carbon reuse are emerging strategic objectives

Competitive Advantage

- High efficiency, robust, selective, patented biocatalyst
- P2G energy storage enables practically unlimited storage capacity via existing gas grid infrastructure
- Scalable process enables a broad range of applications (1 to > 100 MW power input)
- Lower CAPEX and OPEX than chemical methanation
- Biocatalyst is compatible with variable duty cycles and common impurities in CO_2 sources

Customers

- Plant operators reduce CO_2 emissions and double their methane production, for example landfills, wastewater treatment plants, dairies, biogas plants
- Cement and lime industry valorize the unavoidable CO_2 emission and generate renewable energy
- Gas network operators generate a long-term strategy by “greening” the existing gas grid
- Utilities, community choice aggregators and energy providers achieve flexibility in the use of renewable electricity and gas
- Power grid operators avoid capital expenditures for grid expansion and new storage infrastructure
- Producers and users of CO_2-neutral fuels benefit from a stably supply of renewable fuel

Business Model

- Near term income is generated from technology development services, and from biocatalyst and technology license fees
- Over the medium and long term, revenue will be generated from royalties on the sale of gas, heat and system services

Market & Competition

- The key markets are countries and regions with a high percentage of wind and solar energy production and/or regulation of CO_2 emissions
- The demand for biogas and renewable gas is growing sharply in Germany, in the EU and in the US, in particular in California
- When regulatory changes are adopted that unmask the pricing signal for low cost renewable power, the energy and CO_2 storage market can be in the billions (EUR 195 bn by 2030).

Competition

Competing technologies	
Traditional Batteries	– comparatively resource-intensive – less flexible charge-discharge sequence – short duration and limited energy-storage capacity
Hydrogen	– significantly more expensive to store and distribute – admixture with natural gas limited – hydrogen infrastructure not available
Thermochemical Methanation	– Utilization of pure CO_2 only – Post gas treatment required – Expensive operating conditions (high temperature and pressure) – Low tolerance for contaminants (H_2S, NH_3, O_2)

Milestones

2006: Basic research and "proof of concept": Prof. Laurens Mets and his colleagues at the University of Chicago recognize the potential of archaea for methane production and isolate a highly efficient strain

2011-2014: First major laboratory-scale field tests with raw biogas in St. Louis, USA, and on pre-commercial scale (5000L bioreactor) in Foulum, Denmark.

2014: Electrochaea GmbH established as part of Series A financing by Munich Venture Partners, btov, Sirius Venture Partners, KfW, Energie 360°and Caliza Holding.

2016: The team grows/go-to-market: To establish the company's market position, an international team of 20 engineers and scientists was formed around Mich Hein (CEO), Doris Hafenbradl (CTO). Commissioning of the world's first 1 MW plant (BioCat Project) in Denmark, with support from Energinet. Initiated second grid scale pilot project in Switzerland with Horizon 2020 Project Store&Go.

2017/2018: Accelerated development of high efficiency microbial electrolysis cell and laboratory pressure reactor with grant and equity funding

2019: Storengy invests in Electrochaea. Commissioning and inauguration of the BioCat plant in Solothurn, Switzerland. Inauguration of ORBIT pilot reactor in Regensburg. First grid-injection of renewable methane produced by the BioCat system in Solothurn, Switzerland and in Avedøre, Denmark. Commissioning of BioCat plant in Golden, CO, USA.

Reference Facilities & Projects

- Pilot plants in Copenhagen, Denmark; Solothurn, Switzerland; Golden, CO, USA
- Funded BioCat Projects: Avedøre BioCat, STORE&GO, POWERSTEP, ORBIT

Partners

SoCalGas, NREL; Partners in the BioCat Project: Audi, BIOFOS, Hydrogenics, Energinet.dk, HMN Gashandel, Insero, Neas Energy; partners in other projects: MVM Group, Regio Energie Solothurn, Storengy, NEL

Investors

- Munich Venture Partners, btov, Sirius Venture Partners, KfW, Energie 360°, Caliza Holding, Focus First Holdings
- Strategic investor: Storengy
- In November 2014, the company closed Series A financing for a figure in the EUR mid-single-digit millions range, followed by a Series B closing in August 2018 and the Series C financing in February 2019

Memberships

- BVES, IBB Netzwerk, UseCO_2, The Danish Partnership for Hydrogen and Fuel Cells, The Danish Wind Turbine Owners' Association

Team & Management

- 21 employees at the Munich-Planegg headquarters, 3 employees at the Avedøre Copenhagen site
- Mich Hein (CEO & Managing Director), Doris Hafenbradl (CTO & Managing Director), Thomas Friehe (Finance Director), Gorm Teper (Director of Process Execution)

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Management Team Résumés

Mich Hein, Ph.D. (CEO, Managing Director)

As an inventor, entrepreneur and corporate executive, Mich has 35 years experience in technology development and commercialization. In addition to his role at Electrochaea, Mich is a Partner at Focus First. Prior to starting Focus First, Mich served as Executive in Residence at the University of Chicago's Office of Technology and Intellectual Property, and as Chief of Staff at the Illinois Medical District where he managed the Chicago Technology Park. He started his career as a research chemist with Monsanto and then PPG Industries before joining the faculty at The Scripps Research Institute in La Jolla, CA. Mich's investigations into mucosal immunology and plant-based proteins led him to found Epicyte Pharmaceutical, Inc which was acquired by Biolex, Inc in 2004. His entrepreneurial career also included positions as CEO at Chromatin, Inc. and as founder of Heliose. Mich holds a B.S. degree from the Honors Tutorial College of Ohio University and both an M.Sc. and Ph.D. in Plant Physiology from the University of Minnesota.

Doris Hafenbradl, Ph.D. (CTO, Managing Director)

Doris has enjoyed a successful career as scientist and corporate executive in the biotech and pharma industry in the US and Europe. She joined Electrochaea from Axxam, a leading provider of integrated discovery services for the life sciences industry, where she was responsible for the company's discovery services activities. Prior to Axxam, she held several senior management roles in international, industry-leading pharmaceutical firms including BioFocus, Proteros, GPC Biotech, Axxima Pharmaceuticals, Genomics Institute of the Novartis Research Foundation, and Diversa. Doris dedicated her doctoral research in microbiology to the study of hyperthermophilic archaea in the laboratory of Prof. Dr. Karl Stetter at the Archaea Centre at the University of Regensburg.

Thomas Friehe (Finance Director)

Thomas has 21 years of experience in financial planning and forecasting, business development, M & A, and contract management in large and small multinational companies. As Senior Financial Controller at Knorr-Bremse AG, Thomas, in addition to controlling income statements and financial forecasts, was instrumental in affiliate consolidation and company risk management. Thomas also brings considerable experience in cost optimization, company restructuring and customer sales from his successes at Infineon Technologies AG, Boshuku Europe and Resmed. At the EDAG (Engineering + Design AG) subsidiary FFT in Puebla, México, Thomas demonstrated his skills in business development, participating in the growth of an automotive industry technology center. Thomas earned a Diplom Kaufmann in Economics from the University of Freiberg, Germany, and studied at the University of St. Thomas in Minneapolis, MN, USA, with focus on buyer behavior, communications and marketing.

Gorm Teper (Director of Project Execution)

Gorm has global experience in Project Engineering, Management and Business Development. His career includes experiences in construction, automation, water & wastewater, waste to energy and oil & gas industries. With his roots in Denmark, Gorm has an international upbringing from living in Indonesia, South Korea, Norway, Australia and now Germany. He has worked internationally as a Project Engineer and Site Manager, with experience in estimating, tendering, and contracting as well as process design. Before joining Electrochaea, Gorm was involved in large world class projects such as Brisbane Water Enviro Alliance (BWEA), Project Aurora – Incitec Pivot's chemical plant in Queensland, INPEX LNG in Darwin where he gained experience in contract management on a range of contract styles including design and construct and alliances, and more recently in Business Development for delivering packaged high efficiency ultrafiltration systems. Gorm earned his Bachelor's Degree in Civil Engineering from the Australian Queensland University of Technology, which included studies abroad at the Norwegian University of Science and Technology (NTNU). In Norway, his training included civil design, blast design, nuclear plant design and hydropower. His lifetime of international experiences brings a strong multi-cultural outlook and maturity to Electrochaea.