



Rotterdam, 24 May 2019

Rotterdam The Hague Airport initiates study for the production of renewable jet fuel from air

This Friday May 24, Rotterdam The Hague Airport and a European consortium led by EDL Anlagenbau Gesellschaft GmbH will sign a cooperation agreement for a study, which aims at developing a demonstration plant that produces renewable jet fuel from air. This plant aims to be the first worldwide to offer renewable jet fuel from air to the market. Compared to conventional fossil-based jet fuels, renewable jet fuel from air has a significantly lower carbon footprint and fine particles emission. This project thus demonstrates a significant step towards a carbon-neutral aviation industry.

Sustainable Aviation

The aviation industry is an emitter of carbon dioxide (CO₂) and air travel continues to increase. This also applies to Rotterdam The Hague Airport, where the number of passengers keeps growing every year. Unlike cars, airplanes cannot switch to electric or hydrogen propulsion in the short-term. Rotterdam The Hague Airport is therefore proud to kick-start the realization and commissioning of this plant for the production of renewable jet fuel from air.

The path towards production of renewable jet fuel from air

Following the study, a demonstration plant is to be realized and commissioned on the premises of the airport, producing about 1'000 liters of renewable jet fuel per day. This would be the first time ever that renewable jet fuel from air production exceeds laboratory scale of a few liters per day. A series of highly innovative, but proven technologies are linked to each other to achieve this: First, CO₂ is captured from ambient air by Climeworks' direct air capture technology. The gas is subsequently transformed into syngas through electrolysis, using electrolyser cells developed by Sunfire. Then, the syngas is turned into synthetic hydrocarbons by means of Fischer-Tropsch synthesis, enabled by Ineratec. Finally, EDL takes care of the process to convert synthetic hydrocarbons into jet fuel and of the overall process and plant integration. The entire process runs sustainably, thanks to renewable energy, preferably produced on site from the airport's solar panels.

SkyNRG, the global market leader for sustainable aviation fuel solutions, is in this project responsible for the commercialization strategy.

The first potential customer has also announced itself. Transavia has committed itself to the plan and indicated it intends to reduce its CO₂ exhaust with renewable fuel from air in the future.

Innovation Campus

Due to the innovative technologies that will be applied, the demonstration plant will be relatively compact. The architectural integration by Rotterdam based Urban Crossovers & Blueroom will ensure that the plant is part of the overall RHIA campus and fit in both its size and in its objectives.

Foundation Rotterdam The Hague Innovation Airport

The set-up of this plant is facilitated by the foundation Rotterdam The Hague Innovation Airport (RHIA), which was established by the airport and the City of Rotterdam. The foundation focuses on promoting four issues – Entrepreneurship, Energy & Environment, Education, and Emergency – through several innovative projects. The study on renewable jet fuel from air is the first of these projects.

Goal of the study

The study will define the concept and basic engineering for onsite production of renewable jet fuel from air at Rotterdam The Hague Airport. It will enable a cost estimate for both the actual construction of the plant and the fuel itself, which will be decisive for further project development. Rotterdam The Hague Airport is an ideal location for the study due to its size and organization. Royal Schiphol Group, the parent company of RTHA, through its Schiphol Innovation Board, is a partner in making this project possible.

Future

The large-scale production of renewable jet fuel requires an upscaling and, where beneficial, an integration into existing refineries, which will not take place at the airport. Instead, this project aims to provide one of the keys to the transformation of the current fossil dominated petrochemical complex of the Rotterdam Harbor. However, smaller renewable jet fuel production facilities can also be attractive to utilize stranded decentralized renewable power and for remote consumers.

Key Points Summary:

- A consortium led by EDL Anlagenbau Gesellschaft GmbH will conduct a study with the aim to realize a demonstration plant producing renewable jet fuel from air at the Rotterdam The Hague (innovation) Airport
- The renewable jet fuel would be produced from air-captured CO₂ and renewable electricity
- Compared to conventional fossil-based jet fuel, renewable jet fuel from air has a significantly lower carbon footprint
- The project is a milestone for the further development of renewable jet fuel, which can help the aviation industry become carbon-neutral in the future

Note to editor, not for publication:

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The study will be executed by EDL Anlagenbau Gesellschaft GmbH, Urban Crossovers B.V., Climeworks AG, Sunfire GmbH, Ineratec GmbH and SkyNRG B.V. Subsidiary partners are PlusProjects, Deardanandfriends and Blueroom Architects.

EDL Anlagenbau Gesellschaft mbH, www.edl.poerner.de

EDL based in Leipzig / Germany was established as subsidiary of Edeleanu GmbH in 1991 and refers to tradition and experience in plant engineering and technologies of more than one hundred years. Since 2003 EDL has been part of the Austrian Pörrner Group.

As partner of the refinery, petrochemical and chemical industry EDL offers the full range of services for process plant engineering and assists its customers with advanced process solutions and new climate-friendly technologies in sustainably operating their productions. Customers benefit from EDL's wide experience gained from hundreds of successfully executed greenfield and brownfield projects. With more than 50 major modernization projects EDL is deemed one of the leading revamp specialists.

EDL offers advanced technologies for residue processing including solvent deasphalting, extraction, dewaxing & deoiling, spray micronization and BTX aromatics extraction as well as climate-friendly technologies such as used oil processing, waste plastics depolymerisation, Power-to-X (PtX) and

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About Urban Crossovers BV, www.urbancrossovers.com

Based in Rotterdam, The Netherlands, Urban Crossovers acts as a platform for innovations of scale to address global and local urban challenges.

With experts from varying disciplines (tech, design, branding & marketing, legal assessments, financial models, fundraising) Urban Crossovers elaborates integral resilient solutions to facilitate and accelerate the transition of the built environment. Projects range from funding concepts, design brief development, building concepts and urban concepts to energy landscapes, creating crossovers of scale between CO₂ exhaust reduction, CO₂ removal, sustainable energy generation, innovative food production and increasing biodiversity.

Projects include the resilient redevelopment of a former port area in Rotterdam and the repositioning of a countryside estate in Rotterdam. Urban Crossovers, Climeworks and Cleantech Rotterdam have initiated the first steps to start the jet fuel from air project at Rotterdam The Hague Innovation Airport.

For this project Urban Crossovers manages day to day contact between the airport and the consortium, and collaborates with PlusProjects (www.plusprojects.nl) for funding works, Deardanandfriends (www.deardanandfriends.com) for branding works, and with Blueroom (www.blueroom.design) for architectural design works to fit the pilot project and its visitor center into the RHIA campus context.

Urban Crossovers is the business accelerator for Climeworks in The Netherlands.

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About Climeworks, www.climeworks.com

Climeworks captures CO₂ from ambient air with the world's first commercial carbon dioxide removal technology. The Climeworks direct air capture plants capture CO₂ with a patented filter and are powered by either waste or renewable energy.

Climeworks air-captured CO₂ is sold to customers in the Food, Beverage & Agriculture; and Renewable Fuels & Materials markets. Climeworks also offers Emissions Reversal, enabling customers to realize their climate goals by safely and permanently storing air-captured CO₂ underground, and thereby ultimately stopping climate change from reaching dangerous levels. Founded by engineers Christoph Gebald and Jan Wurzbacher, Climeworks has assembled the world's largest team of experts in the field and has a goal of capturing one per cent of global emissions by 2025.

Climeworks AG is based in Zurich, Switzerland with a subsidiary in Cologne, Germany.

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About Sunfire, www.sunfire.de

As one of the world's most innovative companies, Sunfire GmbH develops and manufactures energy conversion systems to produce renewable industrial gases and fuels. The technology used for this conversion process is a highly innovative and uniquely efficient electrolysis based on the solid oxide cell (SOC) technology, often referred to as high-temperature electrolysis.

More precise, high-temperature electrolysis produces valuable hydrogen from water, by using renewable electricity. In the latest version, high-temperature electrolysis can reactivate not only water to hydrogen, but also CO₂ to CO, and thus transform, in the most direct way, combustion off-gases into clean feedstock. The CO, H₂ mixture, often referred to as syngas, is the basic component necessary for downstream synthesis to replace mineral oil and/or natural gas through synthetic alternatives. Thanks to this technology, the entire transport sector and many industrial processes which today rely on oil, gas or coal, can be transformed in a sustainable and CO₂-neutral way. Thanks to the SOC technology, unmatched efficiencies can be achieved, enabling cost efficient production and securing competitive advantage.

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About Ineratec, www.ineratec.de

INERATEC enables the production of a climate-neutral alternative to fossil products by using greenhouse gases and renewable energy.

INERATEC stands for the development, manufacture, realization, operation and sale of containerized chemical compact plants and their products as well as for complete chemical processes and turnkey solutions for demanding chemical reactions. The compact technology can be integrated into containers. This makes a decentral application and modular numbering-up possible. The USPs are the innovative micro-structured reactors. They provide a high load flexibility as well as quick start-up and shut-down times. This makes the plants ideal for storing renewable energy in synthetic hydrocarbons, e.g. gasoline, diesel and kerosene which are characterized by their high energy density.

The containerized compact plants (engineering, construction and implementation by INERATEC) have been scaled up to industrial dimensions. The decentral application enables the utilization of renewable energy. These can be used to produce synthetic long- and short-chain hydrocarbons (e.g. fuels such as gasoline, diesel, kerosene), which are especially pure. There is a wide field of applications: CO₂ from off-gas or the ambient air, biogas or other methane-containing gases are used as feedstock.

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About SkyNRG, www.skynrg.com

SkyNRG is the global market leader for renewable jet fuel (RJF), having supplied over 25 airlines on all continents. SkyNRG sources, blends and distributes RJF, guarantees sustainability throughout the supply chain and helps to co-fund any price premium versus conventional jet fuel. At the same time, SkyNRG focuses on developing regional supply chains that offer a real sustainable and affordable alternative to fossil fuels.

SkyNRG has its operations RSB certified and is structurally advised by an independent Sustainability Board in which WWF International, European Climate Foundation, Solidaridad Network and the Energy Research Centre of the Netherlands hold a seat.

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