



# **Life Cycle Analysis by Swiss Paul Scherrer Institute proves Industrial Solar's LF-11 Fresnel Collector as environmentally friendly heat source for Climeworks direct air capture technology**

Within the frame of the Swiss case study of Horizon 2020 ACT project ELEGANCY – Enabling a low-carbon economy via hydrogen and CCS (<https://www.sintef.no/elegancy>), researchers at the Paul Scherrer Institute (PSI) conducted a Life Cycle Analysis of Industrial Solar's LF-11 Fresnel Collector. The impressive results prove the unique collector design of Industrial Solar to be an outstanding environmentally friendly heat generation technology that can support the scale up of solutions like Climeworks' direct air capture.

Beside renewable energy technologies, direct air capture and storage (DACs) is one of the technological solutions that remove CO<sub>2</sub> emissions from the air (carbon dioxide removal) and that may contribute to keeping the rise in global average temperature within the limits of the Paris Agreement. Carbon dioxide removal might become a major mean of achieving net negative emissions and reducing the CO<sub>2</sub> concentration in the atmosphere. Despite the importance of carbon dioxide removal, there has been a large disconnect between policy ambitions, technology readiness and industrial uptake. ELEGANCY will fast-track the deployment of carbon dioxide removal in Europe and worldwide by providing innovative and cutting-edge solutions to key technical challenges for CO<sub>2</sub> transport, injection and storage, as well as H<sub>2</sub> - CO<sub>2</sub> separation.

One of the partners of the consortium of the ELEGANCY project is Climeworks, a company that develops, builds and operates direct air capture (DAC) machines that remove CO<sub>2</sub> from the air. The air-captured CO<sub>2</sub> can either be recycled and used as a raw material, or completely removed from the air by safely storing it. Since Climeworks' DAC machines require heat at temperatures of around 100 C° to regenerate the adsorbent, researchers in the Technology Assessment Group at PSI conducted a detailed life cycle analysis (LCA) of different heat sources and their respective impact on climate and environment with the aim to find a suitable and eco-friendly heat source to operate these DAC machines. The LCA results show that Industrial Solar's Fresnel technology at various locations in the Middle East, Chile, or Southern Europe performs best in most environmental impact categories compared to heat from impact-intensive hard coal or oil furnaces, but also state-of-the-art natural gas boilers and even wood chips furnaces. Absolute impacts on the environment are very low per MJ heat produced. Thus, making use of solar energy via this plant is a

well-suited system to generate heat in an environmentally friendly way, e.g. to be used in a combined Fresnel – solar photovoltaics – DAC design. A scientific publication is currently being written which will show the calculations, assumptions, and detailed results.

### **About the Paul Scherrer Institute:**

The Paul Scherrer Institute PSI is the largest research institute for natural and engineering sciences in Switzerland, conducting cutting-edge research in three main fields: matter and materials, energy and the environment and human health. PSI develops, builds and operates complex large research facilities. Every year, more than 2500 scientists from Switzerland and around the world come to PSI to use our unique facilities to carry out experiments that are not possible anywhere else. PSI is committed to the training of future generations.

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### **About Climeworks:**

Climeworks empowers people to reverse climate change by permanently removing carbon dioxide from the air. The Climeworks vision is to inspire 1 billion people to act now.

The direct air capture company returns the carbon dioxide it captures to earth where it remains permanently removed from the air for millions of years. The Climeworks direct air capture technology runs exclusively on clean energy, and the modular CO<sub>2</sub> collectors can be stacked to build machines of various sizes. Alternatively, the air-captured carbon dioxide can be upcycled into carbon-neutral fuels, paving the way towards a climate-positive world.

[www.climeworks.com](http://www.climeworks.com)

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Industrial Solar Holding Europe AB holds 100% of Industrial Solar GmbH and 100% of SolarSpring GmbH - both located in Freiburg/Germany.

Industrial Solar GmbH is an international leading technology and solution provider, which develops projects mainly based on its innovative Fresnel collector technology suitable for fulfilling an expected growing market of solar process heat. As a one-stop-shop Industrial Solar offers turnkey solutions for customers in several industries.

Find out more about Industrial Solar GmbH at the following address:

<https://www.industrial-solar.de/>

Founded in 2009 as a spin-off of the Fraunhofer ISE, SolarSpring GmbH - membrane solutions, has evolved into an international pioneer in the field of membrane distillation offering innovative waste- and drinking water treatment technology.

Find out more about SolarSpring GmbH at the following address:

<https://www.solarspring.de/>