Press release

October 11th, 2023

CARBON, supported by its partners, confirms its technological roadmap and speeds up on the 6th generation of solar cells!

CARBON, an innovative player in a photovoltaics sector experiencing a full rebirth, continues to unfold its technological roadmap.

- **Together with European partners, CARBON targets a technological optimum for its future photovoltaics products, through an ambition that lives by these 5 words: competitive, reliable, sustainable, recyclable, efficient.**
- **The industrial company chose the TOPCon technology and its improvment through TBC (TOPCon back-contact) as well as the future industrial development of 6th generation solar cells called « tandem ».**
- **The technological roadmap of CARBON affects the whole value chain in order to guarantee the ecodesign of photovoltaïcs products and to be at the vanguard of innovation.**
- **CARBON will devote at least 3% of its future turnover, i.e. several tens of millions of euros per year, to R&D.**

An ambitious albeit realistic technological roadmap

CARBON reiterates its initial choice of the **5th generation technology called TOPCon** (Tunnel oxide passivated contact), a new generation of innovative but globally-endorsed cells, which is set to become the mainstream on the solar market in the coming years. Thanks to specific innovations, the company intends to further improve this technology performance on an industrial scale.

As previously announced, and upon the commissioning of its giga-factory will be done, CARBON will also commit to an **improvement of its cell technology called TBC** (TOPCon back-contact) which presents tremendous advantages in terms of resource consumption but also yield and aesthetics.

To pave the way for the future, CARBON is already considering the industrial development of the **6th generation of so-called « tandem » solar cells**, which combine two semiconductors enabling the capture of a larger part of the solar spectrum. CARBON, supported by its R&D partners, is examining the tandem technology known as silicon-perovskite with 2 terminals to sustain investments on the 5th generation and to seek better yields (beyond 30%). Work also focuses on the stabilization of perovskites. Additionnally,

CARBON is exploring alternative tandem technologies to cover multiple technological options by 2030.

Outside the cell which is the core of value chain, CARBON works with its partners on **innovations on other steps of the process and components of its products** in order to guarantee the ecodesign of its photovoltaics modules and to always remain at the vanguard of incremental and disruptive innovation. This applies for example to the epitaxial growth of silicon wafers, the evolution or even the disappearance of the frame, the reduction of the thickness or even the replacement of solar glass, etc.

A European ecosystem for research, development and innovation

CARBON relies on a **European network of innovative research centers**, with the Commissariat à l'énergie atomique et aux énergies alternatives (CEA) at the Institut national de l'énergie solaire (INES) in France, as well as the International Solar Center (ISC) Konstanz in Germany. Through the European research projects of its partners, CARBON also has access to specialized expertise in Switzerland, Spain and Belgium, among others.

Together with these strategic partners in research, development and innovation around its technological roadmap, CARBON intends to fully engage in European cooperation and target a **technological optimum for its future photovoltaics products, through an ambition that lives by these 5 words: competitive, reliable, sustainable, recyclable, efficient**. This is about achieving the best performances while ensuring the lowest carbon footprint of the market and reducing the consumption of critical resources.

CARBON keeps a steady watch on future technological developments. As a reminder, **CARBON will devote at least 3% of its future turnover**, i.e. several tens of millions of euros per year, **to R&D**, which will help consolidate a leading European ecosystem regarding innovation on solar PV.

> *« Through these partnerships, CARBON intends to deploy its technological roadmap and positioned itself at the heart of the European ecosystem in terms of innovation on photovoltaics. Our goal: to be at the vanguard of technology and further strengthen the links between industry and research. CEA at the INES in France and ISC Konstanz in Germany are top-tier partners that we are proud to have by our side. »*
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> **Pierre-Emmanuel MARTIN**, President of CARBON

> *« CEA has been conducting research in the field of photovoltaics on the INES campus for almost 20 years now. Since the origin, we are supporting this strategic sector, with our technological research and innovation strengths and our French research partners, The project of CARBON fits perfectly with this ambition. We are excited to contribute with our expertise on silicon and perovskite on silicon photovoltaic technologies to this industrial initiative. »*

David DUCA, Chef du Département des Technologies Solaires au CEA

« Since our foundation of ISC Konstanz in 2005 we have been working on bifacial n-type technologies - more than 15 years before mainstream. Now, as the PV market is entering bifacial n-type era, we are well prepared to assist companies with ramping up GW solar cell and module production. With CARBON we have identified the right partner to set up the first vertical integrated GW PV production in EU. In addition, the experience of ISC Konstanz on the state-of-art crystalline silicon cell technology will help paving the way for tandem technologies in future. »

Dr. Radovan Kopecek, Co-founder, Member of the Executive Committee

About CARBON

Europe is quickly reaching a point of no return: it must decarbonize its economy and at the same time establish its energy sovereignty. In this context, CARBON, a French initiative with a European presence, wants to contribute to the sustainable reindustrialization of France and Europe by building a large-scale industrial solution for the solar sector.

CARBON, a French company located in Lyon and Marseille, brings together an unprecedented coalition of entrepreneurs, industrial operators, and solar professionals, all of whom are both convinced of the need for energetic transition in response to the climate challenge, and are determined to create local employment by contributing to the reconstruction of an entire industrial network, that CARBON's success will contribute to consolidate and amplify: R&D centers, equipment manufacturers, raw material suppliers, modules assemblers…

Our project? A 5 GWp gigafactory integrating the core of the photovoltaïcs industrial value chain to produce in France and widely market competitive, reliable, sustainable, high-yield and ultra-low carbon PV cells and modules, fully traceable and compliant with the highest ESG standards. This 4.0 and 100% electrical gigafactory will be located on the maritime industrial zone of Fos-sur-Mer (South of France), on a 62 hectares plot. The result: more economic sovereignty and energy independence for France and Europe, 3,000 direct industrial jobs and 22 million tCO2e emissions avoided in 10 years.
More information: carbon-solar.com

About CEA

The CEA's mission is to guide public decisions and provide the scientific and technical means that civil society (businesses and local authorities) needs to better manage major societal changes, such as the energy transition, digital transformation, future health, defence and global security. The CEA's Liten Institute, located at the CEA Grenoble centre and at INES, is a CEA's technological research institute specializing in energy transition technologies. Its research activities focus on several key areas: solar energy, grid management, storage, including batteries, and hydrogen, focused on energy efficiency and

the circular economy. His research covers various applications in the markets of energy production and distribution, transport and industrial processes, as well as for the environment. The Liten Institute of the CEA is a member of the Carnot Institute of Energies of the Future.
More information: cea.fr

About INES

Initiated in 2005 by the Conseil Départemental de Savoie and the Auvergne Rhône-Alpes Region with the drive to create in France a research and training center of international magnitude, the INES (National Institute for Solar Energy) brings together 11 laboratories of CEA-Liten, 2 joint research units of the University of Savoie Mont Blanc – CNRS, and the association INES Plateforme Formation et Evaluation. In 2023, the INES is the reference centre in France and a leading global player, dedicated to research, innovation and training on solar energy. It approximately welcomes around 500 employees on a 22,000 sqm site and is one of the leading international centres for technological research in the field of solar energy. Its facilities are operated by the CEA which organizes the hosting of INES partners: founders, industrial partners and spin-off startups, external service providers. The research and development activity is dedicated to advanced photovoltaic solar technologies, their integration into electrical systems and networks and the smart management of both electrical and thermal energy, at the heart of the building and the city. The INES also welcomes, again via the CEA, the Institute for the Energy Transition INES.2S together with various manufacturers (Renault, Colas, CNR, Steadysun, and Deltadore), INES Platform Training Evaluation and the University of Savoie Mont-Blanc.
More information: ines-solaire.org

About ISC Konstanz

International Solar Energy Research Center (ISC) Konstanz, founded in 2005, is a private research institute specializing in the research and development of crystalline silicon industrial solar cells, modules and systems. Currently 65 employees are dedicated to reduce production costs and increase the efficiency of solar technology. Since 2014 ISC Konstanz is also involved in technology transfer of its device “technology zoo”.

In addition ISC recognizes the importance of promoting the use of PV technology. ISC provides advanced training for experts in PV, offer internships and study visits to our labs for schools, as well as organize specialized workshops on emerging PV technologies.
More information: isc-konstanz.de

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