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# Next – generation interdigitated back-contacted silicon heterojunction solar cells and modules by design and process innovations


# NextBase - Deliverable report

## D9.3 Report on NextBase technology environmental analysis

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# Publishable summary

The objective of this work package is to economically and ecologically assess silicon heterojunction interdigitated back-contacted (SHJ-IBC) solar cells, modules and systems. This global task will include in particular a cost and life cycle analysis of SHJ-IBC solar cells, considering not only the solar cell, but at the end the whole system integration for such specific products (LCOE estimation).

This deliverable (D 9.3) ecologically assesses the SHJ-IBC technology developed in NextBase. The Life Cycle Assessment (LCA) approach was used to determine the environmental impact of PV systems which are built upon SHJ-IBC solar cells. SimaPro, an industry leading LCA tool, was used to perform the simulations and calculations. Inputs into the tool were taken from the same process flows described in D 9.1 and 9.2. The expected impacts calculated here for SHJ-IBC technology are compared to those of other technologies such as Al-BSF and bifacial standard SHJ solar cells.

The carbon footprint of PV systems with SHJ-IBC technology is calculated to be around 42 g $CO_2$ eq/kWh. Fossil fuels are normally in the range of kg $CO_2$ eq/kWh, while nuclear power is usually estimated to ~ 12 g $CO_2$ eq/kWh. So PV systems successfully meets the environmental low carbon emission objectives. Furthermore, when comparing the SHJ-IBC technology to other PV technologies, the SHJ-IBC technology has a significantly smaller footprint than Al-BSF technologies while having a roughly similar impact than standard SHJ, bifacial technologies. Main differences arises mostly from the different amount of energy produced by each technology.

Next, a thorough description of myriad impact categories is provided through the SimaPro analysis. The impact of SHJ-IBC is again compared to that of other PV technologies. In almost every category the conclusion is quite similar: SHJ-IBC solar cells, considered in a monofacial configuration has a slightly larger impact than standard SHJ solar cells available in a bifacial configuration. However, if SHJ-IBC cells can reach slight bifaciality (5 to 10%), they would then be the most efficient in LCA perspective, with even smaller impact than PV systems built with standard SHJ bifacial cells.

Bifaciality, cell efficiency and system location are then varied for sensitivity analyses. The objective is to show how changes in all of these properties can affect the final environmental impacts of the SHJ-IBC technology.

In summary, this document provides a thorough LCA analysis of the SHJ-IBC technology produced by the NextBase project. The results here show that the process flow developed by NextBase has a very low impact, though it may be slightly higher than the impact of standard SHJ bifacial technology if the SHJ-IBC modules are considered as purely monofacial. However, this favourable environmental impact should aid in suggesting that no roadblocks are expected for industrial adoption of the SHJ-IBC technology.