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## Innovative silicon-based PV technologies to reduce electricity production costs

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The costs per watt of the solar cell has dropped so fast that the module manufacturing is a small fraction of the total costs, and the balance of system cost, or commodity materials, drive the cost of producing solar energy. Because of the cost structure, increasing efficiency and average energy generation are Today the most powerful levers for overall cost reduction.

Silicon Heterojunction (HJT) is an innovation in PV, which can win the competition with mainstream technologies based on consolidated diffusion processes in silicon. In fact, by leveraging on high efficiency, high thermal stability, lower degradation per year and high bifacial factor, HJT can lead to a remarkable reduction of the levelized cost of energy (LCOE) in €/kWh. The fabrication process of HJT is simpler and makes

it the most performing technology based on silicon, relying on its compatibility with several advances that will allow the solar cell to overcome the theoretical limits of silicon, aiming at achieving more than 30% cell efficiency. In particular, multi-junction solar cells are the most promising path to increase PV module performances, several approaches are explored to find a tandem structure, which can be industrialized. Coupling with an HJT bottom cell seems a viable path to obtain an industrial application. We report on the efforts for the development and industrialization of innovative Si heterojunction technology towards more than 25% efficiency, as well as on the activities to overcome the theoretical limits of silicon, aiming at more than 28%, through implementation of multiple junction structures.

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