

## Summary of life cycle assessment (LCA) of MEYER BURGER modules by Fraunhofer Institute for Solar Energy Systems ISE

### Life Cycle Analysis

Environmental balancing of whole product life cycle of HJT-solar modules by MEYER BURGER from raw material extraction to module recycling including balance of system (BOS<sup>c</sup>).



### GWP results

Product (lifetime)	Lifetime energy yield <sup>a</sup> [kWh/kWp]	GWP <sup>b</sup> [g CO <sub>2</sub> -Eq/kWh]	GWP <sup>b</sup> without BOS <sup>c</sup> and use phase		GWP <sup>b</sup> module recycling <sup>d</sup> potential [g CO <sub>2</sub> -Eq/kWh]
			g CO <sub>2</sub> -Eq/kWh	kg CO <sub>2</sub> -Eq/kWp	
MEYER BURGER WHITE (25a)	27260	26.8	17.6	479	-1.6
MEYER BURGER BLACK (25a)	27259	26.8	17.5	478	-1.6
MEYER BURGER GLASS (30a)	33081	22.2	14.7	487	-

a: calculated with Smart.Calc-Software, global in-plane irradiation (GTI) 1266 kWh/(a\*m<sup>2</sup>), 57°N, b: Global warming potential (IPCC 2013, 100 a), c: Balance of System (additional system components e.g. inverter, mounting structure), d: Recycling gain/burdens calculation based on EN 15804.

### GWP of selected lifetime stages

Product (lifetime)	Poly-Si production [g CO <sub>2</sub> -Eq/kWh]	Packaging/Transportation [g CO <sub>2</sub> -Eq/kWh]
MEYER BURGER WHITE (25a)	5.54	0.15
MEYER BURGER BLACK (25a)	5.57	0.14
MEYER BURGER GLASS (30a)	4.62	0.13

Comparison to PERC module (CN): Up to 54% CO<sub>2</sub>-Eq savings in Poly-Si production due to use of Wacker Chemie AG Poly-Si in MEYER BURGER production, up to 90% CO<sub>2</sub>-Eq savings in transportation (for plant installed in Europe).

### Payback times

Product	Location	Energy payback time (EPBT <sup>e</sup> ) [a]		CO <sub>2</sub> payback time <sup>f</sup> [a]		
		Temperate Continental	Subtropical Arid	Germany	Austria	Switzerland
MEYER BURGER WHITE		0.96	0.55	1.23	1.90	6.40
MEYER BURGER BLACK		0.96	0.55	1.23	1.90	6.40
MEYER BURGER GLASS		0.96	0.55	1.24	1.92	6.47

e: calculated with a global grid efficiency of 33%, the yield and irradiation of the GWP results refers to the 'Temperate Continental' location, and a GTI of 2296 kWh/(a\*m<sup>2</sup>), 33°N to the 'Subtropical Arid' location, respectively, f: calculated with the first year's PV yield at 'Temperate Continental' location, which is assumed to replace the same electricity amount in the country-specific low voltage electricity grid mix (D: 542 g CO<sub>2</sub>-Eq/kWh, A: 350 g CO<sub>2</sub>-Eq/kWh, CH: 104 g CO<sub>2</sub>-Eq/kWh).

### Comparability and Benchmarking

LCA results can be calculated with different background databases, modeling assumptions, geographic scope and time periods, all of which are valid and acceptable according to ISO standards. The user of the LCA results should take care when comparing LCAs from different companies. Assumptions, data sources, and assessment tools may all affect the uncertainty of the final results and make comparisons misleading.

### LCA assumptions and limitations

To calculate the LCA results for the MEYER BURGER WHITE and MEYER BURGER BLACK a 25-year lifetime (30 years for MEYER BURGER GLASS) and a 15 kWp rooftop system was assumed. LCA considers DIN EN ISO 14040-4, DIN EN 15804, recommendation of IEA PVPS methodology guidelines for LCA of PV and the Product Environmental Footprint Category Rules for PV of EU-commission. The results are based on production data of MEYER BURGER and background data of ecoinvent Version 3.7.1 (2020). The used LCA software was Umberto Version 11.