

One year performance assessment of silicon hetero-junction solar modules on horizontal single axis tracker

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Abstract

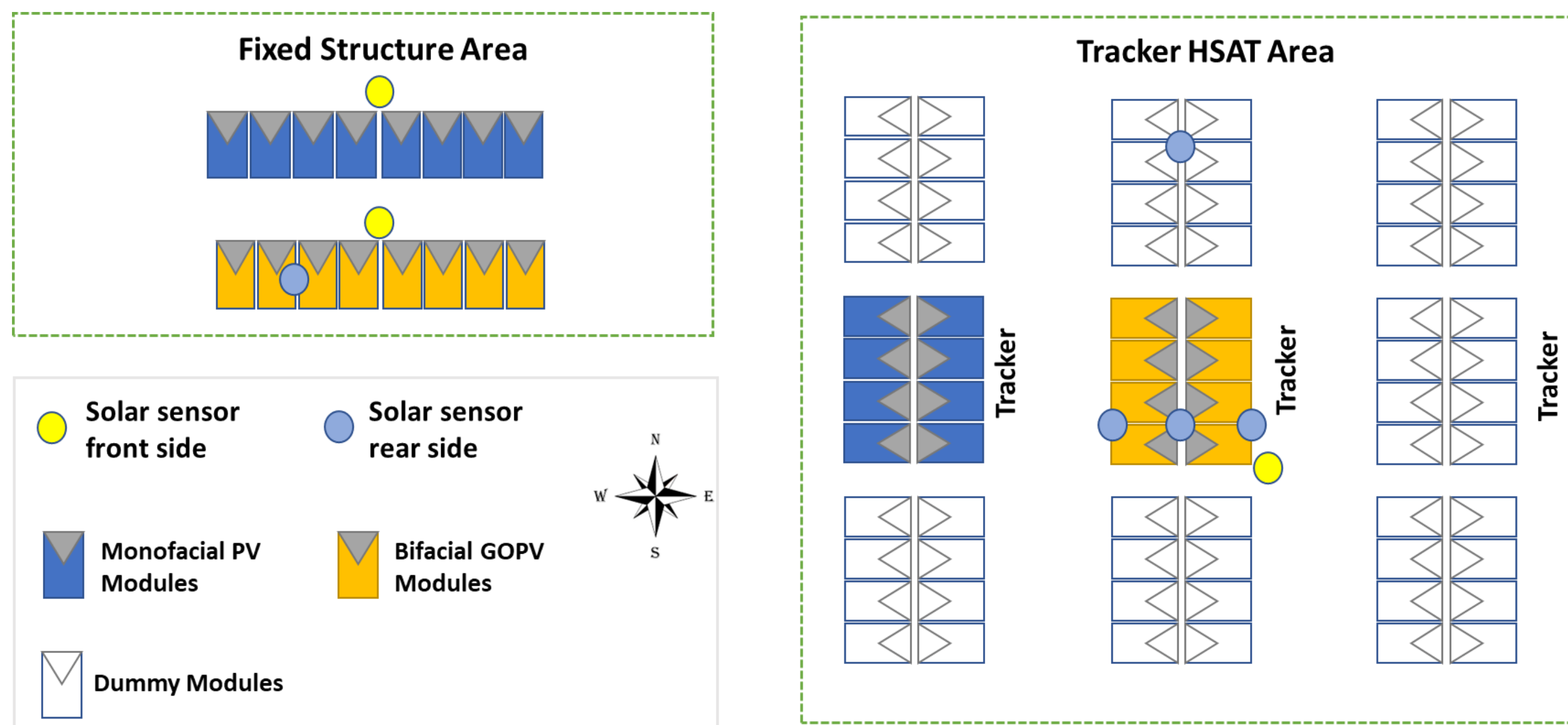
The deployment of **single-axis tracker bifacial PV systems** is growing rapidly globally, attracting the interest of several PV operators particularly targeting the utility-scale market segment.

In the framework of GOPV H2020 project an **experimental PV pilot plant** have been installed in Cadarache CEA Center solar platform (**France, 43° N**) consisting of **bifacial half-cell silicon heterojunction (HJT) PV modules combined with Horizontal Single Axis Trackers (HSAT), east-west sun tracking.**

This work compares the **energy gain** of the bifacial HJT technology, installed both on an inclined fixed structure and on a HSAT tracker, **with a PERC monofacial technology** installed on an inclined fixed structure, which is used as a benchmark.

PURPOSE OF WORK

Performance assessment of Heterojunction (HJT) bifacial technology combined with Horizontals Solar Axis Tracker (HSAT), with respect to the monofacial (PERC) mounted on a fixed tilted structure that is considered as reference in this analysis.



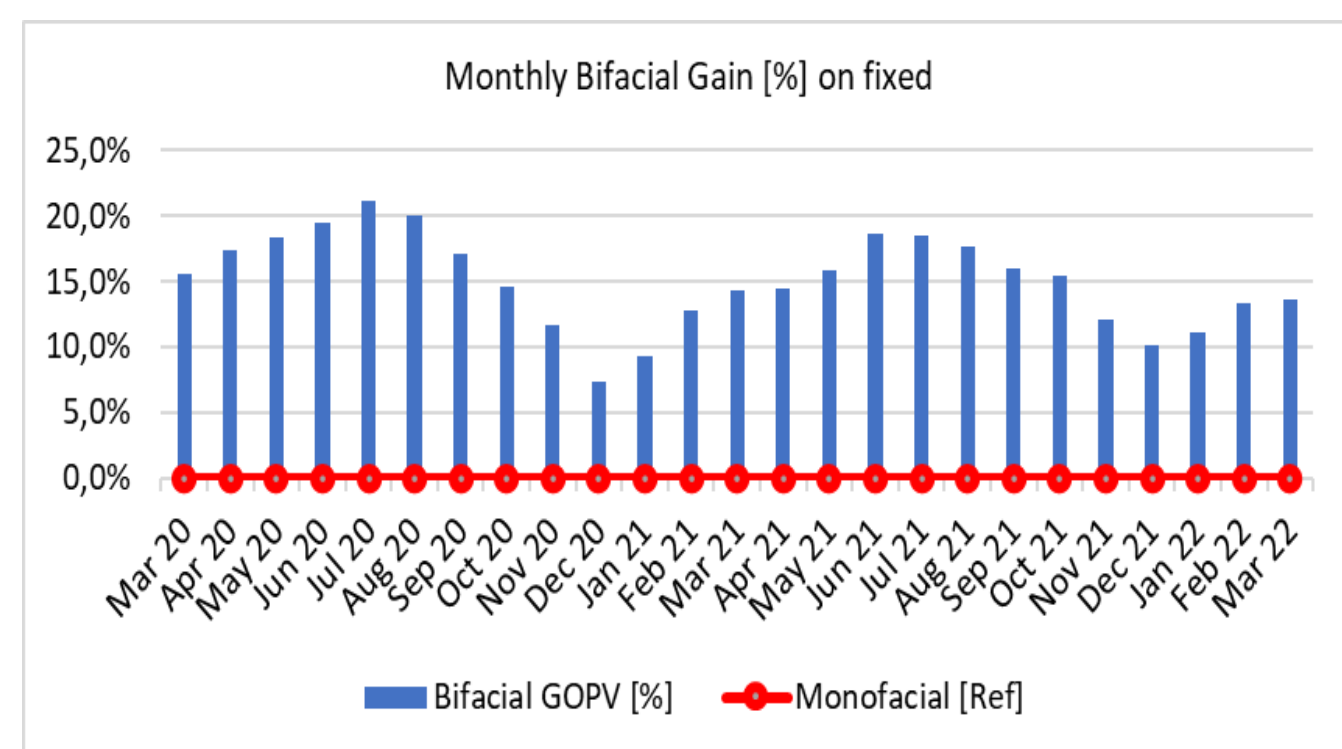
	Fixed		HSAT	
N. Modules	8		8	
N. Strings	1		1	
Layout	P		2P	
Technology	HJT Bfc	PERC Mfc	HJT Bfc	PERC Mfc
P_{STC} [kW]	2,95	2,56	2,97	2,56
Tilt	30°	30°	+/-55°	+/-55°
Elevation [m]	1	1	2,3 (*)	2,3 (*)
Albedo [avg]	0,25			
Soil Material	Gray gravel			

P – Portrait; 2P – two module in Portrait;
 Bfc – Bifacial; Mfc – Monofacial
 (*) average height of the tracker



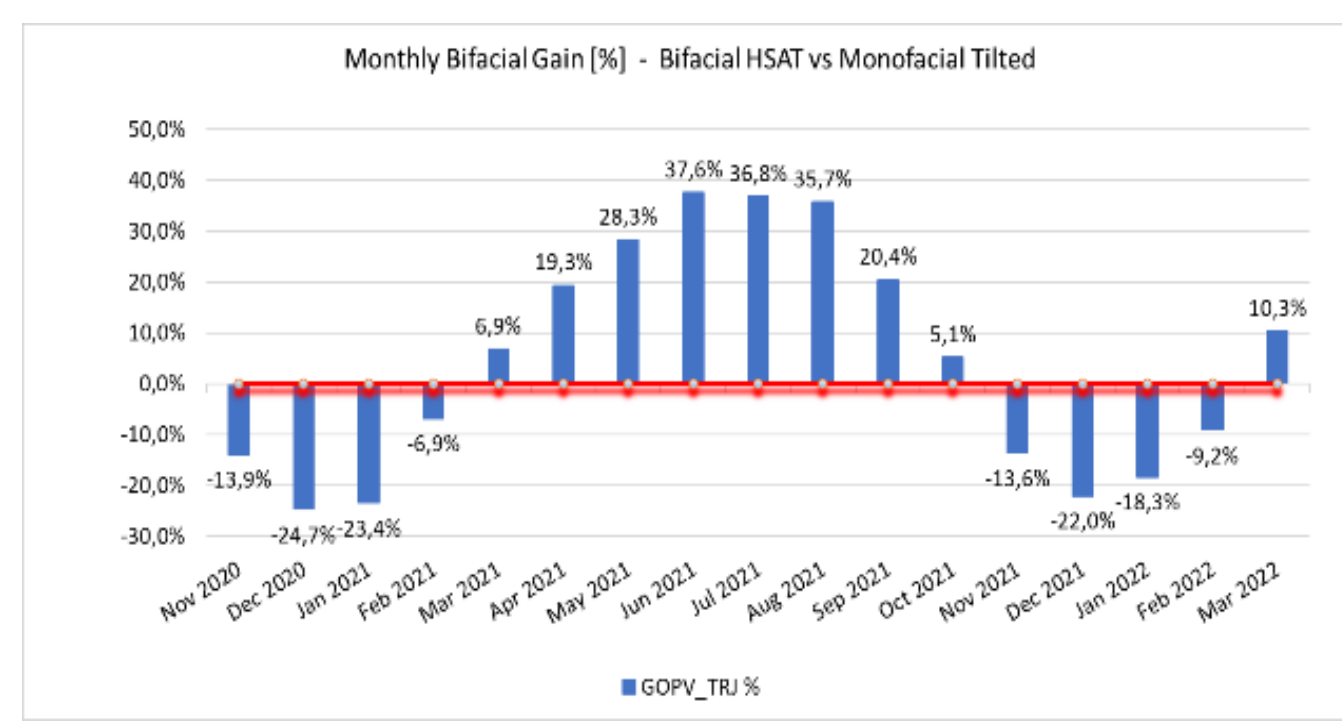
RESULTS

Energy Yield



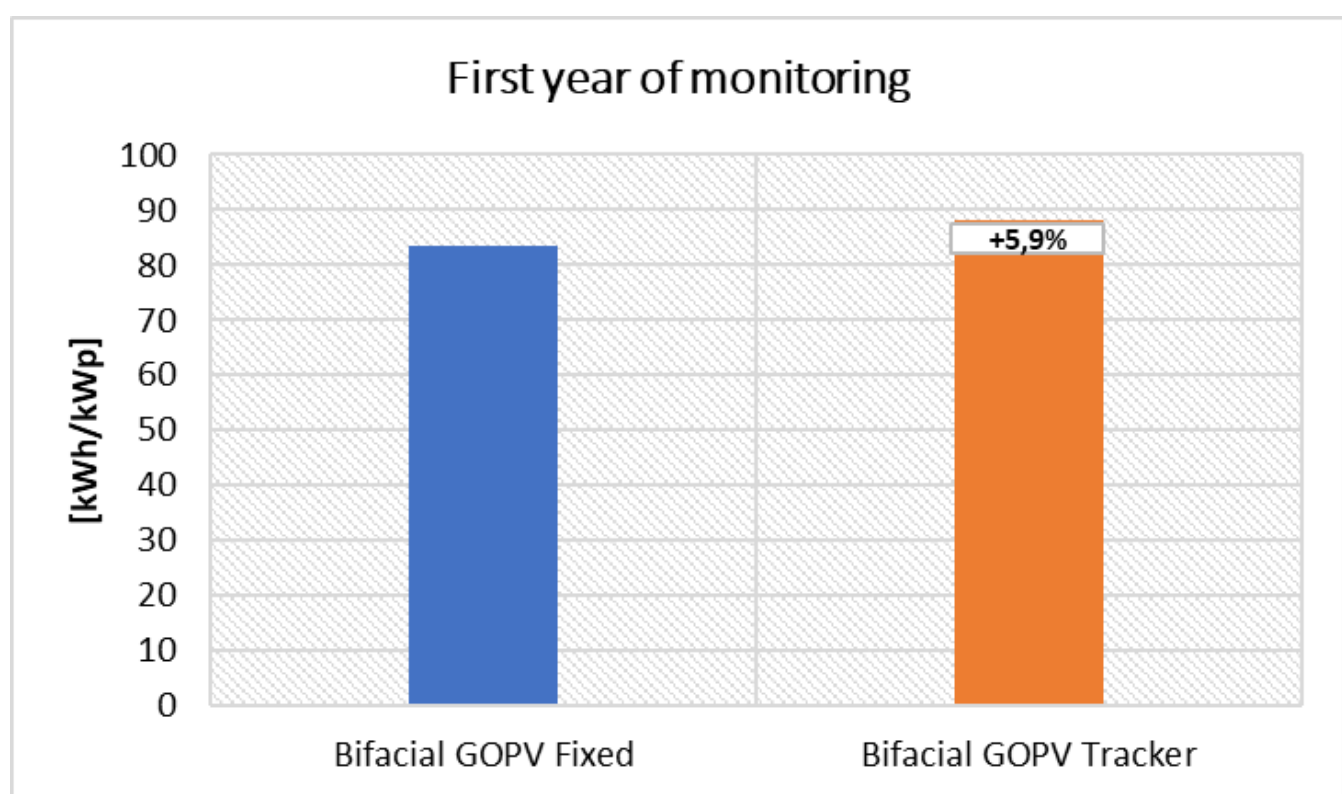
Fixed to fixed (Bifacial Gain):

GOPV bifacial versus Monofacial PERC - from March 20 to March 22 is, on average +15%.

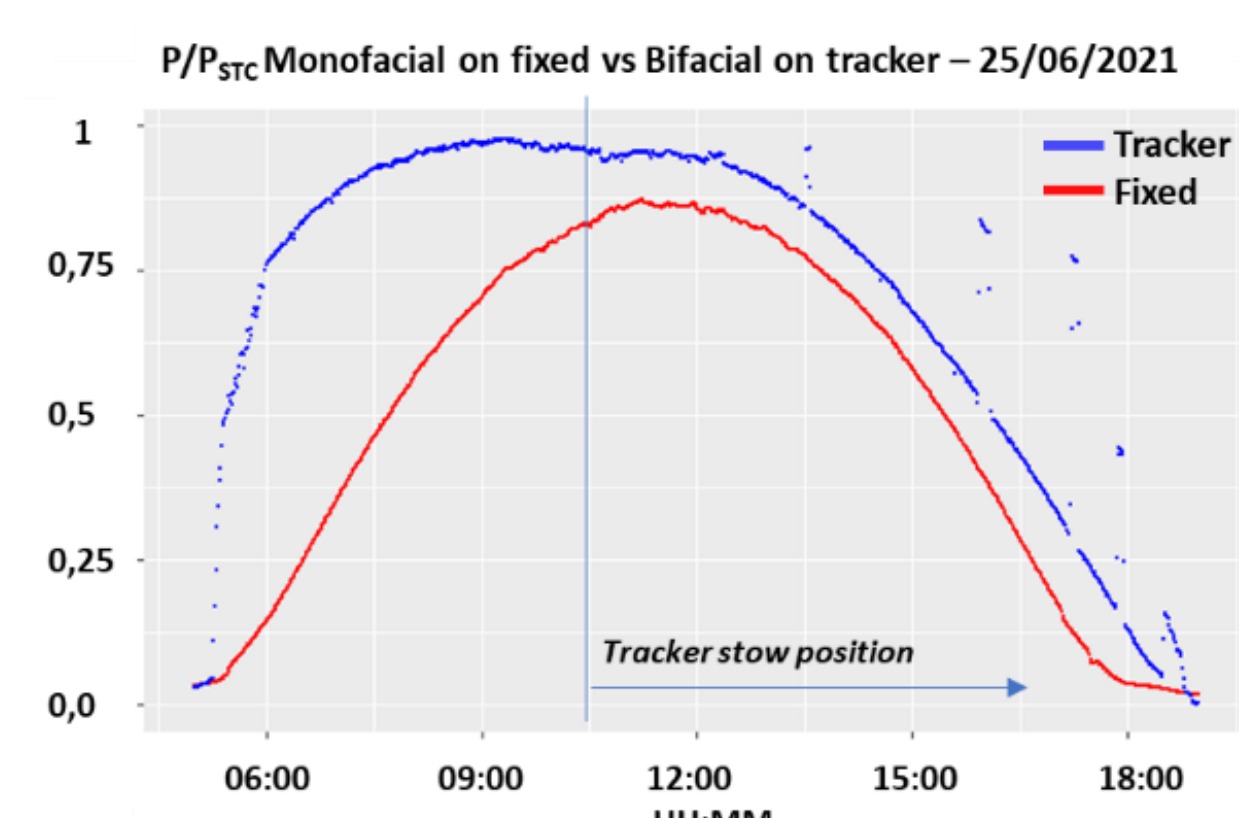


Tracker to fixed (Energy Gain):

GOPV bifacial (tracker) vs. Monofacial PERC (fixed) - during the summer months June, July and August the Energy Gain exceed the value of 35%.

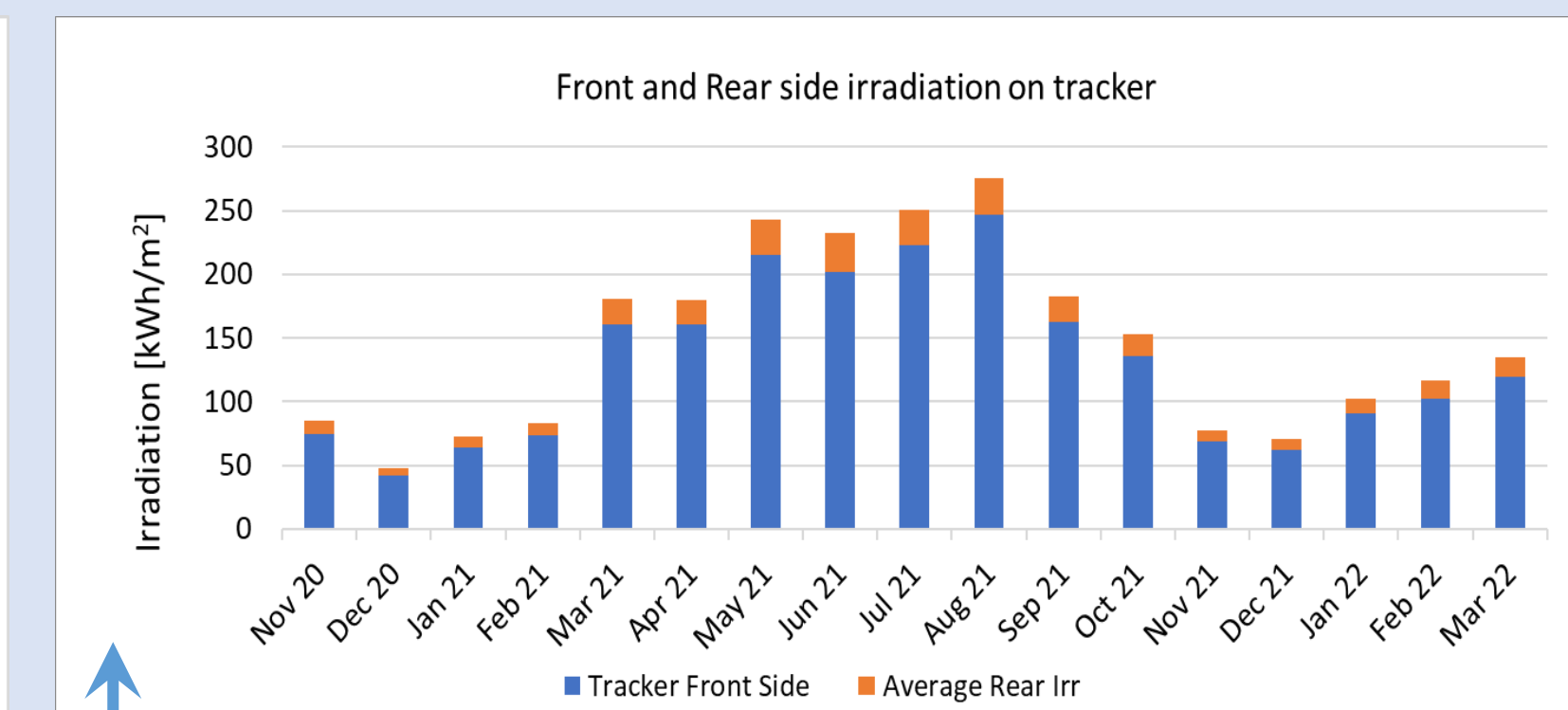
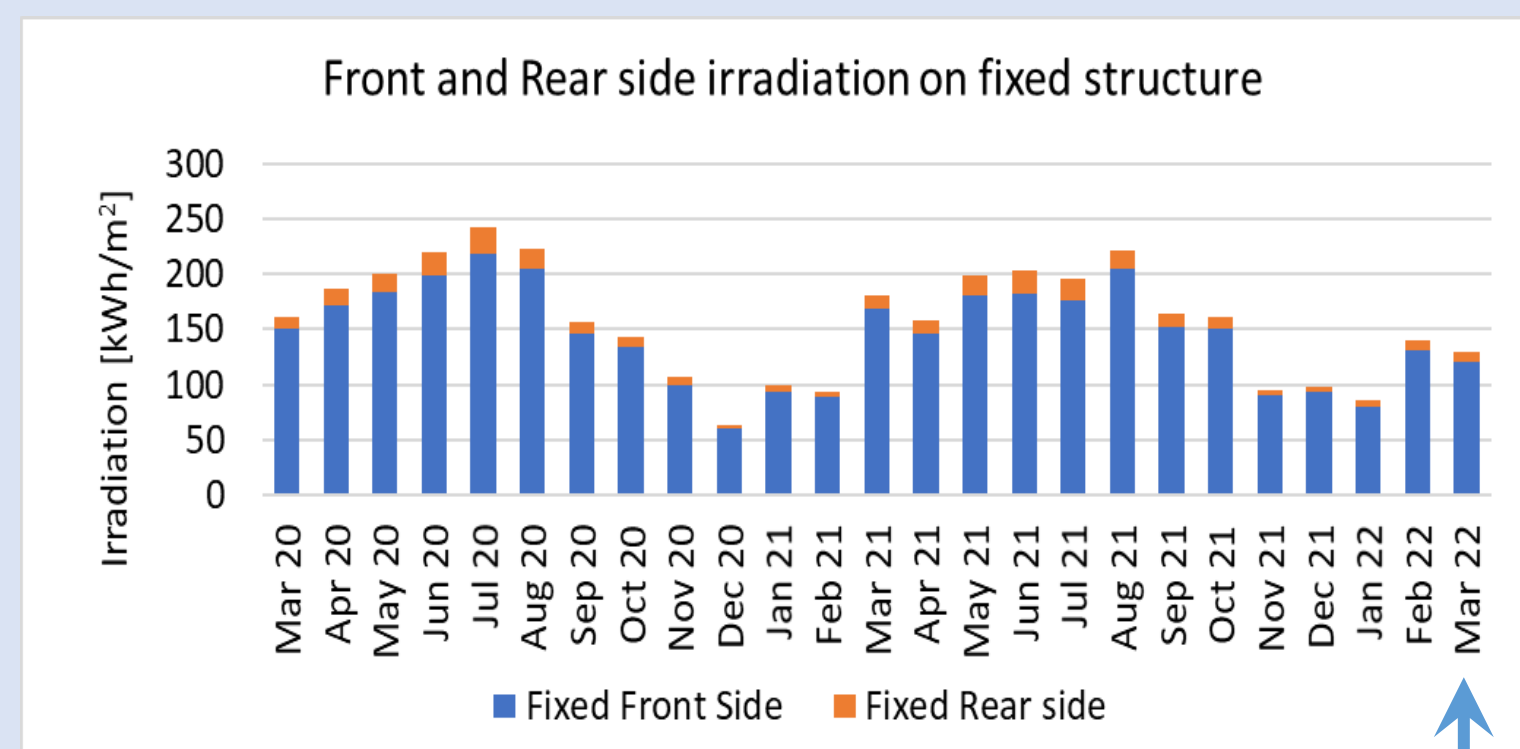


GOPV bifacial (tracker) vs. GOPV bifacial (fixed) -> Tracker energy gain +5,9%(based on only 12 days selected over the year); the expected, model-based was ~7%

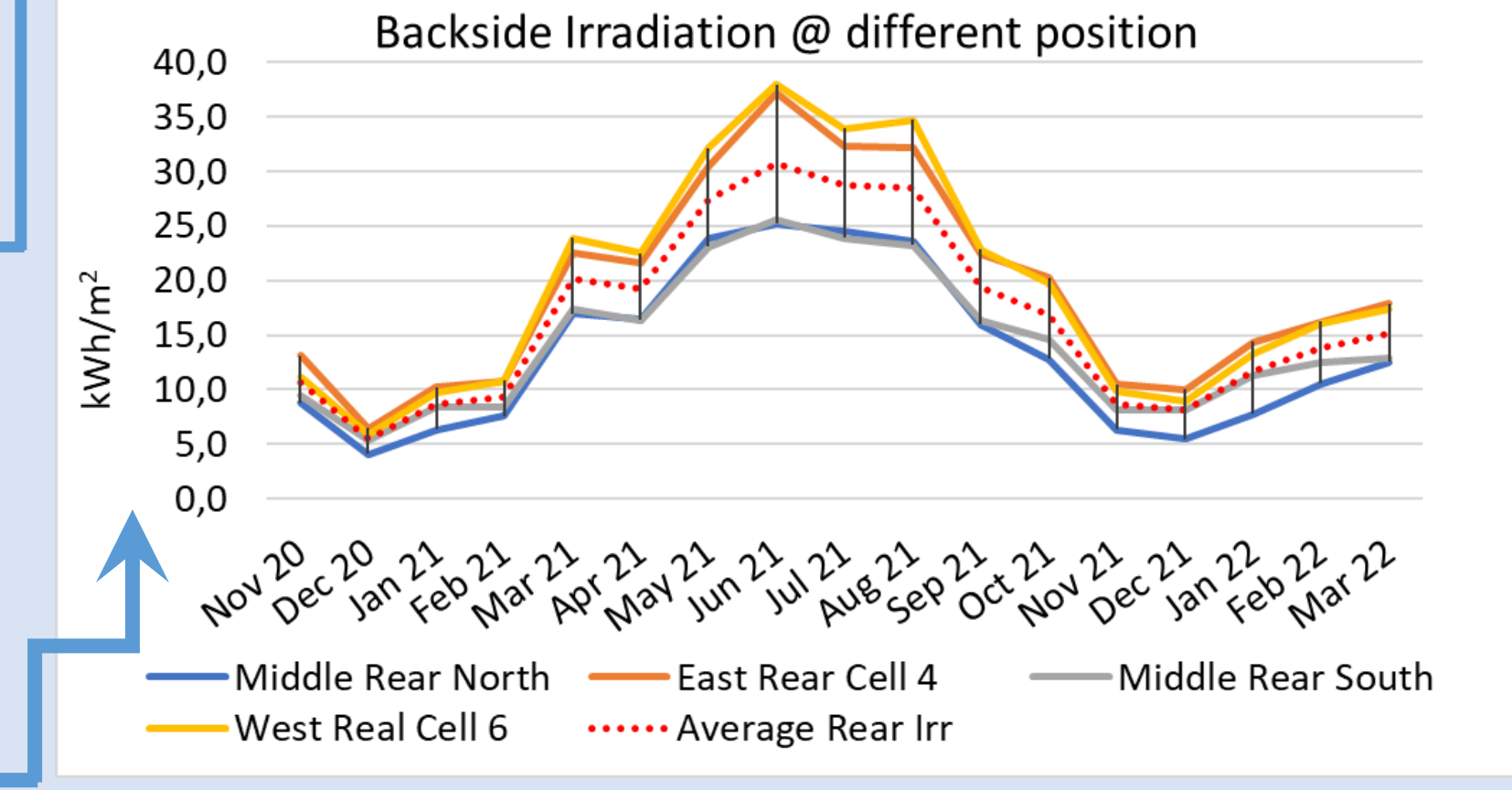


Power curves of the tracker in Stow Position: the power curve of the tracker takes the typical shape of a fixed system. The additional power contribution is only that linked to the bifacial gain.

Backside irradiation

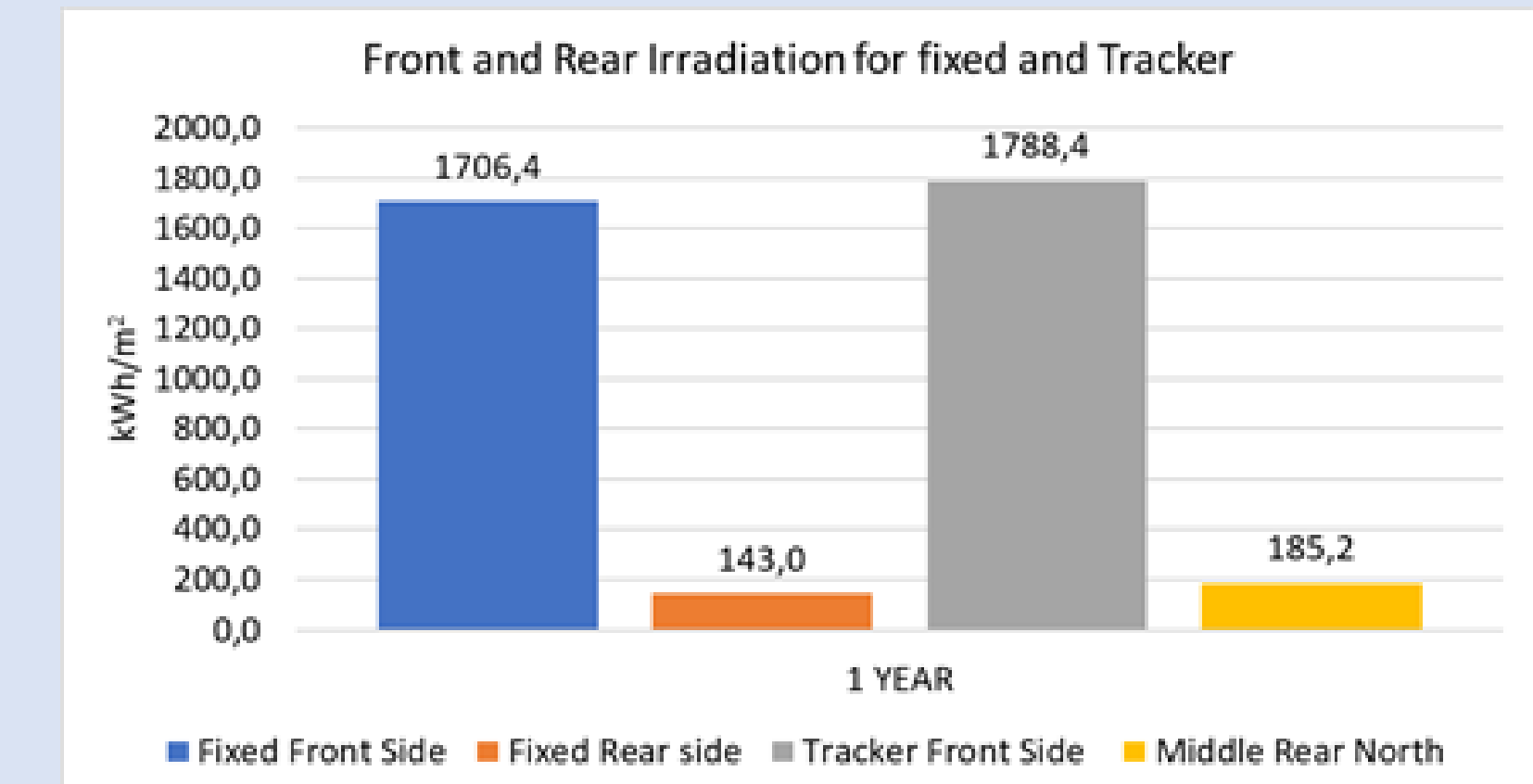


Monthly irradiance for fixed and tracker structures; the amount of rear-side radiation is less during the winter period due to fewer sunny days with clear skies, lower radiation, and lower sun elevation.



The rear-side inhomogeneity between the middle and edge of the structure is higher during the summer period

Backside contribution for tracker and fixed bench (1 Year): 10.4% for the tracker and 8.4% for the fixed structure; the effective irradiation (rear + front) on the tracking bench is 6,72% higher compared to fixed one



SUMMARY & OUTLOOK

The good result confirms the correctness of the technical solutions adopted during the project and the reliability of the components developed, both modules and trackers. The GOPV bifacial module, compared to Monofacial PERC reference, **shows + 15 % of array yield over the test period**, exceeding +20% in July 2020. The higher gains in summer months (up to 35%) of the tracker, compared to the monofacial on fixed, highly compensate the losses of the winter months, justifying the adoption of the tracker technology. A **tracker energy gain of 5,9%** (vs. expected ~7%) has been observed comparing GOPV bifacial technology on fixed and tracker.

H2020 GOPV - Global Optimization of integrated PhotoVoltaic system for low electricity cost; Partner:



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