

More panels or trackers?

The time value of solar

The next design decision should weigh the value of each generation hour against the lifetime cost of delivering it.



Illustrative sector photograph: TheUltimateGrass / Wikimedia Commons, CC0 1.0; cropped. Not a study plant.

1.0 Optimise the generation profile

At a fixed AC capacity, developers can install more DC modules, add single-axis trackers, or combine both. Our preliminary simulation shows that tracking broadens the generation profile, while extra fixed-tilt DC also raises output outside midday (Figure 1). Annual energy (Table 1) cannot settle the choice.

Make the commercial test explicit

Extra morning and late-afternoon energy earns a premium only when the applicable price is higher. Pair exported electricity with Indian Energy Exchange (IEX) day-ahead prices, then test the gain against equipment, land and maintenance costs. A flat-tariff power purchase agreement does not automatically capture that premium.

Figure 1. Tracking changes when electricity is generated

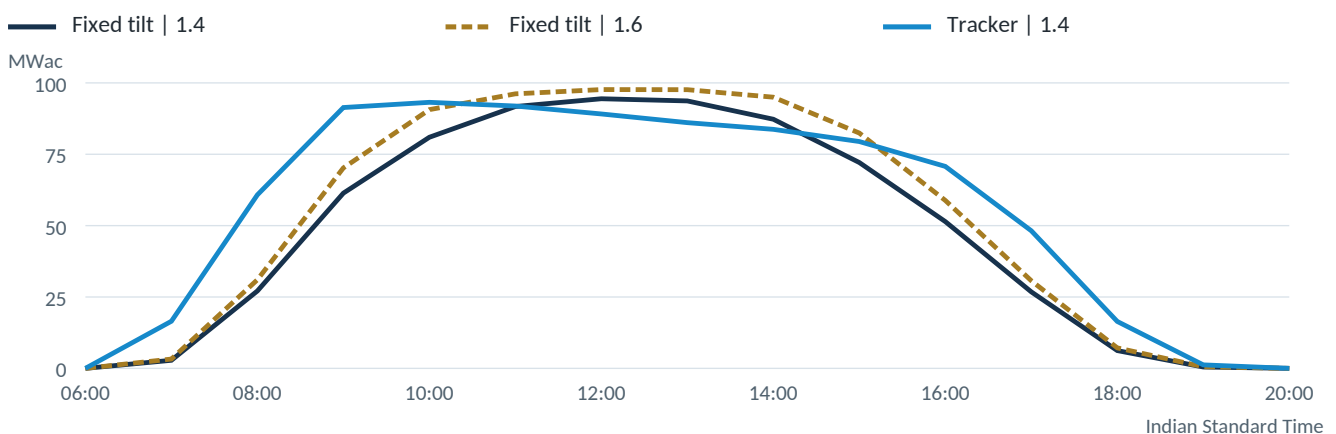


Table 1. More energy, different profiles

Configuration	DC/AC	GWh/year
Fixed tilt	1.4	254.2
Fixed tilt + DC	1.6	277.9
Single-axis tracker	1.4	302.5

The investment test

Gross value = Σ (export $\times$ price)

Match MWh and Rs/MWh by interval.

Then compare lifetime net value after additional capital, land and operating costs.

Sources for Figure 1 and Table 1: Firstgreen preliminary screening (3 October 2026); PVWatts v8 / PySAM, PVGIS-ERA5 typical-year weather, Rajasthan. 100 MWac; fixed tilt 25°; tracker backtracking; ground coverage 0.35; monofacial; losses 14%; inverter efficiency 98%. No client measurements or IEX prices used. Economic ranking remains untested.

2.0 Compare technologies on a common baseline

Field evidence calibrates the model. A controlled comparison tests the design.

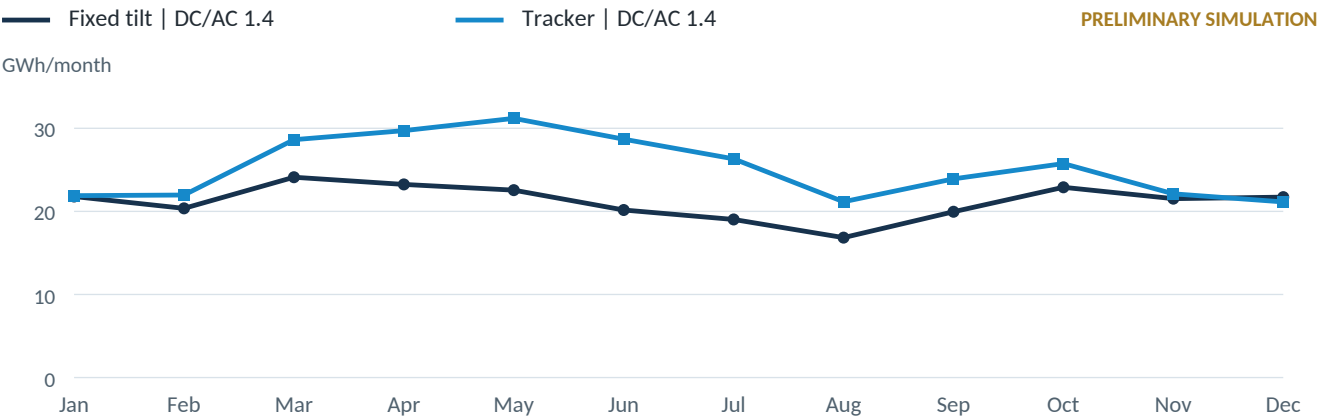
2.1 Control the site differences

Two 100 MWac plants can differ in solar resource, module technology, DC loading, temperature and grid availability. Their annual exports cannot isolate the value of tracking. Use the anonymised field records in Table 2 to calibrate each plant, then compare both designs under common weather, equipment assumptions and capacity limits.

2.2 Test the full seasonal cycle

The common-weather model in Figure 2 gives tracking a **19.0% annual energy gain** at equal DC/AC of 1.4. Monthly gains range from -2.7% to +42.3%. A short test window can therefore misrepresent the annual outcome. This is a preliminary simulation; a full-year measured comparison remains unverified.

Figure 2. The tracking gain changes with the season



Both cases: 140 MWp / 100 MWac. Source: Firstgreen PVWatts v8 / PVGIS-ERA5 screening; representative Rajasthan typical-year weather, with assumptions as on page 1. Monthly sums are inverter-side energy, not measured exports. No IEX prices are included.

Table 2. Evidence to establish before a measured comparison

Evidence	Plant F (fixed)	Plant T (tracker)	Analysis treatment
DC/AC basis	Drawing reviewed	Test records	Reconcile capacity
Metered energy	Year not verified	Test-period records	Obtain full year
Weather series	Not verified	Raw checks open	Validate sensors
Outage records	Partial records	Checks unresolved	Separate losses
Land & layout	Layout reviewed	Area not verified	Price usable land

Source: Firstgreen review of anonymised engineering and test records, 3 October 2026. Status describes the material reviewed; it is not a complete inventory of either plant.

Preserve the value signal. Validate sensors without forcing equal plane-of-array irradiation across technologies. Separate clipping, curtailment and equipment outages. For valuation, retain all valid metered energy, including low-irradiance periods; performance-test eligibility filters must not silently remove electricity that can earn revenue.

3.0 Optimise DC capacity and tracking together

The next increment of capacity matters as much as the total annual yield.

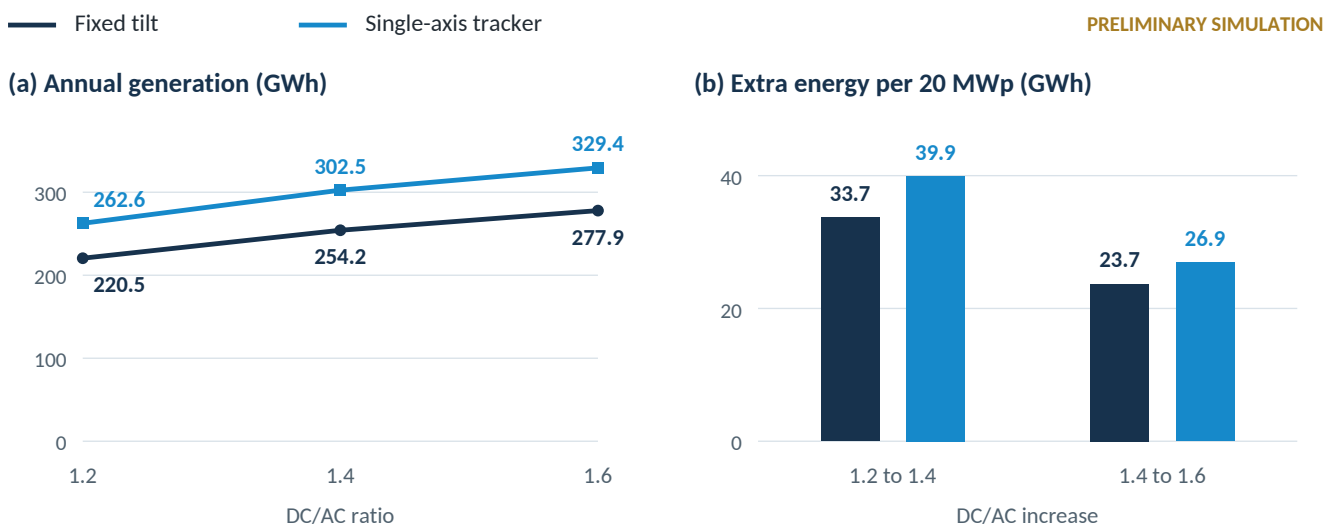
3.1 Compare six design options

Figure 3 tests both technologies at 120, 140 and 160 MWp behind 100 MWac of inverter capacity. A 140 MWp tracker produces **8.9% more energy** than 160 MWp of fixed tilt in this screening. Tracking and DC oversizing can be combined; the preferred option still depends on lifetime cost and electricity value.

3.2 Measure the marginal gain

More DC increases annual generation, but each additional 20 MWp delivers less energy than the previous increment. Fixed tilt falls from **33.7 to 23.7 GWh**; tracking from **39.9 to 26.9 GWh**. These diminishing energy returns make the value and cost of each increment essential to selecting the economic optimum.

Figure 3. More DC raises output, with diminishing energy returns



Source: Firstgreen PVWatts v8 / PVGIS-ERA5 screening, 3 October 2026. Representative Rajasthan typical-year weather; 100 MWac in all cases; assumptions as on page 1. Values are simulated inverter-side energy. Land, costs and IEX prices are not included.

Table 3. More DC increases hours at the inverter ceiling

DC/AC ratio	DC capacity (MWp)	Fixed tilt (h)	Tracker (h)
1.2	120	1	17
1.4	140	590	685
1.6	160	1,273	1,642

Source: same annual screening. [1] Anderson et al. (2022), The Effect of Inverter Loading Ratio on Energy Estimate Bias, NREL/CP-5K00-82812.

3.3 Check land and lifetime cost

Equal ground coverage does not mean equal land area. Include actual layout, land, tracker and maintenance costs when ranking the six configurations.

3.4 Check losses at finer intervals

Ceiling hours are not lost MWh. Hourly models can understate clipping; check high DC/AC designs with subhourly data.[1]

4.0 Price the generation profile, interval by interval

More energy and better timing make separate contributions to market value.

4.1 Match energy with its price

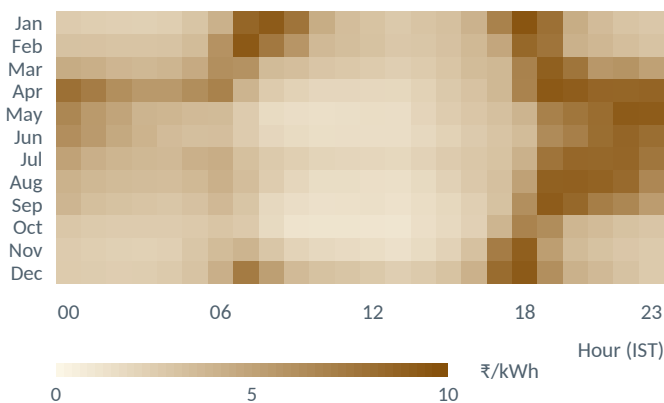
All **35,040 IEX day-ahead price blocks** in 2025 are paired with the existing typical meteorological year (TMY) simulation. Hourly generation is held constant across four 15-minute blocks, with time zones aligned. This is a **2025 price-weighted TMY scenario**, not actual 2025 plant revenue.

4.2 Separate volume and timing

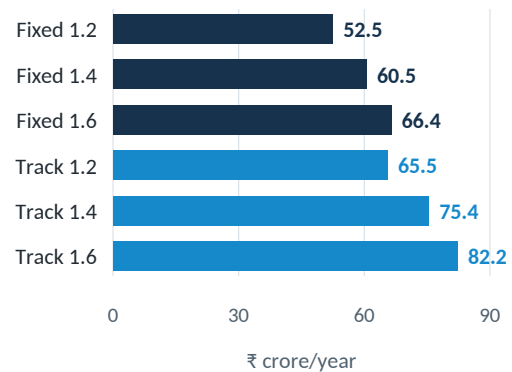
At DC/AC 1.4, tracking increases gross value by **24.6%**, compared with 19.0% more energy. Of the ₹14.88 crore gain, ₹11.49 crore comes from additional energy at fixed tilt's capture price; **₹3.39 crore** comes from the higher capture price achieved by tracking.

Figure 4. Generation timing changes the value of solar

(a) IEX price pattern, 2025



(b) Gross scenario value



Source: IEX Day Ahead Market, 1 January-31 December 2025, retrieved 3 October 2026; Firstgreen PVWatts simulation. Heatmap: monthly mean price by clock hour, for display only. Values use date-specific 15-minute market-clearing prices (MCP), with hourly power held constant; weather is TMY.

Table 4. Capture price distinguishes energy from value

Design DC/AC	Energy (GWh)	Capture (₹/kWh)	Gross (₹ crore)
Fixed tilt 1.2	220.5	2.380	52.48
Fixed tilt 1.4	254.2	2.380	60.50
Fixed tilt 1.6	277.9	2.389	66.39
Tracker 1.2	262.6	2.495	65.52
Tracker 1.4	302.5	2.492	75.38
Tracker 1.6	329.4	2.496	82.22

Gross inverter-output value at MCP, before delivery losses, fees, imbalance charges, outages, curtailment and contract limits. IEX flagged congestion in 247 blocks; applicable regional settlement prices can differ.

Capture price (₹/kWh) = gross benchmark value (₹) ÷ total modelled energy (kWh).

5.0 Let lifetime value set the tracker premium

Compare the extra capital cost with the discounted value it can earn.

5.1 Price the alternative design

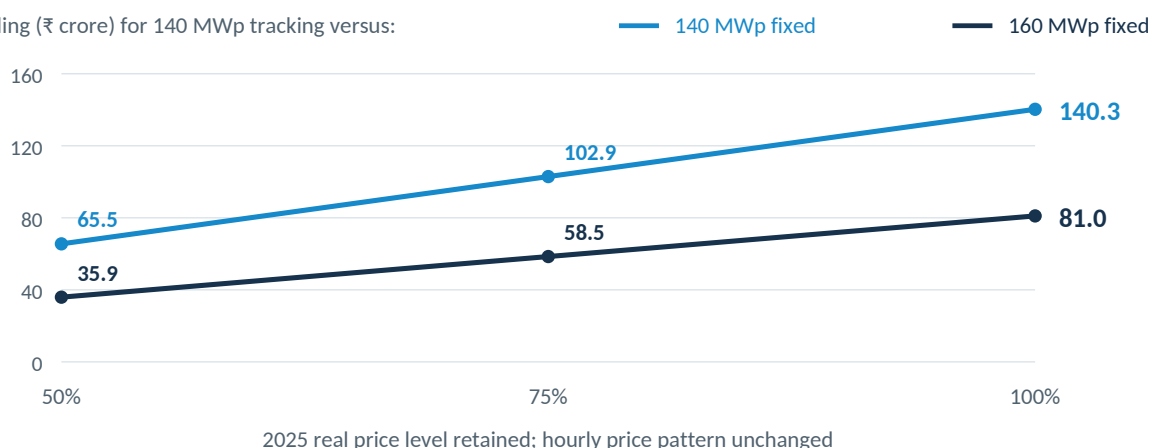
A 140 MWp tracker adds ₹14.88 crore/year of gross value against 140 MWp fixed tilt in the page 4 scenario. Under the assumptions below, it supports **₹140.3 crore** of extra upfront capital. Against 160 MWp fixed tilt, that ceiling falls to **₹81.0 crore**. These are screening limits, not quoted project costs.

5.2 Make the choice conditional

Tracking is preferred only when its quoted cost premium is below the relevant ceiling and its land requirement is feasible. Test wind stow, maintenance, availability and future price patterns. Under a flat-price PPA, value the extra energy at the contracted tariff; the IEX timing premium is not automatically earned.

Figure 5. Lower prices reduce the affordable capital premium

Ceiling (₹ crore) for 140 MWp tracking versus:



Source: Firstgreen calculations using page 4 IEX/PVWatts results. Historical prices are repeated in real terms for this sensitivity, not forecast. All options retain 100 MWac; no equal-land constraint is imposed.

Table 5. Timing and performance change the ceiling

Sensitivity (₹ crore ceiling)	vs 140 MWp fixed	vs 160 MWp fixed
2025 pattern; 8% real	140.3	81.0
No capture-price uplift	106.3	49.9
Tracker output 2% lower	125.1	65.9
10% real discount rate	119.8	69.3

Illustrative basis: 25 years; 8% real discount rate; 0.5% annual AC-value degradation; 98% common delivery factor; extra O&M plus land rent ₹0.75 crore/year in both comparisons; extra replacement ₹3 crore in year 12; zero terminal value. Pre-tax, unlevered, constant 2025 rupees. Fees, other curtailment and contract limits are excluded. Each table stress is separate; “no uplift” values both designs at the comparator fixed-tilt capture price.

Decision rule: incremental NPV = capital ceiling minus quoted upfront cost difference.

Include EPC and upfront land; re-run all six designs with validated exports and quoted costs.

Method: discounted cash flow; Firstgreen calculation. Full inputs, annual cash flows and sources accompany this report.