Cirata Floating Solar: modelled yield brief

192 MWp DC / 145 MWac, Cirata reservoir, West Java. v0.2, sources as of 2026-10-20, built 2026-10-20T15:20:45+00:00 with pvlib 0.16.1.

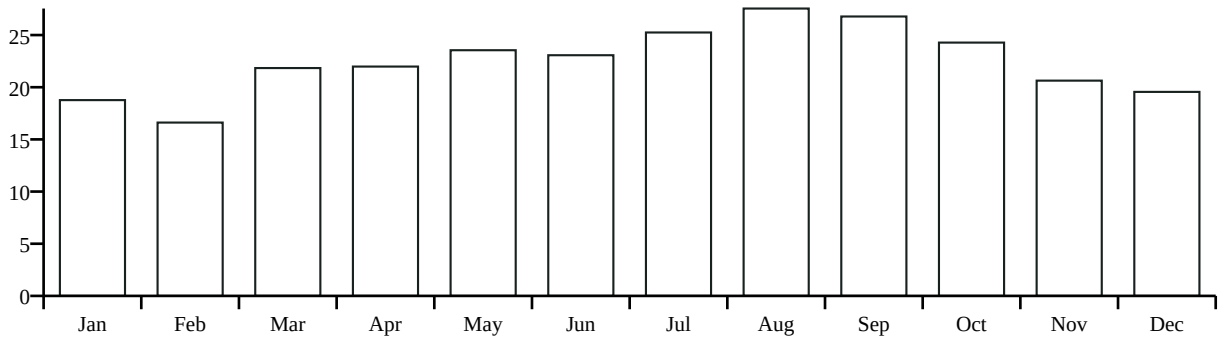
Weather: NASA POWER hourly, 2002-2025[1]; PVGIS-ERA5 2006-2023 as a cross-check[2].

What this is. Cirata publishes only annual and cumulative output, so this is a forecast from a physics model checked against sparse reports. It is not a calibrated model and not live data. Reported figures never set a parameter.

Key figures (mid scenario unless a range is given)

Metric	Value	Range	Badge
Annual energy, P50[8,1]	271 GWh	248-291 GWh (scenarios)	modelled
Weather spread (mid)	P90 253 / P10 286 GWh	24 weather years	modelled
Capacity factor (AC)	21.4%	19.5%-22.9%	modelled
Specific yield	1414 kWh/kWp	1290-1515	modelled
Performance ratio	86.5%	POA 1635 kWh/m2/yr	modelled
Revenue per year[38]	US$15.8M	US$14.4-16.9M at 58.179 US$/MWh	modelled x reported tariff
Build cost[39,40,42]	US$129-143M	Rp1.7T; conflicting, unverified	reported, secondary
Homes powered[51]	~179,000	at 1,519 kWh/household (ESDM-derived); official claim 50,000	inference
Avoided CO2 per year[33,15]	236 kt	at 0.87 t/MWh; 0.84 and 0.80 also quoted	inference, unverified

Monthly energy, mid scenario, median across weather years (GWh)



Scoreboard: model vs reports (GWh)

Each modelled value covers exactly the reporting period, repeated over every weather year; the envelope spans all scenarios. 'Same-period' uses that period's actual weather. Curtailment is not modelled; gross or net is not stated for any report.

Reported figure	Period	Reported	Same-period model (mid)	All-years mid P50	Envelope	Confidence
Inauguration to June 2024[27]	2023-11-09 to 2024-06-30	158	161.4	161.1	135-187	primary
Cumulative to mid-Nov 2024[34]	2023-11-09 to 2024-11-15	267	275.6	276.6	229-316	secondary
Calendar 2024[30]	2024-01-01 to 2024-12-31	279	264.6	271.6	225-313	secondary
AGM 2025 figure (probably 2024)[35]	2024-01-01 to 2024-12-31	273.68	264.6	271.6	225-313	secondary

Claims (not measurements)

Claim	Who	GWh/yr
Design: 245 GWh/yr[32]	ESDM / PLN NP, Nov 2023	245
250-300 GWh/yr[31]	PMSE	250-300
300 GWh/yr[19]	JinkoSolar	300
More than 200 GWh/yr[28]	PLN NP, Feb 2025	>200
Capable of 300 GWh/yr[36]	PLN NP via Warta Ekonomi / Dunia Energi	300

UGM thesis: output 95% of target; PR 'up to 93%' (best month, not annual); +17% PR vs nearby ground PV. The 17% is not a cooling effect (measured FPV cooling gain is 1-6%): it mixes module age, technology and O&M.; Shown as a claim only, never a model input.[33]

Checks (inference)

Plane-of-array sunlight needed for 1,453 kWh/kWp: 1709 kWh/m2 at PR 0.85, 1562 at PR 0.93. Modelled 2024: 1596 kWh/m2.[30,8]

Reports imply Jan-Jun 2024 about 122 GWh and Jul-Dec about 157 GWh (assumes a flat daily rate). Model with 2024 weather: 124.4 and 140.3 GWh.[27,30]

Methodology

Hourly, in UTC: NREL SPA sun position; Hay-Davies transposition with pvlib's infinite-sheds model (row shading, constant water/float albedo); PVsyst cell temperature with a floating-PV heat-loss coefficient; PVWatts DC; soiling, mismatch and first-year degradation; rear-side bifacial gain as a separate input; PVWatts inverter efficiency with clipping at 153.1 MW (49 inverters); AC losses; export cap at 145 MW; availability. Low and high scenarios set every assumed input to its pessimistic or optimistic end at once. No input is tuned to reported output.

Inputs (FIXED = reported, ASSUMED = not public, TUNED = none)

Input	Class	Low	Mid	High	Unit
Module tilt (facing north)[9,38]	ASSUMED	10	10	10	deg
Module azimuth[9]	ASSUMED	0	0	0	deg from N
Ground coverage ratio (row spacing)[9]	ASSUMED	0.75	0.65	0.55	-
Row width (module slant length)[9]	ASSUMED	2.3	2.3	2.3	m
Module height above water[9,21]	ASSUMED	0.5	0.5	0.5	m
Water/float albedo[9,10]	ASSUMED	0.06	0.07	0.08	-
Bifacial rear-side gain[9,20]	ASSUMED	0.0	0.02	0.03	fraction
Cell heat-loss coefficient Uc (cooling)[9,12,11]	ASSUMED	35	37	50	W/m2K
Power temperature coefficient[20]	FIXED	-0.003	-0.003	-0.003	1/degC
Soiling loss[9]	ASSUMED	0.04	0.02	0.01	fraction
Mismatch, DC wiring and wave motion[9]	ASSUMED	0.035	0.025	0.015	fraction
First-year module degradation[20]	FIXED	0.01	0.01	0.01	fraction
Annual degradation after year 1[20]	FIXED	0.004	0.004	0.004	fraction/yr
Extra degradation from humid over-water environment[9]	ASSUMED	0.003	0.001	0.0	fraction/yr
Inverter nominal efficiency[9]	ASSUMED	0.975	0.98	0.985	fraction
AC loss to export point (600 V to 20 kV to 150 kV)[9]	ASSUMED	0.025	0.015	0.01	fraction
Availability (uptime)[9,33]	ASSUMED	0.95	0.97	0.99	fraction
DC capacity[16,17]	FIXED		192000		kWp
Inverter AC capacity (49 x 3,125 kW)[15]	FIXED		153125		kW
Export limit[17,41]	FIXED		145000		kW
Location[46,9]	ASSUMED		-6.70056, 107.36694		deg
Altitude[2,47]	FIXED		220		m
PPA tariff[38]	FIXED		58.179		US$/MWh
Capital cost[39,40,42]	FIXED	129	129-143	143	US$ million
Household use (ESDM-derived)[51]	FIXED		1519		kWh/yr

Loss waterfall (mid, median weather year 2008, GWh)

Step	GWh after step	Change
Sunlight on panels at rated efficiency	313.8	
Temperature loss	301.2	-12.5
Soiling	295.2	-6.0
Mismatch, wiring, degradation	285.0	-10.3
Bifacial gain	290.7	+5.7
Inverter efficiency and AC losses	280.1	-10.6

Step	GWh after step	Change
Inverter clipping at 153.1 MW	279.9	-0.1
Export cap at 145 MW	279.8	-0.2
Availability	271.4	-8.4

Sensitivity (swing around 271.4 GWh)

Input	Low end	High end
Weather year (10th-90th percentile)	P10 year: -18.8	P90 year: +14.2
Availability (uptime)	0.95: -5.6	0.99: +5.6
Soiling loss	0.04: -5.5	0.01: +2.7
Bifacial rear-side gain	0.0: -5.2	0.03: +2.6
Cell heat-loss coefficient Uc (cooling)	35: -0.5	50: +2.2
Module tilt (facing north)	5: +0.1	15: -2.4
Water/float albedo	0.06: +0.0	0.08: +0.0

Contradictions ledger

Topic	Values (who said it)	Used here
Module rating	560 Wp (PMSE)[16] 570 W (JinkoSolar)[19]	560 Wp (570 W gives 336,842 modules, inconsistent with 'more than 340,000')
Array area	about 200 ha water (dossier (source not recorded))[15] about 250 ha incl. land (dossier (source not recorded))[15]	250 ha total, 200 ha water
Reservoir coverage	4.0% (250/6,200) (derived)[9] 20% (id.wikipedia)[24]	4.0%; 20% confuses the regulatory ceiling with coverage
Annual output claims	245 GWh (ESDM / PLN NP)[32] 250-300 GWh (PMSE)[31] 300 GWh (JinkoSolar)[19] >200 GWh (PLN NP)[28]	Shown as claims only, never as inputs
World ranking	3rd largest (President, Nov 2023)[32] 5th largest (PLN NP, Feb 2025)[28]	Not used
PPA signed	2020 (PMSE)[16] Jan 2021 (Power Technology, NS Energy)[38]	Not used in the model
Transmission line	3.2 km (PMSE)[16] about 4 km (one source)[15]	3.2 km
Homes powered	50,000 homes (official)[15] about 183,700 homes (ESDM-derived, 1,519 kWh)[51]	ESDM-derived by default; official as a toggle
Capex	US$95M (2025 review (looks partial))[15] US$129M (Jakarta Post, IPB)[39] US$143M (Listrik Indonesia)[42] Rp1.7T (official remarks)[15]	US$129-143M, unverified
Debt	US$114M (sponsor article)[15] about US$140M (PLN president director via Bisnis.com)[15]	Not used (implied gearing 80-88%, not public)
2024 output	279 GWh (Ecobiz)[30] 273.7 GWh (AGM 2025)[35]	Both shown on the scoreboard (1.9% apart)
Fish cages	about 100,000 (Satgas Citarum Harum, Jul 2026)[50] 93,641-120,000 (earlier counts)[15]	about 100,000 (latest primary)
Panels per island	over 28,000 (PowerChina via CRI)[26] 26,374 (derived 342,857 / 13)[9]	Layout shown as illustrative only
PR advantage	+17% PR vs ground PV (UGM thesis)[33] 1-6% cooling gain (FPV literature)[12]	17% shown as a flagged claim; not a model input

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Not public

Tilt, Azimuth, Row spacing, Availability, Gross vs net metering of reported output, PPA indexation, deemed dispatch, curtailment, O&M; cost, Inverter make/model, Hourly or monthly metered output, Cirata U-value, Bifaciality factor for this plant, Official Jamali combined-margin emission factor, Reservoir level feed, Array centroid coordinates.

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