Optimum PV Cleaning Interval for Soiling

Cleaning interval that minimises the cost of soiling losses plus cleaning for a PV plant with a steady soiling rate, with the average loss and yearly cost.

Method: Economic interval for a linearly growing loss

Input parameters

Unit system: SI

Parameter	Value	Unit
Clean-array energy per day	5,000.0	kWh
Soiling loss rate per day	0.20000	%
Value of energy (currency per kWh)	0.050000	
Cost per cleaning (currency)	1,500.0	

Calculated results

Parameter	Value	Unit
Optimum interval (days)	77.460	
Average soiling loss at the optimum	7.7460	%
Cost of soiling and cleaning per day	38.730	
Cost per year	14,136	
Cleanings per year	4.7121	

Notes for this case

• Linear soiling: lost energy per day over an interval T averages E r T/2, so daily cost = E r T c_e/2 + C/T, minimised at T* = √(2C/(E r c_e)). Rain cleans arrays naturally; use the dry-season soiling rate.

Formula and method

$$T^* = \sqrt{\frac{2C}{Erc_e}}, \quad c_{day,min} = \sqrt{2CErc_e}, \quad \bar{l} = \frac{rT^*}{2}$$

Variables

E	Clean-array energy per day	J
r	Soiling loss rate per day	-
c_e	Value of energy (currency per kWh)	-
C	Cost per cleaning (currency)	-
T^*	Optimum interval (days)	-
$\bar{l}$	Average soiling loss at the optimum	-
c_{day}	Cost of soiling and cleaning per day	-
c_{year}	Cost per year	-
n	Cleanings per year	-

Method and standards

Cleaning optimisation.

Assumptions and limits

- Constant soiling rate; full recovery at each cleaning.

References

Economic interval for a linearly growing loss

Report details

Report reference	FCC-GCSH-2RRT (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/solar-pv/pv-soiling-cleaning-interval

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.