Levelised Cost of Electricity Storage (LCOS)

Levelised cost per MWh discharged of a battery or other store from energy and power cost, cycles, round-trip efficiency, life, discount rate and charging price.

Method: Levelised cost of storage with a capital recovery factor

Input parameters

Unit system: SI

Parameter	Value	Unit
Power rating	50.000	MW
Storage duration at rated power (hours)	4.0000	
Energy-related capital cost (currency per kWh)	250.00	
Power-related capital cost (currency per kW)	150.00	
Fixed O&M (fraction of capital per year)	2.0000	%
Round-trip efficiency	86.000	%
Usable depth of discharge	90.000	%
Full cycles per year	300.00	
Life (years)	15.000	
Discount rate	7.0000	%
Charging electricity price (currency per MWh)	30.000	

Calculated results

Parameter	Value	Unit
Capital cost	6.3056e+07	
Capital recovery factor	10.979	%
Energy discharged per year	60,000	MWh
Capital cost per MWh discharged	115.39	
O&M cost per MWh discharged	21.019	
Charging cost per MWh discharged	34.884	
Levelised cost of storage per MWh	171.29	

Notes for this case

- Nameplate energy = P·h/DoD; annual discharge = P·h·N_c; LCOS = (CRF + f_O&M)·C/E_d + c_ch/η_RT. Degradation, augmentation and end-of-life value are not included; add them for a bankable model.

Formula and method

$$LCOS = \frac{(CRF + f_{O\&M})C}{E_d} + \frac{c_{ch}}{\eta_{RT}}, \quad C = c_E \frac{Ph}{DoD} + c_P P$$

Variables

P	Power rating	W
h	Storage duration at rated power (hours)	-
c_E	Energy-related capital cost (currency per kWh)	-
c_P	Power-related capital cost (currency per kW)	-
$f_{O\&M}$	Fixed O&M (fraction of capital per year)	-
η_{RT}	Round-trip efficiency	-

DoD	Usable depth of discharge	-
N_c	Full cycles per year	-
n	Life (years)	-
i	Discount rate	-
c_{ch}	Charging electricity price (currency per MWh)	-
C	Capital cost	-
CRF	Capital recovery factor	-
E_d	Energy discharged per year	J
c_{cap}	Capital cost per MWh discharged	-
$c_{O\&M}$	O&M cost per MWh discharged	-
c_{ch}/η	Charging cost per MWh discharged	-
$LCOS$	Levelised cost of storage per MWh	-

Method and standards

Levelised cost of storage.

Assumptions and limits

- Constant cycles and prices; no degradation.

References

Levelised cost of storage with a capital recovery factor

Report details

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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/environmental/hydrogen-fuel-cells/levelised-cost-of-storage

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.