Gravity Energy Storage with Lifted Mass

Energy stored by lifting a mass through a height, the mass needed per MWh, power at a lowering speed and the round-trip energy delivered.

Method: Potential energy storage

Input parameters

Unit system: SI

Parameter	Value	Unit
Mass lifted	35,000	t
Height difference	120.00	m
Round-trip efficiency	80.000	%
Lowering speed	0.50000	m/s

Calculated results

Parameter	Value	Unit
Potential energy stored	11.441	MWh
Energy delivered (√η on discharge)	10.233	MWh
Mass per MWh stored	3,059.1	t
Discharge power at the lowering speed	153.50	MW
Discharge time	0.066667	h

Notes for this case

- E = mgh; round-trip efficiency split equally between lifting and lowering. Storing 1 MWh needs about 3,000 t lifted 120 m, which is why pumped hydro (moving water) dominates gravity storage.

Formula and method

$$E = mgh, \quad E_{out} = \sqrt{\eta}\, E, \quad P = mgv\sqrt{\eta}$$

Variables

m	Mass lifted	kg
h	Height difference	m
η	Round-trip efficiency	-
v	Lowering speed	m/s
E	Potential energy stored	J
E_{out}	Energy delivered (√η on discharge)	J
m/MWh	Mass per MWh stored	kg
P	Discharge power at the lowering speed	W
t	Discharge time	s

Method and standards

Gravity storage.

Assumptions and limits

- Rigid mass; constant efficiency.

References

Potential energy storage

Report details

Report reference	FCC-D1GS-GV63 (the same inputs always give the same reference)
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Calculator	Gravity Energy Storage with Lifted Mass
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Software release	FireCAD Calc, release of 22 November 2026
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/gravity-energy-storage

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.