Geothermal Reservoir Heat in Place and Power Capacity

Heat stored in a geothermal reservoir by the volumetric method, and the electrical capacity it supports from recovery factor, conversion efficiency and plant life.

Method: Volumetric heat-in-place method

Input parameters

Unit system: SI

Parameter	Value	Unit
Reservoir area	10.000	km²
Reservoir thickness	1,000.0	m
Reservoir temperature	250.00	°C
Rejection (abandonment) temperature	80.000	°C
Porosity	10.000	%
Rock volumetric heat capacity	2,500.0	kJ/Nm³
Fluid volumetric heat capacity	3,500.0	kJ/Nm³
Recovery factor	15.000	%
Conversion efficiency to electricity	12.000	%
Plant life	30.000	a
Capacity factor	90.000	%

Calculated results

Parameter	Value	Unit
Heat in place above the rejection temperature	1,227,778	GWh
Recoverable heat	184,167	GWh
Electrical energy over the life	22,100	GWh
Electrical capacity	93.374	MW
Capacity per km² (MW)	9.3374	

Notes for this case

• Volumetric (heat-in-place) method: Q = Ah[(1 − φ)ρ_rc_r + φρ_wc_w](T_r − T_f); capacity = R_f η Q/(L·CF). Recovery factor (often 0.05–0.25) and efficiency carry most of the uncertainty; use Monte Carlo ranges for resource reporting.

Formula and method

$$Q = Ah\left[(1-\phi)\rho_r c_r + \phi\rho_w c_w\right](T_r - T_f), \quad P = \frac{R_f \eta Q}{L \cdot CF}$$

Variables

A	Reservoir area	m²
h	Reservoir thickness	m
T_r	Reservoir temperature	K
T_f	Rejection (abandonment) temperature	K
ϕ	Porosity	-
$\rho_r c_r$	Rock volumetric heat capacity	J/m³
$\rho_w c_w$	Fluid volumetric heat capacity	J/m³
R_f	Recovery factor	-

η	Conversion efficiency to electricity	-
L	Plant life	s
CF	Capacity factor	-
Q	Heat in place above the rejection temperature	J
Q_r	Recoverable heat	J
E	Electrical energy over the life	J
P	Electrical capacity	W
P/A	Capacity per km² (MW)	-

Method and standards

Volumetric resource estimate.

Assumptions and limits

- Uniform reservoir properties; single deterministic estimate.

References

Volumetric heat-in-place method

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/geothermal-ocean/geothermal-reservoir-heat-in-place

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.