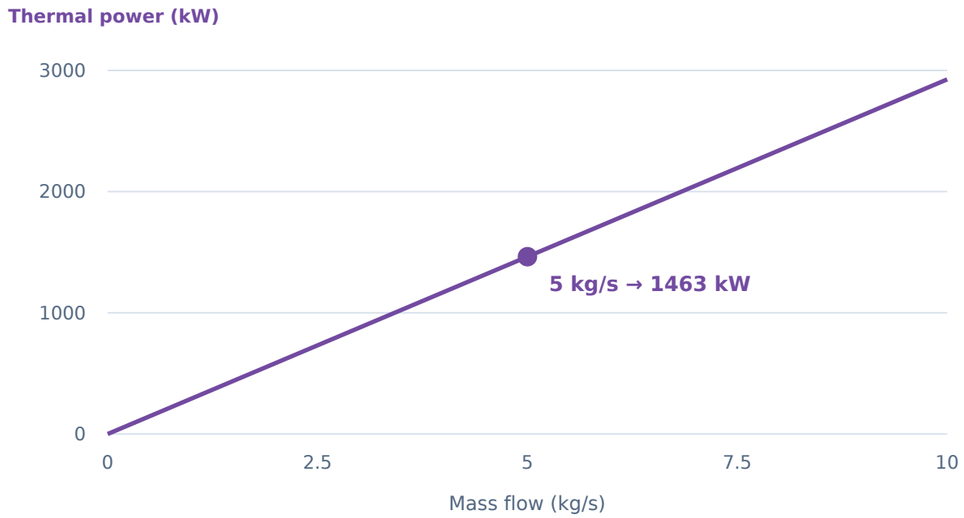
Open Thermal Lab: geothermal heat balance

A steady-flow water-loop example connecting an explicit system boundary, a worked calculation and a testable next question.

FICTIONAL TEACHING EXAMPLE · NO MEASURED FINDINGS

Thermal power at a fixed 70 K temperature drop



5.5 × 4.18 × (120 - 50) = 1609.3 kW thermal (+10%)

Linear sensitivity follows from the imposed temperatures and constant cp. The outlet is an input, not a prediction of exchanger capacity. Assumes pressure sufficient to retain liquid water.

Dr. Leila Haddad · fictional researcher

Read with the profile’s research brief and interactive app.

01 · Research question

How much thermal power leaves a geothermal water stream for specified flow and inlet/outlet temperatures?

02 · Demonstration model

P = m_dot × cp × (Tin − Tout)
Choose cp = 4.18 kJ/(kg·K), hold outlet at 50 °C and assume pressurized, single-phase liquid water. Inputs are illustrative.

03 · Sensitivity result

5 kg/s and a 70 K drop give 1463 kW thermal. At fixed temperatures, 5.5 kg/s gives 1609.3 kW (+10%). This is a model identity, not a measured improvement or electrical output.

04 · Next validation step

Measure flow, temperature and pressure; evaluate heat losses and actual fluid properties. Exchanger limits and reservoir behavior require additional models.
Dr. Leila Haddad · fictional researcher