

Pumped Hydro Storage Lab

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/pumped-hydro/>

Name: _____ Date: _____

Learning objectives

- Explain gravitational energy storage.
- Compute stored energy from mass and height.
- Define round-trip efficiency.

Variables to change

- Reservoir height
- Water volume
- Flow rate

Procedure

1. Pump water uphill to store energy and note the energy used.
2. Release it through the turbine to recover energy.
3. Compare energy stored with energy recovered.

Observations

Record stored vs recovered energy and how height and volume change the stored amount.

Questions

1. How is energy stored in pumped hydro?
2. Write the stored energy.
3. How does reservoir height affect storage?

4. What is a typical round-trip efficiency?
5. Why is pumped hydro used for grid storage?

Answer key (instructors)

- **1.** As gravitational potential energy of water raised to a higher reservoir.
- **2.** $E = mgh = \rho Vgh$ (mass or water volume $\times$ g $\times$ height).
- **3.** Stored energy is proportional to height — higher head stores more per unit volume.
- **4.** About 70–80%, after pumping and generation losses.
- **5.** It can store large amounts of energy and release it quickly to balance supply and demand.

Pumped hydro stores energy by pumping water uphill ($E = mgh$) and recovers it by letting the water drive a turbine. Stored energy grows with height and volume; round-trip efficiency is ~70–80%, and it scales to grid-sized storage.