

Hydropower

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The largest power plant of any kind in the world is the Three Gorges Dam.

Location: China. Installed Capacity: 22.500 GW



Figure courtesy of Wikipedia

In its simplest form, hydropower comes from potential energy

$$P = g * \rho * Q * H_1$$

P_{th} = power theoretically available (W)

ρ = density (kg/m^3) ($\sim 1000 \text{ kg}/\text{m}^3$ for water)

Q = water flow (m^3/s)

g = acceleration of gravity ($9.81 \text{ m}/\text{s}^2$)

H = falling height, head (m)

It can also be derived from flowing water, but that is rare and we will not discuss that here.

What would be the height (H) and water flow (Q) on Niagara Falls?



Figure courtesy of Wikipedia

What would be the height (H) and water flow (Q) on this dam?

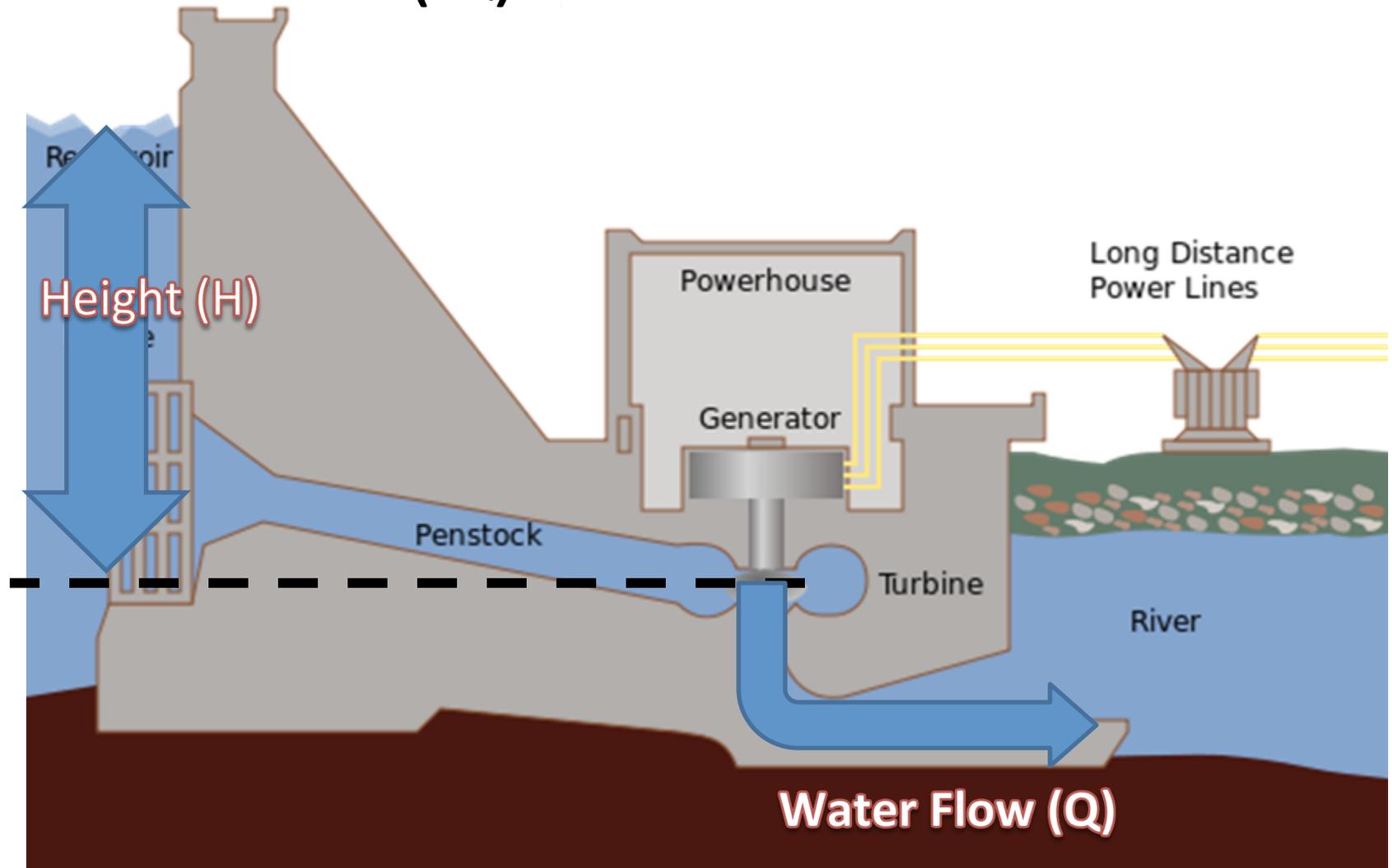


Figure courtesy of Wikipedia

Yes, water flows from the reservoir across the generator to make electricity.

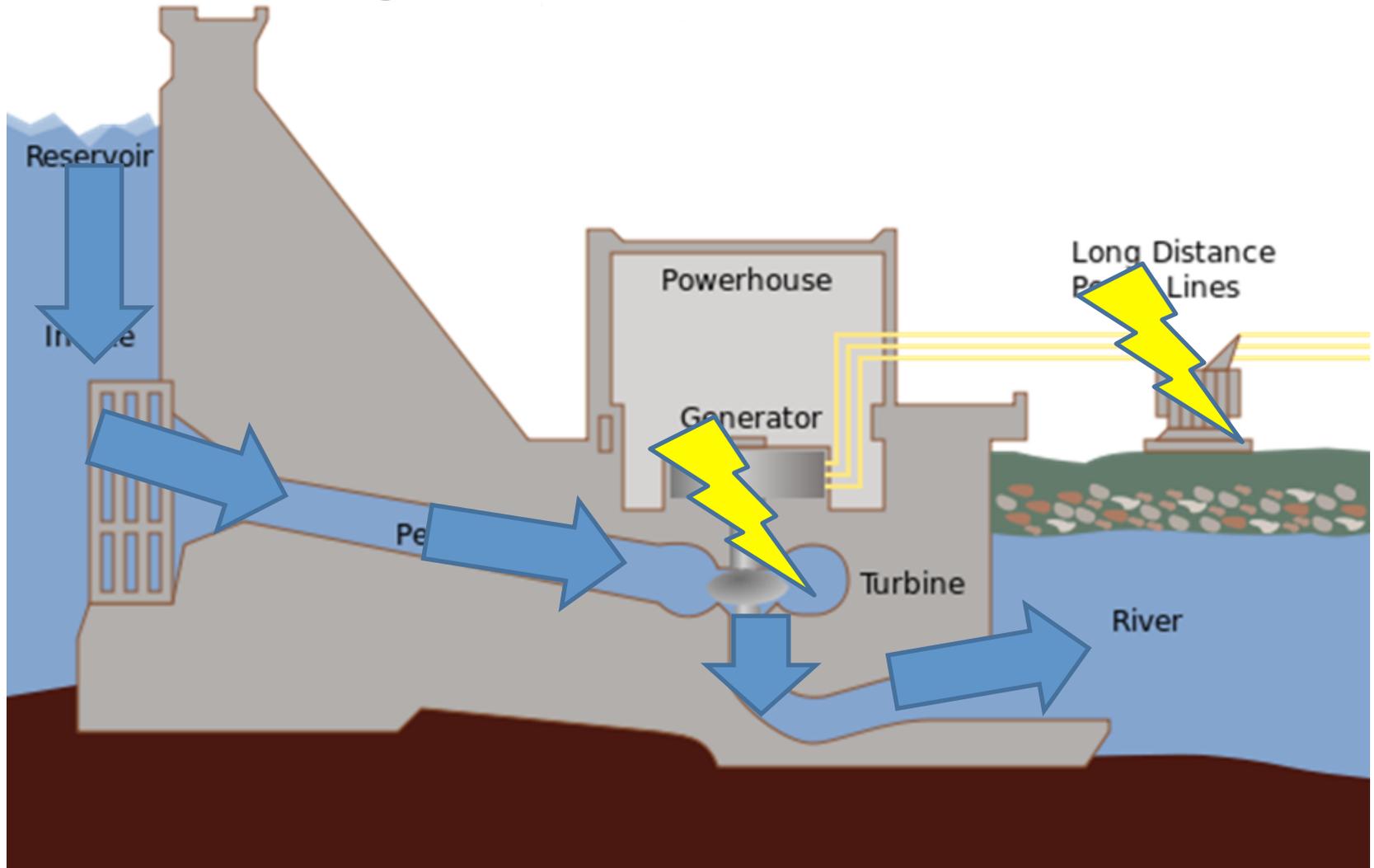


Figure courtesy of Wikipedia

Hydropower pros

- High efficiency
- Flexibility
- Reliable
- Mature technology
- Cheap
- Relatively pollution free

Hydropower cons

- Source of greenhouse gases (due to displaced trees and increase in algae).
- Decreases water quality
- Floods large areas (e.g., people's homes)
- Multiple legal issues (e.g., international discussions over water rights)

Environmental & Social Impacts

- Environment
 - Local x Regional impacts
 - Water quality
 - Sediments
 - Fish and the fish transposing systems
 - GHG fluxes in the reservoirs

- Social
 - The dam construction
 - People Reallocation
 - Land use
 - Conflicts