Example: Ljósafoss Power Station

- The installed capacity is 16 MW, and the power plant produces 105 GWh/yr. Determine the capacity factor.
- The head is 17m, with a maximum water flow rate of 104 m^3/s. Calculate the efficiency.

www.landsvirkjun.com/company/powerstations/ljosafosspowerstation/

- Maximum Possible Annual Energy Production:

$$16\times10^{6}\,\mathrm{W}\left(8760\,\frac{\mathrm{h}}{\mathrm{y}}\right)=140\times10^{9}\,\frac{\mathrm{Wh}}{\mathrm{y}}$$

- Capacity Factor:

$$C=\frac{\text{Actual Energy Production}}{\text{Maximum Possible Energy Production}}$$

$$C=\frac{105\,\frac{\mathrm{GWh}}{\mathrm{y}}}{140\,\frac{\mathrm{GWh}}{\mathrm{y}}}=0.749$$

- Power into Turbines

$$P_{IN} = \rho Q g h$$

$$P_{IN} = \left(10^3 \frac{kg}{m^3}\right)\left(104 \frac{m^3}{s}\right)\left(9.81 \frac{m}{s^2}\right)(17m) = 17.3 \times 10^6 W$$

- Efficiency of Turbines

$$\text{Efficiency} = \eta = \frac{P_{OUT}}{P_{IN}} = \frac{16MW}{17.3MW} = 0.92$$