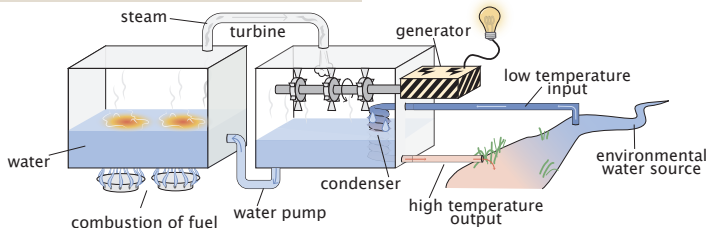



(A) ELECTRICITY GENERATION BY BOILING WATER



(B)

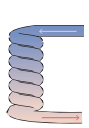
ESTIMATING VAPORIZED WATER VOLUME



$$\begin{aligned}
 & E_{\text{thermoelectric}} \approx 10^{20} \text{ J / year} \\
 & \Delta H_{\text{vaporization}} \approx f \times 10^6 \text{ J / kg H}_2\text{O} \\
 & \Phi_{\text{energy transfer}} \approx 70\% \\
 & V_{\text{H}_2\text{O}}^{(\text{vaporized})} \approx \frac{10^{20} \text{ J}}{\text{year}} \times \frac{1 \text{ kg}}{f \times 10^6 \text{ J}} \times \frac{1}{0.7} \times \frac{1 \text{ kg}}{1 \text{ L}} \\
 & \approx 10^{14} \text{ L / year}
 \end{aligned}$$

(C)

ESTIMATING ONCE-THROUGH COOLANT VOLUME



$$\begin{aligned}
 & E_{\text{thermoelectric}} \approx 10^{20} \text{ J / year} \\
 & \Phi_{\text{residual heat}} \approx 30\% \\
 & E_{\text{steam}} \approx \frac{10^{20} \text{ J}}{\text{year}} \times \frac{1}{0.3} \approx f \times 10^{19} \text{ J / year} \\
 & \Delta T \approx f \text{ } ^\circ\text{C} \\
 & C_{\text{H}_2\text{O}} \approx \frac{f \times 10^3 \text{ J}}{^\circ\text{C} \times \text{kg}} \quad \text{specific heat of H}_2\text{O} \\
 & V_{\text{H}_2\text{O}}^{(\text{cooling})} \approx \frac{f \times 10^{19} \text{ J}}{\text{year}} \times \frac{^\circ\text{C} \times \text{kg}}{f \times 10^3 \text{ J}} \times \frac{1}{f \text{ } ^\circ\text{C}} \times \frac{1 \text{ L}}{1 \text{ kg}} \\
 & \approx f \times 10^{15} \text{ L / year}
 \end{aligned}$$