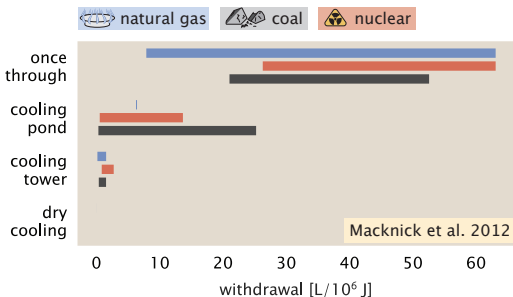


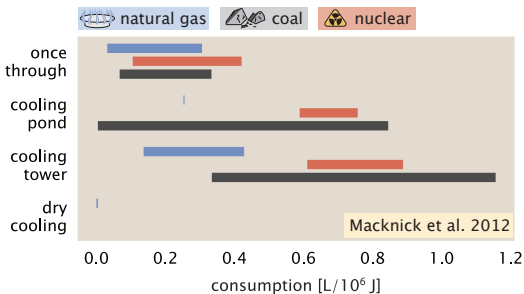
(A)

WATER WITHDRAWAL BY COOLING MECHANISM



(C)

WATER CONSUMPTION BY COOLING MECHANISM



(B)

once-through withdrawal

$$\begin{aligned}
 E_{\text{thermoelectric}} &\approx 10^{20} \text{ J / year} \\
 \Phi_{\text{once-through}} &\approx 50\% \\
 w_{\text{once-through}} &\approx \frac{f \times 10 \text{ L}}{10^6 \text{ J}} \\
 V_{\text{H}_2\text{O}}^{(\text{once-through})} &\approx 0.5 \times \frac{10^{20} \text{ J}}{\text{year}} \times \frac{f \times 10 \text{ L}}{10^6 \text{ J}} \\
 &\approx 1. f \times 10^{15} \text{ L / year}
 \end{aligned}$$

cooling tower & pond withdrawal

$$\begin{aligned}
 E_{\text{thermoelectric}} &\approx 10^{20} \text{ J / year} \\
 \Phi_{\text{recirculation}} &\approx 50\% \\
 w_{\text{other}} &\approx \frac{10 \text{ L}}{10^6 \text{ J}} \\
 V_{\text{H}_2\text{O}}^{(\text{other})} &\approx 0.5 \times \frac{10^{20} \text{ J}}{\text{year}} \times \frac{10 \text{ L}}{10^6 \text{ J}} \\
 &\approx f \times 10^{14} \text{ L / year}
 \end{aligned}$$

total withdrawn volume

$$V_{\text{H}_2\text{O}}^{(\text{withdrawal})} \approx V_{\text{H}_2\text{O}}^{(\text{once-through})} + V_{\text{H}_2\text{O}}^{(\text{other})} \approx 2 \times 10^{15} \text{ L / year}$$

(D)

once-through consumption

$$\begin{aligned}
 E_{\text{thermoelectric}} &\approx 10^{20} \text{ J / year} \\
 \Phi_{\text{once-through}} &\approx 50\% \\
 c_{\text{once-through}} &\approx \frac{0. f \text{ L}}{10^6 \text{ J}} \\
 V_{\text{H}_2\text{O}}^{(\text{once-through})} &\approx 0.5 \times \frac{10^{20} \text{ J}}{\text{year}} \times \frac{0. f \text{ L}}{10^6 \text{ J}} \\
 &\approx 10^{13} \text{ L / year}
 \end{aligned}$$

cooling tower & pond consumption

$$\begin{aligned}
 E_{\text{thermoelectric}} &\approx 10^{20} \text{ J / year} \\
 \Phi_{\text{recirculation}} &\approx 50\% \\
 c_{\text{other}} &\approx \frac{0.5 \text{ L}}{10^6 \text{ J}} \\
 V_{\text{H}_2\text{O}}^{(\text{other})} &\approx 0.5 \times \frac{10^{20} \text{ J}}{\text{year}} \times \frac{0.5 \text{ L}}{10^6 \text{ J}} \\
 &\approx f \times 10^{13} \text{ L / year}
 \end{aligned}$$

total consumed volume

$$V_{\text{H}_2\text{O}}^{(\text{consumed})} \approx V_{\text{H}_2\text{O}}^{(\text{once-through})} + V_{\text{H}_2\text{O}}^{(\text{other})} \approx f \times 10^{13} \text{ L / year}$$