

33.39. Model: Assume an ideal transformer.

Visualize: An ideal transformer changes the voltage, but not the power (energy conservation).

Solve: (a) The primary and secondary voltages are related by Equation 33.23. We have

$$V_2 = \frac{N_2}{N_1} V_1 \Rightarrow N_1 = \frac{V_1}{V_2} N_2 = \frac{15,000}{120} 100 = 12,500 \text{ turns}$$

(b) The input power equals the output power and we recall that $P = I\Delta V$, so

$$P_{\text{out}} = P_{\text{in}} \Rightarrow I_1 \Delta V_1 = I_2 \Delta V_2 \Rightarrow I_1 = \frac{I_2 \Delta V_2}{\Delta V_1} = \frac{(250 \text{ A}) 120 \text{ V}}{15,000 \text{ V}} = 2.0 \text{ A}$$

Assess: These values seem reasonable, because houses have low voltage and high current while transmission lines have high voltage and low current.