

36.71. Model: Mass and energy are equivalent and given by Equation 36.43.

Solve: (a) The power plant running at full capacity for 80% of the year runs for
 $(0.80)(365 \times 24 \times 3600) \text{ s} = 2.52 \times 10^7 \text{ s}$

The amount of thermal energy generated per year is

$$3 \times (1000 \times 10^6 \text{ J/s}) \times (2.52 \times 10^7 \text{ s}) = 7.56 \times 10^{16} \text{ J}$$

(b) Since $E_0 = mc^2$, the mass of uranium transformed into thermal energy is

$$m = \frac{E_0}{c^2} = \frac{7.56 \times 10^{16} \text{ J}}{(3.0 \times 10^8 \text{ m/s})^2} = 0.84 \text{ kg}$$