

(21.9) 0.0015 Ci ^{239}Pu is released annually from a reprocessing plant. What will be the corresponding release of ^{238}Pu and ^{240}Pu for typical isotopic plutonium composition of LWR fuel?

$$Bq := \text{sec}^{-1}$$

$$Ci := 3.7 \cdot 10^{10} \cdot Bq$$

$$x_{238} := 1.5 \cdot \%$$

$$x_{239} := 56.6 \cdot \%$$

$$x_{240} := 26.0 \cdot \%$$

Table 21.6

$$t_{h238} := 87.74 \cdot \text{yr}$$

$$t_{h239} := 2.411 \cdot 10^4 \cdot \text{yr}$$

$$t_{h240} := 6550 \cdot \text{yr}$$

$$\lambda_{238} := \frac{\ln(2)}{t_{h238}}$$

$$\lambda_{239} := \frac{\ln(2)}{t_{h239}}$$

$$\lambda_{240} := \frac{\ln(2)}{t_{h240}}$$

$$R_{239} := 0.0015 \cdot \frac{Ci}{\text{yr}}$$

$$N_{239} := \frac{R_{239}}{\lambda_{239}}$$

$$R_{238} := N_{239} \cdot \frac{x_{238}}{x_{239}} \cdot \lambda_{238}$$

$$R_{238} = 4.042 \cdot 10^8 \cdot \frac{Bq}{\text{yr}}$$

$$R_{240} := N_{239} \cdot \frac{x_{240}}{x_{239}} \cdot \lambda_{240}$$

$$R_{240} = 9.384 \cdot 10^7 \cdot \frac{Bq}{\text{yr}}$$