57. From Eq. 31-51 and Eq. 31-43, the rate at which the energy is being stored in the inductor is

$$\begin{aligned}\frac{dU_B}{dt} &= \frac{d\left(\frac{1}{2}Li^2\right)}{dt} = L\,i\,\frac{di}{dt} \\ &= L\left(\frac{\mathcal{E}}{R}\left(1-e^{-t/\tau_L}\right)\right)\left(\frac{\mathcal{E}}{R}\frac{1}{\tau_L}\,e^{-t/\tau_L}\right) \\ &= \frac{\mathcal{E}^2}{R}\left(1-e^{-t/\tau_L}\right)e^{-t/\tau_L}\end{aligned}$$

where $\tau_L = L/R$ has been used. From Eq. 27-22 and Eq. 31-43, the rate at which the resistor is generating thermal energy is

$$P_{\text{thermal}} = i^2R = \frac{\mathcal{E}^2}{R^2}\left(1-e^{-t/\tau_L}\right)^2 R = \frac{\mathcal{E}^2}{R}\left(1-e^{-t/\tau_L}\right)^2 .$$

We equate this to dU_B/dt, and solve for the time:

$$\frac{\mathcal{E}^2}{R}\left(1-e^{-t/\tau_L}\right)^2 = \frac{\mathcal{E}^2}{R}\left(1-e^{-t/\tau_L}\right)e^{-t/\tau_L} \implies t = \tau_L\,\ln 2 = (37.0\,\text{ms})\ln 2 = 25.6\text{ ms} .$$