59. (a) If the battery is applied at time $t = 0$ the current is given by

$$i = \frac{\mathcal{E}}{R}\left(1 - e^{-t/\tau_L}\right) ,$$

where $\mathcal{E}$ is the emf of the battery, $R$ is the resistance, and $\tau_L$ is the inductive time constant $(L/R)$. This leads to

$$e^{-t/\tau_L} = 1 - \frac{iR}{\mathcal{E}} \implies -\frac{t}{\tau_L} = \ln\left(1 - \frac{iR}{\mathcal{E}}\right) .$$

Since

$$\ln\left(1 - \frac{iR}{\mathcal{E}}\right) = \ln\left[1 - \frac{(2.00 \times 10^{-3}\,\mathrm{A})(10.0 \times 10^3\,\Omega)}{50.0\,\mathrm{V}}\right] = -0.5108 ,$$

the inductive time constant is $\tau_L = t/0.5108 = (5.00 \times 10^{-3}\,\mathrm{s})/0.5108 = 9.79 \times 10^{-3}\,\mathrm{s}$ and the inductance is

$$L = \tau_L R = (9.79 \times 10^{-3}\,\mathrm{s})(10.0 \times 10^3\,\Omega) = 97.9\ \mathrm{H} .$$

(b) The energy stored in the coil is

$$U_B = \frac{1}{2}Li^2 = \frac{1}{2}(97.9\,\mathrm{H})(2.00 \times 10^{-3}\,\mathrm{A})^2 = 1.96 \times 10^{-4}\ \mathrm{J} .$$