50. (a) The charge q on the capacitor as a function of time is $q(t) = (\mathcal{E}C)(1 - e^{-t/RC})$, so the charging current is $i(t) = dq/dt = (\mathcal{E}/R)e^{-t/RC}$. The energy supplied by the emf is then

$$U = \int_0^\infty \mathcal{E}i\,dt = \frac{\mathcal{E}^2}{R}\int_0^\infty e^{-t/RC}dt = C\mathcal{E}^2 = 2U_C$$

where $U_C = \frac{1}{2}C\mathcal{E}^2$ is the energy stored in the capacitor.

(b) By directly integrating i^2R we obtain

$$U_R = \int_0^\infty i^2Rdt = \frac{\mathcal{E}^2}{R}\int_0^\infty e^{-2t/RC}\,dt = \frac{1}{2}C\mathcal{E}^2\ .$$