2. (a) The change in kinetic energy for the meteorite would be

$$\begin{aligned}\Delta K &= K_f - K_i = -K_i = -\frac{1}{2} m_i v_i^2 \\ &= -\frac{1}{2}\left(4 \times 10^6\,\mathrm{kg}\right)\left(15 \times 10^3\,\mathrm{m/s}\right)^2 \\ &= -5 \times 10^{14}\ \mathrm{J}\end{aligned}$$

where the negative sign indicates that kinetic energy is lost.

(b) The energy loss in units of megatons of TNT would be

$$-\Delta K = \left(5 \times 10^{14}\,\mathrm{J}\right)\left(\frac{1\,\mathrm{megaton\,TNT}}{4.2 \times 10^{15}\,\mathrm{J}}\right) = 0.1\ \mathrm{megaton\,TNT}\ .$$

(c) The number of bombs $N$ that the meteorite impact would correspond to is found by noting that megaton = 1000 kilotons and setting up the ratio:

$$N = \frac{0.1 \times 1000\,\mathrm{kiloton\,TNT}}{13\,\mathrm{kiloton\,TNT}} = 8\ .$$