Deriving E_{reheat}

$$V_{vir}^2 = \frac{GM_{vir}}{R_{vir}}, \quad k_B T_{vir} = \frac{1}{2}\mu m_p V_{vir}^2$$

$$T_{vir} = \frac{\mu m_p}{2k_B}\frac{GM_{vir}}{R_{vir}}$$

from Virial Shock heating

$$T_2 = \frac{3}{16}\frac{\mu m_p}{k_B}V^2, \quad T_{shock} \sim \frac{3}{16}\frac{\mu m_p}{k_B}V_{vir}^2$$

$$T_{vir} = \frac{1}{2}\frac{\mu m_p}{k_B}V_{vir}^2, \quad u = \frac{3}{2}\frac{k_B T}{\mu m_p}$$

$$U = M_g u = \frac{3}{2}\frac{M_g k_B T}{\mu m_p}$$

$$\boxed{\Delta E = \frac{3}{2}\frac{M_g k_B}{\mu m_p}\left(T_f - T_i\right)}$$