Given: $F(x) = 1-0.8e^{-0.02x} - 0.2e^{-0.001x}$, $x \geq 0$

policy limit: $u = 1000$

Want: $E(X \wedge u) = E(X \wedge 1000) = ?$

Shortcut: $E(X \wedge u) = -\int_{-\infty}^{0} F(x)\,dx + \int_0^u S(x)\,dx.$

$$= 0 + \int_0^u S(x)\,dx, \quad (F(x)=0,\ x \leq 0)$$

$$= \int_0^u 1-F(x)\,dx$$

$$E(X \wedge 1000) = \int_0^{1000} 1-F(x)\,dx = \int_0^{1000} 0.8e^{-0.02x} + 0.2e^{-0.001x}\,dx$$

$$= 0.8 \times \left(-\frac{1}{0.02} e^{-0.02x}\right) + 0.2 \times \left(-\frac{1}{0.001} e^{-0.001x}\right) \Big|_0^{1000}$$

$$= -40 e^{-0.02x} \Big|_0^{1000} - 200 e^{-0.001x} \Big|_0^{1000}$$

$$= -40 \times (e^{-20}-1) - 200(e^{-1}-1) = 166.4$$

Without the shortcut:

$$E(X \wedge u) = \int_{-\infty}^{u} x f(x)\,dx + \int_{u}^{\infty} u f(x)\,dx$$

$$= \int_{0}^{1000} x f(x)\,dx + \int_{1000}^{\infty} 1000 f(x)\,dx$$

$$= xF(x)\Big|_{0}^{1000} - \int_{0}^{1000} F(x)\,dx + 1000\,(1 - F(1000))$$

$$= 1000F(1000) - 0 - \int_{0}^{1000} F(x)\,dx + 1000 - 1000F(1000)$$

$$= 1000 - \int_{0}^{1000} F(x)\,dx = \int_{0}^{1000} (1 - F(x))\,dx.$$