P#45

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Find C: $A = 1.0 \times 10^{6}\ m^2$
$d = 800\ m$

$$C = \frac{\varepsilon_0 \cdot A}{d} = \frac{(8.85 \times 10^{-12}\ C^2/N \cdot m^2)(1.0 \times 10^{6}\ m^2)}{(800\ m)}$$

$$C = 1.1 \times 10^{-8}\ F$$

Find V: $d = 800\ m$
$E = 3.0 \times 10^{6}\ N/C$

$$E = \frac{V}{d} \quad \text{so} \quad 3.0 \times 10^{6}\ N/C = \frac{V}{800\ m}$$

$$V = 2.4 \times 10^{9}\ V$$

Find U: $U = \frac{1}{2} \cdot C \cdot V^2$

$$= \frac{1}{2}(1.1 \times 10^{-8}\ F)(2.4 \times 10^{9}\ V)^2$$

$$\boxed{U = 3.19 \times 10^{10}\ J}$$