

Energy stored in a capacitor is

$$W = \frac{1}{2} CV^2 = \frac{1}{2} QV = \frac{Q^2}{2C}$$

WKT Energy stored

$$W_E = \frac{1}{2} \int D \cdot E \, dV$$

$$= \frac{1}{2} \int \epsilon_0 E^2 \, dV$$

$$E = \frac{Q}{\epsilon S}$$

$$W_E = \frac{1}{2} \int \epsilon_0 \frac{Q^2}{\epsilon^2 S^2} \, dV$$

$$= \frac{\epsilon Q^2}{2 \epsilon^2 S^2} \int d$$

$$= \frac{Q^2}{2} \left(\frac{d}{\epsilon S} \right)$$

$$= \frac{Q^2}{2C}$$

$$\boxed{W_E = \frac{1}{2} QV}$$

$$\text{Energy density} = \frac{1}{2} \epsilon_0 E^2 = \frac{D^2}{2 \epsilon_0} = \frac{1}{2} D \cdot E$$

Single operator that is composite of gradient and divergence operators. This operator is known as Laplacian. ($\nabla^2 V$)