$$\mathcal{E}_{ind} = \int \vec{f} \cdot \vec{dl}$$

$$\vec{f} = \frac{\vec{F}}{q} = \frac{q\vec{v} \times \vec{B}}{q} = \vec{v} \times \vec{B} = \omega \rho B \, \hat{e}_\varphi \times \hat{e}_z = \omega \rho B \, \hat{e}_r$$

$$\vec{v} = \omega \rho \, \hat{e}_\varphi$$

$$\mathcal{E}_{ind} = \int_0^a \omega \rho B \, \hat{e}_r \, d\rho = \frac{\omega B a^2}{2} \qquad I = \frac{U}{R} = \frac{\omega B a^2}{2R}$$