1φ L-R rectifier

Derive:

$$\frac{\Delta i_{(ripple)}}{I_{DC}} = \frac{5.5\, P_{DC(load)}}{f\,(W_L)}$$? Where from

W_L = energy stored in L

Assume $E_{DC(load)}$ is fixed over time scale E_{AC}

$E_{AC(rms\ source)}$ L

$$\frac{\Delta E_L}{L}\, dt \equiv \Delta i$$

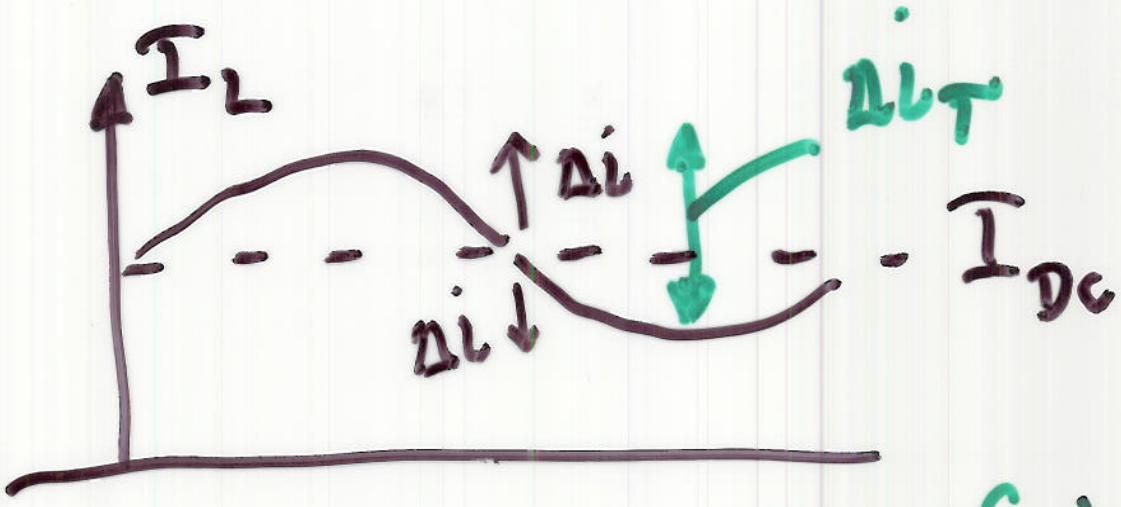
$$\Delta E_L = E_{AC(rms)} - E_{DC} \simeq \text{Constant over } dt$$

$E_{AC(rms)} \simeq \frac{E_{DC}}{.9}$

$0.11\, E_{DC}$

$$\Delta t \simeq \frac{1}{2 f_{mains}} \simeq \frac{1}{2}\ \text{cycle duration}$$

$$\Delta i = 0.11\, E_{DC} / L\,(2 f_m) \quad \text{for up cycle}$$



Total $\Delta i_T \equiv 2\Delta i$ Careful!

$$\frac{\Delta i_T}{I_{DC}} = 100\% * \frac{\Delta i_T}{I_{DC}} = \frac{11.1\, E_{DC}}{L f I_{DC}}$$

in % multiply $\frac{I_{DC}}{I_{DC}}$

$$\frac{\Delta i_T}{I_{DC}} = \frac{11.1}{f} \frac{E_{DC} I_{DC}}{L I_{DC}^2} = \frac{11.1}{2f} \frac{P_{DC}}{W_L(DC)}$$

$$= \frac{5.5}{f} \frac{P_{DC}}{W_L(DC)}$$