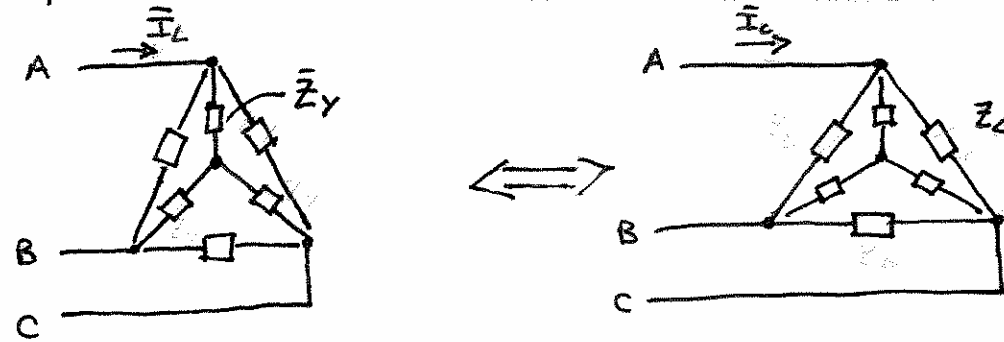


# Fundamentos de Transformadores y Máquinas Eléctricas

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Clase 6

# Equivalente de un circuito $\Delta$ en Y

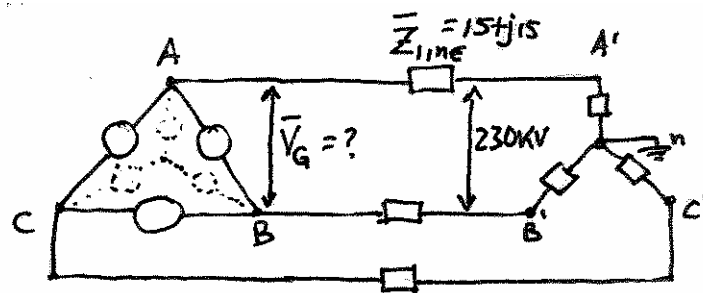


I.  $|S_Y|_{\phi} = I_L^2 Z_Y$

II.  $|S_{\Delta}|_{\phi} = I_{\phi}^2 Z_{\Delta}$   
 $= \left(\frac{I_L}{\sqrt{3}}\right)^2 Z_{\Delta} = \frac{I_L^2}{3} Z_{\Delta}$

III.  $S_Y = S_{\Delta}$   
 $I_L^2 Z_Y = \frac{I_L^2}{3} Z_{\Delta}$

$Z_{\Delta} = 3 Z_Y$



$$P_L = 20 \text{ MW @ } 80\% \text{ p.f. lag}$$

Hacer equivalente por fase del circuito (diagrama monolineal)

$$\bar{V}_{A'n} = \frac{230}{\sqrt{3}} \angle 0^\circ \text{ kV}$$

$$\bar{V}_{A'n} = ?$$

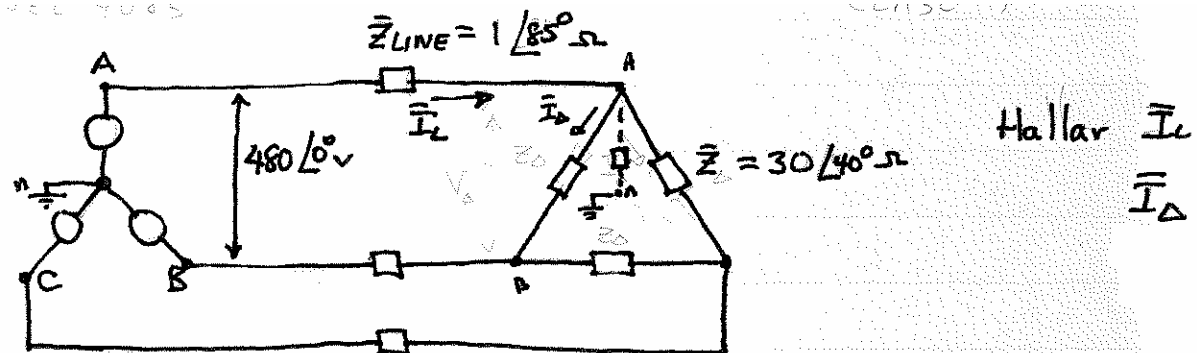
$$\bar{I}_L = \frac{20 \text{ MW} \angle -36.9^\circ}{\sqrt{3}(230)(0.8)} = 62.72 \angle -36.9^\circ \text{ A}$$

$$\bar{V}_{\text{Load}} = \bar{V}_{A'n} = \frac{230}{\sqrt{3}} \angle 0^\circ \text{ kV}$$

$$\bar{V}_{Gn} = \bar{I}_L \bar{Z}_{\text{Line}} + \bar{V}_{\text{Load}} = (62.76 \angle -36.9^\circ \text{ A})(15 + j15 \Omega) + \frac{230}{\sqrt{3}} \angle 0^\circ \text{ kV}$$

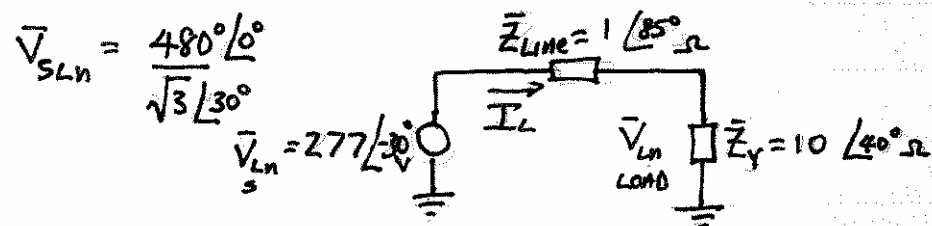
$$\bar{V}_{Gn} = 132,194 \angle 0.08^\circ \text{ V}$$

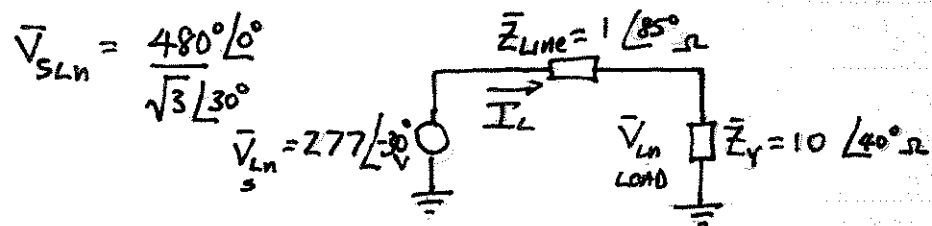
$$\bar{V}_G = \sqrt{3} (132,194 \angle 0.08^\circ + 30^\circ) \text{ V} = 232.3 \angle 30.08^\circ \text{ kV}$$



I. Hallar equivalente por fase

$$\bar{Z}_\Delta = 3 \bar{Z}_Y \quad \bar{Z}_Y = \frac{30 \angle 40^\circ}{3} = 10 \angle 40^\circ \Omega$$





$$\bar{V}_{L_{LOAD}} = \bar{V}_{Ln} \cdot \frac{\bar{Z}_{Y_{LOAD}}}{\bar{Z}_{Y_{LOAD}} + \bar{Z}_{LINE}} = (277 \angle -30^\circ \text{ V}) \left( \frac{10 \angle 40^\circ \Omega}{10 \angle 40^\circ \Omega + 1 \angle 85^\circ \Omega} \right)$$

$$\bar{V}_{L_{LOAD}} = 258.14 \angle -33.78^\circ \text{ V}$$

$$\bar{I}_L = \frac{\bar{V}_{Ln}}{\bar{Z}_Y + \bar{Z}_{LINE}} = 277 \angle -30^\circ \text{ V} / (10 \angle 40^\circ + 1 \angle 85^\circ) \text{ A}$$

$$\bar{I}_L = 25.8 \angle -73.78^\circ \text{ A}$$

$$\bar{I}_\Delta = \bar{I}_{ab} = \frac{\bar{I}_a}{\sqrt{3} \angle -30^\circ} = \frac{25.8 \angle -73.78^\circ}{\sqrt{3} \angle -30^\circ} = 14.9 \angle -43.78^\circ \text{ A}$$

$$\bar{V}_{LL_{LOAD}} = \bar{I}_\Delta \bar{Z}_\Delta = 447.12 \angle -3.78^\circ \text{ V}$$