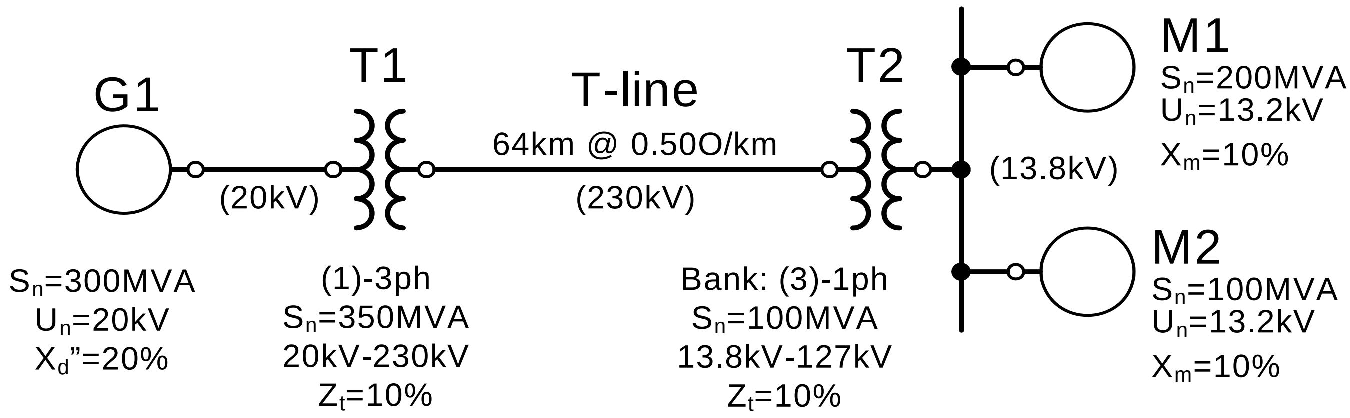
System depicted in below figure needs to be represented in per unit quantities assuming that $Z_1 = Z_2 = Z_0$.



SYSTEM DATA:

Base quantities are selected to relate to power/voltage source i.e.

$U_{b\_G1} := 20kV$ $\qquad$ $S_{b\_sys} := 300MVA$

Base voltage for transmission line is calculated for the step-up transformer ratio:

$U_{b\_Tline} := \frac{230}{20} \cdot U_{b\_G1}$ $\qquad$ $U_{b\_Tline} = 230\,kV$

Consequently, base voltage for loads (i.e. motors) is calculated based on step-down transformer ratio. With (3) single phase transformers connected in bank and each of the transformer ratio is 127/13.2kV, then:

$U_{b\_M} := \frac{13.2}{\sqrt{3} \cdot 127} \cdot U_{b\_Tline}$ $\qquad$ $U_{b\_M} = 13.802\,kV$

The base impedances in each of the parts of the system are:

$Z_{b\_G1} := \frac{U_{b\_G1}^{2}}{S_{b\_sys}}$ $\qquad$ $Z_{b\_G1} = 1.33333333\,\Omega$ $\qquad$ $U_{b\_G1} = 20.00000000\,kV$

$Z_{b\_Tline} := \frac{U_{b\_Tline}^{2}}{S_{b\_sys}}$ $\qquad$ $Z_{b\_Tline} = 176.33333333\,\Omega$ $\qquad$ $U_{b\_Tline} = 230.00000000\,kV$

$Z_{b\_M} := \frac{U_{b\_M}^{2}}{S_{b\_sys}}$ $\qquad$ $Z_{b\_M} = 0.63497055\,\Omega$ $\qquad$ $U_{b\_M} = 13.80185368\,kV$

GENERATOR DATA - G1:

$GEN_{qty} := 1$

$S_{n\_G1} := 300MVA$ $Conn := "Y\text{-}Xgnd"$

$U_{n\_G1} := 20kV$

$X_{d\_pp\_G1} \equiv 0.20pu$ $XoR_{G1} := 10$

$S_b := S_{n\_G1}$

$V_b := U_{n\_G1}$

CALCS

$X_{G1} := X_{d\_pp\_G1}$ $X_{G1} = 0.20000000\,pu$

TRANSFORMER DATA - T1:

$TR\_qty := 1$ Transformer is one three phase unit

$S_{n\_T1} := 350MVA$ $Conn := "dY\text{-}gnd"$

$U_{n\_x} := 20kV$

$U_{n\_h} := 230kV$

$Z_{T1} \equiv 0.10pu$ $XoR := 40$

CALCS

$$Z_{T1} := Z_{T1} \cdot \left(\frac{S_b}{S_{n\_T1}}\right) \cdot \left(\frac{U_{n\_h}}{U_{b\_Tline}}\right)^2$$

$Z_{T1} = 0.08571429\,pu$

TRANSFORMER DATA - T2:

$TR\_qty := 3$ Transformer is a bank of (3) single phase units

$S_{n\_T2} := 100MVA$ $Conn := "Ygd"$

$U_{n\_x} := 13.20kV$

$U_{n\_h} := 127kV$

$Z_{T2} \equiv 0.10pu$ $XoR := 40$

CALCS

$$Z_{T2} := Z_{T2} \cdot \left(\frac{S_b}{TR\_qty \cdot S_{n\_T2}} \right) \cdot \left(\frac{U_{n\_x}}{U_{b\_M}} \right)^2 \qquad Z_{T2} = 0.09146881\,pu$$

EQUIVALENT MOTOR DATA - M1:

$TR\_qty := 1$

$S_{n\_M1} := 200MVA$ $Conn := "Yg"$

$U_{n\_M1} := 13.20kV$

$X_{m\_1} \equiv 0.20pu$ $XoR := 20$

CALCS

$$X_{M1} := X_{m\_1} \cdot \left(\frac{S_b}{S_{n\_M1}} \right) \cdot \left(\frac{U_{n\_M1}}{U_{b\_M}} \right)^2 \qquad X_{M1} = 0.27440643\,pu$$

EQUIVALENT MOTOR DATA - M2:

TR_qty := 1

$S_{n\_M2} := 100MVA$ Conn := "Y"

$U_{n\_M2} := 13.20kV$

$X_{m\_2} \equiv 0.20pu$ XoR := 20

CALCS

$$X_{M2} := X_{m\_2} \cdot \left(\frac{S_b}{S_{n\_M2}}\right) \cdot \left(\frac{U_{n\_M2}}{U_{b\_M}}\right)^2 \qquad X_{M2} = 0.54881285\,pu$$

T-LINE DATA - TLINE:

CKT_qty := 1

$L_{Tline} := 64km$

$x_l \equiv 0.50 \frac{\Omega}{km}$

CALCS

$$X_{L\_pu} := \frac{x_l \cdot L_{Tline}}{Z_{b\_Tline}} \qquad X_{L\_pu} = 0.1815\,pu$$