Echipa 1
BOZA Rares-Ionut
FLOREA Alexandra
TOADER Ionut

Etapa 1

$nr_{grupuri} := 4$

$P_{ng} := 120$ [MW] $S_{C1} := 100$ [MVA]

Circuit de racire inchis $S_{S1} := 140$ [MVA]

$T_{pi} := 4700$ [h/an]

$U_1 := 110$ [kV]

$U_2 := 400$ [kV]

$i_{sc1} := 11$ [kA]

$i_{sc2} := 13$ [kA]

$cos\phi := 0.85$

$S_{ng} := \frac{P_{ng}}{cos\phi} = 141.176471$ [MVA]

$\varepsilon_b := 0.09$

$\varepsilon_g := 0.02$

$S_{sp1} := (\varepsilon_b + \varepsilon_g) \cdot S_{ng} = 15.529412$ [MVA]

$S_{ev} := S_{ng} - S_{sp1} = 125.647059$ [MVA]

$\beta_{sp1} := \frac{S_{sp1}}{25} = 0.621176$ => Aleg transformatorul de 25 [MVA]

Pentru: $S_{nTSP} := 25$ [MVA] => $u_{kTSP} := 2.5$ [%]

$\Delta P_{kTSP} := 125$ [kW]

$\Delta P_{0TSP} := 29$ [kW]

$i_{0TSP} := 0.7$ [%]

$S_{nPORG} := 1.5 \cdot S_{nTSP} = 37.5$ [MVA]

$\beta_{PORG} := \frac{S_{nPORG}}{40} = 0.9375$ 0.938>0.85 => $\beta_{PORG} := \frac{S_{nPORG}}{63} = 0.595238$

Pentru: $S_{nTPORG} := 63$ [MVA] => $u_{kPORG} := 12$ [%]

$\Delta P_{kPORG} := 265$ [kW]

$\Delta P_{0PORG} := 55$ [kW]

$i_{0PORG} := 1$ [%]

$\beta_{Snev} := \frac{S_{ev}}{160} = 0.785294$ => $S_{nevU1} := 160$ [MVA] => $u_{kTBU1} := 12.5$ [%]

U1

$\Delta P_{kTBU1} := 550$ [kW]

$\Delta P_{0TBU1} := 85$ [kW]

$i_{0TBU1} := 0.5$ [%]

$S_{nevU2} := 200$ [MVA] => $u_{kTBU2} := 12.5$ [%]

U2

$\Delta P_{kTBU2} := 560$ [kW]

$\Delta P_{0TBU2} := 220$ [kW]

$i_{0TBU2} := 0.5$ [%]

$S_{centrala} := nr_{grupuri} \cdot S_{ev} = 502.588235$ [MVA]

$S_{S2} := S_{centrala} - (S_{C1} + S_{S1}) = 262.588235$ [MVA]

Solutia I

Toate grupurile sunt conectate la U1

$S_a := 4 \cdot S_{ng} - S_{S1} - S_{C1} = 324.705882$ [MVA]

$S_b := (4-1) \cdot S_{ng} - S_{S1} - S_{C1} = 183.529412$ [MVA]

$S_{c1.1} := 4 \cdot S_{ng} - 0.4 \cdot S_{S1} - S_{C1} = 408.705882$ [MVA]

S_c - Cea mai mare putere (S_{ML})

$\beta := \frac{S_{c1.1}}{630} = 0.648739$

V1.1: 1TRx630 [MVA] 100%

V1.2: 2TRx630 [MVA] 100%

V1.3: 2TRx250 [MVA] 50%

V1.1: 1TRx630 [MVA] 100% => $u_{k1.1} := 12.5$ [%]

$\Delta P_{k1.1} := 1350$ [kW]

$\Delta P_{01.1} := 450$ [kW]

$i_{01.1} := 0.35$ [%]

V1.2: 2TRx630 [MVA] 100% => $u_{k1.2} := 12.5$ [%]

$\Delta P_{k1.2} := 1350$ [kW]

$\Delta P_{01.2} := 450$ [kW]

$i_{01.2} := 0.35$ [%]

V1.3: 2TRx250 [MVA] 50% => $u_{k1.3} := 12.5$ [%]

$\Delta P_{k1.3} := 600$ [kW]

$\Delta P_{01.3} := 240$ [kW]

$i_{01.3} := 0.45$ [%]

Solutia II

3 grupuri sunt conectate la U1 si unul la U2

$S_a := 3 \cdot S_{ng} - S_{S1} - S_{C1} = 183.529412$ [MVA]

$S_b := (3-1) \cdot S_{ng} - S_{S1} - S_{C1} = 42.352941$ [MVA]

$S_c := 3 \cdot S_{ng} - 0.4 \cdot S_{S1} - S_{C1} = 267.529412$ [MVA]

S_c - Cea mai mare putere (S_{ML})

$$\beta := \frac{S_c}{320} = 0.836029$$

V2.1 -> 1TRx320 [MVA] 100%

V2.2 -> 2TRx320 [MVA] 100%

V2.3 -> 2TRx250 [MVA] 50%

V2.1: 1TRx320 [MVA] 100%	=>	$u_{k2.1} := 12.5$	[%]
		$\Delta P_{k2.1} := 700$	[kW]
		$\Delta P_{02.1} := 320$	[kW]
		$i_{02.1} := 0.45$	[%]
V2.2: 2TRx320 [MVA] 100%	=>	$u_{k2.2} := 12.5$	[%]
		$\Delta P_{k2.2} := 700$	[kW]
		$\Delta P_{02.2} := 320$	[kW]
		$i_{02.2} := 0.45$	[%]
V2.3: 2TRx250 [MVA] 50%	=>	$u_{k2.3} := 12.5$	[%]
		$\Delta P_{k2.3} := 600$	[kW]
		$\Delta P_{02.3} := 240$	[kW]
		$i_{02.3} := 0.45$	[%]

Solutia III

2 grupuri sunt conectate la U1 si 2 grupuri la U2

$S_a := 2 \cdot S_{ng} - S_{S1} - S_{C1} = 42.352941$ [MVA]

$S_b := (2-1) \cdot S_{ng} - S_{S1} - S_{C1} = -98.823529$ [MVA]

$S_c := 2 \cdot S_{ng} - 0.4 \cdot S_{S1} - S_{C1} = 126.352941$ [MVA]

S_c - Cea mai mare putere (S_{ML})

$\beta_I := \frac{S_c}{250} = 0.505412$

V3.1 -> 1TRx250 [MVA] 100%

V3.2 -> 2TRx250 [MVA] 100%

V3.3 -> 2TRx200 [MVA] 50%

V3.1: 1TRx250 [MVA] 100% => $u_{k3.1} := 12.5$ [%]

$\Delta P_{k3.1} := 600$ [kW]

$\Delta P_{03.1} := 240$ [kW]

$i_{03.1} := 0.45$ [%]

V3.2: 2TRx250 [MVA] 100% => $u_{k3.2} := 12.5$ [%]

$\Delta P_{k3.2} := 600$ [kW]

$\Delta P_{03.2} := 240$ [kW]

$i_{03.2} := 0.45$ [%]

V3.3: 2TRx200 [MVA] 50% => $u_{k3.3} := 12.5$ [%]

$\Delta P_{k3.3} := 560$ [kW]

$\Delta P_{03.3} := 220$ [kW]

$i_{03.3} := 0.5$ [%]

Solutia IV

Un grup este conectat la U1 si 3 la U2

$S_a := 1 \cdot S_{ng} - S_{S1} - S_{C1} = -98.823529$ [MVA]

$S_b := (1-1) \cdot S_{ng} - S_{S1} - S_{C1} = -240$ [MVA]

$S_c := 1 \cdot S_{ng} - 0.4 \cdot S_{S1} - S_{C1} = -14.823529$ [MVA]

S_b - Cea mai mare putere (S_{ML})

$\beta_I := \frac{|S_b|}{320} = 0.75$

V4.1 -> 1TRx320 [MVA] 100%

V4.2 -> 2TRx320 [MVA] 100%

V4.3 -> 2TRx250 [MVA] 50%

V4.1: 1TRx320 [MVA] 100% => $u_{k4.1} := 12.5$ [%]

$\Delta P_{k4.1} := 700$ [kW]

$\Delta P_{04.1} := 320$ [kW]

$i_{04.1} := 0.45$ [%]

V4.2: 2TRx320 [MVA] 100% => $u_{k4.2} := 12.5$ [%]

$\Delta P_{k4.2} := 700$ [kW]

$\Delta P_{04.2} := 320$ [kW]

$i_{04.2} := 0.45$ [%]

V4.3: 2TRx250 [MVA] 50% => $u_{k4.3} := 12.5$ [%]

$\Delta P_{k4.3} := 560$ [kW]

$\Delta P_{04.3} := 220$ [kW]

$i_{04.3} := 0.5$ [%]

Solutia V

Toate grupurile sunt conectate la U2

$S_a := 0 \cdot S_{ng} - S_{S1} - S_{C1} = -240$ [MVA]

$S_b := 0 \cdot S_{ng} - 0.4 \cdot S_{S1} - S_{C1} = -156$ [MVA]

S_b - Cea mai mare putere (S_{ML})

$\beta := \frac{|S_a|}{320} = 0.75$

V5.1 -> 1TRx320 [MVA] 100%

V5.2 -> 2TRx320 [MVA] 100%

V5.3 -> 2TRx250 [MVA] 50%

V5.1: 1TRx320 [MVA] 100% => $u_{k5.1} := 12.5$ [%]

$\Delta P_{k5.1} := 700$ [kW]

$\Delta P_{05.1} := 320$ [kW]

$i_{05.1} := 0.45$ [%]

V5.2: 2TRx320 [MVA] 100% => $u_{k5.2} := 12.5$ [%]

$\Delta P_{k5.2} := 700$ [kW]

$\Delta P_{05.2} := 320$ [kW]

$i_{05.2} := 0.45$ [%]

V5.3: 2TRx250 [MVA] 50% => $u_{k5.3} := 12.5$ [%]

$\Delta P_{k5.3} := 560$ [kW]

$\Delta P_{05.3} := 220$ [kW]

$i_{05.3} := 0.5$ [%]

Etapa 2

$t_{st} := 20$ [ani]

=> $T_{TST} := 7.46$ ani

$a := 12$ [%/an]

$C_P := 1500$ [€/KWinstalat]

$C_{w110} := 0.05$ [€/KWinstalat]

$C_{w400} := 0.04$ [€/KWinstalat]

$C_{iT110} := 9$ [€/KVAinstalat]

$C_{iT400} := 15$ [€/KVAinstalat]

$C_{iATL} := 12$ [€/KVAinstalat]

Soluta I - $V1.1$

$C_{iTB110} := C_{iT110} \cdot 160 \cdot 1000 = 1.44 \cdot 10^6$ [Euro]

$C_{iTB400} := C_{iT400} \cdot 200 \cdot 1000 = 3 \cdot 10^6$ [Euro]

$C_{iTATL} := C_{iATL} \cdot 630 \cdot 1000 = 7.56 \cdot 10^6$ [Euro]

$C_{icel110} := 145500$ [Euro] $n_{cel110} := 5$

$C_{icel400} := 256000$ [Euro] $n_{TB110} := 4$

$C_{i110} := C_{icel110} \cdot n_{cel110} \cdot 1.65 + C_{iTB110} \cdot n_{TB110} = 6.960375 \cdot 10^6$ [Euro]

$C_{i400} := 1.65 \cdot C_{icel400} \cdot 1 + C_{iTATL} \cdot 1 = 7.9824 \cdot 10^6$ [Euro]

$C_i := C_{i110} + C_{i400} = 1.494278 \cdot 10^7$ [Euro]

$C_{exan110} := \frac{3.3}{100} \cdot C_{i110} = 2.296924 \cdot 10^5$ [Euro/an]

$C_{exan400} := \frac{1.5}{100} \cdot C_{i400} = 1.19736 \cdot 10^5$ [Euro/an]

$C_{exan} := C_{exan110} + C_{exan400} = 3.494284 \cdot 10^5$ [Euro/an]

$C_{exact} := C_{exan} \cdot T_{TST} = 2.606736 \cdot 10^6$ [Euro]

Etapa 3

$c_p := 1500$

$c_{w110} := 0.05$

$c_{w400} := 0.04$

$T_{sm} := T_{pi} = 4.7 \cdot 10^3$

Soluta I - $V1.1$

V1.1: 1TRx630 [MVA] 100%

$T_{BU1} := 630$ [MVA]

$\Delta P_{01.1} = 450$ [KW]

$\Delta P_{k1.1} = 1.35 \cdot 10^3$[KW]

$CPW_{an}FeT_{TR1} := \Delta P_{01.1} \cdot \left(\frac{c_p}{T_{TST}} + c_{w400} \cdot 8760 \right) = 2.481626 \cdot 10^5$ [Euro/an]

$\tau := T_{sm} \cdot \frac{10000 + T_{sm}}{27500 - T_{sm}} = 3.030263 \cdot 10^3$

$CPW_{an}BT_{TR1} := \Delta P_{k1.1} \cdot \left(\frac{c_p}{T_{TST}} + c_{w400} \cdot \tau \right) \cdot \left(\frac{S_{c1.1}}{T_{BU1}} \right)^2 = 1.831099 \cdot 10^5$ [Euro/an]

$CPW_{anTR1} := CPW_{an}BT_{TR1} + CPW_{an}FeT_{TR1} = 4.312724 \cdot 10^5$ [Euro/an]

$S_{nevU1} = 160$ [MVA]

$\Delta P_{kTBU1} = 550$ [kW]

$\Delta P_{0TBU1} = 85$ [kW]

$CPW_{an}FeT_{U1} := \Delta P_{0TBU1} \cdot \left(\frac{c_p}{T_{TST}} + c_{w110} \cdot 8760 \right) = 54321.152815$ [Euro/an]

$CPW_{an}BT_{U1} := \Delta P_{kTBU1} \cdot \left(\frac{c_p}{T_{TST}} + c_{w110} \cdot \tau \right) \cdot \left(\frac{S_{ev}}{S_{nevU1}} \right)^2 = 1.195892 \cdot 10^5$ [Euro/an]

$CPW_{anU1} := CPW_{an}BT_{U1} + CPW_{an}FeT_{U1} = 1.739103 \cdot 10^5$ [Euro/an]

$S_{nevU2} = 200$ [MVA]

$\Delta P_{kTBU2} = 560$ [kW]

$\Delta P_{0TBU2} = 220$ [kW]

$$CPW_{an}FeT_{U2} := \Delta P_{0TBU2} \cdot \left(\frac{c_p}{T_{TST}} + c_{w400} \cdot 8760 \right) = 1.213239 \cdot 10^5$$ [Euro/an]

$$\tau := T_{sm} \cdot \frac{10000 + T_{sm}}{27500 - T_{sm}} = 3.030263 \cdot 10^3$$

$$CPW_{an}BT_{U2} := \Delta P_{kTBU2} \cdot \left(\frac{c_p}{T_{TST}} + c_{w400} \cdot \tau \right) \cdot \left(\frac{S_{ev}}{S_{nevU2}} \right)^2 = 7.123115 \cdot 10^4$$ [Euro/an]

$CPW_{anU2} := CPW_{an}BT_{U2} + CPW_{an}FeT_{U2} = 1.925551 \cdot 10^5$ [Euro/an]

$CPW_{an} := CPW_{anU2} \cdot 0 + CPW_{anU1} \cdot 4 + CPW_{anTR1} \cdot 1 = 1.126914 \cdot 10^6$ [Euro/an]

$CPW_{act} := CPW_{an} \cdot T_{TST} = 8.406777 \cdot 10^6$ [Euro]

Puterea medie nelivrata

$V1.1$

$$S_{mednelivr} := \frac{S_{c1.1} \cdot T_{sm}}{8760} = 219.282836$$ [MVA]

$t_{intrpl110} := 2 + 24 = 26$ [h/an]

$t_{intrpl400} := 3.5 + 32 = 35.5$ [h/an]

$t_{intrplTR} := 85$ [h/an]

$t_{intrpl} := 85$ [h/an]

$t_{intrnpl110} := 0.02 + 0.25 + 4.2 + 0.06 = 4.53$ [h/an]

$t_{intrnpl400} := 0.35 + 0.1 + 13 + 0.07 = 13.52$ [h/an]

$t_{intrnplTR} := 7.5$

$t_{intrnpl} := t_{intrnpl110} + t_{intrnpl400} + t_{intrnplTR} = 25.55$ [h/an]

$d_{SP} := 0.05$

$D_{anpl} := 0.1 \cdot S_{mednelivr} \cdot t_{intrpl} \cdot d_{SP} = 93.195205$

$D_{annpl} := S_{mednelivr} \cdot t_{intrnpl} \cdot d_{SP} \cdot 5 = 1.400669 \cdot 10^3$

$D_{an} := D_{anpl} + D_{annpl} = 1.493864 \cdot 10^3$

$D_{anact} := D_{an} \cdot T_{TST} = 1.114423 \cdot 10^4$

$CTA := C_i + CPW_{act} + C_{exact} + D_{anact} = 2.596743 \cdot 10^7$ [euro]

V3.1 Este cea mai buna varianta

Etapa 4

K1 pe 110kV

$C_{u110} := 1.1$ $U_{b110} := 110$ [kV]

$C_{u400} := 1$

$S_b := 10$ [MVA]

$S_{sc1} := \sqrt{3} \cdot 10 \cdot 110 = 1.905256 \cdot 10^3$ [kA]

$S_{sc2} := \sqrt{3} \cdot 15 \cdot 400 = 1.03923 \cdot 10^4$ [kA]

$X_1 := C_{u110} \cdot \frac{S_b}{S_{sc1}} = 0.005774$ [-]

$X_2 := C_{u110} \cdot \frac{S_b}{S_{sc2}} = 0.001058$ [-]

$X_3 := \frac{u_{kTBU1}}{100} \cdot \frac{S_b}{S_{nevU1}} = 0.007813$ [-]

$X_4 := \frac{u_{kTBU1}}{100} \cdot \frac{S_b}{S_{nevU1}} = 0.007813$ [-]

$X_5 := \frac{u_{kTBU2}}{100} \cdot \frac{S_b}{S_{nevU2}} = 0.00625$ [-]

$X_6 := \frac{u_{kTBU2}}{100} \cdot \frac{S_b}{S_{nevU2}} = 0.00625$ [-]

$x''_d := 19.2$

$X_7 := \frac{x''_d}{100} \cdot \frac{S_b}{120} = 0.016$ [-]

$X_8 := X_7$ $X_9 := X_7$ $X_{10} := X_7$

$X_{11} := \frac{u_{k3.1}}{100} \cdot \frac{S_b}{250} = 0.005$ [-]

$X_{12'19} := 2 \cdot \frac{u_{kTSP}}{100} \cdot \frac{S_b}{S_{nTSP}} = 0.02$ [-]

$X_{TPORG} := \frac{u_{kPORG}}{100} \cdot \frac{S_b}{S_{nTPORG}} = 0.019048$ [-]

$$X_{21} := X_3 + X_7 = 0.023813$$

$$X_{22} := X_4 + X_8 = 0.023813$$

$$X_{23} := X_5 + X_9 = 0.02225$$

$$X_{24} := X_6 + X_{10} = 0.02225$$

$$p := 1 + X_{11} \cdot \left(\frac{1}{X_2} + \frac{1}{X_{23}} + \frac{1}{X_{24}} \right) = 6.173213$$

$$X_{30} := p \cdot X_2 = 0.006534$$

$$X_{31} := p \cdot X_{23} = 0.137354$$

$$X_{32} := p \cdot X_{24} = 0.137354$$

S1: $X_{nS1} := X_1 \cdot \frac{13000}{S_b} = 7.505553$ >3

G1: $X_{nG1} := X_{21} \cdot \frac{S_{ev}}{S_b} = 0.299197$ <3

G1: $X_{nG2} := X_{22} \cdot \frac{S_{ev}}{S_b} = 0.299197$ <3

G3: $X_{nG3} := X_{31} \cdot \frac{S_{ev}}{S_b} = 1.725813$ <3

G4: $X_{nG4} := X_{32} \cdot \frac{S_{ev}}{S_b} = 1.725813$ <3

S2: $X_{nS2} := X_{30} \cdot \frac{13000}{S_b} = 8.494453$ >3

$$i_b := \frac{S_b}{\sqrt{3} \cdot U_{b110}} = 0.052486$$

S1: $i_{p0S1} := C_{u110} \cdot \frac{i_b}{X_1} = 10$ [kA]

$$i_{p\infty S1} := i_{p0S1}$$

G1: $i_{p0G1} := 3.48 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 2.524474$ [kA]

$$i_{p\infty G1} := 2.33 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 1.690237$$ [kA]

G2: $i_{p0G2} := 3.48 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 2.524474$ [kA]

$i_{p\infty G2} := 2.33 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 1.690237$ [kA]

G3: $i_{p0G3} := 0.585 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 0.424373$ [kA]

$i_{p\infty G3} := 0.636 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 0.461369$ [kA]

G4: $i_{p0G4} := 0.585 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 0.424373$ [kA]

$i_{p\infty G4} := 0.636 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 0.461369$ [kA]

S2: $i_{p0S2} := C_{u110} \cdot \frac{i_b}{X_{30}} = 8.835829$ [kA]

$i_{p\infty S2} := i_{p0S2}$

$i_{p0total} := i_{p0S1} + i_{p0G1} + i_{p0G2} + i_{p0G3} + i_{p0G4} + i_{p0S2} = 24.733523$ [kA]

$i_{p\infty total} := i_{p\infty S1} + i_{p\infty G1} + i_{p\infty G2} + i_{p\infty G3} + i_{p\infty G4} + i_{p\infty S2} = 23.139042$ [kA]

$i_{soc} := \sqrt{2} \cdot 1.8 \cdot i_{p0total} = 62.961271$ [kA]

$m := 0.05$ $n := 0.71$

$raport := \frac{i_{p0total}}{i_{p\infty total}} = 1.068909$

$i_{et} := i_{p0total} \cdot \sqrt{(m+n)} = 21.562185$ [kA]

Alegem din tabelul A10.2

$U_{nk1} := 110$ [kV]

$I_{nk1} := 1600$ [A]

$I_{rupk1} := 31.5$ [kA]

$I_{1dk1} := 80$ [kAmax]

$I_{1t} := 63$ [kAs]

Dispozitiv de actionare: 3 MOP

K2 pe 400kV

$C_{u110} := 1.1$ $C_{u400} := 1$ $U_{b400} := 400$ [kV] $S_b := 10$ [MVA]

$X_{21} := X_3 + X_7 = 0.023813$ $X_{23} := X_5 + X_9 = 0.02225$

$X_{22} := X_4 + X_8 = 0.023813$ $X_{24} := X_6 + X_{10} = 0.02225$

$$p := 1 + X_{11} \cdot \left(\frac{1}{X_1} + \frac{1}{X_{21}} + \frac{1}{X_{22}} \right) = 2.285973$$

$X_{30} := p \cdot X_1 = 0.013198$

$X_{31} := p \cdot X_{21} = 0.054435$

$X_{32} := p \cdot X_{22} = 0.054435$

S1: $X_{nS1} := X_{30} \cdot \frac{13000}{S_b} = 17.157492$ >3

G1: $X_{nG1} := X_{31} \cdot \frac{S_{ev}}{S_b} = 0.683956$ <3

G2: $X_{nG2} := X_{32} \cdot \frac{S_{ev}}{S_b} = 0.683956$ <3

G3: $X_{nG3} := X_{23} \cdot \frac{S_{ev}}{S_b} = 0.279565$ <3

G4: $X_{nG4} := X_{24} \cdot \frac{S_{ev}}{S_b} = 0.279565$ <3

S2: $X_{nS2} := X_2 \cdot \frac{13000}{S_b} = 1.376018$ <3

$$i_b := \frac{S_b}{\sqrt{3} \cdot U_{b400}} = 0.014434$$

S1: $i_{p0S1} := C_{u400} \cdot \frac{i_b}{X_{30}} = 1.093626$ [kA]

$i_{p\infty S1} := i_{p0S1}$

G1: $i_{p0G1} := 1.48 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.268407$ [kA]

$i_{p\infty G1} := 1.52 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.275661$ [kA]

G2: $i_{p0G2} := 1.48 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.268407$ [kA]

$i_{p\infty G2} := 1.52 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.275661$ [kA]

G3: $i_{p0G3} := 3.75 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.680085$ [kA]

$i_{p\infty G3} := 2.39 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.433441$ [kA]

G4: $i_{p0G4} := 3.75 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.680085$ [kA]

$i_{p\infty G4} := 2.39 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.433441$ [kA]

S2: $i_{p0S2} := 0.73 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.13239$ [kA]

$i_{p\infty S2} := 0.805 \cdot C_{u400} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 400} = 0.145992$ [kA]

$i_{p0total} := i_{p0S1} + i_{p0G1} + i_{p0G2} + i_{p0G3} + i_{p0G4} + i_{p0S2} = 3.122999$ [kA]

$i_{p\infty total} := i_{p\infty S1} + i_{p\infty G1} + i_{p\infty G2} + i_{p\infty G3} + i_{p\infty G4} + i_{p\infty S2} = 2.657821$ [kA]

$i_{soc} := \sqrt{2} \cdot 1.8 \cdot i_{p0total} = 7.949857$ [kA]

$m := 0.05$ $n := 0.71$

$raport := \frac{i_{p0total}}{i_{p\infty total}} = 1.175022$

$i_{et} := i_{p0total} \cdot \sqrt{(m+n)} = 2.722567$ [kA]

Alegem din tabelul A10.2

$U_{nk1} := 400$ [kV]

$I_{nk1} := 1600$ [A]

$I_{rupk1} := 31.5$ [kA]

$I_{1dk1} := 80$ [kAmax]

$I_{1t} := 63$ [kAs]

Dispozitiv de actionare: 3 MOP

K3 pe 110kV

$C_{u110} := 1.1$ $U_{b110} := 110$ [kV]

$C_{u400} := 1$

$S_b := 10$ [MVA]

$S_{sc1} := \sqrt{3} \cdot 10 \cdot 110 = 1.905256 \cdot 10^3$ [kA]

$S_{sc2} := \sqrt{3} \cdot 15 \cdot 400 = 1.03923 \cdot 10^4$ [kA]

$X_1 := C_{u110} \cdot \frac{S_b}{S_{sc1}} = 0.005774$ [-] $X_3 := \frac{u_{kTBU1}}{100} \cdot \frac{S_b}{S_{nevU1}} = 0.007813$ [-]

$X_2 := C_{u110} \cdot \frac{S_b}{S_{sc2}} = 0.001058$ [-] $X_4 := \frac{u_{kTBU1}}{100} \cdot \frac{S_b}{S_{nevU1}} = 0.007813$ [-]

$X_5 := \frac{u_{kTBU2}}{100} \cdot \frac{S_b}{S_{nevU2}} = 0.00625$ [-]

$X_6 := \frac{u_{kTBU2}}{100} \cdot \frac{S_b}{S_{nevU2}} = 0.00625$ [-]

$x''_d := 19.2$

$X_7 := \frac{x''_d}{100} \cdot \frac{S_b}{120} = 0.016$ [-]

$X_8 := X_7$ $X_9 := X_7$ $X_{10} := X_7$

$X_{11} := \frac{u_{k3.1}}{100} \cdot \frac{S_b}{250} = 0.005$ [-]

$X_{12'19} := 2 \cdot \frac{u_{kTSP}}{100} \cdot \frac{S_b}{S_{nTSP}} = 0.02$ [-]

$X_{TPORG} := \frac{u_{kPORG}}{100} \cdot \frac{S_b}{S_{nTPORG}} = 0.019048$ [-]

$X_{21} := X_3 + X_7 = 0.023813$

$X_{22} := X_4 + X_8 = 0.023813$

$X_{23} := X_5 + X_9 = 0.02225$

$X_{24} := X_6 + X_{10} = 0.02225$

$$p := 1 + X_{11} \cdot \left(\frac{1}{X_2} + \frac{1}{X_{23}} + \frac{1}{X_{24}} \right) = 6.173213$$

$$X_{30} := p \cdot X_2 = 0.006534$$

$$X_{31} := p \cdot X_{23} = 0.137354$$

$$X_{32} := p \cdot X_{24} = 0.137354$$

$$p := 1 + X_3 \cdot \left(\frac{1}{X_1} + \frac{1}{X_{22}} + \frac{1}{X_{31}} + \frac{1}{X_{32}} + \frac{1}{X_{30}} \right) = 3.990639$$

$$X_{40} := p \cdot X_1 = 0.02304$$

$$X_{41} := p \cdot X_{22} = 0.095027$$

$$X_{43} := p \cdot X_{31} = 0.54813$$

$$X_{44} := p \cdot X_{32} = 0.54813$$

$$X_{42} := p \cdot X_{30} = 0.026076$$

S1: $X_{nS1} := X_{40} \cdot \frac{13000}{S_b} = 29.951955$ >3

G1: $X_{nG1} := X_7 \cdot \frac{S_{ev}}{S_b} = 0.201035$ <3

G2: $X_{nG2} := X_{41} \cdot \frac{S_{ev}}{S_b} = 1.193987$ <3

G3: $X_{nG3} := X_{43} \cdot \frac{S_{ev}}{S_b} = 6.887095$ >3

G4: $X_{nG4} := X_{44} \cdot \frac{S_{ev}}{S_b} = 6.887095$ >3

S2: $X_{nS2} := X_{42} \cdot \frac{13000}{S_b} = 33.898296$ >3

$$i_b := \frac{S_b}{\sqrt{3} \cdot U_{b110}} = 0.052486$$

S1: $i_{p0S1} := C_{u110} \cdot \frac{i_b}{X_1} = 10$ [kA]

$$i_{p\infty S1} := i_{p0S1}$$

G1: $i_{p0G1} := 5 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 3.627118$ [kA]

$$i_{p\infty G1} := 2.57 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 1.864339$$ [kA]

G2: $i_{p0G2} := 1.19 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 0.863254$ [kA]

$i_{p\infty G2} := 0.94 \cdot C_{u110} \cdot \frac{S_{ev}}{\sqrt{3} \cdot 110} = 0.681898$ [kA]

G3: $i_{p0G3} := C_{u110} \cdot \frac{i_b}{X_{43}} = 0.105331$ [kA]

$i_{p\infty G3} := i_{p0G3}$

G4: $i_{p0G4} := C_{u110} \cdot \frac{i_b}{X_{44}} = 0.105331$ [kA]

$i_{p\infty G4} := i_{p0G4}$

S2: $i_{p0S2} := C_{u110} \cdot \frac{i_b}{X_{42}} = 2.214139$ [kA]

$i_{p\infty S2} := i_{p0S2}$

$i_{p0total} := i_{p0S1} + i_{p0G1} + i_{p0G2} + i_{p0G3} + i_{p0G4} + i_{p0S2} = 16.915173$ [kA]

$i_{p\infty total} := i_{p\infty S1} + i_{p\infty G1} + i_{p\infty G2} + i_{p\infty G3} + i_{p\infty G4} + i_{p\infty S2} = 14.971038$ [kA]

$i_{soc} := \sqrt{2} \cdot 1.8 \cdot i_{p0total} = 43.059$ [kA]

$m := 0.05$ $n := 0.71$

$raport := \frac{i_{p0total}}{i_{p\infty total}} = 1.12986$

$i_{et} := i_{p0total} \cdot \sqrt{(m+n)} = 14.746306$ [kA]

Alegem din tabelul A10.2

$U_{nk1} := 110$ [kV]

$I_{nk1} := 1600$ [A]

$I_{rupk1} := 31.5$ [kA]

$I_{1dk1} := 80$ [kAmax]

$I_{1t} := 40$ [kAs]

Dispozitiv de actionare: 1 MOP