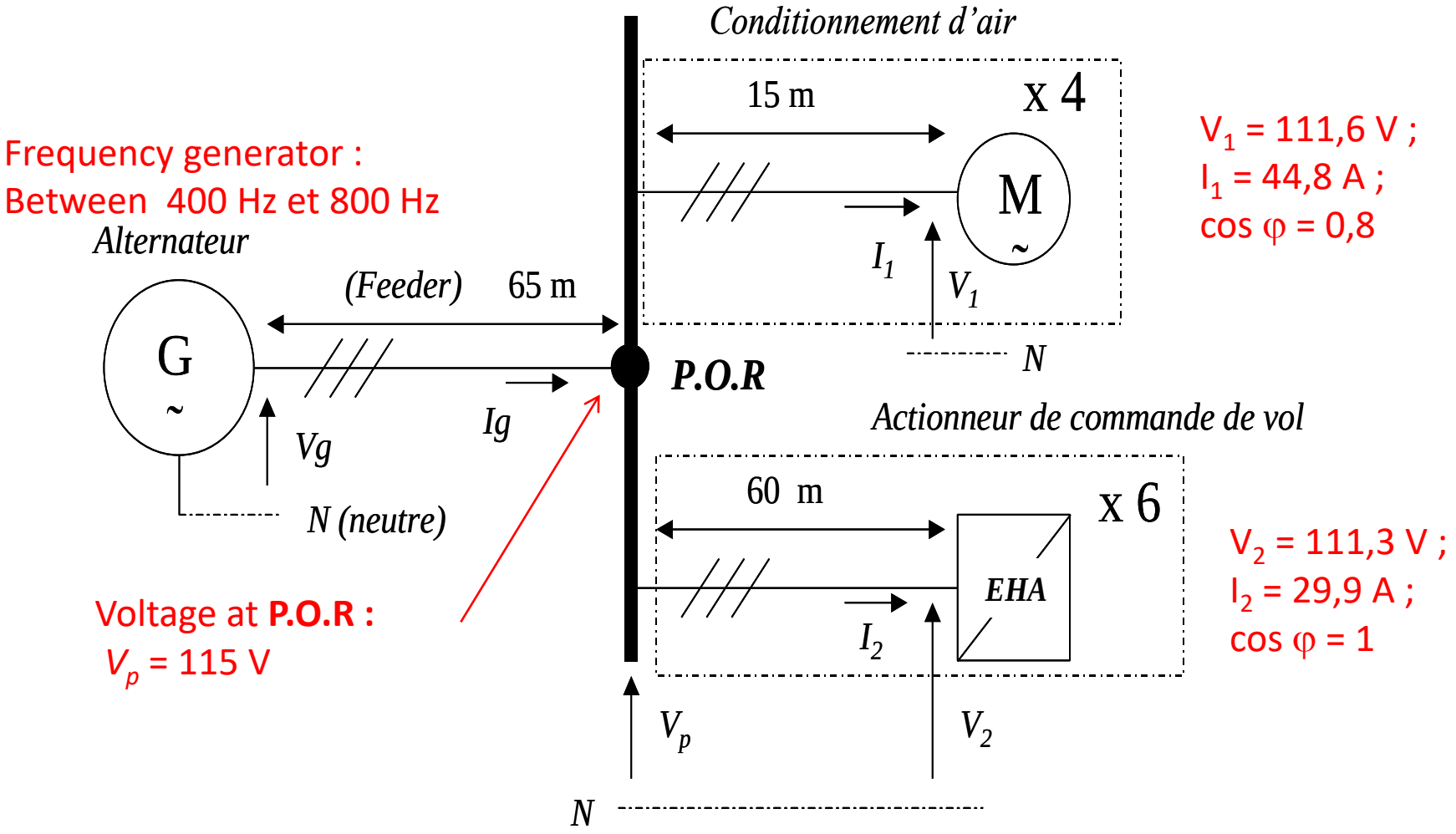
Tutorial 1 - Aircraft on board electrical supply network
Point of regulation


Conditionnement d'air
15 m
x 4
M
~
I_1
V_1
N
Frequency generator :
Between 400 Hz et 800 Hz
Alternateur
(Feeder) 65 m
G
~
Vg
Ig
N (neutre)
P.O.R
Actionneur de commande de vol
60 m
x 6
EHA
I_2
V_p
V_2
N
Voltage at P.O.R :
V_p = 115 V
V_1 = 111,6 V ;
I_1 = 44,8 A ;
cos φ = 0,8
V_2 = 111,3 V ;
I_2 = 29,9 A ;
cos φ = 1
Power sources
Power consumers

Question 1:

Active and reactive powers of motors

Pm= 12 kW ; Qm= 9 kVAR

Active and reactive powers of motor cables

P**c1** = 542 W ; Q**c1**= 45 VAR

Active and reactive powers of EHA

Pm= 10 kW ; Qm= 0

Active and reactive powers of EHA cables

P**c2** = 339 W ; Q**c2**= 81 VAR

Question 1.5:

$$P_{POR} = 4.(P_m + P_{c1}) + 6.(P_{EHA}+P_{c2}) = 112\ 202\ \text{W}.$$

$$Q_{POR} = 4.(Q_m + Q_{c1}) + 6.(Q_{EHA}+Q_{c2}) = 36\ 668\ \text{VAR}.$$

$$S_{POR}=\sqrt{P_{POR}^2+Q_{POR}^2} = 118\ 042\ \text{VA}.$$

D'où : $$I_g=\frac{S_{POR}}{3.V_p} = 342\ \text{A et cos}\ \varphi_p = 0{,}95;\ (\varphi_p = 18{,}2°)$$

Question 2: ***feeder weight***.

The feeder is a feeder made of 3 conductors (1 for each phase).

Characteristics of the feeder:
length : 65 m
diameter : 20mm
material : copper

$$\text{Weight} = 3 * 65 * 0.01^2 \pi * 8960 = 549\ kg$$