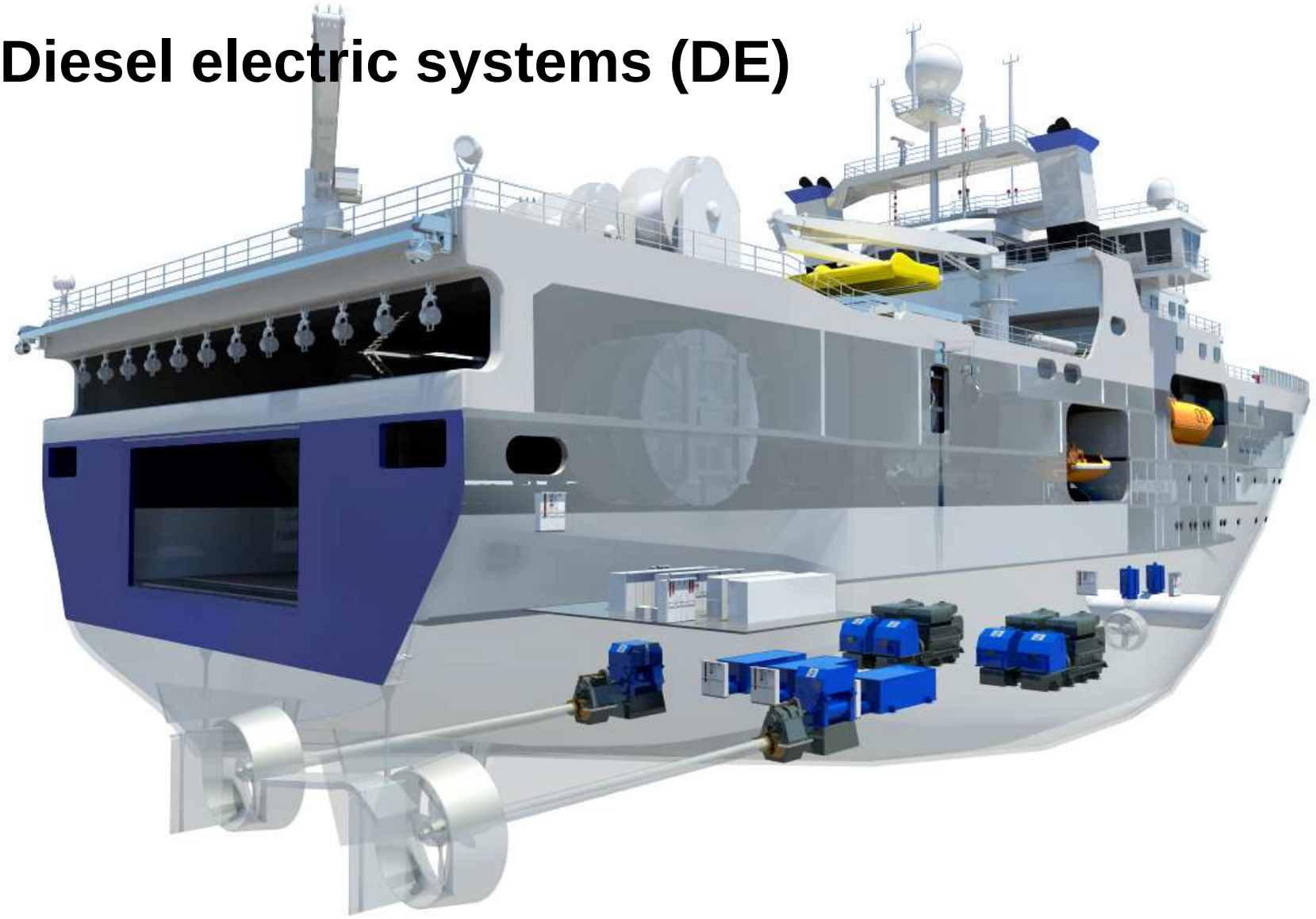
Scandinavian Electric System AS
Part of Rolls-Royce Group

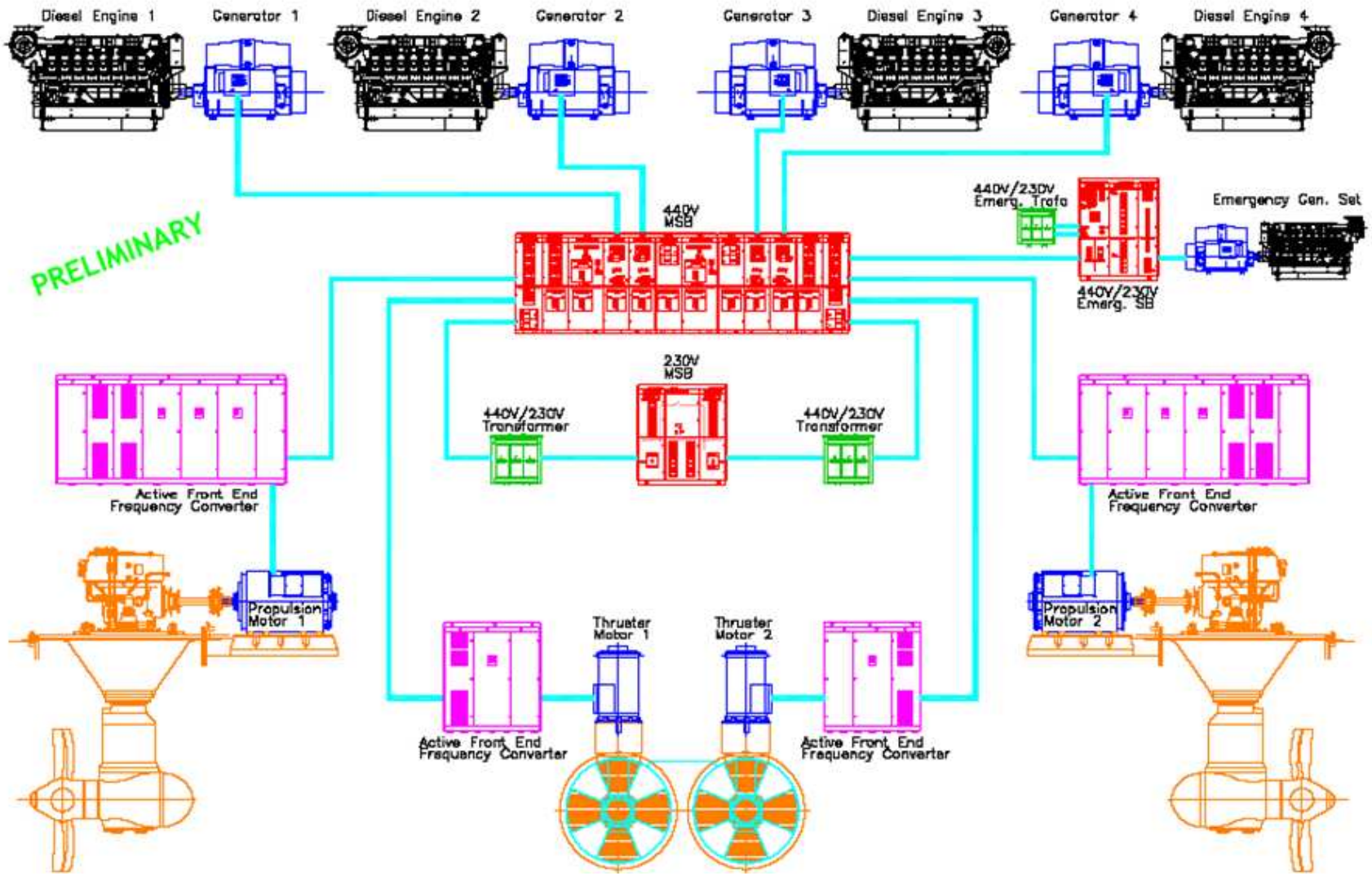
Atle David Monsen
Sales Manager

Typical applications

Diesel electric systems (DE)

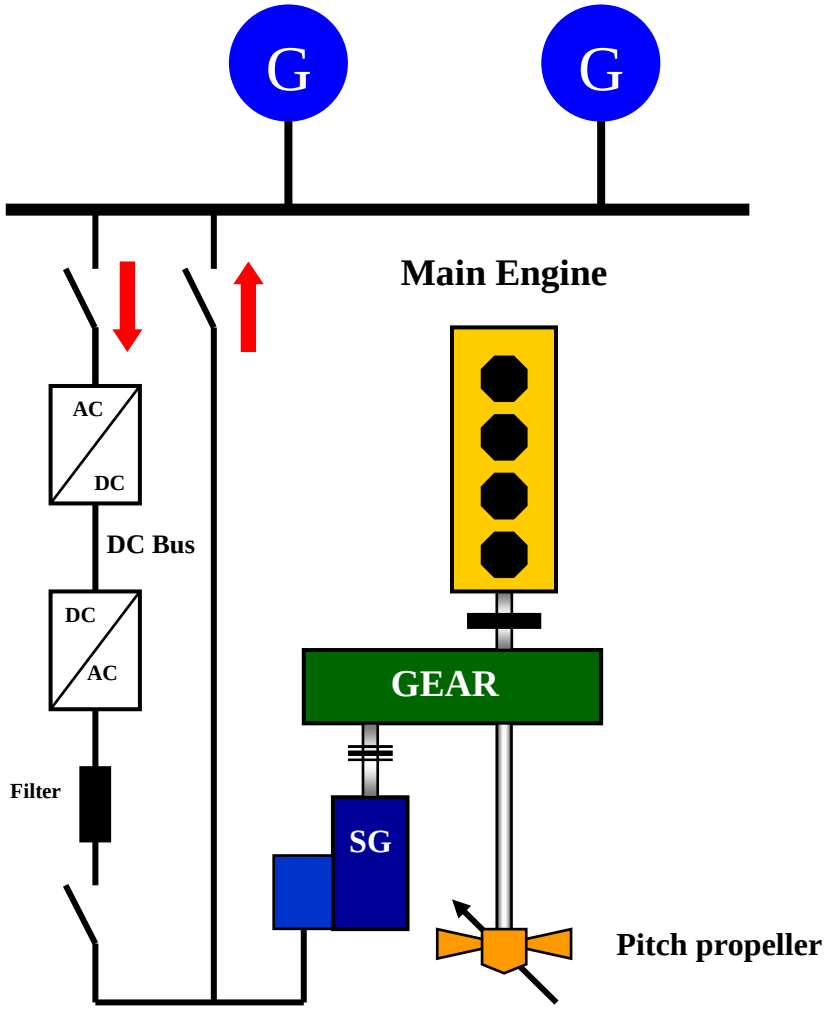


System layout – Diesel Electric System



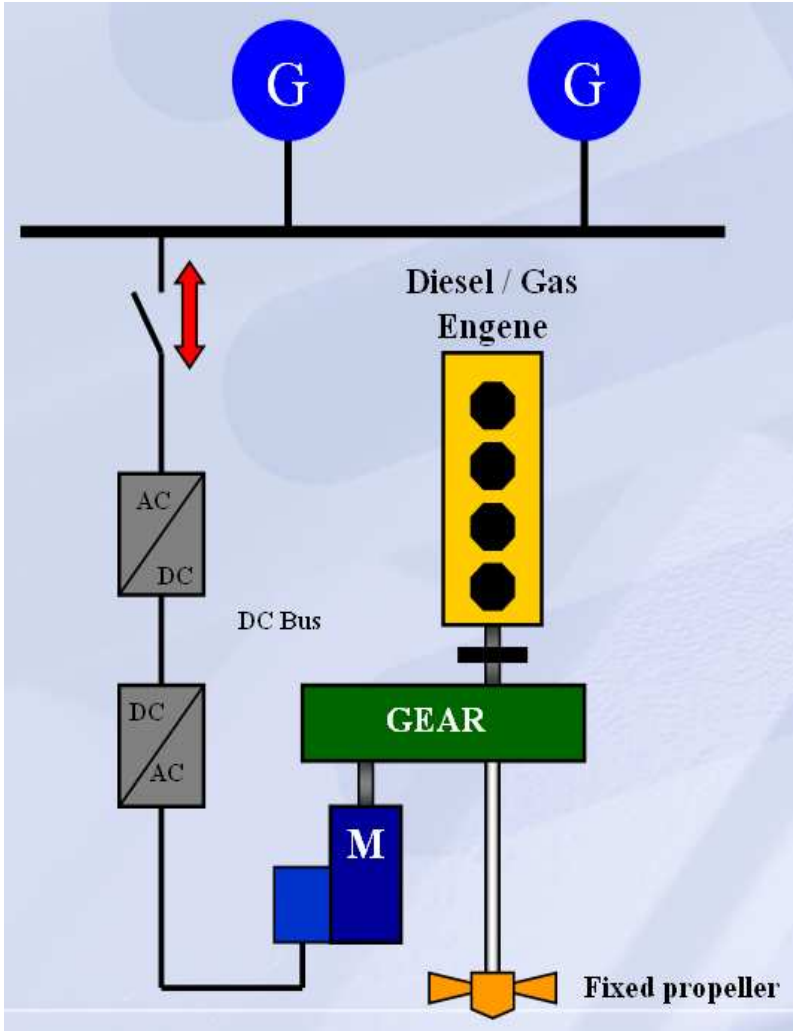
Syncronous Hybrid System

- AFE FREQUENCY CONTROLLED SHAFT GENERATOR
- FOR PTI/PTO OPERATION
- TO BE USED WITH PITCH PROPELLER
- RE-INSTALLATION IN EXCITSTING DM PROP. SYSTEM
- NEWBUILDING HYBRIDE SOLUTION
- SPEED RANGE 25 – 110% OF NOMINAL SG SPEED
- EXSTENSIVE FUEL SAVEING
- PURE SINUSOILDAL CURRENT IN BOTH DIRECTINS, NO HARMONIC DISTORTION

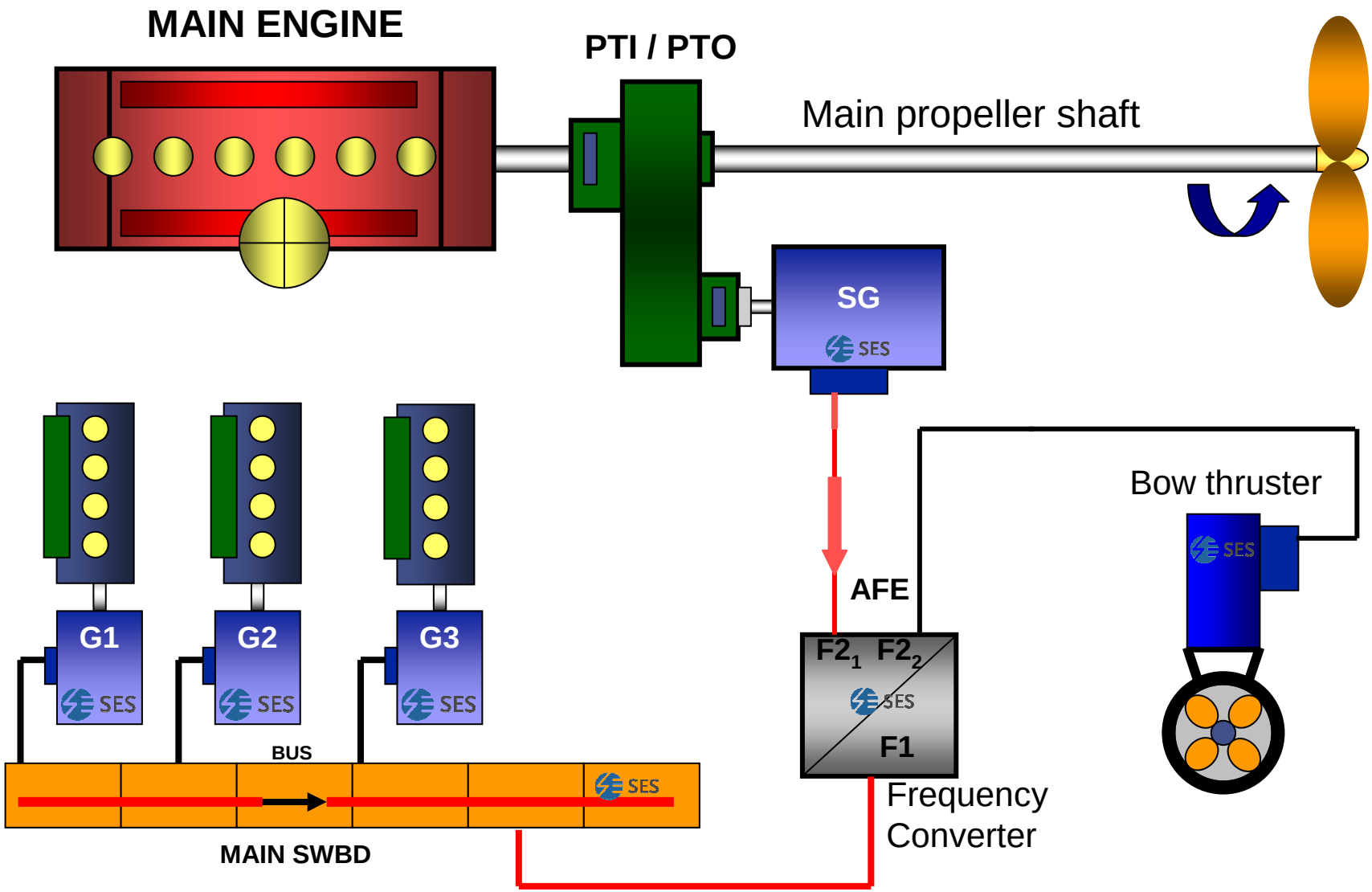


Asyncronous Hybrid System

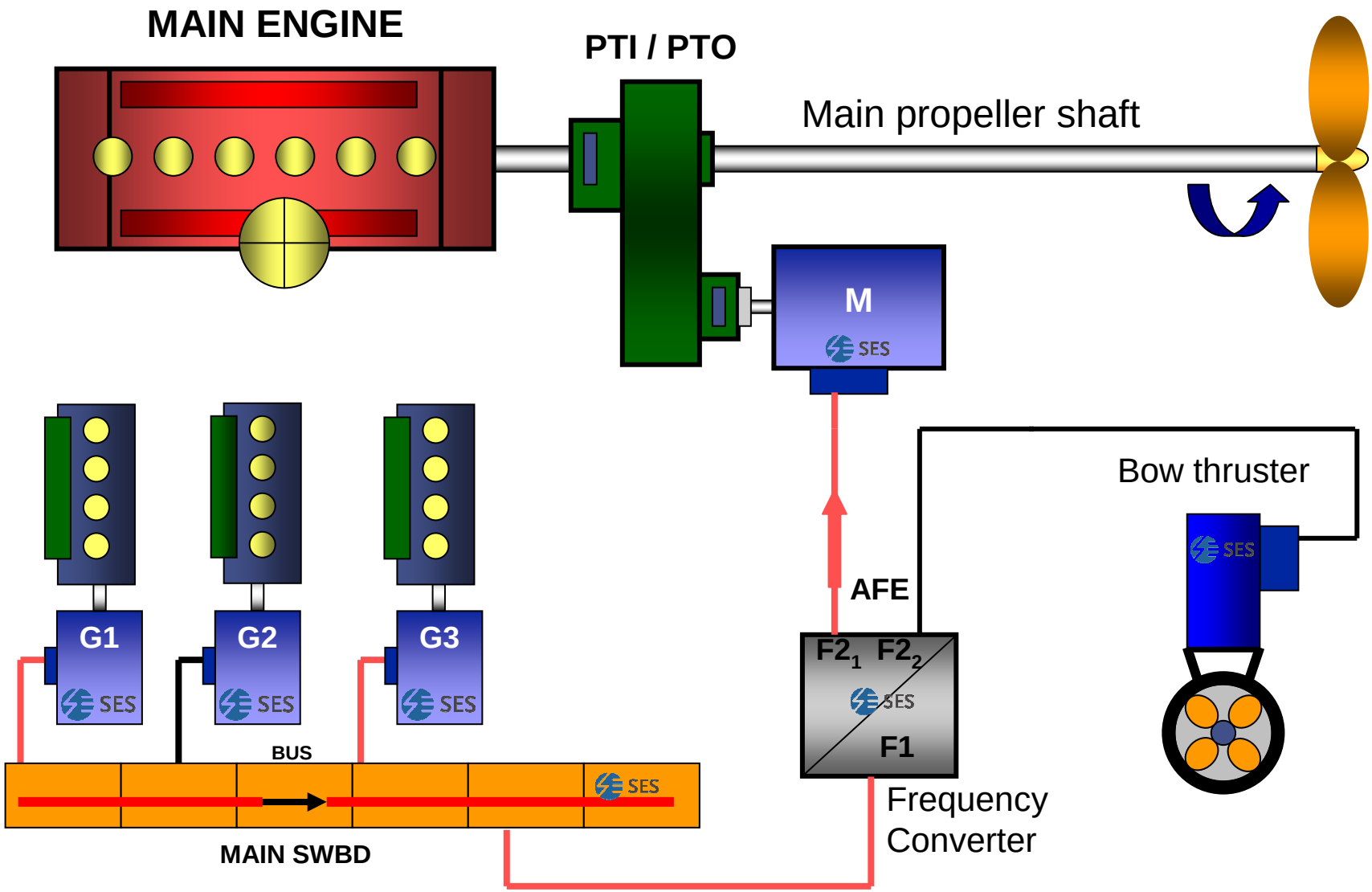
- PTI / PTO SOLUTION WITH ASYNCHRONUS MOTOR
- REDUCED NUMBER OF CLUCHES
- 0-110% SPEED RANGE
- 100% STARTING TORQUE
- HYBRID SOLUTION FOR FIX PROPELLERS
- VARIABLE INPUT SPEED FROM MAIN ENGINE , CONSTANT VOLTAGE AND FREQUENCY ON SWICHBOARD
- 100% POWER FEEDBACK TO MAINS VIA AFE IN PARALLELL WITH AUX. GENERATOR OR AS STAND ALONE UNIT FEEDING MAIN SWICHBOARD
- PURE SINUSOILDAL CURRENT IN BOUT DIRECTINS, NO HARMONIC DISTORTION
- HIGH EFFICENCY



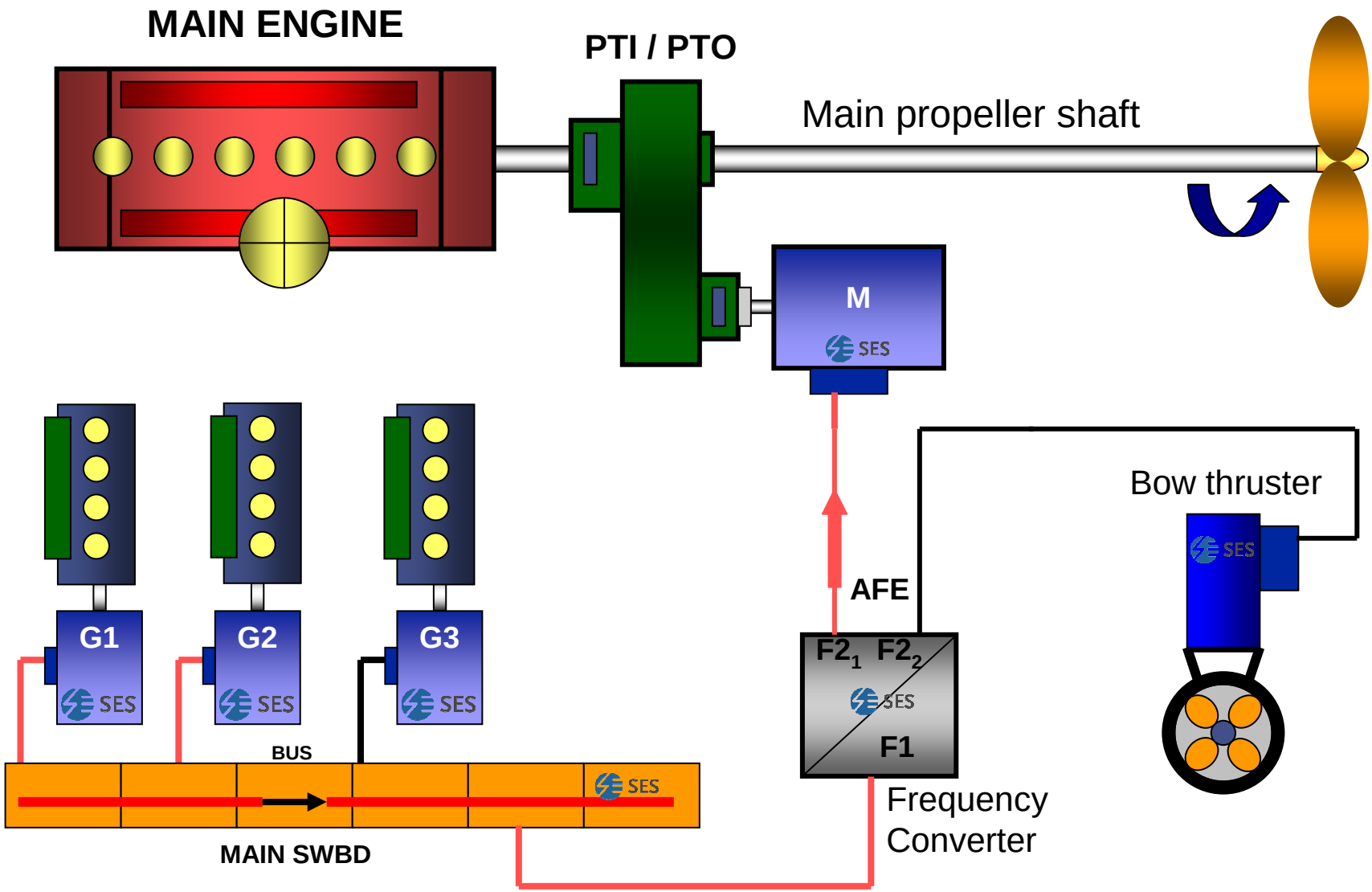
HYBRID PROPULSION (Diesel mechanical mode)



HYBRID PROPULSION (Diesel Electric mode)

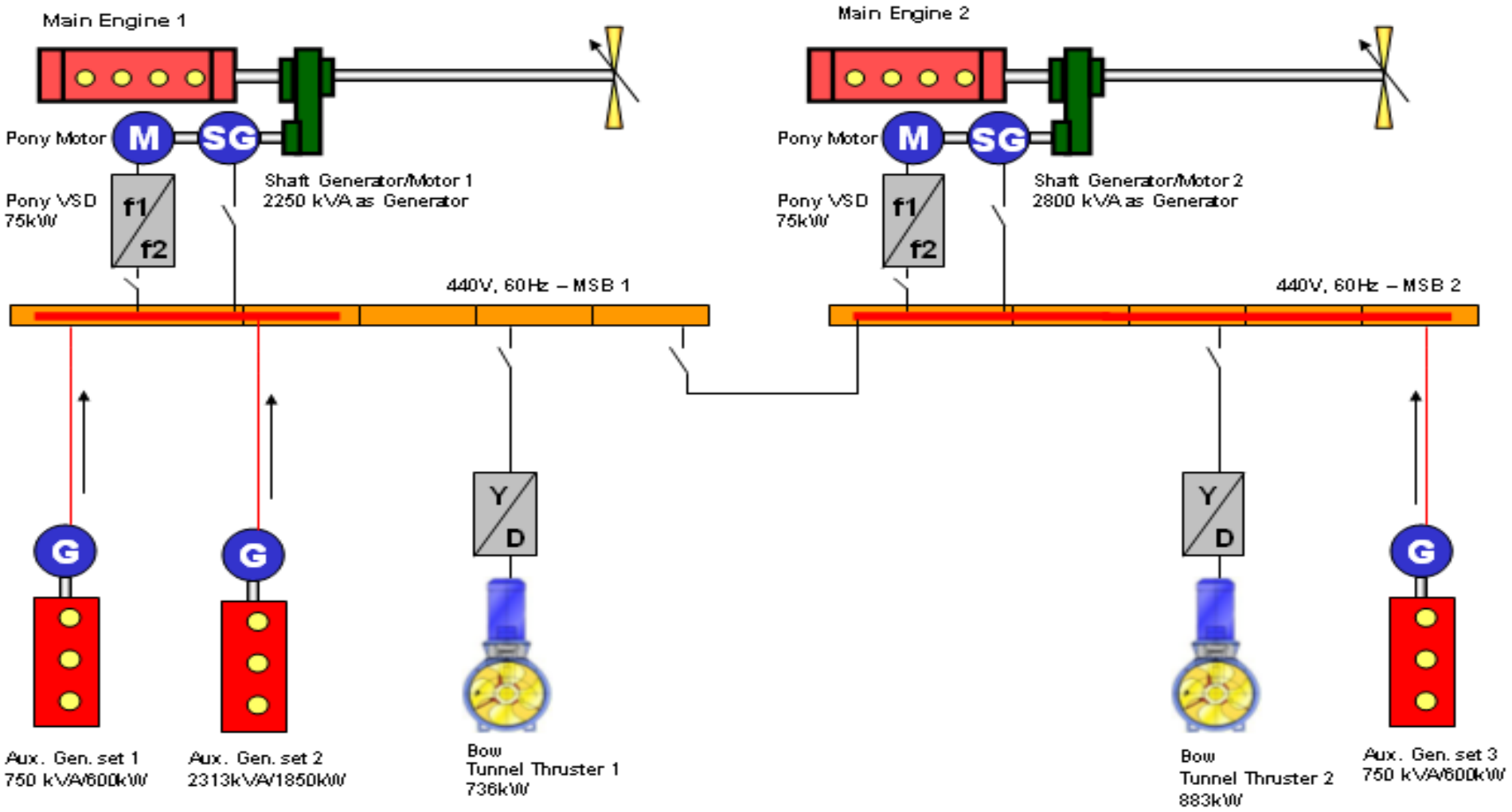


HYBRID PROPULSION (Diesel mechanical boost mode)



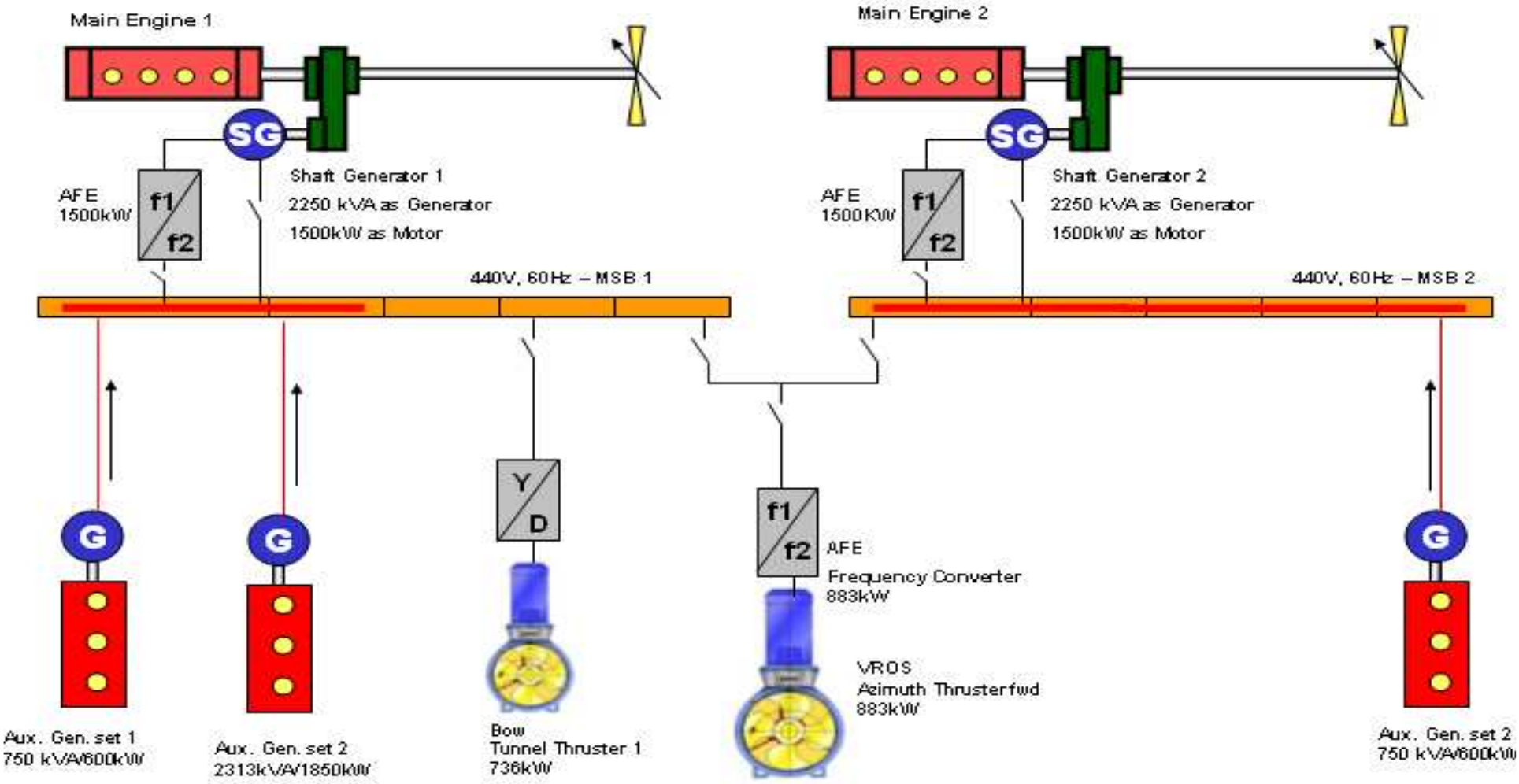
KV-Harstad

Before reconstruction – 0 Pitch Losses at 385kW pr. Propeller



KV-Harstad

After reconstruction – Fuel Savings – 5.5 tons a day - 0 Pitch Losses at 25kW pr. Propeller



Convertion to hybrid systems

KV Harstad - after reconstruction:

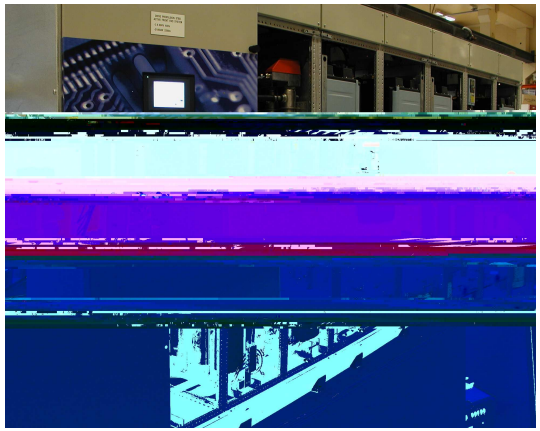
- Fuel savings, 4.5 tons per day.
- 0 pitch losses at 25kW pr. Propeller.

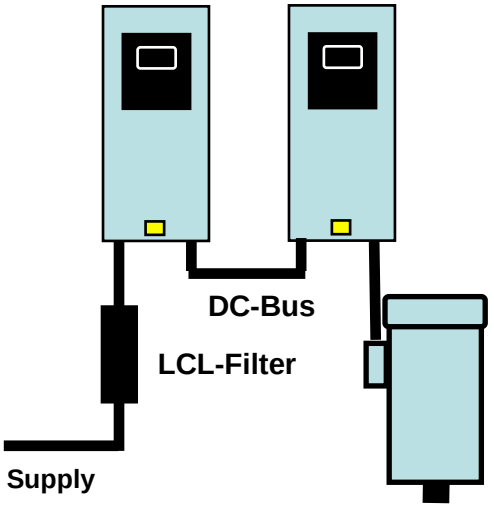
Savings:

- 0 pitch losses reduced from 385 kW to 25 kW per propeller
- Daily fuel oil consumption reduced from 10 tons to 5.5 tons
- 45 % reduction in emissions, NOx and CO2.
- NOx tax can be used to fund this type of conversion

Active front end (AFE)

- One motor inverter and one supply inverter
- THD less than 2%
- Power limits in both directions
- Power factor better than 0.99
- One cabinet, with connections for power input and power output
- Can load generator up to 100%
- Saves overall installation cost
- Several units can be in common network with several generators





THD

- Total Harmonic Distortion (THD)
- High THD can make several problems onboard:
  - Mainly: overheat in cables and windings (increased losses)
- DNV requirement is THD [V] < 5%
- We have measured maximum 2% on SES systems onboard vessels
  - Low THD gives less losses (fuel savings)
- Typical value on SES systems is between 1,8-1,5%
  - Starting at 1,8% at low AFE drive load
  - Decreasing to 1,5% at full AFE drive load

Known Technology

- SES AFE used World Wide
- In operation: 35 vessels
- In order backlog: 60 systems

THANK YOU FOR YOUR ATTENTION

Contact:

Ålesund – **Otto-Per Gjerde** **tel: 70 10 37 40**
otto-per.gjerde@rolls-royce.com

Monrad Hide **tel: 70 10 37 16**
monrad.hide@rolls.royce.com

Bergen – **Atle Monsen** **tel: 55 50 60 91**