



Rolls-Royce

Scandinavian Electric System AS Part of Rolls-Royce Group

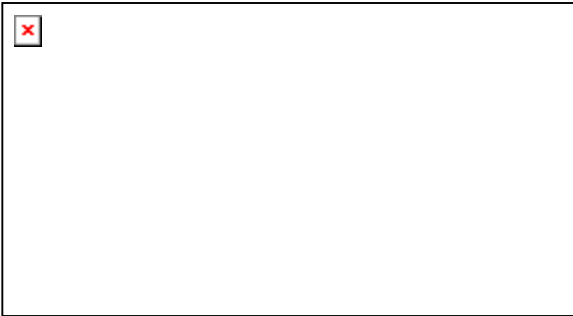
Atle David Monsen
Sales Manager

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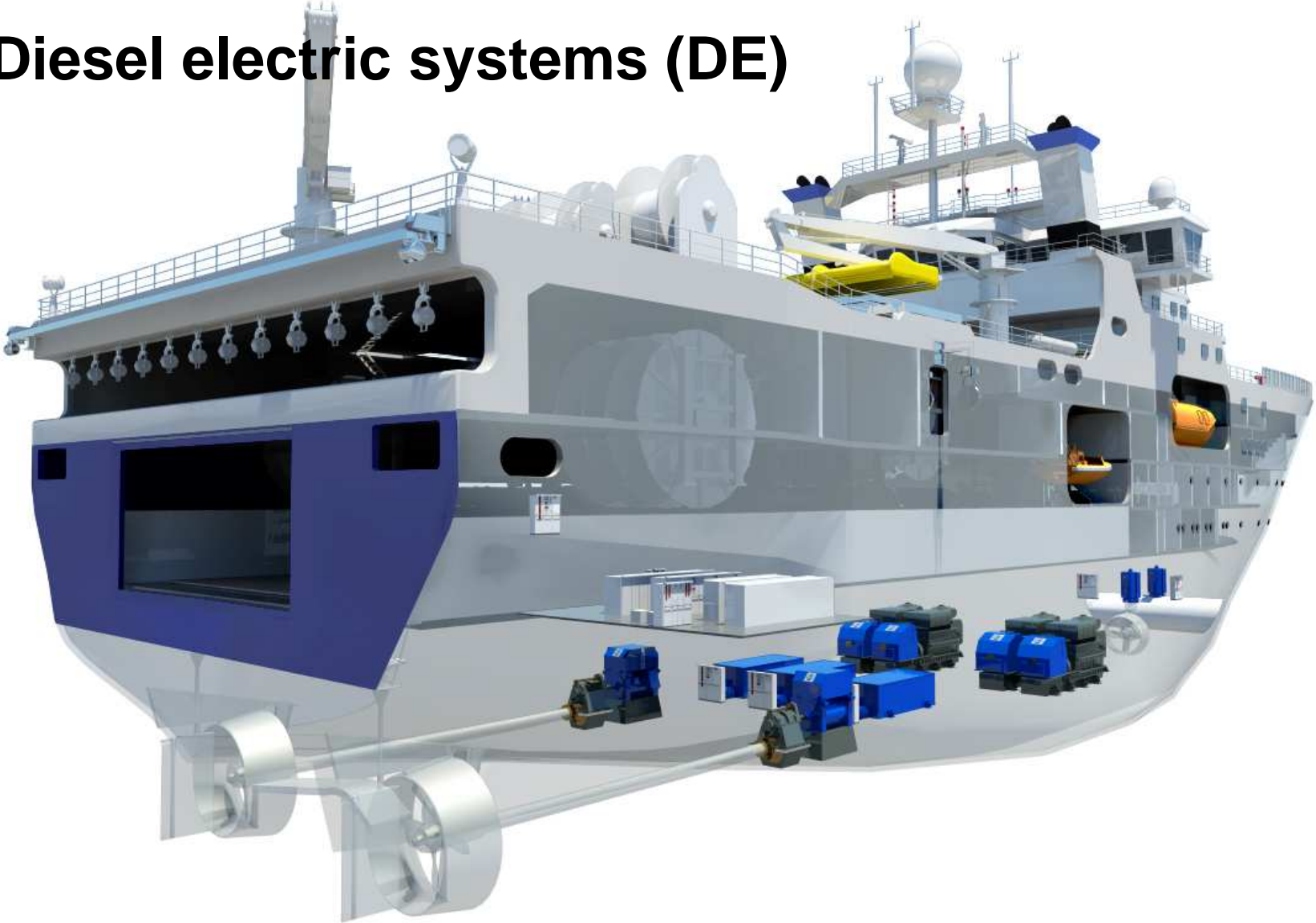
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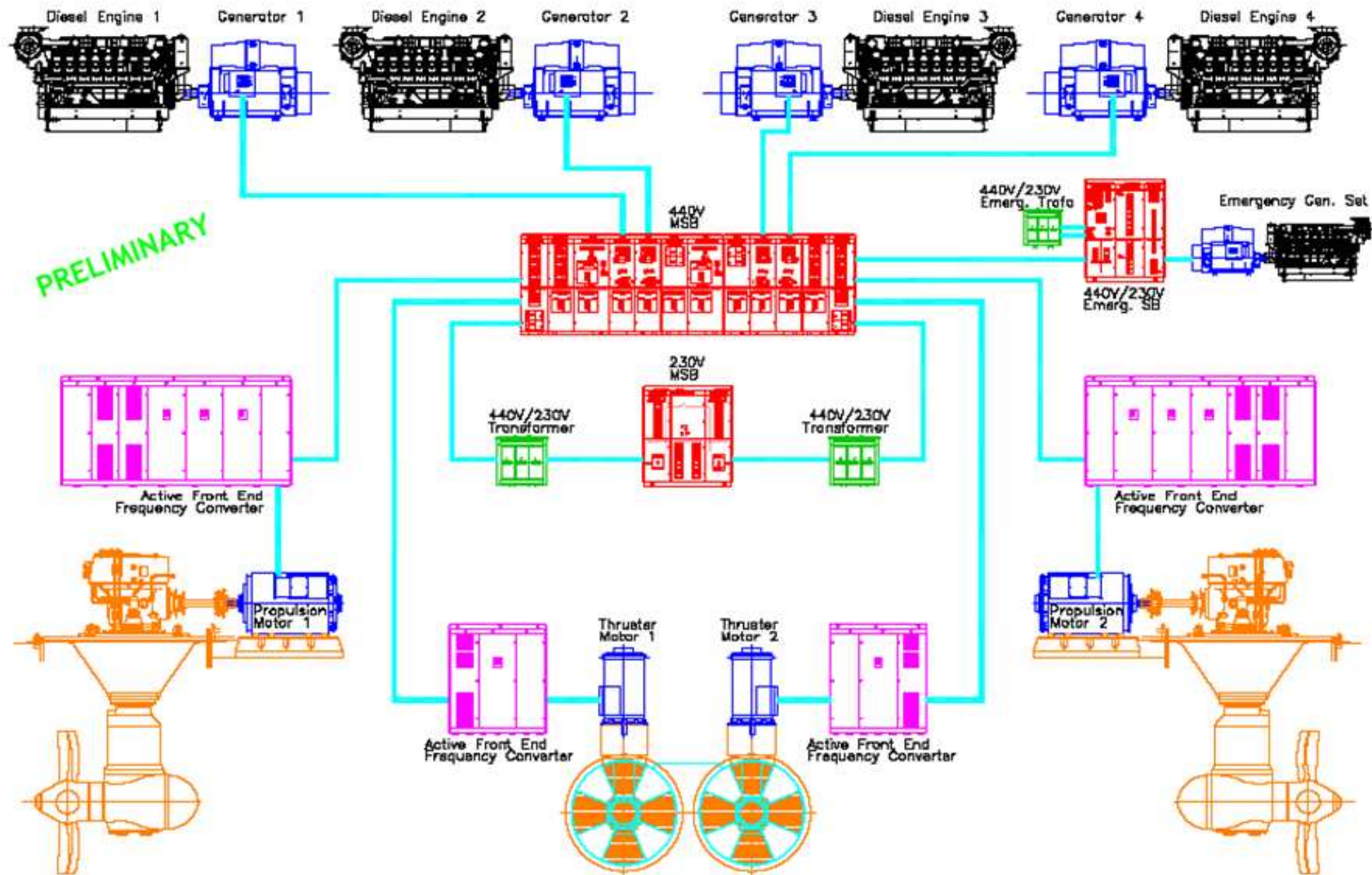
Typical applications



Diesel electric systems (DE)

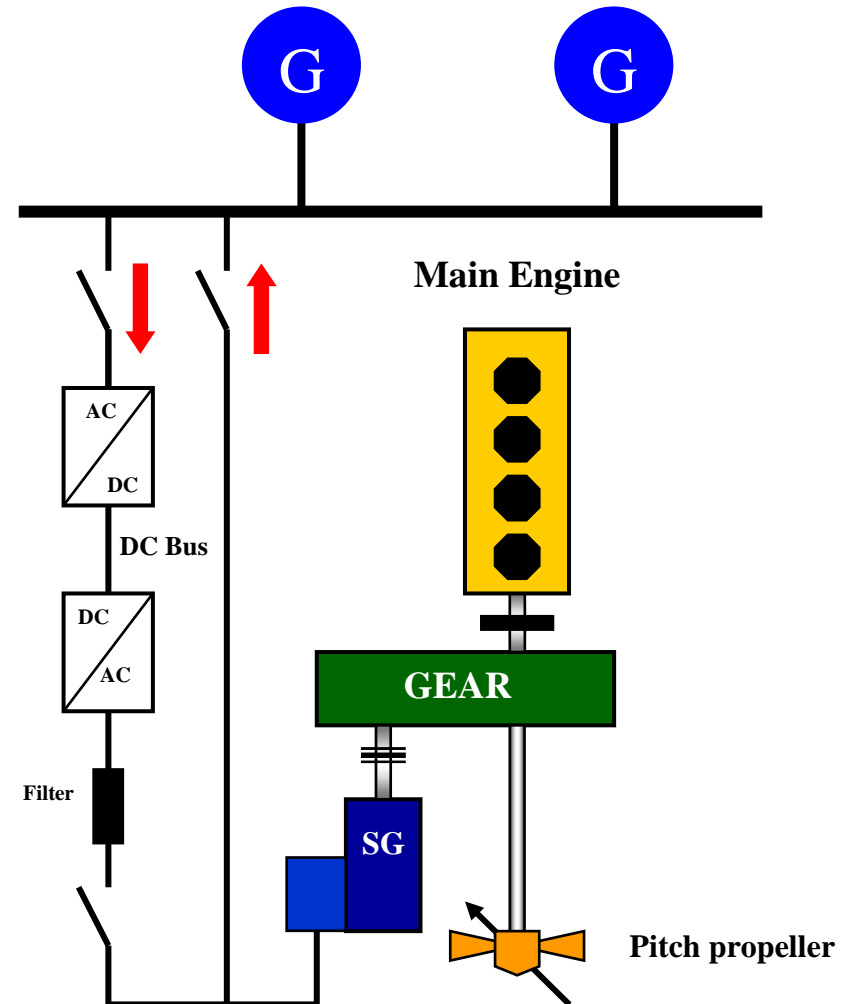


System layout – Diesel Electric System



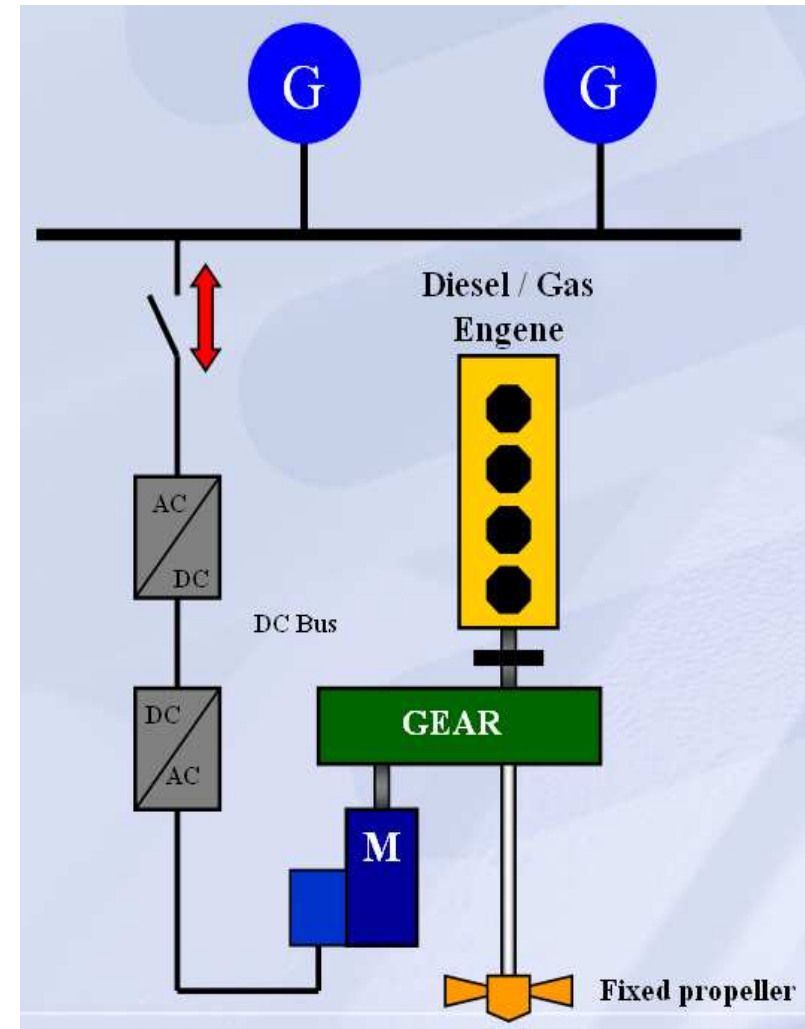
Synchronous Hybrid System

- AFE FREQUENCY CONTROLLED SHAFT GENERATOR
- FOR PTI/PTO OPERATION
- TO BE USED WITH PITCH PROPELLER
- RE-INSTALLATION IN EXISTING DM PROP. SYSTEM
- NEWBUILDING HYBRID SOLUTION
- SPEED RANGE 25 – 110% OF NOMINAL SG SPEED
- EXTENSIVE FUEL SAVING
- PURE SINUSOIDAL CURRENT IN BOTH DIRECTIONS, NO HARMONIC DISTORTION

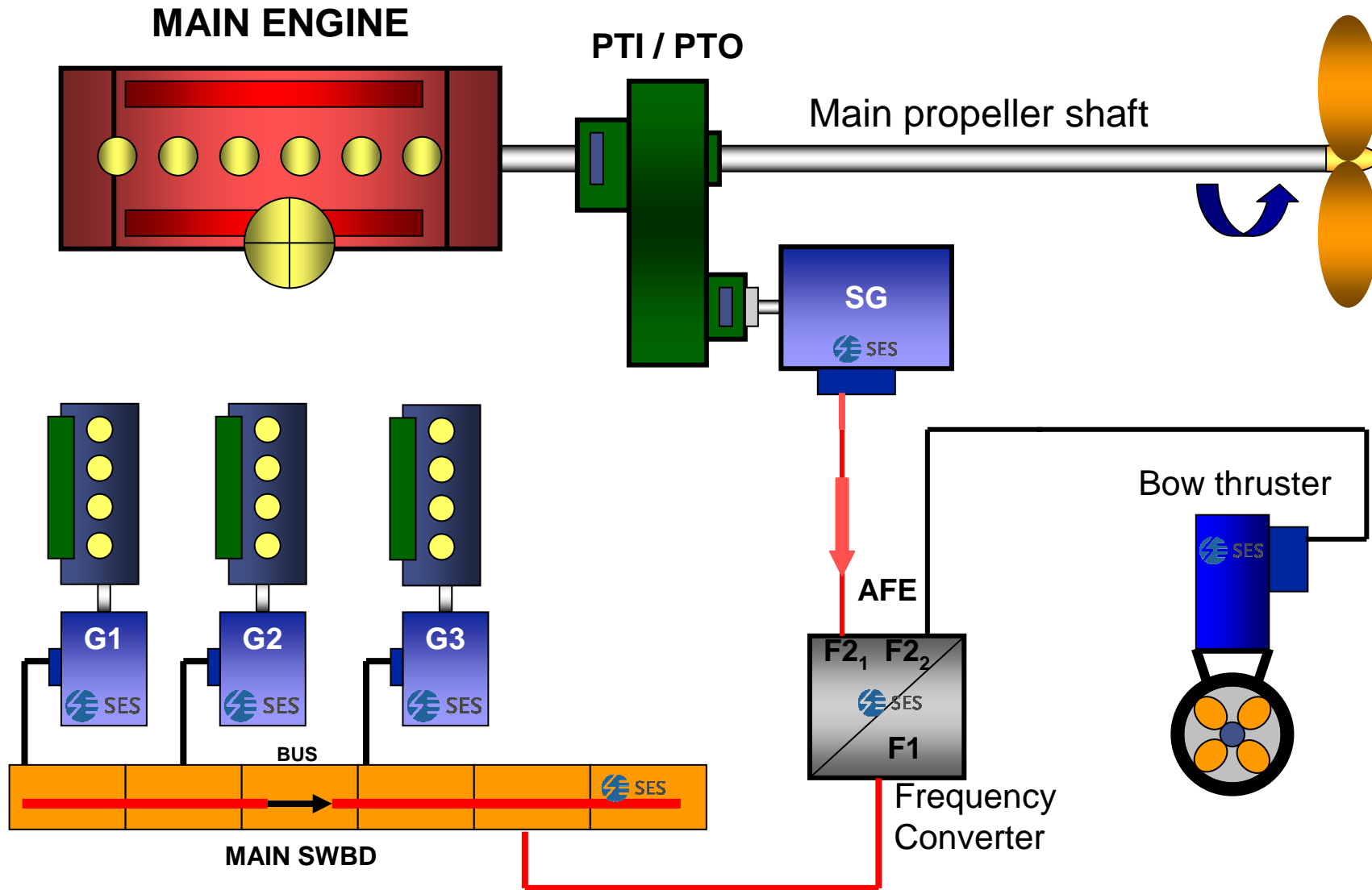


Asynchronous Hybrid System

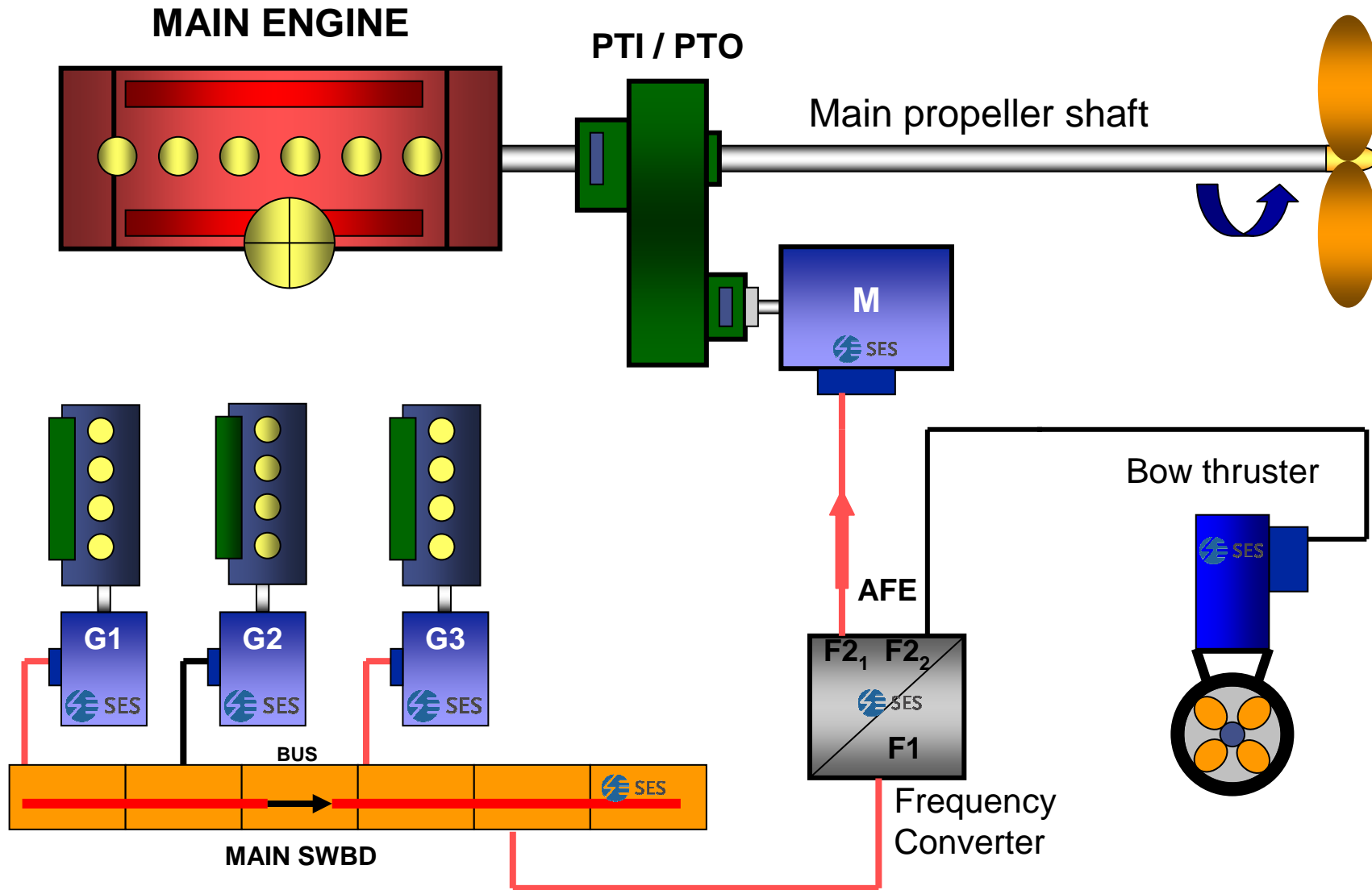
- PTI / PTO SOLUTION WITH ASYNCHRONOUS MOTOR
- REDUCED NUMBER OF CLUCHES
- 0-110% SPEED RANGE
- 100% STARTING TORQUE
- HYBRID SOLUTION FOR FIX PROPELLERS
- VARIABLE INPUT SPEED FROM MAIN ENGINE , CONSTANT VOLTAGE AND FREQUENCY ON SWICHBOARD
- 100% POWER FEEDBACK TO MAINS VIA AFE IN PARALLELL WITH AUX.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



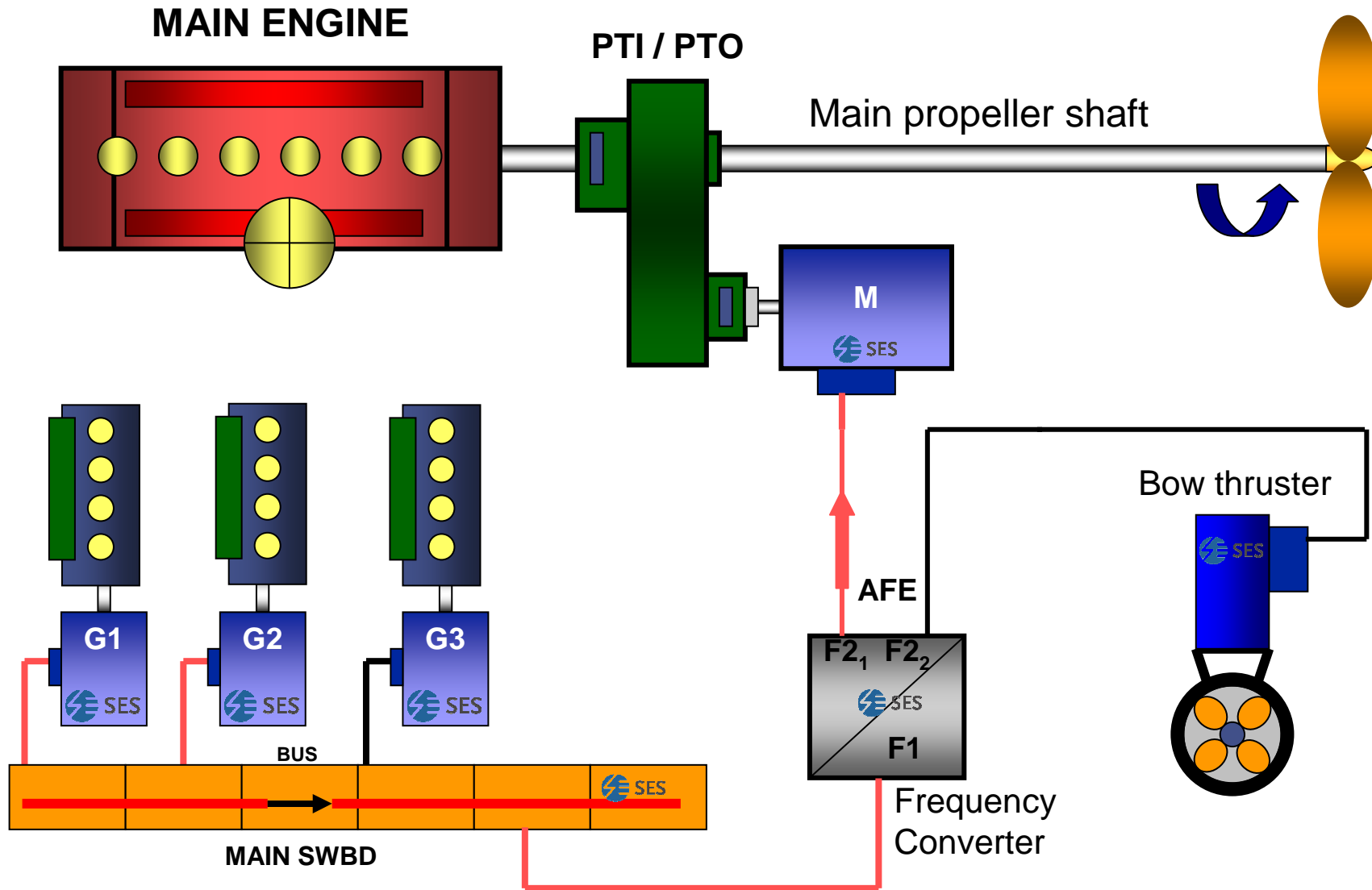
HYBRID PROPULSION (Diesel mechanical mode)



HYBRID PROPULSION (Diesel Electric mode)

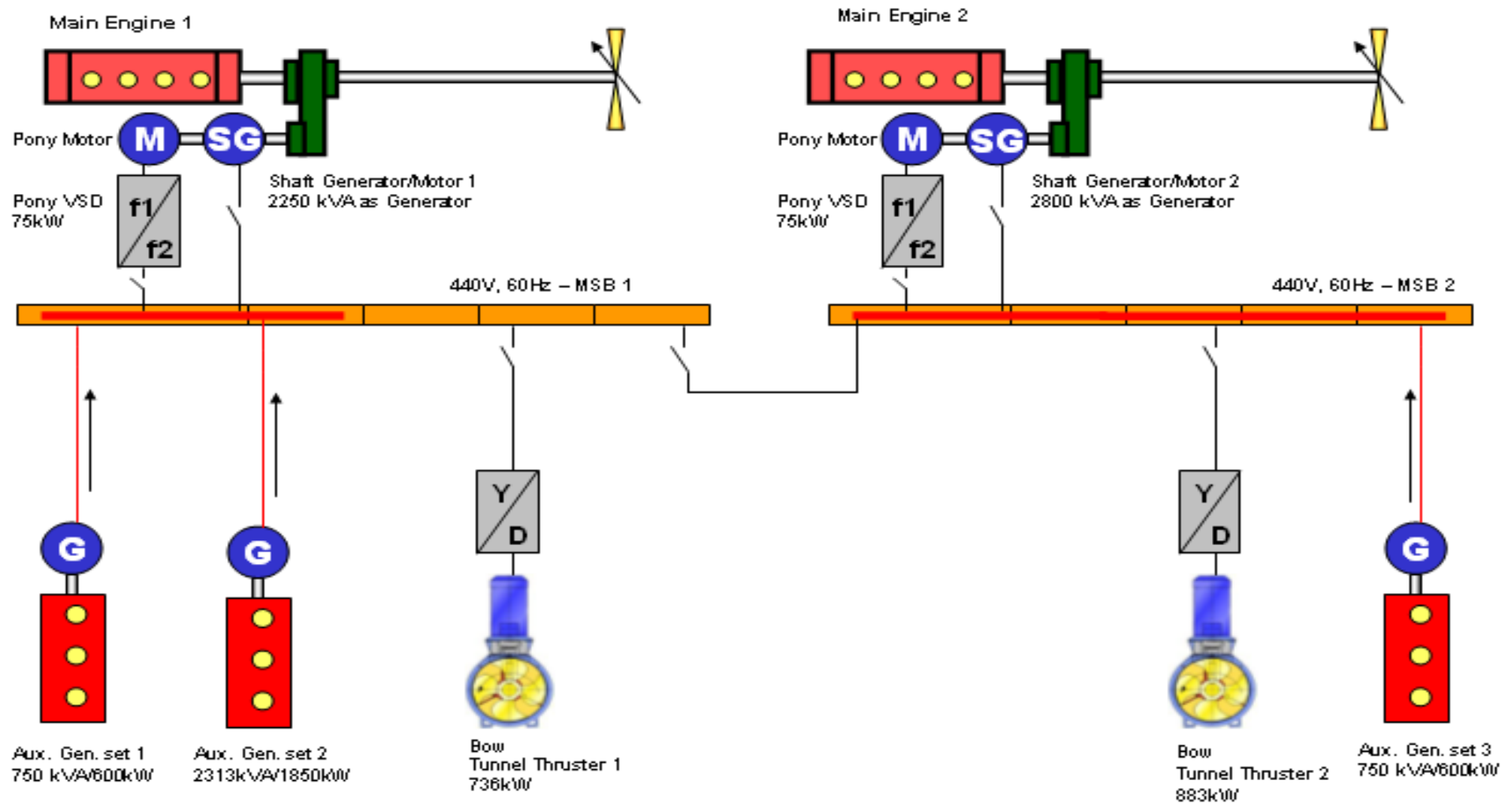


HYBRID PROPULSION (Diesel mechanical boost mode)



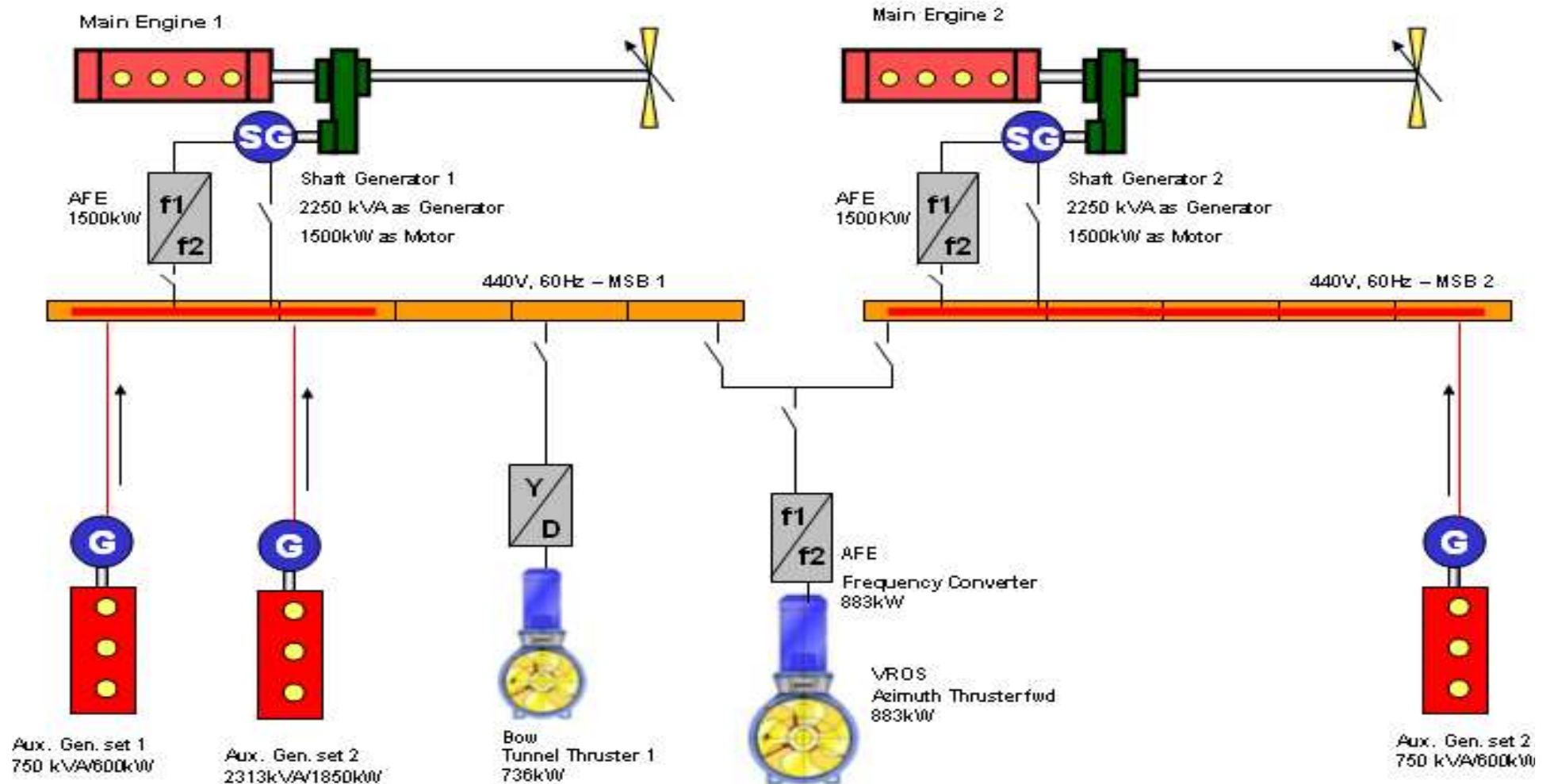
KV-Harstad

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



Conversion to hybrid systems

KV Harstad - after reconstruction:

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

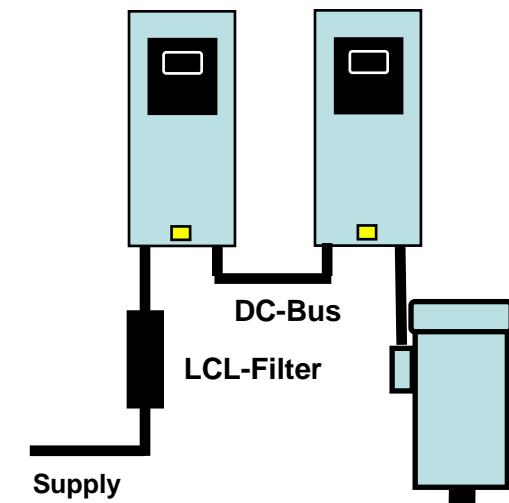
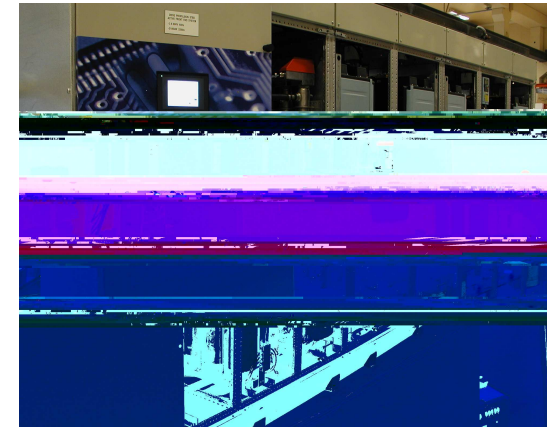


Savings:

- 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

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