

# Variable Frequency Active Front-End Power & Propulsion System

GE's frequency-independent propulsion system employs variable frequency, active front-end (VF-AFE) drives in an advanced system configuration to increase operational efficiency.

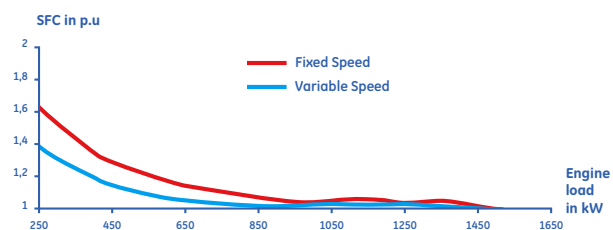
The system utilizes proven technology to provide an innovative response to the challenges of increasing fuel economy while reducing environmental pollution and service costs.

When a conventional solution sets a fixed frequency it does not permit adjustment of the speed of the gensets to match the variable load. A fixed speed must be maintained in order to match the frequency needs of the electrical network – regardless of the engine's most fuel-efficient speeds.

VF-AFE technology manages the engine/alternator speeds in the range 75-100%, according to actual electrical load demand, allowing the engines to operate with a significantly better fuel-efficient point.

## Example of fuel savings

Calculation based on specific operating conditions - assuming a fuel price of \$900 per tonne, with the engines loaded at 50% of rated load, for a full year, on a ship with 8MW of installed power, operating for 300 days a year, 24 hours a day, the fuel savings could be up to \$300,000 per year. ROI is between 6 to 12 months.



## Key benefits

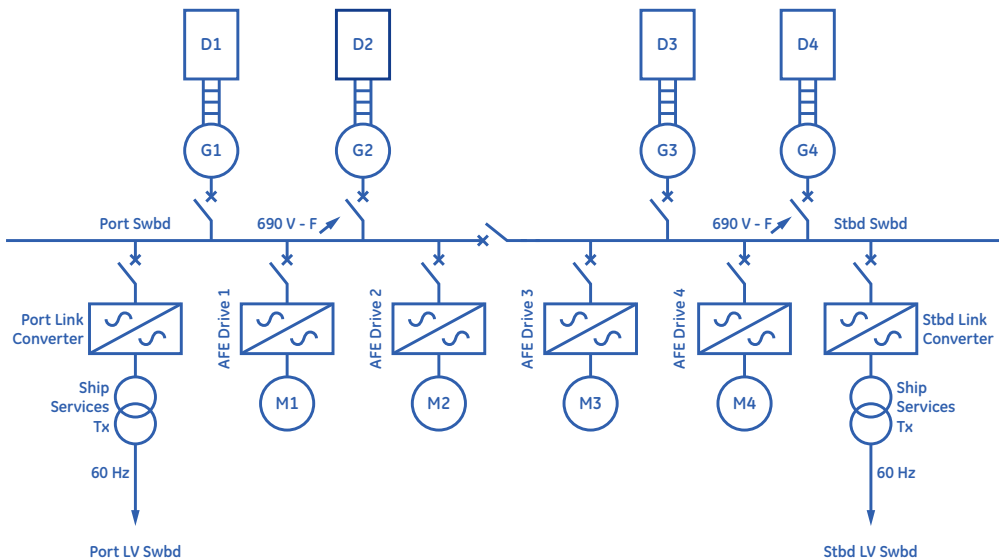
- Varying engine speed between 75-100% gives up to 15% Specific Fuel Consumption (SFC) reduction
- Reduced emissions due to increased optimization of engine speed
- Smart engineering enables the use of proven technology in an innovative configuration that limits changes to existing, familiar, system topology
- Helps extend maintenance intervals, reduce need to re-train crews and lower service costs

VF-AFE utilizes the latest low voltage drives to operate the main network at variable frequency and the ship service network at a fixed frequency.

In the VF-AFE solution, energy storage may be included to bring further benefits like fault-ride-through capability, single generator operation and smoothing power fluctuation.

VF-AFE can be easily integrated into existing vessels as an upgrade package and is suitable for various engine types.





Variable frequency network architecture

### Technical specification

- Steady state frequency: 45 to 60 Hz
- Rated voltage: 690 V
- Thruster drive power rating: 1/2/3/4 MW
- Thruster drive technology: PWM IGBT
- Link converter technology: PWM IGBT
- Thruster drive range: MV3000
- Link converter range: MV3000
- Link converter power rating: 550 KVA/1.1 MVA
- Link converter by-pass mode
- Thruster drive size:
  - 1 MW drive: 1800 mm length/2100 mm height/1200 mm width
  - 2 MW drive: 2900 mm length/2100 mm height/1200 mm width
  - 3 MW drive: 4000 mm length/2100 mm height/1200 mm width
  - 4 MW drive: 5400 mm length/2100 mm height/1200 mm width

- Thruster drive weight:
  - 1 MW: 2400 kg
  - 2 MW: 4300 kg
  - 3 MW: 6200 kg
  - 4 MW: 8100 kg
- Link converter size:
  - 550 kVA/1.1 MVA: 2400 mm length/2100 mm height/1200 mm width
- Thruster drive weight:
  - 550 kVA/1.1 MVA: 2700 kg/2900 kg
- Link converter and thruster drive cooling system: water/water heat exchanger
- Primary water temperature: 15°C to 38°C
- Air ambient temperature: 0/45°C
- Standalone PMS with variable frequency function
- Integrated PMS within GE vessel control system
- 1 unit main network power factor
- Compatible with GE diesel engines

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