

EASTERN
PACIFIC
SHIPPING



EPS Research
*Shaft Generator Retrofits on
Bulk Carriers*

The Project

Background

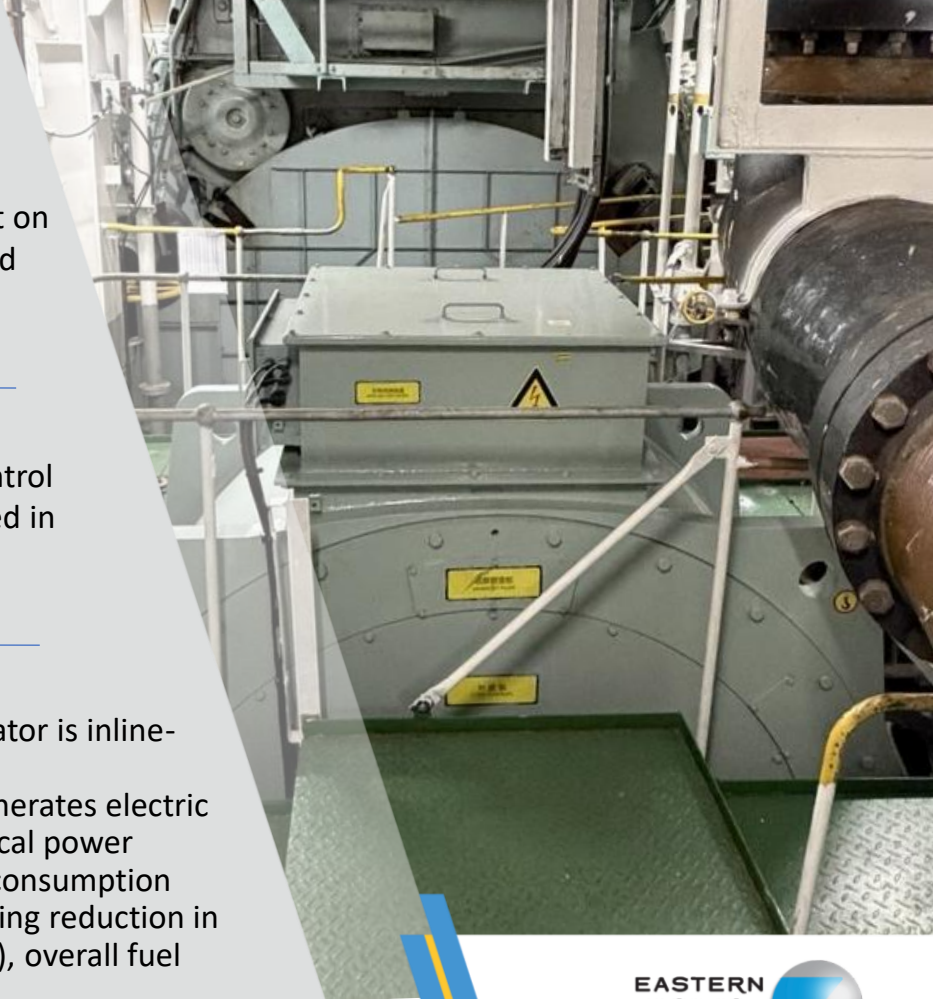
In early 2026, EPS installed shaft-generators (“SGs”) as a retrofit on two of its 2016-built Capesize bulk carriers – Mount Hermon and Mount Bolivar. EPS is planning to complete similar retrofit installations on additional vessels in 2027.

Shaft Generator Installation Particulars

- 900kW Permanent Magnet SG & Variable Frequency Drive control
- Produced by ContiOcean® Global Energy Solutions & retrofitted in China during 2nd vessel special survey
- Timeline from order confirmation to sea trials: 100 days

Operating Principle

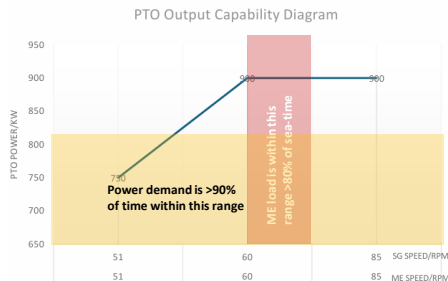
- To improve the energy efficiency of the vessels, a shaft generator is inline-coupled (mounted) to the intermediate shaft
- When the ME is operating within the design range, the SG generates electric power by converting mechanical energy from the ME to electrical power
- Due to the higher combined efficiency of the ME (lower fuel consumption per kWh), transformer and VFD control systems, and the resulting reduction in the electrical load demanded from the auxiliary engines (“AEs”), overall fuel consumption is reduced



Pre-Installation Assessments

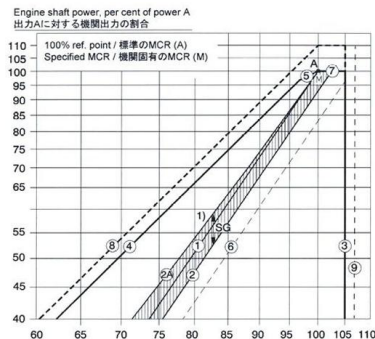
Operating profile

- Assessing historical operational profile (RPM) of ME to confirm suitability for retrofit
- SG sized to ensure at-sea demand is covered in almost all scenarios



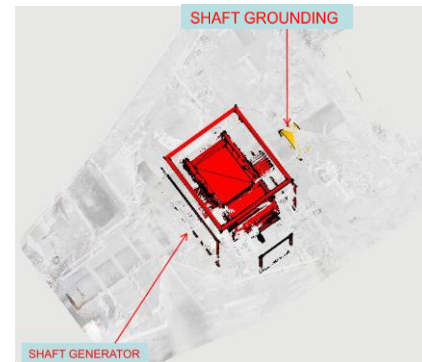
Power assessment

- To confirm increased ME load remains within the designed MCR (Maximum Continuous Rating)
- EPL (Engine Power Limitation) and LRM (Light Running Margin) remain within safe operational limits

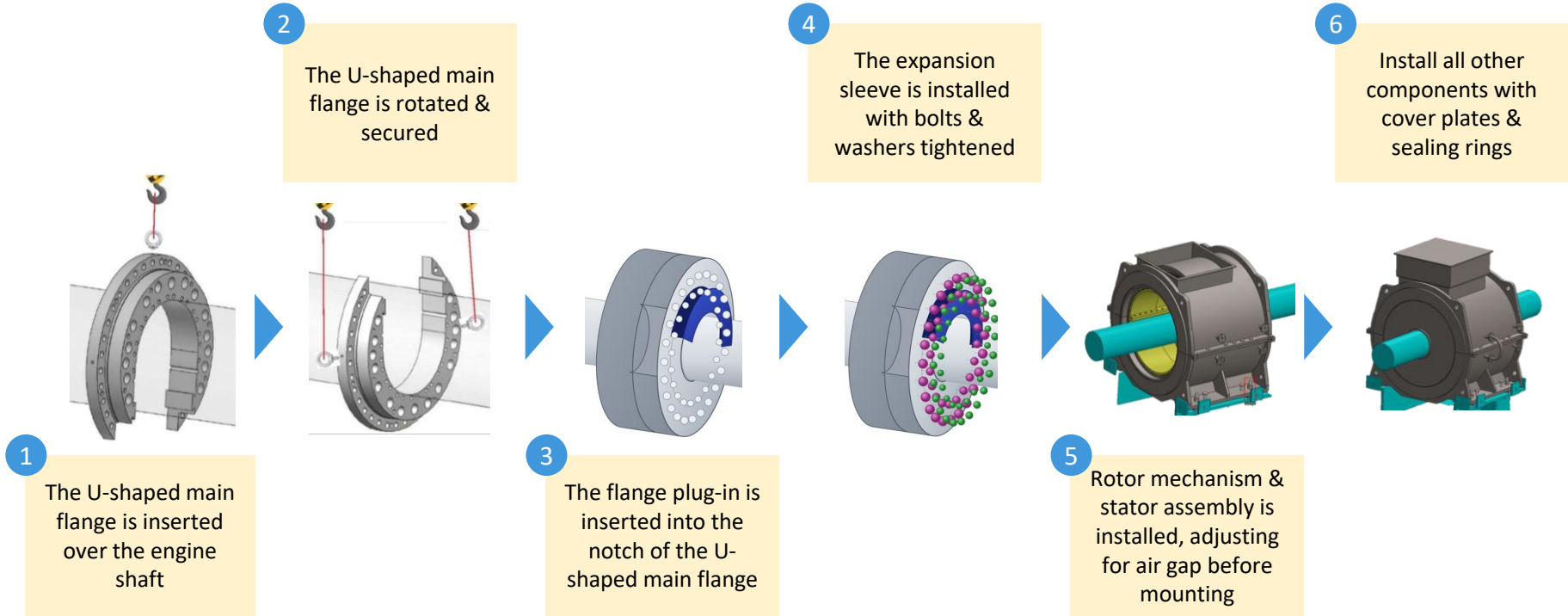


Other key assessments

- 3D scan survey
- Electrical load analysis
- Torsional vibration, Axial vibration and shaft alignment calculation
- EEXI impact
- Economic payback analysis



Installation Process Overview



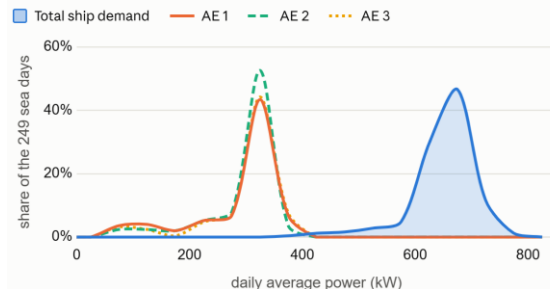
Mount Hermon: Operational Profile Before & After SG Retrofit

Before retrofit

- Three 720kW auxiliary generators in service
- Typical electrical sea load of 660 kW
- Post-scrubber retrofit, two AEs required to meet sea load
- Typical AE load around 45% with SFOC of 242g/kWh (HFO)
- ME load 8,000kW with average SFOC 186 g/kWh (HFO)

Mount Hermon — at-sea electrical demand

249 sea days, February 2025 – January 2026

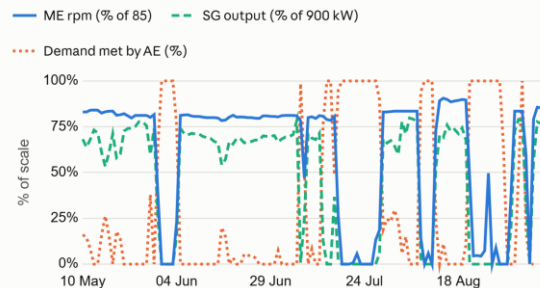


After retrofit

- High-frequency data available for 4-month period (May-Sep)
- ME within SG operations range 99% of time at sea
- 100% power demand at sea usually met by SG, which provided 90% of total electrical power generated at sea
- 3,884 generator running hours avoided at sea
- Longest SG-only passage – 11 days
- 84% of time at sea spent with AEs fully off
- AEs re-engage when approaching port, during maneuvering, at anchorage, in bad weather conditions or congested waters

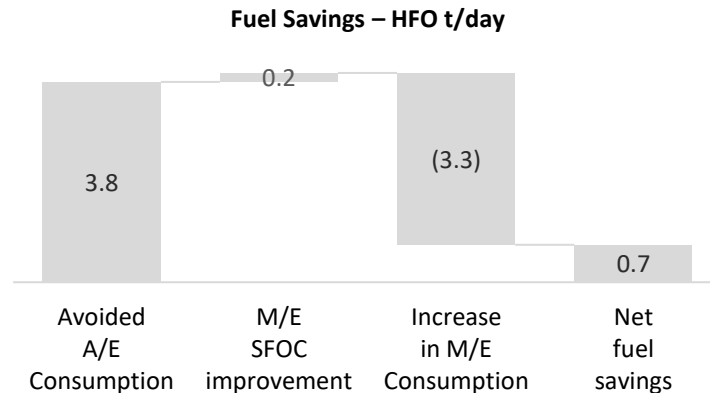
Mount Hermon — shaft generator in service

Daily averages, 10 May – 9 September 2026



Mount Hermon: Estimated Fuel Savings

Illustrative
daily fuel
savings



- Avoided AE Consumption = Fuel required to generate the same kWh with AE instead
- ME SFOC improvement – higher ME load due to SG results in SFOC improvement, reducing fuel needs for same propulsive power demand
- Increase in ME Consumption – additional fuel consumed by ME due to SG engagement

Annual
Savings

Fuel

170 tonnes of HFO

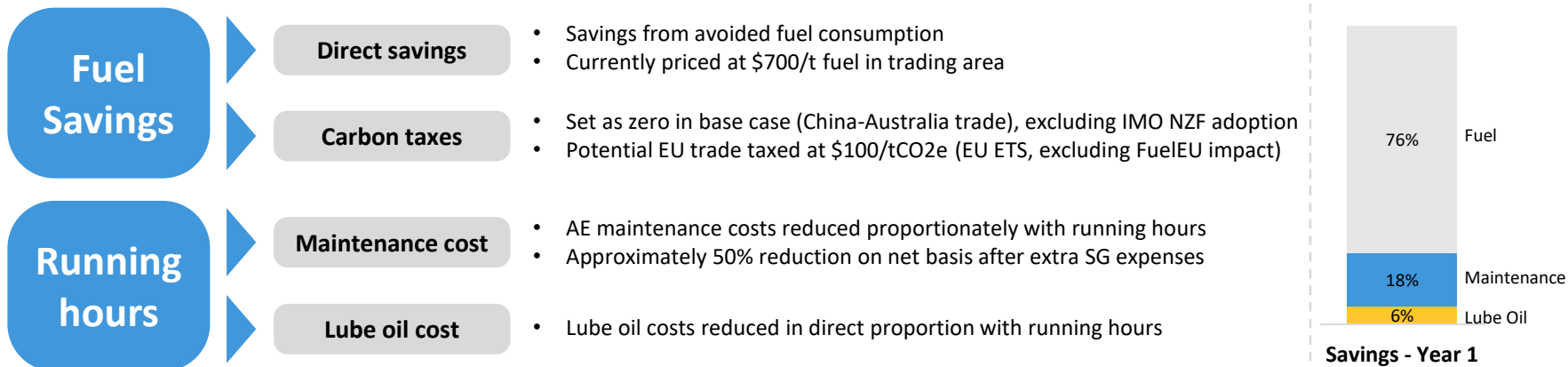
A/E Hours

12,000 running hours

Assumptions: Actual savings calculated at 1-minute intervals for the 4-month period for which data is available May-Sep and annualized proportionately. Savings calculated as actual consumption (SG + AE) compared to inferred consumption for the same period if power had been supplied by auxiliary engines only operating at usual required loads



Mount Hermon: Payback Calculations



Sensitivity table

Expected pay-back period (years)		HFO price \$/t fuel			
		500	600	700	800
Carbon taxes USD/tCO ₂ eq TtW basis	0	6.6	5.8	5.2	4.7
	50	5.4	4.9	4.4	4.0
	100	4.6	4.2	3.9	3.6
	150	4.0	3.7	3.4	3.2

- SG retrofit on Mount Hermon demonstrates robust 3-6 year payback depending on future fuel prices and effective carbon tax
- Adding CII compliance benefit shortens period by approximately 1 year due to reduced amount of biofuel required post 2030 to avoid D rating