



ALARIS

COMPANIES

NEW GENERATION

Shipboard Energy

AND

Emissions Management



QUANTIFICATION • LIFE CYCLE ANALYSIS
VESSELS • OFFICES • FACILITIES • TERMINALS

UNOLS VESSEL ENERGY MANAGEMENT

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USCG Licensed Chief Engineer
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Alaris Companies

MARITIME ENERGY MANAGEMENT

Method of quantifying and reducing energy consumption and cost and associated environmental footprint



Presentation Overview

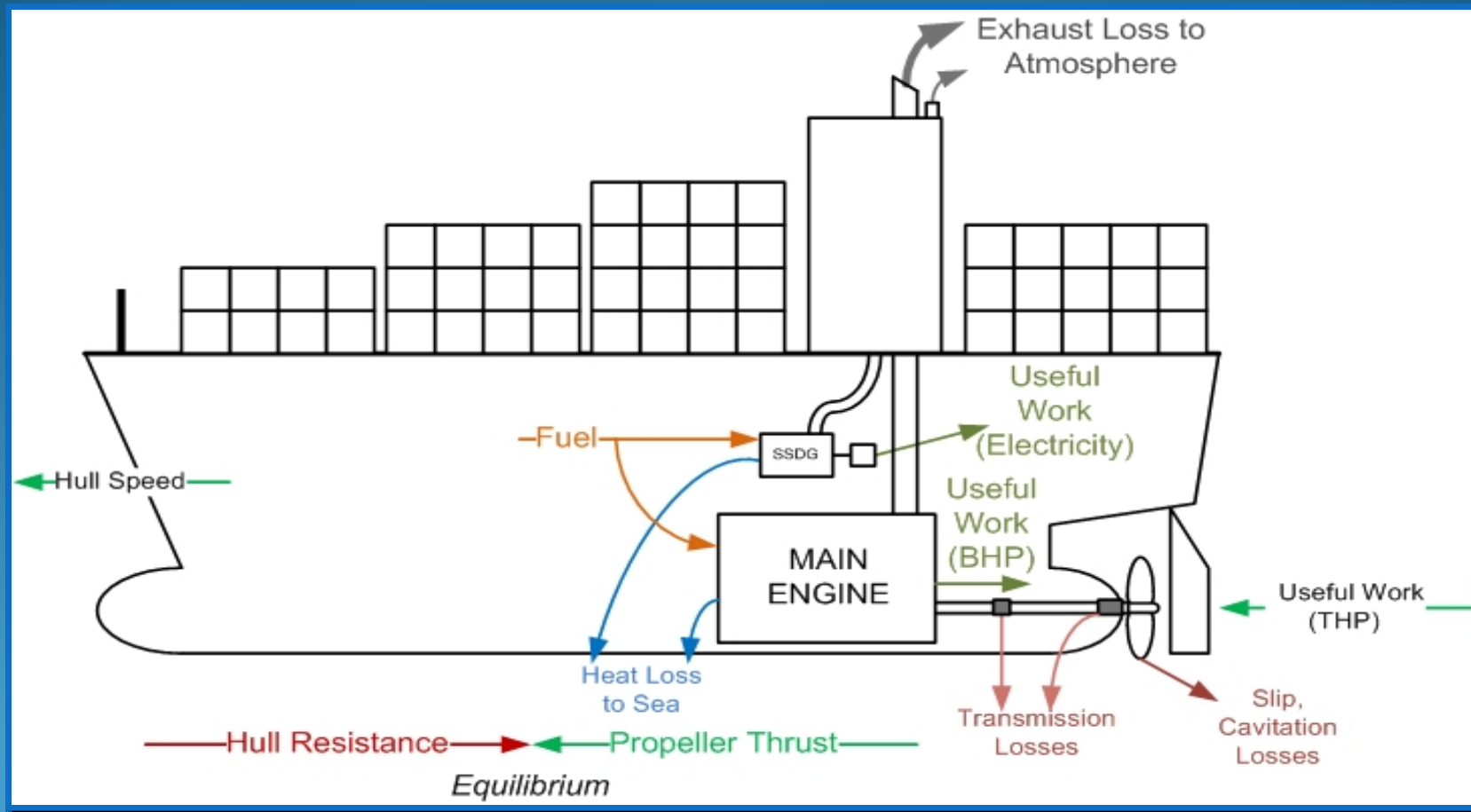
Three Components of Energy Management

- Baseline of Energy Consumption, Cost, and Emissions
- Energy Conservation Measures (ECMs)
- Shipboard Energy Efficiency Plan (SEEMP)

How Are Energy Savings Achieved?



BASELINE ENERGY USAGE AND COST LOSSES AND USEFUL WORK



BASELINE: MEASURE ENERGY CONSUMPTION OF EQUIPMENT/ SYSTEMS



Alaris' EQUATE Energy Modeling Program

The screenshot displays the EQUATE software interface. On the left is a tree view of equipment, with '4PDB-4-307-1 B01' highlighted. On the right is a data entry form for this equipment, showing 'SEWAGE EJECTOR PUMP NO. 2A' and 'Use as Measured Data' selected. The form includes fields for 'Calculated Power' (5.1), 'Max Kva', 'Calculated Ratio' (.5), and 'Code' (ALL THE TIME TOTAL). Below these are 'E Source' fields with values 11169, 5585, and 5585, and an 'Energy Total' of 22338. A table at the top right shows energy usage by source for various equipment categories.

Code Description	Source 1	Source 2	Source 3	Source 4	Source 5	Source 6	Tot
ALL THE TIME TOTAL	4380.00	0.00	2190.00	0.00	0.00	2190.00	876
ANCHOR	10.00	0.00	0.00	0.00	0.00	0.00	10.
COMBAT SYSTEMS	4380.00	0.00	0.00	0.00	0.00	0.00	438

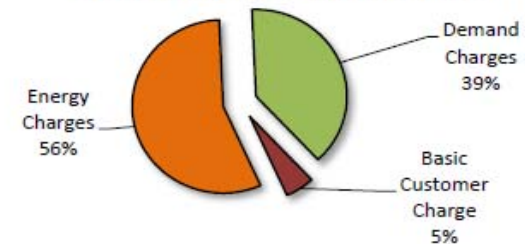
NEW GENERATION SHIPBOARD ENERGY AND EMISSIONS MANAGEMENT

USCGC Liberty May 2011 Monthly Report

Monthly Shorepower Consumption Summary	
Total kWh Consumed	18,015 kWh
Total CO2(e)	15.9 MT
Maximum 15 Minute Integral Demand*	53.4 kW
Time of Occurance	Mon, May 2, 0215
Billing Demand†	67.1 kW
Lay Days	21.7 Days
CO2(e) per Lay Day	0.731 MT/Day
kWh per Lay Day	829.9 kWh/Day
Cost per Lay Day	\$83.24 \$/Day
Average Power	24.1 kW
Average Power Factor	69.4%
Lowest Power Factor	21.8%
Highest Power Factor	97.1%

Estimated Monthly Bill	
Basic Customer Charge	\$ 99.24
Energy Charges	\$ 1,067.92
Demand Charges	\$ 739.06
TOTAL ESTIMATED BILL	\$ 1,806.97

Monthly Bill Breakdown



*This value is an estimate, and may be different from the actual demand value shown on the electric bill. As the Obvius DAS only records values every 15 minutes, a true rolling 15 minute demand value cannot be established in the same manner that the kilowatt-hour meter does.

†Billing Demand is the maximum 15 minute demand increased by 1% for each percent or fraction thereof that the average power factor is less than 95%.

Electric Bill (Rates Effective 8-1-10)	
Basic Customer Charge	\$ 99.24
Energy Charge	\$ 1,066.51
Power Cost Adjustment	\$ (8.54)
Regulatory Cost Charge	\$ 9.94
Demand Charge	\$ 739.06

Alaska Electric & Light Rate 24D	
Charge	Description
\$ 0.0592	Peak Season kWh, Nov-May, per kWh
\$ 0.0554	Off Peak Season kWh, June-Oct, per kWh
\$ (0.000474)	Power Cost Adj, per kWh
\$ 0.000552	Regulatory Cost Charge, per kWh
\$ 13.84	Peak Season Demand Charge, Nov-May, per kW
\$ 8.82	Off Peak Season Demand Charge, June-Oct, per kW
\$ 99.24	Customer Charge



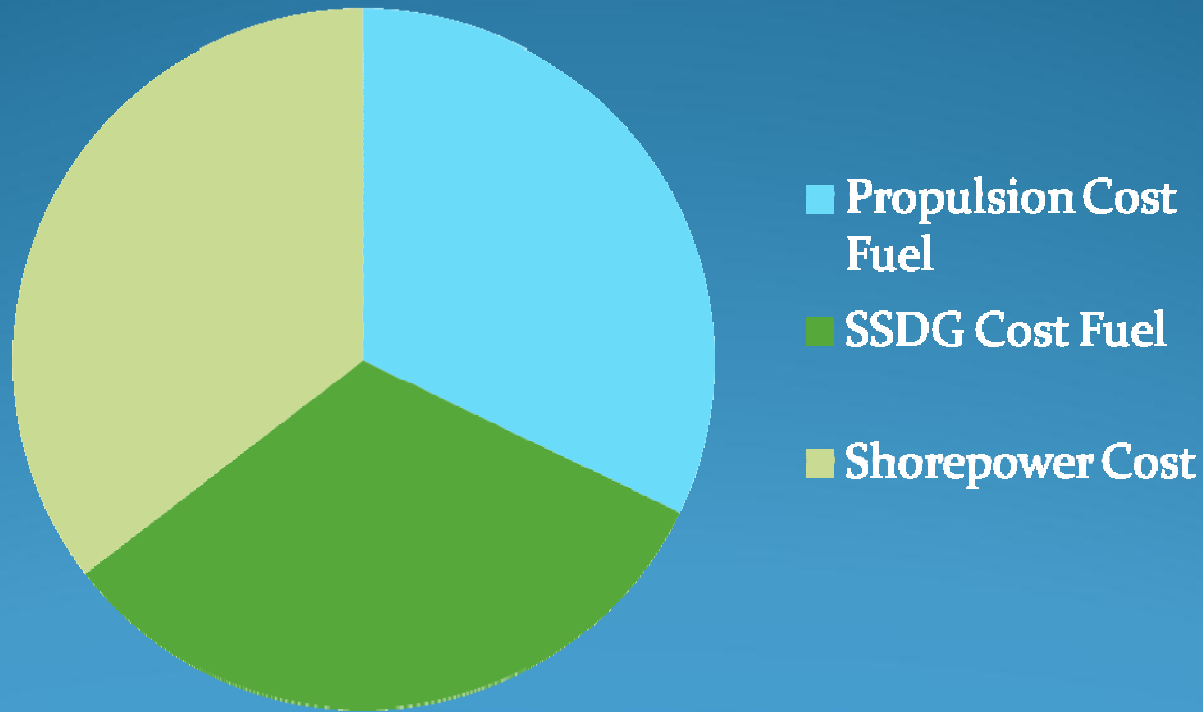
COMPANIES

From Alaris' EQUATE ERMS Module

BASELINE

DISTRIBUTION OF ENERGY COST

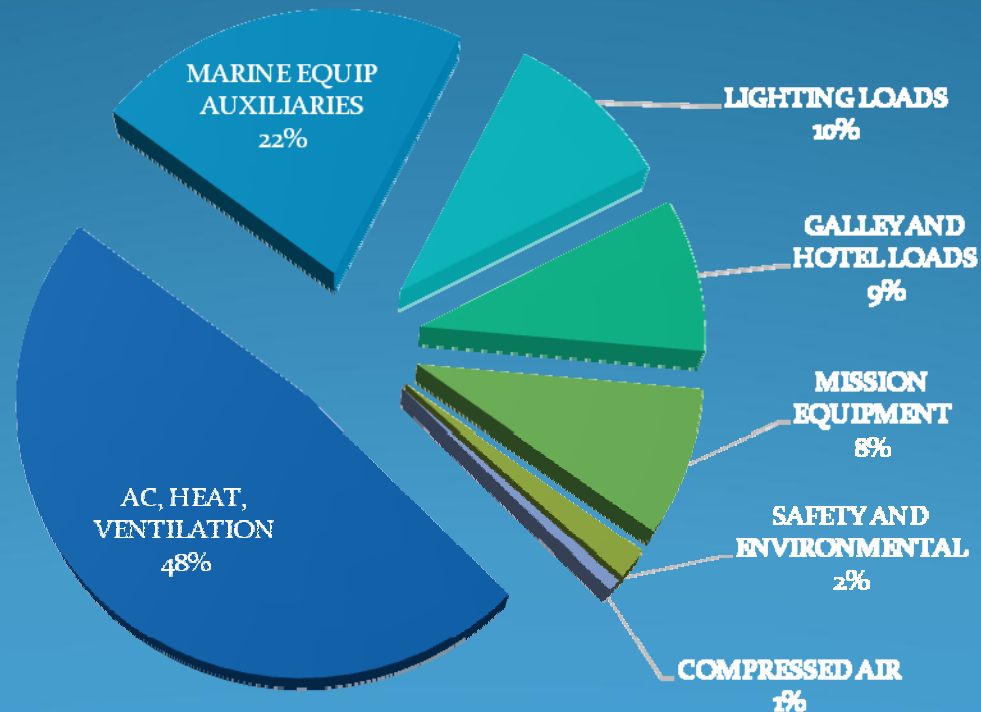
Energy Total Cost \$618,529



BASELINE

DISTRIBUTION OF ELECTRICAL ENERGY CONSUMERS

Annual Electrical Consumption



BASELINE**ENERGY COST AT THE EQUIPMENT LEVEL**

CONSUMER	ENERGY	COST
A/C CHILLER NO. 1 COMPRESSOR MOTOR CLG LVL 1	115,864	\$ 29,384
DUCT HTR (DH 24) GALLEY HOOD PREHTR	45,568	\$ 11,556
HOT WATER HTR	40,634	\$ 10,305
DUCT HTR 02-75-2 DH22 PREHEATER AC2	29,638	\$ 7,516
A/C CHILL WATER CIRC PUMP NO. 1	28,308	\$ 7,179
HARBOR PUMP, LOWER	24,357	\$ 6,177
AC2 FAN COIL UNIT R02-74-2	23,700	\$ 6,010
PORT MAIN ENGINE JW HTR	22,839	\$ 5,792
STBD MAIN ENGINE JW HTR	22,839	\$ 5,792
SSDG NO. 2 JW HTR	20,889	\$ 5,298

BASELINE

ENERGY CONSERVATION MEASURES (ECMS):
EVALUATE FINANCIALLY AND ENVIRONMENTALLY

INSTALL A PREMIUM EFFICIENCY MOTOR
AND VFD

INITIAL INVESTMENT	\$5,660
FIRST YEAR SAVINGS	\$4,582
PAYBACK (YR)	1.24
ROI	86%
NET PRESENT VALUE	\$44,558
CO₂- SAVINGS (MT)	32

ENERGY CONSERVATION MEASURES (ECMS)

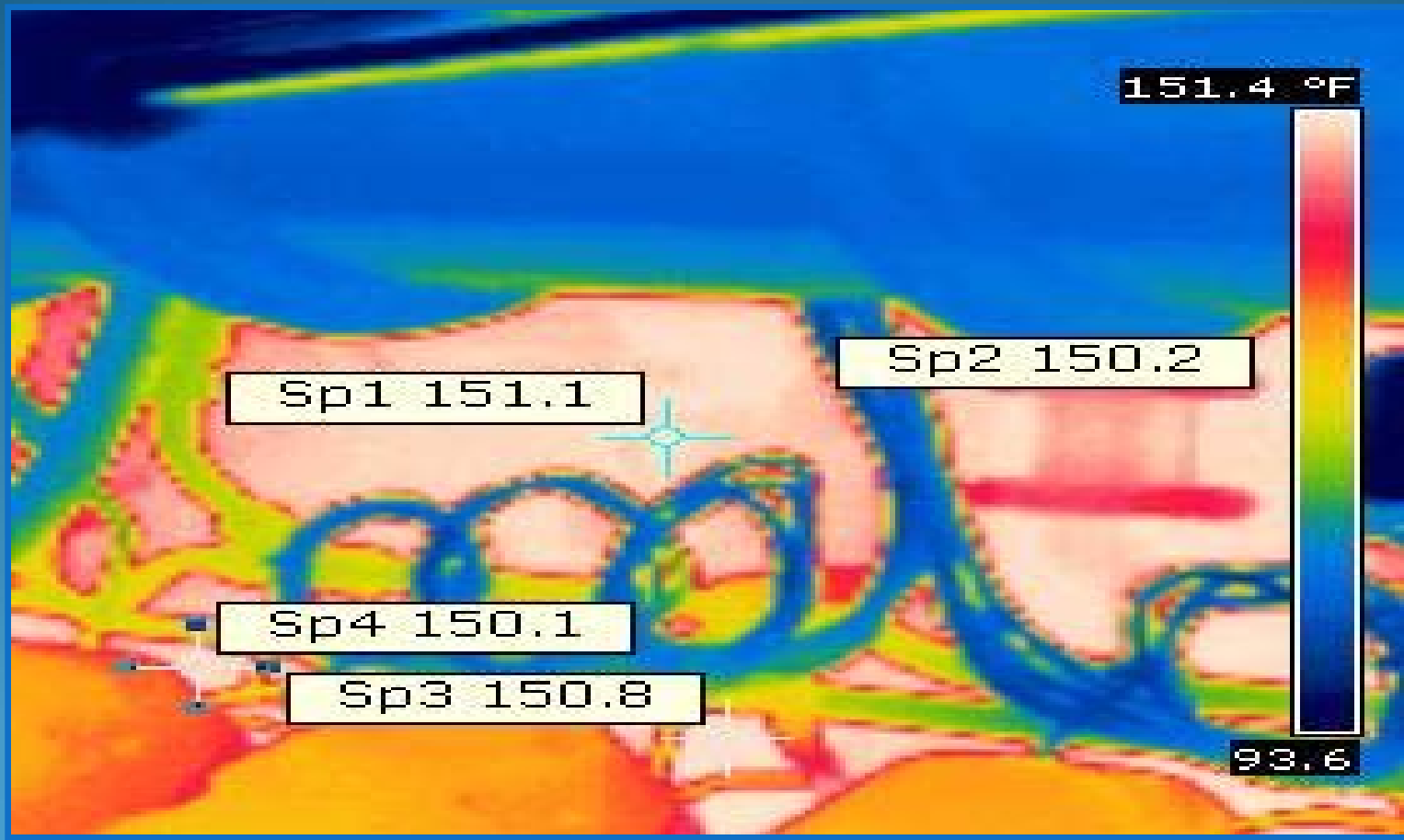
Two Main Types of ECMs

- Operational: Culture and Policy Changes
- Technical: Equipment Upgrades



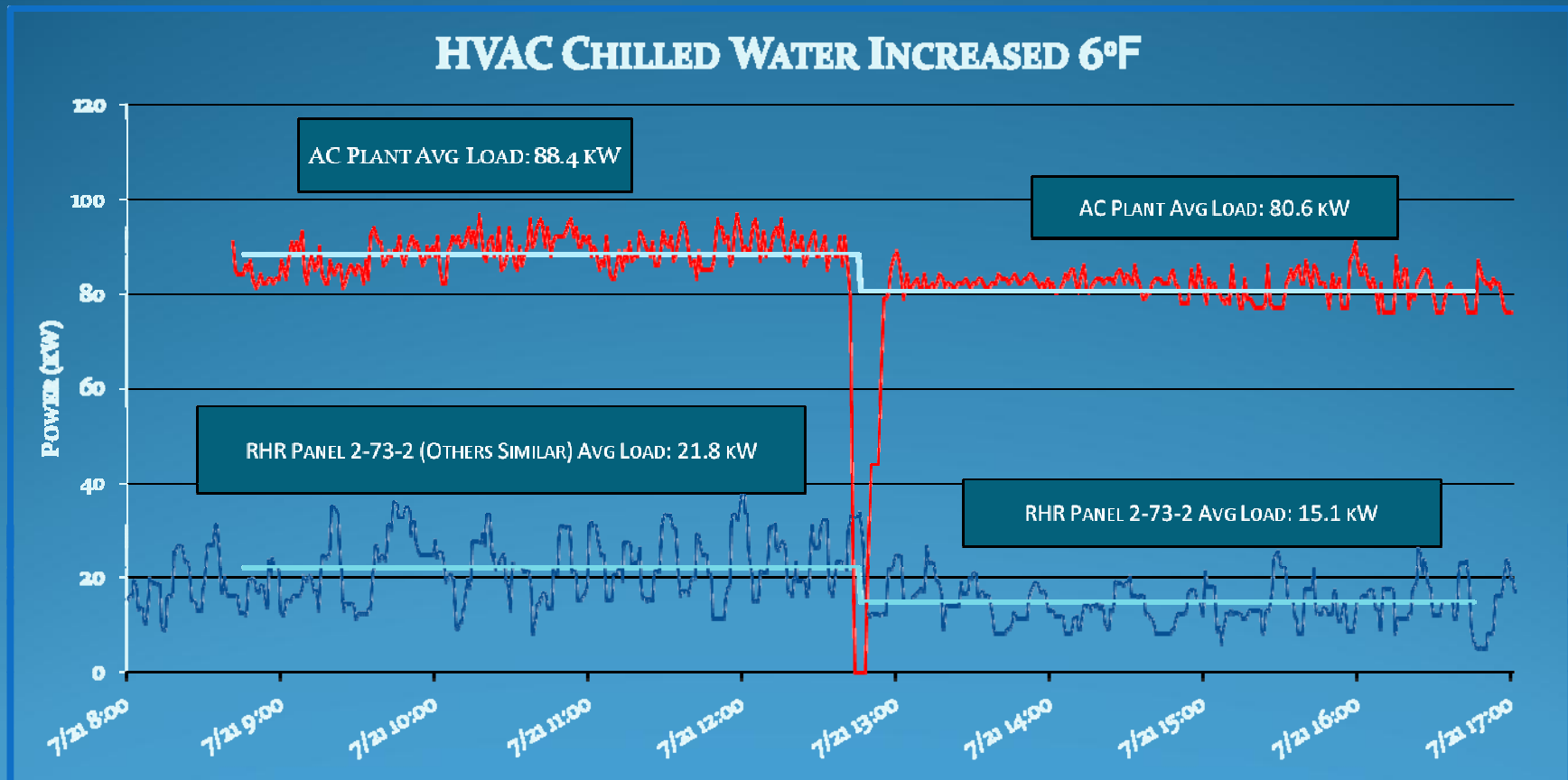
OPERATIONAL ECM

KEEP INPORT ENGINE JACKET WATER AT MINIMUM TEMPERATURE



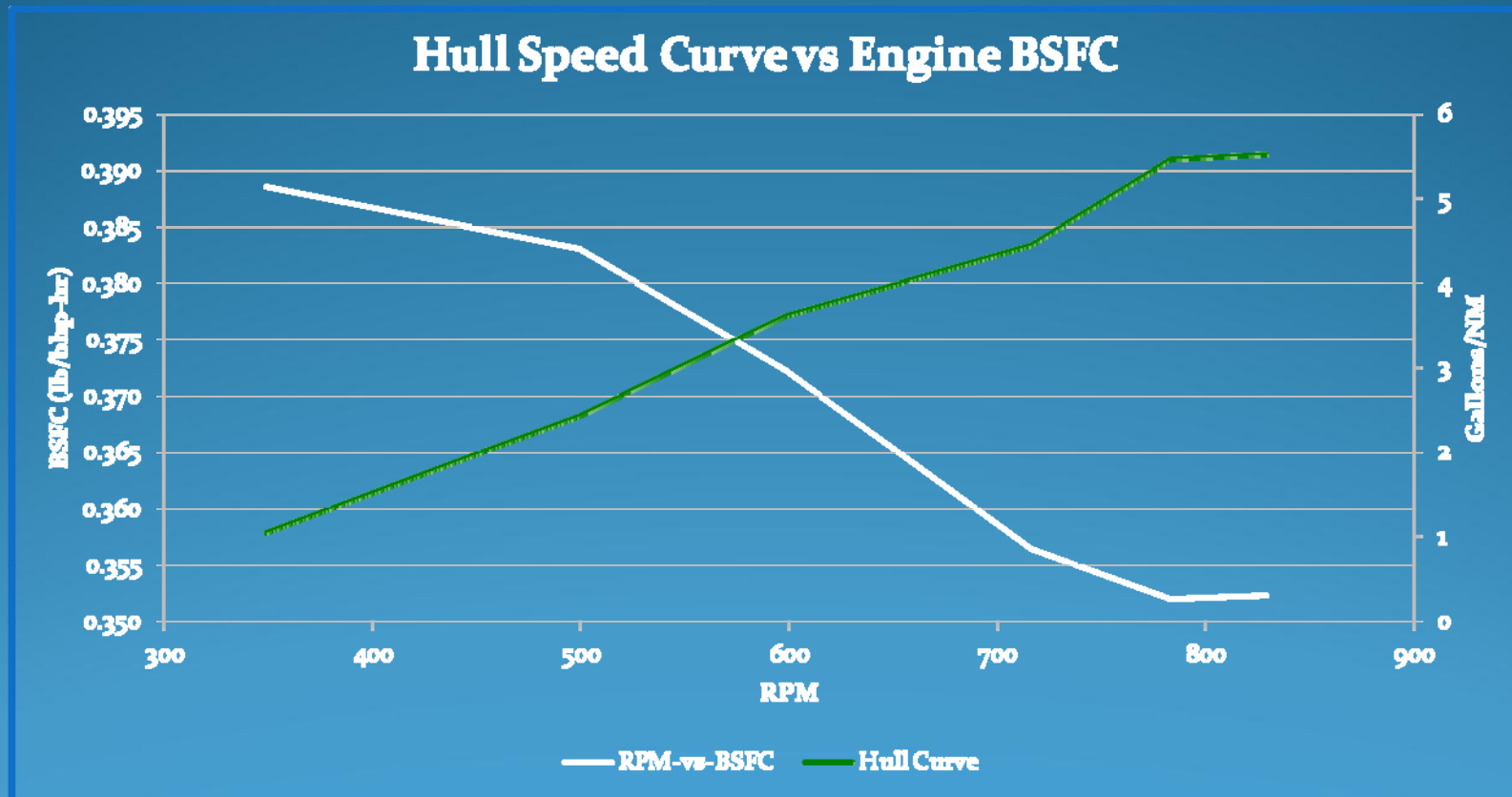
OPERATIONAL ECM

ADJUST SET-POINTS FOR MAX EFFICIENCY



OPERATIONAL ECM

OPERATE AT ECONOMICAL SPEED



OPERATIONAL ECM

SECURE EQUIPMENT WHEN NOT NEEDED



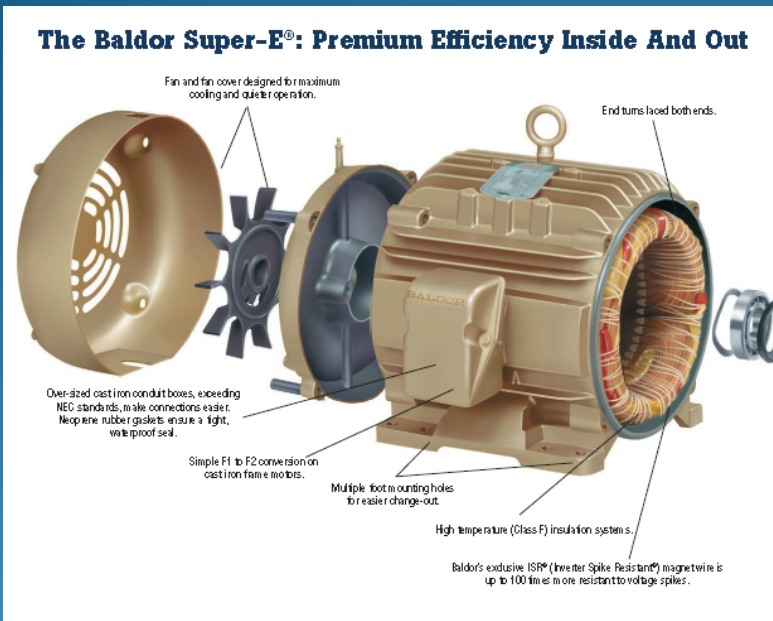
TECHNICAL ECM

ACCOMMODATION SPACE EXHAUST AIR ENERGY RECOVERY



TECHNICAL ECM

Motor Variable Frequency Drives (VFD)



Premium Efficiency Motors

TECHNICAL ECM



Utilize Heat
Pumps with
Waste heat
Recovery for
A/C and
Heating
Requirements

TECHNICAL ECM

ENERGY STAR LABEL REQUIREMENTS



LED Marine Fixture

BASELINE

PROVIDES METRICS TO MEASURE IMPROVEMENT
AND PERFORMANCE

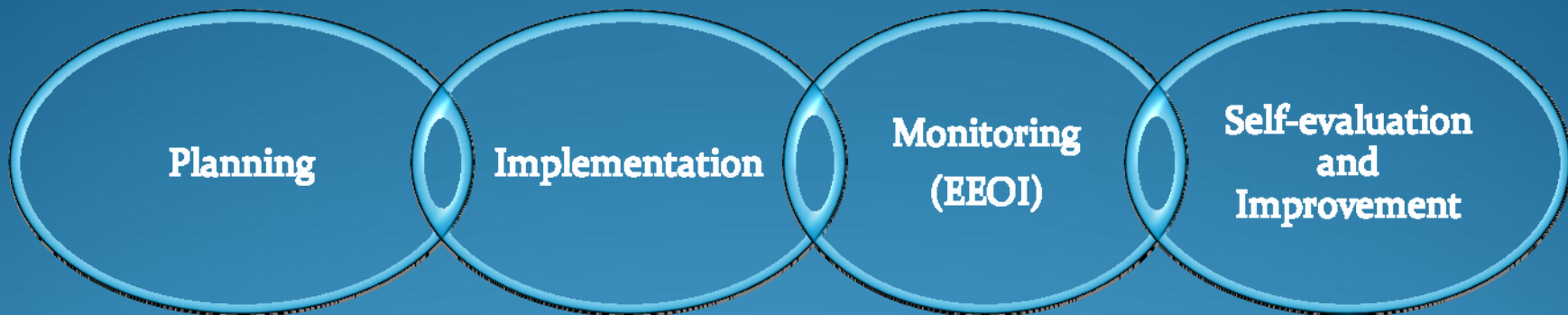
	INDEX (KWH/LAYDAY)	Cost Index (\$/Layday)	CO ₂ INDEX (KG CO ₂ /LAYDAY)
BEFORE EM	14,089.0	1,878.4	4.3
AFTER EM	10,485.0	1,418.4	3.2
SAVINGS FROM EM	3,604.0	459.9	1.1

How to Implement Vessel Energy Management



Shipboard Energy Efficiency Management Plan (SEEMP)

- **Four Step Ship Specific Plan:**



- SEEMP Adopted by IMO MEPC 62nd session from 11 to 15 July 2011
- SEEMP requirement begins 1 Jan 2013

Energy Efficient Operational Indicator (EEOI)

- Used as a monitoring tool for SEEMP
- For ship owners and operators to be used on a voluntary basis
- Establishes benchmarks for different fleets by ship type and size

**EEOI = actual CO₂ emission
performed transport work**



Thank You!

