



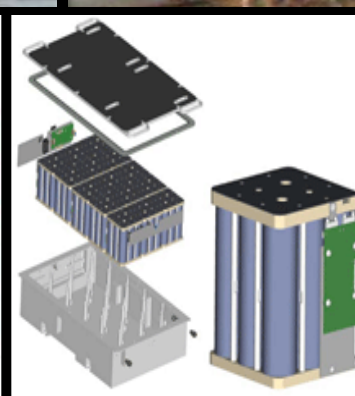
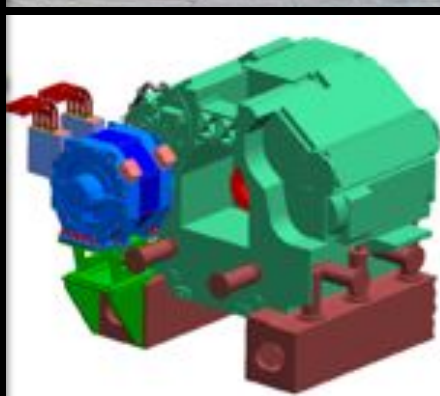
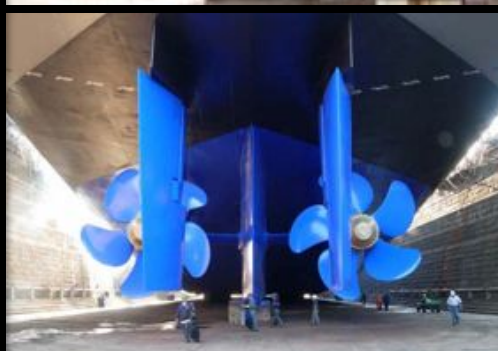
Adapting Ship Operations to Energy Challenges

Glen Sturtevant
Director for Science & Technology
29 March 2011



Baseline Shipboard Energy Consumption and Identify Major Energy Consumers

Energy Efficiency Enabling Technologies



Energy Efficiency Enabling Technologies



2012

Hybrid Electric Drive

Alternate Fuels

Solid State Lighting

Foul Release Coatings

Online GT Water Wash

GT Efficiency Improvements

Combustion Trim Loop

Smart Voyage Planning Decision Aid

Stern Flaps

Variable Speed Drives

Low Solar Absorption Coatings

2016

Hull Hydrodynamic Mods

Generator Mods

Heat Energy Recovery

High Efficiency Chillers

Energy Dashboard

Propulsion Mods

Degaussing Mods

Modular Refrigeration Units

Advanced RO Desalinators

Electric Meters

Energy Storage Module

Future

New Engines and Generators

Fuel Cells

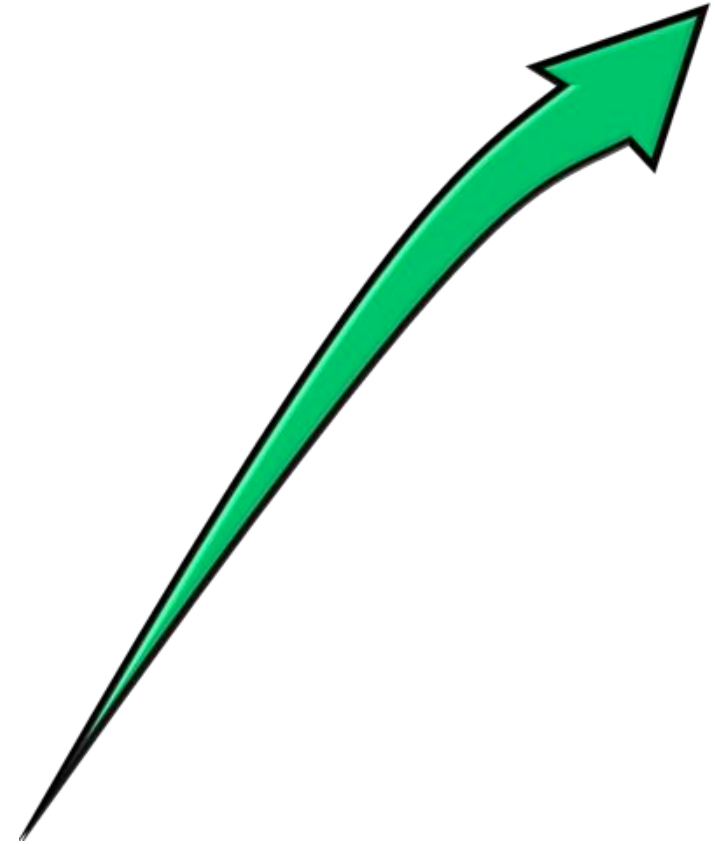
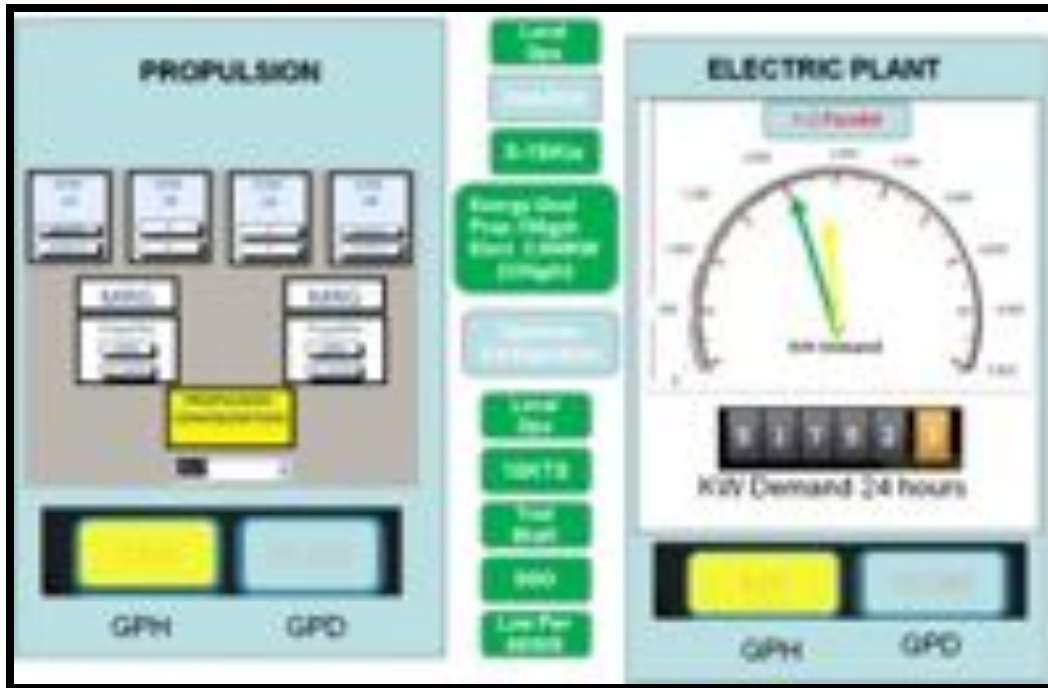
Wind Energy Harvesting

Solar Energy Harvesting

Advanced Hull Drag Reduction



Energy Dashboard



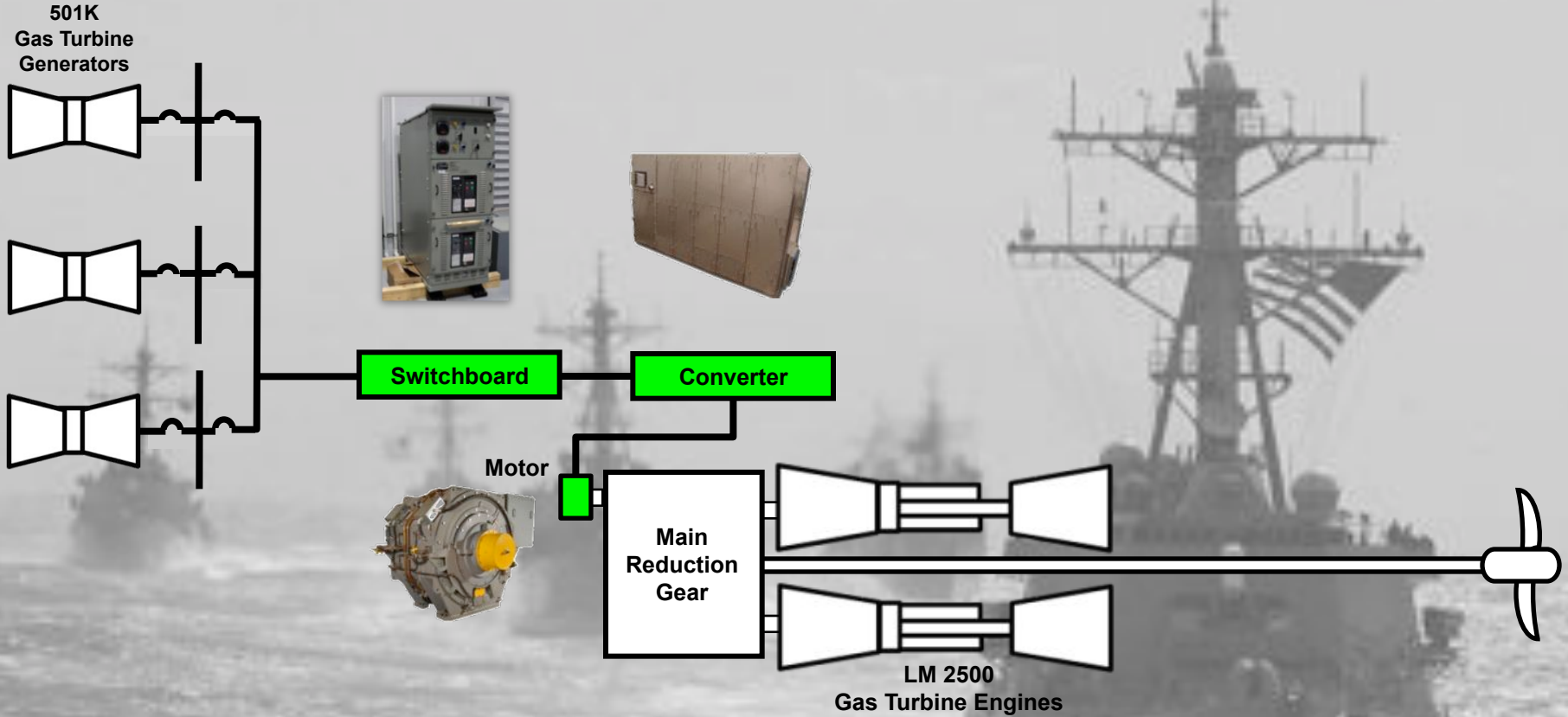
- Fuel
- Electric Power
- Influence Crew Actions



DDG 51 Hybrid Electric Drive



Propulsion Plant Line Up

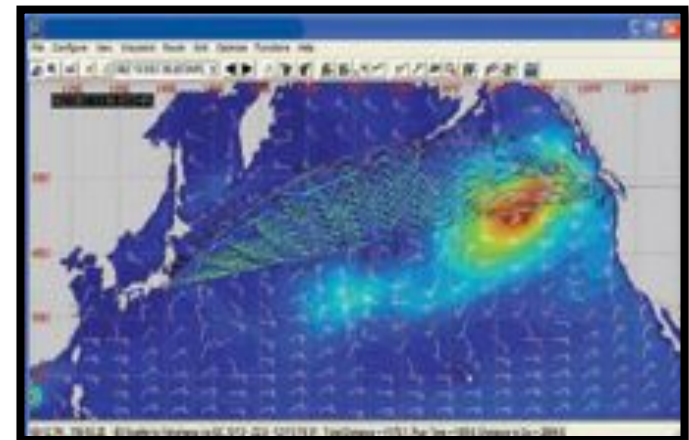
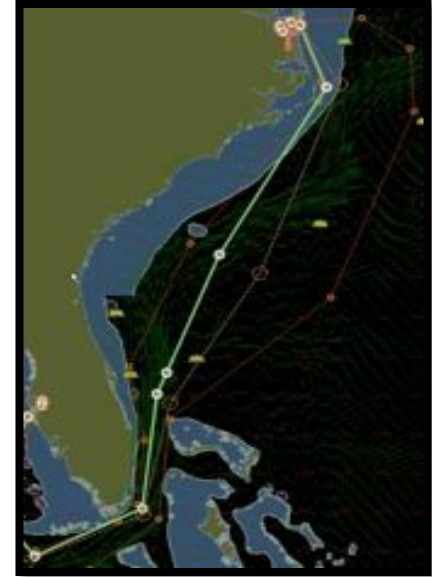


Provides propulsion at low ship speeds without the need for LM 2500 main engines

Smart Voyage Planning Decision Aid



- Optimizes ship routing for both maximum fuel efficiency and safety
- Fleet Weather Centers will push fuel efficient routes to all Navy ships
- Reduces energy consumption by considering
 - Weather
 - Waves
 - Currents
 - Ship specific hydrodynamic data



Alternate Fuel Test Plan



