

Advanced Energy Storage

At a Glance

What is it?

A shipboard Energy Storage Module that enables ride-through capability for Single Engine Cruise shipboard operating condition.

How does it work?

Distributed Energy Storage Modules (ESMs) provide continuous power to loads until standby GTGs can be started.

The combination of an advanced power dense power converter with energy storage subsystem ties into ship distribution and offers distributed backup to ship loads.

What will it accomplish?

The provision of a suitably sized, distributed ESM solution, to enable SEC allows the ship to turn off engines and operate on load profiles that are far more conducive to fuel savings.

Metrics:

- Potential fuel savings: 7600 bbl/yr/DDG
- Sized to critical ship's load at a minimum or transparent plant operations at maximum while allowing for multiple GTG starts.

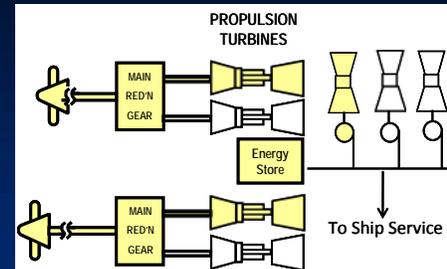
Platforms:

- DDG51/CG47.
- Applicable to any class that uses diesel or GTG-based electrical power generation.

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Description:

Presently, DDG-51 and CG-47 Class Ships account for a significant portion of the total surface ship fuel consumption. Various methods are being used to reduce fuel consumption including trail shaft operation and pitch scheduling. However, further significant fuel savings can be achieved through the incorporation of Single Engine Cruise (SEC). SEC is an operating mode where only a single electrical generator is utilized to power an entire ship. This increases shipboard fuel efficiency through the reduction of total number of Gas Turbine Generators (GTG) kept on line and improving the on line unit specific fuel consumption operating point.

In order to keep electrical plant integrity during SEC plant alignment, a ride-through capability for essential services is necessary in case the GTG shuts down. It requires an instantaneous changeover of supply (no break) in power to ride through until standby GTGs can be brought back on line to assume ships load. Each GTG, by design, can be started and assume full load in 60 seconds after a dead bus condition exists. This will requires an Energy Storage Module (ESM) which incorporates the energy storage device, such as batteries, and high density power electronics interface. The ESM needs to be of size to maintain critical ship's load at a minimum or transparent plant operations at maximum while allowing for multiple GTG start attempts. In addition, the ESM will be required to be designed to be modular with high power density to allow for flexible backfit installations or future plant configuration.

Benefits:

By ensuring that a "dark ship" condition can not occur, engines that are utilized to split load for redundancy may be turned off, optimizing loading on shipboard generators, and minimizing fuel consumption. Such savings can be quite large, given that the specific fuel consumption for simple cycle gas turbines increase sharply below 50% load.