

Drivers, challenges and lessons to be learned

13.11.2015 Electrification in Ports and Vessels / Su Len Quach

Combining cost-efficiency with sustainability



Makes the difference

What are the drivers & challenges?



What are batteries good for?



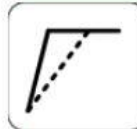
Spinning Reserve

- Backup for running gensets
- Fewer engines needed online
- Improved fuel efficiency
- Reduced engine running hours



Peak Shaving

- Level the power seen by engines
- Offset the need to start new engine
- Improved fuel efficiency
- Reduced engine running hours



Enhanced Dynamic Support

- Instant power in support of running gensets
- Enable use of «slower» engines in dynamic applications;
 - LNG/DualFuel engines
 - Fuel Cells

OPTIMAL



Strategic Loading

- Charging and discharging ES media in such a way that it optimizes the operating point of the gensets.
- Power is produced at peak efficiency

0^{CO₂}
No_x
dB

Zero Emission Operation

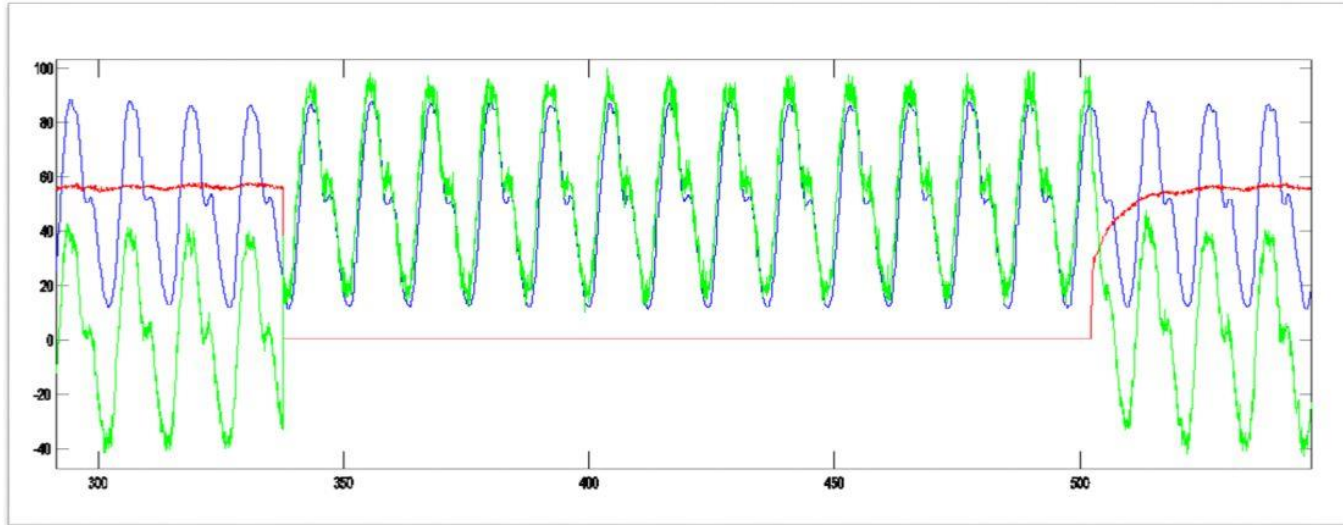
- Zero emissions in harbour
- Quiet engine room

UPS

Enhanced Ridethrough

- ES storage solutions can give UPS like functionality for all or portions of power system
- New ways of achieving high ERN numbers
- Higher power system availability

In real life?

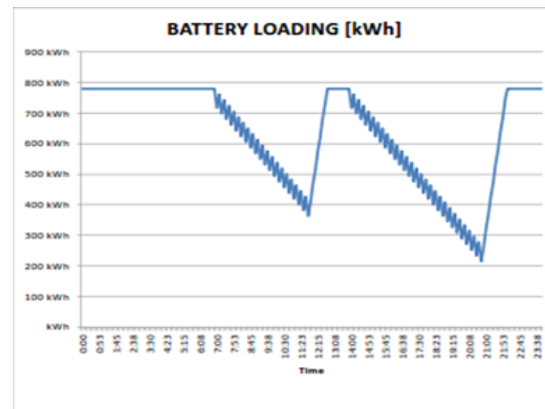


 *Generator Load*

 *Motor Load*

 *Battery Load*

Double-Ended Ferry



	Diesel- Electric	Battery	Hybrid
Operational cost / year [€]	100 %	37 %	37 %
First cost [€]	100 %	156 %	231 %
Rate of interest [%]	5 %	5 %	5 %
Amortization time [years]	20 years	10 years	20 years
Amortized first cost [€]	100 %	252 %	327 %
Annual cost [€]	100 %	59 %	67 %

Lessons learned

- > Not suitable for every vessel type
 - Operation profile of the vessel has a big impact!
- > Batteries definitely increasing their share in the marine segment
- > Trend is increasing efficiency & decreasing cost

Lessons to be learned "My Vision 2025"

- > Definitely new applications
 - With current oil prices ROI is high, but the trends...
- > Ports infrastructure shifts more to cold ironing
- > Modular thinking