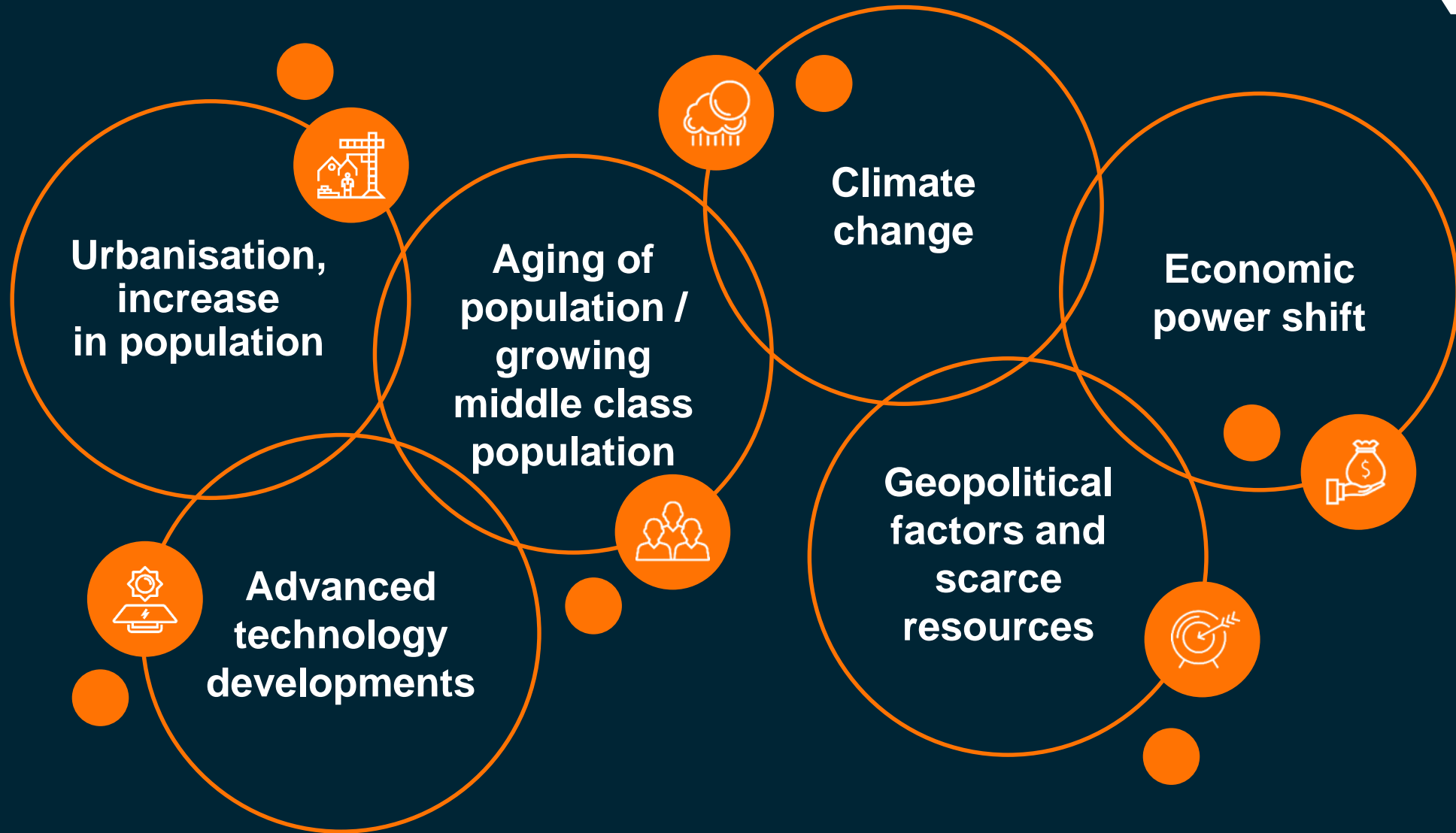


# Wärtsilä **Smart Marine** Vision

Enabling sustainable societies with smart technology





Wartsila was founded in 1834

1980's & 1990's

Purpose :

Engines

Focus : Market share

2000 - 2017

New vision :

Vessels

Focus : Market share

2018 -

New vision :

Smart Marine Ecosystem

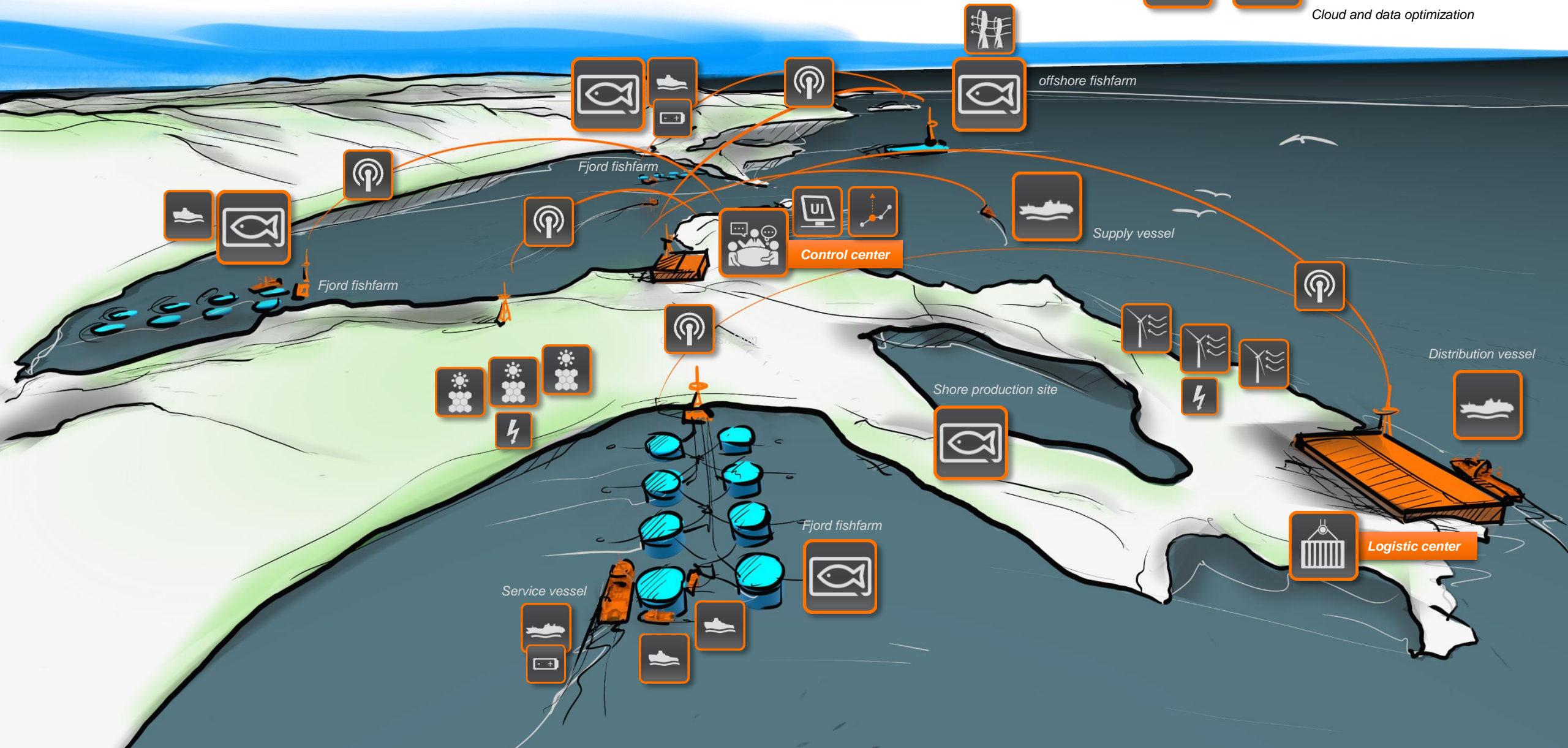
Focus :

Sustainability









The Wärtsilä way is connecting intelligent vessels with smart ports, and actors in the Marine Ecosystems

Enabling sustainable smart vessels optimized to fit its purpose

Innovative technologies  
Disruptive business models  
Strategic partnerships

# **WASTE**

**Overcapacity**

**Inefficient  
Fuel  
Consumption**

**Waiting time**

# Wärtsilä **Smart Marine** Vision is about ways to reduce waste from the Marine Eco System





# Digitalisation sets new standards for the entire industry.



## Learning by measuring

By measuring and collecting data from any operation onboard the ship we learn to understand better and to improve.

## Optimizing approach

Optimizing the vessel, fleet or an entire value chain provides opportunities for efficiency improvements and growth

## Lifecycle of the vessel

Optimizing lifecycle efficiency leads to new levels of performance

A **1% improvement** of an annual billion-dollar fuel bill represents a massive **ten million dollars** in savings.

# Smart vessel



1

## **HYBRID SYSTEM**

An electrical power distribution system holding power storage,

2

## **Intelligent system(s) for operational purpose**

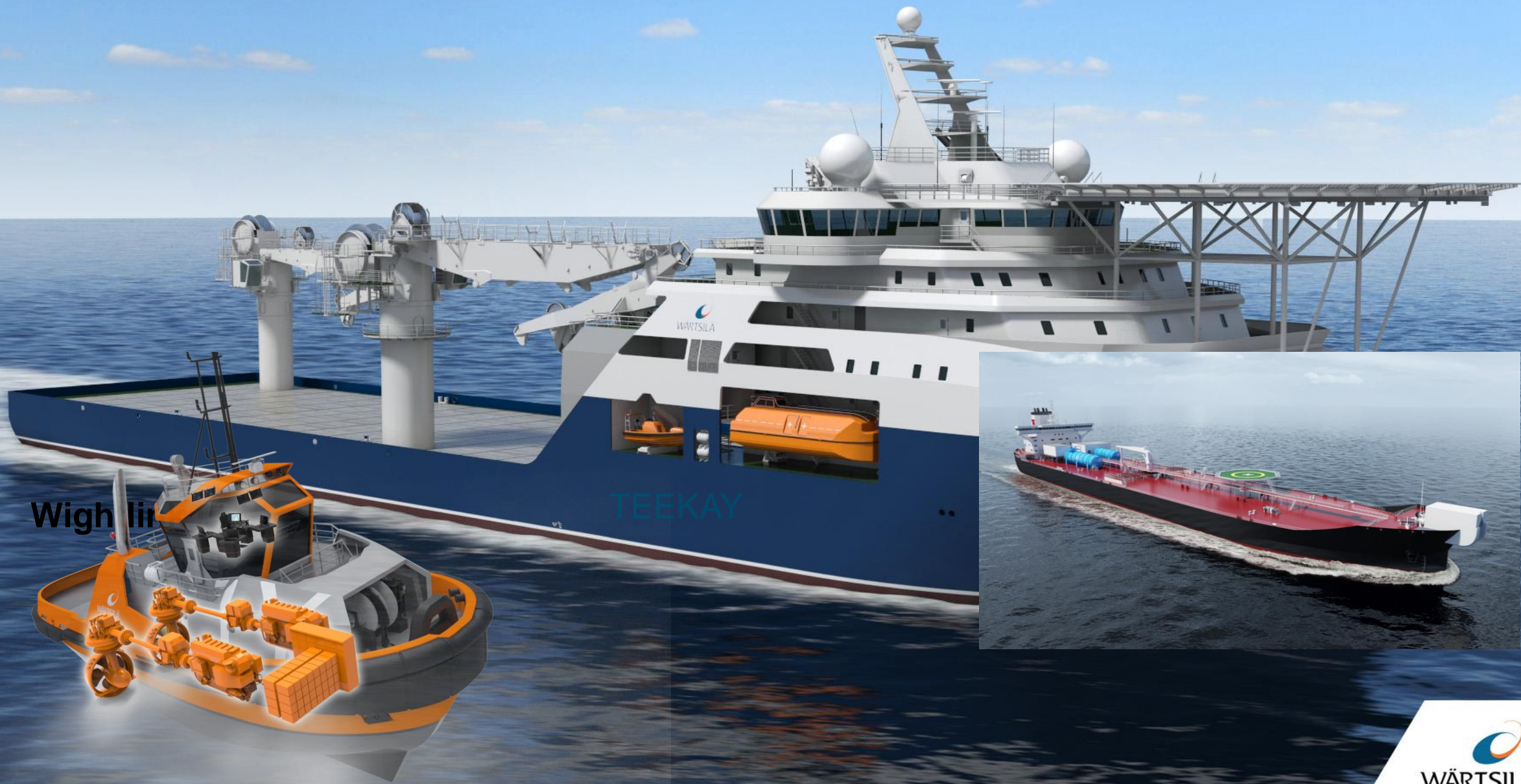
Systems that optimizes the operation of the vessel to bring down risk of error, fuel consumption and waste.

3

## **Data communication**

Data communication units keeps the vessel connected to destinations in the Marine Eco system.



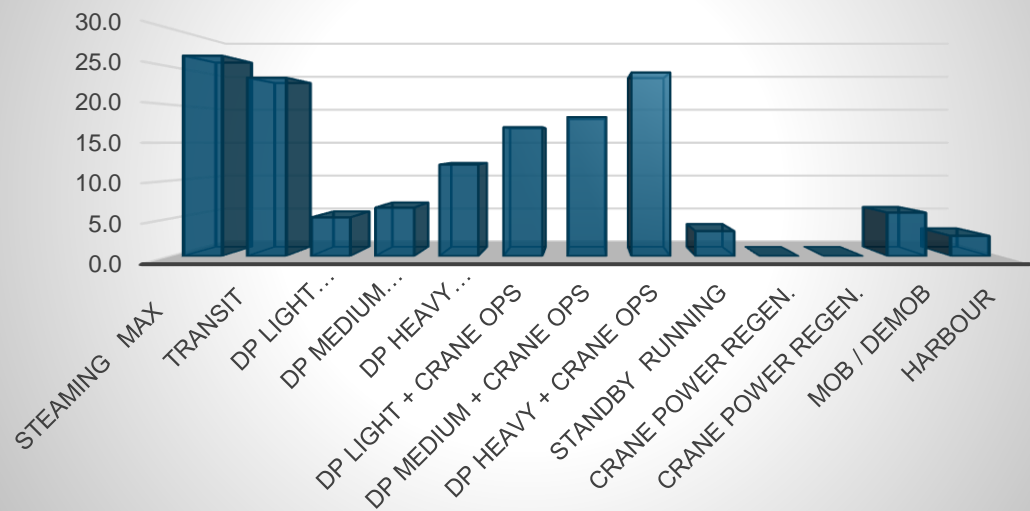


Wigh lin

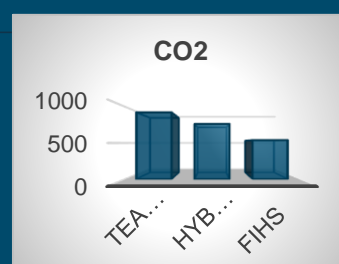
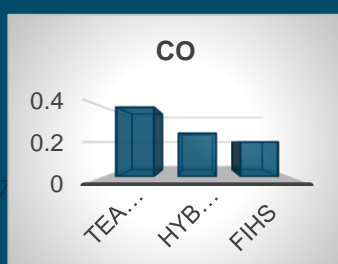
TEEKAY

# A Game Changer on fuel and emissions

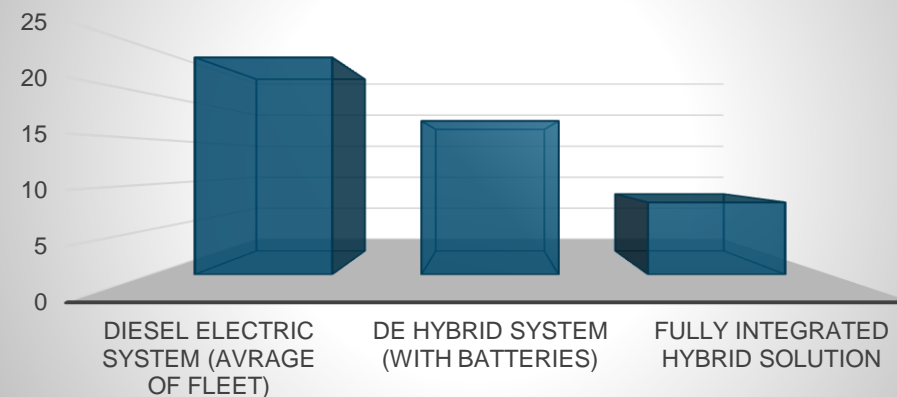
**T/day Fuel Consumption on operational profile**



**Fully Integrated Hybrid System**



**T/Day in DP Mode**





# NEW SHUTTLE SPIRIT - Main strategic goals for TEEKAY

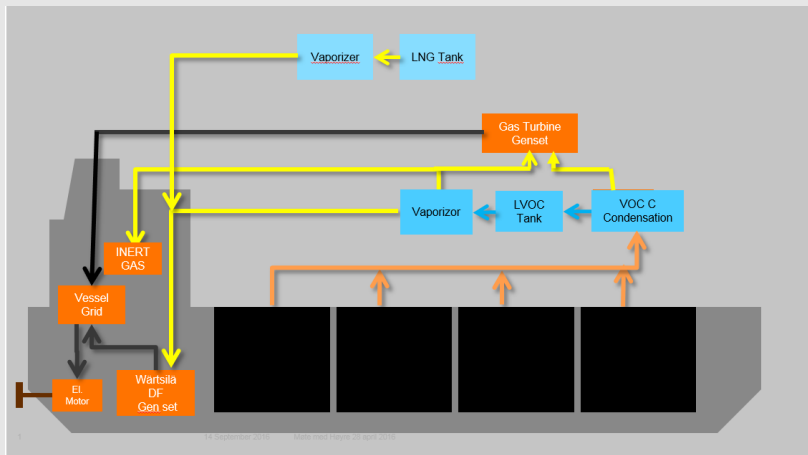
**Effective** – safe and flawless offshore logistics

**Efficient** – improved fuel performance

**Environmental sustainable** – less harmful emissions from cargo and machinery systems

**Economical sustainable** – commercially competitive on Capex & Opex

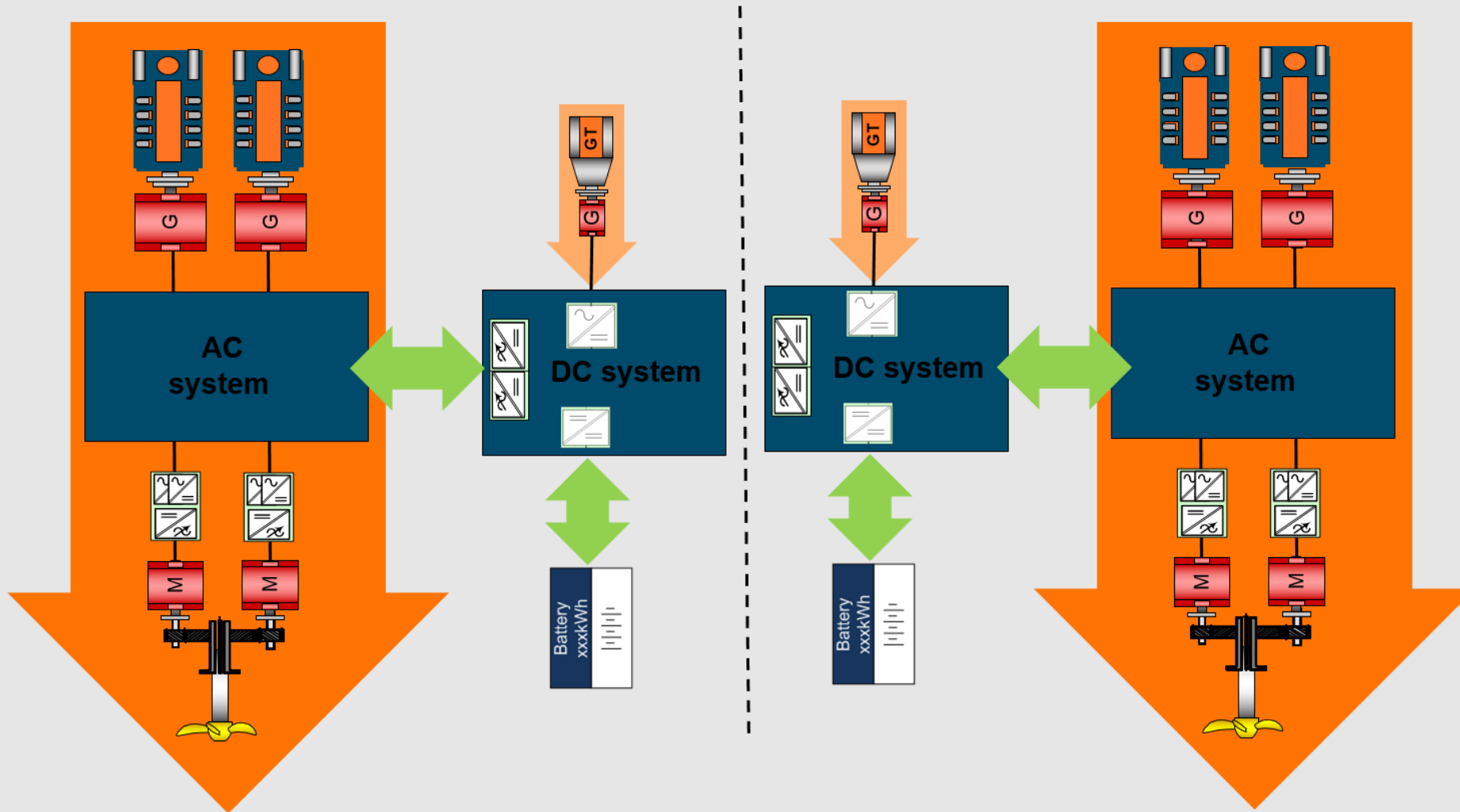
Bringing "A Game Changing" concept to the world with **New Shuttle Spirit Tanker**



New Shuttle Spirit versus Amundsen Spirit:

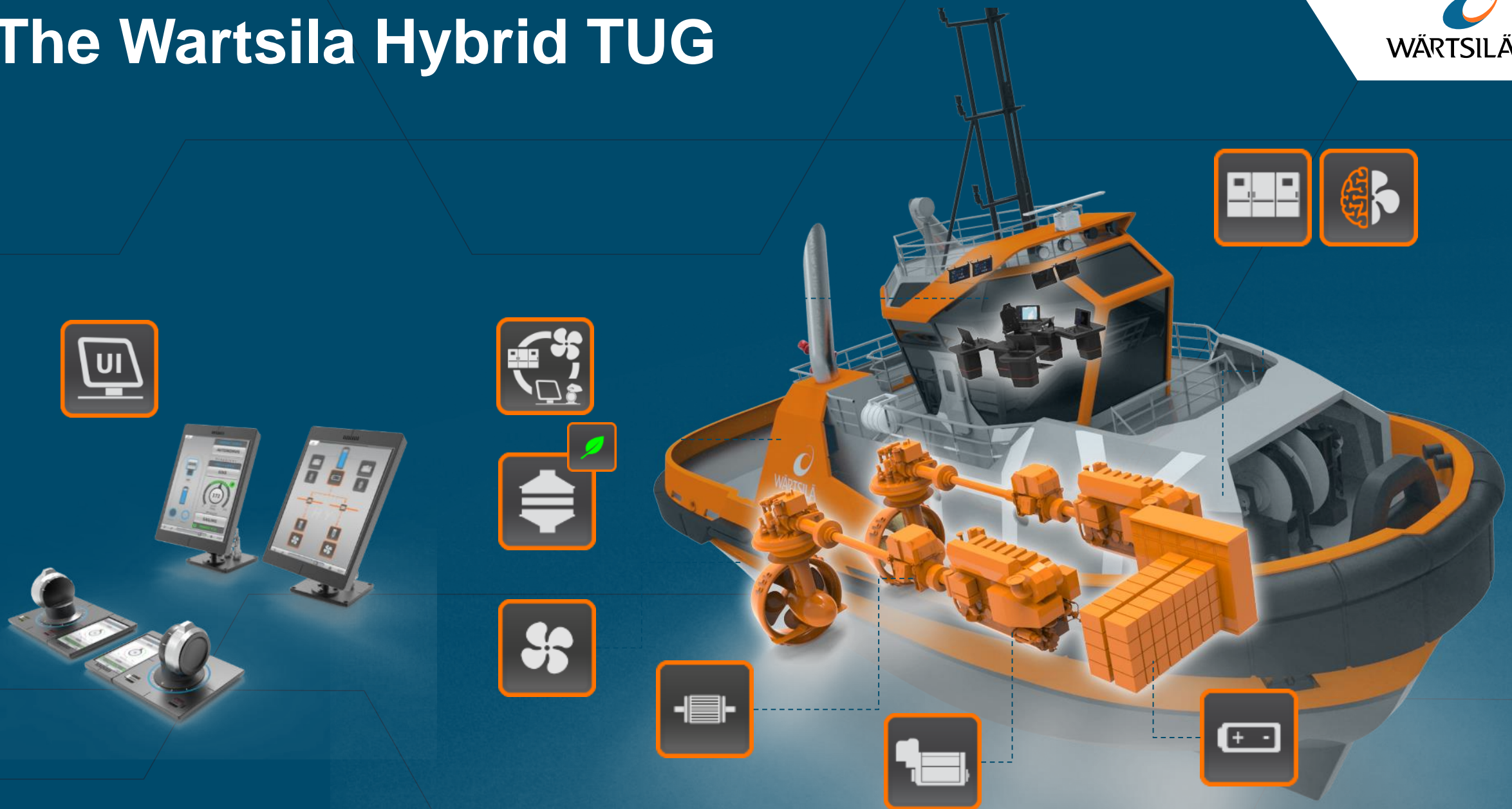
- Overall system analysis based on DNV\_GL operation profile report.
- Changes from 2-stroke main engines with aux. gen sets to 4-stroke main DF generator sets.
- Changes from direct engine propulsion to electric propulsion system.
- Changes from conventional power distribution to Low Loss Hybrid concept.
- Installation of batteries for Black Out prevention and Peak Shaving.
- Decrease the installed mechanical propulsion power from 28 to < 20 MW.
- Changes from MGO to LNG as Main fuel.
- Installation of VOC condensation plant to eliminate emissions from cargo tanks.
- Changes from Boiler to Gas Turbines to produce electricity from Surplus VOC during loading
- Utilization of recovered VOC mixed with LNG as clean fuel for the DF engines.





- Main power generation
- AC distribution and propulsion drives
- DC system, battery and SVOC power

# The Wartsila Hybrid TUG



## A hybrid vessel has a number of advantages compared to conventional power setups



Instant start



Silent operations



Instant response



No smoke



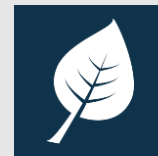
Increased safety



Reduced Fuel Consumption



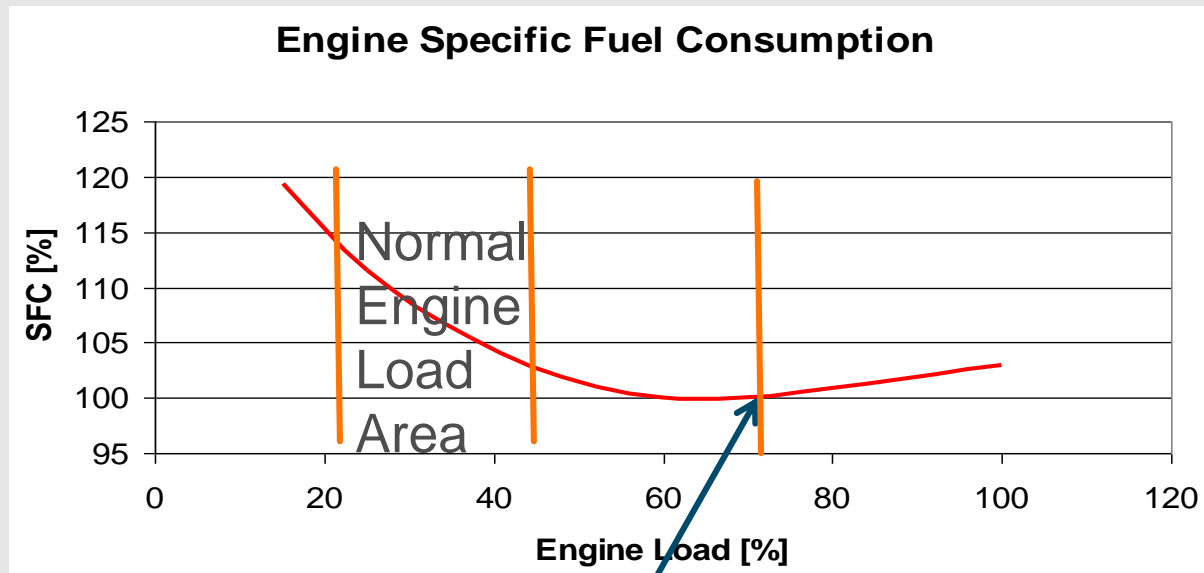
Reduced maintenance



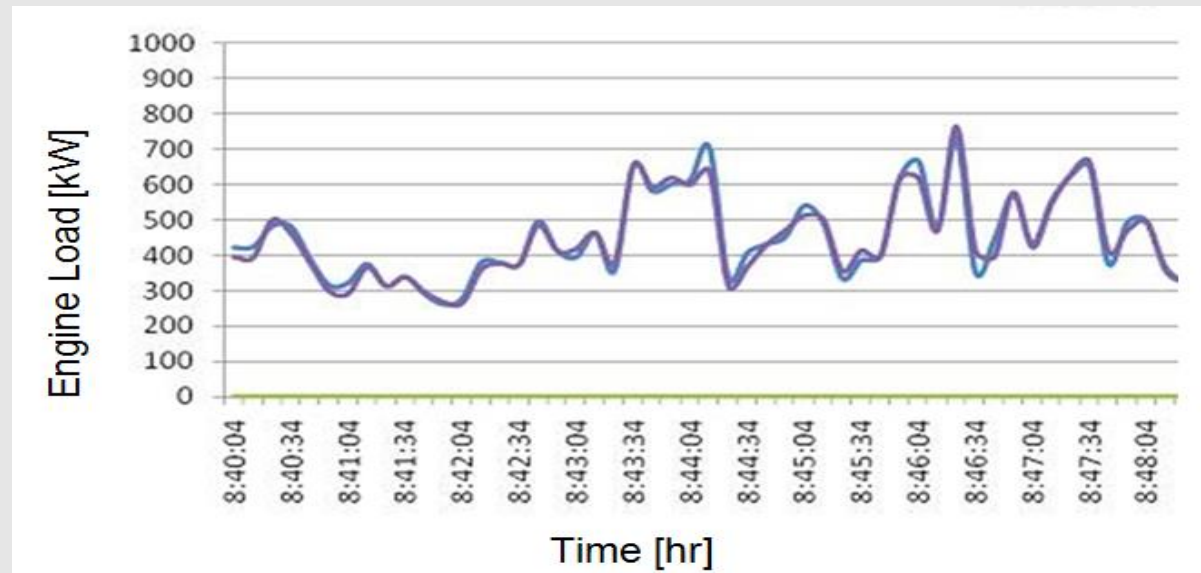
Reduced emissions



To understand the main benefits with the hybrid system, ideal engine running conditions and peak shaving has to be explained.

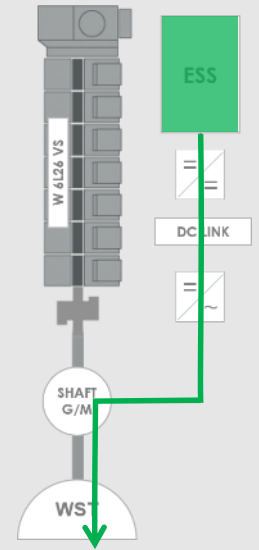
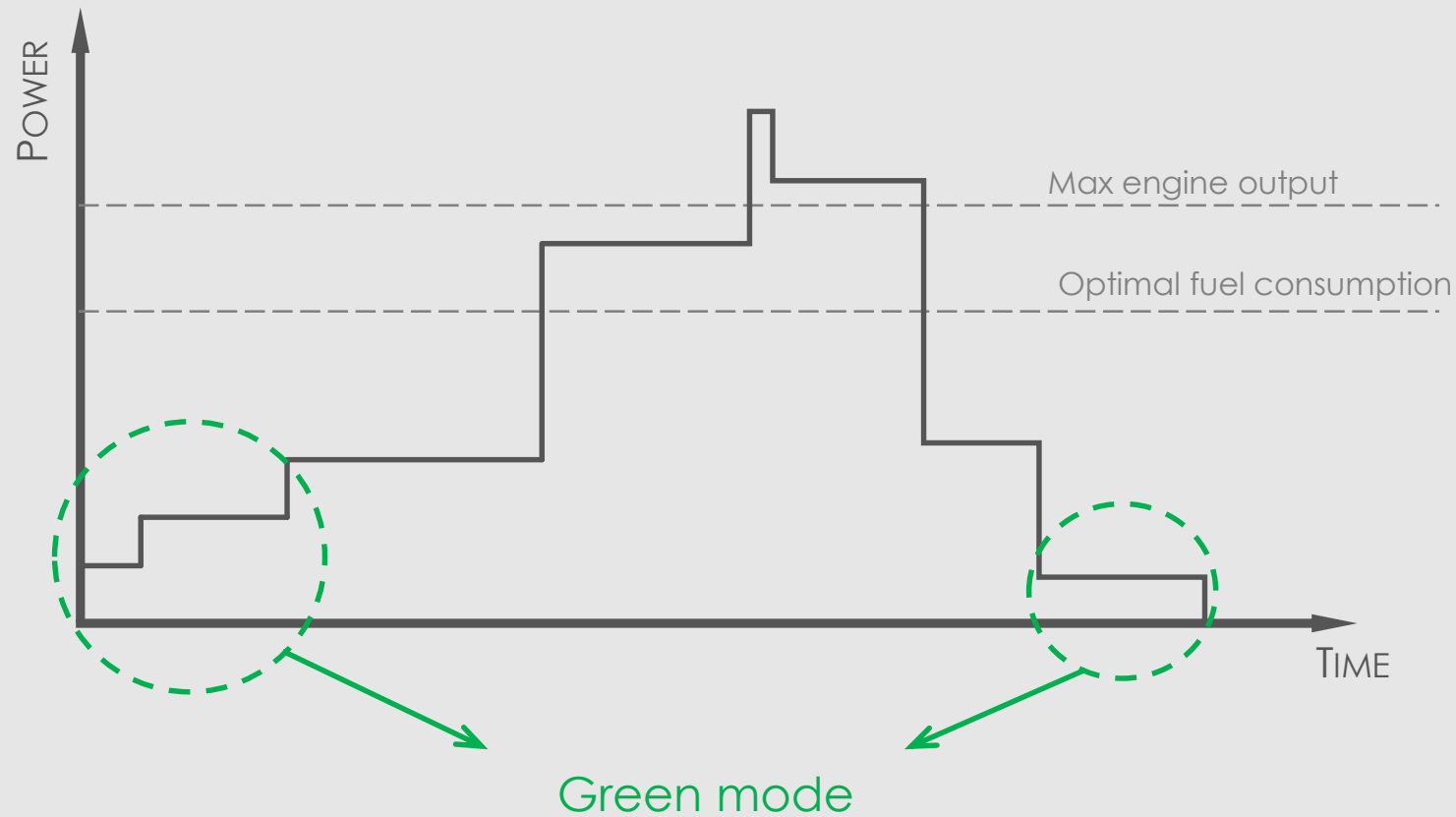


Engine Specific Fuel Consumption is at its lowest around 75 – 85% load condition, which is the ideal running point used in hybrid operation.

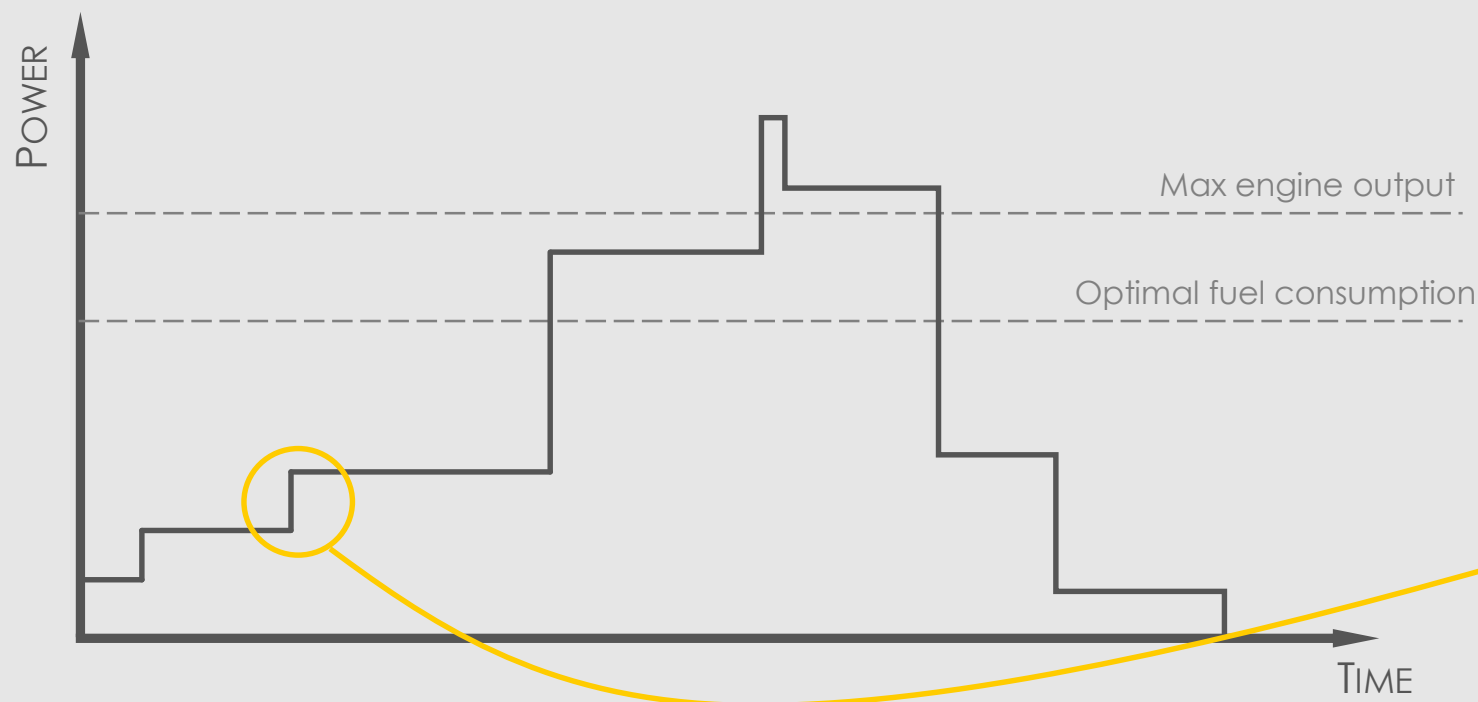


When engine and battery is running in parallel fluctuation load will be handled by the battery and the engine load will operate on steady conditions.

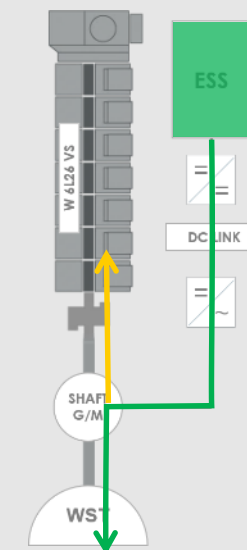
**In green mode the engine is not started and the vessel operates on battery power only.**



**When requested power is exceeding available battery power or battery charging needed, the engine will start automatically.**

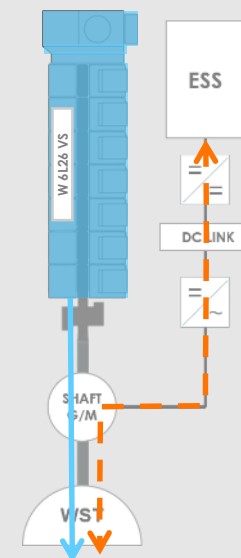
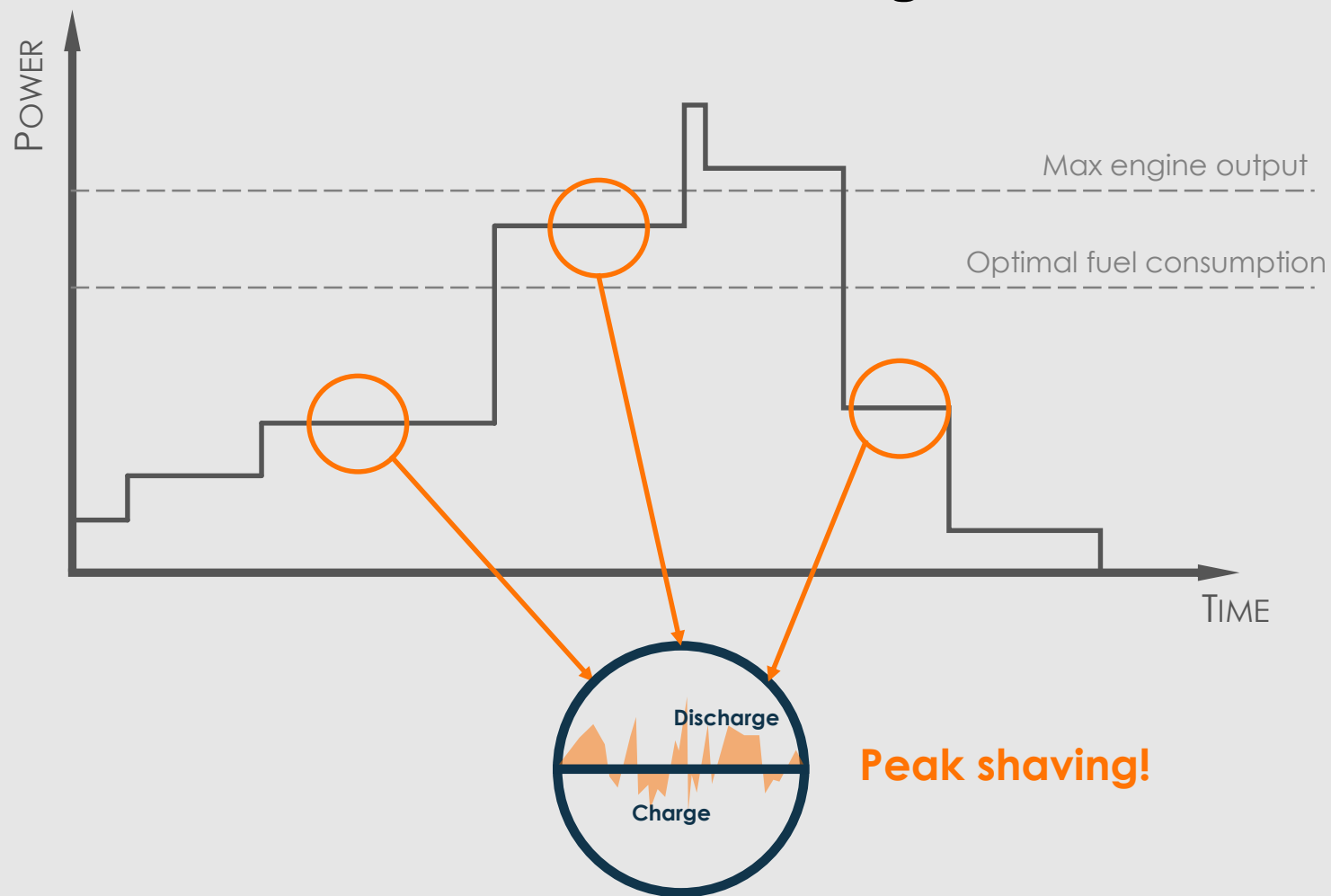


**HYBRID START!**  
New, patented,  
start-up procedure

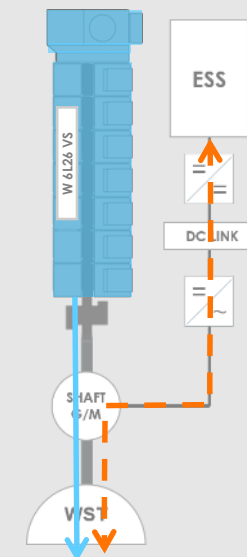
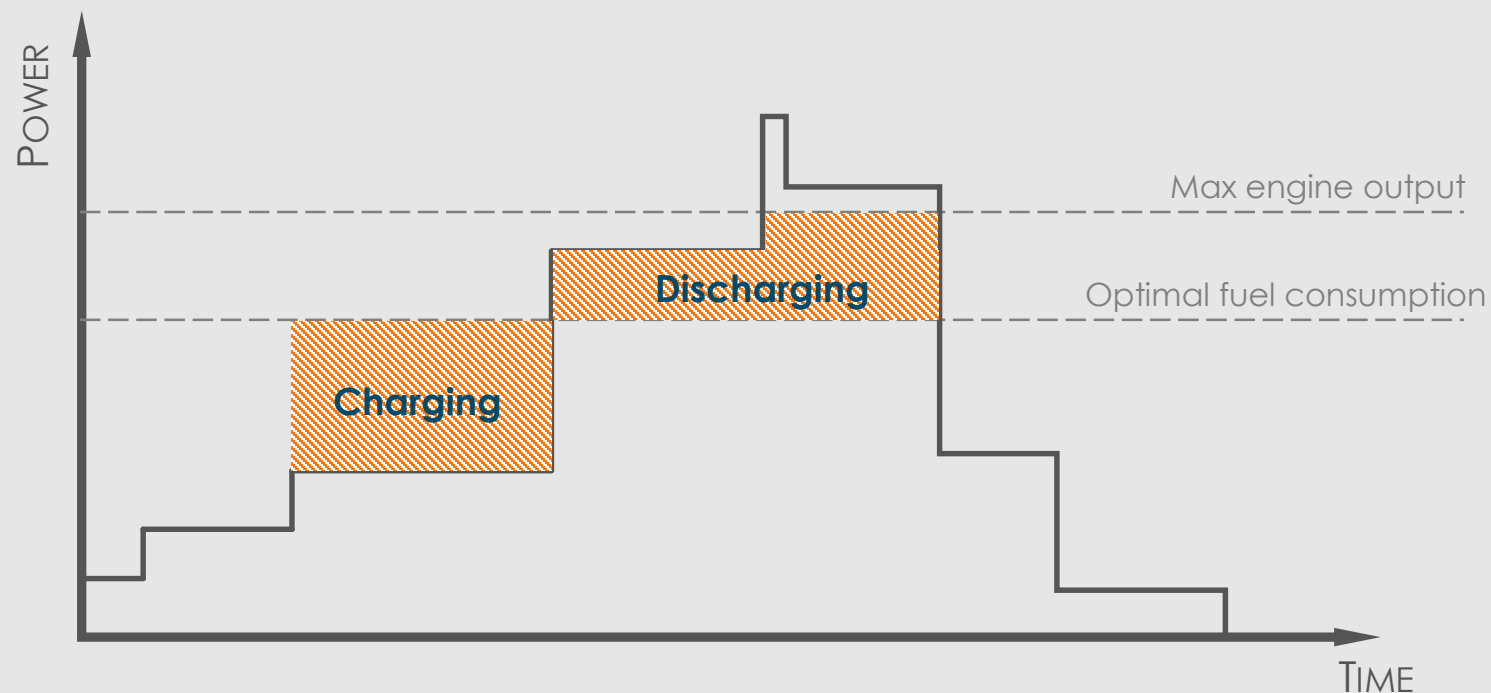




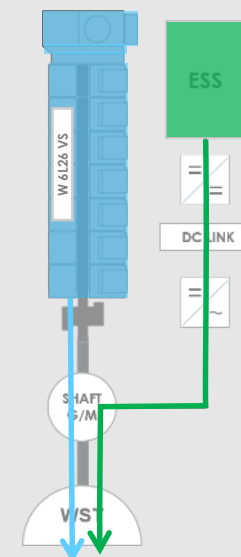
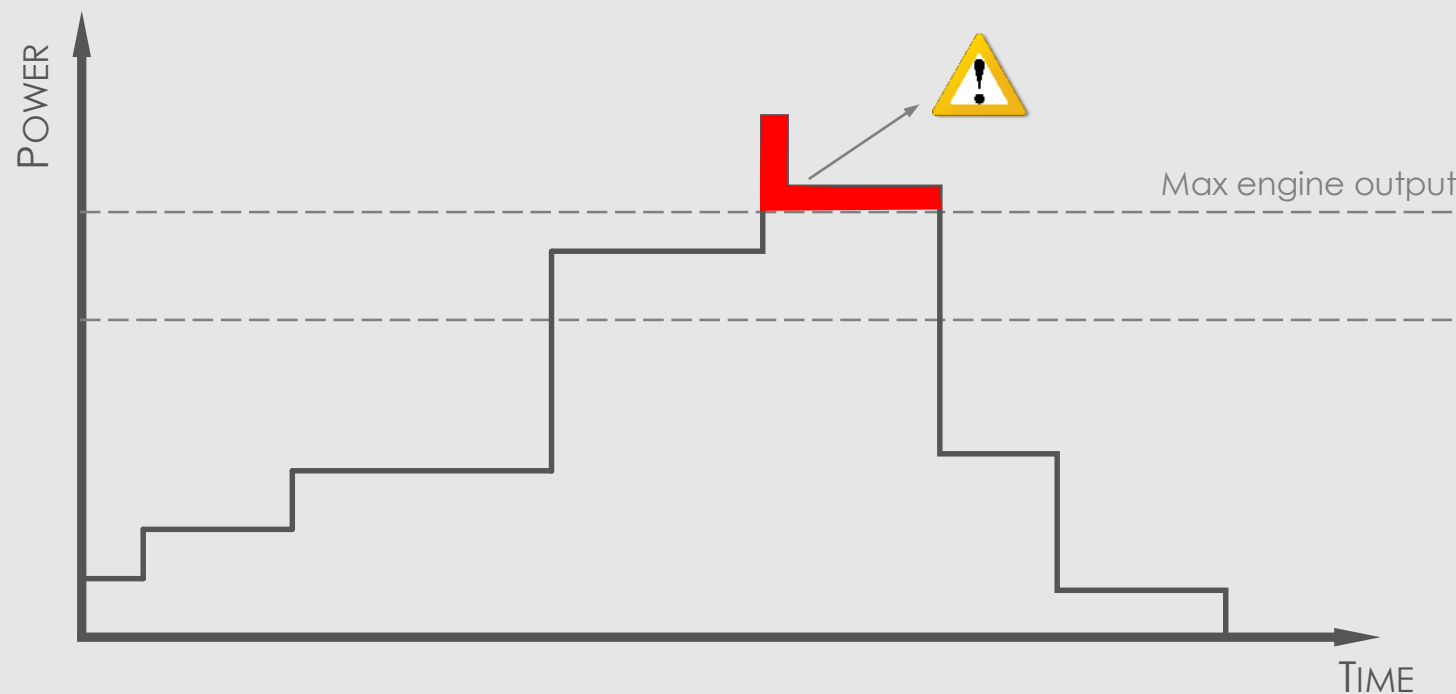
When main engine(s) are running the battery will automatically smooth the load variations on the engine



**Engines will always run on optimal conditions. If power consumption is lower than generated power the batteries are charged. If exceeding, the battery is discharging.**



If full power is needed, the boost power button is pressed, and the vessel will have full power available instantly.



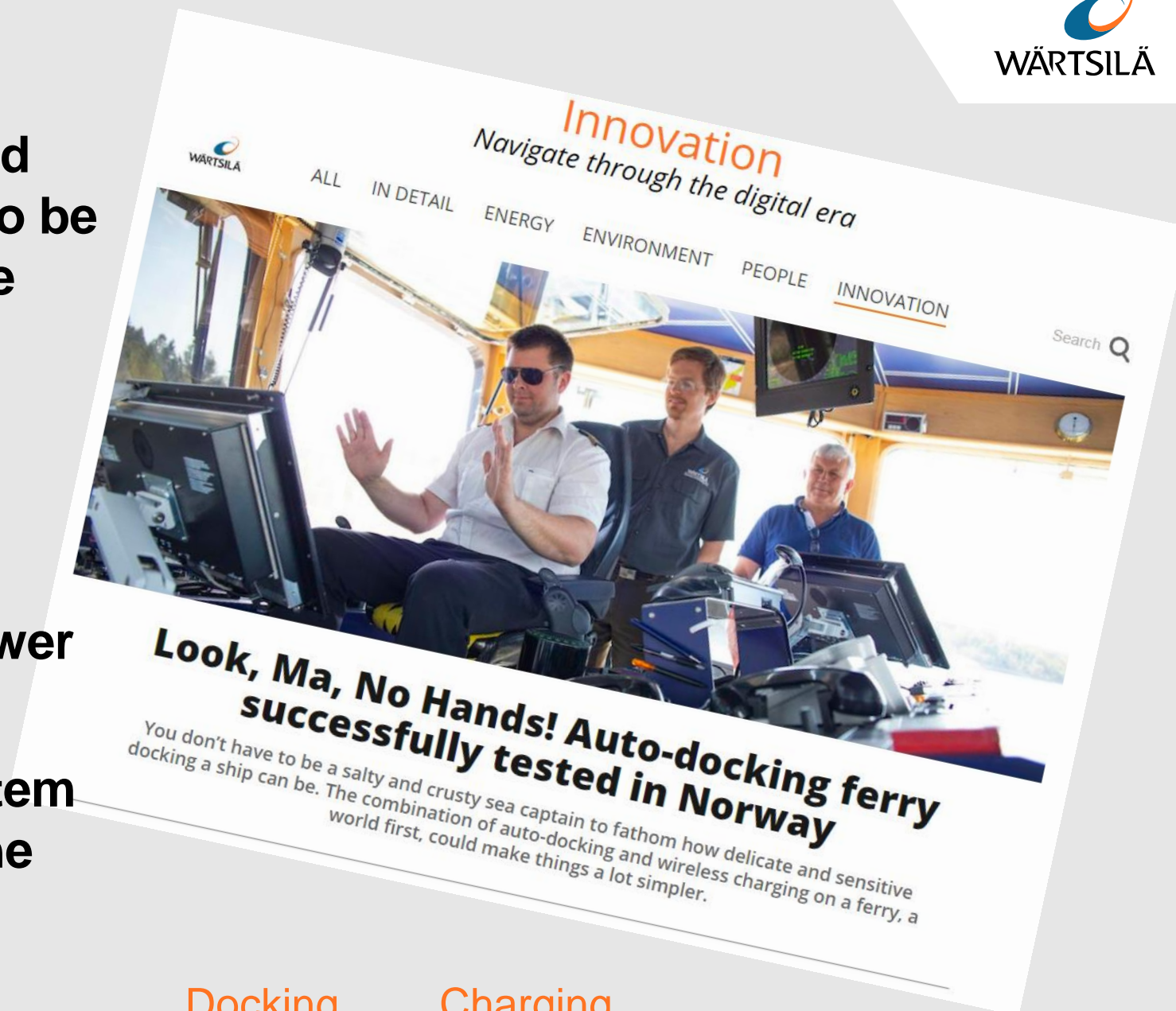


Gulfmark Offshore support vessel  
in North Sea successfully **remote  
control operated** from San Diego  
in August 2017.



“Folgefonn” is the first car and passenger ferry in the world to be operated from one dock to the other without human touch.

- The system makes smoother dockings, with a result of lower overall fuel consumption.
- The safety built into the system takes care of the safety of the vessel and the passengers onboard.



Docking

Charging



# THE FUTURE IS NOW!

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WÄRTSILÄ