


**Thrustmaster**



**HOUSTON, TEXAS,**

A banner at the top right of the slide features a collage of images showing people in a meeting, a person working at a computer, and a large blue industrial propulsor. The text "30 Years of History Innovation & Power." is overlaid on the collage in a white, sans-serif font.

30 Years of History  
Innovation & Power.

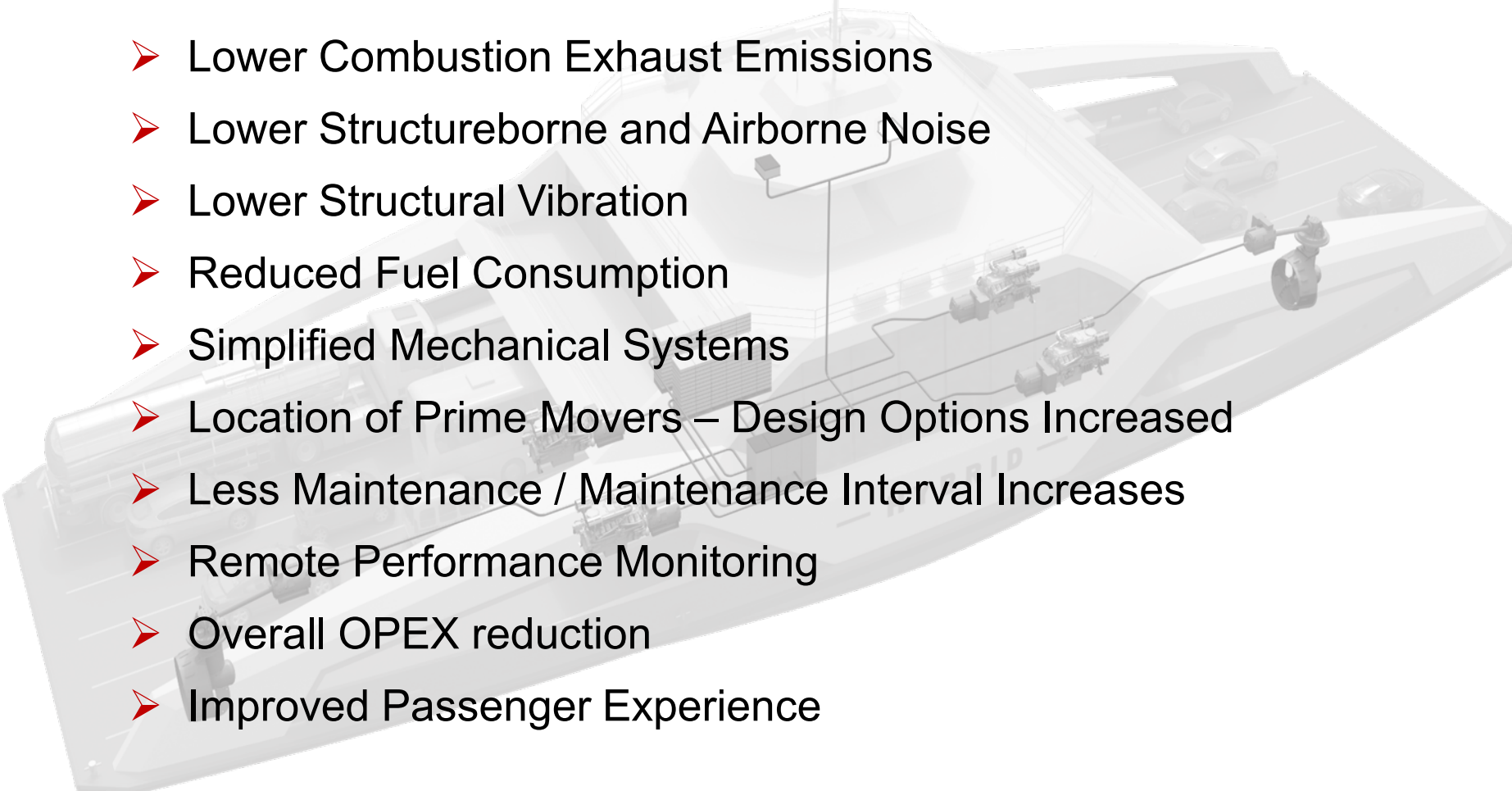
## About Thrustmaster

- Designer and manufacturer of marine propulsion systems since 1984
- American designer and manufacturer located in Houston, TX
- Full in-house engineering staff of doctored and master of science electrical, structural, mechanical, and fluid dynamic engineers
- Thrustmaster can reduce the fuel consumption and reduce the vessel emissions by automatically and seamlessly drawing power from the most efficient source.
- Can design and supply complete turnkey vessel propulsion system compliant with Buy America requirements including the power generation, energy storage, power management system, drives, motors, and propulsors

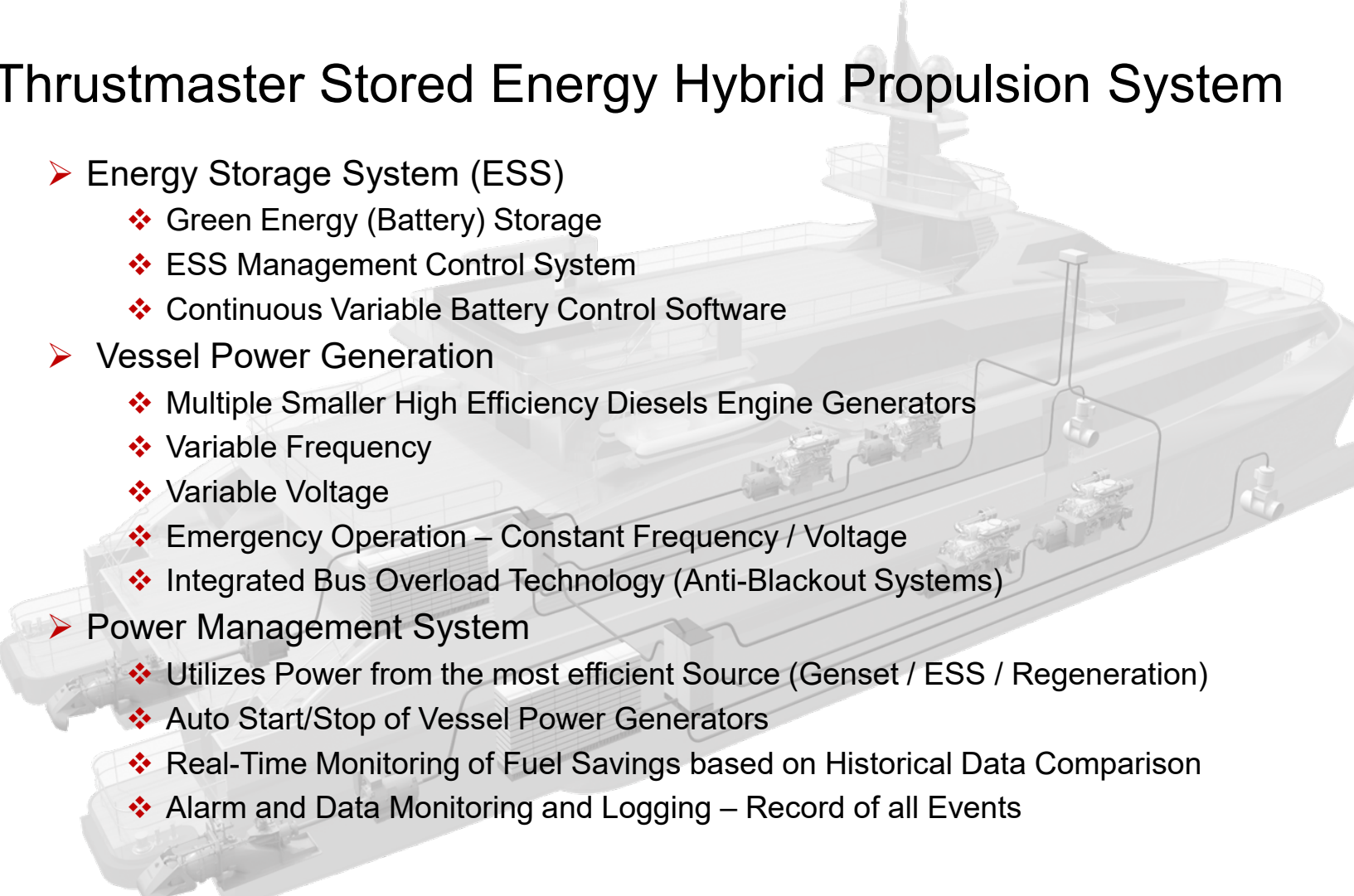
## WHY HYBRID PROPULSION NOW

- Continuing search for more efficient power systems.
- Reduced emissions – IMO Green House Gas Strategy.
- More efficient equipment available:
  - Prime Movers – Multiple fuel options
  - Generators – Variable voltage/frequency/rpm control optimized output rates
  - Electric Motors/Generators – PM, improved efficiency over operating range
  - High Efficiency Inverters
  - Battery Storage – Higher density power sources available
  - Ability to control and select multiple power sources seamlessly
  - Energy Harvesting Software
- Thrustmaster can reduce the fuel consumption and reduce the vessel emissions by automatically and seamlessly drawing power from the most efficient source.

## HYBRID PROPULSION BENEFITS

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- A 3D cutaway diagram of a ship's hull, showing the internal layout of the engine room and fuel systems. The diagram is semi-transparent, revealing the complex arrangement of engines, fuel tanks, and piping. The ship's deck and superstructure are visible in the background.
- Lower Combustion Exhaust Emissions
  - Lower Structureborne and Airborne Noise
  - Lower Structural Vibration
  - Reduced Fuel Consumption
  - Simplified Mechanical Systems
  - Location of Prime Movers – Design Options Increased
  - Less Maintenance / Maintenance Interval Increases
  - Remote Performance Monitoring
  - Overall OPEX reduction
  - Improved Passenger Experience

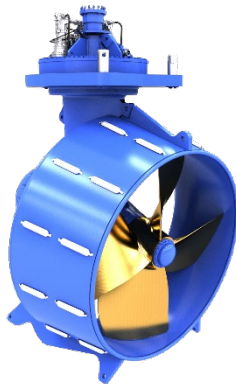
# Thrustmaster Stored Energy Hybrid Propulsion System

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- A 3D cutaway diagram of a ship's hull, showing the internal layout of the propulsion system. The diagram is rendered in a light gray, semi-transparent style, allowing the viewer to see the internal components. The components include several diesel engine generators, a battery storage system, and a power management system. The ship's superstructure, including the bridge and various decks, is also visible. The diagram is positioned in the background of the slide, behind the text.
- Energy Storage System (ESS)
    - ❖ Green Energy (Battery) Storage
    - ❖ ESS Management Control System
    - ❖ Continuous Variable Battery Control Software
  - Vessel Power Generation
    - ❖ Multiple Smaller High Efficiency Diesels Engine Generators
    - ❖ Variable Frequency
    - ❖ Variable Voltage
    - ❖ Emergency Operation – Constant Frequency / Voltage
    - ❖ Integrated Bus Overload Technology (Anti-Blackout Systems)
  - Power Management System
    - ❖ Utilizes Power from the most efficient Source (Genset / ESS / Regeneration)
    - ❖ Auto Start/Stop of Vessel Power Generators
    - ❖ Real-Time Monitoring of Fuel Savings based on Historical Data Comparison
    - ❖ Alarm and Data Monitoring and Logging – Record of all Events

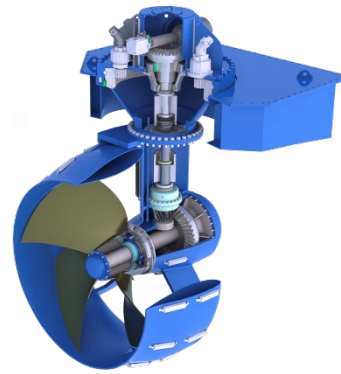


# PROPULSOR SOLUTIONS

L-drive  
Thrusters



Z-drive  
Thrusters



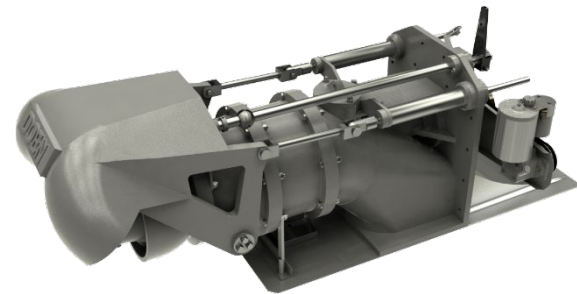
Electric Podded  
Thrusters



Tunnel  
Thrusters



Waterjets



## THE THRUSTMASTER ADVANTAGE

- **One Single Propulsion System Integrator**
- **In-house expertise in Marine Hybrid Propulsion Systems**
- **Hybrid Propulsion Patent Holders**
- **Proven Power Management System**
- **Proven Marine Thruster & Waterjet Manufacturing**
- **Made in the USA**