

## Long Range Power Trimaran Concept Paper

The dream of letting slip the lines and heading off over the horizon to exotic locations is shared by many who love boating and the outdoors. For too long however, people have been forced to choose between efficiency and speed. Unfortunately for the power boat industry, outside of the super yacht paradigm, little has changed in the last 100 years to revolutionize either of these factors. Thus in the mass production market we have either high speed planing boats that all look the same or low speed trawling designs that all look the same. No one has yet managed to solve the commercial design equation where moderate speed (12-28 knots) and very high fuel efficiency can be realized while still retaining acceptable interior volume and amenities.

This is primarily a function of traditional propulsion systems that force yacht designers to adopt typical form factors to accommodate large and heavy engines and fuel tanks.

What if the boat could be designed from the water up with a distributed power system so that new and innovative form factors could be considered?

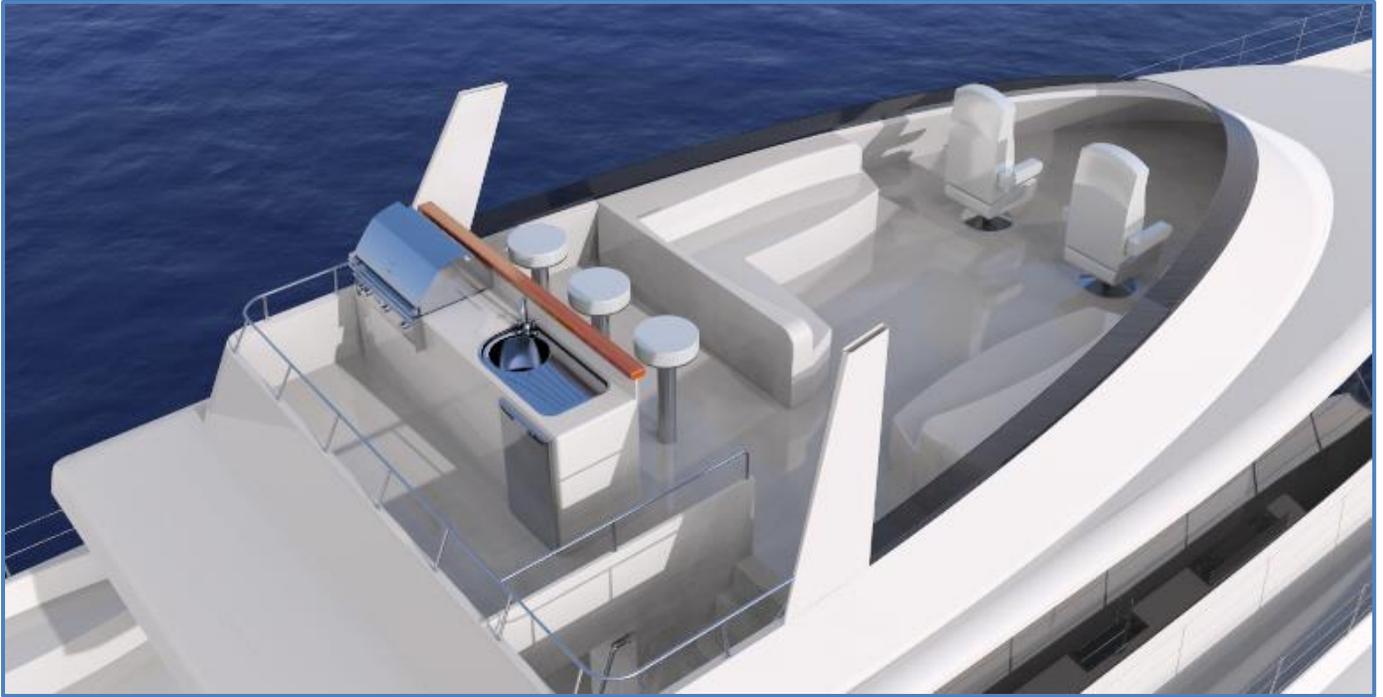
What if the boat while idle at port could power the city where it is docked, helping to pay for its own berth in the process?

What if those factors were combined in a sleek modern design that could travel up to 10 times further on the same amount of fuel, could be completely silent in operation and produced minimal environmental pollution?

Welcome to the future...









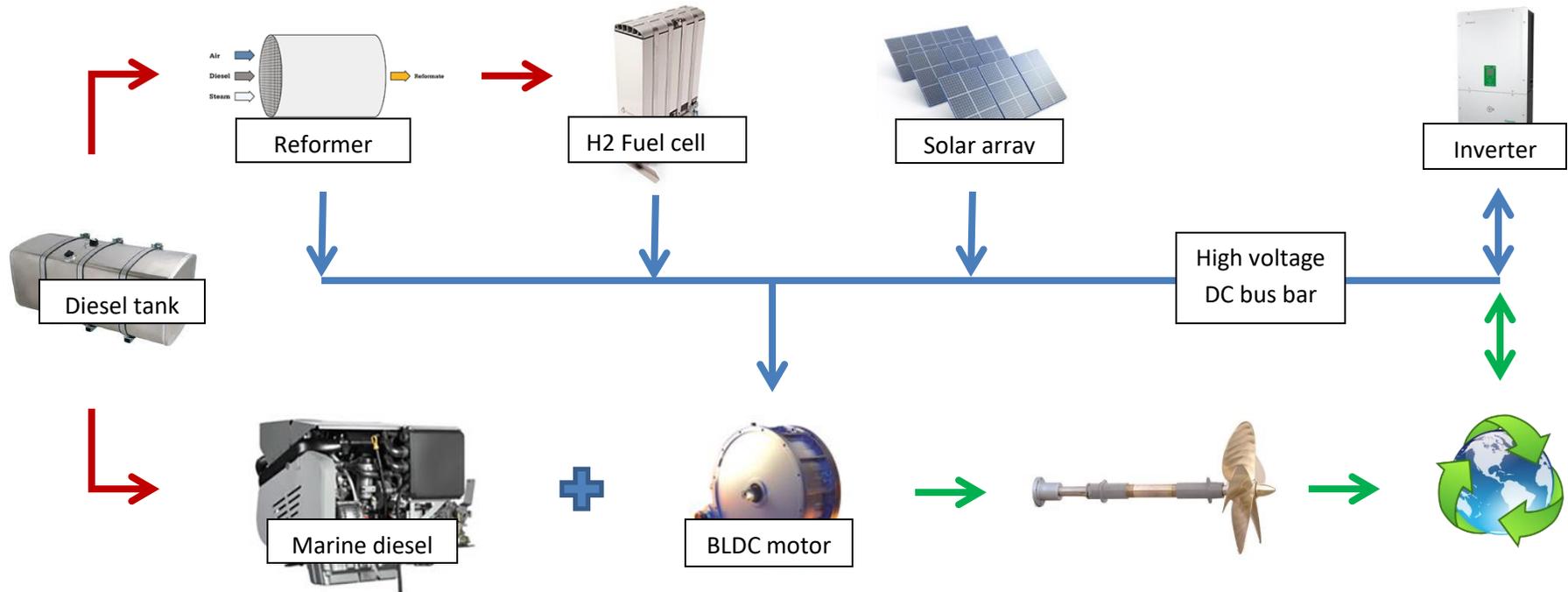
### **Key features of trimaran hull form**

- Narrow length to beam ratio (10 to 1) enables design to exceed “hull speed” with minimal power input
- Shallow draft (1 meter) allows operation in all cruising destinations
- No active stabilization means minimal underwater drag and parasitic power loss
- Reduced overall cost of design due to passive stabilization
- Hull design can “dry out” in tidal areas reducing the need for specialist dry dock facilities
- Wave piercing design to allow high speed operation across a variety of sea states
- Trimaran hull form is inherently more sea kindly in all sea states
- Ability to “surf” sideways in very high wave conditions reduces the risk of capsizing
- Centralization of fuel tanks allows center of gravity and center of buoyancy to be collocated thus dramatically reducing pitching in a sea way
- No change to center of buoyancy due to differing fuel loads and/or fuel use
- Unique interior layout allows very efficient space utilization giving 5 king bed staterooms with en-suite heads plus ample crew quarters within a 30 meter/100 foot form factor
- Built in 5.2 meter/17 foot dinghy garage allows easy and secure storage for the tender and personal water craft
- Integrated swim platform creates teak beach and easy access to water toys

## Propulsion Concept

Very efficient full displacement hull design combined with hybrid marine diesel engine/BLDC electric drive and PEM fuel cell range extender powered by a combination of solar panels, diesel fuel and reformed diesel fuel.

## Propulsion system diagram:



Since the Long Reach provides stylish and fast cruising with **10x less fuel** it's good for the planet and good for the wallet!

## Propulsion system details:

- 2 x 134 kW Yanmar 4BY3-180 marine diesel ([Yanmar Marine](#)) or 1 x CAT C12 ACERT
- 2 x 40 kW BLDC electric motor ([REAPsystems](#))
- 80 kW PowerCell S3 fuel cell with integrated reformer ([PowerCell](#))
- 5 kW solar panel array
- 5 kW grid tied inverter/battery charger
- 8,000 liter diesel fuel tank

## Advantages of propulsion system

- Multiple power sources provide very high efficiency power delivery
- Combination of fuel cell and BLDC motor to provide peak high speed operation
- Silent and vibration free cruising possible
- Multiple power sources provide very high reliability and guaranteed “get home” ability
- Cheaper installed cost than comparable marine engine setups (i.e. 2 x 1,500 hp diesel)
- Much lower installed weight as comparable marine engine setups
- Very low emissions from the fuel cell meeting the most stringent environmental requirements
- Electric drive means complete control during low speed maneuvers (100% torque at zero rpm)
- Grid tied inverter allows boat to power a home/car/power grid to generate income and enhance the environment (approximately 10,000 kWhr per annum)
- Single propeller driven by twin engines allows for efficient power transfer to the water via a large diameter propeller while providing optimal loading on both engines across a broader speed range

## Propulsion modes (based on design weight of 35 tons light ship):

- Speeds to 12 knots – 9,000 NM range (main engine) 15,000 NM range (fuel cell only)
- Speeds to 22 knots – 4,500 NM range (main engine)
- Speeds to 25 knots – 3,000 NM range (main engine)
- Speeds to 30 knots – 2,000 NM range (main engine plus electric boost)