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HyZET Tugboat

The maritime industry is exploring opportunities for emissions reduction, and among the fuel alternatives under evaluation, liquid hydrogen (LH2) is one of the most promising. While LH2 has been reliably used in specific land-based industries for years, it has yet to be tested to scale for maritime application. Marine-ready fuel cells and LH2 storage have only recently become available, and cost remains a barrier, as is true across industries seeking to decarbonize with hydrogen.

CALSTART is leading a team of industry experts, including Crowley, ABB, DNV, Chart Industries, Ballard Fuel Cell Systems, and the Port of Los Angeles, in developing a fully hydrogen-powered vessel design for one of the harshest duty cycles among commercial harbor craft: tug operations.

We estimate a tug of this fuel cell-powered design will realize, in operation, approximately 476 million metric tons of carbon dioxide equivalent (MTCO2e) savings per year. In the future, with hydrogen sourced from 100% renewable energy, one fuel cell-powered tug is estimated to realize 2,204 MTCO2e savings per year.

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Vessel Specifications

Overall Dimensions

Length	90’
Beam	40’-0”
Bollard Pull	90 short tons (~82 MT)
Propilsors	5.0MW total installed ABB Azipod® or L-Drive
Power & Propulsion System	ABB Onboard DC Grid™ fully electrified propulsion integrating: ~6 x Ballard FCwave @ 200 kW. 2 x battery sized for bollard pull test (est. 800kWh with high C-rate)
Energy Storage/ Peak Shaving	1.2MW FC power + 3.6MW ESS power
Design Range and Bunkers	Minimum one week operation between re-fueling.Bunker time: <3 hours. Current consumption: 15,000 gal disel/ month
Air draft limitations	Must be able to transit under the Henry Ford and Schuyler Heim bridges in all conditions- nomialy the air draft is to be less than 42 ft.
Operational Objections	LA/ Long Beach Operations, Escort capability, Maximum Pilot House visibility (Pilot needs to be able to see vessel touch points with minimal effort), Hull designed for traveling astern without water coming over the transom, 2 person operations
Mooring & Towing Equipment	Simple aft tow winch with brake SWL for bollard oull and 8” HMPE line (450’)

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