



Bristol Harbor Group, Inc.

Casco Bay Island Transit District- Down Bay Ferry Design

Cory Wood, Vice President

04NOV25



Project Update

- Propulsion System Options & Evaluation – *COMPLETE*
- Preliminary Design Report – *DRAFT COMPLETE*
 - BHGI is recommending proceeding to contract design with a diesel electric propulsion system utilizing (3) Cat C18 main generators



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Principal Characteristics

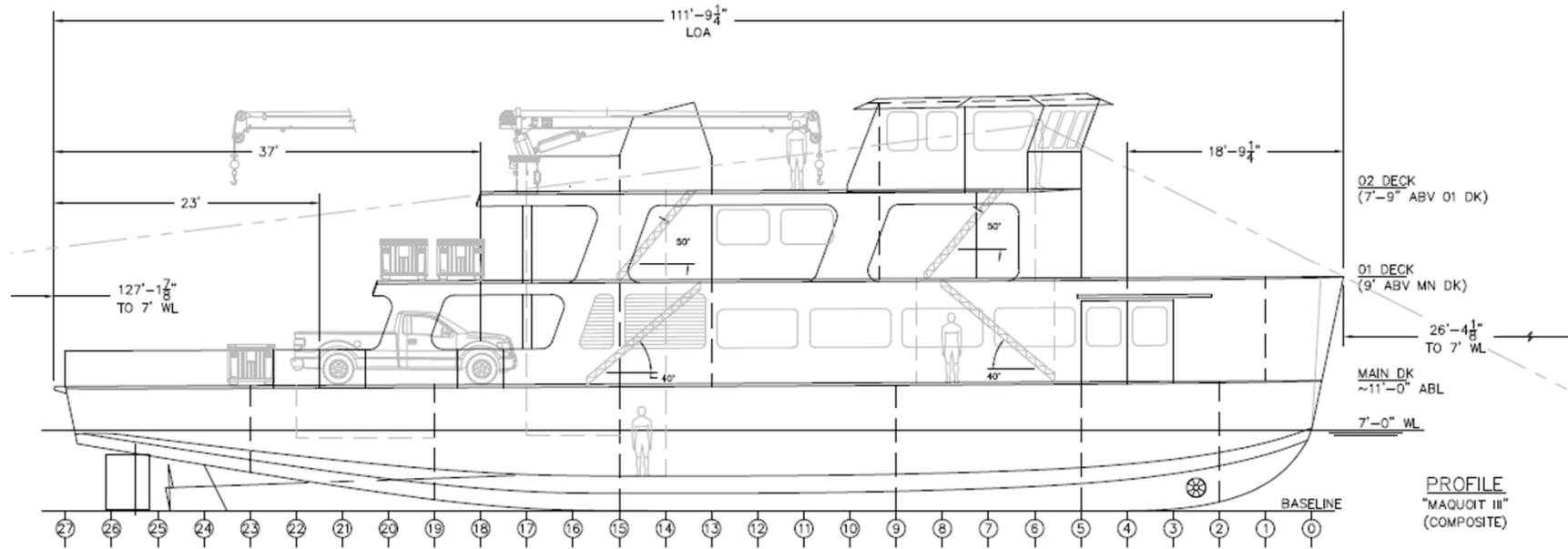
PRINCIPAL CHARACTERISTICS

LENGTH, OVERALL	111'-9 $\frac{1}{4}$ "
LENGTH, WATERLINE	107'-2 $\frac{1}{2}$ "
BREADTH, MOLDED	33'-0"
BREADTH, OVERALL	35'-0"
DEPTH, MOLDED AMIDSHIPS TO MAIN DECK AT SIDE	10'-9"
DESIGN DRAFT	7'-0"
<u>CAPACITIES: (APPROXIMATE)</u>	
FUEL OIL (98%)	6,000 GAL
POTABLE/BLACK WATER	750 GAL
EXPOSED CARGO AREA	~1,845 FT ²
COVERED CARGO AREA	~930 FT ²
EXTERIOR FIXED SEATING	53
INTERIOR FIXED SEATING	142
TOTAL PASSENGERS	~310 INCL STANDING



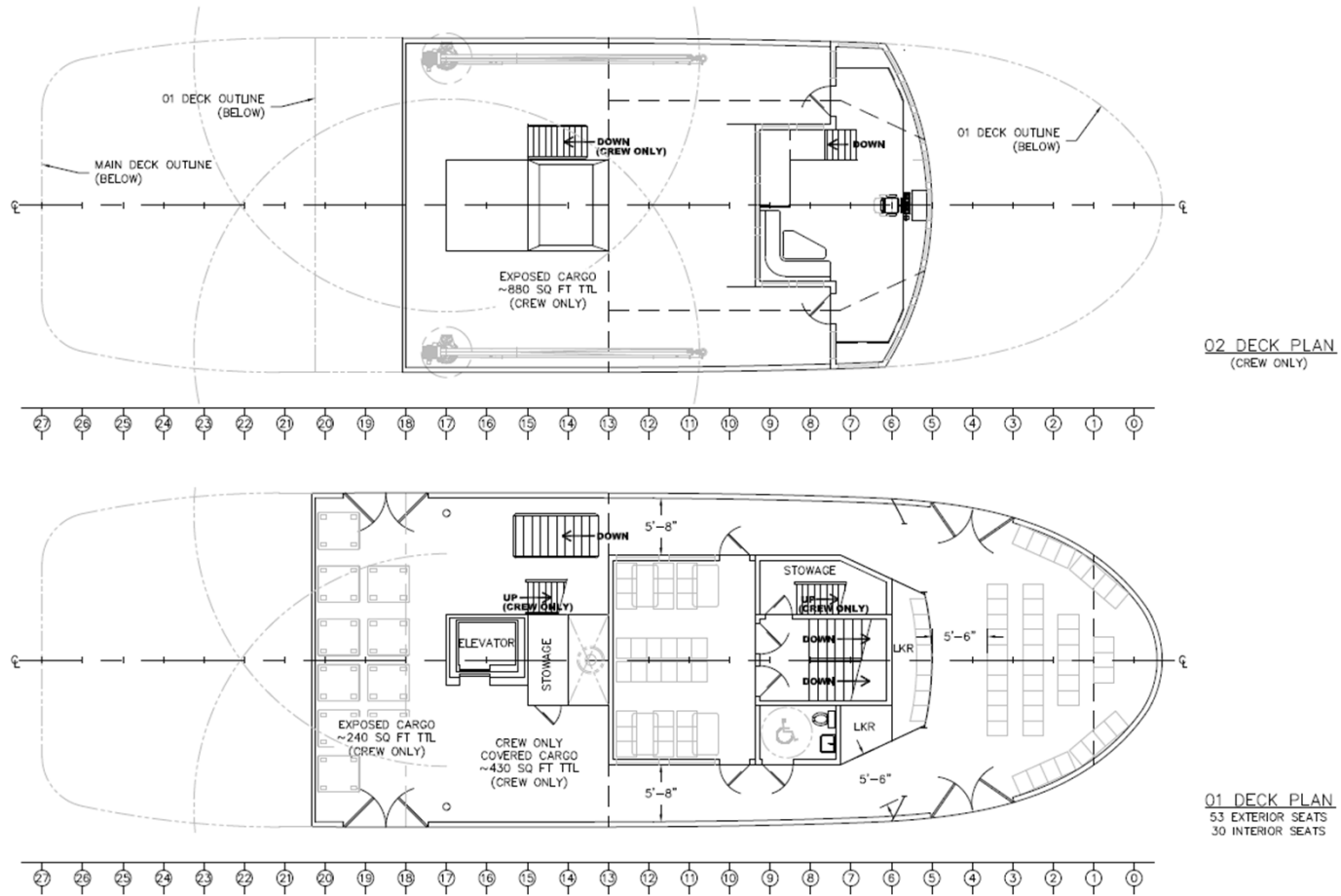
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Outboard Profile



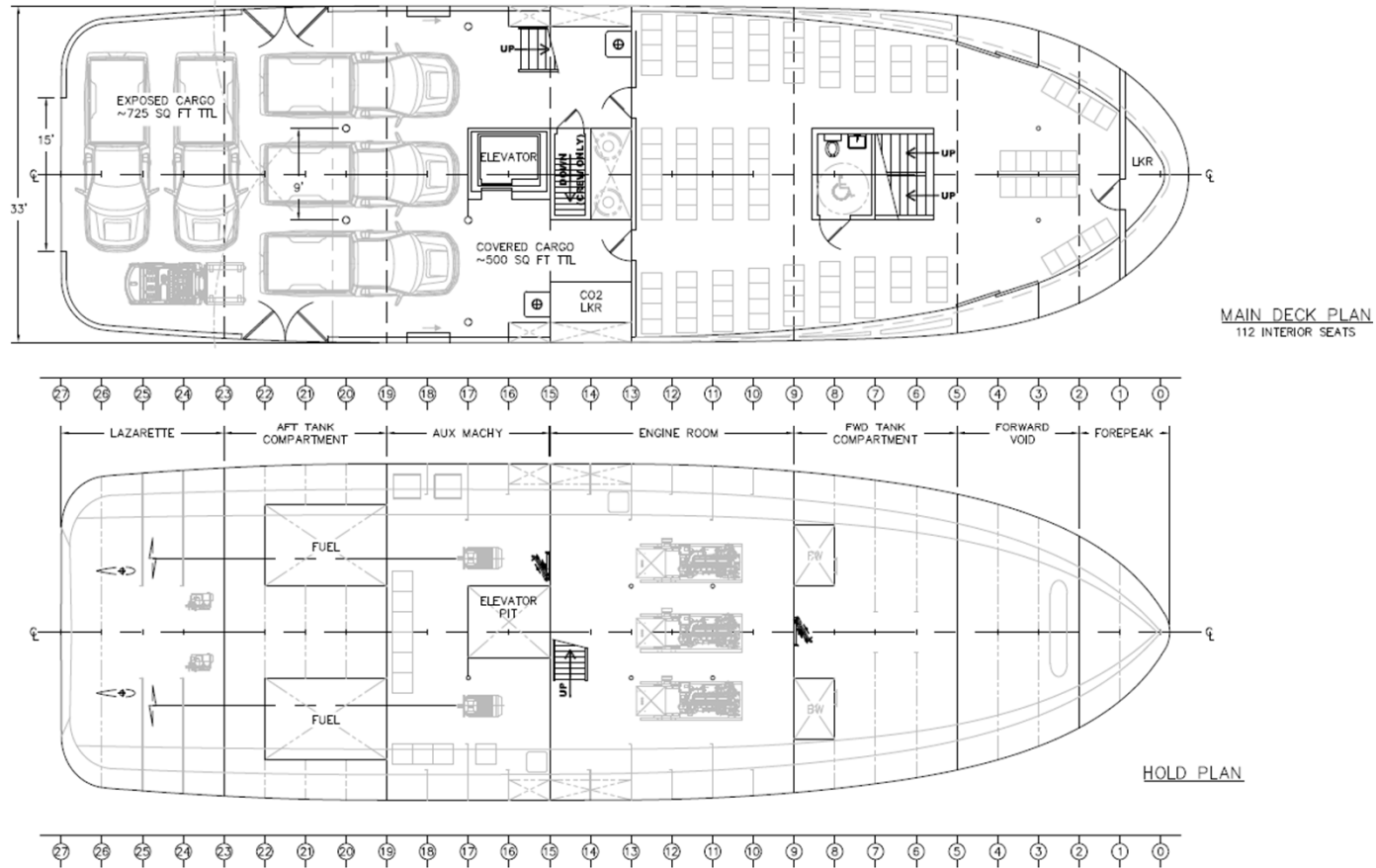
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Upper Decks



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Lower Decks



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Concept Level Cost Estimate

- Baseline estimate assumes MAQUOIT III concept with conventional propulsion system w/(2) C18's
- Total estimated cost includes adjustment for recommended DE propulsion system
- Estimated costs are in 2025 USD

HULL ONE - 2025							
VESSEL CONSTRUCTION ESTIMATE							
GROUP	DESCRIPTION	LABOR (HOURS)	MATERIALS (\$)	SUBTOTAL (\$)	MATERIAL MARKUP (\$)	TOTAL ITEM (\$)	PERCENT
0	ENGINEERING & YARD SERVICES	0	\$ -	\$ -	\$ -	\$ -	0.0%
1	HULL STRUCTURE	18,760	\$ 432,287	\$ 2,046,000	\$ 65,000	\$ 2,111,000	13.9%
2	PROPULSION	4,184	\$ 1,224,232	\$ 1,584,000	\$ 184,000	\$ 1,768,000	11.6%
3	ELECTRIC PLANT	5,698	\$ 733,395	\$ 1,223,000	\$ 110,000	\$ 1,333,000	8.8%
4	COMMAND AND SURVEILLANCE	513	\$ 523,118	\$ 567,000	\$ 78,000	\$ 645,000	4.2%
5	MACHINERY, GENERAL	9,443	\$ 2,028,690	\$ 2,841,000	\$ 304,000	\$ 3,145,000	20.6%
6	OUTFIT & FURNISHINGS	9,042	\$ 1,470,059	\$ 2,248,000	\$ 221,000	\$ 2,469,000	16.2%
8	INTEGRATION	16,504	\$ 832,500	\$ 2,252,000	\$ 125,000	\$ 2,377,000	15.6%
9	POST CONSTRUCTION SUPPORT	5,140	\$ 820,181	\$ 1,262,000	\$ 123,000	\$ 1,385,000	9.1%
	SUBTOTAL	69,285	\$8,064,461	14,023,000	\$1,210,000	\$15,233,000	
	LABOR RATE - 2025	\$86.00	PER HOUR				
	MATERIAL MARKUP	15%		1,210,000			
	PRICE - 2025 DOLLARS			15,233,000			
	CONTINGENCY - CONCEPT DESIGN	15%		2,284,950			
	PRICE WITH CONTINGENCY			17,517,950			

MAQUOIT III Conceptual Cost Estimate	
(2025 USD)	
Baseline Cost Estimate (Ref 1)	\$ 17,517,950
Adjustment for Propulsion Option 3	\$ 1,596,000
Total Estimated Cost	\$ 19,113,950

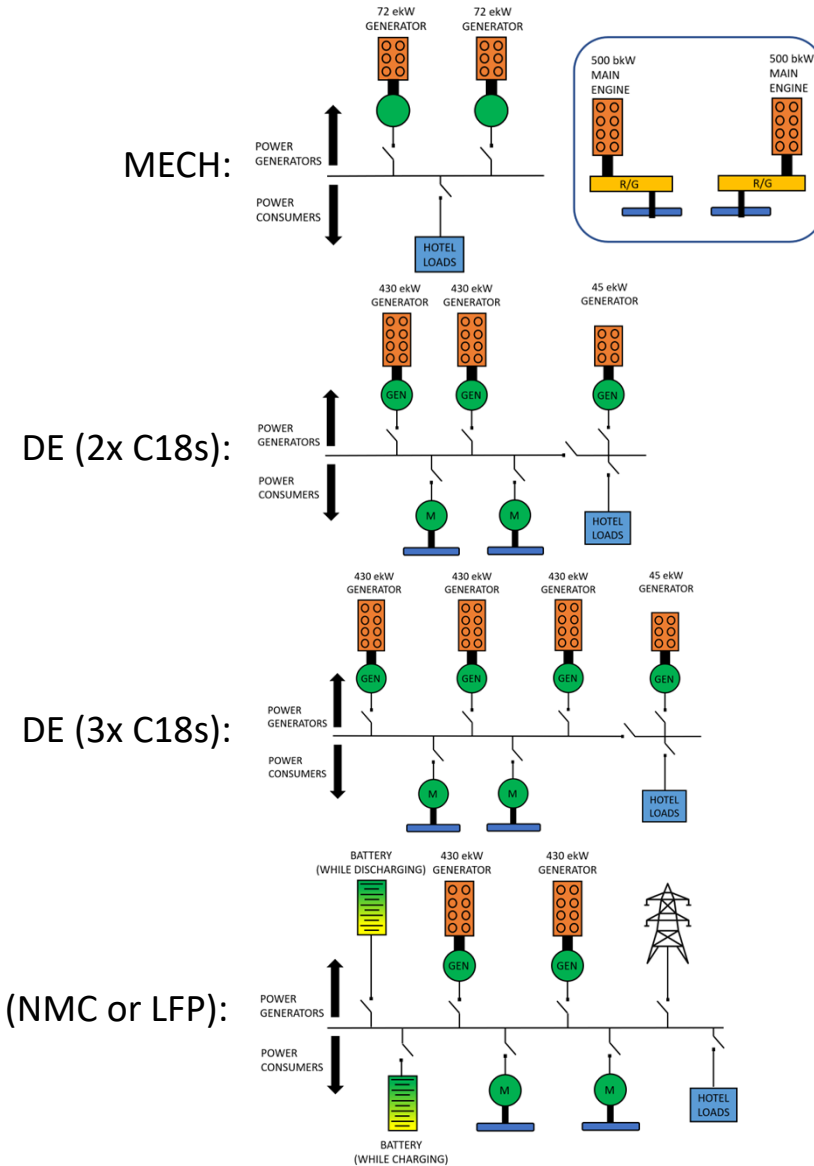
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Propulsion System Feasibility Study

Propulsion Systems Studied:

1. Diesel mechanical system with 2 C18 (500 bkW) engines and 2 house generators (72 ekW)
2. Diesel electric system with 2 C18 generators (430 ekW) and 1 house generator (45 ekW)
3. Diesel electric system with 3 C18 generators (430 ekW) and 1 house generator (45 ekW)
4. Diesel electric system with 2 C18 generators (430 ekW) and 1,000 kWh of NMC batteries
5. Diesel electric system with 2 C18 generators (430 ekW) and 1,000 kWh of LFP batteries

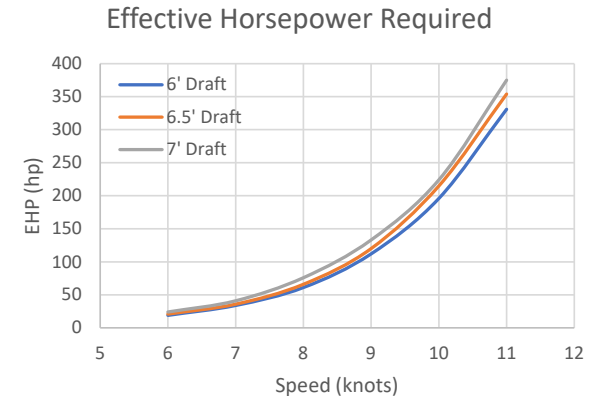
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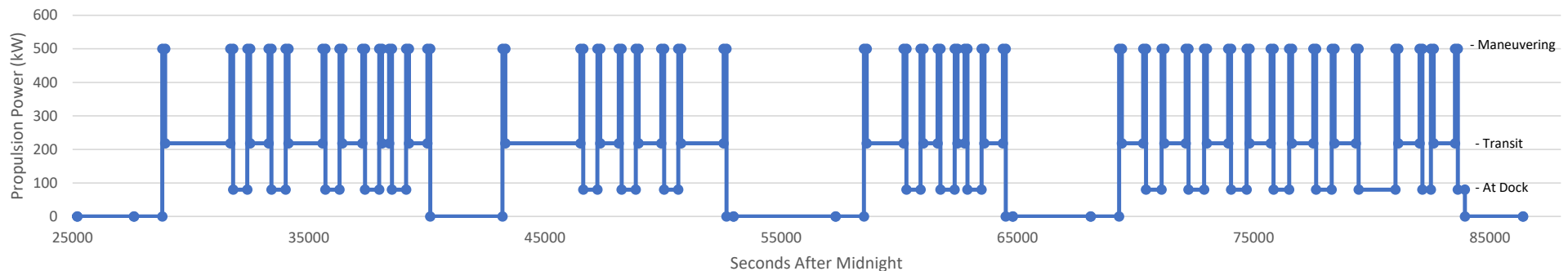
Propulsion System Feasibility Study

Operational Profile:

- Used existing vessel schedule and computational fluid dynamics (CFD) analysis used to get power demand
- 8, 9, 10 & 11 knot transit speeds studied at 6', 6.5' and 7' drafts
 - 8 knots was minimum speed to enforce 30-minute load and unload time in Portland
- A 9 knot transit speed and 50% of time at a 6.5' draft & 50% of time at a 7' draft was used in all feasibility study calculations
- Departure time from Portland fixed. Other departure times dependent on transit speed
- 10-minute load/unload time at each location
- 2-minute maneuvering/acceleration/deceleration



Propulsion Delivered Power Profile - 9 Knot Transit Speed at a 7' Draft



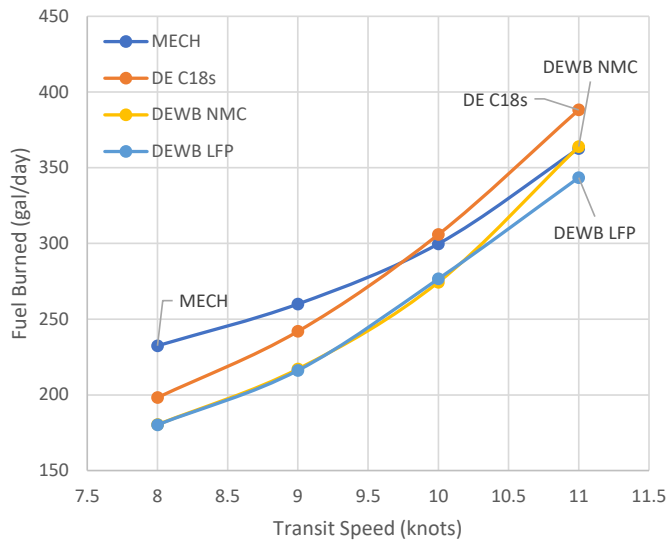
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Propulsion System Feasibility Study

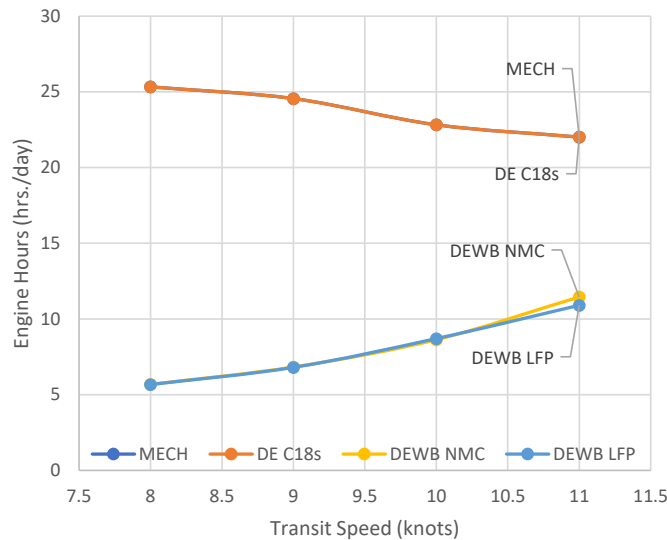
Propulsion System Simulations:

- Models and control logic were set up in MATLAB and Simulink
- Transit speeds from 8-11 knots were simulated
- Engine/generator hours, fuel usage, and CO₂ emissions were tracked
- 50% of time at a 6.5' draft and 50% of time at a 7' draft was assumed

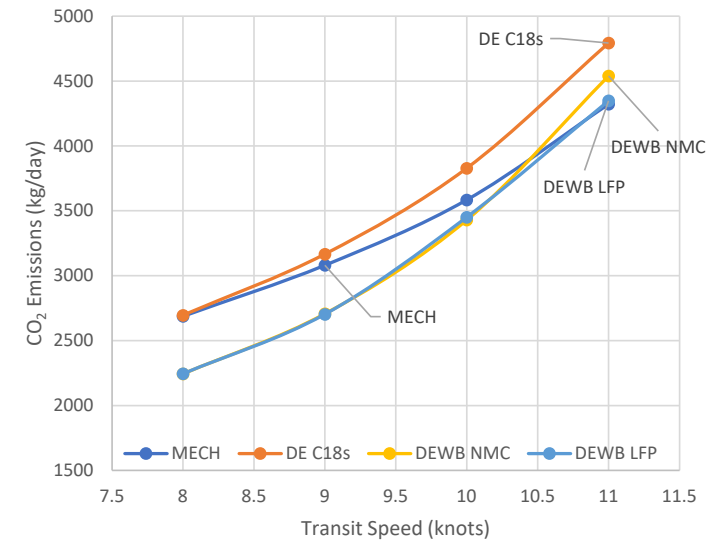
Average Daily Fuel Burned vs Transit Speed



Average Daily Engine Hours vs Transit Speed



Average Daily CO₂ Emissions vs Transit Speed



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Propulsion System Feasibility Study

Feasibility Study Criteria:

- Operational Expenses (OPEX)
- Capital Expenses (CAPEX)
- Sustainability
- Serviceability
- Reliability

Evaluation Criteria	Weighting of Overall Score
OPEX	39%
CAPEX	19%
Sustainability	12%
Serviceability	10%
Reliability	20%

Evaluation Criteria	MECH	DE 2xC18s	DE 3xC18s	DEWB NMC	DEWB LFP
OPEX	7.90	8.41	8.41	10.00	10.00
CAPEX	9.95	9.26	9.18	8.14	8.63
Sustainability	8.77	8.54	8.54	9.98	10.00
Serviceability	7.00	5.80	5.80	4.60	4.60
Reliability	7.18	4.40	8.43	10.00	10.00
Weighted Sum:	8.47	7.78	8.57	9.31	9.40

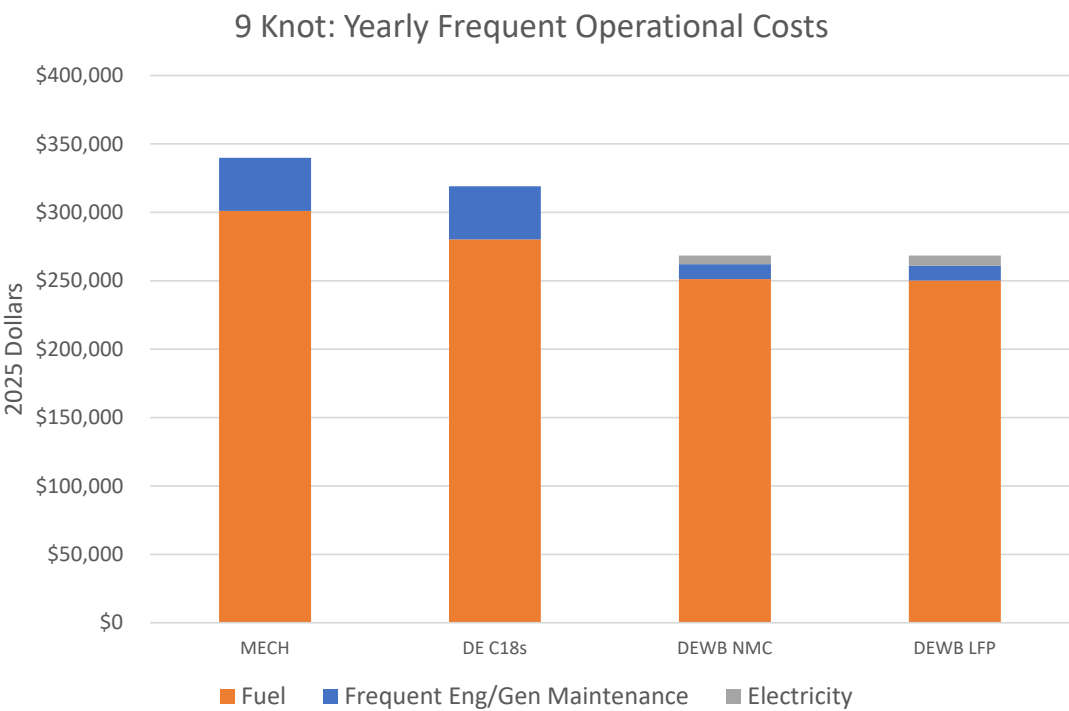
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Propulsion System Feasibility Study

Operational Expenses:

- Fuel Costs
- Electricity Costs
- Frequent Main Engine Maintenance
 - Events occurring at less than 1,000-hour intervals

Evaluated at 9 knots for the Feasibility Study



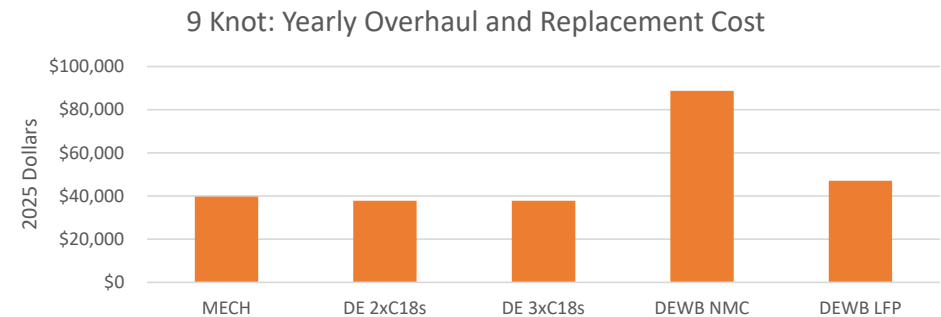
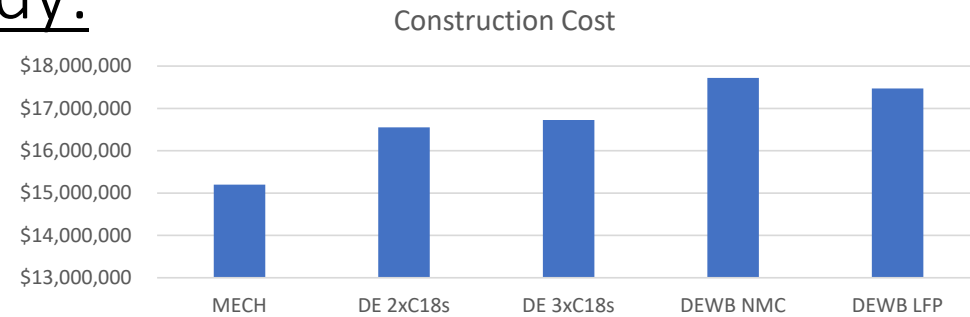
OPEX Sub-Criteria:	MECH	DE 2xC18s	DE 3xC18s	DEWB NMC	DEWB LFP
OPEX	7.90	8.41	8.41	10.00	10.00

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Propulsion System Feasibility Study:

Capital Expenses (CAPEX):

- Construction Cost Estimates
 - Estimates reflect different engines, generators, switchboards, VFD drives, propulsion motors, batteries, battery room equipment, and extra fire protection if applicable
 - 90% Weighting
- Equipment Overhaul and Replacement Costs
 - Infrequent Main Engine Maintenance
 - Events occurring at greater than 1,000-hour intervals.
 - House Generator Maintenance
 - Battery Replacement
 - Motor Replacement
 - 10% Weighting



CAPEX Sub-Criteria	MECH	DE 2xC18s	DE 3xC18s	DEWB NMC	DEWB LFP
Construction Costs	10.00	9.18	9.09	8.58	8.70
Equipment Overhaul and Replacement Costs	9.51	10.00	10.00	4.26	8.03
Weighted Sum:	9.95	9.26	9.18	8.14	8.63

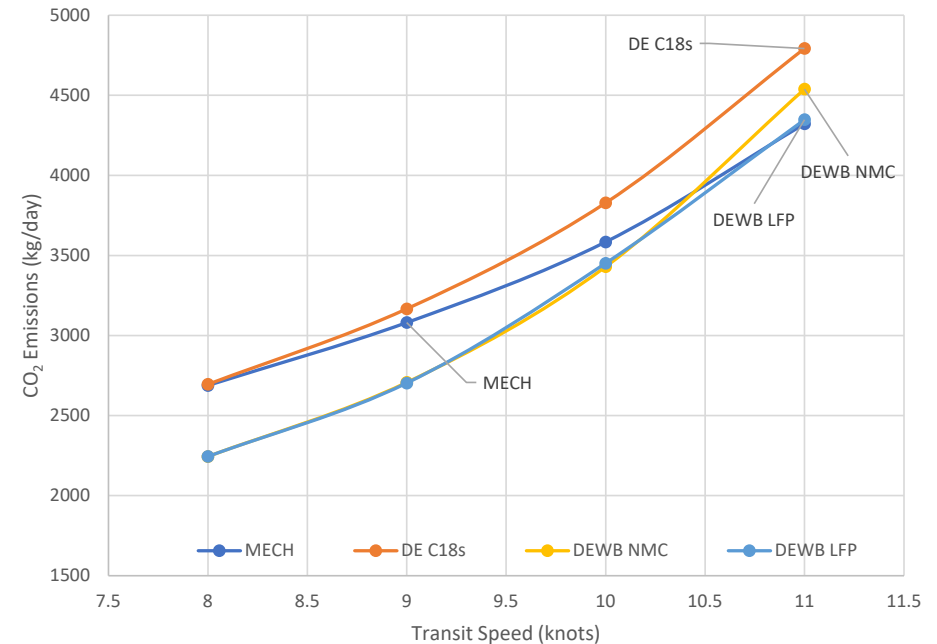
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Propulsion System Feasibility Study:

Sustainability:

- CO₂ emissions were evaluated for a 9-knot transit speed.
 - Total Well-to-Wake emissions calculated:
 - Well-to-Tank Emissions
 - Engine Emissions
 - Electrical Grid Emissions
- These were directly compared to calculate scores for each propulsion system

Average Daily CO₂ Emissions vs Transit Speed



Sustainability Sub-Criteria:	MECH	DE 2xC18s	DE 3xC18s	DEWB NMC	DEWB LFP
Carbon Dioxide (CO ₂) Emissions	8.77	8.54	8.54	9.98	10.00

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Propulsion System Feasibility Study

Serviceability:

- Evaluated for five criteria
 - Scored subjectively with a possible ranking from 1-10.
 - TSGI did not evaluate any sub-criteria as extremely low or high as the technology being proposed has been industry proven and Casco Bay Lines has an existing ferry or a new build ferry that utilizes the technologies being proposed

Serviceability Sub-Criteria	Sub-Criteria Weighting
Spare Parts Requirements	20%
Replacement Part Availability	20%
Service Technician Availability	20%
Downtime for Repairs	20%
Fleet Similarity	20%

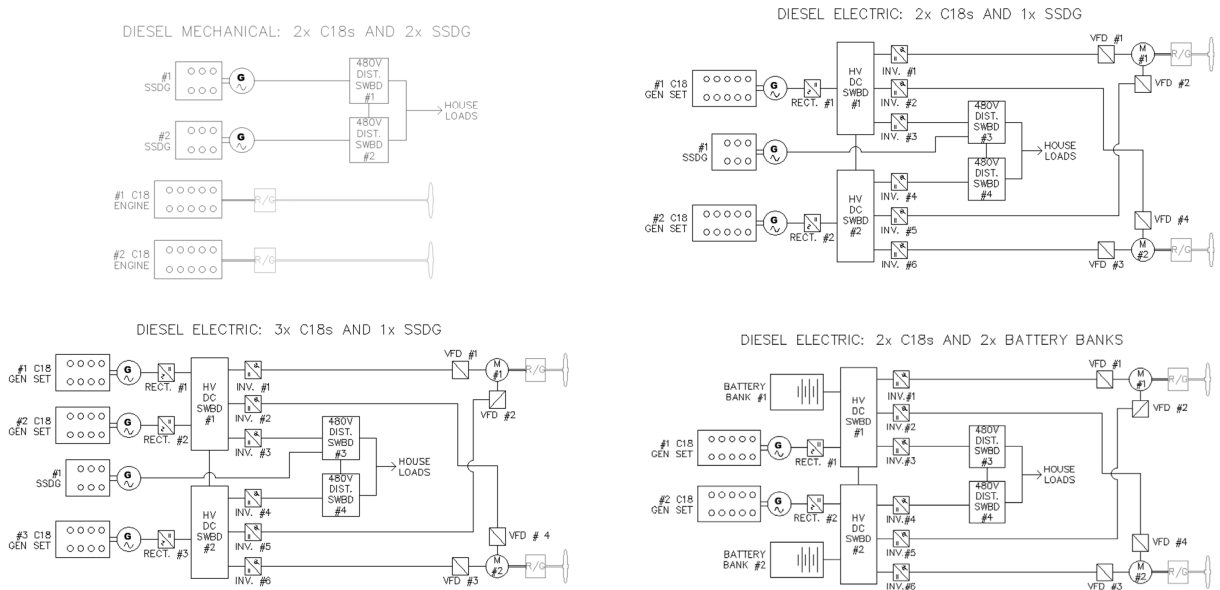
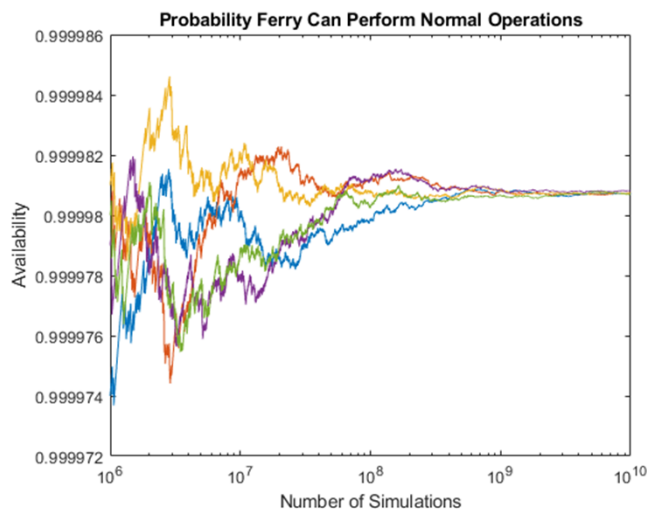
Serviceability Sub-Criteria	MECH	DE 2xC18s	DE 3xC18s	DEWB NMC	DEWB LFP
Spare Parts Requirements	7.00	5.00	5.00	4.00	4.00
Replacement Part Availability	7.00	5.00	5.00	4.00	4.00
Service Technician Availability	7.00	6.00	6.00	4.00	4.00
Downtime for Repairs	7.00	7.00	7.00	5.00	5.00
Fleet Similarity	7.00	6.00	6.00	6.00	6.00
Weighted Sum:	7.00	5.80	5.80	4.60	4.60

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Propulsion System Feasibility Study:

Reliability:

- Monte Carlo simulations were run to evaluate availability of the propulsion systems to perform normal operations



Reliability Sub-Criteria:	MECH	DE 2xC18s	DE 3xC18s	DEWB NMC	DEWB LFP
Availability	7.18	4.40	8.43	10.00	10.00

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