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"Where will our knowledge take you?"

Designing Vessels that Respect the Environment and the Community

Ferry Safety & Technology Conference
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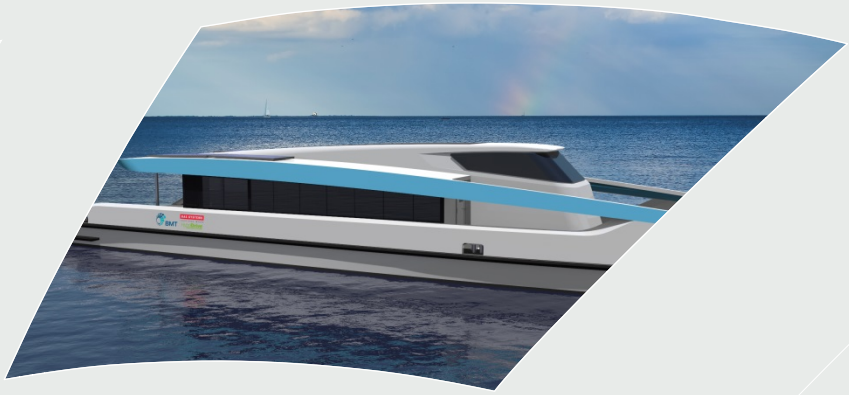
BMT



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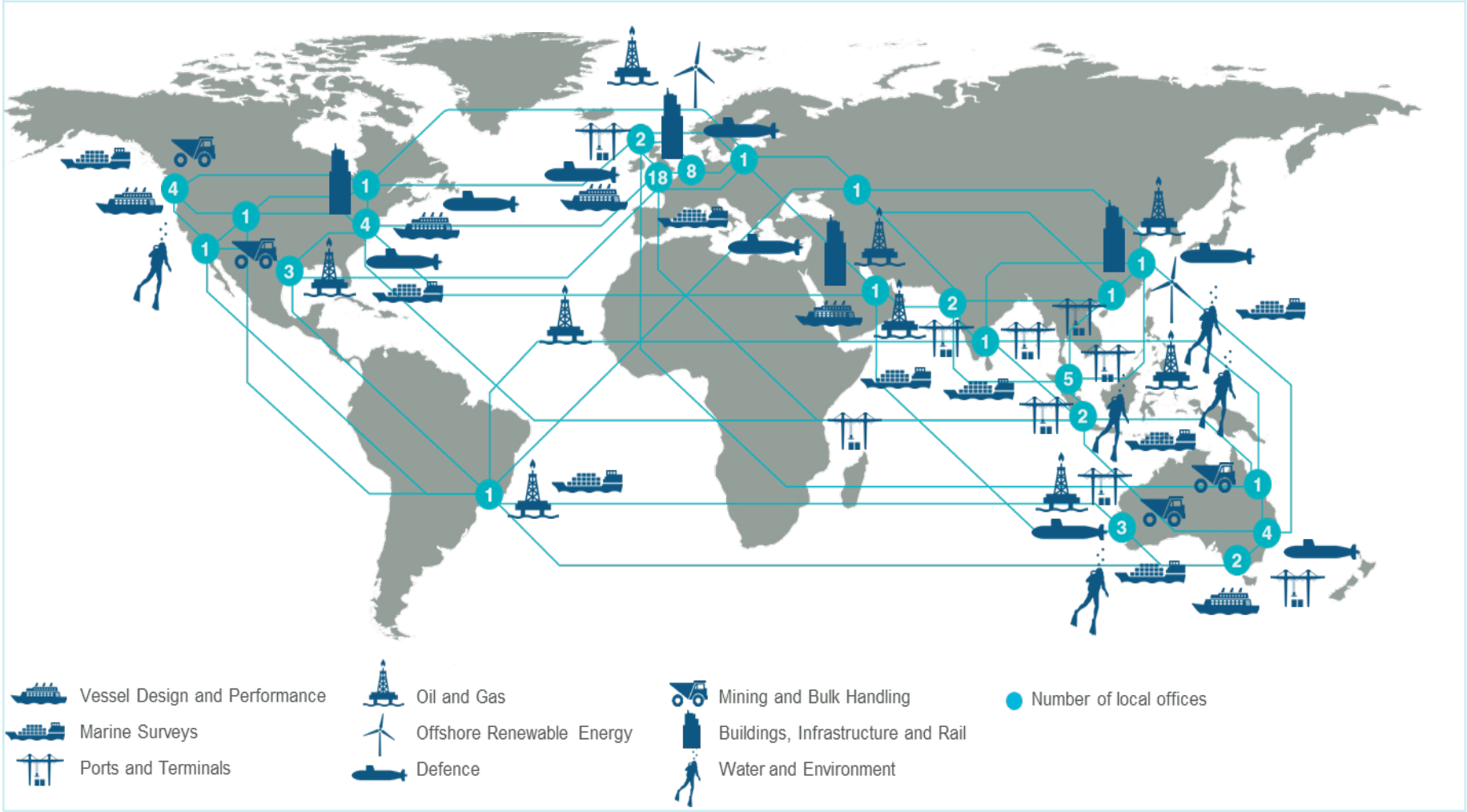
Vessel Design and Performance
Marine Surveys
Ports and Terminals
Oil and Gas
Offshore Renewable Energy
Defence
Mining and Bulk Handling
Buildings, Infrastructure and Rail
Water and Environment
Number of local offices

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A climate of change…

Hybrid and alternative powering solutions have been pushed firmly onto the agenda in recent years.

- The Paris Agreement (197 countries) now ratified

- Many cities around the world are in the process of declaring Clean Air Zones (CAZ), Low emission Zones (LEZ) and Zero Emission Zones (ZEZ).

- Over 220 towns and cities across Europe currently operate or are phasing in LEZ's with many cities around the world following suit with similar initiatives.

- The sight and smell of diesel fumes billowing up from the ferry dock will soon become a conspicuous sight and it's only a matter of time before diesel exhausts will be outlawed completely. – Paris to ban all diesel and petrol cars by 2030.

- 'More than half of new vehicles will be electric and almost all autonomous in the US within 10 years' (Elon Musk – CEO Tesla) - Who would bet against him?

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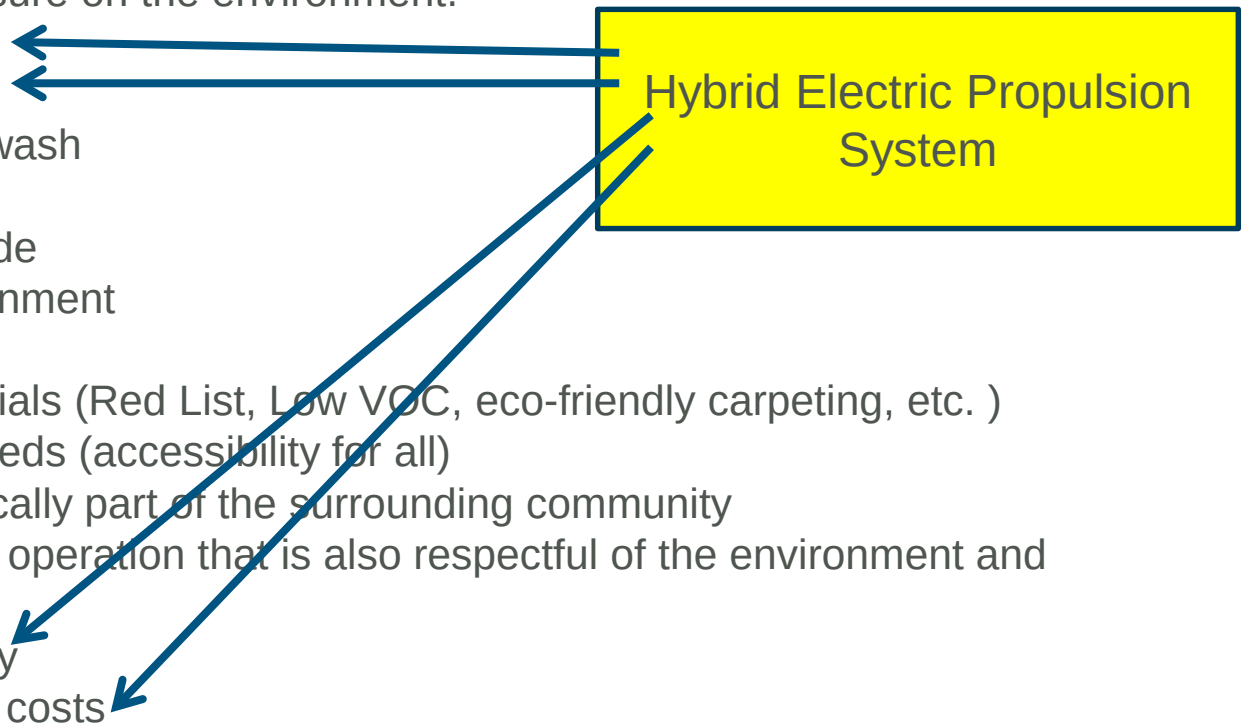
Designing Vessels that Respect the Environment and the Community

- ✓ Serves the community reliably and safely.
- ✓ Places no undo pressure on the environment.
  - ✓ Low emissions
  - ✓ Minimal Noise
  - ✓ Ultra low wake wash
- ✓ Provides passengers
  - ✓ A comfortable ride
  - ✓ A healthy environment
    - ✓ Low noise
    - ✓ Safe materials (Red List, Low VOC, eco-friendly carpeting, etc.)
    - ✓ Specific needs (accessibility for all)
- ✓ Visually and aesthetically part of the surrounding community
- ✓ Promotes a business operation that is also respectful of the environment and community.
  - ✓ Energy efficiency
  - ✓ Low operational costs
  - ✓ Zero discharge
  - ✓ Carbon offsets



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Design Issues with Hybrid Systems

- ✓ Can it deliver the required performance? Route Specific
- ✓ Vessel Characteristics
  - ✓ Space Available?
  - ✓ Weight Margins – Size of battery vs. Charging frequency
  - ✓ Weight locations
- ✓ What system is appropriate?
  - ✓ Series
  - ✓ Parallel
  - ✓ Diesel Electric
- ✓ How do you handle propulsion loads?
- ✓ Operator interface issues?

Basis of Design: Vessel

- ✓ A state-of-the-art ultra-low wake wash parent hull form developed and optimized by BMT.
- ✓ Perfect platform for hybrid ferry design.
- ✓ Eight 30m Waterbuses successfully operating for more than 10 years.

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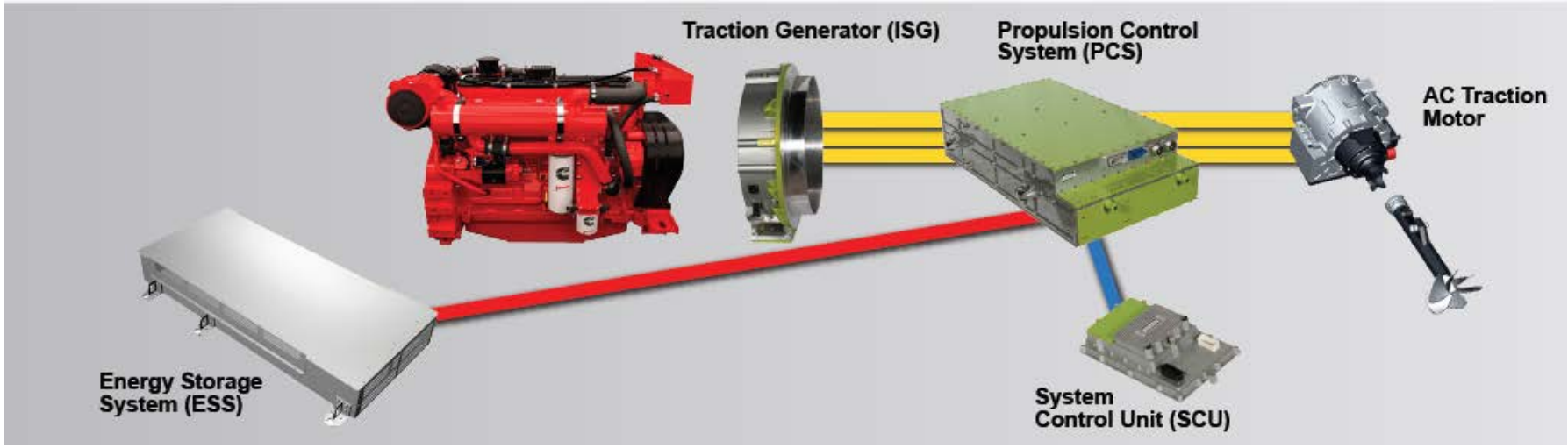
Basis of Design: Hybrid Propulsion System



- Only the traction generator is coupled to the engine.
- Brings a new flexibility to the installation as the diesel generator needn't be in the shaft line enabling optimized trim conditions.
- All drive goes through the AC Traction Motor.
- Generator switches on automatically when the batteries are depleted by 80%
- Engines can operate at a more efficient speed.

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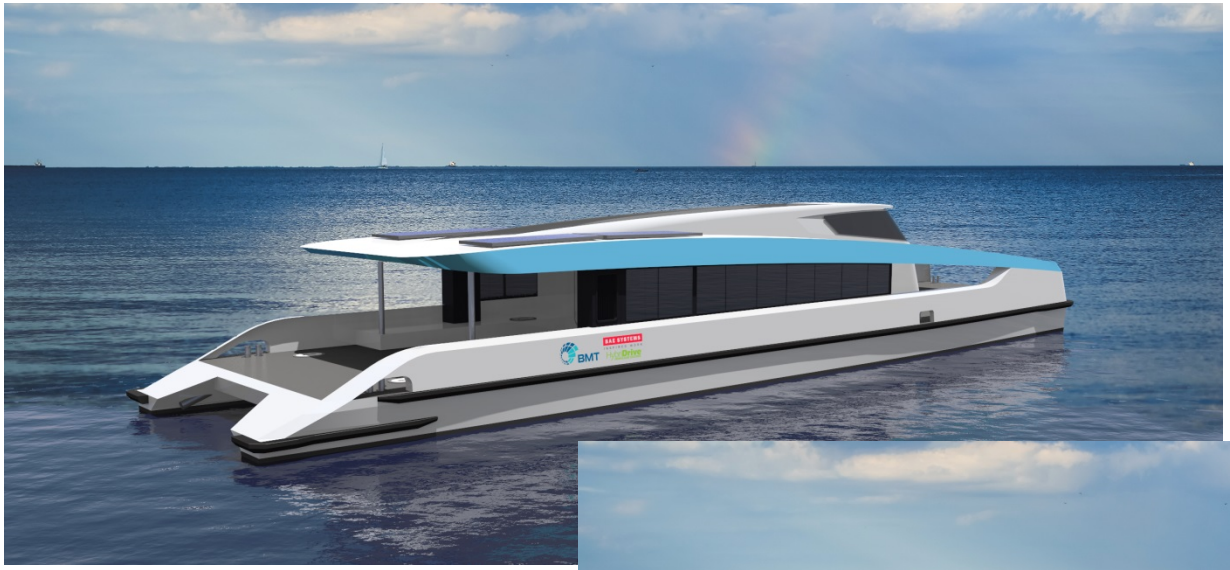
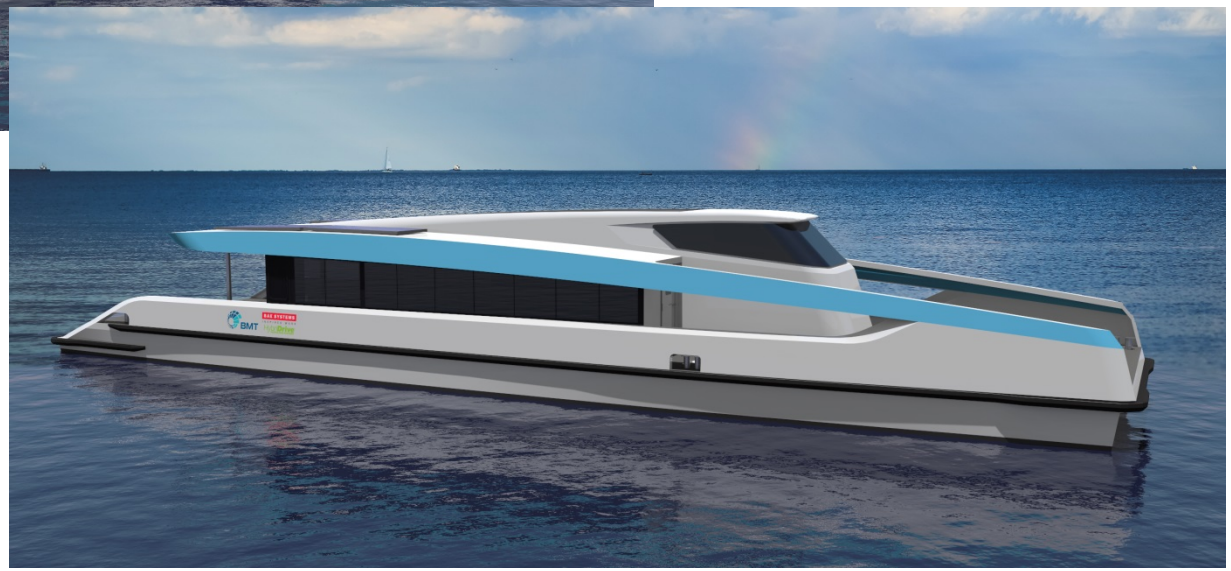
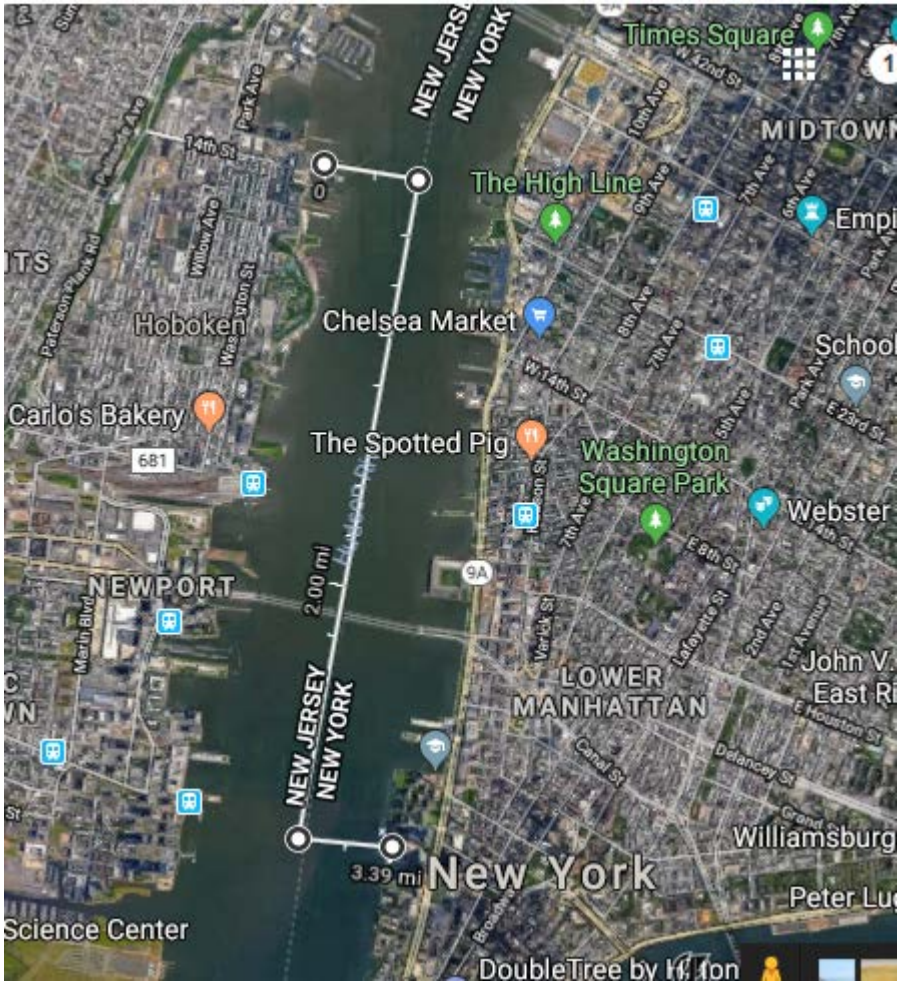
VESSEL





Example Route:
Hoboken 14 St. – World Financial Center Terminal



- ✓ 20 kt transit speed
- ✓ Charge batteries only on long leg
- ✓ On battery during embarkation/disembarkation.
  - ✓ No Exhaust or engine noise

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Operational Scenario

Journey Breakdown (Round Trip)	Time Minutes	Average Speed (knots)	Distance (nm)	Battery Level (%)
Passengers embark	5	0	0.00	99.63
Manoueuvre out from dock	1	1	0.02	99.42
Transit to main Channel	2	8	0.27	98.34
20kt Cruise	6.5	20	2.17	100.00
Transit from main channel to dock	2	8	0.27	98.93
Manoueuvre onto from dock	1	1	0.02	98.71
Passengers Disembark	2	0	0.00	98.56
Passengers embark	5	0	0.00	98.19
Manoueuvre out from dock	1	1	0.02	97.98
Transit to main Channel	2	8	0.27	96.91
20kt Cruise	6.5	20	2.17	100.00
Transit from main channel to dock	2	8	0.27	98.36
Manoueuvre onto from dock	1	1	0.02	98.15
Passengers Disembark	2	0	0.00	98.00

Engines are off for 26 mins out of the 39 minute round trip or 67% of the time

Conclusion

- ✓ System optimized for route
- ✓ Generator(s) operate at most efficient RPM
- ✓ Significant reduction in:
  - ✓ Engine hours
    - ✓ Maintenance Costs
    - ✓ Fuel Consumption/Costs
      - ✓ Emissions
- ✓ Improved Passenger experience.
- ✓ Operator interface issues?
  - ✓ the system integrates seamlessly with the engine controls. The engine manufacturer supplied controls are used.

THANK YOU