Glosten

CONCEPT DESIGN
PROPULSION SYSTEM TRADE-OFF
ENGINEERS COST ESTIMATE
GENERAL UPDATE

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CONCEPT DESIGN

32 Vehicles, 150 Passengers

178' length x 53' beam

Off center deckhouse

Four lanes of vehicles

USCG Subchapter T vessel

Steel hull

Aluminum house and bulwarks

Z-drive thrusters at 750 kW each

DESIGN DRIVERS

Terminal interface

- Governs shape at ends, restricts beam
- Dolphins have limited capacity

High tidal currents

- Installed power dictated by maneuvering requirements
- Short and steep waves means greater freeboard

Vehicle capacity

- Drives overall length of vessel
- Projected to increase 74% over next 40 years

Two round trips per hour

- Charging designed around tempo and adverse weather

Emergency services

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PROPULSION SYSTEM STUDY

Five propulsion options

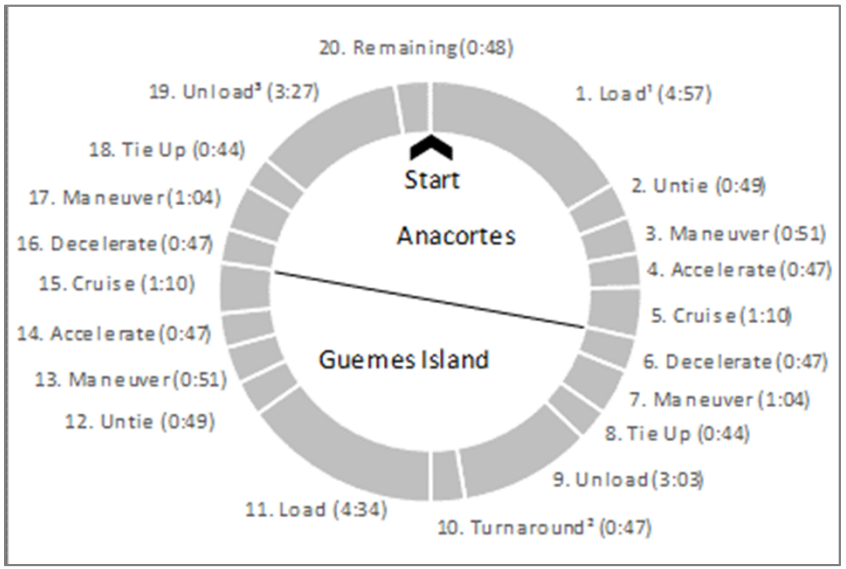
- Geared Diesel (baseline)
- Diesel Electric
- Series Hybrid
- All-Electric
- Plug-in Hybrid

Operational profile is key

Shore power infrastructure

- Charging Anacortes only
- Major driver in capital cost

OPERATING PROFILE



Assumptions

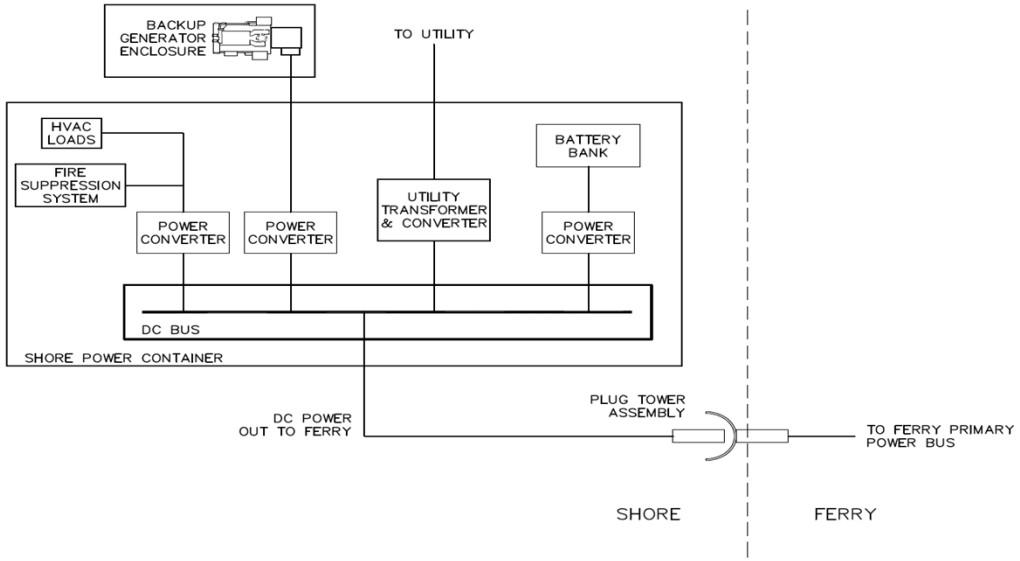
- 32 car ferry
- Maintain 2 round trips per hour

One-Way Profile

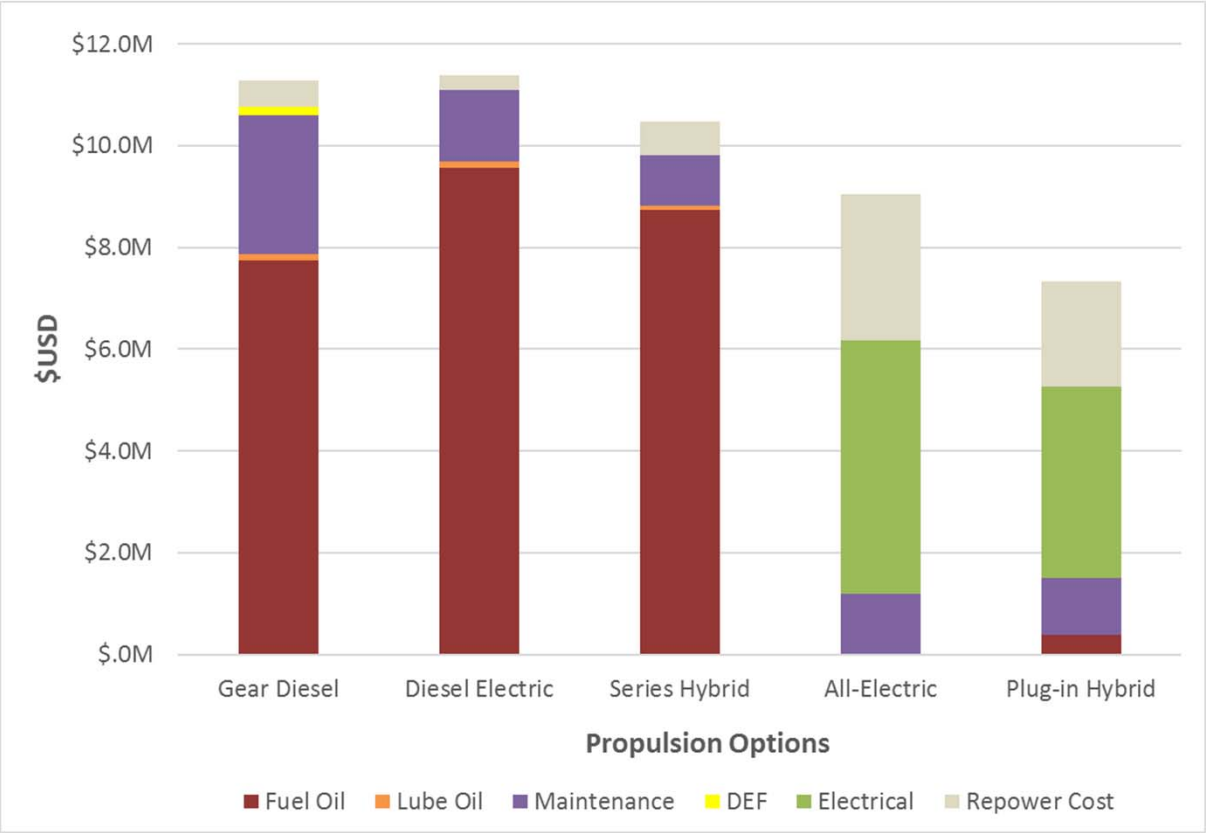
- Load/Unload – 70%
- Maneuver – 6%
- Accelerate – 5%
- Cruise – 8%
- Decelerate – 5%
- Maneuver – 7%

SHORE POWER DESIGN

- Automatic charging system necessary to meet vessel turnaround times (8 min charging)
- Components must be sized to meet peak demand
- One-side charging, infrastructure upgrades on Guemes Island would be cost prohibitive



OPERATING COST – PROPULSION SYSTEM



Consumables

- Annual consumption of Fuel, DEF, Electrical, and Lube Oil
- Propulsion efficiency affects consumption

Maintenance

- Includes oil changes to engine overhauls

Repower

- Mid-life engine repower
- 8 year battery replacement

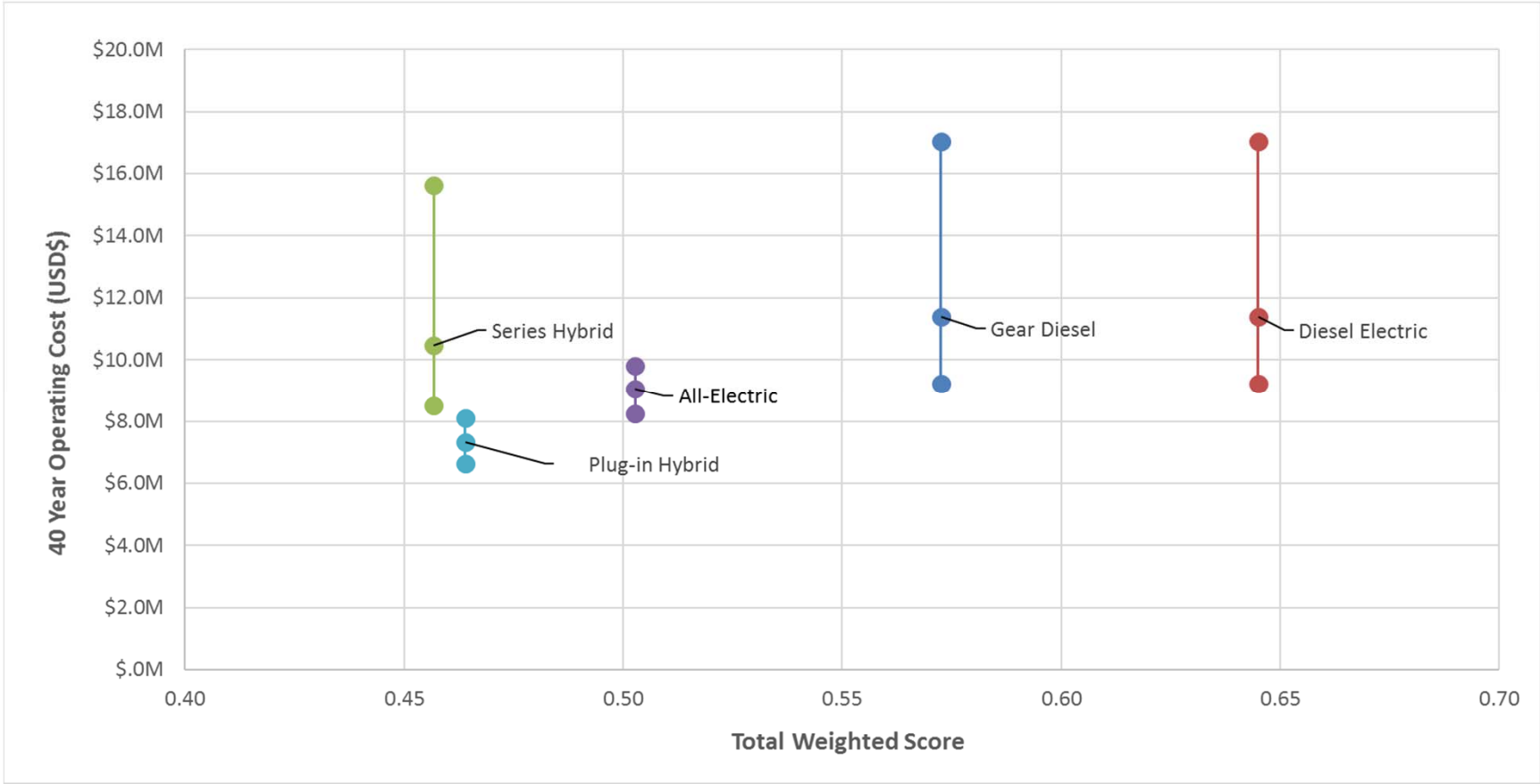
SCORING SYSTEM

- **System Weight** – Weight of all propulsion equipment installed on vessel
- **Design and Build Complexity** – May affect cost of engineering to complete design as well as cost to build the vessel and shore-side infrastructure
- **Reliability and Availability** – Probability of failures based on risk assessment
- **Airborne Noise** – Noise created from vessel engine operation
- **Vessel Air Emissions** – local engine exhaust, measured in particulate matter

Scoring Category	Weighting Factor
Capital Cost	0%
Operations and Maintenance Cost	0%
System Weight	10%
Design and Build Complexity	20%
Reliability and Availability	45%
Airborne Noise	10%
Vessel Air Emissions	15%

Total must equal 100%

OPERATING COST RANGE – PROPULSION SYSTEM



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ENGINEER'S CAPITAL COST ESTIMATE

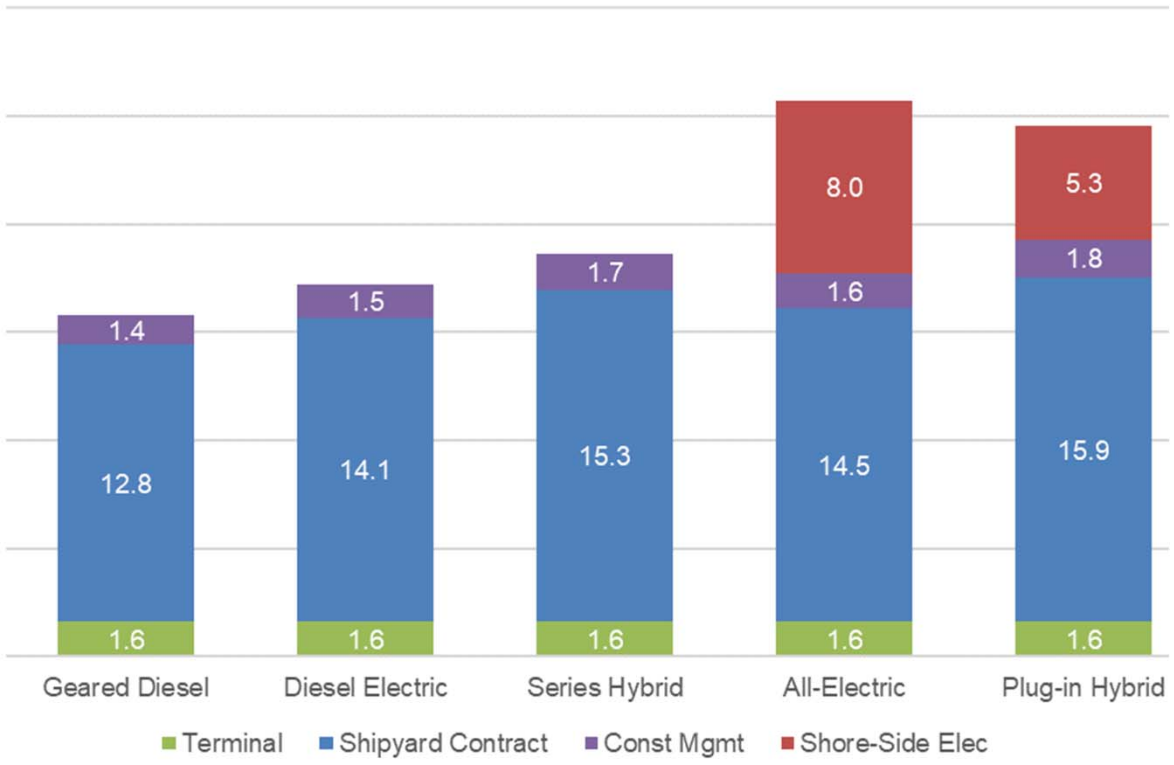
20% contingency

Vessel is tax exempt

8.5% tax for shore

Included:

- County oversight
- Design
- Const. Management



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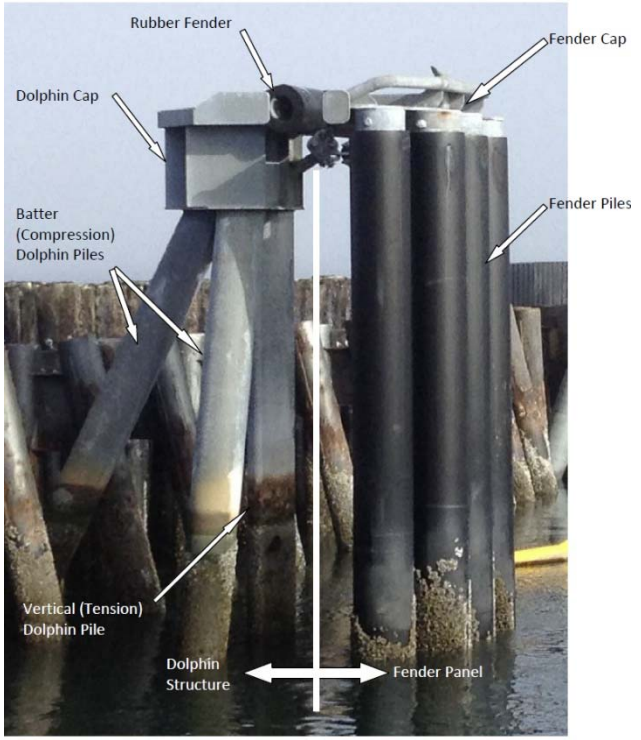
PUBLIC QUESTIONS

Vessel Size and Cost

- **32 vehicles – based on medium low growth projections for 40 year design life**
- **52% increase in capacity**
- **Not Replaced:**
  - Approach spans, transfer spans, towers and headframes, dolphin structure, wingwalls, and breakwater
- **Replaced:**
  - Aprons and dolphin fender panels

Environmental

- **Underwater noise will not be substantially different**
- **Local air pollution significantly less with electric**



PUBLIC QUESTIONS

Capability

- All options presented have the same capability
- Emergency services has small impact on cost
- Frequency of service in adverse weather is driving on-shore costs

Safety

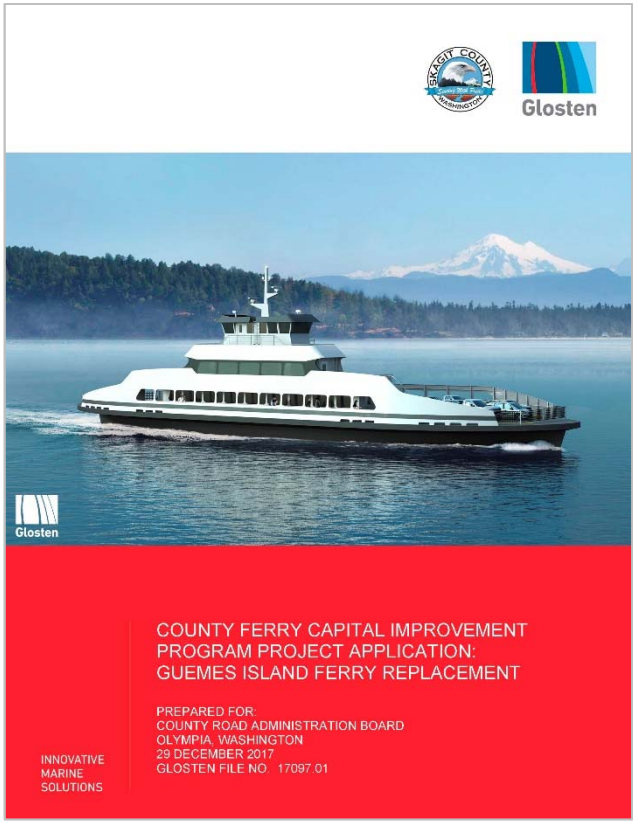
- Fire risk of lithium batteries will be mitigated
- Life rafts under consideration

Ferry Availability

- Reliability of propulsion systems scored
- Equipment choices will consider local service reps

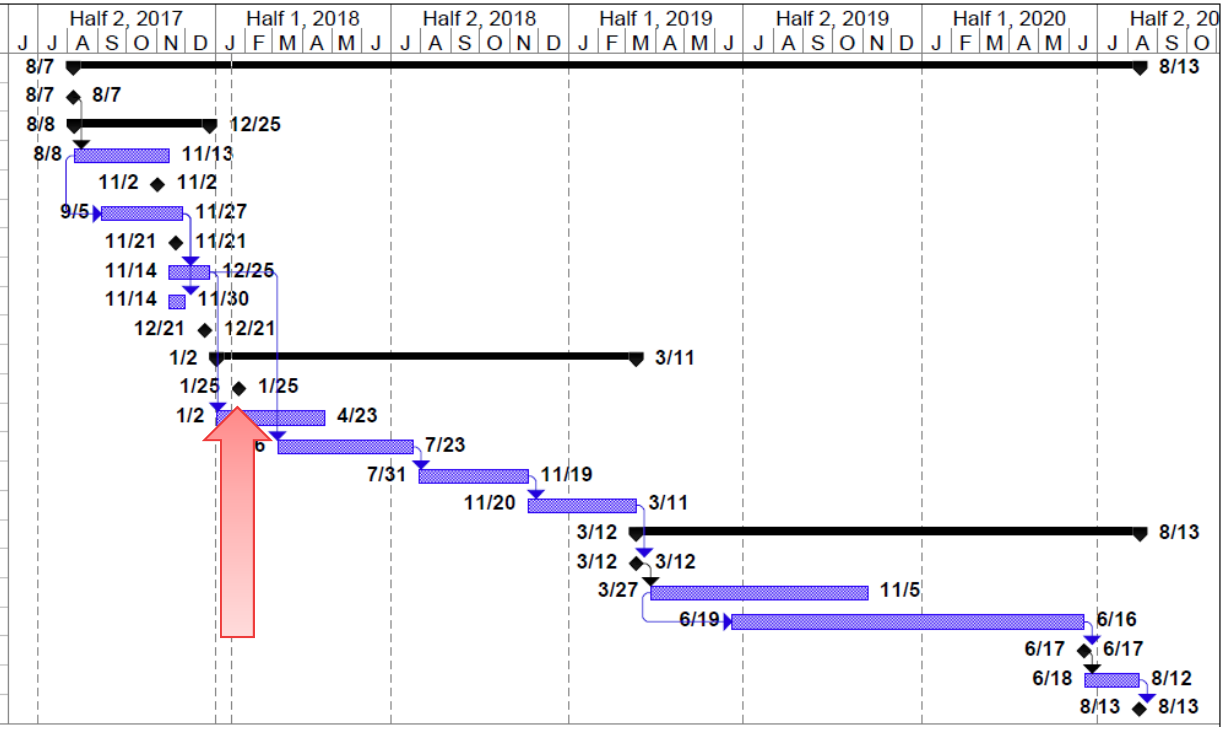
CRAB APPLICATION PACKAGE

- Cover Letter
- Project Overview
- Concept Design Report
- Design Drawings
- Vessel Capacity Study
- Transportation System Assessment
- Engineers Cost Estimate
- Outside Funding Sources
- Financial Plan
- Cash Flow and Amortization Schedule
- Letters of Support



LONG-TERM SCHEDULE

ID	Task Name
1	**Guemes Ferry Replacement**
2	NTP
3	**Phase 1 Design**
4	Design Studies
5	Public Meeting
6	Concept Design
7	Concept Design Review
8	Design to 30%
9	Cost Estimate
10	Submit CRAB Funding Request
11	**Phase 2 Design**
12	Public Meeting
13	CRAB Funding Support
14	Preliminary Design
15	Contract Design
16	IFB and Negotiation
17	**Construction**
18	Shipyard NTP
19	Functional and Production Design
20	Construction
21	Delivery
22	Crew Training
23	Vessel In Service



Q & A

William L. Moon, PE
Jeffrey M. Rider, PE
David W. Larsen, PE
www.glosten.com
206.624.7850