LNG - LOOKING AHEAD

AMERICAN ASSOCIATION OF PORT AUTHORITIES

PHIL MORRELL
VP MARINE OPERATIONS, COMMERCIAL
TOTE SERVICES
# Building the best, by land, air and sea.

- **Our values:** safety, reliability and commitment
- **Family owned and managed**
- **$2.8 billion in annual revenues**
- **More than 7,500 employees**
- **Investment Grade credit rating**
- **90% of earnings reinvested**

<table>
<thead>
<tr>
<th>Company</th>
<th>Subsidiary Description</th>
<th>Revenues</th>
<th>Key Stats</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>FOSS</td>
<td>Largest coastal and harbor service company in the United States</td>
<td>Revenues $435M</td>
<td>Over 150 tugs and barges</td>
<td>2 Shipyards, International towing operations, Hawaii inter-island common carrier</td>
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<tr>
<td>INTERSTATE</td>
<td>National full truckload operation</td>
<td>Revenues $300M</td>
<td>1,500 Tractors, 5,600 Trailers</td>
<td>18 Terminals</td>
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<tr>
<td>NORTHSTAR PETROLEUM</td>
<td>Independent petroleum marketer and distributor in Alaska &amp; Hawaii</td>
<td>Revenues $800M</td>
<td>Over 20 million gallons of fuel storage capacity</td>
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<tr>
<td>NORTHERN AVIATION SERVICES</td>
<td>Largest all-cargo air carrier in Alaska &amp; Hawaii</td>
<td>Revenues $165M</td>
<td>100–150 weekly scheduled flights, Ad-hoc 737 charter service in N.America</td>
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<tr>
<td>TOTE</td>
<td>Leading domestic logistics &amp; marine transportation provider</td>
<td>Revenues $700M</td>
<td>5 Vessels; 4 Sailings per week, Heavy Haul Trucking</td>
<td>170,000 square feet of warehouse, 325 Tractors</td>
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<tr>
<td>Tropical Shipping</td>
<td>Cargo transportation to the Bahamas &amp; The Caribbean</td>
<td>Revenues $500M</td>
<td>14 vessels, Ports from Canada to South Florida, Cargo insurance, consolidation and logistics</td>
<td>Fixed day sailings, fastest transit times</td>
</tr>
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[www.saltchuk.com](http://www.saltchuk.com)
• High-speed, high-quality liner service in US Domestic Trade
  o Washington to Alaska
  o Florida to Puerto Rico
• Logistics based operations in Alaska, Hawaii, and Puerto Rico
  o Terminals in Anchorage, Fairbanks, Kenai, Kodiak, Prudhoe Bay and Seward, as well as Tacoma, WA, Houston, TX, Blaine, MN, and Edmonton, AB
  o Jacksonville and other Southeast locations
• Full technical management and partial management/crewing services
Alaska

- Totem Ocean Trailer Express has been serving Alaska since 1982
- Twice-weekly service to Anchorage
- Transports 30% of all cargo to Alaska
- Orca vessels, delivered in 2003, were built for Alaska
- Currently the most environmentally friendly ships in the trade
Sea Star Line offers twice-weekly service between Jacksonville and San Juan, PR and select Caribbean destinations.

- Transport 23% of all cargo to Puerto Rico.
- Ro/Ro, Ro/Con, break bulk and bulk liquid capabilities.
Acquisition in May 2013 significantly increased cargo consolidation, warehousing, trucking and other logistics capabilities.
North American Emission Control Area (ECA) Challenge and Opportunity
Possible Solutions

- **Do nothing:** Cost of 1% compliant IFO 380 is significantly higher with further increases expected in 2015 and beyond

- **Install exhaust gas cleaning system:** Scrubbers use existing fuel with added costs

- **Convert to Natural Gas:** Meet all current and future emissions requirements, cleanest of all options
LNG – A Clean & Safe Fuel

• Conversion to natural gas will reduce ship emissions well below even the world's most stringent air quality standards that are outlined in the North American Emissions Control Areas.

• LNG will virtually eliminate Particulate Matter (PM) and dramatically reduce Sulfur Dioxide (SOx), Nitrous Oxide (NOx) and Carbon Dioxide (CO2).

• No other viable fuel source provides the same levels of environmental safety.
**MARLIN Class**

- First Steel Cutting on February 24, 2014
- Keel July and November 2014
- Engine mounted for Hull 495
- Launch on schedule April and August 2015
New LNG Ships – MARLIN Class

- 3100 TEU
- First LNG container ships in the world
- Dual fuel capable MAN engine
- Bunker in Jacksonville
- First delivery 4th QTR 2015, second 1st QTR 2016
MARLIN Class

- Slow speed engine fueled by LNG
- Dual fuel capable
- Two 900 cubic meter LNG tanks
- MAN ME-GI Direct drive
- Main and Auxiliary Engines manufactured by Doosan
Bow Thruster

Dual Fuel Diesel Generators (DFDG)
Fisheye view of Hull 495 on Way 4
LNG Tank
Emissions Comparison: *Ponce* versus *Marlin*

Vessel Emissions (kg/annual kFEU-nm)

- **PM emissions**: 99% reduction
- **CO2 emissions**: 71% reduction
- **SOx emissions**: 98% reduction
- **NOx emissions**: 91% reduction

Legend:
- Ponce Class (HFO)
- 3100 TEU Containership (LNG)
Other Important Vessel Attributes

• Marlins will accommodate 5x more 53’ containers than current ships serving Puerto Rico
  – Extension of domestic supply chains
• Increased capacity for refrigerated equipment
  – Multi-temp being tested and evaluated
  – 40’, 45’, 53’ all accommodated
• Specialized container assets will accommodate break bulk, bulk liquids & cars
• Bulk tanks designed to fit 53’ cells below
**ORCA Re-Engine**

- Built for Alaska Trade
- 400,000 gals of LNG needed per week, per ship
- Dual fuel capable Wartsila engines.
- Bunker in Tacoma or Anchorage
- Minimal out of service time during re-engining
ORCA Class

- Wartsila chosen for engine replacement
- NASSCO project design
- Shipyard - TBD later this year as full design packages available. Down selected to 2 yards

1) Replace four existing diesel engines with dual fuel engines
2) Gas Valve Unit, one for each engine (GVU)
3) Fuel Gas Supply (FGS) room
4) LNG containment tanks
5) Bunker station
LNG Bunkering - Jacksonville

- Pivotal/Wespac chosen as vendor
- Short term supply available from existing peak shavers
- Preliminary long term plant location chosen
- Contracting for bulk bunker barge
  - Design considerations
  - Simultaneous operations
  - Common bunker procedures
- Training and safety considerations
**LNG Bunkering - Tacoma**

- Working with PSE for long term LNG supply
- Long term plan is to bunker from a cryogenic pipeline connecting to a plant in the Port of Tacoma
- Port of Tacoma has approved lease of necessary land
- Short term supply sourcing LNG from existing peak shavers
- Close cooperation with USCG and others for safety, operations, common policies across all Ports are important considerations for the future
Jones Act Playing a Significant Role in U.S. Maritime Innovation

Advantages

• Dedicated trade lanes
• Long-term capital investments 🇺🇸
• Consistent weekly bunkering requirements
Snowball Effect of Adoption

Shipboard LNG Technology

Clear regulatory frameworks

LNG infrastructure

Environmental benefits
Some Lessons We Are Learning

- Conversion is difficult and complex
- LNG fuel acquisition critical but available
- Every deployment and vessel type has its own issues
- Regular itineraries are helpful to insure supply of LNG fuel
- Many misconceptions at all levels that require education and outreach
- Bunkering LNG is very different from loading LNG vessels
- Bunkering LNG is safer than current fuels
Now is the Time

- LNG as a transportation fuel will dramatically increase as road, rail and maritime refine the technology
- Clear window of opportunity to develop LNG supply infrastructure for the maritime industry
- For vessels spending a third of their time or more in the ECA, LNG is a viable alternative to consider
- We predict a boom in the construction of dual fuel, LNG powered vessels as well as LNG as a transportation fuel