



Great Lakes Maritime Research Institute

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LNG AS MARITIME FUEL ON THE GREAT LAKES: REGULATORY ISSUES September 27, 2012

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Research Overview/Purpose

- Project Tasking
- Research Process/Field Work
- Current U.S. Regulatory Framework
- Roadblocks to Success
- Recommendations



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Project Tasking

Analyze U.S. Regulations regarding LNG propulsion on commercial vessels

- Identify federal, state and local regulatory gaps
- Review *SS Michigan* Car Ferry Badger Operations and make recommendations
- Roadblocks to Moving Ahead
- Recommendations for Successful Implementation



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Research Process/Field Work

Conducted literature review

Field Work

- Rode SS *Michigan* Car Ferry Badger
- Interviewed Federal, State and Local Officials in Michigan, Wisconsin and Washington D.C.
- Phone interviews of other Federal, State and Local Officials
- Attended LNG Supply Chain Conference – Superior WI
- Norway trip: met with Rolls-Royce, Norwegian Maritime Authority and Det Norske Veritas



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Current U.S. Regulatory Framework

Federal, State and Local regulations

- Vessel
- Facility

Fixed (building)

Portable (tank truck)



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Federal, State and Local Facility Requirements

| Agency/Organization | NFPA | Regulations | Policy | IMO |
|---------------------|------|-------------|--------|-----|
| USCG | YES | NO | YES | NO |
| FERC | NO | NO | NO | NO |
| EPA | NO | NO | NO | NO |
| State of Michigan | YES | NO | NO | NO |
| State of Wisconsin | YES | YES | NO | NO |
| ACOE | NO | YES | NO | NO |
| FMCSA | NO | NO | NO | NO |
| City of Ludington | YES | YES | NO | NO |
| City of Manitowac | YES | YES | NO | NO |
| PHMSA | NO | YES | NO | NO |
| FRA | NO | NO | NO | NO |
| DOE | NO | NO | NO | NO |



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Federal, State and Local Tank Truck Requirements

| Agency/Organization | NFPA | Regulations | Policy | IMO |
|---------------------|------|-------------|--------|-----|
| USCG | YES | NO | YES | NO |
| FERC | NO | NO | NO | NO |
| EPA | NO | NO | NO | NO |
| State of Michigan | NO | NO | NO | NO |
| State of Wisconsin | NO | NO | NO | NO |
| ACOE | NO | NO | NO | NO |
| FMCSA | NO | YES | NO | NO |
| City of Ludington | YES | NO | NO | NO |
| City of Manitowoc | YES | NO | NO | NO |
| PHMSA | NO | NO | NO | NO |
| FRA | NO | NO | NO | NO |
| DOE | NO | NO | NO | NO |



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Federal, State and Local Vessel Requirements

| Agency/Organization | NFPA | Regulations | Policy | IMO |
|---------------------|------|-------------|--------|-----|
| USCG | YES | NO | YES | YES |
| FERC | NO | NO | NO | NO |
| EPA | NO | YES | YES | NO |
| State of Michigan | NO | NO | NO | NO |
| State of Wisconsin | NO | NO | NO | NO |
| ACOE | NO | NO | NO | NO |
| FMCSA | NO | NO | NO | NO |
| City of Ludington | YES | NO | NO | NO |
| City of Manitowoc | YES | NO | NO | NO |
| PHMSA | NO | NO | NO | NO |
| FRA | NO | NO | NO | NO |
| DOE | NO | NO | NO | NO |



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U.S. Coast Guard

- Vessels -Responsible for navigation safety, vessel engineering and safety standards
- Facilities -safety of facilities or equipment located in or adjacent to navigable waters up to the last valve immediately before the receiving tanks
- No Regulations for LNG Propulsion and LNG Facilities (small quantities)
- Case by Case Basis



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U.S. Coast Guard- Current Regulations/Policy

- Navigation and Vessel Inspection Circular (NVIC) 01-2011 (Guidance Related to Waterfront LNG Facilities)
- 33 CFR 127 (Waterfront Facilities Handling LNG)
- COMDTINST 16010.3 (Risk Based Decision-Making Guidelines)
- CG 521 Policy Letter (01-12) : Equivalency Determination – Design Criteria for Natural Gas Fuel Systems
- Maritime Transportation Security Act (33 CFR 104/105)



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U.S. Coast Guard- Current Regulations/Policy

- Current guidance and regulations pertain to facilities that handle LNG (33 CFR 127) as cargo and not applicable to smaller quantities used for fuel
- Coast Guard developing guidance on ship/shore transfer and training requirements
- Merchant Marine Personnel Advisory Committee (MERPAC) formed working group to advise Coast Guard on STCW qualifications



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Army Corps of Engineers

- Facilities (Fixed)

Permit under Section 10 of the Rivers and Harbors Act
Section 404 of the Clean Water Act

- Facility (Tank Truck)

Not Regulated

- Vessel

Not Regulated



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Environmental Protection Agency

- 40 CFR 1042
- Replace entire engine then required to meet the present emissions standards.
- Only modify fuel source then no EPA emission requirements



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Other Federal Agencies

Federal Energy Regulatory Commission (FERC)

- Establishes rates for LNG.
- National Environmental Policy Act
- Natural Gas Act – Siting of facilities for import/export of LNG
- Would not be involved with LNG used as fuel

Pipeline and Hazardous Materials Safety Administration (PHMSA)

- The Federal hazardous materials transportation law (Federal hazmat law), 49 U.S.C. § 5101
- transportation of hazardous materials in interstate, intrastate and foreign commerce by aircraft, railcar, vessel, and motor vehicle.



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Other Federal Agencies

Federal Railroad Administration

- Passenger and Freight Rail Safety
- Hazardous Material Tank Car Safety

Federal Motor Carrier Safety Administration (FMCSA)

- Carriers have to be registered;
- Companies need a US DOT number and a MC number

Department of Energy (DOE)

- Natural gas imports and exports
- Section 3 of the Natural Gas Act of 1938



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Michigan

- Facilities (Fixed)
 - Regulations for CNG but not LNG
 - Case by case basis
 - Submit Application for Installation of Natural Gas Facility
- Facility (Tank Truck)
 - Transfer Operation Not Regulated
- Vessel
 - Not Regulated



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Wisconsin

- Facilities (Fixed)
 - Required State Approved Plans
 - State Review (2009 Commercial Building Code Section 307)
 - Building Permit
- Facility (Tank Truck)
 - Transfer Operation Not Regulated
- Vessel
 - Not Regulated



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Ludington, MI

- Facilities (Fixed)

 - Need Building Permit and City Council Approval

 - Case by case basis; no city ordinance

 - Submit Transfer Procedures to Fire Chief

 - Comply with NFPA Standards

 - LNG fire fighting training

- Facility (Tank Truck)

 - Not Regulated: No Permit or City Council Approval

 - NFPA Standards/fire fighting training/transfer procedures

- Vessel

 - Not Regulated but fire fighting training for fire department



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Manitowoc, WI

- Facilities (Fixed)

 - Need Zoning Permit & Planning Commission Approval (Code 15.350)

 - Conditional Use Building Permit (2009 Commercial Building Code)

 - Submit Transfer Procedures to Fire Chief

 - Comply with NFPA Standards

 - LNG fire fighting training

- Facility (Tank Truck)

 - Not Regulated: No Permit or City Council Approval

 - NFPA Standards/fire fighting training/transfer procedures

- Vessel

 - Not Regulated but fire fighting training for fire department



Supply Chain in Great Lakes

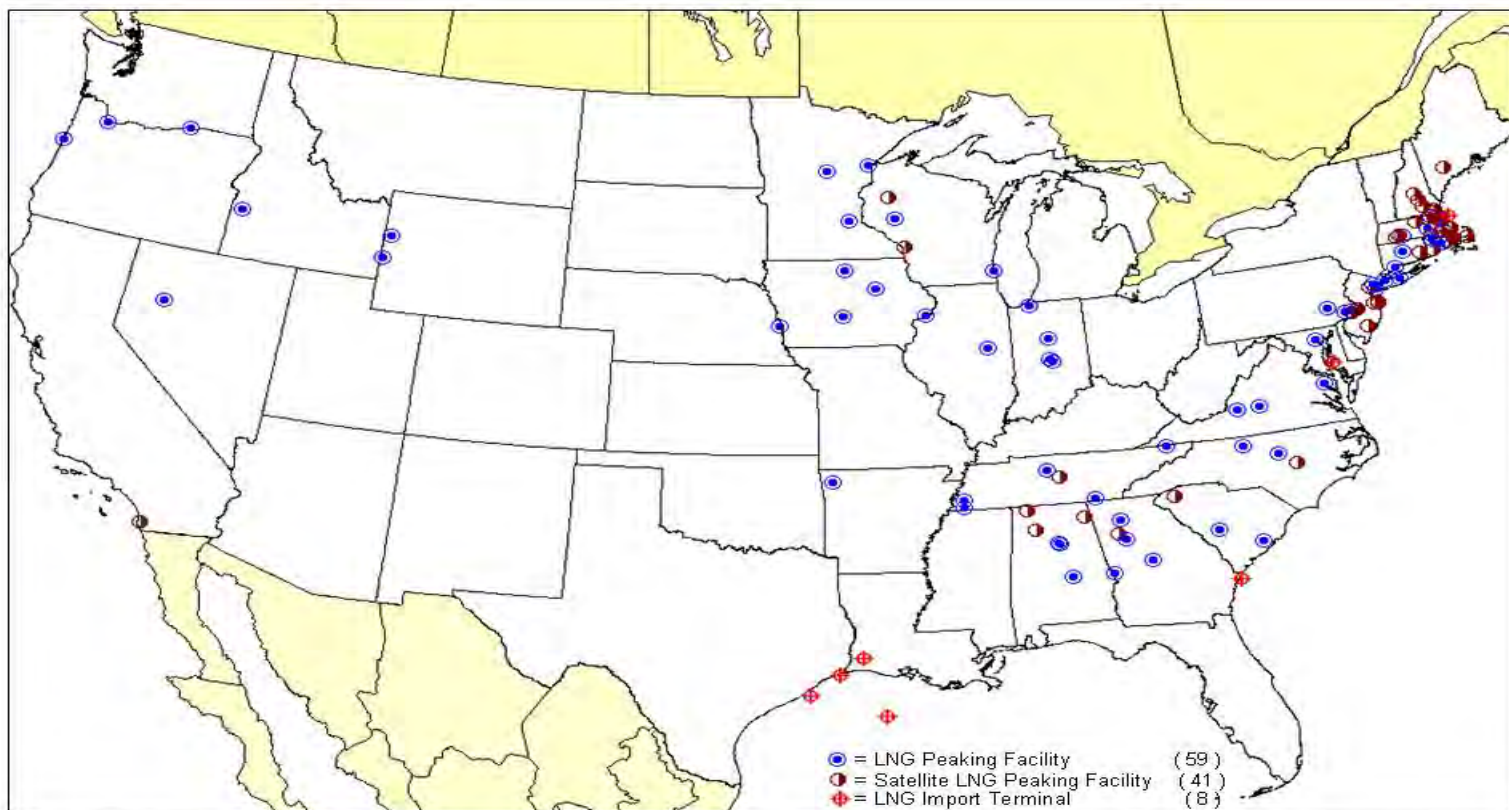
- Plentiful Natural Gas Supply
- Interest from companies to provide LNG
- LNG Peak Shaving facilities in the Great Lakes region
- Badger can be fueled by tank truck



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U.S. LNG Peaking Shaving and Import Facilities, 2008



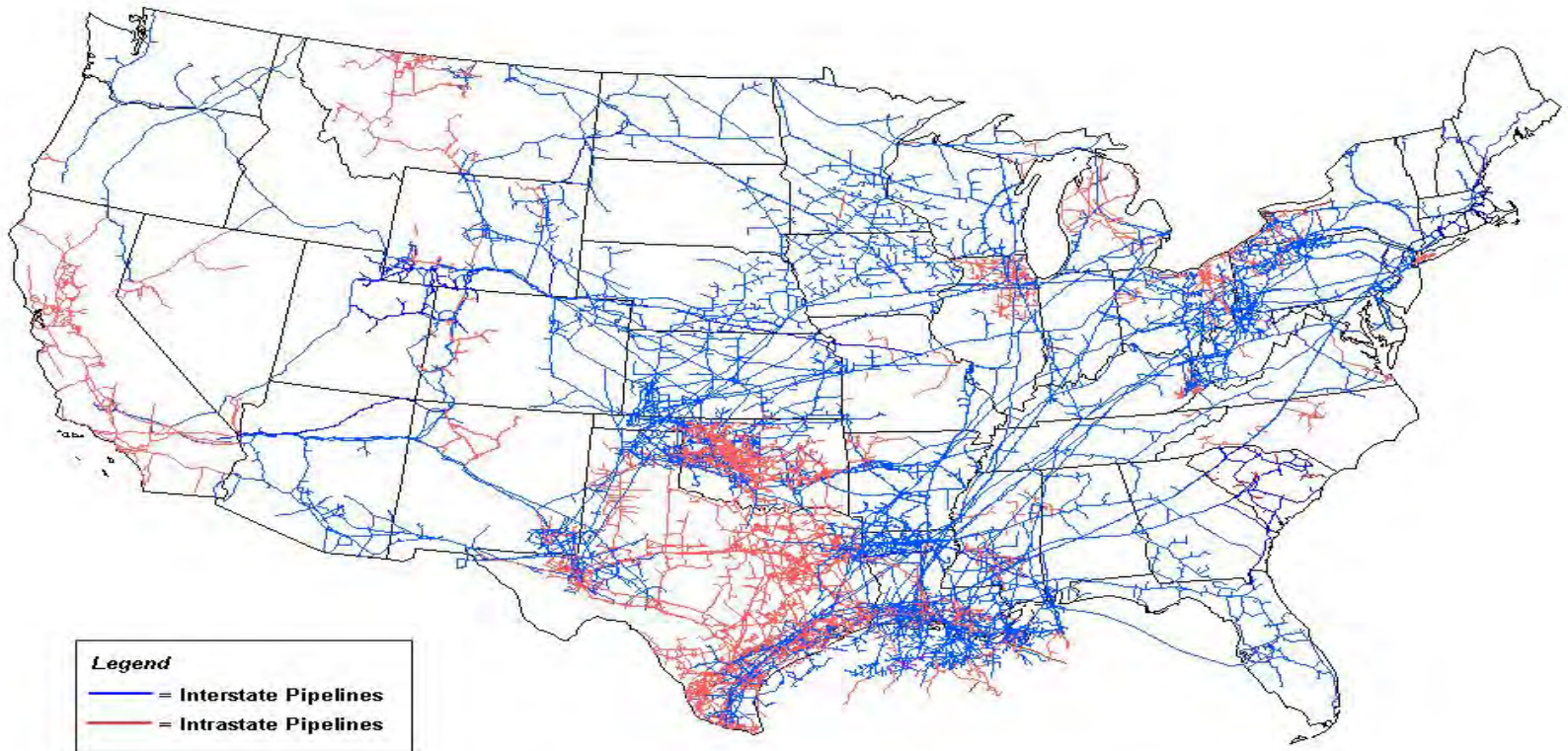
Note: Satellite LNG facilities have no liquefaction facilities. All supplies are transported to the site via tanker truck.
Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division Gas, Gas Transportation Information System, December 2008.



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U.S. Natural Gas Pipeline Network, 2009



Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System



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LNG Use In Norway

- Environmentally Driven
- Supply chain and availability of bunkering station in ports – a concern but increasing
- Significant Quantities of LNG
- 5 LNG production facilities in Norway
- Safe track record of LNG operations
- Norwegian government provides incentives for using LNG technology



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Norwegian LNG Regulations

- Det Norske Veritas (DNV) developed standards for LNG fueled vessels currently adopted by the Norwegian government and served as the basis for IMO Resolution MSC 285(86) (Interim Guidelines for Gas-Fuelled Engines on Ships)
- Non Classified Ships: DNV rules currently in force for gas-fueled engine installations
- LNG bunkering from shore to ship is regulated by the Directorate for Civil Protection and Emergency Planning (DSB).



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NOx Fund

- Establishment of a private NOx fund
- Companies voluntarily contribute funds
- 85 percent of differential costs between the LNG and non-LNG engine plants can be recouped from the fund by companies who upgrade their technology with NOx reducing equipment.



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NMA Recommendations

- Ensure good cooperation between government & industry
- Advertise as green solution
- Positive message to all stakeholders
- Incentive to industry and government



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Roadblocks to Successful Implementation In the Great Lakes

- Stakeholder concern over LNG
- Cost to implement
- Delays in completing Federal, State and Local regulatory requirements
- Lack of LNG supply chain infrastructure
- Non support at Federal, State or Local level



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Recommendations

1. Outreach

- Work closely with Federal, State and Local officials in planning and implementation (i.e., fueling procedures, fire fighting training, transfer requirements, licensing qualifications, etc)
- Develop an outreach plan to obtain buy-in and support from the local community
- Start the process sooner than later



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Recommendations

2. LNG Facilities

- Continue to develop LNG supply chain in Ludington, Manitowoc and around the Great Lakes
- Create a phased-in approach: start out with LNG bunkering by tank truck and develop plans and obtain approvals/permits from applicable federal, state and local agencies for LNG storage tanks or liquefaction plants, if desired.

3. Vessels

- Work closely with the U.S. Coast Guard (Marine Safety Center and Sector Lake Michigan) to obtain plan approval for LNG conversion
- Implement Coast Guard mandates for transfer procedure requirement, training and licensing, when applicable.



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QUESTIONS?