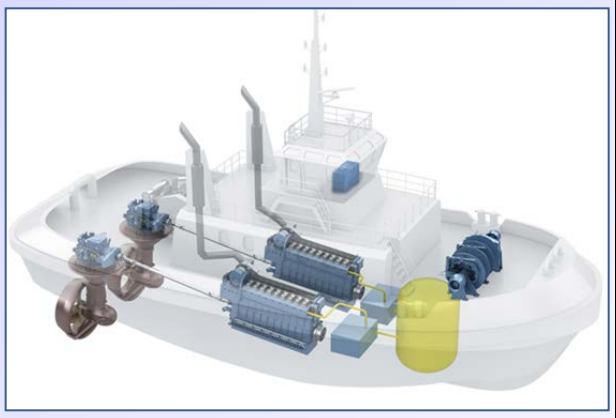
Safety Standards for LNG Fueled Vessels



Transportation Research Board
Marine Board Fall Meeting
October 29, 2014

CAPT John W. Mauger
Office of Design & Engineering Standards
U.S. Coast Guard Headquarters

How to Proceed With Gas Fueled Vessel Design?

- Federal Regulations do not specifically address natural gas as fuel
- Need to establish equivalency to Title 46 CFR
- Vessel-specific concept review
- Design Basis – framework of standards and requirements

Equivalent level of safety to Title 46 CFR

Viking Grace

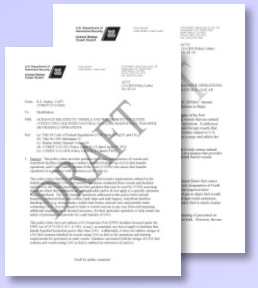
Typical LNG Fuel System Components

WÄRTSILÄ

United States Coast Guard
Marine Safety, Security, and Stewardship

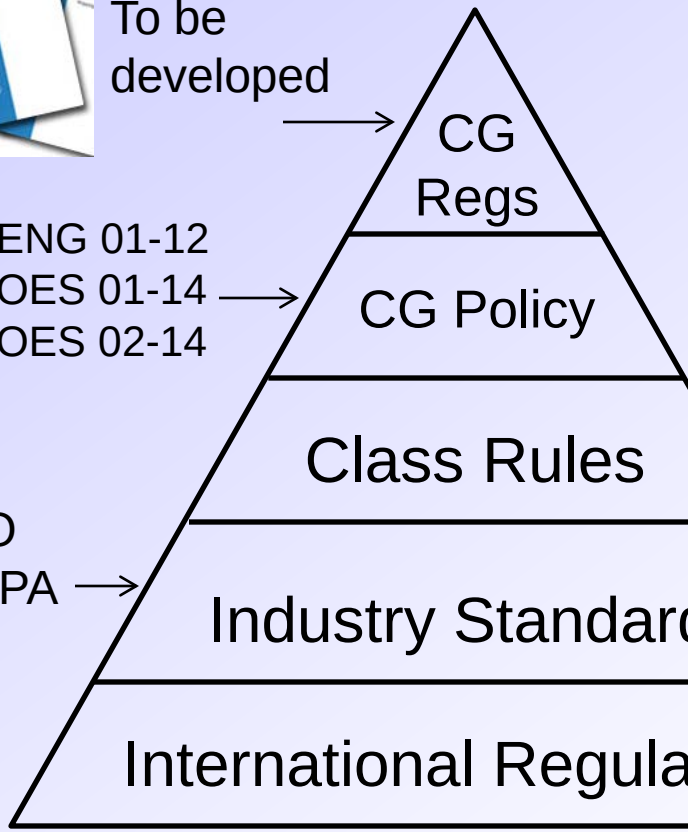
Leveraging International, Industry and Classification Society Standards

To be developed



CG-ENG 01-12
CG-OES 01-14
CG-OES 02-14

ISO
NFPA



ABS
DNV-GL

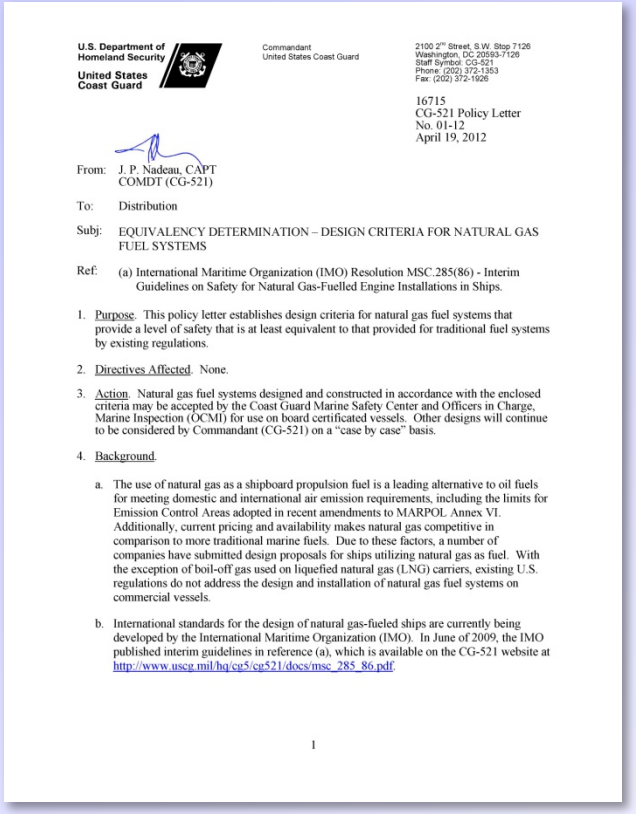
IMO

IMO Standards

- IMO Resolution MSC 285 (86)
  - **"Interim Guidelines on Safety for Natural Gas-fuelled Engine Installations in Ships"**
  - Adopted 1 June 2009
- International Gas Fueled Ships Code (IGF Code)
  - Draft completed - September 2014
  - Anticipated implementation - 2017

U.S. Review of Gas-Fueled Vessels

Policy Letter 01-12



U.S. Department of Homeland Security
United States Coast Guard

Commandant
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2100 2nd Street, S.W. Stop 7126
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Phone: (202) 372-1353
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16715
CG-521 Policy Letter
No. 01-12
April 19, 2012

From: J. P. Nadeau, CAPT
COMDT (CG-521)

To: Distribution

Subj: EQUIVALENCY DETERMINATION – DESIGN CRITERIA FOR NATURAL GAS FUEL SYSTEMS

Ref: (a) International Maritime Organization (IMO) Resolution MSC.285(86) - Interim Guidelines on Safety for Natural Gas-Fuelled Engine Installations in Ships.

1. Purpose. This policy letter establishes design criteria for natural gas fuel systems that provide a level of safety that is at least equivalent to that provided for traditional fuel systems by existing regulations.

2. Directives Affected. None.

3. Action. Natural gas fuel systems designed and constructed in accordance with the enclosed criteria may be accepted by the Coast Guard Marine Safety Center and Officers in Charge, Marine Inspection (OCMI) for use on board certificated vessels. Other designs will continue to be considered by Commandant (CG-521) on a "case by case" basis.

4. Background.

a. The use of natural gas as a shipboard propulsion fuel is a leading alternative to oil fuels for meeting domestic and international air emission requirements, including the limits for Emission Control Areas adopted in recent amendments to MARPOL Annex VI. Additionally, current pricing and availability makes natural gas competitive in comparison to more traditional marine fuels. Due to these factors, a number of companies have submitted design proposals for ships utilizing natural gas as fuel. With the exception of boil-off gas used on liquefied natural gas (LNG) carriers, existing U.S. regulations do not address the design and installation of natural gas fuel systems on commercial vessels.

b. International standards for the design of natural gas-fueled ships are currently being developed by the International Maritime Organization (IMO). In June of 2009, the IMO published interim guidelines in reference (a), which is available on the CG-521 website at http://www.uscg.mil/hq/cg5/cg521/docs/msc_285_86.pdf.

1

- streamlined review process
- provides "equivalent level of safety" to **46 CFR**
- Baseline: **IMO Interim Guidelines**
- add'l requirements & modifications
- designs outside policy can still apply for Concept Review

Safety Considerations

- **Fuel System**
  - Machinery space configuration
  - Tank placement
  - Tank & piping requirements
- **Gas Detection**
  - System certification
- **Hazardous Locations**
  - Classification of areas
  - Electrical equipment
- **Fire Protection**
  - Installed firefighting systems
  - Fire detection

Policy Letter 01-12 – Limitations

Policy does not address the following:

- fuel stored as compressed natural gas (CNG)
- single-wall gas piping in engine room (ESD-concept)
- fuel tanks below accommodation spaces
- Portable fuel tanks, or "tank-tainers"

Limited Scope:

- vessel & system design, not operational requirements

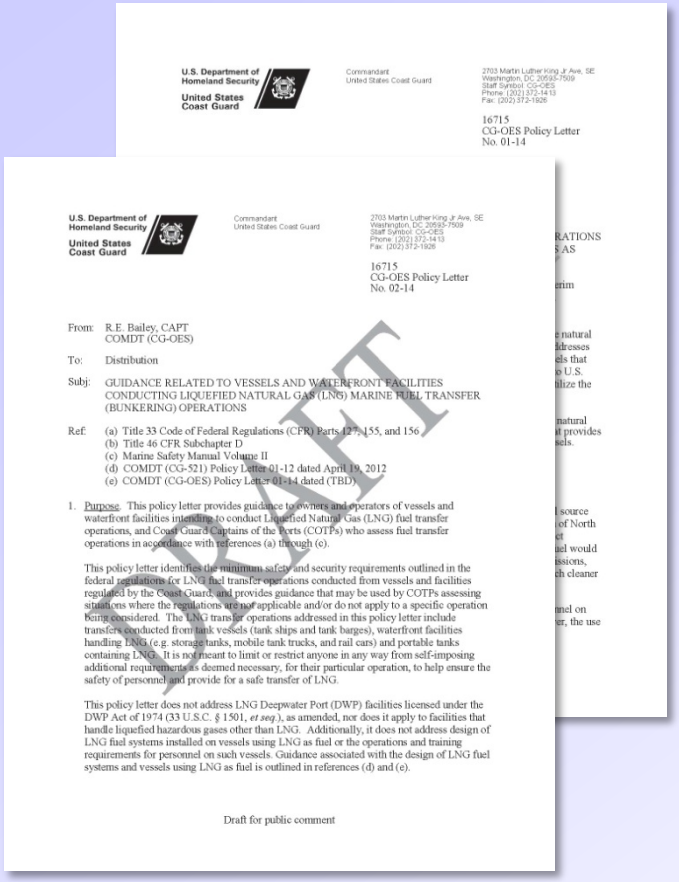
Regulation of Fueling Infrastructure

Shore to Ship

Tank Truck to Ship

Ship to Ship

U.S. Coast Guard Policy Letters



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16715
CG-OES Policy Letter
No. 01-14

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16715
CG-OES Policy Letter
No. 02-14

From: R.E. Bailey, CAPT
COMDT (CG-OES)

To: Distribution

Subj: GUIDANCE RELATED TO VESSELS AND WATERFRONT FACILITIES CONDUCTING LIQUEFIED NATURAL GAS (LNG) MARINE FUEL TRANSFER (BUNKERING) OPERATIONS

Ref: (a) Title 33 Code of Federal Regulations (CFR) Parts 127, 155, and 156
(b) Title 46 CFR Subchapter D
(c) Marine Safety Manual Volume II
(d) COMDT (CG-521) Policy Letter 01-12 dated April 19, 2012
(e) COMDT (CG-OES) Policy Letter 01-14 dated (TBD)

1. Purpose. This policy letter provides guidance to owners and operators of vessels and waterfront facilities intending to conduct Liquefied Natural Gas (LNG) fuel transfer operations, and Coast Guard Captains of the Ports (COTPs) who assess fuel transfer operations in accordance with references (a) through (e).

This policy letter identifies the minimum safety and security requirements outlined in the federal regulations for LNG fuel transfer operations conducted from vessels and facilities regulated by the Coast Guard, and provides guidance that may be used by COTPs assessing situations where the regulations are not applicable and/or do not apply to a specific operation being considered. The LNG transfer operations addressed in this policy letter include transfers conducted from tank vessels (tank ships and tank barges), waterfront facilities handling LNG (e.g. storage tanks, mobile tank trucks, and rail cars) and portable tanks containing LNG. It is not meant to limit or restrict anyone in any way from self-imposing additional requirements as deemed necessary, for their particular operation, to help ensure the safety of personnel and provide for a safe transfer of LNG.

This policy letter does not address LNG Deepwater Port (DWP) facilities licensed under the DWP Act of 1974 (33 U.S.C. § 1501, *et seq.*), as amended, nor does it apply to facilities that handle liquefied hazardous gases other than LNG. Additionally, it does not address design of LNG fuel systems installed on vessels using LNG as fuel or the operations and training requirements for personnel on such vessels. Guidance associated with the design of LNG fuel systems and vessels using LNG as fuel is outlined in references (d) and (e).

Draft for public comment

DRAFT

Short Term Solution to Bridge Gaps:

- Policy letters drafted to bridge gaps in regulations
- Policy letters based on existing regulations applicable to LNG cargo operations scaling down to fit needs and accomplish safety mission.
- Aligned with ongoing work of leading international organizations (e.g. IMO, ISO, SIGTTO, etc.).
- Utilize existing USCG OCMI/COTP authorities to implement existing regs & evaluate safe alternatives.

Next Steps?

- Continue development of national/international standards
  - Domestic bunkering, training, risk assessment policies
  - Design policy for LNG bunker barge
  - IMO IGF Code, ISO Bunkering Standard for LNG Fuel, NFPA 52 Vehicular Gaseous Fuel Systems – Marine Chapter
- Continue discussions with broader stakeholder to address 'System' issues associated with:
  - Maintenance and repair, drydock, hotwork, salvage and emergency response

Thank You

CAPT John Mauger
Office of Design & Engineering Standards
U.S. Coast Guard Headquarters, Washington, DC

www.uscg.mil/hq/cg5/cg521