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CG-OES Policy Letter
No. 02-14

From: R.E. Bailey, CAPT
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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 (c).

   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).

2. Action. Coast Guard COTPs assessing operations involving the transfer of LNG for use as fuel should refer to this policy letter for guidance in evaluating LNG fuel transfer operations in their COTP zones. Owners and operators of vessels and waterfront facilities conducting LNG transfer operations as well as owners and operators of vessels using LNG as fuel should be familiar with the contents of this policy letter.

3. Directives Affected. None.

4. Background.

   a. On 1 August 2012, the North American Emission Control Areas (ECA) as designated by the International Maritime Organization came into force. The ECA is intended to reduce air pollution and will impose enforceable limits on a variety of air emissions from vessels. In order to comply with these stricter emissions standards, there has been a growing interest by the maritime industry in converting and/or constructing vessels to use LNG as fuel. LNG produces substantially lower air pollutants and by converting to its use as a primary marine fuel source, the maritime industry is looking to achieve compliance with the more restrictive air emissions limits.

   b. The maritime industry is considering a variety of methods for supplying LNG to vessels for use as fuel. Such methods include, but are not limited to, supplies delivered from vessels (e.g. barges, and small tankers), or via shore based structures (e.g. storage tanks, mobile tank trucks, and rail cars).

   c. To meet the growing demand for LNG marine fueling operations, international organizations (e.g., International Maritime Organization and the International Standards Organization) are working to develop guidelines that countries can use to establish standardized infrastructure and operational procedures to help ensure LNG marine fuel transfer operations are conducted safely and uniformly in the global maritime community. However, these guidelines remain a work in progress, and it is unclear whether the standards will be published in time to meet the needs of the maritime industry.

5. Discussion.

   a. This policy letter has been developed to assist owners, operators, and Coast Guard units understand the existing U.S. regulations that apply to various types of LNG marine fuel transfer operations currently being considered. In addition to existing regulations, the Coast Guard has referred to applicable international guidance, and best available information relative to the ongoing work that is being conducted to develop international standards for LNG fueling operations.

   b. Regulations for waterfront facilities handling LNG are contained in 33 CFR Part 127. Although written primarily to address large quantities of LNG imported or exported as

cargo, it contains general regulations which are applicable where LNG is being transferred between vessels and shore-based structures, including tank trucks and rail cars.

c. Vessels transferring LNG for use as fuel are tank vessels and are regulated in accordance with 46 CFR subchapter D and, in most cases, subchapter O and 33 CFR Parts 155 and 156.[1] Owners of tank barges intending to transport LNG as cargo should contact the U.S. Coast Guard, Headquarters Office of Design and Engineering Standards, Commandant (CG-ENG) to discuss design requirements.

d. The regulations in 33 CFR Part 127 are issued under the Port and Waterways Safety Act (PWSA), and apply to structures that are located in, on, or under the navigable waters of the U.S. Under the PWSA, navigable waters of the U.S. are measured as 12 nautical miles from the territorial sea baseline. However, for jurisdictional purposes, waterfront facilities handling LNG must be located shoreward of a State's seaward boundary in order for 33 CFR Part 127 to apply.[2] Generally, State seaward boundaries extend 3 nautical miles from the territorial sea baseline; however, the west coast of Florida, Texas, and Puerto Rico have seaward boundaries that extend out to 9 nautical miles. Structures located beyond State seaward boundaries that are used or intended for use as a port or terminal for the transportation, storage or further handling of oil or natural gas to a State are considered deepwater ports and are regulated under 33 CFR Parts 148-150.

e. Enclosures (1) and (2) identify the existing regulations discussed in paragraphs (b) and (c) and provide recommendations which may be used by Coast Guard COTPs/OCMIs when evaluating alternatives for procedures, methods, or equipment as a means for complying with applicable regulations. Enclosure (3) lists current regulations related to the operation of tank barges and tank ships found in 46 CFR parts 35 and 154. As used in the context of this document, the words "must" and "shall" are used in the context of mandatory requirements imposed by the Code of Federal Regulations (CFRs). The words "should" and "may" are used to describe a preferred provision or describe alternatives respectively.

6. Disclaimer. While the guidance contained in this document may assist the industry, public, Coast Guard, and other Federal and State regulators in applying statutory and regulatory requirements, the guidance is not a substitute for applicable legal requirements nor is it a regulation itself. Thus, it is not intended to nor does it impose legally binding requirements

[1] 33 CFR 156 Subpart B adopts the definition of hazardous material found at 33 CFR 154.105. This definition of hazardous material excludes liquefied gases, including LNG. However, regulations at 46 CFR Part 154 (Safety Standards for Self-Propelled Vessels Carrying Bulk Liquefied Gases) clarify that transfers of liquefied gases must meet the requirements of references (a) and (b).

[2] The Deepwater Port Act regulates structures located beyond State seaward boundaries that are used to handle natural gas for transportation to or from any State (see 33 USC 1502, as amended).

on any party outside the Coast Guard.

7. Changes. This policy letter will be posted on the web at www.homeport.uscg.mil. Changes to this policy will be issued as necessary. Suggestions for improvements of this policy should be submitted in writing to Commandant (CG-OES) at the address listed on the first page.

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Encl: (1) Regulations and Recommendations for Waterfront Facilities Bunkering LNG
(2) Regulations and Recommendations for Vessels Bunkering LNG
(3) Operational Requirements found in 46 CFR Parts 35 and 154

Regulations and Recommendations for Waterfront Facilities Bunkering LNG

This enclosure outlines the existing regulations applicable to various types of LNG bunkering operations performed from waterfront facilities handling LNG. LNG bunkering operations conducted by tank vessels (e.g., tank barges and tank ships) are addressed in enclosure (2).

Waterfront facilities handling LNG are subject to existing regulations at 33 CFR part 127. These existing regulations should be applied to LNG bunkering activities to the extent practicable. Where specific requirements are not practicable or where alternatives are otherwise appropriate, the Coast Guard Captain of the Port (COTP) should use the existing process in 33 CFR 127.017 to consider alternatives.

1. Regulations and Alternatives under 33 CFR Part 127

Section 127.005 defines a waterfront facility handling LNG to include any structure on, in, or under the navigable waters of the United States, or any structure on land, or any area on shore immediately adjacent to such waters, used or capable of being used to transfer liquefied natural gas, in bulk, to or from a vessel. The definition is further clarified in the Marine Safety Manual (see MSM Volume II, Section B, Chapter 7.C). It includes any pier, wharf, dock or similar structure to which a vessel may be secured that is used, or is capable of being used, to transfer LNG to or from a vessel, in bulk. It includes areas of land, water, or land and water under and in immediate proximity to the structure, buildings on or contiguous to the structure, and equipment and materials on the structure or in the buildings. Additionally, in discussing facilities and structures, the MSM defines "bulk" as a material that is transported on board a vessel without mark or count and which is loaded into a hold or tank on a vessel without containers or wrappers (see MSM Volume II, Section B, Chapter 7.B.2).

The regulations in 33 CFR Part 127 were established to ensure that a minimum level of safety is provided for LNG transfer operations conducted between shore structures and marine vessels. They outline requirements pertaining to general information, general design, equipment, operations, maintenance, firefighting, and security. Because the regulations cannot foresee all possible situations, they provide the Coast Guard COTP the ability to allow alternative procedures, methods, or equipment to be used in place of the regulations, if those alternatives provide at least the same degree of safety provided by the regulations. The procedures for considering alternatives are outlined in 33 CFR 127.017.

An owner or operator may request alternative procedures, methods, or equipment by following the request process outlined in 33 CFR § 127.017. The request should identify the "gaps" where requirements cannot be met or are not appropriate, and should explain what alternatives the COTP should consider instead. Whenever possible, owners and operators should reference existing standards, practices, and procedures to help substantiate the request.

a. LNG Tank Trucks and Railcars

Independently, LNG tank trucks and railcars are not considered waterfront facilities handling LNG. However, when trucks or railcars are used as a means for transferring LNG to a marine vessel, the location where the transfer occurs (i.e., any area on shore immediately adjacent to such waters, used or capable of being used to transfer liquefied natural gas, in bulk, to or from a vessel) becomes subject to the existing regulations at 33 CFR Part 127.[1] In addition to the requirements and alternatives discussed in the previous section, COTPs should be aware that tank trucks and rail cars are subject to additional, existing State and Federal requirements.

Discussion

Any location where LNG tank trucks or railcars are used to transfer LNG to vessels for use as a marine fuel must be viewed and regulated as a waterfront facility handling LNG. The owner of the structure or area of land where the transfer occurs and the operator of the tank truck or railcar conducting the operation are jointly responsible for ensuring that the requirements in 33 CFR Part 127 are met if a LNG transfer takes place.

Tank trucks, railcars, and their associated equipment should meet applicable state and/or federal design requirements which they are normally required to meet. In general, the federal requirements for carriage of hazardous materials by highway and railway outlined in 49 CFR Parts 172, 173, 174, 177 and 179 will apply. Operators of tank trucks and/or railcars should meet the applicable state and/or federal requirements for training along with other requirements which may be imposed for persons in charge of a shoreside LNG transfer operation (e.g., 33 CFR 127.301 and 49 CFR 172.704).

Coast Guard jurisdiction of waterfront facilities handling LNG applies primarily over the marine transfer area for LNG as defined in 33 CFR 127.005. For the particular case at hand, this should generally be from the vessel to the last manifold or valve immediately before the tank truck or railcar and would normally include associated piping and transfer hoses. However due to this unique situation and potential for overlapping federal jurisdiction between the Coast Guard and the Department of Transportation, special consideration should be given to the Hazardous Material Regulations outlined in 49 CFR Subchapter C. Owners and operators intending to use tank trucks or rail cars as part of their LNG transfer operation should provide the COTP with a detailed list of requirements in 49 CFR Subchapter C that are applicable to their intended operation.

Typical tank trucks and railcars will carry around 13,000 gallons (49.2 m^3) and 34,500 gallons (130.6 m^3) of LNG respectively. These quantities are far less than the 265,000

[1] See e.g., Coast Guard Marine Safety Manual, Volume II, Section B, Chapter 7: Marine Facilities and Structures, p. B7-6.

m^3 cargo capacity vessels envisioned by the regulations. Accordingly, it would be appropriate for the COTP to consider alternatives for some of the requirements outlined in 33 CFR Part 127 when considering these types of operations. However, as noted previously, the regulations should be applied to the extent practicable utilizing the provisions in 33 CFR 127.017 allowing the COTP to consider alternatives. See the previous section for additional details on alternatives.

Facility owners and operators must ensure that all aspects of the tank truck and/or railcar operations are incorporated into the operational requirements outlined in 33 CFR Parts 127.301 to 127.321, which includes emergency response planning and fuel transfer operations. Owners and operators of facilities proposing to use tank trucks and/or rail cars should also ensure that the requirements listed below are taken into consideration when developing operations and emergency manuals and evaluating security risks associated with their LNG transfer operations:

49 CFR Subpart G (172.600-172.606) – Emergency Response Information
49 CFR Subpart H (172.700-172.704) – Training
49 CFR Subpart I (172.800-172.822) – Safety and Security Plans

b. Storage Tanks Ashore

Storage tanks on shore with pipelines leading to a manifold at a pier may also meet the definition of waterfront facility handling LNG, and would also be subject to 33 CFR part 127. As is discussed in the previous section on tank trucks and railcars, the quantity of LNG stored on shore may be far less than that envisioned by the regulations and in that regard may give rise to the need for consideration of alternatives under 33 CFR 127.017.

Discussion

Design requirements for the storage tanks, associated equipment, and piping systems outside the marine transfer area defined in 33 CFR 127.005 will be subject to local, state, or federal requirements depending on the details of the design. Unlike LNG import and export facilities which are subject to direct federal oversight from the Federal Energy Regulatory Commission (FERC), permitting of the siting, construction, and operation of smaller LNG bunkering facilities may be shared between a variety of federal, state, and local agencies. As required by 33 CFR127.007(c)(2), owners proposing these types of facilities should identify and consult with appropriate local, state and federal authorities to determine the applicable regulations which may apply. In the unlikely event that no local, state or federal authority having jurisdiction can be identified, COTPs should consult with the U.S. Coast Guard Headquarters, Office of Operating and Environmental Standards (CG-OES) for further discussion and guidance.

c. Vessels Moored to Shore based Structures used to Transfer LNG

Vessels inspected under the regulations in Title 46 of the CFR are never considered facilities; however, craft that are routinely operated dockside and not inspected under Title 46 may be considered part of a facility. If they are part of a waterfront facility handling LNG, the same Part 127 regulations and alternatives provision apply.

Discussion

The definition of a waterfront facility under the Magnuson Act and the PWSA does not include vessels, railways, cranes, working areas, roadways, entrance and operating areas, stock and cargo piles, storage areas, container fields, parking lots, fueling areas, storage tanks, and handling areas, unless they are located upon the structure of the pier or wharf, or within a building upon or contiguous to the structure. Hence, a vessel temporarily moored to a waterfront facility does not become part of the facility.

Any pier, wharf, dock or similar structure that is used, or is capable of being used, to transfer LNG to or from a vessel, in bulk is considered a waterfront facility handling LNG and must comply with 33 CFR Part 127.

Similar to previous examples described above the regulations should be applied to the extent practicable utilizing the provisions in 33 CFR 127.017 to allow for alternatives.

d. Mobile LNG Tank Trucks forming Part of a Vessel's Fuel Supply System

Mobile tank trucks which are driven aboard a vessel for the purpose of acting as a fuel supply source are not covered by the regulations applicable to facilities in 33 CFR Part 127. Such installations would be subject to consideration under the regulations applicable to vessels found in Title 46 and may also be subject to consideration by the Department of Transportation concerning the applicable regulations for cargo tank motor vehicles in Title 49. Questions concerning these types of installations should be directed to the U.S. Coast Guard Headquarters, Office of Design and Engineering Standards (CG-ENG).

e. LNG Delivered in Portable Tanks

The loading or unloading of portable LNG tanks to be used as a fuel source is not considered bunkering. In general, these operations should follow the stowage and handling requirements for portable tanks containing hazardous materials in 49 CFR Part 176. Specific details for stowage will need to be reviewed as part of the vessel's design approval process. Since these portable tanks are not being loaded as cargo, the location where they are loaded onto the vessel does not have to comply with 33 CFR Part 126.

Questions concerning these types of installations should also be directed to the U.S. Coast Guard Headquarters, Office of Design and Engineering Standards (CG-ENG).

2. LNG Transfer Operations from Waterfront Facilities Handling LNG

Owners and operators of waterfront facilities handling LNG must ensure that LNG fuel transfer operations are conducted safely. Operations and emergency manuals must be developed as outlined in existing regulations at 33 CFR 127.305 and 127.307. The person in charge (PIC) of the shoreside transfer operation must meet the requirements of 33 CFR 127.301 and should meet additional training requirements established for tank trucks or railcars as applicable. The PIC must ensure the requirements outlined in 33 CFR 127.315, 127.317, and 127.319 regarding preliminary transfer inspections, declaration of inspection, and transfers are met. Coordination with the PIC of the vessel receiving LNG for use as fuel is extremely important and the operations manual should document procedures for interacting with vessel personnel. Additionally, transfer procedures for waterfront facilities handling LNG should include provisions to ensure the requirements listed in 33 CFR 127.315, 127.317, and 127.319 are met.

3. Waterway Suitability Assessment (WSA)

Waterfront facilities subject to existing 33 CFR part 127 also are subject to the WSA requirements contained in that part. In considering various design proposals that have been submitted to the Coast Guard, however, we have determined that the WSA regulations were drafted for large LNG tankships and large waterfront facilities (e.g., those importing and exporting LNG as cargo). Elements of the WSA outlined in the regulations and described in Navigation and Inspection Circular 01-11 may not be appropriate for smaller waterfront facilities intending to conduct LNG bunkering operations.

A safety and security assessment which considers the scope and particulars of the proposed operation is still considered relevant, but the COTP has discretion to accept an alternative to the WSA required by regulation. For such purposes, standards of the International Organization for Standardization (ISO) or other recognized organizations may be used. ISO 28460:2010, *"Petroleum and Natural Gas Industries – Installation and Equipment for Liquefied Natural Gas – Ship-to-shore Interface and Port Operations"*, ISO/TS 16901: 2013, *"Guidelines on Performing Risk Assessments in the Design of Onshore LNG Installations Including the Ship/Shore Interface*", ISO 31010:2009, *"Risk Management – Guidelines on Principles and Implementation of Risk Management"*, and ISO 17776:2000, *"Offshore Production Installations – Guidelines on Tools and Techniques and Risk Assessment"* may be used to help ensure a comprehensive safety and security assessment is completed. Such assessments may be considered by the COTP as an alternative to the WSA required by 33 CFR 127.007 and described in NVIC 01-11.

Facility owners and operators should be encouraged to seek the assistance of a third party familiar with the hazards associated with LNG and its impact on vessels, the marine

environment, vessel personnel, and the public to assist them in preparing a safety and security assessment for their particular operation.

4. Security

Waterfront facilities handling LNG must meet the security requirements outlined in 33 CFR 127.701 through 127.711. As previously described, the COTP may consider alternatives in accordance with 33 CFR 127.017. In addition to the security requirements of 33 CFR Part 127, security requirements imposed by the Maritime Transportation Security Act (MTSA) outlined in 33 CFR Subchapter H also apply and waterfront facilities handling LNG must comply with 33 CFR Part 105.

Similar to the consideration for alternatives provided in 33 CFR Part 127, equivalent security measures to the requirements outlined in 33 CFR Part 105 may be accepted by the Coast Guard in accordance with 33 CFR 101.130. Owners and operators of waterfront facilities who wish the Coast Guard to consider equivalent security measures should contact the U.S. Coast Guard Headquarters, Office of Facility Compliance (CG-FAC).

Regulations and Recommendations for Vessels Bunkering LNG

This enclosure outlines the existing regulations applicable to vessels providing LNG for use as fuel, and the Coast Guard's recommendations for safe vessel-to-vessel transfer of LNG fuel. LNG transfer operations conducted from waterfront facilities are addressed in enclosure (1).

1. Source of Regulations and Recommendations in this Enclosure

Vessels providing LNG for use as fuel meet the regulatory definition of tank vessels and must be designed in accordance with 46 CFR Subchapter D, 46 CFR Part 154, and/or design criteria specified by the Coast Guard in reference (d) of this policy letter. Questions concerning the design of tank vessels should be directed to the U.S. Coast Guard Headquarters, Office of Design and Engineering Standards (CG-ENG).

Existing operational requirements for tank vessels and personnel involved in transferring LNG from a tank vessel are outlined in 46 CFR Part 35, 46 CFR Subpart 38.15, 46 CFR Part 154, and 33 CFR Parts 155 and 156. Enclosure (3) provides a table indicating the applicable operational requirements for tank ships and tank barges carrying LNG that are listed in 46 CFR Parts 35 and 154. Owners and operators of vessels providing LNG as fuel, and Coast Guard Marine Safety personnel, should be familiar with these requirements.

The risk management information and vessel compatibility assessments discussed in this enclosure are based on recommendations established by the Society of International Gas Tanker and Terminal Operator's Ltd (SIGTTO), in their LNG Ship to Ship Transfer Guidelines, 1st Ed., 2011. Owners and operators are encouraged to use that publication to the greatest extent practicable. The following International Organization for Standardization (ISO) standards may also be helpful resources: ISO 28460:2010, *"Petroleum and Natural Gas Industries – Installation and Equipment for Liquefied Natural Gas – Ship-to-shore Interface and Port Operations"*, ISO/TS 16901: 2013, *"Guidelines on Performing Risk Assessments in the Design of Onshore LNG Installations Including the Ship/Shore Interface*", ISO 31010:2009, *"Risk Management – Guidelines on Principles and Implementation of Risk Management"*, and ISO 17776:2000, *"Offshore Production Installations – Guidelines on Tools and Techniques and Risk Assessment"* .

2. Risk Management

Vessel to vessel LNG fuel transfer operations are complex and have not been widely used in the U.S. and overseas. Accordingly, it is important to recognize and identify the unique elements which may be associated with such transfers.

The risk associated with any activity is a product of likelihood (frequency) of any occurrence and its impact (consequence). Most normal activities involve a range of potential risks, from frequent, low-impact risks to rare high-impact risks. The consequences resulting from a spill of LNG during a vessel to vessel transfer operation

are potentially serious and effective mitigation measures should be put in place to reduce the likelihood of such an event occurring.

Owners and operators of vessels intending to conduct vessel-to-vessel transfers of LNG fuel should be directed to Commandant, U.S. Coast Guard Headquarters, Office of Operating and Environmental Standards, (CG-OES) for evaluation of the proposed operation on a case by case basis.

3. Vessel Compatibility Assessment

Vessel compatibility assessments should be conducted to confirm the suitability of vessels participating in LNG fuel transfer operations. At minimum, vessel compatibility assessments should evaluate the following:

Vessel characteristics

Manifold arrangements

Cargo handling equipment

Mooring arrangements

Parallel mid-body and fendering arrangements

Gas-safe areas

Personnel transfer

Emergency Shutdown Device (ESD) and communication systems

Contingency planning and emergency procedures

Temperatures and pressure conditions in both vessels

Cargo transfer and ballast plans

Vapor management capacity of each vessel

Purging and inerting capability

4. Transfer Operations

a. Person In Charge (PIC) and Persons on Duty: As outlined in 46 CFR 35.35-1 and 46 CFR 154.1831, there must be enough Tankerman-PICs or restricted Tankerman-PICs and Tankerman-Assistants, authorized for LNG, on duty to safely conduct an LNG transfer. Additionally, each transfer of LNG, cool-down, warm-up, gas-free or air-out

must be supervised by a person designated as a PIC by name or position as outlined in 33 CFR 155.700.

b. Qualifications of PIC: Each operator or agent of the vessel, or the person who arranges or hires a person to be in charge of the LNG transfer must ensure that the PIC meets the qualifications listed in 33 CFR 155.710 for the type of vessel from which the transfer will occur.

c. Limitations of PIC: As outlined in 33 CFR 156.115, no person may serve as the PIC in charge of more than one transfer point (vessel or facility) unless authorized by the Coast Guard Captain of the Port (COTP).

d. Transfer Procedures: The operator of a vessel transferring LNG for use as fuel must provide transfer procedures that meet the requirements of 33 CFR 155.720 through 155.760 and 33 CFR Part 156. In accordance with 33 CFR 155.740, the transfer procedures must be available for inspection by the COTP whenever the vessel is in operation, legibly printed in a language understood by personnel involved in the transfer, and permanently posted or available where they can be seen and used by personnel engaged in the transfer.

e. Content of Transfer Procedures: To the extent that they apply, the items listed in 33 CFR 155.750 must be included in the vessel's transfer procedures. Recognizing that the transfer procedures outlined in the regulations were not developed specifically with LNG transfer operations in mind, operators are encouraged to augment the procedures with information that is specific to their intended operation. Guidance provided by SIGTTO and/or the Swedish Marine Technology Forum (SMTF) concerning LNG ship to ship bunkering operations should be reviewed and considered when developing LNG transfer procedures. Guidance provided by these organizations may help encourage certain best practices and can help ensure that proper actions are taken by personnel involved in LNG transfer operations. Owners and operators of vessels intending to conduct LNG transfer operations are encouraged to review and incorporate the guidance they provide into their transfer procedures. The SMTF ship to ship bunkering procedure document can be viewed on the World Wide Web at the link below.

http://www.smtf.se/fileadmin/documents/LNG02_projektrapport_appendix_www.pdf

Information available from SIGTTO may be viewed at the following link:

http://www.sigtto.org/Publications/Publications-and-downloads

Due to the variation and complexity of LNG fuel transfer systems that can exist aboard vessels using LNG as fuel, operators of vessels supplying LNG should develop LNG transfer procedures that are specific to each vessel they intend to service. Operators of both vessels (supplier and end user) should work together to ensure that the transfer procedures are aligned, equipment is in place and actions of personnel involved in the transfer are clearly understood. Meetings, walk throughs, and dry transfer drills are encouraged and should be conducted well in advance of the first liquid cargo transfer.

Such drills should be conducted at regular intervals to ensure that a safe transfer can be conducted by all personnel involved in the transfer.

f. Advance notice of transfer: No person should conduct a transfer operation involving LNG without providing advance notice to the local COTP. The operator of a vessel intending to provide LNG as fuel to a vessel in a vessel-to-vessel transfer operation should notify the COTP as to the time and place of the transfer operation at least 4 hours before it begins. A COTP may impose such requirements in accordance with 33 CFR 156.118.

g. Requirements for transfer: A transfer is considered to begin when the person in charge of the transferring vessel or facility and the person in charge on the receiving facility or vessel first meet to begin completing the declaration of inspection, required by 33 CFR 156.150. No person shall conduct an LNG transfer operation unless the applicable requirements of 33 CFR 156.120 are met.

h. Conduct before a LNG Fuel Transfer: Before transferring LNG to a vessel for use as fuel, the person in charge of transferring LNG should-

(1) Inspect the accessible portions of the transfer piping system and equipment to be used during the transfer and ensure that any worn or inoperable parts are replaced;

(2) Review and agree with the person in charge of receiving LNG as to -

(i) The sequence of transfer operations;
(ii) The transfer rate;
(iii) The duties, location, and watches of each person assigned for transfer operations;
(iv) Emergency procedures; and
(v) For each of the tanks to which LNG will be transferred, note the pressure, temperature, and volume to ensure that they are safe for transfer to the vessel's tanks and piping systems;

(3) Ensure that transfer connections allow the vessel to move to the limits of its moorings without placing strain on the loading arm or transfer piping system;

(4) Ensure that each part of the transfer system is aligned to allow the flow of LNG to the desired location;

(5) Ensure that warning signs are displayed;

(6) Eliminate all ignition sources in the transfer area;

(7) Ensure that personnel are on duty in accordance with the LNG fuel transfer system operations manual;

(8) Ensure firefighting equipment is ready for use; and

(9) Test the following to determine that they are operable:

(i) The sensing and alarm systems;
(ii) The emergency shutdown system; and
(iii) The communication systems.

i. Conduct during a LNG Fuel Transfer: During the LNG fuel transfer operation, the person in charge of transferring LNG should -

(1) Be in continuous communication with the person in charge of receiving LNG on the vessel;

(2) Ensure that an inspection of the transfer piping and equipment for leaks, defects, and other symptoms of safety and operational problems is conducted at regular intervals during transfer; and

(3) Ensure that the transfer operations are discontinued before electrical storms or upon notification of any contingency identified in the emergency manual.

j. Conduct after a LNG Fuel Transfer: After a LNG fuel transfer, the person in charge of transferring LNG should ensure that the hoses, manifold, and piping used during the transfer operation are –

(1) Properly drained and inerted prior to disconnecting;

(2) Free of residual LNG; and

(3) Securely blanked

5. Equipment

a. Firefighting Equipment: Vessels providing LNG as fuel should be outfitted with firefighting equipment capable of effectively handling an incident involving LNG. In evaluating the risks and hazards for a particular operation, owners and operators should identify the firefighting equipment required. Where firefighting equipment is not specified by regulations, or where it is considered ineffective based on the regulations specified, owners and operators should consider providing equipment that will reduce the risk and potential for a fire to occur, and, if one were to occur, will ensure appropriate first response assets are available to provide for an appropriate response to such an event. When considering requirements for unmanned barges, firefighting equipment installed on towing vessels, or provided by waterfront facilities handling LNG, or installed on the vessels receiving LNG for use as fuel, may be considered as part of the overall LNG transfer operation.

b. Emergency Shutdown: As outlined in 46 CFR 154.1866, cargo transfer hose connections should comply with the requirements outlined in 46 CFR 154.538 and all machinery associated with cargo loading, unloading, or cooling should be capable of being shut down from a remote location. An emergency shutdown system should be

provided for the LNG fuel transfer system at each transfer control location. The system should be capable of manual, remote, and automatic operation of the shutdown valve required in International Maritime Organization (IMO) Resolution MSC.285(86), Section 2.9.2.2, and may be integrated with the safety systems described in 46 CFR 62.35-50.

The remotely operated valve should shutdown upon—

(1) Manual activation of the emergency shutdown system from the transfer control location; and

(2) Automatic activation by the vessel's-

(i) Gas detection system;

(ii) Fire detection system; and

(iii) High fuel tank level detection system.

c. LNG Fuel Transfer Hoses: LNG fuel transfer hoses stored on the vessel for the purpose of transferring LNG should meet the requirements of 46 CFR 154.551.

Transfer hose connections should include provisions to prevent electrical flow during connection or disconnection of the transfer hose string through the hose string or the loading arm. This can be accomplished by the insertion of one short length of non-conducting hose or installation of an insulating flange.

Note: Only one non-conducting hose or insulating flange should be provided in each hose string.

d. LNG Bunkering Manifold: The LNG bunkering manifold should be designed to withstand the external loads during bunkering. The connections at the bunkering station should be of a dry-disconnect type equipped with additional safety dry break-away coupling/self-sealing quick release. Questions concerning the design of LNG bunkering stations should be directed to the U.S. Coast Guard, Headquarters, Office of Design and Engineering Standards, Commandant (CG-ENG).

e. Radio and Communication Equipment: Radio and communication equipment should meet the following specifications:

(1) Radio and communication equipment with antennas located where flammable gas may accumulate should be secured prior to transfer;

(2) Portable radio devices for use during the LNG fuel transfer operations should be tested and listed or certified intrinsically safe (UL 913 or IEC 60079-11, Ex "ia") by an independent laboratory accepted by the Commandant under 46 CFR part 159;

(3) Portable electronic devices such as mobile phones, cameras, and other devices using batteries should not be allowed in hazardous areas unless they are listed or certified intrinsically safe (UL 913 or IEC 60079-11, Ex "ia") by an independent laboratory accepted by the Commandant under 46 CFR part 159; and

(4) Antennas of radio and communication equipment should be located in unclassified locations when possible. The antenna location should not pose an obstruction to helicopter landing areas, platform cranes, or other unit operations and antenna feed lines should be protected from possible physical damage.

f. Deck Lighting: A vessel engaged in transfer operations between sunset and sunrise should have deck lighting that illuminates the transfer area, and is suitable for service in the intended location including meeting any applicable hazardous area equipment requirements. Lighting should be located or shielded so as not to mislead or otherwise interfere with navigation on the adjacent waterways. Lighting should adequately illuminate-

(1) Each transfer operation's work area and each transfer connection point in use on the vessel; and

(2) Each transfer operation's work area and each transfer connection point in use in the transfer system transferring to the vessel.

Where the illumination is apparently inadequate, the OCMI/COTP may require verification by instrument of the levels of illumination. On a horizontal plane 3 feet above the deck the illumination should measure at least-

(1) 5.0 foot-candles at transfer connection points; and

(2) 1.0 foot-candle in transfer operations work areas.

g. Personnel Protection: Each owner or operator of a vessel transferring LNG should provide appropriate personal protective equipment for use by personnel engaged in operations involving the handling of LNG. The following personal protective equipment should be suitable for use with LNG and provided in a place where it is readily available to personnel:

(1) Gloves;

(2) Eye protection; and

(3) Protective clothing.

h. Portable Gas Detectors: Owners and operators of vessels transferring LNG should ensure that all personnel engaged in the transfer have portable gas detectors capable of measuring 0-100% of the lower flammable limit of methane.

46 CFR PART 35—OPERATIONS (TS = Tank Ships TB = Tank Barges)		
Subpart 35.01—General Provisions; Special Operating Requirements	**TS**	**TB**
§ 35.01-1 Inspection and testing required when making alterations, repairs, or other such operations involving riveting, welding, burning, or like fire-producing actions	X	X
§ 35.01-5 Sanitary condition and crew quarters	X	
§ 35.01-10 Shipping papers	X	X
§ 35.01-15 Carriage of persons other than crew	X	X
§ 35.01-25 Sacrificial anode installations	X	X
§ 35.01-35 Repairs and alterations to firefighting equipment	X	X
§ 35.01-45 Open hopper type barges		X
§ 35.01-50 Special operating requirements for tank barges carrying certain dangerous bulk cargoes		X
§ 35.01-55 Pilot boarding operation.	X	
§ 35.01-60 Person excluded.	X	
Subpart 35.03—Work Vests	**TS**	**TB**
§ 35.03-1 Application	X	X
§ 35.03-5 Approved types of work vests	X	X
§ 35.03-10 Use	X	X
§ 35.03-15 Shipboard stowage	X	X
§ 35.03-20 Shipboard inspections	X	X
§ 35.03-25 Additional requirements for hybrid work vests.	X	X
Subpart 35.05—Officers and Crews	**TS**	**TB**
§ 35.05-15 Tank vessel security	X	X
§ 35.05-20 Physical condition of crew	X	X
§ 35.05-25 Illness, alcohol, drugs	X	X
Subpart 35.07—Logbook Entries	**TS**	**TB**
§ 35.07-1 Application	X	X
§ 35.07-5 Logbooks and records	X	X
§ 35.07-5 Logbooks and records	X	X
Subpart 35.08—Stability Information	**TS**	**TB**
§ 35.08-1 Posting of stability letter.	X	X
Subpart 35.10—Fire and Emergency Requirements	**TS**	**TB**
§ 35.10-1 Emergency training, musters, and drills	X	
§ 35.10-3 Display of plans	X	X
§ 35.10-5 Muster lists, emergency signals, and manning	X	
§ 35.10-15 Emergency lighting and power systems	X	
Subpart 35.15—Notice and Reporting of Casualty and Voyage Records	**TS**	**TB**
§ 35.15-1 Notice and reporting of casualty and voyage records	X	X
Subpart 35.20—Navigation	**TS**	**TB**
§ 35.20-1 Notice to mariners; aids to navigation	X	
§ 35.20-5 Draft of tankships	X	
§ 35.20-7 Verification of vessel compliance with applicable stability requirements	X	X
§ 35.20-10 Steering gear test	X	
§ 35.20-20 Master's and officer's responsibility	X	X
§ 35.20-30 Flashing the rays of a searchlight or other blinding light	X	
§ 35.20-35 Whistling	X	
§ 35.20-40 Maneuvering characteristics	X	
§ 35.20-45 Use of Auto Pilot	X	

46 CFR PART 35—OPERATIONS (TS = Tank Ships TB = Tank Barges)		
Subpart 35.25—Engine Department	**TS**	**TB**
§ 35.25-1 Examination of boilers and machinery by engineer	X	
§ 35.25-10 Requirements for fuel oil	X	
Subpart 35.30—General Safety Rules	**TS**	**TB**
§ 35.30-1 Warning signals and signs	X	X
§ 35.30-5 Fires, matches, and smoking	X	X
§ 35.30-10 Cargo tank hatches, ullage holes, and Butterworth plates	X	X
§ 35.30-15 Combustible gas indicator	X	X
§ 35.30-20 Emergency equipment	X	X
§ 35.30-25 Explosives	X	X
§ 35.30-30 Portable electric equipment	X	X
§ 35.30-35 Spark producing devices	X	X
§ 35.30-40 Flammable liquid and gas fuels as ship's stores	X	X
Subpart 35.35—Cargo Handling	**TS**	**TB**
§ 35.35-1 Persons on duty	X	X
§ 35.35-5 Electric bonding	X	X
§ 35.35-10 Closing of freeing-ports, scuppers, and sea valves	X	X
§ 35.35-15 Connecting for cargo transfer	X	X
§ 35.35-20 Inspection before transfer of cargo	X	X
§ 35.35-25 Approval to start transfer of cargo	X	X
§ 35.35-30 "Declaration of Inspection" for tank vessels	X	X
§ 35.35-35 Duties of person in charge of transfer	X	X
§ 35.35-40 Conditions under which transfer operations shall not be commenced or if started shall be discontinued	X	X
§ 35.35-42 Restrictions on vessels alongside a tank vessel loading or unloading cargo of Grade A, B, or C	X	X
§ 35.35-45 Auxiliary steam, air, or electric current		X
§ 35.35-50 Termination of transfer operations		X
§ 35.35-55 Transfer of other cargo or stores on tank vessels	X	X
§ 35.35-60 Transportation of other cargo or stores on tank barges	X	X
§ 35.35-70 Maintenance of cargo handling equipment	X	X
§ 35.35-75 Emergencies	X	X
§ 35.35-85 Air compressors	X	X
Subpart 35.40—Posting and Marking Requirements	**TS**	**TB**
§ 35.40-1 General alarm contact maker	X	X
§ 35.40-5 General alarm bells	X	X
§ 35.40-6 Emergency lights	X	X
§ 35.40-7 Carbon dioxide and clean agent alarms	X	
§ 35.40-8 Carbon dioxide warning signs	X	
§ 35.40-10 Steam, foam, carbon dioxide, or clean agent fire smothering apparatus	X	X
§ 35.40-15 Fire hose stations	X	X
§ 35.40-17 Foam hose/monitor stations	X	
§ 35.40-18 Water spray systems	X	X
§ 35.40-20 Emergency equipment	X	X
§ 35.40-25 Fire extinguishers	X	X
§ 35.40-30 Instructions for changing steering gear	X	X
§ 35.40-35 Rudder orders	X	X
§ 35.40-40 Marking and instructions for fire and emergency equipment	X	X

46 CFR PART 154 —SAFETY STANDARDS FOR SELF-PROPELLED VESSELS CARRYING BULK LIQUEFIED GASES
Subpart E - Operations
§ 154.1800 Special operating requirements under Part 35 of this chapter.
§ 154.1801 Certificates, letters, and endorsements: U.S. flag vessels.
§ 154.1802 Certificates, letters and endorsements: Foreign flag vessels.
§ 154.1803 Expiration of Certificates of Compliance.
§ 154.1804 Document posted in wheelhouse.
§ 154.1806 Regulations on board.
§ 154.1808 Limitations in the endorsement.
§ 154.1809 Loading and stability manual.
§ 154.1810 Cargo manual.
§ 154.1812 Operational information for terminal personnel.
§ 154.1814 Cargo information cards.
§ 154.1816 Cargo location plan.
§ 154.1818 Certification of inhibition.
§ 154.1820 Shipping document.
§ 154.1822 Shipping document: Copy for transfer terminal.
§ 154.1824 Obstruction of pumproom ladderways.
§ 154.1826 Opening of cargo tanks and cargo sampling.
§ 154.1828 Spaces containing cargo vapor: Entry.
§ 154.1830 Warning sign.
§ 154.1831 Persons in charge of transferring liquid cargo in bulk or preparing cargo tanks.
§ 154.1834 Cargo transfer piping.
§ 154.1836 Vapor venting as a means of cargo tank pressure and temperature control.
§ 154.1838 Discharge by gas pressurization.
§ 154.1840 Protective clothing.
§ 154.1842 Cargo system: Controls and alarms.
§ 154.1844 Cargo tanks: Filling limits.
§ 154.1846 Relief valves: Changing set pressure.
§ 154.1848 Inerting.
§ 154.1850 Entering cargo handling spaces.
§ 154.1852 Air breathing equipment.
§ 154.1854 Methane (LNG) as fuel.
§ 154.1858 Cargo hose.
§ 154.1860 Integral tanks: Cargo colder than −10 °C (14 °F).
§ 154.1862 Posting of speed reduction.
§ 154.1864 Vessel speed within speed reduction.
§ 154.1866 Cargo hose connection: Transferring cargo.
§ 154.1868 Portable blowers in personnel access openings.
§ 154.1868 Portable blowers in personnel access openings.
§ 154.1872 Cargo emergency jettisoning.