ABS Group is an independent subsidiary of the American Bureau of Shipping (ABS), one of the world's leading marine and offshore classification societies founded in 1862.

ABS Group provides data-driven risk and reliability solutions and technical services that help clients confirm the safety, integrity, quality and environmental efficiency of critical assets and operations. We are focused on adding value to the industries we serve and strategically capturing synergies with ABS.

1000+ Employees
20+ Countries
45+ Years

ABS Group is an independent subsidiary of the American Bureau of Shipping (ABS), one of the world's leading marine and offshore classification societies founded in 1862.
LNG Marine Fuel Development 2020

- 170 LNG fueled vessels in service, 184 on order as of Dec 2019 (SGMF)

Ongoing Challenges?
- Equipment and Installation Cost
- Supply and Distribution Infrastructure
- Technical, Risk and Operations Issues
Perspective: 55+ years of LNG Marine fuel

- LNG Carriers were the first LNG fueled vessels
- Since the mid 1960’s, LNG carriers have been designed to use their cargo as fuel:
  - 1960s- Steam Turbine era, 60s – present
  - 2005- Dual fuel Diesel Electric (DFDE)
  - 2007- Tri fuel diesel electric (TFDE)
  - 2010- ME-GI, 2S HP Fuel Injection Direct Drive
  - Gas turbine (proposed)

- About 28% of the current conventional trading LNGC fleet are dual fuel diesel
- About 67% of LNGCs on order are dual fuel diesel
- Technical development over 50 years of operational experience is adopted for use in gas fueled ships (non-LNGC) today
As of 01 January 2017:

IGF Code Chapter 19:
- “Companies shall ensure that seafarers have training appropriate to duties and responsibilities…”

STCW Regulation A-V/3
- Mandatory minimum requirements for the training and qualifications of masters, officers, ratings and other personnel on ships subject to the IGF Code:
  - Seafarers responsible for designated safety duties
  - ...with the care, use or in emergency response to the fuel...
  - Shall complete basic training in accordance with Section A-V/3-1
STCW Advanced Training Requirements

- Applies specifically to “Masters, engineer officers and all personnel with immediate responsibility for the care and use of fuels and fuel systems…”

- for a certificate in advanced training for service on ships subject to the IGF Code shall:
  - have successfully completed the approved advanced training per table A-V/3-2; and
  - Completed at least one month of seagoing service with three bunkering operations (2 may be simulated)

- May meet the requirements with “appropriate training and certification” according to the requirements for service on liquefied gas tankers
## Summary Crew Training Requirements

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Competencies</th>
</tr>
</thead>
</table>
| **Basic**              | Designated safety duties  
Care, use, or emergency response  
STCW Table A-V/3-1                                                   | **Basic Competencies:**  
1. Safe Operation  
2. Prevent hazards  
3. Health & Safety  
4. Firefighting  
5. Emergency Response  
6. Prevent Pollution |
| **Advanced**           | Masters, Engineer Officers & Personnel with immediate responsibility  
STCW Table A-V/3-2  
At least 1-month sea time,  
Participation in 3 bunkering operations | **Advanced Competencies:**  
1. Properties of LFPF  
2. Operate Propulsion  
3. Operate / Monitor  
4. Safe Bunkering  
5. Prevent Pollution  
6. Regulatory Compliance  
7. Prevent Hazards  
8. Health & Safety  
9. Prevent / Control Fire |
| **Ship Specific**      | ALL Seafarers on gas fueled ships  
Prior to assignment of shipboard duties  
Ship and Equipment specific familiarization |                                                                                                   |

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ENERGY AND TRANSPORTATION (LNG AND ALTERNATIVE MARINE FUELS) CONFERENCE
USCG Policy Letter 01-15, GUIDELINES FOR LIQUEFIED NATURAL GAS FUEL TRANSFER OPERATIONS AND TRAINING OF PERSONNEL ON VESSELS USING NATURAL GAS AS FUEL

Training Requirements:

- All mariners must complete ship specific familiarization and basic training before assuming duties and responsibilities (46 CFR 15.405)
- Basic Training for Mariners responsible for designated safety duties
- Advanced training for Masters, Engineer Officers, and all persons with Immediate Responsibility for care and use of fuel
- Current holders of Tankerman PIC LG and Tankerman Assistant LG meet the qualification requirements (with 3 months service in last 5 years plus company and vessel specific training)
STCW Equivalence for LNGC Service

To meet gas fueled ship **Basic** per STCW Regulation A-V/3-6:

- Meet STCW Chapter A-V, Reg 2 and 5 (Tankerman assistant LG (Basic))
- 3 months seagoing service on LNGC –OR–
- Approved basic training
- Qualified and certified

-- OR --

- Meet STCW Chapter A-V Reg 4 and 5 (Tankerman LG (Advanced))
- Meet LNGC basic training requirements
- 3 months LNGC seagoing service or approved 1-month onboard training
- Qualified and certified

---

To meet IGF Code **Advanced** per STCW Regulation A-V/3-8:

- Be “qualified and certified” for Tankerman LG Basic (meet Reg 2) --Plus---
  - Gas fueled ship specific familiarization
  - One month approved gas fueled ship seagoing service with minimum 3 bunkering operations* OR-
  - 3 Cargo transfers AND 3 months seagoing service in the previous 5 years
Onboard Training Programs

• STCW Section B-V/3 Guidance for seagoing service:
  • Experience appropriate to their duties…
  • Practical “hands on experience” related to seafarer employment
  • Under the supervision of qualified and experienced personnel
  • On board a ship for which the certification is required
  • Specialized equipment for safe transfer and handling is brought into operation

• General onboard training principles for all ship types
  • Trainee should have no other duties
  • Managed and coordinated by the ship manager
  • Identify a “shipboard training officer” and “company training officer”
  • Training record book for documentation of completed tasks and exercises
  • Program should replicate / demonstrate all aspects related to the trainees expected duties and responsibilities
 ABS Group Crew Training Experience

- **Crews / Vessel Type**
  - Harvey Gulf International Marine (HGIM): 10 OSV series, U.S. Gulf of Mexico
  - BC Ferries: 3 newbuild 2 conversion car/passenger ferries, BC Canada
  - Seaspan Ferries: 2 newbuild trailer ferries, BC Canada
  - TOTE 2 new build 2800 TEU Container ships, U.S. Jacksonville to Puerto Rico
  - Transport Desgagnes, 2 newbuild handy size asphalt/chemical tankers, QC, Canada
  - Crowley, 2 ConRos, U.S. Jacksonville to Puerto Rico
  - Various LNG stakeholders, including USCG, Transport Canada, Suppliers, Shipyards and Class surveyors

- **Services**
  - Collaborative partnership with U.S. Maritime Resource Center (USMRC)
  - LNG Technical and Operations seminars for marine operations staff—safety, risk management, operations and emergency procedures, vetting, quality assurance, system design and functional requirements
  - Training material development according to IMO STCW
  - Experienced instructors with actual LNG experience
  - Coordination and liaison with Regulators for flag state acceptance
## Representative Course Outline: Basic Day 1

<table>
<thead>
<tr>
<th>Topic</th>
<th>Time</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome and Introduction to the Training Program</td>
<td>60 min</td>
<td>08:00</td>
</tr>
<tr>
<td>Safe Operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01 LNG Physical &amp; Chemical Properties</td>
<td>60 min</td>
<td>09:00</td>
</tr>
<tr>
<td>02 Why LNG?</td>
<td>15 min</td>
<td>10:00</td>
</tr>
<tr>
<td>Coffee (15 mins)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 Gas Fueled Ships Design &amp; Operational Characteristics</td>
<td>60 min</td>
<td>10:30</td>
</tr>
<tr>
<td>04 Safety Management</td>
<td>30 min</td>
<td>11:30</td>
</tr>
<tr>
<td>Lunch (30 mins)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 Fuels and Fuel Storage Systems’ Operations</td>
<td>90 min</td>
<td>12:30</td>
</tr>
<tr>
<td>Coffee (15 mins)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevent Hazards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06 LNG Fuel Hazards &amp; Controls</td>
<td>90 min</td>
<td>2:15</td>
</tr>
<tr>
<td>Day 1 Wrap up</td>
<td>15 mins</td>
<td>3:45</td>
</tr>
</tbody>
</table>

**ABS Group**

ENERGY AND TRANSPORTATION (LNG AND ALTERNATIVE MARINE FUELS) CONFERENCE
<table>
<thead>
<tr>
<th>Topic</th>
<th>Time</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome to Day 2</td>
<td>30 min</td>
<td>08:00</td>
</tr>
<tr>
<td>Health and Safety Precautions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07 Gas Measuring Instruments</td>
<td>15 min</td>
<td>08:30</td>
</tr>
<tr>
<td>08 Safety Equipment And Protective Devices</td>
<td>30 min</td>
<td>08:45</td>
</tr>
<tr>
<td>09 Safe Working Practices and Personal Shipboard Safety</td>
<td>45 min</td>
<td>09:15</td>
</tr>
<tr>
<td>Coffee (15 mins)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firefighting and Emergencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Fire Fighting Operations</td>
<td>45 min</td>
<td>10:15</td>
</tr>
<tr>
<td>11 Emergency Response</td>
<td>60 min</td>
<td>11:00</td>
</tr>
<tr>
<td>Lunch (30 mins)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevent Pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Pollution Prevention</td>
<td>15 min</td>
<td>12:30</td>
</tr>
<tr>
<td>Day 2 Wrap up</td>
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<td></td>
</tr>
<tr>
<td>Review</td>
<td>30 min</td>
<td>12:45</td>
</tr>
<tr>
<td>Coffee (15 mins)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competency Assessment</td>
<td>60 min</td>
<td>1:30</td>
</tr>
</tbody>
</table>
Firefighting and Emergency Response Training

- **TABLE A-V/3-1 Competence:**
  - Carry out firefighting operations on a ship subject to the IGF Code

- **Knowledge, Understanding and Proficiency:**
  - Fire organization and actions to be taken on LNG fueled vessels
  - Special hazards associated with LNG fuel systems and handling
  - Firefighting agents and method to detect, control and extinguish fires involving low flash point fuels
  - Firefighting system operations

- One-day firefighting field exercise meeting STCW training requirement under “approved and truly realistic training conditions”
Tabletop Bunkering / Simulation Exercise

• Interactive classroom exercise to examine each phase of the LNG bunkering process for each available transfer mode
• Guided role-playing exercise of the LNG fueling procedure including all activities from Pre-planning, pre-bunkering, during transfer through post-bunkering
• Includes completion of bunker safety checklists and can be ship specific procedure
Simulator Training

- May substitute for 2 of the STCW required 3 bunkerings

Source: Wartsila
Training Development Approach

• **Develop Material**
  - Compliant with STCW – all basic and advanced competence and KUPs addressed
  - Follow IMO model course training format (not currently developed for IGF Code)
  - Incorporate ship specific design and operational procedures
  - Incorporate LNG fire fighting and emergency response field training

• **Regulator Review**
  - Communication, coordination and liaison with flag state / RO
  - ABS guidance and explanation of compliance requirements
  - Encourage regulator attendance at training sessions
  - Acceptance or approval depending on implementation of SOLAS and STCW amendments

• **Conduct Training** - usually owner arranges schedule and venue:
  1. 2 days basic classroom instruction (for crewmembers with "designated safety duties")
  2. 1 day firefighting field training for all participants
  3. 2 days advanced classroom instruction (for crewmembers with “immediate responsibility”)

  - Minimum requirements to demonstrate competence:
    - Passing grade on exam, quizzes and class exercises
    - Satisfactory completion of fire fighting field training
    - Seagoing service and 3 bunkering operations (2 simulated)
    - Issuance of certification from USMRC (flag state approved training provider)
• Where can the mandatory minimum requirements for LNG fueled ship crew training and competence be found?
  - Flag state regulations
  - IGF Code
  - STCW Table A-V/3-1 and A-V/3-2
  - ABS Class Rules

• Which crew members are required to meet the requirements for Advanced Training:
  - All crew with designated safety duties on board
  - All officers
  - Masters, engineer officers and those with immediate responsibility
  - None of the above

• True or false? Crew members of LNG Carriers are exempt from the STCW training and competence requirements for low flashpoint fueled ships.
  - True
  - False

• Are Administrations required to issue endorsements for seafarers meeting the qualification and certification requirements of the STCW?
  - Yes
  - No