



U.S. Coast Guard

**Maritime Transport of LNG
Presentation to the National
Academies' LNG-by-Rail Committee**

Date: 21 Sept 2021



Introduction and Agenda



Participants:

- CAPT Dan Cost and LCDR Dan Velez,
COMDT CG-ENG, Washington, DC
 - LCDR William Hickey and Mr. Joe Brown,
Liquefied Gas Carrier National Center of Expertise, Houston, TX
- Introductions and Overview: CAPT Cost
 - Historical Perspective and Gas Carrier Design: Mr. Brown
 - Regulatory Overview: LCDR Velez
 - Compliance & Enforcement: LCDR Hickey
 - Discussion / Q & A

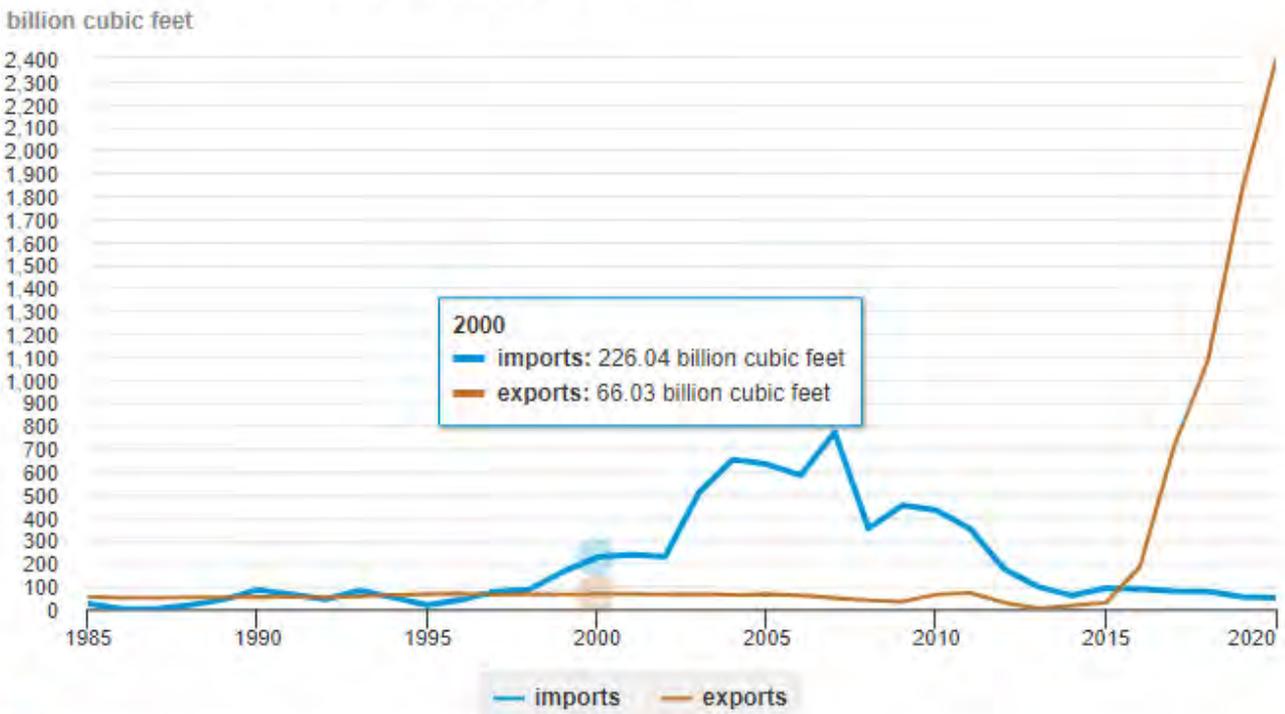




Demand for LNG Transportation Infrastructure



U.S. LNG imports and exports, 1985-2020



Source: U.S. Energy Information Administration, *Natural Gas Monthly*, May 2021

- Rail, DOT-113C120W: 30,000 gallons/per car
- Road, MC-338: 9,000 gallons/per truck
- Maritime Gas Carrier: 4.5 million gallons/per vessel
- Pipeline: 200 trillion gallons/per year





Liquefied Gas Carriers



Methane Pioneer, 106 meters
5,000 cubic meters



Diamond Gas Victoria, 297 meters
174,000 cubic meters

- Liquefied gas
 - Vapor pressure exceeds 0.28 MPa absolute at a temperature of 37.8 C
 - 37 listed cargoes in IGC Code
- LNG
 - 1959: Methane Pioneer
 - Today: over 400 LNG carriers
 - U.S. flagged bunker barges

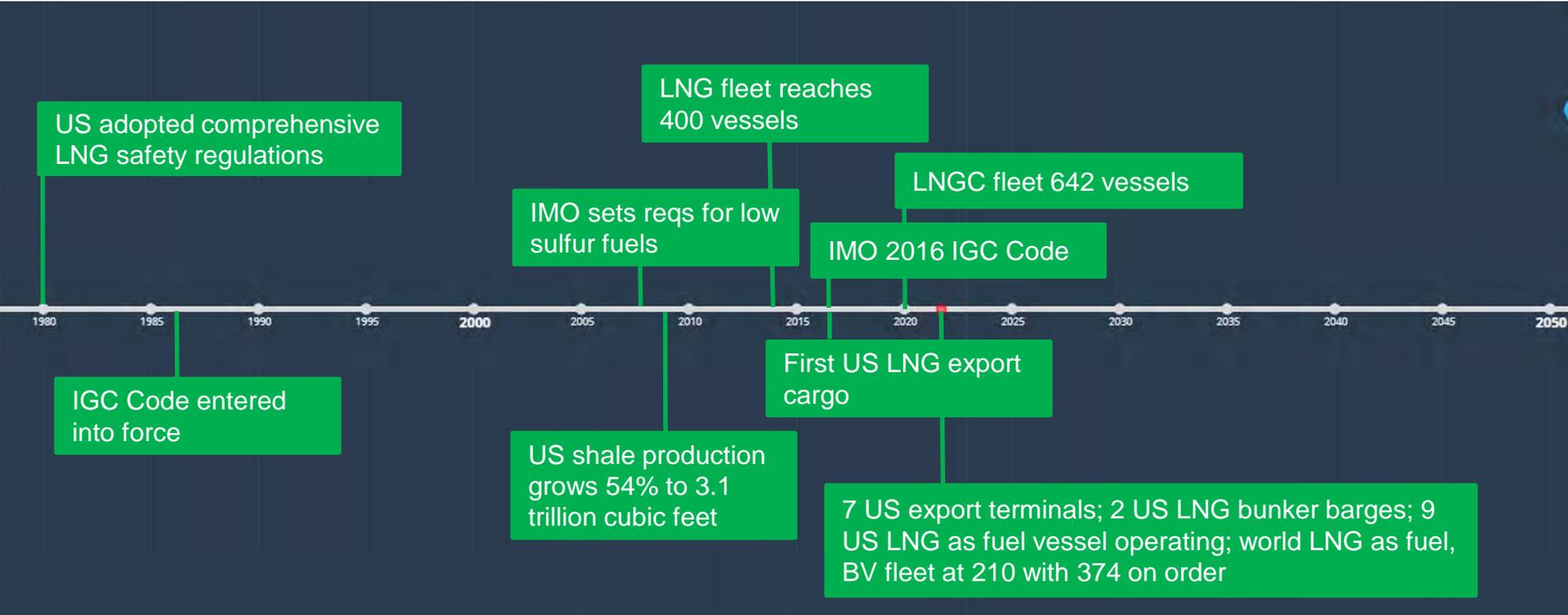


Q-LNG 4000, 98.7 meters
4,000 cubic meters





U.S. Liquefied Natural Gas Timeline





U.S Coast Guard Role in Shipping LNG



Domestic

- Regulatory Authority for bulk shipments
 - Design standards
 - Operating standards
- Competent Authority and Modal Enforcement Agency for packaged hazmat

Domestic Regulations

- Vessels
46 CFR 154
- Facilities
33 CFR 127

International

- International Maritime Organization
 - Development of International Instruments
- Flag Administration
 - U.S. vessels
- Port Administration
 - Foreign vessels

International Instruments

- International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)
- 1976 (New ships and existing ships)
 - 1983
 - 1993
 - 2016



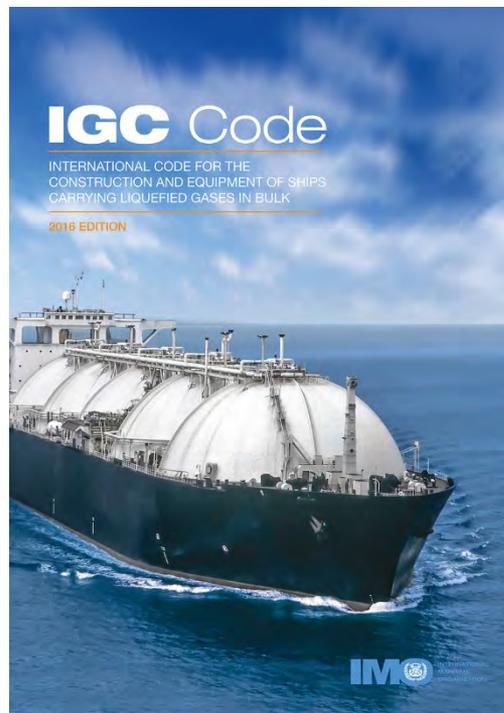


IGC Code



Holistic approach to design and construction

- Survival capability
- Cargo tank location
- Ship arrangements
- Cargo Containment
- Piping
- Materials
- Pressure/temperature control
- Vent systems



- Atmosphere control
- Electrical installations
- Fire protection
- Ventilation
- Instrumentation
- Personnel protection
- Filling limits
- Use of cargo as fuel





U.S. Regulations



- All gas carriers entering the U.S. must meet 46 CFR 154.
- Foreign flag vessels may enter U.S. waters if vessel has
 - Certificate of Compliance from U.S. Coast Guard (COC)
 - Subchapter O Endorsement (SOE)
- Ambient design temperatures for material selection
 - 46 CFR 154.174 and 154.176
 - Prevent brittle fractures of tanks and hull materials
- Use appropriate design stress factors for tank construction
 - 46 CFR 154.447 and 154.450
 - CG-ENG Policy Letter 04-12





Equivalencies and Alternatives



- 46 CFR 154.32 allows for alternatives if a vessel does not meet requirements
- Standard is equivalent level of safety to the requirement.
 - Flag state may grant equivalency for the IGC Code and note on COF.
- U.S. may accept or deny equivalencies





Safety Considerations and Enforcement



- **Tank Viability**
 - Methane leakage/gas detection
 - Cold spot detection
 - Isolated vapor pocket failure
- **Fuel System**
 - Machinery space configuration
 - Tank placement
 - Tank & piping requirements
- **Hazardous Locations**
 - Classification of areas
 - Electrical equipment
- **Fire Protection**
 - Installed firefighting systems
 - Fire detection



- Coast Guard Certificate of Compliance Program
- Declaration of Inspection (facility)
- Emergency Procedures, and Cargo Operations Manual (Ch. 18, IGC Code)





Up Next: Historical perspective & Gas Carrier Design



1st LNG carrier to transport LNG from Cameron LNG in Southwest Louisiana in May 2019

