Project SEAMIST (South-East Area Maritime Industry Safety Training)

Nova Southeastern University (NSU)
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Liquefied Natural Gas (LNG) Training for the Maritime Community

Project HazMIRTSI
Hazardous Material Maritime Industry Response Training Safety Initiative

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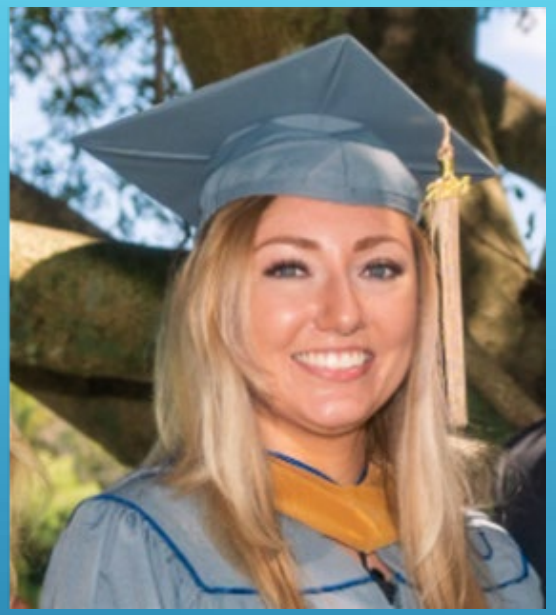

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https://osteopathic.nova.edu/professional-training/hazmat-health-and-safety/index.html

WHAT IS LNG?

WHY LNG?

… as opposed to Diesel, Marine Diesel Oil/Marine Gas Oil

- 100% decrease in Sulfur oxides (conventional pollutants)
- 90% decrease in Nitrogen oxides (conventional pollutants)
- 20% decrease in Carbon Dioxide
- 100% decrease in particulate matter
- Cost for LNG is 25-30% cheaper for the same energy delivered
- January 2020, the International Maritime Organization (IMO) began requiring ships to use fuel with a maximum sulfur content of 0.5% or require a costly sulfur scrubbing system to meet the requirements.

LNG Production

- The primary source of LNG is natural gas extracted from underground reserves, both onshore and offshore

- LNG can also be produced from biogas generated by organic waste such as:
  - food scraps,
  - agricultural waste,
  - manure,
  - and sewage sludge.

LNG Production and Risks

- requires the use of heavy hydrocarbon chemicals.
- The gas is cleaned, chilled and condensed into a volume 600x smaller than it started.

Danger: A leak of those chemicals can form a so-called vapor cloud of hydrocarbons — compounds that are denser than the surrounding air and hug the ground like a fine mist. These clouds can even form outdoors if the wind is still. And vapor clouds will explode if ignited.

LIQUEFIED NATURAL GAS

- Deriving LNG from landfill gas is experimental
  - A landfill in California is producing 13,000 gallons of LNG per day
  - This LNG is being utilized to operate collection vehicles
- LNG is the dominant fuel in the industrial sector providing approximately 40% of the energy necessary for production of:
  - Paper, metal, chemicals, petroleum, stone, clay, glass, clothing and food processing,
- LNG is also being utilized for heavy duty fleet operations

LNG Storage

- 21 LNG Ports Worldwide
- The United States has several LNG ports, primarily located along the Gulf Coast and the East Coast

Port Canaveral: home to North America's first LNG cruise port. It has facilities for LNG bunkering and serves as a fueling station for LNG-powered cruise ships

Port Miami and Port Tampa: handles and receives LNG delivered by truck or rail, which can then be loaded onto container ships or oceangoing carriers for export

Jacksonville Port Authority: on-dock and near-dock LNG fueling capabilities

LNG TRANSPORTATION

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Potential Risks and Health Concerns

Handling LNG involves working with extremely cold temperatures (-260°F) and highly flammable materials

- **Asphyxiation-** in closed or confined spaces LNG vapors can displace oxygen, and may contain impurities like hydrogen sulfide or ammonia which are **toxic** and can pose health risks
- **Vapor Cloud Explosions (VCE)**: A release of LNG vapor can form a flammable cloud that, if ignited, can result in a powerful explosion
- **RAPID PHASE TRANSITION-** LNG can rapidly transition from liquid to gas if exposed to higher temperatures, leading to pressure build-up and potential hazards

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Need for Training for the Maritime Community

Port Canaveral

Maritime Academy

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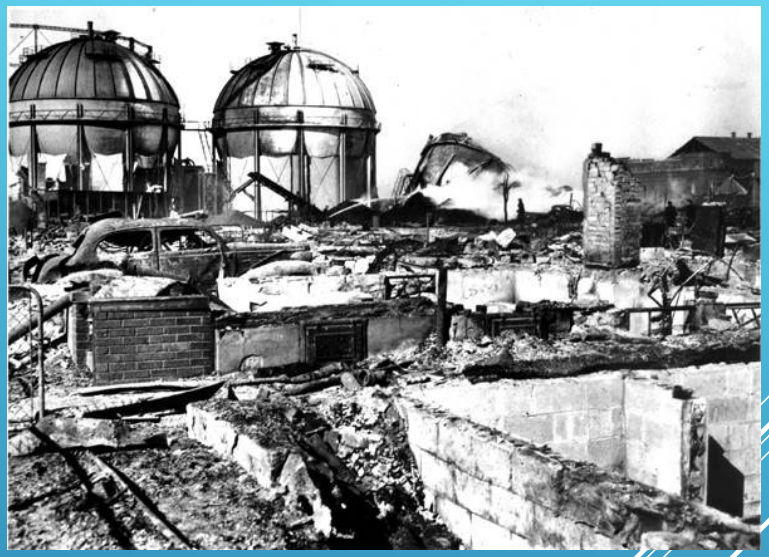
Major U.S. Incidents involving LNG

Cleveland Ohio- 1944, one of the first LNG facilities failed
Killed 128; injured over 200



Plymouth, Washington- 2014, significant incident at the plant resulted in $45 million in damages

Southern California- 2015, massive methane leak at the storage facility led to the displacement of thousands of residents

Freeport, Texas- 2022, an explosion and fire shot down 1/5 of the country's LNG export capacity

CURRENT USE OF LNG

- 39 cruise ships to enter service utilizing LNG between now and 2025
  - NOT ALL FLORIDA BASED
    - **Cruise lines**

Aida	**Costa**	**Ponent**
Carnival	**P&O**	**Disney**
MSC	**Silversea**	**Royal Caribbean**
Princess	**TUI**	

- As of January 2024, over 1000 ships were operational, or on the global orderbook that utilize LNG.
- Many ships also fitted to utilize other advanced fuels

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CURRENT USE OF LNG

- Space X
- Blue Origin
- Relativity Space
- United Launch Alliance

Port Canaveral Maritime Academy

PORT CANAVERAL

CANAVERAL FIRE RESCUE

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LNG FUTURE NEED

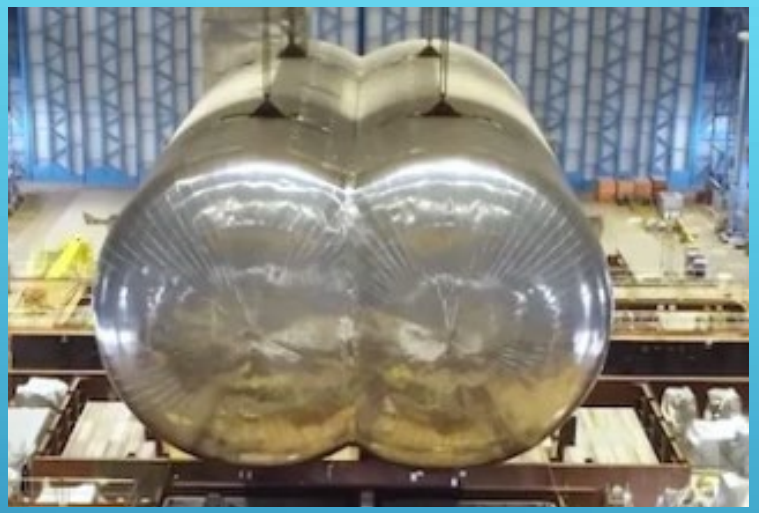
- Anticipation that global LNG production capacity will grow by roughly 193 MTPA (Metric Tons per Annum) from 2024 through 2028, rising from
  - Approximately 474 MTPA of capacity at the beginning of this year.
  - To 666.5 MTPA by the end of 2028.

- This will be the fastest capacity growth in the global LNG industry's brief history, **representing a 40% increase in just 5 years**

Not without controversy

- Icon of the seas was the first to get 307-Ton LNG Fuel Tank Installed- January 2024

- Methane Slip
- Emit more greenhouse gas emissions
- Concern for climate change and global warming



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Key Differences in LNG

Fire protection

- **Use of water for extinguishment is ineffective**
  - Water may be used to direct vapor to safe areas
- Use of **dry chemical extinguishers is highly effective** in extinguishment
- Use of high expansion foam is effective in vapor suppression until vapor can be safely disbursed.

Port Canaveral Maritime Academy

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Thank you to our partners

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