

LNG SAFETY & EMERGENCY MGT

Committee for the Safe Transportation of Liquefied Natural Gas by
Railroad Tank Car – Phase 2 Kick-off Meeting June 07, 2021

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Technical Safety & Risk Engineer
B.S. Mechanical Engineering / Fire Protection Engineer,
Certified Fire Protection Specialist, Certified Safety Professional and a qualified Incident Commander.

20+ years' experience in LNG as fuel for Transport.



- 20 years in the Fire Service, from Firefighter/Paramedic to Fire Chief of a volunteer fire department (retired).
- Instructor at the University of Nevada – Reno Fire Training Academy
- Trainer for several Fire Departments on LNG Safety & Emergency Response
- Chairman of Butler County KS Local Emergency Planning Commission (LEPC).



Development/Construction/Operation of LNG Refueling Stations, LNG Bunkering, LNG Plants, LNG Storage, LNG By Road/Rail/Marine

Developed the LNG Manual on Safety & Emergency Mgt. – endorsed and used by IAFC, NASFM & 15 FD's.

Trained Fire Departments, HAZMAT Teams in 6 states on LNG Safety and LNG Emergency Response.

Larry D. Jantzen

- HazMat Training Coordinator, Jarrell Fire Department
- Over 35 years of experience in the fire service.
- Chief Jantzen retired from the Austin Fire Department as the Assistant Chief over their Special Operations and Homeland Security and Logistics Divisions with 34 years of service in 2019
- Currently serving as the HazMat Training Coordinator for the Jarrell Fire Department and a Chief Planner with the City of Austin's Office of Homeland Security and Emergency Management.
- Contract instructor at the Emergency Management Institute in Emmitsburg MD,
- Senior Consultant with Emergency Management Solutions Inc. and an "Urban Shield" Exercise planning and conduct consultant for Cytel Group Inc.
- Associate of Applied Science Degree in Fire Protection Technology and graduated from EMI's Emergency Management Advanced Academy.
- Master Exercise Practitioner (MEP), Professional Continuity Practitioner, Fire Officer IV, Fire Service Instructor III Master, Firefighter Master, Haz Mat Technician, Haz Mat Incident Commander, Fire Inspector Basic, Incident Safety Officer, EMT-B.

LNG SAFETY & EMERGENCY MGT MANUAL

MANUAL OF LNG SAFETY & EMERGENCY MANAGEMENT

A BASIC GUIDE ON LNG, ITS PROPERTIES
ITS USE IN TRANSPORTATION
AND GENERAL RESPONSE GUIDELINES FOR
MANAGING A LNG SPILL AND FIRE SITUATION

AND

Fully developed training program with
supporting material / references / Instructor
guides

Used in

- NASFM Training Portal
- IAFC HAZMAT Conference
- Training of 15 FD's in 6 States

Train-The-Trainer Program



LNG SAFETY & EMERGENCY MANAGEMENT

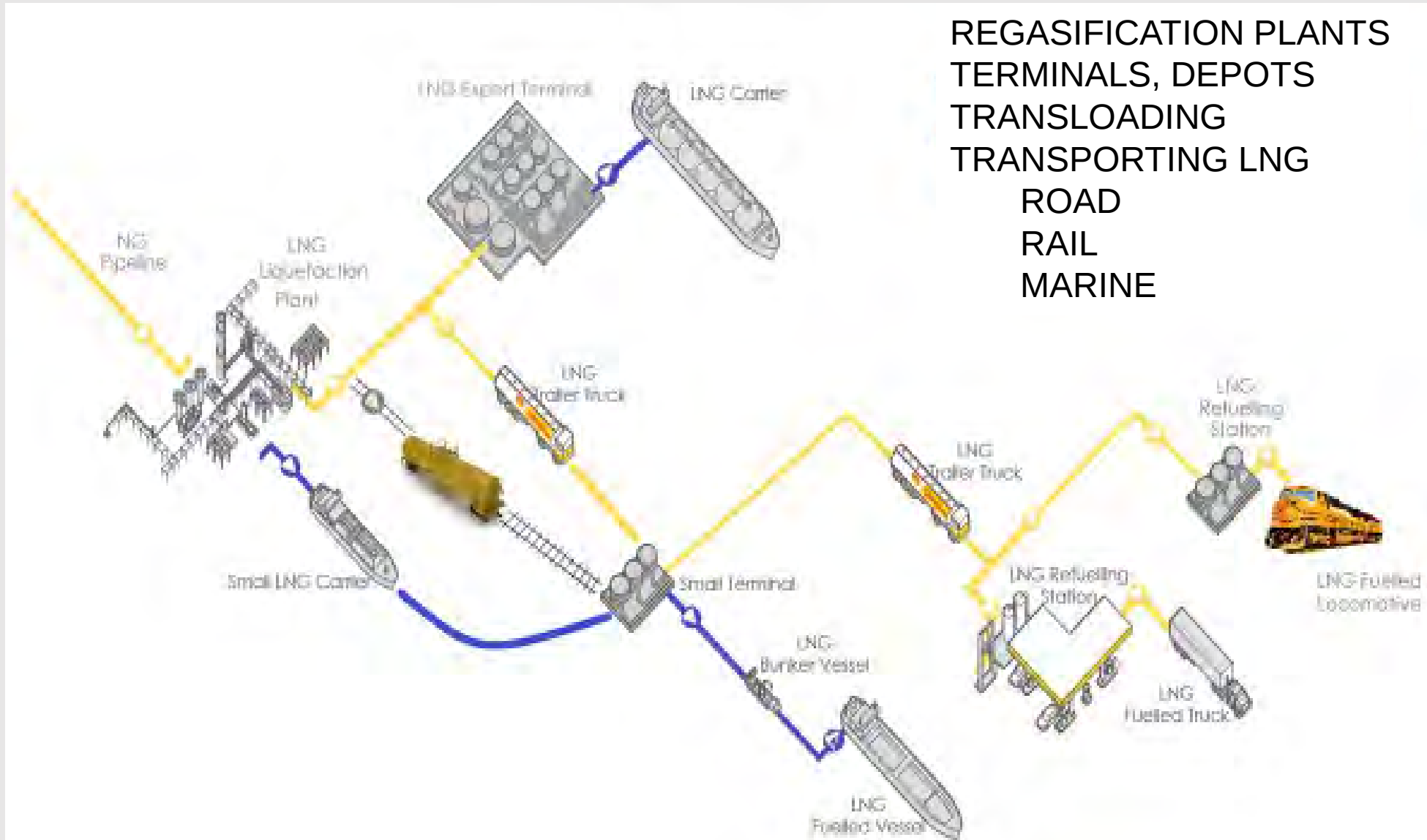
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LNG INFRASTRUCTURE

NEW LNG INFRASTRUCTURE TO SUPPLY AND MOVE LNG TO THE NEW MARKET



PREPARE



If the responders had the knowledge and experience with LNG, the extent of the incident would have been much smaller with no risk to the responders or the public. Given some LNG tanker incidents, the correct emergency response / tactics a fire on an LNG tanker can be handled effectively without endangering people or premises



The duration of the intervention had great economic impact which would have been avoided had the emergency services been well-informed/trained and the necessary materials/knowledge had been readily available. The correct information on how to proceed in such interventions was not readily available, thus all responding emergency units (fire brigade, security forces, recovery service) were learning as they went.

MYTHS, FACTS, EXPERIENCE, KNOWLEDGE

WHAT LNG IS AND WHAT IT IS NOT

IT'S JUST NATURAL GAS

MYTHS, MISCONCEPTIONS, FALSE INFO

EXPERIENCE & HISTORY

BLEVE CONSIDERATIONS

LNG TANKS/VESSELS VS TANKS/VESSELS FOR PROPANE, BUTANE, GASOLINE, ETHANAL

CRUDE RAIL AND ETHANOL RAIL CAR INCIDENTS

No 'bomb trains': 14 states aim to take new rule on LNG transport off the rails

By Hannah Chinn/WHYY

AUGUST 21, 2020 | 7:28 AM

The Horrifying History of Liquefied Natural Gas



Ignitable Vapor Cloud

That Will Drift Downwind - On Shore Billowing and Spreading as it Becomes Ignitable Once the Gas Dispersion Level Reaches [anywhere between 5% to 15% of Gas to Oxygen]
It Will Ignite From Any Source it Encounters Cell Phone, Cigarette Lighter, Attic Fan, Light Switch, Auto or Boat Engine Spark Plug, Carpet Spark, etc...

Result... Fiery Mass Destruction



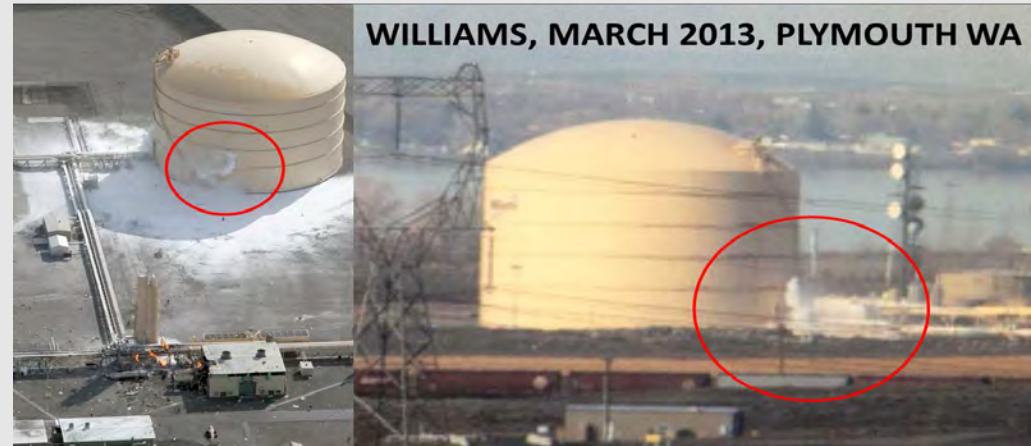
A Liquefied Natural Gas Environmental Impact Report (EIR) has shown up to 70,000 casualties

before, so we already know how massive its destruction can be. In 1977, Oxnard opposed an LNG project after the city's for the Oxnard EIR can be applied to all LNG proposals - worldwide.

Environmental Concerns: LNG is Another Dirty Fossil Fuel

According to the United States Environmental Protection Agency - methane is a major [Environmental Concerns](#)

MYTHS, FACTS, EXPERIENCE, KNOWLEDGE



MURCIA 2011 / TIVASSA 2002



GASNOR - NORWAY 2011



LNG BY RAIL



US DOT-113C120W Tank Car

LNG BY RAIL

PIPELINE ?

BACKGROUND

PILOT BY FERC, CNR, BNSF,
CHART

STANDARDS BY FRA, AAR

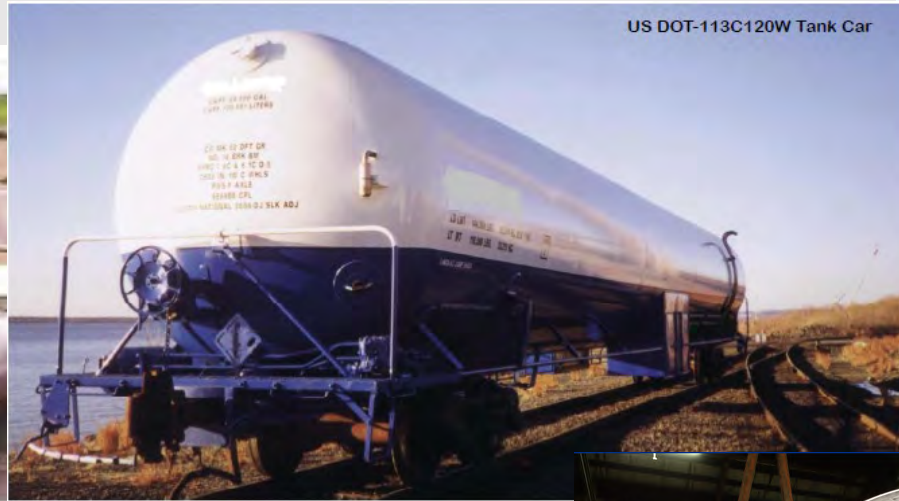
NEW PHMSA RULING

COMMON/DIFFERENT ACROSS DIFFERENT MODES

STORAGE VESSEL DESIGN/CONSTRUCTION



Figure 3: Tank Damage After 30 ft Drop Test



US DOT-113C120W Tank Car



PLANT / FACILITY STORAGE



LNG FUELED VEHICLE – “GAS TANK”



LNG TRANSPORT TRAILER

SAFETY TESTING

- Tests have shown that LNG fuel tanks can withstand pressure of up to 1100psi (calculated value), well above their maximum allowable working pressures.
- Sample tanks are subjected to :
 - Destructive testing such as drop tests
 - the tank is filled with liquid nitrogen and dropped from 10ft and 30ft and must not leak
 - Flame tests
 - the tank is filled with Liquid Nitrogen or LNG and subject to a fire for at least 20min to ensure that during a fire the tank will not rupture
 - Material Tests
 - Tensile test
 - Impact Test
 - Bending Test
 - Weld examination
 - Low Temp Test (-163 oC)



BLEVE

- Considerable debate
 - 2011 Murcia, Spain and 2002 Tivissa, Spain incidents often cited
 - Claim Tivissa incident the first LNG-related "BLEVE"
 - Official report does not describe the incident as a BLEVE;
 - The road tanker vessels were:
 - single-wall
 - applied polyurethane insulation that does not stay in place.
 - This type of vessel design construction is not as robust.
- US and Canadian tank construction standards require:
 - Two nested tanks form the insulated vessel.
 - Double layering of tanks and structural supports protect against physical damage and the effects of external fires.
 - Tanks tested to function safely at much higher pressures (vs. relatively low pressure level normally operate)
 - Multiple backup levels of pressure release devices.
 - Sample destructive testing and flame tests (verify not susceptible to physical compromise or fire damage).
- Experts have concluded that the accidents would not have occurred in the US.

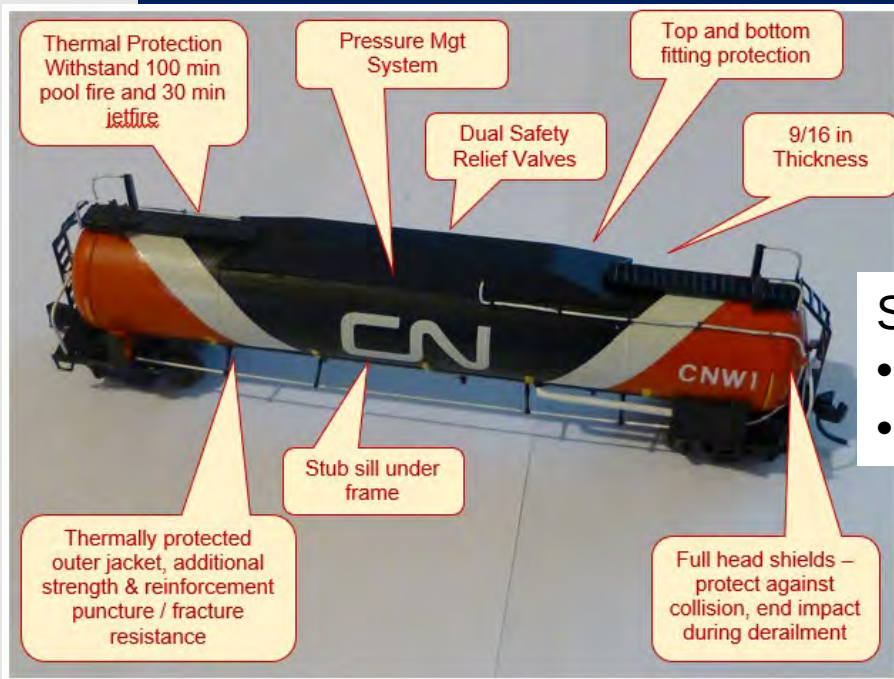
"The combination of physical barriers also makes direct thermal input to the LNG inner tank more limited, reducing the chances BLEVE occurring in the event of a fire."

- Sandia National Lab, LNG Safety Research Report to Congress, May 2012
- National Institute Standards & Technology, NIST Safety Manual, Jan 30, 2013
- Southwest Research Institute (SWRI)
- DOT – Argonne National Lab LNG Case Study
- National Petroleum Council – Qualitative Discussion on Safety Considerations for LNG
- Centre for Studies on Technological Risk (CERTEC).
- Robin Pitbalbo, DNV, "Potential for BLEVE associated with marine facilities", Journal of Hazardous Materials, Volume 140, Issue 3, 2007
- Filippo Gavelli, "Liquefied Natural Gas Explosion Hazards – Are They Real?," Hydrocarbon World, 2009



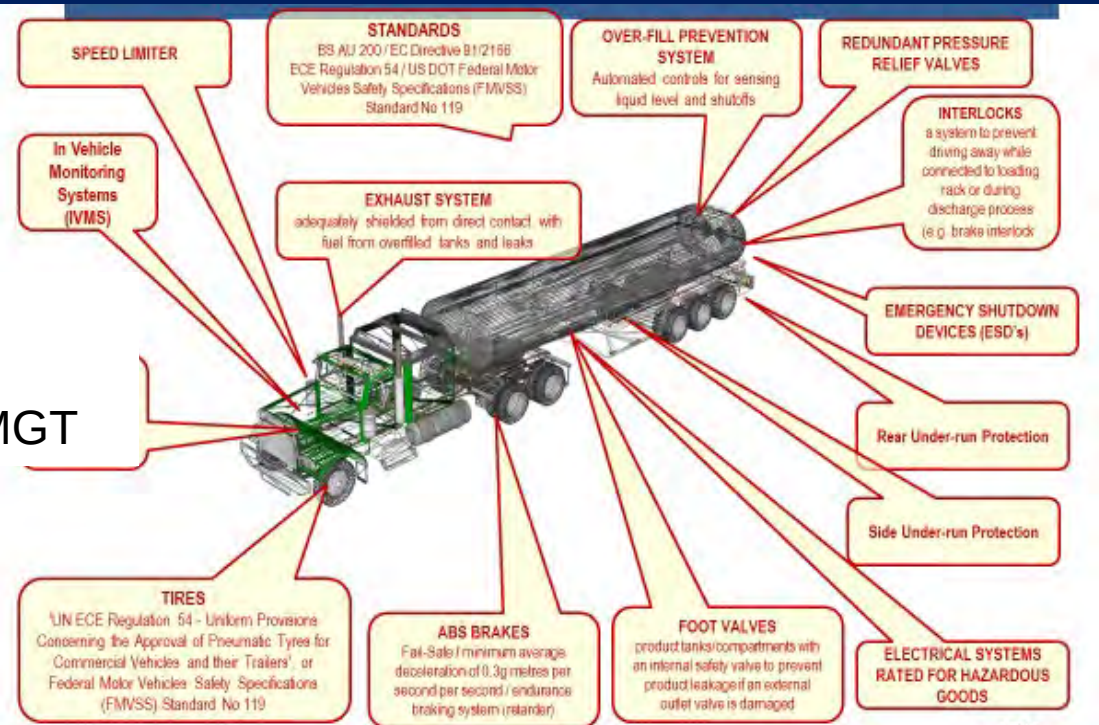
- The double walled construction **inherently more robust than the equivalent tanker truck design.**
- An **explosion of an LNG container is a highly unlikely event**, possible only if:
 - pressure relief equipment or system fails completely or
 - combination of high vaporization rate and obstruction of venting
 - **This is a highly unlikely event** due to code requirements for pressure relief.
 - No reports in the literature reviewed of any BLEVE occurring with LNG.

COMMON/DIFFERENT ACROSS DIFFERENT MODES



SAFEGUARDS

- ESD's
- PRESSURE MGT



COMMON/DIFFERENT ACROSS DIFFERENT MODES

MANAGING TRANSPORT INCIDENTS

- STRUCK BY --- STRIKE AGAINST
- TRANSP ROLLOVER /// DERAILMENT
- QTY ACROSS MODES
 - 1 ROAD TRANSP /// UNIT OR MANIFEST TRAIN



COMMON/DIFFERENT ACROSS DIFFERENT MODES

MANAGING TRANSPORT INCIDENTS

- OVER LAND, OVER WATER
 - TRANSPORT OVER BRIDGE, ALONG LAKE, RIVER, ROLLOVER INTO WATER FILLED DITCH
- CONGESTED / UNCONGESTED
 - UNDER BRIDGES, OVERPASSES
 - TUNNELS
 - UNDERGROUND (SEWERS, UTILITIES, DRAINAGE)



COMMON/DIFFERENT ACROSS DIFFERENT MODES

LOADING / OFFLOADING

- Normal Operations
- Emergency incident



MANAGING AN INCIDENT INVOLVING LNG

PRIORITIES:

- ☐ Rescue,
- ☐ Evacuation, and
- ☐ Scene Control

ASSESS THE INCIDENT

- leaks, spills, releases
- With or without ignition
- Pressure management / Venting
- External impact



INCIDENT MANAGEMENT

- NOT ATTACK
- ATTACK

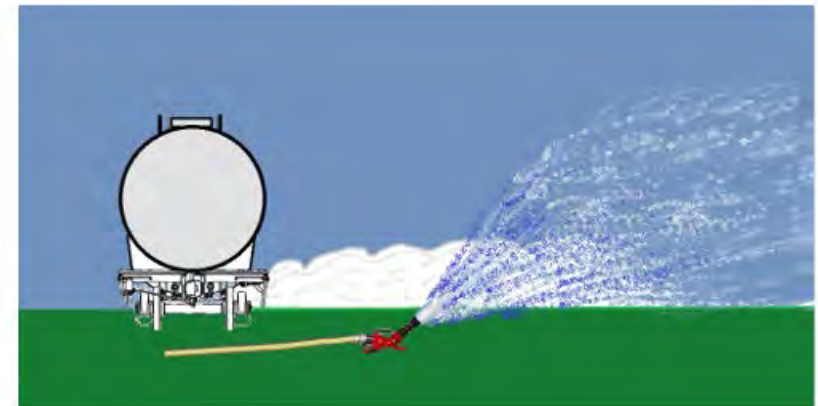
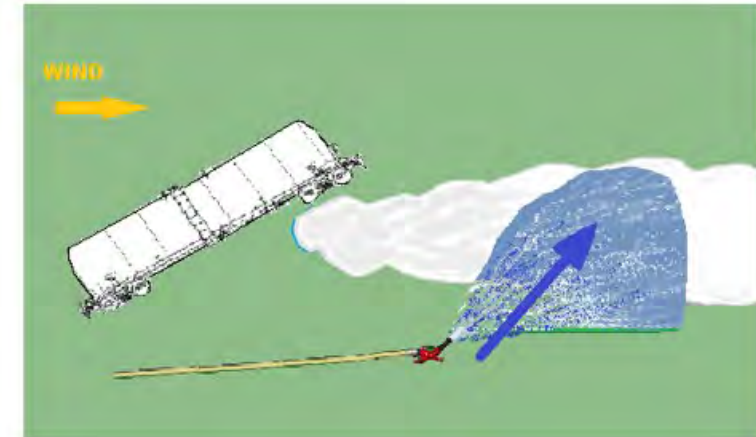
MANAGING AN INCIDENT INVOLVING LNG

CONTAINMENT

VAPOR CLOUD MANAGEMENT



LNG SAFETY & EMERGENCY MANAGEMENT
LNG FAQ

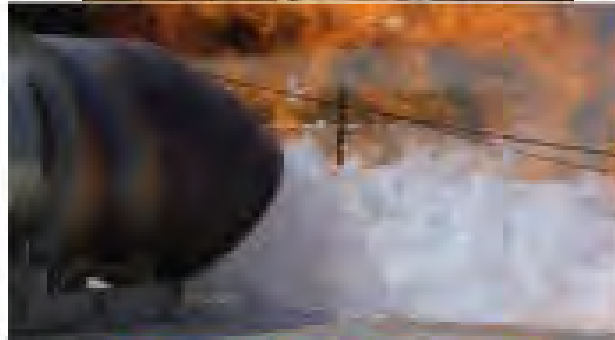


MANAGING AN INCIDENT INVOLVING LNG

WATER



FOAM



DRY CHEM



LNG BY RAIL



LESSONS
LEARNED
FROM
INCIDENTS



KNOWN
STRATEGIES
& TACTICS



