

## LNG – Properties & Hazards SWP-106

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### 1.0 Purpose

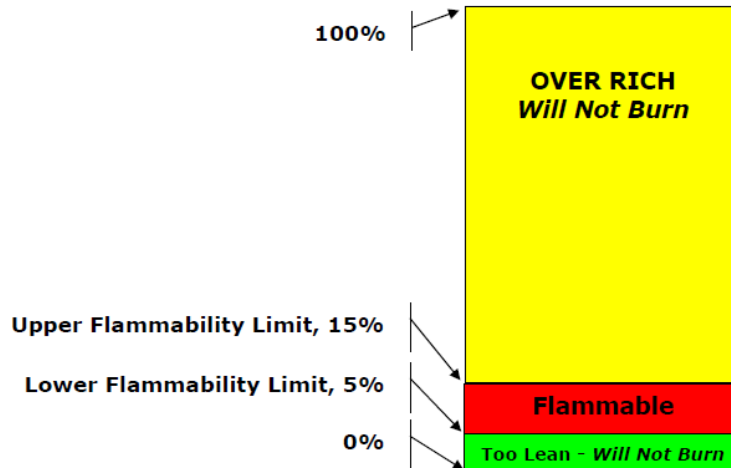
- 1.1 To provide workers with the properties and characteristics of LNG so that work can be performed in a safe manner.
- 1.2 This SWP only applies to the Yukon Energy Whitehorse Gas Generating (WG0) facility.

### 2.0 LNG properties

- 2.1 Liquefied natural gas (LNG) is natural gas that is cooled to approx.  $-160^{\circ}\text{C}$  ( $-260^{\circ}\text{F}$ ) to form a cryogenic liquid.
- 2.2 LNG is comprised of 4 main components:
  - **Methane; 83% - 99%**
  - Ethane; 1% -13%
  - Propane; 0.1% - 3%
  - Butane; 0.2% - 1%
- 2.3 LNG occupies 1/600<sup>th</sup> it's volume in the liquid state.
- 2.4 LNG has an expansion rate of 600:1 (liquid to vapour).
- 2.5 LNG is odourless, colourless, non-corrosive, and non-toxic.
- 2.6 LNG vapour can be heavier than air and become lighter than air as the vapour warms.
- 2.7 LNG **is not flammable in the liquid state.**
- 2.8 LNG release results in evaporation and formation of a visible vapour cloud.
- 2.9 Ignition temperature for LNG vapour is approx.  $537^{\circ}\text{C}$  ( $1000^{\circ}\text{F}$ ).
- 2.10 Flame temperature of LNG vapour fire is approx.  $1370^{\circ}\text{C}$  ( $2500^{\circ}\text{F}$ ).
- 2.11 LNG vapour is non-toxic; but is an asphyxiate.
- 2.12 As LNG vapour concentrations rise, the lower flammable limit (LFL) of 5% (see section 3.0) will be reached long before the dangers of oxygen deprivations are present.

**3.0 LNG flammability**

- 3.1 LNG (in the liquid state) is not flammable.
- 3.2 LNG vapour is flammable when mixed with air. The flammable range for LNG is 5%; lower flammable limit (LFL) to 15%; upper flammable limit (UFL).
- 3.3 Keep ignition sources away from LNG and LNG vapour.



**4.0 LNG hazards & release**

4.1

**Potential hazards –**

- Contact with LNG
- Contact with LNG equipment/piping; cold surfaces
- LNG (vapour) release
- High pressure

**Potential injuries or damage -**

- (Cold) burns and frostbite.
- Skin adhesion and frostbite.
- Breathing discomfort; frostbite; asphyxiation.
- Fire or explosion.
- Bodily injury

- 4.2 When LNG is released on land or water, it vapourizes quickly and leaves no residue.
- 4.3 A release to land or water will result in a visible vapour cloud.
- 4.4 LNG evaporates 5 times faster on water.
- 4.5 Vapour cloud size and shape depend on wind speed, vapourization rate, and atmospheric conditions (temperature, humidity).
- 4.6 Hazard control
  - 4.6.1 Primary Containment – Accomplished by employing good engineering practices and using suitable materials for storage tanks.
  - 4.6.2 Secondary Containment – Use of containment area that is designed to exceed the volume of a single storage tank.

- 4.6.3 Safeguard Systems – Minimize the uncontrolled release of LNG and mitigate the effects of a release.
- 4.6.4 Separation – LNG facility located a safe distance from industrial sites, communities and other public areas.
- 4.6.5 These 4 conditions, combined with adequate PPE, industry standards and guidelines, good engineering practices, and regulatory compliance are vital to maintain strong LNG industry safety performance.

## **5.0 Reference documents**

- YEC SWP-100; LNG – General Site Rules
- YEC SWP-103; LNG – Personal Protective Equipment
- YEC SWP-107; LNG – First Aid Measures
- YEC LNG Emergency Procedures Manual
- FortisBC LNG SDS
- CSA Z276-13; Liquefied natural gas (LNG) - Production, storage, and handling