

# LNG: Transportation Logistics and Opportunities – Northern Territories



## FUELLING THE CANADIAN NORTH

*Fuel represents 42% of ALL Cargo Shipped to the Canadian Northern Territories*

### The Problem:

- **Security of Supply now an Issue**
  - Major Oil Companies Not Interested in the Supplying the North
  - Refineries are Being Mothballed
  - Remaining Refineries at Full Capacity, AND Distribute to Markets Easy to Access
  - No New Refineries in the Last 35 years. Upgraders are Challenged
  
- **Diesel Fuel Emissions are Significant**
  
- **Diesel Fuel in the North is Expensive; based on Highest Cost of Transportation**

# FUELLING THE CANADIAN NORTH

## The Opportunity

- Western Canada is Awash in Shut-in Natural Gas
- Export Projects Increasingly Encumbered, therefore
- Increasing Interest in Domestic NG Liquefaction & Distribution
- NG Pricing reflects North American Oversupply
- NG can replace diesel fuel: power plants and mines
- Emissions Much Less Than Diesel, and
- Much Cheaper

# What is Liquefied Natural Gas (LNG)?

- ❑ Liquefied Natural Gas (LNG) is a clear, colorless, odorless, non-toxic liquid
- ❑ LNG is natural gas that is refrigerated and turns to a liquid at -162 degrees Celsius.
- ❑ LNG is less than ½ the weight of water.

# Safety, Handling Fundamentals

- As a liquid, LNG is not flammable
- Ignition & burning requires vaporization and mixture with O<sub>2</sub> (air)
- LNG vapor is flammable. Temperature necessary to ignite NG is about 540° C. Gasoline requires only 230° C.
- Burning is not sustainable outside the flammability limits (5% to 15% air, above 15% there is not enough O<sub>2</sub>).
- LNG burns as a “lazy flame.” More like a candle and not gasoline.
- An LNG vapor cloud in the atmosphere will not explode, unlike propane
- LNG is not shipped or stored under high pressure.
- LNG is stored at -162° C (- 260° F), at low pressure.
- Transport LNG at low pressure In double wall vacuum jacket trailers.

# Environmental Benefits of LNG

## Air Emissions for LNG Compared to Diesel\*

- **100% Reduction in Sulfur Dioxide (SO<sub>2</sub>)**
- **Up to 97 % Reduction in Nitrogen Oxides (NO<sub>x</sub>)**
- **50% Reduction in Carbon Dioxide(CO<sub>2</sub>)**
- **91% Reduction of Carbon Monoxide (CO)**
- **89% Reduction in Particulate Matter (PM)**
- **50% Reduction In Volatile Organic Hydrocarbon (VOC)**

\* US Department of Energy



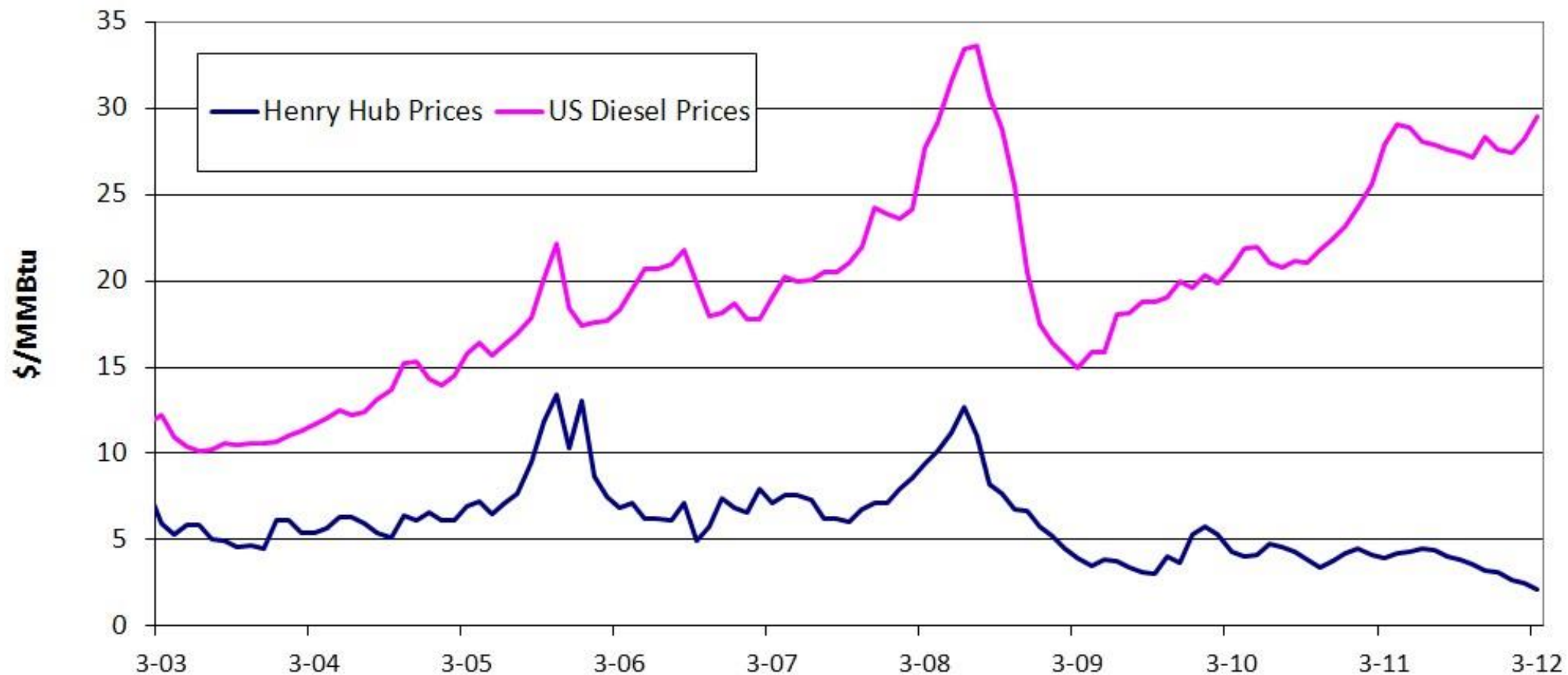
# LNG Receiving

- ❑ LNG Truck Unloading
- ❑ LNG Storage
- ❑ Regasification (Vaporize LNG to Natural Gas)



- ❑ Simple, Compact, Scalable
- ❑ Low Energy Use
- ❑ Heat Recovery from Power Generation for LNG Vaporization

### Historical Comparison of US Diesel to Henry Hub



		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>US Diesel</b>	(\$/MMBTU)	7.96	7.93	8.82	8.57	7.46	8.00	10.67	10.03	9.40	10.78	12.91	17.14	19.33	20.59	27.20	17.60	21.36	27.47	28.37
<b>Henry Hub</b>	(\$/MMBTU)	1.77	1.73	2.75	2.48	2.09	2.27	4.31	3.96	3.36	5.50	5.91	8.81	6.74	6.98	8.86	3.95	4.39	4.00	2.45
<b>Margin</b>	(\$/MMBTU)	6.19	6.20	6.07	6.09	5.37	5.73	6.36	6.07	6.04	5.28	7.01	8.32	12.58	13.60	18.34	13.65	16.97	23.48	25.92







Yukon Energy Corporation



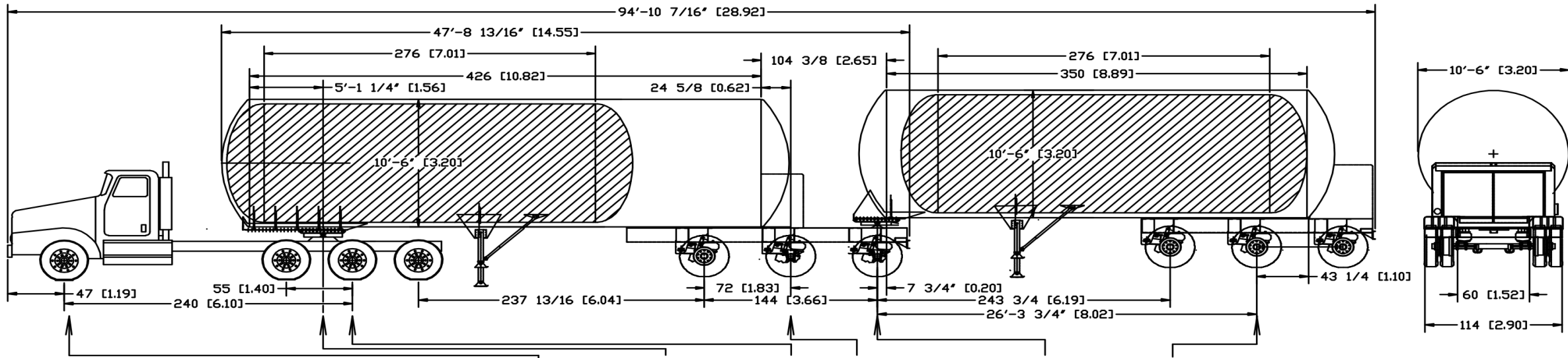


Yukon Energy Corporation

**PRO  
LOG  
CANADA**

CV120410GA

ZONE	REV	DESCRIPTION	DATE	APPROVED
-	A	RESIZING TO ACHIEVE DESIRED PAYLOAD	5/6/14	RMB



	STEERING AXLE		KING PIN		TRACTOR TANDEM		LEAD TRIDEM		KING PIN		PUP TRIDEM		TOTAL WEIGHT	
	ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
TRACTOR TARE	11122	5503	--	--	12707	5764	--	--	--	--	--	--	24838	11266
TRAILER TARE	1048	475	10270	4658	9222	4183	40361	18308	6251	2835	20487	9293	56080	25438
PAYLOAD	3522	1598	34503	16561	30981	14053	12549	5692	15038	6821	32423	14707	94513	42871
FULL COMBINATION	16701	7576	44773	20309	52910	24000	52910	24000	21289	9657	52910	24000	175431	79575

97.75 CUBIC METERS

A

B

UNLESS OTHERWISE SPECIFIED, INTERPRET DIMENSIONS AND TOLERANCE PER ANSI Y14.5M - 1982. DIMENSIONS ARE IN INCHES (MM).  
**DIMENSIONAL TOLERANCES**  
 1 PLACE ± .1  
 2 PLACE ± .06  
 3 PLACE ± .010  
 ANGLE ± 1.5°  
 REMOVE BURRS  
 FILLETS AND RADII .01-.03  
 BREAK SHARP EDGES .01-.03

JOB FIRST USED  
 DRAWN RMB 4/15/14  
 CHECK \_\_\_\_\_  
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CRYOGENIC VESSEL ALTERNATIVES  
 9528 WARREN ROAD MONT BELVIEU, TX 77580  
 WESTERN COPPER & GOLD  
 GENERAL ARRANGEMENT/WEIGHT DISTRIBUTION  
 CVA-14.5K/14.5K-20/47-BTR-P-LNG  
 SIZE B DWG. NO. CV120410GA REV A  
 SCALE NONE WEIGHT SHEET 1 OF 1

ORIGINATED FROM: -

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