

# Natural Gas For Heavy Duty Trucks

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# Energy Outlook 2010 – 2040



“By the year 2040, we expect to see...”

# Energy Outlook 2010 – 2040

Source: ExxonMobile



- 2 billion more people on the planet
- Approx. 35% greater demand for energy
- China and India lead the growth in energy demand
- Natural gas surpass coal as the second-largest fuel source
- Globally, GDP per capita will grow by about 80% from 2010 to 2040
- Demand for diesel is expected to increase by 75% from 2010 to 2040

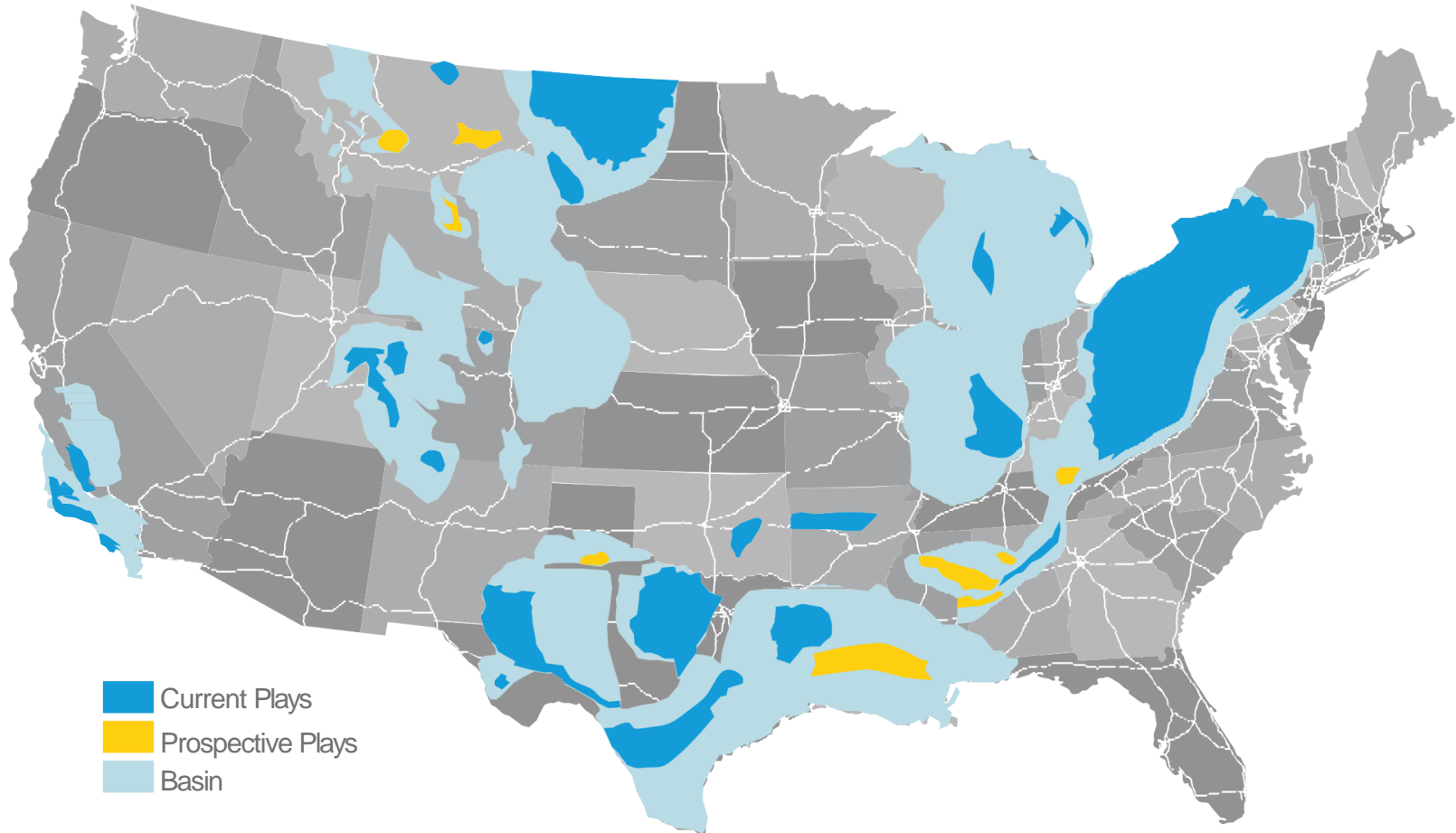
# Energy Outlook 2010 – 2040

Source: ExxonMobile



- Demand for diesel is expected to increase by 75% from 2010 to 2040
- Gasoline expected to be flat from 2010 to 2040
- Diesel to have stricter marine emissions standards
- Natural gas is likely to grow in use as a transportation fuel due to economics and emissions
- Highest growth in natural gas as a transportation fuel: heavy-duty and commercial vehicles

# US Natural Gas Reserves



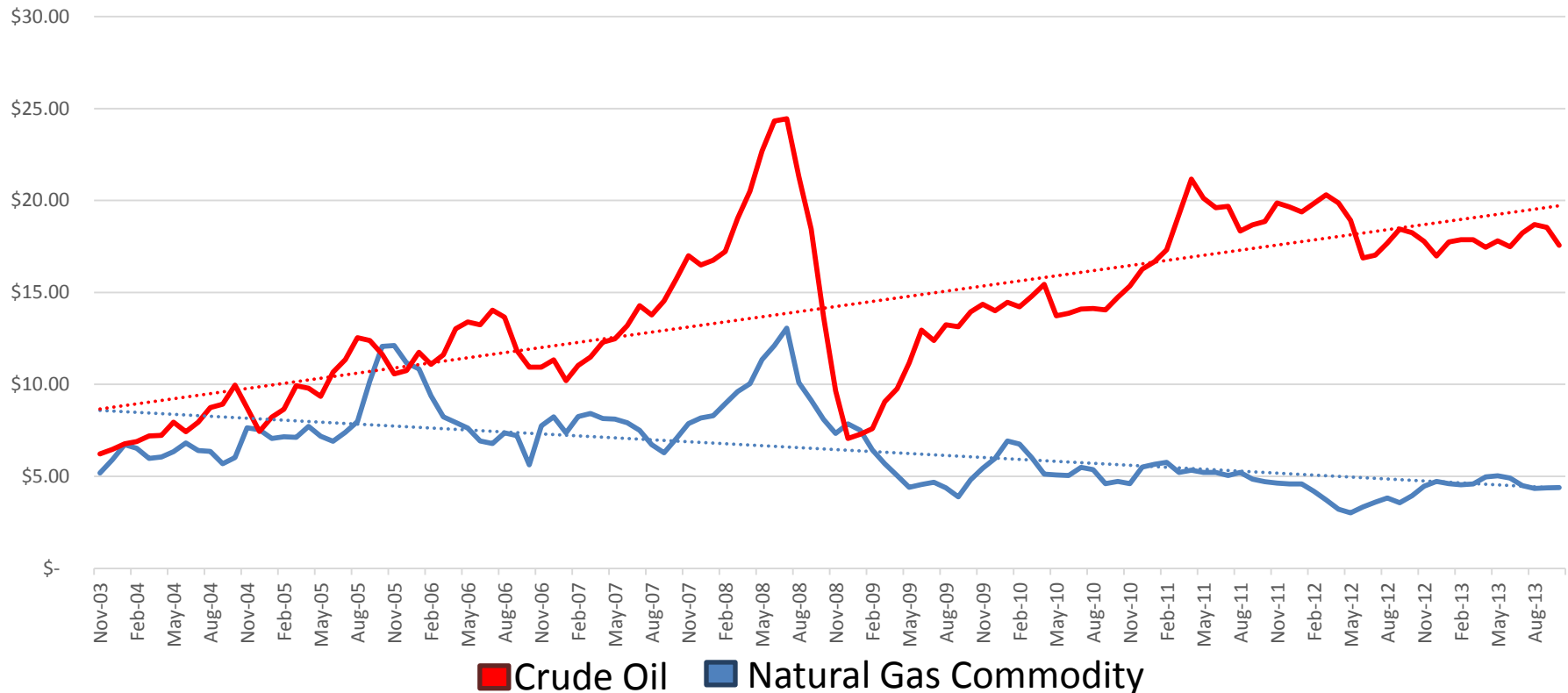
It is projected that U.S. Natural Gas production will steadily increase, with a 56% increase between 2012 and 2040, reaching 37.6 trillion cubic feet (tcf) of production per year. It is estimated that the U.S. has 2,203 trillion cubic feet (tcf) of recoverable natural gas.

Sources: EIA

# Natural Gas vs. Crude Oil



NG Commodity vs. Crude Oil (\$/MMBTU)



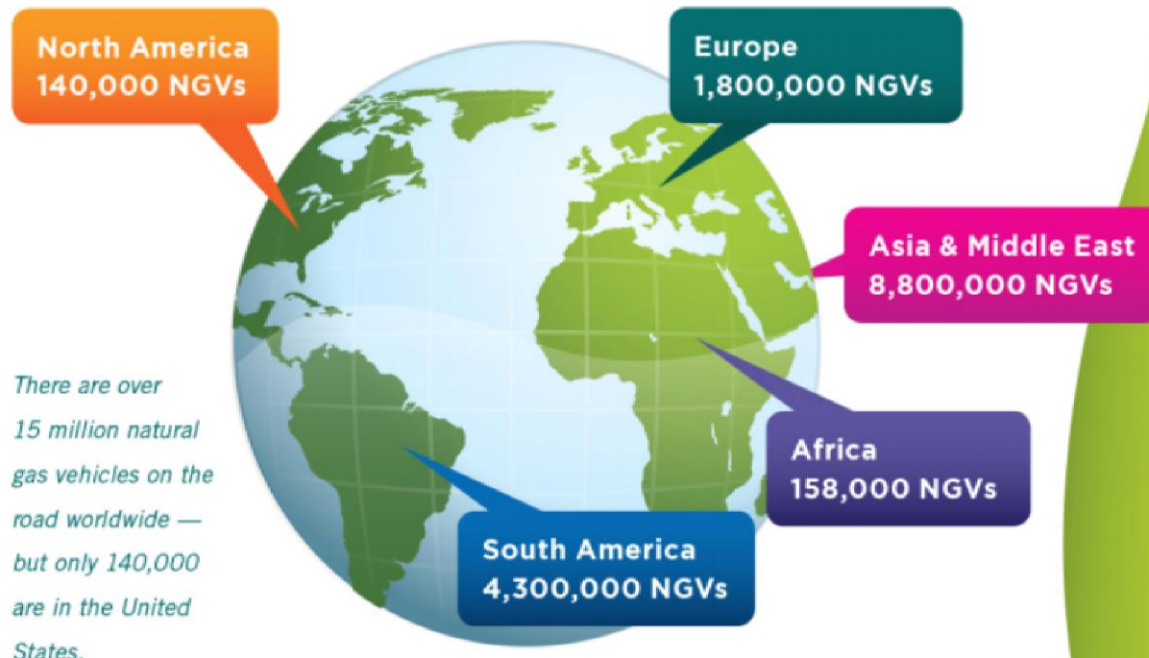
Over the last 10 years the average annual growth rate of Crude Oil has been 18% while the average annual growth rate of Natural Gas has been -5%.

# Natural Gas Vehicles



**The U.S. is the world's largest natural gas producer, but lags behind other nations in natural gas transportation.**

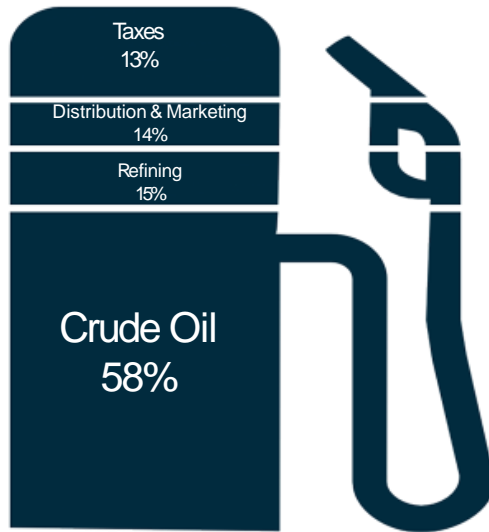
- Alternative fuel vehicle programs and policies should recognize the full benefits of natural gas.



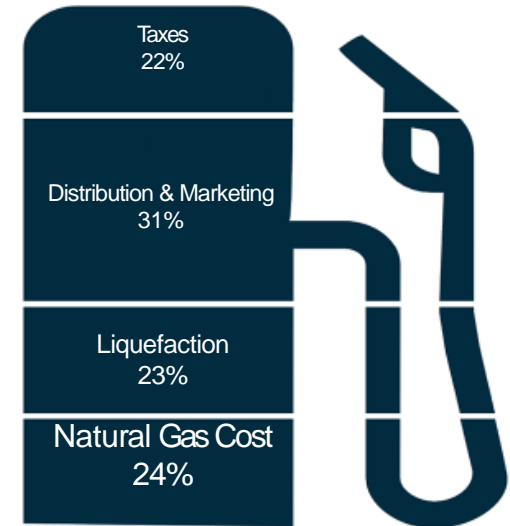
# Breakdown: Correlation to Commodity



Diesel  
Average  
Retail Price:  
**\$3.98**



LNG  
Average  
Retail Price:  
**\$2.62**



LNG is better situated to absorb fluctuations in the cost of commodity because only 24% of the retail price is the commodity.

Did you know?

**90%**

of natural gas consumption in the U.S. is produced domestically.

In its most recent annual energy outlook, the EIA expressed enough confidence in the durability of the U.S. natural gas boom that it anticipates LNG prices will sit 40% below diesel for the next 30 years.



# State Incentives: Arkansas



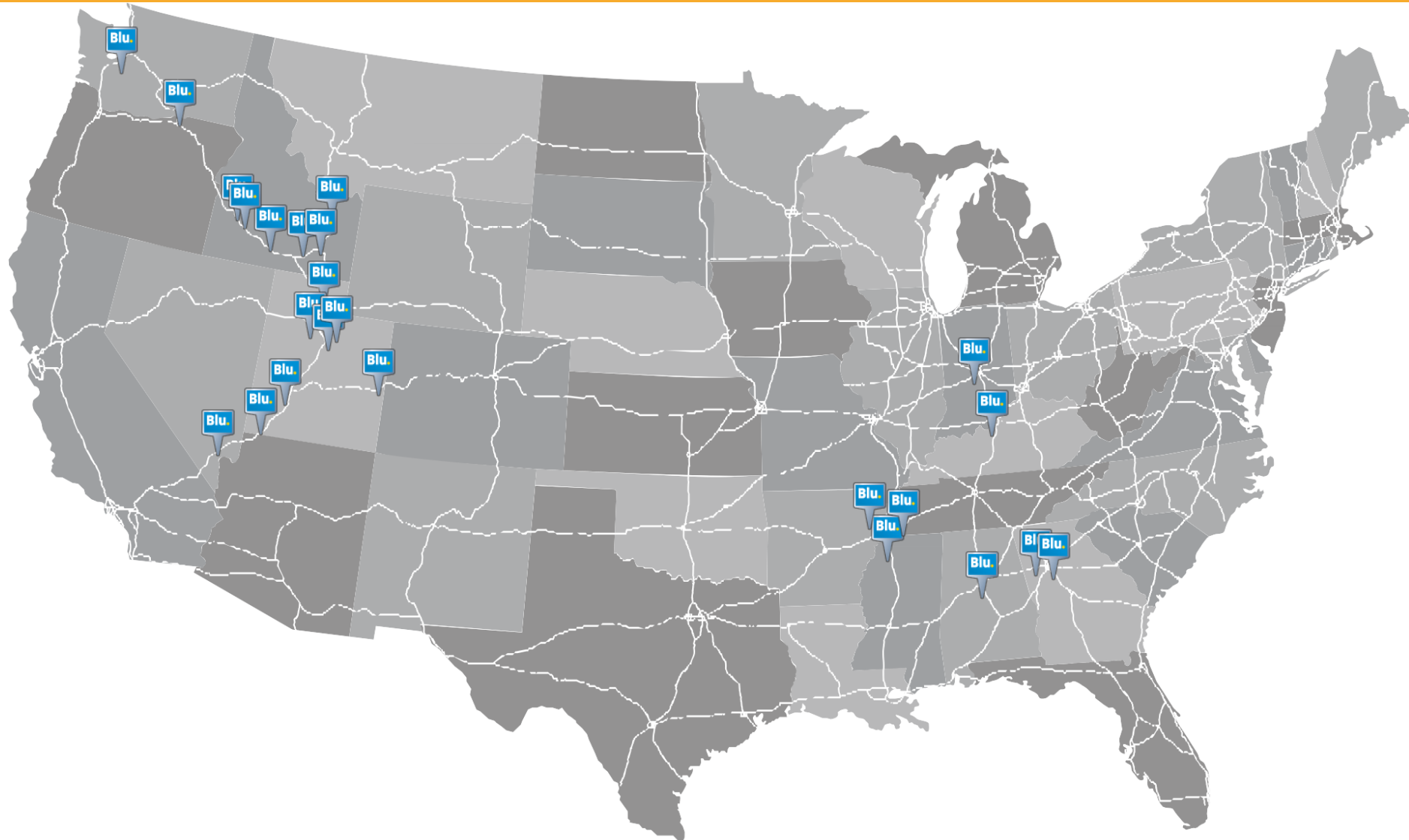
## **Alternative Fuel Tax Rate:**

Alternative fuel vehicles are subject to a special tax rate. Tax is levied in gallon equivalents at a rate of **\$0.05**. That rate increases to \$0.07 after 1,000 vehicles running on a specific fuel are registered.

## **Alternative Fuel Vehicle Rebate:**

The Arkansas Energy Office of the Arkansas Development Commission will administer a rebate program funded by the Clean-Burning Motor Fuel Development Fund. Rebates will be available for 50% of the conversion cost up to \$4,500, specifically for vehicle conversions to hydrogen fuel cells, compressed natural gas (CNG), liquefied natural gas (LNG), or liquefied petroleum gas (propane).

# Blu. Station Network



# The Technology



What is LNG?  
What is CNG?



# Video: Introduction to LNG



An Introduction  
to  
Liquifid Natural Gas (LNG)

# LNG versus CNG



## LNG

- Cooled to -260°F
- Lighter Tanks
- Fill time similar to diesel
- More fill by volume
- Ideal application for hub and spoke
- Up to 1,000 mile range

## CNG

- Pressurized to 3600 psi
- Requires more tanks for same DGE as LNG
- Real estate on the truck becomes an issue
- Payload can be an issue
- Longer fill times and not as full of a fill
- Ideal application for trucks that return to base and can be filled overnight

# LNG Tank Packages



SPECIFICATIONS	36 DGE		59 DGE		75 DGE		98 DGE	
MODEL*	HLNG-72		HLNG-119		HLNG-150		HLNG-196	
Dimensions	in	mm	in	mm	in	mm	in	mm
Diameter	26	660	26	660	26	660	26	660
Length	50	1270	76	1905	90	2285	116	2945
Capacity	gal	ltr	gal	ltr	gal	ltr	gal	ltr
Net	65	245	108	410	135	511	176	668
Gross	73	270	120	454	150	561	196	742
Weight	lbs	kg	lbs	kg	lbs	kg	lbs	kg
Empty	320	145	505	230	615	280	775	352
Full**	550	250	885	400	1065	483	1390	630

\* Available in custom sizes from 13" to 34" diameter up to 280 gross gallon capacity.

\*\* Full weight calculations are based on 3.5 lb/gal (.42 kg/ltr) density LNG.

# LNG Applications



Off-Road Applications



# Blu. Terminal Stations



Atlanta (Ryder)



Las Vegas



# Stand Alone Station



# Network Operations Center



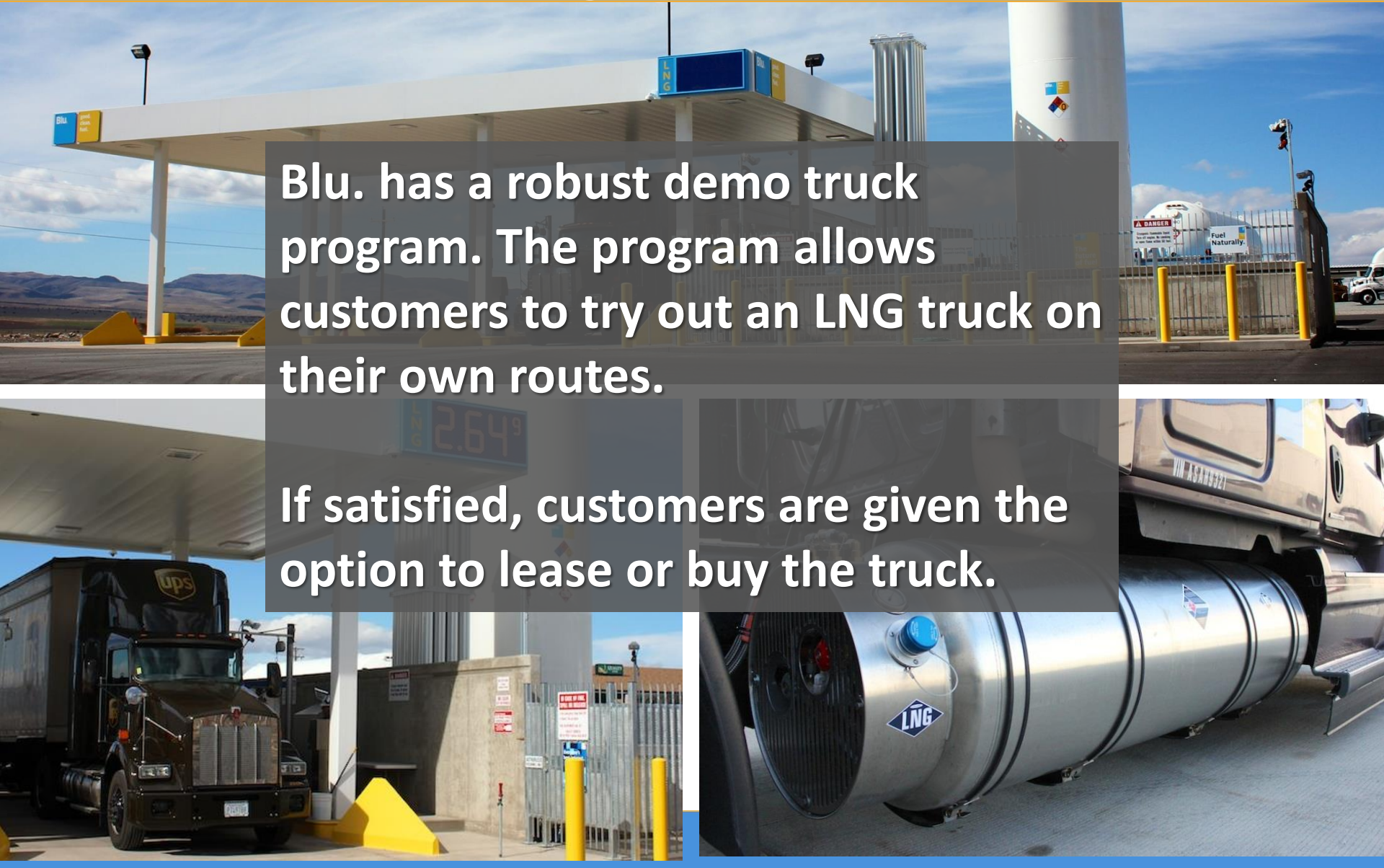
# LNG Heavy Trucking Solutions

## The Truck Demo Program

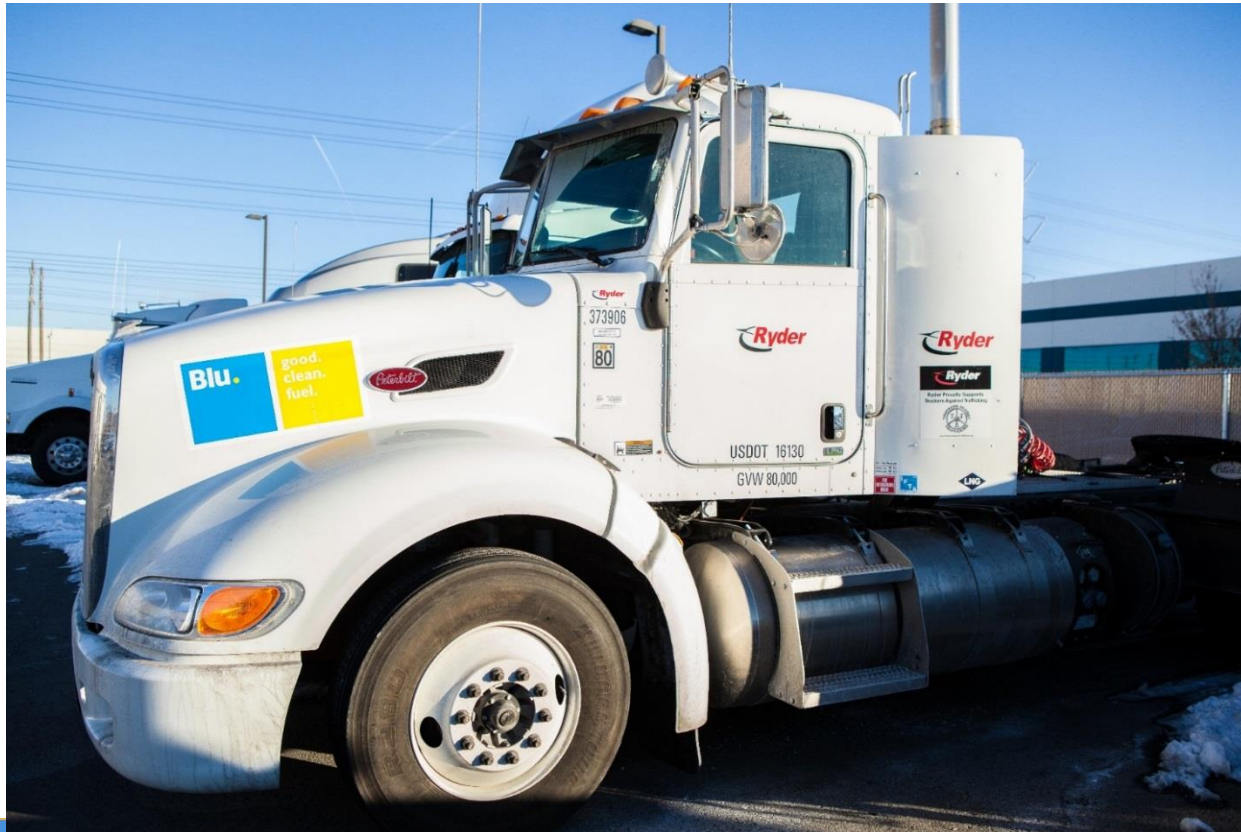


Blu. has a robust demo truck program. The program allows customers to try out an LNG truck on their own routes.

If satisfied, customers are given the option to lease or buy the truck.



# Ryder Trucks



# Payback Calculator



Miles per Year	110,000	Diesel vs. LNG Tractor Comparison					
Life Cycle Miles	550,000						
Tractor Capital Costs	Variables	Diesel	Operating Costs	Cost per Mile	LNG	Operating Costs	Cost per Mile
Tractor		\$ 125,000			\$ 175,000		
Finance Rate		0%			0%		
Term of Finance (Months)	60	60			60		
Residual	35%	\$ 43,750			\$ 61,250		
<b>Payment</b>		<b>\$1,354</b>	<b>\$ 81,250</b>	<b>\$0.15</b>	<b>\$1,896</b>	<b>\$ 113,750</b>	<b>\$0.21</b>

Fuel							
Miles per Gallon	6.00				5.25		
Diesel per Gallon	\$4.000		\$ 366,667	0.667			
DEF (Diesel Exhaust Fluid)	\$2.700		\$ 6,806	0.012			
LNG (DGE)	\$2.690				100.00%	\$ 281,810	0.512
<b>Total Fuel Costs</b>			<b>\$ 373,473</b>	<b>\$0.68</b>		<b>\$ 281,810</b>	<b>\$0.51</b>

Maintenance per Mile	\$0.100		\$ 55,000	\$0.10	\$0.115	\$ 63,250	\$0.12
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<b>Total Operating Cost</b>			<b>\$ 509,723</b>	<b>\$0.93</b>		<b>\$ 458,810</b>	<b>\$0.83</b>
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Fuel Savings per Mile Savings	\$ 0.17
Net Savings per Mile	\$ 0.09
Net Monthly Savings	\$ 849
Net Annual Savings	\$ 10,183
Total Lifecycle Savings (per Tractor)	\$ 50,913
Payback (Months)	21
Payback (Miles)	195,007
5 Year IRR	31%

# Natural Gas Trucks



Every major truck manufacturer offers LNG trucks

	9 Liter	12 liter	13 liter	15 liter
				
				2015
				 2016
				 2016
				

# Next Steps



- ✓ Payback Calculator Analysis
- ✓ Evaluate lanes and locations
- ✓ Private On-Site Fueling
- ✓ Demo Program

## Thank you!

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