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Use of LNG-Powered Vehicles for Industrial Freight:

Carrier survey results show high interest, but slow adoption



In the U.S. we are producing natural gas at record rates. Production from shale alone is expected to increase 41% by 2020. This supply increase, combined with lower demand due to the warm winter in 2012, has driven natural gas prices to a 10-year low.

This, in turn, has increased industry interest in the feasibility of natural gas vehicles (NGVs) for transporting freight. While Compressed Natural Gas (CNG) vehicles are appropriate for “return-to-base” vehicles like school buses, garbage trucks, and local delivery trucks, Liquefied Natural Gas (LNG) vehicles, because of their increased range, are currently a better option for long-haul, heavy-duty trucking. Adoption of LNG within the transportation industry is limited, but there are decided advantages to more widespread adoption by shippers and carriers, including:

- Reduced fuel cost
- Reduced price volatility based on use of a domestic fuel source
- Reduced carbon emissions
- Support growth of the North American natural gas industry and the attendant economic impact

Within the heavy industrial sector, trucking has unique characteristics that challenge LNG adoption. To determine the potential of LNG vehicle use for industrial freight, PLS Logistics surveyed senior executives at 100 industrial freight carriers in the first quarter of 2012. Most carriers surveyed had a fleet size over 50 power units. This paper summarizes the results of this survey.



Kenworth T800 LNG factory-direct natural gas truck powered by Westport HD

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Awareness and Interest in LNG-powered Vehicles

The majority of survey respondents (76.1%) were either aware of LNG technology or were actively analyzing its use. However, no one surveyed is planning to purchase LNG vehicles in 2012.

Awareness has been increased by recent LNG references in the press. President Obama, in his 2012 State of the Union address, announced his administration's support for tax incentives to spur investments in natural gas powered vehicles. In addition, Clean Energy Fuels, Inc. recently announced plans to invest in LNG fueling stations and has partnered with Navistar to provide LNG truck leasing options to carriers (See below).

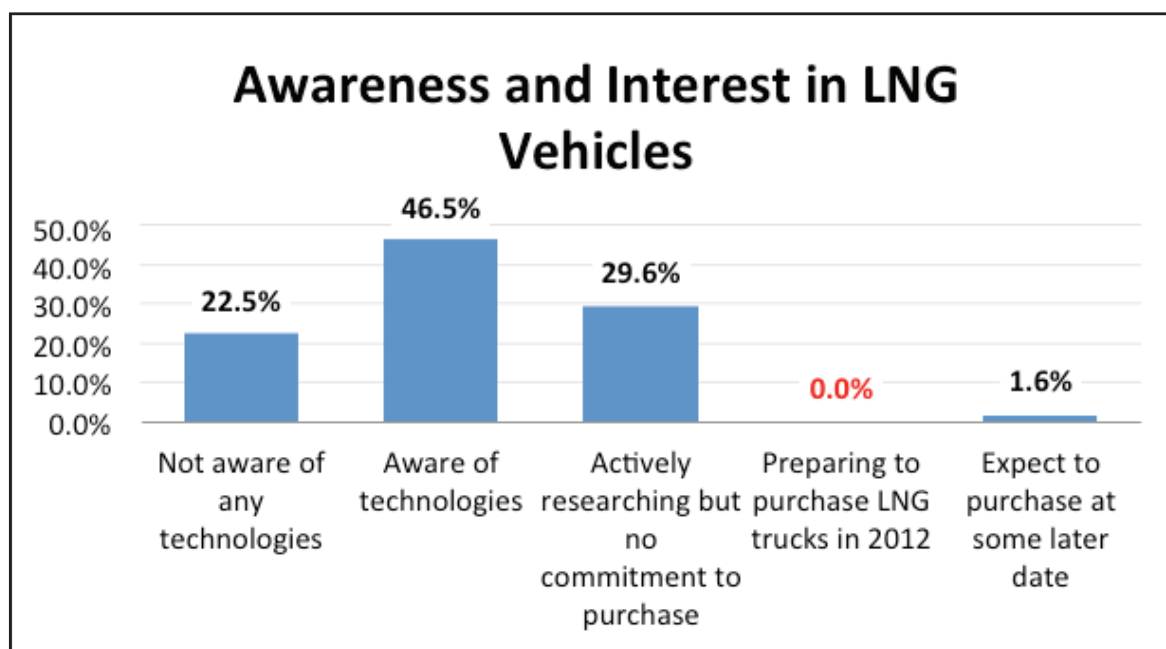


Figure 1

Use of LNG Vehicles for Over-The-Road Trucking

While respondents were generally aware of LNG-powered vehicles, 72% felt that the technology had limited adoption potential for industrial freight. Heavy-duty, over-the-road trucking operates regionally, with driver home time limited to weekends. This makes a public refueling infrastructure essential. In addition, OTR carriers require a longer operating range before refueling to remain efficient.

Industrial sector carriers require higher horsepower and torque to handle heavy cargo weights. Typical diesel engines used in heavy-duty fleets are 450-550 horsepower with 1,600-1,800 torque. Most LNG-powered engines fall short of this performance, although the Westport HD LNG engine does hit the lower end of the power requirement.

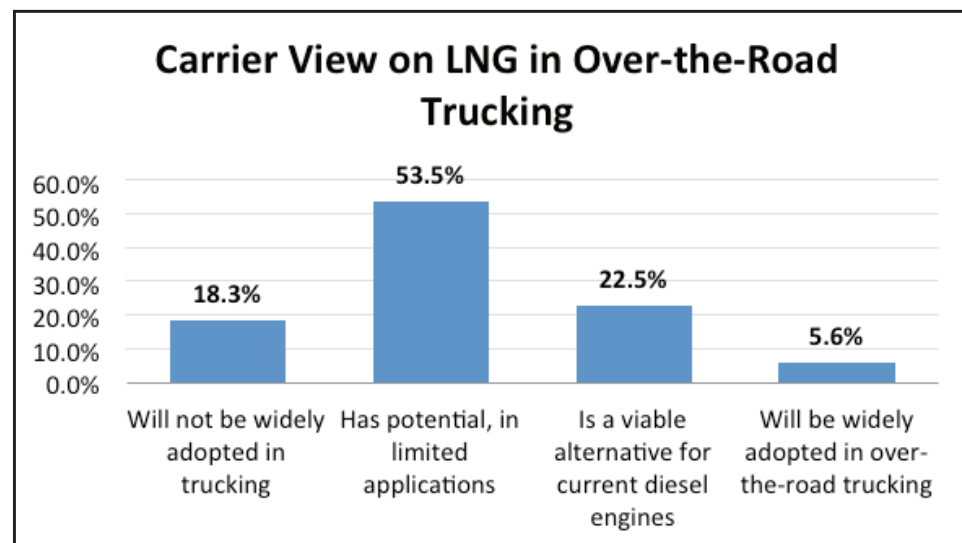


Figure 2

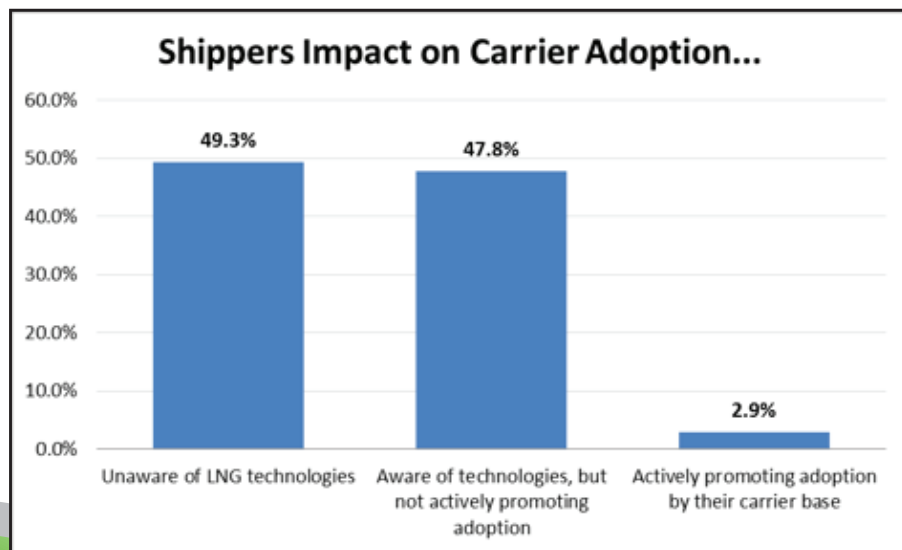


Figure 3

Survey results also indicated that carriers are under no pressure from customers to move toward cleaner LNG vehicles. As seen in Figure 3, just 3% of carriers say that their customers are actively promoting adoption by their carrier base.

This finding is important because it suggests that LNG adoption by motor carriers is not currently on the radar of industrial shippers. Yet widespread adoption of LNG will reduce costs in the supply chain and generate sustained demand for natural gas drilling (and the sand, steel, equipment and industrial services needed to support drilling). One would expect shipper awareness will increase in the future given the potential to impact costs as well as revenue development.

Obstacles to Adoption of LNG Vehicles

With predicted adoption rates low, survey respondents were asked about the primary barriers to adoption. Topping the list, at 53.6%, was the inadequacy of the LNG refueling infrastructure. As of February 2012, there were just 46 public LNG stations across the U.S. (U.S. Dept. of Energy). Clean Energy Fuel, Inc. has raised \$450 million and has committed to build 150 LNG stations along what they call “America’s natural gas highway” – a pre-defined corridor of heavy volume freight traffic. The goal of the project, done in partnership with Pilot Flying J travel centers, is to establish stations 250-300 miles apart.

The next biggest barrier to adoption (23.2%) was the **higher cost of LNG vehicles**, currently between \$30,000–\$50,000 more than diesel. Some estimate the ROI on this incremental cost at less than one year for high-mileage vehicles. Additionally, incentives are being discussed to mitigate this increased capital expense. In January, 2012, Clean Energy Fuel and Navistar announced a partnership to provide leases that effectively eliminate the equipment cost differential if the carrier signs a long-term fuel agreement with Clean Energy. The fuel would be purchased at a guaranteed minimum discount to diesel.

Currently, there are bills in both the House and Senate that promote tax incentives for the purchase of LNG vehicles, and President Obama has announced his support for the legislation.

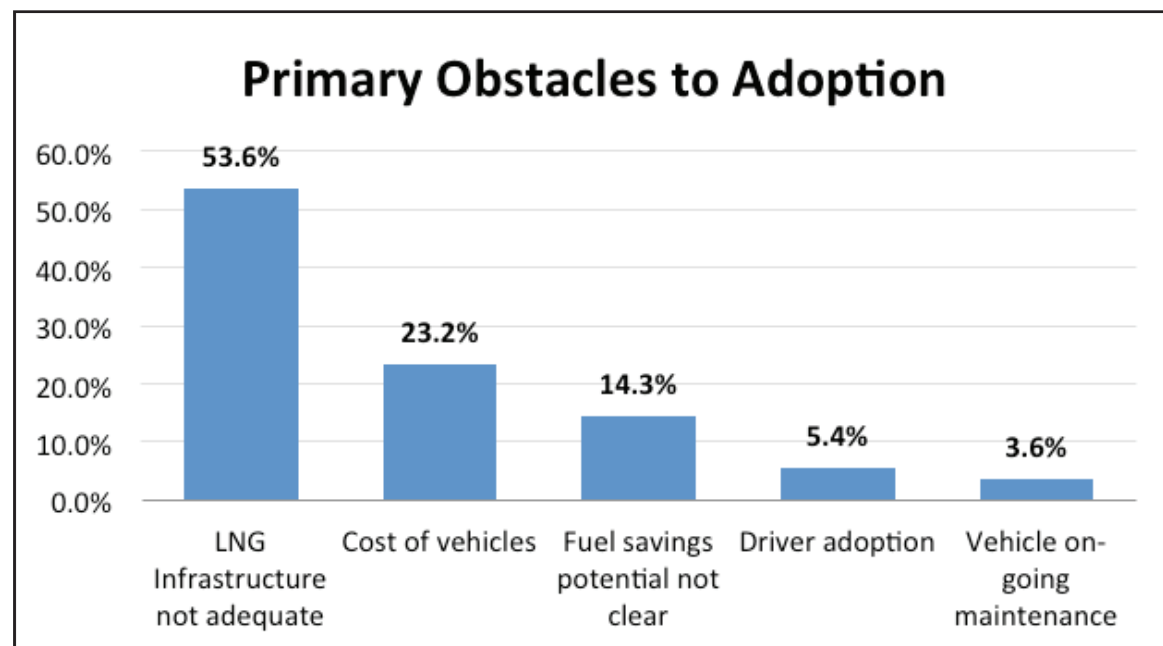
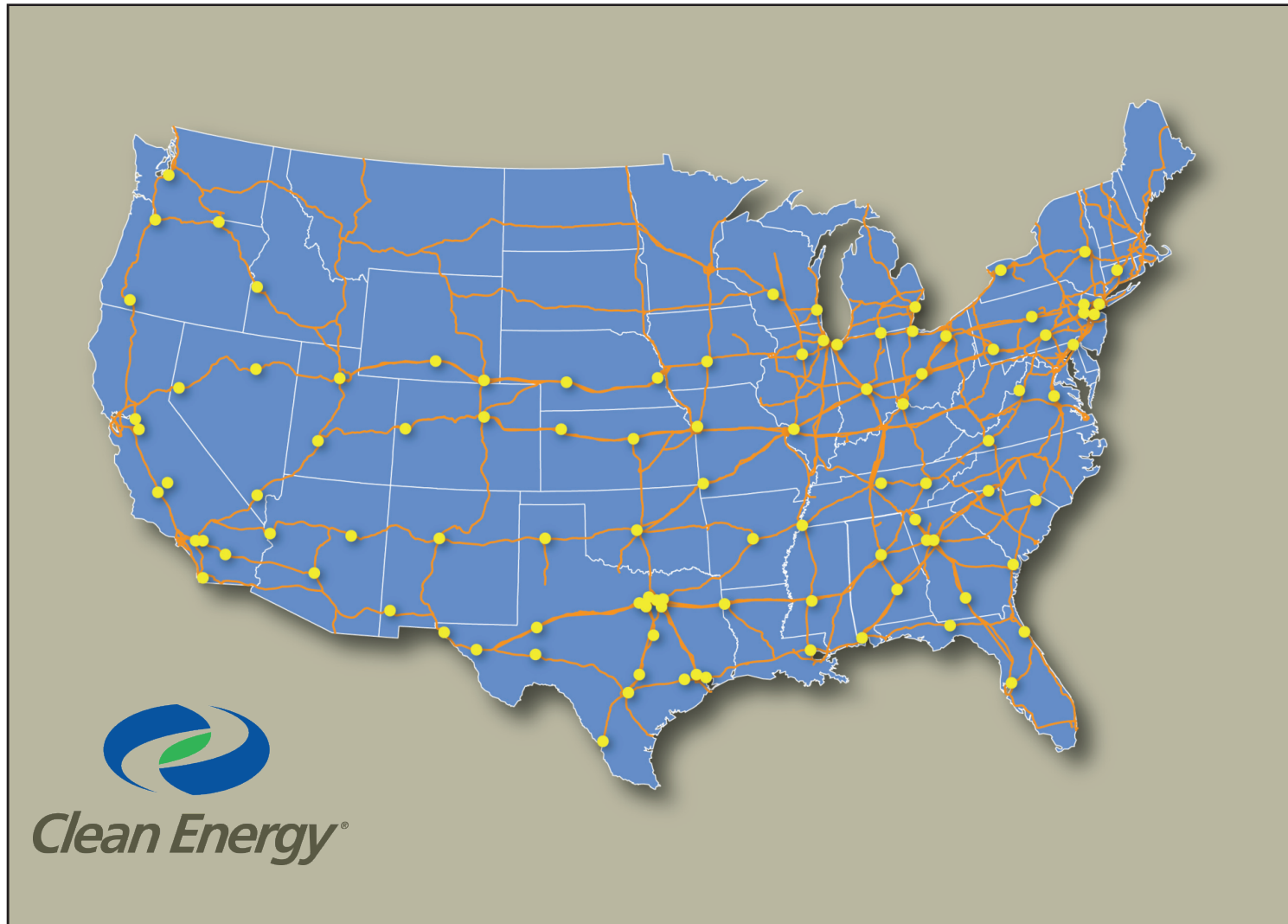


Figure 4



Clean Energy is currently building a network of LNG truck fueling stations on the Interstate Highway System and major metropolitan areas. Map is courtesy of Clean Energy Fuels.

Obstacles to Adoption of LNG Vehicles

Ranking third on the list of obstacles (14.3%) was that the **fuel savings potential was not clear**. Survey respondents were asked to estimate the cost differential between diesel and LNG. As seen in figure 5, responses varied widely, with more than 25% estimating no difference at all in the cost for a diesel equivalent gallon (DEG).

Transport Topics reported, in April 2012, that the cost difference for LNG is around \$1.50 less per DEG, based on data from Clean Energy Fuel. However, precise numbers are not yet available since a portion of the fuel savings may be reduced by performance degradation, maintenance costs, and other factors. Companies are now doing their own studies to develop a precise formula for an apples-to-apples cost comparison.

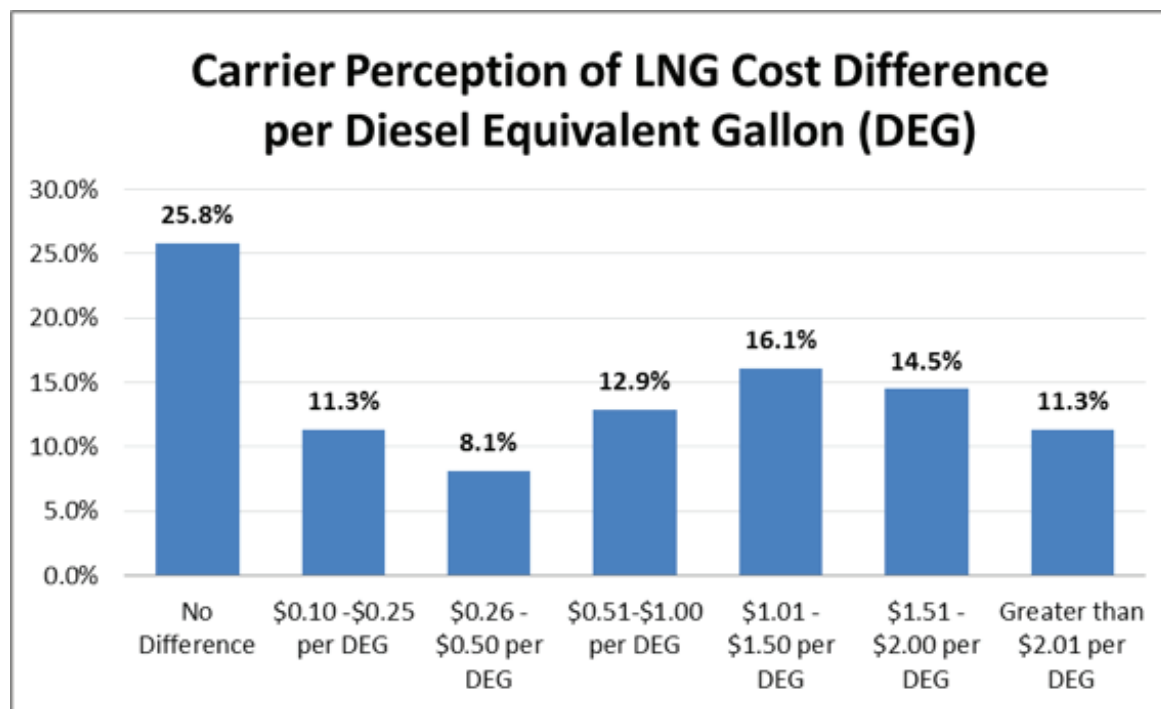


Figure 5

Conclusions

LNG-powered engines are currently the most viable fuel alternative for heavy duty trucking. The upside of this technology is simply too compelling to ignore:

- Reduced fuel costs and overall operating costs
- Reduced price volatility linked to use of domestically sourced fuel
- Reduced greenhouse gas emissions
- New U.S. jobs linked to gas production
- Reduced dependence on foreign oil

Despite these advantages, carriers question the potential for widespread adoption of LNG units to carry heavy loads. For certain, barriers do exist, but the main ones are being addressed:

- A refueling network is being built
- Engine power is increasing
- Tax incentives are likely to mitigate the cost differential versus diesel

If this progress continues, LNG-powered engines could have a major impact within years, not decades. It is advisable for both carriers and shippers of heavy freight to monitor advances and capitalize on this ground-breaking technology as soon as possible.

About PLS Logistics Services

PLS Logistics Services is one of America's largest freight brokers and the largest third-party logistics provider to the industrial sector. The company's 12,000 pre-qualified carrier partners give shippers access to 150,000 trucks; including the largest network of flatbeds in North America.



PLS Logistics Services - 3120 Unionville Rd, Bld 110 - Cranberry Township PA, 16066
724.814.5825 - energy.plslogistics.com