

**David Waller, Waller Marine, USA,**  
discusses marine infrastructure for the  
supply of LNG to the US brown water  
and offshore supply boat fleets.

# A NEW DAWN for ol' man river?

**T**he availability of relatively inexpensive natural gas supply in the US has prompted this resource to be considered as a fuel for the US flag marine industry. New construction and conversions of Jones Act vessels are driven by lower costs and the need for mandatory compliance with the North American Emissions Control Area (ECA) standards that come into force on 1 January 2015. LNG-fuelled Jones Act compliant ships and supply vessels for blue water operations are already under construction and sources of fuel supply are planned. This is not the case, however, for the US brown water fleet, an industry that is slowly adopting plans to use LNG as a fuel.

In some respects this is understandable, since the industry is already largely compliant with emissions laws as it uses low sulfur fuels. Additionally, there is not currently an LNG supply or associated infrastructure to serve the brown water fleet – a huge fleet of towboats that ply US rivers and

intracoastal waterways that are capable of transporting as much as 40 000 t of cargo in a single tow. In fact, the industry is faced with a classic chicken and egg scenario: large investment is needed to both supply and burn LNG fuels. So what comes first?

Based upon the cost disparity between ultra low sulfur diesel and the projected cost of an LNG fuel supply, the financial rewards of converting part of the brown water fleet to LNG fuels are compelling. The fleet comprises approximately 5500 towboats with over 11 million hp. Approximately 800 million tpy of cargo is transported on US waterways, which equates to over 300 billion ton-miles. These vessels consume well over 1 billion gal./year of diesel fuel. Cost could be driven lower by converting a large percentage of the fleet to run on clean-burning natural gas, which is why it is now coming to fruition. So why did this not happen until now?

There is no single answer to this question, but the lack of LNG supply and the infrastructure to support it is surely one explanation. Additionally, achieving the wide distribution of LNG fuels and the conversion of towboats to burn LNG is a challenging – albeit very possible – task. The lower and upper Mississippi and Ohio River system combined with the



**Figure 1.** US inland waterway network.



**Figure 2.** Harvey Gulf's LNG-fuelled US flag offshore supply vessel.

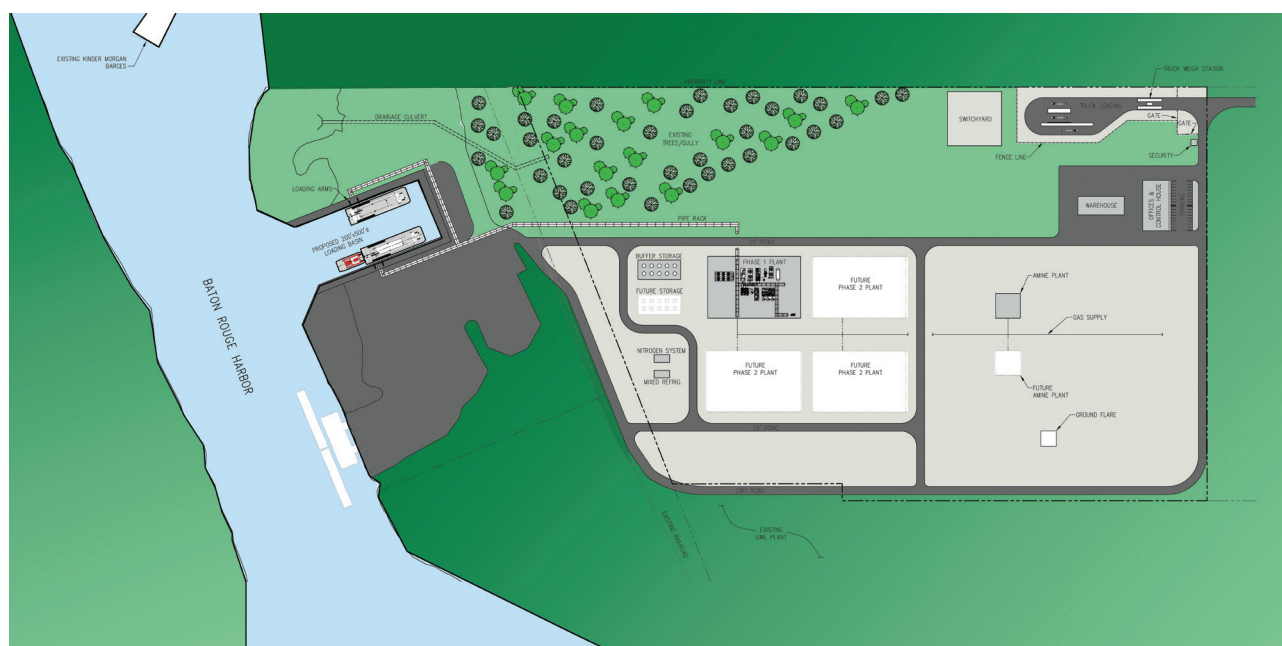
Intracoastal system total some 12 000 miles. Major ports that either load, discharge or transfer cargoes are far flung, stretching over 2000 miles in both a north-south and east-west direction. LNG supply and infrastructure cannot be installed in the short-term throughout the system, but this may be possible regionally, using similar strategies to those applied by the truck industry as it expands its LNG fuels infrastructure across the country.

The US inland waterway system is almost entirely centred on the eastern half of the country, with the Mississippi-Ohio Rivers providing the backbone of the system. The Mississippi river system accounts for 65% of the total cargoes moved on the waterways and the majority of the high horsepower towboats (some up to 10 000 hp) move large barge trains on the lower reaches of the river.

## Strategies

In developing a strategy for the use of LNG fuels on the river system, focus should be on its supply and transportation in these heavy traffic locations. It has been suggested that the section of the Mississippi River between Baton Rouge and New Orleans and below would provide an initial central geographic location for the installation of a first LNG liquefaction facility. This would serve multiple purposes: the river liner operations between New Orleans and St. Louis, ocean going ships at their anchorages, and the offshore industry (the latter to supply LNG storage terminals on the river and at Port Fouchon, Louisiana, where the first LNG-fuelled supply boats will be based).

Harvey Gulf was the first to market with the construction of LNG-fuelled US flag supply boats for operation in the US Gulf of Mexico. The first of six vessels was launched in January 2014 and the company is presently constructing the first LNG bunkering terminal at its base in Port Fouchon. In keeping with the localised supply-distribution strategy, it makes sense for an LNG liquefaction facility to be constructed on the lower reaches of the Mississippi River. Such a facility is planned on the Barge Canal at



**Figure 3.** Liquefaction facility at Baton Rouge.



Baton Rouge, a phased project that will eventually produce 700 000 gal./day of LNG.

LNG fuels will require delivery systems that are not truck-based (trucks being the only method of transportation at this time with limiting 10 000 gal. loads). While it would be far more efficient to transport product by water, there is not a single US flag vessel in operation that is capable of doing so. Nor are there any vessels capable of bunkering ships or towboats capable of using LNG fuel. Any future LNG fuel supply system will require vessels to move relatively large volumes of LNG from liquefaction locations to fuelling terminals on the river; likewise for bunkering operations. Vessels are planned for this purpose with designs for both transport and bunker barges being priced for construction by shipyards.

Economies of scale will need to be adopted for any LNG distribution system to counter the high capital costs of LNG barges. Larger product capacity barges with dimensions that comply with the standards adopted by the waterway industry and its infrastructure, such as locks, will need to be constructed. It is envisaged that river barges with 10 000 m<sup>3</sup> (2.6 million gal.) capacities will be built for supply to fuelling terminals on the river and even larger vessels will be built for fuel supply to other ports via coastwise routes. Plans for ocean going vessels with proprietary Articulated Tug Barge (ATB) unit designs are already in progress for this service ranging in capacity from 3000 m<sup>3</sup> (800 000 gal.) to 30 000 m<sup>3</sup> (8 million gal.).

As the number of LNG-fuelled vessels continues to grow, it will be necessary for towboat companies to convert or repower their existing vessels and perhaps construct new ones in order to remain competitive in the industry. This is an intensive yet rewarding exercise when considering costs for conversion of existing propulsion engines of a triple screw 8400 hp towboat are in the order of US\$ 3 - 5 million and repowering at US\$ 7 - 10 million. Such a vessel would consume approximately 9000 gal./day of LNG fuel combined with a small percentage of diesel pilot fuel on an up river tow. Considering approximate costs of, for example, US\$ 27 and US\$ 18/million Btu of ultra low sulfur diesel and LNG, respectively, and a regular up and down river voyage between New Orleans and St. Louis, an estimated saving of approximately US\$ 2 million/year can be gained by switching to LNG fuel. This would provide a payback of about 2 years for a conversion and 4.5 years for repowering.

## Long-term goal

Despite the high initial capital investment, brown water fleet owners are likely to elect to move into LNG fuels to reap the benefit of long-term fuel savings and environmental compliance, following initial trial conversions to reaffirm the integrity of the technology and operations. This would indicate that LNG-fuelling infrastructure on the river is in for a slow start. However, it may also be argued that if one company were to take the initiative then others would need to follow in order to maintain their competitiveness in the market. Overall, fuel costs on high horsepower towboats could be reduced by 25 - 30% by converting from diesel to LNG fuel.

## Conclusion

The offshore oil and gas industry, as well as US flag container ship operators, has already initiated the move to LNG fuel supply, distribution and storage infrastructure. It is envisaged that this will gradually work its way into the brown water fleet, albeit in a small way, and in a confined geographical area, similar to the early beginnings of the truck industry. The expansion to the entire inland waterway system will require crucial investment in the industry, not only in LNG-fuelled towboats, but in liquefaction facilities, terminals, transport and bunker barges. The rules concerning LNG operations on the inland waterways and bunkering operations are still being promulgated by the US Coast Guard and other interested authorities. However, considering that the population of towboats serving the Mississippi River and Gulf region alone accounts for 3600 towboats and 6.7 million hp, converting just 25% would require approximately 1.7 million gal./day of LNG supply or over 1 million tpy at a projected saving to the industry of over US\$ 1 billion/year. **LNG**



**Figure 4.** 2000 m<sup>3</sup> (530 000 gal.) bunker LNG barge.



**Figure 5.** 3000 m<sup>3</sup> (800 000 gal.) LNG ATB.



**Figure 6.** Towboat converted to LNG fuel.



# **Waller Marine, Inc.**

**14410 W. Sylvanfield Dr.**

**Houston, TX 77014**

**(P) 281.444.9650 / (F) 281.444.8055**

**[www.WallerMarine.com](http://www.WallerMarine.com)**