

L-NGV Growth Anticipated to Follow Dramatic LNG Market Expansion in Asia and Europe

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World LNG demand is forecast to rise from 226 billion cubic metres (bcm) during 2007 to 640 bcm by 2020 and close to 790 bcm by 2030, according to projections by the International Energy Agency and supported by a 2008 analysis by Ocean Shipping Consultants (OSC) (London). This represents a compound annual growth rate of 5.6%.

In Europe, continued increases in LNG demand from Spain and France, and large-scale usage from the UK will significantly increase imports into Europe. In addition, there are many countries planning LNG terminals such as Germany, Poland and the Netherlands. Overall LNG demand in the region is forecast to reach 254 bcm by 2030. As such, the market for liquefied natural gas vehicles (L-NGVs) should strengthen concurrently as more countries incorporate LNG into their energy strategies.

In the Asia Pacific region Japan and South Korea will remain the region's largest LNG consumers. LNG demand growth in China and India will significantly increase during the study period. In addition, the Philippines, Thailand and even Indonesia are planning future LNG receiving terminals. LNG demand in the region is forecast to approximate 385 bcm by 2030.

LNG IN ASIA PACIFIC

Brenda Smith, CEO of Gas Advisers, a Hong Kong-based LNG consultancy said of the Asia-Pacific LNG market, "LNG is developing rapidly as a transport fuel in Asia, with China, Korea and Thailand already embracing it and several other countries, including India, Pakistan, Bangladesh and Iran, poised to launch LNG infrastructure projects."

- **China.** China boosted its 2007 LNG imports to 1M tons from just 100,000 tons in 2006. 40,000 taxis run on CNG in Shanghai sourced from LNG, supplied in part by a 100,000 gallon/day liquefaction plant. There is one LNG refuelling station for Beijing Bus; one LNG station in Changsha (Hunan province); four proposed LNG fuelling stations for buses and taxis in Guyiang and Guizhou Provinces and 12 LNG stations being built in Sujian Province, with potentially 41 stations by 2010, using LNG from a nearby terminal.
- **South Korea.** Almost all of S. Korea's 36 bcm of natural gas demand comes through three LNG receiving terminals. Three currently operating liquefied-to-compressed natural gas (L-CNG) stations are only a fraction of the ambitious plans to create 200-300 LNG stations supplying heavy duty trucks, with principal support from the Korean Gas Company Kogas. Their 2007 annual report touts the conversion of heavy duty trucks to dual-fuel LNG and CNG so that, "Soon, we might be able to smell nature in urban areas rather than (vehicle) exhaust fumes."
- **Thailand.** Natural gas, anticipated growing from 38% of the national energy consumption in 2003 to 44% by 2017 will see larger use of LNG, with a 5 million ton per year production facility anticipated to come on line in Map Ta Phut in 2011. Anticipated vehicle applications include heavy duty trucks and fishing boats. LNG and L-CNG could make a contribution to supplying gas to areas not served by local gas pipelines.

- **India.** LNG use began in 2004 with 2 million tons imported, and has grown rapidly to 4.1 million tons in the first half of 2007. There are two LNG terminals on the west coast in Dahej and Hazira with a combined capacity of 8.9 million tons and a third coming on line in Dabhol in the south west, with an annual capacity of 5 million tons. LNG imports are anticipated to grow to 10.5 million tons in 2015 and 21.1 million tons in 2020. Leading gas companies anticipate LNG to play an increasingly important role in expanding both NGVs and L-CNG fuel stations.
- **Australia.** A major exporter of LNG, Australia is one of the emerging markets for heavy-duty natural gas vehicles. With some of the toughest conditions and longest road journeys in the world, Australia has proved a formidable testing ground for heavy-duty engines and systems from Westport Innovations, Cummins Westport and Clean Air Power (dual-fuel providers). 'Road trains' in excess of 150 tonnes hauling loads over 1,000 kms has attracted the interest of fleet operators nationwide. Local energy giant, Wesfarmers Kleenheat and BOC Gases (part of the global Linde Group) both have ambitious plants either operating or under way to meet demand for LNG transport fuel. Though a relatively small market, Australia is likely to position itself as a world leader for LNG vehicles on a per capita basis.

L-NGVs IN EUROPE

While European L-NGVs still remain a niche market among NGVs, they represent diverse types of applications that are able to utilize a methane-based fuel instead of (or in the absence of) compressed natural gas.

- **Norway.** Norway's use of L-NGVs has been pioneered since January 2000 by passenger ferries (currently there are five in operation) and the tanker ship business within the vast inland waterway network where small, agile ships delivering LNG to remote communities are required to operate safely in narrow fjords
- **Spain.** With five LNG terminals currently in operation, Spain is the largest LNG market in Europe. With an LNG receiving terminal in Barcelona, LNG refuse trucks have been in operation there for the past five years. The Iberian Peninsula could see substantial growth of LNG vehicles as it becomes one of the essential European locations for future LNG imports.
- **Sweden.** Renewable biogas is being converted to LNG (known there as liquefied biogas, or LBG) by *Scandinavian GtS* who, together with *Mitt Sverige Vatten* and *AGA* built Sweden's first LBG fueling station in Sundsvall. A small import terminal (20,000 m³) is to be built by 2010 in Nynäshamn, 55 km south of Stockholm, by *Stockholm Gas*, *AGA* and *Nynas*. Estimates are that 24 well-located LNG or L-CNG stations could provide an adequate refueling network for long-distance, heavy duty vehicles with one station every 200-to-300 km along the major Swedish highways. Truck manufacturer Volvo AB is investigating the potential of dual fuel LNG technologies.
- **Mercedes Benz:** Based on their CNG version, MB is now offering the LNG Econic NGT 1828 semi-tractor suitable for urban and smaller haul routes (350 km).
- **AB Volvo:** The Swedish truck and bus builder currently is exploring CNG and LNG dual fuel applications in their vehicles, and will present their views on how their technology is developing at the LNG is HOT workshop in December.

LNG is HOT

The strong growth of LNG as a vehicle fuel is raising many new issues within the NGV community that must be addressed. *LNG is HOT: Opportunities, Challenges & Strategies as a Vehicle Fuel* is the second in the series of Clean Fuels Consulting *Critical Issues Workshops* being held in Brussels, Belgium on 3-4 December 2009, presenting an opportunity to identify and explore the most important strategies, technologies and marketing issues for liquefied natural gas vehicles (L-NGVs) and renewable liquefied biogas (so-called LBG). Leading, international industry experts will address a knowledgeable audience of LNG and LBG stakeholders who, together, will discuss: LNG markets and experiences in Europe, Asia-Pacific and North America; L-NGV technology – retrofit systems and factory-built products; technologies and strategies for LNG fuelling, including L-CNG; and LBG production. The development and harmonization of L-NGV standards, codes and regulations will receive focused attention as a key building block to the industry achieving worldwide sustainability.

The goal, after two, half days of presentations and discussion is to leave with a firm idea of the key issues facing the industry and what next steps and strategies are required to advance the sustainable growth for LNG and LBG in over-the-road and non-road vehicle transportation and fuelling technologies.

Who Should Attend

LNG is **HOT** provides an excellent networking opportunity to engage with NGV and LNG industry experts, equipment suppliers, customers, and public sector policymakers. Seven table top exhibit spaces are available to facilitate networking and promotional opportunities. Westport, the worldwide supplier of heavy duty natural gas and LNG, high pressure direct injection engines is a Principal Sponsor; Gladstein, Neandross & Associates, a consulting firm specializing in LNG and located in California is a Supporting Sponsor, and Czas Na Gaz, the European-based NGV/LPG magazine is a Media Sponsor. The workshop is being marketed extensively throughout the global NGV and LNG communities.

Visit www.LNGisHOT.com for details.

(This report is combined from articles appearing in Asian NGV Communications and Czas Na Gaz.)

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Liquefied Natural Gas for Europe – Some Important Issues for Consideration, European Commission Joint Research Center, Institute for Energy, 2009.