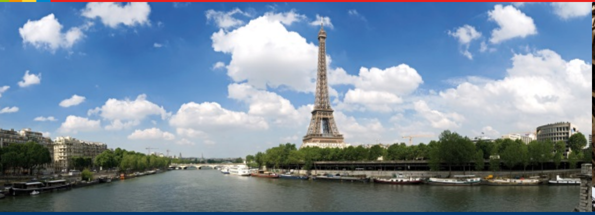
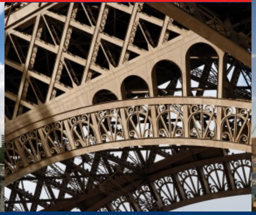
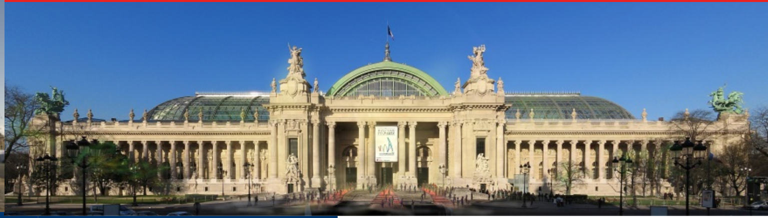
26th World Gas Conference

1 – 5 June 2015, Paris, France



PGCD.2
THE NEW 'MARKET SWEET SPOT' : LNG IN TRANSPORT

Michael Stoppard
Chief Strategist Global Gas, IHS Energy

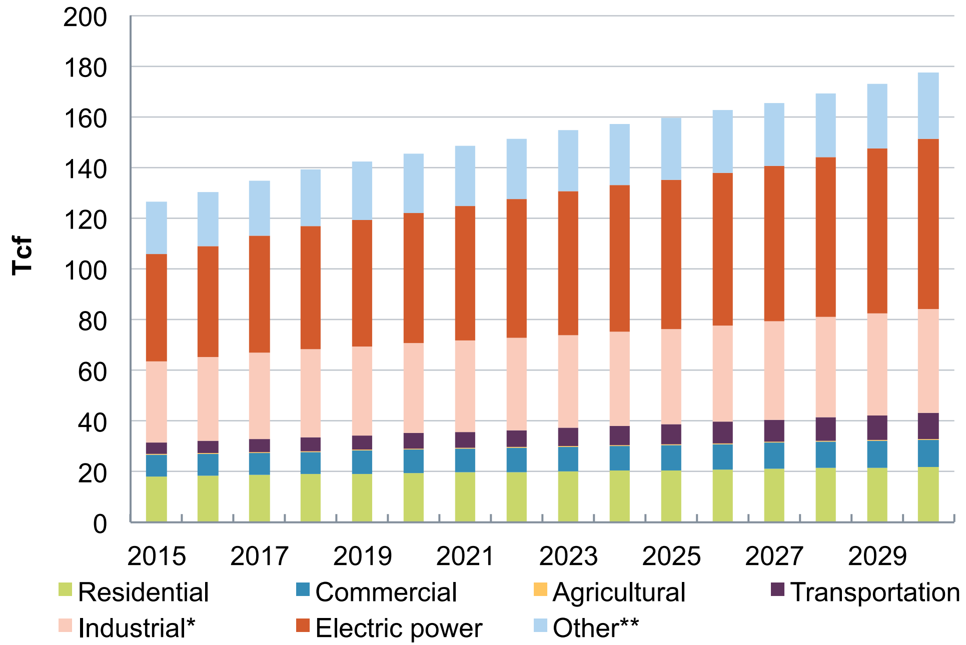
WGCPARIS2015
WORLD GAS CONFERENCE
IGU

Looking for markets beyond power generation

- Global outlooks for natural gas project a big role in power, and only a niche role in transport. But...
- Gas faces a ‘value squeeze’ in the power sector: coal remains highly cost competitive in most regions and renewable generation costs are declining
- The value of gas in transport may be stronger if/as
  - The oil price recovers
  - Natural gas vehicle (NGV) truck costs decline and retail infrastructure expands
- The fall in oil prices will slow the uptake of gas in transport, but the medium and long-term drivers remain, especially for LNG

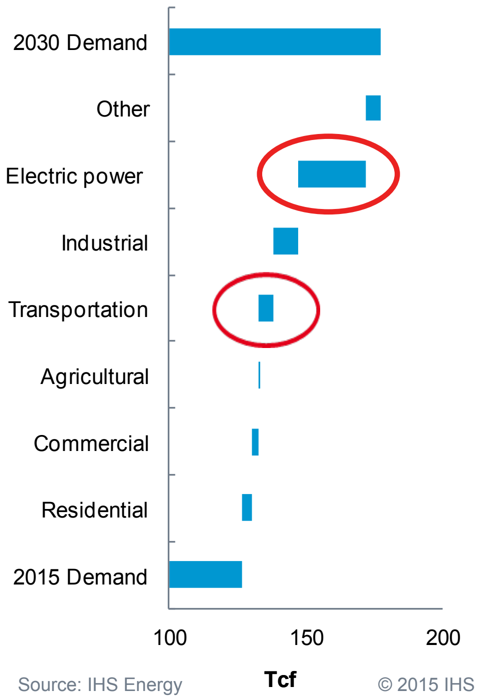
Natural gas demand to grow strongly, driven primarily by power

Gas demand growth by sector: 2015 to 2030



Notes: * Includes feedstocks. **Includes energy sector uses, distribution losses and statistical differences. Negative numbers may indicate use of synthetic fuels.
Source: IHS Energy

Gas demand growth by sector 2015 vs 2030

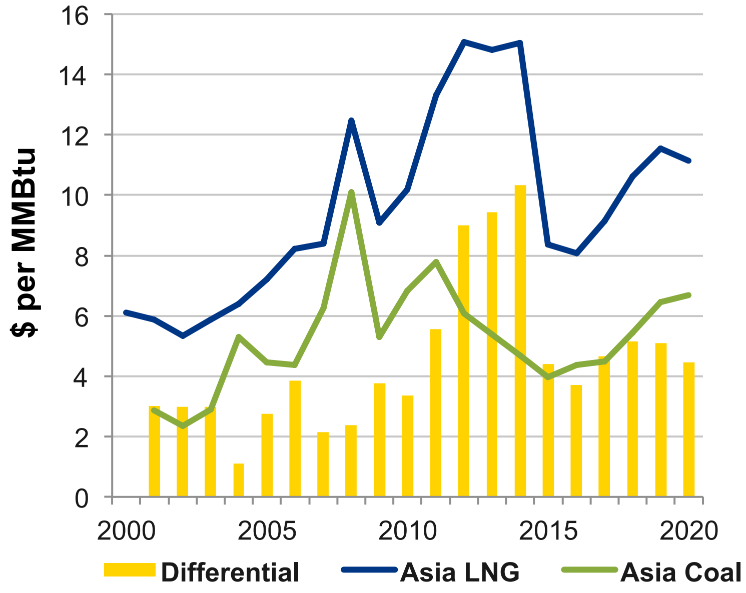


Source: IHS Energy

But natural gas faces a 'value squeeze' in the power sector

LNG-coal price premium will remain high

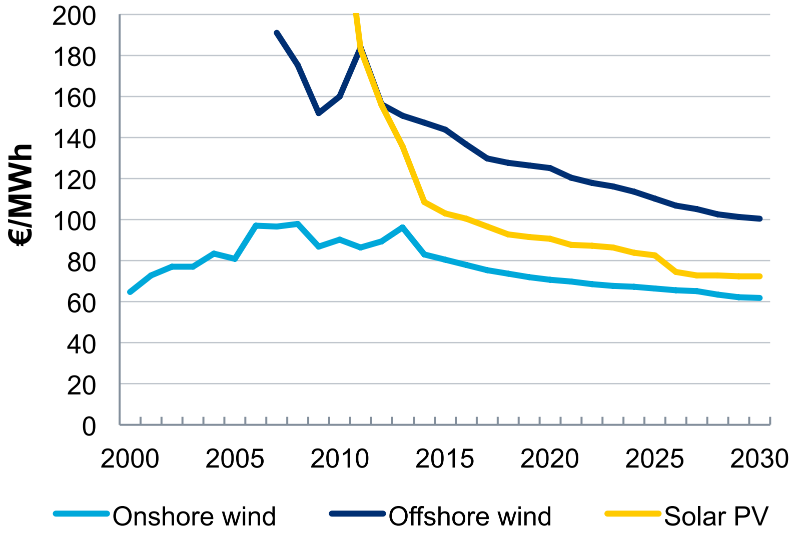
Coal (gas equivalent) Vs. Gas Prices



Source: IHS

Renewable costs are declining

LCOE - European Union

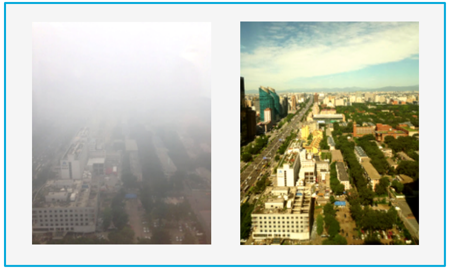


Notes: An LCOE cost comparison *overstates the economic competitiveness* of renewables because it does not take into account intermittency and back-up costs
Source: IHS

Three key enablers support the case for natural gas in transport

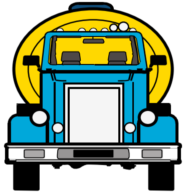
Economic

- Natural gas expected to be priced at a discount to oil
- Differentials in fuel prices create strong commercial incentive for switch to natural gas



Environmental

- Natural gas offers much lower harmful emissions in transport, even with increasingly strict fuel standards for oil
- Policies to improve air quality make a stronger case to move to natural gas



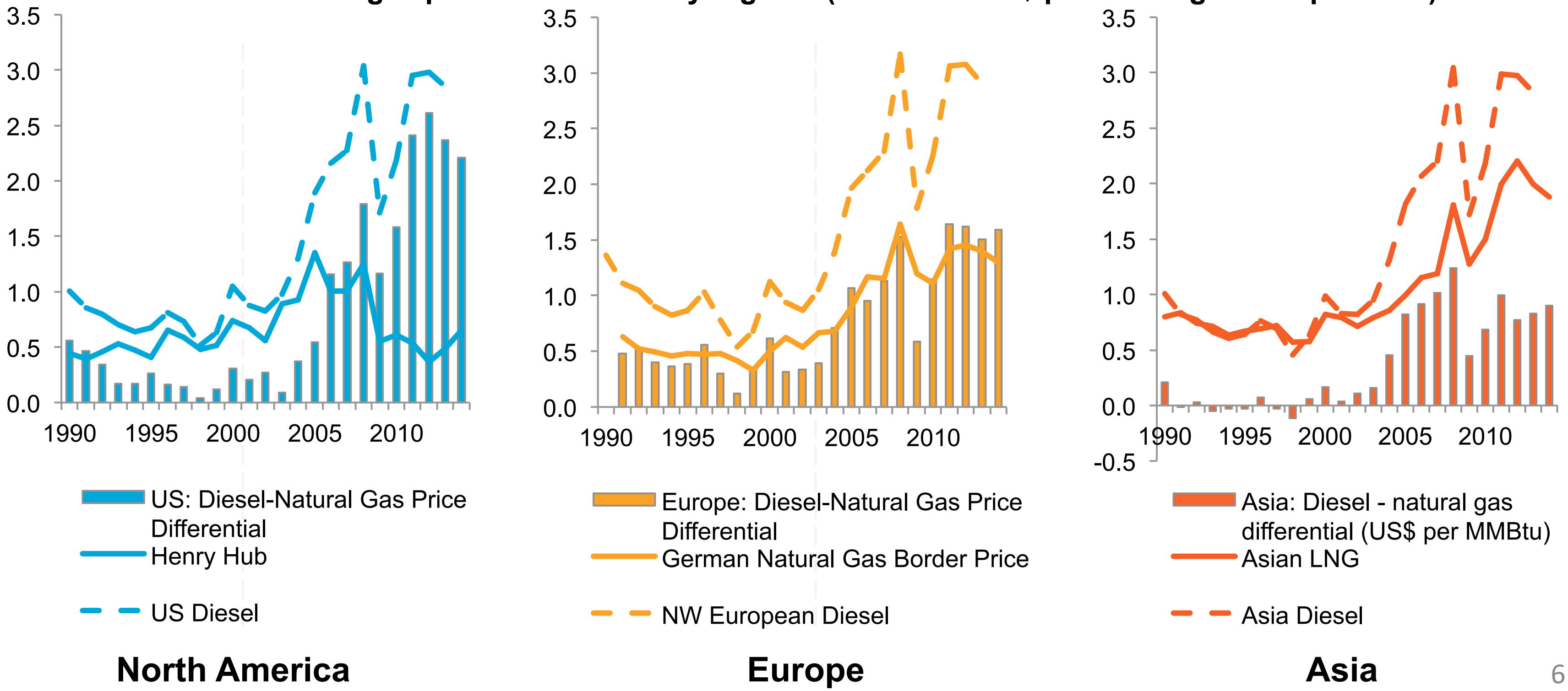
Technical

- Technology for natural gas engines has continued to develop, closing the performance gap to diesel
- New generation of vehicles are becoming more attractive for operators

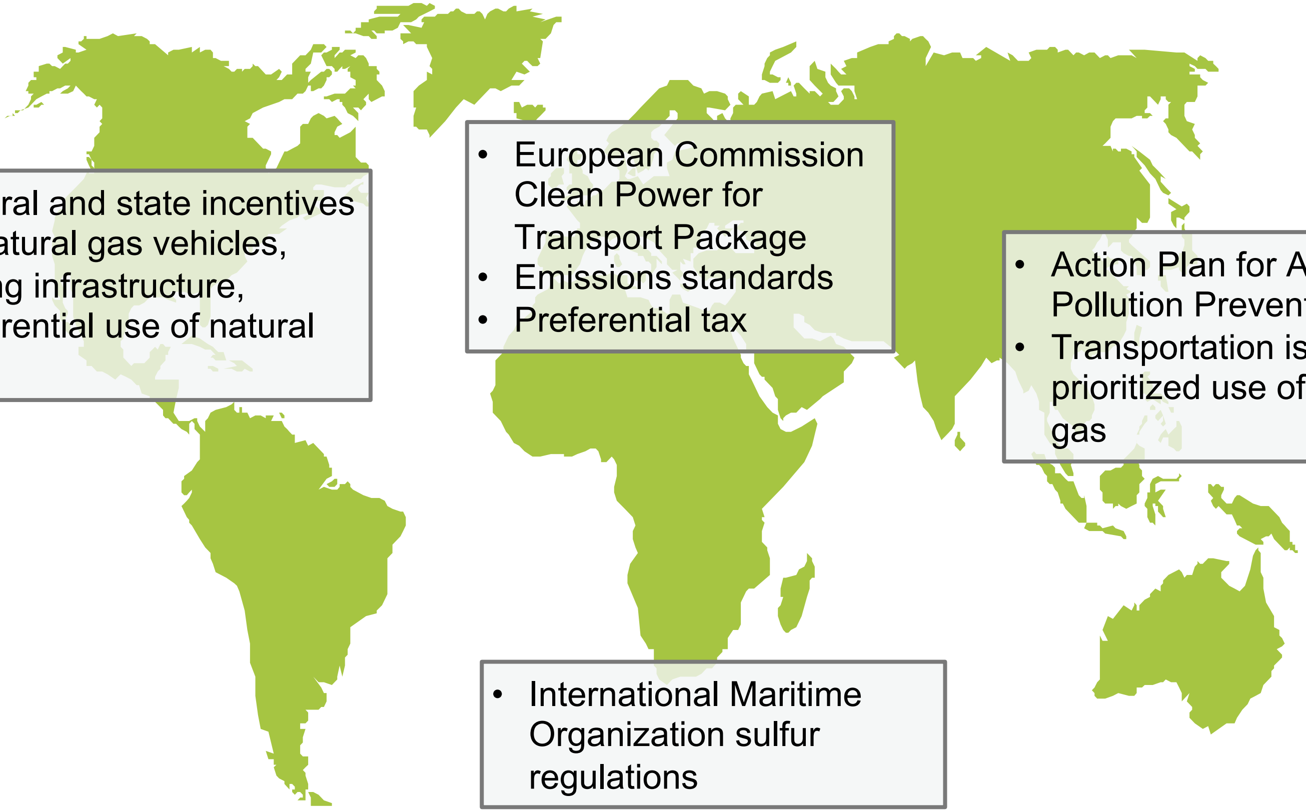
Historical fuel price trends suggest a divergence between diesel and natural gas prices

However 2014/15 oil price collapse makes investors cautious

Diesel and natural gas price outlooks—key regions (Real 2013 US$ per diesel gallon equivalent)



The environmental case: A mixture of policy support and mandates



- Federal and state incentives for natural gas vehicles, fueling infrastructure, preferential use of natural gas

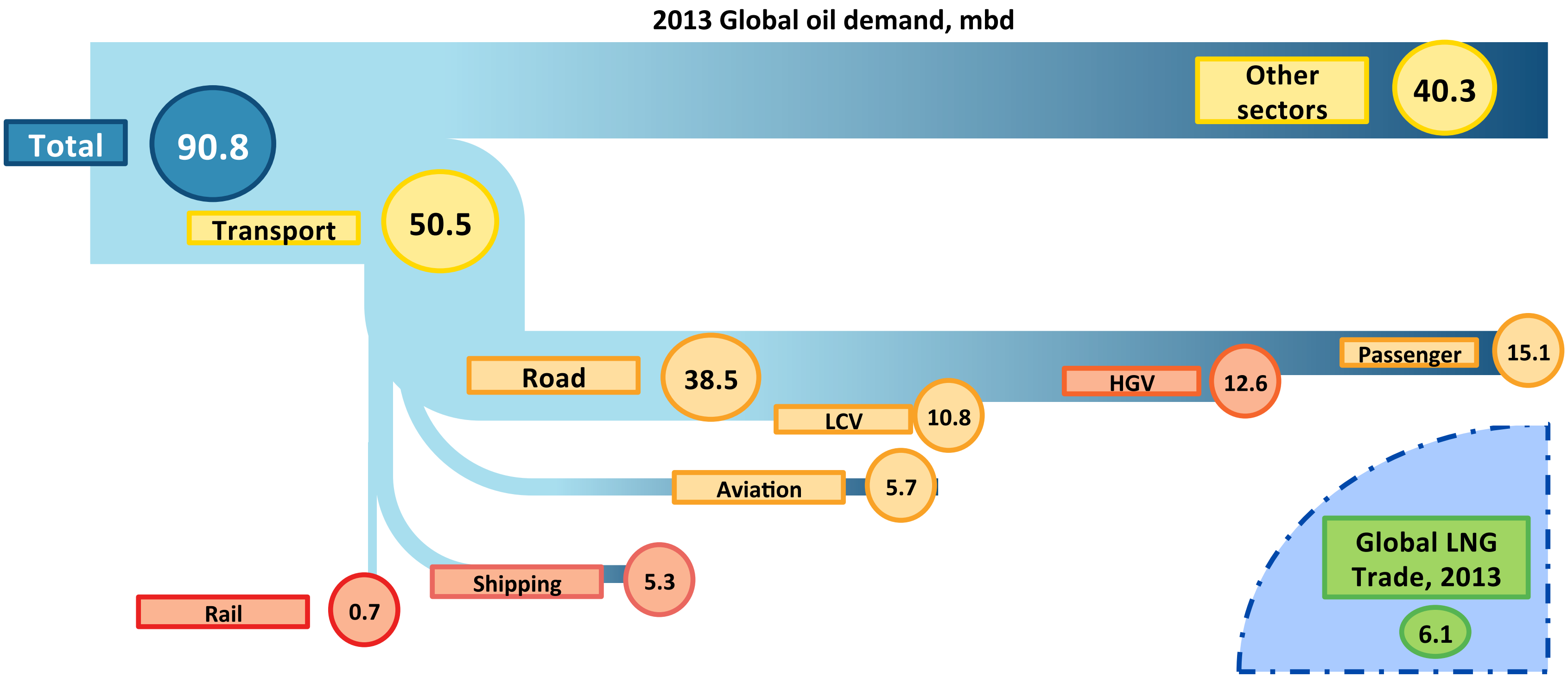
- European Commission Clean Power for Transport Package
- Emissions standards
- Preferential tax

- Action Plan for Air Pollution Prevention
- Transportation is prioritized use of natural gas

- International Maritime Organization sulfur regulations

Big volume potential in heavy goods vehicles (HGVs) and shipping

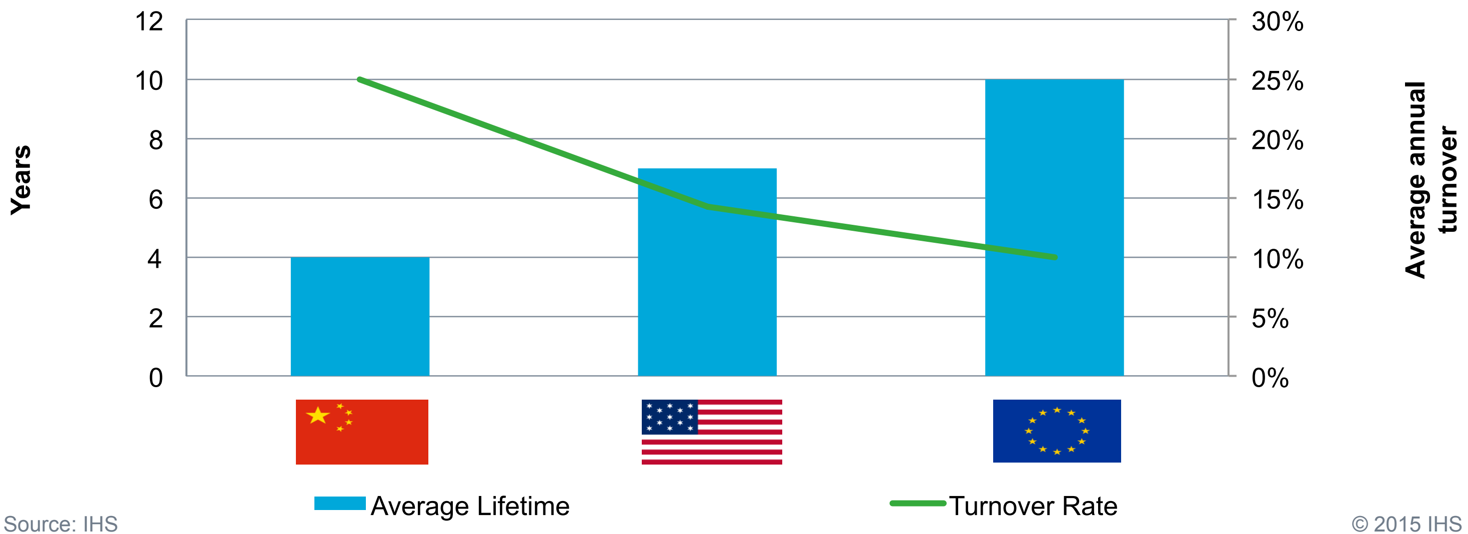
HGVs, marine bunkers and rail account for more than 20% of total oil demand



Source: IHS Energy. HGV = Heavy Goods Vehicles, LCV = Light Commercial Vehicles. Other transport demand of 0.1 mbd not shown.

Truck fleet has a rapid turnover

Fleet turnover regionally varied

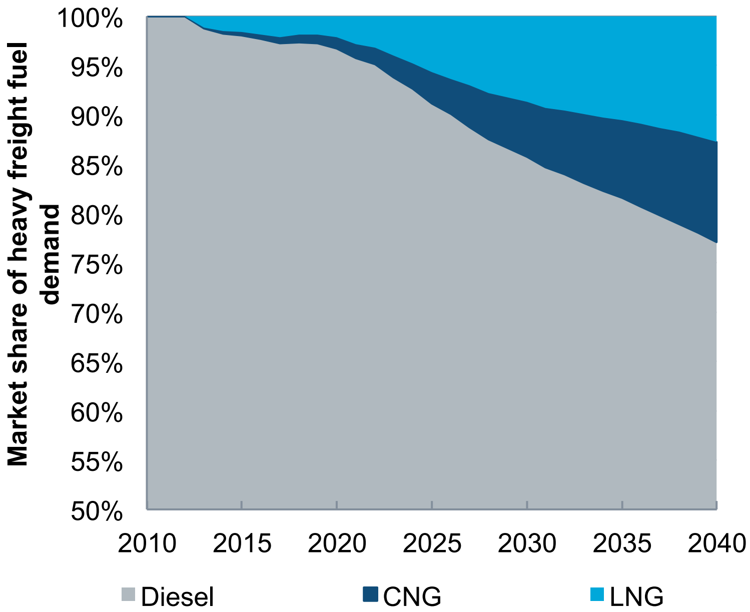


Source: IHS

- Quick turnover of the truck fleet makes possible a rapid uptake of gas-fuelled solutions
- Most of the world's trucks for use post-2025 have not yet been built or ordered

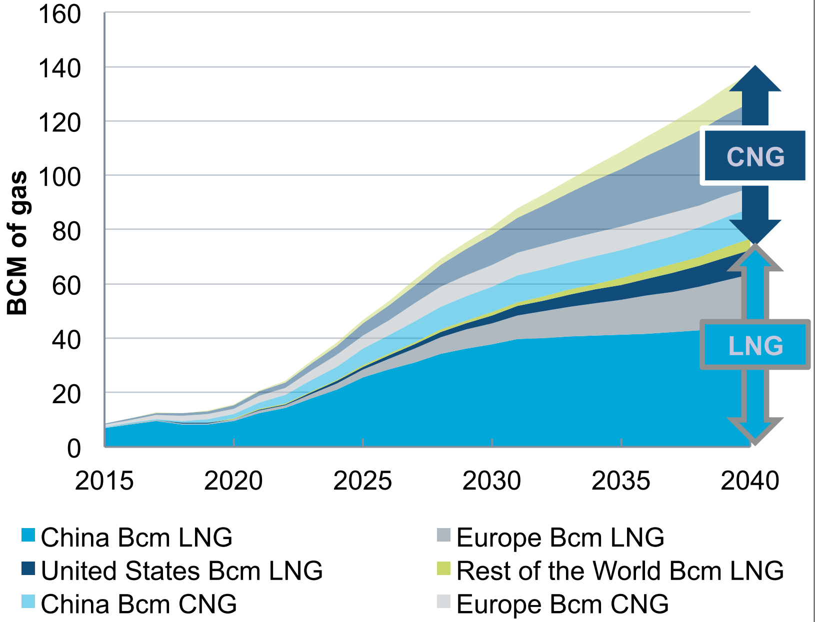
Global outlook for natural gas in heavy freight: oil to lose considerable market share

Global heavy freight natural gas market shares



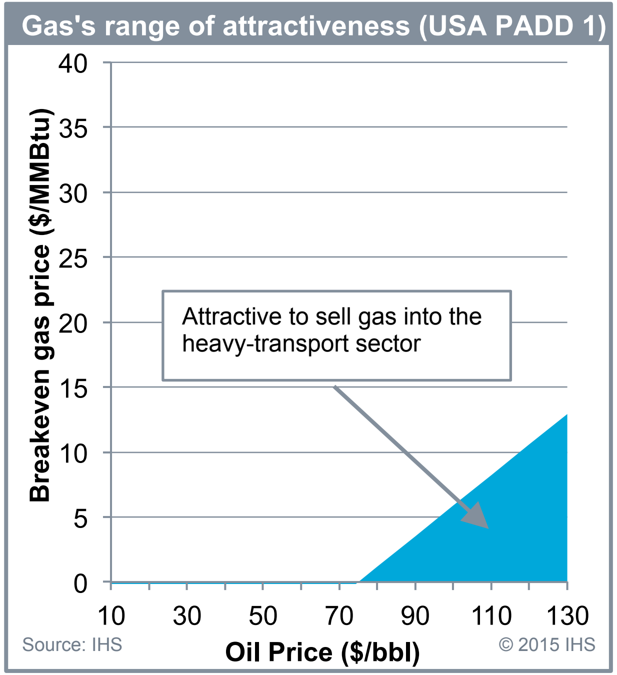
Source: IHS

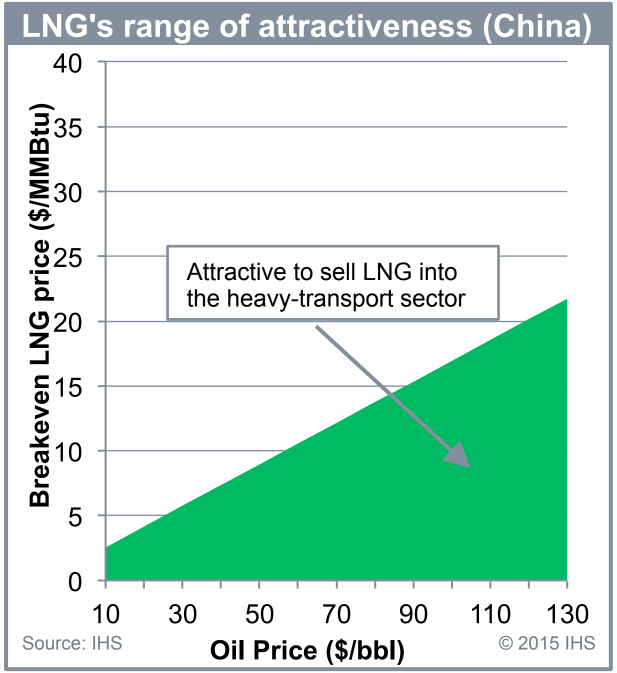
Global heavy freight natural gas demand

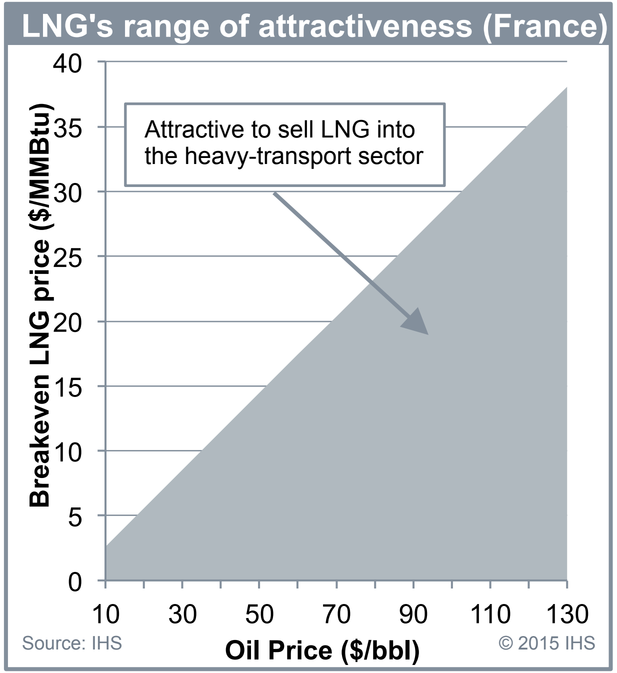


Source: IHS

The netback value of gas used in trucks varies by region







Oil price matters!

Truck cost matters!

Tax matters!

Notes: Three year payback for a "typical" truck (100,000 miles per year in the US, 90,000 in France and 40000 in China). Paybacks of 3 years in the US and France, 2 in China. Diesel prices based on historical relationships with WTI (US) and Brent (France, China). Incremental truck costs of $9,800 (China), $32,000 (US) and $40,000 (France). Fuel economy (diesel, LNG) of 6.5 and 5.7 in USA, 7.8 and 6.8 in France, and 5.9 and 4.9 in China.

Conclusions

- The main growth market for natural gas will be power. However, natural gas faces a ‘value squeeze’
- The demand for gas in transport has significant upside potential and may offer more attractive netbacks
- The case for gas in transportation is supported by environmental, economic and technology drivers
- The volumes of LNG in the HGV and shipping market could be a significant
- IHS estimates
  – gas demand in HGV and marine transport will be <u>98 Bcm by 2030</u>
  – LNG demand in HGV and marine sector will be <u>48 mt by 2030</u>
- With a large overhang of potential LNG, producers need to catalyze development of the HGV and marine markets