



Natural Gas for Ships, Trains and Trucks

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Projected U.S. Energy Prices by Source, 2008 - 2035

	2010	2015	2020	2025	2030	2035
Distillate Fuel Oil	\$20.54	\$21.83	\$25.03	\$26.61	\$27.48	\$27.93
Residual Fuel Oil	\$14.89	\$13.07	\$14.88	\$16.39	\$17.01	\$16.85
Natural Gas	\$10.56	\$6.45	\$6.95	\$7.81	\$8.26	\$8.91
Difference, NG vs. Distillate	\$9.98	\$15.38	\$18.08	\$18.8	\$19.22	\$19.02
Difference, NG vs. Residual	\$4.33	\$6.62	\$7.93	\$8.58	\$8.75	\$7.94

Source: U.S. Energy Information Agency, AEO2011-Energy_Prices_by_Sector and Source-United State Reference Case



Natural Gas in Heavy Duty Trucking

- Albertsons Markets
- American Honda Parts Division
- Border Valley Trading
- California Cartage Company
- Core Mark International
- Frito Lay
- Golden State Foods
- Harris Ranch
- HayDay Farms
- HEB Grocery
- Hunter & Hunter Trucking
- J.B. Hunt Transport, Inc.
- Jack B. Kelley Trucking
- Kroger
- Monarch Beverage
- Pepsi
- Ralphs Groceries
- Ryder Truck
- Stater Bros. Markets
- Sysco Food Services
- TCI Inc.
- Transystems
- United Parcel Service
- Vons Grocery / Safeway



Core-Mark®

Frito Lay
Good fun!

Kroger

Good things come from Sysco™

Ryder®

ups

HONDA

gsfc
golden state foods

PEPSI

J.B. HUNT



Natural Gas in Transportation: Off-Road (High Horsepower - HHP)

Types

- Cargo Handling Equipment
- Construction
- Mining
- Drilling
- Locomotives
- Marine



Off Road has Higher Fuel Use per Unit

Optimal strategy to quickly increase demand:
Target largest fuel use w/ least amount of infrastructure



1,000 - 3,000



50 - 300



50 - 200



40 - 50



LNG Market Potential

End Use	Billions of Gallons
Marine	5.5
Railroad	3.7
E&P	2.8
Mining	2
Total	14

- 14 billion gallons of diesel =
- 24 billion gallons of LNG =
- 1.7 tcf =
- 7% of total U.S. gas consumption

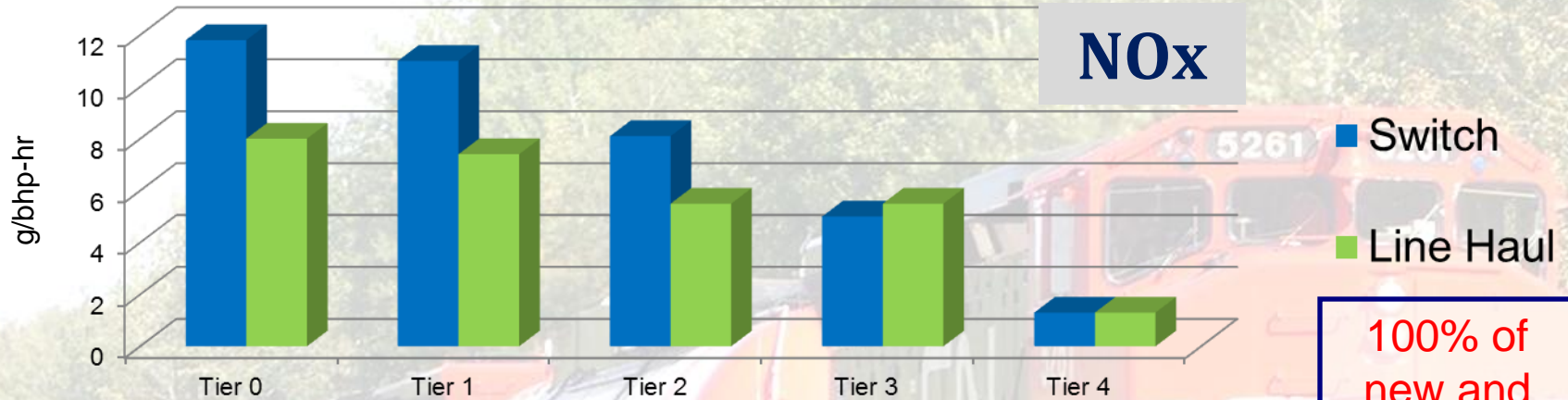


IMO's ECA Drives Marine Applications

- International Maritime Organization (IMO) Emission Control Areas (ECAs)
- Enforceable August 2012 up to 200 nautical miles off coast of U.S., Canada.
- Objective is to reduce emissions of NO_x, Sulfur Oxides (SO_x) and Particulate Matter (PM).
- Enforceable on any flagged ship. U.S. Coast Guard has signed Memorandum of Understanding (MOU) with U.S. EPA to enforce ECA compliance.
- March 2010 – Fuel sulfur content can not exceed 1.0% (10,000 ppm*). International average for Heavy Fuel Oil (HFO) is 3.5%.
- January 2015 – Fuel sulfur content can not exceed 0.1% (1,000 ppm).
- January 2016 – New engines operating in ECA must use emission control technology that achieves an 80% reduction in NO_x.

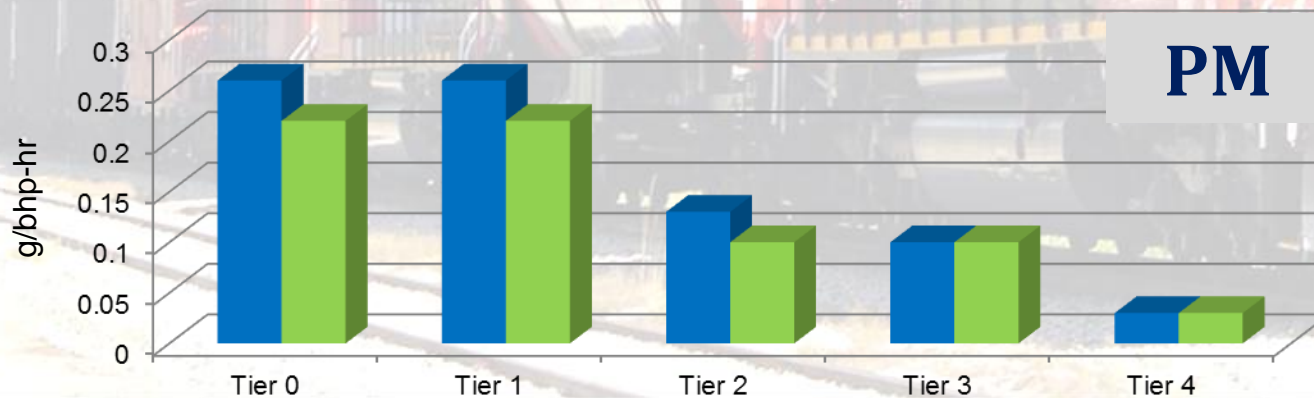


Regulation Implementation Dates



	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4
Switch	1973-2001	2002-2004	2005-2010	2011-2014	2015 or later
Line Haul	1973-1992	1993-2004	2005-2011	2012-2014	2015 or later

100% of new and rebuilt diesel and natural gas locomotive must meet Tier 4 Emissions in 2015



Market Players: Off-Road Equipment & Engine Manufacturers

Marine



Rolls-Royce



MITSUBISHI

Kawasaki
Let the good times roll.



Rail



Mining



Westport™



Drilling & Production

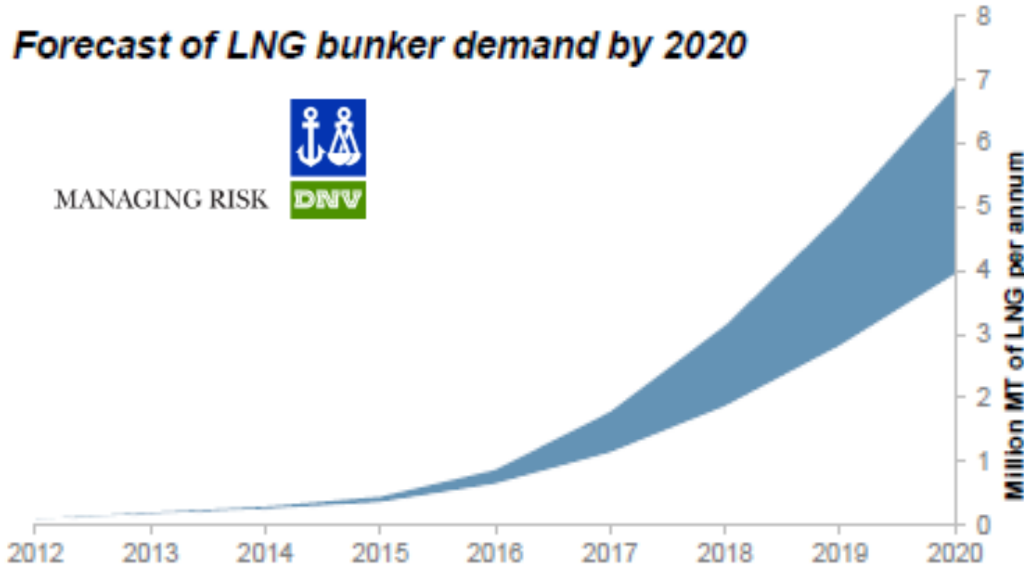


Natural Gas for Marine Applications



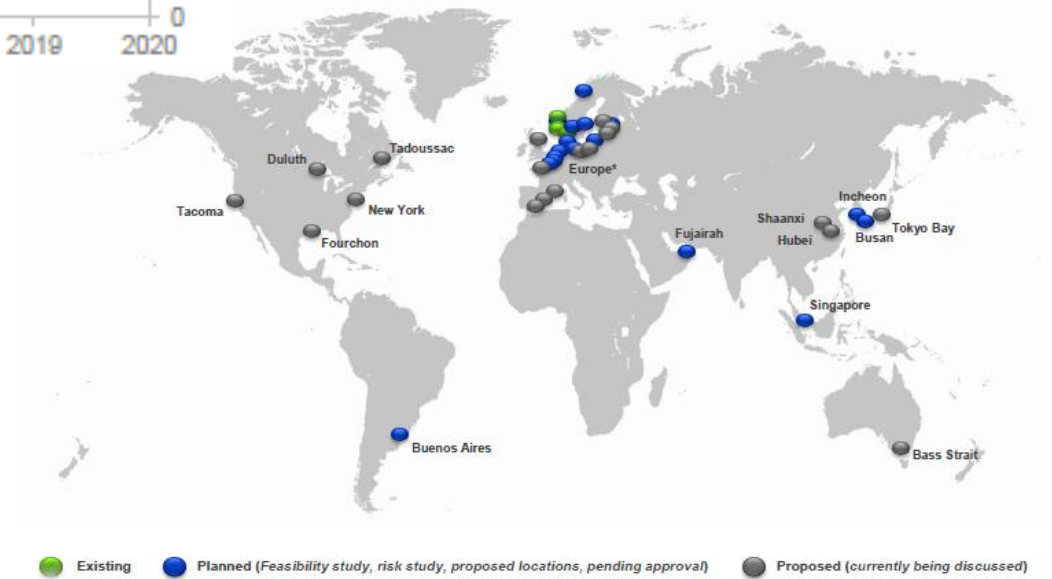
Projections of Marine LNG Demand

Forecast of LNG bunker demand by 2020



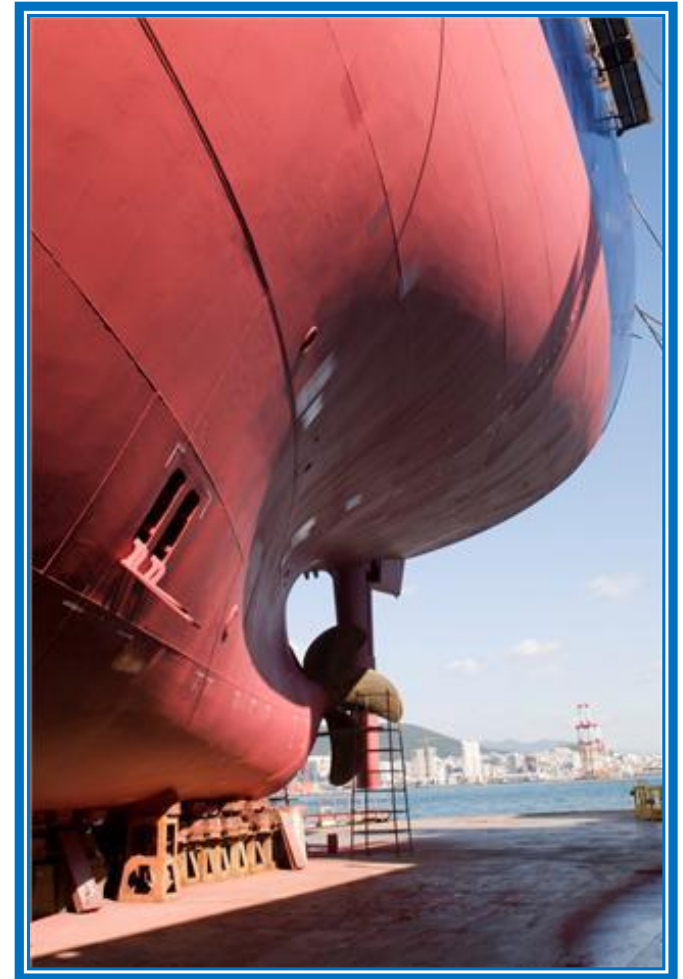
DNV projects the upper and lower limit of LNG demand from the marine sector through 2020 to be 4 – 7 Million Metric Tons (MMT), up from 0.07 – 0.09 MMT in 2012

By 2020, LNG from the marine sector is projected to be 0.9 – 1.4 MMT in N. America and 0.3 – 0.4 MMT in S. America



MEC, Cambridge Energy Associates Project Massive Marine LNG Use

- October 2011 report by MEC Intelligence claims that, due to increased environmental regulation and lower total ownership cost over ship's lifecycle, that LNG propulsion will enjoy "huge growth".
 - Project LNG-fueled vessels will grow to 10,000 by decades end.
- CERA Projects that new marine emission regulations will lead to transformative change in the marine industry.
 - Estimates that LNG use in the marine sector will expand internationally to 65 million metric tonnes by 2030.
 - This is about 15% of the projected LNG demand.
 - This is about 22% of the projected bunker demand.



LNG for Locomotives



Market Players: LNG

LNG Station Providers

Fuel & Station



Station General Contractors



Equipment & Station



LNG Fuel Providers

Exploration and Production: Majors



Exploration and Production: ANGA



Industrial Gas Companies



Peak Shavers



Conclusion

- Natural gas will maintain its cost superior cost differential with petroleum-based fuels for the foreseeable future and the abundant supply will provide stable prices for decades.
- Besides economics, there are some clear regulatory drivers that are helping pull natural gas in to key markets, i.e., rail, marine and trucking.
- As a substitute for diesel, natural gas to fuel ships, trains and trucks helps reduce emissions from these sectors.



For More Information

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