Overview: LNG for Transportation in the U.S.

Presentation to
LNG 17 Transportation Pavilion

April 17, 2013
Energy Use in On-Road Vehicles

- Total energy usage: 21.15 quads or Tcf (2012)*:
  - Light-duty: 15.47
  - Heavy-duty freight: 4.90
  - Commercial light trucks: 0.54
  - Buses: 0.24

* 10.3 million barrels per day equivalent
Independent Forecasts

- **Frost & Sullivan:**
  - By 2017: 8% of Class 6-8 truck market
  - In 2017: Almost 30,000 trucks purchased

- **PIRA Consulting:**
  - By 2030: 5.1 Tcf gas used in vehicles per year
  - Equal to 24% of today’s on-road energy use

(continued)
Independent Forecasts

• National Petroleum Council (NPC) study:
  – Under “aggressive” (high oil price case), NPC’s scenario shows, by 2050, NGV capturing:
    • 50 percent of LD market
    • Upwards of 35 percent of the class 3-6 truck market
    • Almost 50 percent of the class 7-8 truck market by 2050
Key Factors for Underlying Growth

- Economics:
- Vehicle Availability
- Fueling infrastructure
- Public Policy
Economics: The Fuel

• America’s economically producible gas resource base is huge:
  – Horizontal drilling, hydraulic fracturing
  – 100 years supply – and growing

(continued)
Economics: The Fuel

Figure 1. Shale gas offsets declines in other U.S. supply to meet consumption growth and lower need

U.S. dry gas production (trillion cubic feet per year)

History

Projections

- Net imports
- Shale gas
- Non-associated onshore
- Non-associated offshore
- Tight gas
- Coalbed methane
- Associated with oil
- Alaska

PGC Resource Assessments, 1990-2010

Shale Basins and the U.S. Pipeline Grid
Source: American Clean Skies Foundation

Methane Hydrates?

(continued)
Economics: The Fuel

• America’s economically producible gas resource base is huge:
  – Horizontal drilling, hydraulic fracturing
  – 100 years supply – and growing

• Natural gas price in North America defined by supply and demand in North America

• Rapidly increasing supply + slowly growing demand = low prices (for a long time)
Economics: The Vehicle

• NGVs always cost more to buy or convert, BUT …

… they cost much less to operate

• At $4.00/Mcf, natural gas now selling for the energy equivalent of $22.40 per barrel of oil:
  – At the pump: Savings of $1.50-$2.00 per gallon
Vehicle Availability
HD NGVs from OEMs, SVMs

OEMs
- Freightliner Truck
- International/Navistar
- Kenworth
- Volvo
- Peterbilt
- Mack
- ALF Condor
- Crane Carrier
- Autocar Truck
- Capacity

SVMs: Diesel
- American Power Group
- Clean Air Power
- EcoDual
- NGV Motori
Local-Regional Haul/Line Haul
Vocational/Specialty/Work Truck
Legacy Diesel Fleets

• Recent revisions to EPA regulations open tremendous new opportunity for EPA approval of “Out of Useful Life (OUL)” HD engine dual-fuel natural gas retrofits

• Lower cost “approval” process will make introduction of these retrofit systems economically attractive to legacy fleets

• Approval process requires technical paper, supporting documentation, field data
Infrastructure
LNG Infrastructure Strategy

• Focus: Over-the-road trucks
• Can’t be bottom:
  – Must be top-down to create a national fueling network quickly
• Clean Energy Fuels building 150 LNG fueling stations:
  – Located at Pilot-Flying J Truck stop at the intersections of interstates about 250 miles apart
  – Over 70 already in place

(continued)
LNG Infrastructure Strategy

- Shell to build 100 LNG stations at Travel Centers
- ENN (Chinese) and Blu LNG announced plans for 50 LNG station
America’s Natural Gas Highway
Public Policy
Public Policy

• With domestic gas supply no longer an issue, policy makers are finally embracing NGVs because of public policy benefits:
  – Foreign oil displacement:
  – Greenhouse gas reduction
  – Urban pollution reduction
  – Jobs
Federal Incentives

• Many pieces of legislation already passed to level the playing field in small ways for NGVs

• Biggest legislative “effort”: The NAT GAS Act (The “New Alternative Transportation to Give Americans Solutions” Act)
  – For five years would:
    • Extend 50 cent per GGE fuel credit
    • Expand infrastructure credit to 50% or $100,000
    • Implement a vehicle purchase credit

(continued)
Federal Incentives

• Correcting the LNG penalty:
  – Currently, LNG and diesel are taxed the same but the tax is on volume not Btu content

• Reducing the incremental FET on vehicle purchases:
  – Would eliminate the 12% federal purchase tax on incremental price of vehicle

• Getting weight exemption for HD trucks:
  – Would allow LNG trucks to be slightly heavier
Federal: Administration Support
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• On January 26\textsuperscript{th}, President Obama unveiled his “Blueprint to Make The Most of America’s Energy Resources”

• Four sections:
  – Two on increasing natural gas supply
  – Two on increasing use of NGVs

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Federal: Administration Support

• On March 15th, President proposed specifics, including:
  - Committing “to partnering with the private sector to adopt natural gas and other alternative fuels in the Nation’s trucking fleet”
  - “… putting in place new incentives for medium- and heavy-duty trucks that run on natural gas or other alternative fuels, providing a credit for 50 percent of the incremental cost of a dedicated alternative-fuel truck for a five-year period …”
Federal: Administration Support

- “… supporting research to ensure the safe and responsible use of natural gas …”
- “… funding to support a select number of deployment communities”

- The President also called for “establishing a $2 billion, 10-year Energy Security Trust that “will support research into a range of cost-effective technologies—like advanced vehicles that run on electricity, homegrown biofuels, fuel cells, and domestically produced natural gas…”

NGVAMERICA
Natural Gas Vehicles for America
35 States have some type of incentives for NGVs

- Tax Credits:
  - Oklahoma; Louisiana; WV; others

- Grants:
  - Texas TERP
  - Pennsylvania ($20 million)

Over 250 pieces of alt fuel legislation introduced since January
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Non-Road Applications

• Off-road heavy equipment:
  – 5.2 billion gallons of diesel (725 Bcf) market

• Marine:
  – 5.2 billion gallons of diesel (725 Bcf) market

• Railroads:
  – 3.3 billion gallons of diesel (465 Bcf) market
Off-Road Equipment

- Targets: All mobile equipment not designed to be used on-road, e.g.:
  - Mining
  - Construction
LNG for Marine

• Targets:
  – Container vessels
  – Ferries
  – Port vessels
  – Barge Tugs
Marine

• US developments:
  – Washington evaluating LNG ferries
  – A Staten Island Ferry being converted
LNG for Railroad Locomotives

- New emissions standards go into effect in 2015, increasing cost of diesel locomotives

- Recent developments:
  - BNSF Railway will begin testing a number of locomotives on LNG
  - LA MetroLink studying this option
Questions?

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