LNG Use in Trucking

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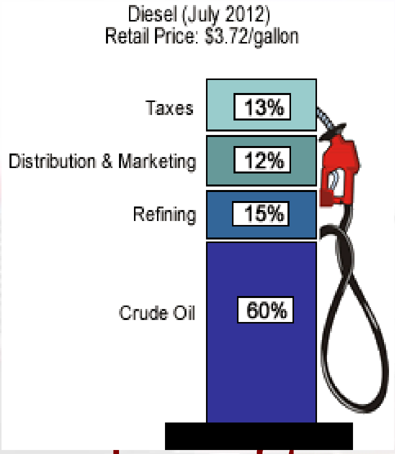
Agenda

- Why Natural Gas
- LNG vs CNG
- Considering a change
- Fueling Infrastructure
- Industry Momentum
- The future
- Conclusions

Why Natural Gas?

- Environmental Benefit
  - 25% less tailpipe carbon emissions
  - Compromised by well-to-wheel methane leakage
  - Bridge fuel
- Cost – LNG is about $1.00 cheaper per gallon.
  - Represents a significant economic benefit
    - Fuel and Payroll are the two largest expenditures for trucking
    - Less volatile



- Movement to convert is largely driven by economic benefits

LNG vs CNG

- Fuel choice is driven by scope of operations
  - CNG is good for short haul, intracity, return to base (<250mi/d)
    - Less Dense
      - Requires more storage, more tanks (4X the weight)
      - Range is compromised.
      - More CNG infrastructure is available. Time fill.
    - Cheaper
  - LNG longer haul, regular route
    - More Dense
      - Less storage
      - Lighter tanks
    - Better Range. 350-850mi.
    - “Boil Off”

LNG Special Considerations

- Vehicle Cost
  - Estimates range. 40-80K premium
- Engine Type/Availability
  - Spark Vs Compression
    - **Compression Pros:** Power, fuel economy,
    - **Compression Cons:** Heavier, Requires Diesel and DEF Tank, After-treatment maintenance required, more expensive
    - **Spark Pros:** No after-treatment , Lighter, No diesel or DEF required
    - **Spark Cons:** Less efficient, additional maintenance

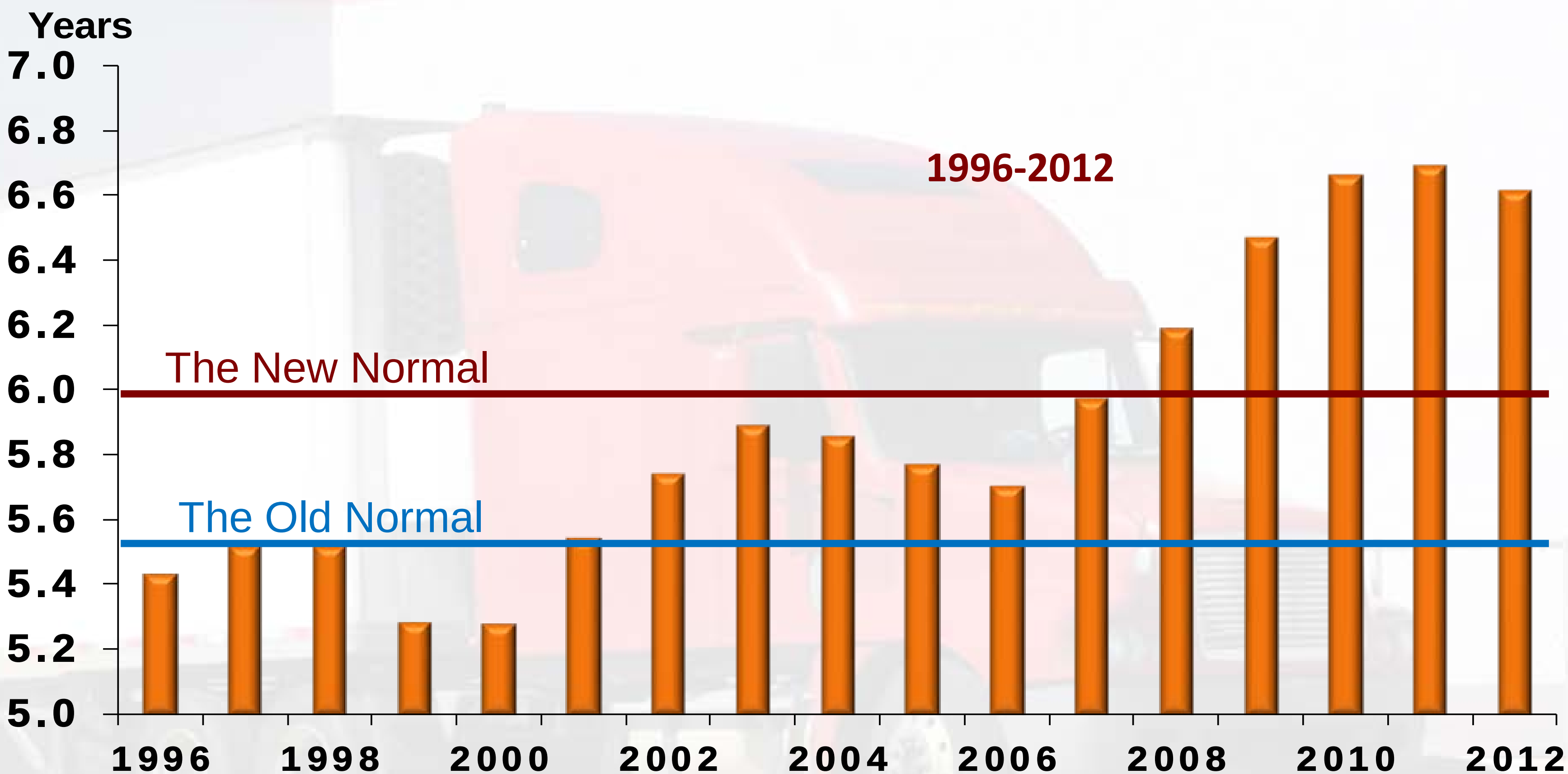
LNG Special Considerations

- Weight/space penalty
- Range – Up to 850 mi.
- Maintenance Cost
  - Maintenance facility upgrades
- Tax Penalty
  - Fuel Tax
  - FET
- Fuel Availability
- Resale
- ROI

LNG ROI

- ROI is dependent on
  - Mileage Driven
  - Fuel Price
    - At $3.00 diesel, economics break even
  - Fuel infrastructure, if any
  - Maintenance facility
  - Fleet Turnover

LNG ROI



Source: ACT Research

LNG's Best Application

- Hub and Spoke
  - Centrally fueled
  - Predictable routes
  - Private refueling infrastructure
- Established Freight Corridors
  - Must be regular route
  - Must be medium range (500-700 miles)

Fueling Infrastructure

- Chicken and Egg
  - Public build-out has begun
    - Clean Energy – 100-125 stations by end 2013
      - 76 in 33 states last year (waiting for trucks) (15 open)
      - Many co-located at Pilot Flying J Truck Stops
    - TA/Shell – 200 Lanes in 100 locations
    - Love's Travel Stops – Balanced CNG Distribution approach
    - Encana – 1 public station, experimenting with mobile LNG refueling
    - ENN – Plans for 50 stations by end of 2013

Fleet Adoption of LNG

- UPS –
  - April announcement 700 LNG truck purchase
  - June announcement 285 additional trucks
  - All Class 8 purchases in 2014 will be natural gas
    - Nine additional fueling stations
- Ryder –
  - 300 natural gas powered trucks
  - 2 fueling stations, plans for 4 more
  - Also building maintenance facilities
- Waste Management
  - 1,700 CNG Vehicles
    - Creates own Natural BioGas

97% of the industry has <20 trucks

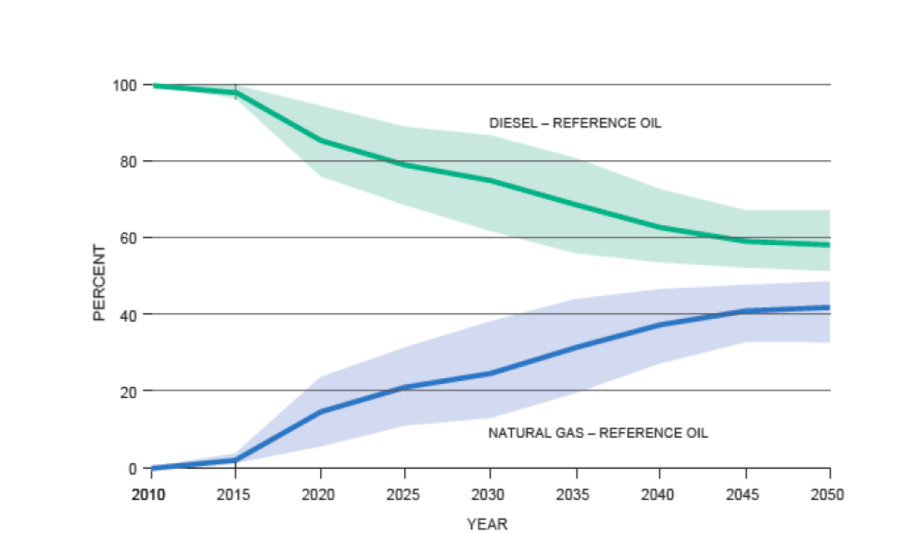
Fleet Adoption

- Many other fleets in the testing phase
- Shipper Pressure
  - Proctor & Gamble: 20% of freight hauled in next 2 years
    - 8 carriers under contract
  - Owens Corning: 22 lanes under contract for natural gas users
  - Office Depot: Dedicated Philly to Chicago
  - May shift fuel surcharge paradigm

The Future

- More Engines become available
  - 11.9 L 2013, 13 L 2014, 15L Spark 2015
- More trucks will be sold (Estimates vary)
  - Low case: 4% by 2017
  - High case: 15% by 2017
- Distant Future
  - Low case: 40% by 2050
  - High case: 48% by 2050
- EIA, optimistic

Class 7 & 8 Market Shares of New Diesel and Natural Gas Trucks: Reference Oil Case



National Petroleum Council

The Future

- EIA
  - LNG prices 40% below diesel for Next 30 years
  - Natural gas as a fuel for vehicles will rise 12% per year through 2040
  - Will be 6% of total highway energy mix by 2040

Conclusions

- There is momentum for natural gas use in trucking
- Economics will ultimately drive the change
- Trucking is complex, natural gas won't fill all niches
- Petroleum is still the way forward for the foreseeable future.

Thank You

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