

Evaluating CNG for Forestry Applications

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Overview

- Forestry – Define the Demand
- Challenges to CNG
 - Price
 - Delivery Infrastructure
 - Equipment
 - Externalities
- Plan of Action



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Forests in Alabama

- 22.5 million acres of timberland in Alabama
- 2 out of every 3 acres is timberland



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Forests in Alabama

- Public Land- 1.25 million acres
- Private Land- 21.25 million acres
 - Non industrial private- 14.7 million acres
 - Forestry Industry- 3.5 million acres
 - Non industrial corporate- 3.0 million acres



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Sustainable Resource

- 2005
- 1.5 billion cubic feet of growth
- 1.3 billion cubic feet harvested
- 200 million cubic feet of surplus



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Forestry Employment

- 2002
- Primary Manufacturing- 19,700
 - Lumber and plywood- 9,869
 - Pulp and paper- 9,907
- Secondary Manufacturing- 15,000
- Payroll- \$1.3 billion



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Alabama Payrolls

- 2002
- Forest Products- \$1.3 billion
- Transportation Equip- \$1.3 billion
- Food Mfg - \$875 million
- Primary Metals- \$775 million
- Chemicals- \$671 million
- All Manufacturing- \$9.7 billion



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Timber Removal

- 2005
- 825 million cubic feet – softwood
- 390 million cubic feet- hardwood
- Equals nearly 31 million tons annually



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Transportation Fuel Use

- Average weight- loaded trailer- 25 tons
- Annual loads- 1.24 million
- Approximately 3,400 loads delivered/day



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Transportation Fuel Use

- Average Roundtrip distance/load- 100 miles
- Average Fuel Efficiency- 5 mpg
- Daily diesel consumption- transportation – 68,000 gallons/day or 24.8 million gallons/year



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Transportation Energy

- One gallon diesel equivalent to 136,000 btu
- Annual transportation consumption of 3,375,520 MMBtu
- Daily transportation consumption of 9,248 MMBtu



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Production Fuel Use

- Average Logging crew produces 60,000 tons annually
- 500 crews working
- 40,000 gallon diesel consumption/crew annually
- Annual diesel consumption- 20 million gallons



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Production Energy

- One gallon diesel equivalent to 136,000 btu
- Annual production consumption of 2,720,217 MMBtu
- Daily transportation consumption of 7,452 MMBtu



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Total Forestry

- Transportation- 9,248 MMBtu/day
- Production- 7,452 MMBtu/day
- Total- 16,700 MMBtu/day
- Approximately 45 million gallons diesel annually



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CNG as a Fuel for Forestry

- Good Prospective Market
 - Established mature industry
 - Large consumer
 - Actively seeking expense reductions
- Barriers
 - Stability of Price Differential between Oil and Natural Gas
 - Delivery Infrastructure
 - Equipment to utilize CNG



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Price- Equivalent Cost of Fuel

- Diesel @ \$3.00/gal
- Federal Environmental Fee Recovery- \$0.019/gallon
- Federal Diesel Fuel Tax- \$0.244/gallon
- State Diesel Fuel Tax- \$0.19/gallon
- Net Cost of Diesel- \$2.547/gallon
- Equivalent Energy- \$18.73/MMBtu



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Equivalent Cost of Fuel

- Natural Gas Commodity- \$4.74/MMBtu- \$0.64/gallon
 - Muni: \$0.82+/gallon
 - Transportation- \$0.35/MMBtu- \$0.047/gallon
 - Distribution- \$1.00/MMBtu- \$0.136/gallon
 - Alagasco Interruptible Rate- \$11.68/MMBtu- \$1.59/gallon



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Natural Gas – July 2010

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NYMEX NATURAL GAS Jul 2010 (E)



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Crude Oil- July 2010

NYMEX CRUDE OIL Jul 2010 (E)

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Natural Gas- July 2015

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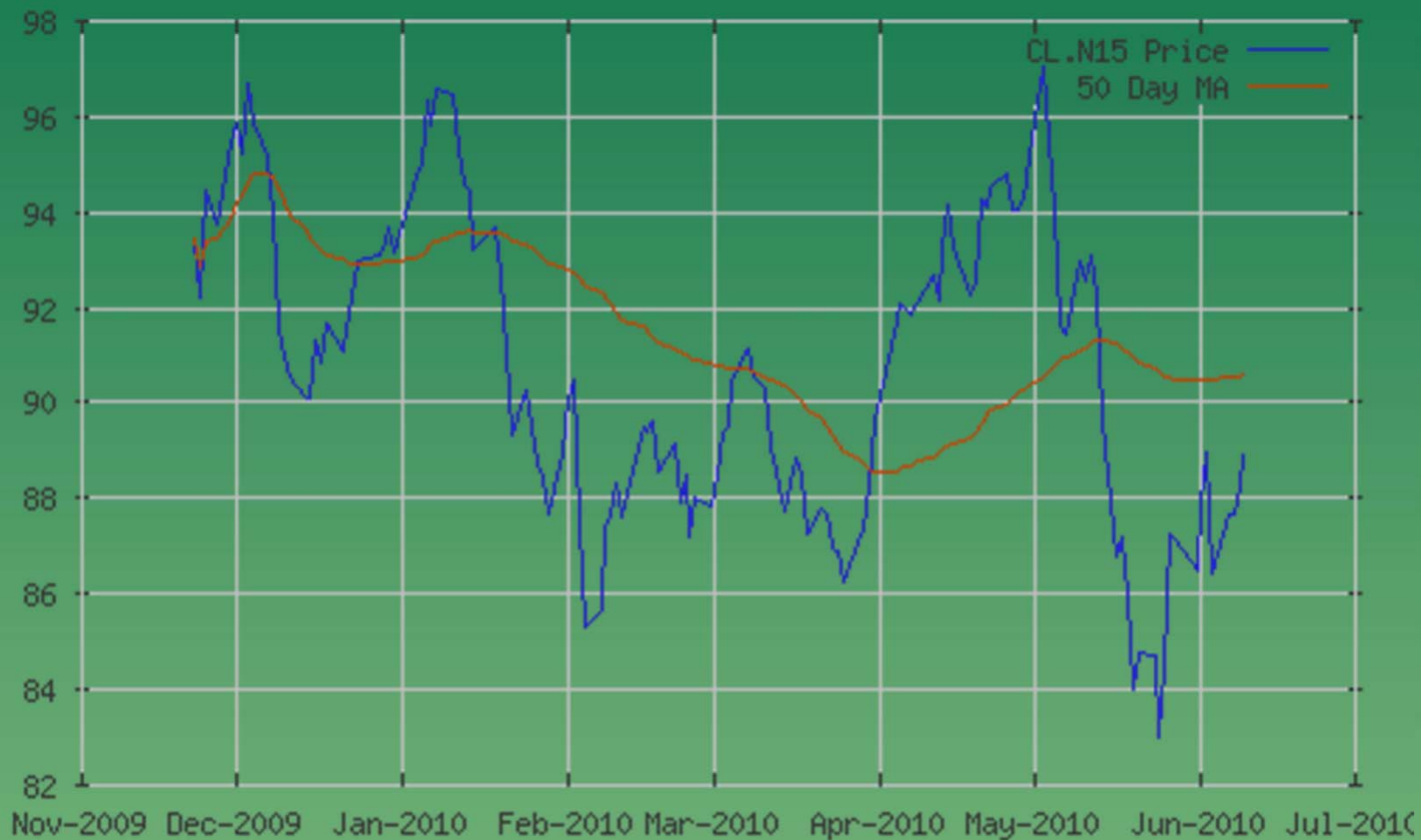


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Crude Oil- July 2015

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Natural Gas- July 2020

NYMEX NATURAL GAS Jul 2020

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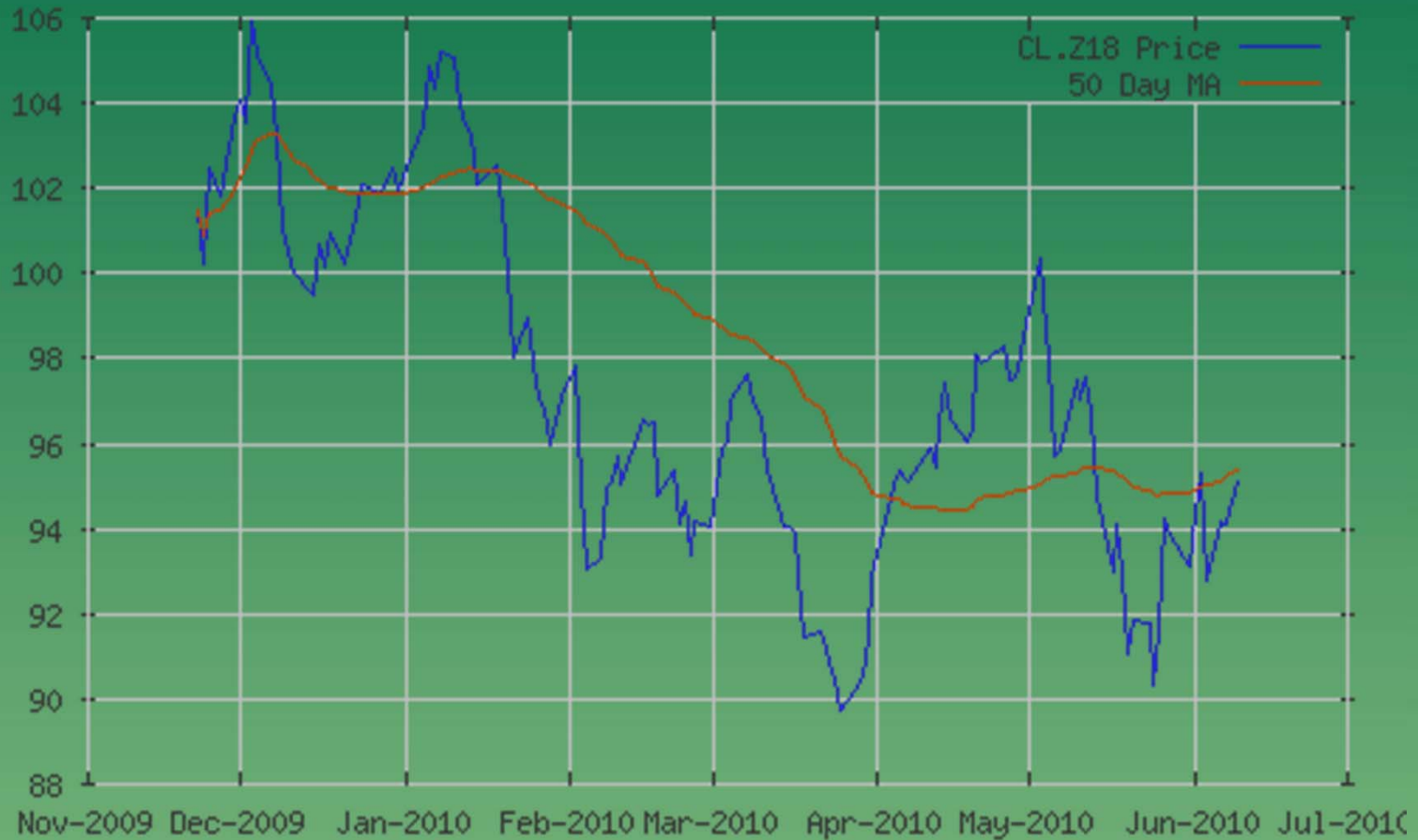


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Crude Oil- Dec 2018

NYMEX CRUDE OIL Dec 2018

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Delivery Infrastructure

- How big to size for?
- Quick fill vs. Slow fill
- Public vs. Private
- Compressor design/type
- “Automatic” vs. Manned



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Delivery Infrastructure

- Sizing Design
- 50 trucks (assumption)
 - 10,429 gal/yr/truck (1,418 MMBtu/yr/truck)
- 200 miles/day
- 261 days/year
- Total Annual Fuel Consumption 521,429 gallons



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Delivery Infrastructure

- 8 hour fill time
- 566 scfm
- Capital Cost- \$2,000/scfm
- Investment- \$1.13 million
- \$0.28/gallon



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CNG Station Operational Expense

- On site gas compression- (Discharge pressure 4,000 psig+) - \$0.12- \$0.275/gallon
- Non fuel O&M- \$0.125 - \$0.375/gallon
- Total O&M- \$0.245- \$0.65/gallon



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Total Delivered CNG Price

- Commodity-
 - Muni -\$0.82/gallon
 - Alagasco- \$1.59/gallon
- Capital Investment- \$0.28/gallon
- O&M- \$0.245 - \$0.65/gallon
- Total- \$1.35- \$2.52/gallon
- Savings - \$1.20 - \$0.02/gallon



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Equipment



- Kenworth T440 Natural Gas model
- Cummins Westport ISL G engine
- 320 hp



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CNG vs. LNG

- CNG less expensive
- LNG more storage, less weight
- LNG has limited production markets in southeast U.S.



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Equipment

- Kenworth T800
- Cummins ISX 15 Engine
- 450 hp
- LNG Only
- \$185,000 vs. \$125,000



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Externalities

- “True Cost of Oil”
 - Energy Security
 - Environmental Considerations
 - Tax Incentives



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Energy Security

- U.S. imports approximately 12 million barrels of oil daily
- 2.4 million come from the Mideast region (20%)
- Iraq war has cost \$804 billion to date
 - 4,000+ deaths, 30,000 wounded
 - Estimated VA future cost of \$9 billion annually by 2017



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Environment

- Oil Disaster in Gulf
- Increased health costs from auto emissions (air pollution)



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Federal Incentives

- Qualified Vehicle Tax Credit- Up to \$32,000 (80% of differential cost of dedicated vehicles) – expires 12/31/10
- Infrastructure Tax Credit- Up to 50% of cost of station (capped at \$50,000) – expires 12/31/10
- Alternative Fuel Excise Tax Credit- \$0.50/gallon (public entities qualify) – expired 12/31/09, up for reauthorization



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Conclusions for Forestry

- Price differential is stable
- Locate infrastructure near paper mills
- Most likely in “Muni” service territory
 - Near high pressure line
 - Rate flexibility
 - Public financing alternatives
- Equipment is the greatest challenge



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