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Freightliner Natural Gas Market and Product Update

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Freightliner Trucks
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Customer Success: It's Still About Their Business

Paper Transport (Wisc.)

Sysco (CA)

Ryder (CA)

City of Sierra Madre (CA)

Suffolk County (NY)

National Grid (NY)

Drivers and Barriers

What's influencing Natural Gas?

DRIVERS

- Improving **operating economics** vs. diesel
- Increasing **diesel fuel costs** driving quick NG payback
- **Reduced after-treatment complexities**
- Reduced GHG **emissions** (up to 23%)
- Environmental initiatives of **government**
- **Muni specs** requiring "Cleanest Technology Available"
- **Noise reduction** - 5-12 dba reduction vs. diesel
- **Domestic Fuel**/Energy Security
- Resources **available**: 100 year supply
- **Renewable** Fuel

BARRIERS

- Insufficient **infrastructure**
- Wait for **federal funding**
- **Right application:** Right engine for right segment, like TBB small NG engine or CAS bigger engine
- Purchase **price**
- Cost for **employee training** (drivers, shop)
- Resale value/No **resale** market
- **Insecurity** about new technology

	Diesel Model		NG Model
Fuel Econ	6		5.4
Ann Mileage	80,000.00		80,000.00
Fuel Price	$ 3.83		$ 1.80
Gall Per Yr	13,333.33		14,814.81
$ in Fuel	$ 51,066.67		$ 26,666.67
Annual Fuel Savings	Payback In Yrs @ $40,000 Premium		
$ 24,400.00	1.64		

M2 112 NGs Delivered / Customer Experience

Vehicles delivered:

- Sterling SB 113 LNG port tractors: 328
- Freightliner M2 112 trucks & tractors: 725
- 1053 Freightliner/Sterling units produced/delivered, including:
  - LNG & CNG port tractors
  - LNG & CNG food delivery tractors
  - CNG regional haul tractors
  - CNG Refuse tractors
  - CNG Sewer trucks
  - CNG Gas Utility trucks
  - CNG Municipal Gov't trucks
- 240 on order, quotes out on 500 more
- Over 1000 units have been delivered

NG Base Specs

Freightliner M2 Specifications

Model: **M2**

Bumper to Back-of-Cab: **112”**

Wheelbase: **ANY**

Engine: **Cummins Westport ISL Gas**

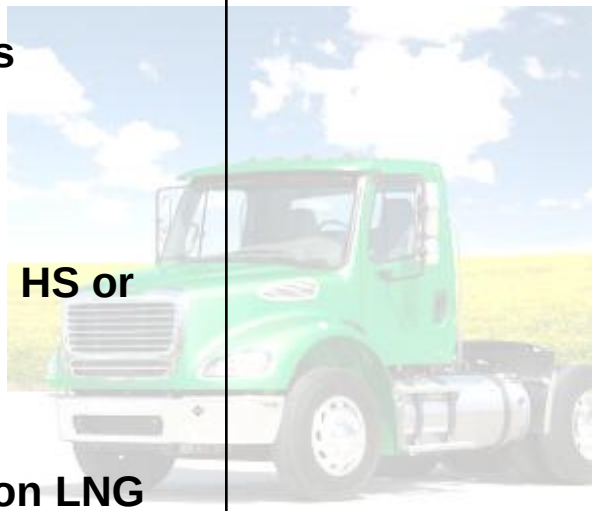
Horsepower: **320 HP**

Torque: **1,000 lb/ft @ 1,300 RPM**

Transmission: **Allison 3000 or 3500; HS or RDS Automatic**

Fuel Tanks: **119 (64) & 150 (84) Gallon LNG**

- **60 and 75 DGE CNG**



Customer Profile – Natural Gas

Who is buying?

- Total fleet size – typically 50 -250 units
- Willing to try between 2 and 5 natural gas units
- NOT installing fuel on site (yet)
- Need retail fuel station with 3600 psi / 5 GPM MINIMUM
- NOT going to drive 50 miles round trip to fuel
    - Assuming fuel not available on planned route
- NOT going to modify shops (yet)

When natural gas project proves it can work in customers' operations:

- More natural gas vehicles will be ordered
- Customers may consider fuel station on site

Lessons Learned: The Buying Cycle

Customer Purchase Process – Natural Gas

- **Research the Business Case**

➢ Will products work for my application?

➢ Will there be compromises to Weight/length?

➢ Funding availability

➢ Financing

➢ Warranties

➢ Insurance

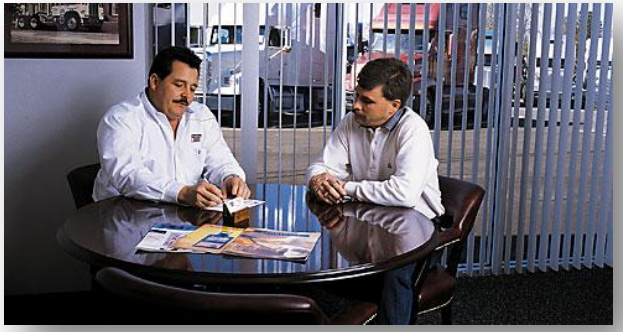
➢ Driver reactions

➢ Service Shop Modifications

➢ Fuel readily available at competitive cost & flow?

☑ 10% YES – LET'S PROCEED!

☒ 90% NO – WALK AWAY AT THIS POINT



Warranty and Maintenance

- Base Warranty: 2 Year/250,000
- B-50 life is 500,000 Miles
- Maintenance Free Aftertreatment System
  - Three-way passive catalyst
  - No regeneration or ash cleaning

ISL G

ISL G Truck

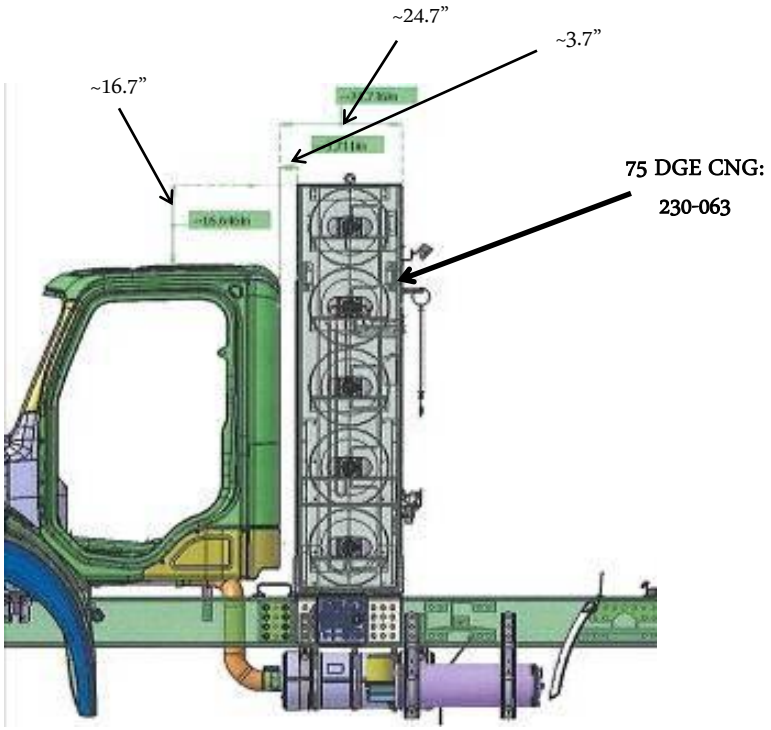
	Miles/Kilometers	Hours	Months
Oil and Filter*	15,000 MI 24,000 KM	500	6
Fuel Filter	30,000 MI 48,000 KM	1,000	12
Coolant Filter	15,000 MI 24,000 KM	500	6
Spark Plugs	45,000 MI 72,000 KM	1,500	18
Change Coolant	60,000 MI 96,000 KM	2,000	24
Valve Adjustment	60,000 MI 96,000 KM	2,000	24

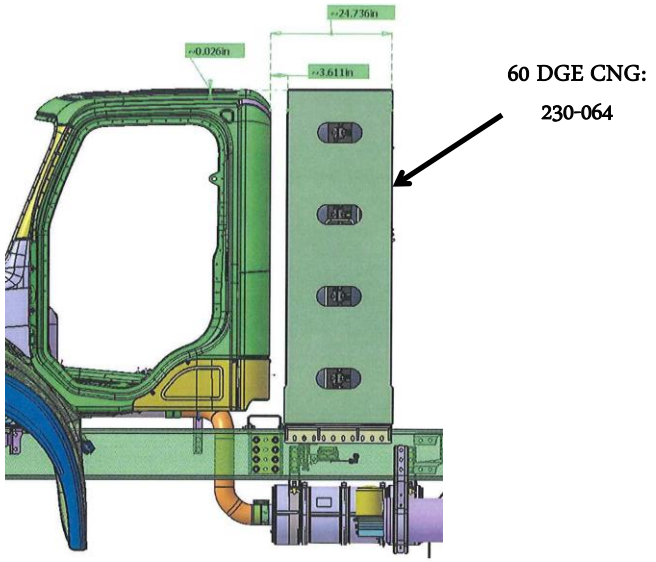
- Intervals will reduce or increase based on average speeds/duty cycles.
- Default interval is the hours stated. Interval is whichever comes first – hours, miles or time.

Saddle tanks will be factory installed in 12 months

CNG Fuel Tanks

Factory Installed 60 and 75 Gallon CNG Tanks

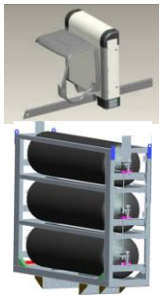




Freightliner is the only “turnkey” NG OEM - all components factory installed & warranted!

Natural Gas Fuel Packages and Capacity

Comparison of CNG and LNG

	CNG	LNG
Fuel Packages	 OR  60 & 75 DGE CNG Fuel Capacity	 119 gallon/65 DGE OR 147 gallon/86 DGE LNG Fuel Capacity
Capacity	 41 DGE CNG Fuel Capacity	LNG: Additional 24 DGE in similar packaging  119 gallon/65 DGE LNG Fuel Capacity

Methane Detection

- Two Sensor System - mounted in cab, engine compartment
- Visually and audibly warns driver of fuel leaks
  - Trace amount (no concern)
  - Significant amount (potential concern)
- Methane Detection installed on LNG and CNG vehicles

In overhead console

Natural Gas Fuel Types

CNG

ADVANTAGES:

- Lowest price
- Lowest emissions
- Extensive infrastructure already exists
- "Truck-Friendly" Technology

CHALLENGES:

- Storage requirements for CNG tanks
- Additional weight and OAL
- Range limits approximately 300 miles
- Existing technology limited to 9 Liter
- Performance of existing stations

LNG

ADVANTAGES:

- Lower price than diesel
- Lower emissions (compared to diesel)
- Fastest Fill
- LNG is lower weight than CNG; allows greater storage and distance (current max of 400 miles)
- Existing truck technology provides 9L or 15L; up to 450HP engine

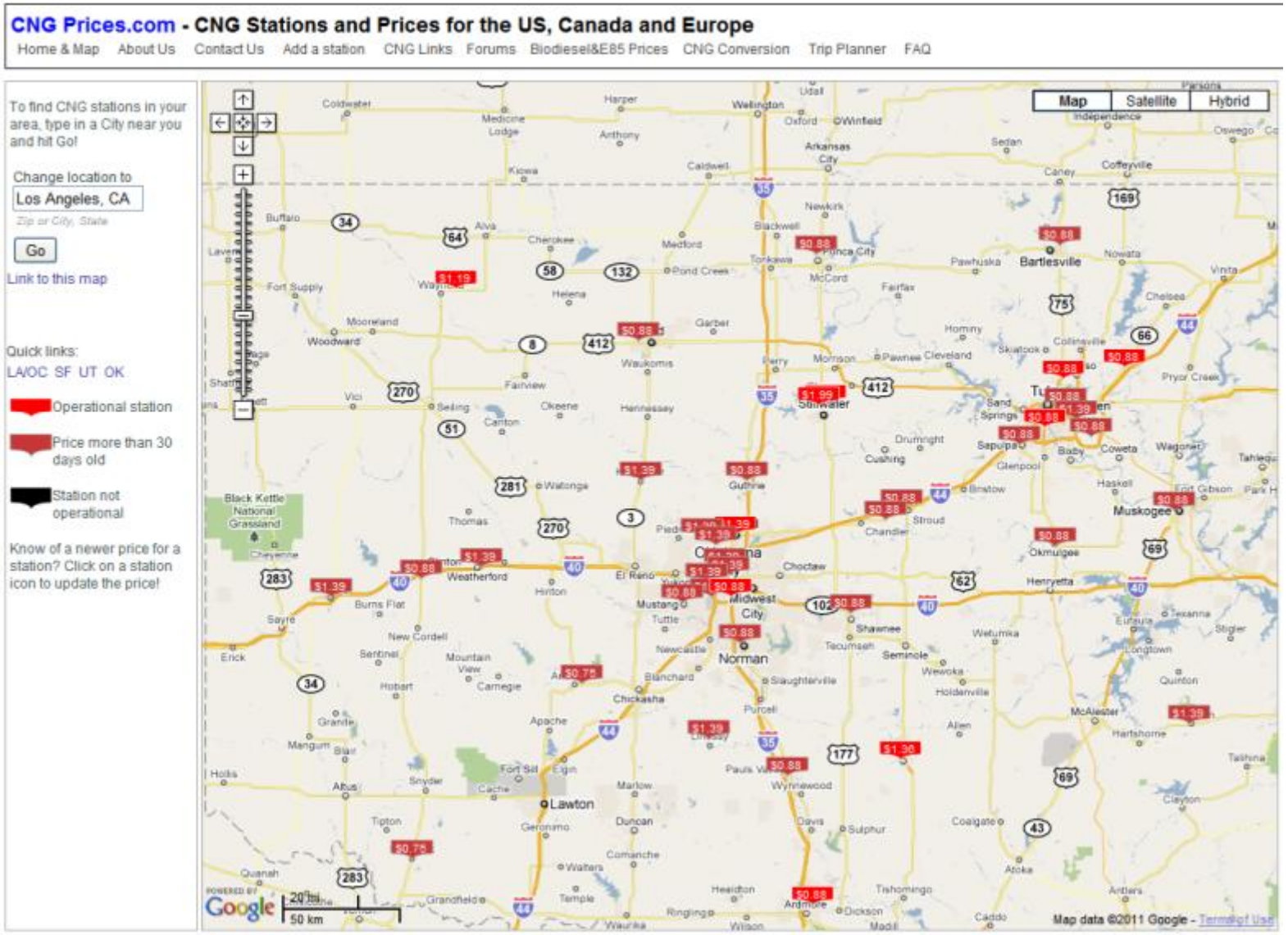
CHALLENGES:

- Infrastructure only exists in Southern California; SLC; and Connecticut
- Venting; Performance Issues
- Higher production and distribution costs
- Truck cost for larger engine (15L)

HOW SAFE IS NATURAL GAS?

- Lighter than air, will not pool under vehicle
- TYPE III and IV Tanks, lightest weight
- 20 Year Tanks
- Heavily Regulated
- Drop/Crash Testing
- Bonfire Testing
- Dynamite Testing
- Pistol/Rifle Testing – Armor Piercing Bullets
- Hydraulic Crush Tests
- Google “CNG Tank Testing” – Numerous Web Sites and You Tube Videos
- SUMMARY: NATURAL GAS IS AS SAFE, OR SAFER, THAN DIESEL AND GASOLINE

NG Fuel Location & Price Resources



Natural Gas Engine Technology

Stoichiometric EGR engine (Example ISL-G/ISX-G)

- Uses high EGR rates in combustion process in place of excess air (Lean Burn).
- End result is an oxygen free exhaust allowing use of a simple 3 way catalyst
- Simple Spark Ignition
- Fuel Neutral- LNG and CNG

Dual Fuel engine (Example ISX15L G)

- Uses diesel fuel as a pilot injection for Liquefied Natural Gas
- Due to the use of diesel fuel, exhaust requires emissions control devices (DPF, DOC, SCR)
- Heavy; High Complexity and Cost
- ONLY operates on LNG

NEW ISX12 G

Freightliner Cascadia: "Proof on Concept" debut May 2011 – SOP Q1 2013?

Target Markets

- Regional haul truck / tractor
- Vocational

Platform & Technology

- ISX 12 base engine
- Spark-ignition with cooled EGR & three way catalyst (TWC)
  - Same technology as ISL G
  - Operates on CNG or LNG
  - 400 HP/ 1350 Ft Lb Torque
  - Allison Automatic or Manual Transmissions
  - Test Vehicles Running Summer of 2011

Cummins Westport ISX 12-G Engine

- The ISX 12-G is built on the Cummins ISX12 platform and it uses the same components as it's diesel counterpart but will operate exclusively on Natural Gas
- Up to 400HP/1450Ft Lbs Torque
- ISX 12-G will be available early 2013
- Engine Brake will be an option
- The technology is the same as the ISL-G which is a three-way catalyst after treatment, which is packaged as a muffler and is maintenance free
- Manufactured at the Cummins Plant in Jamestown, NY
- Target Customer's are Regional Haul truck/ Refuse and Vocational Applications

2012 Natural Gas Marketing Efforts

- **Trade Shows:**
- World of Concrete – January
- NTEA Work Truck Show – March
  - CNG presence in booth and Green Truck Ride & Drive
  - Green Truck Summit
- MATS – March
- BevOps – April
- Waste Expo – May
- ACT Expo – May
- **Collateral:**
- 114SD CNG Sell Sheet
- Cascadia 113 Day Cab CNG Sell Sheet
- Updated Shaping Future Transportation Brochure
- Comprehensive Freightliner Natural Gas Brochure

PR:

- Cascadia CNG/ISX12 G announcement/press release – MATS
- Green truck leadership releases – ACT Expo
- Cross country tour

Interactive:

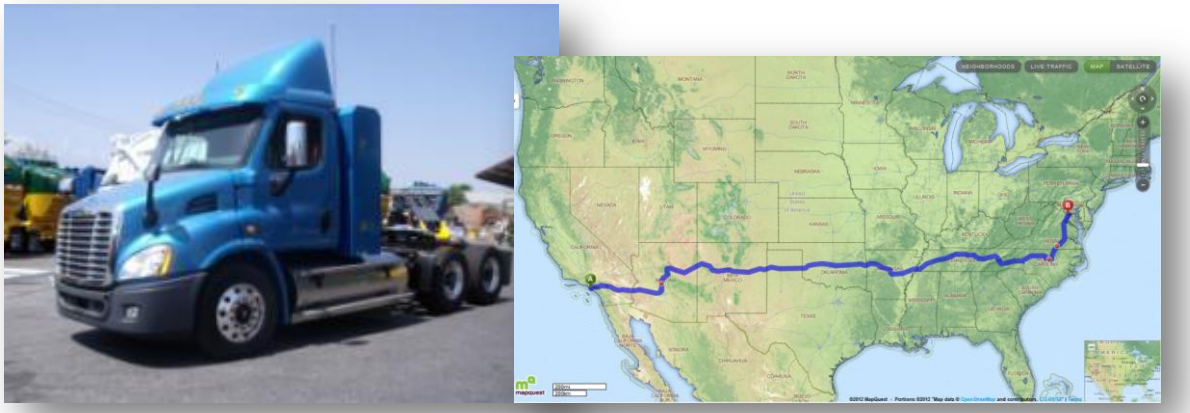
- Updated natural gas page on Freightlinertrucks.com – individual product pages
- Updated content in iPad FST app
- Microsite for cross country tour – expanded to be comprehensive Freightliner green truck site (Freightlinergreen.com?)

Other

- Inclusion of natural gas product training module for sales certification
- Regional events – summer 2012?

CNG Cross Country Tour Summary

- What: Drive Cascadia with ISX12 G from Long Beach, CA to Washington, DC
    - Dealer events
    - Microsite with blogs, photos, videos, social media
    - PR
- When: Begin following ACT Expo, which ends May 17, 2012. First stop on May 18. Tour ends at dealer meeting location in Washington around May 26.
- Where: Five (5) or Six (6) stops between Long Beach and Washington:
    - Phoenix
    - Albuquerque (?)
    - OKC
    - Little Rock
    - Nashville
    - Charlotte



- Why: Promote Cascadia with new 12 liter natural gas engine. Keep FTL in spotlight as natural gas leader. Show natural gas as a fuel, and FTL CNG product, as viable alternative to diesel

New Alternative Transportation to Give Americans Solutions Act (NAT GAS ACT) from 2011

- H.R. 1380
  - Introduced **Apr 6, 2011** - Currently **still** in the House
  - **Fuel Use:** 50 Cent/Gallon Tax Credit Extension
  - **Vehicle Purchase**: $32K to $64K Tax Credit
  - **Infrastructure:** Up to $100K Tax Credit per Station
  - **OEM Installation:** $4K per Vehicle
  - Reauthorize $30M annual for NG R&D/ demonstration at the US DOE
  - Experts Predict Passage with Cost Reductions

- S. 1863
  - **Similar to H.R. 1380, except** for following aspects:
    - **No Fuel Use 50 Cent/Gallon Tax Credit Extension**
    - **Surcharge on natural gas** used in subsidized vehicles which ramps up in a 10-year period from 0 to 12.5 cent/gallon
  - Introduced **Nov 15, 2011** - Currently in the House

- President Obama talks Natural Gas during the 2012 state of the
- union address & UPS Vegas
- Toured the Freightliner Mount Holly Plant March 7, 2012

FREIGHTLINER
NATURAL GAS TECHNOLOGY

Shaping Future Transportation.
CleanDrive Technologies.
A Daimler Initiative.