



UPLIFTING

$$\frac{R^2}{A} \rightarrow V^+$$

SWN
Southwestern Energy®

Arkansas CNG:

Powered by
The Fayetteville Shale

August 16, 2012

- How CNG Works
- SWN's CNG Program
- CNG Market Overview
- Natural Gas Vehicle Economics
- Summary
- Q&A

Economic Benefits

Natural gas powered vehicles offer an economic return to fleets and individual users. Full cycle cost is lowered through reduced fuel price, fewer maintenance problems, and extended vehicle lives.

Clean Air

Natural gas offers a clean alternative to traditional petroleum fuel powered vehicles. Natural gas vehicles (“NGVs”) offer an immediate reduction of 25% in GHG and smog causing emissions.

Local Resources

Southwestern utilizes Fayetteville Shale gas at our Damascus, AR CNG station, to fuel CNG powered trucks – many of which were converted by suppliers based in Arkansas.

Energy Security

Natural gas is an abundant domestic fuel source, which reduces our nation’s dependence upon import oil.

How CNG Works

Station Design Concept

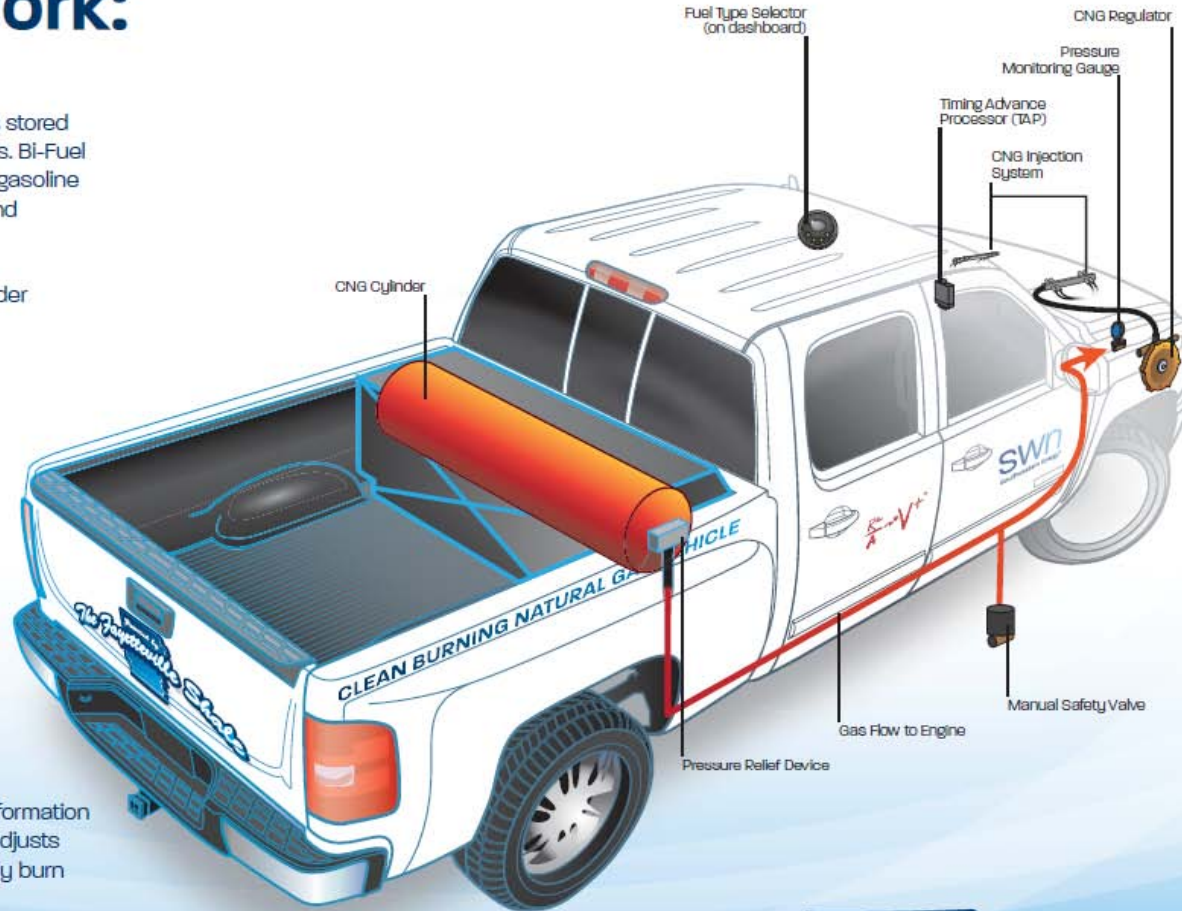
- Dispenser w/ credit card reader
- Provision for POS interface
- Storage tank
- Priority panel
- Compressor; Motor/starter
- Noise abatement (enclosure)
- Dryer; Cooler
- Unit control
- Filter; Valves; Regulators
- Remote control panel

How CNG Works

Basic Vehicle Design

How Natural Gas Vehicles Work:

- **Compressed natural gas** is stored in specially engineered cylinders. Bi-Fuel vehicles retain factory installed gasoline tanks for fuel choice flexibility and extended range.
- **CNG flows** from the fuel cylinder through high pressure tubing to a regulator in the engine compartment.
- **The regulator** reduces the CNG pressure before it is introduced into a multiport fuel-injection system.
- **The fuel-injection system** introduces compressed gas into the engine's cylinders.
- **Sensors relay** fuel mixture information to an internal computer which adjusts the fuel-air mix to most efficiently burn when the spark plugs ignite.



- **CNG cylinders testing**

- Testing procedures include: hydraulic cycle pressure, low temperature cycling, drop/impact, bonfire, environmental exposure, damage tolerance/gunfire, vibration, hydraulic crush, & road drag

- **Limited flammability range**

- Both gasoline and diesel have lower flammability mixture ratios and ignition temperatures

- **Fuel density**

- No pooling / venting properties

- **CNG station requirements**

- NFPA, ASME, local, & state codes

SWN CNG Program

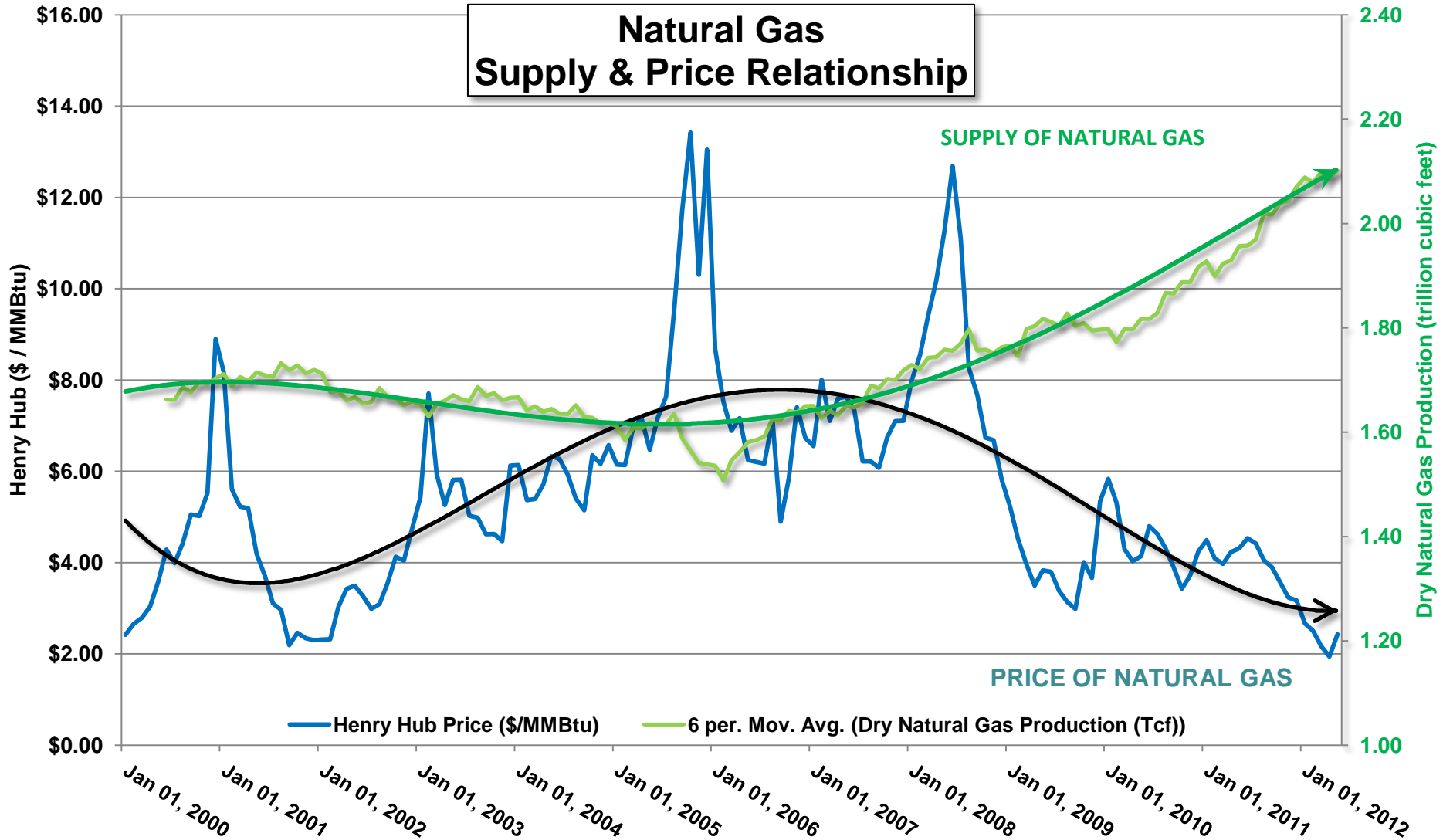
Powered by
The Fayetteville Shale



- **Transition SWN's fleet to CNG**
 - 160 conversions completed to date
 - Minimum of 185 conversions to be completed by end of 2012
- **Support the development of public fueling infrastructure**
 - Damascus CNG Station
 - City of North Little Rock & City of Little Rock
- **Incentivize employee adaptation of CNG**
 - The Big Give
 - SWN Employee CNG program
- **CNG advocacy & training**
 - Drive Natural Gas Initiative, Houston NGV Alliance, ANGA
 - Certification & training for fleet maintenance group

CNG Market Overview

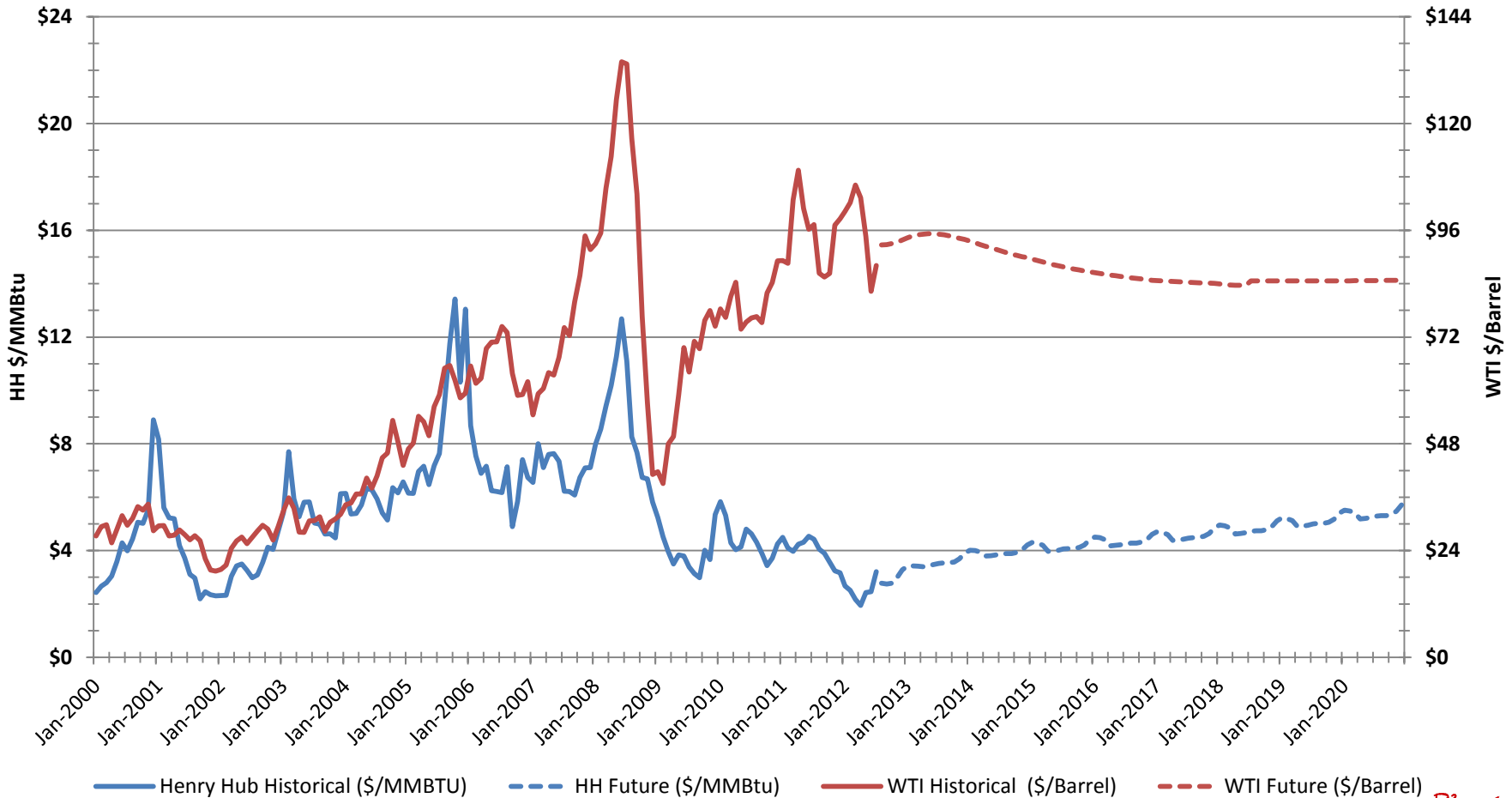
Shale Gas Impact



CNG Market Overview

Shale Gas Impact

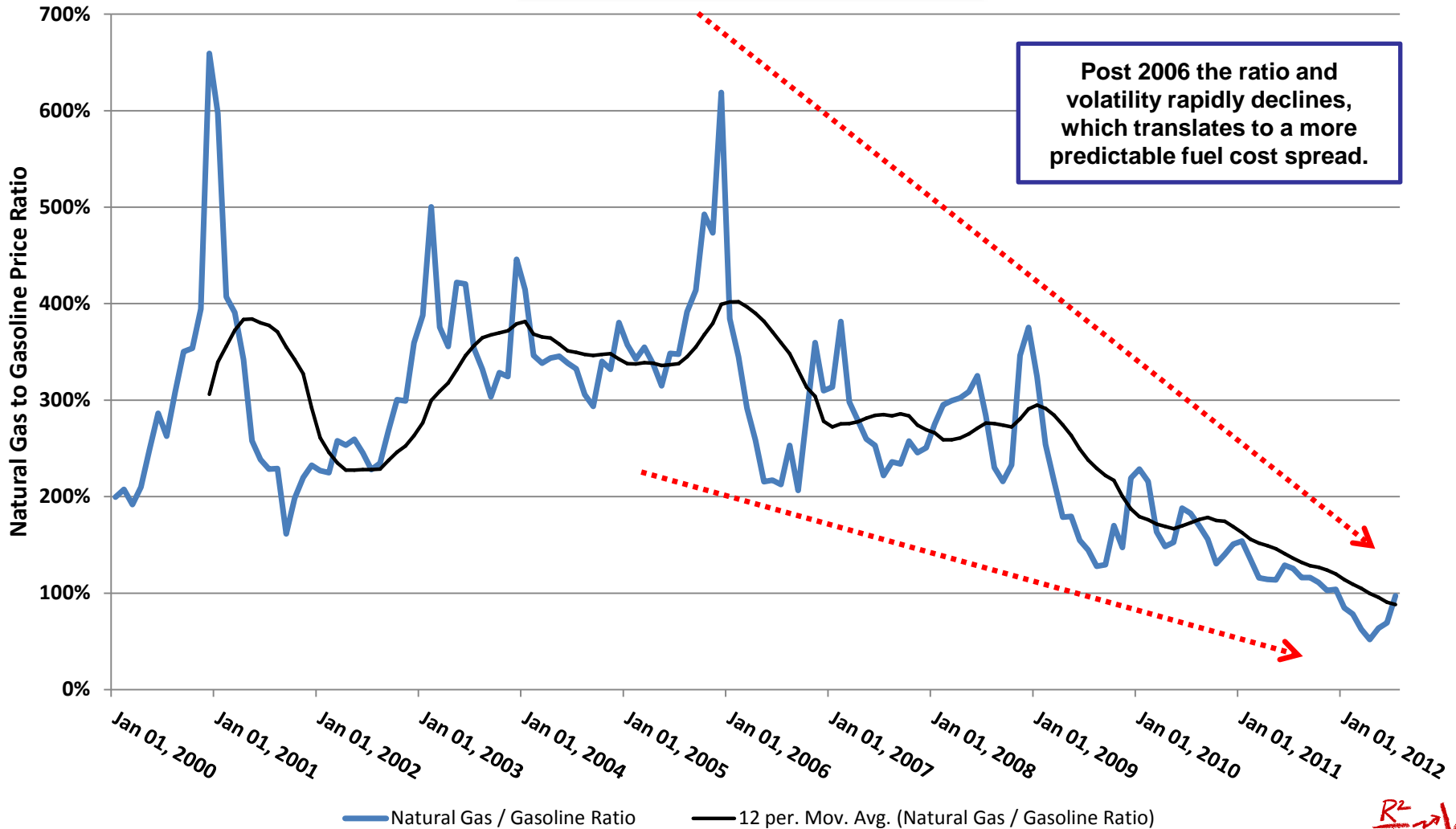
Due to U.S gas supply growth outpacing global oil supply growth, continued oil demand growth, and a lack of near-term growth impacts from US gas demand initiatives, the current wide oil to gas ratio is expected to continue.



CNG Market Overview

Shale Gas Impact

Natural Gas / Gasoline Ratio
(\$/MMBtu-to-\$/Gallon)

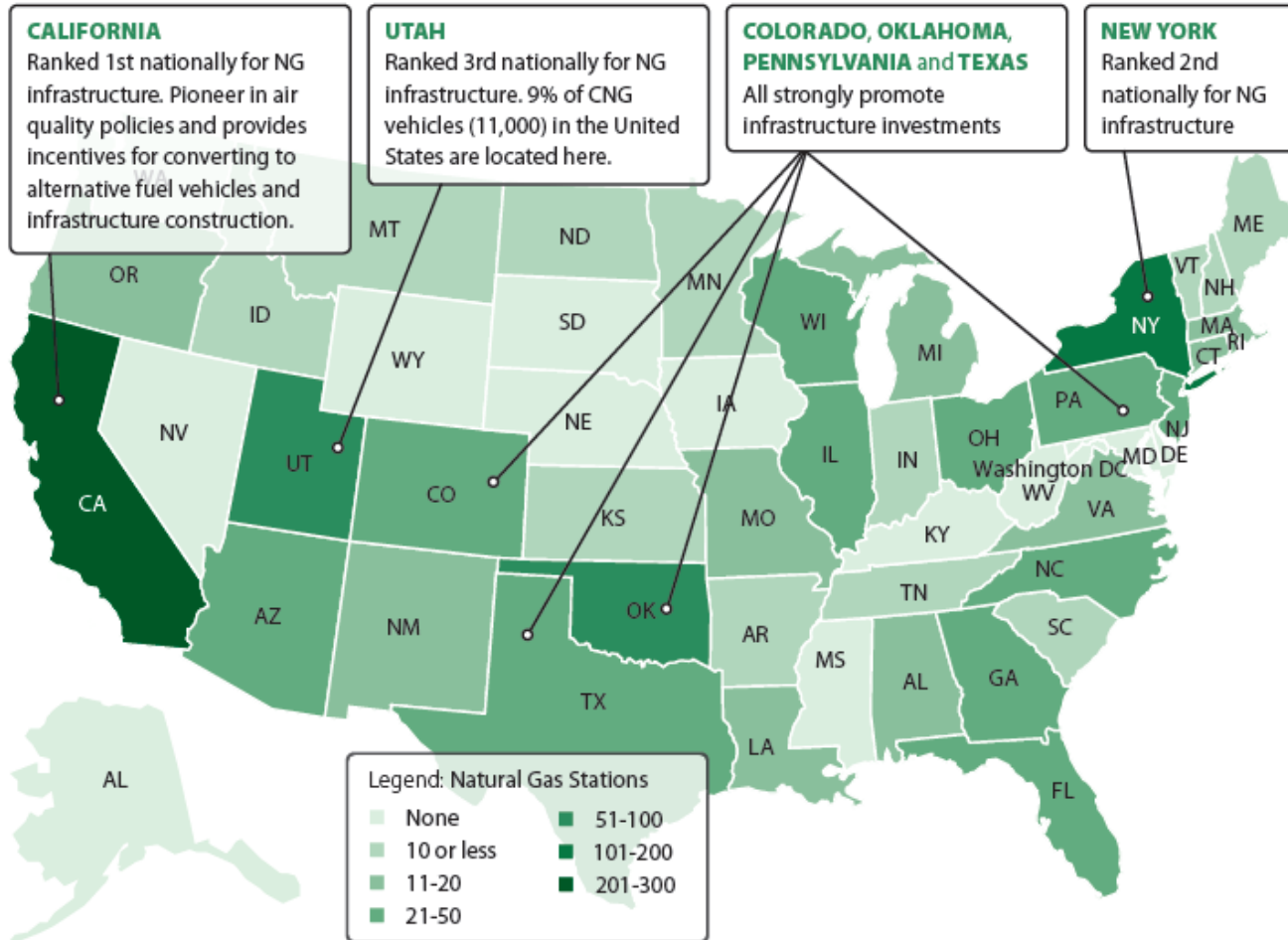


Post 2006 the ratio and volatility rapidly declines, which translates to a more predictable fuel cost spread.

R² → V⁺
A

CNG Market Overview

U.S. Fueling Infrastructure



Source: www.cleanenergyfuels.com/pdf/CE-OS.ANGH.012412.pdf

	Existing Public	Existing Private	Planned
CNG Stations	501	565	96
LNG Stations	23	31	98



CNG Market Overview

Arkansas Fueling Infrastructure



Light Duty Example

Incremental Equipment Cost	\$ 8,900
Average Miles / Year	30,000
MPG	14
Gallons / Year	2,143
Useful Life (Years)	5

Projected Savings per Gasoline Gallon Equivalent ("GGE")		
\$ 1.50	\$ 1.75	\$ 2.00

Payback Period (Months)	33	28	25
Total Fuel Savings Less Investment	\$ 7,171	\$ 9,850	\$ 12,529
Net Present Value of Investment	\$ 3,780	\$ 5,881	\$ 7,983

Current Arkansas State Average: \$3.76/Gallon

SWN CNG Price: \$1.46/GGE

Implied CNG Price Advantage: \$2.30/GGE

Light Duty Vehicles Options



Ford F250 – F450



Dodge Ram 2500 - 3500



Chevy / GMC 2500 HD

Heavy Duty Example (Dillon Trucking)

Incremental Equipment Cost	\$ 50,000
Average Miles / Year	200,000
MPG	5
Gallons / Year	40,000
Useful Life (Years)	5

Projected Savings per Diesel Gallon Equivalent ("DGE")					
\$	1.00	\$	1.25	\$	1.50

Payback Period (Months)		15		12		10
Total Fuel Savings Less Investment	\$	150,000	\$	200,000	\$	250,000
Net Present Value of Investment	\$	107,298	\$	146,519	\$	185,740

Heavy Duty Fleets

- Frito Lay
- UPS
- Waste Management

Heavy Duty Vehicles Options



Kenworth T800 (LNG)



Peterbilt 384, 365, 320
LNG or CNG



Volvo – 2014 LNG Option

- SWN supports CNG
- Shale gas opportunity
- Infrastructure development
- Vehicle economics
- Abundant, Clean, & Domestic



- FL NGV Coalition: released economic study which projected a shift to NGVs would generate 10,000 jobs, \$300 million in wages, and \$1 billion in economic output over 20 years.
- National Association of State Procurement Officials Natural Gas Vehicles RFP
 - 14 Governors signed MOU to support
 - 22 states have indicated interest in RFP
- Nat Gas Act: Representative John Sullivan (Bill Sponsor) defeated in primary.