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# Natural Gas: Opportunities of Abundance

Transportation Research Board  
January 2012

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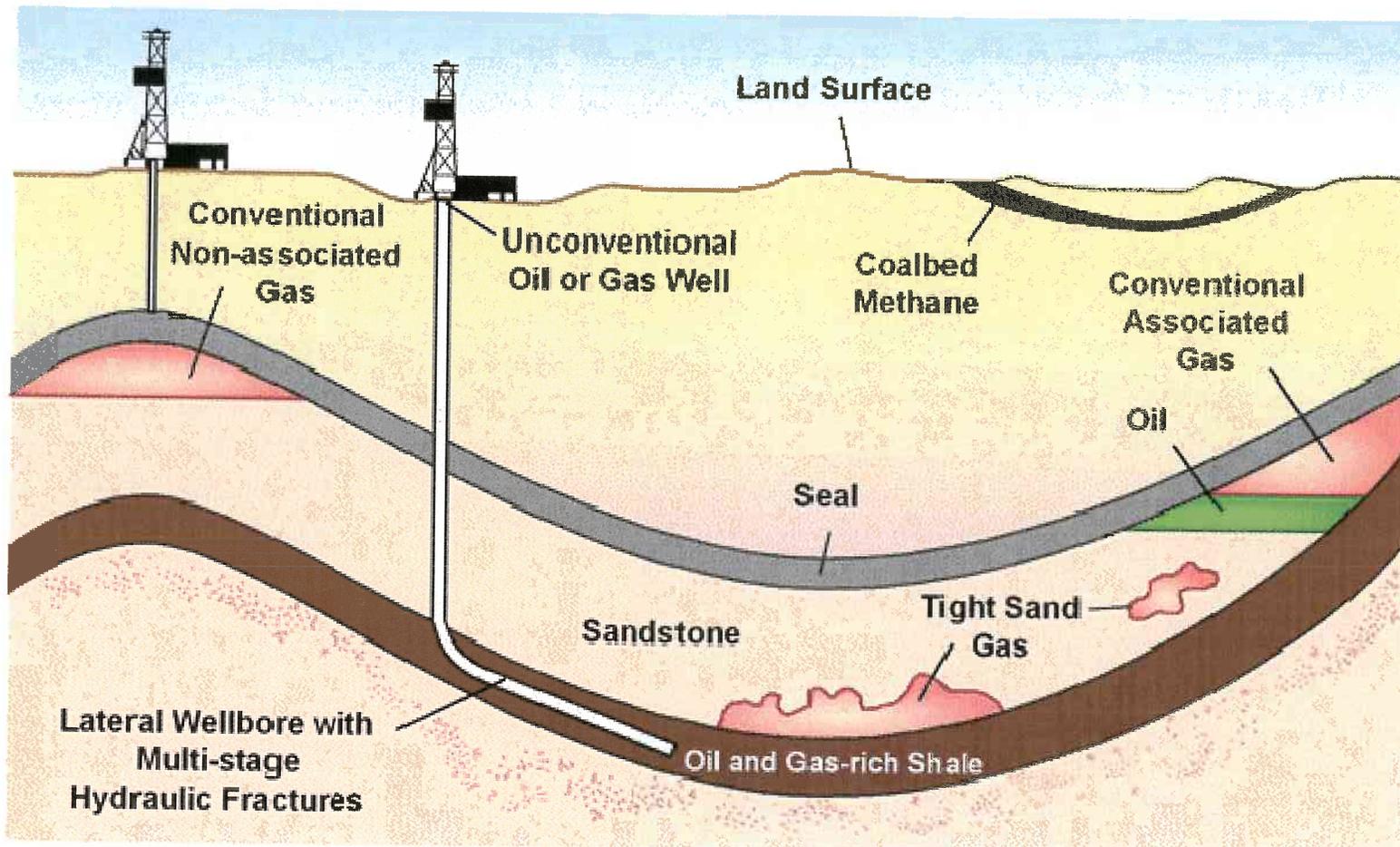
anga   
America's  
Natural Gas  
Alliance

# ANGA Members

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# Conventional/Unconventional Geology



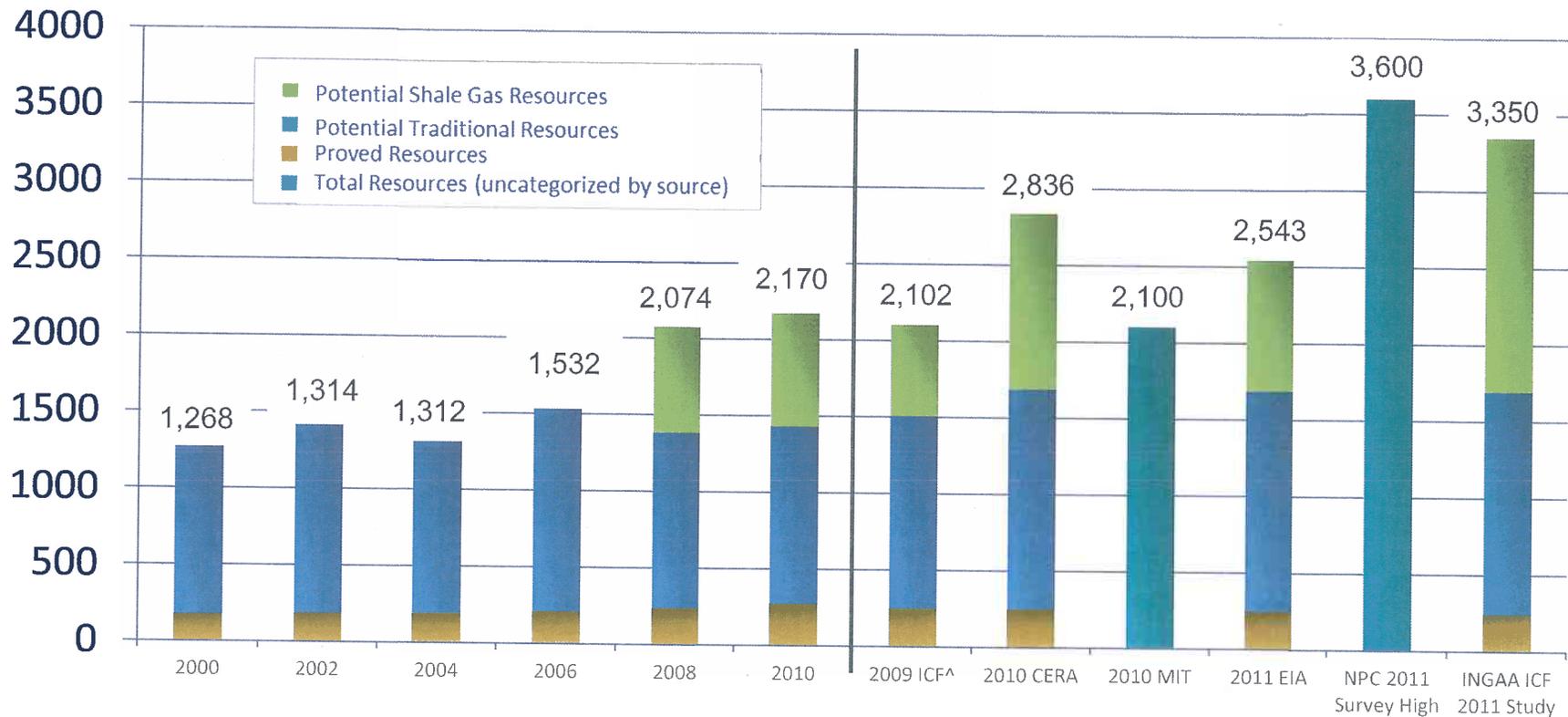
Source: EIA.  
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[http://www.eia.gov/energy\\_in\\_brief/about\\_shale\\_gas.cfm](http://www.eia.gov/energy_in_brief/about_shale_gas.cfm)



# Abundant by Any Estimate

Estimates of U.S. Recoverable Natural Gas  
(TCF – trillion cubic feet)



• Potential Gas Committee

Other Estimates

Sources:

ICF: As reported in MIT Energy Initiative, 2010, *The Future of Natural Gas*, interim report ; Table 2.1

EIA: See <http://www.eia.gov/analysis/studies/worldshalegas/>

PGC: Potential Gas Committee's *Advance Summary* and press release of its biennial assessment; see [www.potentialgas.org](http://www.potentialgas.org)

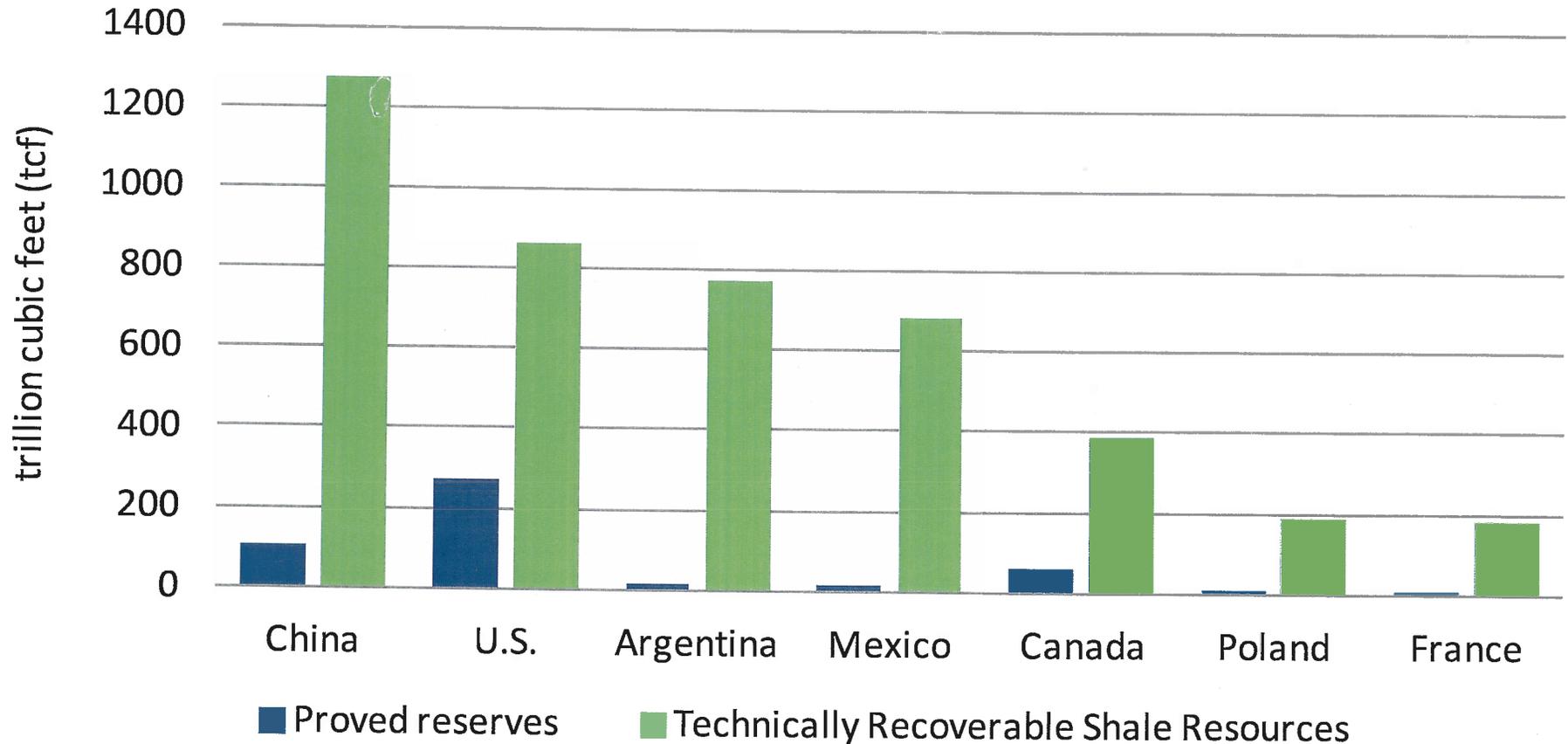
CERA: IHS CERA, 2010, *Fueling North America's Energy Future: The Unconventional Natural Gas Revolution and the Carbon Agenda*

MIT: MIT Energy Initiative, 2010, *The Future of Natural Gas*, interim report

NPC: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources Johns Hopkins University ; *Prudent Development Study 2011*



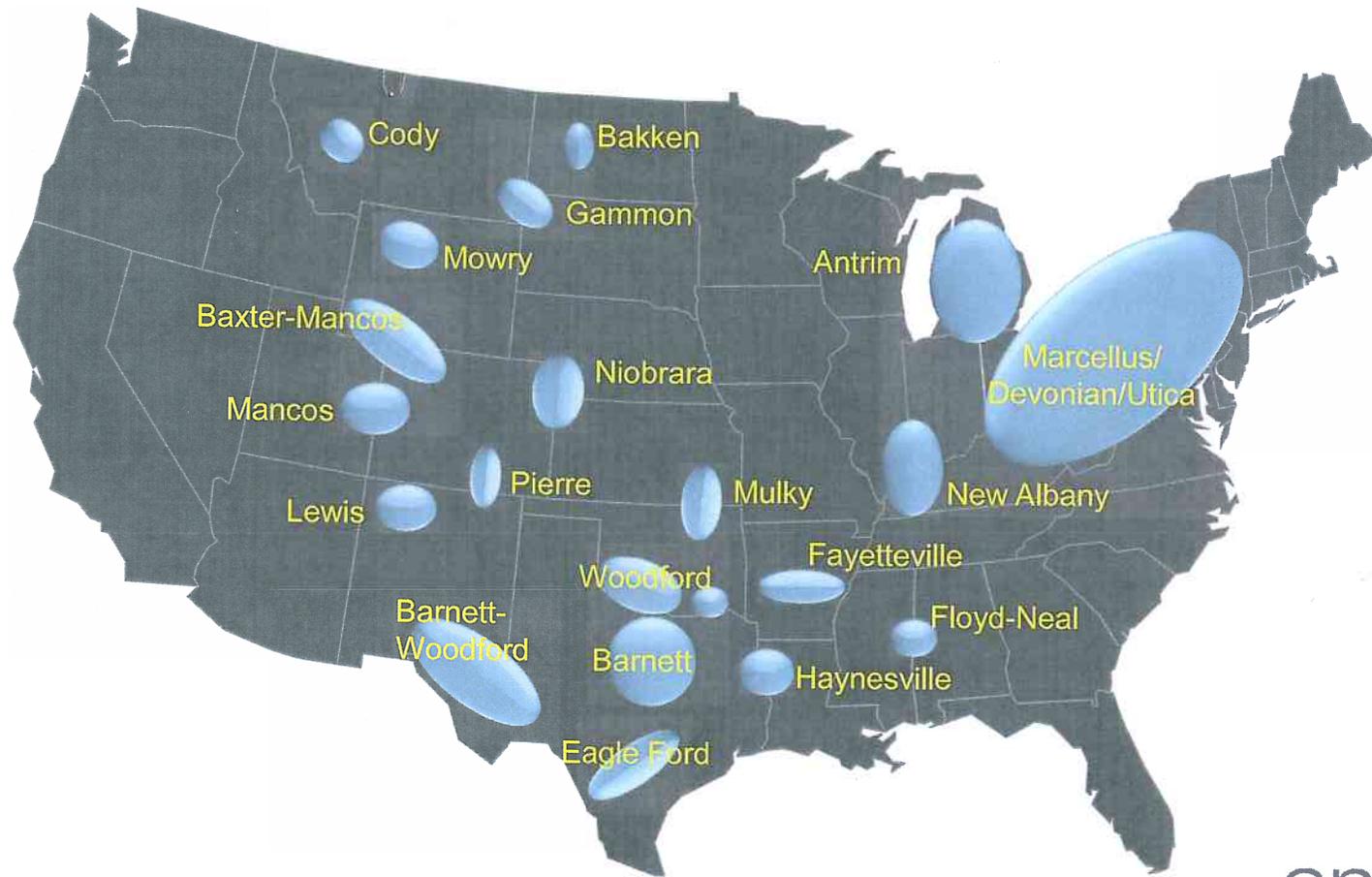
## 2009 Proved natural gas reserves and shale resource estimates, selected countries



Source:  
EIA: See <http://www.eia.gov/analysis/studies/worldshalegas/>

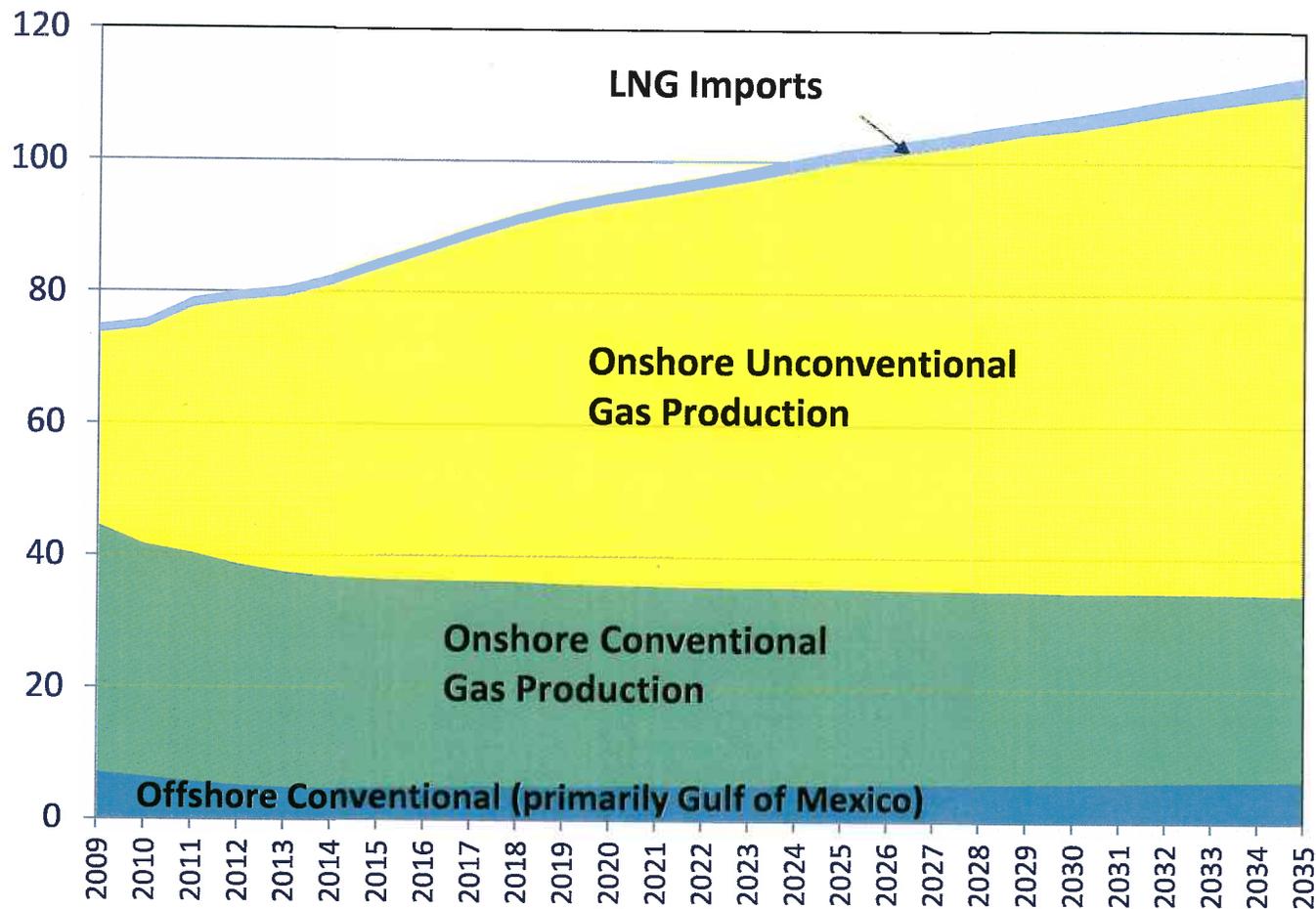
# Location, Location

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# Growing Role for Unconventional

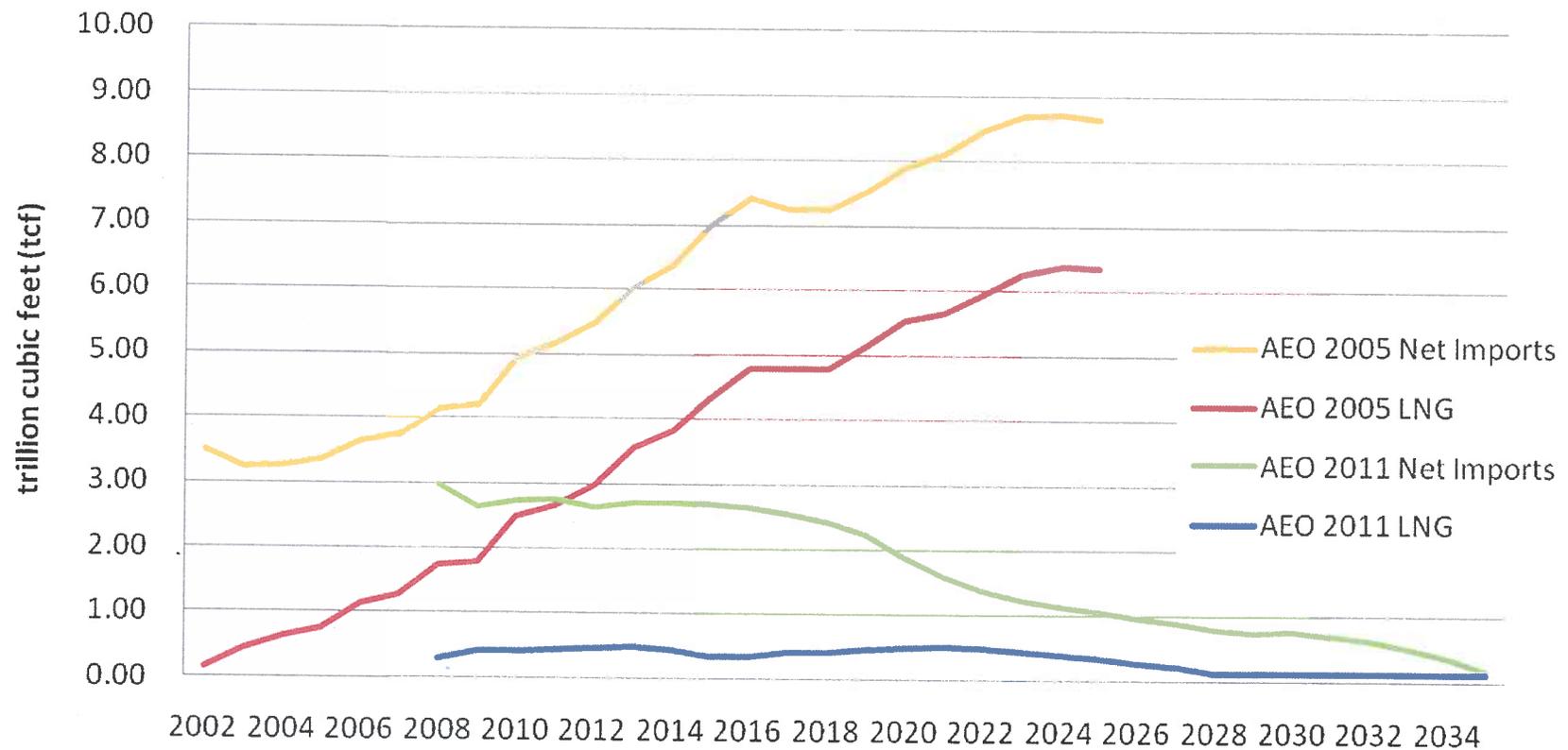
U.S. and Canadian Natural Gas Supplies (Average Annual Bcfd)



Source: INGAA ICF Study, June 2011

# Changing Supply Impacts Trade

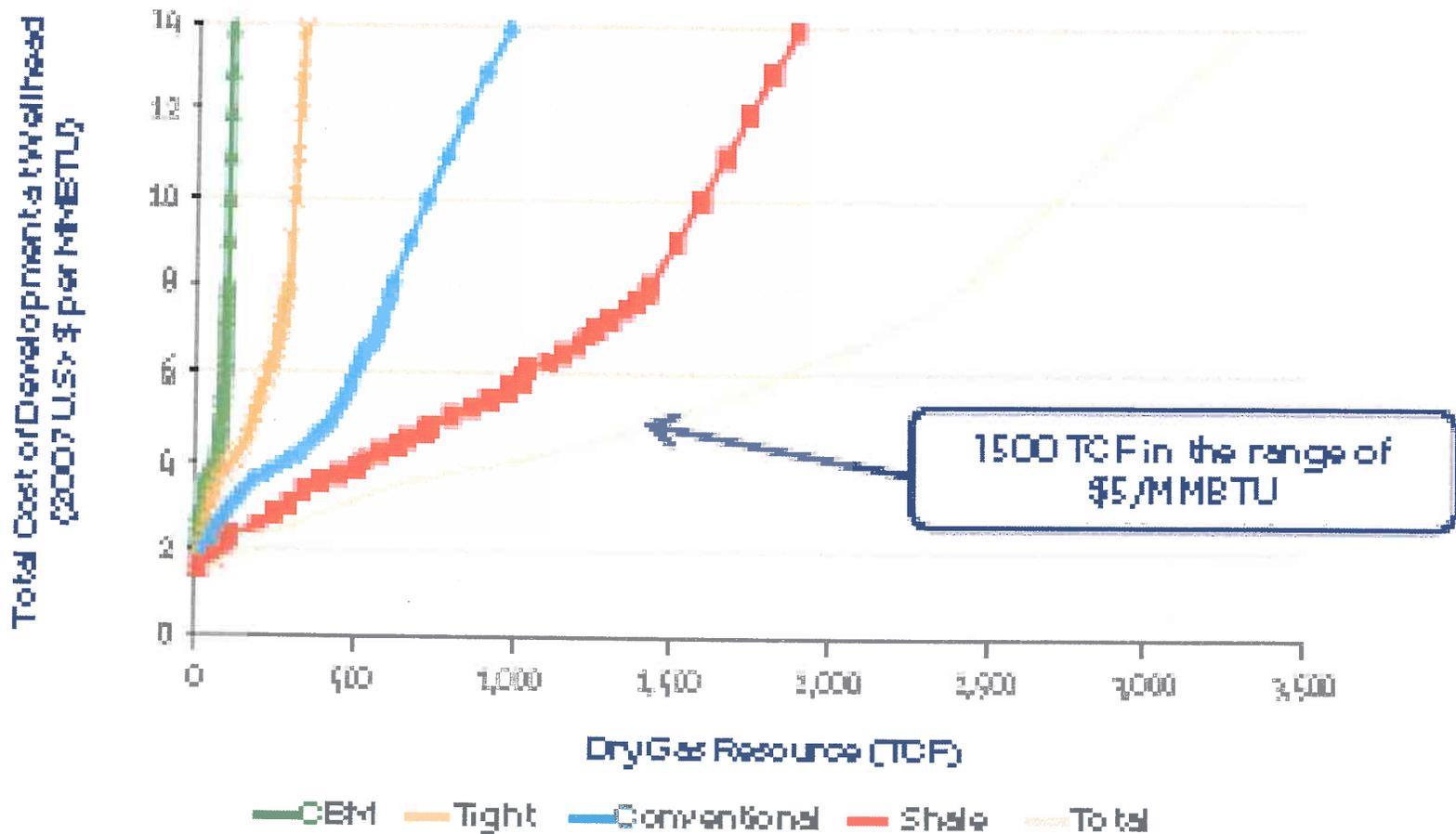
## Forecasts for Net Natural Gas and LNG Imports, EIA



Source: EIA Annual Energy Outlook 2005 & 2011

# Abundance At Low Cost Is Key

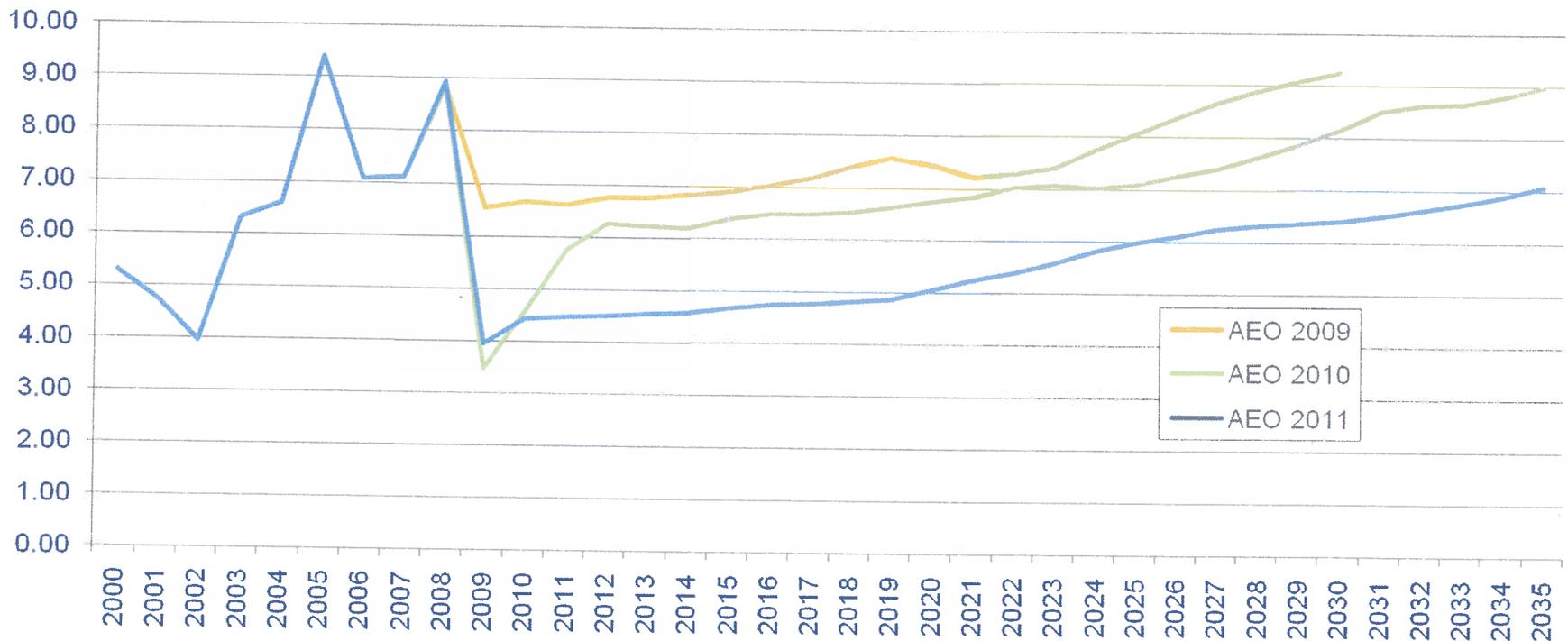
U.S. Natural Gas Resource Cost Curves By Type



Source: ICF as reported by BPC

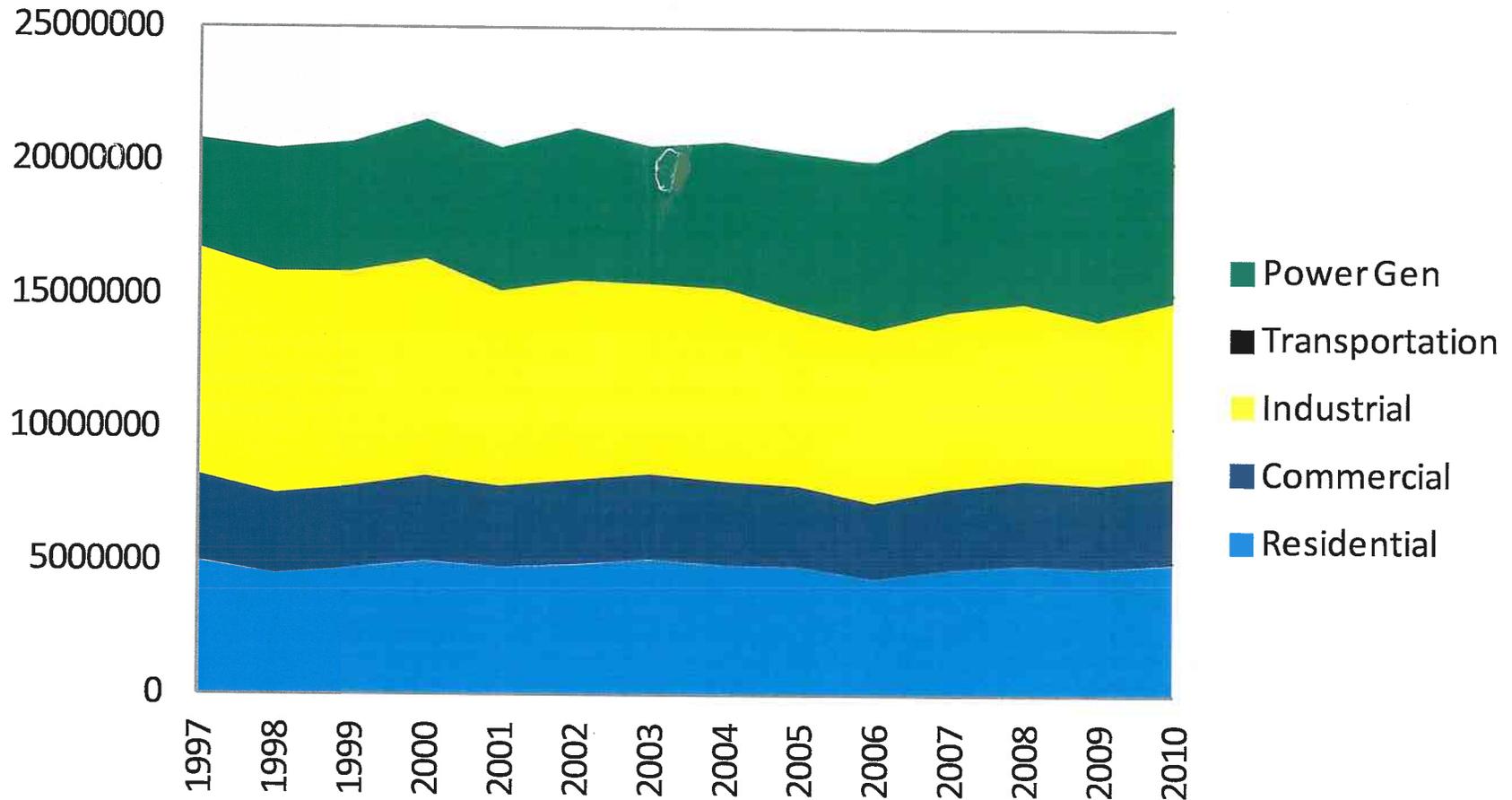
# Falling Outlook for Prices

New Projections for Natural Gas Price Stability  
(2009 dollars, \$ per million BTU)



Source: EIA Annual Energy Outlook 2011; Henry Hub spot prices

## U.S. Natural Gas Consumption by Sector (MMcf)

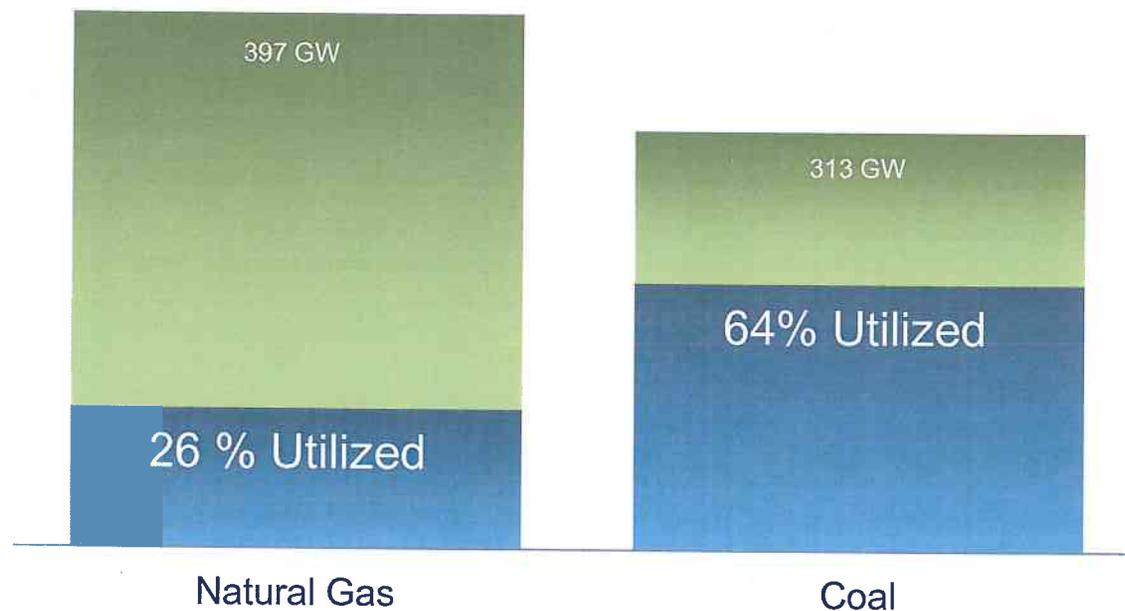


- Roughly 1/3 shares for power gen, industrial, & resid'l/comm'l
- Growing power gen use
- Uptick in industrial use
- Transport: growth from a small base

# Power Sector: Ready Now

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**Utilization of Electric Generation Capability**  
(net generation as a percentage of net summer capacity)



Source: EIA, 2009 Electric Power Annual

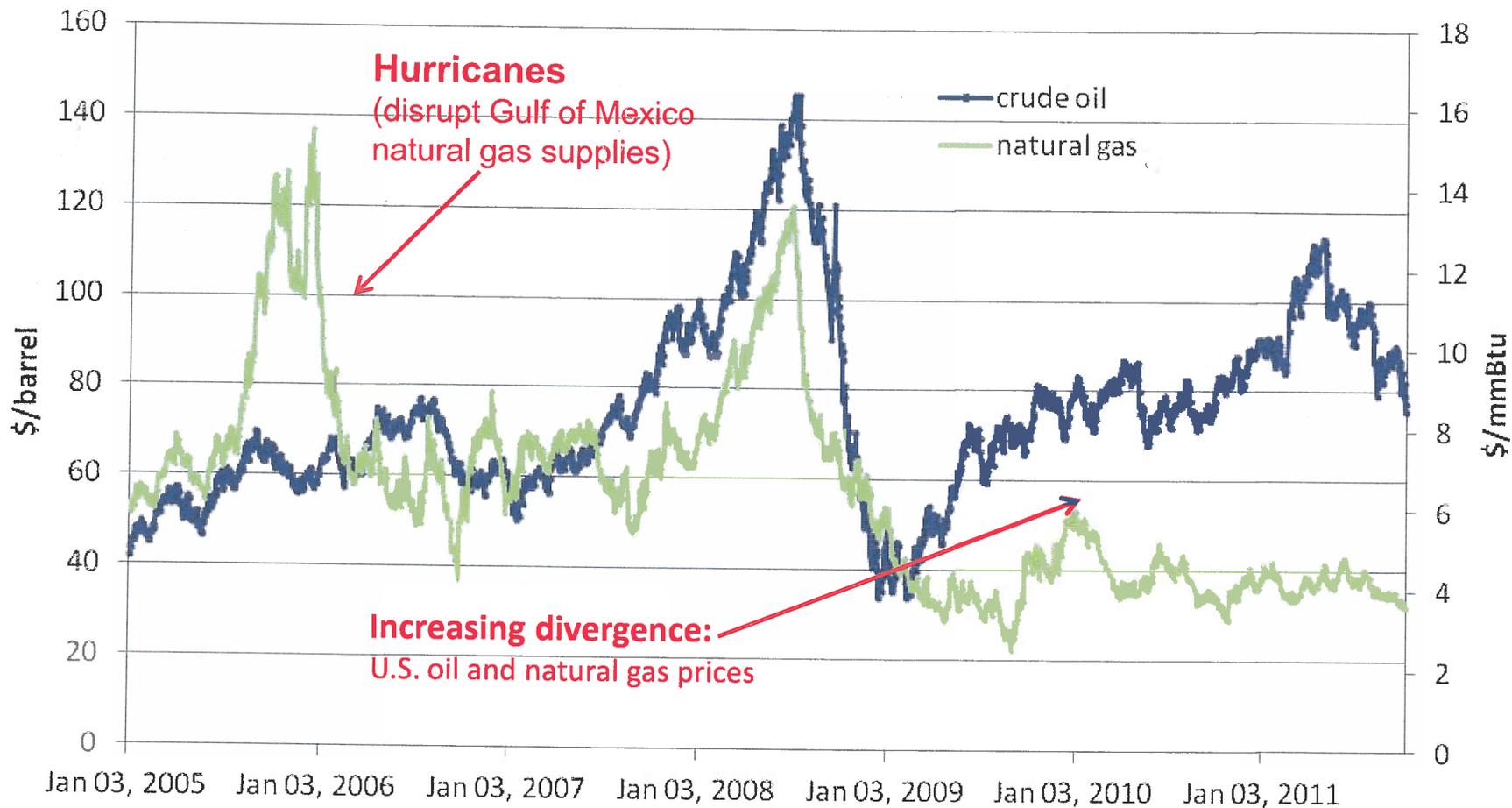
# Economic Impacts

- Natural gas companies contributed over \$3.5 billion per year on average in gas royalty payments alone to the federal government between 2005 and 2010
- Overall contribution to the economy even greater:
  - \$385 billion to the domestic economy in 2008
  - \$180 billion in labor income alone
- Nearly 3 million American jobs
- Over 600,000 Americans are directly employed by natural gas development



Source: IHS Global Insight, 2010

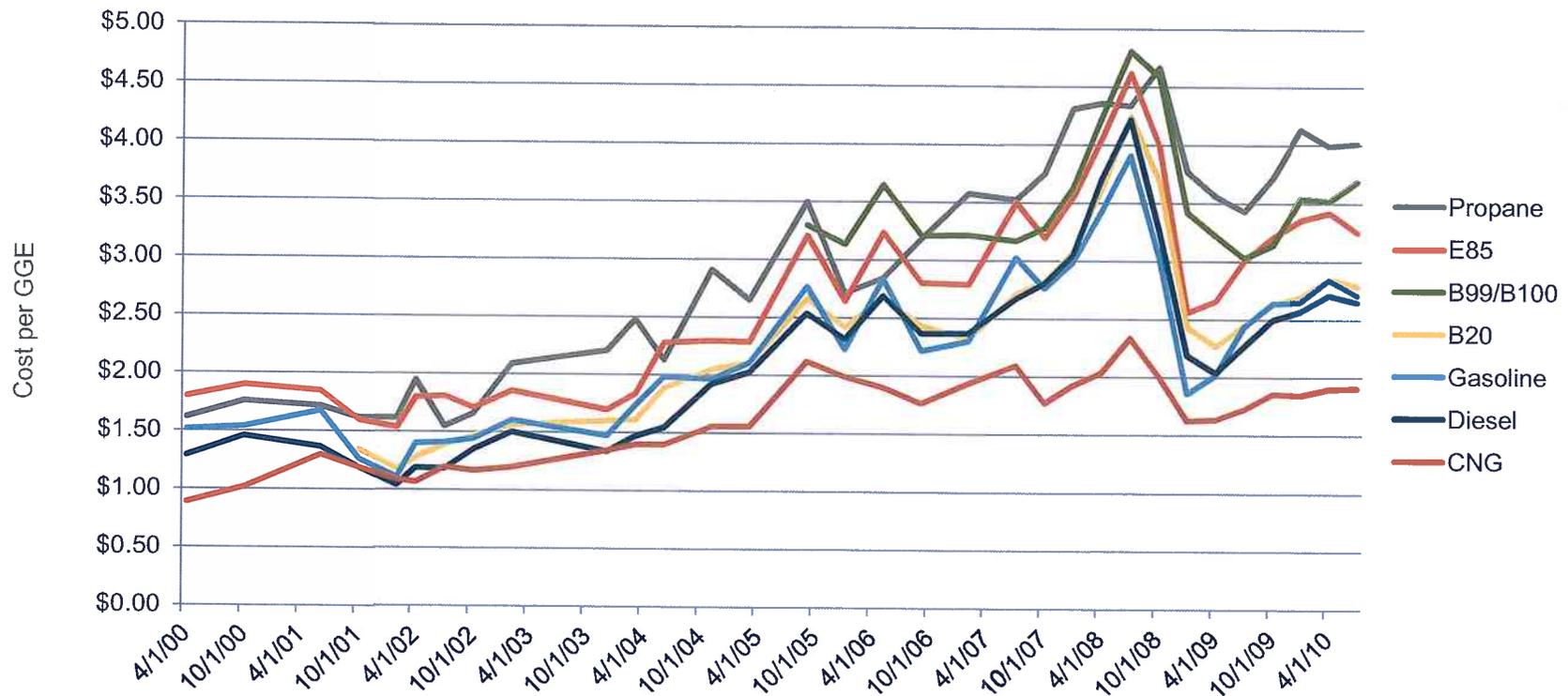
### NYMEX daily closing prices for nearest period contract



Data available from EIA.

# Savings On the Road and at the Pump

Average U.S. Retail Fuel Prices  
Per Gasoline Gallon Equivalent (GGE)

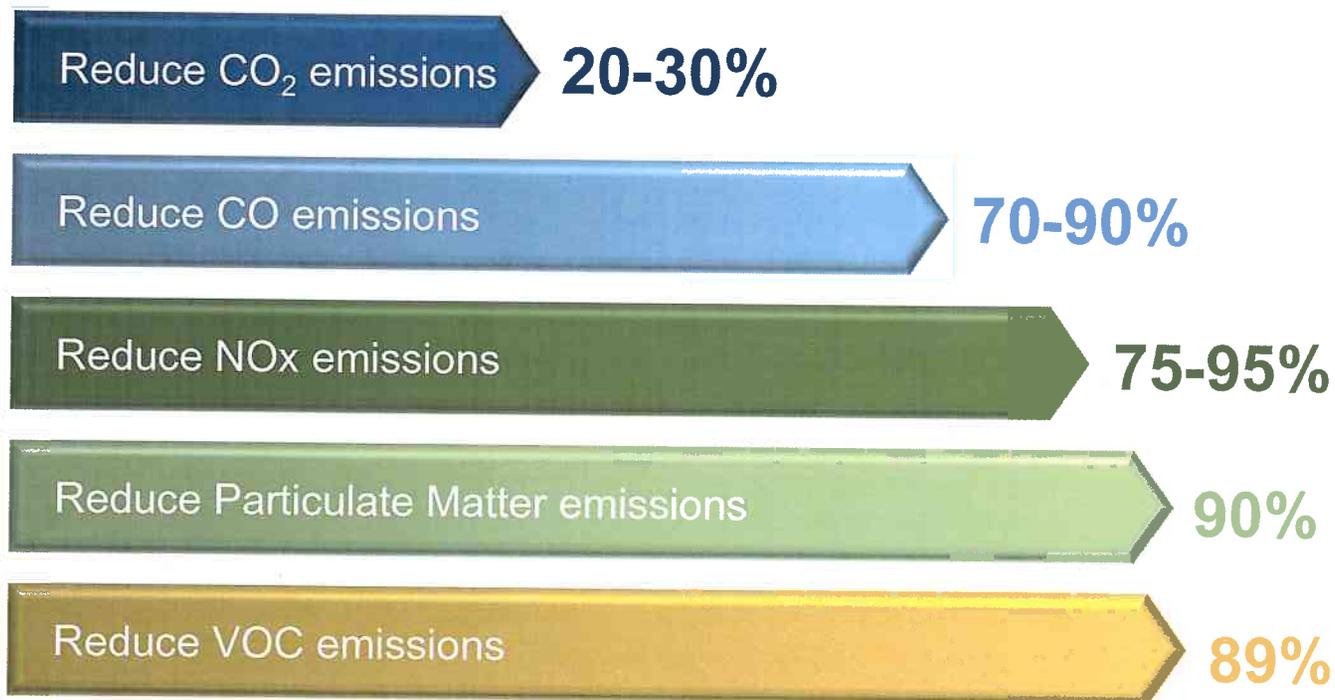


Source: DOE, Alternative Fuels and Advanced Vehicles Data Center

# Cleaner for Vehicles

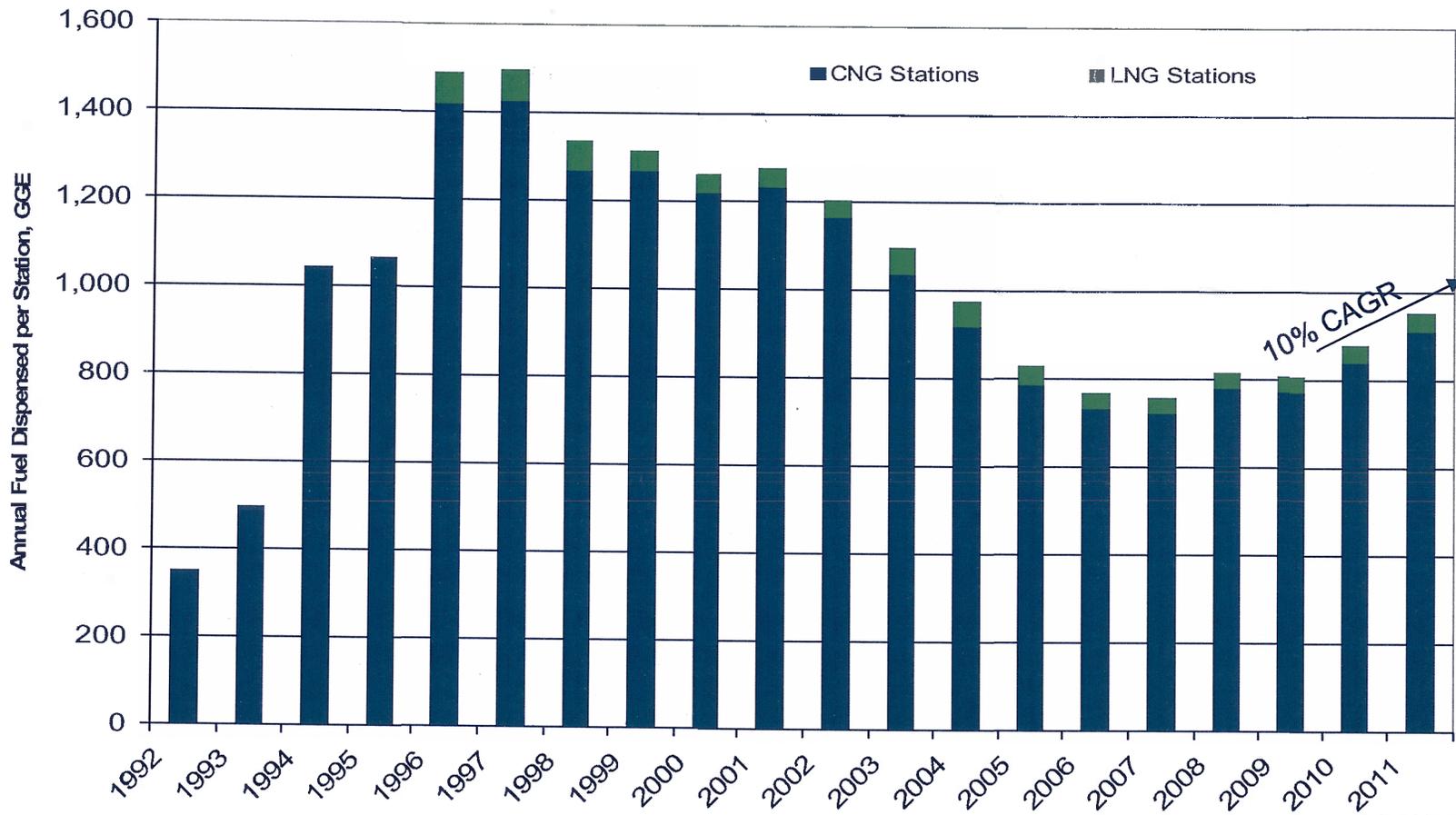
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- Compared to gasoline or diesel, NGVs:



# USA CNG and LNG Stations

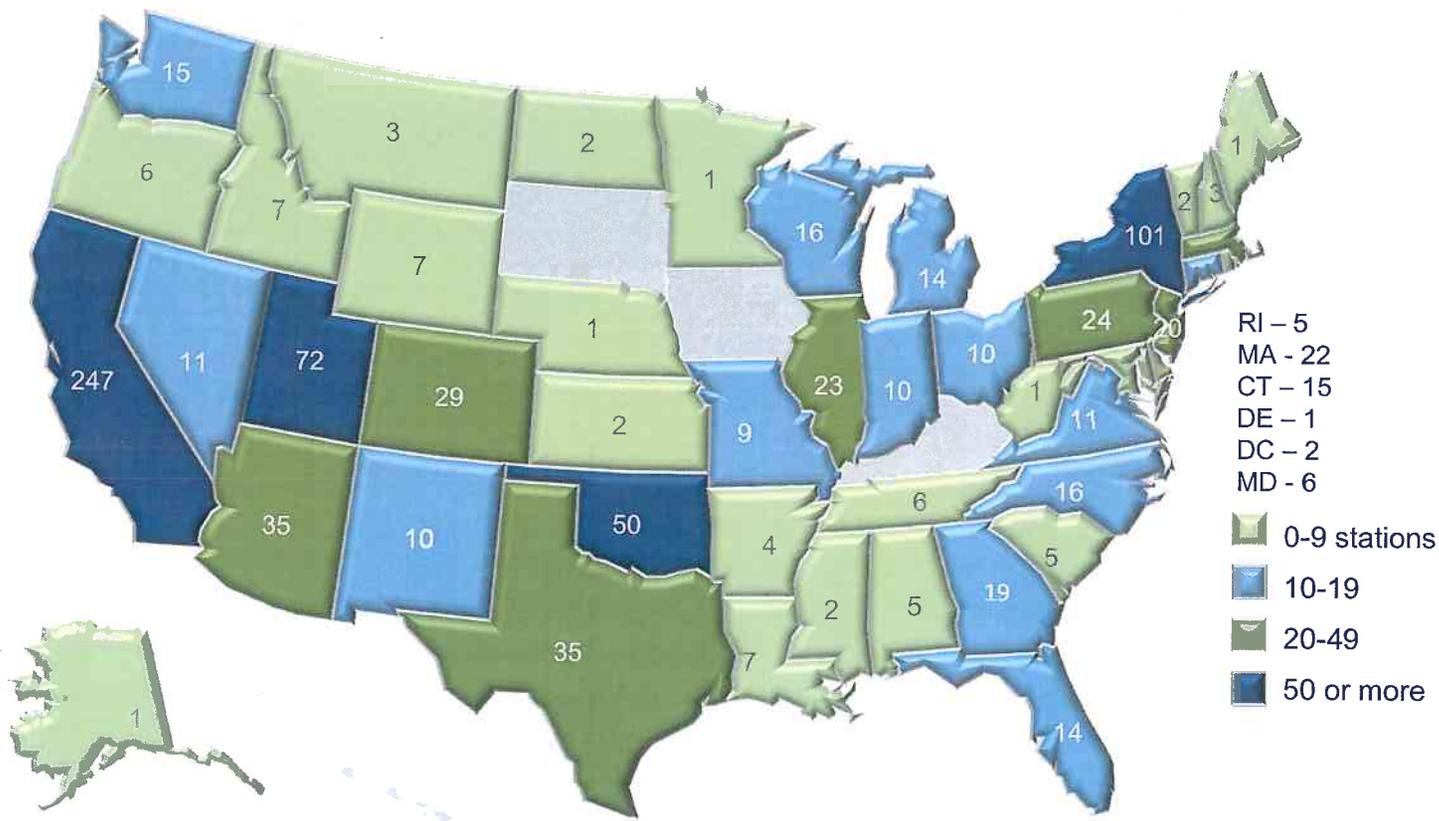
As of September 2011 – 930 CNG stations and 45 LNG stations



Data Source: US DOE Alternative Fuels & Advanced Vehicles Data Center

# Infrastructure: Refueling Stations

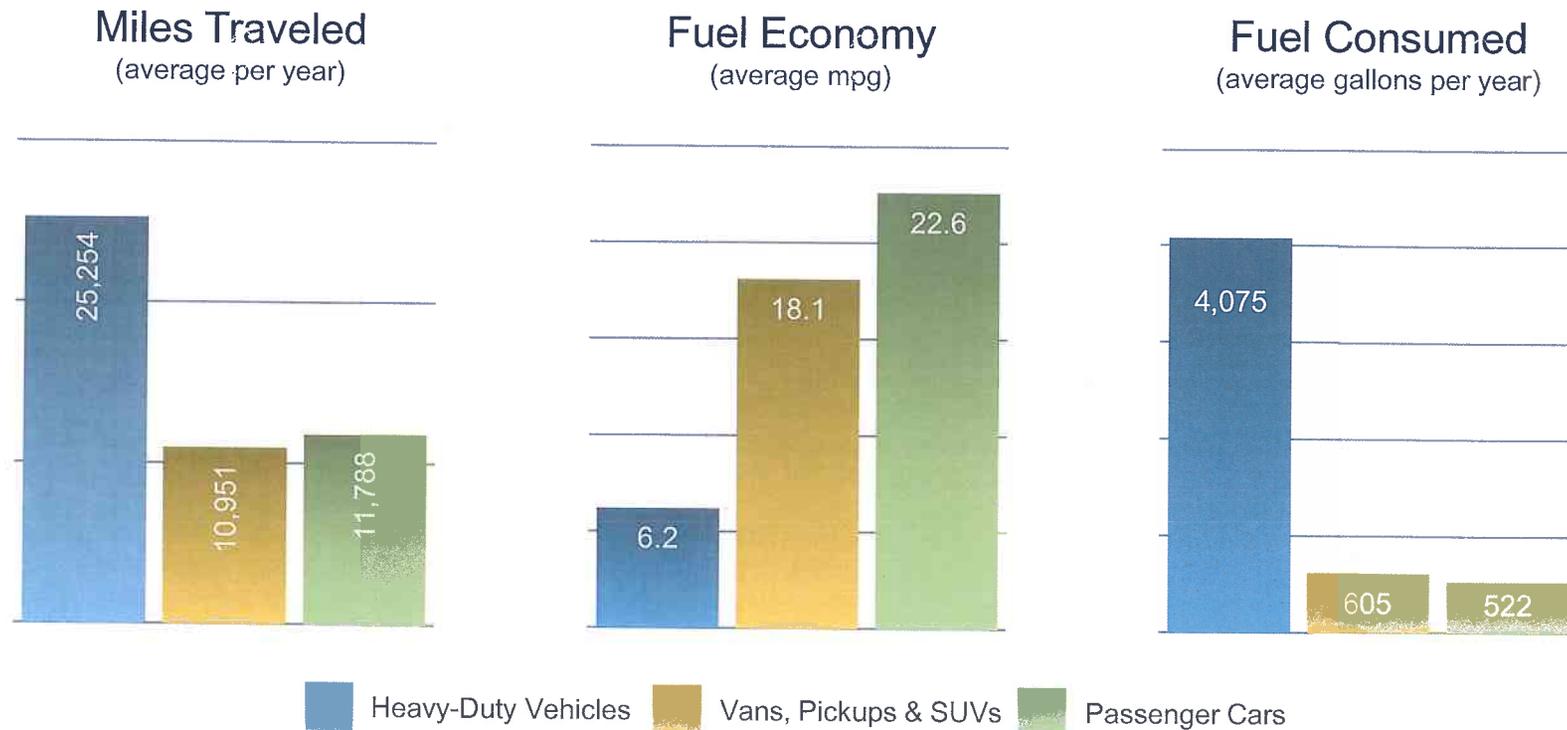
Natural Gas Refueling Stations  
(in operation as of 12/31/2010)



Source: <http://www.afdc.energy.gov/afdc/fuels/stations.html>



# Opportunity: Heavy-Duty Vehicles



Source: EIA Annual Energy Review 2009

# Leading the Way

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- NGVs in fleets across America.
  - About 16 % of all transit buses in US
  - Waste trucks are fastest-growing segment
  - First CNG-powered fire trucks and ambulances are coming into the market
  - Medium trucks used by large fleets like USPS, UPS, AT&T, Comcast





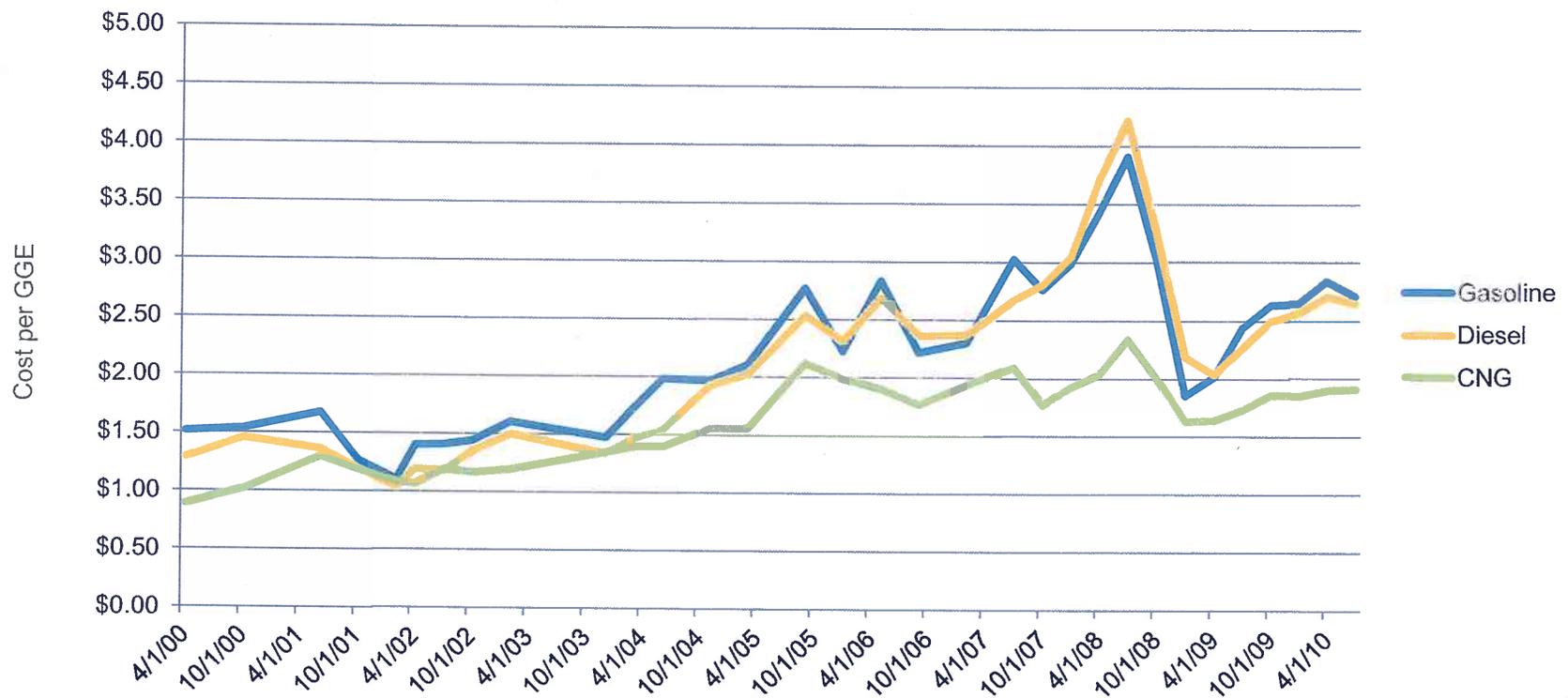
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# Savings On the Road and at the Pump

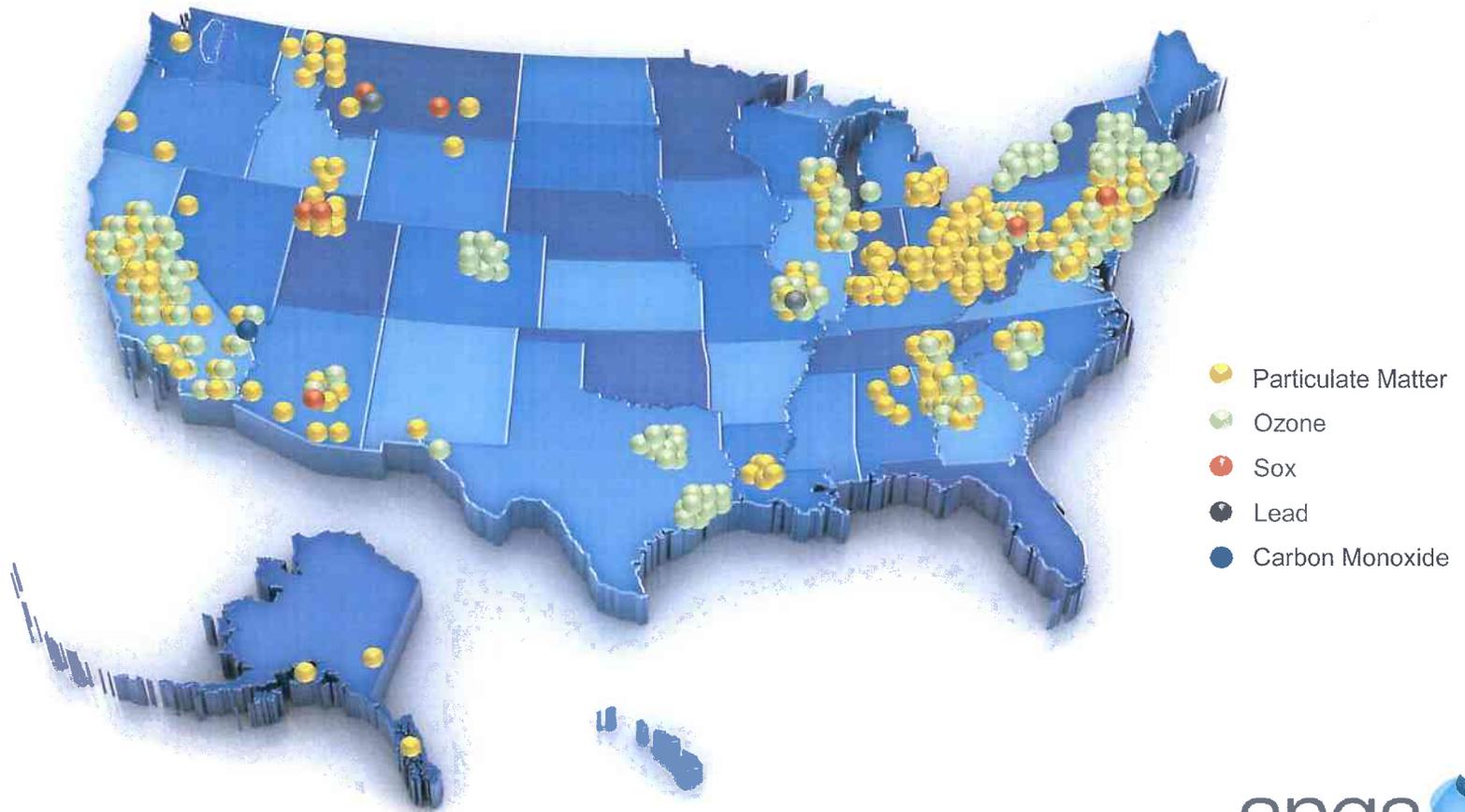
Average U.S. Retail Fuel Prices  
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Source: DOE, Alternative Fuels and Advanced Vehicles Data Center

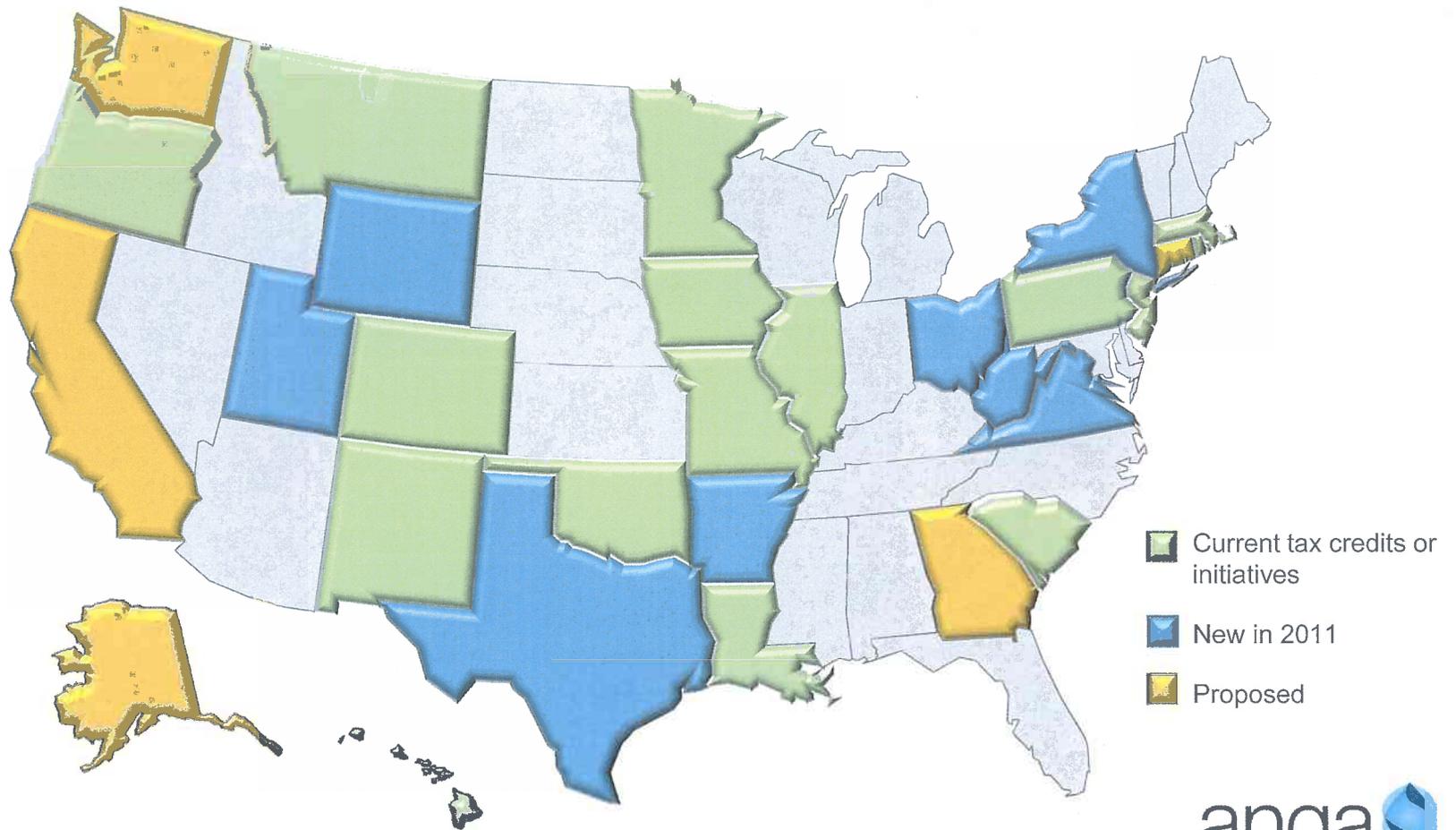
# Meeting Clean Air Goals

Non-Attainment Counties – September 2010



Source: EPA, Green Book, September 16, 2010

# States With NGV Incentives



Source: NGV America and the DOE Alt Fuels Data Center  
<http://www.afdc.energy.gov/afdc/laws/matrix/tech>

# Enough for Generations

	2010	ICF Model Reference Case		AEO 2011 Reference Case	
		2020	2035	2020	2035
US Natural Gas Production (Tcf)	21.3	27.5	33.1	23.4	26.3
Net Imports (Canada+ Mexico +LNG)	2.7	1.9	0.9	1.9	0.2
US Natural Gas Supply (Tcf)	24.0	29.4	34.0	25.4	26.6
Natural Gas Consumption (Tcf)	23.8	28.9	33.8	25.3	26.6
Natural Gas Power Sector (Tcf)	7.4	10.8	14.8	6.8	7.9
Henry Hub Price (2010\$/MMbtu)	\$4.38	\$5.59	\$7.15	\$5.15	\$7.21

Source: INGAA ICF Study, June 2011

# Leading States With NGV Incentives

	Federal	California	Texas	Oklahoma	Oregon	Colorado	Louisiana
Natural Gas Vehicle Count	117,074	37,745	11,454	2,719	1,645	972	378
Natural Gas Station Count (Existing / Planned)	930 / 75	246 / 12	37 / 3	59 / 5	5 / 0	25 / 5	7 / 3
Infrastructure/ Home Refuel	30% up to \$30,000 cap/ \$1,000 Expires: 12/31/11	\$1,000 Home Incentive		75% of infrastructure Expires: 01/01/14	35% of eligible costs for businesses		50% of the cost of constructing an alternative fueling station No current expiry
Vehicle Incentives			\$2,000 rebate for the purchase of a NGV / \$3,000 for the conversion	50% of the incremental cost Expires: 01/01/14	25% of the incremental cost or \$750 for residents / 35% for businesses	75% of incremental cost Expires: 12/31/15	50% of the incremental cost, or 10% of the cost of the motor vehicle or up to \$3,000 No current expiry
Fuel Credits	\$0.50 GGE Excise tax Credit	Paid through an annual flat-fee rate	Preferential NG Fuel rates				Deregulation of CNG as a Motor Fuel
Mandates	Acquisition Requirements	Acquisition Requirements	Acquisition Requirements	Acquisition Requirements	Acquisition Requirements		Acquisition Requirements CNG highway with stations every 100 miles
Funding	Grants / Loans	Grants / Loans	Grants / Loans	Infrastructure Loans	Loans		Loans

Source: DOE AFDC

# Cleaner Air for Texas Cities

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- The TCTT is expected to displace 2.1 million to 4.1 million gallons of diesel per year.
  - Over the expected 10-year vehicle life, this will translate into petroleum displacement of between 20.6 and 41.3 million gallons of diesel fuel per truck.
- Natural gas trucks deployed throughout the TCTT project will have an estimated
  - 90 percent fewer NOx and PM emissions than the estimated 5- to 7-year old diesel trucks they are replacing
  - 100 percent fewer SOx emissions
  - Up to 30 percent fewer GHG emissions

# OEM News

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**Feb. 12:** Dodge considering CNG-Powered Bi-Fuel Pickup Trucks in March 2012

**Mar 8:** EPA certification rec'd on RAM 1500



**Sept 28:** Ford and Westport LD Announce New NatGas System for Super Duty Pickups Spring 2012



**Oct 11:** GM to Introduce CNG-Powered Pickup Trucks in 2012



**HONDA**

**Sept 30:** Honda Unveils New Name, New Features for 2012 Natural Gas Civic

