

America's Oil and Natural Gas Industry



Energizing America: Facts for Addressing Energy Policy



THE FIRST OIL WELL.



Photo of first Hart well. McLaren photo from 1850 showing a cistern-like hole. *Photo Courtesy of the Barker-Darwin Historical Museum*



Tidewater Oil Pipeline

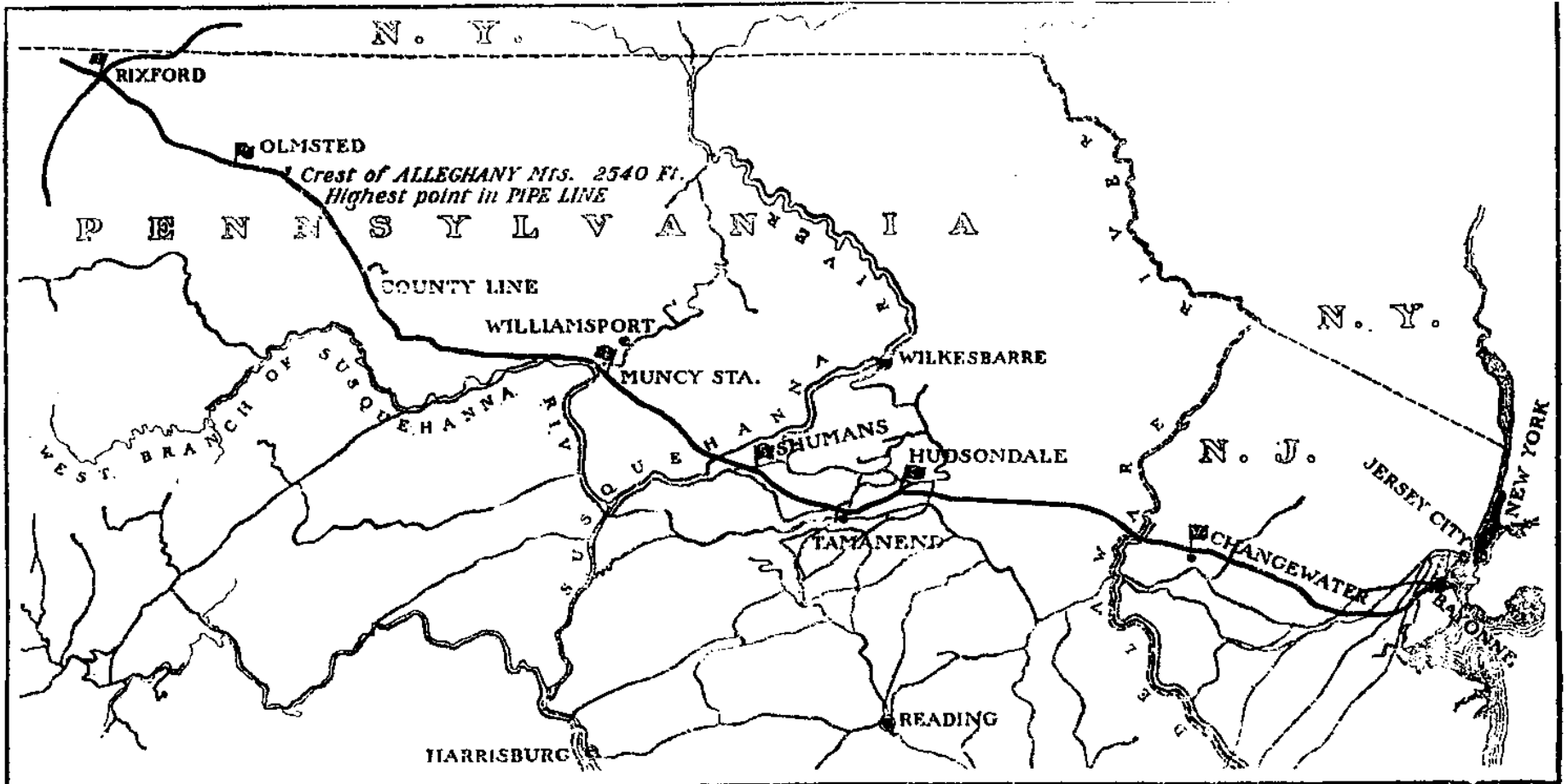


Table 2. – Total Operational and Capital Investment Impact of the Oil and Natural Gas Industry to the US Economy, 2011

Item	Amount	Percent of US Total
<i>Operational Impact</i>		
Employment*	8,445,200	4.9%
Labor Income (\$ millions)**	\$515,368	5.4%
Value Added (\$ millions)	\$1,073,552	7.1%
<i>Capital Investment Impact</i>		
Employment*	1,388,100	0.7%
Labor Income (\$ millions)**	\$82,247	0.9%
Value Added (\$ millions)	\$135,837	0.9%
<i>Total Impacts</i>		
Employment*	9,833,200	5.6%
Labor Income (\$ millions)**	\$597,615	6.3%
Value Added (\$ millions)	\$1,209,389	8.0%

Source: PwC calculations using the IMPLAN modeling system (2011 database).

Details may not add to totals due to rounding.

* Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.

** Labor income is defined as wages and salaries and benefits as well as proprietors' income.

Table 4.– Direct Impact of the Oil and Natural Gas Industry in the US Economy by Subsector, 2011

NAICS	Sub-sector Description	Employment*	Labor Income**	Value Added
		Amount	(\$ Millions)	(\$ Millions)
211	Oil and gas extraction (including NGL extraction)	783,800	61,454	174,178
213111	Drilling oil and gas wells	97,400	9,040	15,883
213112	Support activities for oil and gas operations	269,300	22,271	39,130
2212	Natural gas distribution (private)	112,300	15,599	59,021
2212	Natural gas distribution (public)	6,500	356	557
23712	Oil and gas pipeline and related structures construction	112,500	9,443	10,036
32411	Petroleum refineries	72,500	20,596	125,332
32412	Asphalt paving, roofing, and saturated materials manufacturing	24,200	4,225	25,712
324191	Petroleum lubricating oil and grease manufacturing	10,200	1,899	11,554
4247	Petroleum and petroleum products merchant wholesalers	95,900	7,558	13,297
44711, 44719	Gasoline stations	879,400	30,650	48,522
45431	Fuel dealers	83,200	1,840	6,655
486	Pipeline transportation	<u>43,500</u>	<u>18,660</u>	<u>21,140</u>
	Total Oil and Natural Gas Industry	2,590,700	\$203,591	\$551,018

Source: Estimates based on 2011 employment data from the U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, and U.S. Census Bureau and 2011 input-output relationships from the IMPLAN modeling system.

Details may not add to totals due to rounding.

* Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.

** Labor income is defined as wages and salaries and benefits as well as proprietors' income.

Table 6.– The Direct, Indirect, and Induced Impact of the Oil and Natural Gas Industry to the US Economy, 2011

Sector Description	Employment*	Labor Income (\$ million)**	Value Added (\$ million)
Direct Impact of the Oil and Natural Gas Industry	2,590,700	\$203,591	\$551,018
Indirect and Induced Impact on Other Industries	7,242,600	\$394,024	\$658,372
<i>Operational Impact</i>	<i>5,854,500</i>	<i>\$311,777</i>	<i>\$522,535</i>
Agriculture	84,700	\$2,591	\$3,978
Mining	13,700	\$1,064	\$2,749
Utilities	24,600	\$3,256	\$12,950
Construction	430,000	\$23,762	\$25,822
Manufacturing	380,200	\$26,826	\$46,883
Wholesale and retail trade	777,600	\$33,179	\$54,430
Transportation and warehousing	228,900	\$11,869	\$16,159
Information	101,700	\$10,432	\$20,710
Finance, insurance, real estate, rental and leasing	721,200	\$37,435	\$144,867
Services	2,829,100	\$142,602	\$173,764
Other	262,700	\$18,761	\$21,221
<i>Capital Investment Impact</i>	<i>1,388,100</i>	<i>\$82,247</i>	<i>\$135,837</i>
Agriculture	17,400	\$592	\$876
Mining	3,700	\$282	\$699
Utilities	4,000	\$525	\$2,165
Construction	20,900	\$1,170	\$1,390
Manufacturing	221,800	\$17,941	\$28,886
Wholesale and retail trade	218,000	\$11,497	\$19,450
Transportation and warehousing	57,600	\$3,073	\$4,342
Information	35,200	\$3,810	\$7,950
Finance, insurance, real estate, rental and leasing	155,000	\$8,091	\$26,553
Services	640,500	\$34,270	\$42,575
Other	<u>13,000</u>	<u>\$907</u>	<u>\$983</u>
Total Economic Impact	9,833,200	\$597,615	\$1,209,389

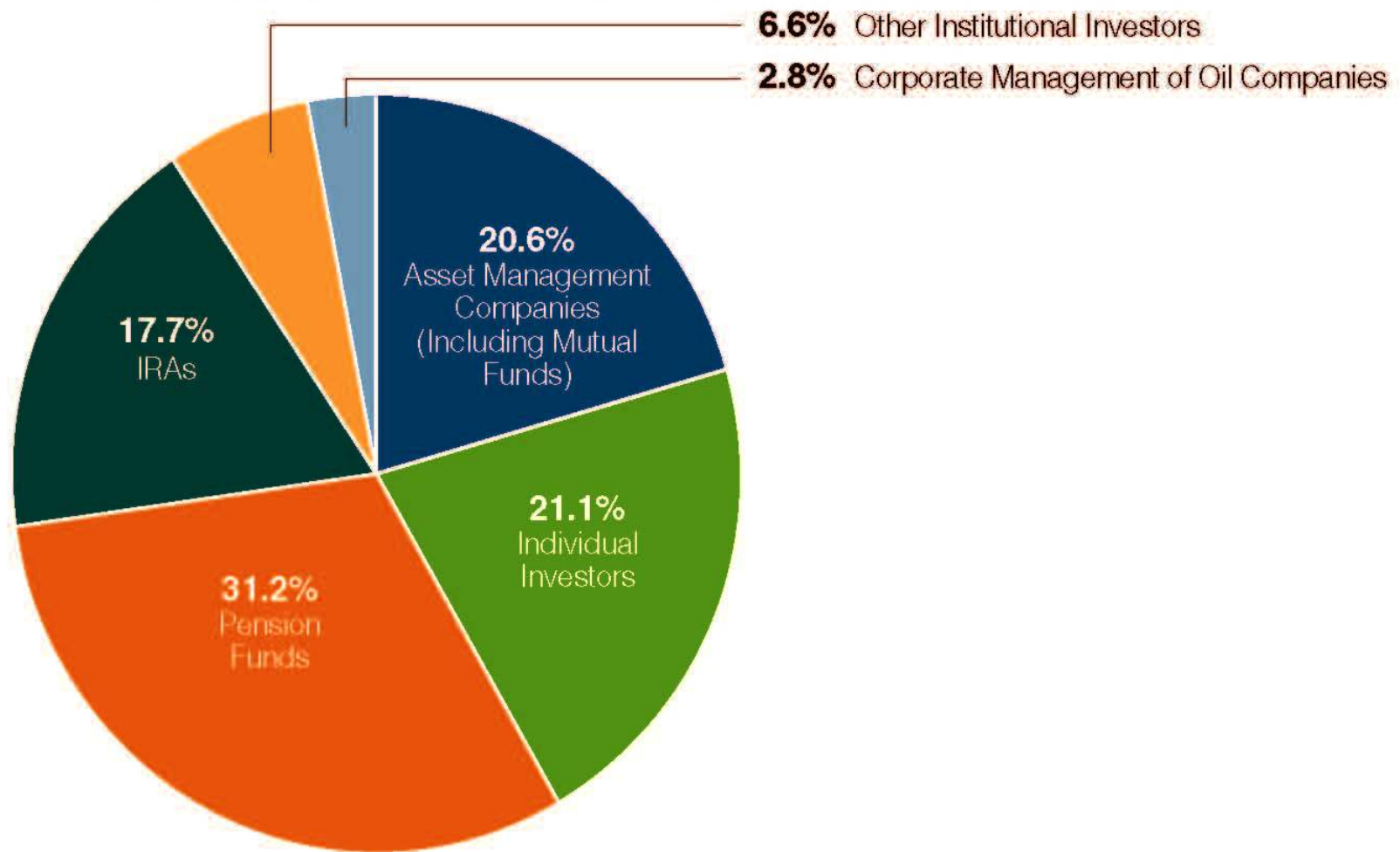
Source: PeC calculations using the IMPLAN modeling system (2011 database).

Details may not add to totals due to rounding.

* Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.

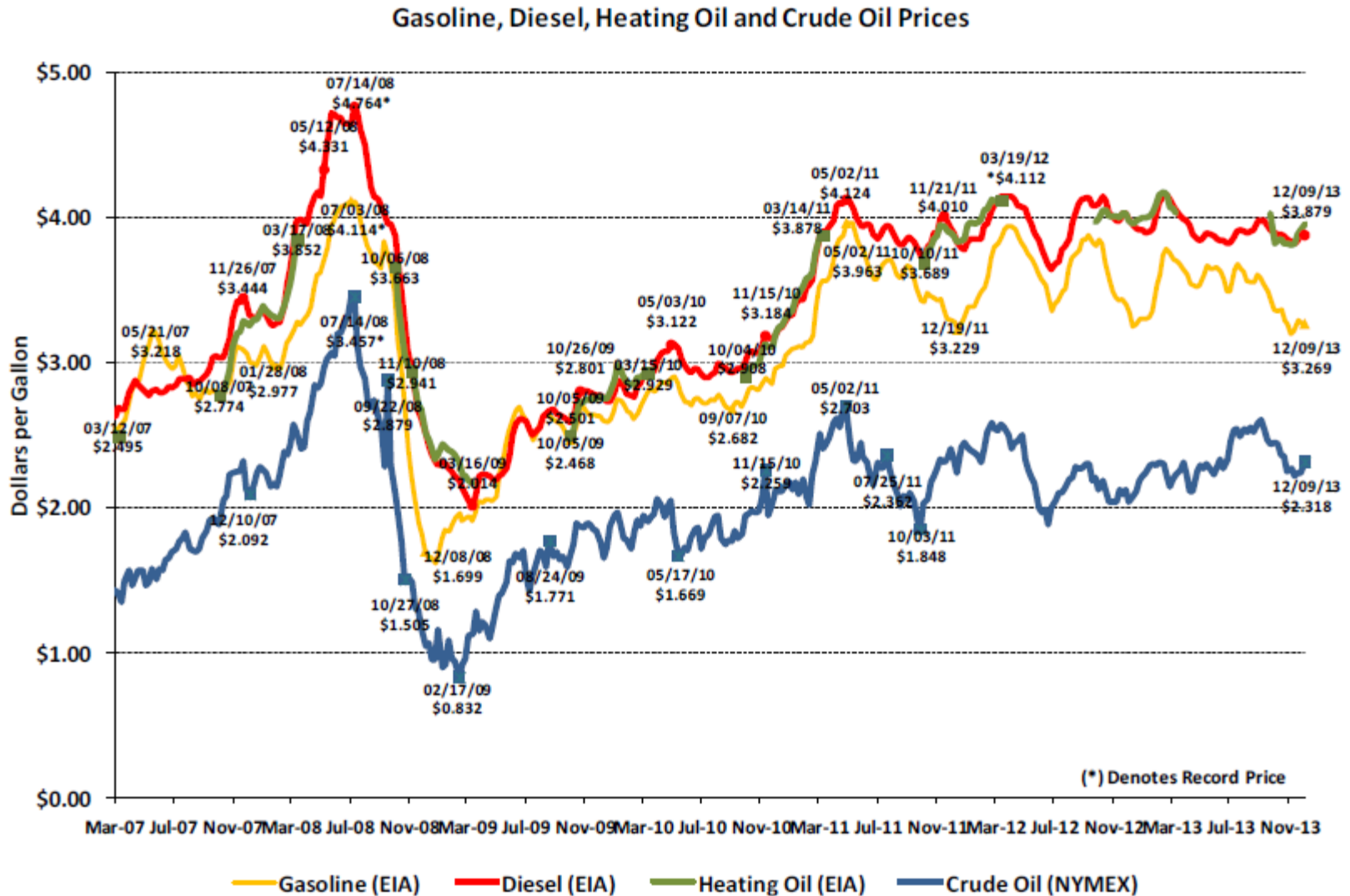
** Labor income is defined as wages and salaries and benefits as well as proprietors' income.

Who Owns "Big Oil?" (Holdings of Oil Stocks, 2011)



Source: *Who Owns America's Oil and Natural Gas Companies*, SONECON, October 2011.

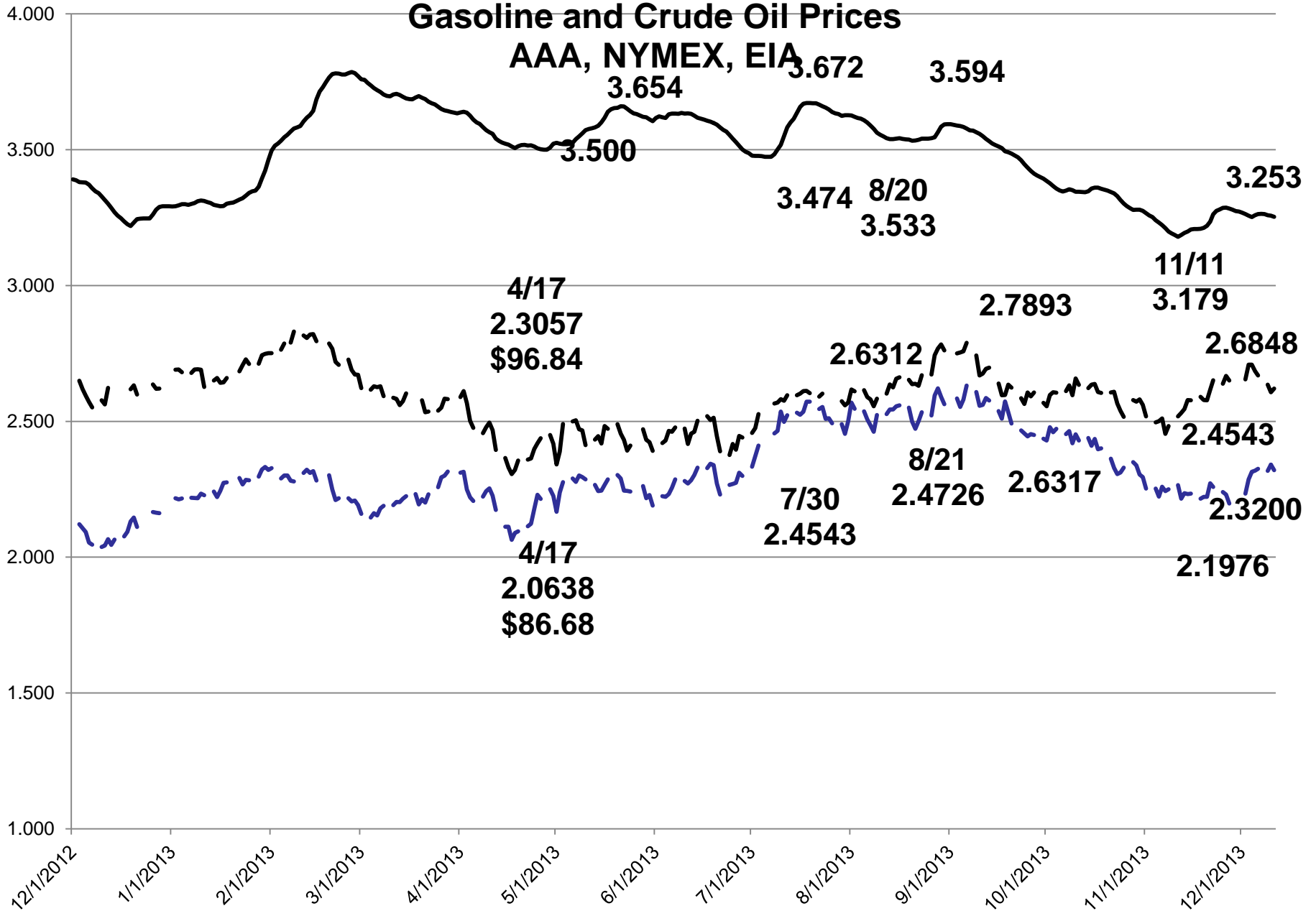
Changes in gasoline and diesel prices mirror changes in crude oil prices

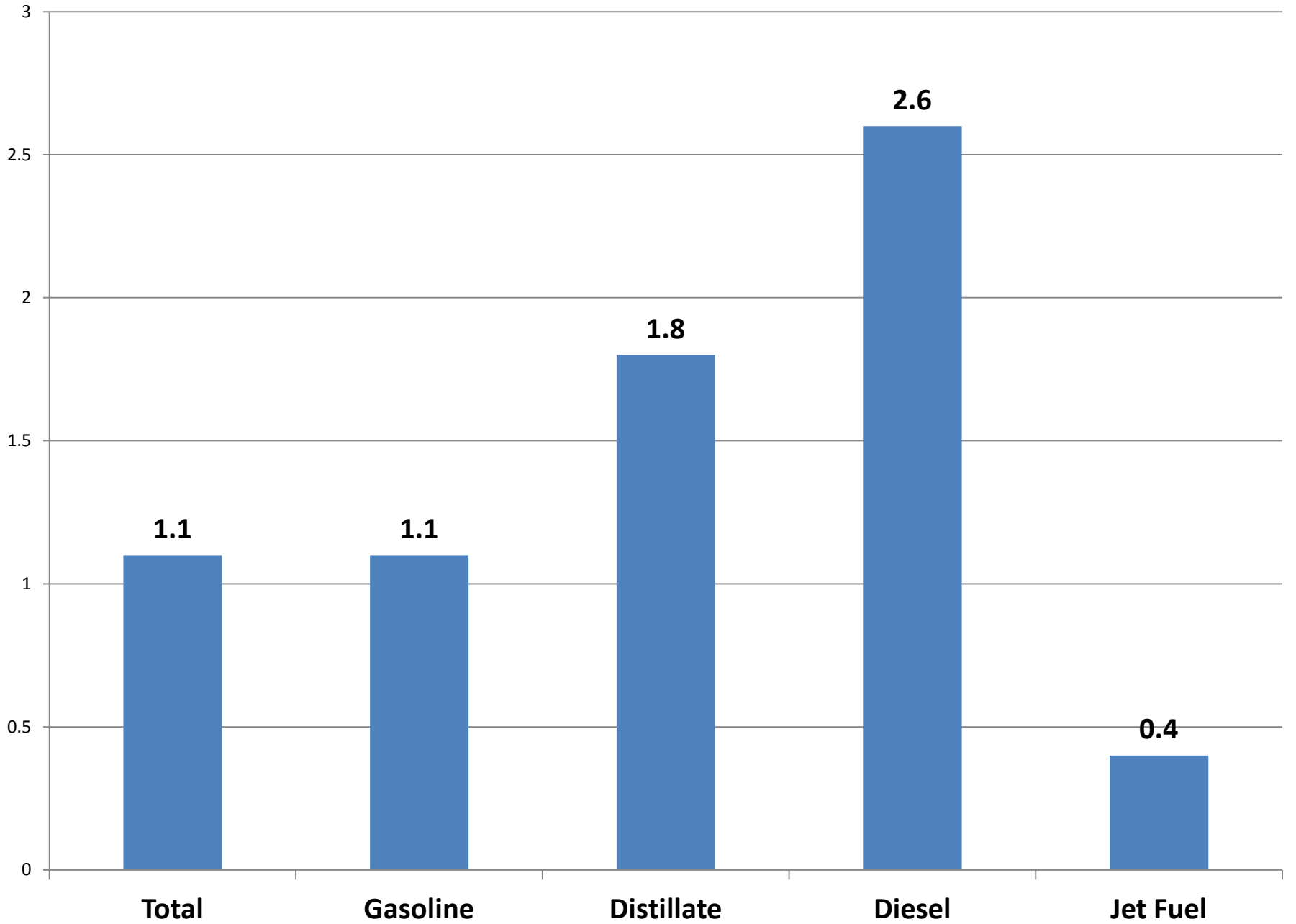


Sources: NYMEX (WTI crude oil) and AAA (gasoline and diesel)

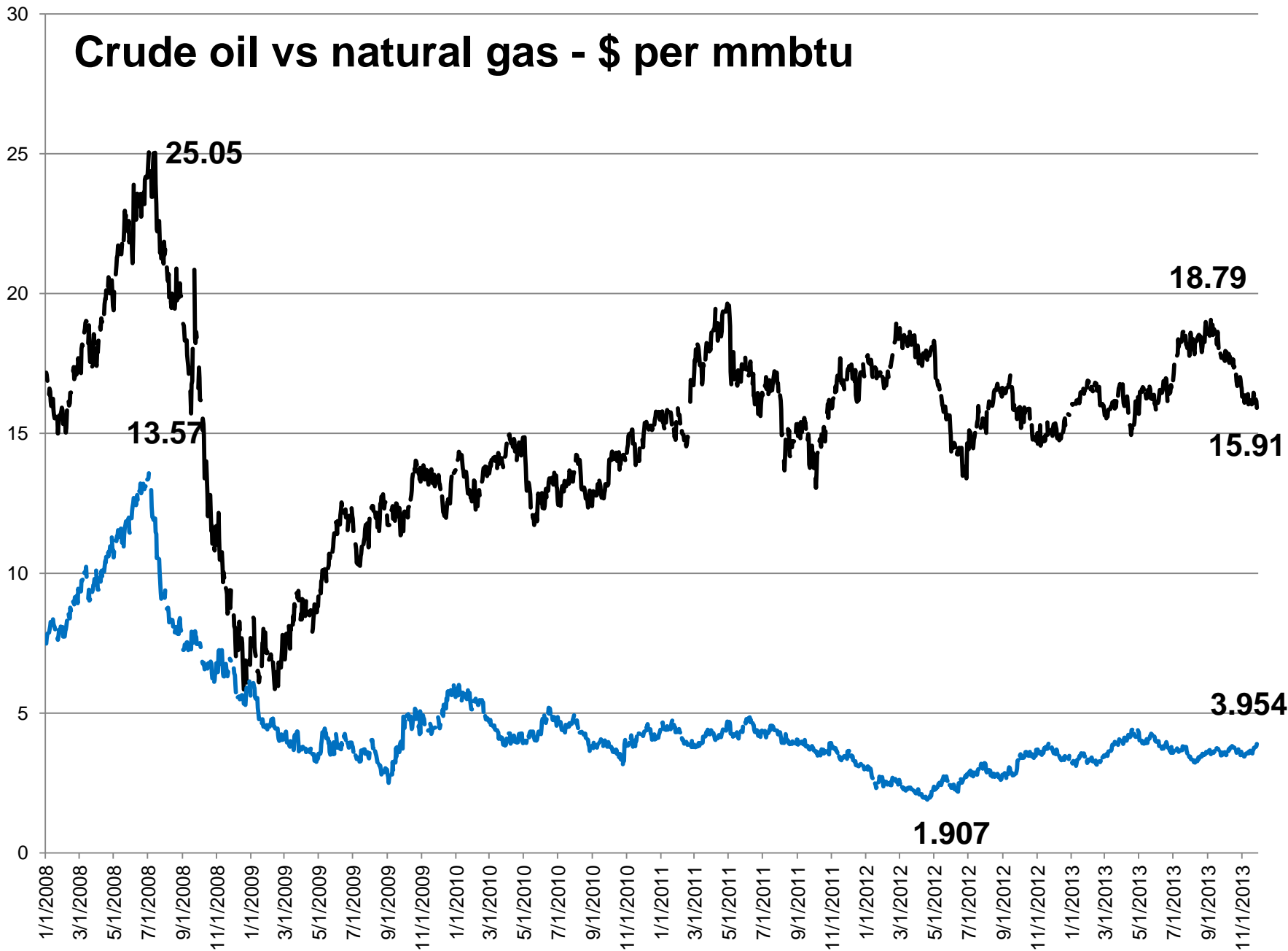
Gasoline and Crude Oil Prices

AAA, NYMEX, EIA

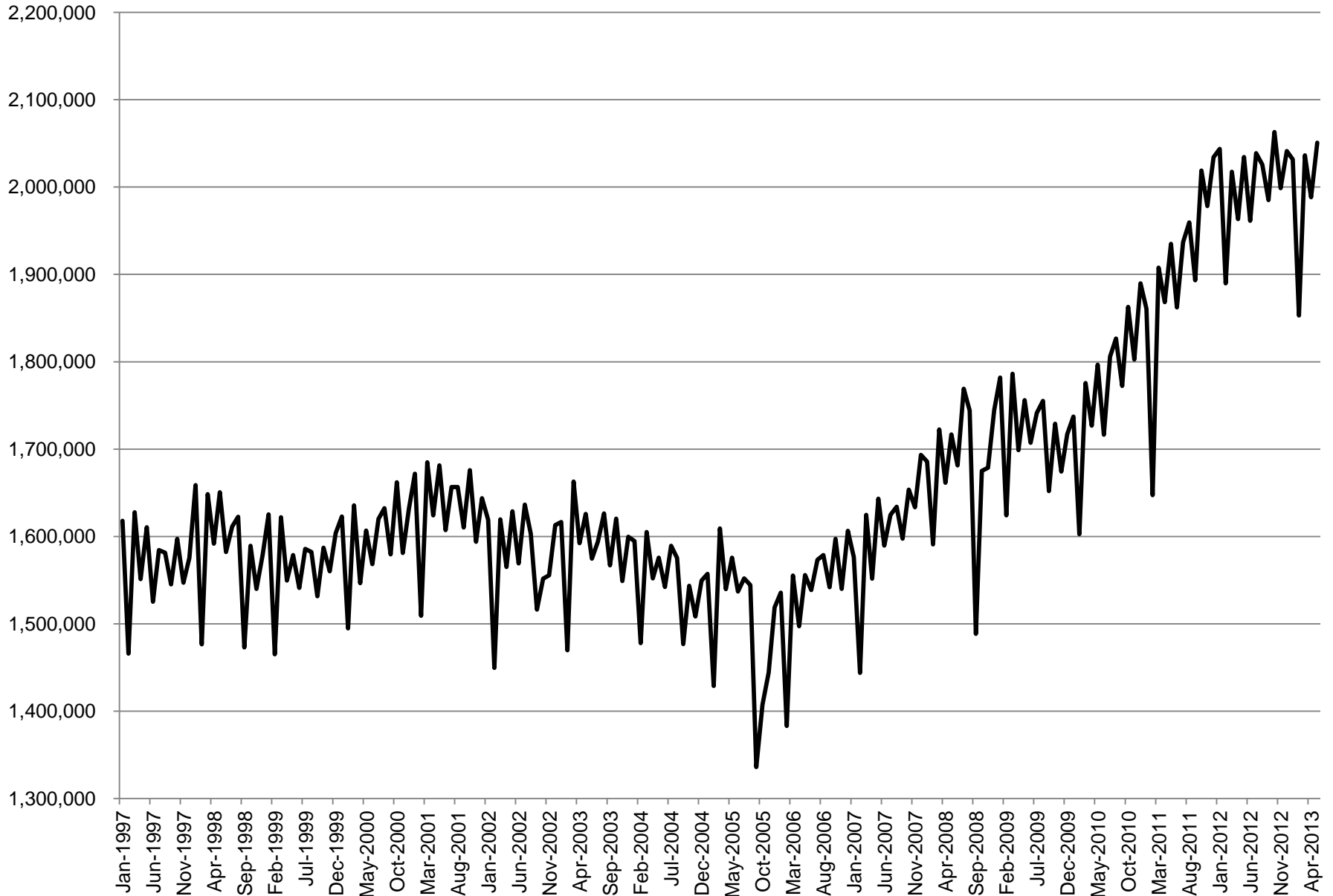




Crude oil vs natural gas - \$ per mmbtu



Natural Gas Production Monthly MMcf







All Yoko Ono and Sean Lennon were saying in Albany yesterday is don't give fracking a chance.

AP

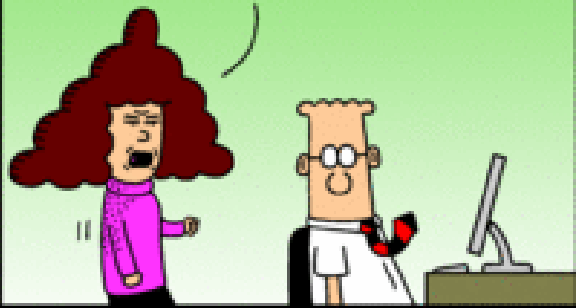
Fracking kills world - Yoko





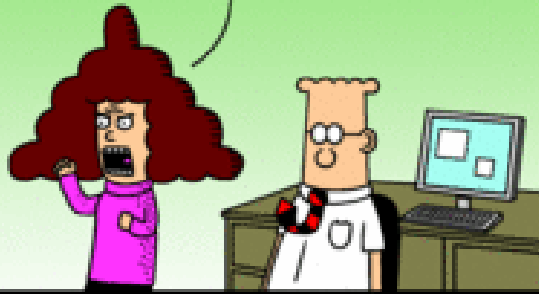
“I love you. You are the only one I know who shares my love for hydraulic fracturing” WSJ

I GOT YOUR STUPID
EMAIL WITH YOUR
STUPID LINK TO THAT
STUPID SCIENTIFIC
STUDY.



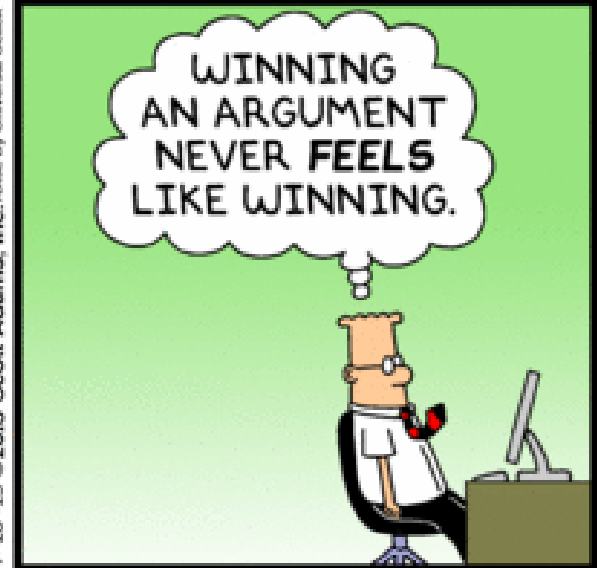
Dilbert.com DilbertCartoonist@gmail.com

I DON'T CARE ABOUT
YOUR SO-CALLED
"FACTS." I KNOW I'M
RIGHT!



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WINNING
AN ARGUMENT
NEVER FEELS
LIKE WINNING.



North American shale plays (as of May 2011)



Current shale plays

Stacked plays

- Shallowest / youngest
- Intermediate depth / age
- Deepest / oldest

* Mixed shale & chalk play
 ** Mixed shale & limestone play
 *** Mixed shale & tight dolostone-siltstone-sandstone play

Prospective shale plays

Basins



Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
 Updated: May 9, 2011

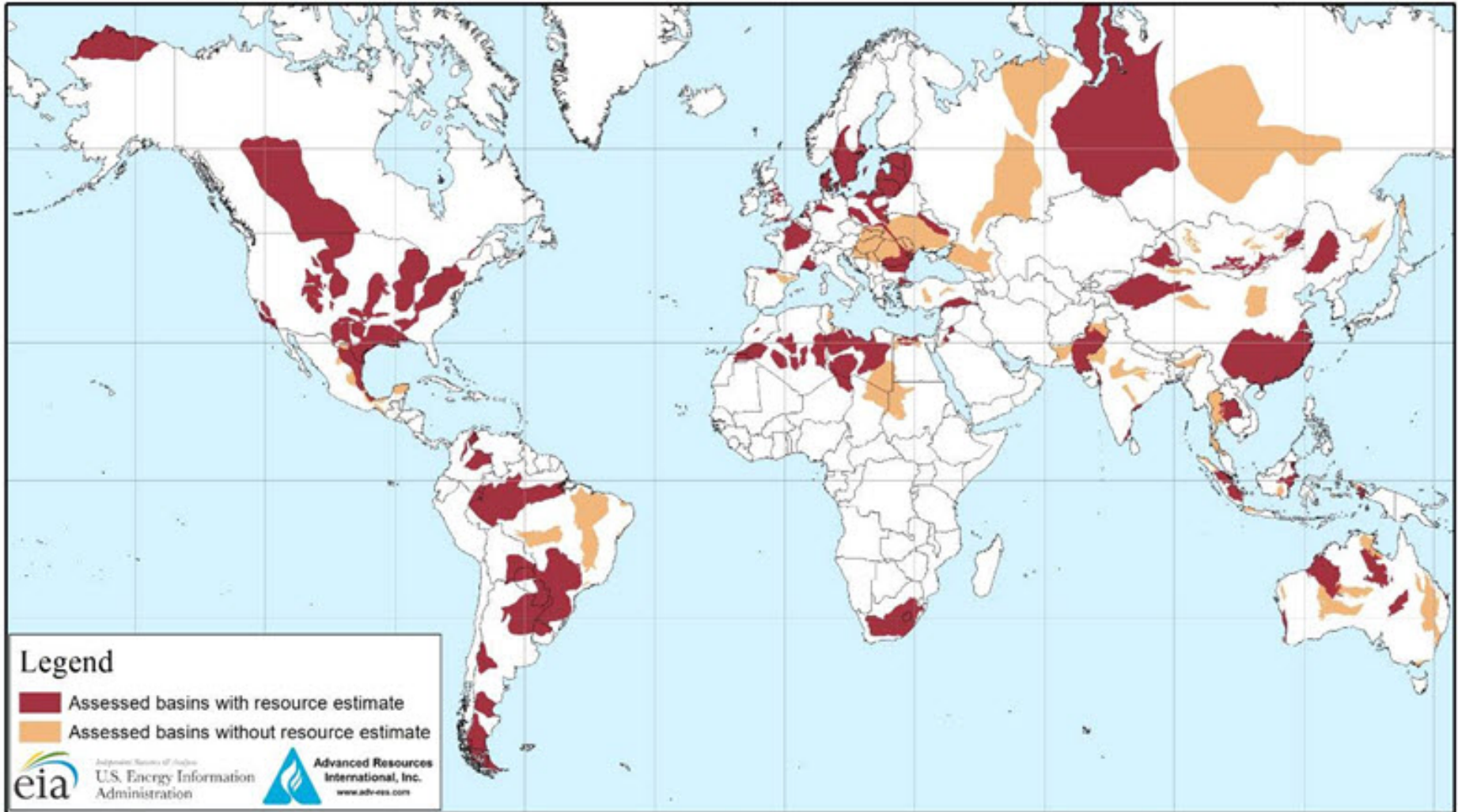
Table 1. INTEK estimates of undeveloped technically recoverable shale gas and shale oil resources remaining in discovered shale plays as of January 1, 2009

Onshore Lower-48 Oil and Gas Supply Submodule region	Shale play	Shale gas resources (trillion cubic feet)	Shale oil resources (billion barrels)
Northeast	Marcellus	410	--
	Antrim	20	--
	Devonian Low Thermal Maturity	14	--
	New Albany	11	--
	Greater Sittstone	8	--
	Big Sandy	7	--
	Cincinnati Arch*	1	--
	Subtotal	472	--
	Percent of total	63%	--
		Haynesville	75
	Eagle Ford	21	3
	Floyd-Neal & Conasauga	4	--
Subtotal	100	3	
Percent of total	13%	14%	
Mid-Continent	Fayetteville	32	--
	Woodford	22	--
	Cana Woodford	6	--
	Subtotal	60	--
Percent of total	8%	--	

Table 1. INTEK estimates of undeveloped technically recoverable shale gas and shale oil resources remaining in discovered shale plays as of January 1, 2009

Southwest	Barnett	43	--
	Barnett-Woodford	32	--
	Avalon & Bone Springs	--	2
Subtotal		76	2
Percent of total		10%	7%
Rocky Mountain	Mancos	21	--
	Lewis	12	--
	Williston-Shallow Niobraran*	7	--
	Hilliard-Baxter-Mancos	4	--
	Bakken	--	4
Subtotal		43	4
Percent of total		6%	15%
West Coast	Monterey/Santos	--	15
Subtotal		--	15
Percent of total		--	64%
Total onshore Lower-48 States		750	24

Figure 1. Map of basins with assessed shale oil and shale gas formations, as of May 2013



Source: United States basins from U.S. Energy Information Administration and United States Geological Survey; other basins from ARI based on data from various published studies

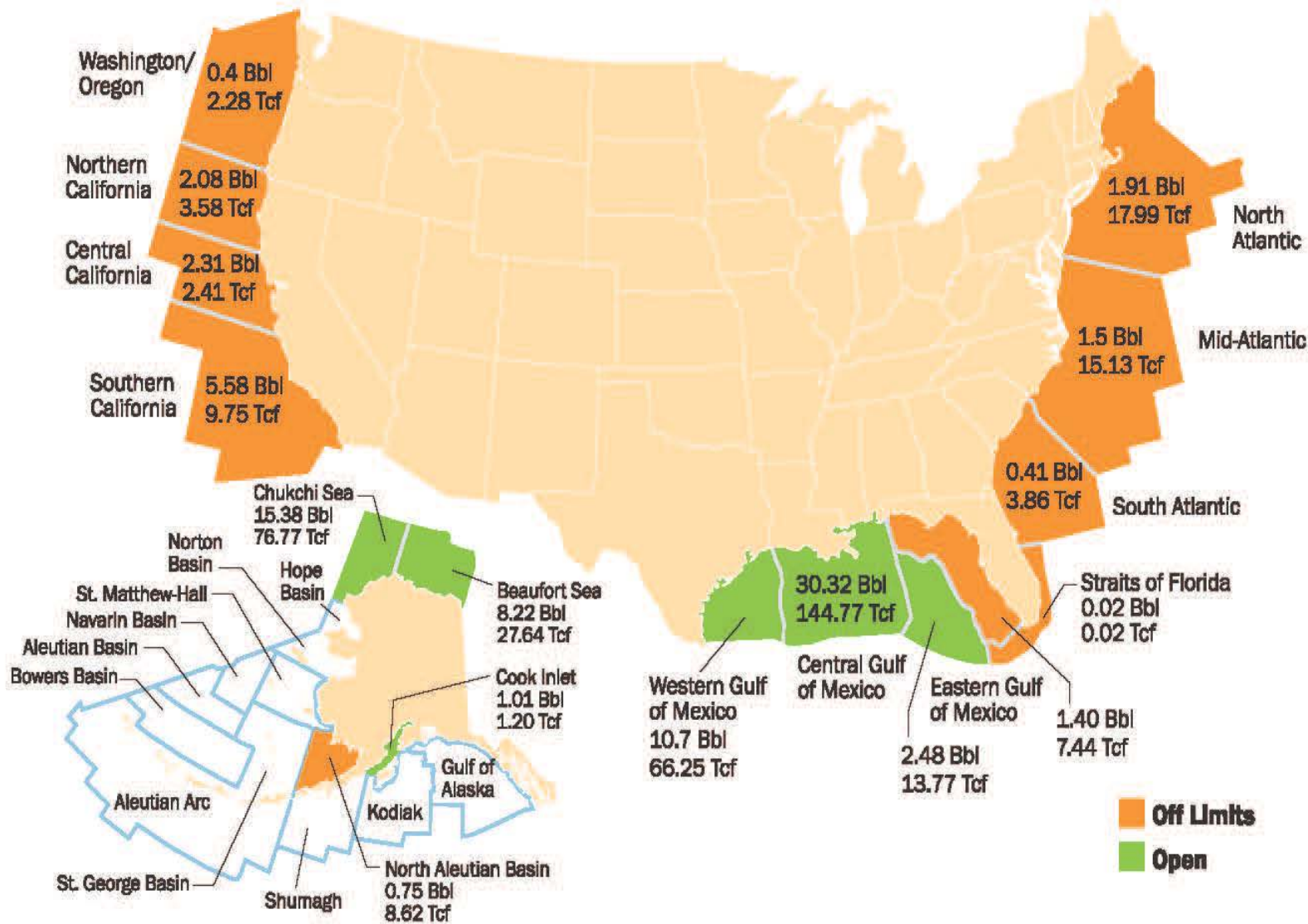
Gentlemen, we can rebuild him. **We have the technology.**



America's New Energy Future: The Unconventional Oil and Gas Revolution and the US Economy – IHS Key Findings

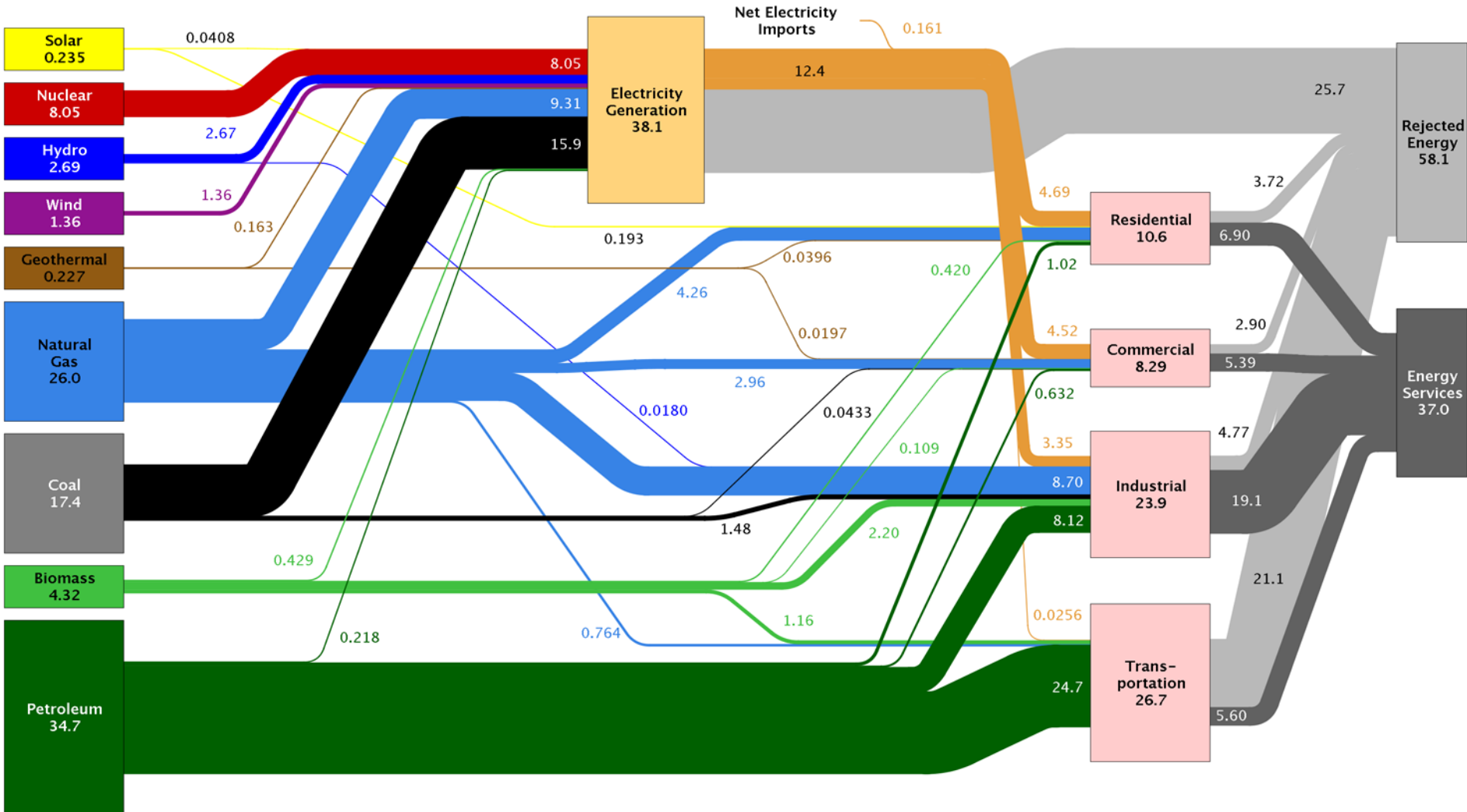
- More than \$5.1 trillion in capital expenditures will take place between 2012 and 2035 across unconventional oil and natural gas activity, of which:
 - Over \$2.1 trillion in capital expenditures will take place between 2012 and 2035 in unconventional oil activity.
 - Close to \$3.0 trillion in capital expenditures will take place between 2012 and 2035 in unconventional natural gas activity.
- Employment attributed to upstream unconventional oil and natural gas activity will support more than 1.7 million jobs in 2012, growing to some 2.5 million jobs in 2015, 3 million jobs in 2020, and 3.5 million jobs in 2035.
- On average, direct employment will represent about 20% of all jobs resulting from unconventional oil and natural gas activity with the balance contributed by indirect and induced employment.
- In 2012, unconventional oil and natural gas activity will contribute nearly \$62 billion in federal, state and local tax receipts. By 2020, total government revenues will grow to just over \$111 billion. On a cumulative basis, unconventional oil and natural gas activity will generate more than \$2.5 trillion in tax revenues between 2012 and 2035.

Offshore Undiscovered Technically Recoverable Federal Oil (Bbl) and Natural Gas (Tcf) Resources



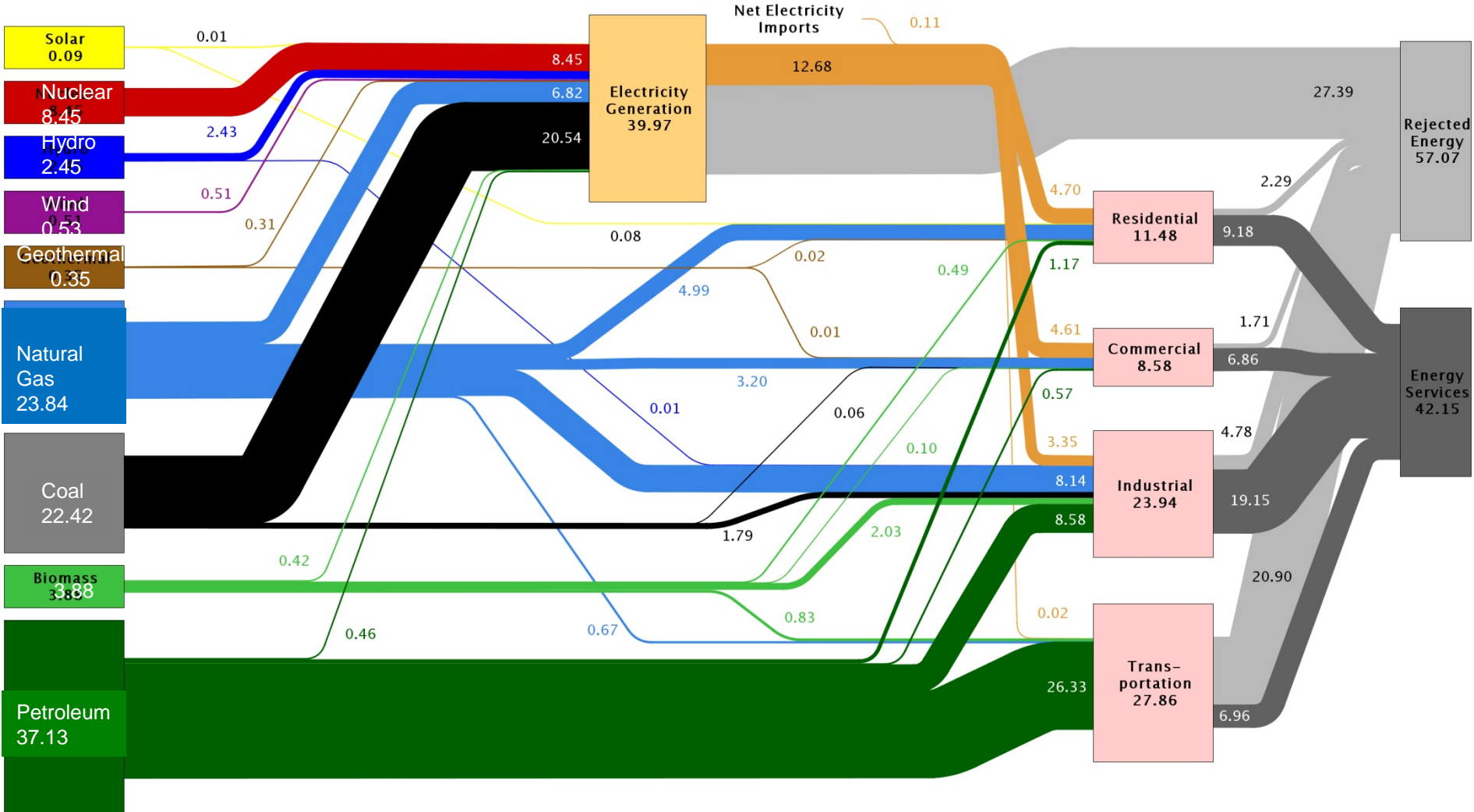
Source: Minerals Management Service and Department of the Interior.

Estimated U.S. Energy Use in 2012: ~95.1 Quads



Source: LLNL 2013. Data is based on DOE/EIA-0035(2013-05), May, 2013. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential and commercial sectors 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

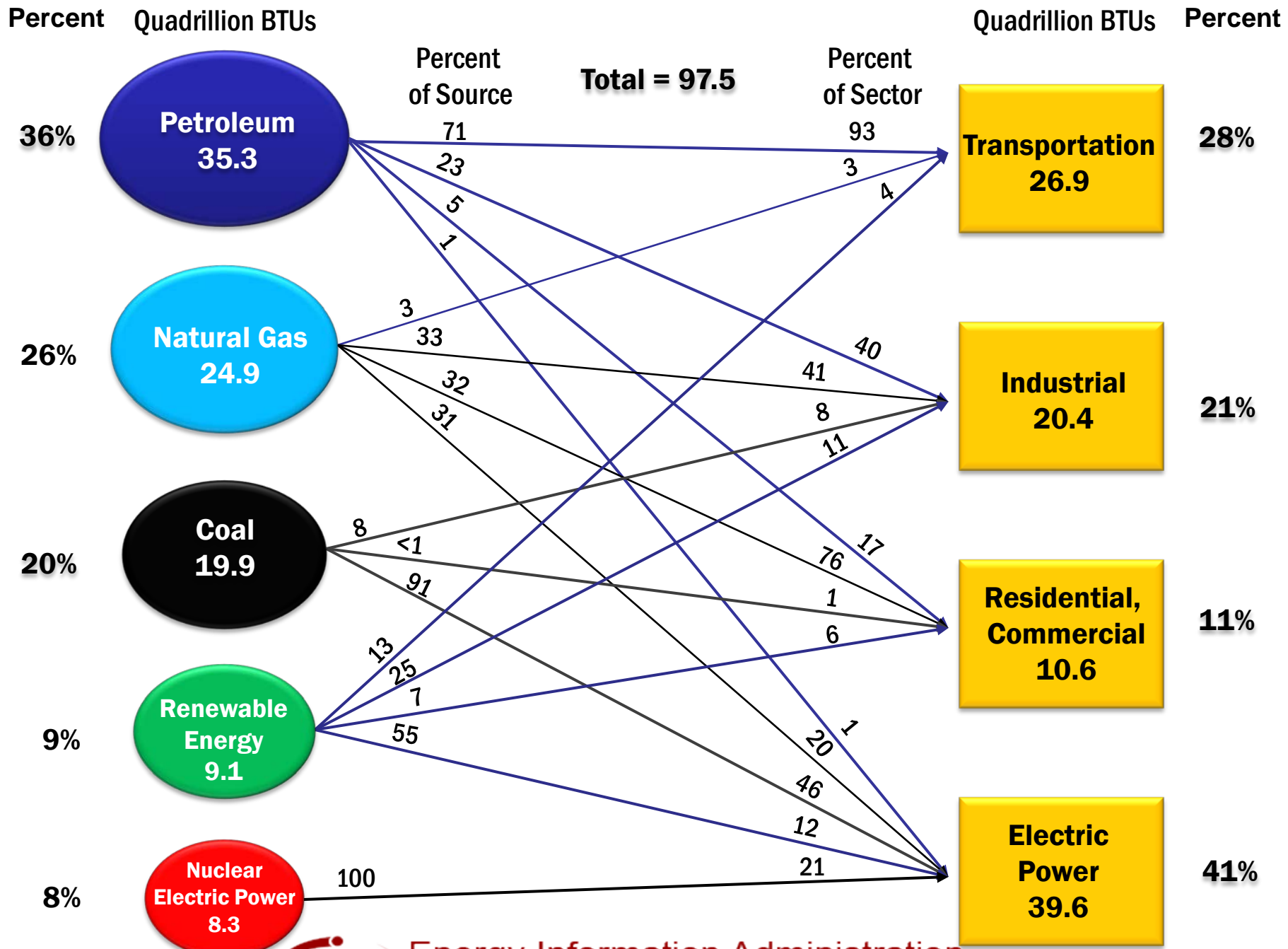
Estimated U.S. Energy Use in 2008: ~99.2 Quads



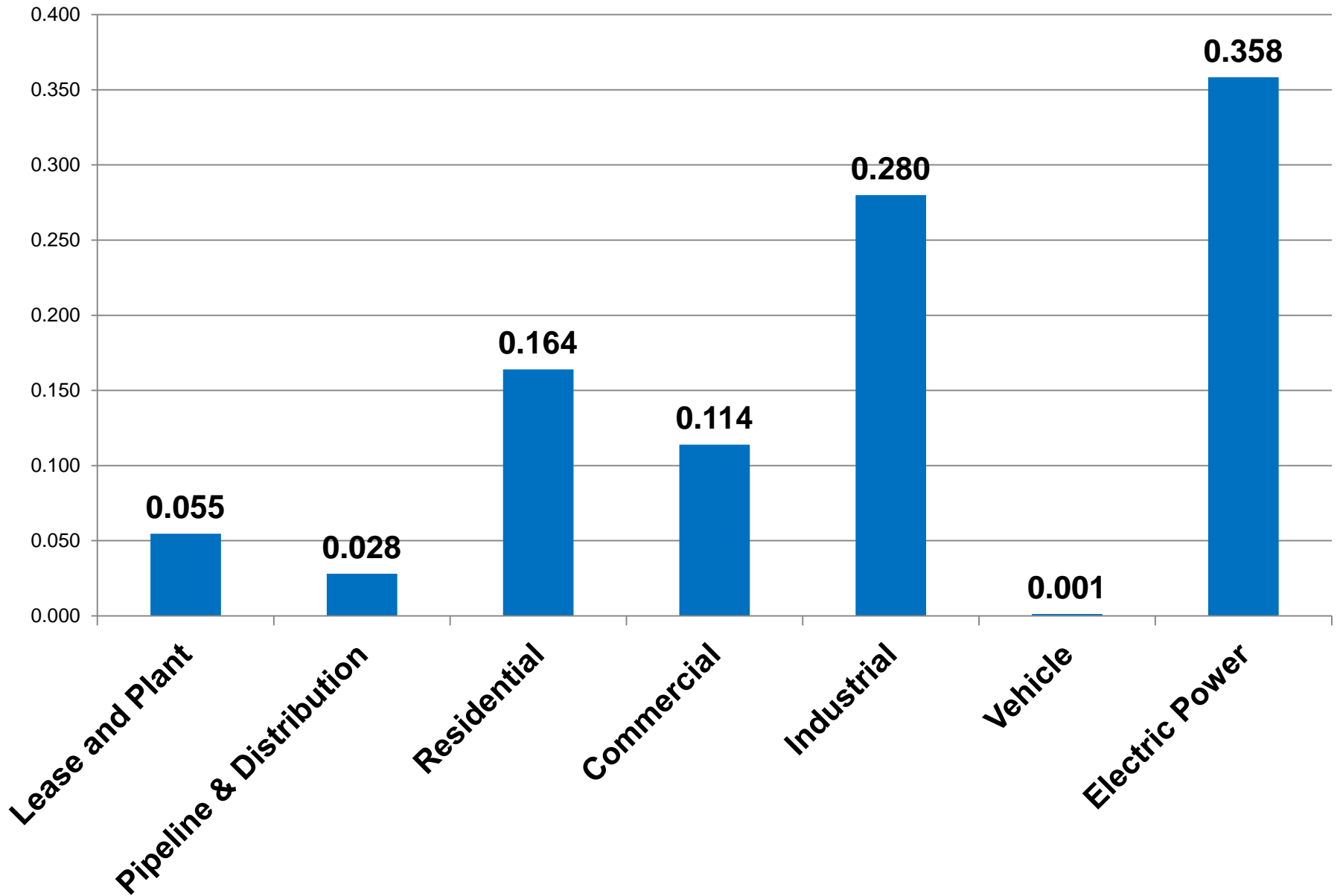
Source: LLNL 2009. Data is based on DOE/EIA-0384(2008), June 2009. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

	2008	Share	2012	Share	change
Solar	0.09	0.0009	0.24	0.0025	0.0016
Nuclear	8.45	0.0852	8.05	0.0846	-0.0005
Hydro	2.45	0.0247	2.69	0.0283	0.0036
Wind	0.53	0.0053	1.36	0.0143	0.0090
Geothermal	0.35	0.0035	0.23	0.0024	-0.0011
Natural Gas	23.84	0.2403	26.00	0.2734	0.0331
Coal	22.42	0.2260	17.40	0.1830	-0.0430
Biomass	3.88	0.0391	4.32	0.0454	0.0063
Petroleum	37.13	0.3743	34.70	0.3649	-0.0094
Total Energy Use	99.2		95.1		
SWG		0.0098		0.0192	0.0094

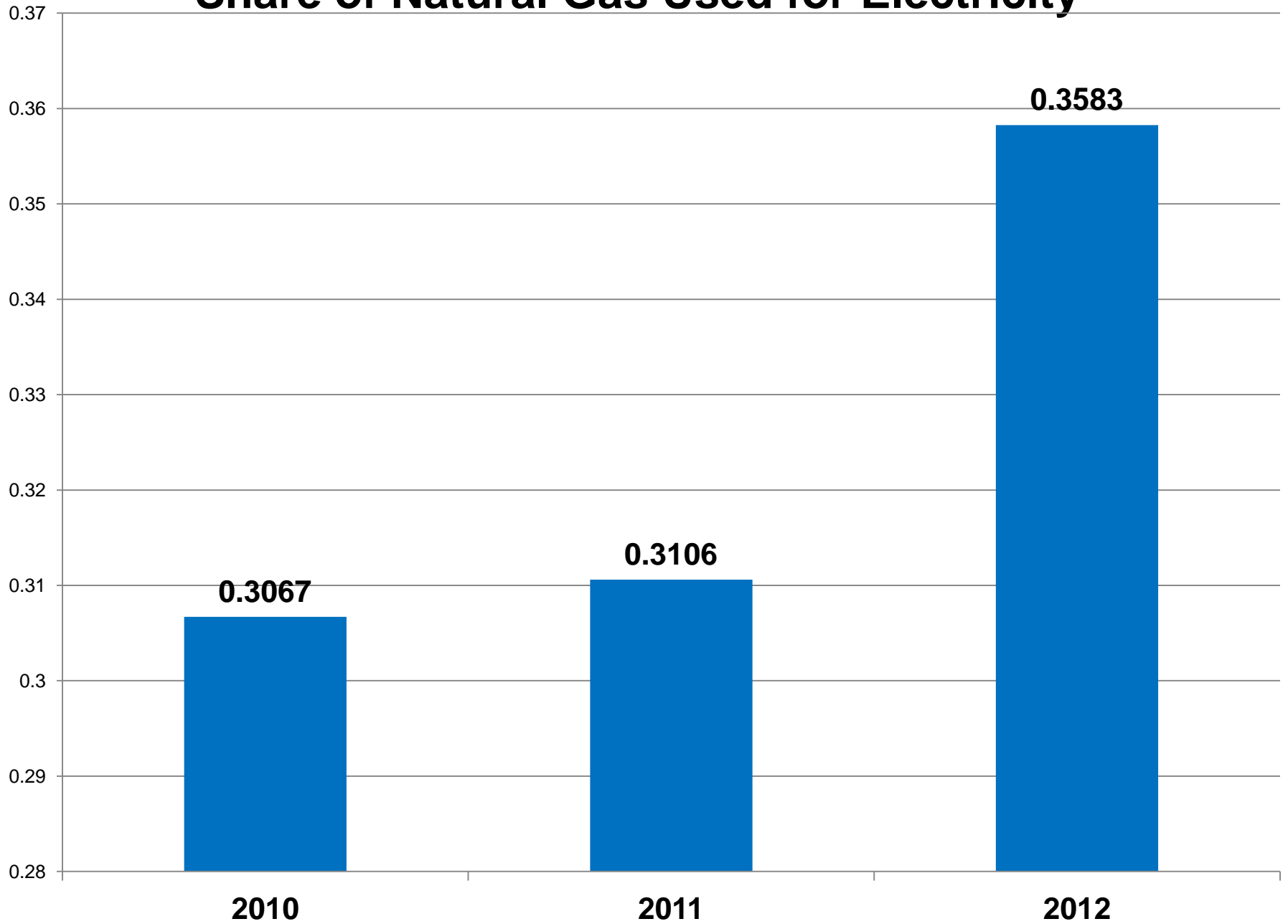
	2008		2012		
Solar	0.09	0.0009	0.24	0.0025	0.0016
Nuclear	8.45	0.0852	8.05	0.0846	-0.0005
Hydro	2.45	0.0247	2.69	0.0283	0.0036
Wind	0.53	0.0053	1.36	0.0143	0.0090
Geothermal	0.35	0.0035	0.23	0.0024	-0.0011
Natural Gas	23.84	0.2403	26.00	0.2734	0.0331
Coal	22.42	0.2260	17.40	0.1830	-0.0430
Biomass	3.88	0.0391	4.32	0.0454	0.0063
Petroleum	37.13	0.3743	34.70	0.3649	-0.0094
	99.2		95.1		



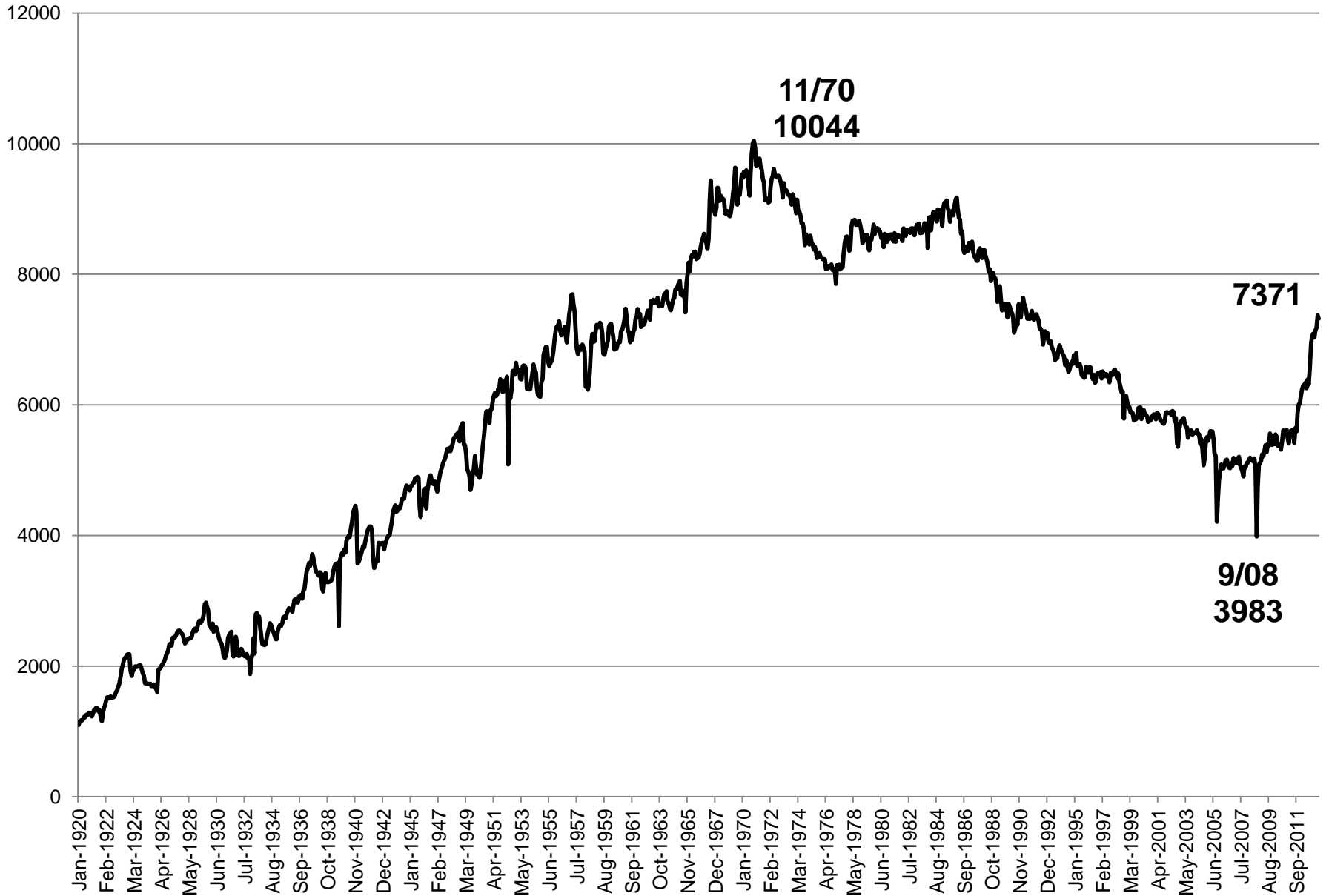
Natural Gas Consumption Shares 2012



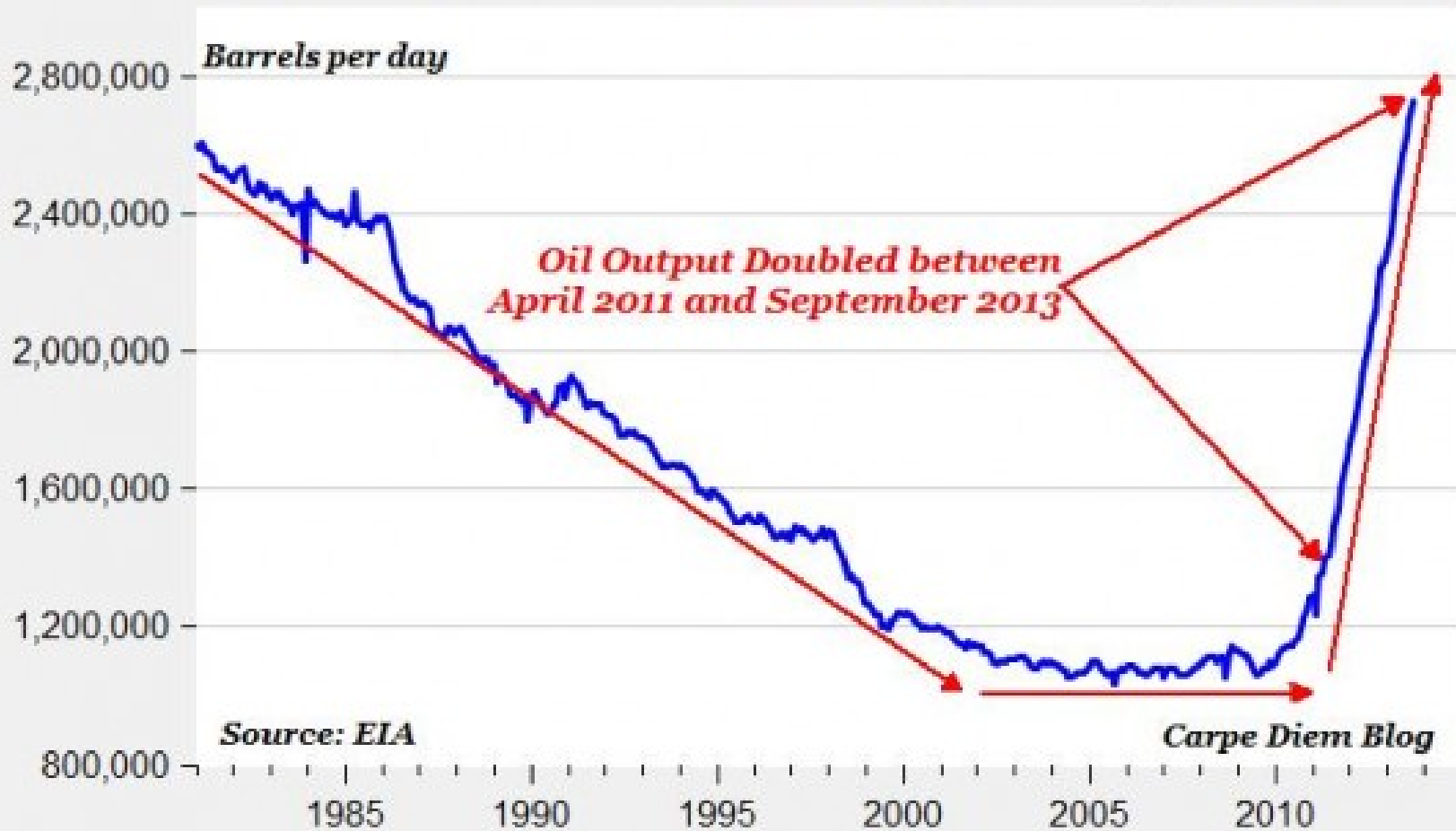
Share of Natural Gas Used for Electricity



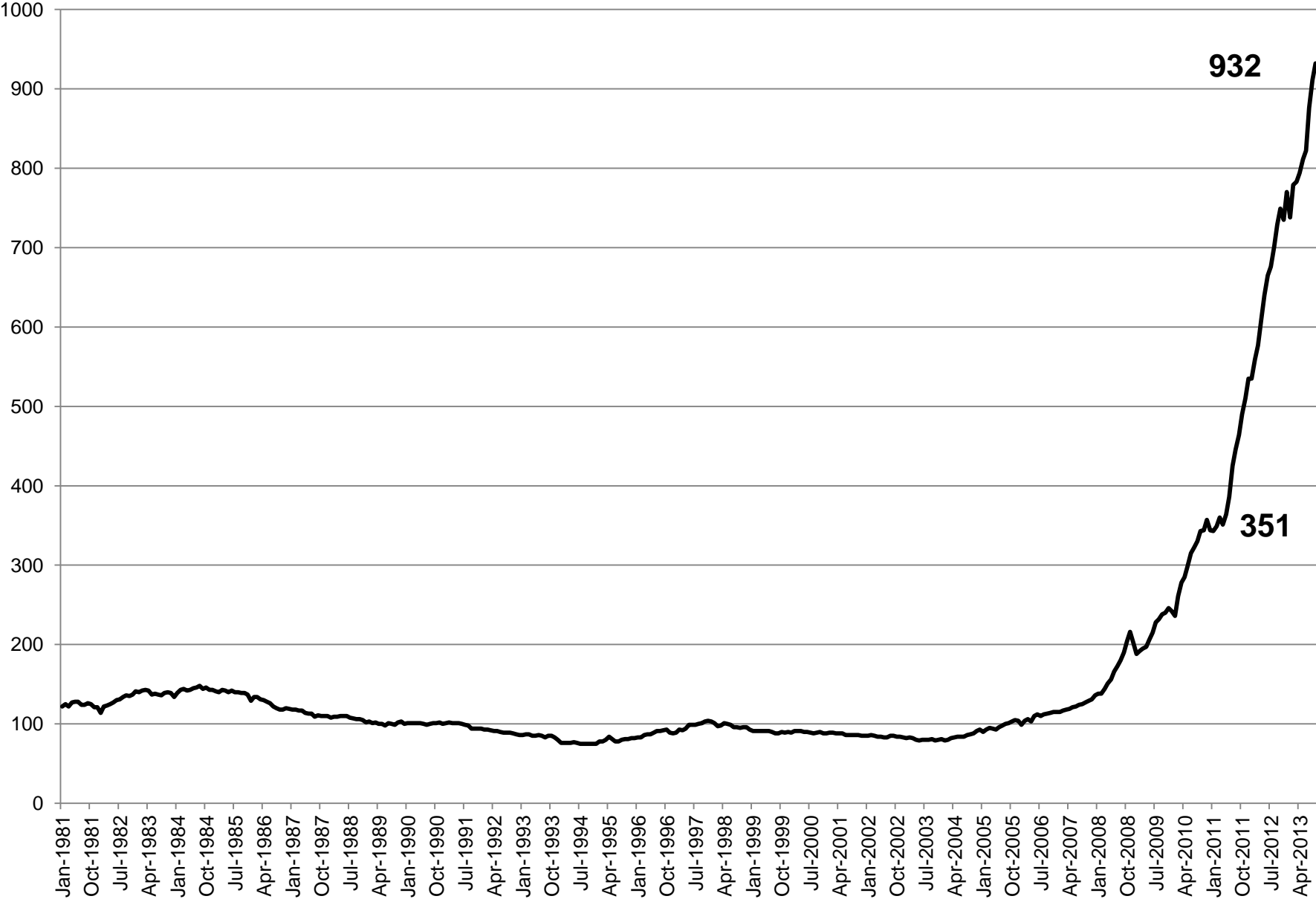
U.S. Crude Oil Production 1000 bpd



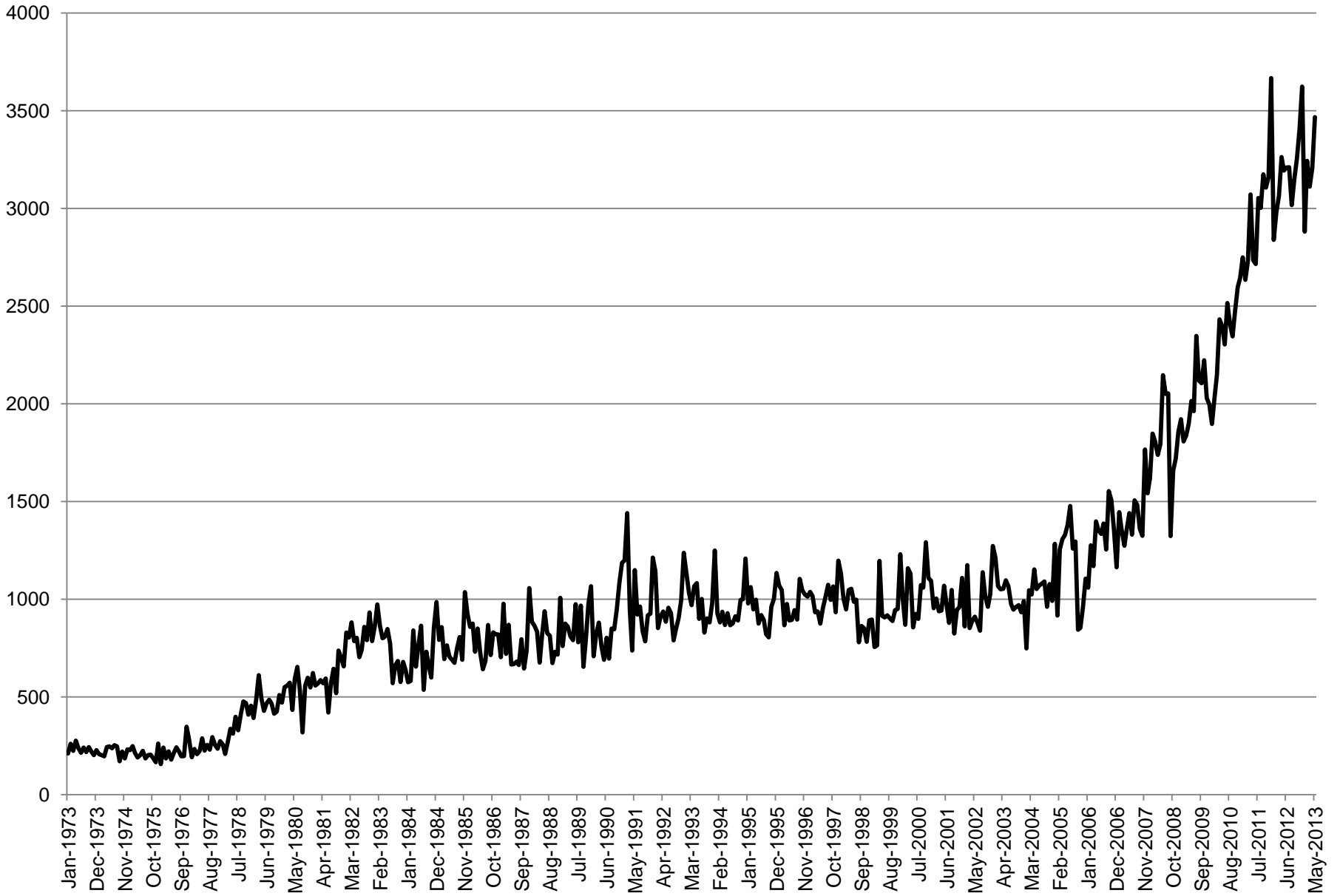
Texas Oil Production, January 1981 to September 2013



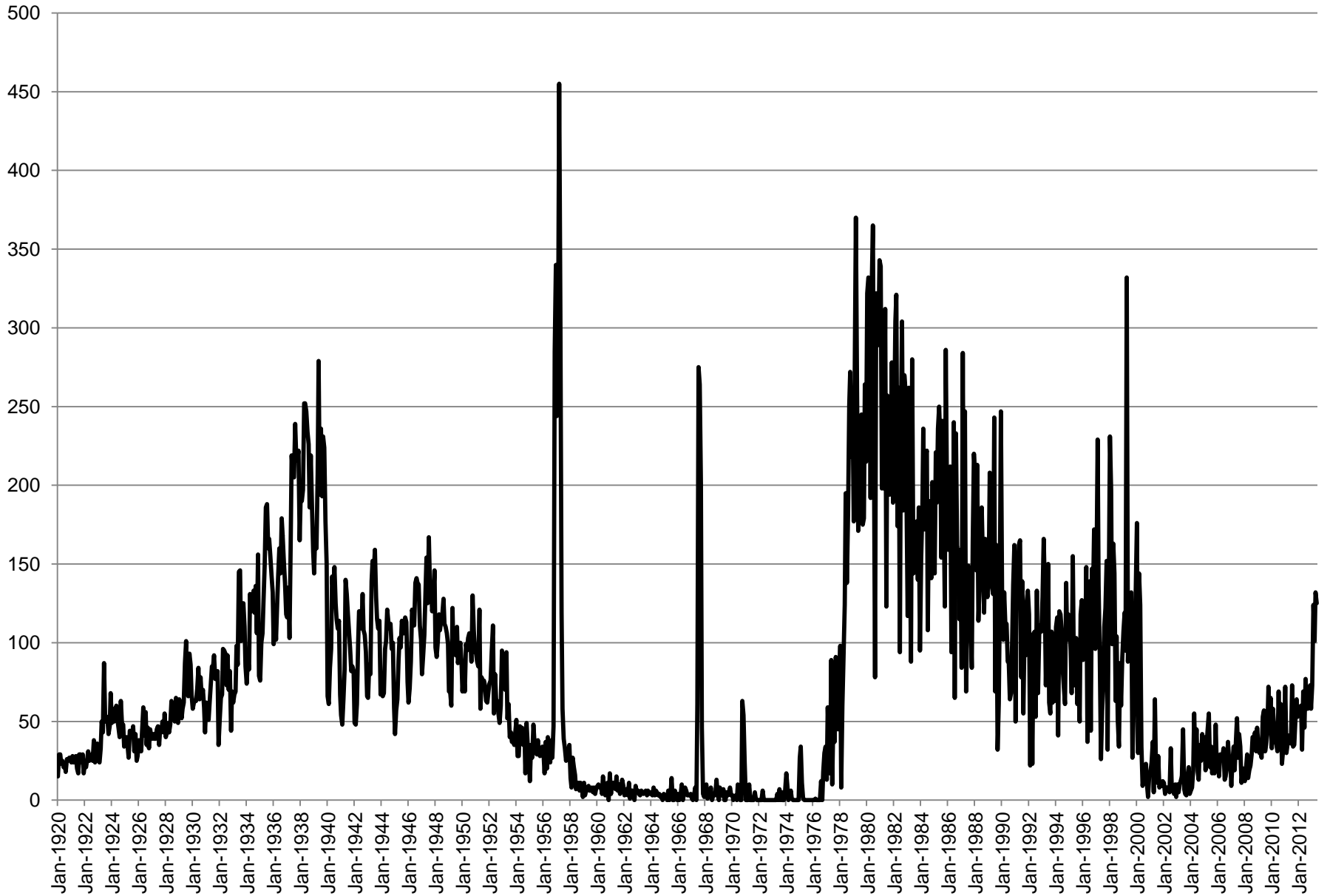
ND Oil Production – 1000 bpd



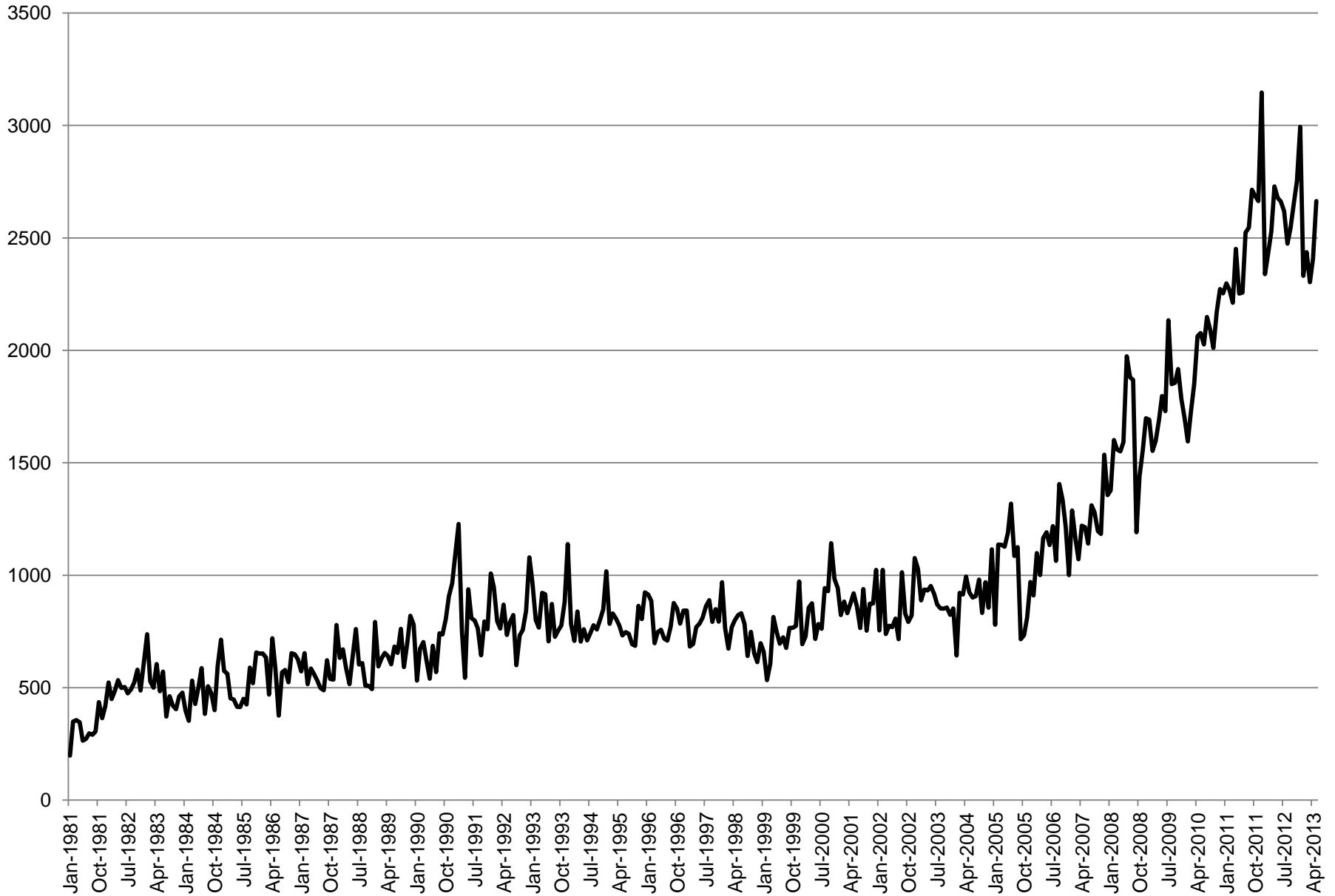
Exports – Total Petroleum



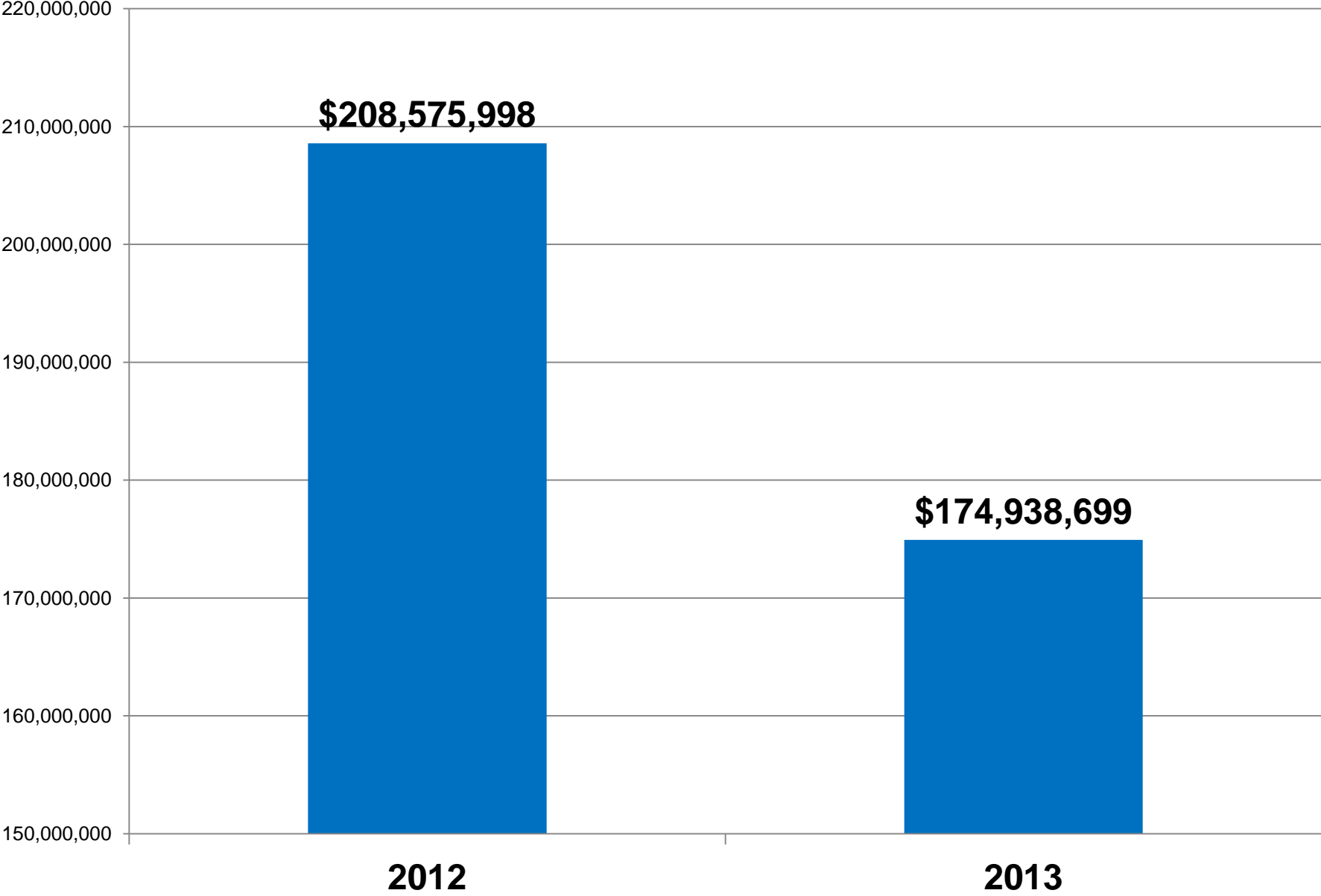
Crude exports



Refined product exports



Total Oil Imports January - June - 1000\$



WHERE FUNDS WILL GO FOR US PROJECTS

Table 1

	2013, million \$	Change 2013-2012, %	2012, million \$	Change 2012-2011, %	2011, million \$
Exploration-production					
Drilling-exploration	240,154	0.4	239,205	7.3	222,936
Production	45,629	0.4	45,449	7.3	42,358
OCS lease bonus	2,100	15.7	1,815	458.5	325
Subtotal	287,883	0.5	286,469	7.8	265,619
Other					
Refining and Marketing	12,700	-2.3	13,000	7.4	12,100
Petrochemicals	1,800	38.5	1,300	333.3	300
Crude and products pipelines	23,246	435.2	4,344	214.6	1,381
Natural gas pipelines	15,254	252.6	4,327	-44.1	7,744
Other transportation	1,800	50.0	1,200	9.1	1,100
Mining, other energy	1,100	—	1,100	10.0	1,000
Miscellaneous	4,500	7.1	4,200	5.0	4,000
Subtotal	60,401	105.0	29,471	6.7	27,625
Total	348,284	10.2	315,939	7.7	293,244

Oil and gas industry employment growing much faster than total private sector employment

Percent change in employment, oil and natural gas industry and all private sector employment
percent change from 2007



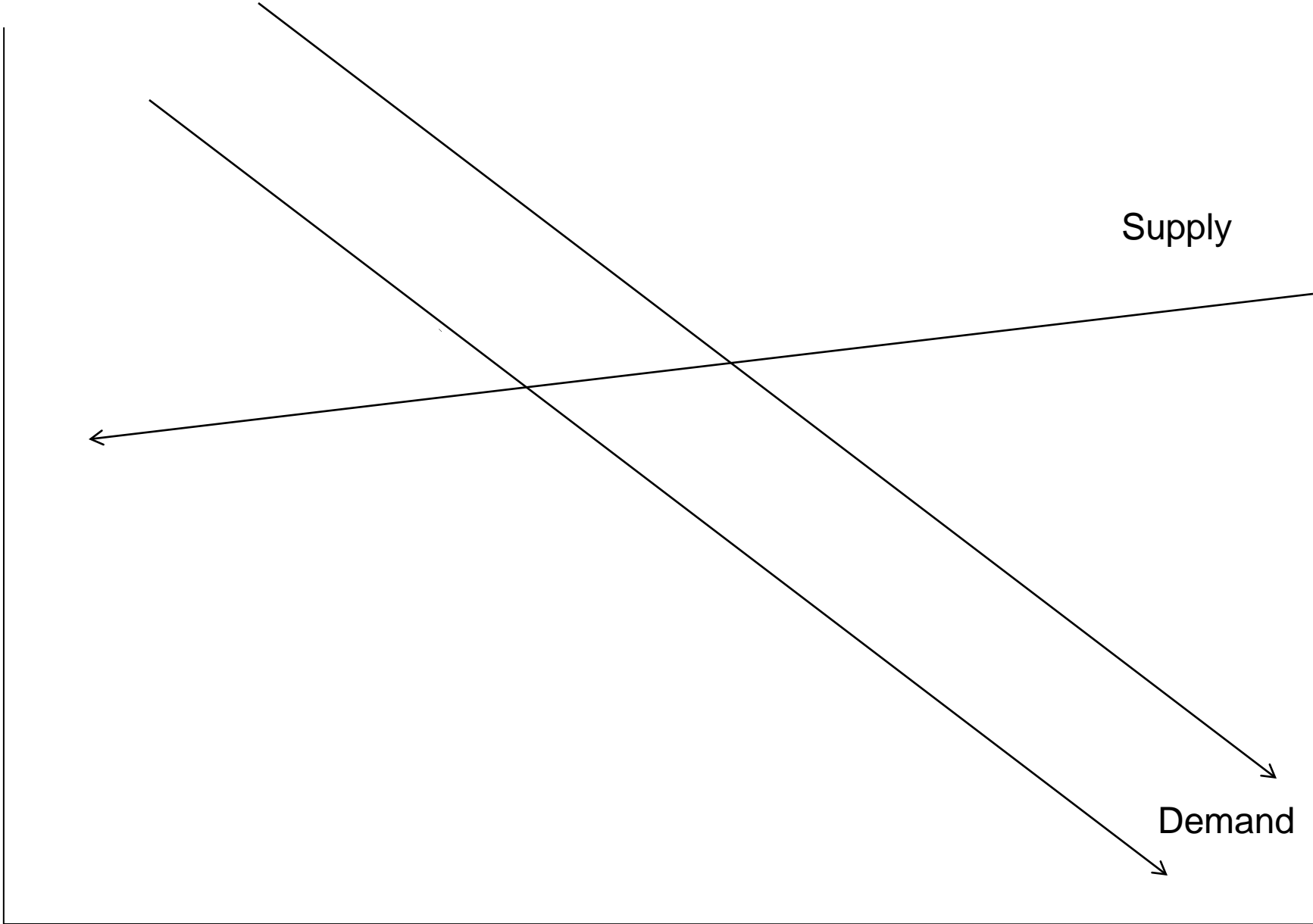
Source: U.S. Bureau of Labor Statistics

Note: Total private sector employment is non-government employment, as derived from the Quarterly Census of Employment and Wages.

From the start of 2007 through the end of 2012, total U.S. private sector employment increased by more than one million jobs, about 1%. Over the same period, the oil and natural gas industry increased by more than 162,000 jobs, a 40% increase.

- **Taxes – Access - Regulation**
- **Hydraulic fracturing**
- **Exports**
- **Oil sands/Keystone XL**
- **RFS, E15, Other fuels issues**

Price



Supply

Demand

Quantity

Key Economic Impacts Relative to the Zero Exports Case

Impact (2016-2035 Averages)*	LNG Export Case (Change from Zero Exports Case)		
	ICF Base Case (up to ~4 Bcfd)	Middle Exports Case (up to ~8 Bcfd)	High Exports Case (up to ~16 Bcfd)
Employment Change (No.)	73,100-145,100	112,800-230,200	220,100-452,300
GDP Change (2010\$ Billion)	\$15.6-\$22.8	\$25.4-\$37.2	\$50.3-\$73.6
Henry Hub Price (2010\$/MMBtu)	\$5.03	\$5.30	\$5.73
Henry Hub Price Change (2010\$/MMBtu)	\$0.32	\$0.59	\$1.02

Source: ICF estimates. Note: * Includes direct, indirect, and induced impacts

I end with a quote from Ellis Wyatt, one of the novel's heroes: "How many years ago was it that they gave up trying to get oil from shale, because it was too expensive?" he opines, surveying the Wyatt Oil Fields of Colorado, "Well, wait till you see the process I've developed. It will be the cheapest oil ever to splash in their faces, and an unlimited supply of it, an untapped supply that will make the biggest oil pool look like a mud puddle. Give me an unobstructed right of way and I'll show them how to move the earth!"

Drake Lawhead, London,
April 2013

Sincerely,

Steven Chu

Steven Chu

RS: We would love to brief the members of the NPC and the task forces, where relevant, on the R&D the DOE is investing in that may dramatically improve the technology choices we could have in 5-15 years. These programs are in ARPA-E, FE and the Office of Science.

Thank You

*For more information
visit*

www.api.org

www.energytomorrow.org