

Hitting the Jackpot During Oil-Gas Price Collapse: The Consumer*

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Search and Discovery Article #70251 (2017)**

Posted April 10, 2017

*Adapted from oral presentation given at 2016 AAPG Pacific Section and Rocky Mountain Section Joint Meeting, Las Vegas, Nevada, October 2-5, 2016

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Abstract

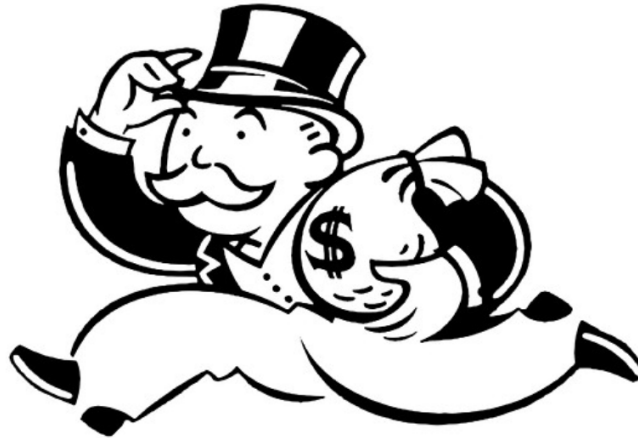
The oil, gas and oilfield services industries are experiencing a “commodity cycle” of monumental proportions. The industries are the victims of success from hydraulic fracturing. Low prices, basement-level rig counts, bankruptcies, back-to-back cuts in capital expenditures, and layoffs are some of the consequences. There’s another side to this, which is the impact of lower oil and natural gas prices on consumers. The 2016 annual report for the Committee on Energy Economics and Technology, part of AAPG’s Energy Minerals Division (EMD), estimated savings to consumers based on pre- and post-shale era pricing, tied to the single year 2015. The resulting figure is \$775 billion, in that year. This astonishing number combines impacts in the U.S and, where documentable, worldwide. It accounts for how hydraulic fracturing first caused natural gas oversupply and price collapse (an additional side-effect being lower costs of wholesale electric power), which led to a focus on higher value oil and liquids-rich plays, which injected 4 million barrels per day into the global oil market after about 3 years, which was the primary driver of the collapse of world oil prices beginning in 2014, which drove down the cost of oil-price linked liquefied natural gas and internationally-traded pipeline gas. 2015 consumer savings add up roughly as follows: (1) US natural gas, residential-commercial-industrial sectors, \$37.9 billion per year (B/yr), plus electric sector \$48.1 B/yr, (2) US gasoline, diesel and jet fuel, \$221 B/yr, (3) global oil, less U.S., principally Canada, Europe, major Asia Pacific countries excl. China and India, \$366 B/yr, (4) global natural gas, less U.S. – centered on European pipeline trade, \$30 B/yr and (5) LNG, principally top five Asia Pacific countries incl. China and India, \$52 B/yr. These estimates do not require cherry-picking to produce an inflated result, but straightforward combination of statistics from U.S. Energy Information Administration, International Energy Agency World Oil Market Report (May), BP 2016 Statistical Energy Review (June), International Gas Union 2016 World LNG Report (April) and its 2016 Wholesale Gas Price Survey (May).

Selected References

Linn, J., L. Muehlenbachs, and Y. Wang, 2014, How do natural gas prices affect consumers and the environment?: RFF DP 14-19, Web Accessed March 25, 2017, <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-14-19.pdf>

Sorenson, R.P., 2003, A Dynamic Model for the Permian Panhandle and Hugoton Fields, Western Anadarko Basin: AAPG Search and Discovery Article 20015, Web Accessed March 25, 2017, <http://www.searchanddiscovery.com/documents/2003/sorenson/>

Hitting the Jackpot During Oil-Gas Price Collapse: The Consumer



AAPG 2016 PS/RMS Las Vegas – October 5, 2016

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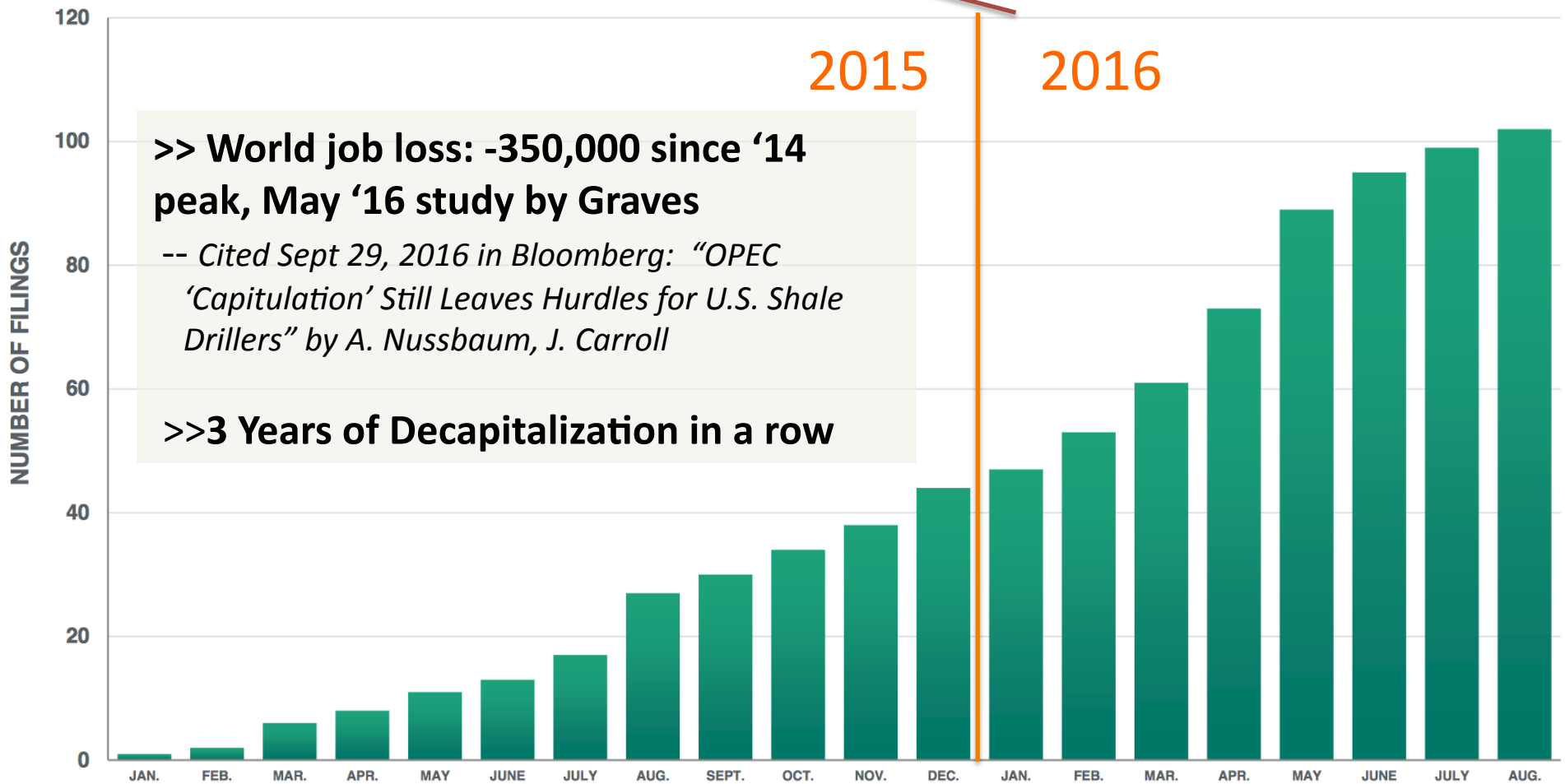
Why This Topic?

- So much is said about how bad is “fracking”, so little is understood about its role.
- Highlights from a contribution for AAPG’s Energy Economics & Technology Committee, part of Energy Minerals Division (*June 18 post*)
- Effort to not overstate the case
 - Readily documentable US and global consumers savings from collapsing oil, nat gas and LNG prices
 - 2015: one year
 - NOT environmental issues, NOT oil and gas industry’s plight, NOT macroeconomic (GDP etc.)



Bankruptcies Balloon into 2016

HAYNES AND BOONE OIL PATCH BANKRUPTCY MONITOR



>> World job loss: -350,000 since '14 peak, May '16 study by Graves

-- Cited Sept 29, 2016 in Bloomberg: "OPEC 'Capitulation' Still Leaves Hurdles for U.S. Shale Drillers" by A. Nussbaum, J. Carroll

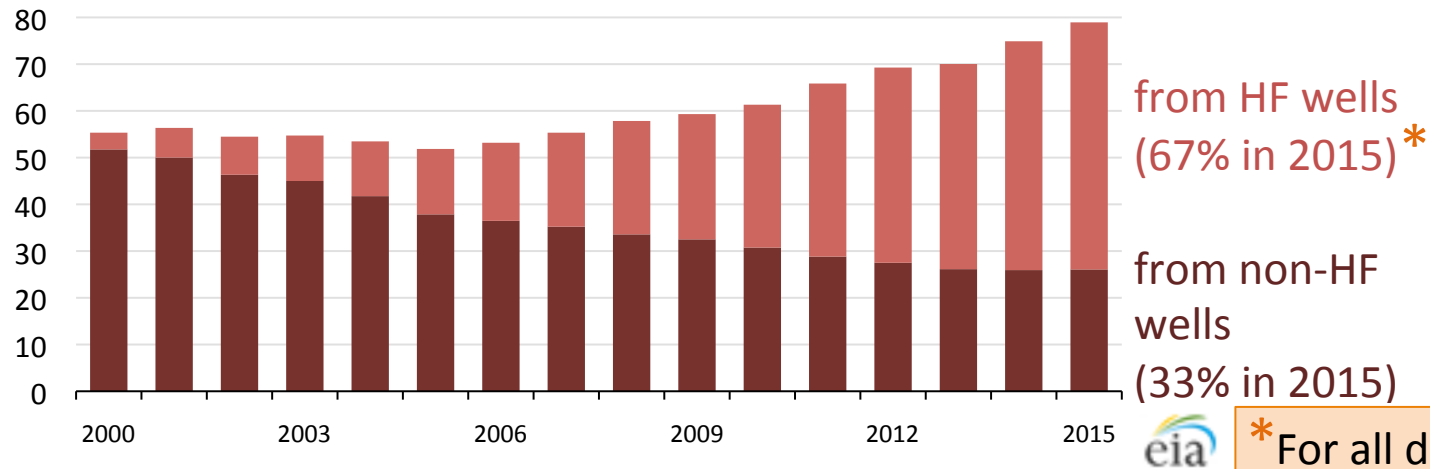
>> 3 Years of Decapitalization in a row

See pages 6-8 for a complete list of bankruptcies.
(As of September 7, 2016)

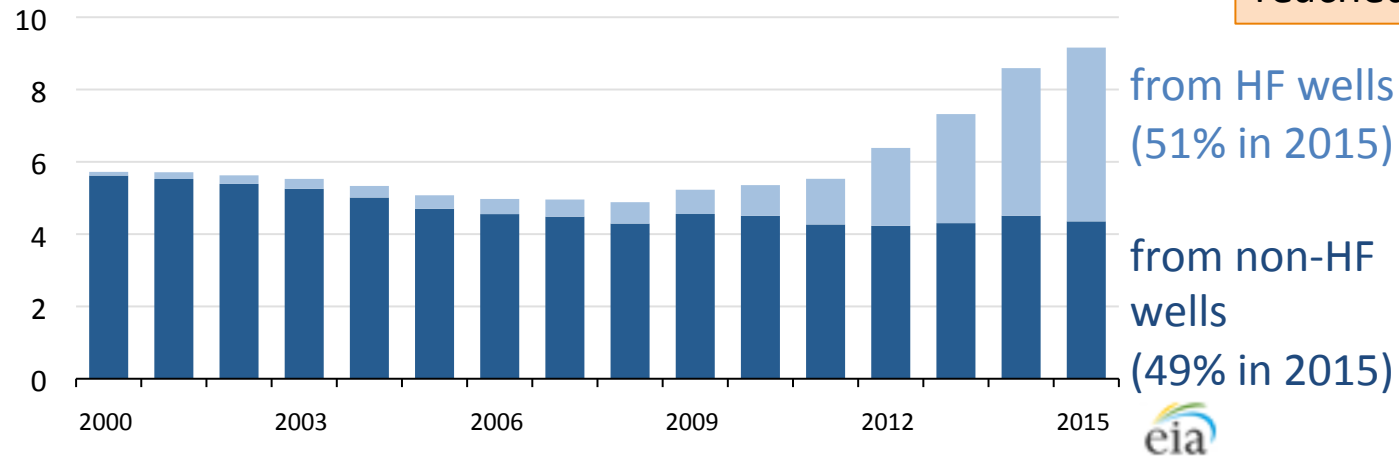
The Technology for All to See

Shares of Production Using “Hydraulic Fracturing”

Marketed NATURAL GAS PRODUCTION in the United States (2000-2015)
billion cubic feet per day



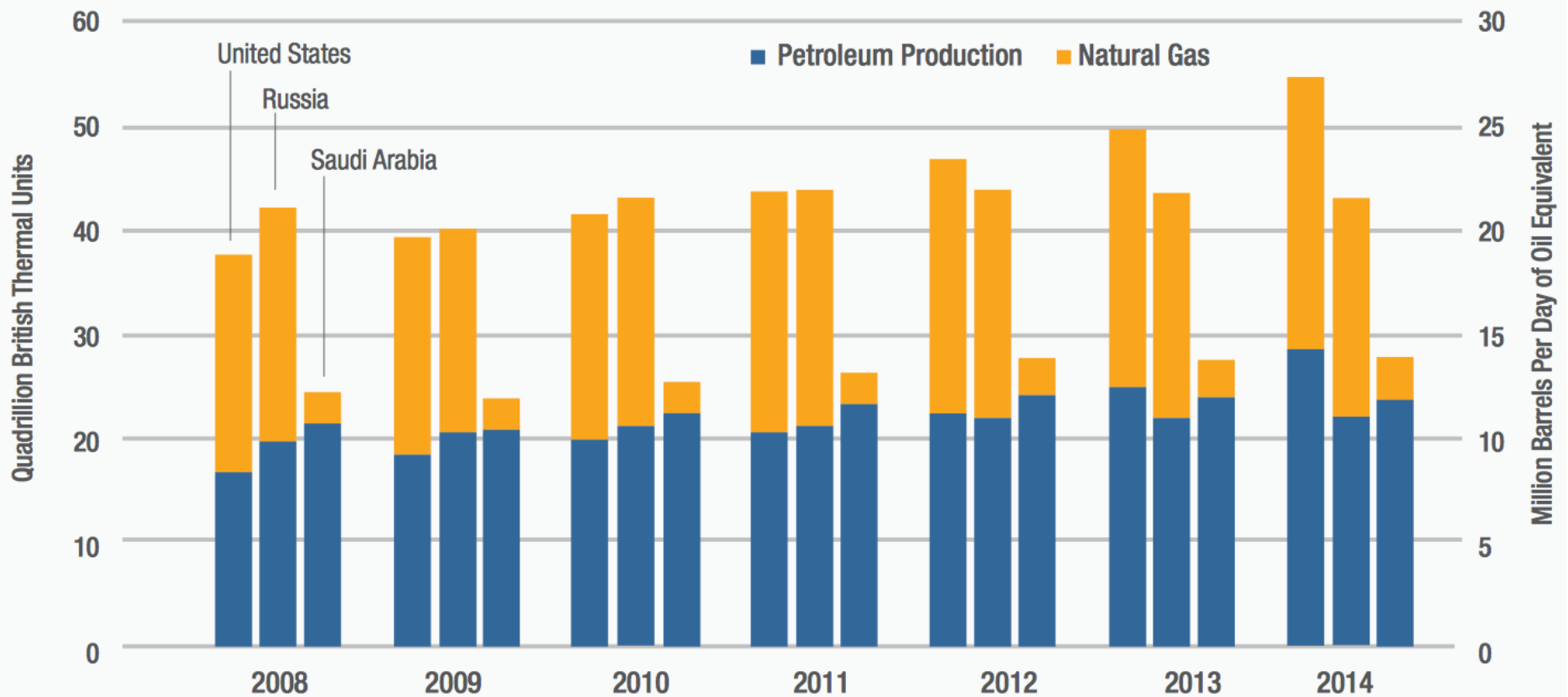
OIL PRODUCTION in the United States (2000-2015)
million barrels per day



* For all deposits. “Shale gas” share reached 57%.

An Indication of US Production on a Global Scale

U.S., Russia and Saudi Arabia Petroleum and Natural Gas Production



Source: <http://www.eia.gov/todayinenergy/detail.cfm?id=20692&src=email> April 7, 2015

<http://www.api.org/news-policy-and-issues/state-of-american-energy/the-state-of-american-energy-report>
API: redraft of EIA graphic, 2016

Chain of Events

SAVINGS

Hydraulic Fracturing of natural gas shales

- ↳ Natural gas oversupply
 - ↳ Natural gas price collapse
 - ↳ Industry shift to oil shales

Residential, Commercial, Industrial sectors
Lower wholesale electricity prices (a “multiplier” over direct fuel costs)

Hydraulic Fracturing of oil shales

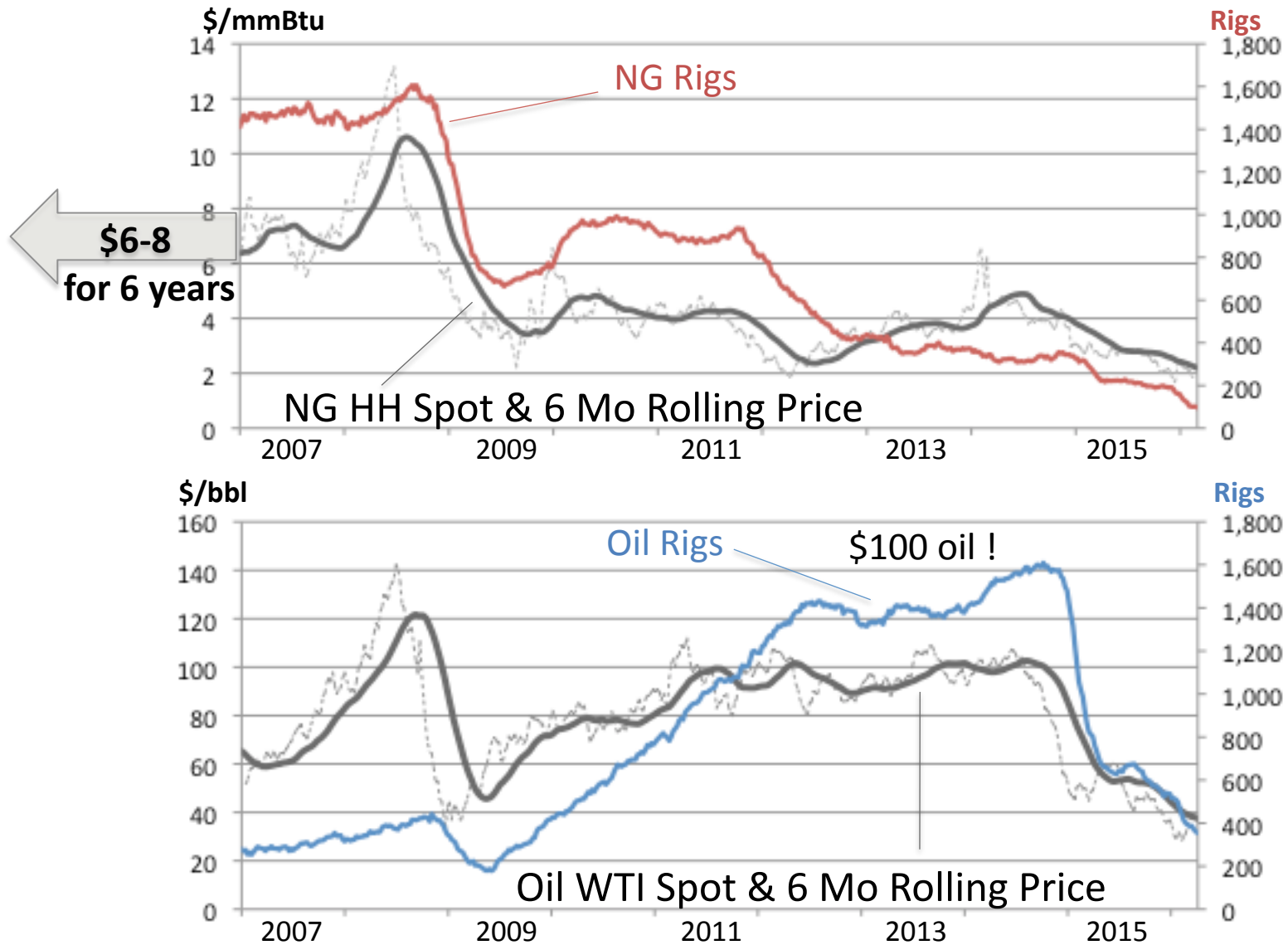
- ↳ Oil (and NGLs) oversupply
 - ↳ US/Global oil price collapse
 - ↳ Saudi vow to not cut prod’n
 - ↳ Global gas price collapse (oil-linked)
 - ↳ LNG price collapse (oil-linked)

US: Gasoline, Diesel, Jet Fuel
Global: Oil [*or Diesel, Gasoline, Naphtha, ...*]

Global pipeline gas

LNG

Sequence of US Gas Bust, Oil Boom and Bust



Simple Concept

$$\text{Pre-shale era price} - \text{Post-shale era price} \times \text{Amount consumed} = \text{Savings}$$

US Gas:

2004-2007

2010-2015

2015

**US and global oil/oil products (US: gasoline, diesel, jet fuel;
global: oil; selectively diesel, gasoline):**

2014

2015

2015

Global (non-US) pipeline gas:

2011-2013

2015

2015

LNG:

2012-2014

2015

2015

Simple Concept?

$$\text{Pre-shale era price} - \text{Post-shale era price} \times \text{Amount consumed} = \text{Savings}$$

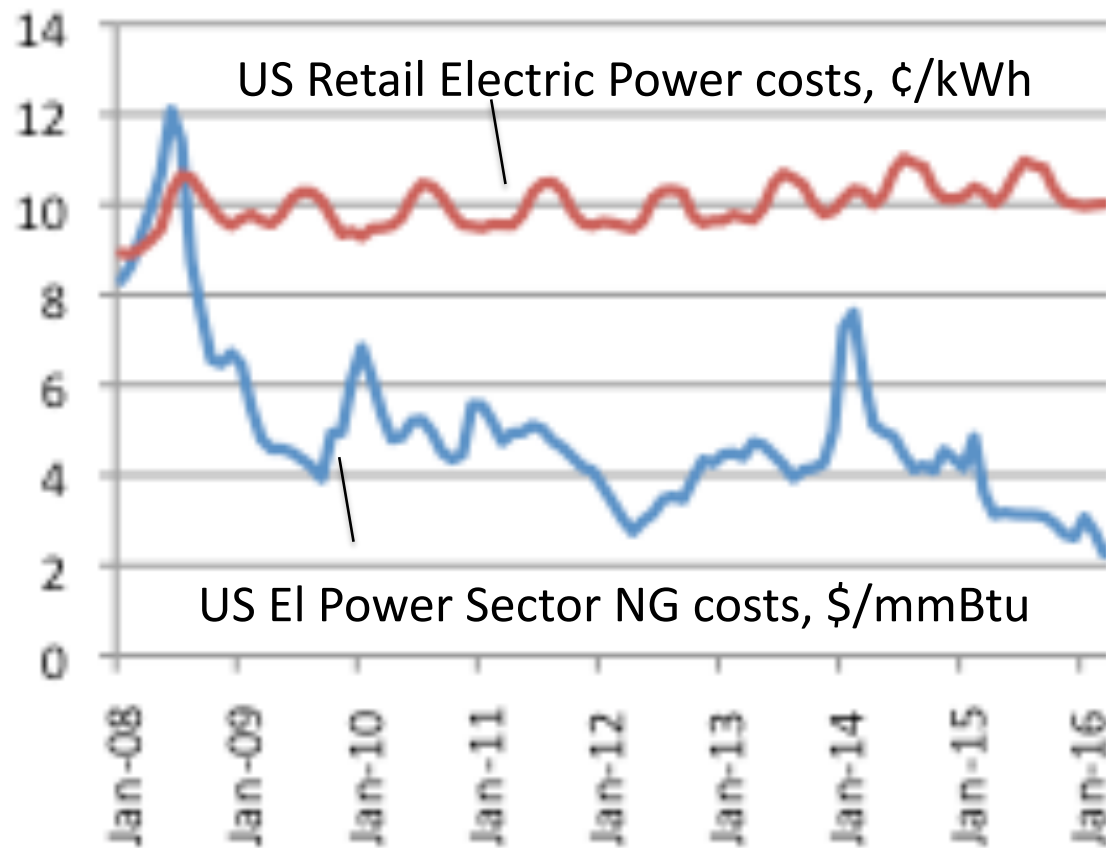
	\$/mcf	\$/mcf	Bmcf = Tcf	\$B
US Gas:		Price Declines Actual		Actual
<u>2004-2007</u>		<u>2010-2015</u> <u>2015</u>	<u>2015</u>	<u>2015</u> <u>2015</u>
Res 12.57	(1.78)	(2.19)	4.6	8.2 10.1
Com 11.03	(2.47)	(3.14)	3.2	7.9 10.1
Ind 7.66	(2.91)	(3.82)	7.5	21.8 28.7
				<u>37.9</u> <u>48.8</u>
				subtotal
El Gen 7.25	(2.79)	(3.88)	9.7	27.0 37.5
	[2.71/mmbtu]	[3.77/mmbtu]		<u>64.9</u> <u>86.3</u>
				total

The average price decline understates savings in 2015.

Electric generation poses special problems.

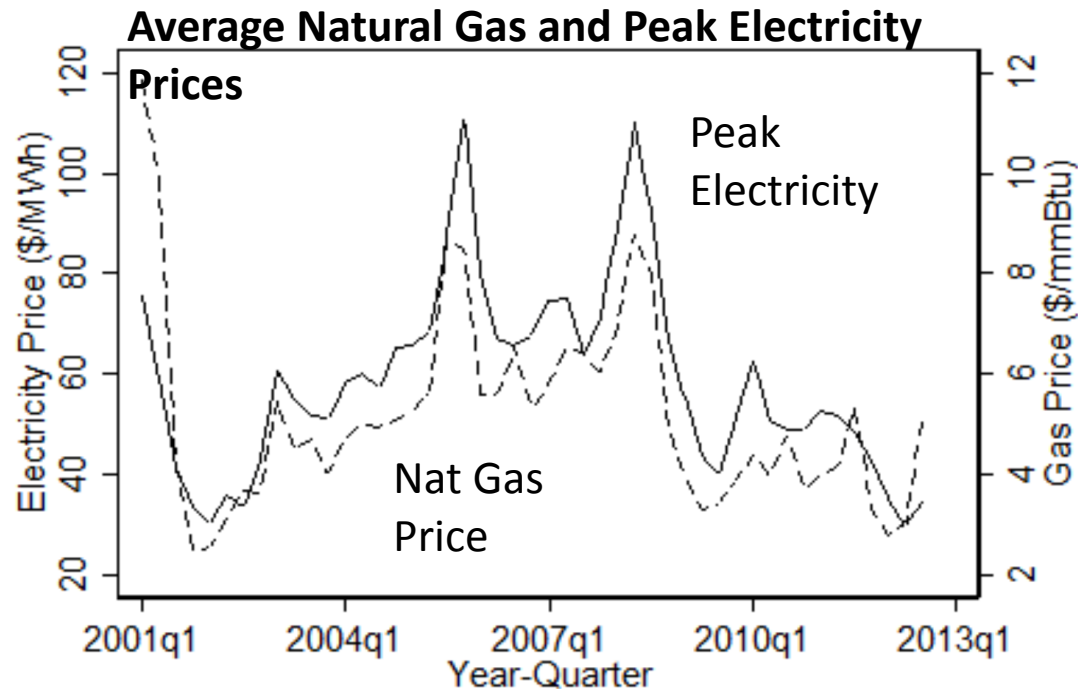
Savings in Electricity are Hidden

- Retail electric power prices increased in spite of swings and decline in natural gas costs.



The Affinity of Gas & Power Prices is Undeniable

- Electricity prices (wholesale) are closely tied to natural gas. NG turbines set marginal prices in much of the country.



- “Much of the country” means electricity should be a HUGE multiplier to the sector’s direct fuel cost savings (\$27 B).

“How do natural gas prices affect consumers and the environment?”, RFF Discussion Paper 14-19, July 2014.; J. Linn and others.

Entirely Different Approach Might Get Electricity

- Based on judgment that about 60% of electric power is linked, indirectly, to natural gas.

El Gen NG Price Decline	X	Heat Rate to make el.	X	US Power Demand	X	NG Linkage	=	Result Savings	Result Multiplier (\$48B/\$27B)
\$/mmBtu		mmBtu/MWh		Billion MWh					
\$2.71		8		3.7		60%		\$ 48.1	~1.8

- Intuitively in the ballpark
- Where are the savings? Some are passed on. Most are combined with offsetting expenses, shielding customers from even higher retail prices.

Tackling Global Impacts

Emphasis on Sound Documentation and Oil-linked Pricing

Mostly a matter of pruning.

- **Oil:** W Europe (13 countries), Israel, Australia/NZ, and JKT (Japan, South Korea and Taiwan). *Not Turkey, China, India, S. America, Africa...*
- **Gas:** Pipeline imports only, W Europe (9 countries)
- **LNG:** W Europe (5 countries), JKT, China and India

Multiple sources provided corroboration of results and quantified the extent of oil-linked pricing.

BP 2016 *Statistical Review of Energy* (June), IEA *World Oil Market Report* (May), Int'l Gas Union: *World LNG Report* (April) and *Wholesale Gas Price Survey* (May)

Price Barometer 1

World LNG Estimated Landed Prices: Sep-14



Price Barometer 2

World LNG Estimated Landed Prices: Dec-15



Price Barometer 3

World LNG Estimated Landed Prices: Aug-16



Results

SAVINGS

Hydraulic Fracturing of natural gas shales

↳ Natural gas oversupply

\$37.9 B

US Residential, Commercial, Industrial sectors

\$27 B (fuel cost alone) -> 48.1 B

US wholesale electricity prices

Hydraulic Fracturing of oil shales

↳ Oil/products oversupply

\$221 B

US Gasoline, Diesel, Jet Fuel
US subtotal: \$307 B

\$366 B

Global Oil (excl. US), subset of countries

\$30 B

Global (excl. US) pipeline gas, subset of countries

\$52 B
=====

LNG, subset of countries

Total: \$755 B

Non-US subtotal: \$448 B



Some Qualifying Comments

- \$755 billion is a pretty big statement.
- Don't take my word for it – see the excruciating details
 - AAPG -> Division -> EMD -> EMD Committees -> Energy Economics and Technology: *Committee Report, June 18th*
- Many assumptions are conservative, e.g.
 - 2015 NG prices much lower than 2010-2015 averages. Many countries/types of oil products left out (less complete or less confidence in data). Economy-wide (GDP) multipliers due to oil/etc. savings are ignored altogether.
- Hydraulic fracturing-induced “supply shock” strongest for 2015, weaker thereafter. LNG an exception?
- Level of distrust in “fracking” is stunning. ... Is it all just too new? What if ...?

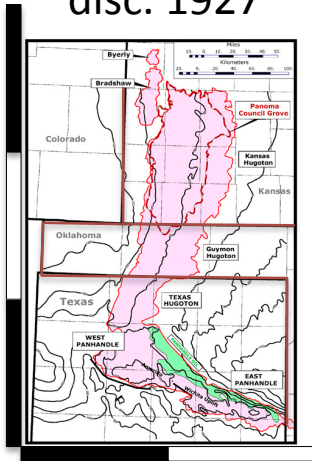
What If?

What if a 500 Tcf NG resource had been found in Kansas in 1967?

Urengoy/Yamburg
disc. 1967 ff.

Maybe we (as a society)
are still just getting used
to this windfall.

Hugoton-
Panhandle
disc. 1927



~80 TCF
EUR

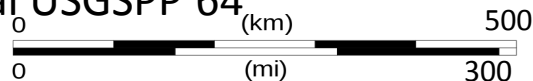
Sorenson, AAPG
Search & Discov.
2003



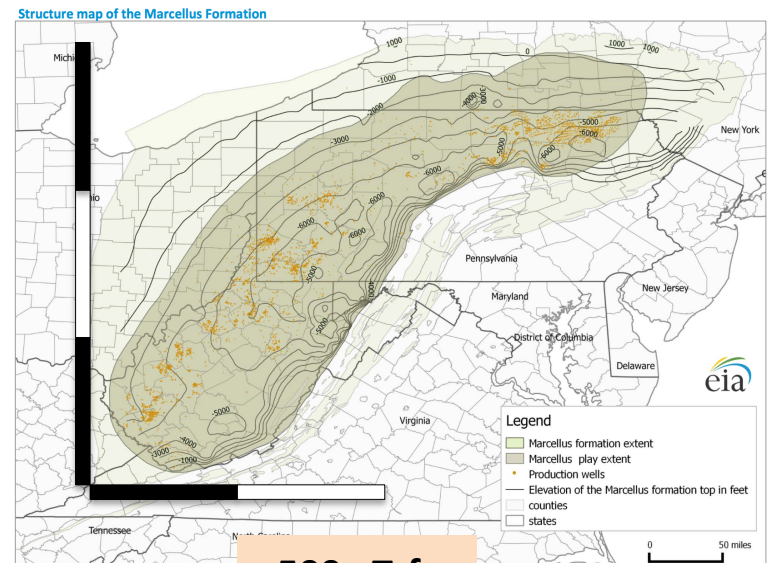
~200 TCF
EUR

~350 TCF
EUR

C. Wurst, *Der Spiegel*, 2007 and Gazprom
Pierce et al USGSP'64



Marcellus



~500+ Tcf

EIA Dec 2014
and auth. est. per PGC '14 report

scales: 300 mi tall, 200 mi wide