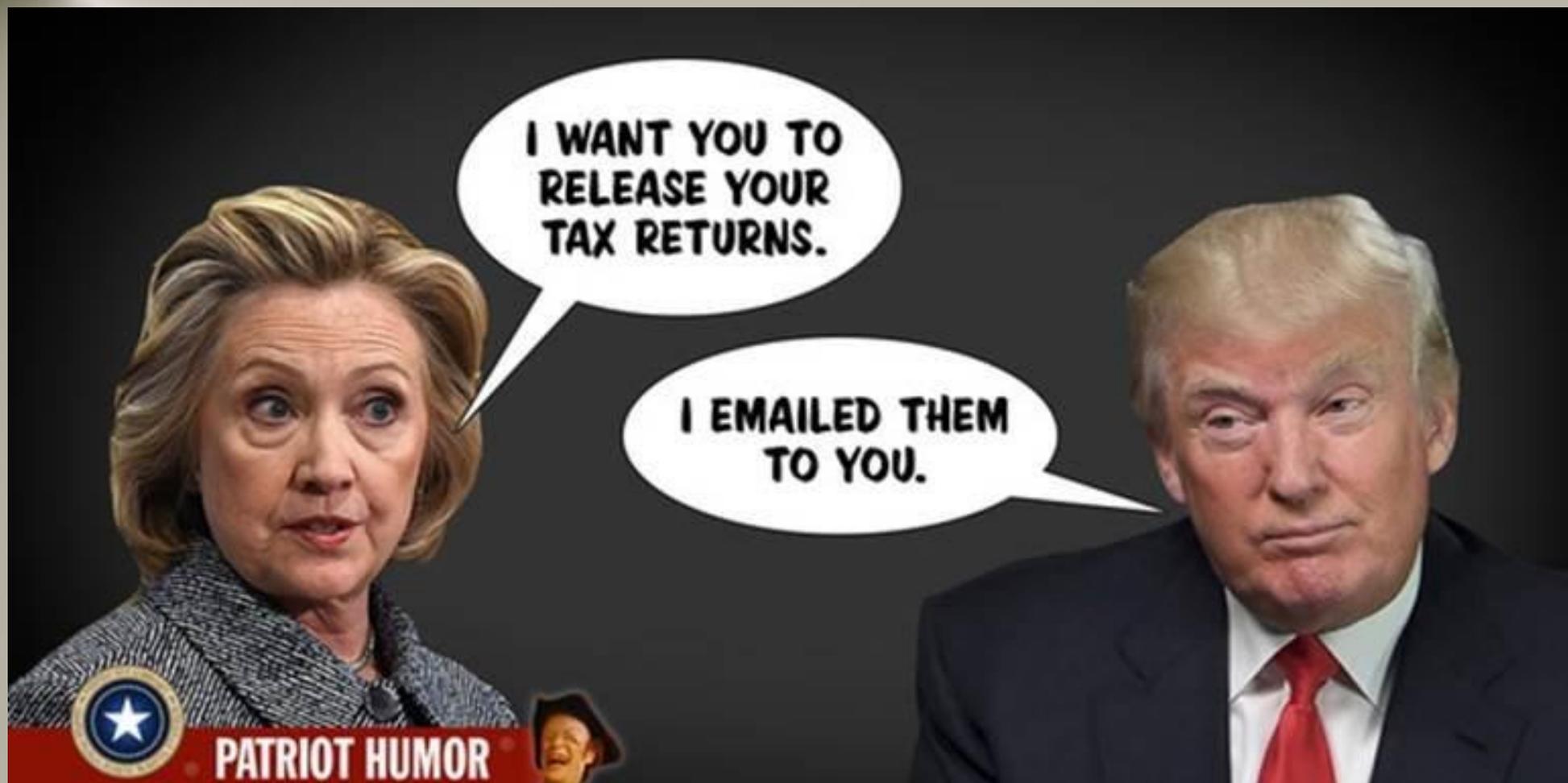




American Association Of Port Authorities

October 26, 2016

**Dr. Loren C. Scott
Loren C. Scott & Associates, Inc.
www.lorencscottassociates.com**



I WANT YOU TO
RELEASE YOUR
TAX RETURNS.

I EMAILED THEM
TO YOU.



PATRIOT HUMOR



A red ribbon is visible in the top-left corner of the slide, partially overlapping the white background.

The Oil Sector

What the heck happened?!

The important impact on GOM ports especially



HIS - Shale plays Responsible for:

U.S. oil production up 85% since 2008---highest growth of any country in world over that period

Impact on Imports of Crude Oil

- **2015:**
 - U.S. Production: 9.3 mmb/d
 - U.S. Imports: 7.3 mmb/d (44%)
- **2008:**
 - U.S. Production: 5.0 mmb/d
 - U.S. Imports: 9.8 mmb/d (66%)
- **Guess who lost 0.5 mmb/d in sales to U.S.?**



Each shale play is different

Technology not as easily transferable

North Dakota's Bakken Field: A Hard Rock Shale

- **2003: 10,000 b/d produced**
- **2015: 1,200,000 b/d produced---120-fold increase**
- **ND 100,000 b/d away from replacing Louisiana as 2nd largest source of domestic oil**

Tuscaloosa Marine Shale: A Clayey Shale



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Result: Different Plays

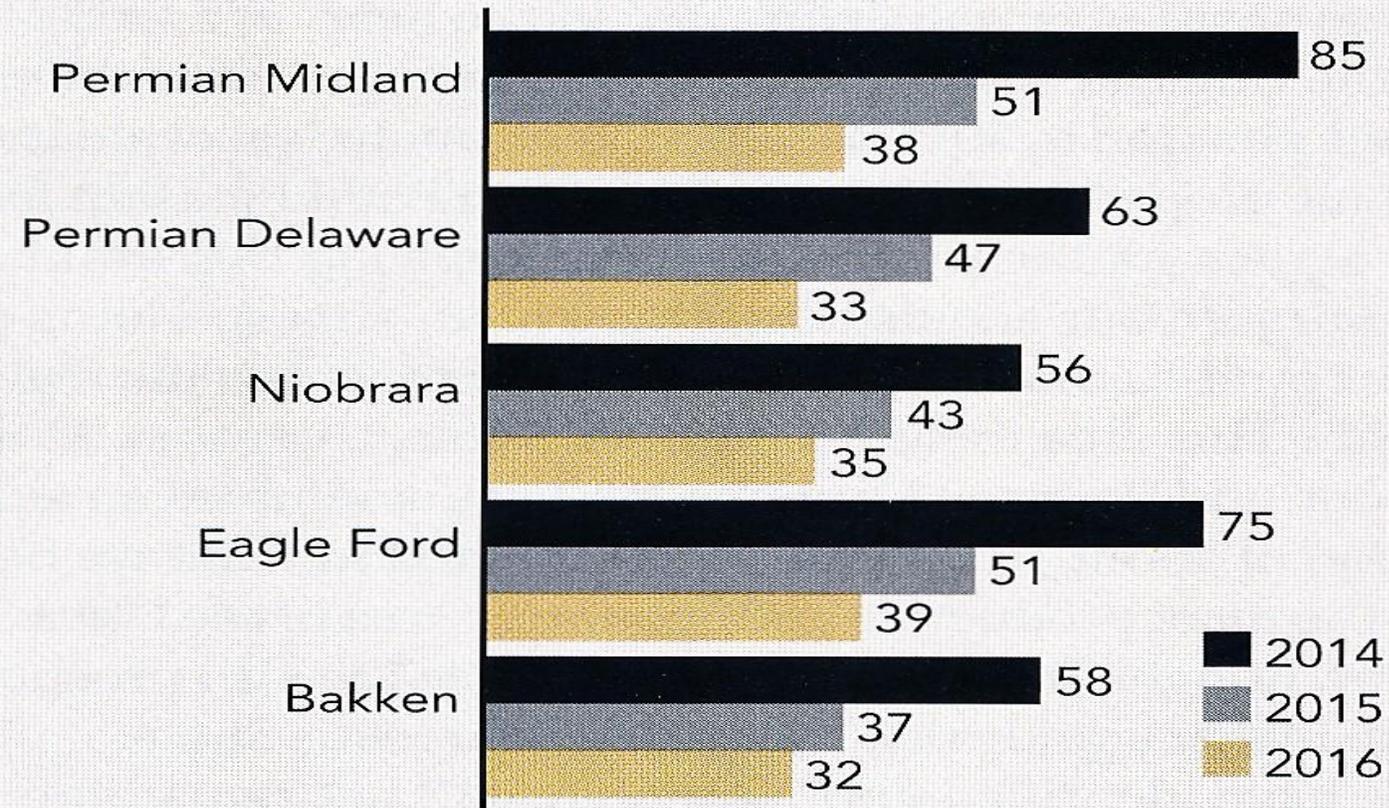
Different Breakeven Prices

Breakeven Oil Prices by Play

(Rodgers Oil & Gas Consulting)

- **Monterey (CA)** \$36
- **Eagle Ford (TX)** \$49
- **Bakken (ND)** \$50
- **Granite Wash (OK)** \$57
- **Niobrara (CO)** \$66
- **Tuscaloosa (MS)** \$69
- **Tuscaloosa (LA)** \$92

Wellhead breakeven prices by play and spud year (USD/boe)



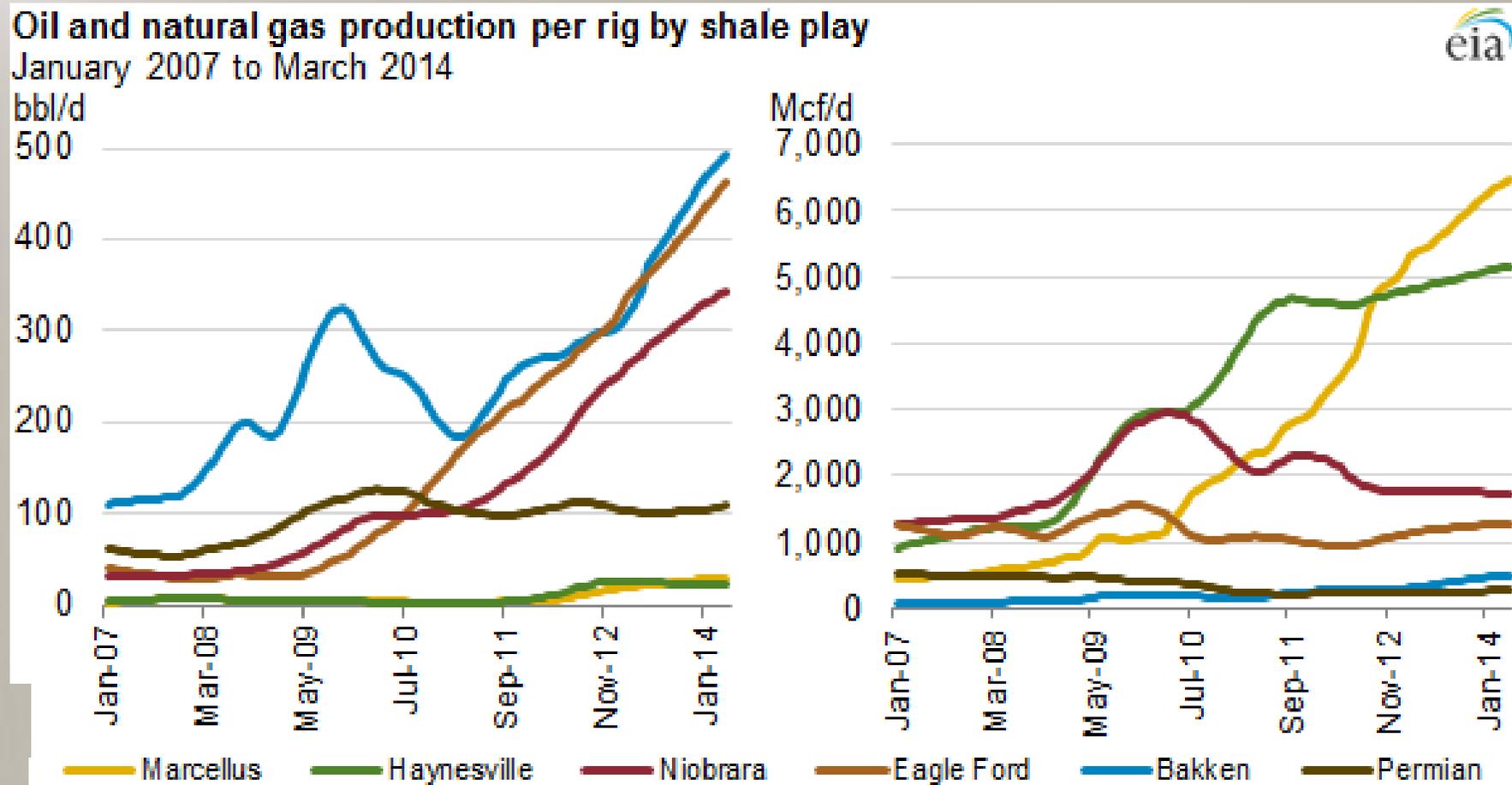
Rystad Energy's monthly NASReport includes analysis of current activity and economic potential of shale gas and tight oil plays in the US and Canada.



Plus more output per well

Daily Output Per Well

(Bakken @ 896 & Eagle @ 1,170 10/16)



Breakeven Within Each Play: **These Are Averages**

- **Monterey (CA)** **\$36**
- **Eagle Ford (TX)** **\$49**
- **Bakken (ND)** **\$50**
- **Granite Wash (OK)** **\$57**
- **Niobrara (CO)** **\$66**
- **Tuscaloosa (MS)** **\$69**
- **Tuscaloosa (LA)** **\$92**

Breakeven Within Plays: Bakken

| <u>County</u> | <u>BE</u> |
|---------------|-----------|
| Dunn | \$29 |
| McKenzie | \$30 |
| Williams | \$36 |
| Stark | \$37 |
| Mountrail | \$41 |
| Billings | \$44 |

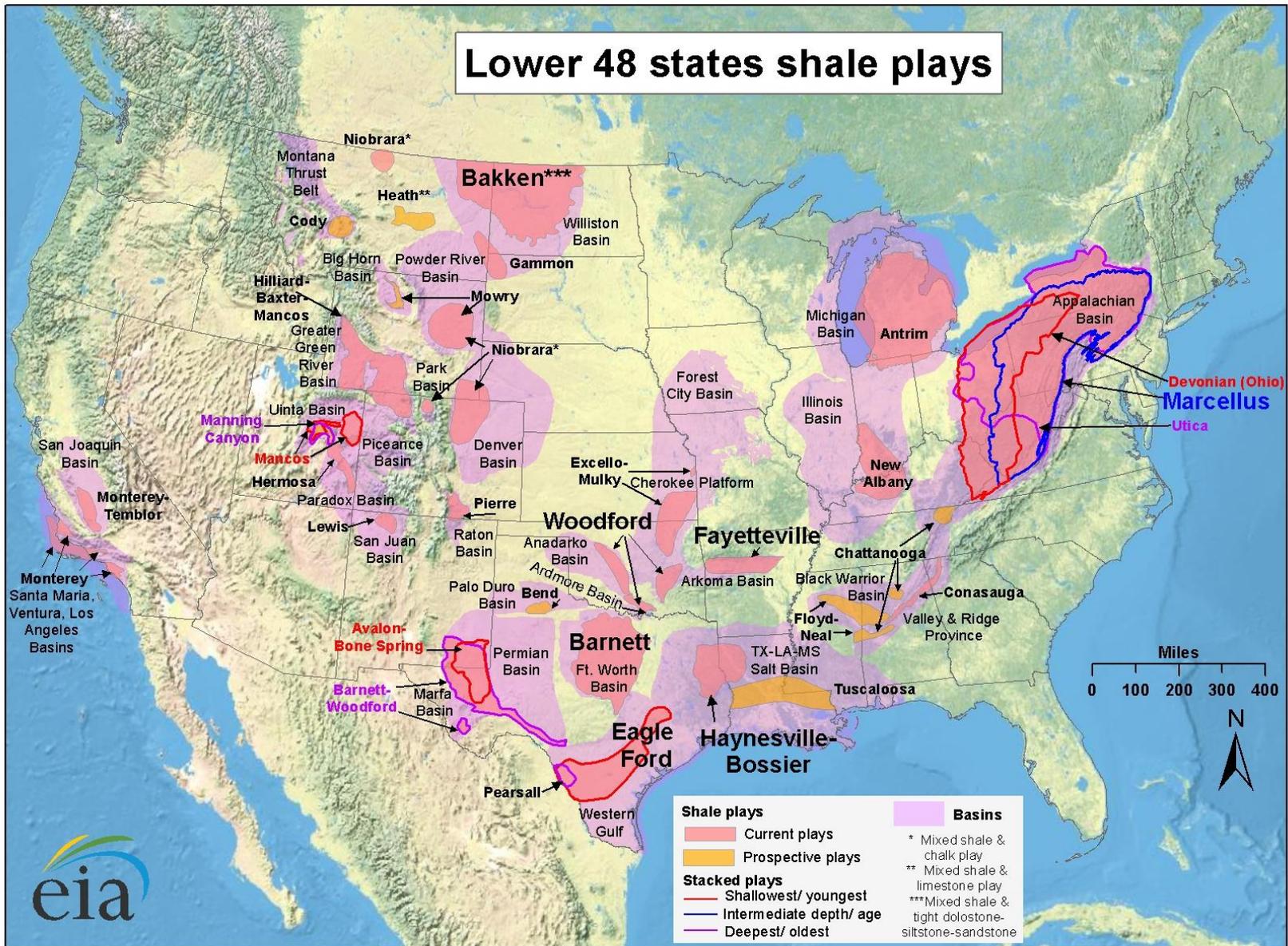
| <u>County</u> | <u>BE</u> |
|---------------|-----------|
| BOT-REN | \$52 |
| Burke | \$62 |
| Divide | \$73 |
| BOW-SLP | \$75 |
| McLean | \$77 |

• Only 6 rigs outside green in 2/15

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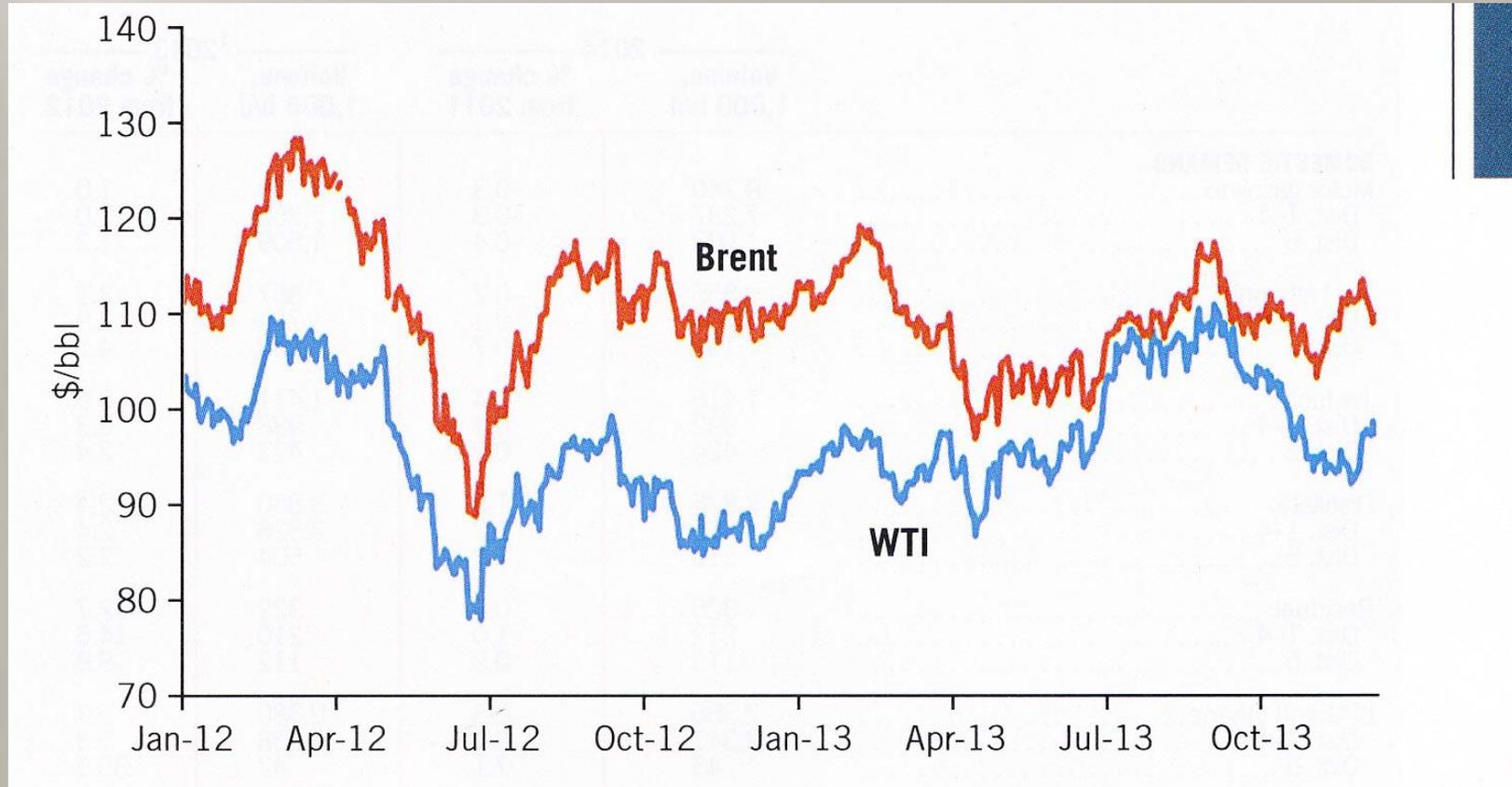
Weird Bakken Effect on Oil Prices

Lower 48 states shale plays

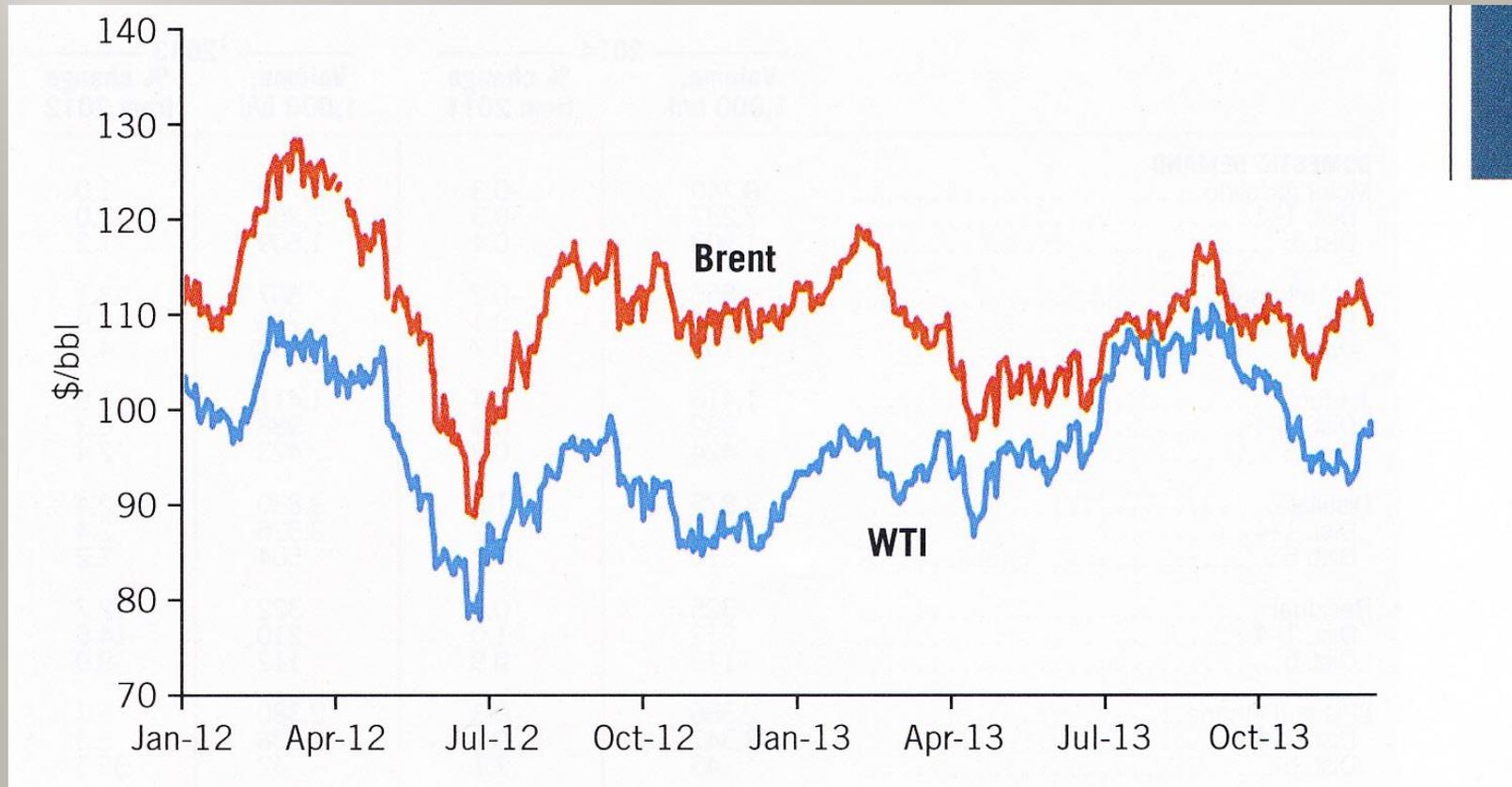


Source: Energy Information Administration based on data from various published studies.
 Updated: May 9, 2011

Oil Price Trends



Oil Price Trends



Desire to Export Oil

- **Key to recent price decline**
- **Export of petroleum had been illegal since 1970s**
- **Export of petroleum products is legal**



What is a “product”?

Is a field-level \$500K to \$5mm facility to strip off volatile propane and butane so condensate can safely flow through pipelines make it a “product”?



Why have oil prices declined?

Why did they drop so quickly?

Was it rising U.S. Production?

Quick drop: Look to Saudis



Saudis & OPEC

**Is it a desire to enforce discipline within
OPEC---a' la 1982?**

Or a desire to maintain market share?



**Main restraint on consistently lower
oil prices:**

“Let’s have a meeting!”

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Kill the Edges:

Impact on U.S. already happening

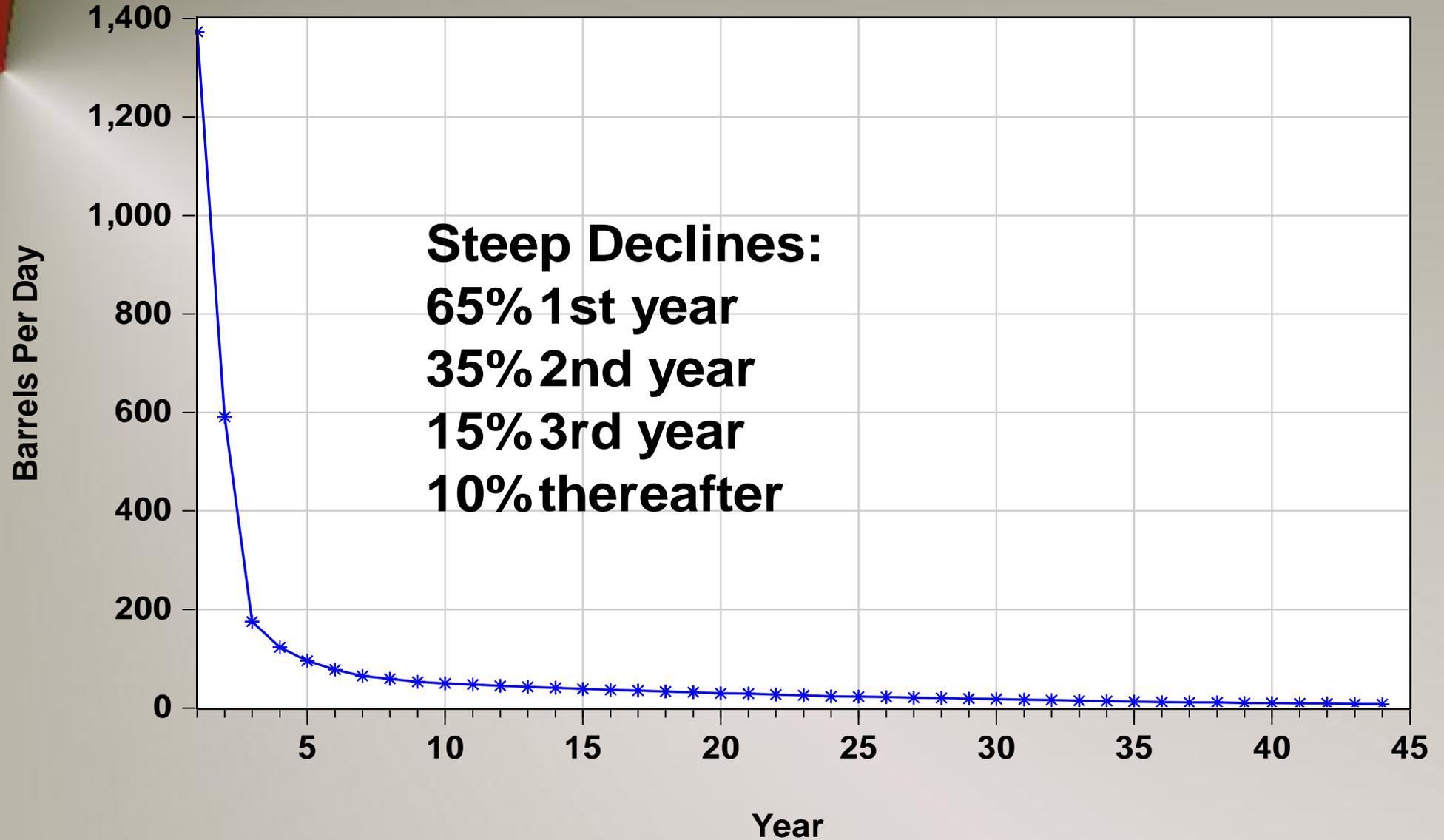
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US Oil Production Heading South

**Peaked 9.6 mmb/d 4/15;8/16 at 8.49 mmb/d;
to 8.1 mmb/d by 12/16**



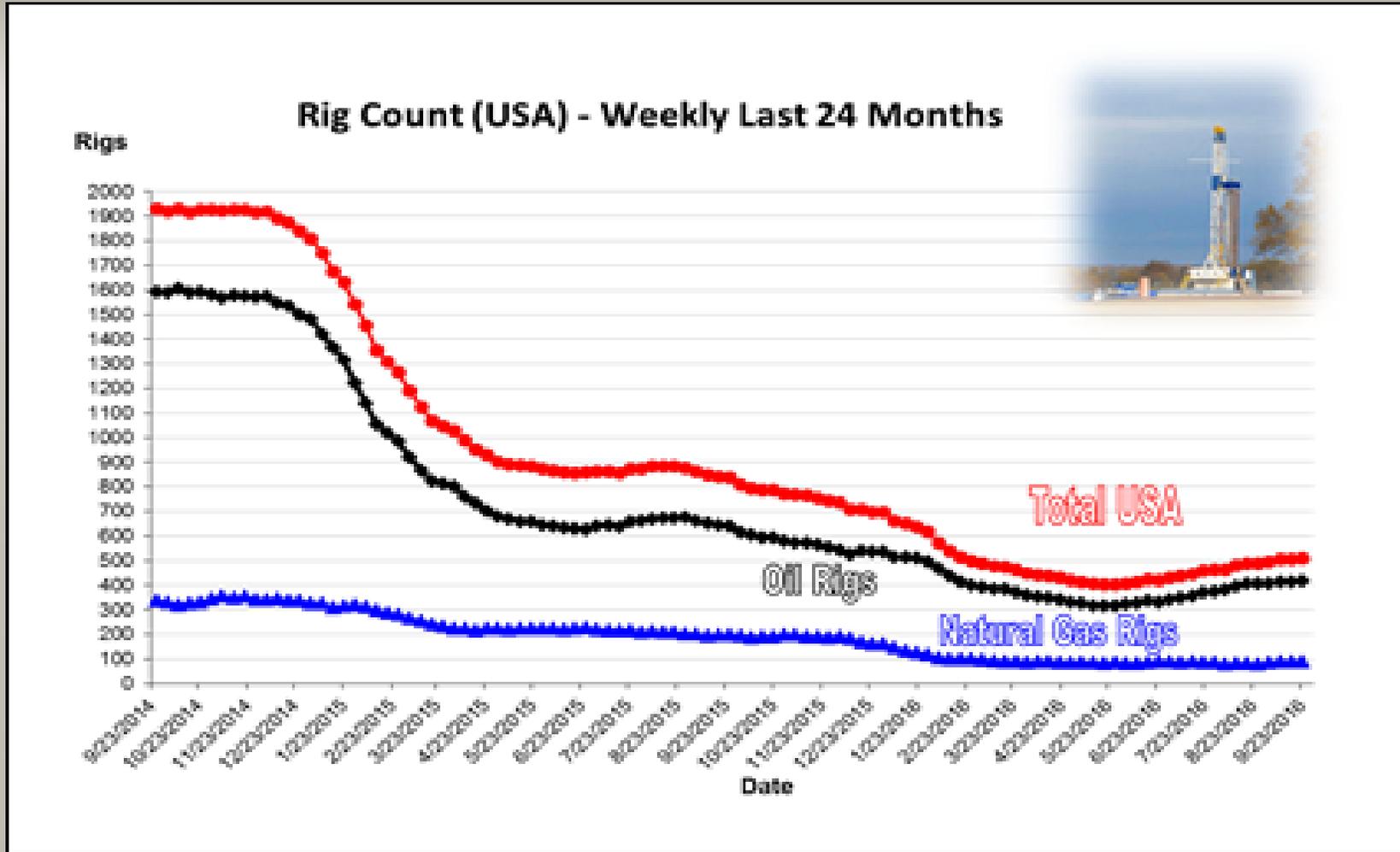
Typical Bakken Well Production



Steep Declines:
65% 1st year
35% 2nd year
15% 3rd year
10% thereafter

Source: ND Dept of Mineral Resources

Down 77% Since 9/14





Communicating well?
How to make a little old lady curse?

Have another little old lady yell “bingo”!

A red ribbon-like corner is visible in the top-left corner of the slide, casting a soft shadow onto the light gray background.

**Production would be down further
were it not for:
GOM Production**

Record GOM Output by 2017

1.54 mmb/d in 2014
1.63 mmb/d in 2016;
1.91 mmb/d end of 2017

Deepwater Gulf of Mexico field starts (2015)

| Field name | Majority operator | Associated project | Water depth (ft) | Discovery year |
|---------------|-------------------|--------------------|------------------|----------------|
| Silvertip | Shell | Perdido | 9,280 | 2004 |
| West Boreas | Shell | Mars B | 3,094 | 2009 |
| Hadrian South | ExxonMobil | Lucius | 7,983 | 2009 |
| Lucius | Anadarko | Lucius | 7,168 | 2009 |
| Deimos South | Shell | Mars B | 3,122 | 2010 |
| Big Bend | Noble Energy | Rio Grande | 7,273 | 2012 |
| Marmalard | LLOG Exploration | Delta House | 6,148 | 2012 |
| Dantzler | Noble Energy | Rio Grande | 6,580 | 2013 |

Record GOM Output by 2017

1.54 mmb/d in 2014

1.63 mmb/d in 2016

1.91 mmb/d end of 2017

Anticipated Deepwater Gulf of Mexico field starts (2016-17)

| Field name | Majority operator | Water depth (ft) | Discovery year | Anticipated production start |
|--------------------|-------------------|------------------|----------------|------------------------------|
| Stones | Shell | 9,556 | 2005 | 2016 |
| Gunflint | Noble Energy | 6,138 | 2008 | 2016 |
| Heidelberg | Anadarko | 5,271 | 2009 | 2016 |
| Holstein Deep | Freeport McMoRan | 4,326 | 2014 | 2016 |
| Son of Bluto 2 | LLOG Exploration | 6,461 | 2012 | 2017 |
| Horn Mountain Deep | Freeport McMoRan | 5,400 | 2015 | 2017 |

Source: U.S. Energy Information Administration, Short-Term Energy Outlook, February 2016

ted project Water depth (ft) Discovery year

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The GOM is critical for some GOM ports

How do we think about it?

GOM Bad News

- **Rig Count:**
 - August 2014: 56
 - 2016: 16
- **ConocoPhillips announcement**
- **2 companies paid about \$500,000 a piece to cancel drillship contracts**
- **Western Gulf Lease Sales:**
 - 2014: 14 firms; 93 bids
 - 2016: 3 firms; 24 bids

GOM Bad News

- **Well costs**
 - Bakken: \$8mm **and falling**
 - GOM: \$130-\$230 mm **and rising**
- **14 new production platforms require 1/4th service boats as drillships and drilling platforms**
- **BSEE well control rules**
 - Wood McKenzie: Capex in GOM falls \$11 billion and rig count to 10

GOM Good News

- **Exploration companies and service companies working to lower well costs in GOM:**
 - 2014: BE = \$70-\$80
 - Now: BE = \$55-\$60
- **70% of well cost expense from new BSEE rules:**
“drilling margin”
 - Exploration cos & BSEE near agreement on procedures that insure safety but not such high costs

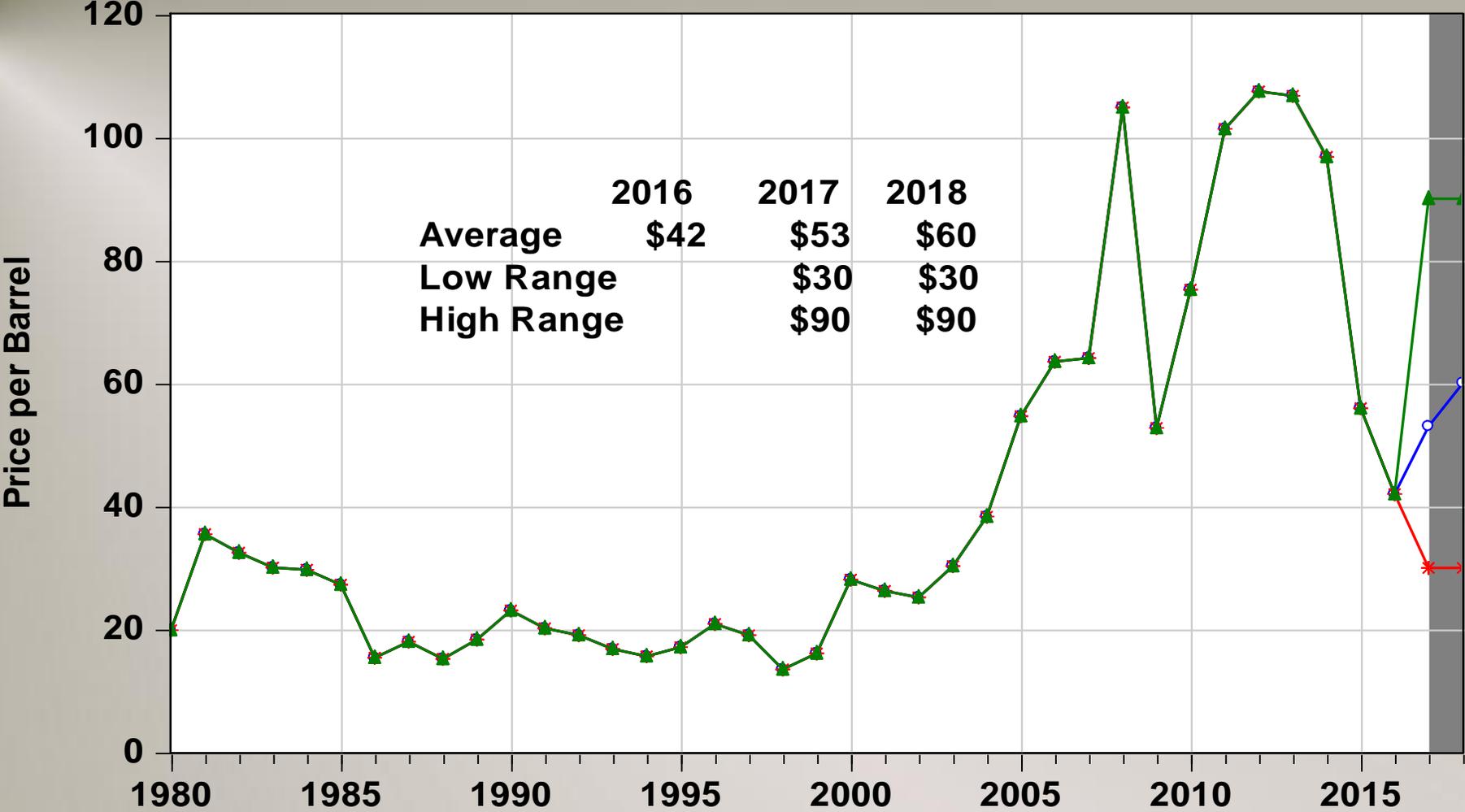
GOM Good News

- **Well production 1st year and decline curve**
 - **Bakken Play: 800 b/d & steep decline**
 - **Chevron's St. Malo Field : 14,000 b/d per well & shallow decline**

What Is the “Market” Saying

- **Futures market is in “contango”**
 - Spot **Sept. 24, 2015** = \$44.48
 - Future June 2016 = \$48.56
 - Future December 2016 = \$50.63
 - Spot **Feb. 8, 2016** = \$29.69
 - Future December 2016 = \$39.53
 - Spot **Oct. 19, 2016** = \$50.29
 - Future December 2017 = \$54.20

Figure 5: Oil Price Forecasts





Things are tough

But they could be tougher...



Burning House

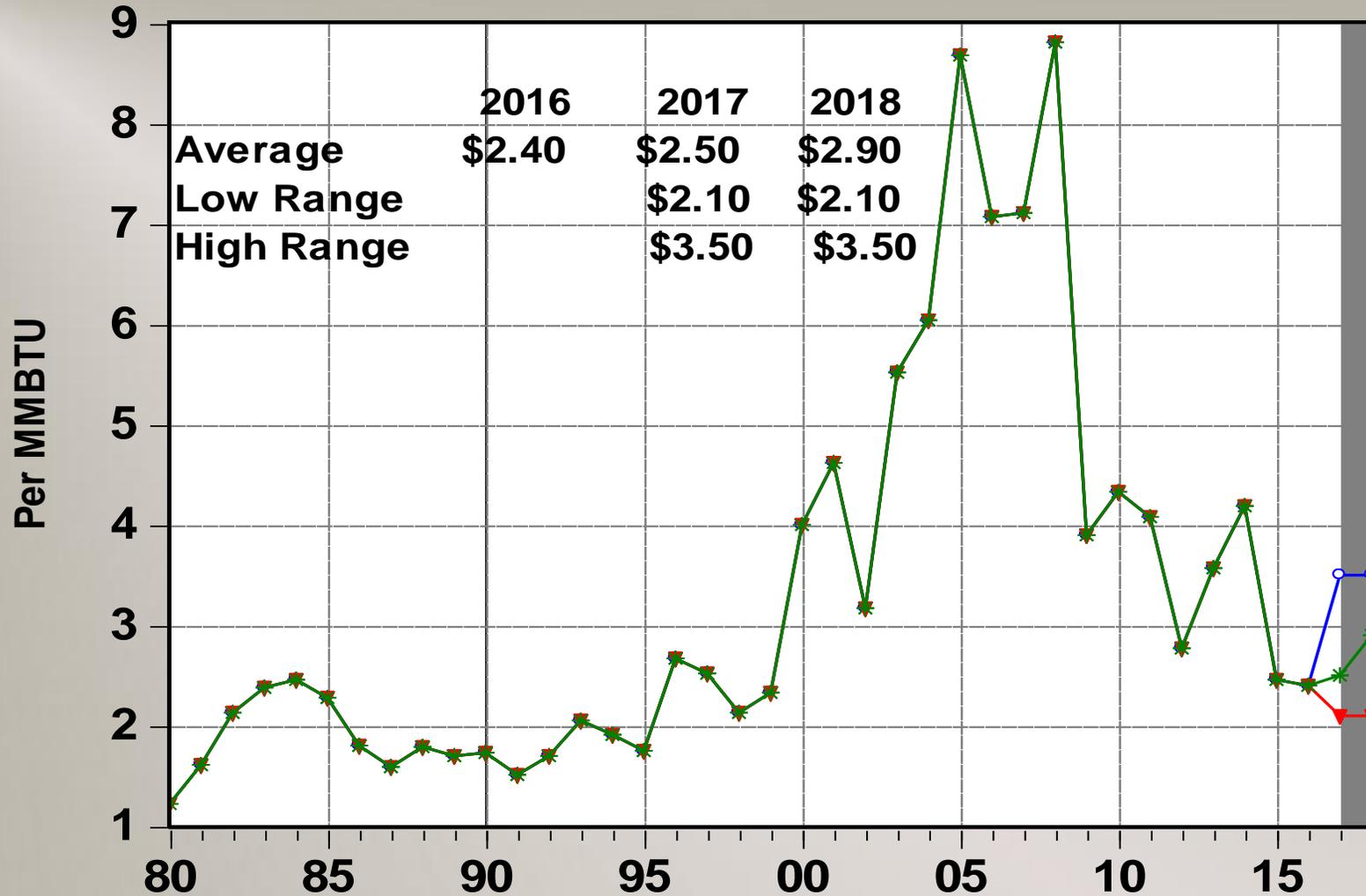
- **Later reported that his wife got out safely.**
- **He did indeed par the hole.**
- **He said divorce was not going to be so bad now that there is no house involved....**

Amazing Industrial Boom: Case of Louisiana

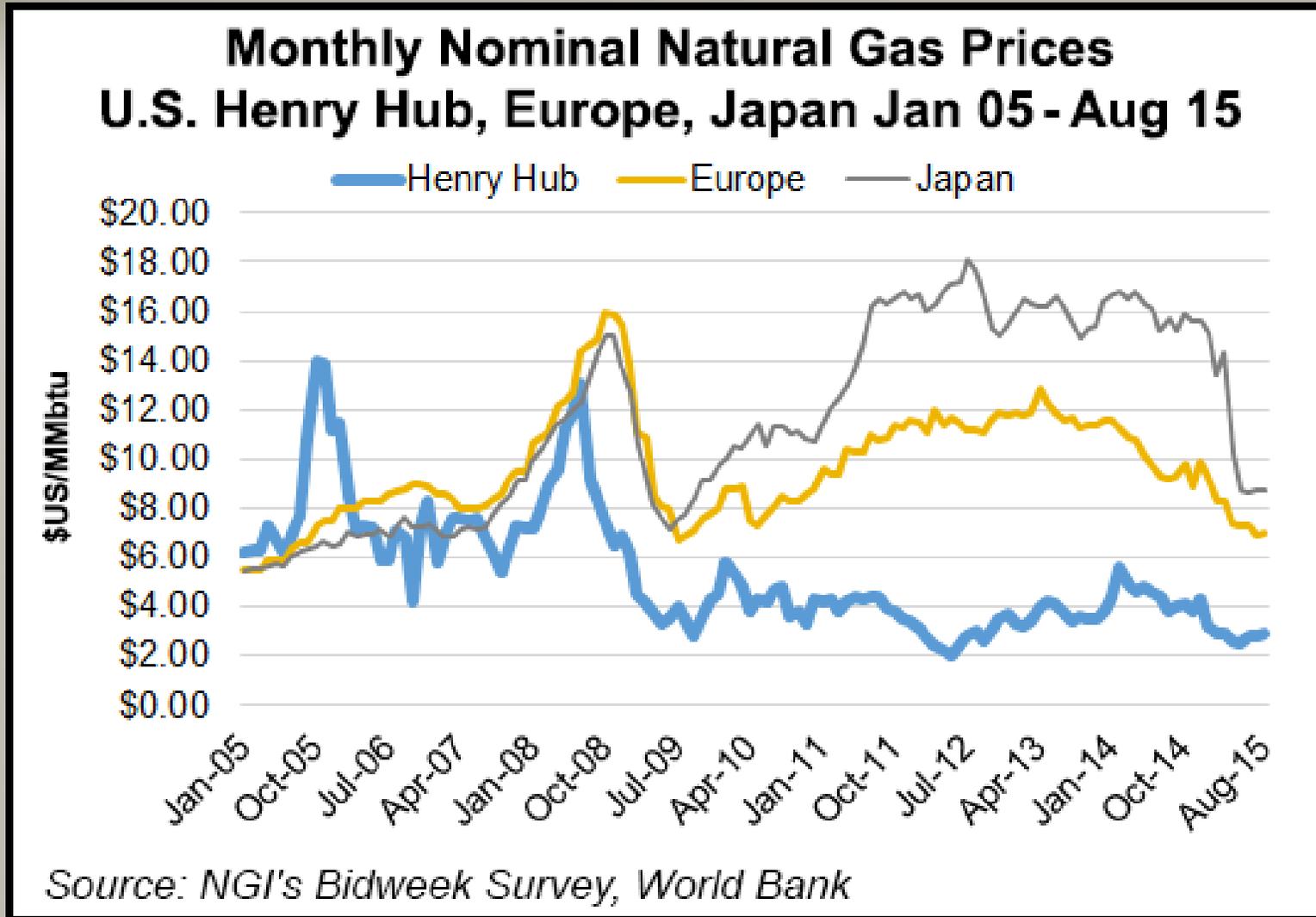
- **Past: Good year = \$5 billion**
- **GRIMA Survey: \$134.8 Billion! (8/16)**
- **Highly concentrated by industry;**
 - **Chemicals = \$50.4 billion**
 - **LNG Exports = \$67.1 billion**
- **Highly concentrated geographically**
 - **Baton Rouge to New Orleans: \$38.0 billion**
 - **Lake Charles MSA: \$96.4 billion**

Reasons for the Boom

Fig. 7: Price of Natural Gas



Global Natural Gas Prices



Of \$134.8 Billion Announced

- Statewide:

- \$59.2 billion underway or completed

- \$75.6 billion @ FEED or permitting stage



LNG Component:
In LA: 2 Under Construction
5 at FEED stage

What are the threats?

Relative Cost: LNG

| | Oil Price = \$100 |
|---|--------------------------|
| Foreign Supplier Charge (15% of Oil Price) | \$15 mmbtu |
| Louisiana Supplier Charge | |
| Henry Hub Price | \$3.50 |
| 15% for liquefaction | \$0.53 |
| Capital Recovery cost | \$3.50 |
| Transportation to Asia | \$2.00 |
| Total Louisiana Supplier Charge | \$9.53 |

Relative Cost of LNG

| | Oil Price = \$100 | Oil Price = \$50 |
|---|-------------------|---------------------|
| Foreign Supplier Charge (15% of Oil Price) | \$15 mmbtu | \$7.50 mmbtu |
| Louisiana Supplier Charge | | |
| Henry Hub Price | \$3.50 | \$2.50 |
| 15% for liquefaction | \$0.53 | \$0.53 |
| Capital Recovery cost | \$3.50 | \$3.50 |
| Transportation to Asia | \$2.00 | \$2.00 |
| Total Louisiana Supplier Charge | \$9.53 | \$8.53 |

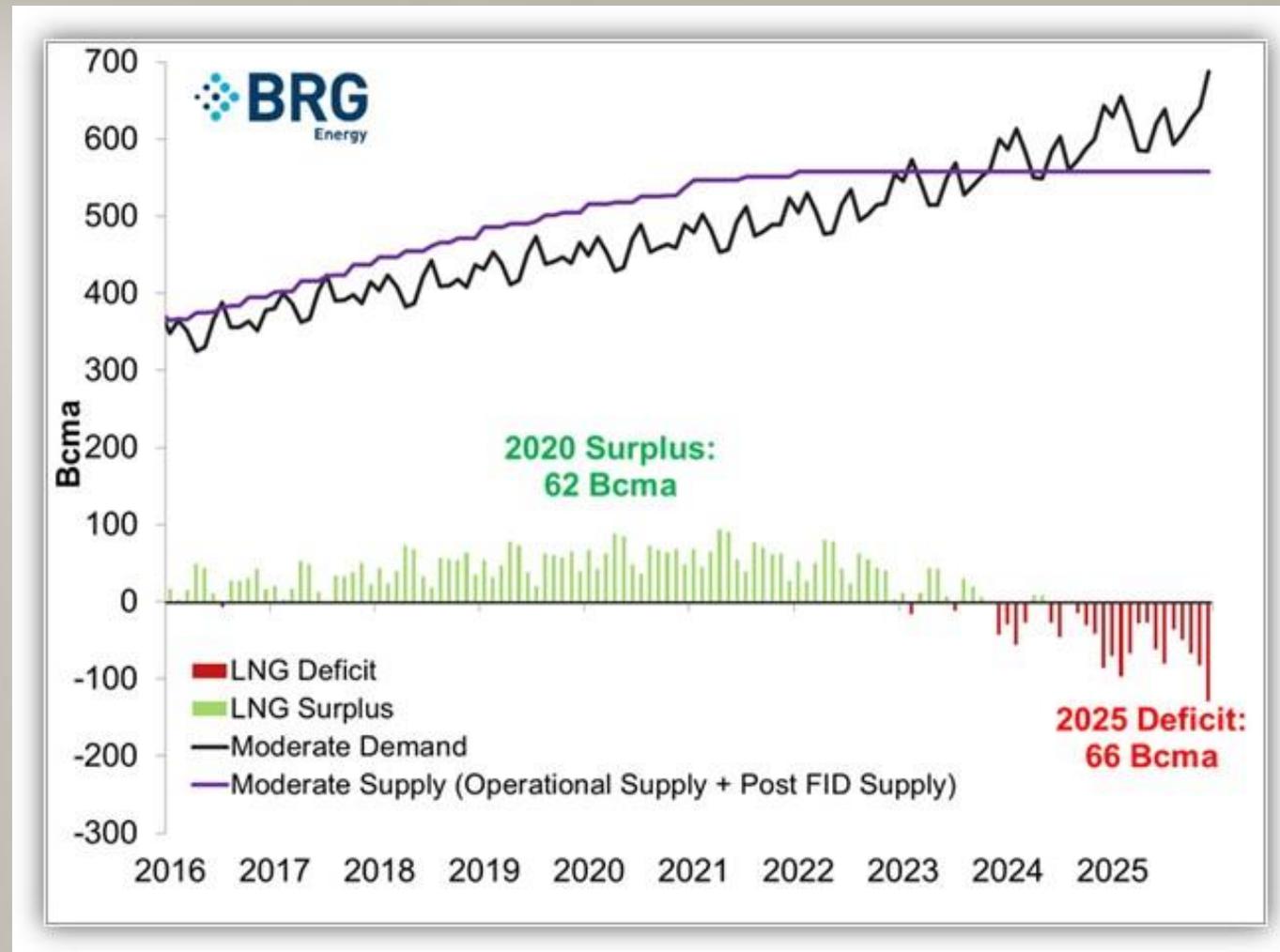
Relative Cost of LNG

| | Oil Price = \$100 | Oil Price = \$50 |
|---|-------------------|------------------|
| Foreign Supplier Charge (15% of Oil Price) | \$15 mmbtu | \$7.50 mmbtu |
| Louisiana Supplier Charge | | |
| Henry Hub Price | \$3.50 | \$2.50 |
| 15% for liquefaction | \$0.53 | \$0.53 |
| Capital Recovery cost | \$3.50 | \$3.50 |
| Transportation to Asia | \$2.00 | \$2.00 |
| Total Louisiana Supplier Charge | \$9.53 | \$8.53 |

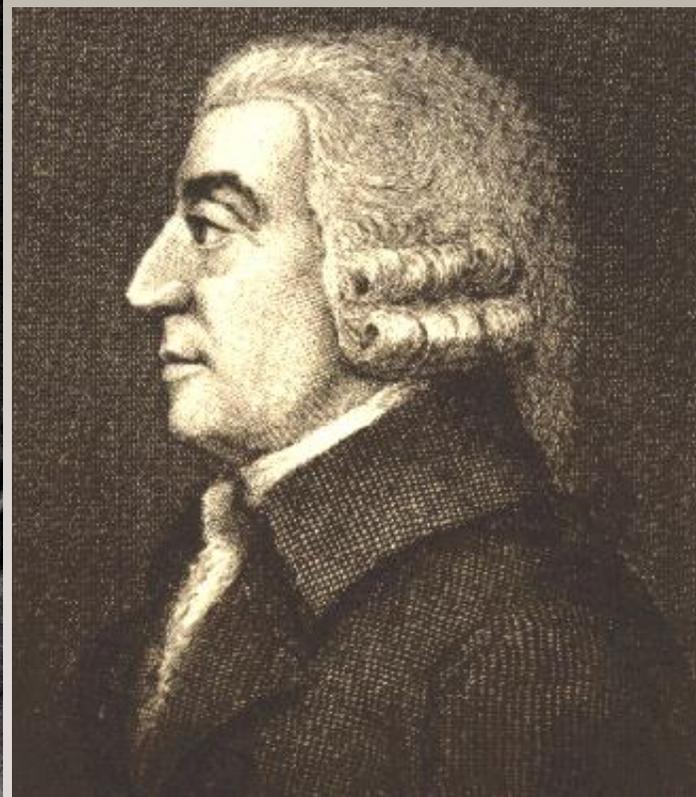
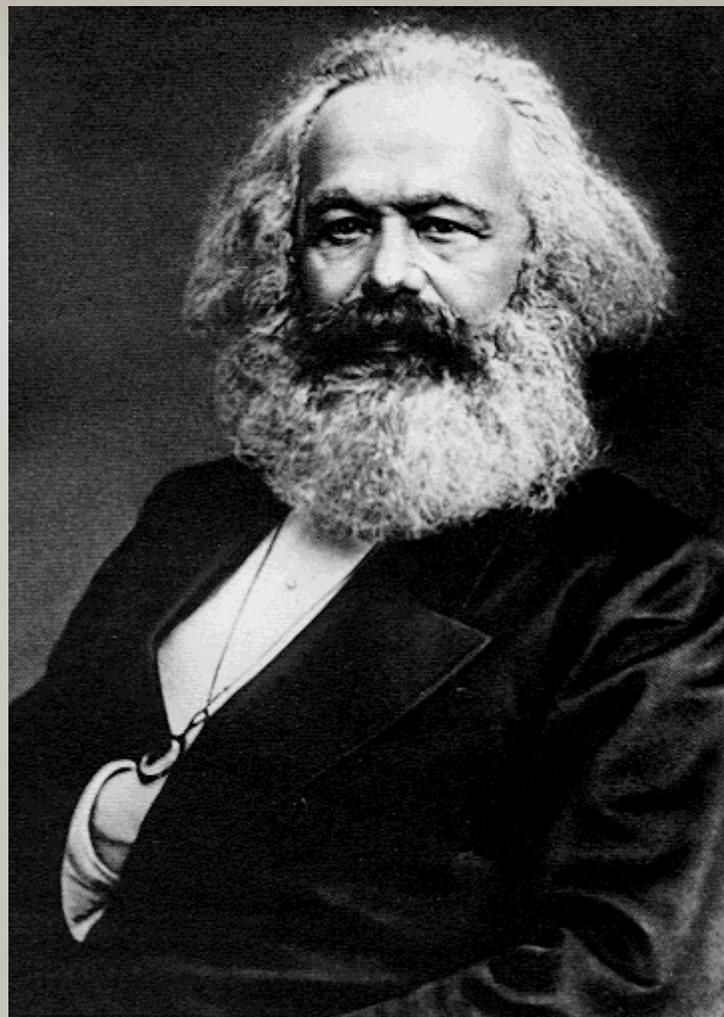
Special Case: LNG Exporters

- **At least \$45 billion at FEED stage**
- **The shifting price advantage**
- **The supply-demand balance**

Startup Timing & Train Size?



The Clash of Ideas



Karl Marx

- **“From each according to his abilities, to each according to his needs”**
- **“The theory of Communism may be summed up in one sentence: Abolish all private property.”**

Adam Smith

- **“Competition alone can regulate prices with equity; it alone restricts them to a moderation which varies little; it alone attracts with certainty provisions where they are wanted or labour where it is required.”**



The Competition begins July 27, 1953

- **North Korea (2003)**
 - **GDP per capita \$1,300**
 - **% below poverty - NA**
 - **% Ag – 30.2%**
- **South Korea (2003)**
 - **GDP per capita- \$17,800**
 - **% below poverty – 4%**
 - **%Agriculture 3.6%**



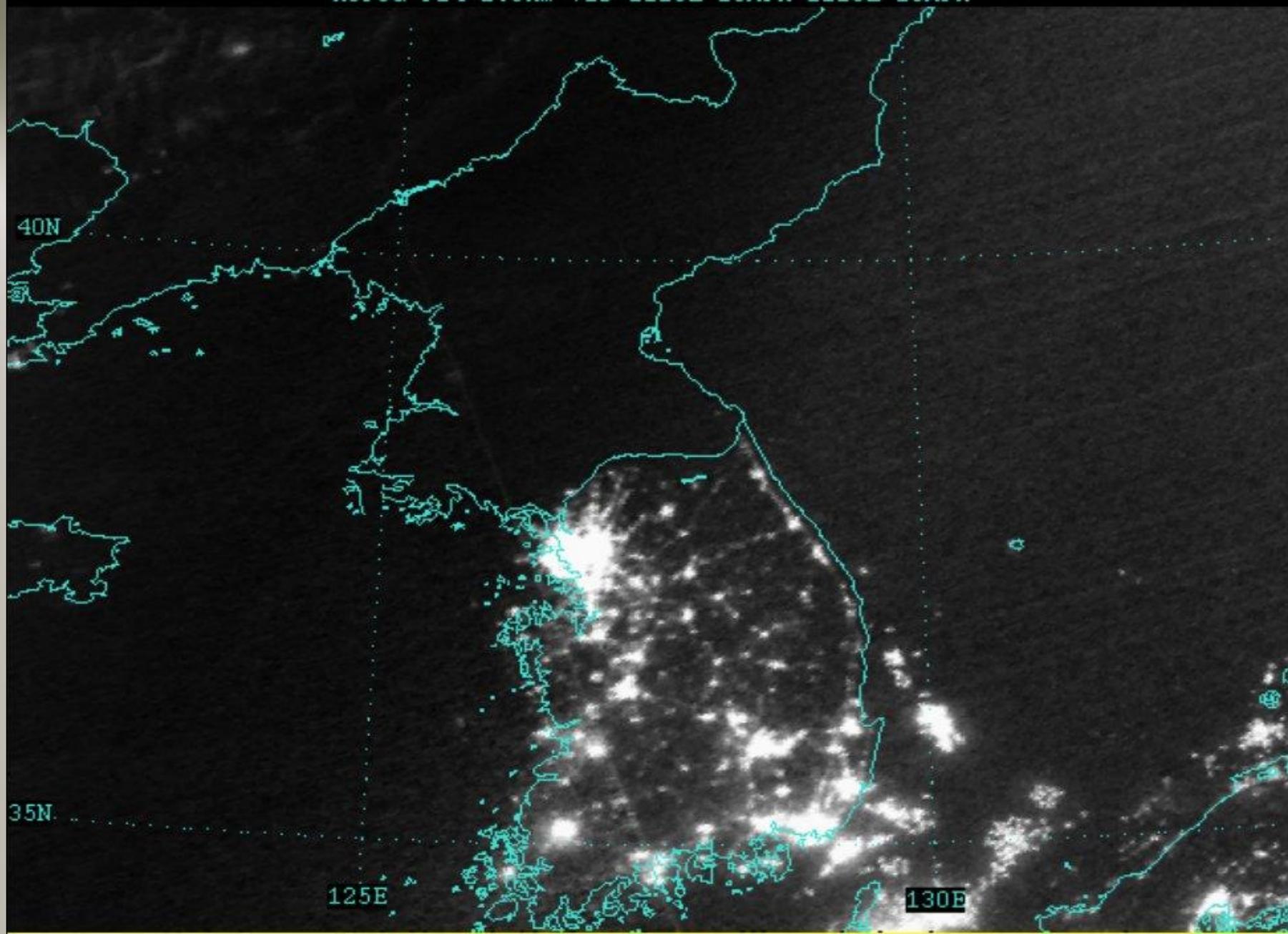
**But these are just technical
economic measures**

Is there another indicator of economic health?

Another measure of an Economy

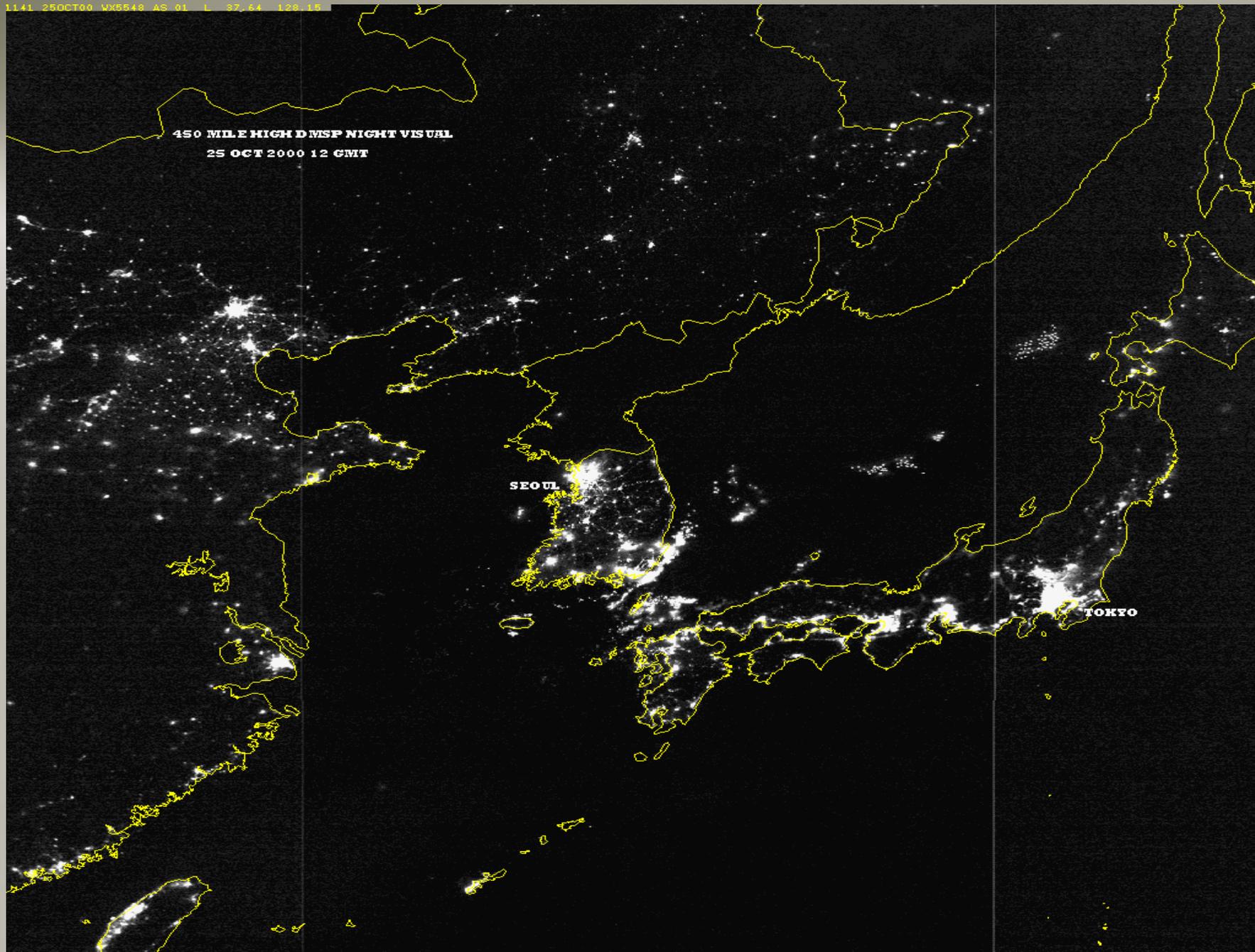


Korea F14 2.0km Vis 1116Z 15APR-1118Z 15APR



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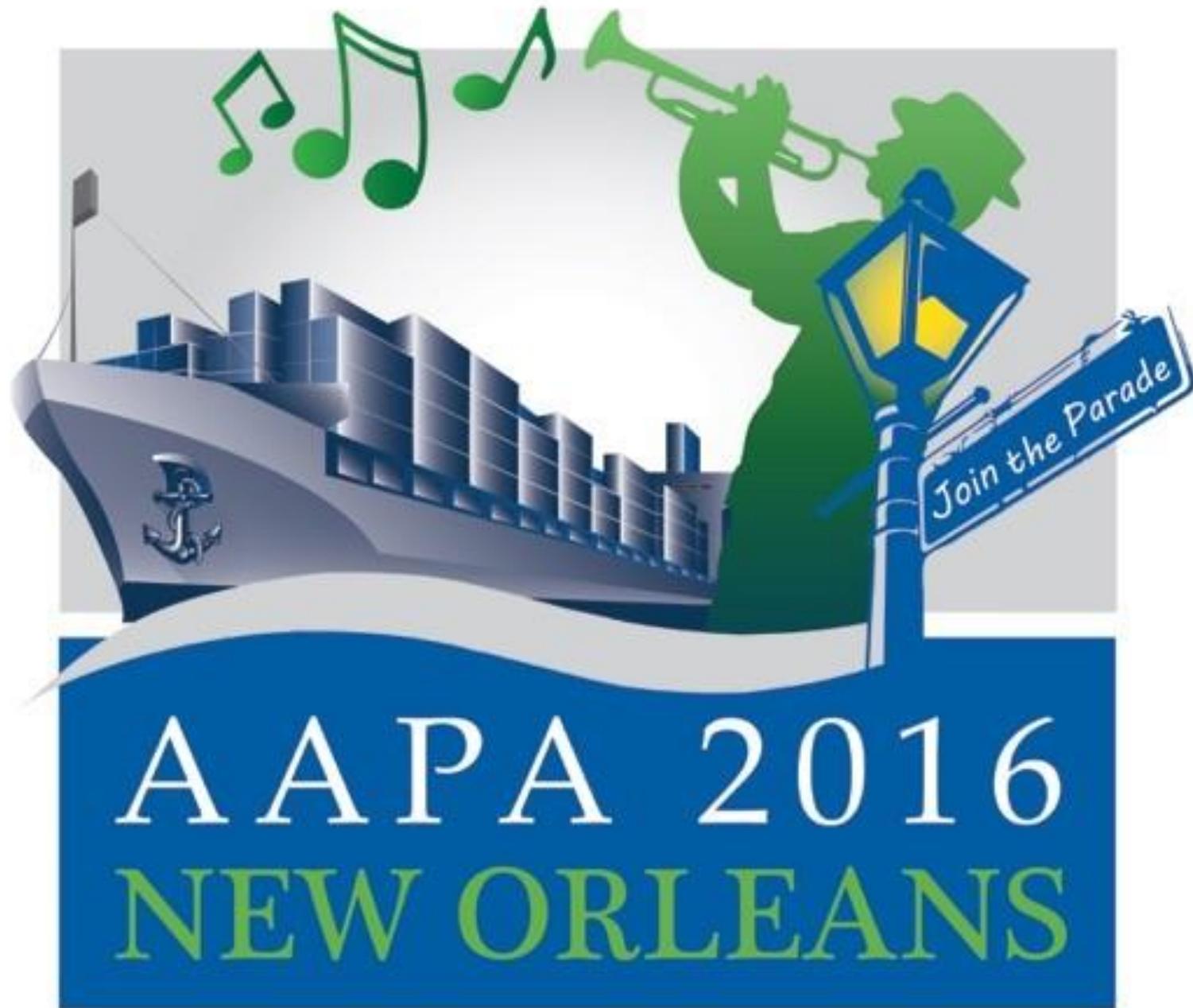




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NEW ORLEANS