



Prospects in the United States: Energy Opportunities and Challenges

Western Dredging Association – Eastern Chapter

Atlanta GA

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The New Energy Reality

Energy Security is central to our national and economic security

- **Demand to increase 56% by 2040**
 - **90% in non-OECD countries**
- **Electricity demand to increase 76%**
- **1.4 billion people without electricity**
- **\$38 trillion of new investment by 2035 to meet rising demand**
- **90% world's oil reserves owned by national oil companies**



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We Possess Tremendous Domestic Energy Resources

● Technically Recoverable Resources

- 120 years of Nat Gas
- 206 Years of Oil
- 464 years of Coal

● In-place Resources

- 586 years of Nat Gas
- 536 years of oil
- 9,844 years of coal

Institute for Energy Resources Analysis of U.S. Government Data

North American shale plays (as of May 2011)





Jobs & Tax Revenues: Kill the Golden Goose?

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Extraction-only Jobs & State Revenue

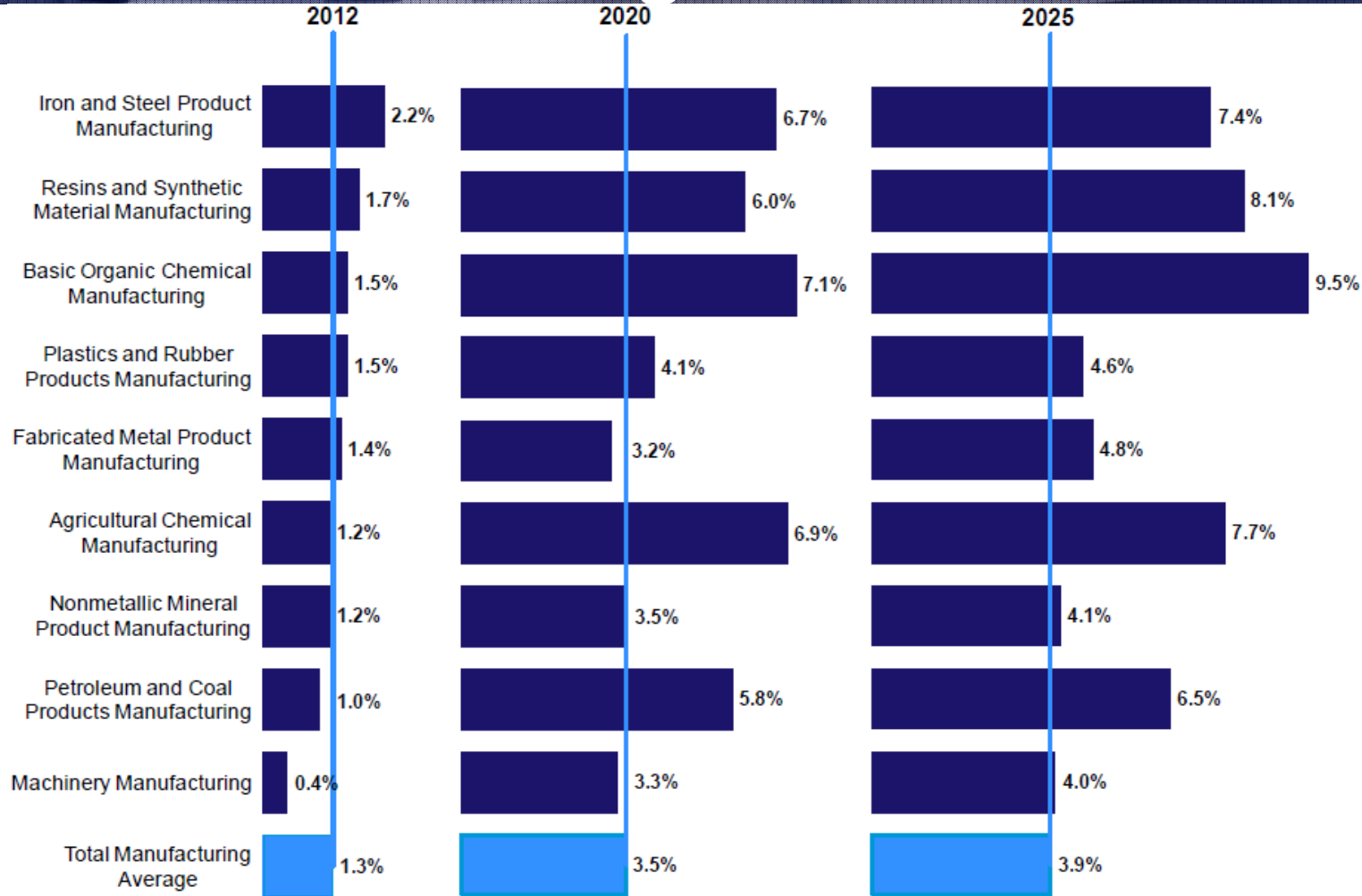
| | 2012 | | 2035 | | 2012-2035 | |
|-----------|-------------|----------------|-------------|----------------|-----------|--|
| | <u>Jobs</u> | <u>Revenue</u> | <u>Jobs</u> | <u>Revenue</u> | | |
| CO | 78k | \$1.45B | 175K | | \$122B | |
| NM | 24k | \$1.1B | 58k | | \$38B | |
| CA | 97k | \$1.6B | 187k | | \$56B | |
| PA | 103k | \$1.3B | 387k | | \$61B | |
| OH | 39k | \$911M | 267k | | \$120B | |



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Shale Revolution Spawns Manufacturing Renaissance



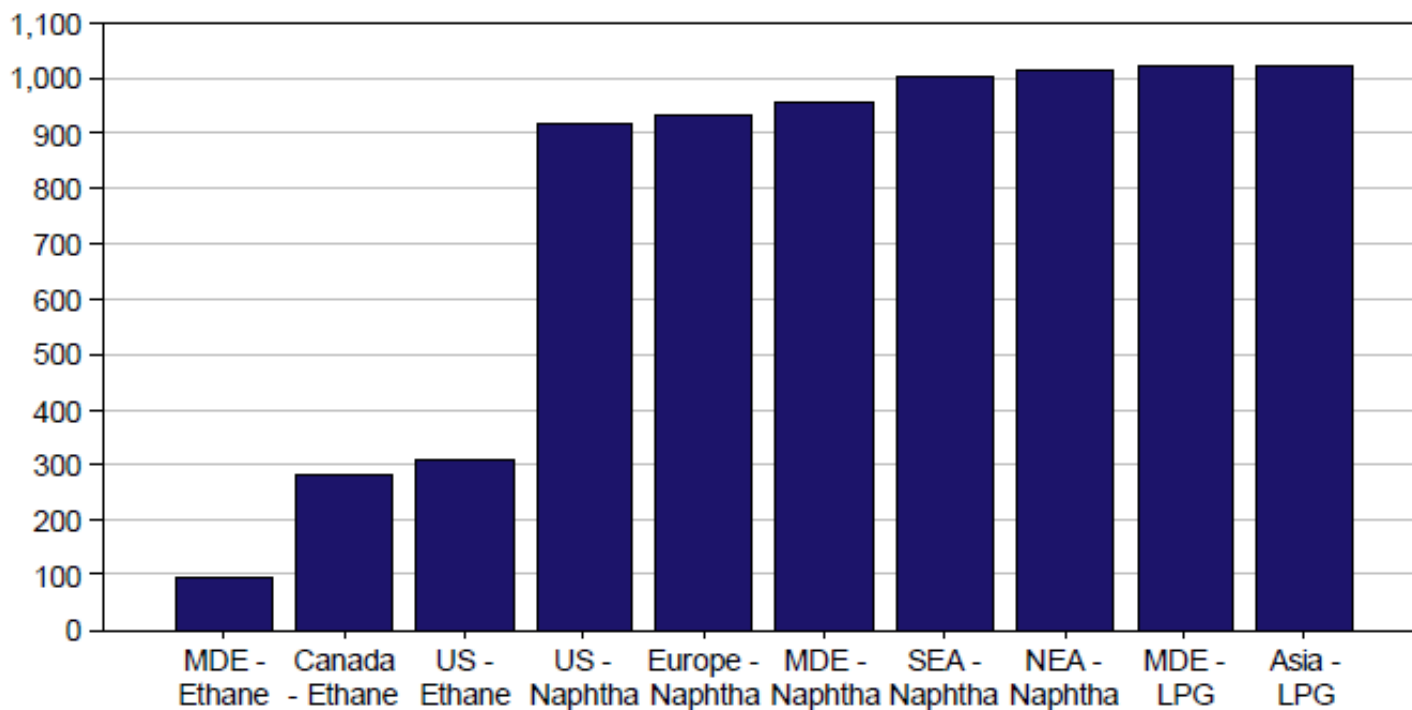
IHS, ANEF 2013



It's All About Price Differential

Cost to Produce One Metric Ton of Ethylene: 2013

\$US per metric ton

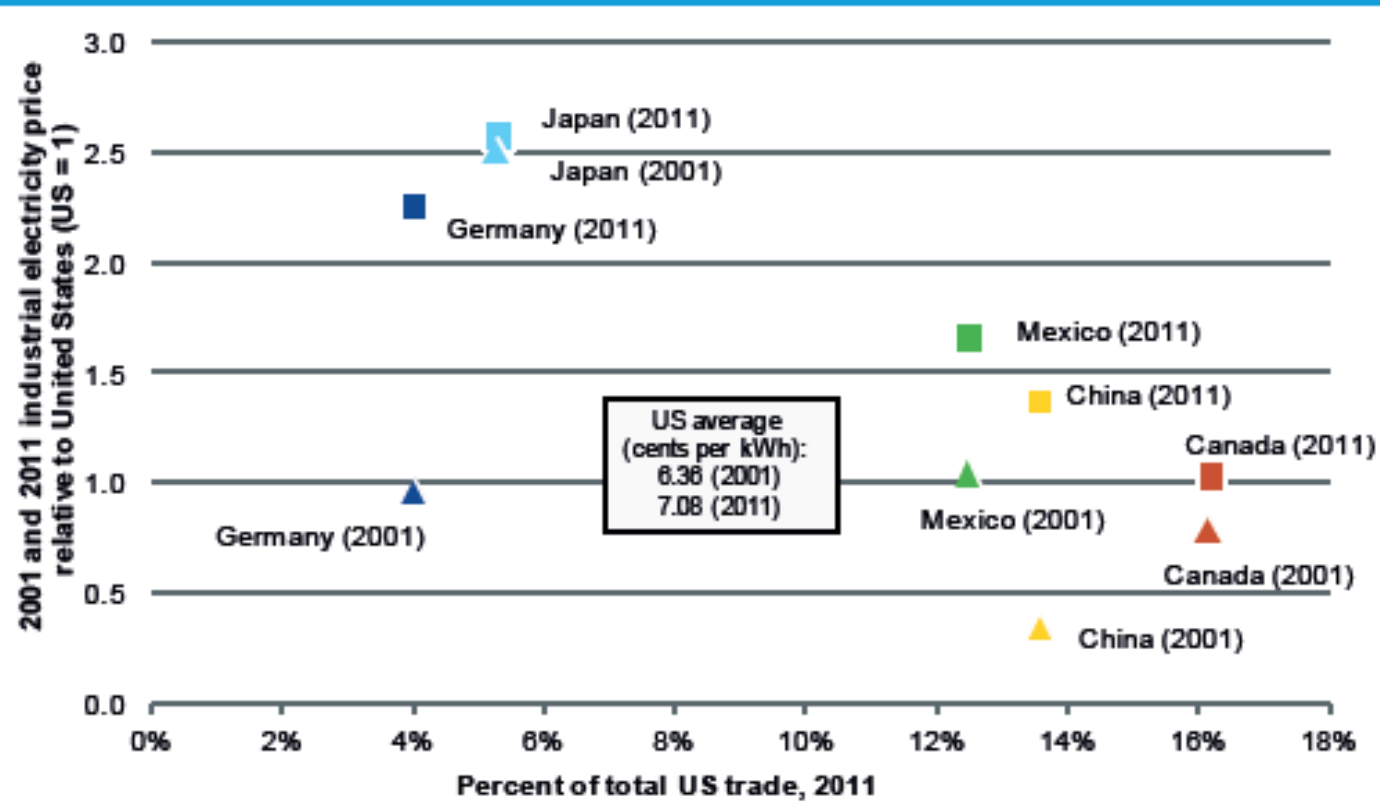


MDE = Middle East, NEA = Northeast Asia, SEA = Southeast Asia



Diversity Has Been a Competitive Advantage

Relative industrial electricity prices for top five US trading partners



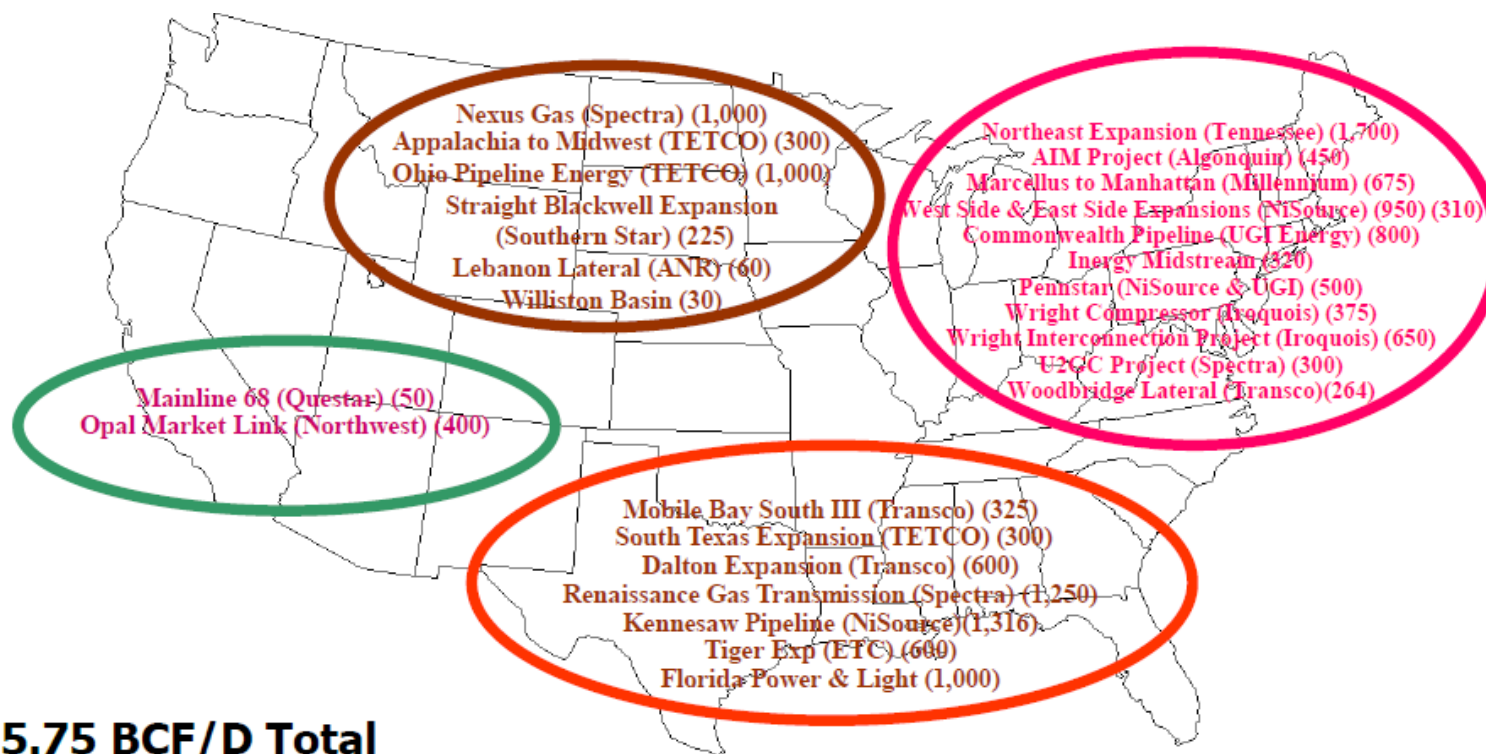
Note: Total trade = exports plus imports.
Source: IHS Energy, US Census Bureau, OECD/IEA

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Midstream Expansion in Overdrive

Pipeline Projects: Jan 2010-Jan 2013 (MMcf/d)



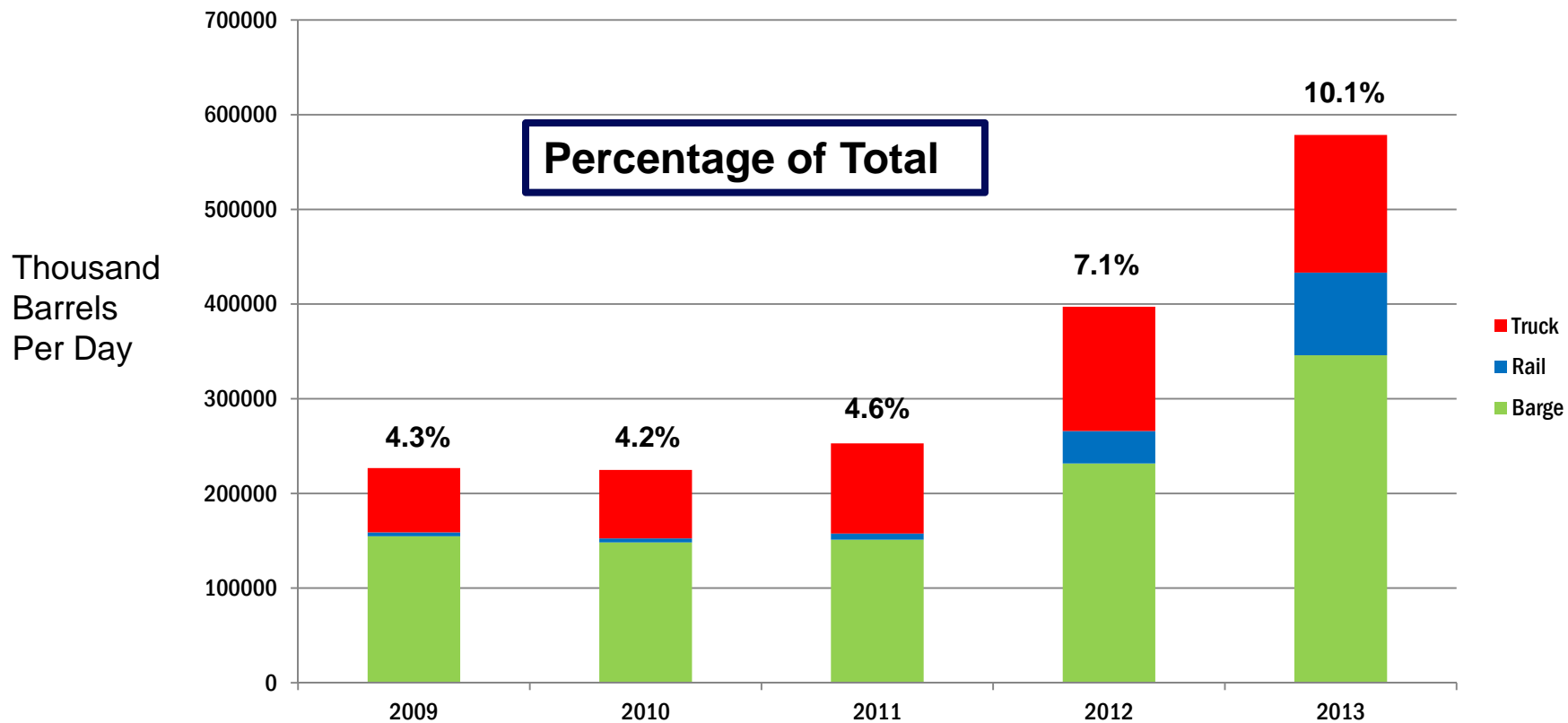
**15.75 BCF/D Total
1,822 Miles**

FERC, Major Pipeline Projects on the Horizon



Rail, Truck, & Barge Shipments Double

Crude Refinery Receipt Shipments



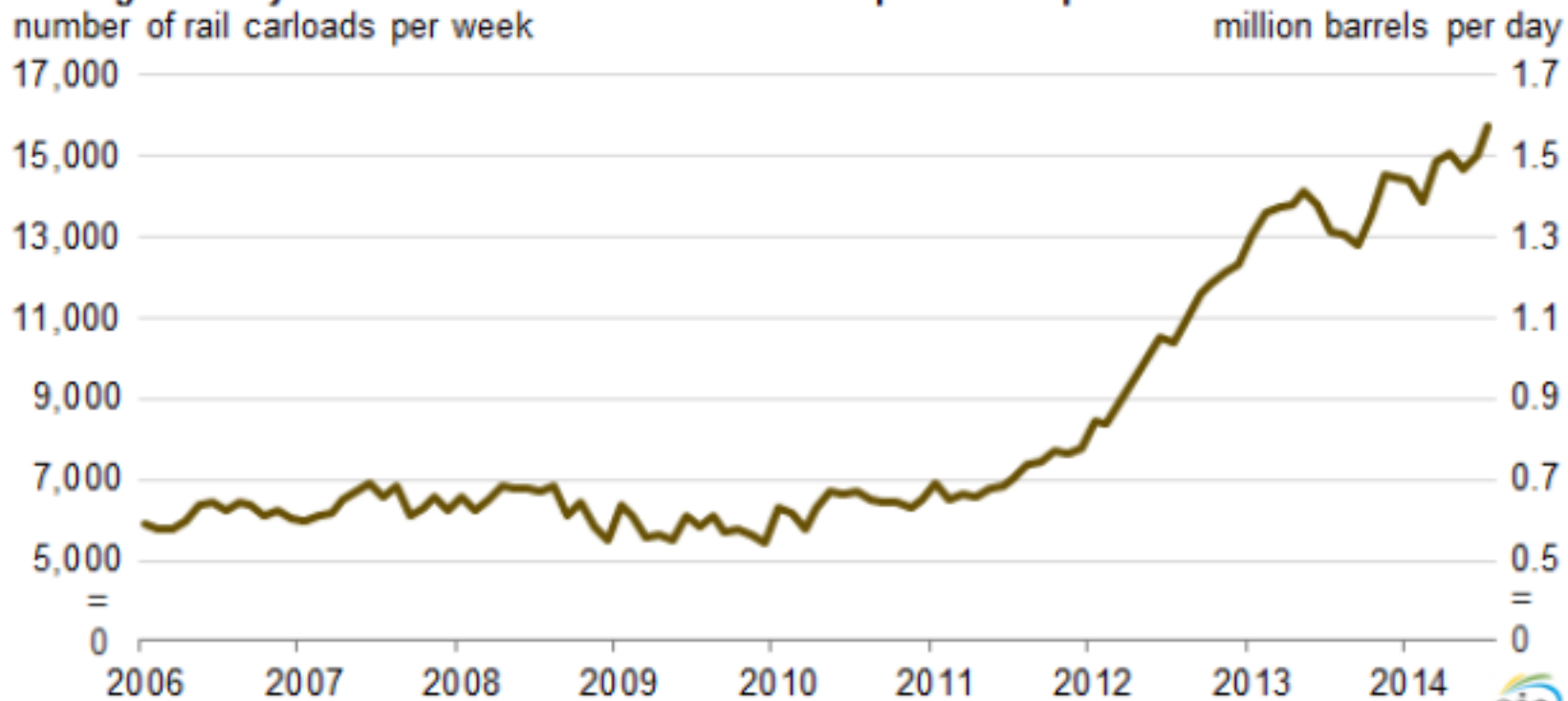
EIA, Refinery Capacity Report. 6-25-14



Rail Isn't a Stopgap Anymore

Rail deliveries of U.S. oil continue to increase in 2014

Average weekly U.S. rail carloads of crude oil and petroleum products



Source: U.S. Energy Information Administration, based on Association of American Railroads



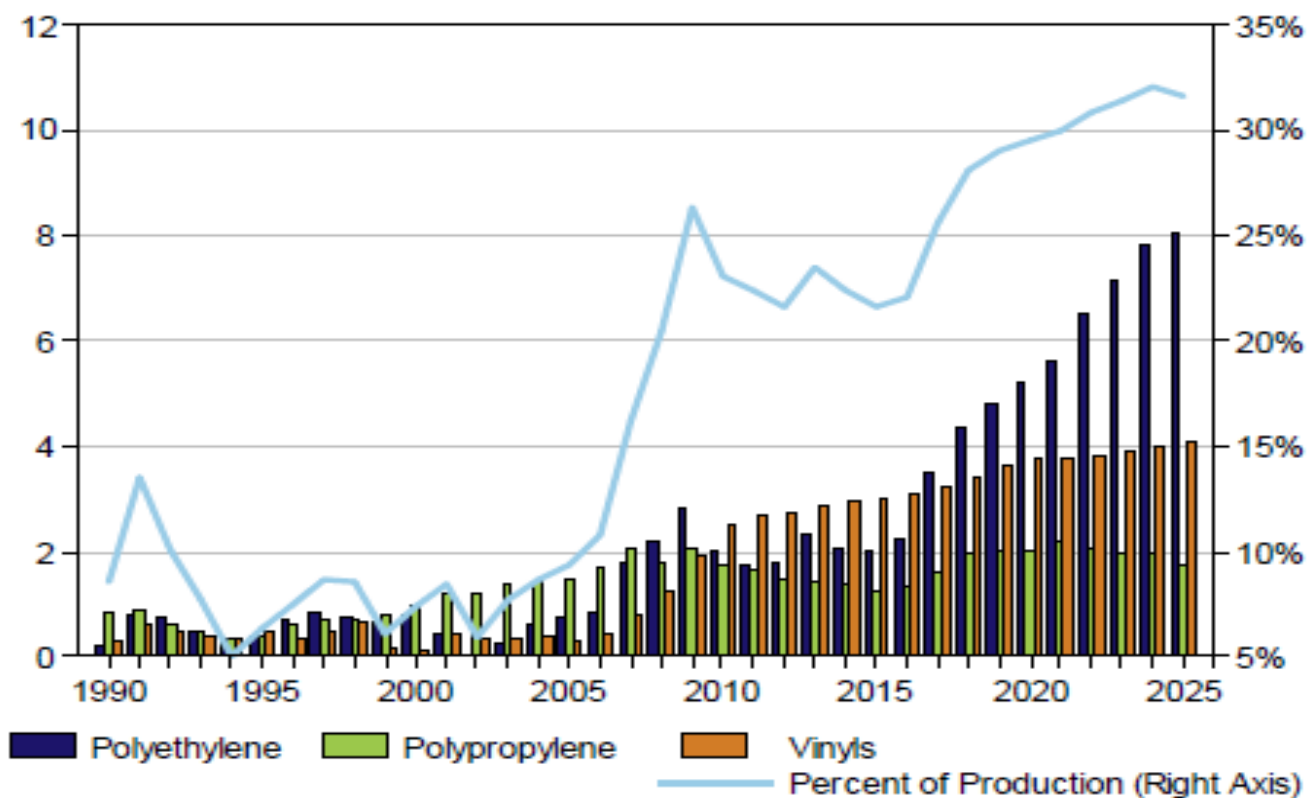
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Exports Increasingly Important to PetChem

US Net Exports for Selected Products

Million metric tons



IHS, ANEF 2013



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America's New Energy Future

Employment Contribution due to the Unconventional Activity Value Chain: Base Case*

(Number of workers)

| | 2012 | 2020 | 2025 |
|--|------------------|------------------|------------------|
| Upstream Energy Activity | 1,748,604 | 2,985,168 | 3,498,678 |
| Midstream and Downstream Energy Activity | 323,648 | 73,530 | 56,989 |
| Energy-Related Chemicals Activity | 53,252 | 277,356 | 318,748 |
| Total Activity | 2,125,504 | 3,336,055 | 3,874,415 |

NOTES: Numbers may not sum due to rounding.

*The unconventional activity value chain represents the sum of unconventional oil and natural gas value chains and energy-related chemicals.

Source: IHS Economics



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America's New Energy Future

Contribution to US Lower 48 Government Revenue due to the Unconventional Activity Value Chain: Base Case*

(2012 \$M)

| | 2012 | 2020 | 2025 | 2012-2025** |
|--------------------------------------|---------------|----------------|----------------|------------------|
| Contribution by Type*** | | | | |
| Federal Taxes | 35,598 | 57,702 | 64,030 | 750,696 |
| Federal Royalty Payments | 1,964 | 3,204 | 2,994 | 39,664 |
| Federal Bonus Payments | 148 | 150 | 138 | 2,139 |
| State and Local Taxes | 36,732 | 64,484 | 71,233 | 822,137 |
| Total Government Revenue | 74,443 | 125,540 | 138,395 | 1,614,636 |
| Lease Payments to Private Landowners | 504 | 915 | 1,103 | 11,696 |

Source: IHS Economics



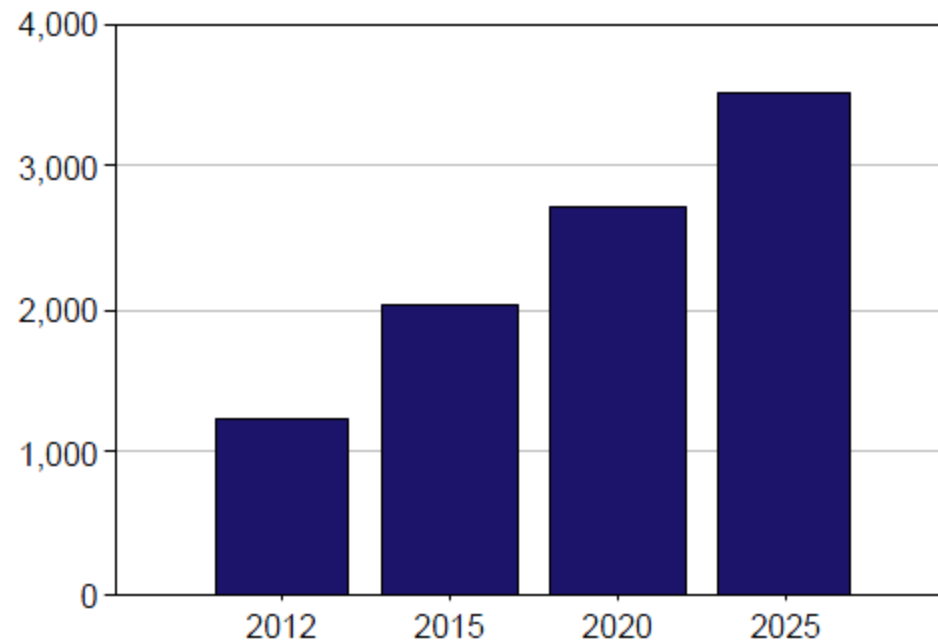
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America's New Energy Future

Change in Disposable Income per Household due to the Unconventional Activity Value Chain: Base Case*

2012 \$



Note: *The unconventional activity value chain represents the sum of unconventional oil and natural gas value chains and energy-related chemicals.

Source: IHS Model of the US Economy



We Can Still Screw This Up

US Lower 48 Economic Contribution Summary due to the Unconventional Activity Value Chain: Difference between Base Case and Low Production Case*

Employment

(Number of workers)

| | 2015 | 2020 | 2025 | 2012-2025** |
|-------------|--------------------|--------------------|--------------------|-------------|
| Loss | (1,416,875) | (2,126,702) | (2,773,511) | NA |

Value Added

(2012 \$M)

| | | | | |
|-------------|------------------|------------------|------------------|-----------|
| Loss | (127,829) | (175,779) | (300,624) | NA |
|-------------|------------------|------------------|------------------|-----------|

Government Revenue

(2012 \$M)

| | | | | |
|-------------|-----------------|-----------------|-----------------|------------------|
| Loss | (29,909) | (41,028) | (72,371) | (534,028) |
|-------------|-----------------|-----------------|-----------------|------------------|

NOTES: *The unconventional activity value chain represents the sum of unconventional oil and natural gas value chains and energy-related chemicals.

**2012-2025 represents the total for all years including those years not reported.

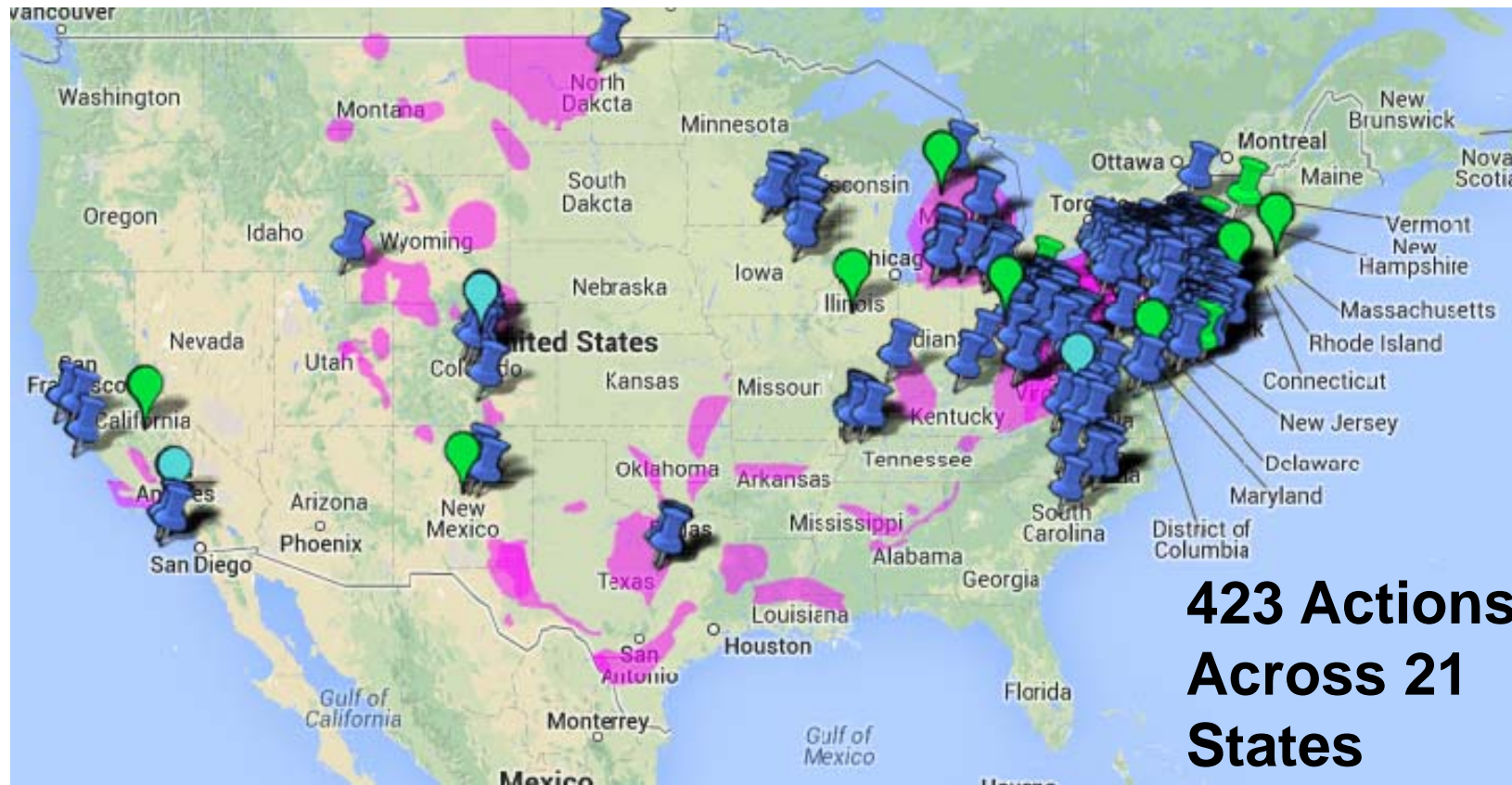
Source: IHS Economics



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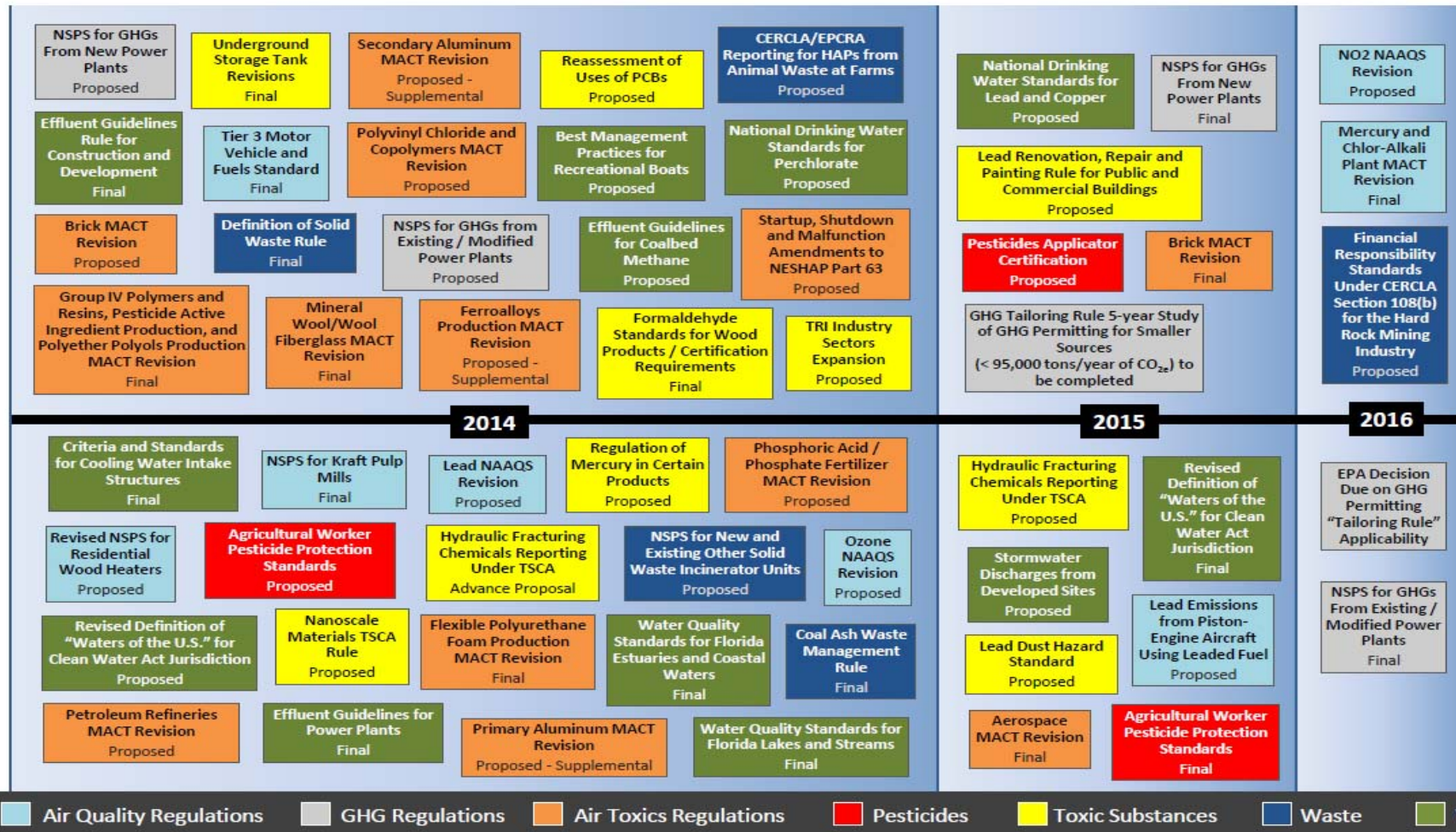
A Bright Future is NOT a Given



Food & Water Watch: Mapping the Movement



EPA Rulemakings on the Runway

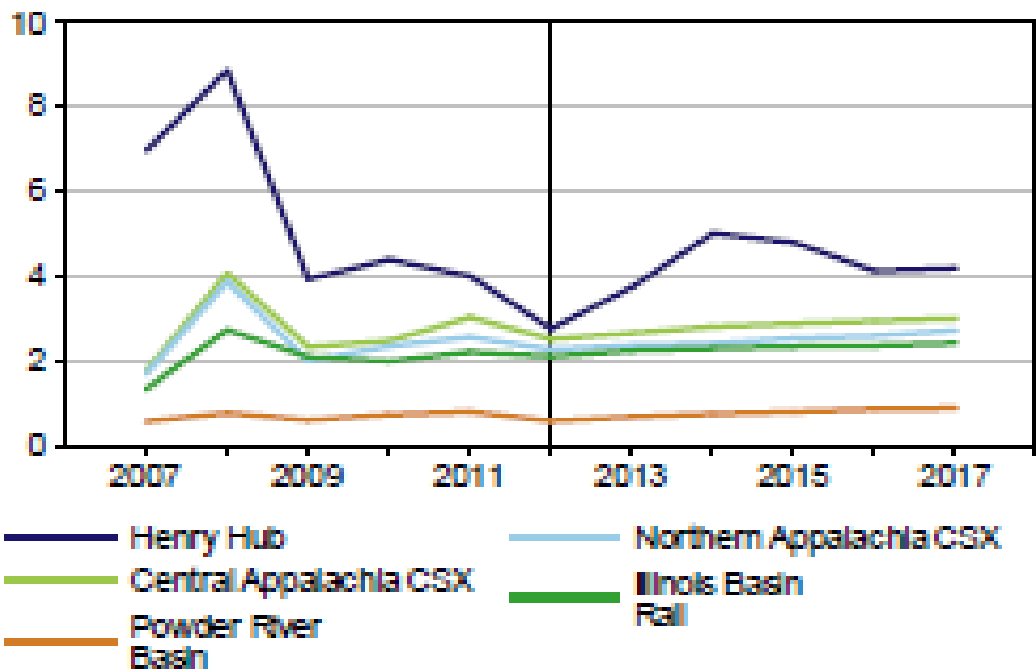




Coal & Gas Prices

Annual Henry Hub and Spot Coal Prices

\$US per MMBtu

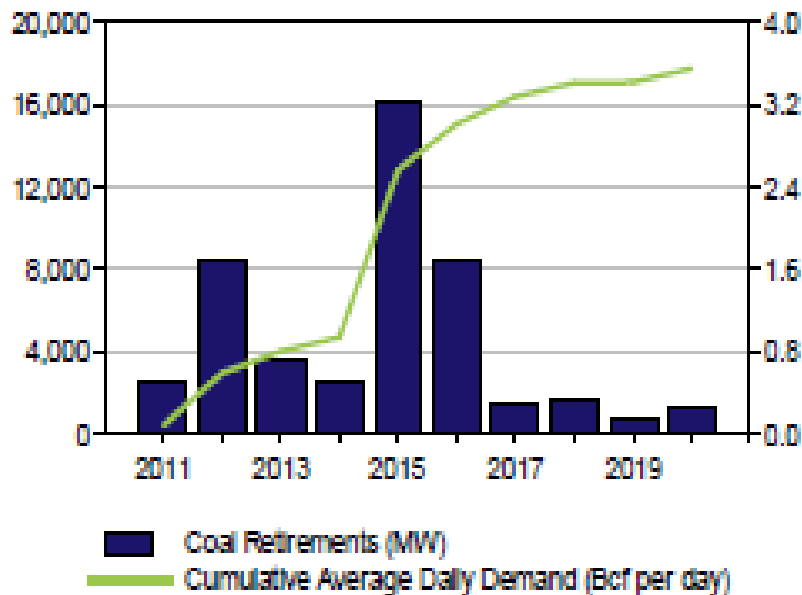


Source: IHS Energy



Expected Coal Plant Closures

US Coal Retirements and Implications for Natural Gas Demand



Note: Gas demand is relative to 2011 coal-fired generation

Source: IHS Energy

- **>50 GW prematurely retired by 2020**
- **15%-20% of entire coal fleet**
- **~10% of all US generation**

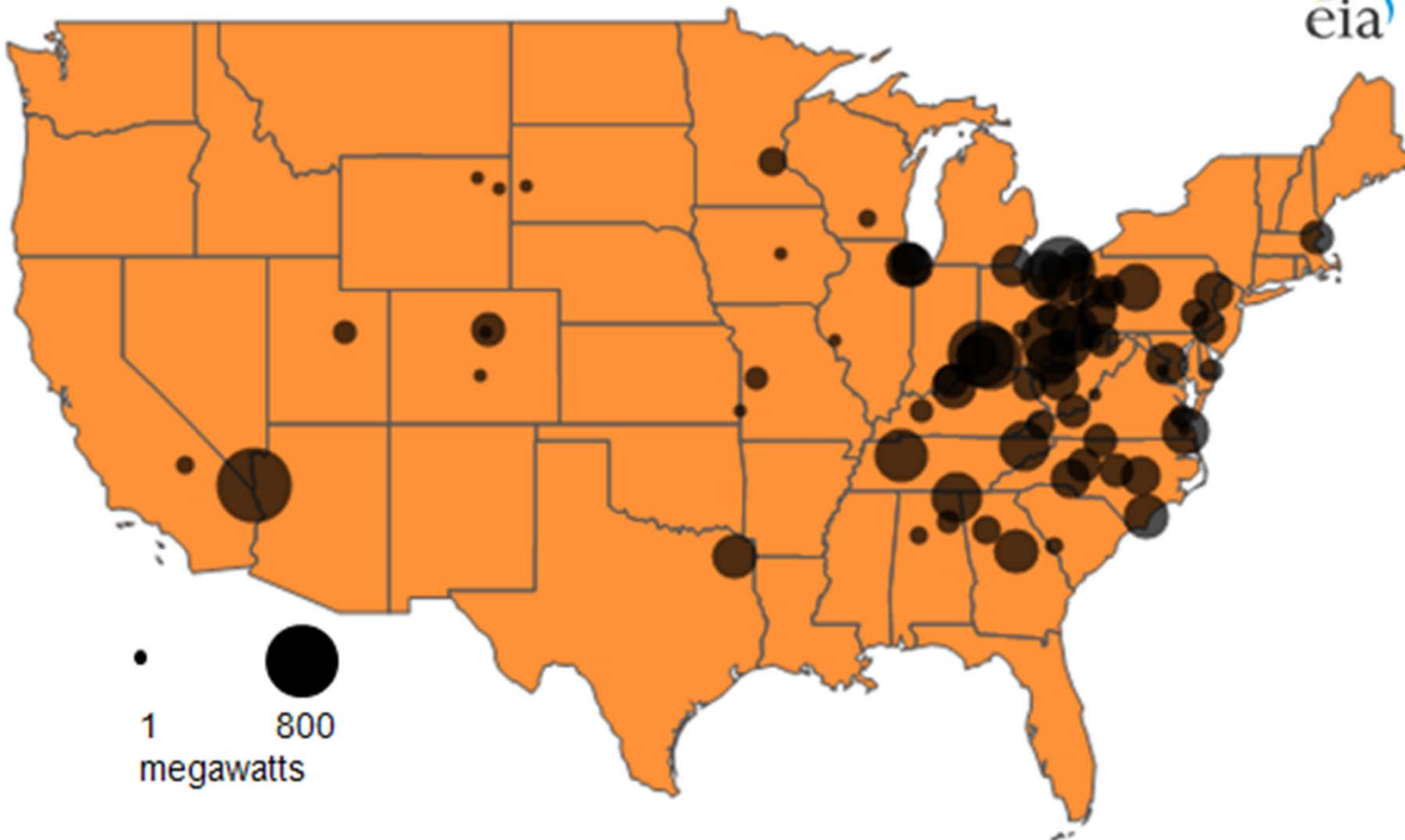


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Heavy Concentration on Retirements

Reported Coal-fired generator retirements, 2012 - 2016





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Still To Come

- **Ozone revisions**
 - “Most Expensive Rule in History”
- **Climate Action Plan (CO₂)**
 - Series to “ratcheting” rule over decades
 - End is predictable: no coal or gas electricity
- **Commonalities**
 - Manufacturing renaissance short lived?
 - No technological roadmap/leadership



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THANK YOU!

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