



Regional Natural Gas Demand Growth: Industrial and Power Generation Trends

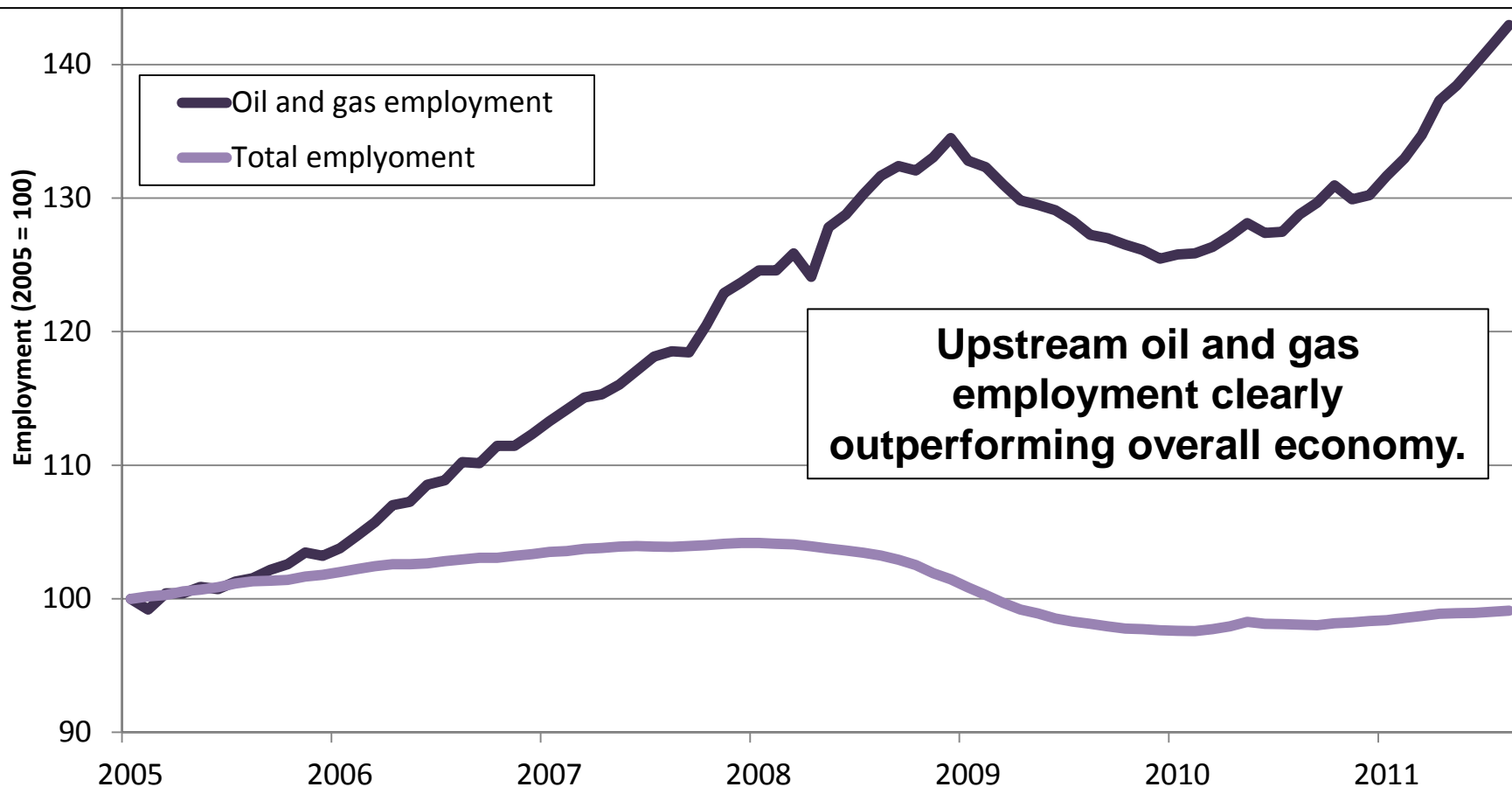
**Kinetica Partners Shippers Meeting
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**Natural Gas and Economic
Development: Moving from
“Revolution” to “Renaissance”**

U.S. Oil and Gas Employment v. Economy-wide Trends (2005 = 100)

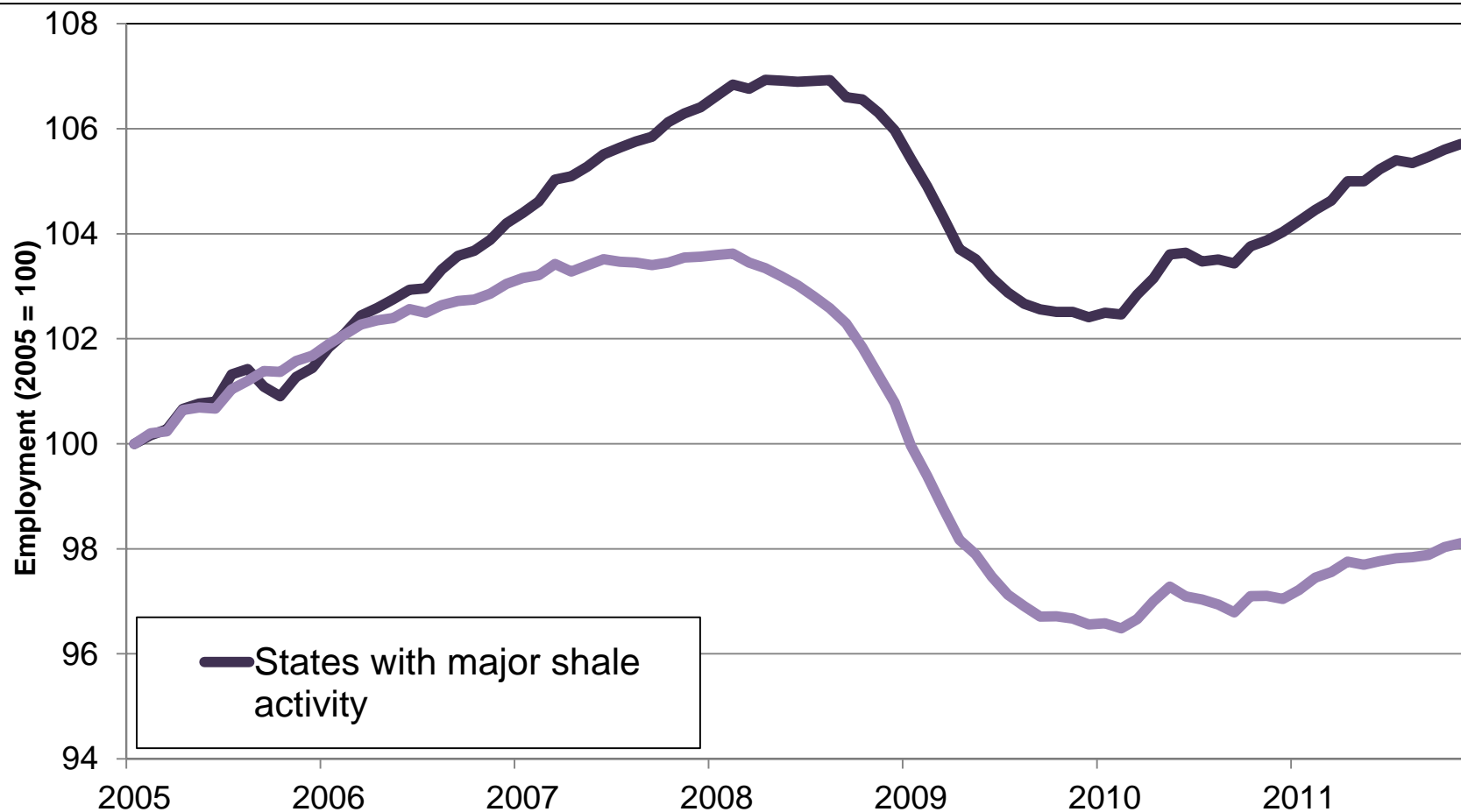
Oil and gas employment is almost 40 percent above its 2005 level while total U.S. employment struggles to regain four years of losses.



Upstream oil and gas employment clearly outperforming overall economy.

U.S. Employment Trends (2005=100): Total Employment, Select States

The “multiplier” effects of upstream development have likely had significant beneficial impacts on shale-producing states.



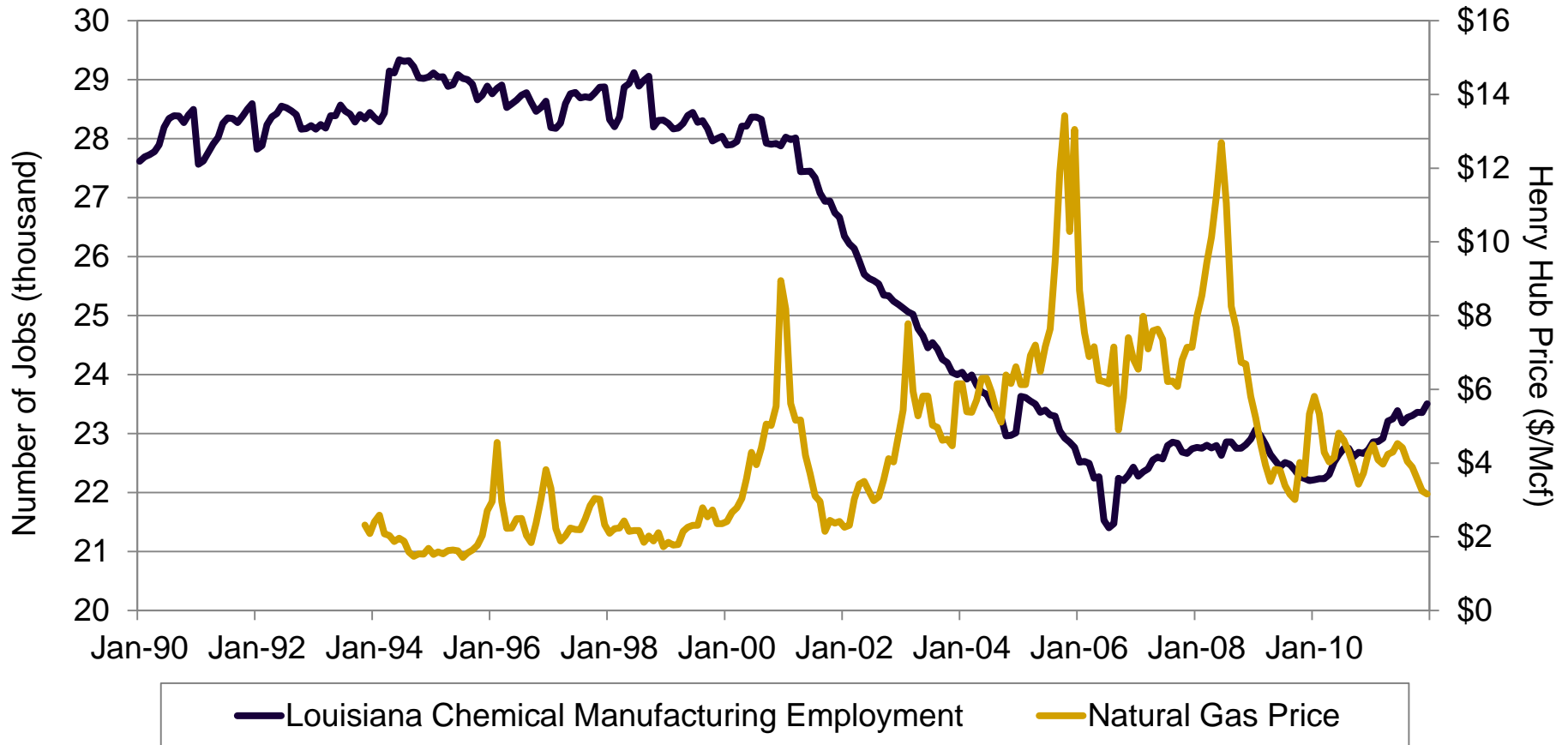
Shale states: LA, TX, AR, ND, UT, CO, & PA

Source: Bureau of Labor Statistics



Louisiana Chemical Industry Employment and Henry Hub Spot Price

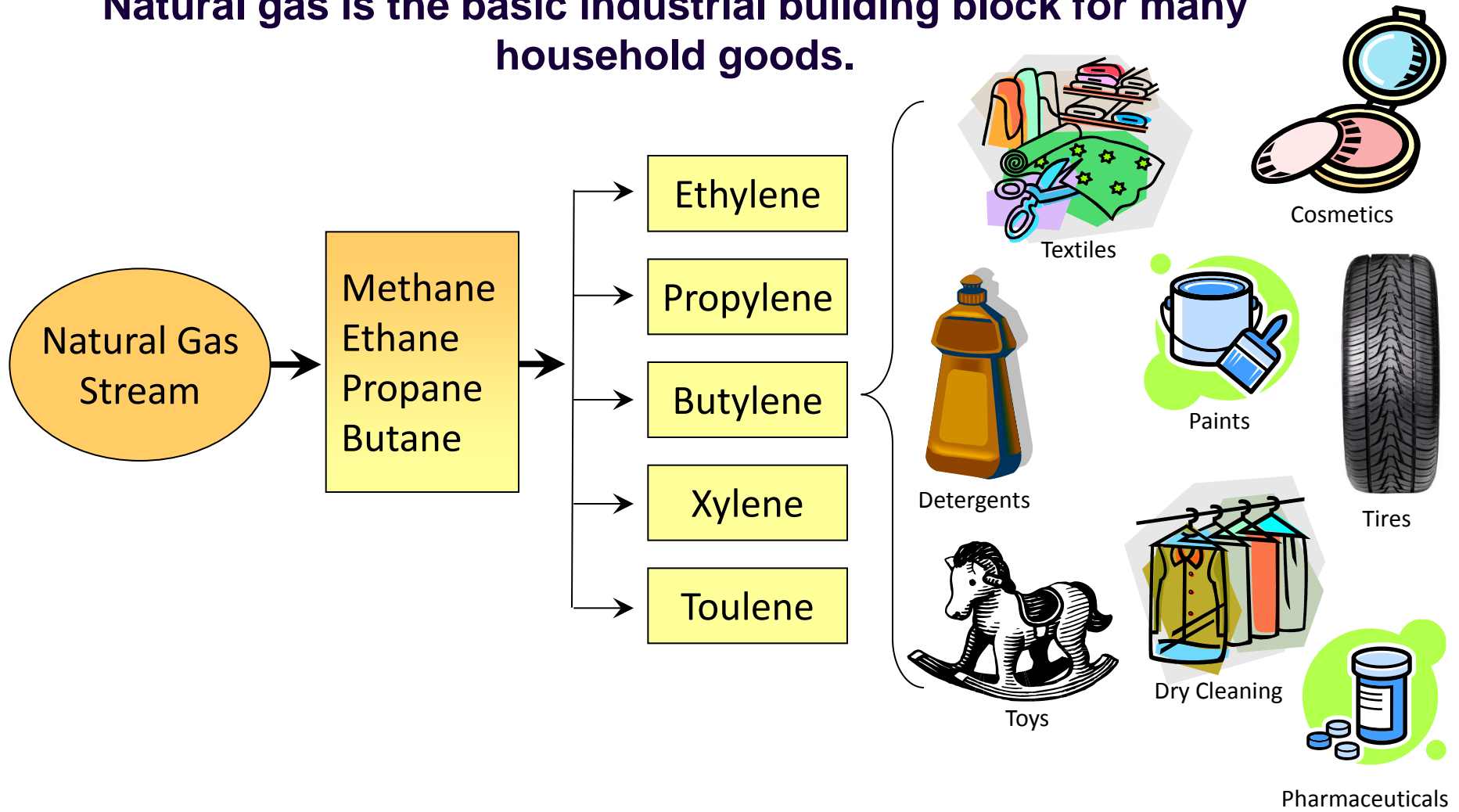
The chemical industry is particularly sensitive to natural gas prices. As natural gas prices increase, chemical industry employment decreases.





Natural Gas Composition and Modern Chemistry

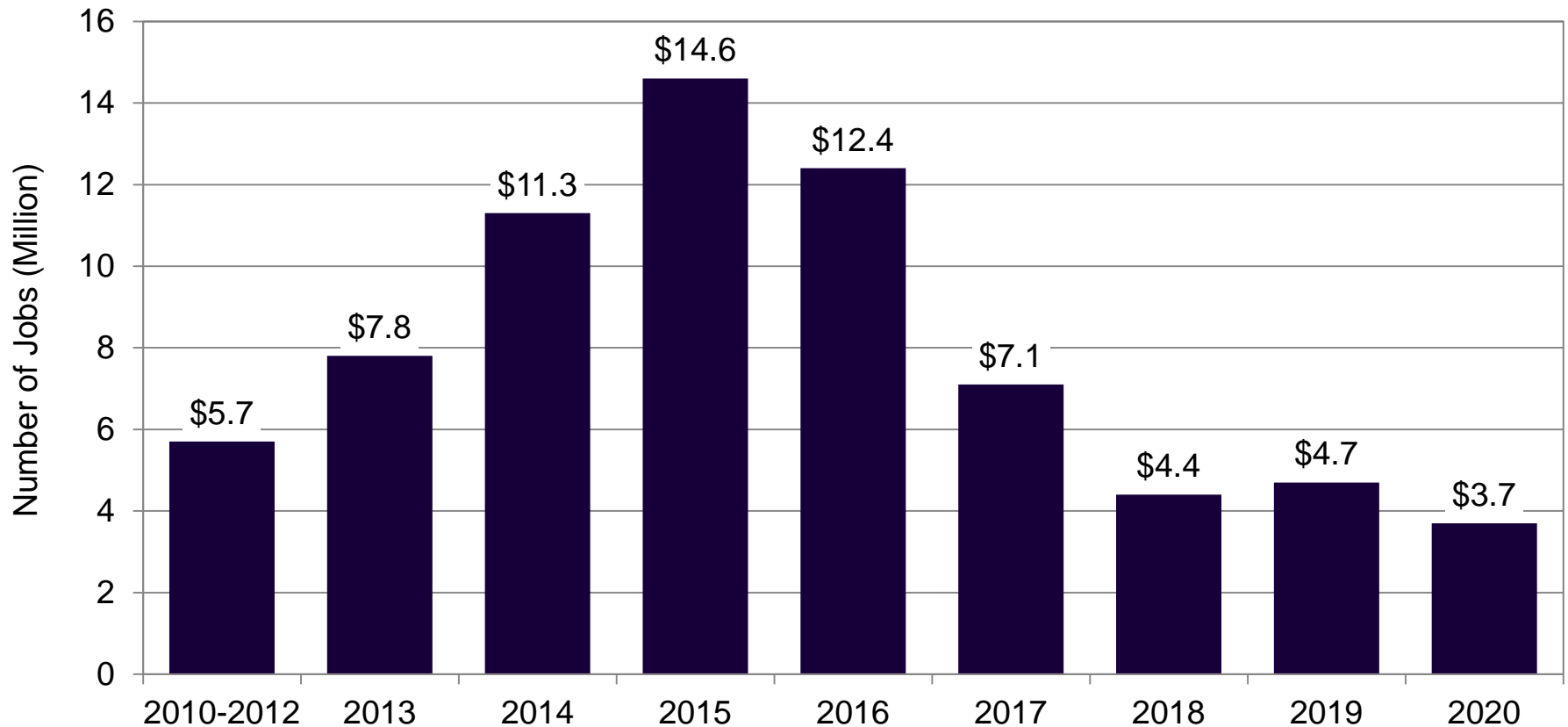
Natural gas is the basic industrial building block for many household goods.





Incremental U.S. Chemical Industry Capital Expenditures

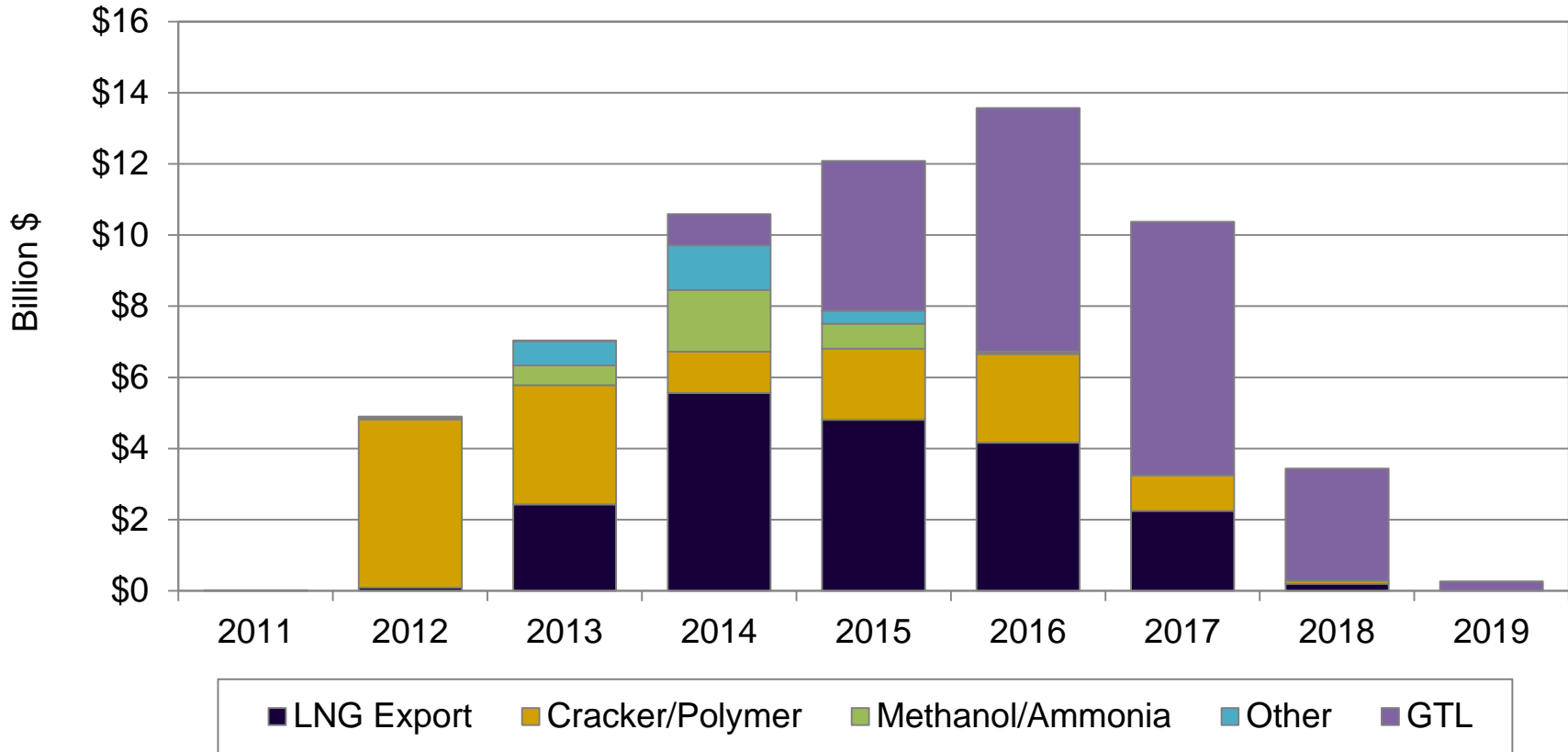
The American Chemical Council estimates that U.S. chemical industry capital investments will total \$71.7 billion through 2020. These investments are based on a “renewed competitiveness from shale gas.”





Louisiana Total Capital Expenditures by Sector

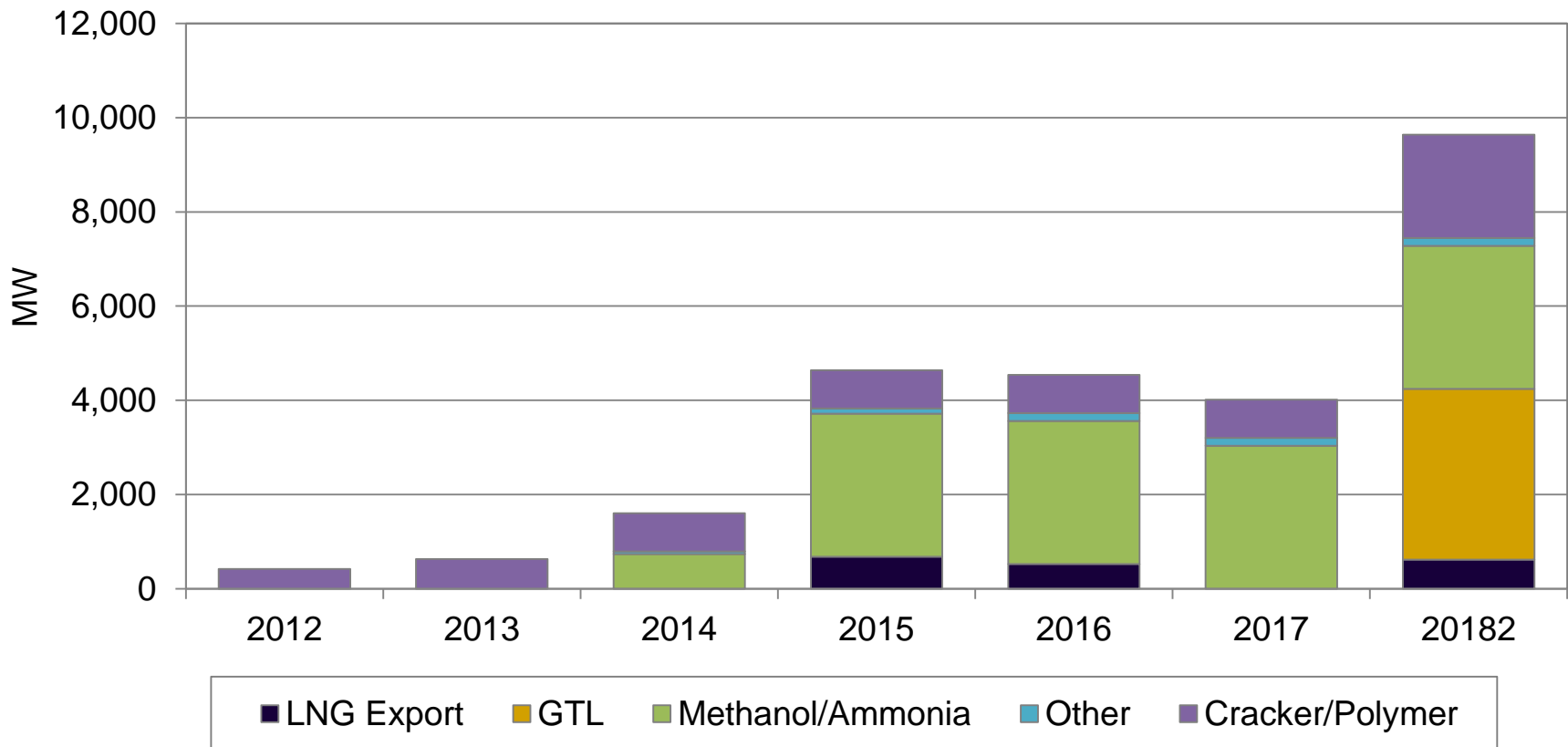
Recent LSU-CES Study found that the total capital investment associated with all announced natural gas-driven manufacturing investments in Louisiana totals over \$62 billion. Most of the investment is anticipated to occur between 2014 and 2017.





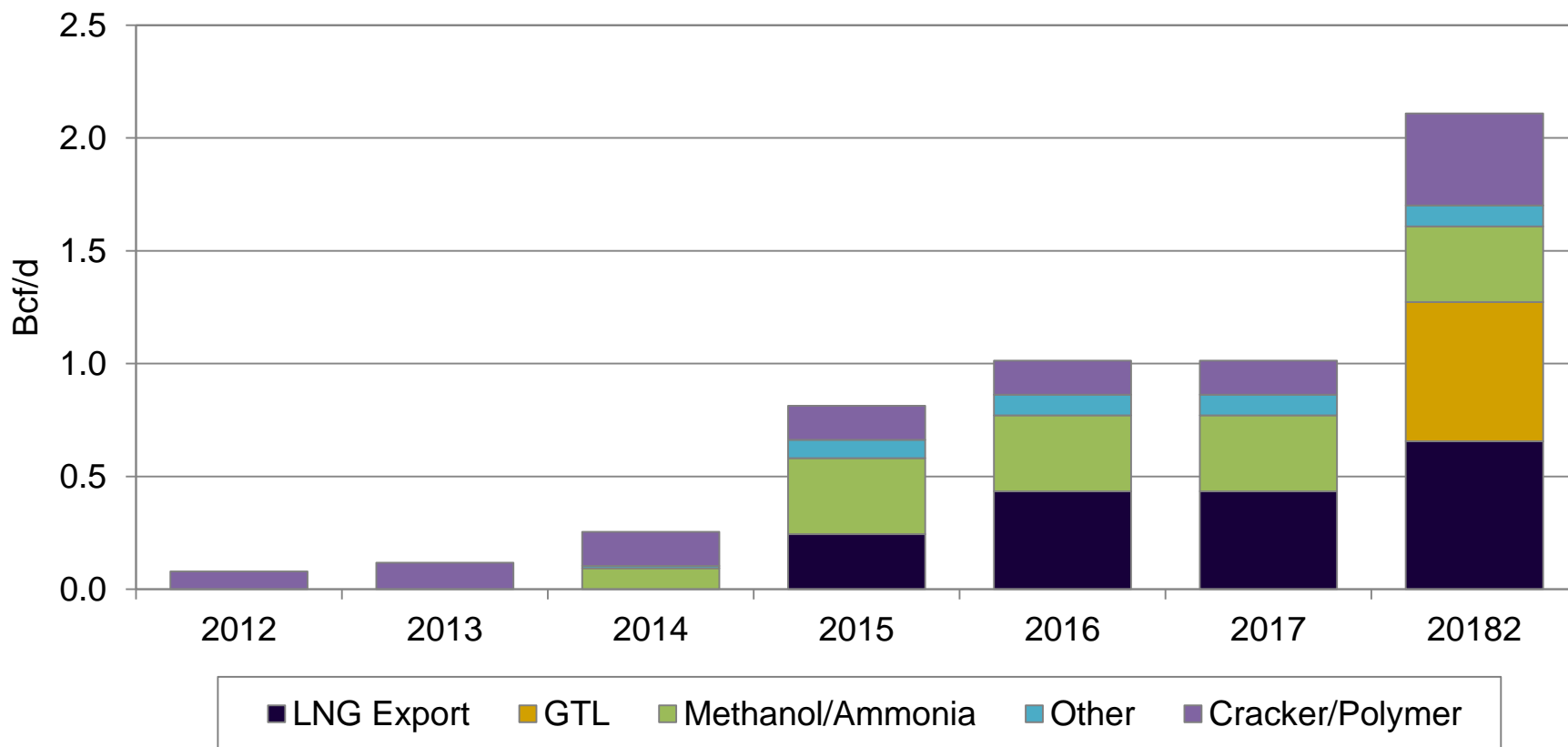
Electric Capacity by Sector and Online Date

Capacity requirements associated with all currently-announced projects would come close to doubling in-state generation capacity.



Total Natural Gas Capacity by Sector and Online Date

Industrial gas demand could also double given current project announcements.



Potential Economic Impacts/Benefit: Construction, State

Not quiet as clear will be the additional power/gas requirements for all the new residential and commercial activities supporting development/operation. Should elevate regional usage trends relative to national averages.

	Construction Impacts									
	Total	2011	2012	2013	2014	2015	2016	2017	2018	2019
Output (million \$)										
Direct	\$ 17,080.2	\$ 4.4	\$ 1,715.4	\$ 2,458.1	\$ 3,535.5	\$ 3,765.0	\$ 3,764.9	\$ 1,696.2	\$ 140.7	\$ -
Indirect	\$ 2,742.2	\$ 0.7	\$ 275.4	\$ 394.6	\$ 567.6	\$ 604.5	\$ 604.4	\$ 272.3	\$ 22.6	\$ -
Induced	\$ 5,315.3	\$ 1.4	\$ 533.8	\$ 765.0	\$ 1,100.2	\$ 1,171.7	\$ 1,171.6	\$ 527.9	\$ 43.8	\$ -
Total	\$ 25,137.6	\$ 6.4	\$ 2,524.6	\$ 3,617.7	\$ 5,203.3	\$ 5,541.1	\$ 5,540.9	\$ 2,496.4	\$ 207.0	\$ -
Employment (jobs)										
Direct	115,726	30	11,623	16,655	23,955	25,510	25,509	11,493	953	-
Indirect	18,500	5	1,858	2,662	3,829	4,078	4,078	1,837	152	-
Induced	47,241	12	4,745	6,799	9,779	10,414	10,413	4,692	389	-
Total	181,468	47	18,225	26,116	37,563	40,001	40,000	18,022	1,495	-
Wages (million \$)										
Direct	\$ 5,566.6	\$ 1.4	\$ 559.1	\$ 801.1	\$ 1,152.3	\$ 1,227.1	\$ 1,227.0	\$ 552.8	\$ 45.8	\$ -
Indirect	\$ 804.7	\$ 0.2	\$ 80.8	\$ 115.8	\$ 166.6	\$ 177.4	\$ 177.4	\$ 79.9	\$ 6.6	\$ -
Induced	\$ 1,493.1	\$ 0.4	\$ 150.0	\$ 214.9	\$ 309.1	\$ 329.1	\$ 329.1	\$ 148.3	\$ 12.3	\$ -
Total	\$ 7,864.5	\$ 2.0	\$ 789.8	\$ 1,131.8	\$ 1,627.9	\$ 1,733.6	\$ 1,733.5	\$ 781.0	\$ 64.8	\$ -

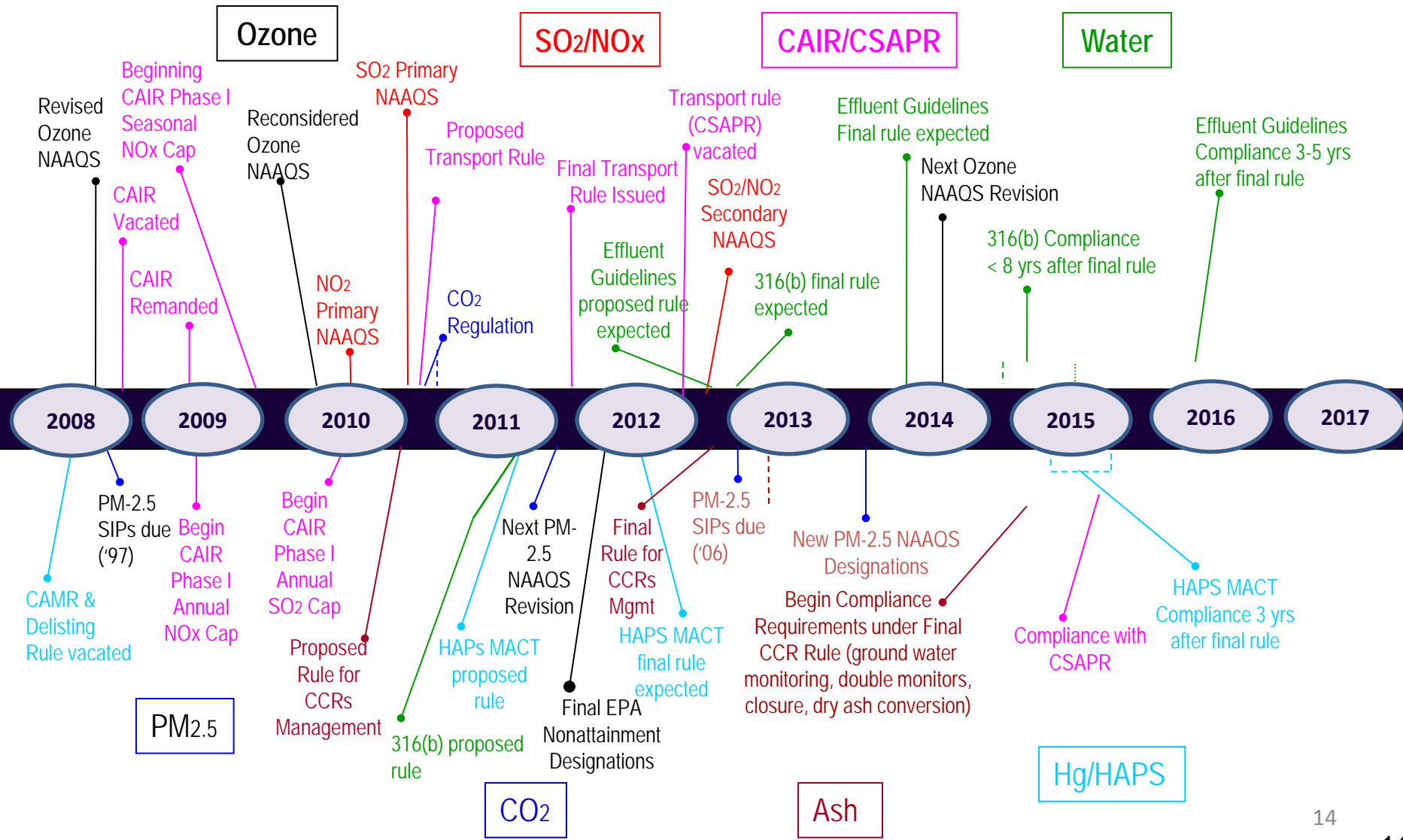
Potential Changes in Power Generation

New Natural Gas End Uses and Fuel Diversity Concerns

- As noted earlier, the industrial “renaissance” is likely to lead to the first increase in industrial natural gas demand in decades. The extent and degree of this is indeterminate. Consider that a new GTL plant or a new LNG facility, use roughly 2/Bcfd alone at full capacity (730 Bcf of annual load each).
- However, power generation has been – and will continue to be – a significant natural gas end use.
- Environmental regulations are having a considerable impact on developers’ capacity development decisions.
- The low cost of natural gas is clearly provides a preference to new gas over new coal.



Electric Industry Environmental Regulations Create Uncertainty for Coal



Coal-Fired Capacity Share by Age Category

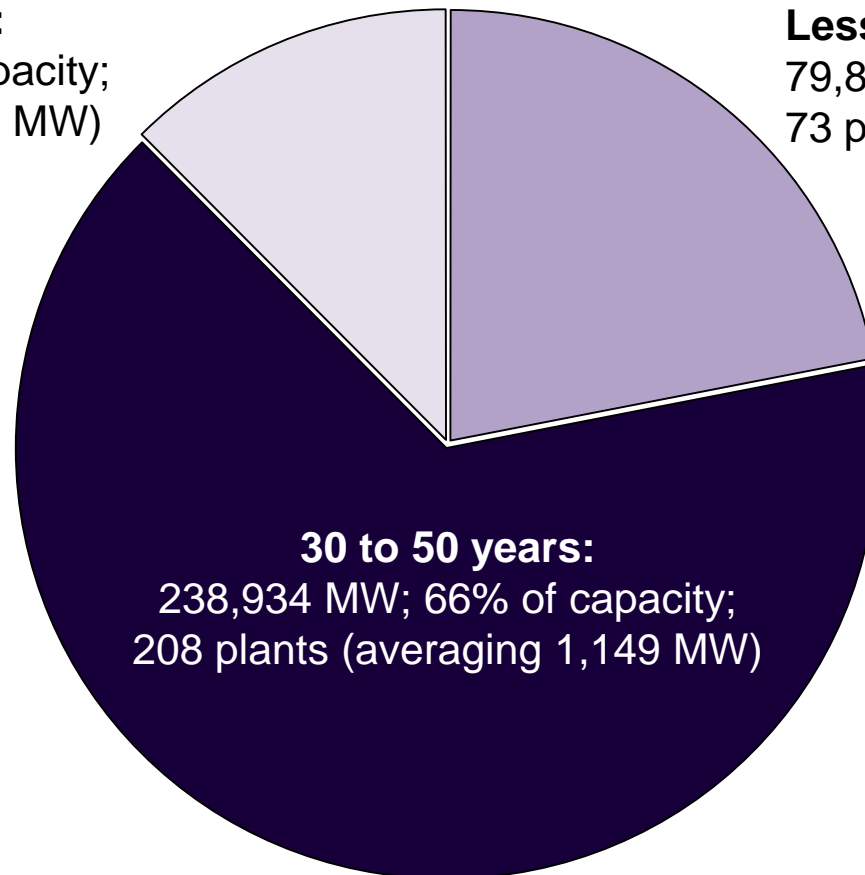
There is a considerable amount of legacy coal capacity (45 GWs) that is relatively old, and in some instances, has few to little controls to meet anticipated standards.

Greater than 50 years:

45,382 MW; 12% of capacity;
72 units (averaging 630 MW)

Less than 30 years:

79,876 MW; 22% of capacity;
73 plants (averaging 1,094 MW)

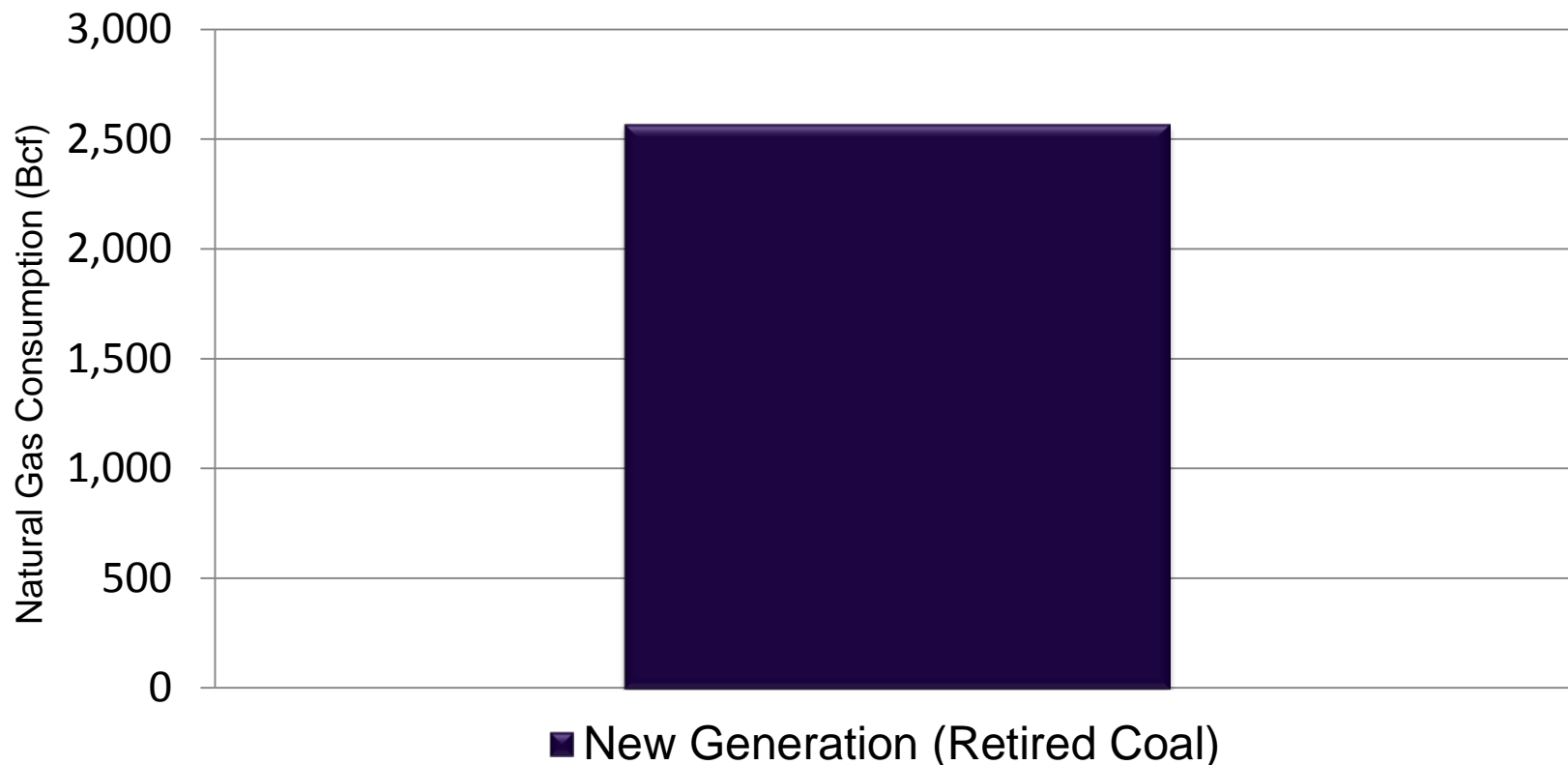


30 to 50 years:

238,934 MW; 66% of capacity;
208 plants (averaging 1,149 MW)

Increased Natural Gas Use from CSAPR-Induced Coal Plant Retirements

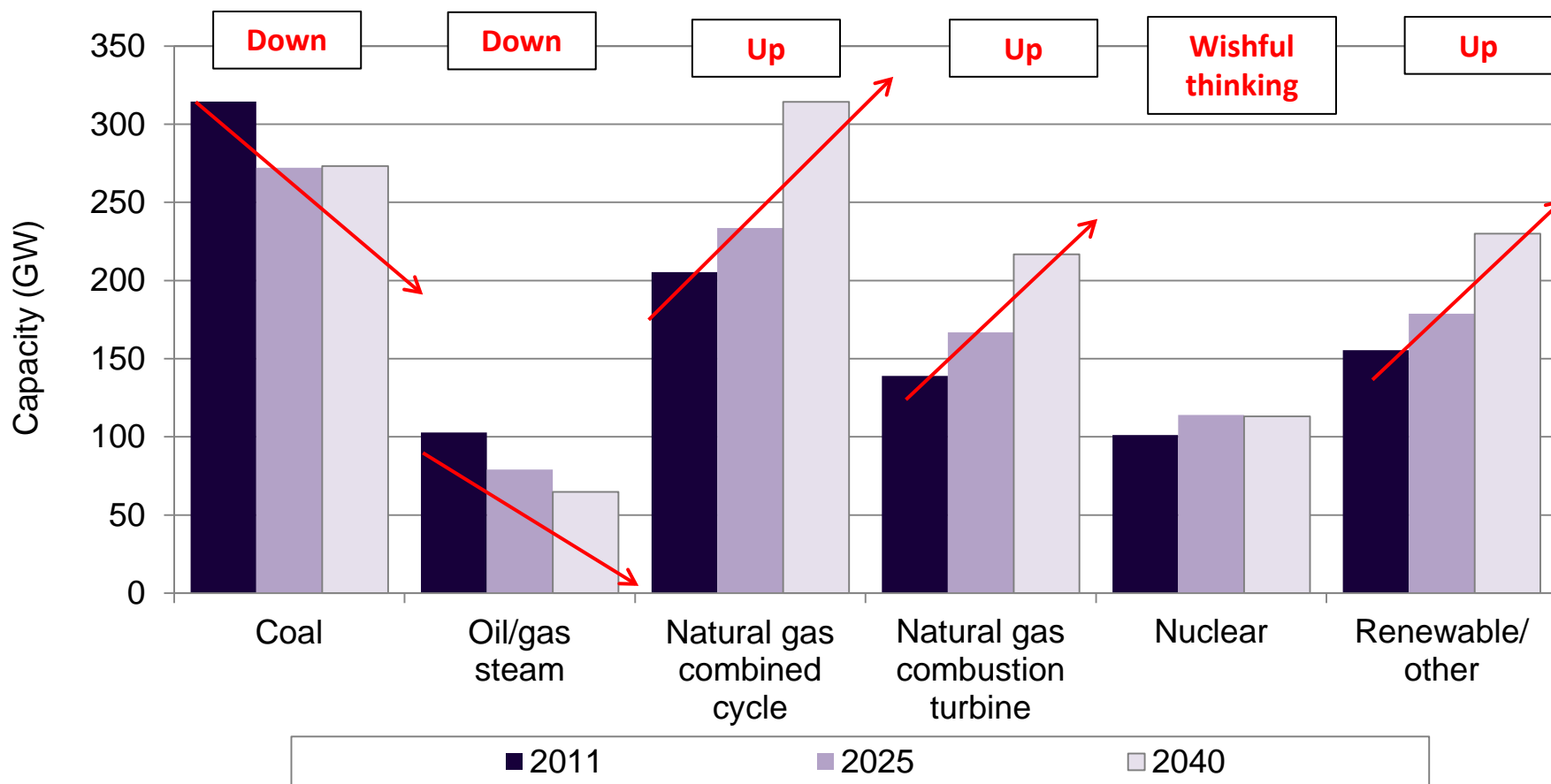
The retirement of 45 gigawatts of capacity would likely have an impact on overall natural gas usage (potentially 2 TCF).



Note: Assumes 160 Bcf of NGV natural gas use. Also assumes retirement of 45 GW of coal-fired capacity, replaced with new natural gas generation with an 85 percent capacity factor and a 7,600 Btu/kWh heat rate.

U.S. Generation Capacity by Fuel Type: 2011, 2025 and 2040

EIA estimates the growth in new generation to come primarily from natural gas (~170 GWs) and renewables (~75 GWs).



SERC/MISO Reserve Margins

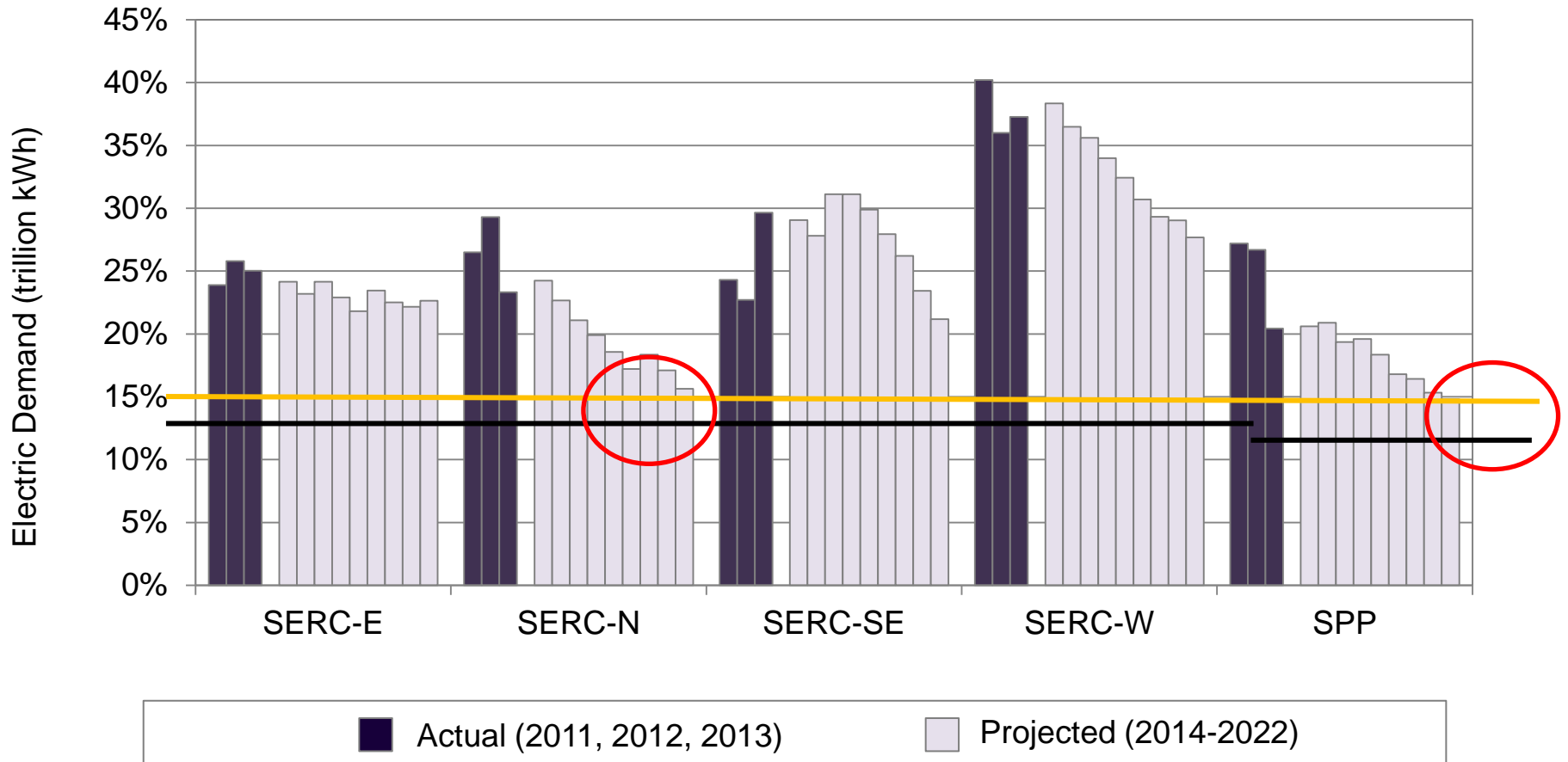
Reserve margins in MISO are much tighter than SERC, creating an opportunity for excess merchant generation to meet new MISO load requirements and potentially displace less efficient generation in that region.





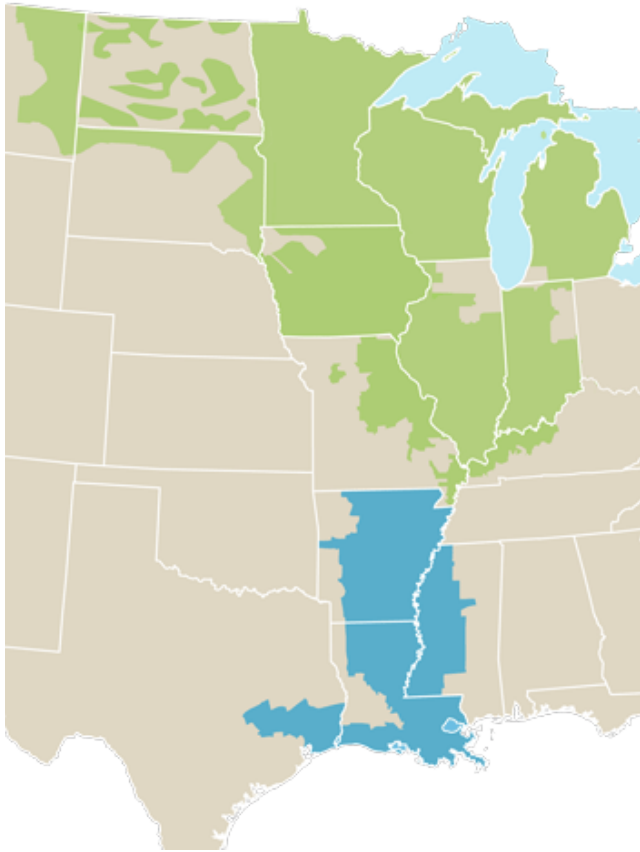
SERC/SPP Historic and Projected Reserve Margins

While margins are anticipated to fall, the conventional wisdom is the decrease will be slow.



Source: NERC; SERC planning standard line at 15 percent; SPP planning standard line at 13.6 percent.

Competitive Wholesale Market Changes/Benefits

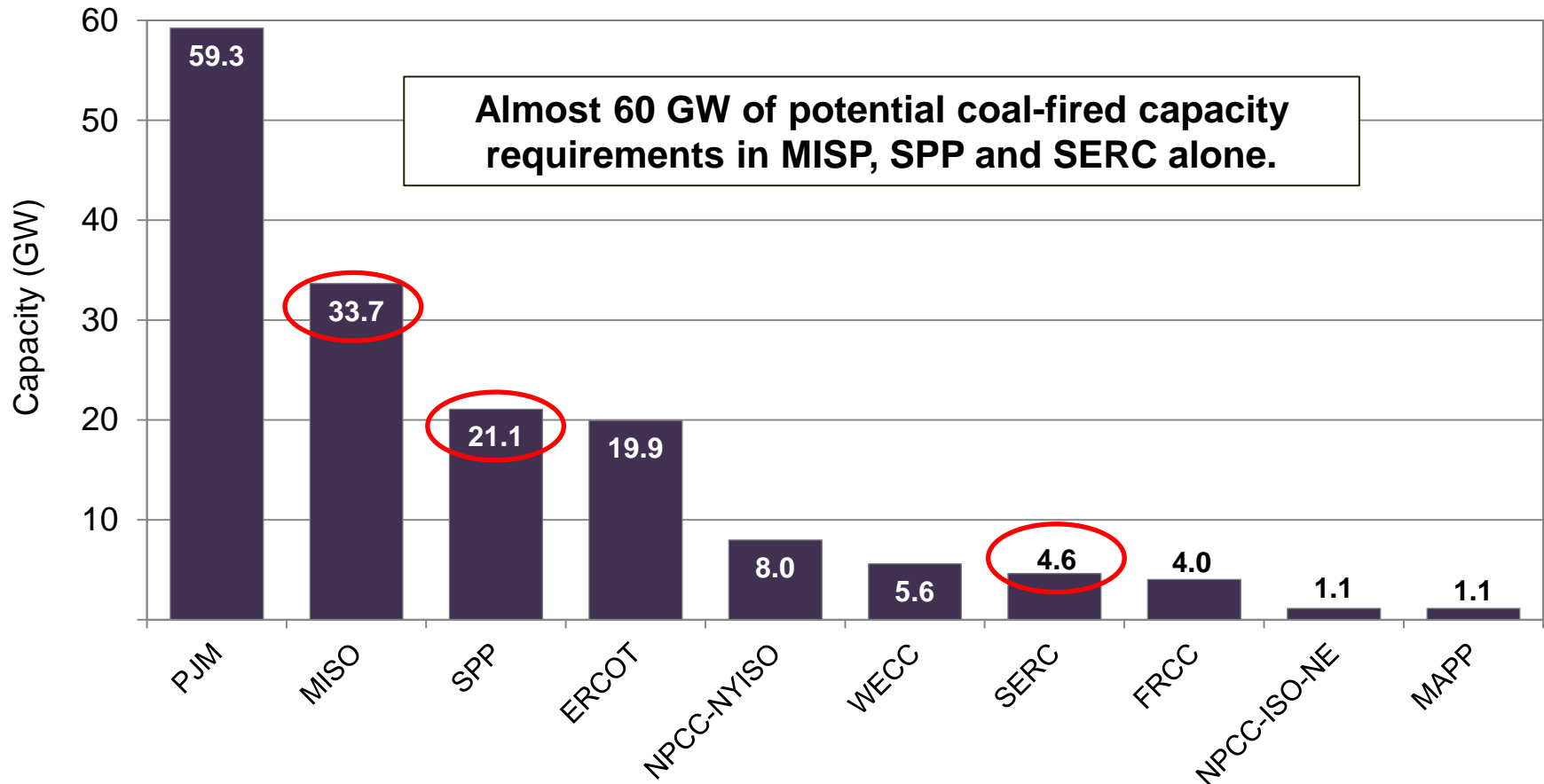


- There are a number of wholesale market benefits that can arise from the expansion of MISO to the Gulf Coast that include:
- Greater power generation market efficiencies.
- The ability to move highly-efficient and environmentally-friendly natural gas fired generation into an area historically dominated by coal-fired generation.
- Greater market scope opportunities by providing lower-cost, highly efficient natural gas generators easier access to quickly growing mid-western electric power markets.

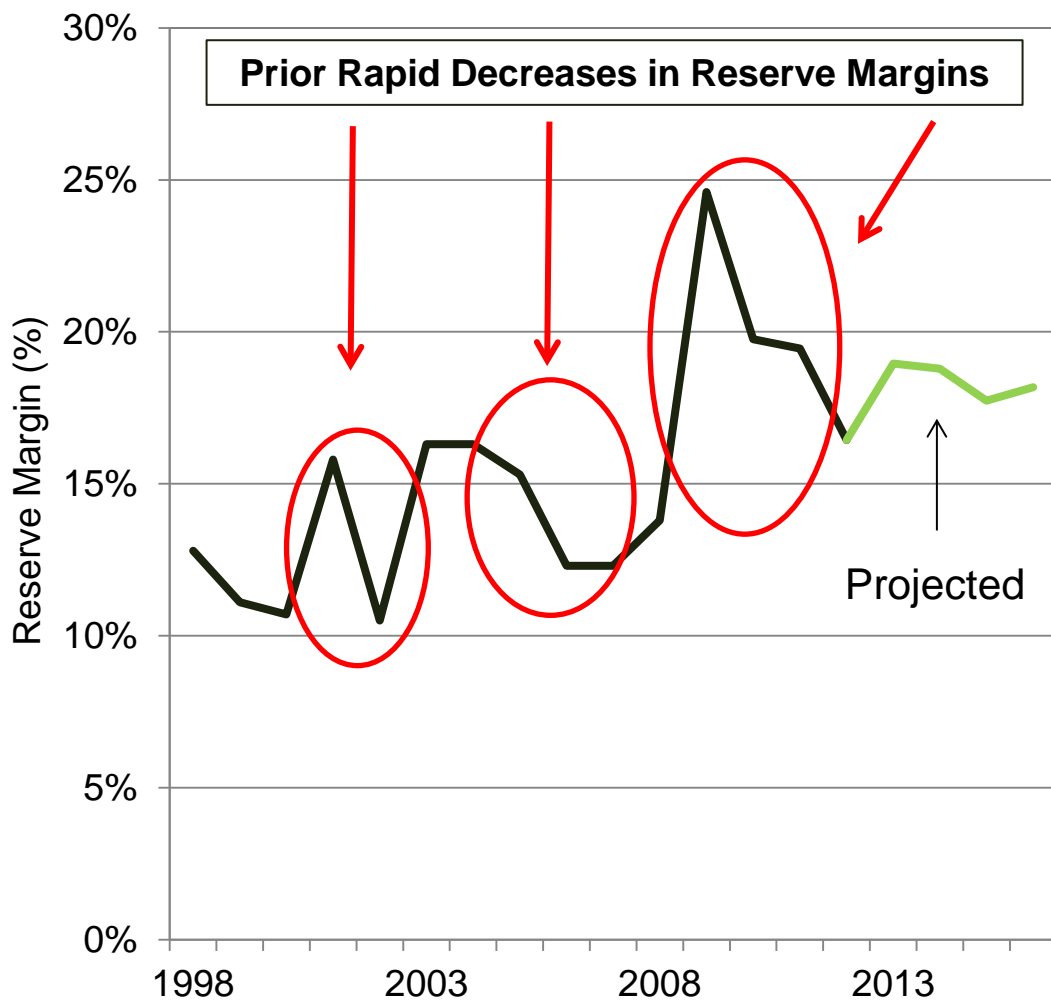


Estimated Environmental Retirements by NERC Region

NERC estimates that 160 GWs (339 units) will need retrofits by 2016. NERC also estimates that MISO will need to control over 33 GW of fossil-fueled generation to comply with new EPA regulations.



Historic and Projected Reserve Margin Changes



Have seen examples in the past where excess generation can be burnt off relatively quickly.

Conclusions

- Large and unprecedented level of industrial development/activity. While some projects may get cancelled, the nature of these projects differs from past infrastructure trends.
- The “multiplier” impacts on energy not often considered but could move what has been flat to decreasing power and gas use upward for smaller use customer classes.
- Environmental regulations will preference more gas.
- So – while conventional wisdom suggests markets are amply supplied, some surprising changes could arise over the next several years.
- History shows how quickly reserve/capacity margins can evaporate.



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