



Center for Energy Economics
and Public Policy

The Energy Transition in Western Coal Country

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Times Change...

A decade ago...

- Oil Prices: \$80-\$100/bbl - Now **\$50-\$55/bbl (-35%+)**
- Nat. Gas Prices: \$6-\$8+/mmbtu - Now **\$3.00 (-50%+)**
- Coal Prices: ~\$13.00/st - Now **\$11.50-\$11.75 (-12%)
Production down 25%+**
- Climate regulation ??????? - Now ???????





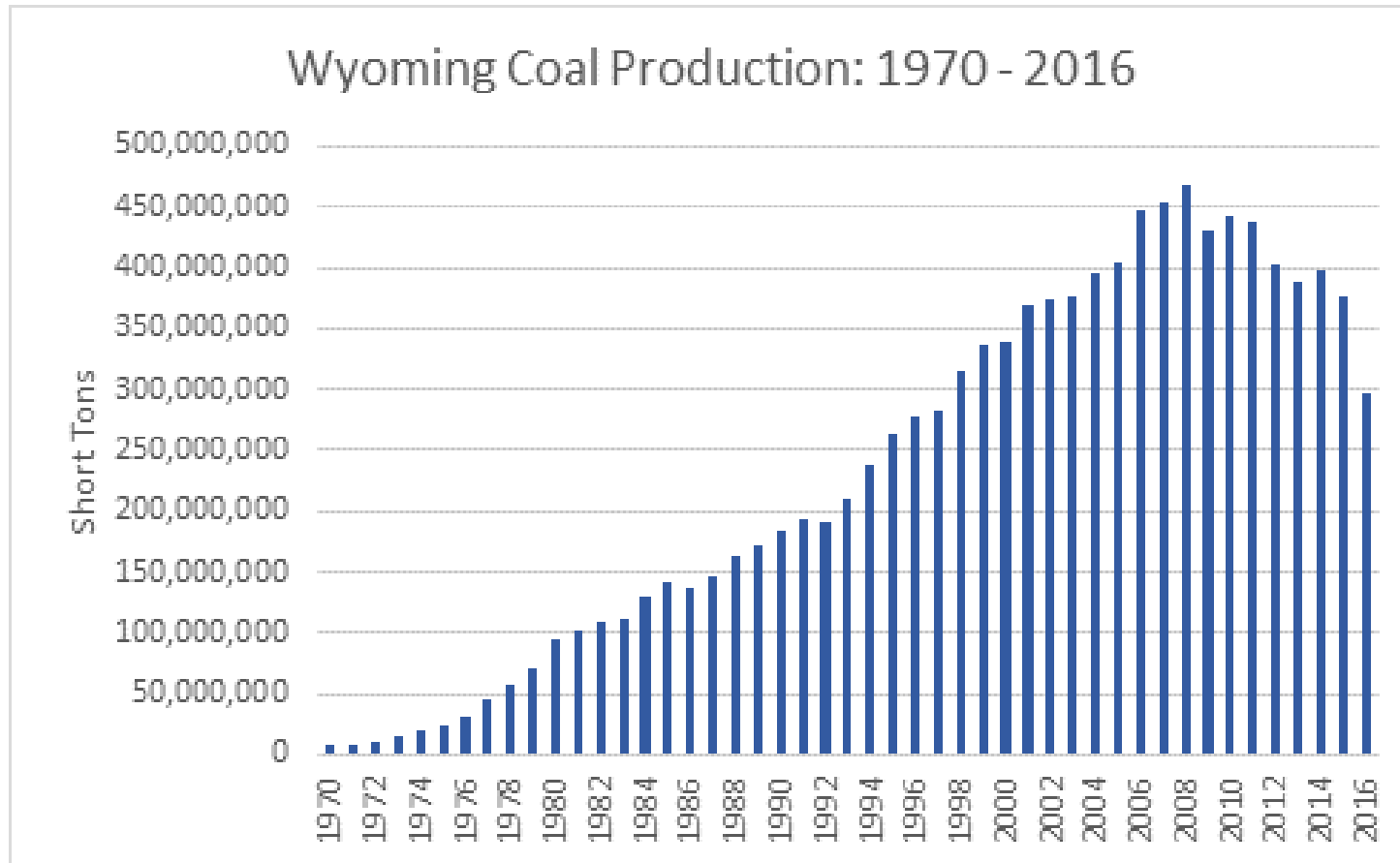
Energy Transition in West. Coal Country

- Focus on Wyoming
- 2nd largest total energy producer in US
 - Largest US coal producer
 - 6th largest nat. gas producer
 - 8th largest oil producer
- Changes and impacts in Wyoming have been abrupt.
 - Major changes in economic conditions and state revenues over past 3 years.
 - Attitudes and mindsets have not kept up with changing conditions





Wyoming: Coal Changes



- Wyoming produces over 40% of US total coal production.
 - More coal than next 6 states combined, from 16 active mines.
 - Over 96% comes from 12 mines in the Powder River Basin.
- Peak production: 2008 = 468 million tons.
- Fell to 297 million tons in 2016.
- 2017 production expected to be in the 310-330 million ton range.





Powder River Basin

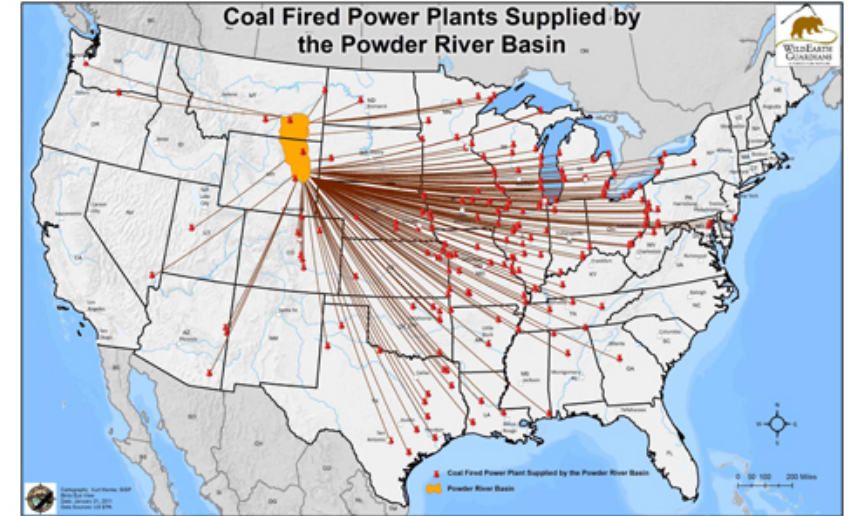
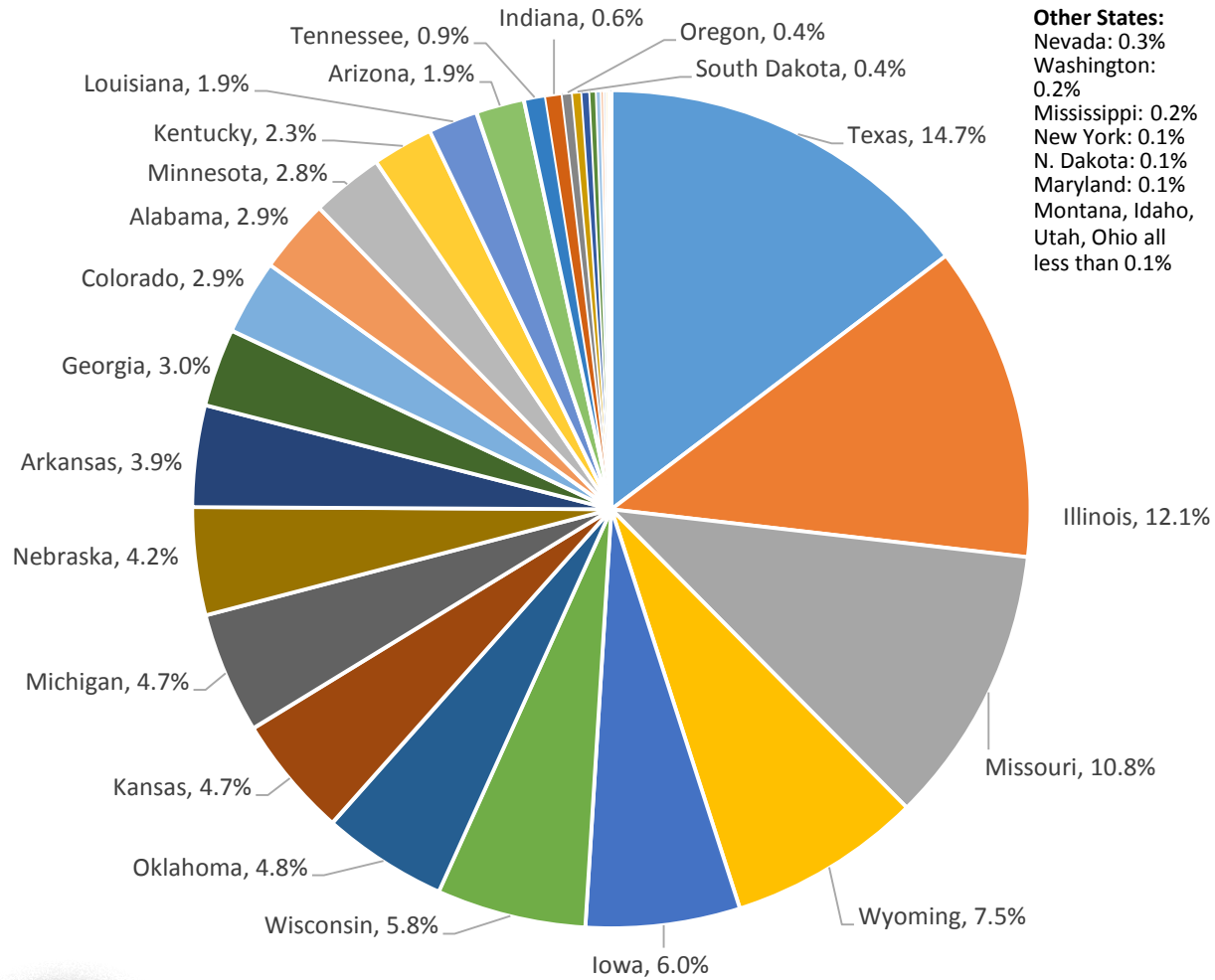


- The Wyoming Powder River Basin has been mined for over 100 years, but only began exporting to the rest of the country in the 1970s.
 - Sub-bituminous coal (8,700 btu/lb)
- Reasons for growth from less than 1% of US production to dominance in the domestic thermal market today:
 - Energy crisis in the 1970s and perceived need to develop domestic energy sources.
 - Economies of scale – reserves allow surface mining on a massive scale.
 - Rail deregulation results in reduced transport costs in 1980s.
 - Very low sulfur content (approx. 1/10 the content of Illinois coal) makes use very appealing after Clean Air Act regulations limit sulfur dioxide emissions on new and then existing plants with 1990 CAA amendments.





Domestic Markets

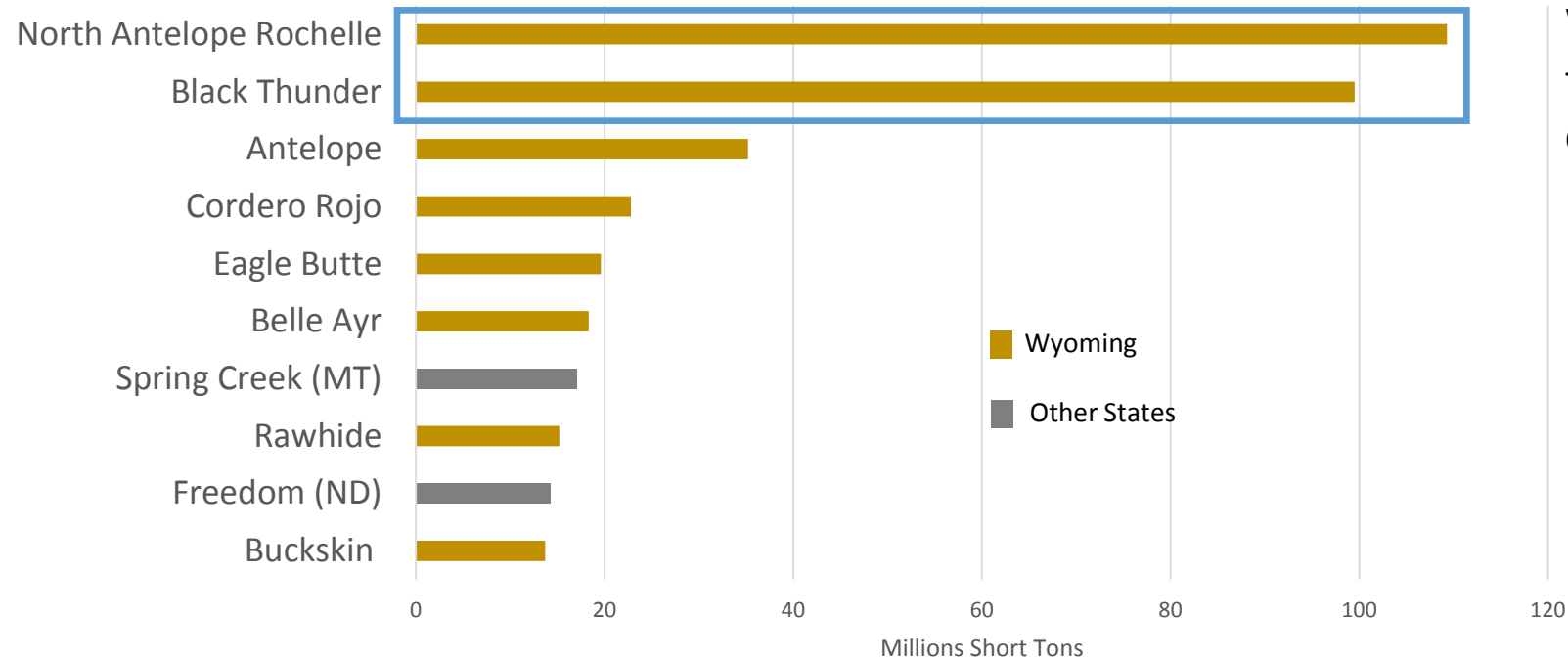


Source: EIA, 2015



Scale Economies

Top 10 Producing Coal Mines by Tonnage in the U.S. (2015)

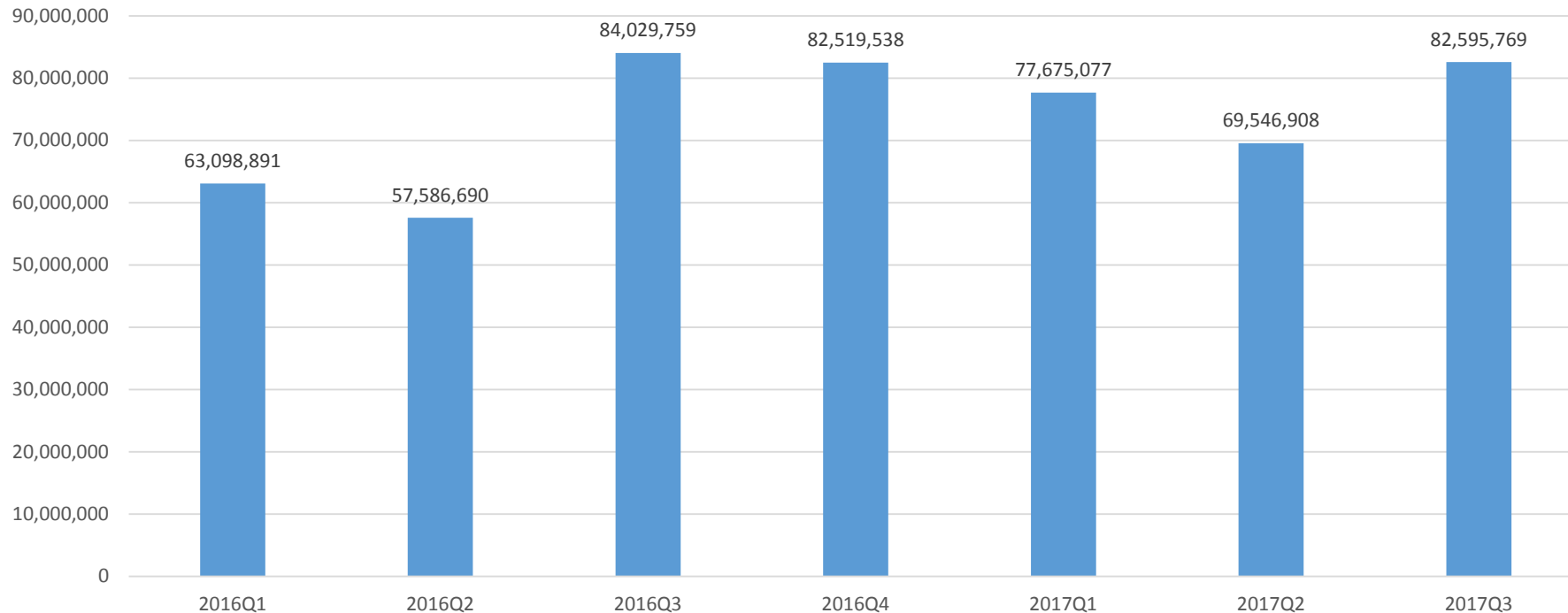


Two largest mines in Wyoming accounted for over 23% of US coal production.



Recent Production

Total PRB Quarterly Production 2016-17



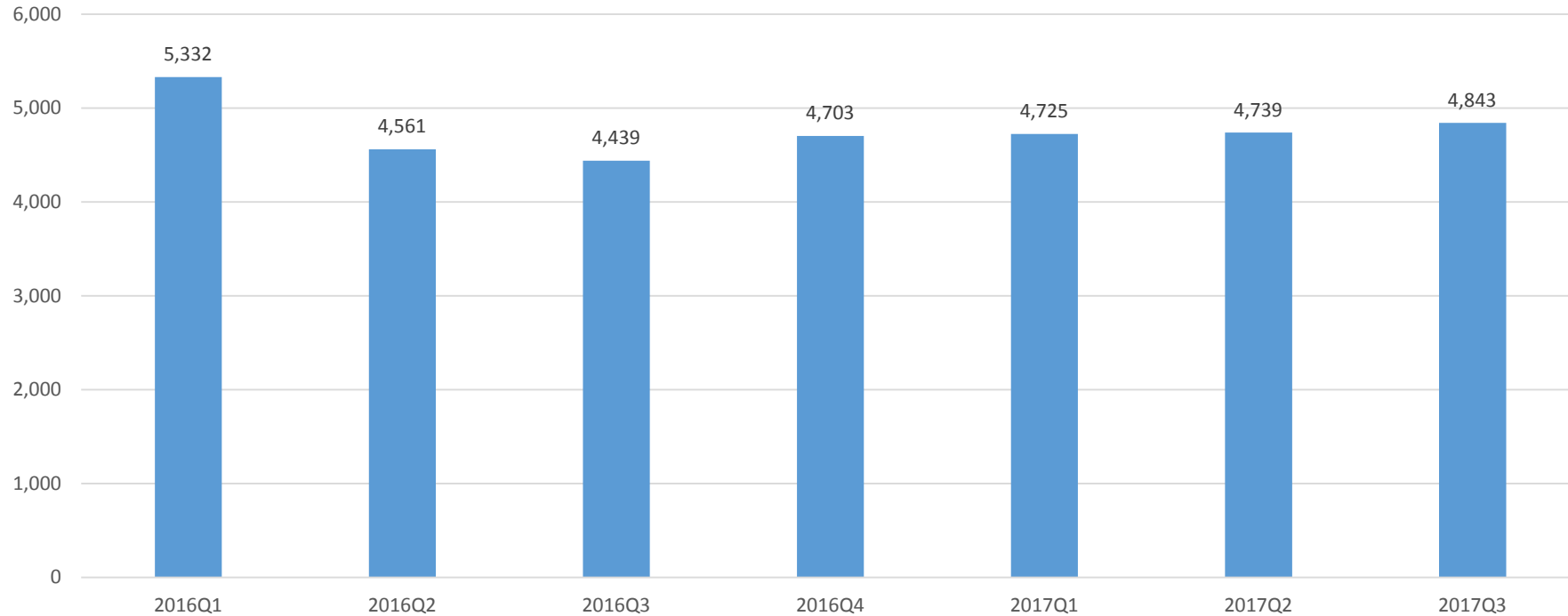
- PRB production in 2016: 287 million tons.
- Current PRB pace: 310-320 million tons (~10% increase over 2016).

Source: MHSa



Mining Employment

Total PRB Quarterly Mining Employment 2016-17

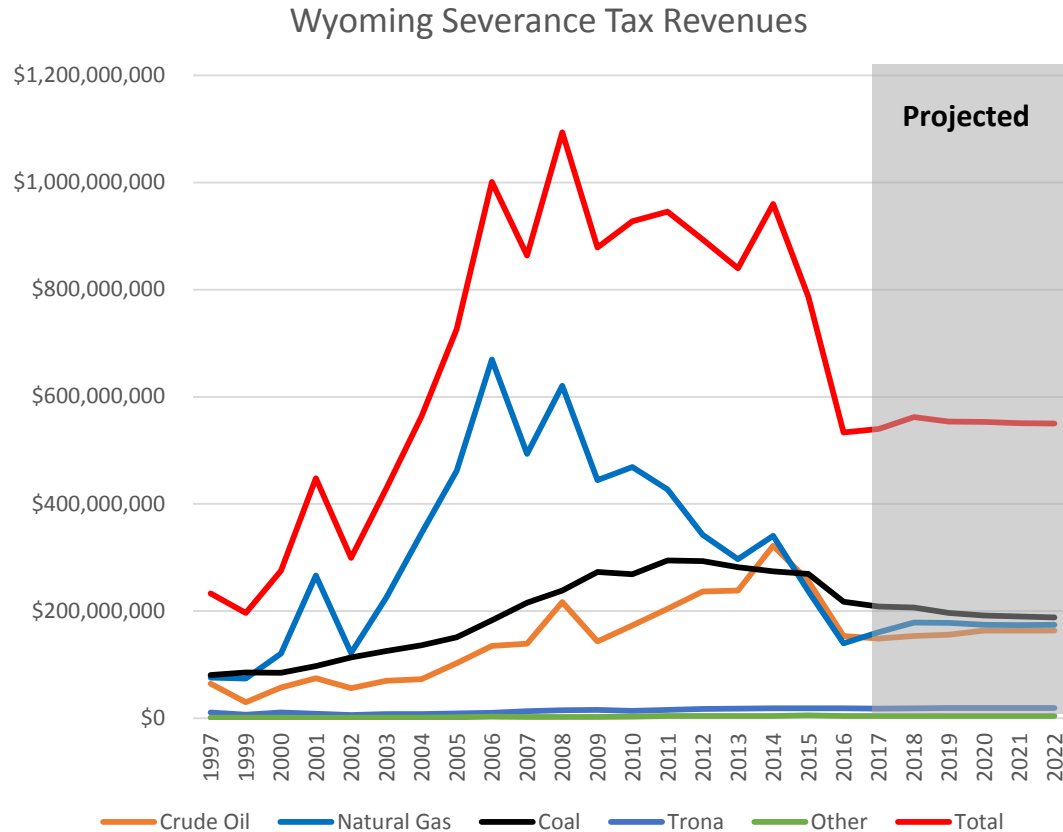


- 18% decline in employment since 2015.
- 9% increase over past year.

Source: MHSa



Severance Tax Revenue Forecasts



- All fossil-fuel severance revenues are forecast to fall in Wyoming over the next five years.
 - Due to current market conditions, and potential future regulations.
- This has had significant impact on state budgets.
- Note coal is the single relatively “stable” source of funds...

Source: Wyoming Consensus Revenue Estimating Group, January 2017.



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Threats to the Wyoming Coal Industry

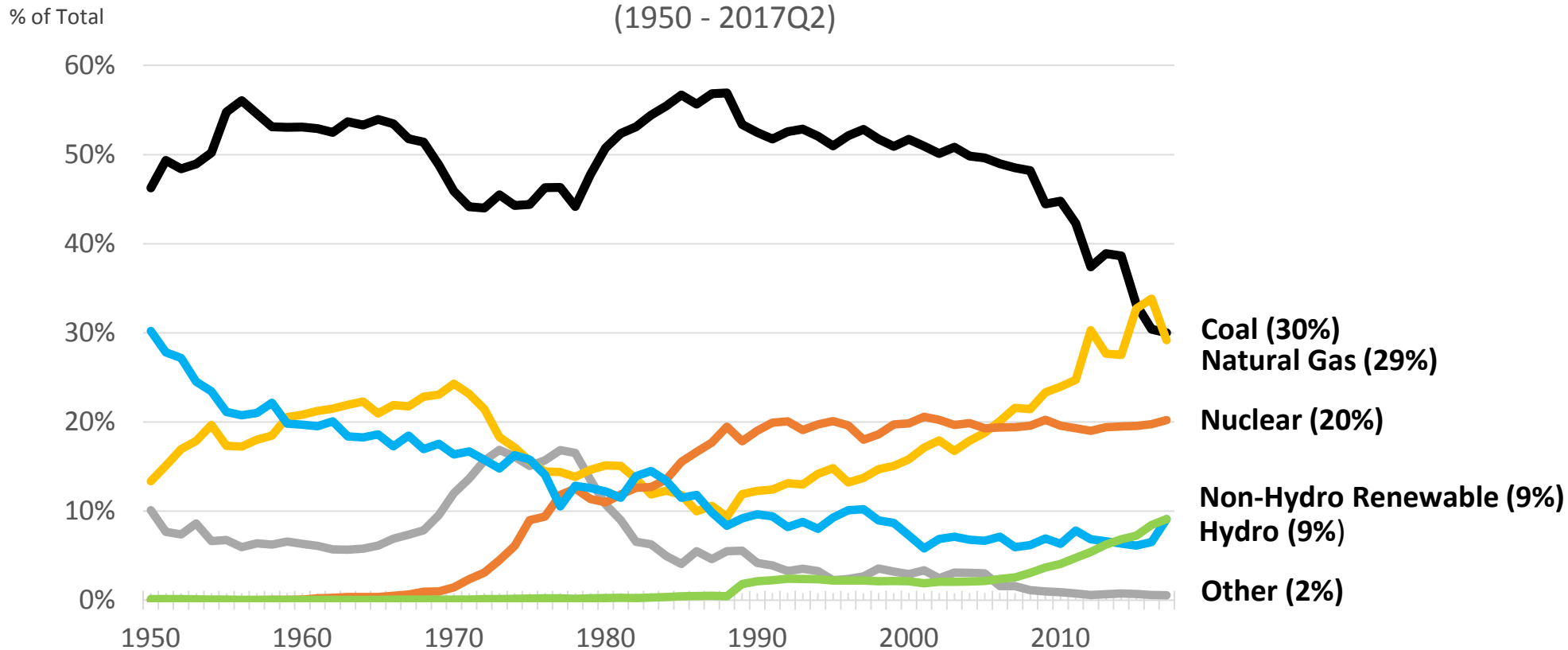
- “Fundamental” Market challenges (short term)
 - Continued low natural gas prices
 - Continued weak electricity demand growth
 - Renewable generation growth
- Long term challenges
 - GHG regulation (domestic and foreign)
 - Lack of new coal plant construction
 - Increased renewable penetration
 - Increased coal production costs.





Impact on Electricity Production

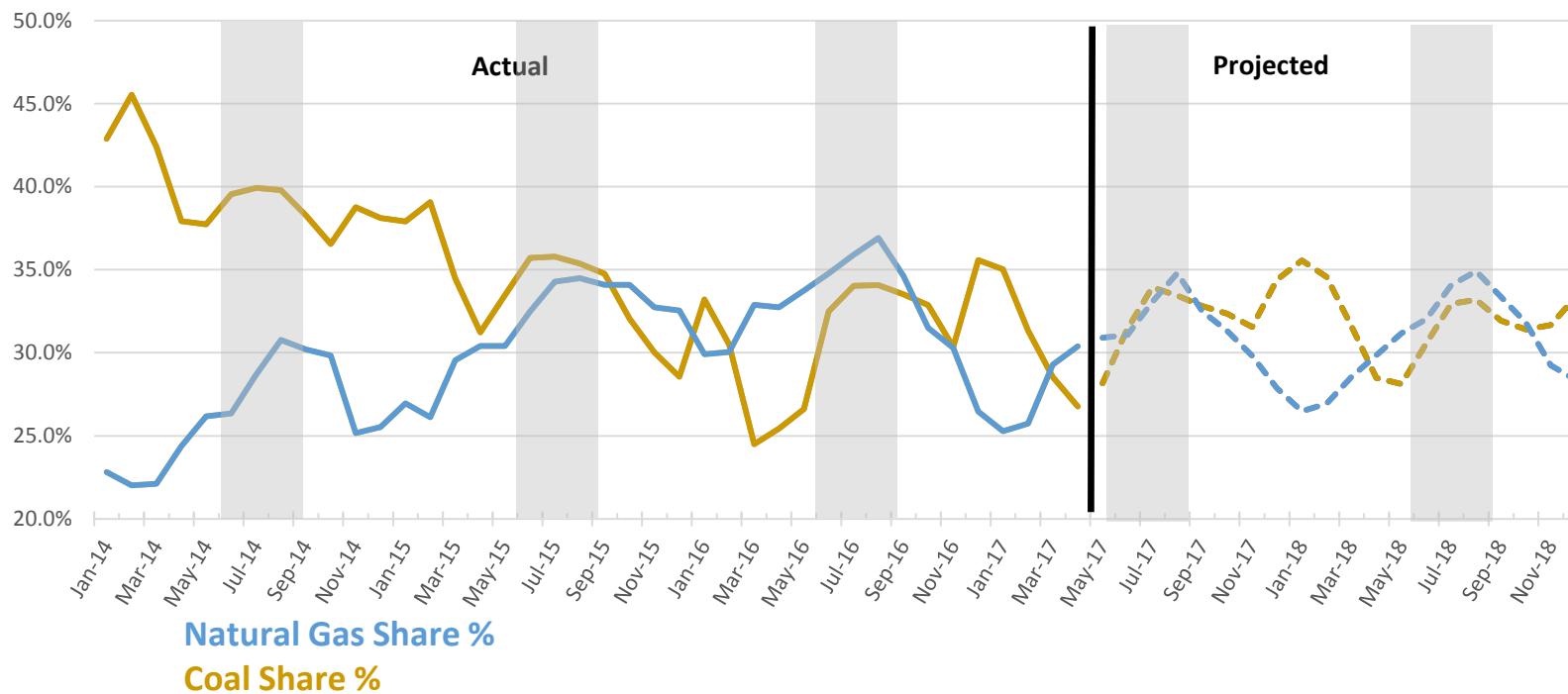
Annual share of total electricity generation by source
(1950 - 2017Q2)





Generation Forecast (Coal vs. Gas)

Generation Shares: Recent and Projected



Near term outcome:

- coal and gas both produce approx. 31% share through 2018.

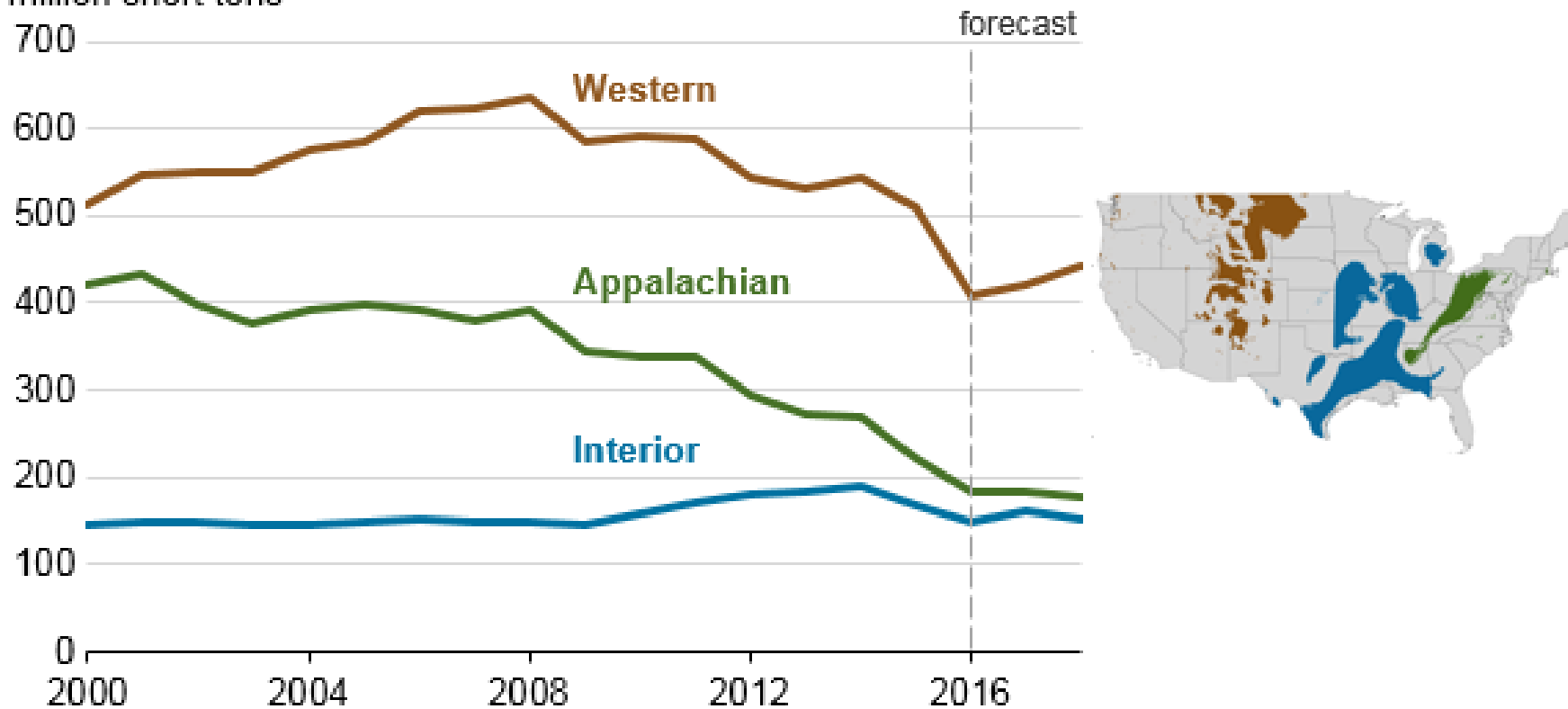
Source: EIA Short Term Economic Outlook, May 9, 2017





Near Term Coal Market Forecast


U.S. coal production
million short tons

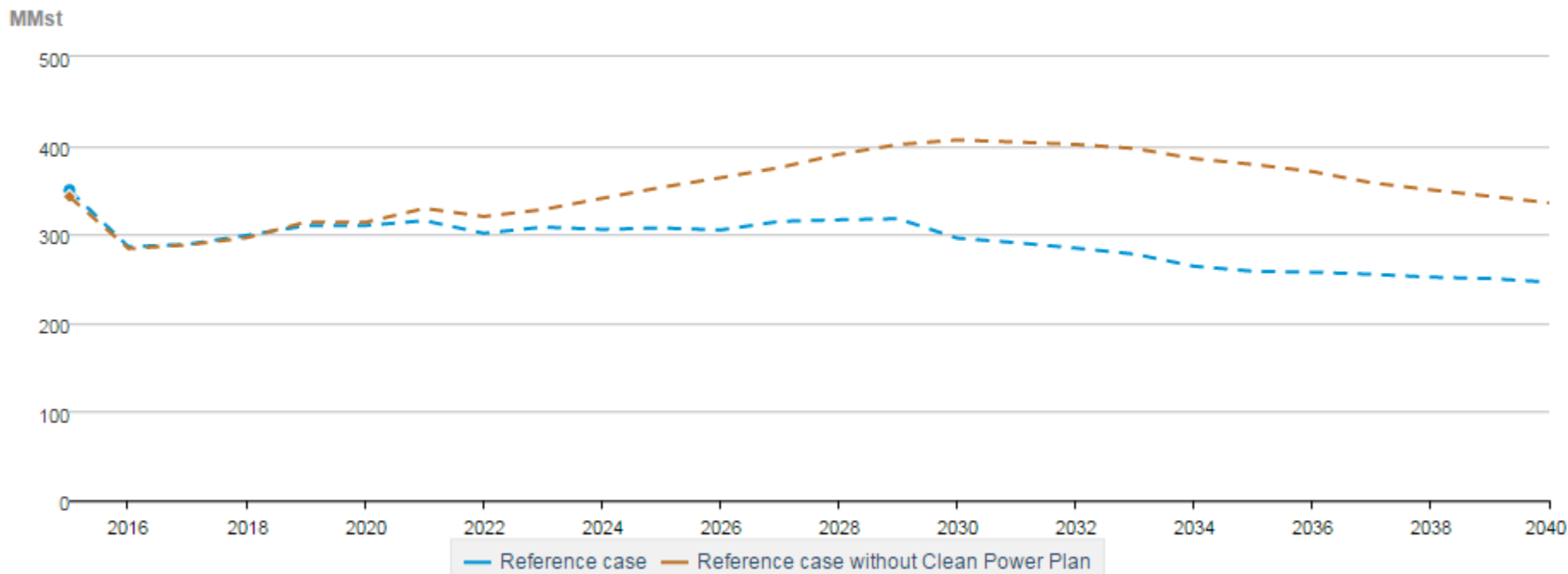




Long Term Coal Forecast

Coal Production: Wyoming, Powder River Basin

 [DOWNLOAD](#)



Source: U.S. Energy Information Administration

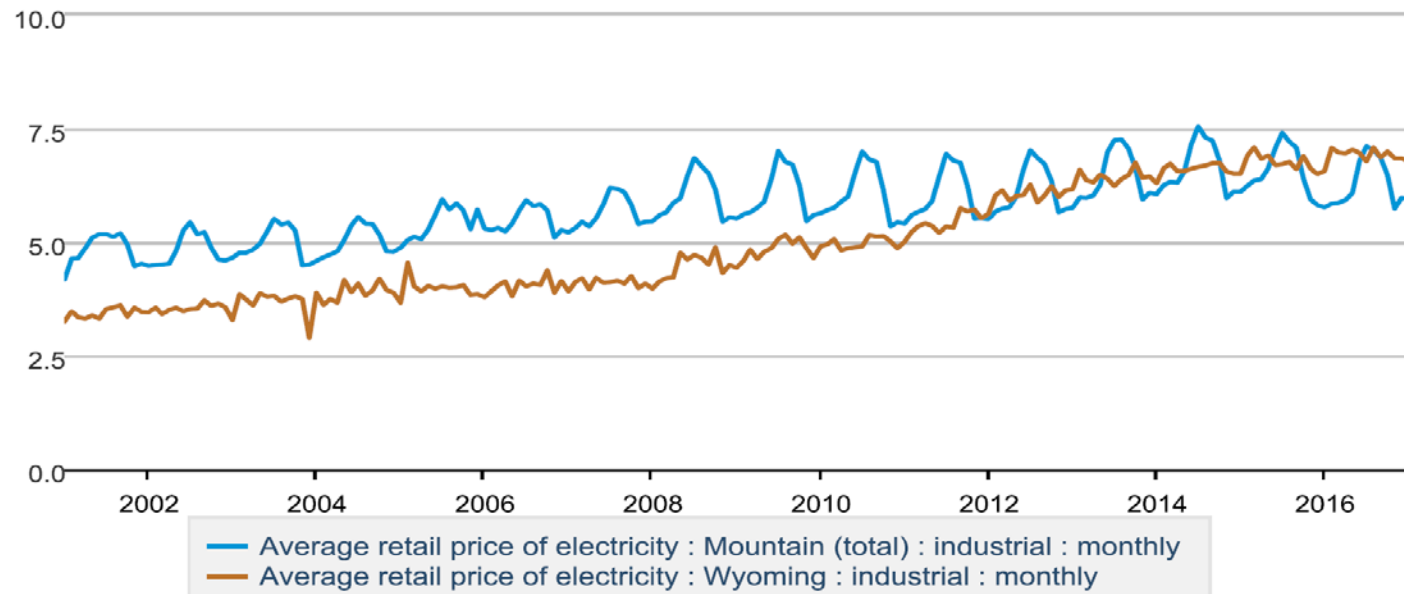




Technological/Market Impacts on Rates

Wyoming vs. Mountain Region (AZ, CO, ID, MT, NV, UT, WY)
Average Price of Electricity 2002-2016

cents per kilowatthour



Data source: U.S. Energy Information Administration





Potential Game Changers:

1. Short-term:

- Changes in nat. gas prices from forecast (high or low).
- Possible changes in valuation of coal for fuel security/reliability/resilience reasons in elec. markets.

2. Long term:

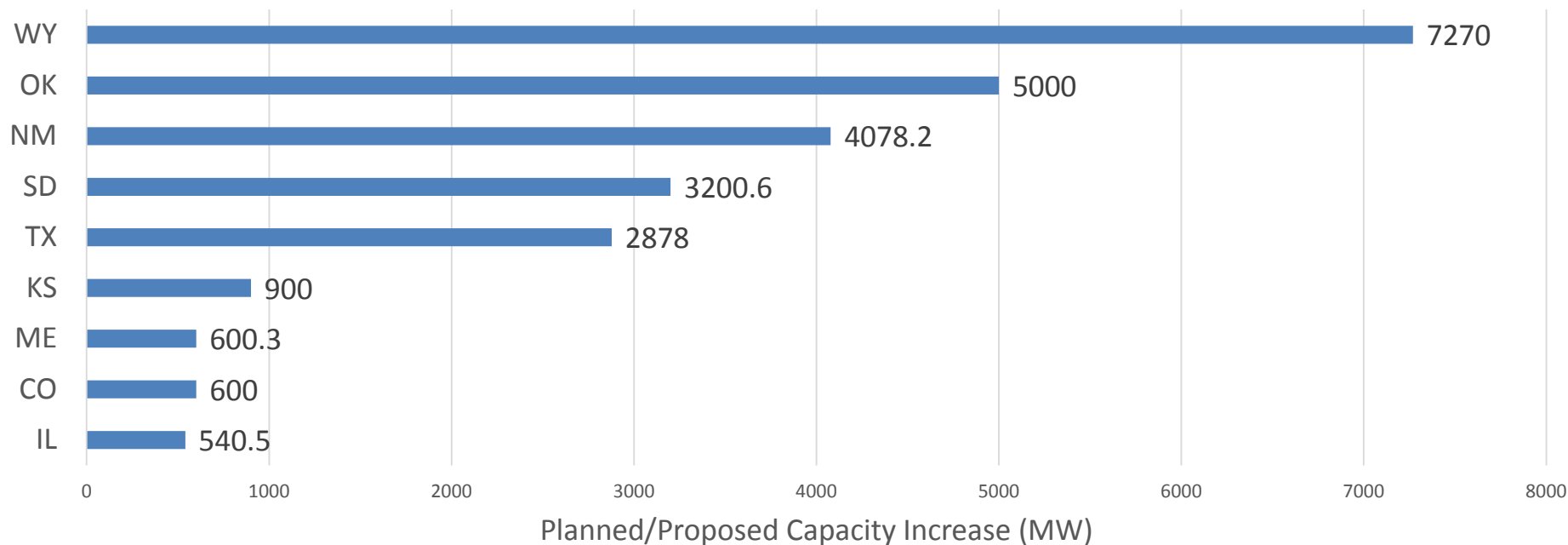
- Changes in GHG regulation (domestic and foreign)
- Increased renewable penetration/PTC changes
- Changes in elec. demand from trend (e.g. EV use)
- Development of international markets (Japan, Korea)
- Major breakthroughs in technology
 - Breakthroughs in CCS processes/CO₂ uses or alternative coal uses.





Opportunity in Wyoming

20 Largest Wind Projects in US: Capacity Impact by State (MW)



Source: S&P Global Market Intelligence 20 largest wind projects in US (August 2017)





Implications for Wyoming

- Potential impact of 8,000MW of new wind construction:
 - Over \$13 billion in potential investment planned in the state in next 5 years,
 - Over \$9 billion in new economic activity in the state,
 - Almost \$4 billion in new labor income,
 - Over \$2.5 billion in new tax revenues over 20-year lifetime of projects at current tax rates,
 - Almost 68,000 job-years of new employment
 - 28,000 job-years of new employment in the initial 5-year construction phase (average 5,600/year)
 - 40,000 job-years of new employment over 20 years of operation (average 2,000 jobs/year)





Policy?

- Wyoming policy has not adapted to current conditions and may not be paying attention to fact that wind development occurs in a competitive market.
 - Taxation/Incentives? (Wyoming taxes elec. production from wind)
 - Regulation practices and policies?
 - Perceived interest by state officials and legislators?
 - Infrastructure and development initiatives and support?





State concerns about Wind: Ironic?

- Protection of cultural values?
 - Landscape
 - Heritage sites
- Species protection?
 - Wildlife/environmental impacts
- Economic impacts?
 - Recreational/Tourism impacts
 - Access/use of lands





Conclusions

- Energy transition is being driven by market and technological trends in the industry – far less so by regulation.
 - Electricity market outcomes, changes in technology development, and consumer/political preferences.
 - Have had significant economic and revenue impacts
 - Recent changes have actually lowered prices and emissions.
- Need more than ever for economic and business research to help policy-makers
 - Impact analyses (transition impacts and opportunities)
 - Revenue analysis (existing and new policies)
 - Techno-economic studies – opportunity analysis





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