



# **Global Energy: Abundant Supply and Policy Uncertainty**

## **Carnegie Moscow Center**

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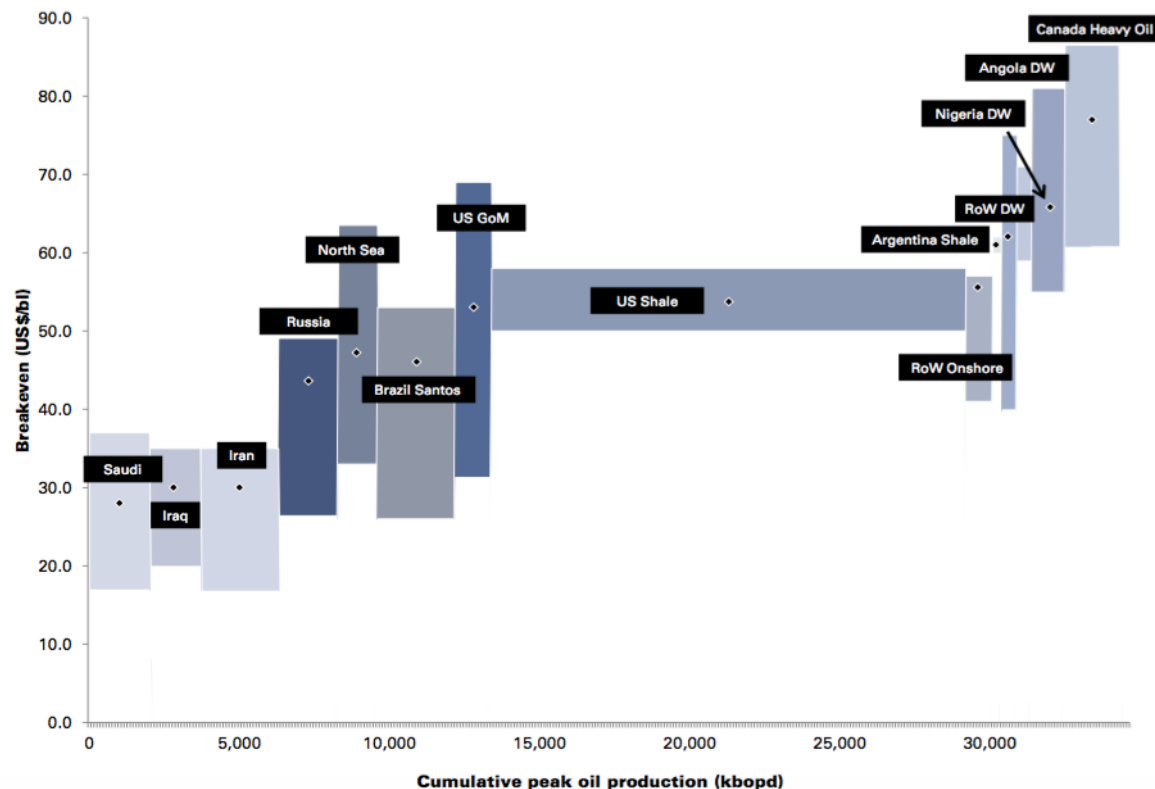
*June 28, 2017 -- Moscow*



# Shale Is No Longer High-Cost Production

## Cost Curve for Incremental Oil Production Volumes Through 2025

Breakeven in \$ per barrels, cumulative peak production in thousand barrels per day



Source: Goldman Sachs

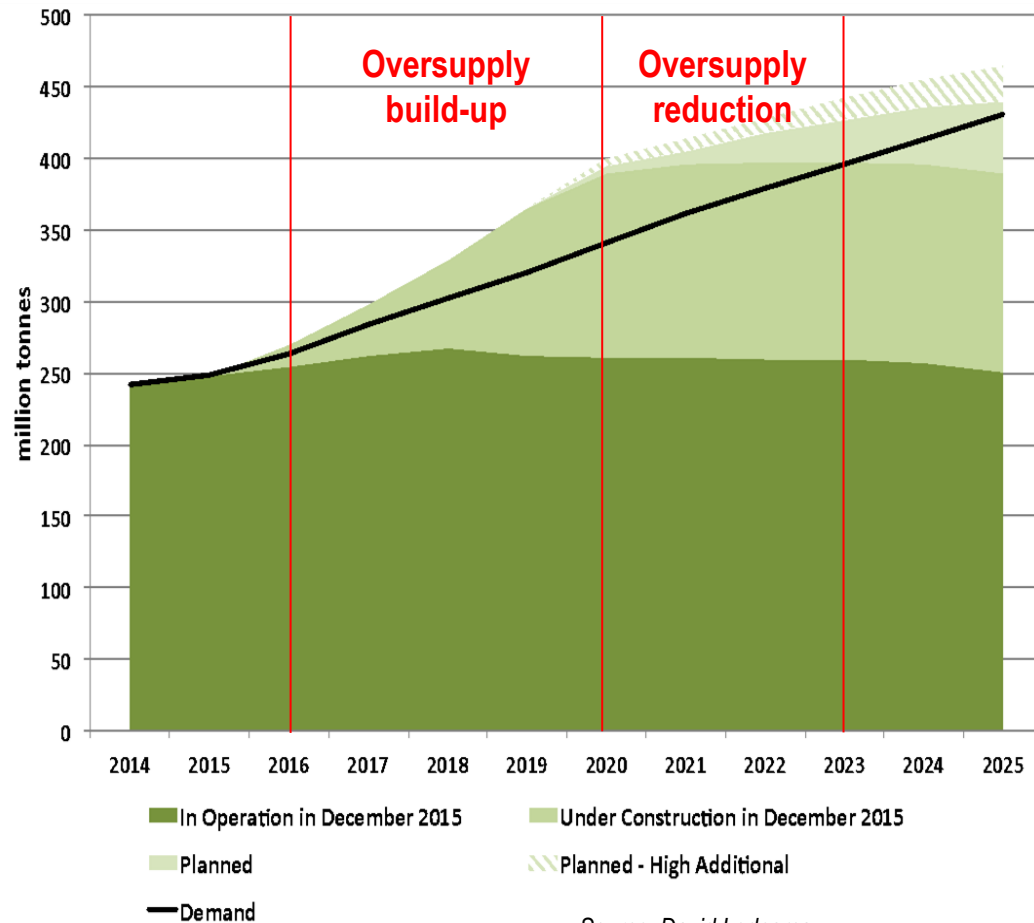
- Average shale breakevens down from of \$80 in 2014 to \$55 in 2016
- Productivity gains to continue at 3%-10% per year through 2020
- Shale breakevens can fall below \$50 by 2020
- Despite improving productivity, US shale needs \$60+ oil price to grow materially



# Oversupplied LNG Markets for The Next 5-10 Years?

## Global LNG Supply and Demand

Million tons per annum



Source: David Ledesma

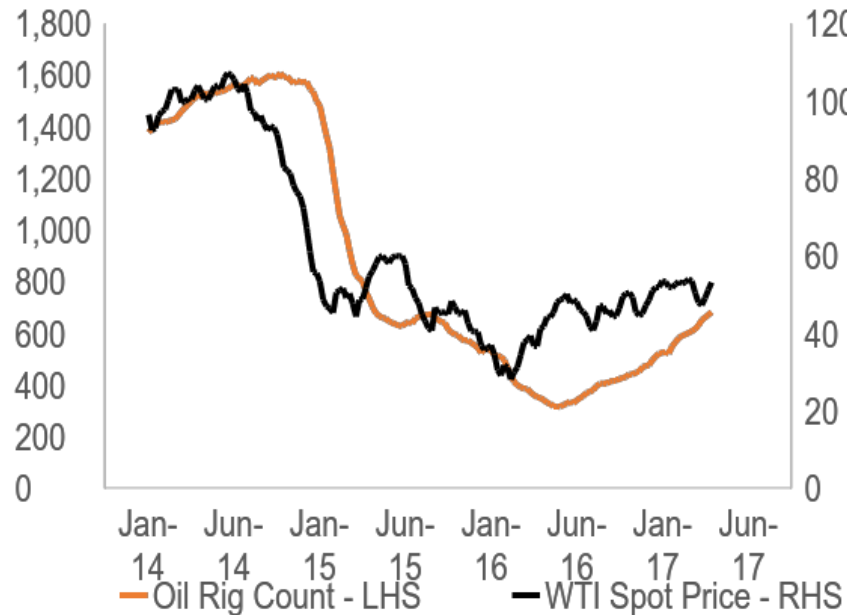
- With US and Australian capacity additions, the global LNG market will likely be oversupplied through the early-2020s
- The economics of new liquefaction projects is challenging at current prices
- Uncertain demand outlook for LNG adds further to the challenges
- Without new FIDs in the next few years, tight markets may return by around 2023



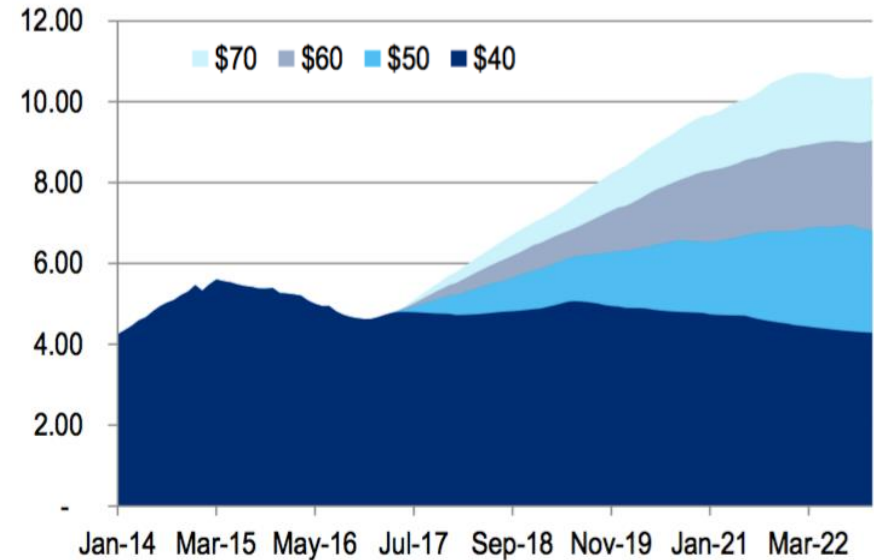
# US Shale Is Responding to Higher Prices

## Oil-Directed Rig Count and WTI Spot Prices

Number of rotary rigs drilling, \$ per barrel



## US Shale Liquids Production under Various WTI Price Scenarios



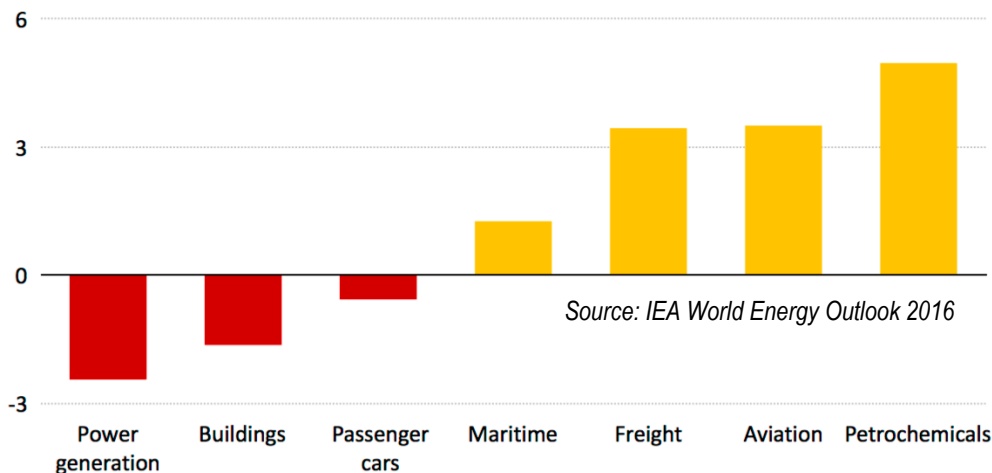
Source: EIA, Baker Hughes, Citi Research

- Rig counts started to recover in response to \$50+ oil prices since mid-2016
- Price elasticity of US shale remains highly uncertain, estimates vary widely
- Long-term trajectory of US shale production depends on WTI, cost reflation, productivity gains

# Peak Demand on the Horizon?

## Change in Oil Demand by Sector (2015-2040)

Million barrels per day



## Peak Oil Demand Initiative

Speculation has shifted from “peak oil” to “peak demand,” driven by:

- Climate policies post-Paris
- Falling renewable costs
- Technological advances (e.g. EVs)
- Growing natural gas availability
- Energy storage, efficiency, digital economy

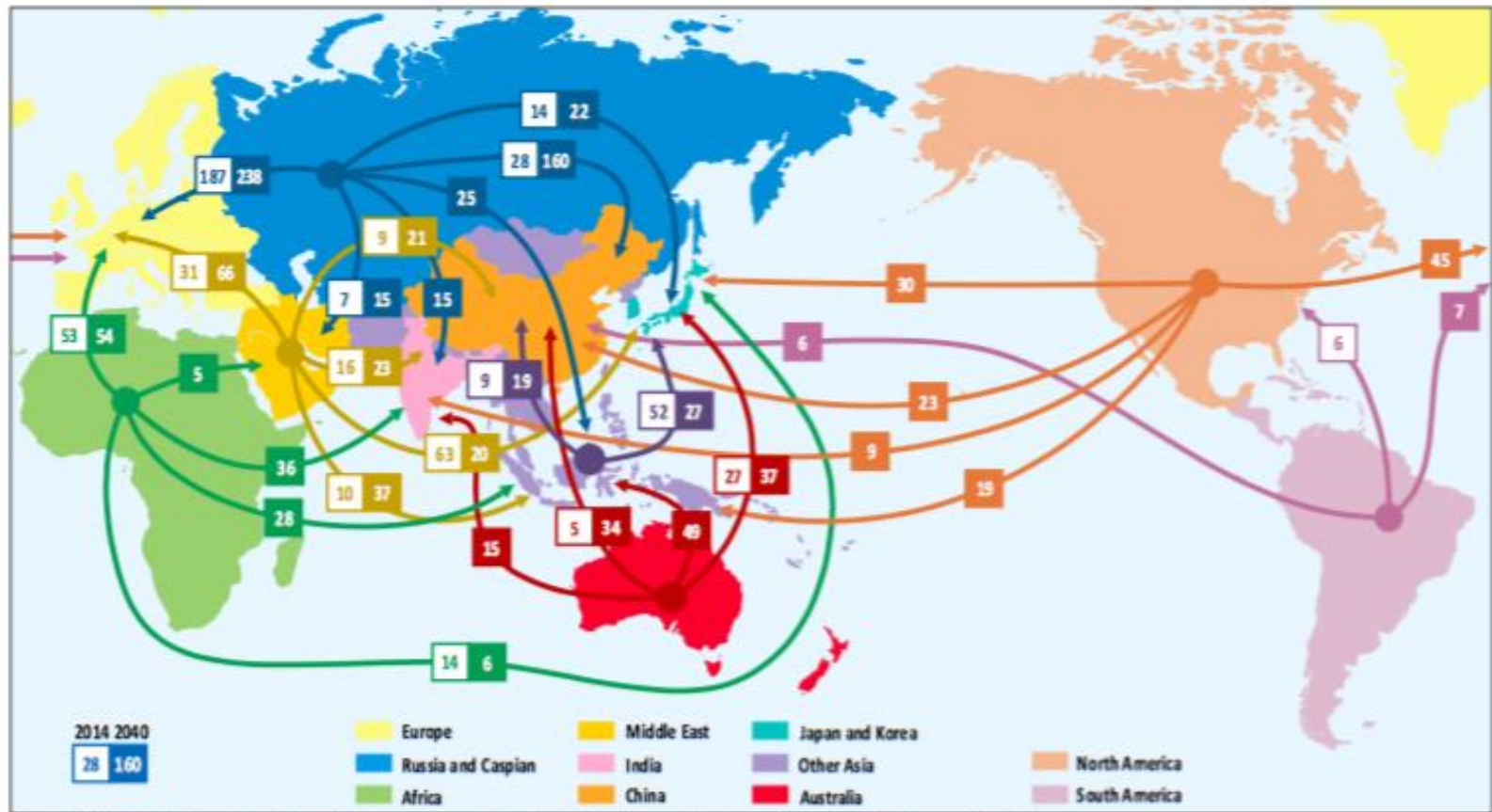
“Peak demand” is pregnant with consequences

- Investments and stranded assets
- Resource optimization
- Geopolitical and policy uncertainties



# Global Gas Trade Is Becoming Increasingly Complex

**Figure 4.17** ▶ Selected global gas trade flows in the New Policies Scenario (bcm)



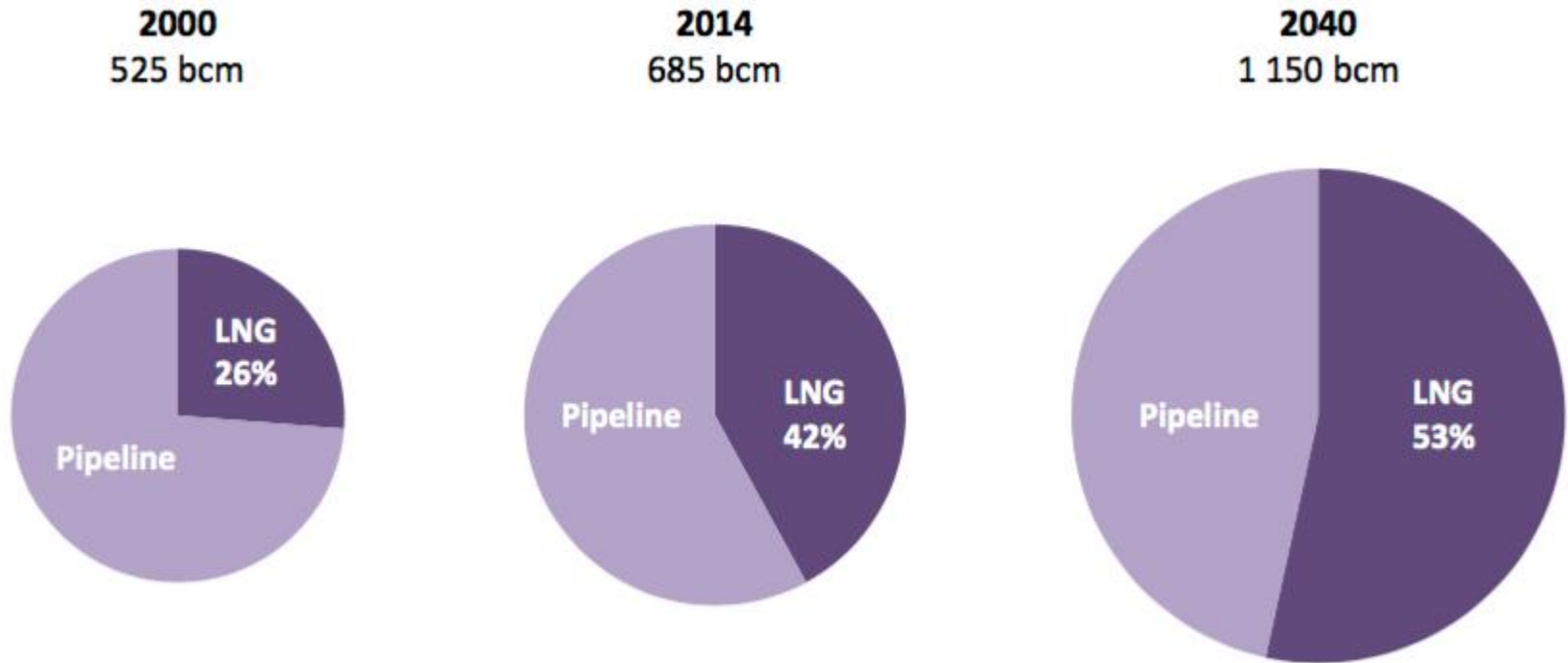
This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

*The strong import growth in Asia underpins a fundamental shift in trade flows away from the Atlantic basin to the Asia-Pacific region*

Source: IEA World Energy Outlook 2016

# Long-Distance Gas Trade Is Set to Increase, Led by LNG

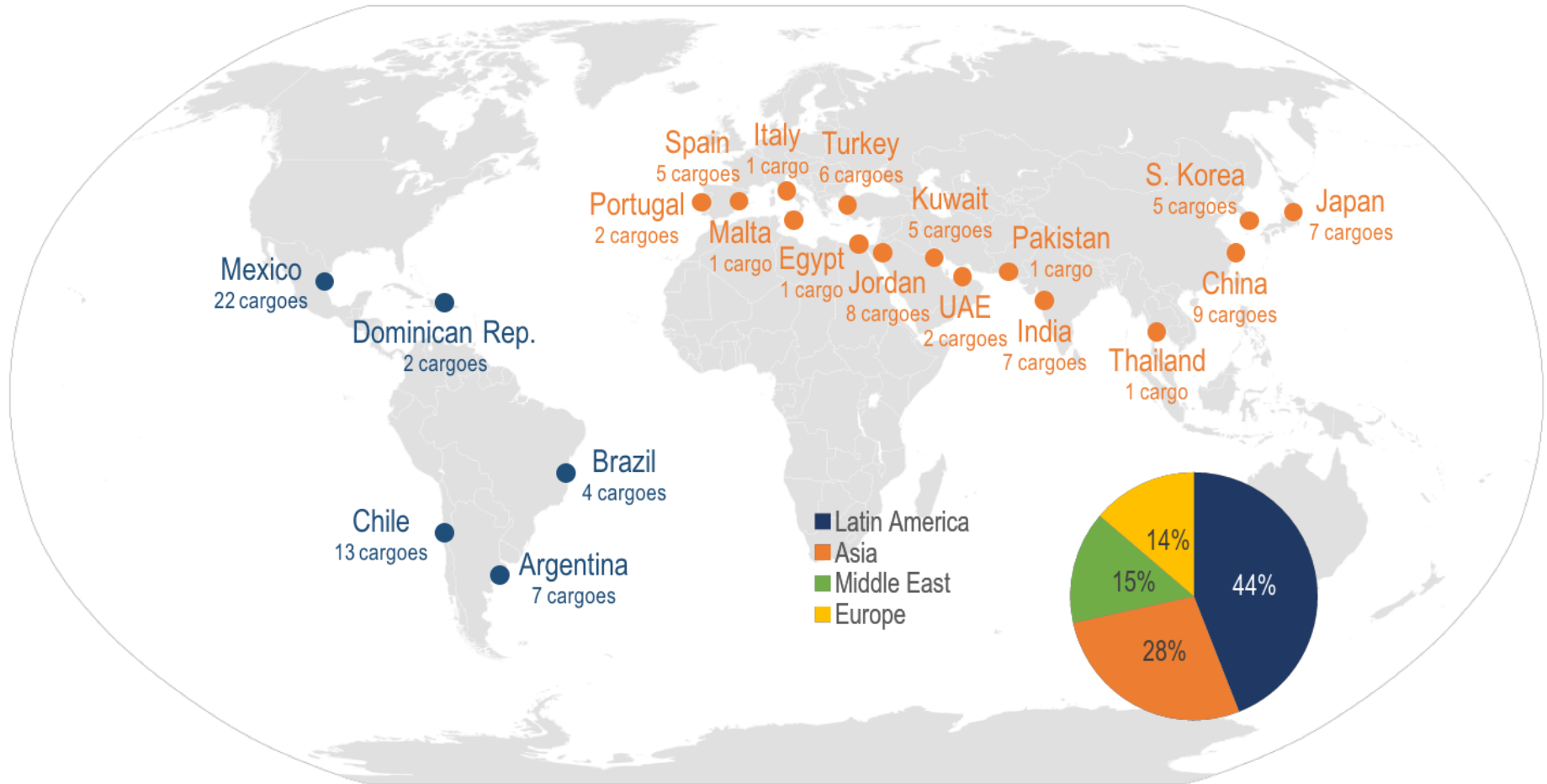
Share of LNG in global long-distance gas trade



Source: IEA World Energy Outlook 2016

# US LNG Export Destinations

Destinations of US LNG Export Cargoes to Date (February 2016 through April 2017)



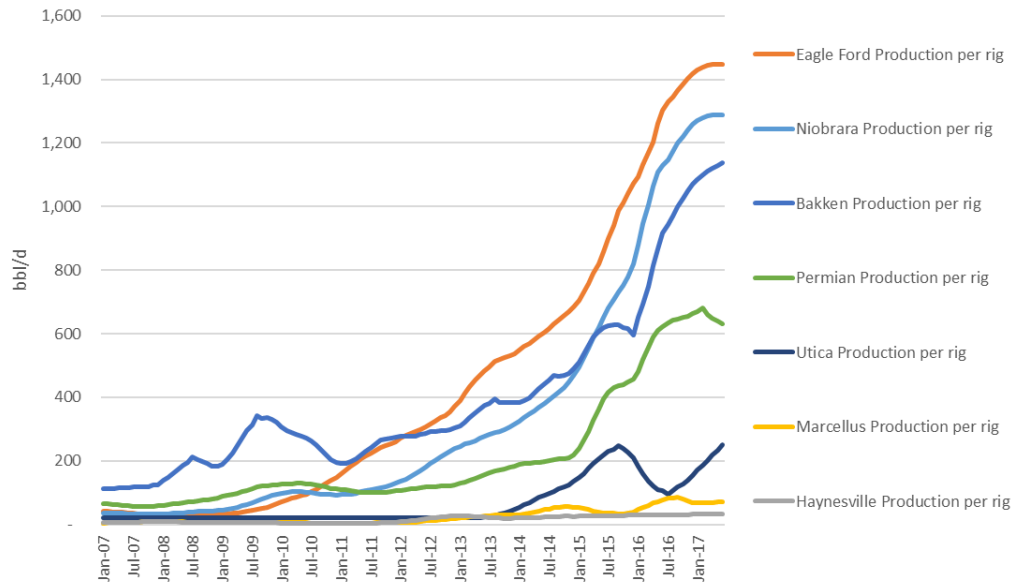
Source: Bloomberg



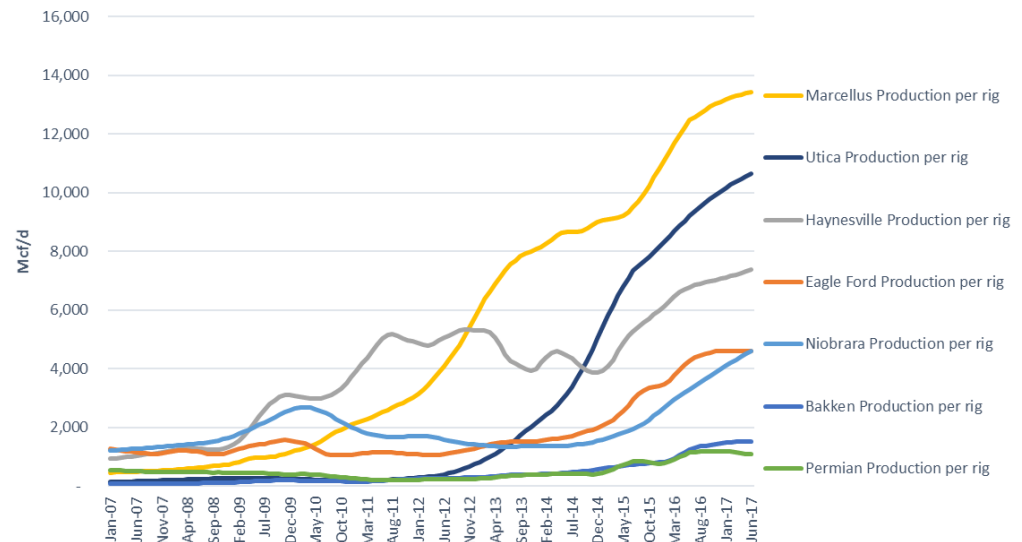


# Drilling Efficiency

Oil Productivity Across United State Shales



Gas Productivity Across United State Shales



-EAI Drilling Productivity Report



# Time of Change in US Energy and Climate Policy



*Trump's "America First" energy plan calls for:*

- *Reduced costs for consumers,*
- *Use of American resources, especially domestic shale gas and oil,*
- *Removal of burdensome regulations,*
- *Revival of coal industry,*
- *Energy "independence"*

*"Under my presidency, we will accomplish complete American energy independence."*

*"We're going to cancel the Paris Climate Agreement"*

*"We're going to rescind all the job-destroying Obama executive actions including the Climate Action Plan"*

# Uncertainty on Key Energy and Climate Issues



## **Dismantling of Obama-era climate policies**

Declared intention to roll back the Clean Power Plan (complex), abandon Paris Agreement (time-consuming)

## **A “bonfire” of regulations**

Effort to delay implementation of regulation on methane leakage (court battle)

## **Renewable investment and production tax credits (ITC/PTC)**

Calls for quicker end of federal support scheme for solar and wind energy (Congress?)

## **Reviving the coal industry**

Unclear how to fulfil this promise absent drastic policy interventions

## **Leasing on federal lands**

Expansion of oil, gas and coal leasing, and Arctic drilling?

## **Fuel economy and biofuel standards**

EPA locked in existing GHG standards at last minute, uncertain future for the RFS

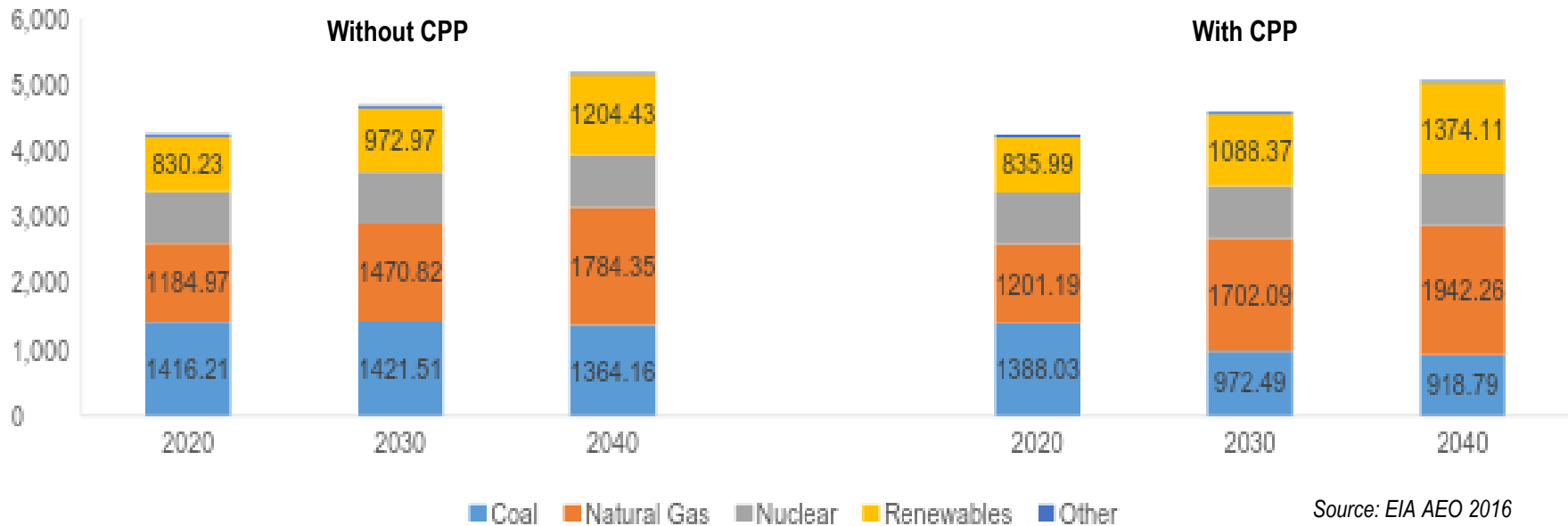
## **Federal permitting of pipeline projects**

Express support for controversial oil pipelines, but FERC currently lacks quorum

# CPP Impact Only Significant Post-2020 In Any Scenario

U.S. Net Electricity Generation by Source With and Without the CPP (EIA AEO 2016 Reference Case)

TWh

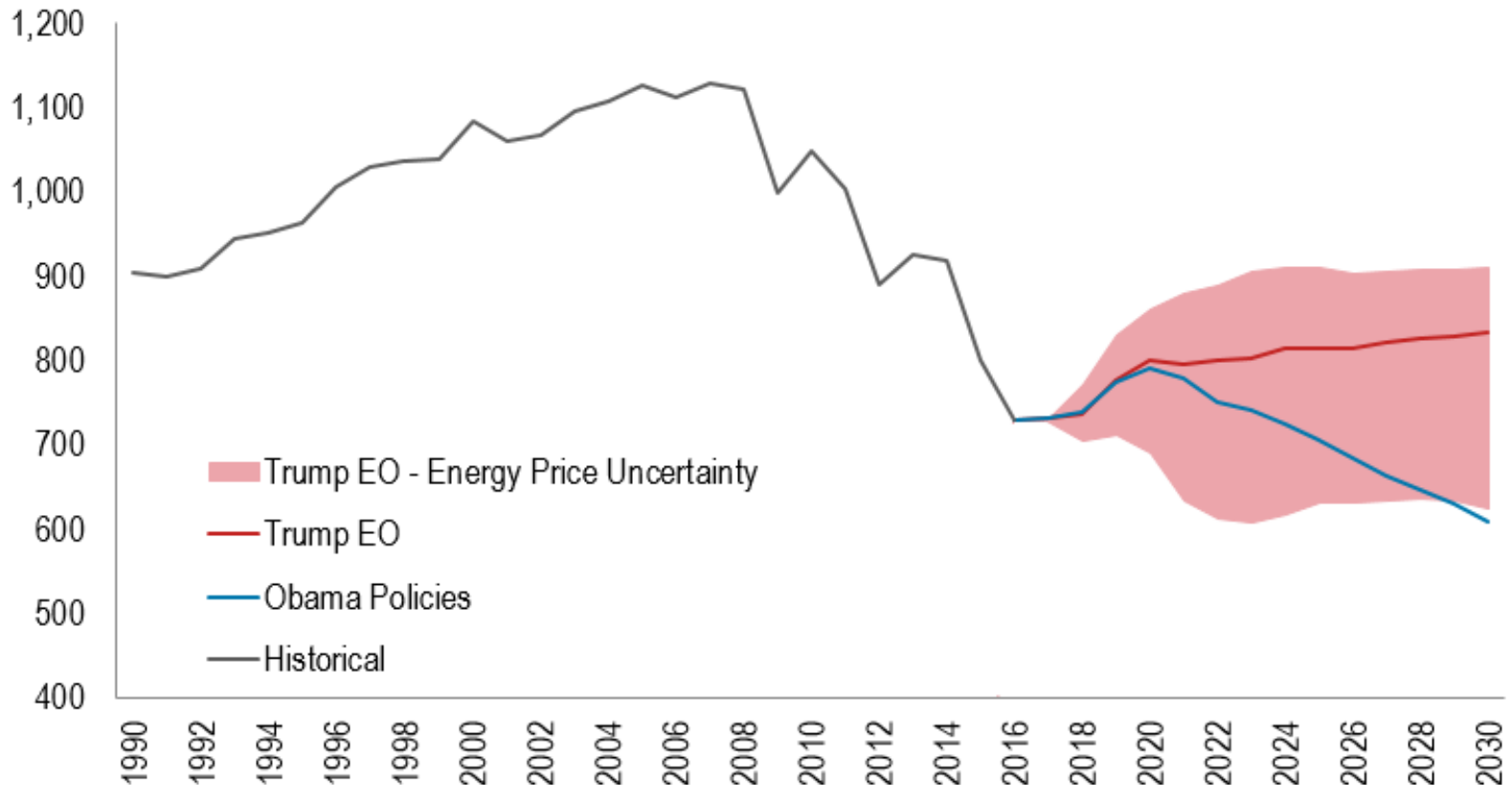


- CPP compliance period only to start in 2022, repeal would only have measurable impact on US electricity mix post-2020
- CPP removal could hit gas more than renewables, coal-fired generation may be the main beneficiary

# Trump EO Stems Decline of Coal, But Doesn't Bring It Back

## US Coal Consumption under Obama Policies and Trump Proposals

Million short tons



Source: Bordoff et al. (2017), "Can Coal Make a Comeback?," Center on Global Energy Policy, April 2017



# Renewables Increasingly Enjoy Bi-Partisan Support

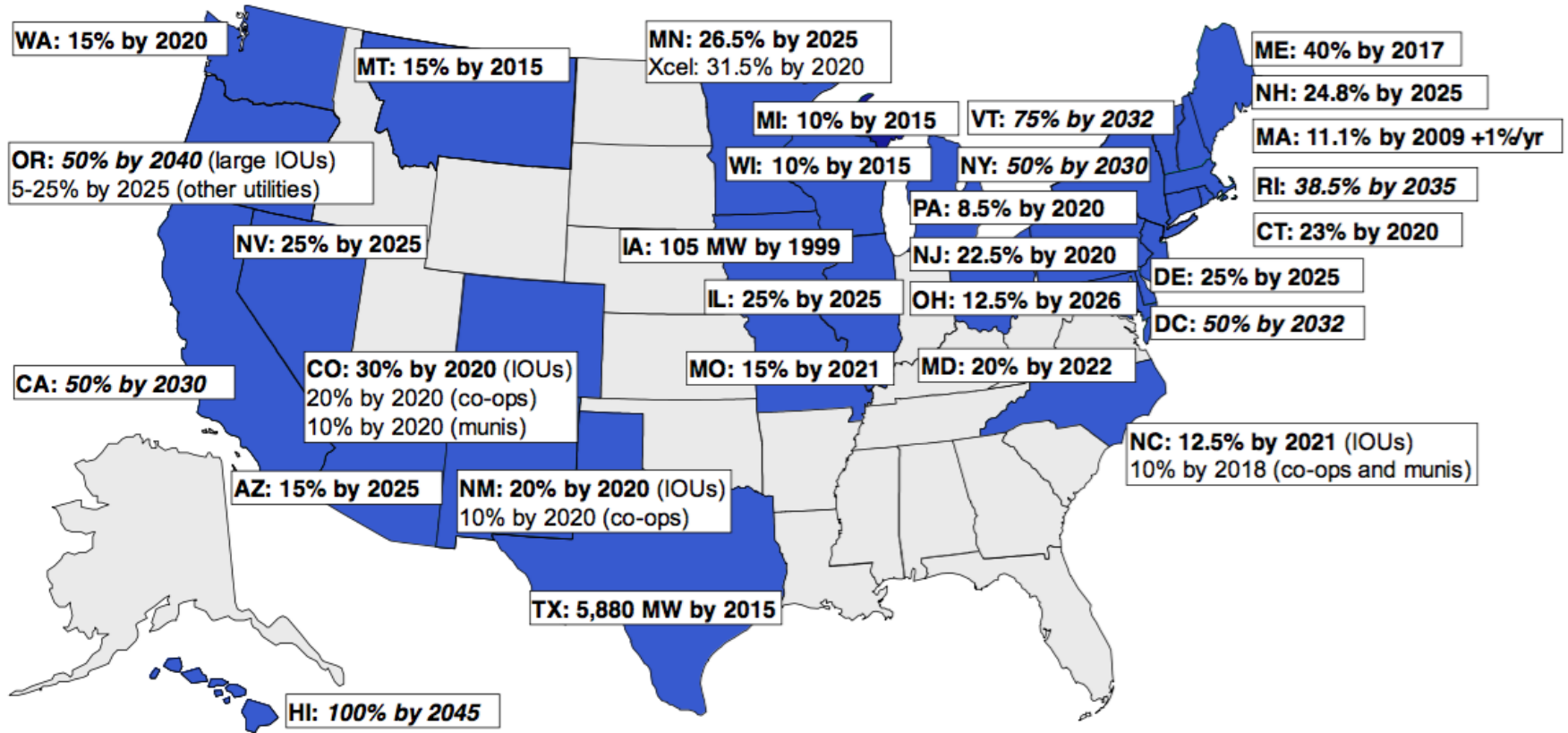
## Top 10 US States by Wind and Solar Capacity (as of late 2016)

Net summer generating capacity, megawatts

Wind Capacity	MW	% of total	2016 vote	Solar Capacity	MW	% of total	2016 vote
Texas	19,424	26%	Rep	California	14,219	45%	Dem
Iowa	6,299	8%	Rep	Arizona	2,528	8%	Rep
California	5,727	8%	Dem	North Carolina	1,904	6%	Rep
Oklahoma	5,451	7%	Rep	New Jersey	1,729	6%	Dem
Kansas	3,847	5%	Rep	Nevada	1,431	5%	Dem
Illinois	3,800	5%	Dem	Massachusetts	1,312	4%	Dem
Minnesota	3,441	5%	Dem	Utah	858	3%	Rep
Oregon	3,167	4%	Dem	Texas	820	3%	Rep
Washington	3,073	4%	Dem	New York	814	3%	Dem
Colorado	3,023	4%	Dem	Georgia	681	2%	Rep
<b>Top 10 total</b>	<b>57,252</b>	<b>75%</b>		<b>Top 10 total</b>	<b>26,295</b>	<b>84%</b>	
<b>US total</b>	<b>76,126</b>			<b>U.S. Total</b>	<b>31,258</b>		

Source: EIA Electric Power Monthly

# US State Renewable Portfolio Standards



Source: Barclays Research (current as of October 2016)





# Thank you!

For more information contact

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