



# Assessment of U.S. Coal Supply Markets

*An Overview of Recent Reports  
by the National Coal Council  
on Factors Affecting the Future of Coal Supply*

**Janet Gellici, CEO, National Coal Council  
American Public Power Association  
Engineering & Operations Technical Conference  
April 1<sup>st</sup>, 2019 – Colorado Springs, Colorado**



# Advisors to the U.S. Secretary of Energy

**NCC is a Federal Advisory Committee  
organized under Federal Advisory Committee Act (FACA) legislation**

**The National Coal Council  
provides advice and recommendations  
to the Secretary of Energy  
on general policy matters  
relating to coal and the coal industry.**

**Celebrating 35 years – 1984 | 2019**

## **Members**

**Appointed by Secretary of Energy  
Limited to 150 members representing a broad spectrum of coal interests**



# Body of Work

## Reports

~ 35 reports prepared by NCC members at no cost to DOE

Extensive Range of Report Topics:

Carbon Management  
Clean Coal Technologies  
Coal & Coal Technology Exports  
Coal Conversion  
Utility Deregulation  
Climate & Clean Air Regulations  
Enhancing Coal's Image  
Building New Coal Plants

Industrial Coal Use  
CCUS for EOR  
Value of Existing Coal Fleet  
Advancing CCS Technologies  
Policy Parity for CCS  
CO<sub>2</sub> Utilization  
**Power Reset: Existing Coal Fleet**  
**Advancing U.S. Coal Exports**



# Power Reset Report Secretary Perry's Request

**Formal request April 7, 2018 charging  
National Coal Council to:**

***... assess "opportunities to optimize  
the existing U.S. coal-fueled power  
plant fleet to ensure a reliable and  
resilient electricity system."***

**Key question to address:**

***"What actions can be taken to  
optimize the U.S. coal-fueled power  
plant fleet so it can continue to  
provide reliable, resilient, affordable  
power as part of a diverse electric  
generation mix, and what unique  
benefits does coal provide?"***



The Secretary of Energy  
Washington, DC 20585

April 07, 2018

Mr. Greg Workman  
Chairman, National Coal Council  
Dominion Generation  
120 Tredegar Street, DC3  
Richmond, Virginia 23219

Dear Mr. Workman:

I am writing today to charge the National Coal Council (NCC) to develop a white paper assessing opportunities to optimize the existing U.S. coal-fueled power plant fleet to ensure a reliable and resilient electricity system.

The white paper should focus on drivers governing the evolution of the existing fleet and its attributes; outlooks on the future U.S. generation mix considering regional drivers, anticipated capacity additions, and retirements; characteristics of a reliable and resilient electricity system; and opportunities for the existing coal-fueled fleet to enhance the said characteristics. The white paper should examine policy, market, and technological aspects influencing the ability of coal-fueled plants to uniquely enable a reliable and resilient electricity system. The key questions for this white paper to address are *"What actions can be taken to optimize the U.S. coal-fueled power plant fleet so it can continue to provide reliable, resilient, affordable power as part of a diverse electric generation mix, and what unique benefits does coal provide?"*

I ask that the white paper be completed no later than September 30, 2018.

Upon receiving this request and establishing your internal working groups, please advise me of your schedule for completing the white paper. The Department looks forward to working with you on this effort.

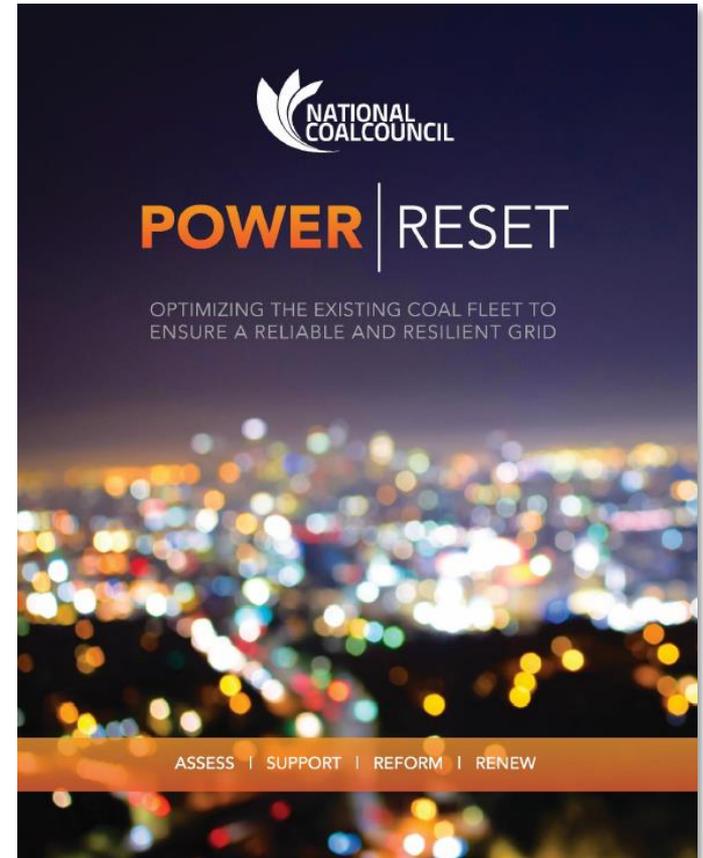
Sincerely,

*Rick Perry*  
Rick Perry



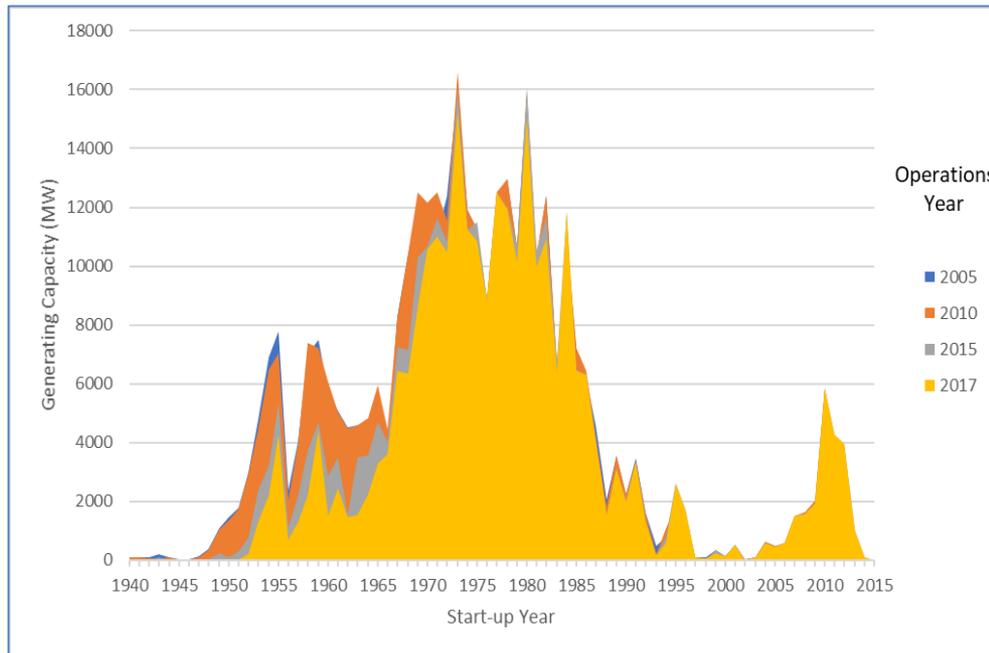
## The Report

- **What We Considered**
  - Coal's Unique Role in the U.S. Energy Portfolio
  - Outlook for Coal Generation
  - Measures to Optimize Diversity & Resiliency



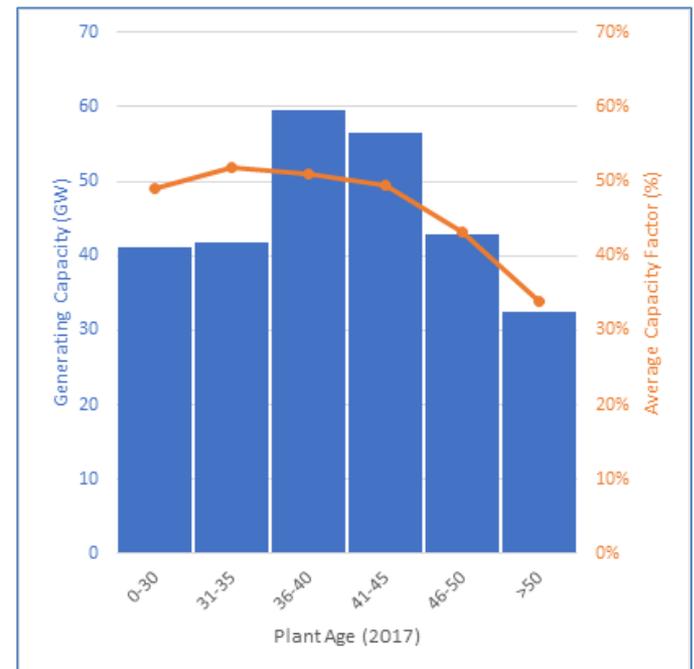
**ASSESS | SUPPORT | REFORM | RENEW**

# Today's Coal Fleet



**Start-up Year & New Generating Capacity**

## U.S. Coal Fleet Age in 2017

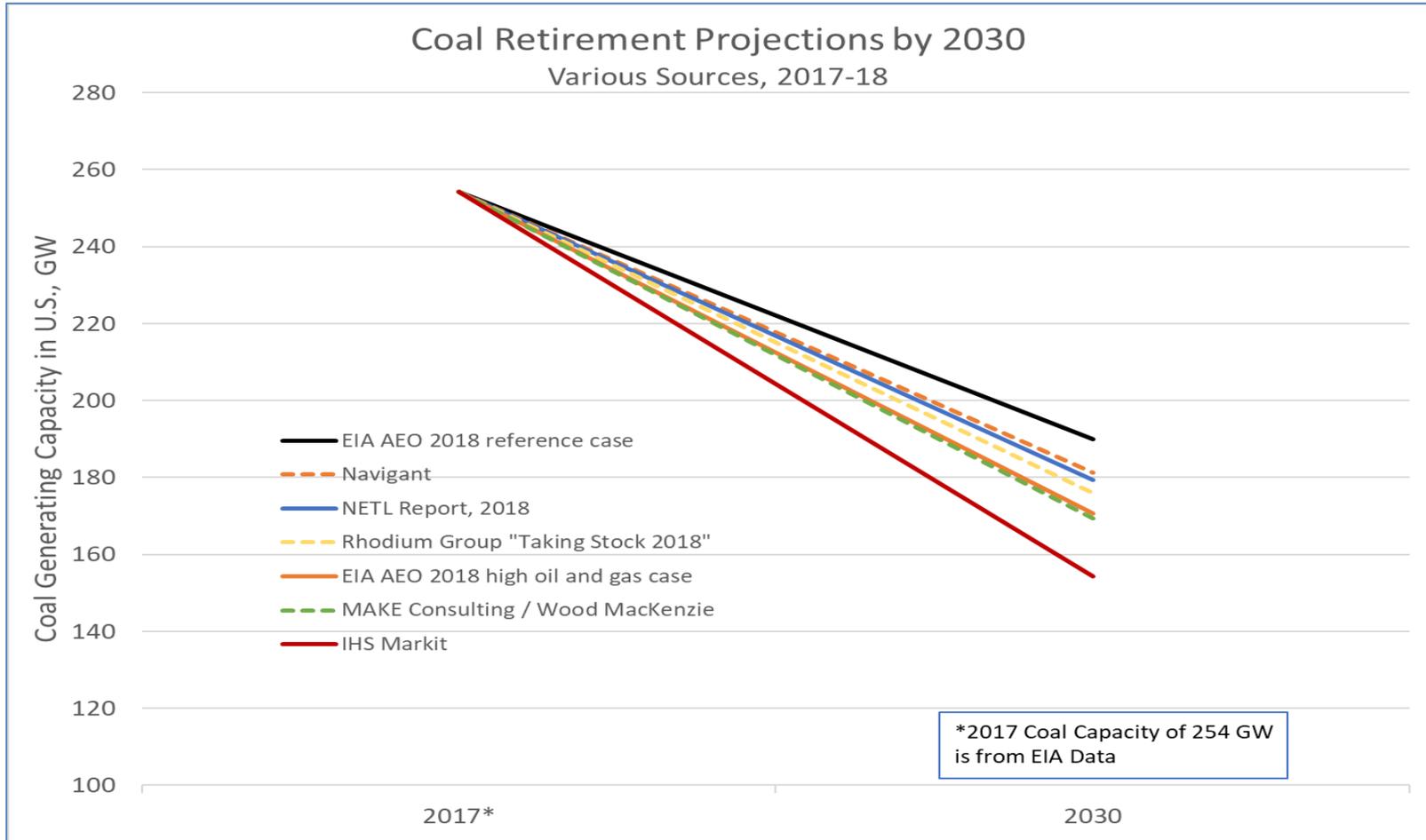




## Coal Retirement Contributing Factors

- Shale Gale: natural gas prices - \$7/MMBtu (2003-2008) vs. \$3.20/MMBtu (2012-2016)
- Intermittent Renewable Energy Subsidies: 2010-2016 IRE's share of subsidies increased from 42% to 45%; coal subsidies increased from 2% to 8%.
- Environmental Regulations: MATS, CWA, NSR, CCR, ELG.
- State Energy Policies: RPS, EERS.
- Technology R&D Support: No existing fleet funding for nearly 10 years.
- Societal Pressures: Divestitures, anti-coal advocacy, coal infrastructure opposition, coal project financing proscriptions

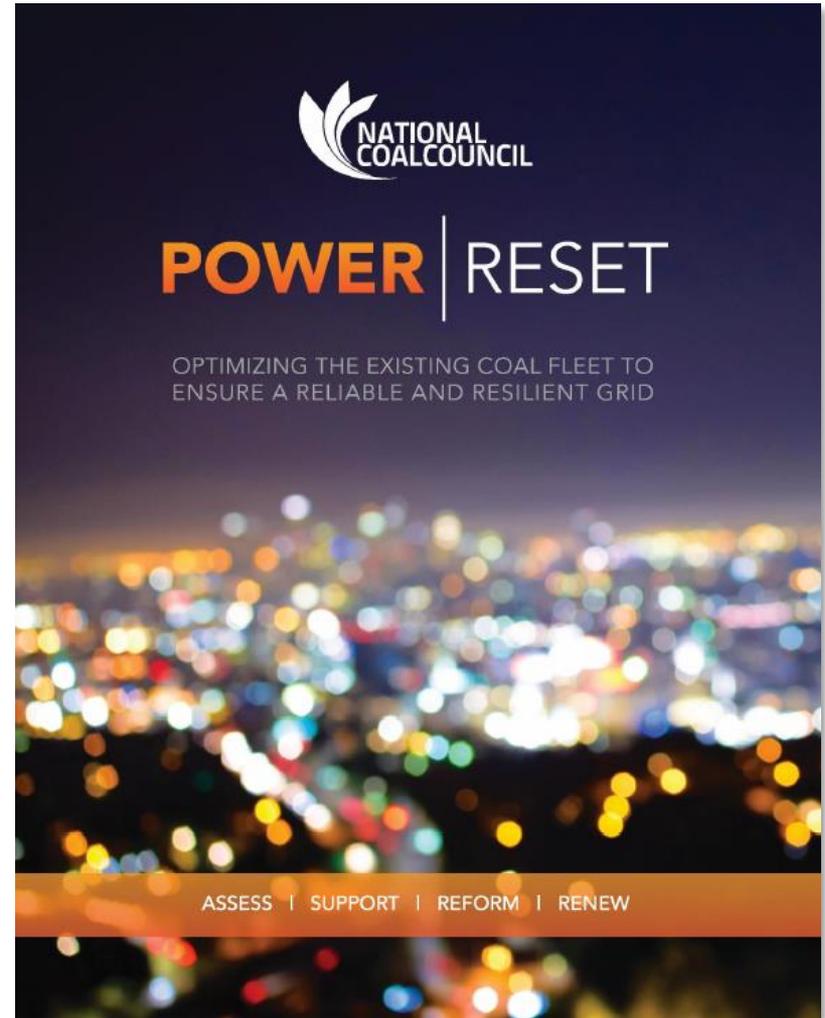
# Outlook for Coal Generation





# Power Reset

Optimizing the Existing Coal Fleet to Ensure a Reliable and Resilient Power Grid



**ASSESS | SUPPORT | REFORM | RENEW**

- **ASSESS | SUPPORT | REFORM | RENEW**
  - Establish a uniform definition of grid resilience.
  - Assess the fuel security of ISOs/RTOs.
  - Establish quantitative metrics against which to evaluate grid resilience.
  - Evaluate the experience of other nations regarding the value of firm, dispatchable power and challenges associated with intermittent renewable energy deployment.



# Coal's Unique Role Reliable & Resilient

## Reliable & Resilient Attributes

**Qualitative Comparison of Grid Reliability and Resilience Attributes by Fuel Type**

Attribute	Coal	Natural Gas	Wind/Solar	Nuclear	Demand Response
Dispatchability	✓	✓		✓	
Inertia	✓	✓	✓(wind)	✓	
Frequency Response	✓	✓	✓ <sup>3</sup>		
Contingency Reserves	✓	✓			✓
Reactive Power	✓	✓		✓	
Ramp Capability	✓	✓			✓
Black Start		✓			
Resource Availability	✓	✓		✓	
On-Site Fuel Supply	✓			✓	✓
Reduced Exposure to Single Point of Disruption	✓		✓	✓	✓
Price Stability	✓		✓	✓	✓

- A diverse generation portfolio is critical to maintaining a reliable and resilient grid.
- Coal excels in:
  - Fuel security/assurance
  - Resource availability
  - Price stability
  - Dispatchability



# Coal's Unique Role

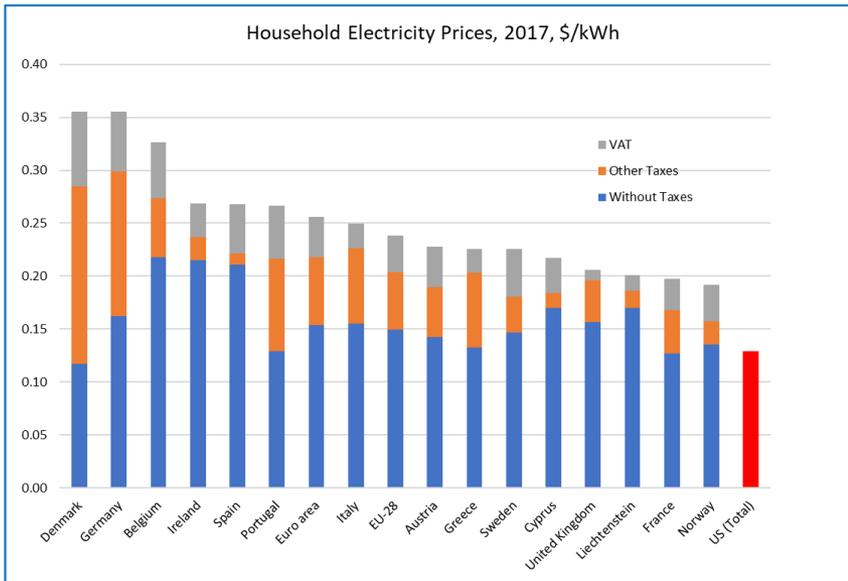
## Dispatchable

**Intermittent electricity** is [electrical energy](#) that is not continuously available due to external factors that cannot be controlled, produced by [electricity generating](#) sources that vary in their conditions on a fairly short time scale. Sources of intermittent electricity include [solar power](#), [wind power](#), [tidal power](#), and [wave power](#). Because of this varying electrical generation these sources are considered [non-dispatchable](#), meaning that their electrical output cannot be used at any given time to meet societies fluctuating electricity demands.

The costs of backstopping intermittent energy sources:

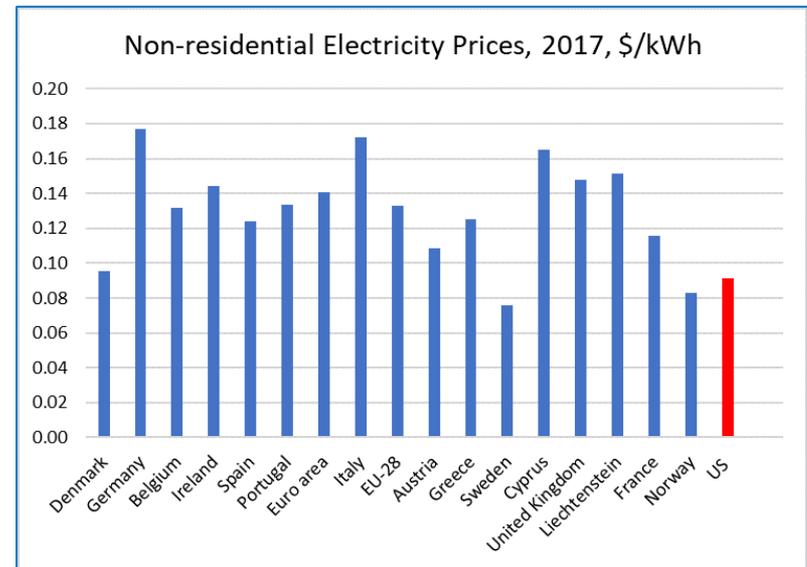
- Lower net generation
- Lower capacity factor
- Less revenue
- Lower efficiency
- Reduced plant life

# Coal's Unique Role Economics



**Residential Electricity Rates**

## Non-residential Electricity Prices





## Recommendation SUPPORT

- **ASSESS | SUPPORT | REFORM | RENEW**
  - Provide appropriate economic and regulatory incentives to stem the tide of plant retirements.
  - Establish an environment that values and compensates diversity.
  - Support mechanisms to immediately compensate the U.S. coal fleet for the essential services it provides.



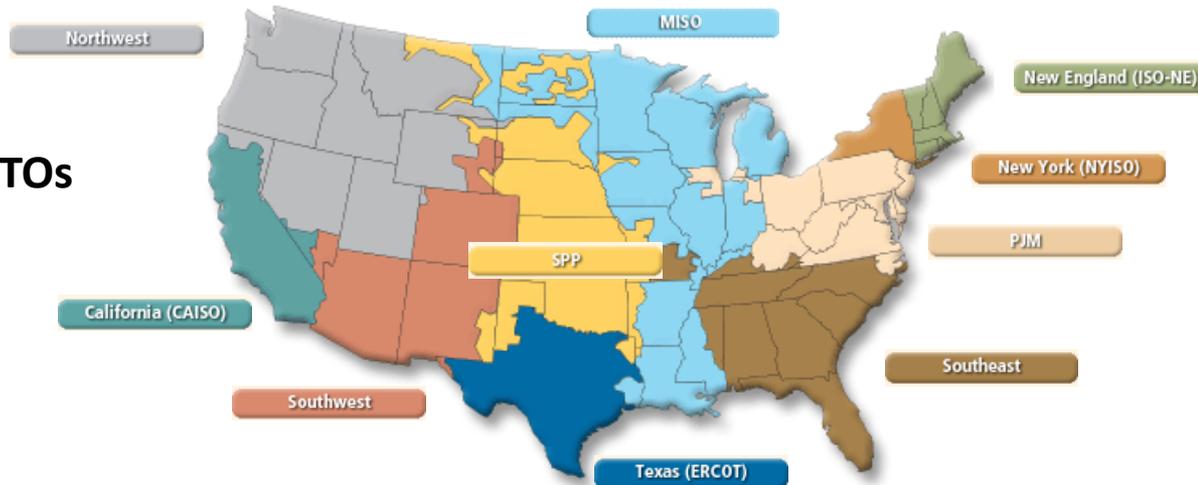
## Recommendation REFORM

- ASSESS | SUPPORT | **REFORM** | RENEW
  - **Policy:** NSR, PURPA, CCR, ELG, CO2 storage on federal lands, engage on the Affordable Clean Energy plan
  - **Market:** FERC capacity reform initiatives, ISO/RTO price formation, standards for essential reliability services, fuel security and resilience assessments
  - **Taxes:** O&M expenses for coal plants, 45Q support, 48Q



# Optimize Diversity & Resiliency Market Considerations

## U.S. ISOs & RTOs



- Federal Energy Regulatory Commission Action
  - Price Formation
  - Essential Reliability Services
  - Capacity Market Reforms
  - Forward Resiliency Market
  - Demand Response Compensation Reform



## Recommendation **RENEW**

- **ASSESS | SUPPORT | REFORM | RENEW**
  - Support the development and deployment of advanced coal technologies that enhance the competitiveness, efficiency and environmental performance of the existing coal fleet
  - Promote education and awareness about the water-energy nexus
  - Promote initiatives to enhance transparency about the inherent costs and benefits associated with all U.S. energy resources



# Optimize Diversity & Resiliency Technology Considerations

- Opportunities exist to streamline, re-evaluate and **amend regulatory and legislative measures** to enable the U.S. existing coal fleet to operate more efficiently and effectively.
- Wholesale **electricity market reform** is needed to equitably value resilience as well reliability attributes.
- Many **technology options** are available to improve the competitiveness of the existing U.S. coal fleet.

Project Name	Capital Cost	B/C Ratio	B/C Ratio Rank
Circulating Water Pump Refurbishment	Low	High	1
Sootblowing Steam Source	Low	High	2
Coal Mill Inerting Source	Low	High	3
Add Condensate Polishing	Medium	High	4
HP/IP/LP Turbine Upgrade	High	High	5
Coal Mills Replacement	High	High	6
Boiler Feed Pump Refurbishment	Low	Moderate	7
Helper Cooling Tower Replacement & Pumps	Medium	Moderate	8
Replace Flame Scanners	Low	Moderate	9
VFD's for Forced Draft Fans	Medium	Low	11
Air Heater Overhaul	Medium	Low	10
Replace Air Preheat Coils	Low	Low	12
VFD's for Induced Draft Fans	Medium	Low	13
Alternate Air Heater Overhaul	Medium	Low	14
Alternate Air Preheat Coils Modification	Medium	Low	15

**Coal Power Plant Efficiency Audit Results**



# Coal Exports Report Secretary's Request

## Formal Request

*"... develop a white paper assessing opportunities to advance U.S. coal exports."*

## Key Questions to Address

- *What market, infrastructure and policy measures could be undertaken to increase export opportunities for U.S. coal?*
- *What global market dynamics present opportunities for increased U.S. coal exports?*
- *How can U.S. coal capitalize on its advantages and become more competitive in international markets?*
- *What institutional and regulatory constraints are limiting the advancement of U.S. coal exports?*



The Secretary of Energy  
Washington, DC 20585

January 07, 2018

Mr. Greg Workman  
Chair, National Coal Council  
1101 Pennsylvania Avenue, NW, Suite 300  
Washington, DC 20004

Dear Mr. Workman:

I am writing today to request that the National Coal Council (NCC) develop a white paper assessing opportunities to advance U.S. coal exports.

The white paper should focus on current market, policy, and infrastructure challenges and opportunities that are relevant to advancing U.S. coal resources in international power and industrial markets. The white paper should examine international market opportunities for both metallurgical and thermal coals from the Eastern, Central, and Western coal-producing regions of the U.S. The white paper should also provide a competitive assessment of the coal market supply chain and associated infrastructure, and offer recommendations that address key barriers impeding the export of U.S. coal.

The key questions to be addressed include:

- What market, infrastructure, and policy measures could be undertaken to increase export opportunities for U.S. coal?
- What global market dynamics present opportunities for increased U.S. coal exports?
- How can U.S. coal capitalize on its advantages and become more competitive in international markets?
- What institutional and regulatory constraints are limiting the advancement of U.S. coal exports?

The white paper should be managed under the auspices of the Executive Advisory Board within the NCC. I ask that the white paper be completed no later than March 30, 2018.

Upon receiving this request and establishing your internal working groups, please advise me of your schedule for completing the white paper. The Department looks forward to working with you on this effort.

Sincerely,

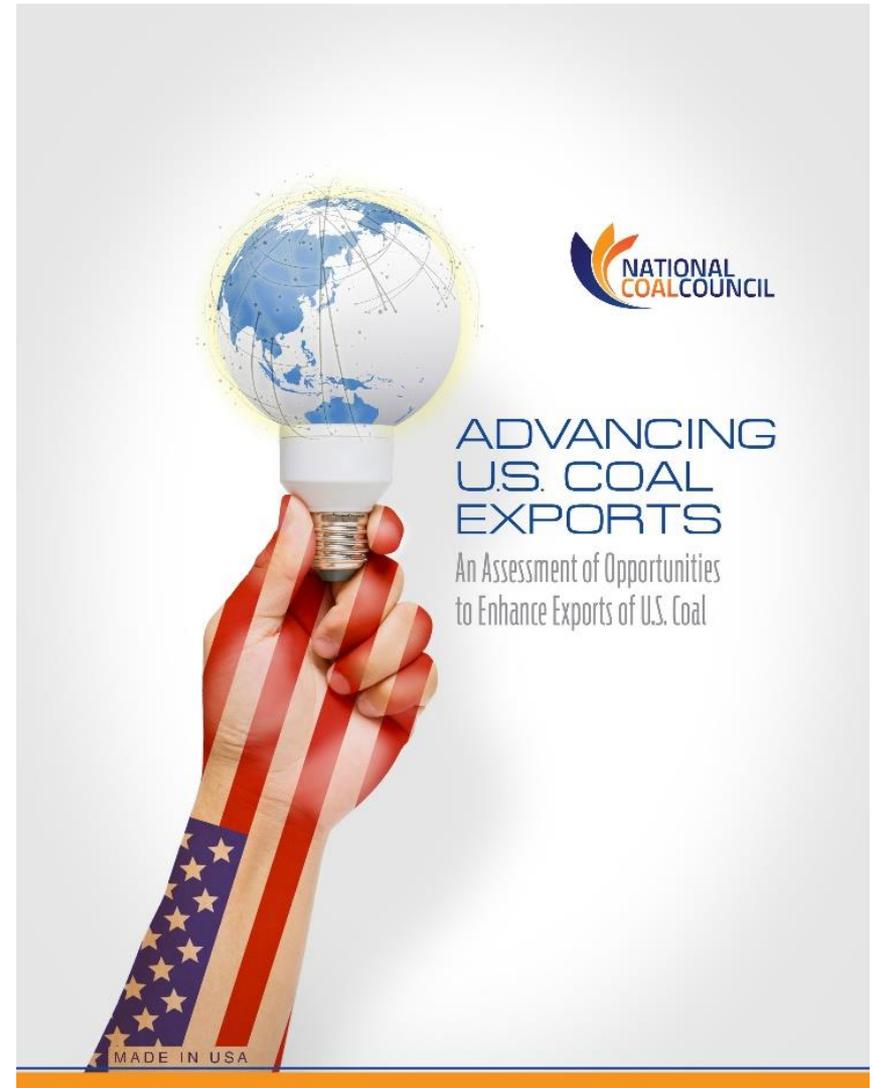
A handwritten signature in black ink that reads "Rick Perry".

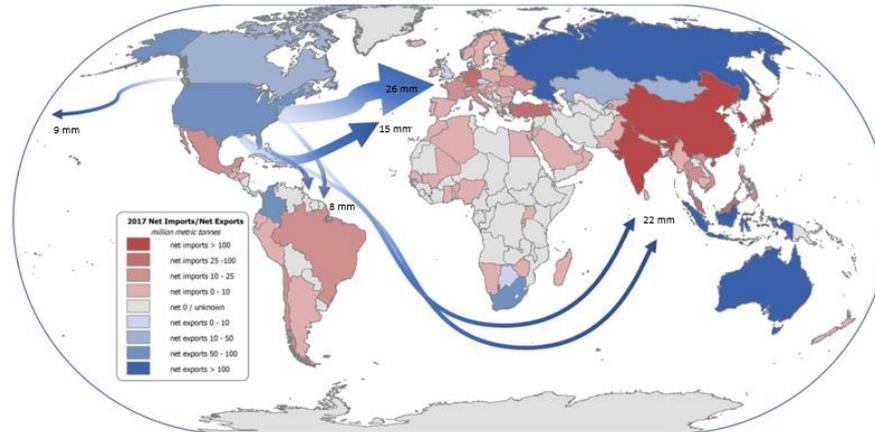
Rick Perry



## What We Considered

- **U.S. Coal Export Landscape**
  - Export Regions
  - Transportation – Rail, Waterways, Ports
  - Prime Markets for U.S. Coal
- **Competitive Assessment**
  - Global Supply & Demand
  - U.S. vis-à-vis Other Suppliers
  - Policy Effects on Global Coal Trade
- **Barriers to U.S. Coal Exports**
  - Production/Supply
  - Transportation & Shipping
  - Institutional & Regulatory





Major U.S. Coal Trade Flows (2017)

- Global coal trade is a robust and growing market; worldwide coal trade has more than doubled since 2000.
- Europe continues to be a principal market for U.S. eastern met coals; burgeoning demand in Asia represents a significant market opportunity for both eastern and western U.S. thermal coal.
- Global coal trade markets are volatile – influenced by economic growth/decline, weather, currency rates, energy policies, trade regulations/agreements and geopolitics.

# Thermal Coal Assessment

## Advantages and Challenges of U.S. Thermal Coal versus Competitive Supply by Country

THERMAL COAL	vs. Australia	vs. Indonesia	vs. Russia	Colombia	South Africa
<b>Mine cost</b>	U.S. mine costs are higher	PRB mine costs are lower	U.S. mine costs are higher	U.S. mine costs are higher	U.S. mine costs are higher
<b>Quality</b>	U.S. sulfur levels are higher in the ILB and NAPP	Broadly similar characteristics (PRB)	Russia has very low sulfur coal	U.S. has higher energy content	U.S. has higher energy content
		U.S. has occasionally high sodium content (PRB)		Colombia has lower sulfur content, on average	
<b>Infrastructure and logistics</b>	U.S. rail costs are higher	Inland rail costs are higher in the U.S.	U.S. rail costs are lower	U.S. rail costs are higher	S Africa has rail capacity constraints
	Government relations with rail companies are better in the U.S.	Port costs are higher in the U.S.	Russia has winter rail disruptions		
			Port costs are higher in Russia		
<b>Ocean freight (OF)</b>	U.S. has higher OF costs to Asian markets	U.S. has higher OF costs to Asian markets	U.S. OF is higher to Asia	U.S. usually has higher OF costs	U.S. has higher OF costs
	U.S. has lower OF costs to Atlantic markets		U.S. OF is lower in the Atlantic		
	U.S. can't always load large vessels, although metallurgical coal consumers and producers usually favor Panamax vessels; dredging ports could be an equalizer, but at a cost				
<b>Security and regularity of supply</b>	U.S. seldom has labor strikes	Indonesia has fiscal instability	Russian winter can interrupt coal delivery	The U.S. has greater fiscal and regulatory stability	The U.S. has greater fiscal and regulatory stability; there is a threat of domestic market obligation in South Africa
	U.S. hurricanes seldom interrupt shipments	Indonesia has domestic market obligation	Russia in transition to market economy		
	U.S. has greater fiscal and regulatory stability	Indonesia has checkered delivery history	U.S. has greater fiscal and regulatory stability		
<b>Shipment uniformity</b>	Broadly similar characteristics	U.S. has better quality control of shipments	U.S. has better quality control of shipments	Broadly similar - U.S. and Colombia both careful shippers that carefully manage contracts	Broadly similar - U.S. and South Africa both careful shippers that carefully manage contracts



# Key Findings

## Barriers to U.S. Exports

### SUPPLY CONSIDERATIONS

- Mining regulations – existing and prospective – can affect the competitiveness of U.S. coal exports.
- Aspects of Federal mineral ownership governance can impede U.S. coal exports.





# Key Findings

## Barriers to U.S. Exports

### TECHNOLOGICAL CONSIDERATIONS

- Technology improvements in coal mining and preparation could enhance the cost-competitiveness of U.S. coal in global markets.





# Key Findings Barriers to U.S. Exports

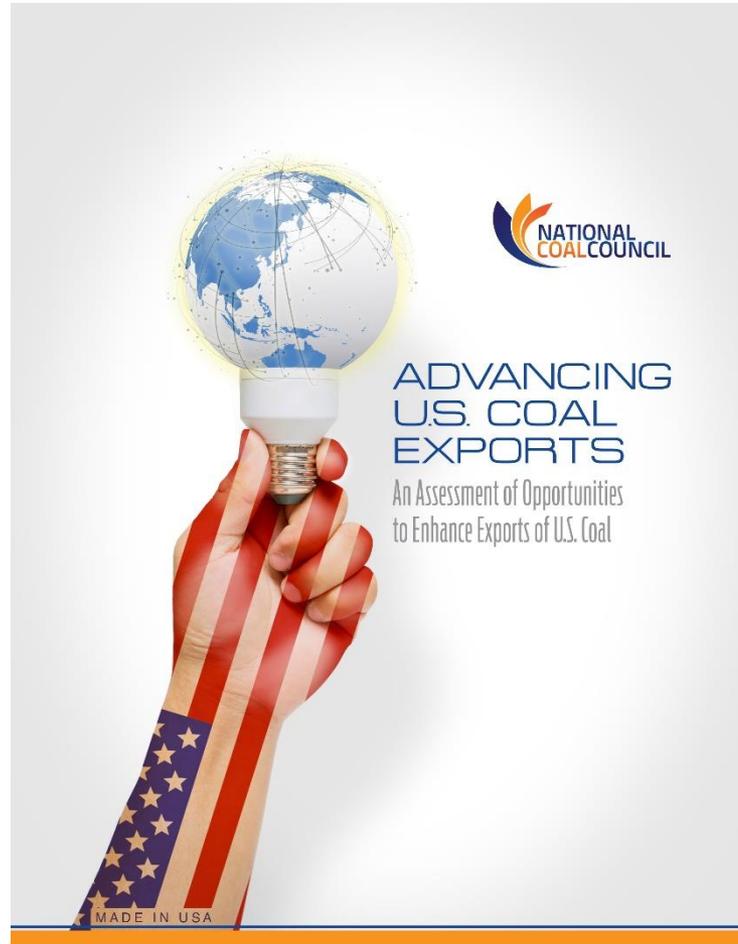
## TRANSPORTATION & SHIPPING CONSIDERATIONS

U.S. coal export economics would improve with channel deepening to accommodate larger bulk carrier vessels, improved dredging and maintenance of the inland waterways, and expansion of export port capacity on the U.S. West Coast.



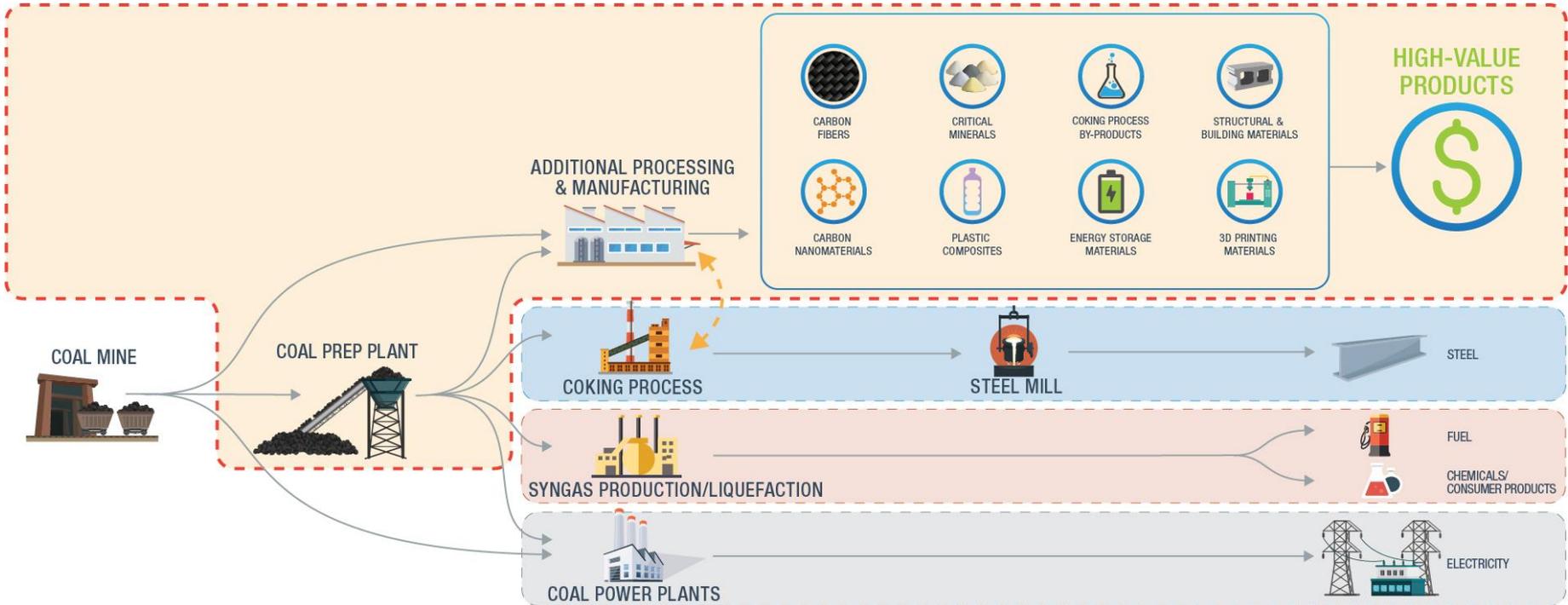


# NCC Recommendations



# Coal in a New Carbon Age





Country	Million Tonnes	Share
U.S	258,709	25.0%
Russia	160,364	15.5%
Australia	144,918	14.0%
China	139,919	13.5%
India	97,728	9.4%
Germany	36,100	3.5%
Ukraine	34,375	3.3%
Poland	25,811	2.5%
Kazakhstan	25,605	2.5%
Indonesia	22,598	2.2%
Other	88,885	8.6%
<b>Total</b>	<b>1,035,012</b>	<b>100.0%</b>

Source: BP Statistical Review of World Energy, June 2017



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