Net Zero Emissions
Why and How

Paul Debevec (debevec@uiuc.edu)
Osher Lifelong Learning Institute at
University of Illinois

Lecture 5

Three issues from lecture 4
Much about policies and politics

Paul Debevec (debevec@uiuc.edu)
Osher Lifelong Learning Institute at
University of Illinois
March 2, 2020

Lecture 5 Outline

- Seven trillion dollar message
- Three issues from Lecture 4
  - August 14, 2003 East Coast blackout (at end if time allows)
  - Buried transmission lines
  - Off-shore wind
- Consumer spending on energy
- Energy employment
- America's attitude toward climate change
- State efforts - RPS
- Regional effort - RGGI
- Failed federal effort - Waxman-Markley
- Green New Deal
- Climate change litigation
- Time for discussion

Investment and Corporate Response to Climate Change

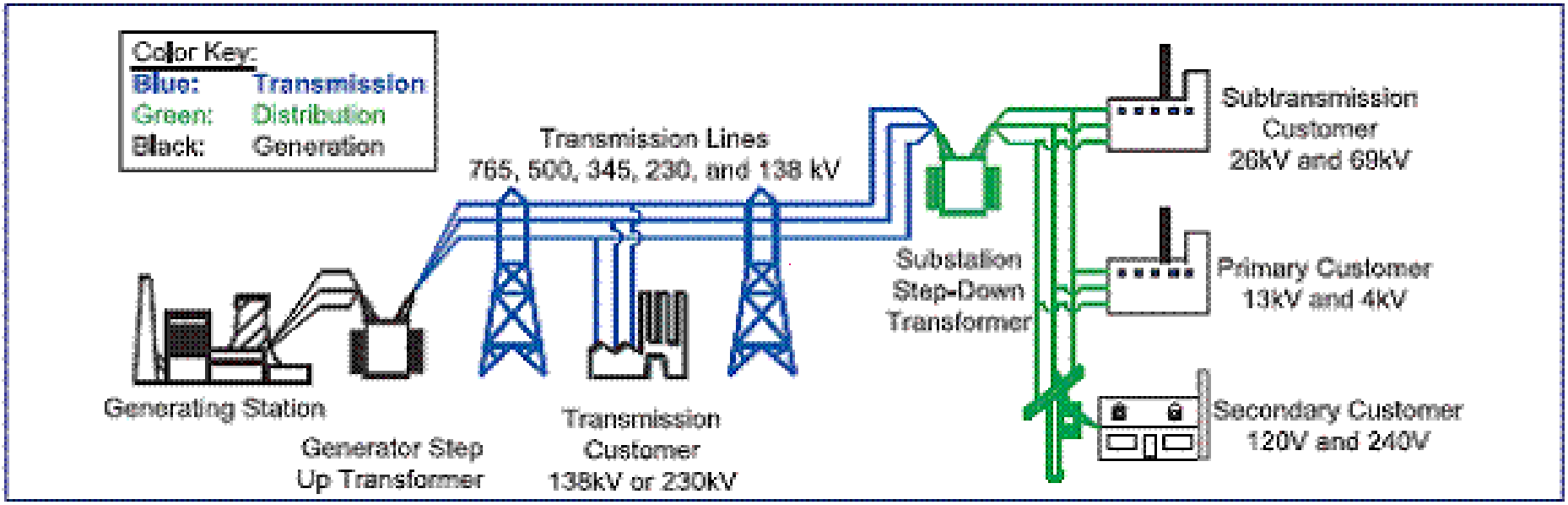
The New York Times

January 14, 2020
BlackRock C.E.O. Larry Fink: Climate Crisis Will Reshape Finance

"The evidence on climate risk is compelling investors to reassess core assumptions about modern finance."

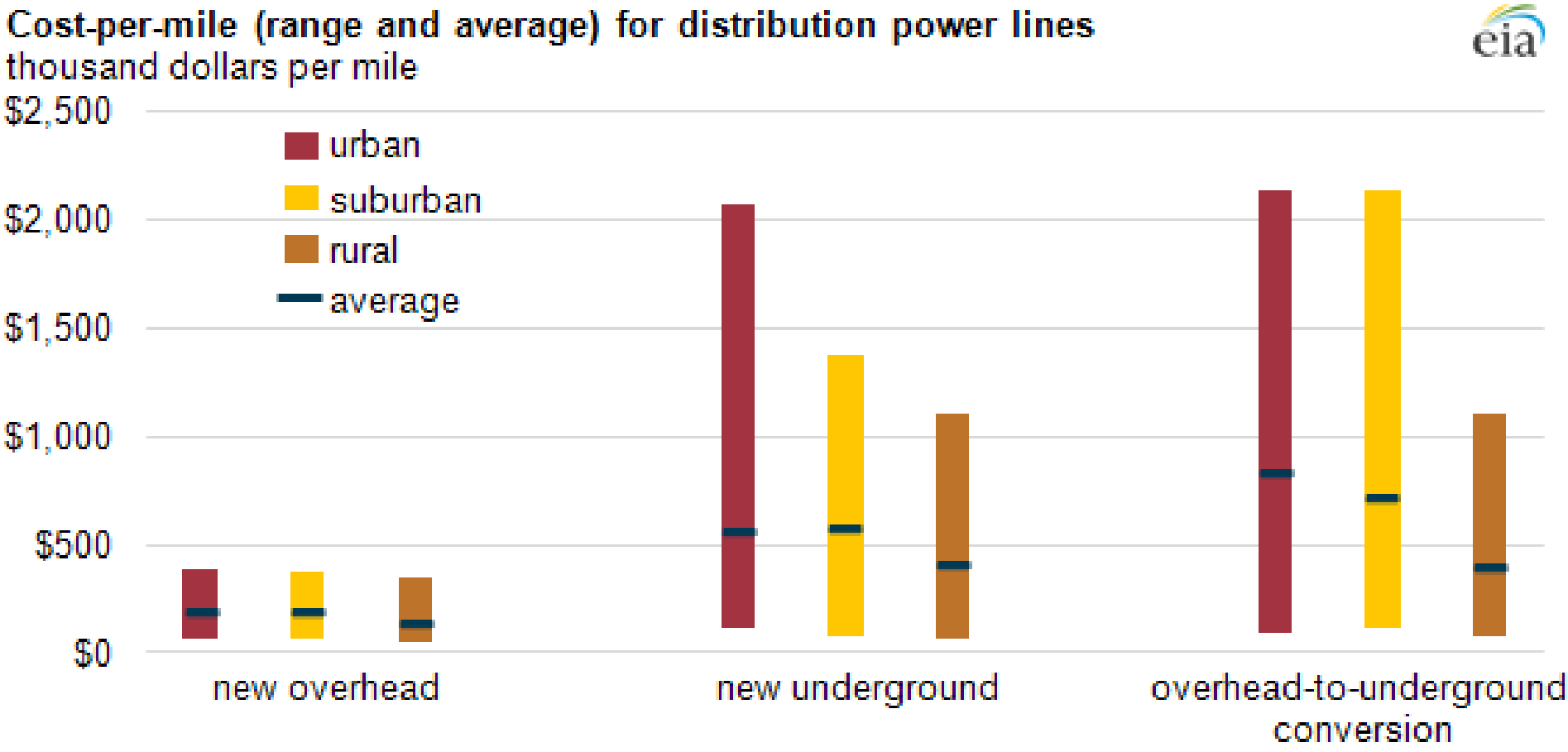
Buried Transmission Lines

Understanding the Grid
Generation, Transmission, and Distribution

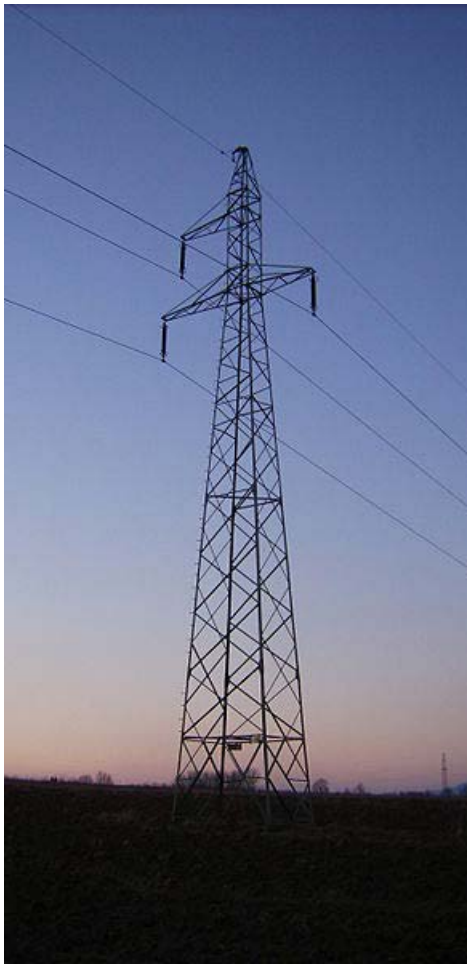


Independent Statistics & Analysis
U.S. Energy Information Administration

July 25, 2012



Typical Transmission Line Towers



single 3-phase circuit with ground wire

double 3-phase with ground wire

MISO 2019 Transmission Cost Estimation Guide

Single circuit transmission line $/mile
Exploratory cost estimate

Location – State	69kV line	115kV line	138kV line	161kV line	230kV line	345kV line	500kV line
Arkansas	$1.3M	$1.4M	$1.5M	$1.6M	$1.7M	$2.7M	$2.9M
Illinois	$1.4M	$1.5M	$1.5M	$1.6M	$1.7M	$2.8M	$2.9M
Indiana	$1.3M	$1.4M	$1.5M	$1.6M	$1.7M	$2.7M	$2.8M
Iowa	$1.4M	$1.5M	$1.5M	$1.6M	$1.7M	$2.7M	$2.9M
Kentucky	$1.4M	$1.5M	$1.6M	$1.7M	$1.8M	$2.9M	$3.0M
Louisiana	$1.6M	$1.7M	$1.7M	$1.9M	$2.0M	$3.2M	$3.4M
Michigan	$1.4M	$1.5M	$1.6M	$1.7M	$1.8M	$2.9M	$3.0M
Minnesota	$1.3M	$1.4M	$1.5M	$1.5M	$1.6M	$2.6M	$2.7M
Mississippi	$1.6M	$1.6M	$1.7M	$1.8M	$2.0M	$3.2M	$3.4M
Missouri	$1.3M	$1.4M	$1.5M	$1.6M	$1.7M	$2.7M	$2.8M
Montana	$1.2M	$1.3M	$1.4M	$1.5M	$1.5M	$2.5M	$2.6M
North Dakota	$1.2M	$1.3M	$1.4M	$1.5M	$1.5M	$2.5M	$2.6M
South Dakota	$1.3M	$1.3M	$1.4M	$1.5M	$1.5M	$2.5M	$2.6M
Texas	$1.5M	$1.6M	$1.7M	$1.8M	$1.9M	$3.1M	$3.3M
Wisconsin	$1.3M	$1.4M	$1.5M	$1.6M	$1.7M	$2.7M	$2.8M

Includes contingency and AFUDC

CEDAR VALLEY BUSINESS MONTHLY

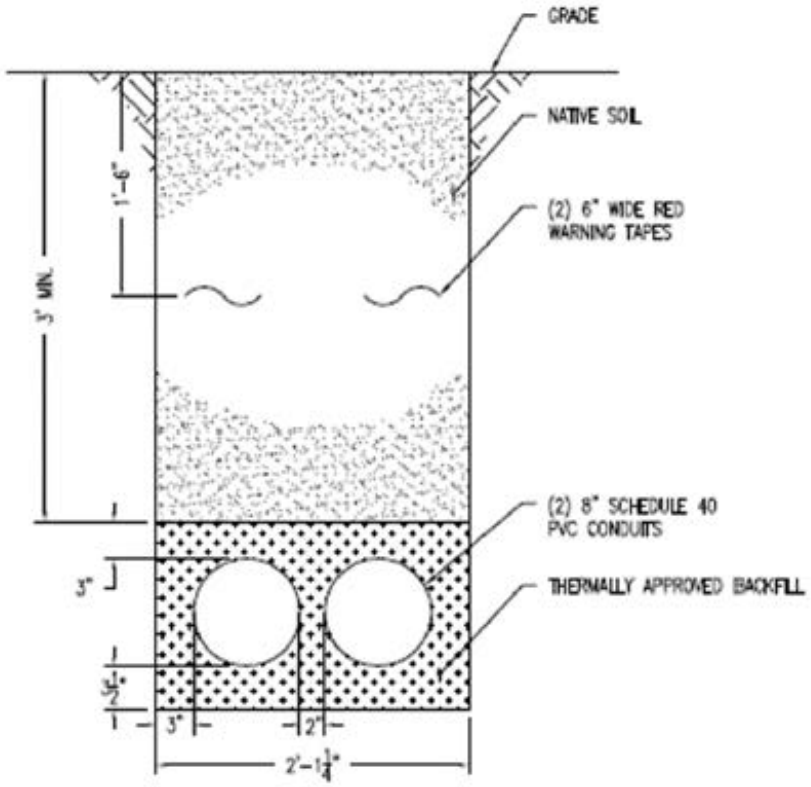
March 12, 2019
Plans unveiled for 349-mile renewable power line through northern Iowa

Estimate 2.5-3.0 G$ approximately 9M$ per mile

Real Estate

The viewshed and environmental impact of overhead transmission lines creates significant landowner resistance

Underground	Overhead



The Project utilizes two slender buried cables approximately five inches in diameter. The compact layout occupies two-and-a-half feet of railroad right-of-way (ROW) at a five foot depth.

Off-shore Wind

Offshore Wind: Why?

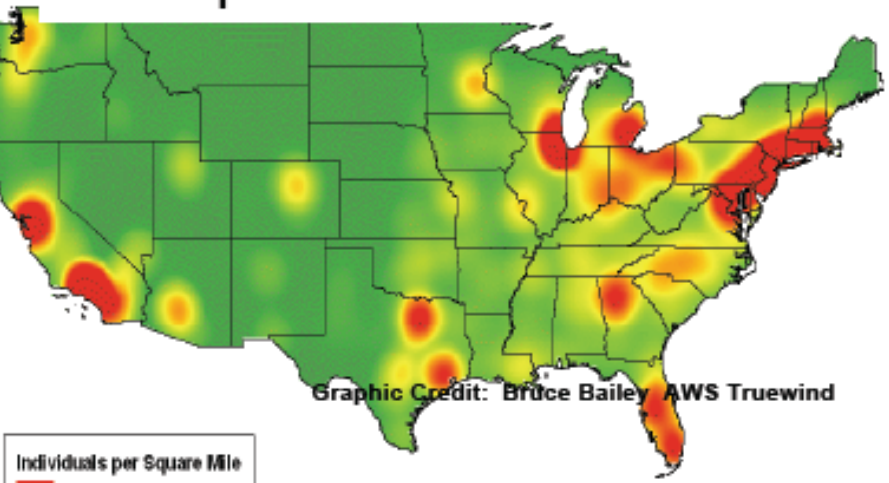
Land-based sites are not close to coastal load centers

Load centers are close to offshore wind sites

28 Coastal States Use 78% of Electricity

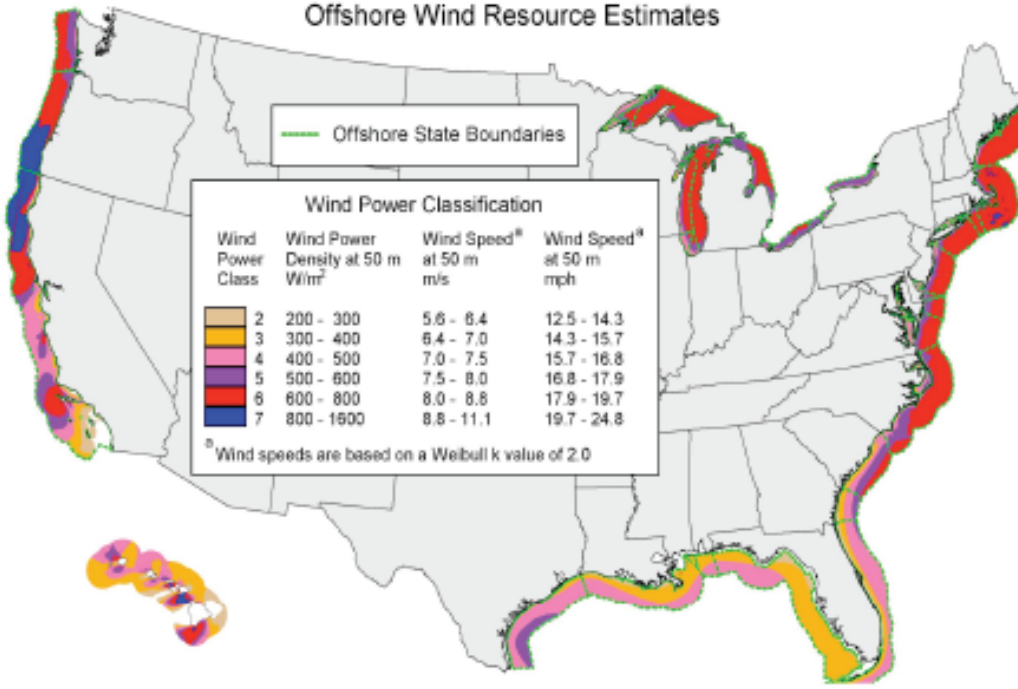
Population Density of the Counterminous United States

US Population Concentration



U.S. Wind Resource

Offshore Wind Resource Estimates



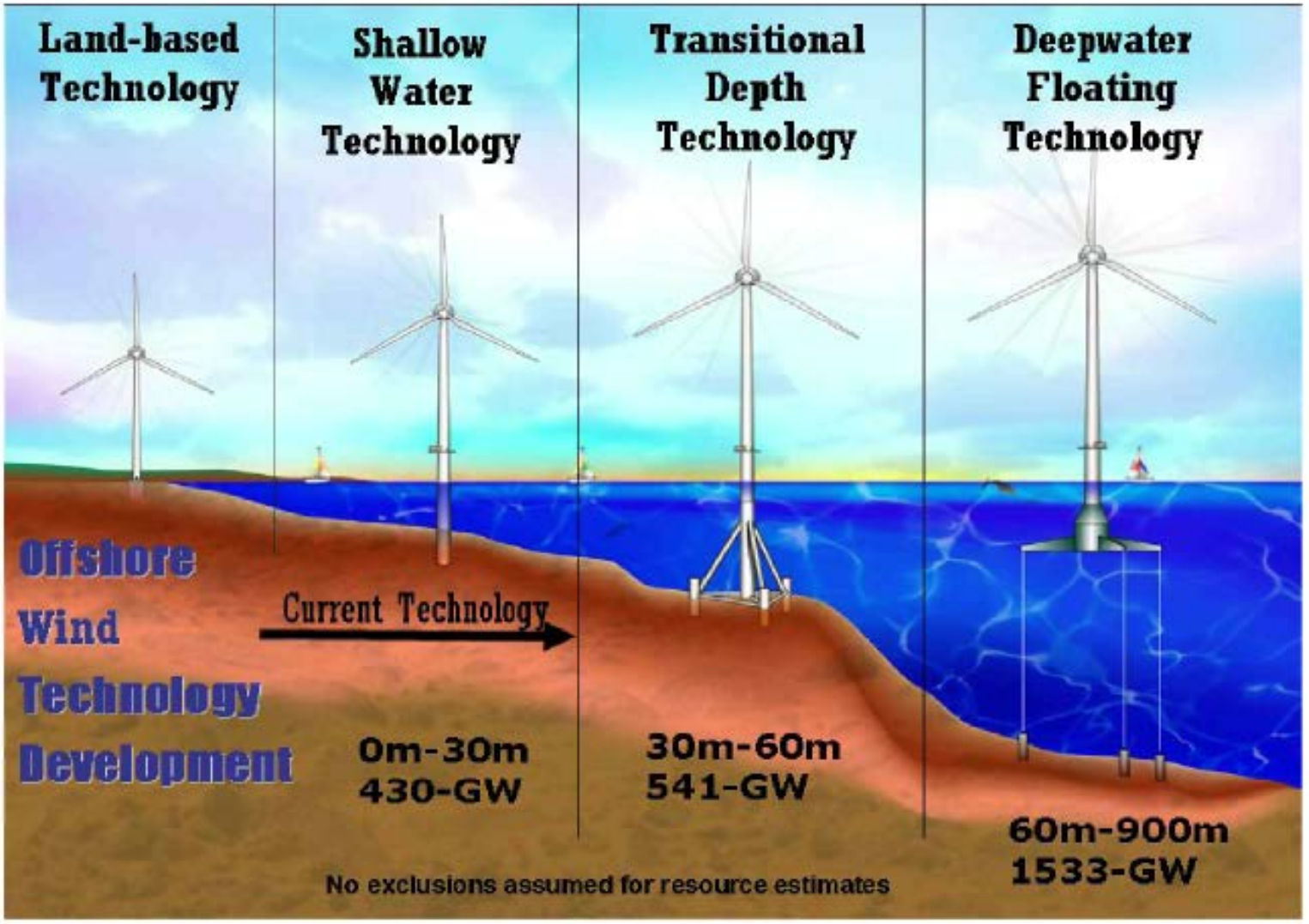
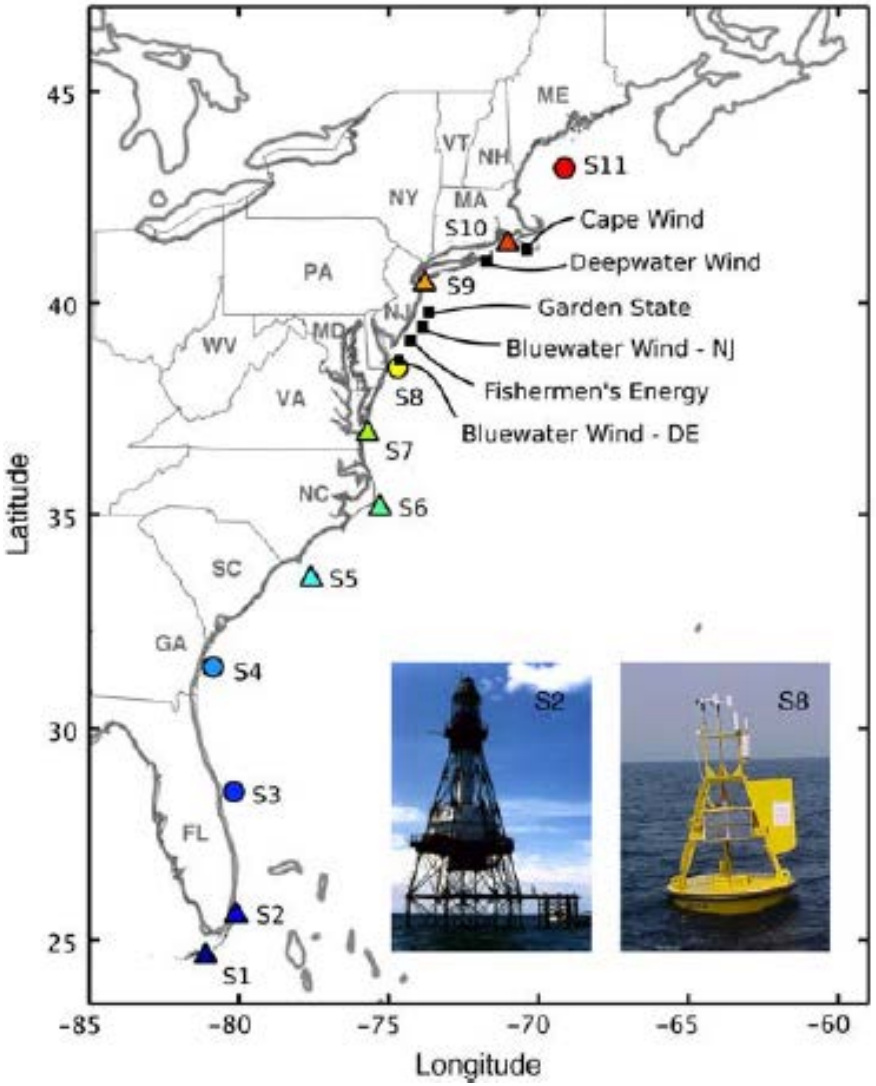


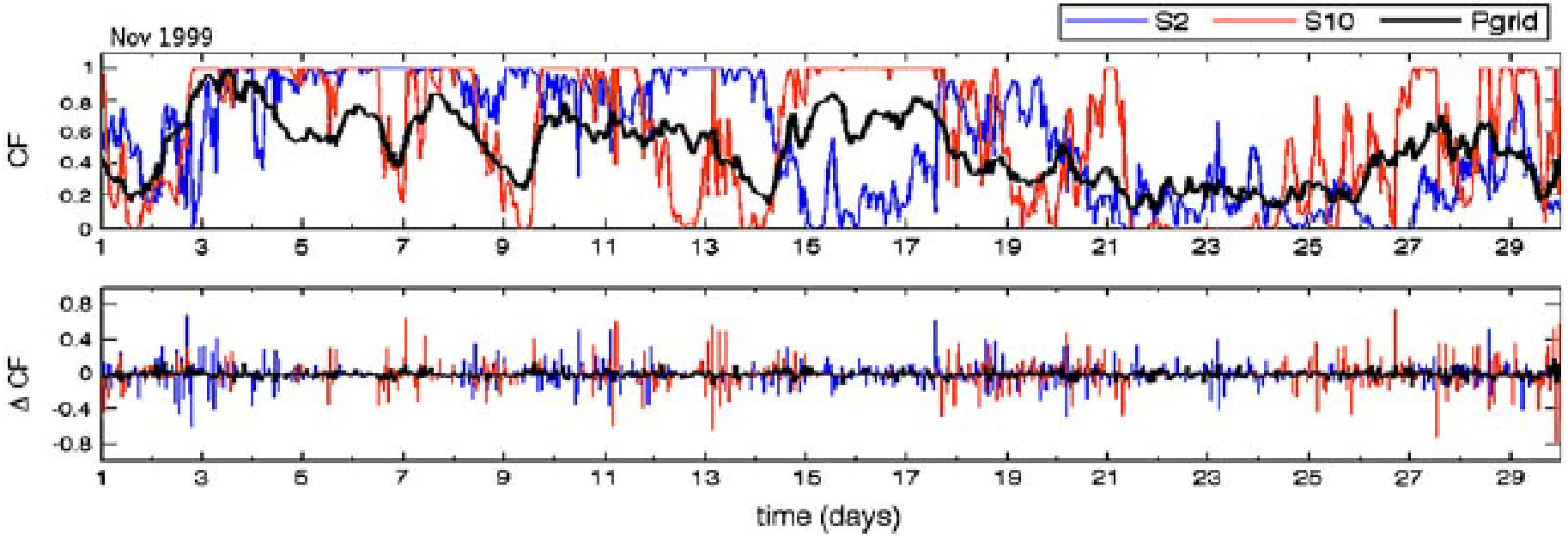
FIGURE 12. Offshore development pathways.

From R. Thresher, “Wind Energy, Current Status and Future R&D Needs,” 2008.

East Coast Off-shore Wind Integration Study



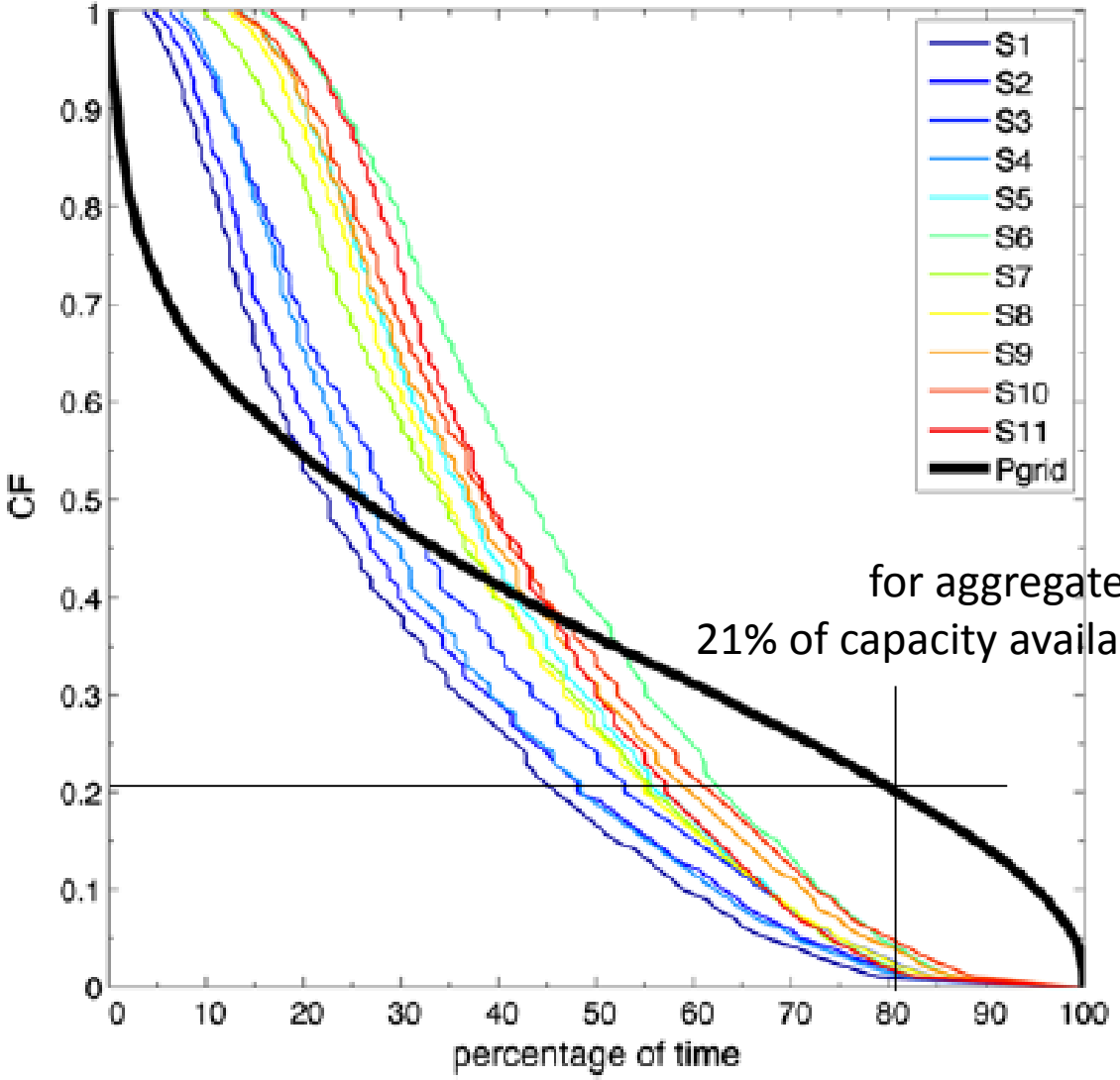
Simulated Hourly Wind Power Time Series for November, 1999



S2 off-shore from Miami, Fl (low CF)
S10 off-shore from Providence, RI (high CF)
Pgrid S1 through S11 interconnected

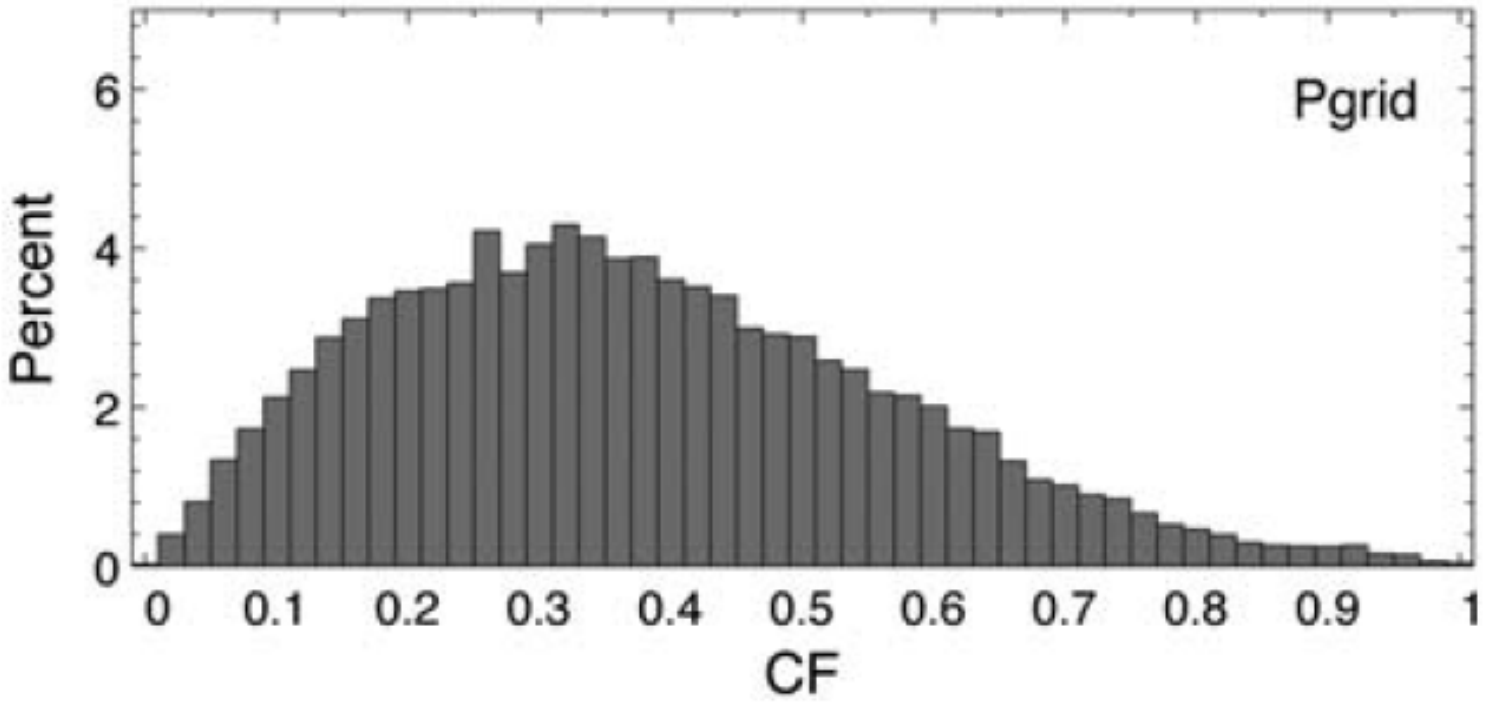
CF: capacity factor

Simulated Wind Power Duration Curve
Eleven Off-shore East Coast Sites



for aggregated sites
21% of capacity available 80% of time

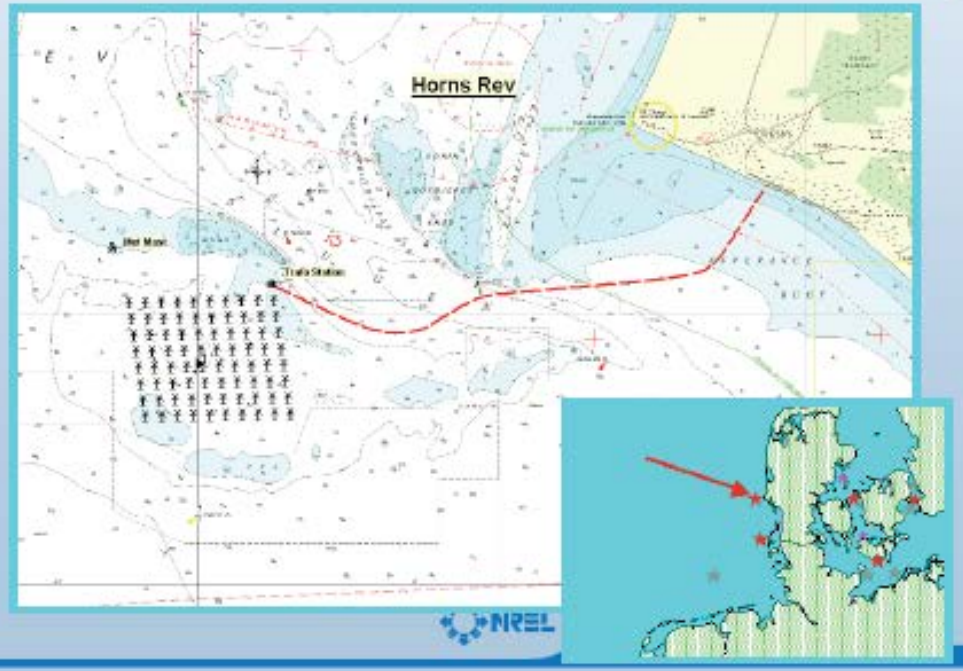
Simulated Capacity Factor Histogram of Eleven Interconnected East Coast Off-shore Sites for 1998 - 2002



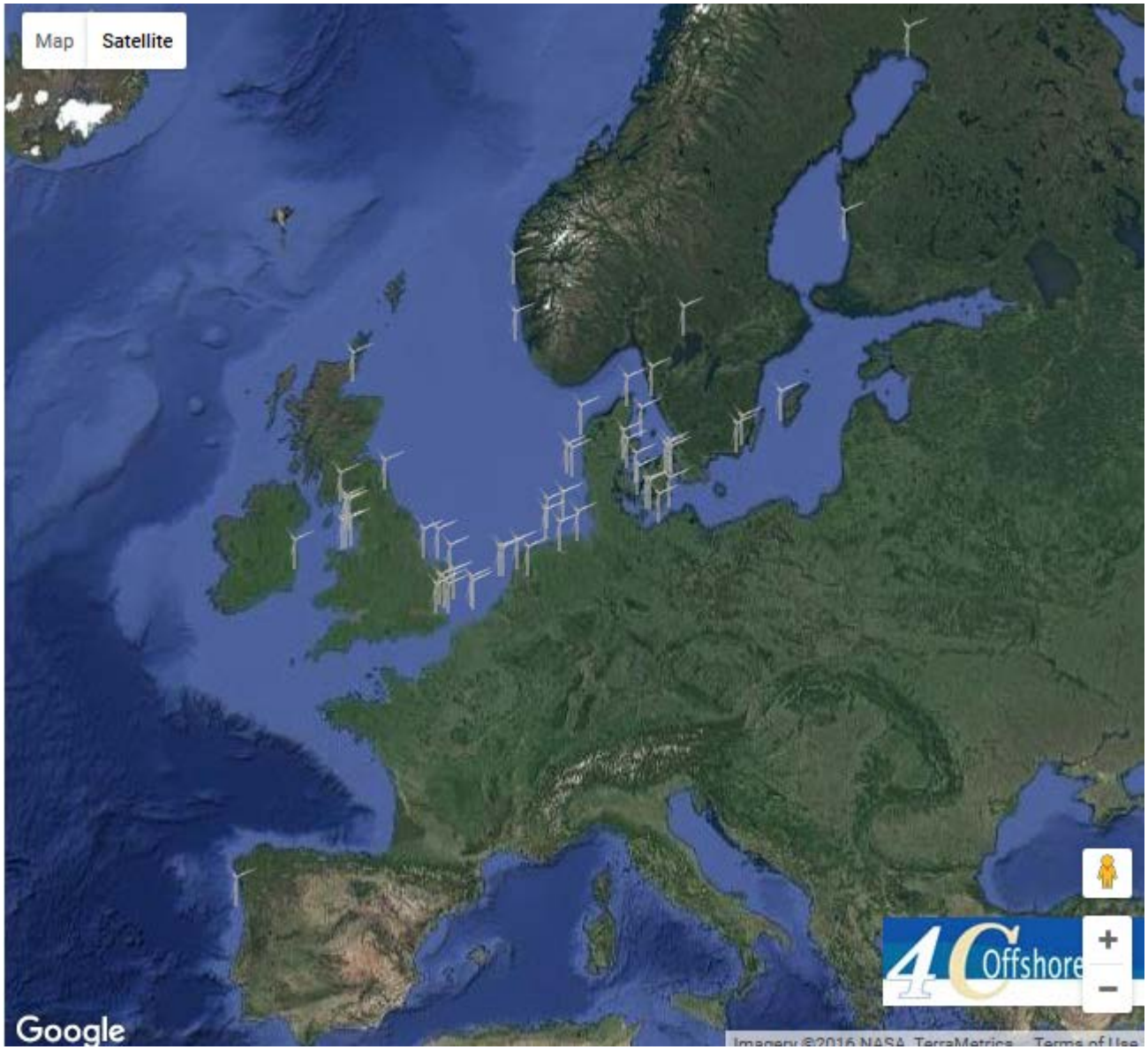
(wind power)

Danish Off Shore Wind Farm

Country: Denmark
Location: West Coast
Total Capacity: 160 MW
Number of Turbines: 80
Distance to Shore: 14-20 km
Depth: 6-12 m
Capital Costs: 270 million Euro
Manufacturer: Vestas
Total Capacity: 2 MW
Turbine-type: V80 - 80m diameter
Hub-height: 70-m
Mean Windspeed: 9.7 m/s
Annual Energy output: 600 GWh

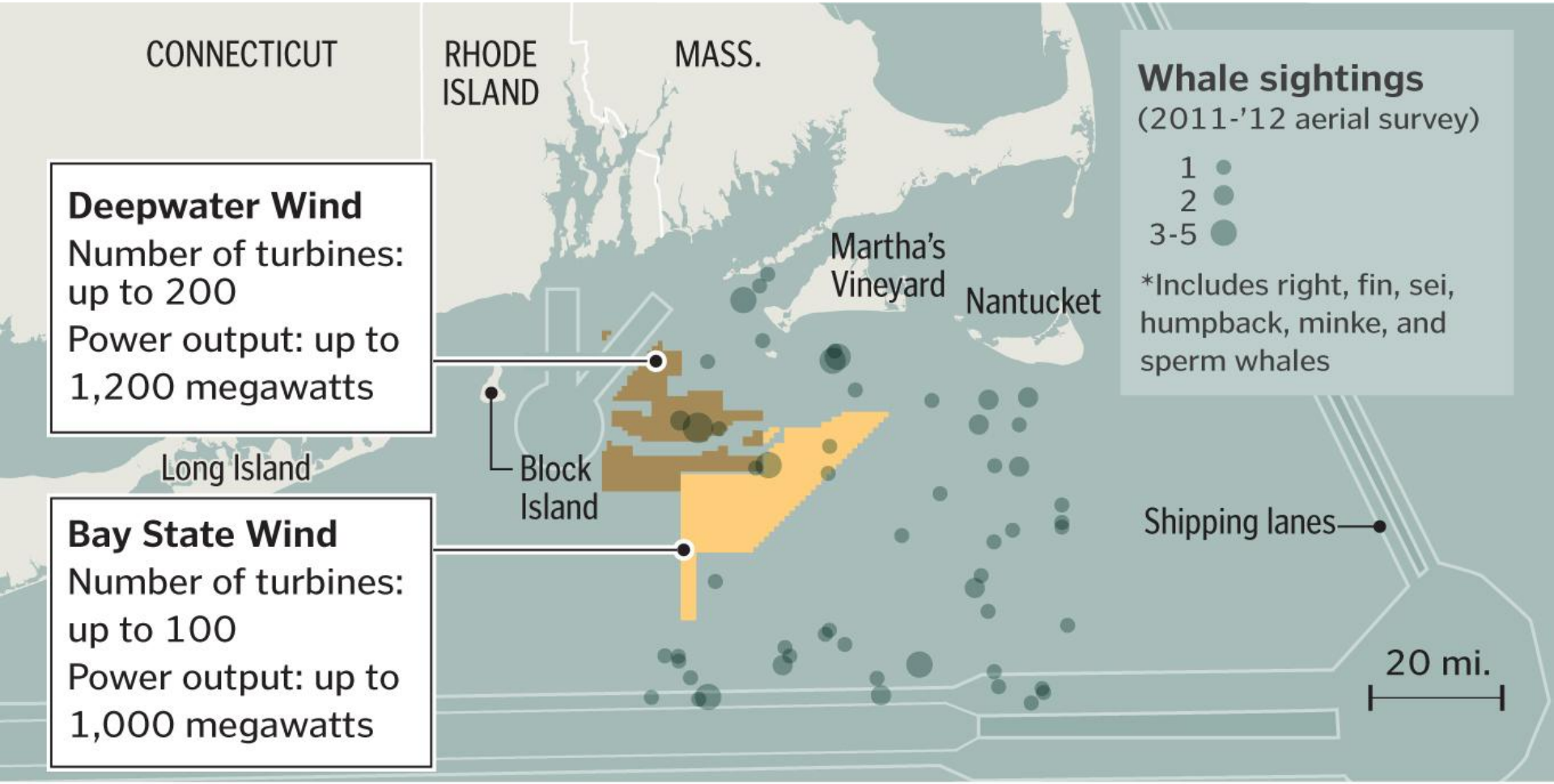


European Offshore Wind Farms



Block Island, RI
First U.S. Offshore Wind Farm

Massachusetts Wind Farm Development Areas

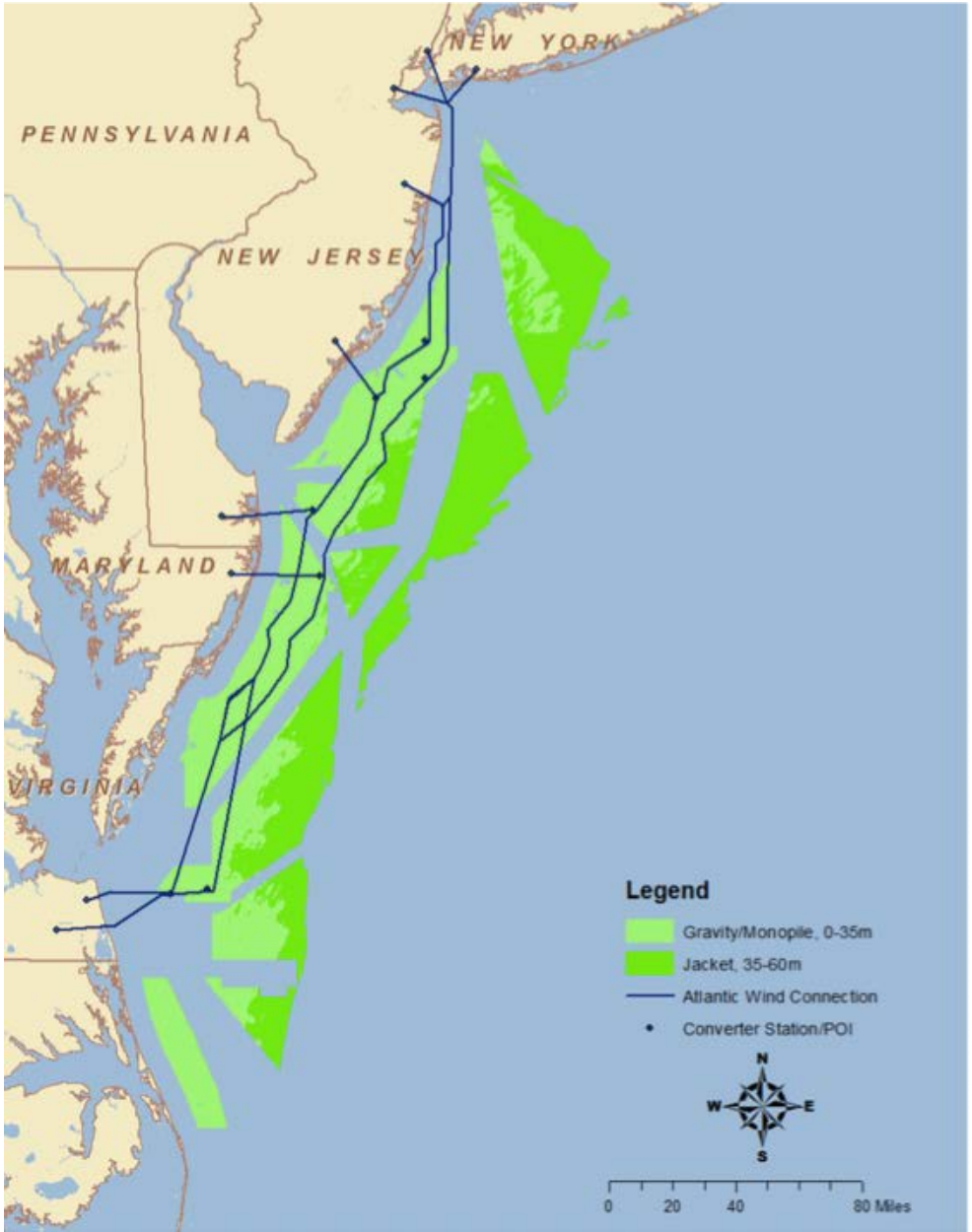


SOURCES: The Bureau of Ocean Energy Management

GLOBE STAFF

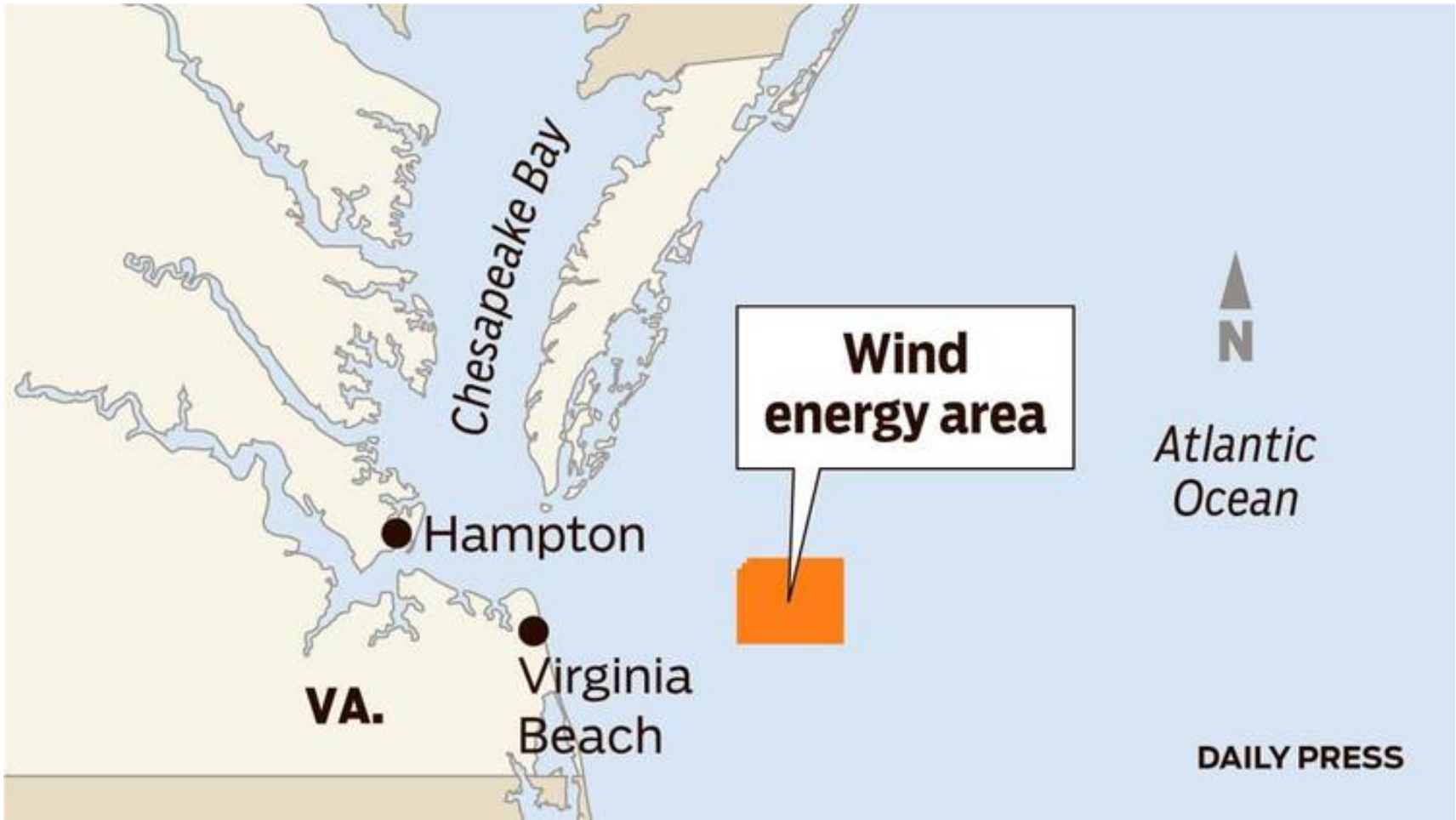
Off-Shore Wind to PJM Territory

- Only bottom-mounted, no floating wind
- 70 GW capacity off PJM states
- Image shows areas + one proposed HVDC system connecting to 9 POIs
- Energy output at ~ 50% CF = 35 GW_a



The Washington Post

September 19, 2019
Dominion Energy plans major offshore wind farm near Virginia Beach



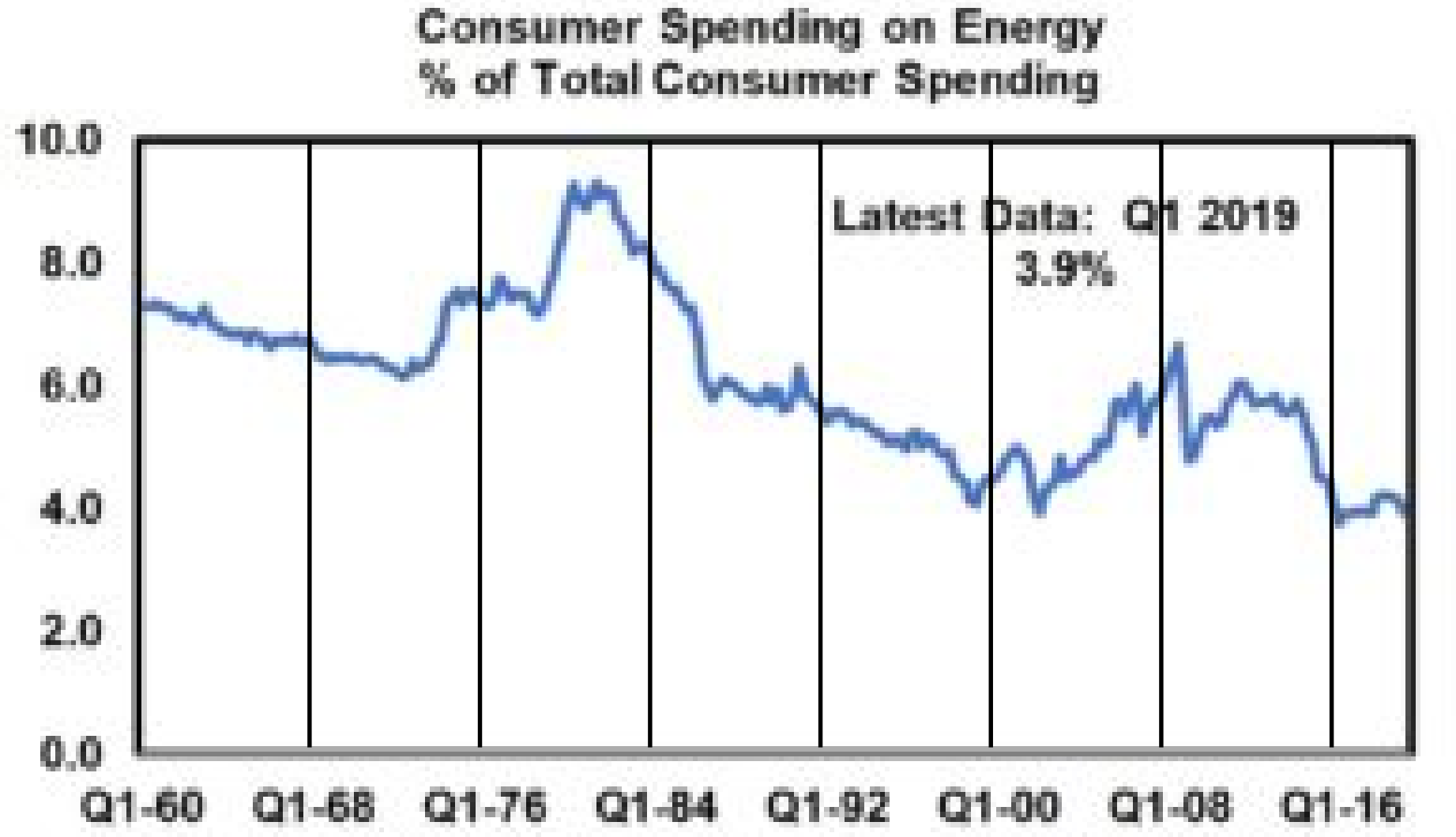
Consumer spending on energy

ENERGY INSTITUTE
UNIVERSITY OF MICHIGAN

U.S. Consumer Spending on Energy A Big Ticket

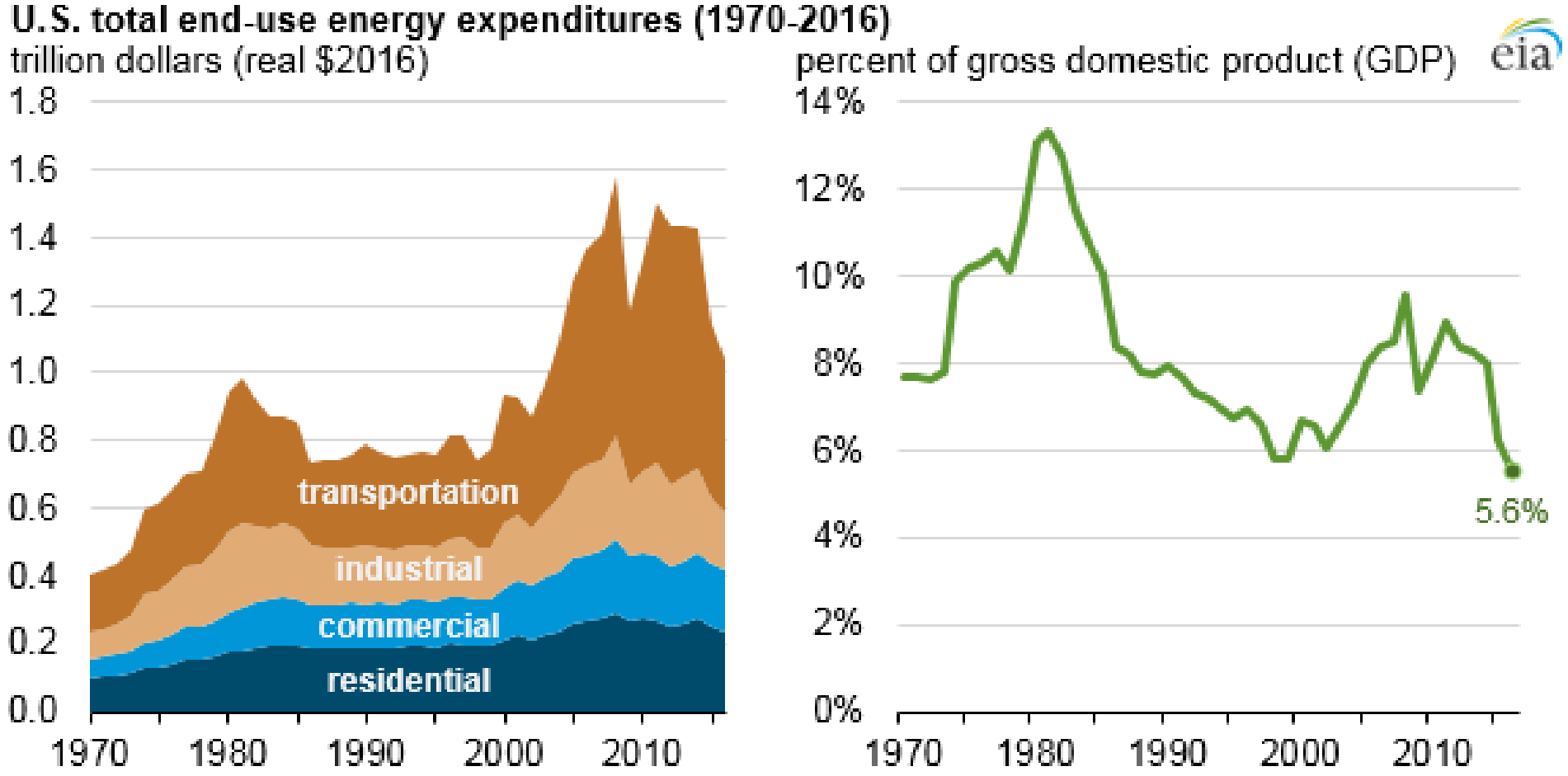
Americans are now spending over $500 billion
on energy goods and services


Consumer Spending on Energy
Per Capita, $
2,500
2,000
1,500
1,000
500
0
Latest Data: Q1 2019
$1,709
Q1-59
Q1-67
Q1-75
Q1-83
Q1-91
Q1-99
Q1-07
Q1-15

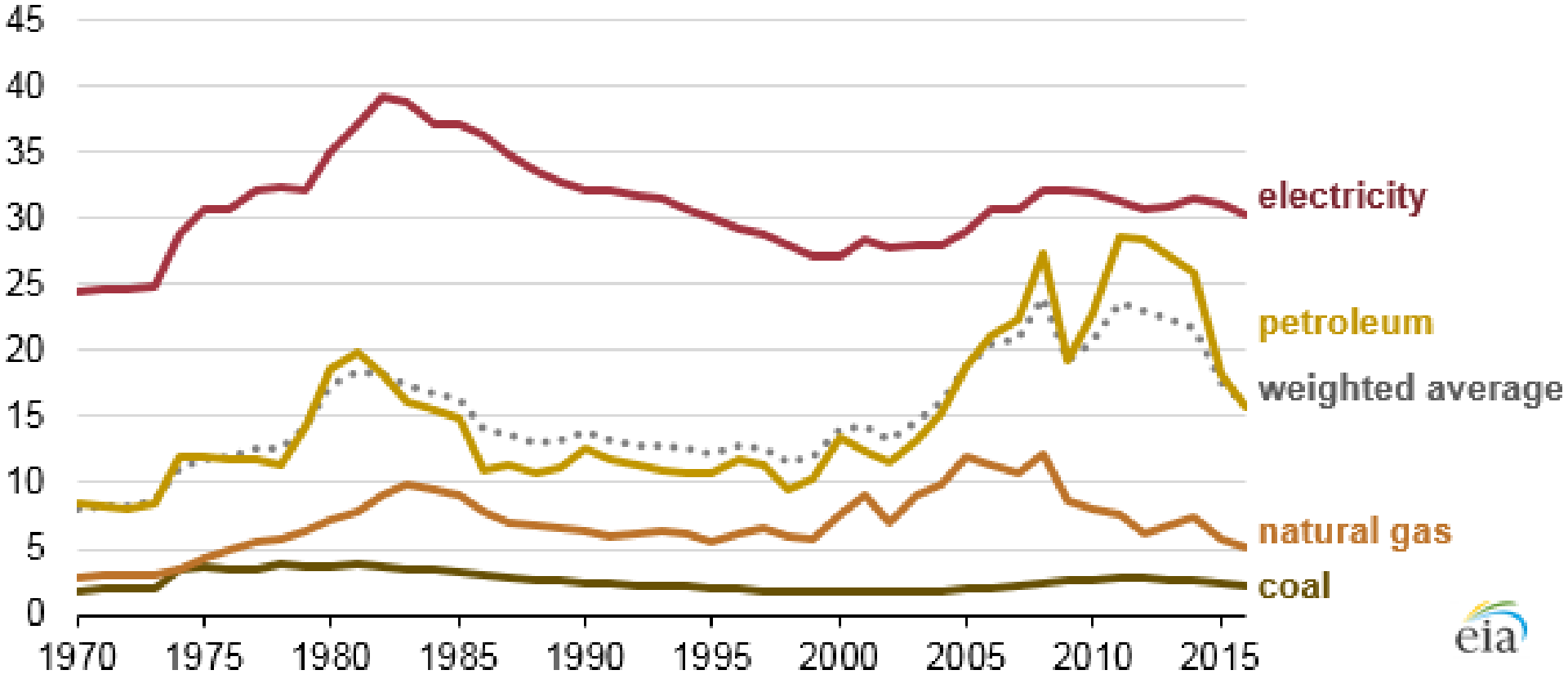

Consumer Spending on Energy
% of Total Consumer Spending
10.0
8.0
6.0
4.0
2.0
0.0
Latest Data: Q1 2019
3.9%
Q1-60
Q1-68
Q1-76
Q1-84
Q1-92
Q1-00
Q1-08
Q1-16

Weekly U.S. Regular All Formulations Retail Gasoline Prices

eia Source: U.S. Energy Information Administration


U.S. total end-use energy expenditures (1970-2016)
trillion dollars (real $2016)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
transportation
industrial
commercial
residential
1970
1980
1990
2000
2010
percent of gross domestic product (GDP)
eia
14%
12%
10%
8%
6%
4%
2%
0%
5.6%
1970
1980
1990
2000
2010

Selected U.S. average energy prices (1970-2016)
dollars per million British thermal units (real $2016)



Energy Employment Statistics

The 2019 U.S. Energy & Employment Report

A JOINT PROJECT OF NASEO & EFI

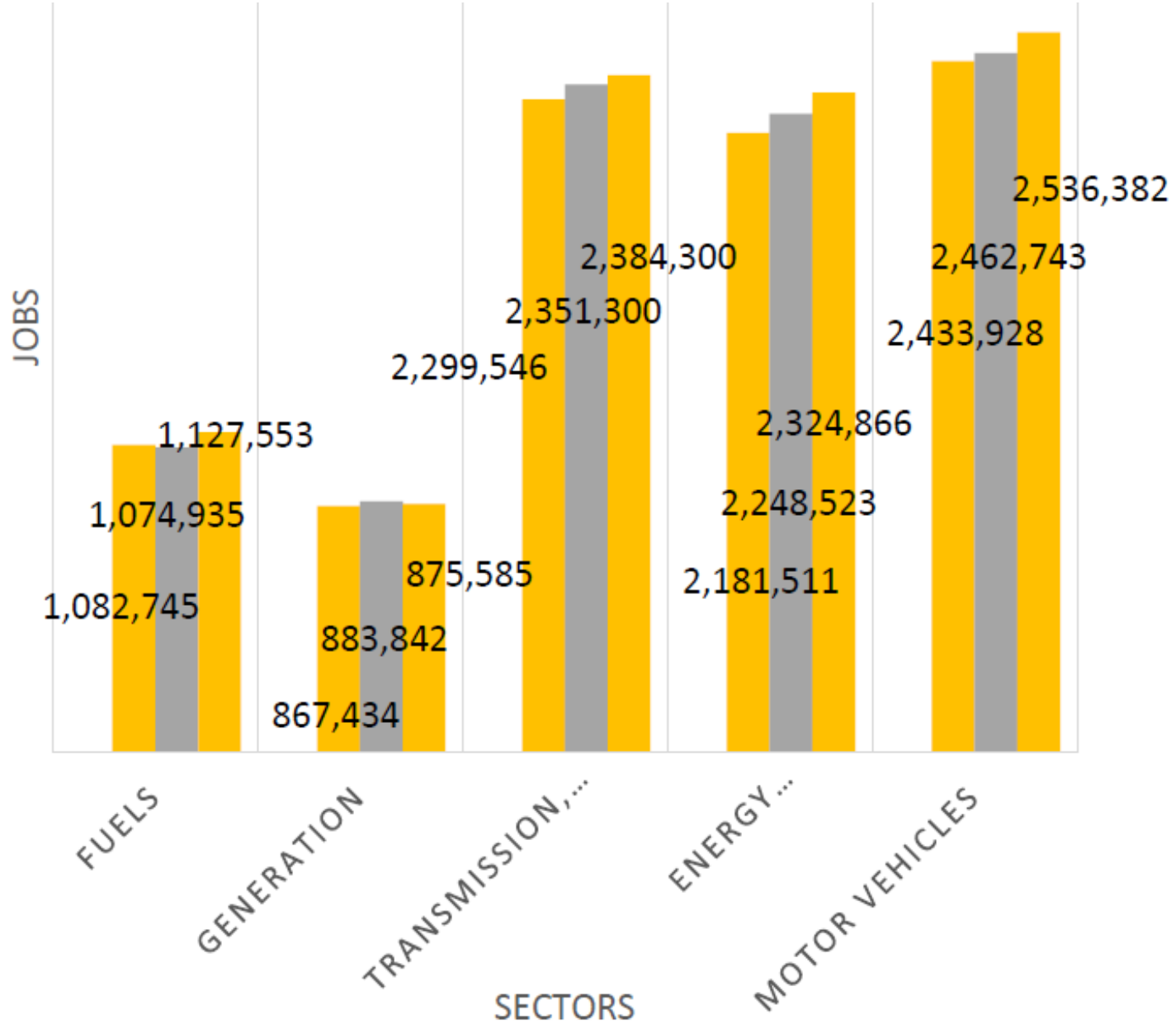
Energy and Employment Report Sectors

- Traditional energy sector
  - Fuels
  - Electric power generation
  - Transmission-Distribution-Storage
- Energy efficiency
- Motor vehicles

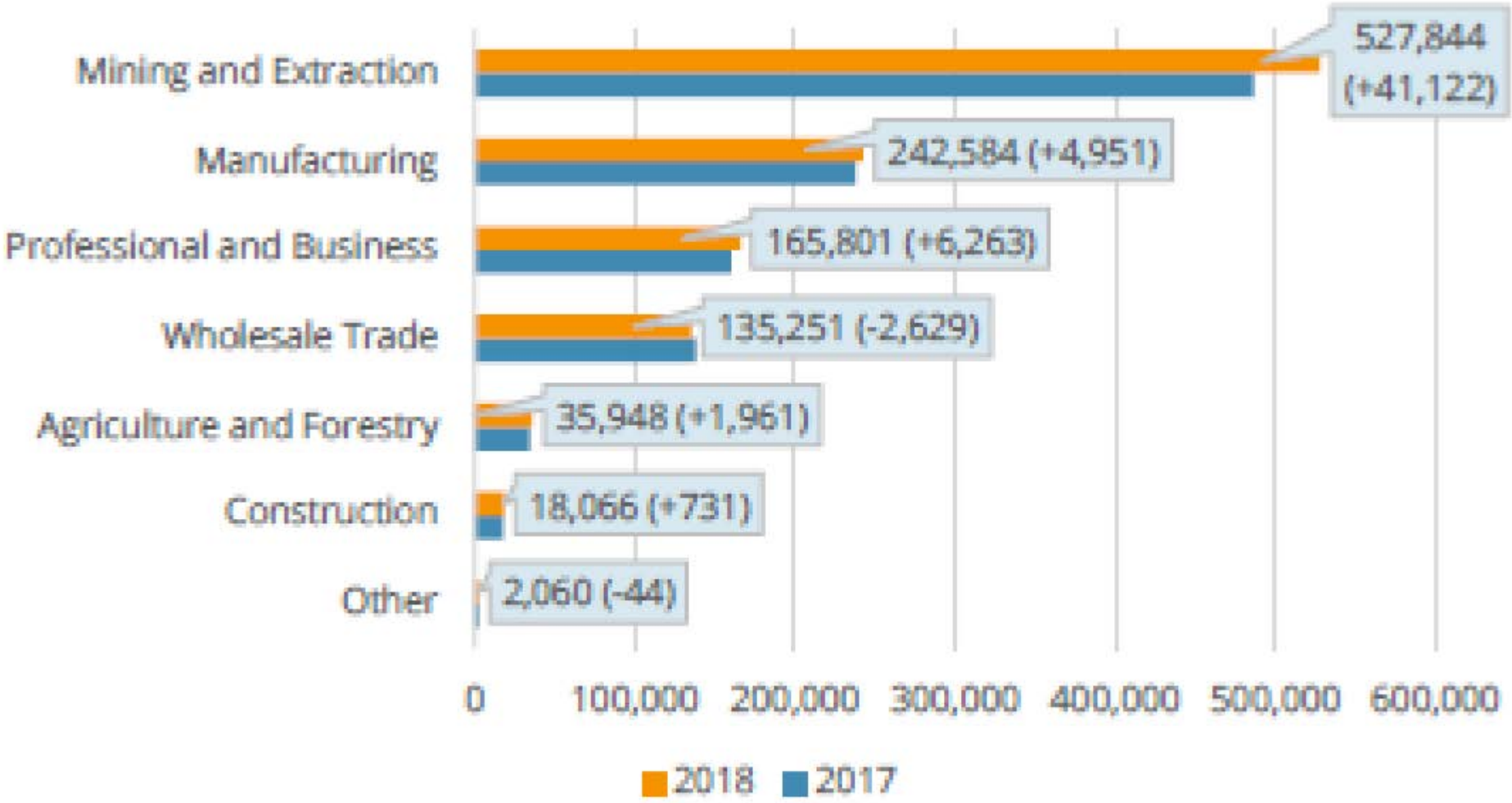
Key Takeaways – 2019 USEER

- Traditional Energy and Energy Efficiency added 152,000 jobs in 2018
- Fuels production added 52,000 new jobs, 33,000 in oil and 17,000 in natural gas, while coal mining held firm.
- Coal generation dropped by 7,000 jobs.
- Solar jobs declined, but low emissions' natural gas, wind, CHP, and geothermal all grew
- Energy storage now employs 81,000 with battery storage at 61,000
- Motor vehicles added 74,000 jobs, while alternative fuel vehicles added 34,000 jobs.
- Overall, surveyed employers predicted a 4.6% growth rate for 2019.

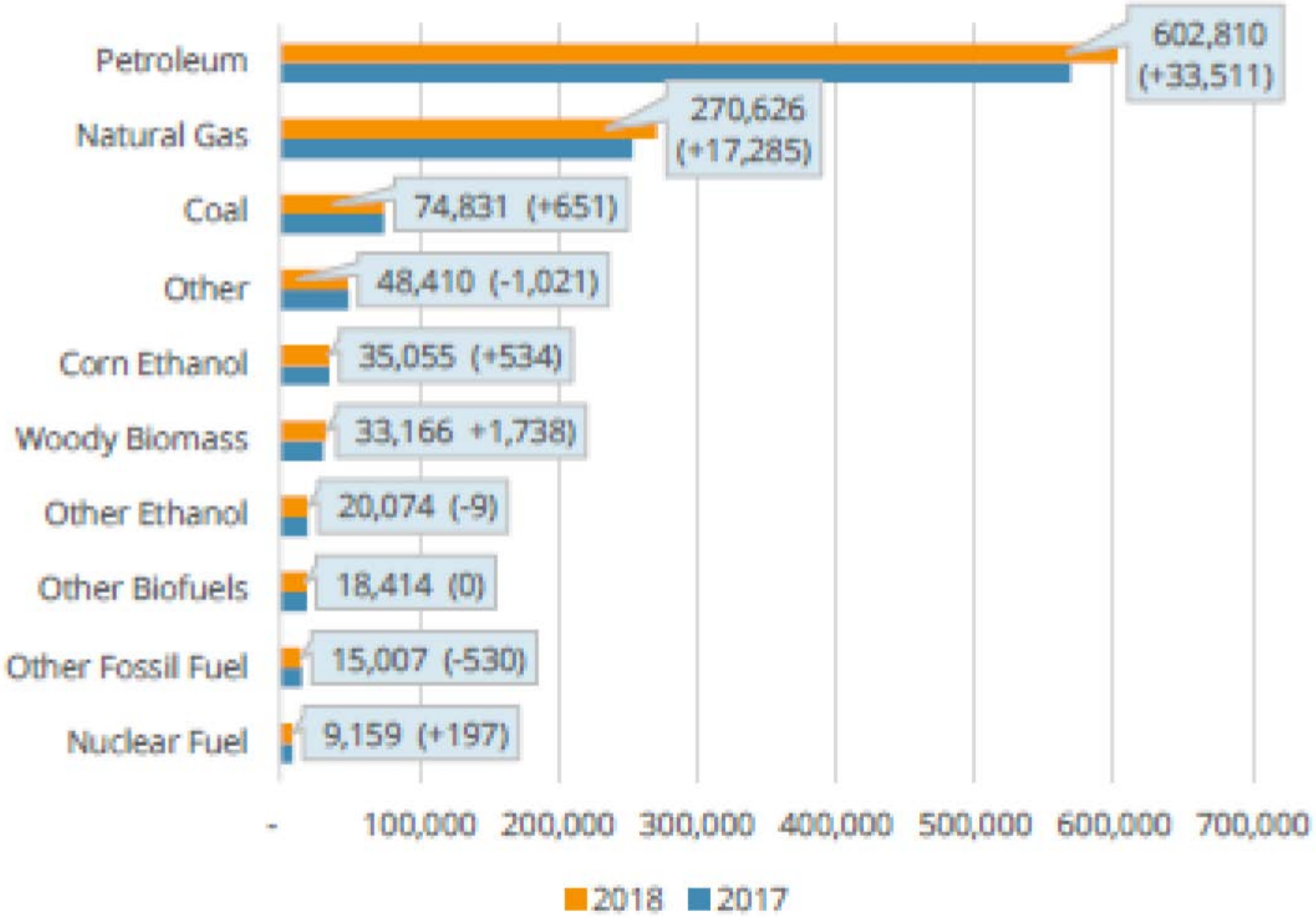
Jobs 4th Quarter 2016 - 2018



Fuels Sector – Employment by Industry, 2017-2018

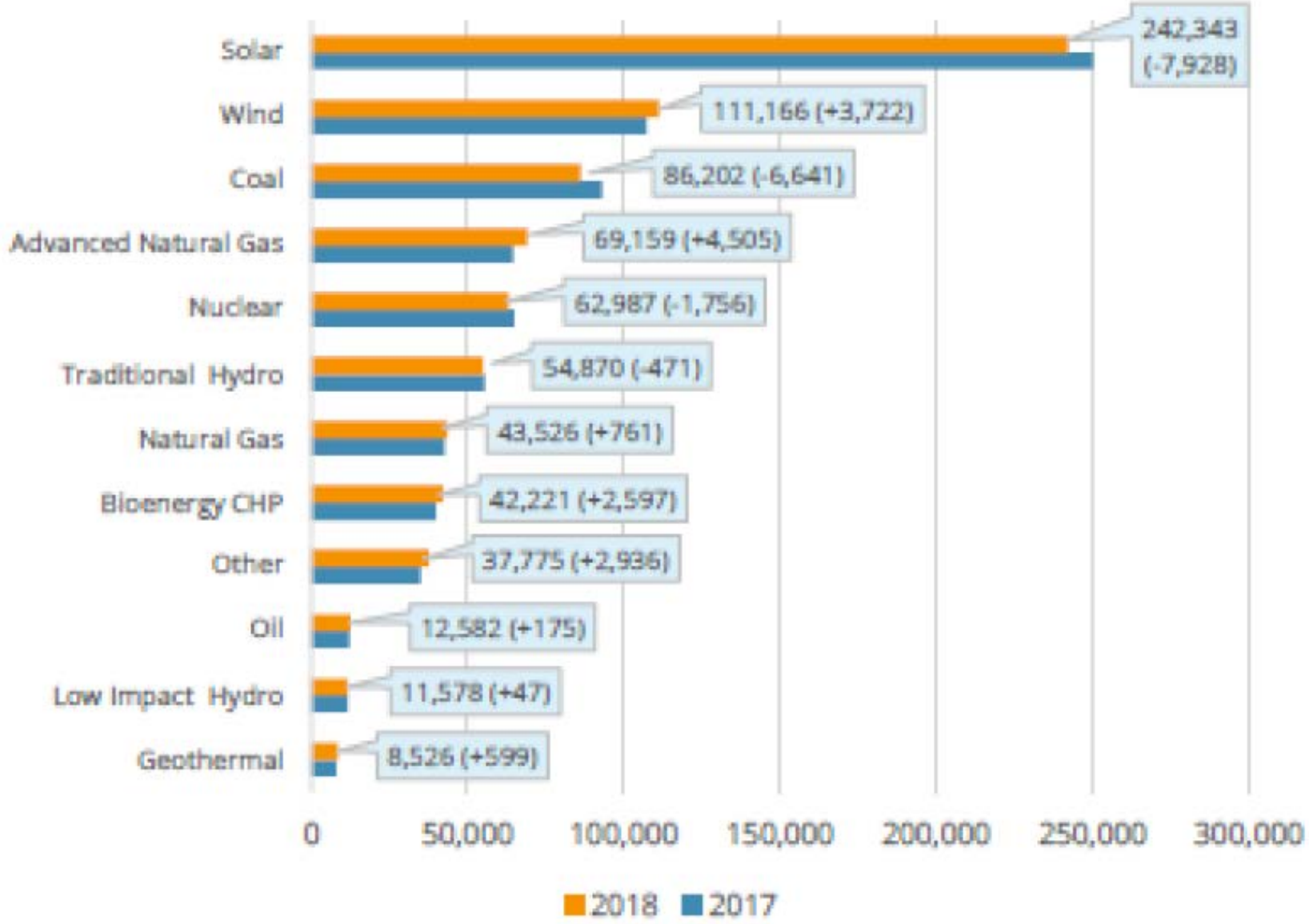


Fuels Sector – Employment by Detailed Technology Application, 2017-2018

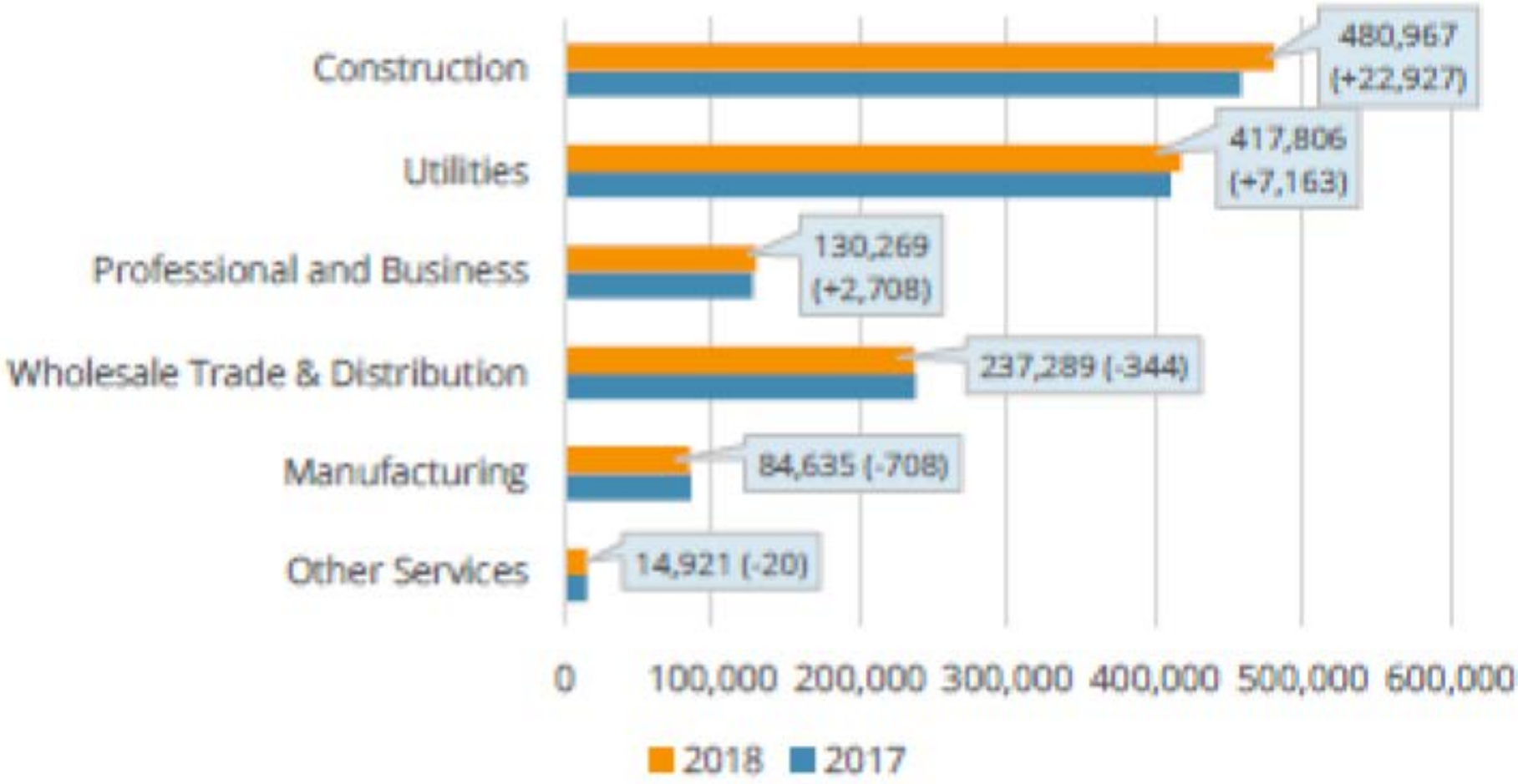


Electric Power Generation Sector – Employment by Industry, 2017-2018

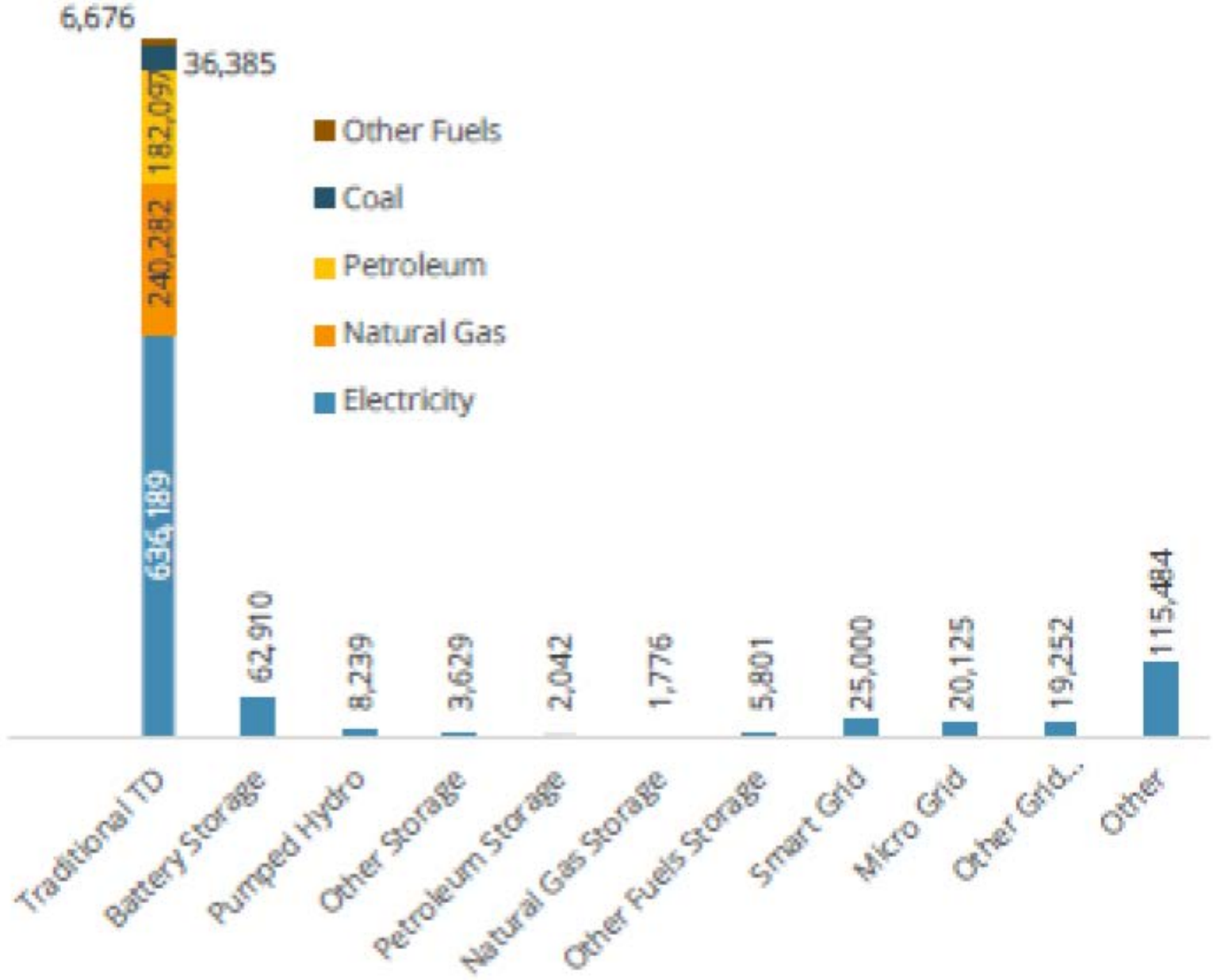
Electric Power Generation Sector – Employment by Detailed Technology Application, 2017-2018[a]



TDS Sector – Employment by Industry, 2017-2018



TDS Sector – Employment by Detailed Technology Application, 2017-2018



High Carbon Fuels and Generation Employment 2018

Petroleum—799,531

Natural gas—626,369

Coal—626,369

2,052,269

CHP—29,000

Biomass—13,000

Low emissions natural gas—69,200

Biofuels—106,000

Low Carbon Fuels and Generation Employment 2018

Solar--335,000 (some part-time)

Wind—111,000

Nuclear—72,000

Geothermal—8,500

Hydro—66,400

America’s attitude on climate action

February 2017

CLIMATE LEADERSHIP COUNCIL

THE CONSERVATIVE CASE FOR CARBON DIVIDENDS

How a new climate strategy can strengthen our economy, reduce regulation, help working-class Americans, shrink government & promote national security

James A. Baker, III
Martin Feldstein
Ted Halstead
N. Gregory Mankiw
Henry M. Paulson, Jr.
George P. Shultz
Thomas Stephenson
Rob Walton

February 2017

Environ. Res. Lett. 12 (2017) 094012 https://

Environmental Research Letters

LETTER

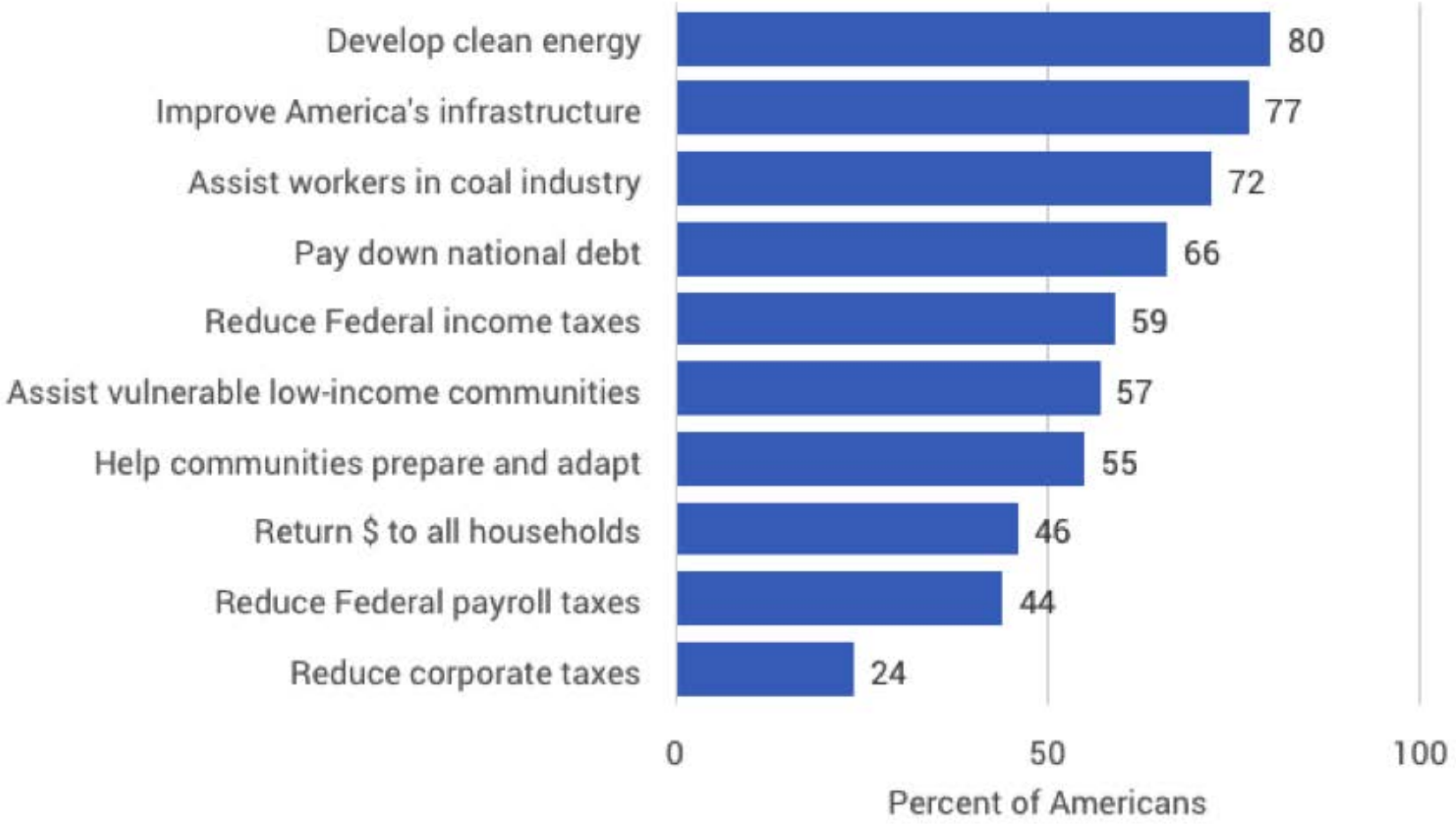
Public willingness to pay for a US carbon tax and preferences for spending the revenue

Matthew J Kotchen[1,2,3], Zachary M Turk[1] and Anthony A Leiserowitz[1]

[1] Yale University, New Haven, CT 06511, United States of America
[2] National Bureau of Economic Research, Cambridge, MA 02138, United States of America
[3] Author to whom any correspondence should be addressed.

Average household willingness for a tax on fossil fuels that increases household energy bills is $177 per year.

American Preferences for How to Spend Carbon Tax Revenues



Congress may consider a tax on fossil fuels (coal, oil, and natural gas) to help reduce global warming. If implemented, how would you like to see the tax money used?

November 2016. Base: Americans 18+.

YALE PROGRAM ON Climate Change Communication

4C

George Mason University
Center for Climate Change Communication

CNN Town Hall March 13, 2016

November, 2018

EPIC | ENERGY POLICY INSTITUTE AT THE UNIVERSITY OF CHICAGO

AP | NORC at the UNIVERSITY of CHICAGO

Is the Public Willing to Pay to Help Fix Climate Change?

FINDINGS FROM A NOVEMBER 2018 SURVEY OF ADULTS AGE 18 AND OLDER

Where Americans Stand On Energy & Climate

- Most Americans believe climate change is happening and that the government should do something about it. Nearly half say the science is more convincing than five years ago.
- Nearly half of Americans support a carbon tax. That share is higher when told that the tax would go toward environmental restoration or renewable energy R&D.
- Greenhouse gas emissions are more important than vehicle prices in shaping American's views on fuel-efficiency standards.

For those who say climate change is real, government has a role.

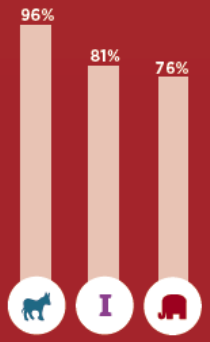
The Climate Change Reality

7 in 10 Americans say **climate change is a reality** and most think human activity has at least something to do with it.

Government's Role

Eighty percent say their state government should address climate change, and 76 percent say their local government or community should address it.

A Large Majority



Among those who believe climate change is happening, substantial majorities of both major parties want the government to take steps to address it.

Extreme Weather is Changing Views

Forty-eight percent of Americans say the science on climate change is more convincing than five years ago, with extreme weather driving their views.

Some willingness to pay.
Strong support for a carbon tax.

Climate Policy

Willingness to Pay a Modest Fee to Combat Climate Change

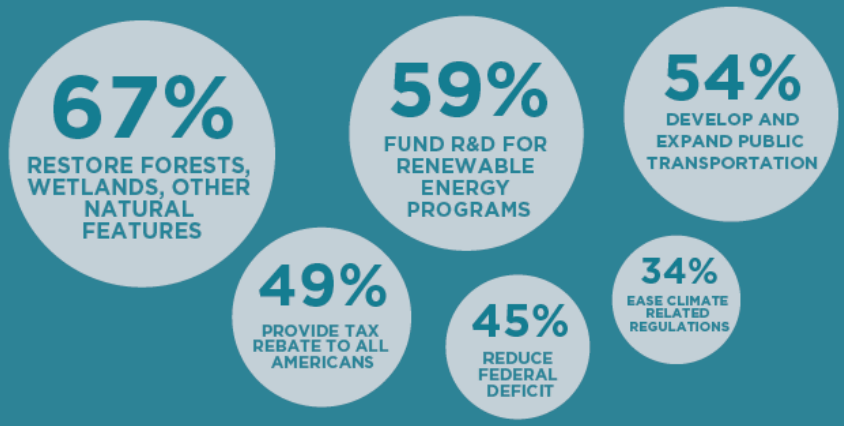
% who would support a monthly fee of at least...

When asked whether they would support a monthly fee on their electricity bill to combat climate change, 16 percent are willing to pay at least $100 per month. Twenty-three percent indicate they are willing to pay at least $40 per month. Party identification and acceptance of climate change are the main correlates of whether or not people are willing to pay, not education or geographic location. Democrats are consistently willing to pay more than Republicans and independents.

Strong Carbon Tax Support

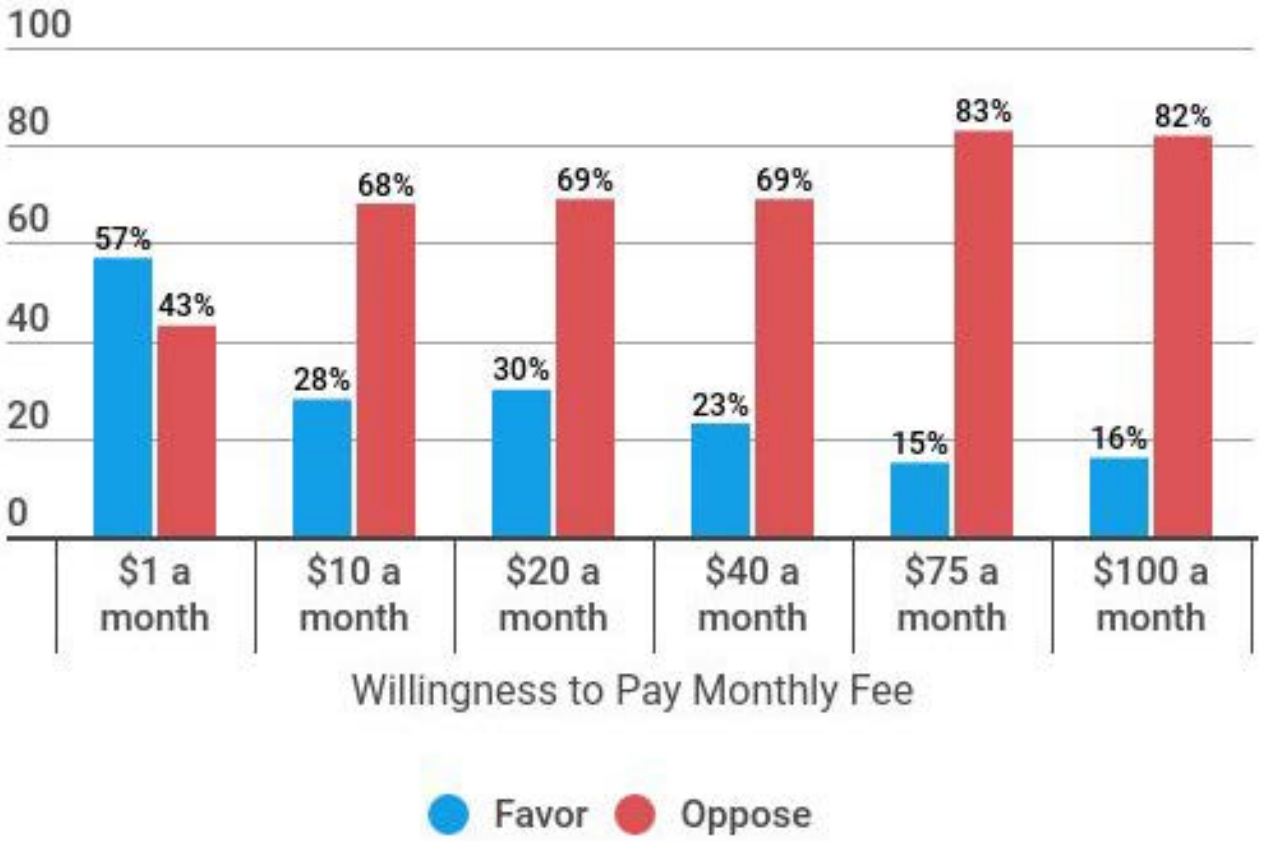
Forty-four percent support a policy to reduce greenhouse gas emissions by taxing the use of carbon-based fuels based on how much they contribute to climate change. That support is generally higher once told how the funds would be used.

% that would support a carbon tax when used for...



EPIC/AP/NORC Poll November 2018 as reported by Cato Institute

Suppose a proposal was on the ballot next year to add a monthly fee to consumers' monthly electricity bill to combat climate change. If this proposal passes, it would cost your household $____ every month. Would you vote in favor of this monthly fee to combat climate change, or would you vote against this monthly fee?



Pew Research Center

November 25, 2019

FOR RELEASE November 25, 2019

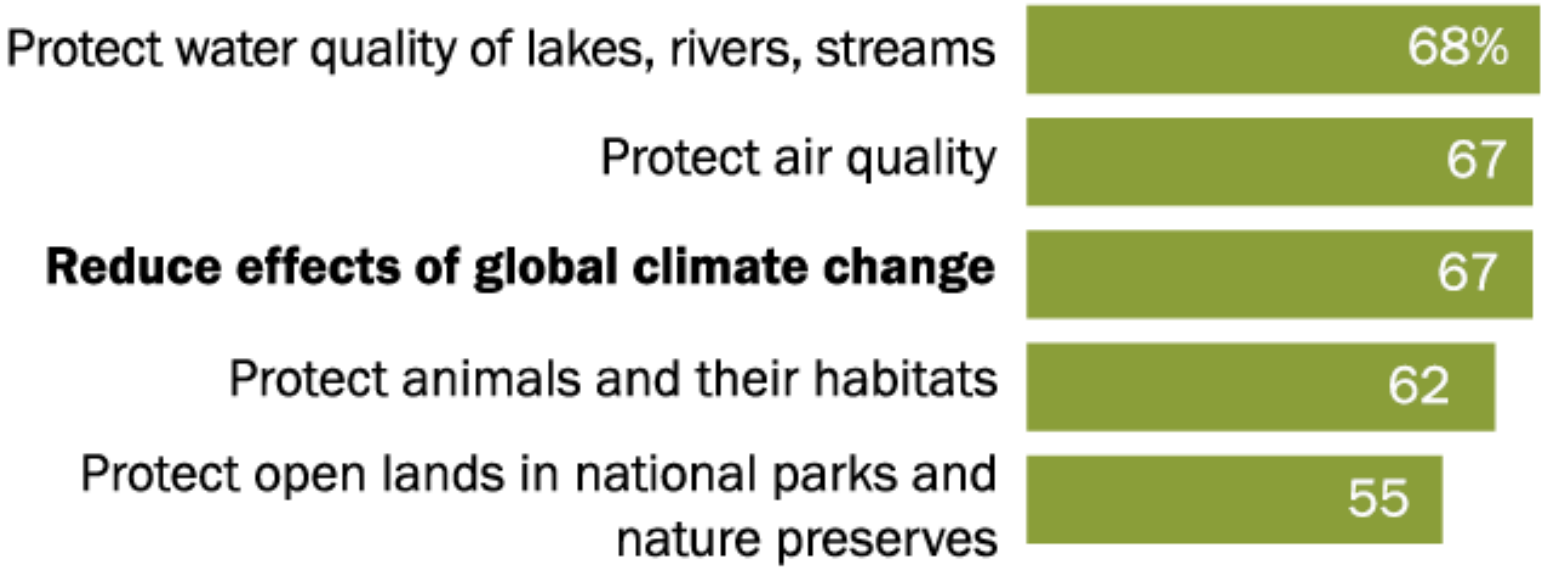
U.S. Public Views on Climate and Energy

Democrats mostly agree the federal government should do more on climate, while Republicans differ by ideology, age and gender

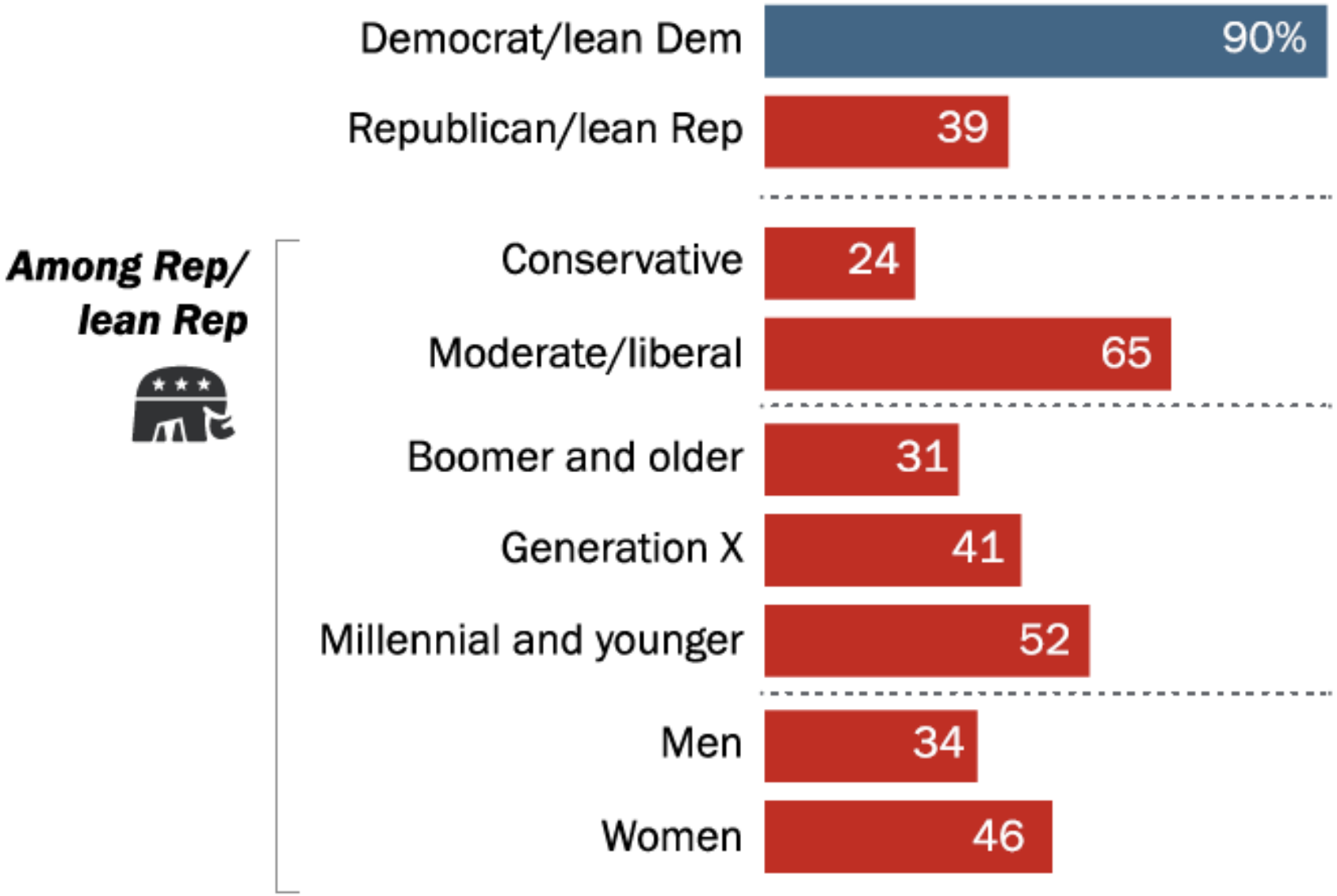
BY *Cary Funk and Meg Hefferon*

Majorities of Americans say the federal government is not doing enough to protect the climate, environment

% of U.S. adults who think the federal government is doing too little to ...

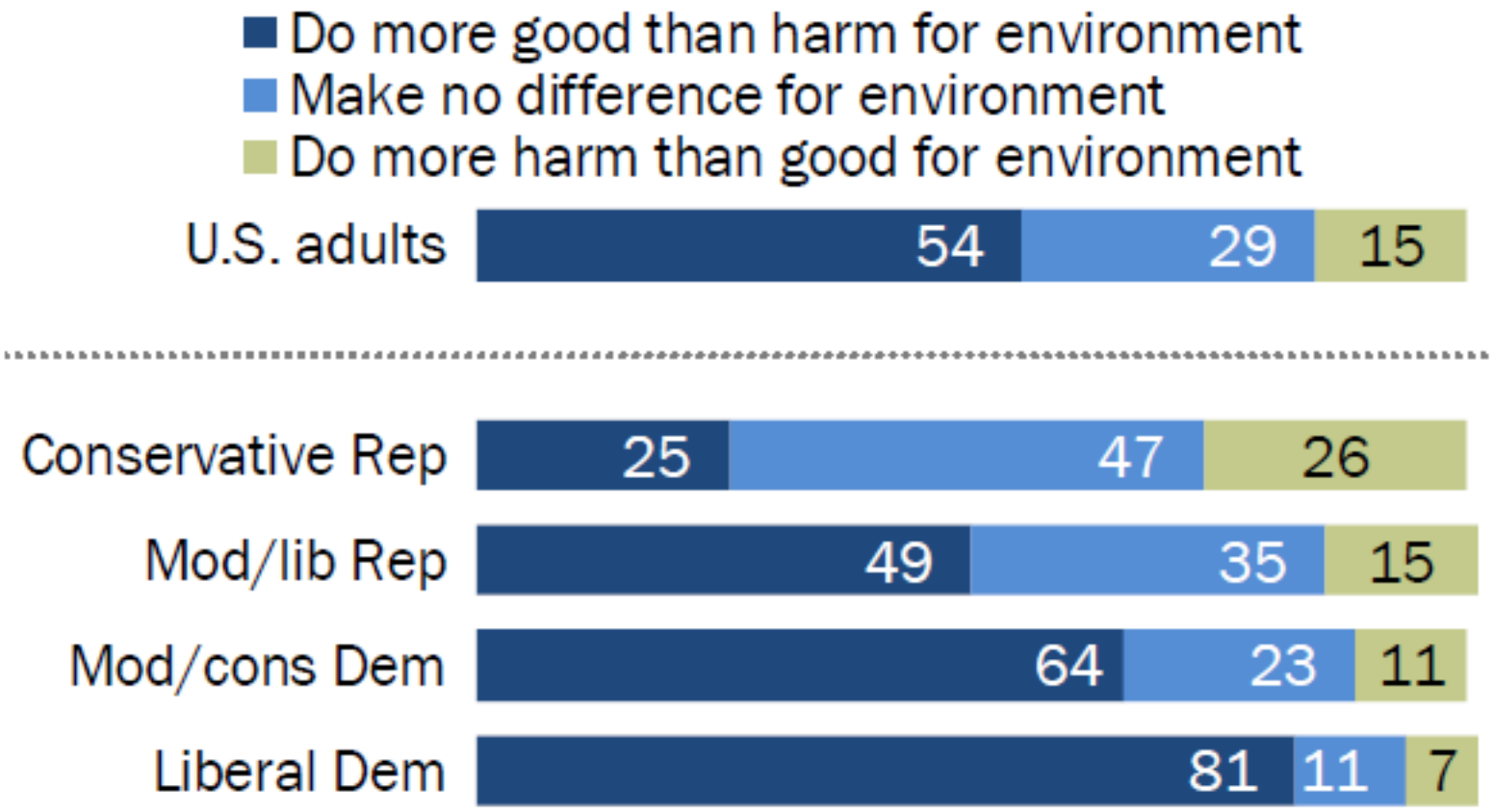


% of U.S. adults who think the federal government is doing too little to reduce the effects of climate change

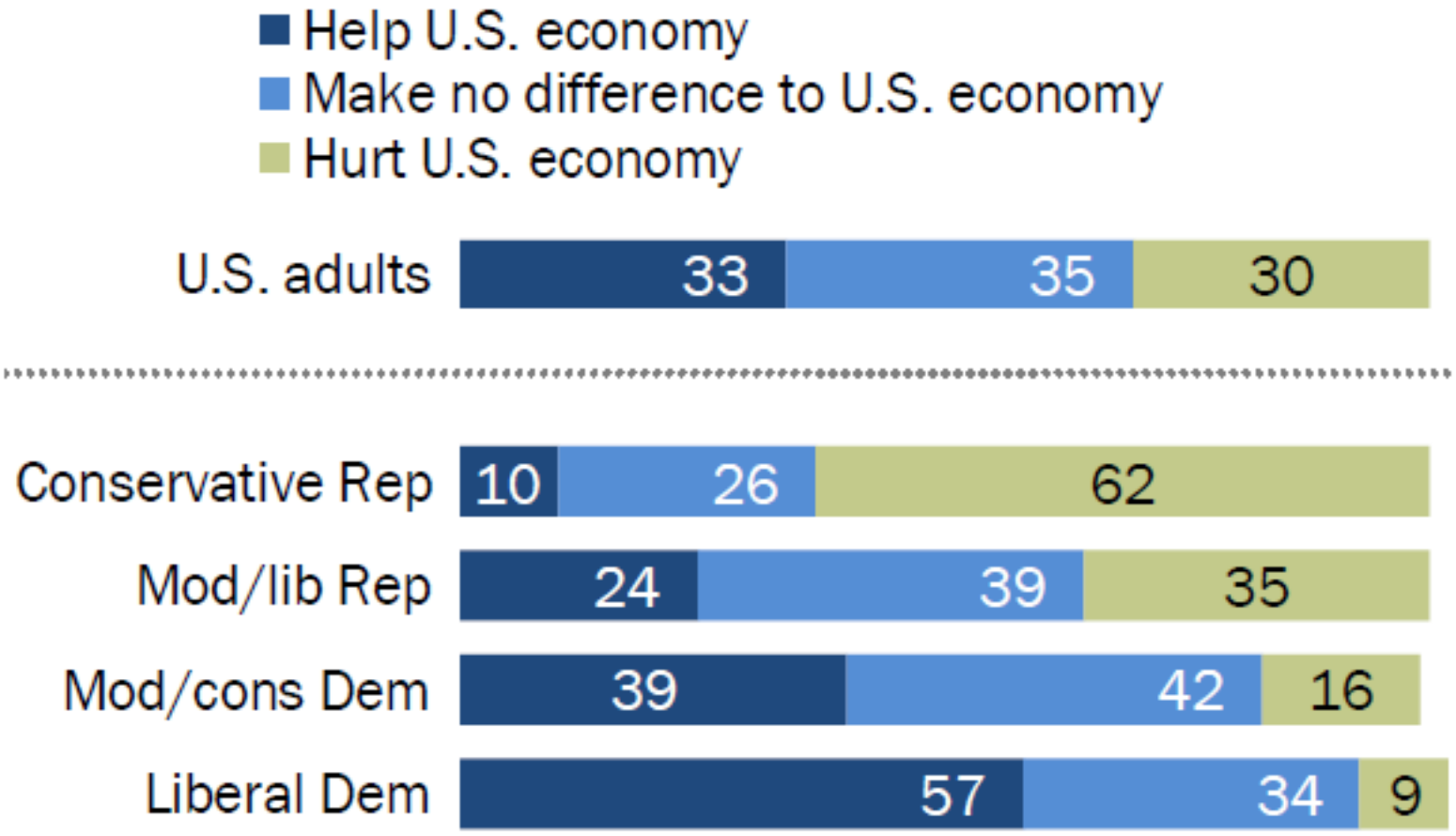


Partisans at odds over effects of climate policies on environment, economy

% of U.S. adults who say policies aimed at reducing the effects of global climate change generally ...

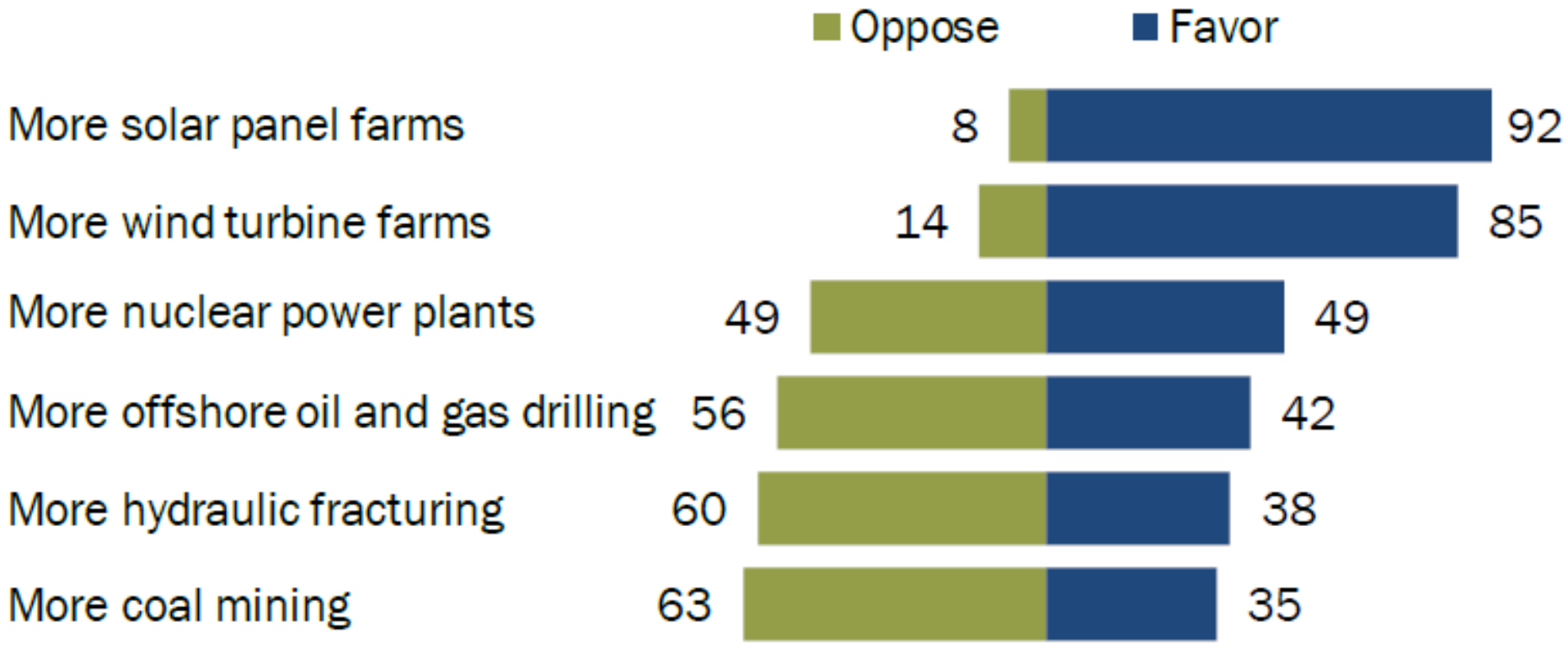


% of U.S. adults who say policies aimed at reducing the effects of global climate change generally ...



Most Americans favor expanding solar or wind power; half or fewer support expanding fossil fuels

% of U.S. adults who say they ____ expanding each energy source



Pew Research Center

February 13, 2020

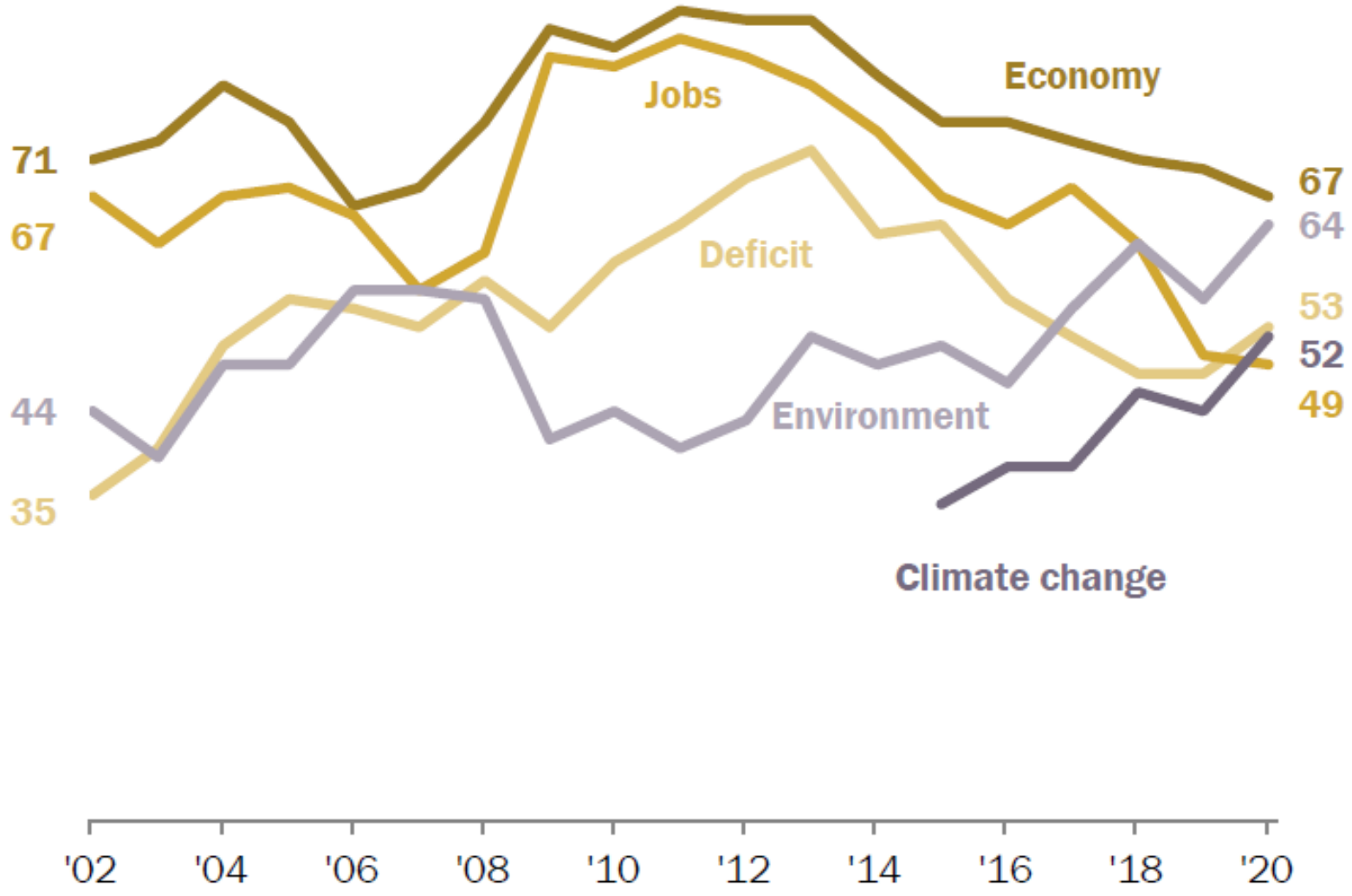
FOR RELEASE FEBRUARY 13, 2020

As Economic Concerns Recede, Environmental Protection Rises on the Public's Policy Agenda

Partisan gap on dealing with climate change gets even wider

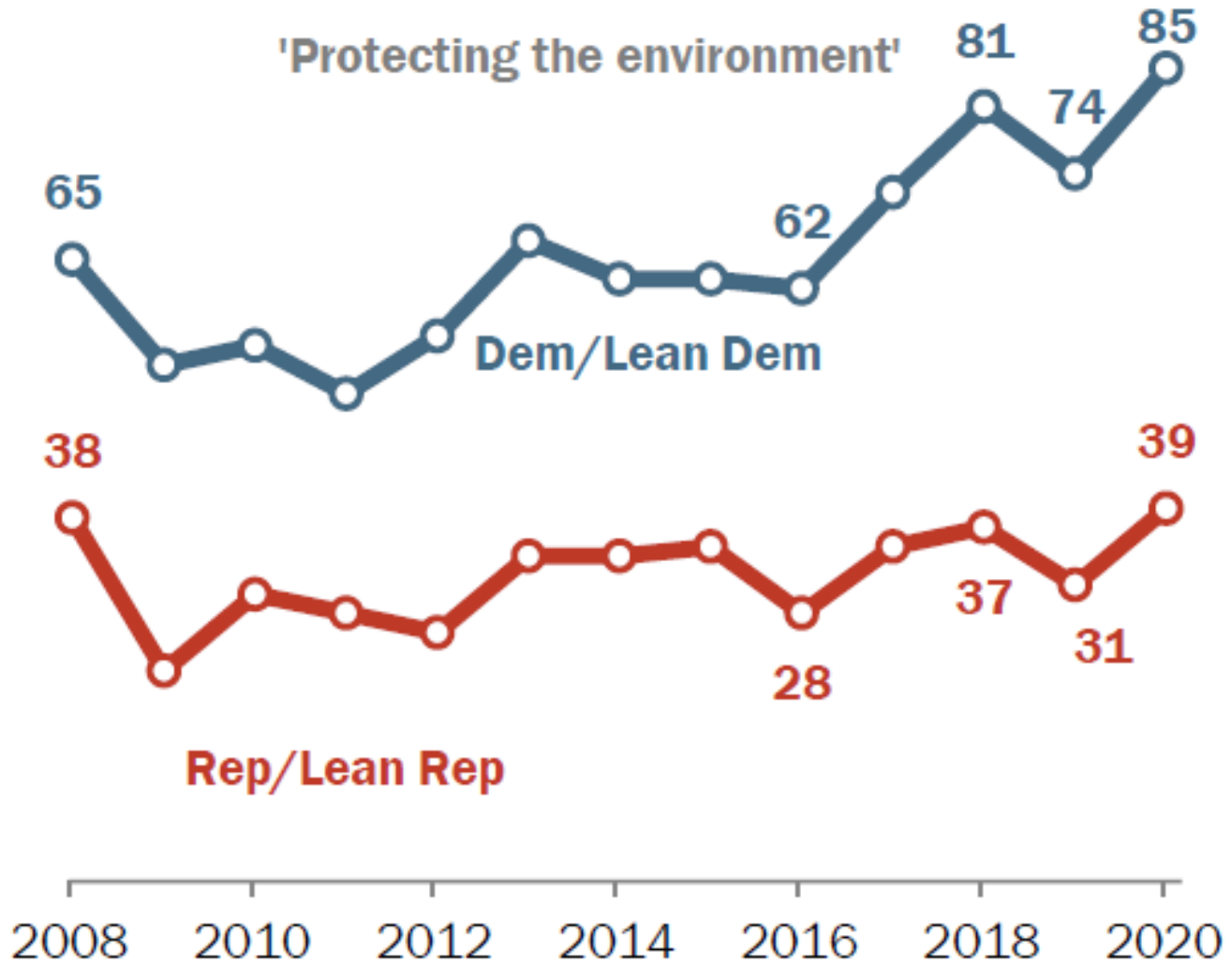
For the first time, environmental protection rivals the economy among the public's top policy priorities

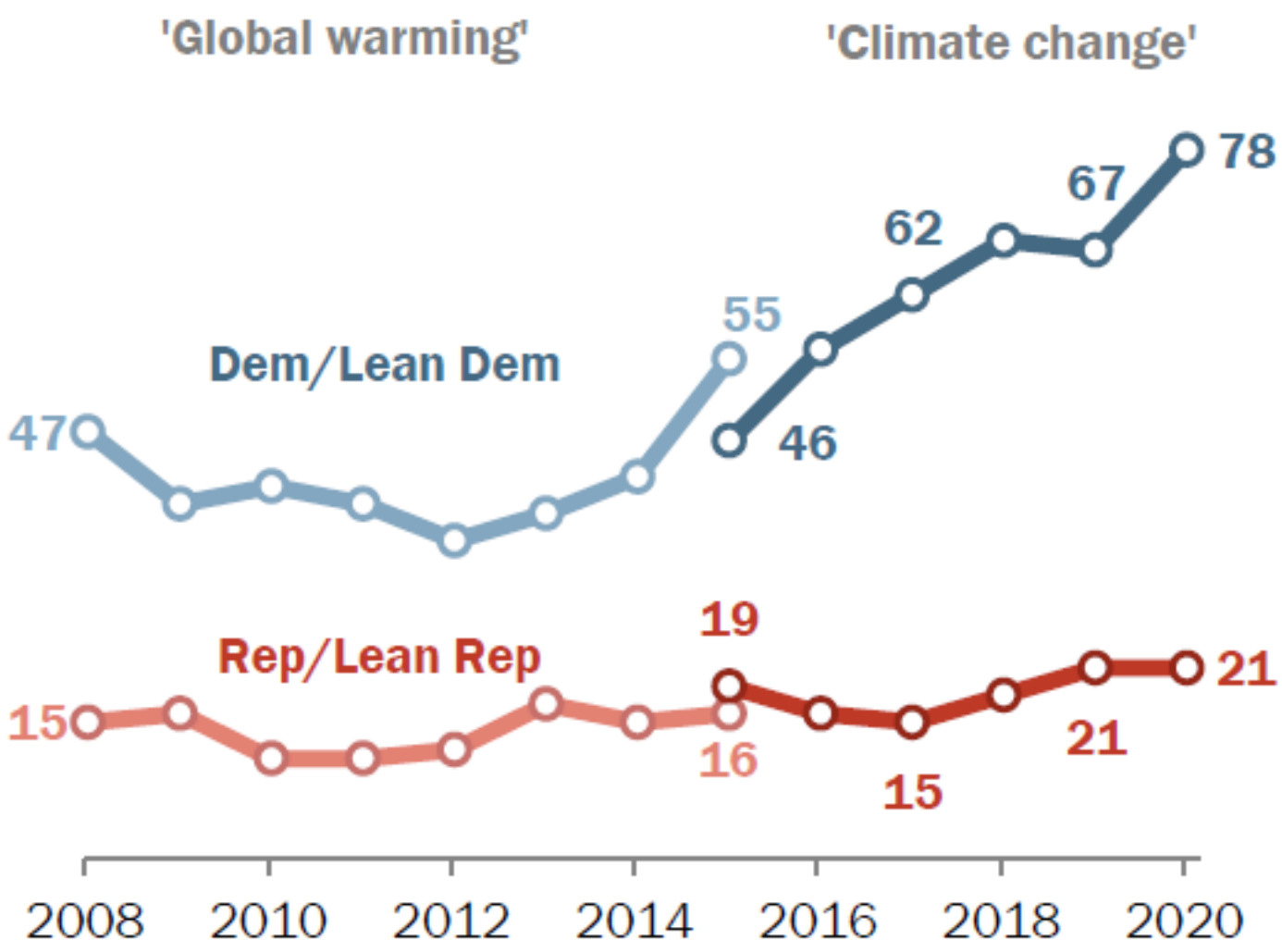
% who say ___ should be a top priority for the president and Congress



Environment rises as a priority, but partisan gap persists

% who say ___ should be a top priority for the president and Congress




'Global warming'
'Climate change'
Dem/Lean Dem
Rep/Lean Rep
47
55
46
62
67
78
15
16
19
15
21
21
2008
2010
2012
2014
2016
2018
2020

Politico/Harvard T.H. Chan School of Public Health Poll

AMERICANS' DOMESTIC PRIORITIES FOR PRESIDENT TRUMP AND CONGRESS IN THE MONTHS LEADING UP TO THE 2020 ELECTION

February 10, 2020

Table 2. Americans' Domestic Priorities (among 22) for President Trump and Congress, by Party Identification

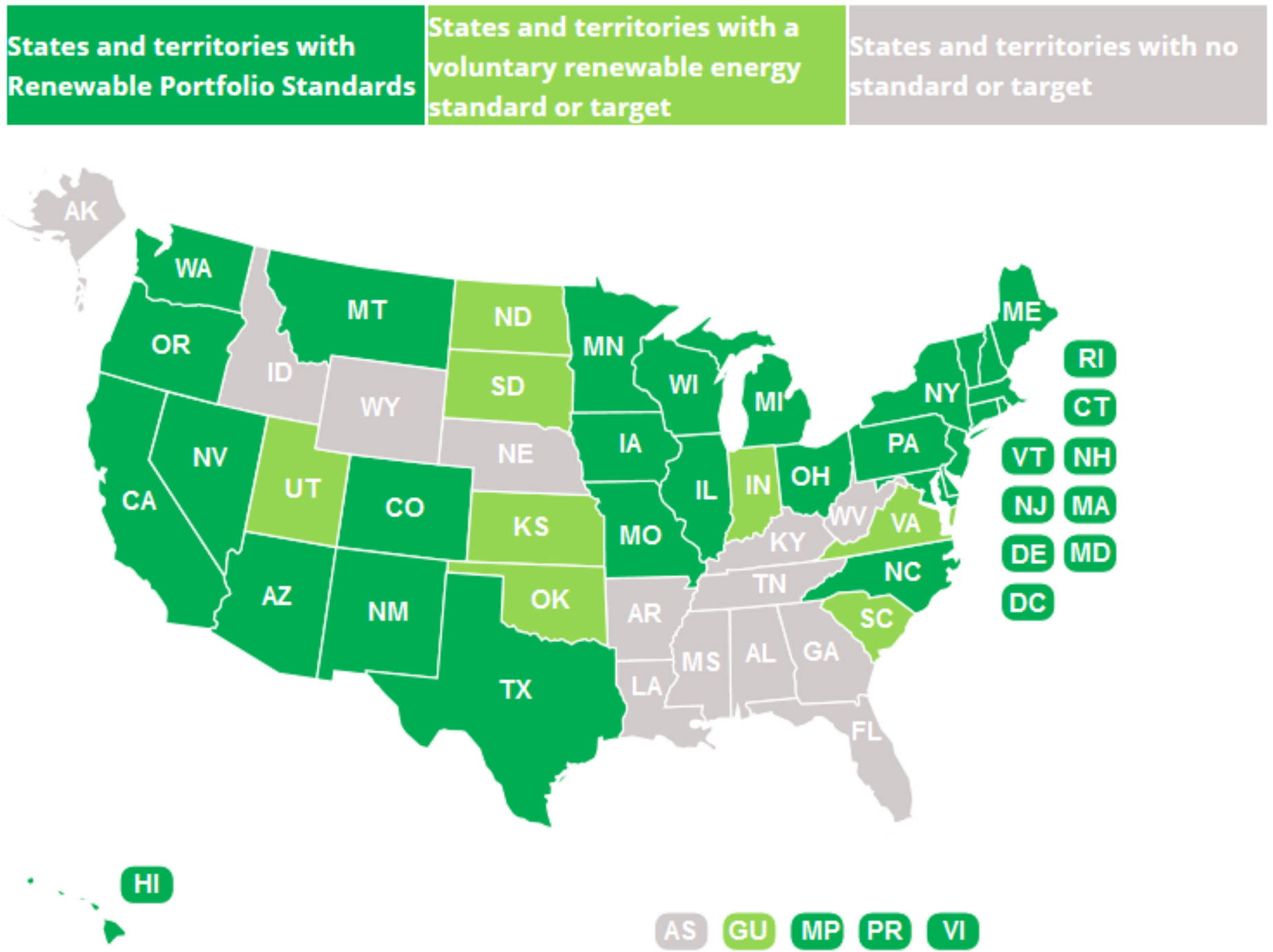
% saying each of the following should be an "extremely" or "very important" priority

	Total	Dems	Reps
Taking steps to lower the cost of health care	80	89	76
Taking steps to lower prescription drug prices	75	85	69
Increasing federal spending on K-12 public education	63	71	44
Increasing efforts to reduce the number of hate crimes committed against people because of their race, religion, or gender	63	76	48
Taking steps to substantially reduce the federal budget deficit	60	60	65
Changing the health care system so that every American can buy into Medicare if they want to	59	74	43
Taking more national action to address the opioid epidemic	57	59	58
Increasing spending on the nation's infrastructure, such as roads, bridges, and airports	56	58	54
Changing the federal tax law enacted in 2017 so it does more for middle income individuals and less for upper-income individuals and businesses	53	58	43
Changing the health care system so that all Americans would get health insurance from Medicare, which is now mainly for people age 65 or over and is paid for by taxpayers. This plan is often called Medicare for All.	53	71	29
Making major increases in federal spending and regulation to reduce climate change	52	68	30

Renewing the Deferred Action for Childhood Arrivals policy, or DACA, which grants temporary legal status to people brought to the US illegally as children	48	55	26
Enacting stricter gun control laws	47	68	21
Restricting unauthorized immigration into the U.S.	45	29	67
Increasing national defense spending	40	36	59
Enacting President Trump's new trade agreement with Canada and Mexico	39	28	61
Impeaching and removing President Trump from office	39	69	11
Investigating President Trump's investments and taxes	38	59	12
Trying again to repeal and replace the Affordable Care Act, also known as the ACA or Obamacare	37	40	37
Taking steps to make sure abortion is legal in all or most cases	34	51	14
Taking steps to make sure abortion is illegal in all or most cases	33	30	51
Decreasing federal regulation of business	24	23	30

State Renewable Portfolio Standards

State Renewable Portfolio Standards and Goals
December 31, 2019


States and territories with Renewable Portfolio Standards
States and territories with a voluntary renewable energy standard or target
States and territories with no standard or target
AK
WA
OR
CA
NV
ID
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
ME
VT
NH
RI
CT
NJ
MA
DE
MD
DC
HI
AS
GU
MP
PR
VI

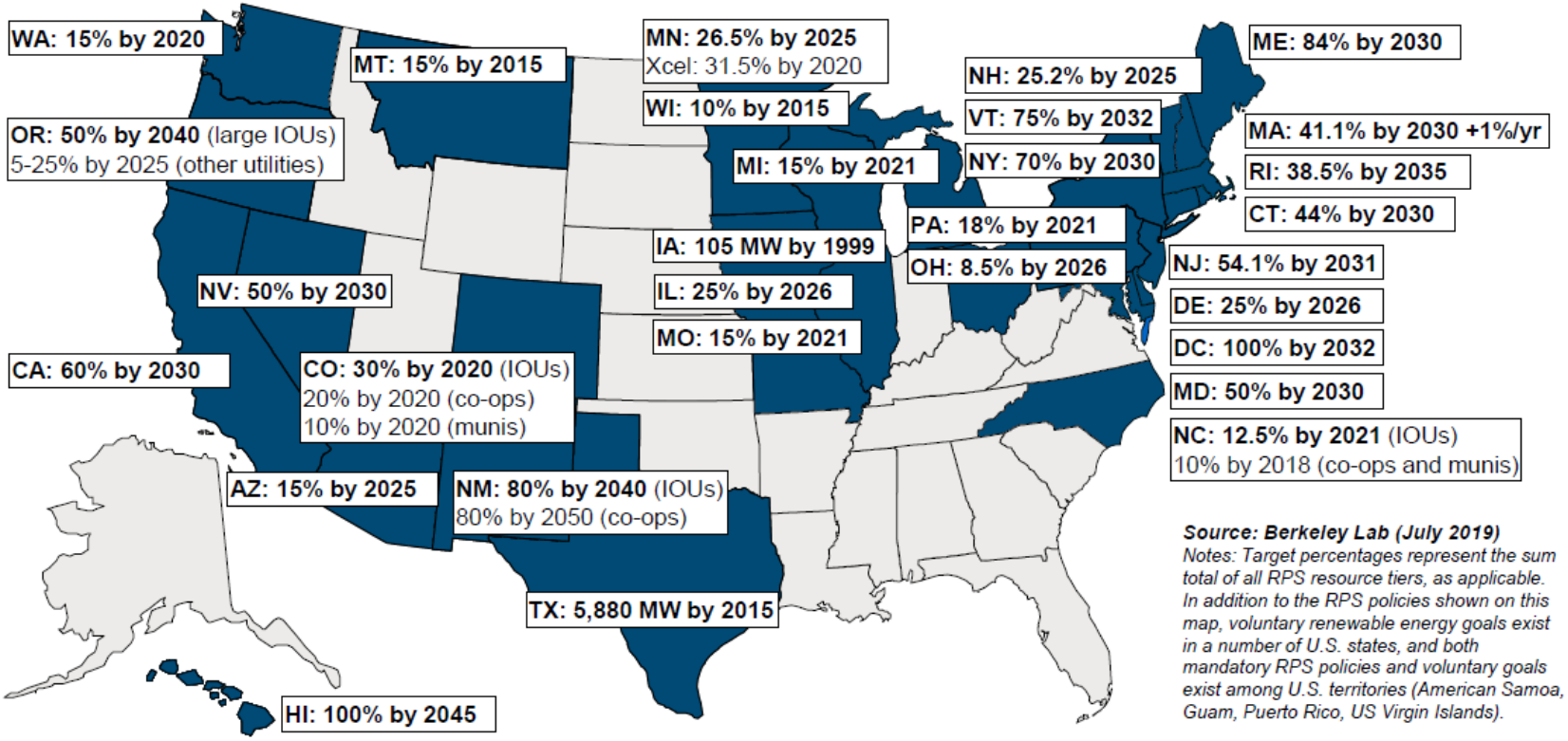
Illinois Renewable Portfolio Standard

Illinois

- **Title:** Renewable Portfolio Standard.
- **Established:** 2001 (voluntary target); 2007 (standard).
- **Requirement:** 25% by 2025-2026.
- **Applicable Sectors:** Investor-owned utility, retail supplier.
- **Cost Cap:** Approximately 1%.
- **Details:** Distributed Generation: 1% of annual requirement beginning in 2015 for IOUs. Wind: 75% of annual requirement for IOUs, 60% of annual requirement for alternative retail electric suppliers. Photovoltaics: 6% of annual requirement beginning in 2015-2016.
- **Enabling Statute, Code or Order:** Ill. Rev. Stat. ch. 20 §688 (2001); Ill. Rev. Stat. ch. 20 §3855/1-75 (2007); Senate Bill 2814 (2016).

RPS Policies Exist in 29 States and DC

Apply to 56% of Total U.S. Retail Electricity Sales



Source: Berkeley Lab (July 2019)

Notes: Target percentages represent the sum total of all RPS resource tiers, as applicable. In addition to the RPS policies shown on this map, voluntary renewable energy goals exist in a number of U.S. states, and both mandatory RPS policies and voluntary goals exist among U.S. territories (American Samoa, Guam, Puerto Rico, US Virgin Islands).

BERKELEY LAB

Regional Greenhouse Gas Initiative

Participating states in the Regional Greenhouse Gas Initiative.

2005 7 states sign MOU: CT, DE, ME, NH, NJ, NY, VT
2007 3 states join: MA, MD, RI
2011 NJ withdraws as of January 1, 2012
2019 NJ rejoins as of January 1, 2020

Table 1. CO_2 Emissions from Energy Consumption

Top 20 Ranked Nations and U.S. States (2016 Data)

Country or State	CO_2 Emissions (million metric tons)	Country or State	CO_2 Emissions (million metric tons)
China	10,593	Canada	633
United States	5,172	Indonesia	513
India	2,155	Brazil	493
Russia	1,767	United Kingdom	481
Japan	1,203	South Africa	472
Germany	826	Mexico	453
South Korea	771	Australia	412
Saudi Arabia	657	**9 RGGI States**	379
Texas	654	**California**	361
Iran	639	Italy	356

RGGI Emissions and Caps

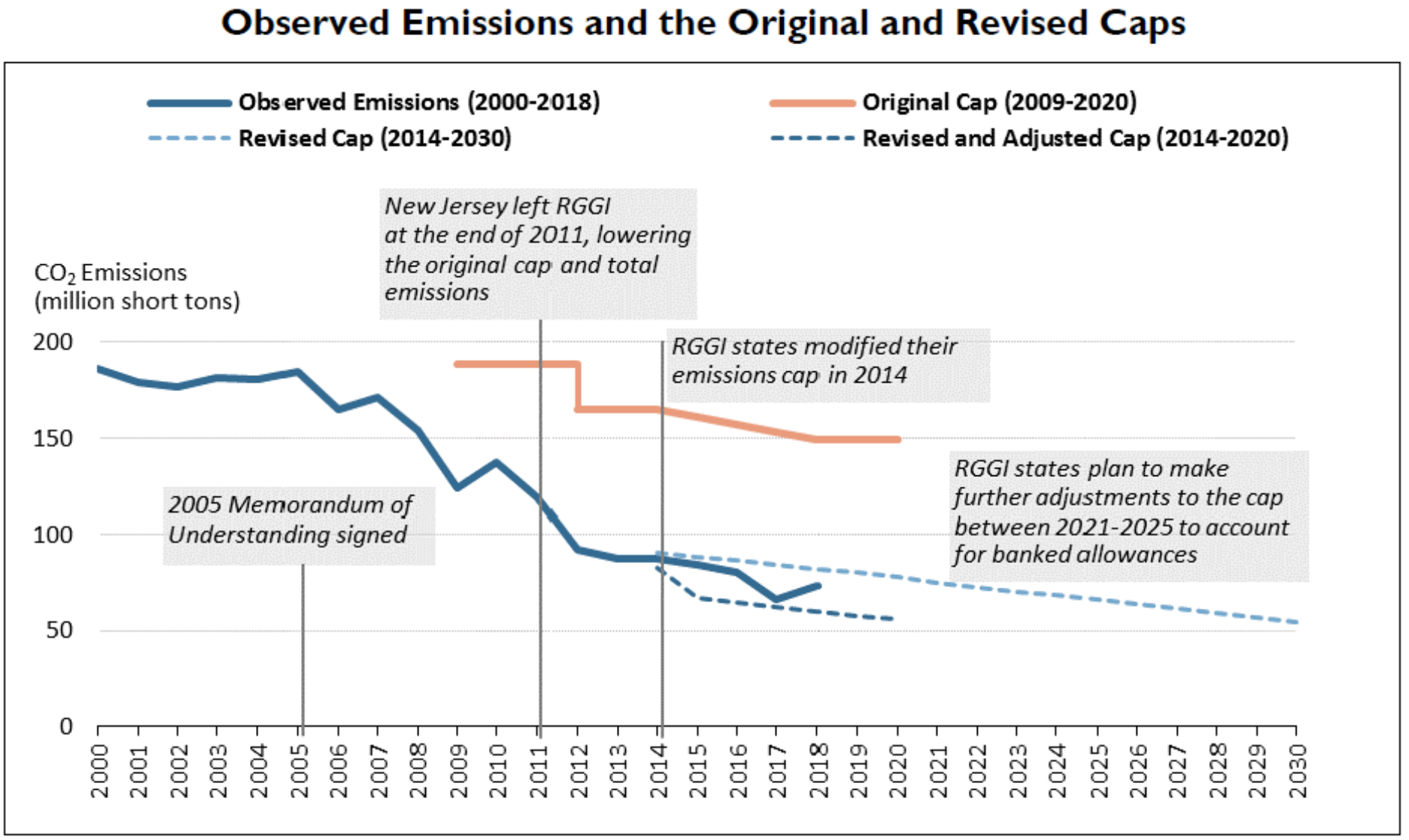


Figure 3. RGGI Auctions Proceeds and Clearing Prices

2008-2019

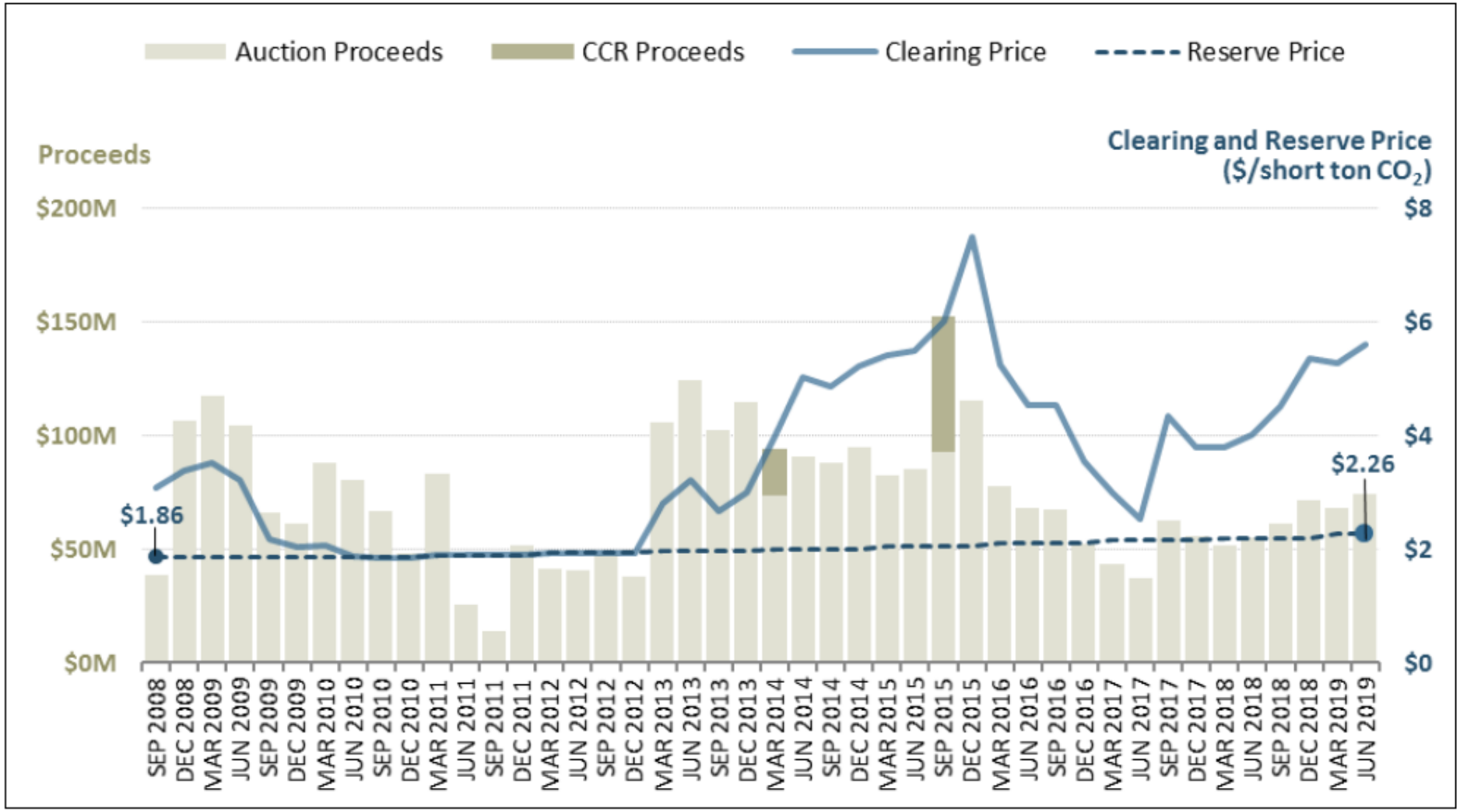
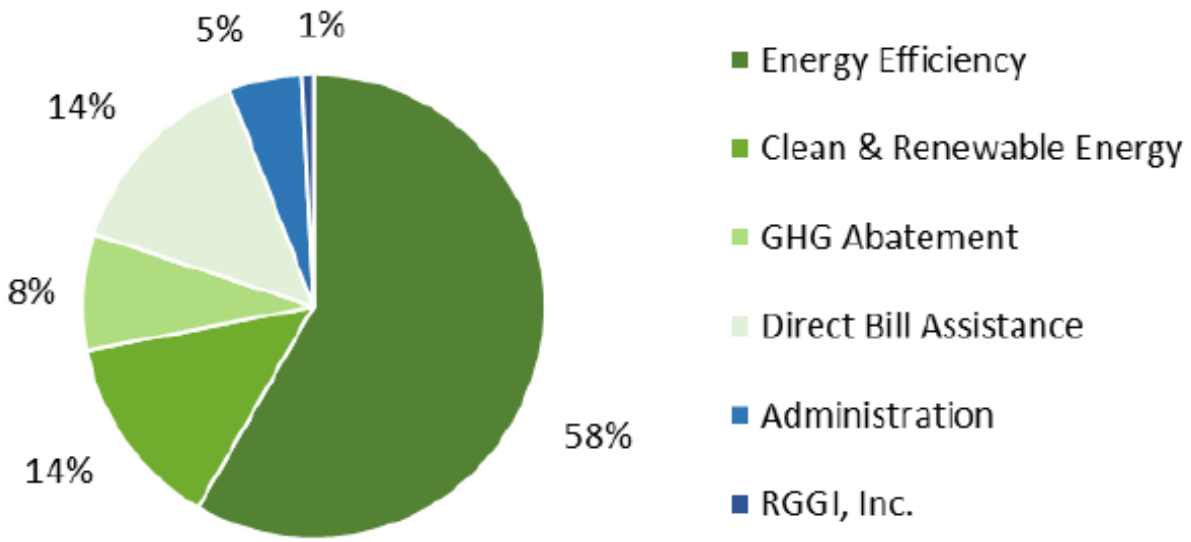


Chart 4: Cumulative RGGI Investments by Category



The nine participating RGGI states invested $2.4 billion from the start of the program through 2017. $161.4MM remained to be invested in 2018 and future programs. $106MM was transferred to state general funds.

E&E NEWS

February 18, 2020

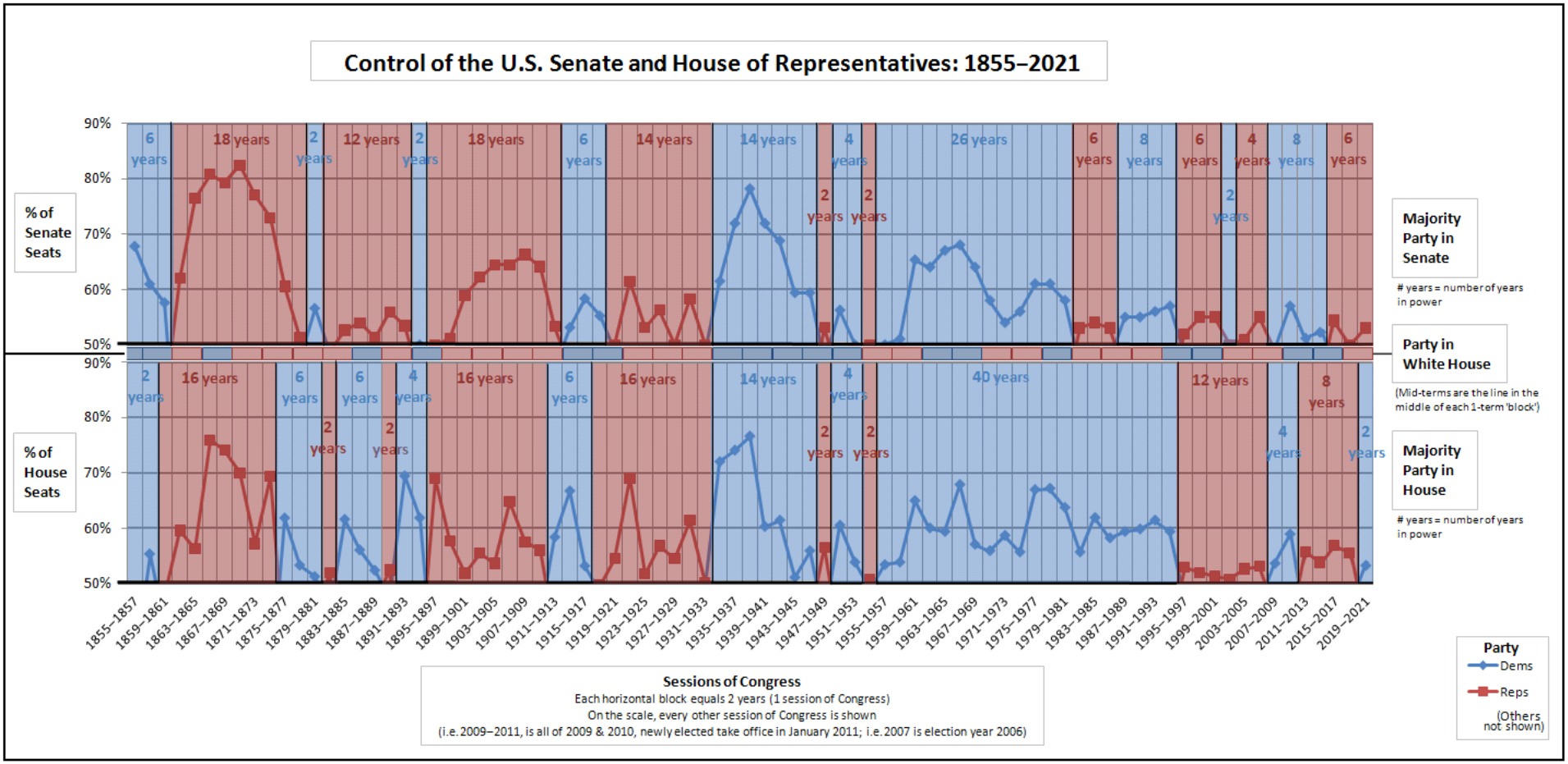
Pennsylvania's future in RGGI uncertain as coal, labor groups attack

WHSV 3 working hard for you

February 28, 2020
Virginia moves toward joining cap-and-trade program

Failed Attempt at Cap-and-Trade
The American Clean Energy and Security Act of 2009
Waxman-Markley Bill

What Is Cap-and-Trade?


Control of the U.S. Senate and House of Representatives: 1855–2021
% of Senate Seats
% of House Seats
90%
80%
70%
60%
50%
6 years
18 years
2 years
12 years
2 years
18 years
6 years
14 years
14 years
4 years
2 years
2 years
26 years
6 years
8 years
6 years
4 years
2 years
8 years
6 years
2 years
16 years
6 years
2 years
6 years
2 years
4 years
16 years
6 years
16 years
14 years
4 years
2 years
2 years
40 years
12 years
4 years
8 years
2 years
1855–1857
1859–1861
1863–1865
1867–1869
1871–1873
1875–1877
1879–1881
1883–1885
1887–1889
1891–1893
1895–1897
1899–1901
1903–1905
1907–1909
1911–1913
1915–1917
1919–1921
1923–1925
1927–1929
1931–1933
1935–1937
1939–1941
1943–1945
1947–1949
1951–1953
1955–1957
1959–1961
1963–1965
1967–1969
1971–1973
1975–1977
1979–1981
1983–1985
1987–1989
1991–1993
1995–1997
1999–2001
2003–2005
2007–2009
2011–2013
2015–2017
2019–2021
Majority Party in Senate
years = number of years in power
Party in White House
(Mid-terms are the line in the middle of each 1-term 'block')
Majority Party in House
years = number of years in power
Party
Dems
Reps
(Others not shown)
Sessions of Congress
Each horizontal block equals 2 years (1 session of Congress)
On the scale, every other session of Congress is shown
(i.e. 2009–2011, is all of 2009 & 2010, newly elected take office in January 2011; i.e. 2007 is election year 2006)

The New York Times

June 26, 2009

House Passes Bill to Address Threat of Climate Change

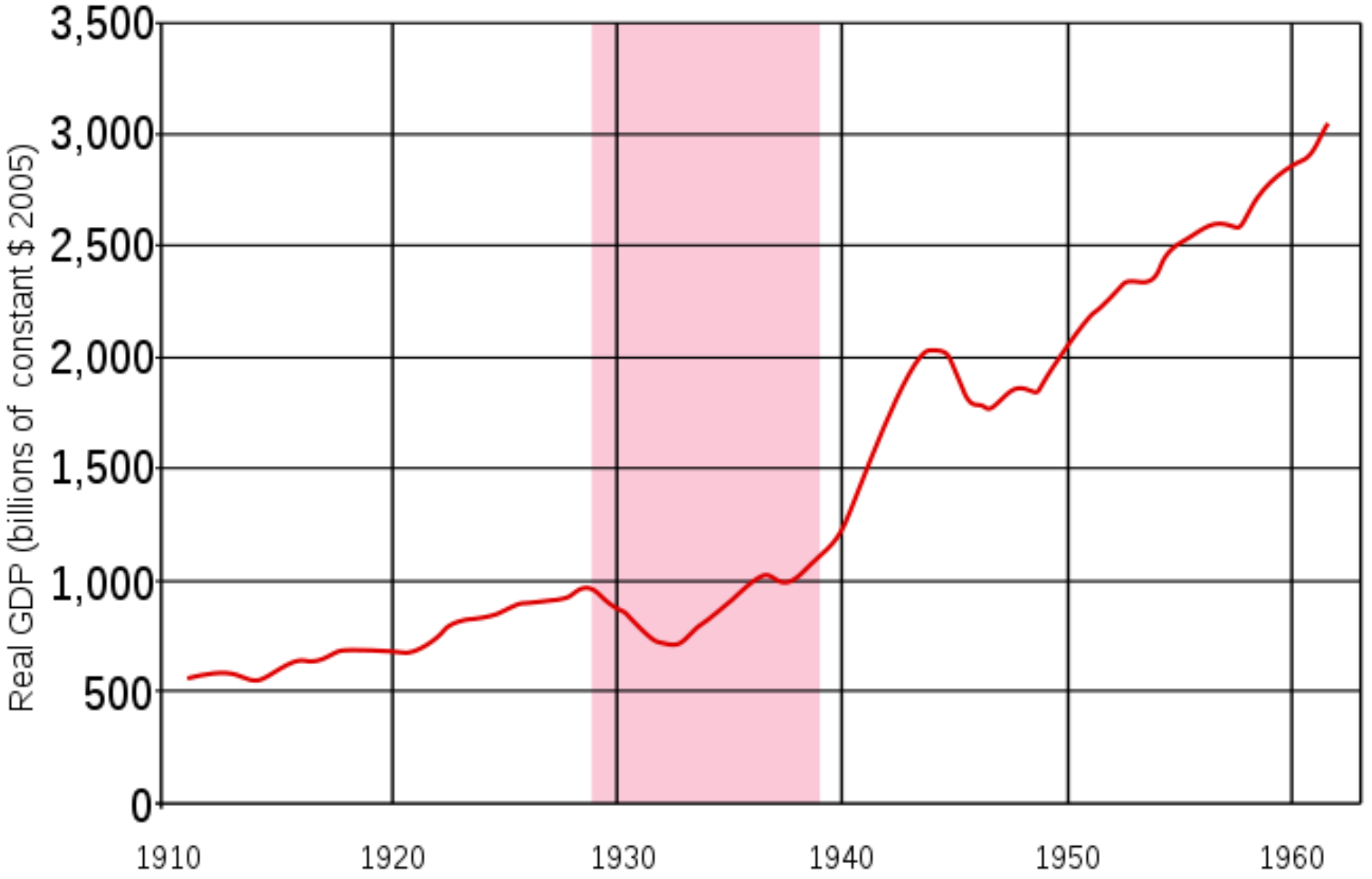
The New York Times

July 22, 2010

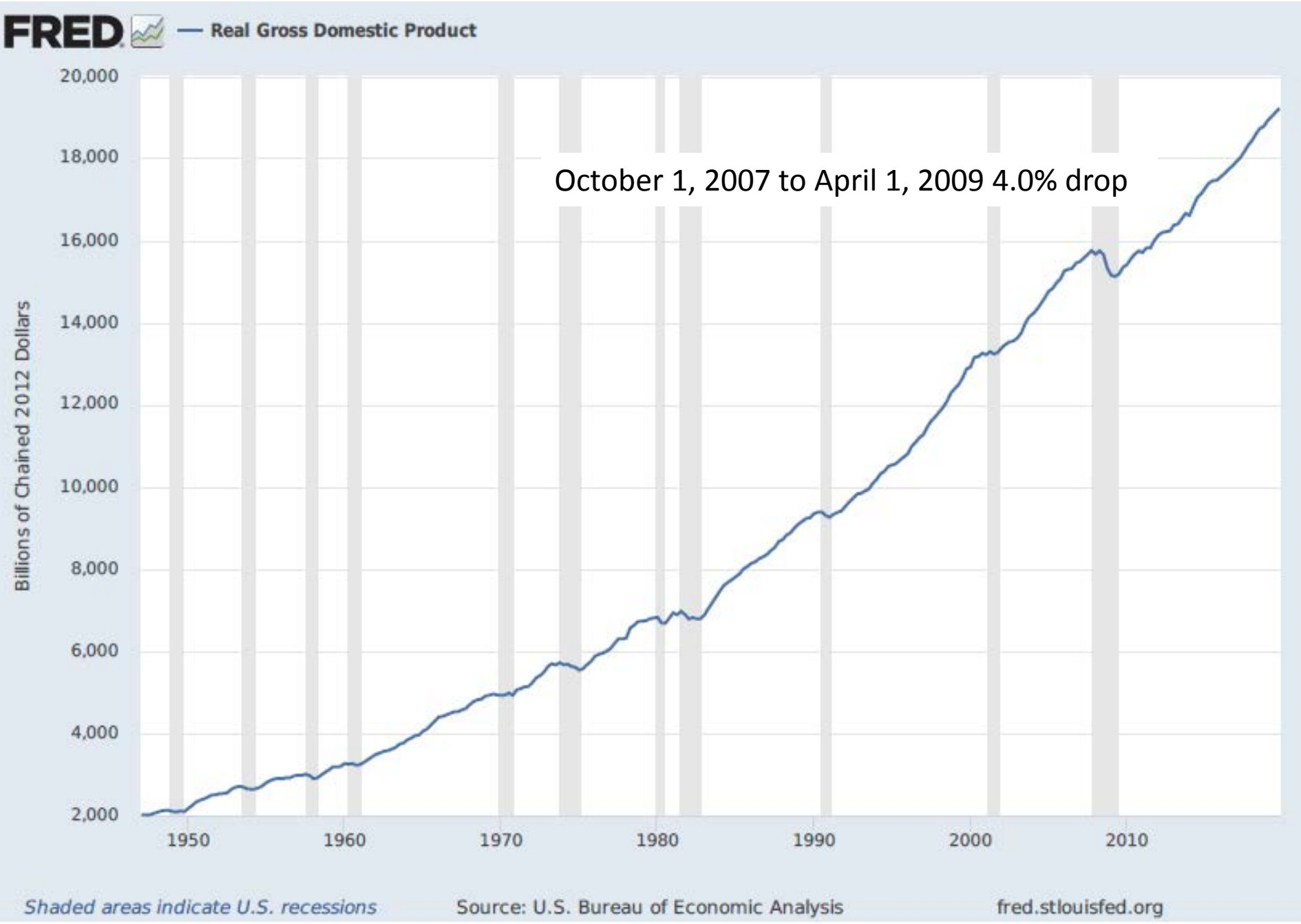
Democrats Call Off Climate Bill Effort

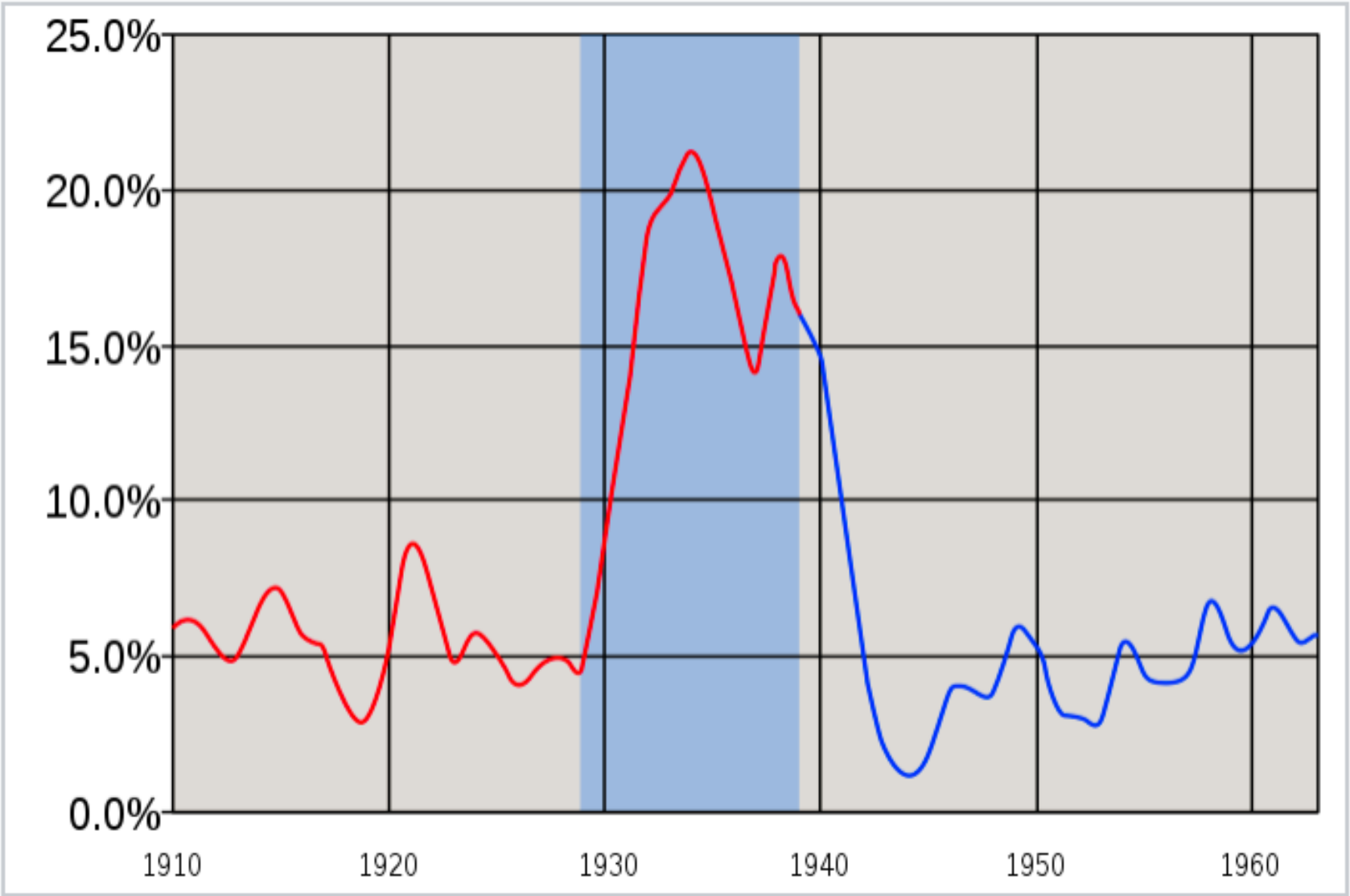
Green New Deal

The New Deal
1933-1939



US annual real GDP from 1910 to 1960, with the years of the Great Depression (1929–1939) highlighted

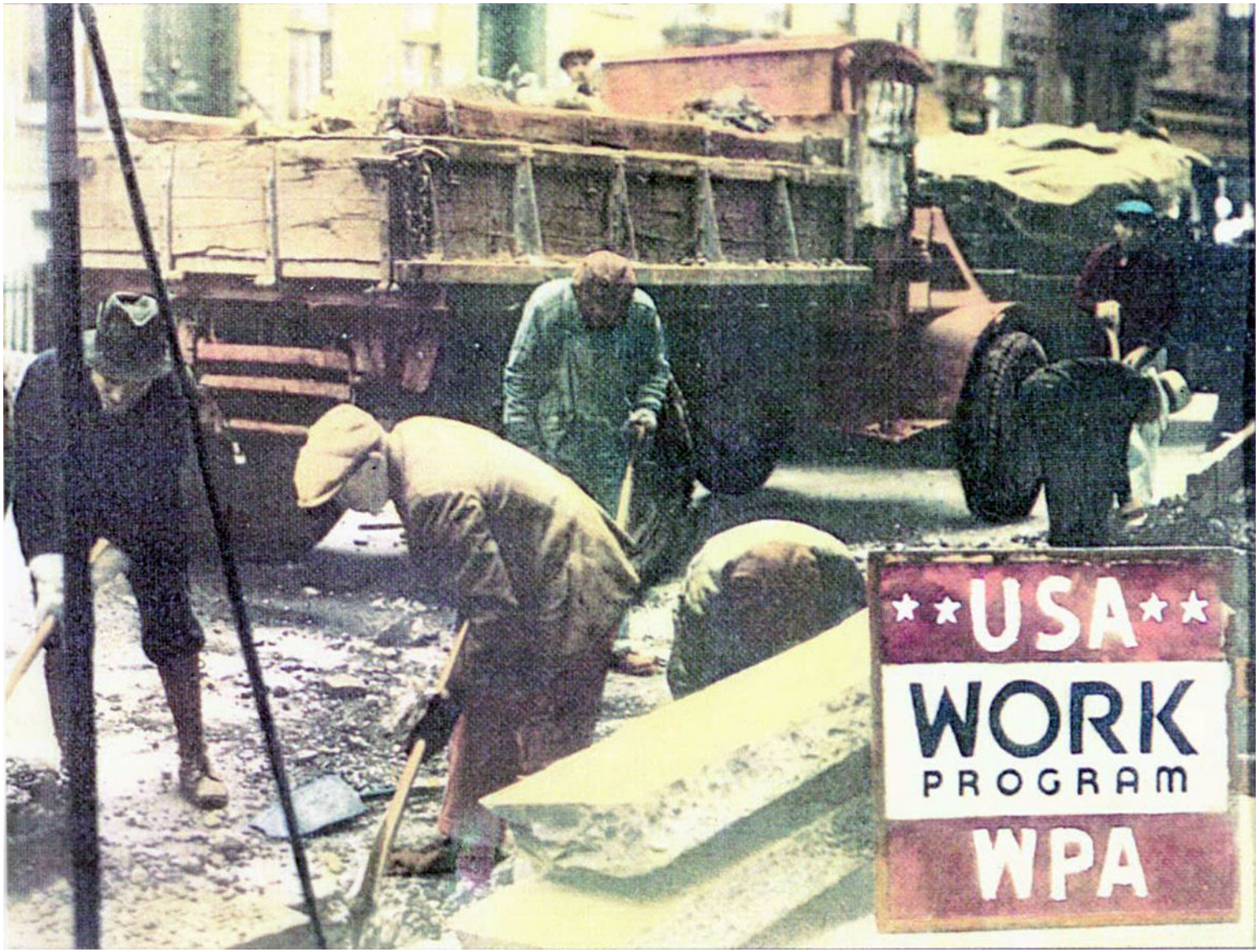

FRED
Real Gross Domestic Product
October 1, 2007 to April 1, 2009 4.0% drop
Billions of Chained 2012 Dollars
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
1950
1960
1970
1980
1990
2000
2010
Shaded areas indicate U.S. recessions
Source: U.S. Bureau of Economic Analysis
fred.stlouisfed.org



Unemployment rate in the United States from 1910–1960, with the years of the Great Depression (1929–1939) highlighted (accurate data begins in 1939)

FDR signs the Social Security Act in 1935.

Works Progress Administration



Civilian Conservation Corps

Selected New Deal Reforms and Regulations

- Emergency Banking Act (1933)
- Glass-Steagall Act (1933)
- Federal Deposit Insurance Corporation (1933)
- Repeal Prohibition (1933)
- Gold Reserve Act (1934)
- Security Exchange Commission (1934)
- Wealth Tax Act (1935)
- Social Security Act (1935)
- National Labor Relations Act (1935)
- Fair Labor Practices Act (1938)

Does the world have

a climate concern?

a climate challenge?

a climate crisis?

a climate emergency?

116TH CONGRESS
1ST SESSION

H. RES. 109

Recognizing the duty of the Federal Government to create a Green New Deal.

IN THE HOUSE OF REPRESENTATIVES

FEBRUARY 7, 2019

Ms. OCASIO-CORTEZ (for herself, Mr. HASTINGS, Ms. TLAIB, Mr. SERRANO,

116TH CONGRESS
1ST SESSION

S. RES. 59

Recognizing the duty of the Federal Government to create a Green New Deal.

IN THE SENATE OF THE UNITED STATES

FEBRUARY 7, 2019

Mr. MARKEY (for himself, Mr. MERKLEY, Mr. SANDERS, Mrs. GILLIBRAND, Ms. HARRIS, Ms. WARREN, Ms. HIRONO, Mr. WYDEN, Mr. BLUMENTHAL, Mr. BOOKER, Ms. KLOBUCHAR, and Mr. MURPHY) submitted the following resolution; which was referred to the Committee on Environment and Public Works

House Resolution 109 Preamble (abbreviated)

- Whereas IPCC and NCA4 document climate change due to human activity;
- Whereas the United States United States must reduce emissions through economic transformation
- Whereas the United States is experiencing crises in basic needs, wage stagnation, income inequality
- Whereas numerous vulnerable communities are disproportionately affected
- Whereas, climate change constitutes a direct threat to the national security
- Whereas the Federal Government led successful mobilizations during World War II and the New Deal
- Whereas the House of Representatives recognizes a new mobilization is a historic opportunity

House Resolution 109 Resolves (abbreviated)

- to create a Green New Deal, which will
- achieve net-zero greenhouse gas emissions through a fair and just transition for all communities and workers
- create millions of good, high-wage jobs
- invest in infrastructure and industry
- secure clean water and air…
- promote justice and equity…

House Resolution 109 Green New Deal 10 Year Mobilization Technical Goals (selected)

- build resiliency against climate change-related disasters
- eliminate pollution and green house gas emissions as much as technologically feasible
- produce 100 percent of the power through clean, renewable, and zero-emission energy sources
- upgrade all existing buildings and build new buildings to achieve maximum energy efficiency
- spur massive growth in clean manufacturing
- remove pollution and greenhouse gas emissions from the agricultural sector as much as is technologically feasible
- remove pollution and greenhouse gas emissions from the transportation sector as much as is technologically feasible

House Resolution 109 Green New Deal Political and Social Goals (selected)

- provide resources, training, and high-quality education, including higher education, to all people of the United States
- guarantee a job with a family-sustaining wage, adequate family and medical leave, paid vacations, and retirement security to all people of the United States
- provide all people of the United States with high-quality health care; affordable, safe, and adequate housing; economic security; and clean water, clean air, healthy and affordable food, and access to nature

Representative Ocasio-Cortez Reads Green New Deal into Public Record

What the GND Does and Does Not Say

- It does propose a time frame of ten years for the Green New Mobilization Goals.
- With respect to 100% renewable power generation, it does not mention any specific technology.
- It does propose to eliminate pollution and GHG emissions as much as technologically feasible.
- It does mention all energy consuming sectors of the economy: agriculture, buildings, electricity generation, and transportation.
- It does not propose a budget nor does it identify a source of funding.

Climate Activists Pressure

Positions of Presidential Candidates

- Joe Biden: “Plan for a Clean Energy Revolution and Environmental Justice”
- Michael Bloomberg: “100% Clean Energy” and more
- Tulsi Gabbard: “OFF Fossil Fuels Act” and more
- Amy Klobuchar: “Plan to Tackle the Climate Crisis”
- Bernie Sanders: “The Green New Deal”
- Elizabeth Warren: package of 11 plans including “100% Clean Energy for America,” “Green Manufacturing Plan,” “Green Jobs”

The New York Times

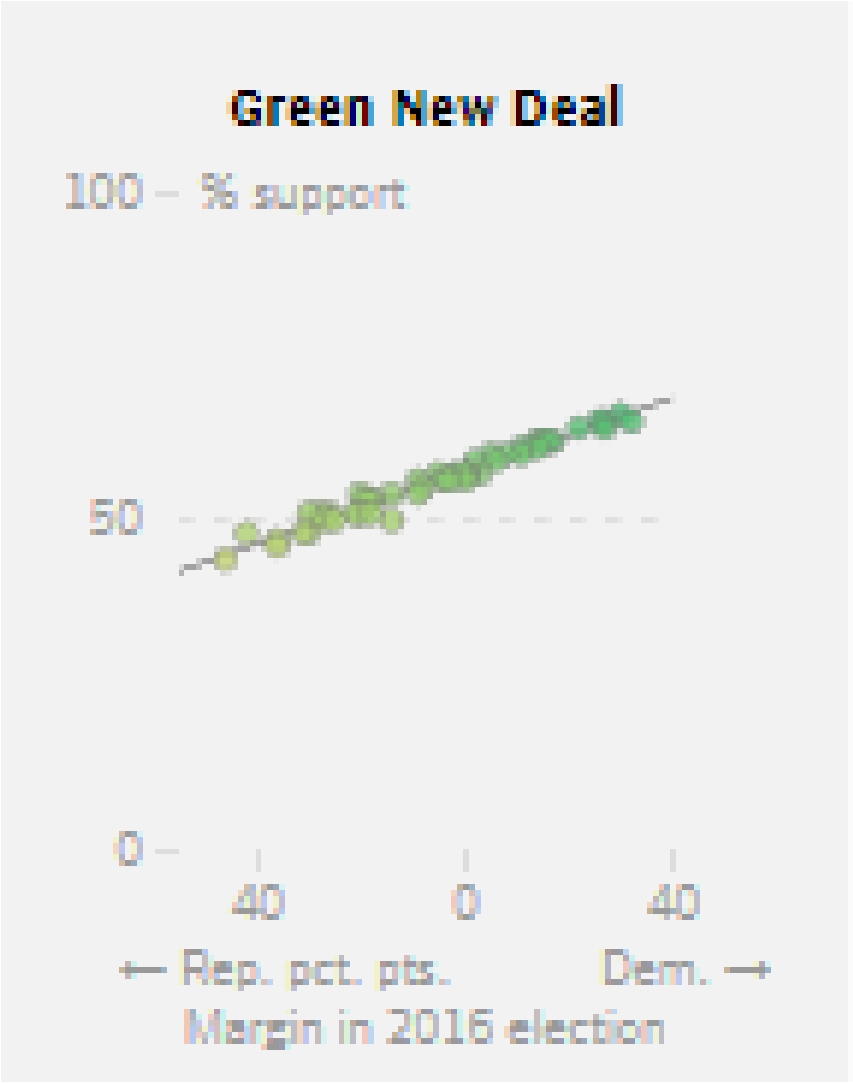
March 27, 2019
Sean McElwee
Data for Progress
People Actually Like the Green New Deal

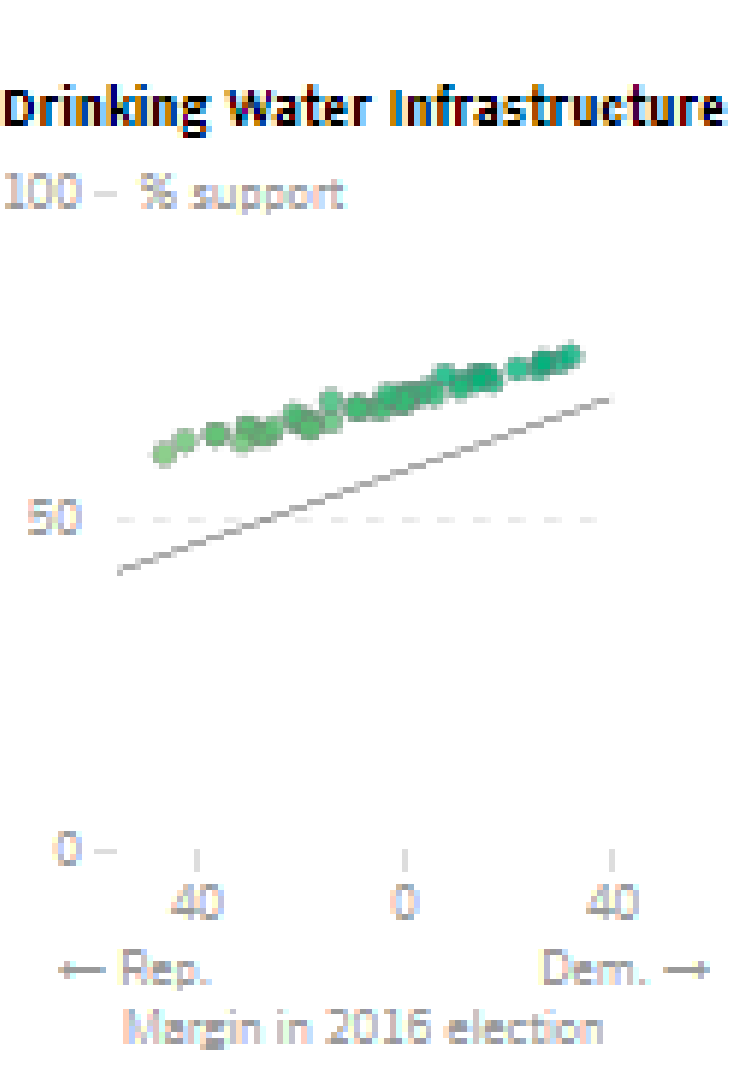
"Would you support or oppose a Green New Deal to end fossil fuel use in the United States and have the government create clean energy jobs? The plan would be paid for by raising taxes, including a tax on carbon emissions."

43% in favor, 38% oppose, 19% uncertain

Support for Green New Deal Proposals by State

Solid line reflects support of the Green New Deal as a whole. Each circle represents a state's level of support for a particular aspect of the plan.

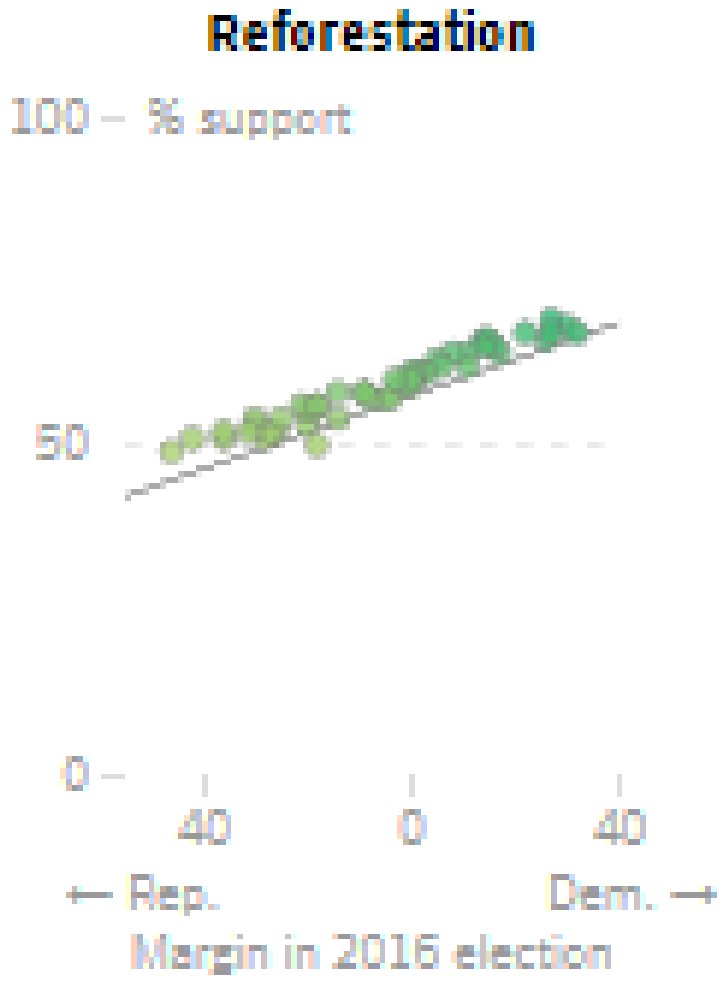


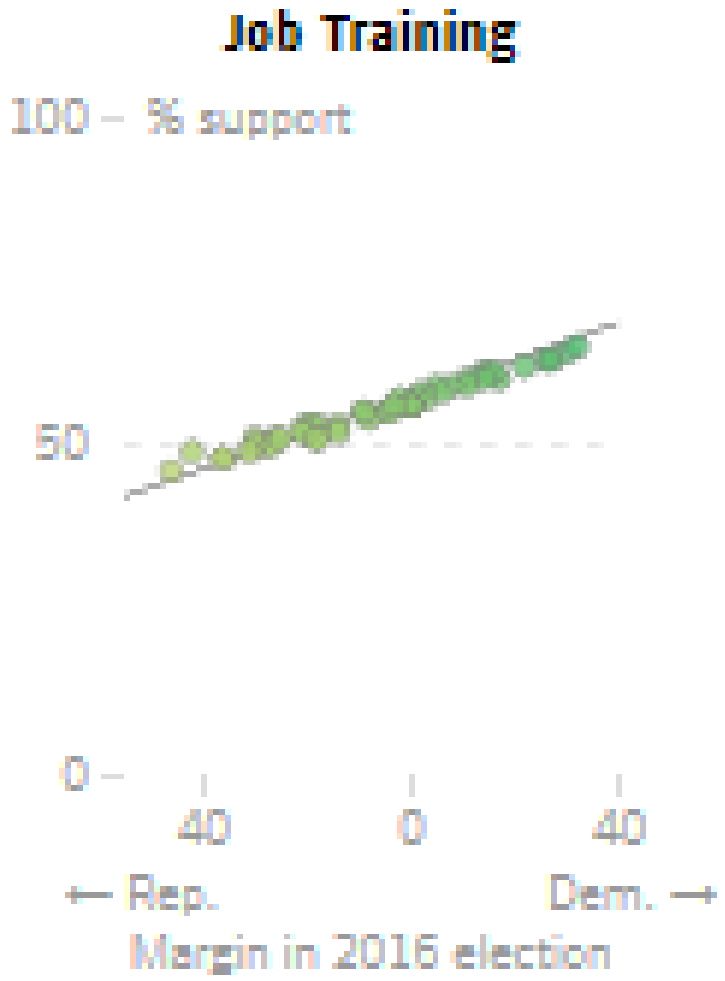


Source: Data for Progress; election results from The Associated Press | Ash Ngu/The New York Times

Support for Green New Deal Proposals by State

Solid line reflects support of the Green New Deal as a whole. Each circle represents a state's level of support for a particular aspect of the plan.

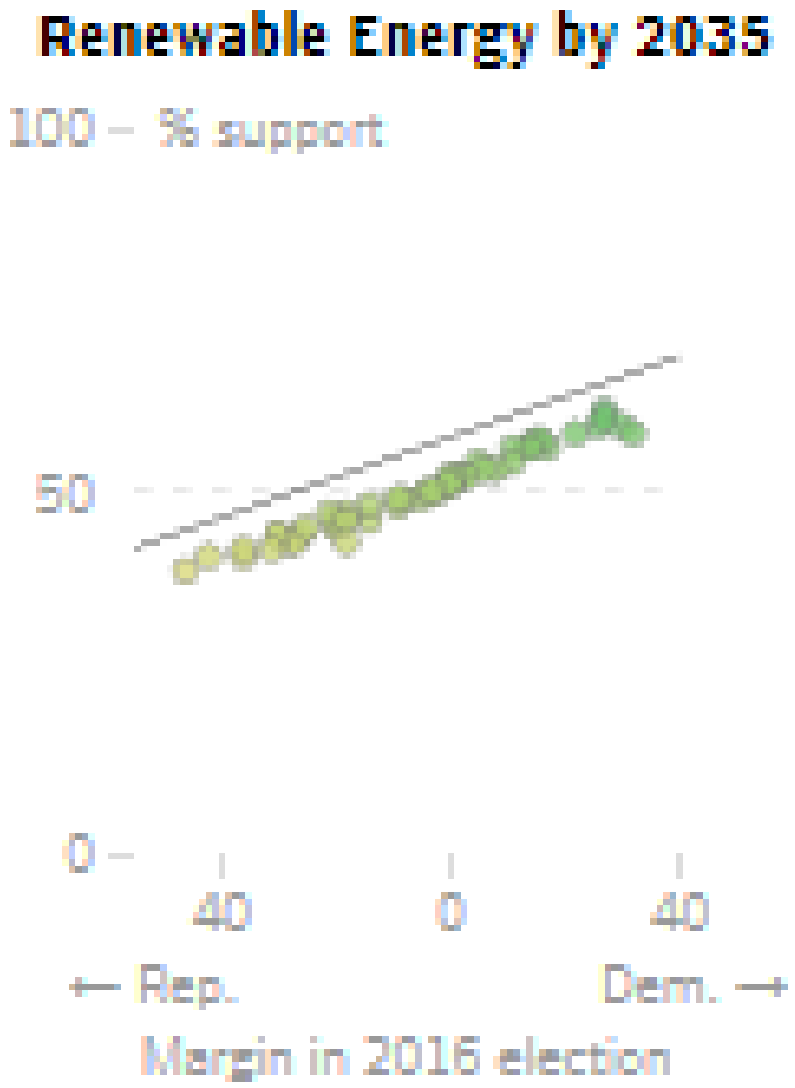


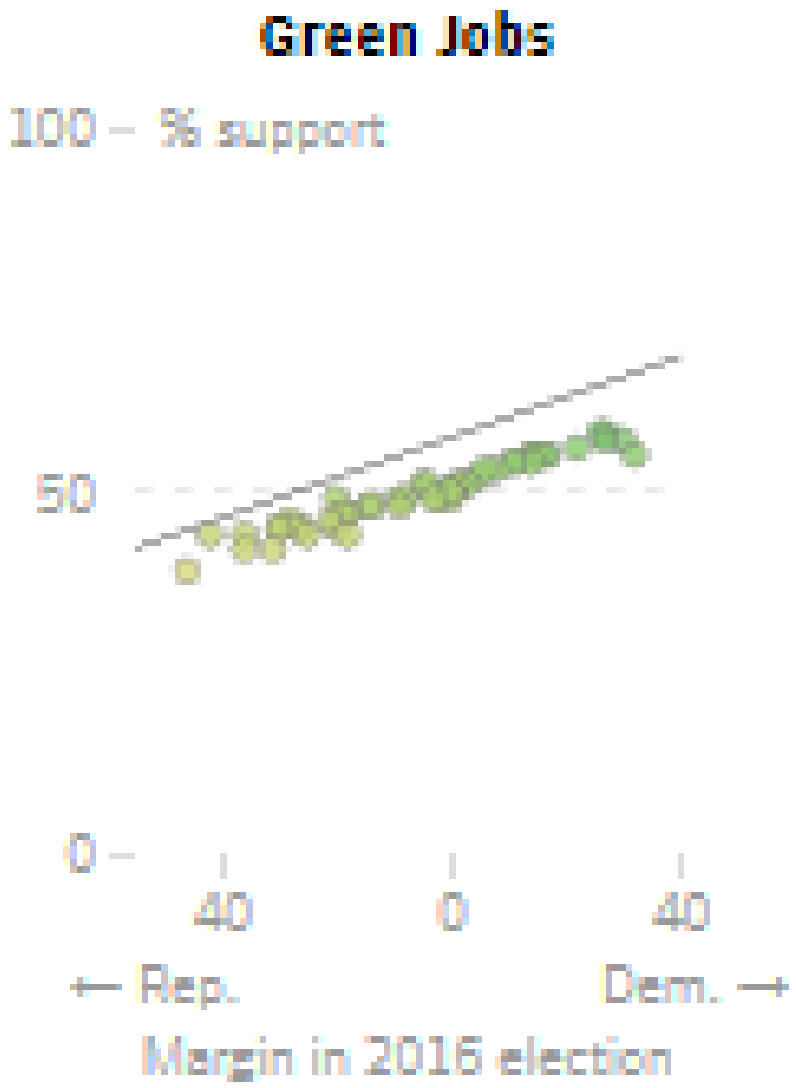


Source: Data for Progress; election results from The Associated Press | Ash Ngu/The New York Times

Support for Green New Deal Proposals by State

Solid line reflects support of the Green New Deal as a whole. Each circle represents a state's level of support for a particular aspect of the plan.

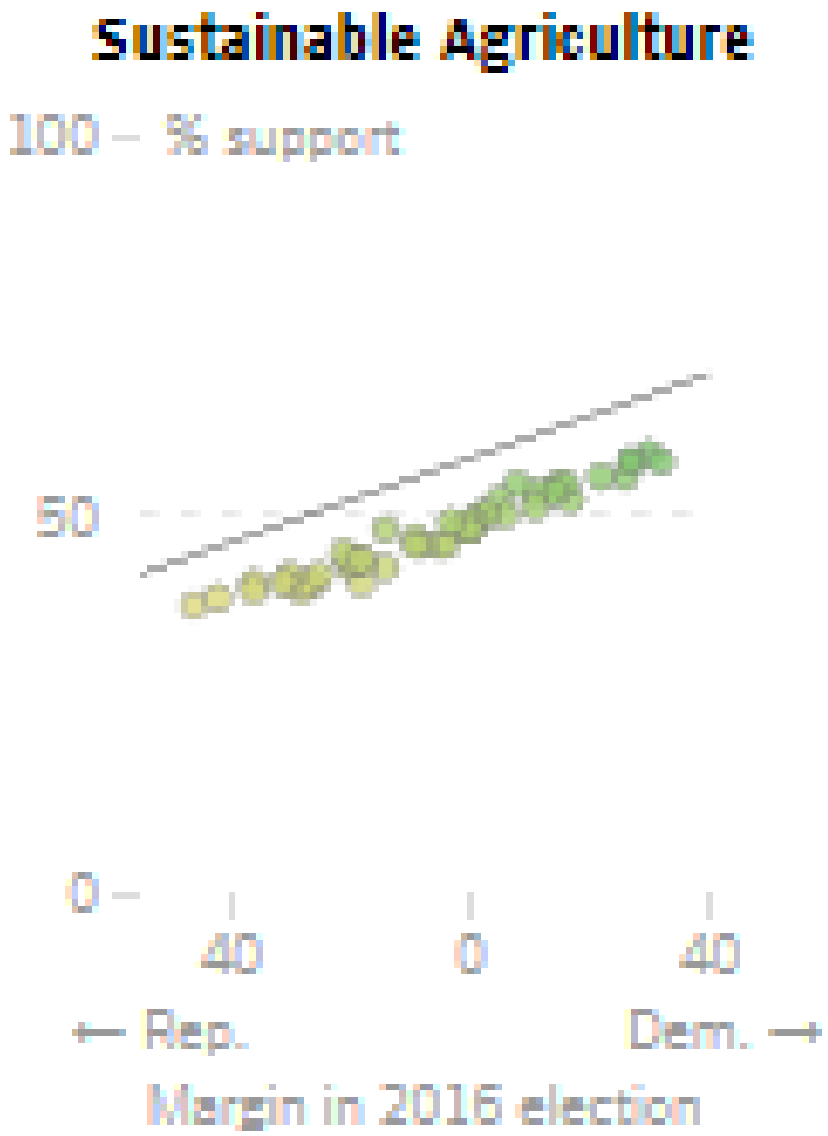


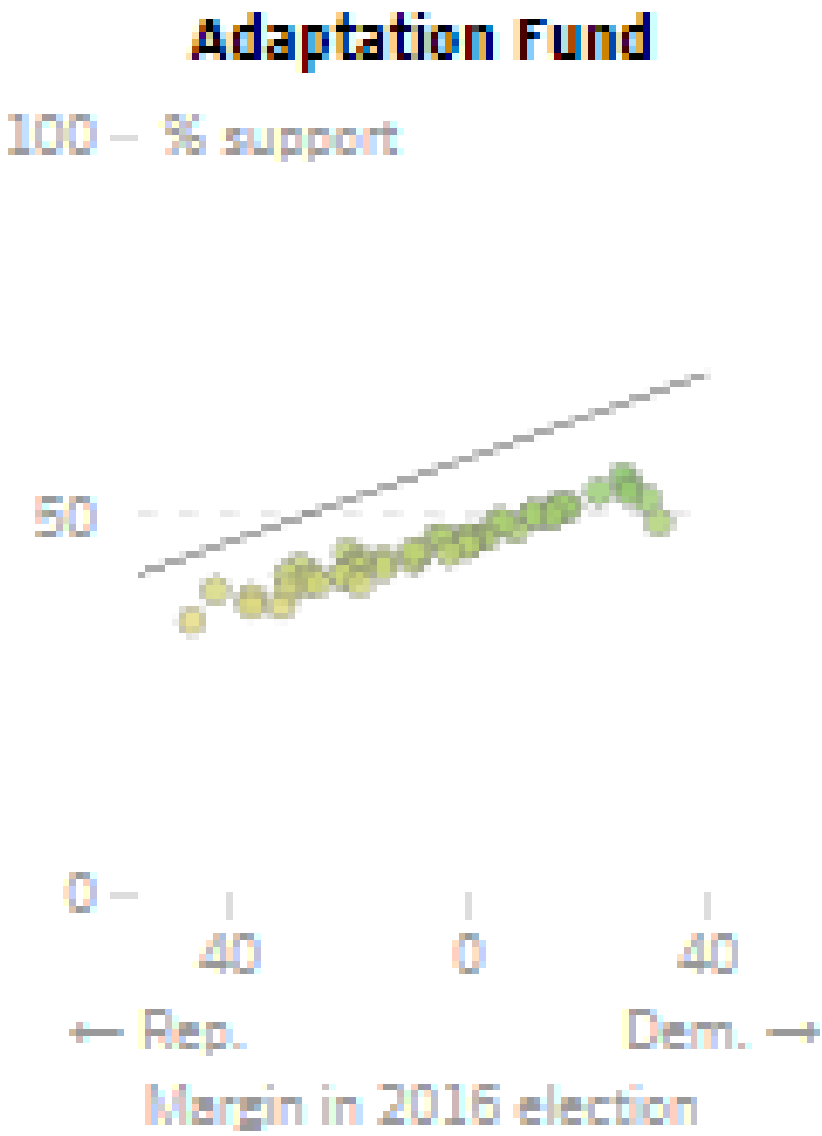


Source: Data for Progress; election results from The Associated Press | Ash Ngu/The New York Times

Support for Green New Deal Proposals by State

Solid line reflects support of the Green New Deal as a whole. Each circle represents a state's level of support for a particular aspect of the plan.

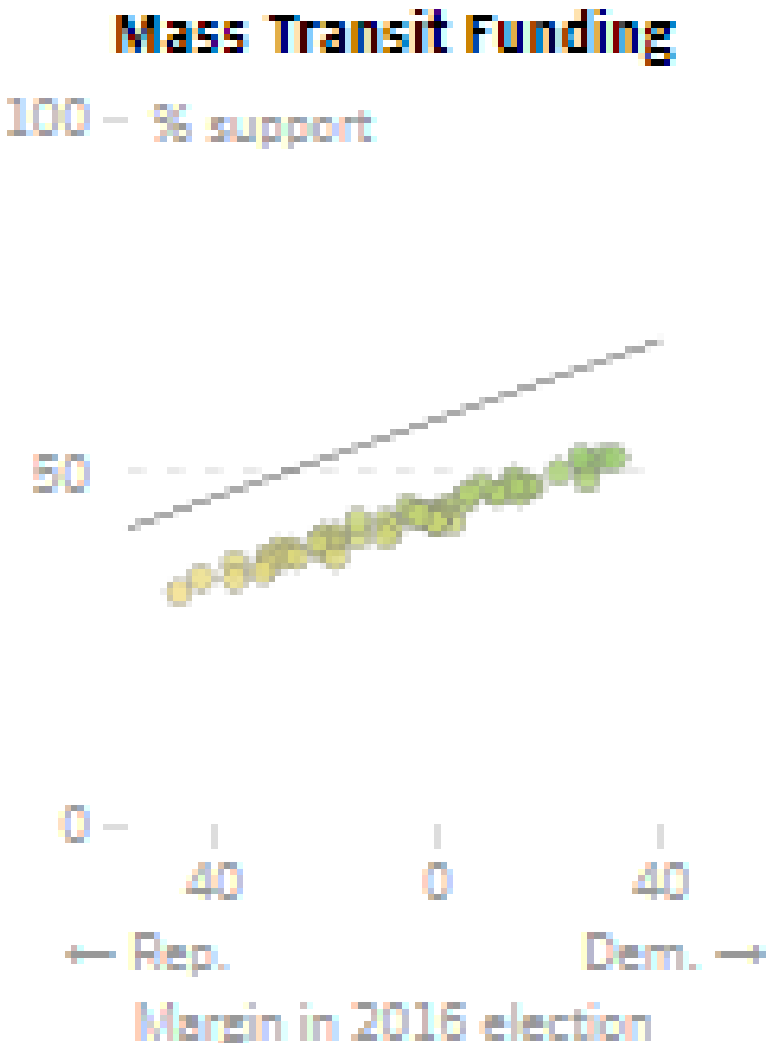


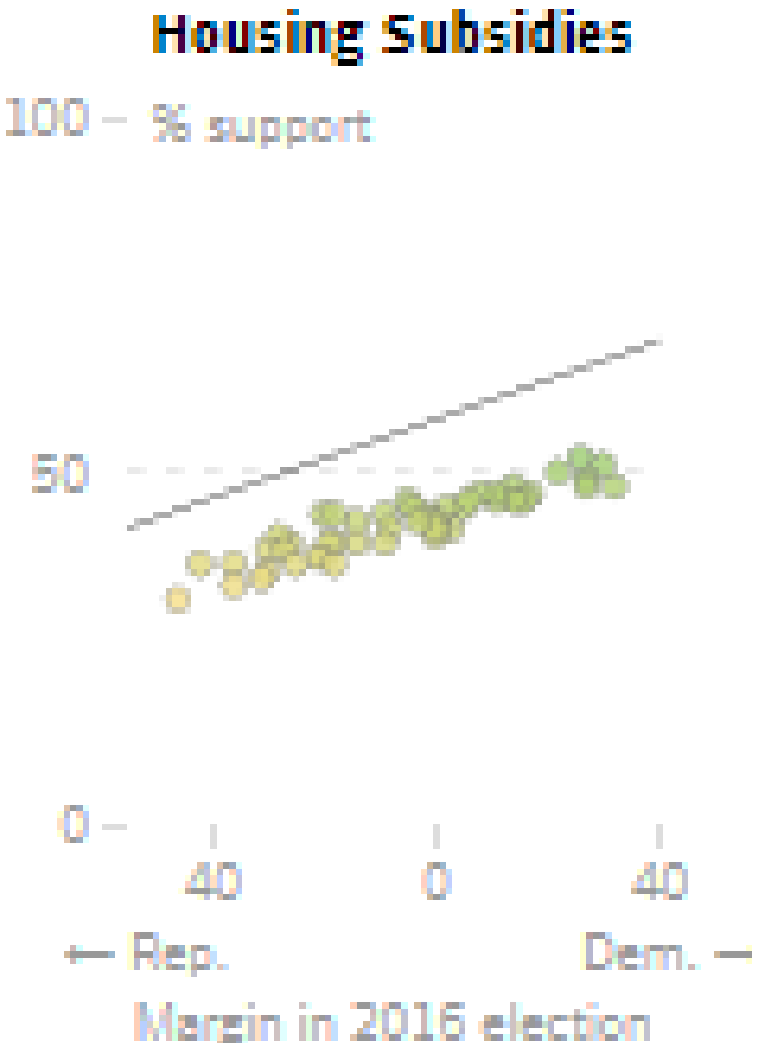


Source: Data for Progress; election results from The Associated Press | Ash Ngu/The New York Times

Support for Green New Deal Proposals by State

Solid line reflects support of the Green New Deal as a whole. Each circle represents a state's level of support for a particular aspect of the plan.

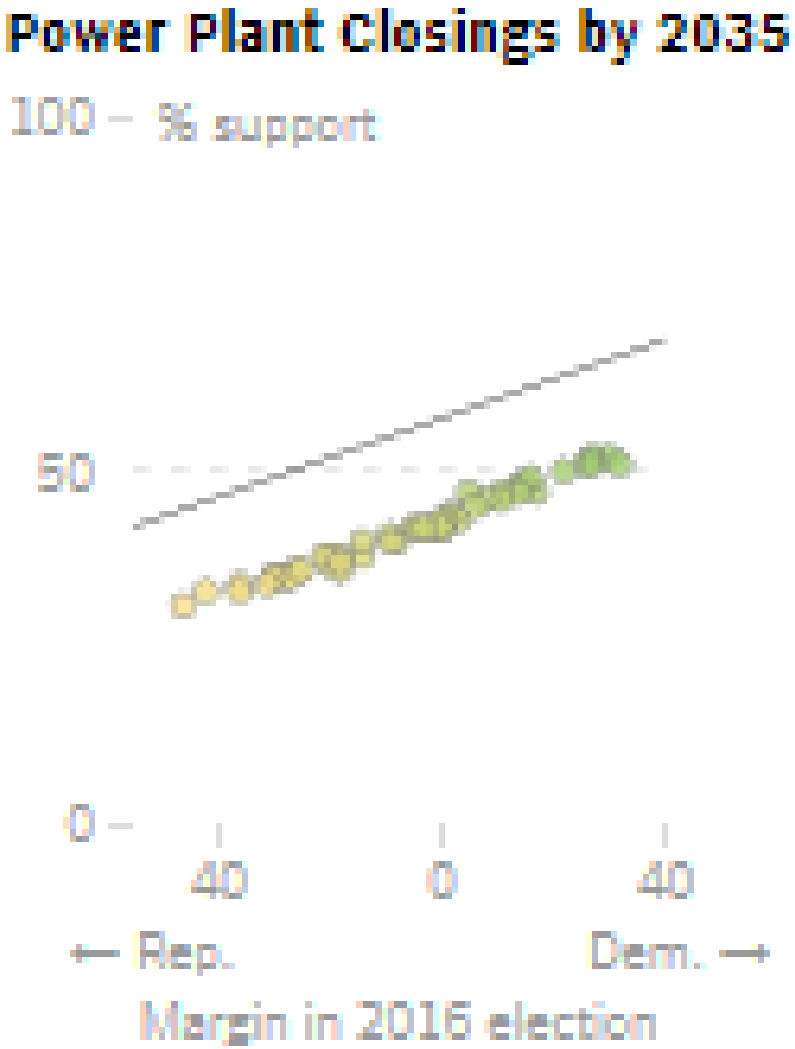


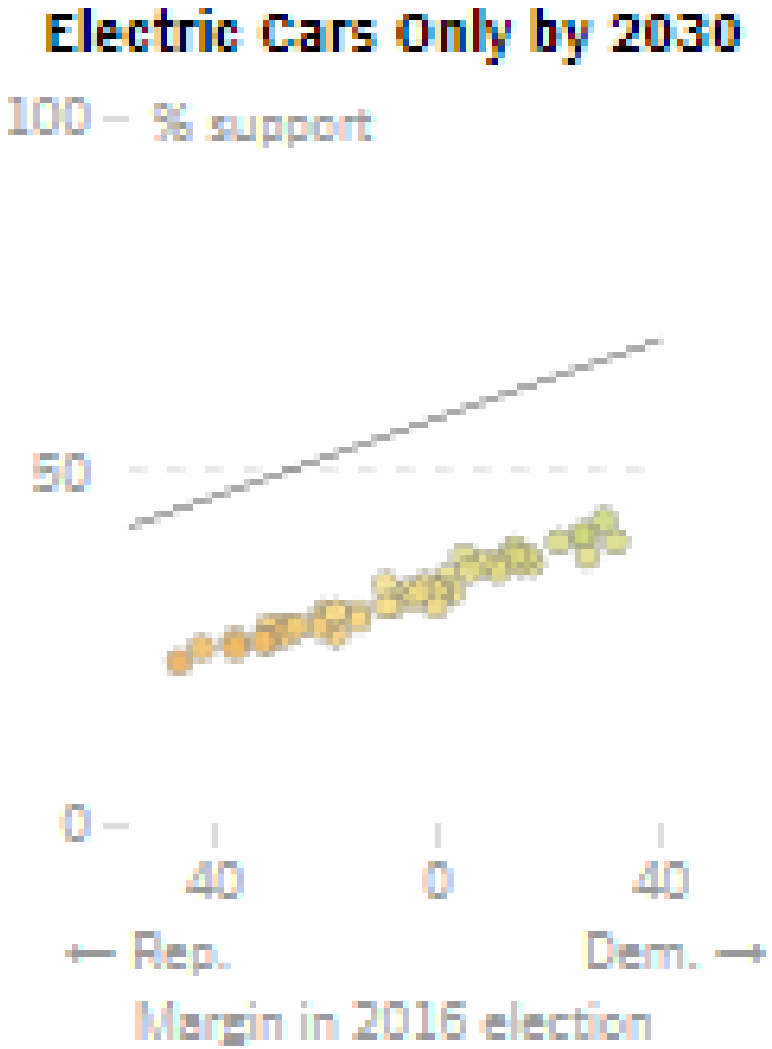


Source: Data for Progress; election results from The Associated Press | Ash Ngu/The New York Times

Support for Green New Deal Proposals by State

Solid line reflects support of the Green New Deal as a whole. Each circle represents a state's level of support for a particular aspect of the plan.





Source: Data for Progress; election results from The Associated Press | Ash Ngu/The New York Times

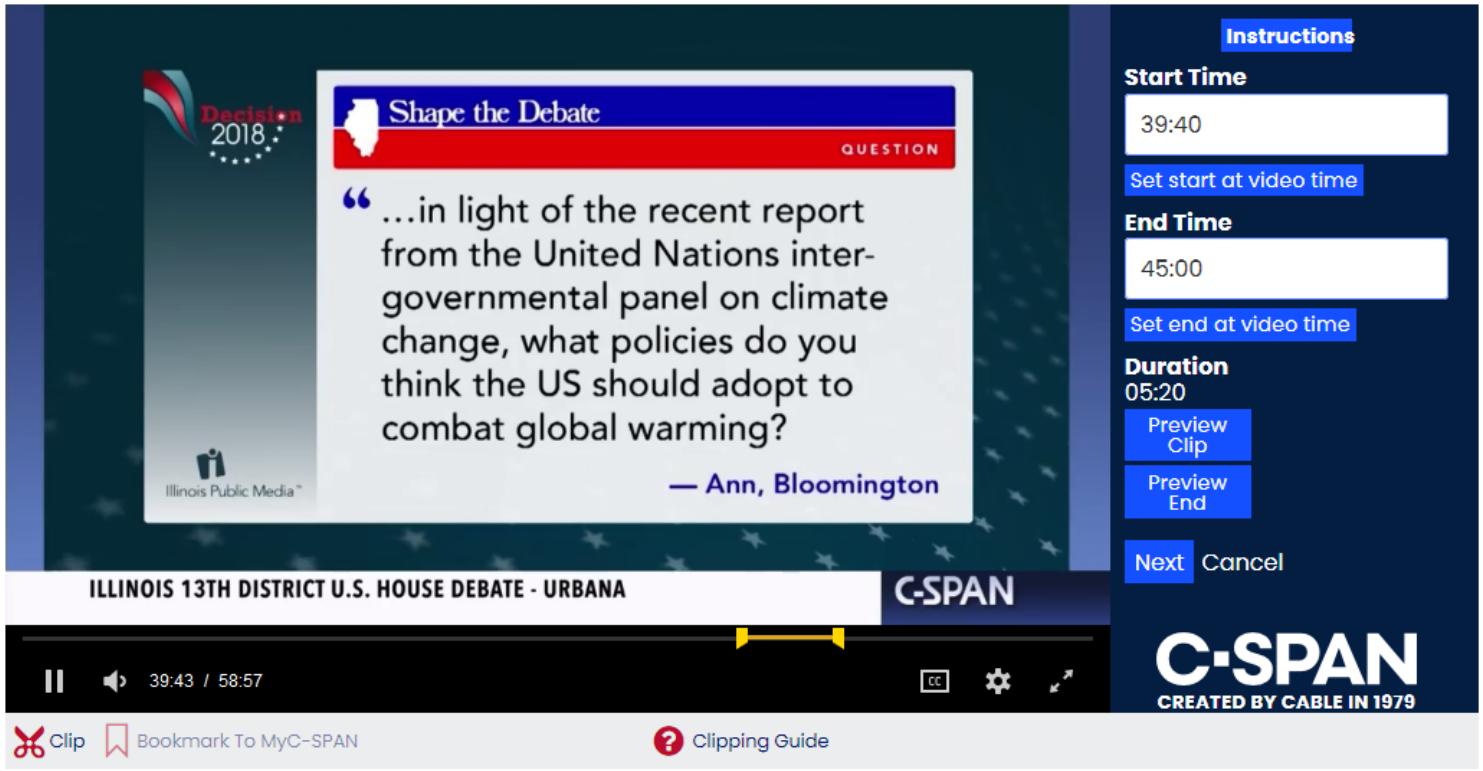
Some Issues Which Divide Candidates

- Mixing climate, social and political goals
- Nuclear power
- Hydraulic fracturing
- Fossil fuel enabling technologies
- Responsibility of fossil fuel corporations

13th Congressional District Debate October 18, 2018

Illinois 13th Congressional District Debate

Candidates in Illinois' 13th Congressional District race, incumbent Representative Rodney Davis (R) and challenger Betsy Dirksen Londrigan (D), faced each other for a debate from Illinois Public Media in Urbana. "



https://www.c-span.org/video/?453481-1/illinois-13th-congressional-district-debate

Open Government Forum
Parkland College
August 19, 2019

by WICS/WCCU Staff | Tuesday, August 20th 2019

Congressman Davis weighs in on climate change at forum. (WICS)

https://newschannel20.com/news/local/congressman-davis-weighs-in-on-climate-change-at-forum

Climate Change Litigation

The New York Times

November 25, 2015

Exxon Mobil Investigated for Possible Climate Change Lies by New York Attorney General

An Exxon Mobil refinery in Los Angeles, CA

The New York Times

August 23, 2017
Exxon Misled the Public on Climate Change, Study Says

An Exxon Mobil refinery in Billings, MT

The New York Times

October 22, 2019

Fossil Fuels on Trial: New York's Lawsuit Against Exxon Begins

Protesters gathered outside Manhattan Supreme Court before a lawsuit against Exxon Mobil began on Tuesday.

The New York Times

December 10, 2019
New York Loses Climate Change Fraud Case Against Exxon Mobil

Demonstrators outside the court in October.

The New York Times

June 25, 2018
Judge Dismisses Suit Against Oil Companies Over Climate Change Costs

- “The problem deserves a solution on a more vast scale than can be supplied by a district judge or jury in a public nuisance case.”
- “The court will stay its hand in favor of solutions by the legislative and executive branches.”
- “Our industrial revolution and the development of our modern world has literally been fueled by oil and coal.”
- “Would it really be fair to now ignore our own responsibility in the use of fossil fuels and place the blame for global warming on those who supplied what we demanded? Is it really fair, in light of those benefits, to say that the sale of fossil fuels was unreasonable?”

January 28, 2020
Lawsuits Seeking Damages for Climate Change Face Critical Legal Challenges

Big oil and gas companies maneuver to steer the lawsuits into federal court, setting the stage for a possible showdown in the U.S. Supreme Court.

Western Energy Alliance Open Letter
New York Times
February 24, 2020

Western Energy Alliance Open Letter New York Times February 24, 2020

Dear Presidential Candidates,

It would be criminal not to produce the reliable, affordable energy that keeps people warm in the winter, cool in the summer, and gets them to school to learn and work to provide for their families. Without our energy, the lights go dark, and smartphones go silent. Medicines and medical devices cease to cure the sick and injured. Food cannot be grown and grocery store shelves go bare.

We're proud to provide the power and raw materials to manufacture the goods Americans use every day, from clothes and shoes to anything with a computer chip. Currently there are no alternatives that do everything that oil and natural gas do. We continue to innovate to produce more energy, reduce costs for consumers, and lessen environmental impacts.

The clean-burning natural gas we produce helps improve air quality and lowers greenhouse gas emissions. Greater use of natural gas electricity is the number one reason the United States has reduced more greenhouse gas emissions than any other country. ***By exporting our clean, abundant natural gas, we can help lift out of poverty the one billion people worldwide without access to electricity.***

Were we to be prosecuted, as you promise, and forced to stop providing our life-sustaining products, 10.3 million jobs and hundreds of billions of dollars would be sent overseas to import the energy that Americans rely on. So we will continue to produce the environmentally responsible energy that powers America and enables a healthy, safe, and modern way of life.

SINCERELY,

David W. Ballard, President
Ballard Petroleum Holdings, LLC

Stephen Barnes, President
Breck Energy Corp.

Rob Bayless, Executive Manager
Robert L. Bayless, Producer LLC

Chris Beato, CEO
Exaro Energy III, LLC

Ryan Birkenfeld, CEO
Northwoods Energy, LLC

Robert S. Boswell, Chairman & CEO
Laramie Energy, LLC

Jim Brown, CEO
PetroStar Services, LLC

Ted D. Brown, President & CEO
Confluence Resource LP

Tony Buchanon, President & CEO
Crestone Peak Resources

Andrew Calerich, CEO
Thunder Basin Resources, LLC

Alex Campbell, Chairman
Western Energy Alliance

Collis Chandler III, President
Chandler Energy, LLC

Dragan Cicvaric, CEO & President
Patriot Well Solutions

Robert J. Clark, Chairman
3Bear Energy, LLC

Bryce Conway, President & CEO
Flex-Chem Corporation

Michael Decker, COO
Altamont Energy, LLC

Christopher Frain, CEO
Rolfson Oil, LLC

Rich Frommer, President & CEO
Great Western Petroleum, LLC

Robert Gardner, President & CEO
Elk Mesa Energy, LLC

Eric Greager, President & CEO
Bonanza Creek Energy, Inc.

Harold Hamm, Executive Chairman
Continental Resources

David L. Herbaly, Manager
Herbaly Exploration LLC

Roger Hutson, President & CEO
HRM Resources III, LLC

Danny Jimenez, CEO
Gradient Energy Services

David Knapp, President
Knapp Oil Corp.

William D. Lancaster, President
GMT Exploration Company, LLC

Don Law, President
Prima Exploration

David Lehman, President & CEO
DJR Energy

James S. McAda, President
McAda Drilling Fluids, Inc.

Jerry McHugh, Jr., President
San Juan Resources, Inc.

Charles S. McNeil, Chairman & CEO
NexGen Resources Corporation

T. Greg Merrion, President
Merrion Oil & Gas

Salar Nabavian, CEO
ARSI Energy, LLC

Kurt Nelson, President
Chaco Energy Company

Eric Noblitt, Partner
Stonegate Resources LLC

Nicholas Noppinger, CFO
Flatirons Field Services

Mike O'Shaughnessy, Chairman & CEO, Lario Oil & Gas Company

C. Mark Pearson, CEO & President
Liberty Resources, LLC

Kyle K. Rhodes, President & CEO
PESCO

Kim Rodell, President, Upstream
Petroleum Management, Inc.

James Schroeder, Managing Partner
Mesa Energy Associates LLC

Kathleen Sgamma, President
Western Energy Alliance

Steve Skinner, President & CEO
Ursa Resources Group II, LLC

George H. Solich, President & CEO
FourPoint Energy, LLC

Daryl Stewart, President
Stewart Petroleum Corporation

Steve Struna, President & CEO
Bayswater

Adam S. Tesanovich, Chief Commercial Officer, Eagle Pipe, LLC

Jeff Vaughan, President & CEO
Tracker Resource Development LLC

Jack Vaughn, Chairman & CEO
Peak Exploration and Production, LLC

Whitney Wickes, COO
Rocking WW Minerals

R. Heggie Wilson, Partner
Stonegate Resources LLC

Jack Wold, CEO
Wold Energy Partners, LLC

R. Scot Woodall, CEO & President
HighPoint Resources

Chris Wright, CEO
Liberty Oilfield Services

Paid for by: WESTERN ENERGY ALLIANCE

www.westernenergyalliance.org

Time for questions and discussion.

East Coast Blackout August 14, 2003

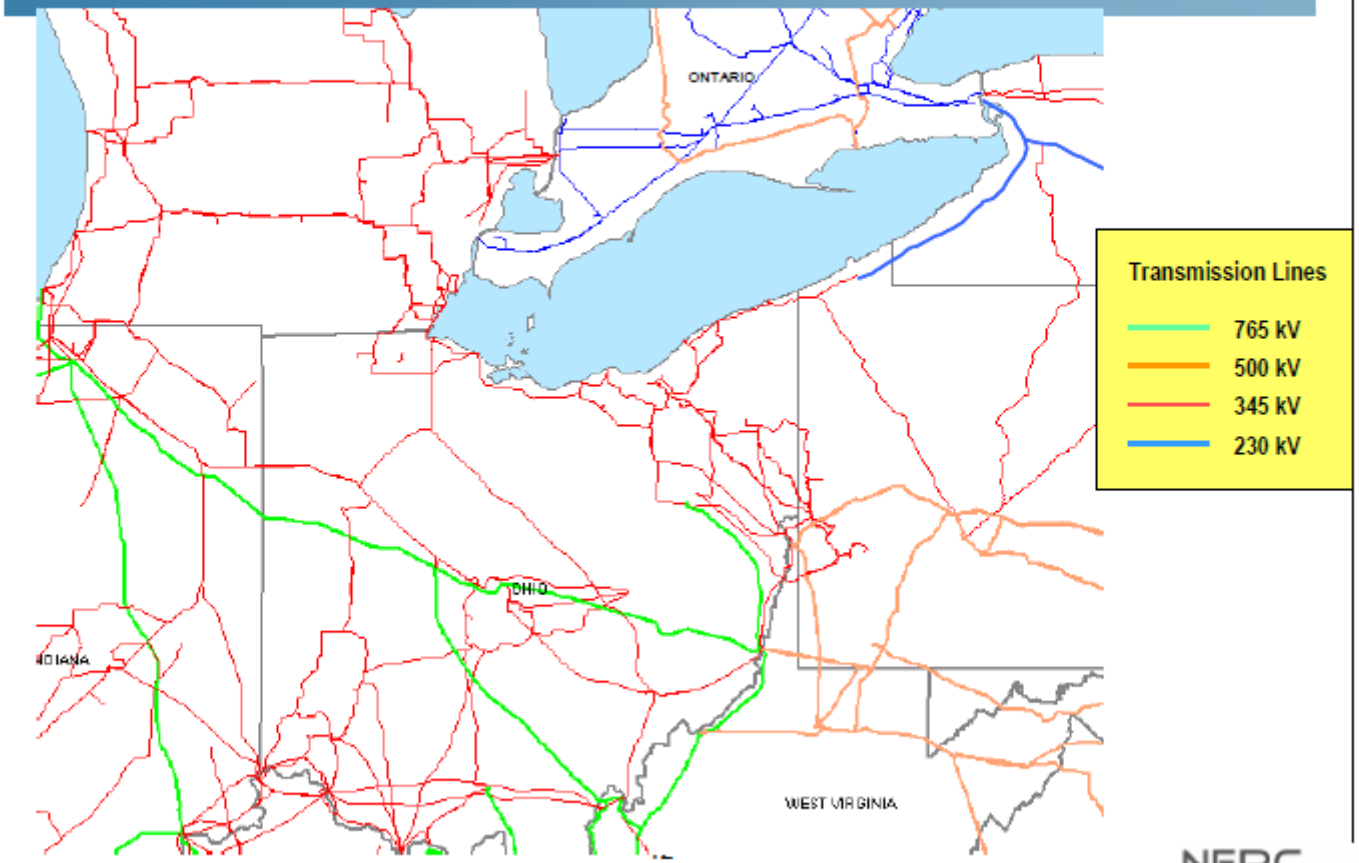
August 14, 2003 Blackout and Subsequent Investigation

NERC/TVA Stability Workshop
May 23, 2007
Chattanooga, TN

Robert W. Cummings – NERC
Eric H. Allen – NERC
Blackout Team Investigators

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

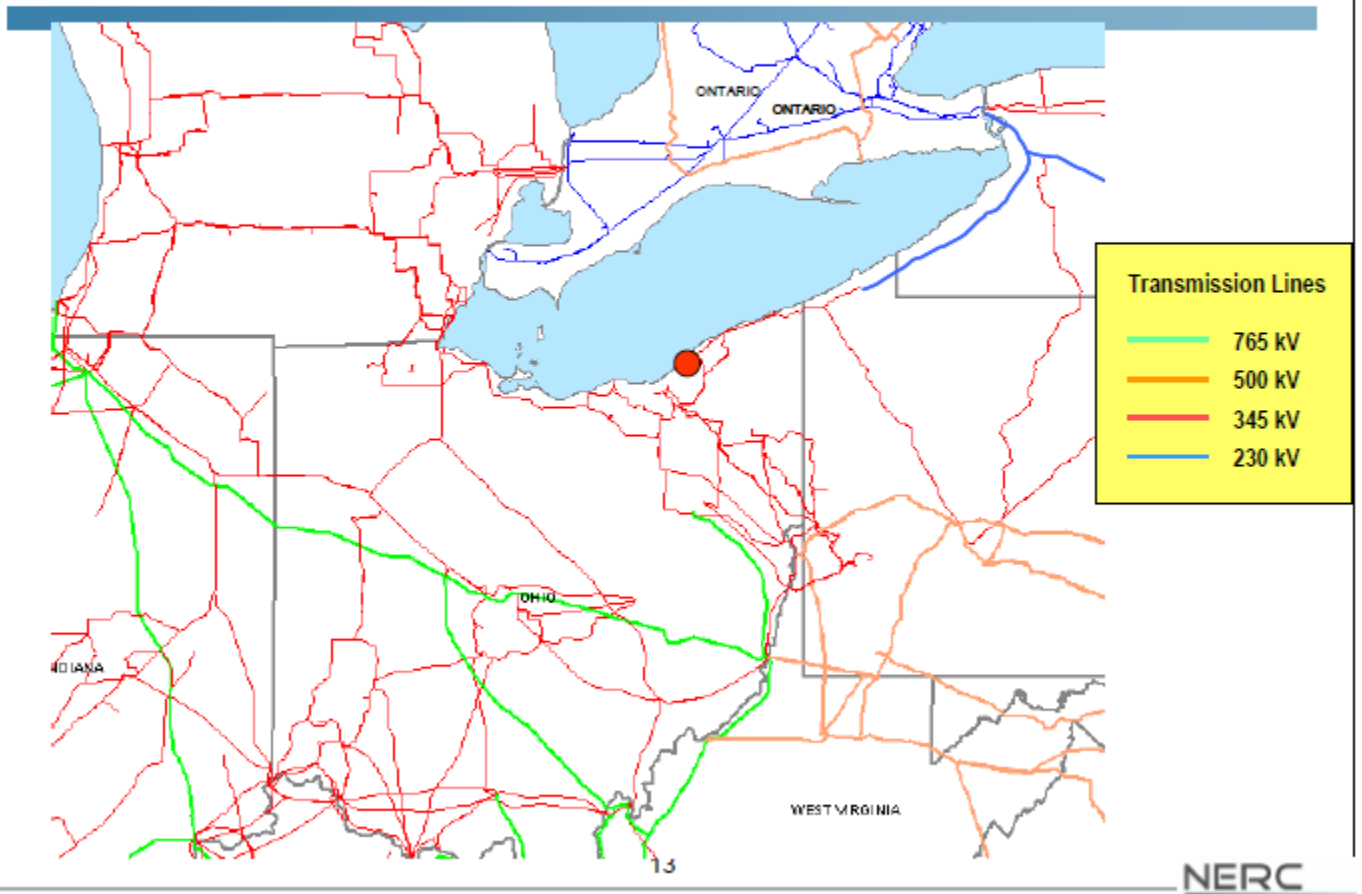
Outage Sequence of Events
Transmission Map Key



NERC

FirstEnergy Control Center

Eastlake #5 Generator Trip 1:31:34 PM

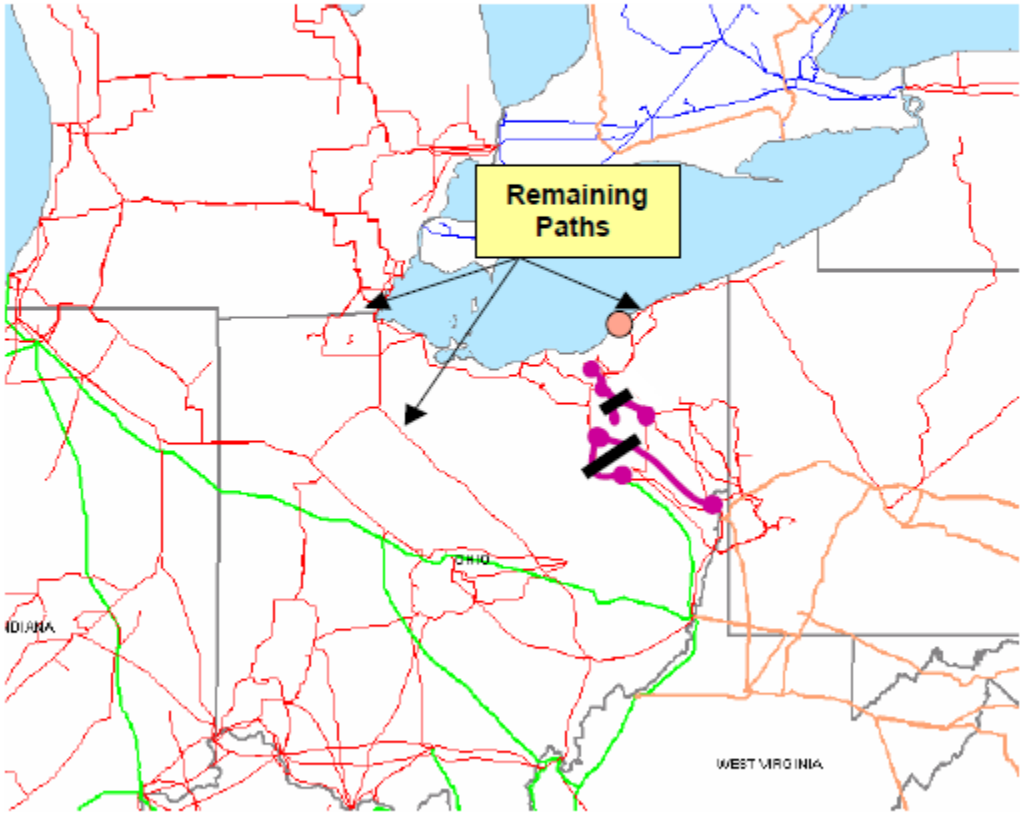


NERC

Power System High Level Sequence

- Premature failure of three 345 kV lines
  - starting at 3:05 PM, three 345 kV line outages within 36 minutes due to tree branches under conductors
- Northern Ohio 138kV cascade began
  - started 3:39 PM - caused by above premature failures
- Northern Ohio 345kV high speed cascade of overloaded lines 4:05:57 - 4:09:07 PM
  - accelerated by Zone 3 directional distance relays
- Eastern Interconnection Separates by 4:11 PM

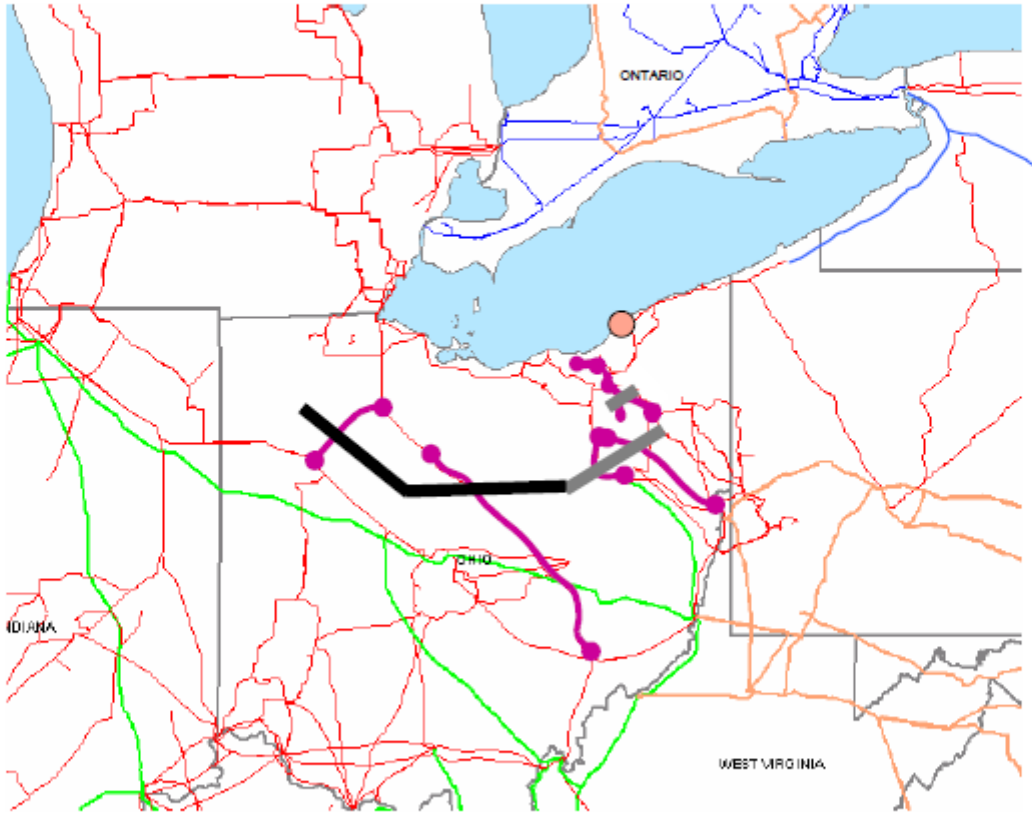
Major Path to Cleveland Blocked after Loss of Sammis-Star 345 kV Line 4:05:57.5 PM



Transmission Lines
765 kV
500 kV
345 kV
230 kV

NERC

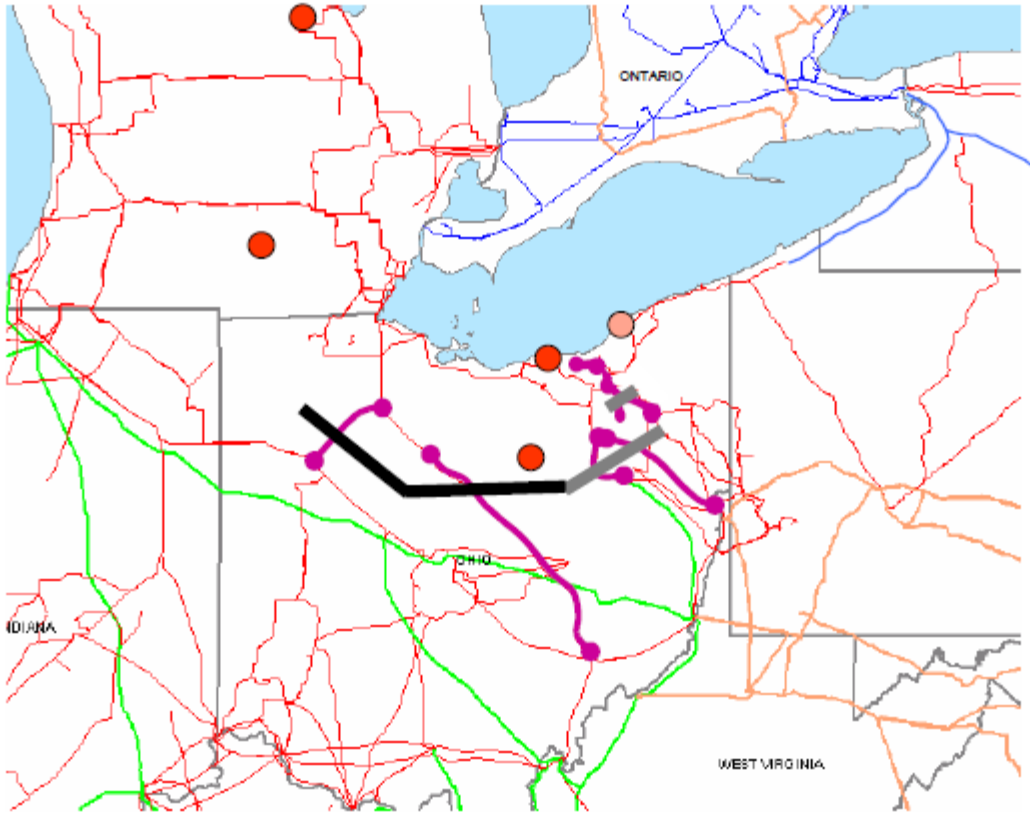
345 kV Lines Trip Across Ohio to West
4:08:59 - 4:09:07 PM



Transmission Lines
765 kV
500 kV
345 kV
230 kV

NERC

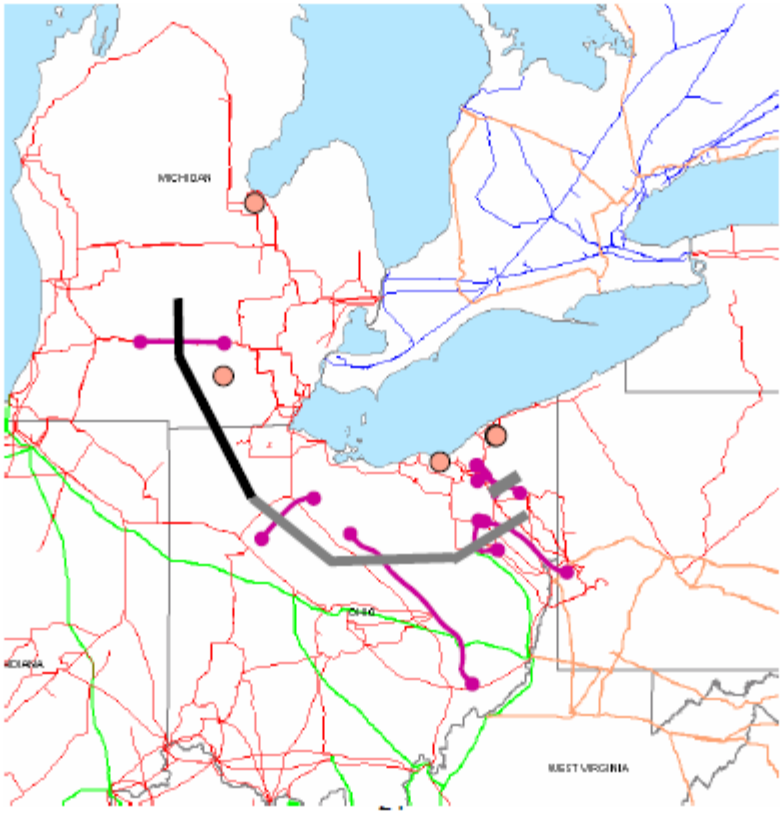
Generation Trips
4:09:08 – 4:10:27 PM



Transmission Lines
765 kV
500 kV
345 kV
230 kV

NERC

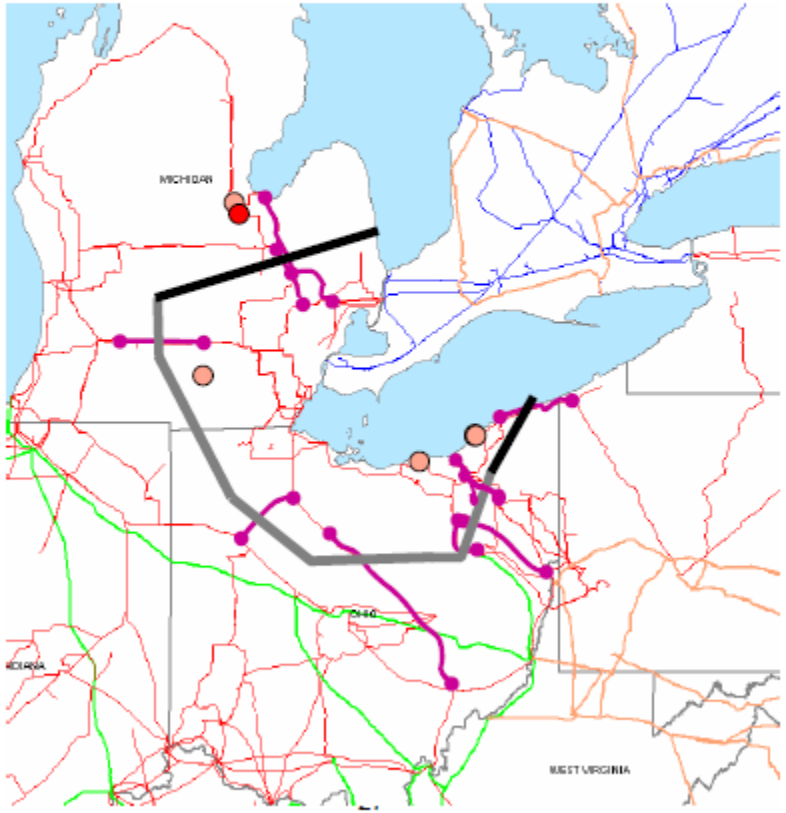
345 kV Cascade Moves North into Michigan
Argenta-Battle Creek Lines Trip 4:10:36 – 4:10:37PM



Transmission Lines
765 kV
500 kV
345 kV
230 kV

NERC

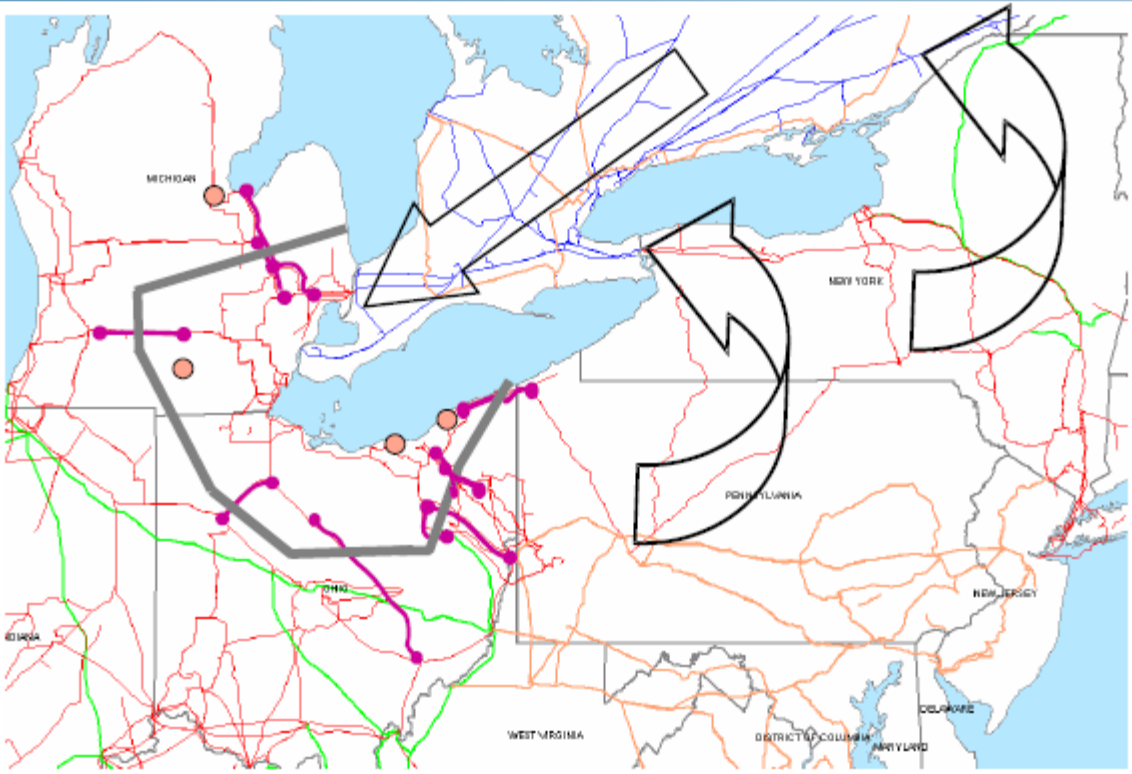
New Phase Begins - "Transient Instability"
Three 345 kv Lines Trip from 4:10:37.5 - 4:10:38.6 PM



Transmission Lines
765 kV
500 kV
345 kV
230 kV

NERC

Power Transfers Shift at 4:10:38.6 PM

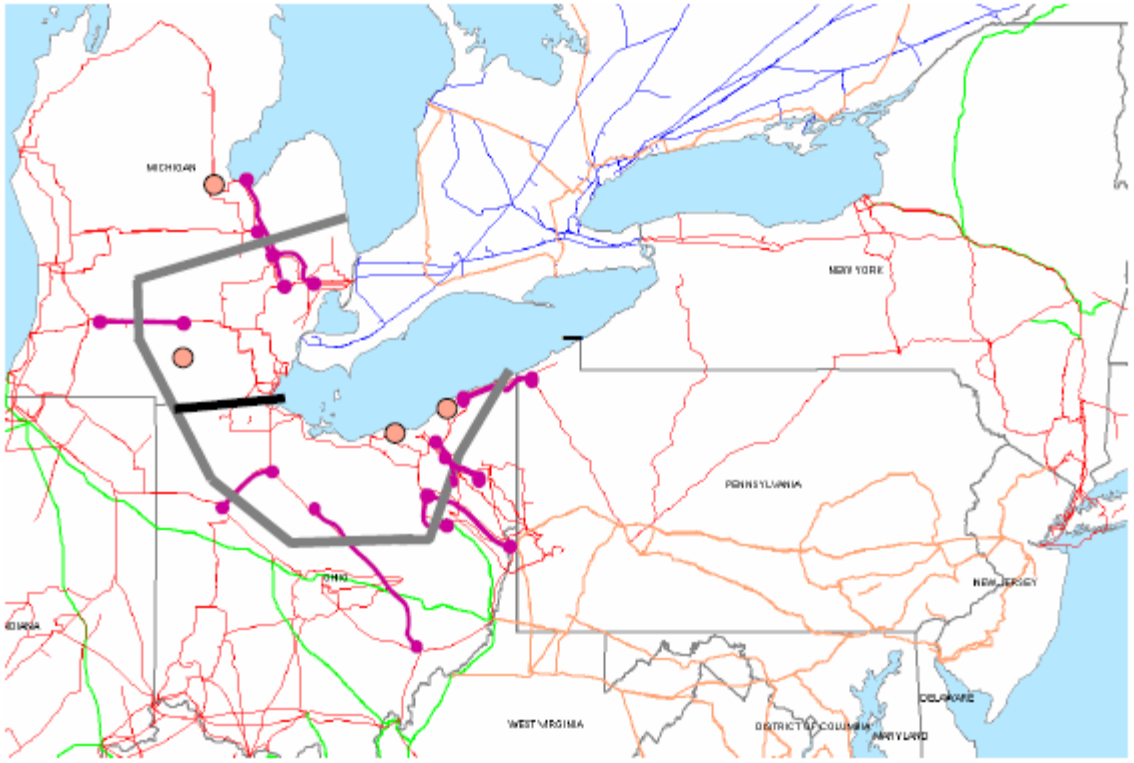


Transmission Lines

- 765 kV
- 500 kV
- 345 kV
- 230 kV

NERC

Michigan and Ohio Separate
4:10:39.392 – 4:10:39.57 PM

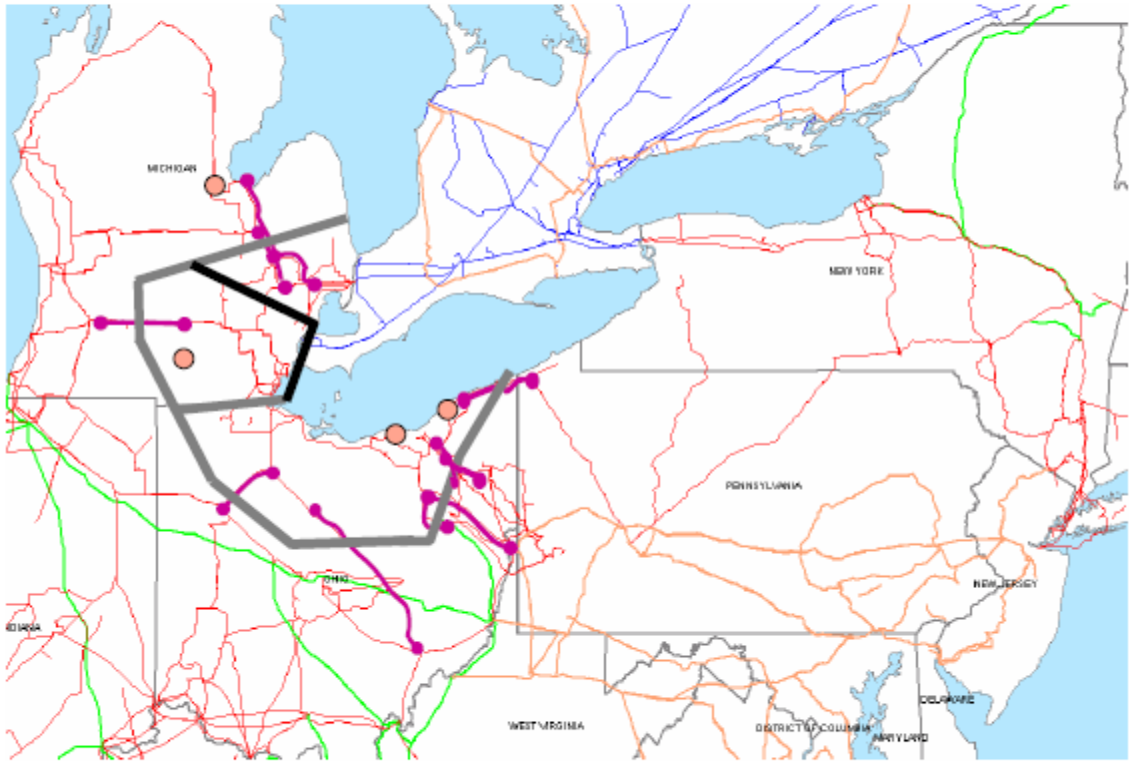


Transmission Lines

- 765 kV
- 500 kV
- 345 kV
- 230 kV

NERC

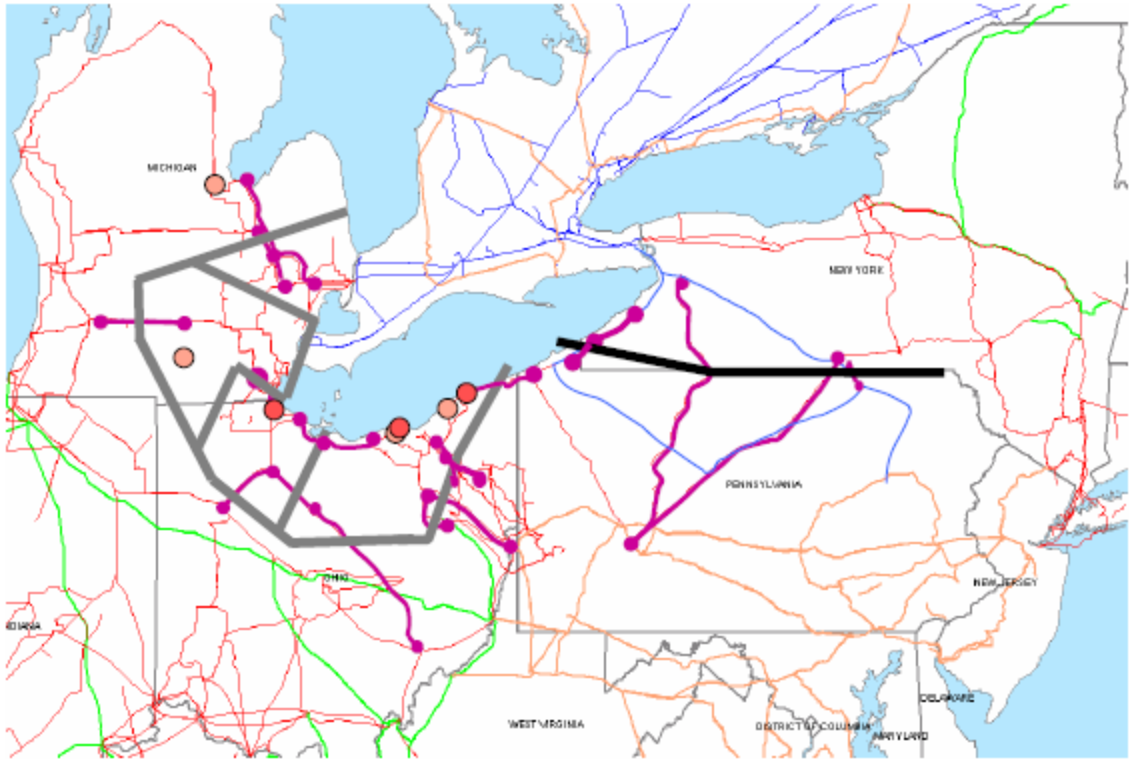
Southeast Michigan Separates into Two Pieces
4:10:39.268 – 4:10:41.105 PM



Transmission Lines
- 765 kV
- 500 kV
- 345 kV
- 230 kV

NERC

Pennsylvania – New York Separation
4:10:39 to 4:10:44 PM

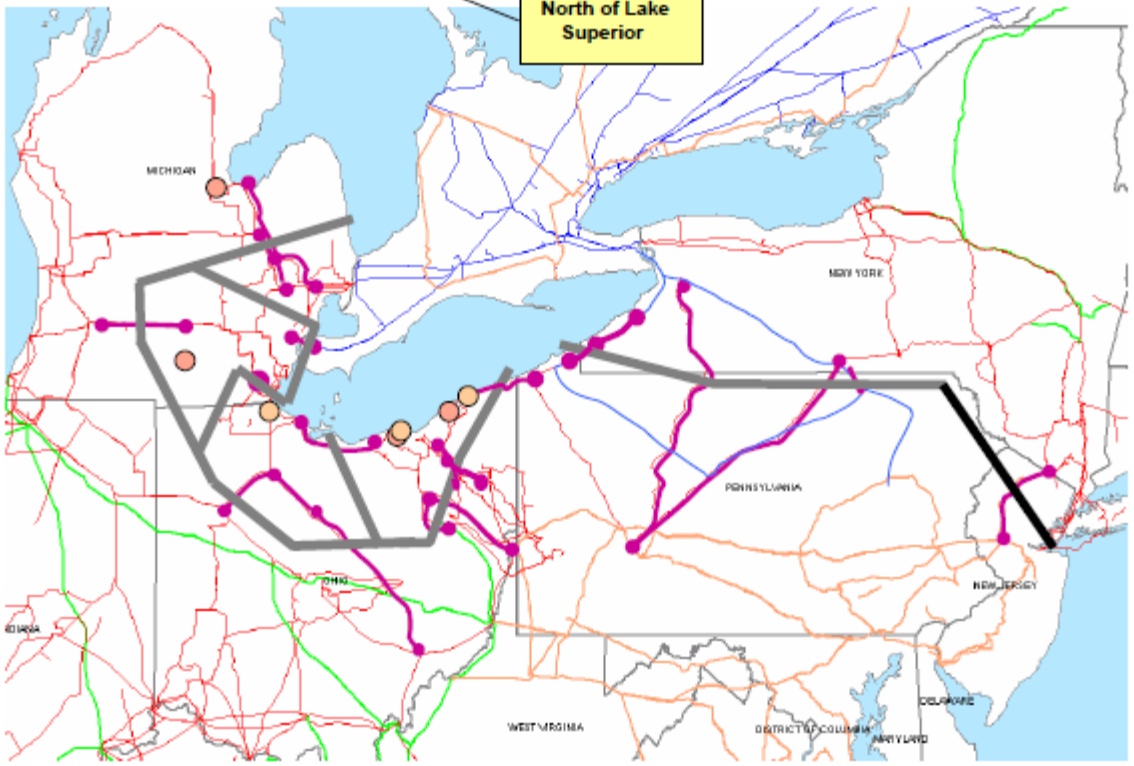


Transmission Lines

- 765 kV
- 500 kV
- 345 kV
- 230 kV

NERC

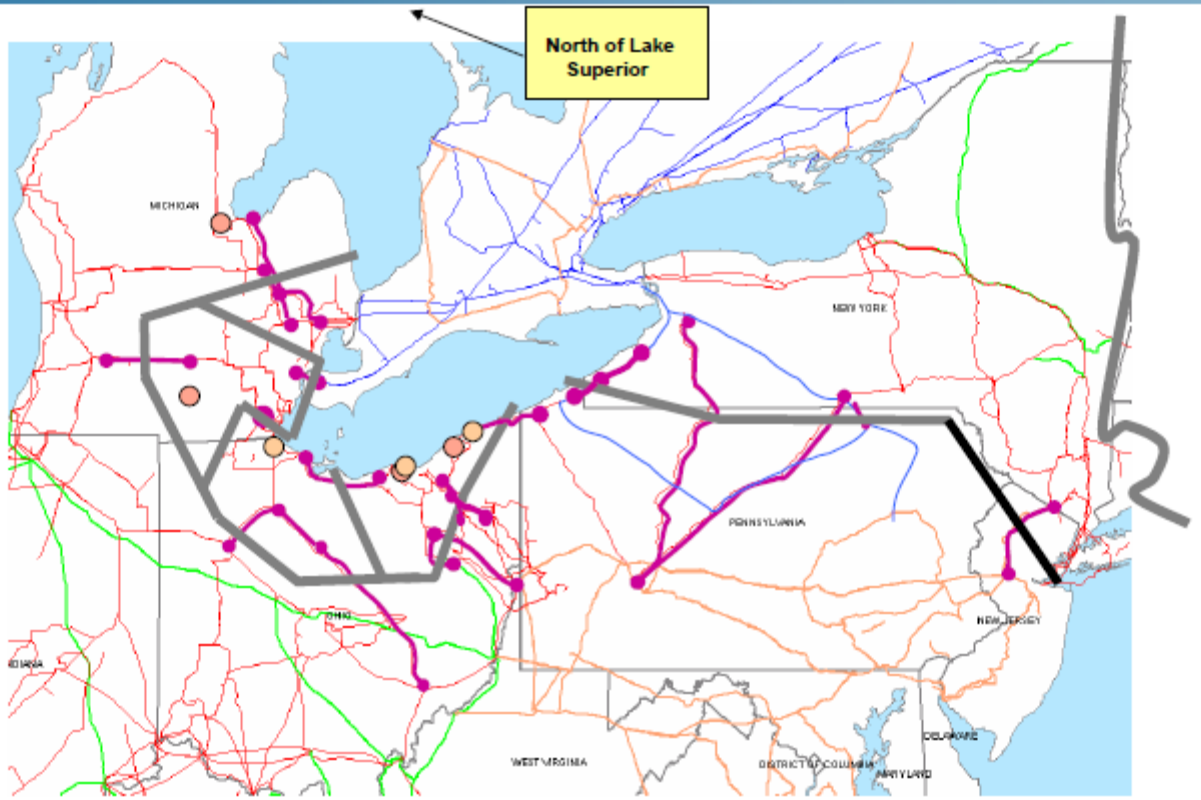
Northeast Island Separates from Eastern Interconnection 4:10:43 – 4:10:45 PM



Transmission Lines
- 765 kV
- 500 kV
- 345 kV
- 230 kV

NERC

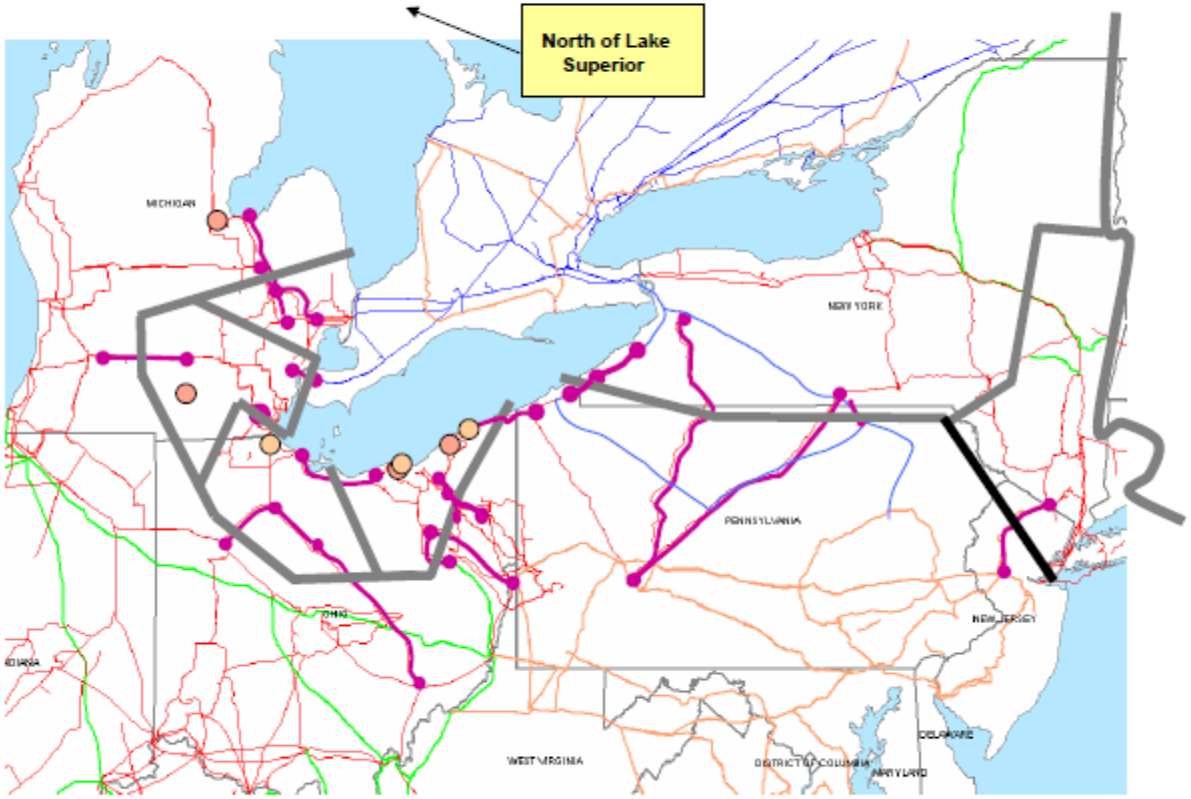
New England Separates from Eastern Interconnection 4:10:46 – 4:10:48 PM



Transmission Lines
- 765 kV
- 500 kV
- 345 kV
- 230 kV

NERC

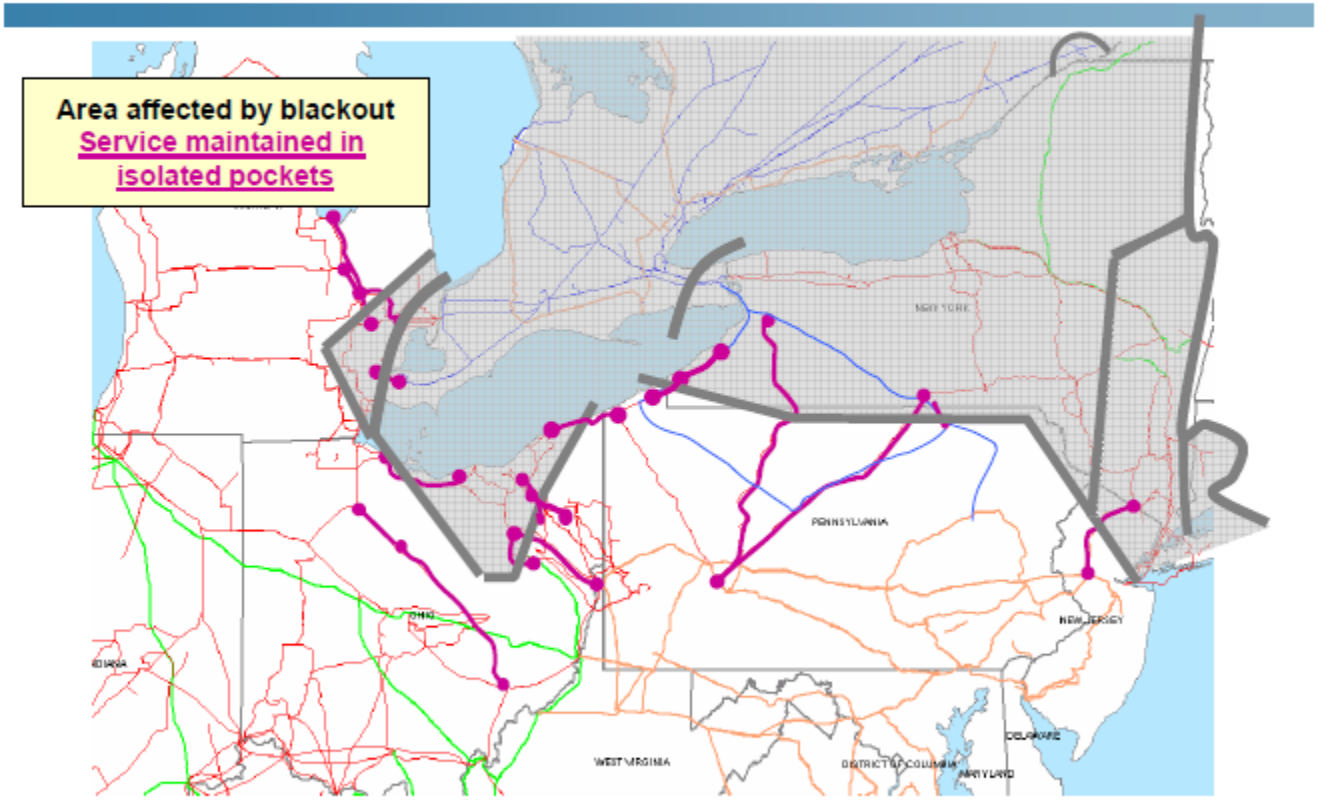
New York Splits Internally
4:10:48.823 – 4:10:49.600 PM



Transmission Lines
- 765 kV
- 500 kV
- 345 kV
- 230 kV

NERC

End of the Cascade



NERC


003/45/7844
ISAT GeoStar 45
23:15 EST 14 Aug. 2003

Climate versus Weather Quiz

How Much Do You Know About Weather and Climate?

How much do you know about weather, climate, and how they're different? Put your knowledge to the test.

TAKE QUIZ