



Decarbonizing Electricity

Seventh Generation Interfaith

February 15, 2019

Welcome!

- ▶ Participants will be in listen only mode until the Q&A section.
- ▶ We will make recording and slides available and post on our website

Reflection



Companions in this conversation



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Agenda

- ▶ **Setting the Stage - Frank Sherman**
- ▶ **Roadmap to Decarbonization - Franz Litz**
- ▶ **Investor Role on the Journey - Dan Bakal**
- ▶ **Q&A**

Undeniable weather patterns...



YALE Climate Connections
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ARTICLE

The many ways climate change worsens California wildfires

Years of record-setting California wildfires are consistent with mounting evidence of climate change as a principal factor.



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Hurricanes and Climate Change: Everything You Need to Know

The most widespread, damaging storms on earth are getting worse, and climate change is a big reason why. Here's a look at what causes hurricanes and how to address the threat of a wetter, windier world.

December 03, 2018 | Melissa Denchak



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Polar vortex: What role does climate change play?

By Justin Rowlatt
BBC News

31 January 2019

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US polar vortex



GETTY IMAGES

Not enough being done...

Climate change > UN climate change conference (COP24)

The IPCC's report on global warming of 1.5°C spells out the urgency of action

IIED director Andrew Norton looks at the new report on climate change.

The New York Times

U.S. Climate Report Warns of Damaged Environment and Shrinking Economy



Fighting the Camp Fire this month in Magalia, Calif. Justin Sullivan/Getty Images

The COP24 climate talks have emphasised the need for urgent action



A participant's silhouette is seen during the COP24 UN Climate Change Conference 2018 in Katowice

Image: REUTERS/Kacper Pempel

Changing political landscape

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DEEP DIVE

New governors accelerate clean energy action, propelled by Democratic midterm wave

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inside climate news

A Pulitzer Prize-winning, non-profit, non-partisan news organization dedicated to covering climate change, energy and the environment.

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HOT TOPICS: 2018 Year in Review Arctic Military Clean Energy Climate Science Extreme Weather

HOME

America's No. 3 Coal State Sets Greenhouse Gas Reduction Targets

The Pennsylvania governor's goal matches the U.S. commitment under the Paris accord, but he'll need the Republican-controlled legislature's help to meet it.

ATTN: High school students want to study climate change.

NEW YORK STATE Services News Government Local

GOVERNOR ANDREW M. CUOMO PRESSROOM SCHEDULE EXECUTIVE ORDERS ISSUES LEGISLATION ABOUT

DECEMBER 13, 2018 | Albany, NY

Governor Cuomo Announces Dramatic Increase in Energy Efficiency and Energy Storage Targets to Combat Climate Change

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ENVIRONMENT

Colorado Governor-Elect Pushes For 100 Percent Renewable Energy

3:41

+ QUEUE

December 27, 2018 · 4:29 PM ET
Heard on All Things Considered

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BRIEF

Green New Deal resolution calls for 100% zero-carbon power within 10 years

Changing political landscape

npr

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Environment And Energy Collaborative

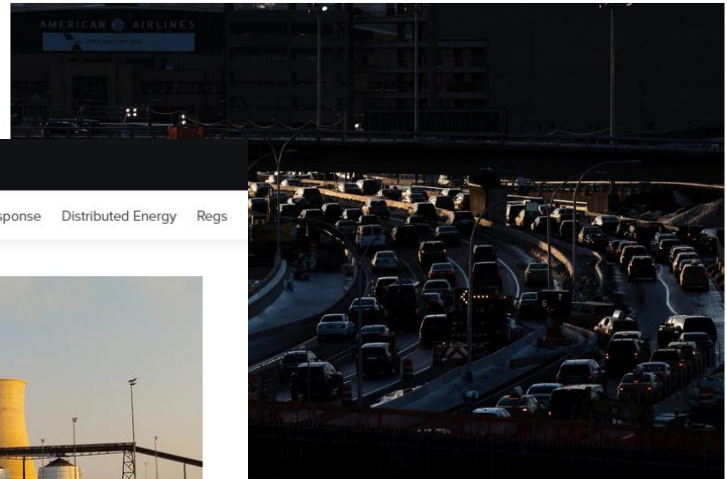
Trump's EPA Plans To Ease Carbon Emissions Rule For New Coal Plants

December 6, 2018 - 4:22 PM ET

JEFF BRADY

The New York Times

E.P.A. Prepares to Roll Back Rules Requiring Cars to Be Cleaner and More Efficient



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BRIEF

TVA to close Paradise, Bull Run coal units despite Trump tweet

Public opinion still lacks urgency

abc NEWS VIDEO LIVE SHOWS

Public backs action on global warming - but with cost concerns and muted urgency (POLL)

By GARY LANGER Jul 16, 2018, 12:00 AM ET

Share Tweet



Burning fossil fuels like coal and oil increases the concentration of carbon dioxide in the atmosphere.
Source: NASA

CNN BUSINESS Markets Tech Media Success Perspectives Video

Washington State voters reject carbon tax

By Lydia DePillis, CNN
Updated 12:55 PM ET, Wed November 7, 2018



More F

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30-yr fix
15-yr fix
5/1 ARM
Loan Ar

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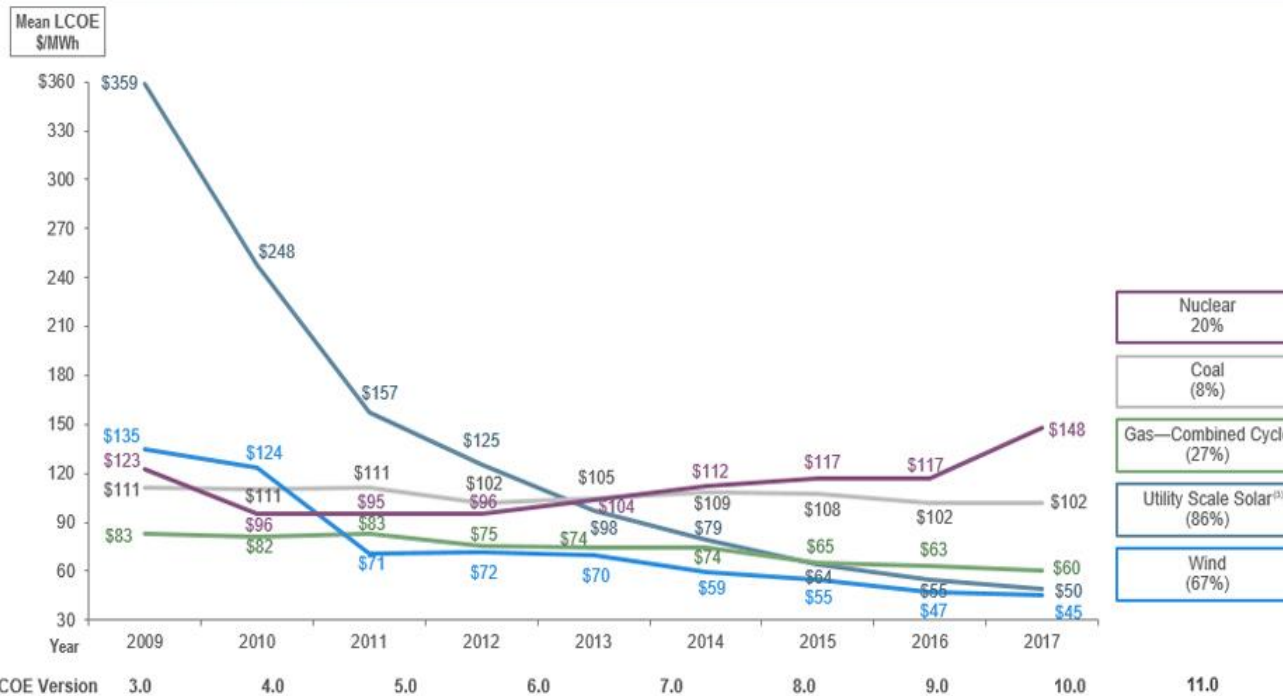
Economic Conditions and Public Opinion on Climate Change

Saill Benegal and Lyle Scuggs
Subject: Communication Online Publication Date: Nov 2016 DOI: 10.1093/acrefore/9780190228620.013.310

Renewable energy reach parity

Summary Findings of Lazard's 2017 Levelized Cost of Energy Analysis⁽¹⁾

Selected Historical Mean LCOE Values⁽²⁾



Source: Lazard estimates.

Note: Reflects average of unsubsidized high and low LCOE range for given version of LCOE study.

(1) Primarily relates to North American alternative energy landscape, but reflects broader/global cost declines.

(2) Reflects total decrease in mean LCOE since the later of Lazard's LCOE—Version 3.0 or the first year Lazard has tracked the relevant technology.

(3) Reflects mean of fixed-tilt (high end) and single-axis tracking (low end) crystalline PV installations.

Electricity sector & climate change

Power plants are no longer America's biggest climate problem. Transportation is.

By Brad Plumer | @bradplumer | brad@vox.com | Jun 13, 2016, 11:10am EDT

f t SHARE

Here's an important energy milestone: For the first time since 1979, America's cars, trucks, and airplanes emit more carbon dioxide than its power plants do. The **chart below comes from** Sam Ori, executive director of the Energy Policy Institute at the University of Chicago:

MOST READ

FutureStructure

Transportation

Electric Utilities Plot Bullish Course for EV Charging Infrastructure

Electric utilities in Ohio, New Jersey and Florida announced plans for the aggressive development of electric vehicle charging ports.

BY SKIP DESCANT / OCTOBER 11, 2018



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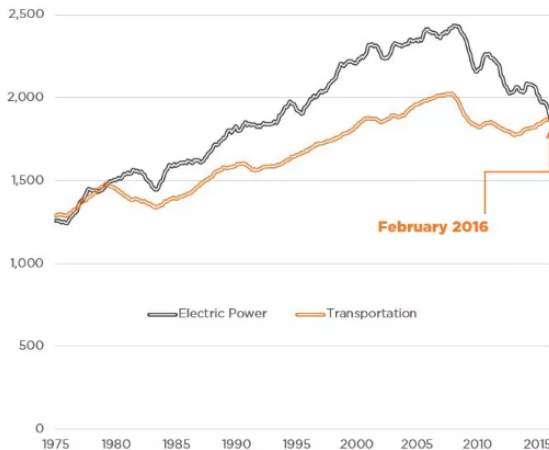


BRIEF

US power sector carbon emissions jump as gas boom outpaces coal decline

Carbon Dioxide Emissions by Sector Moving 12-Month Total

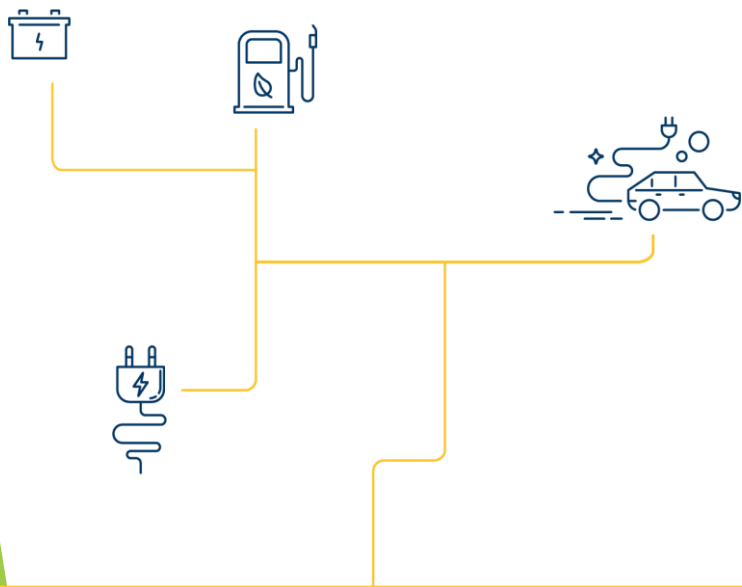
3,000 Million Metric Tonnes of Carbon Dioxide



Electricity Sector GHG Targets

Company	2030 Target	2050 Target	Baseline	Comment
AES	70%		2016	
Alliant	40%	80%	2005	
Ameren			2005	30% by 2035
American Electric Power	60%	80%	2000	
CMS Energy		92%	2005	38% by 2017
DTE Energy Company	40%	80%	2005	
Duke Energy Corporation	40%	72%	2005	
Entergy Corporation			2000	20% by 2020
FirstEnergy		90%	2005	90% by 2045
MGE Energy	40%	80%	2005	
NextEra Energy			2001	65% by 2021
Southern Company	50%	no or low	2007	
TransAlta Corporation	60%		2015	
WEC Energy	40%	80%	2005	40% by 2023
Xcel Energy	80%	100%	2005	





A Road Map to Decarbonization in the Midcontinent: Electricity & EVs

Franz T. Litz
Great Plains Institute

Midcontinent Power Sector Collaborative

Participants

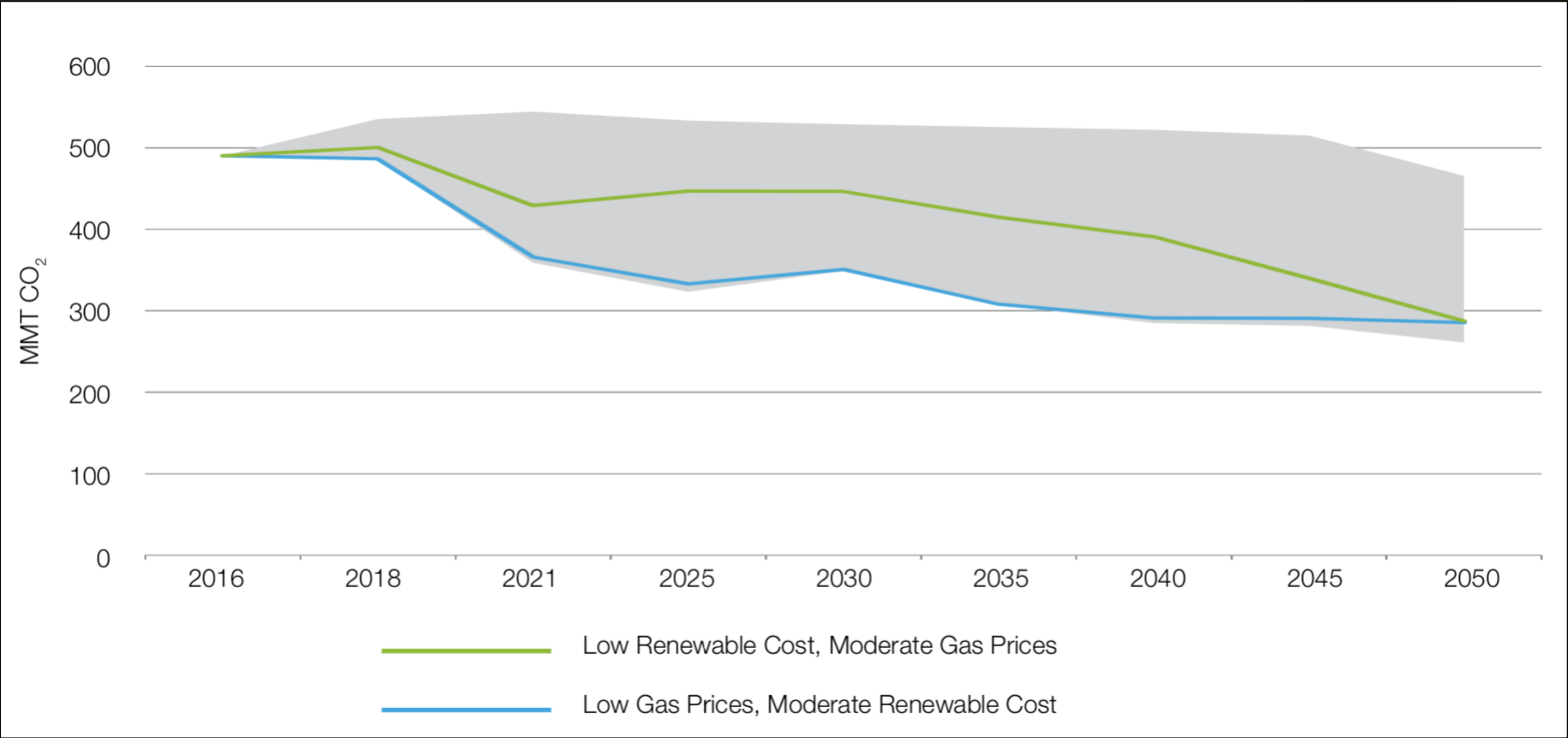
- Center for Energy and Environment
- Clean Air Task Force
- Clean Wisconsin
- Dane County Office of Energy and Climate Change
- DTE Energy
- Ecology Center
- EDP Renewables
- Environmental Defense Fund
- Iowa Environmental Council
- WEC Energy Group
- Madison Gas and Electric
- MidAmerican Energy
- Natural Resources Defense Council
- Union of Concerned Scientists
- Xcel Energy
- Wolverine Power Cooperative
- WPPI Energy

State Agency Observers

- Minnesota Pollution Control Agency
- Michigan Department of Environmental Quality

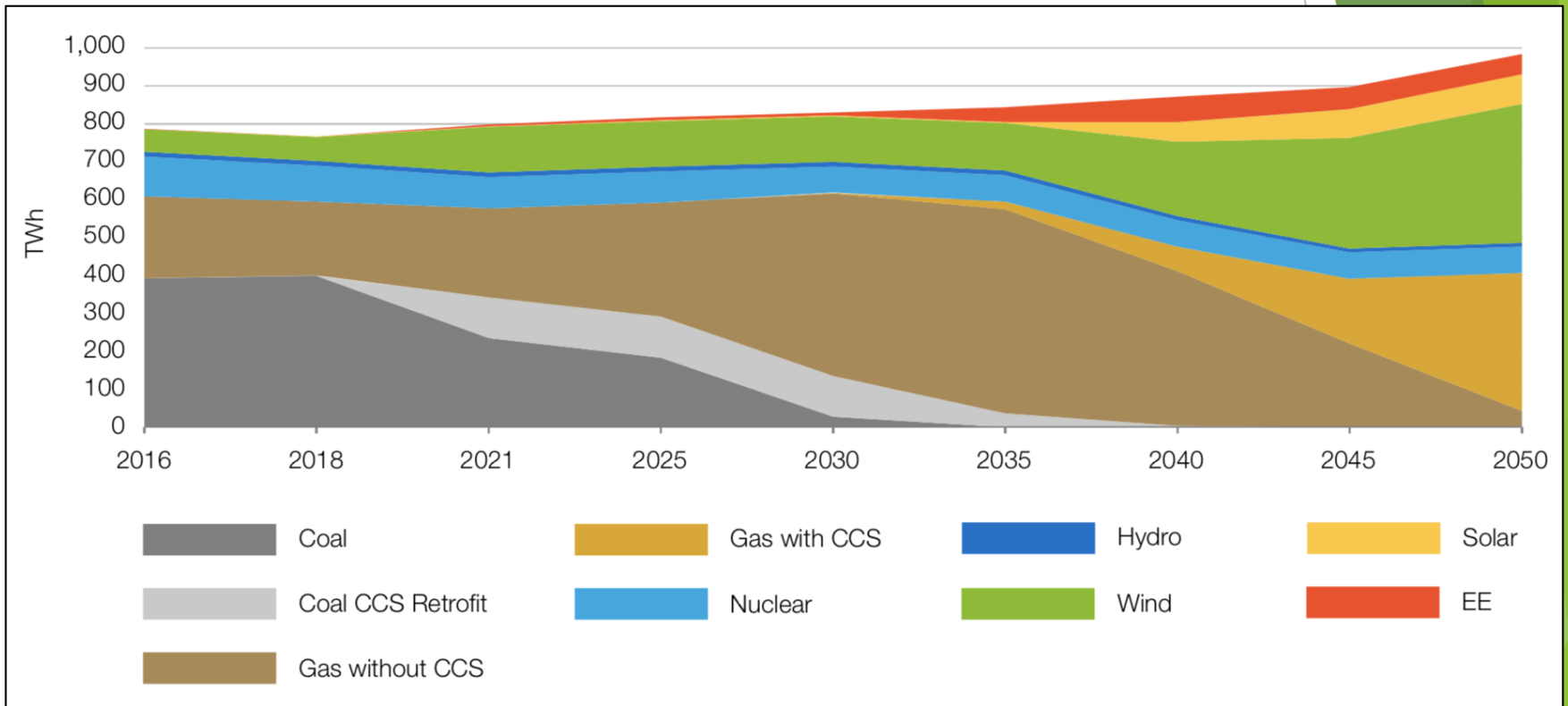


Where are we headed in electricity?



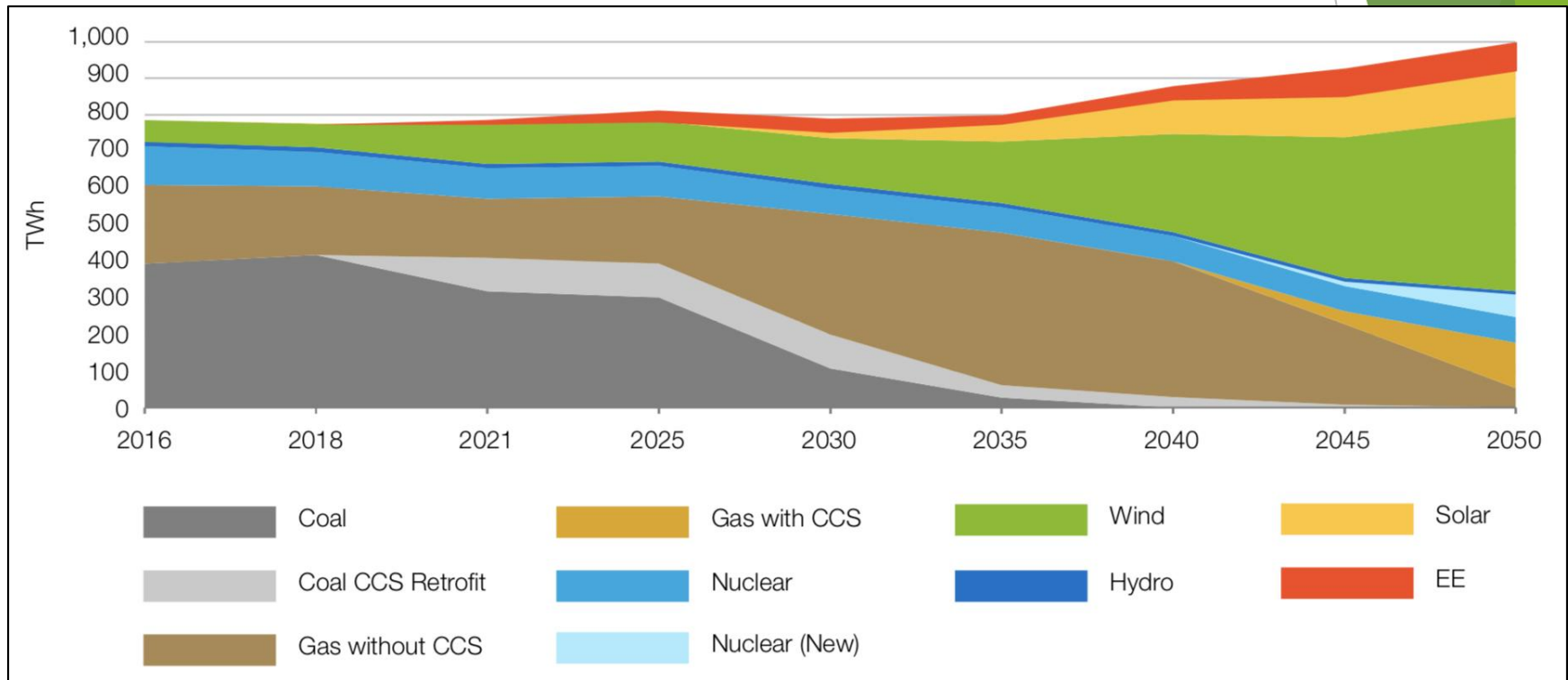
95% Decarbonization

Low natural gas prices



95% Decarbonization

Moderate natural gas prices

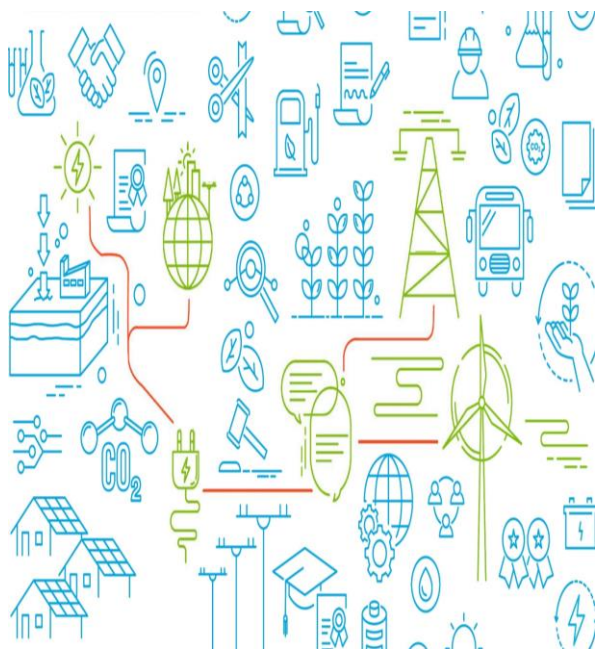


Consensus Principles

- ▶ Cost-effective energy efficiency & renewables
- ▶ Need dispatchable very low and zero-carbon resources
- ▶ Decisions on existing nuclear really matter



Consensus Principles



- ▶ Evaluate investments in carbon-emitting resources against carbon risk
- ▶ Policy should be flexible to allow for step changes
- ▶ Market-based policies combined with targeted policies to ensure broader mix of technologies
- ▶ Research, Development and Deployment efforts needed



A Road Map to Decarbonization in the Midcontinent

TRANSPORTATION ELECTRIFICATION

MIDCONTINENT TRANSPORTATION
ELECTRIFICATION COLLABORATIVE



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THE ROAD MAP

ELECTRICITY

NOW

CURRENT TRAJECTORY

PATHWAYS



The Road Map to Decarbonization

Pointing the Way to a Low Carbon Future





Ceres

Sustainability is the bottom line.

Investor's Role in Decarbonizing Electricity

Dan Bakal

Who we are

Ceres is transforming the economy to build a sustainable future for people and the planet.

Company Network

50+ companies in
more than 15 sectors

Investor Network

160+ investors
representing
\$25 trillion AUM

Policy Network (BICEP)

52+ leading companies

Nonprofit Network

100+ environmental,
social and labor groups

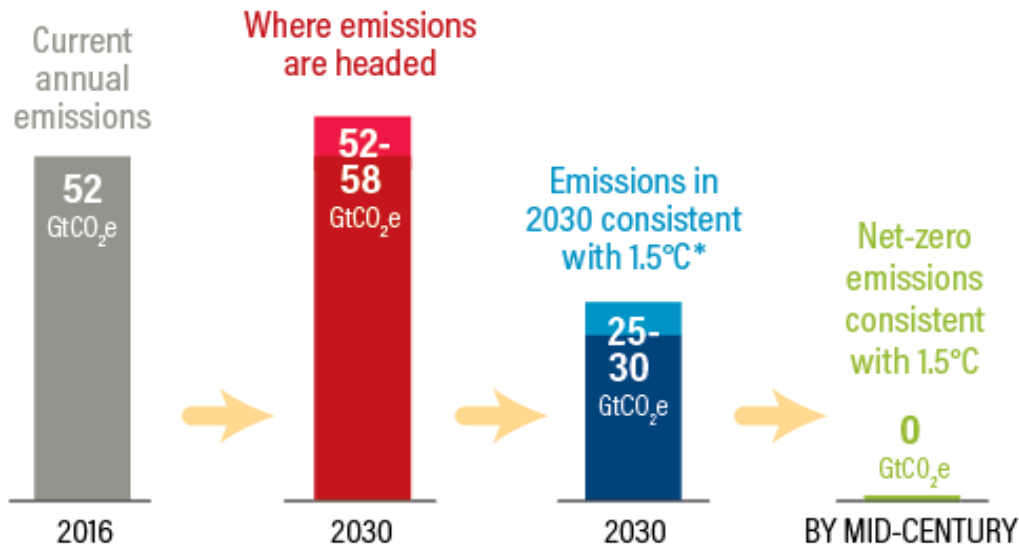


Ceres


Sustainability is the bottom line.

The Challenge

The World Is Not on Track to Limit Temperature Rise to 1.5°C



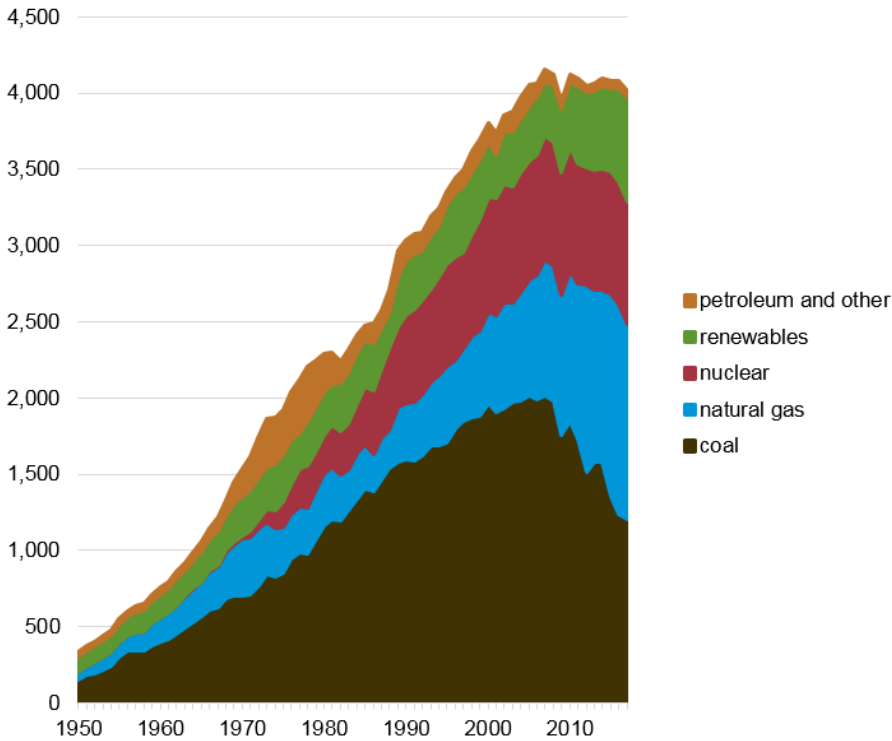
Notes: *on average, no or low overshoot.

 WORLD RESOURCES INSTITUTE

“Limiting warming to 1.5°C is possible. Doing so would require unprecedented changes.” - IPCC Co-Chair

US Electricity Fuel Mix

U.S. electricity generation by major energy source, 1950–2017
billion kilowatthours

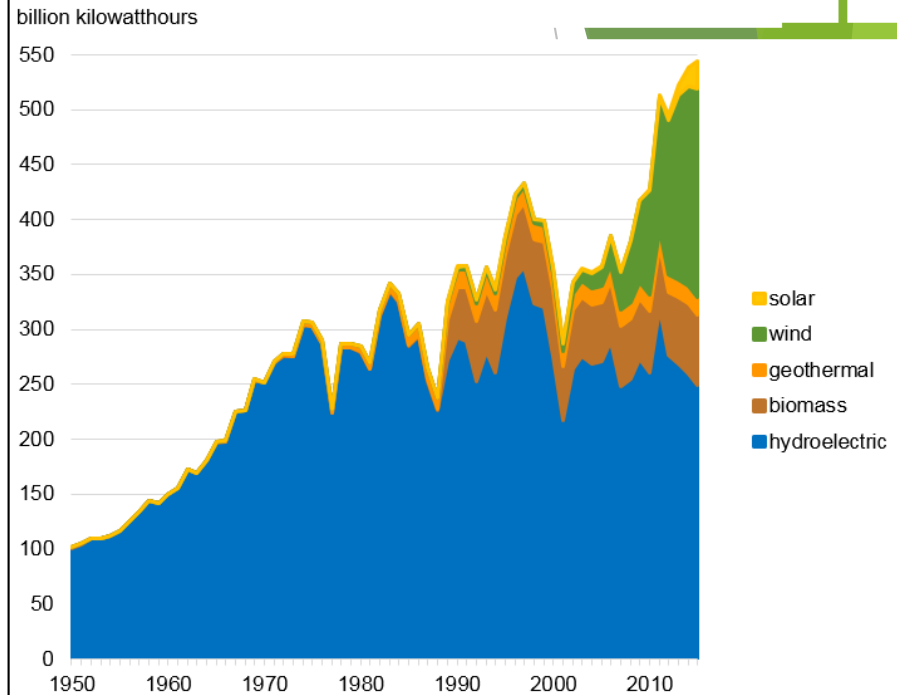


Note: Electricity generation from utility-scale facilities.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 7.2a, March 2018, preliminary data for 2017



U.S. electricity generation from renewable energy sources, 1950–2017
billion kilowatthours

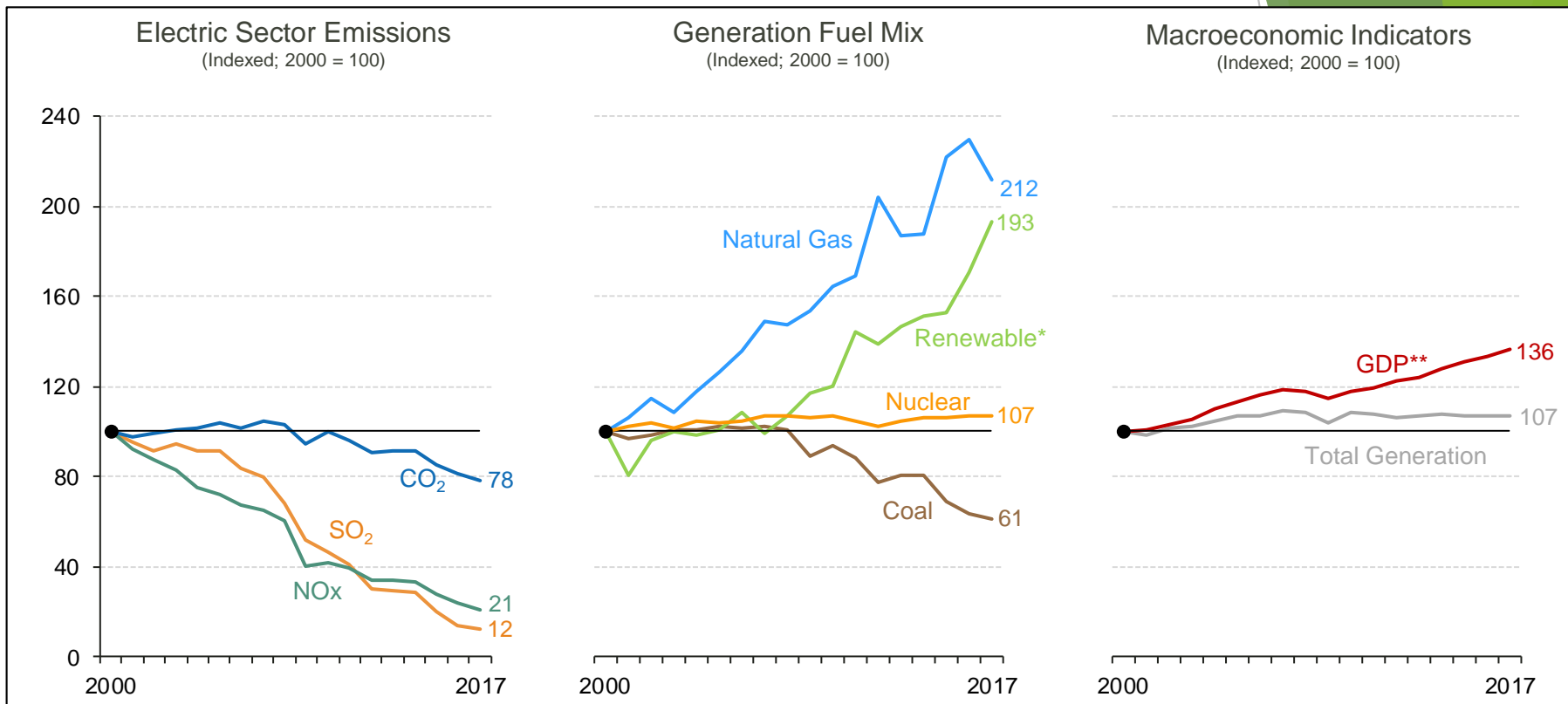


Note: Electricity generation from utility-scale facilities. Hydroelectric is conventional hydropower.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 7.2a, March 2018, preliminary data for 2017



Power Sector Annual Trends

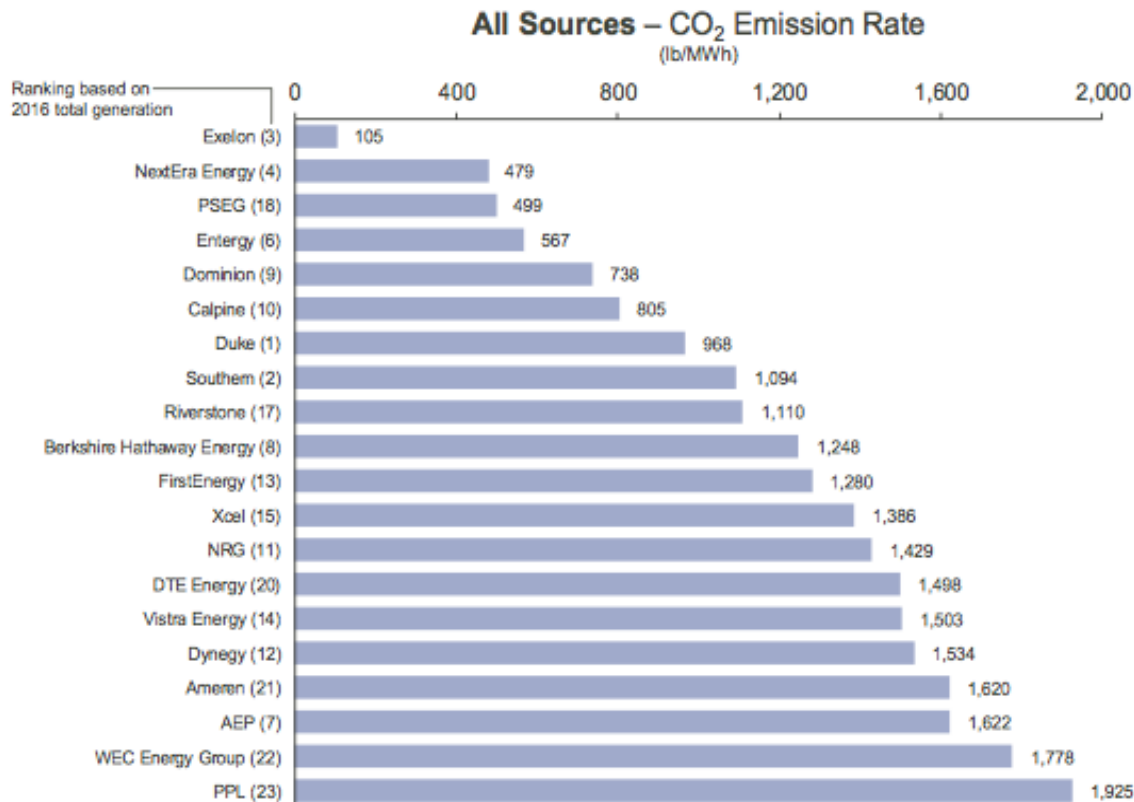


*Includes hydroelectric, wind, solar, biomass, geothermal, and other renewable sources.
 **GDP in chained 2009 dollars.

The electric power sector has made significant progress in terms of reducing its NO_x and SO₂ emissions. From 2000 through 2017, NO_x and SO₂ emission decreased 79 and 88 percent, respectively. From 2005 to 2017, CO₂ emissions decreased 24 percent while GDP grew 20 percent. Over the same period, generation from renewables grew 92 percent.

Benchmarking Air Emissions

Rankings by CO₂ Emission Rate (Top 20 Privately/Investor Owned Power Producers)



Note: "Privately/investor owned" power producers include investor owned, privately held, and foreign owned corporations. This chart does not show public power producers (federal power authorities, state power authorities, municipalities, power districts), or cooperatives.

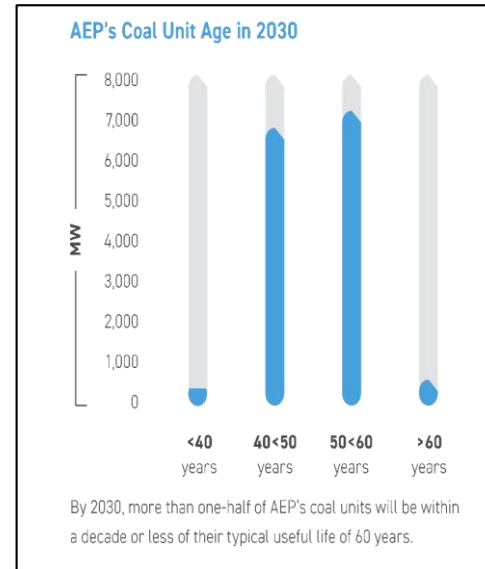
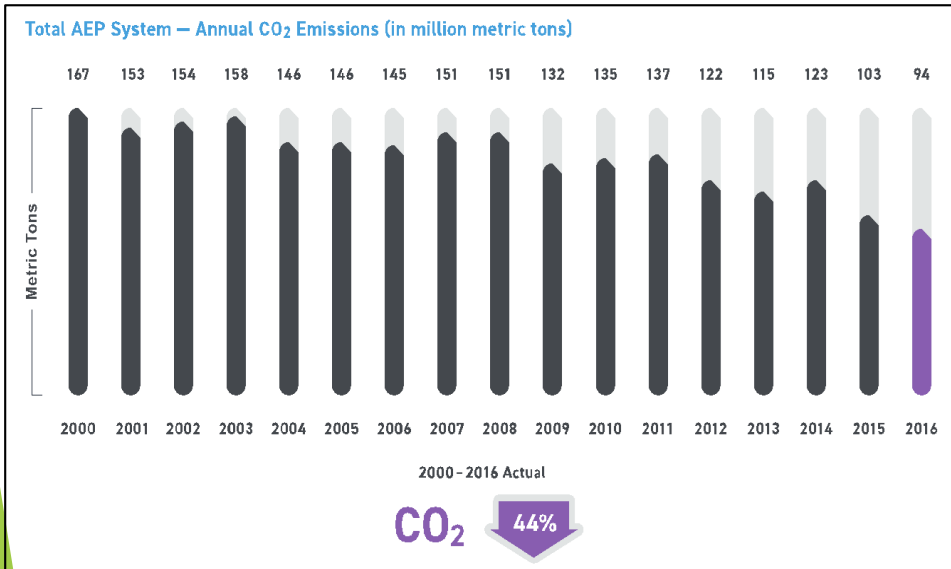
Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States
Full Report at: www.mjbradley.com
JUNE 2018

Power Company Carbon Reduction Commitments

Company	2016 CO ₂ Emissions (MMT)	Interim commitment (2020—2030)	Long-term commitment (2050)	Baseline
Vistra Energy	138.6	None	None	None
American Electric Power	107.9	60% by 2030	80% by 2050	2000
Duke Energy	106.4	40% by 2030	None	2005
Southern Company	102.3	50% by 2030	“Low to no” by 2050	2007
NRG Energy	73.7	50% by 2030	90% by 2050	2014
Dominion Energy	52.0	Carbon intensity 50% by 2030	None	2000
Xcel Energy	51.5	80% by 2030	Net-zero by 2050	2005
NextEra Energy	43.2	Carbon intensity 65% by 2021	None	2001
Evergy, Inc	38.2	43% by 2020	None	2005
Entergy	38.1	Maintain 20% below through 2020	None	2000

Moving AEP to Decarbonize

AEP's new intermediate goal is to **reduce carbon dioxide emissions from AEP generating facilities by 60 percent from 2000 levels by 2030**. In the longer term, AEP anticipates **reducing carbon dioxide emissions from AEP generating facilities by 80 percent from 2000 levels by 2050**.

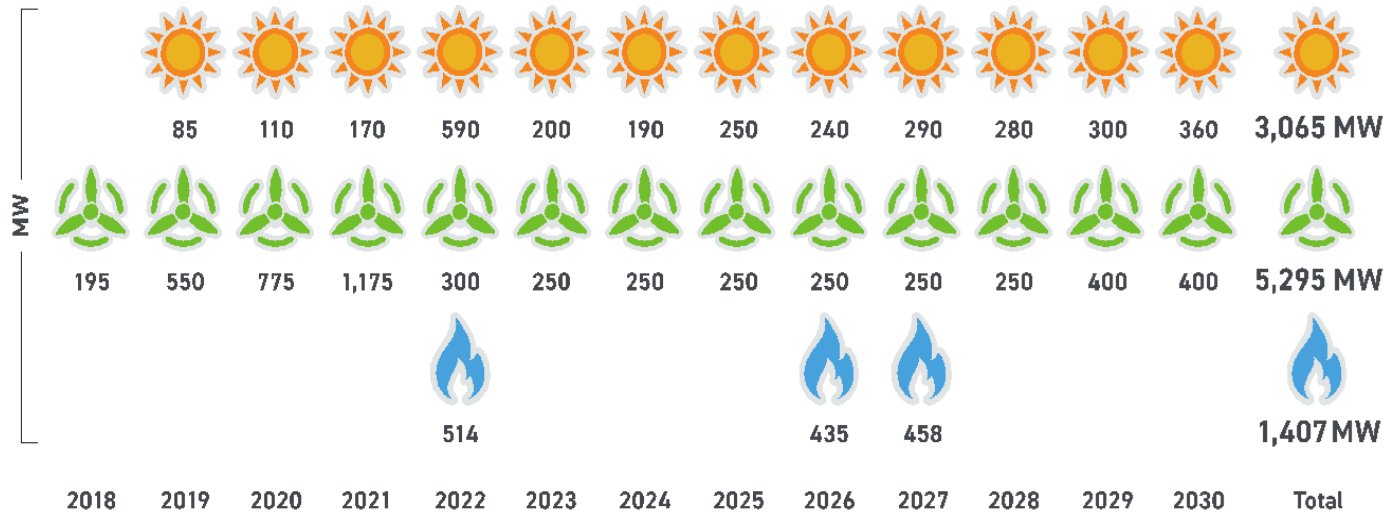


Available at www.AEP2018cleanenergyfuturereport.pdf

AEP's Clean Energy Plan

AEP System Planned Generation Resource Additions

Regulated & AEP Ohio Purchase Power Agreement



Wind and solar represent nameplate MW capacity.

Source: Current Internal Integrated Resource Plans. Excludes impact of Wind Catcher. Reflects PSO's Integrated Resource Plan filed 11/1/17.

Actual additions depend on market conditions, regulatory approval, customer demand and other external factors.

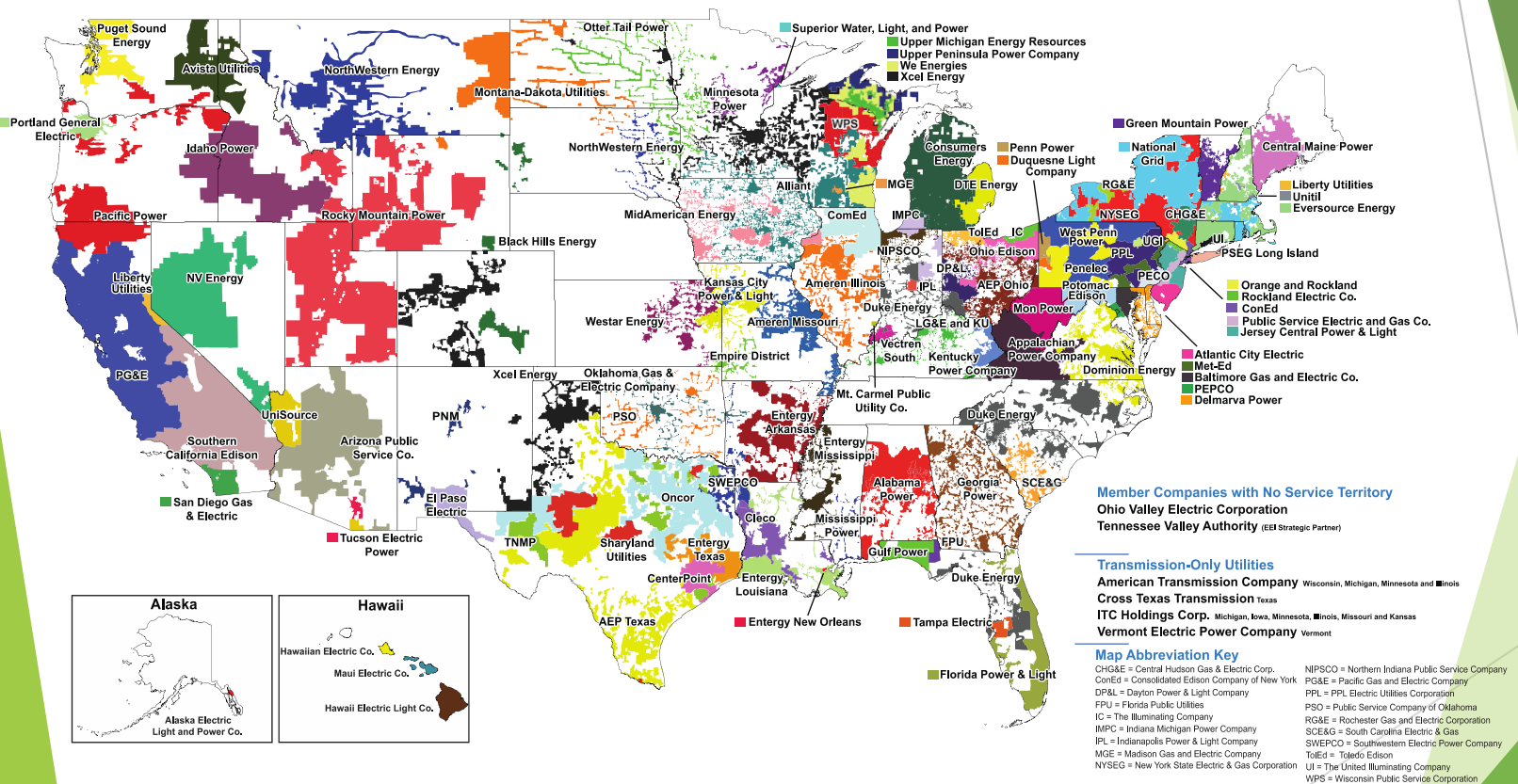
Available at www.AEP2018cleanenergyfuturereport.pdf

Electric Utility Service Territories



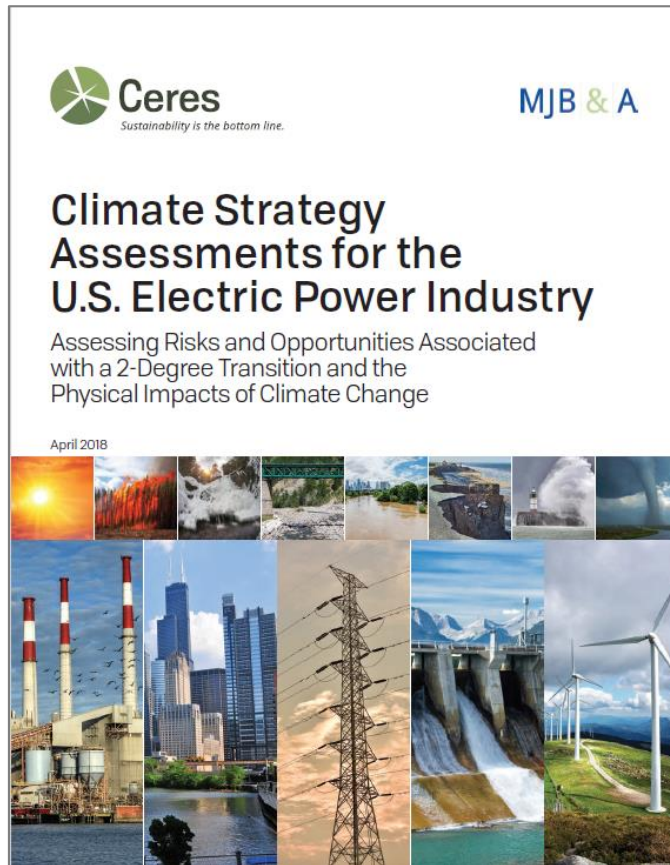
Edison Electric
INSTITUTE

EEI U.S. Member Company Service Territories



Produced by Edison Electric Institute. Data Source: ABB, Velocity Suite. January 2019

Climate Strategy Assessments for the U.S. Electric Power Industry



- ← Guidance for assessing climate change-related risks and opportunities for U.S. electric power industry
- ← Outlines approach companies can use to develop their own climate strategy assessment

<https://www.ceres.org/electric2ds>

Policy Advocacy Matters: Business Support in North Carolina

October 29, 2018

EXECUTIVE ORDER NO. 80

NORTH CAROLINA'S COMMITMENT TO ADDRESS CLIMATE CHANGE AND
TRANSITION TO A CLEAN ENERGY ECONOMY

Investors and Companies Commend Gov. Cooper's Leadership to Boost North Carolina's Clean Energy Economy

"VF Corporation has set a goal to power all owned and operated facilities worldwide with 100 percent renewable energy by 2025. We applaud Gov. Cooper's leadership to ensure North Carolina stays at the forefront of the transition to a clean energy economy."

- Letitia Webster, Vice President, Global Corporate Sustainability, VF Corporation

"Governor Cooper's leadership will help North Carolina and the business community more easily achieve our own clean energy goals..."

- Brad Figel, VP of Government Affairs, Mars, Inc.

Questions?



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Thank You

SeventhGenerationInterfaith.org