NATIONAL GOVERNORS ASSOCIATION

Governors' Advisors Energy Policy Institute

June 24 & July 13-15, 2021

NGA Center for Best Practices

Day 2: Clean Energy and Climate

Tuesday, July 13

NATIONAL GOVERNORS ASSOCIATION

Introduction

1:00-1:05 PM ET

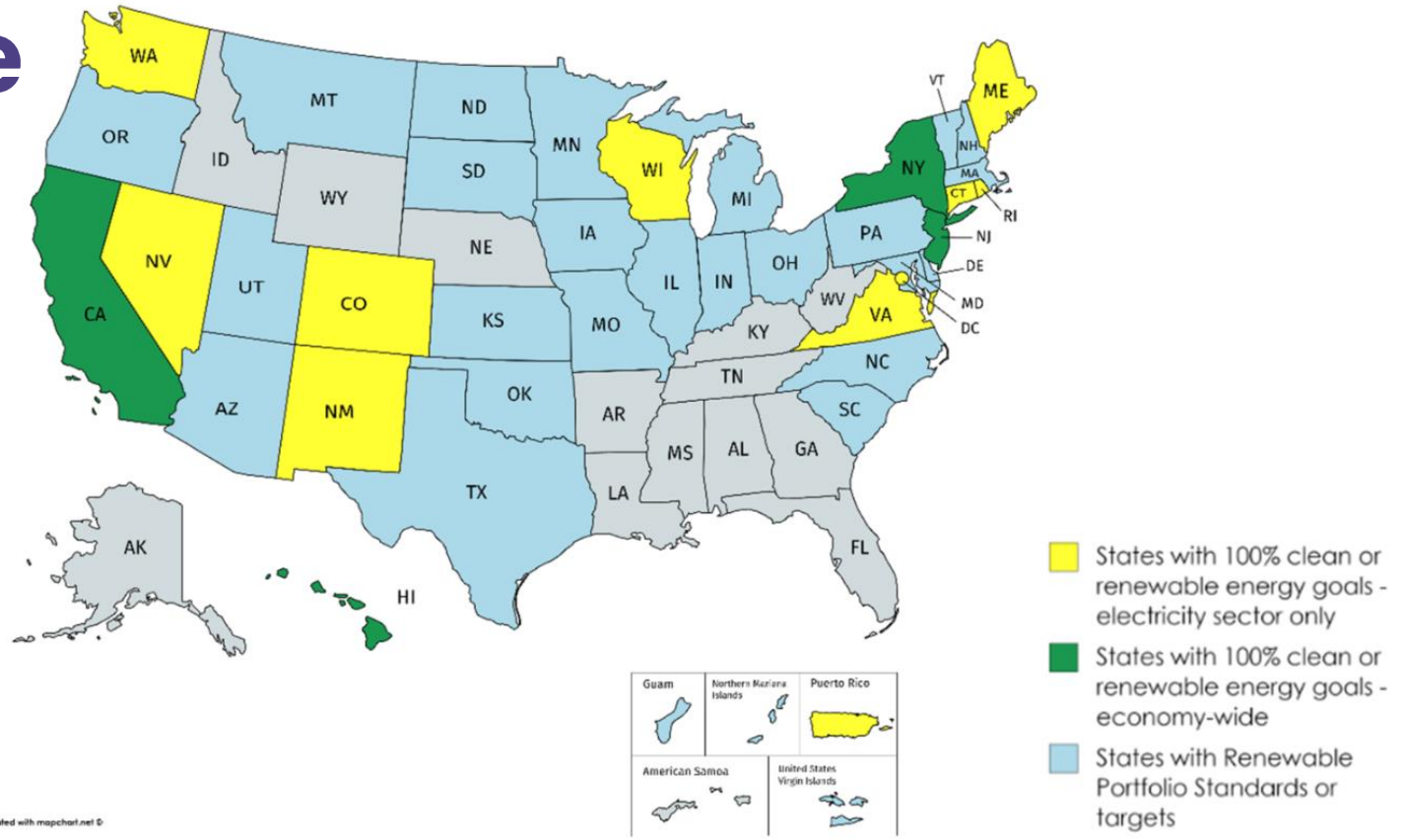
Speaker:
Jessica Rackley, Program Director, Environment & Energy, NGA Center

NATIONAL GOVERNORS ASSOCIATION

Governors Leading on Energy Transitions: An Overview of State Energy Goals

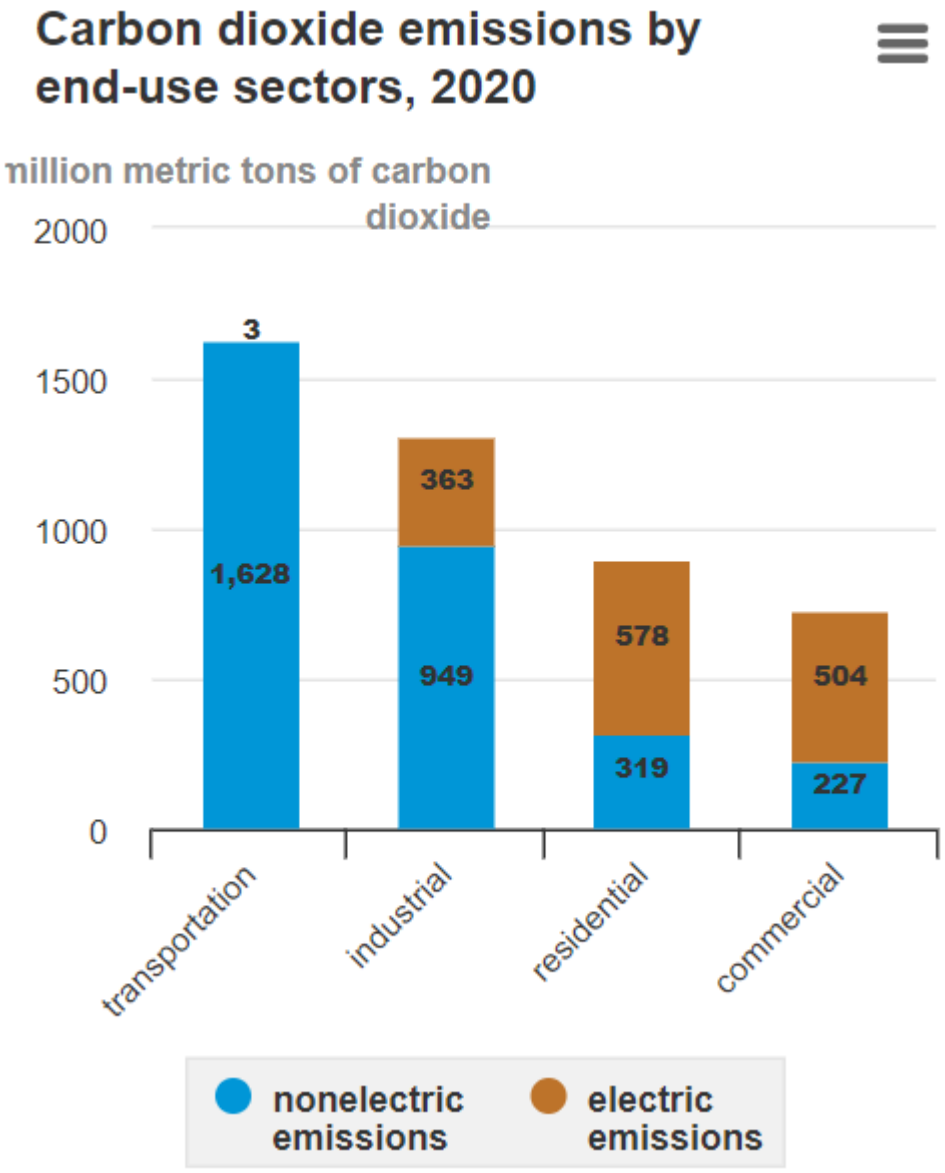
- Enhancing clean energy and storage targets
- Modernizing energy infrastructure
- Rethinking traditional regulatory structures

Report available at:
https://www.nga.org/center/publications/governors-leading-energy-transitions/



Federal Goals

- Carbon pollution-free power sector by 2035
- Net-zero emissions economy by 2050
- 50-52 percent reduction from 2005 levels in economy-wide net greenhouse gas pollution in 2030



Source: EIA, 2021

Advancing Clean Energy to Meet State & Fed. Goals

Key Questions & Challenges

- Decentralized/distributed energy systems (local generation) vs. Buildout of electricity system delivery (transmission & distribution lines)
- Technology role: energy storage; RE, including offshore wind; carbon capture, utilization and storage (CCUS); role of existing and new nuclear generation; alternative fuels such as green hydrogen production
- Costs: what mix of technologies/solutions are the most cost-effective and how does this vary locally and regionally
- Equity concerns: keeping energy affordable and providing nationwide economic opportunities such as clean energy manufacturing jobs
- Timeline: how to quickly meet 2030 and 2050 goals
- How to deliver on these goals with a well-thought out, wholistic strategy

Preview of Today's Agenda

- 1:05 to 1:25 PM – Opening Keynote: Achieving Clean Energy Goals
- 1:25 to 1:45 PM – Financing the Energy Transition
- 1:45 to 2:30 PM – Planning and Policy Strategies to Achieve Near-Term State Goals
- 2:30 to 2:45 PM – Break
- 2:45 to 3:05 PM – Governor Impact: State Case Study
- 3:05 to 3:25 PM – State and International Areas for Collaboration
- 3:25 to 3:30 PM – Closing Remarks

Opening Keynote: *Achieving Clean Energy Goals*

Speaker:
Emily Wimberger, Climate Economist, Rhodium Group

Moderator:
Matt Rogotzke, Policy Analyst, NGA Center

1:05-1:25 PM ET

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Rhodium Group

Achieving Clean Energy Goals

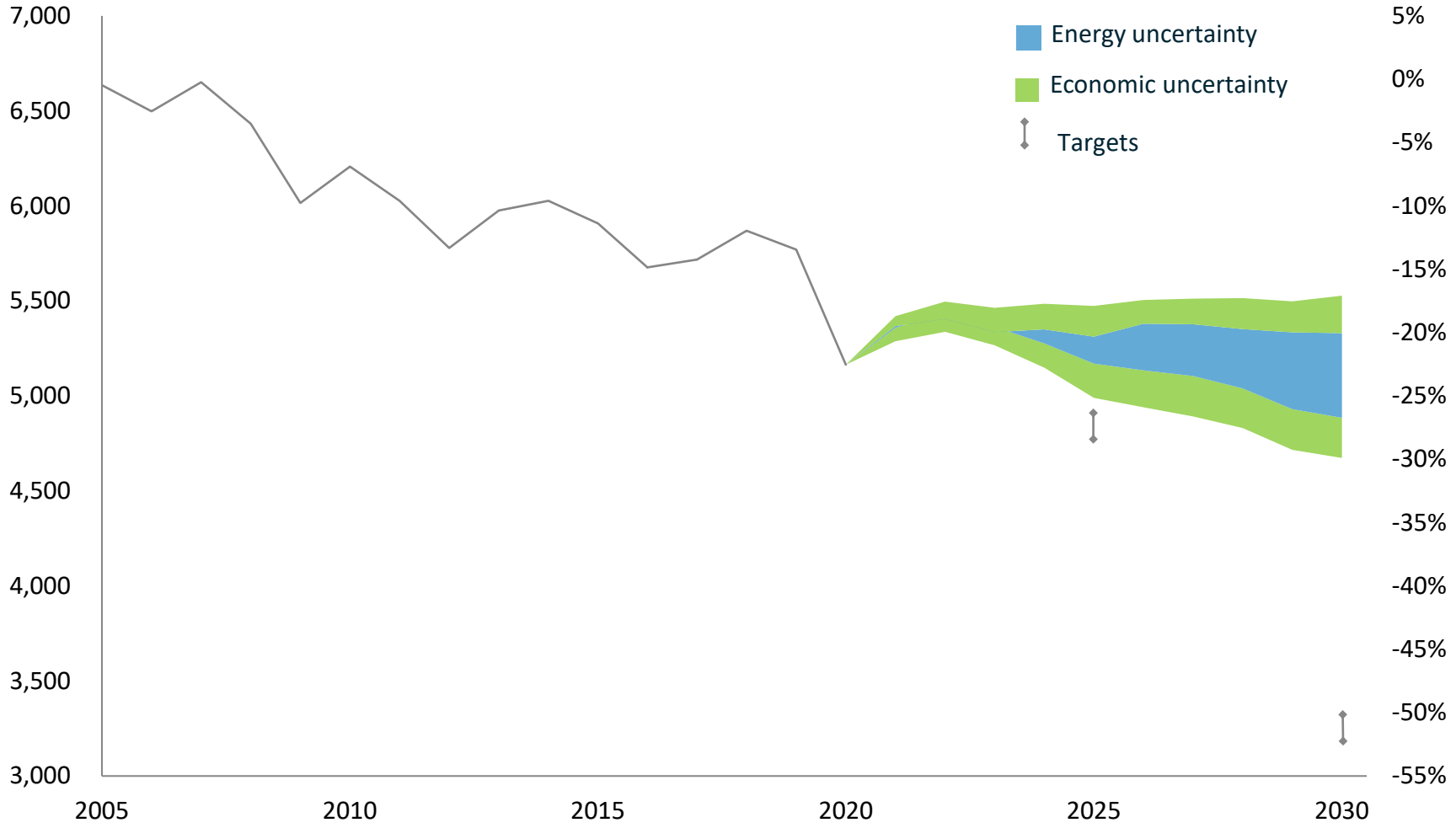
The Role of States in Amplifying Federal Climate Policy

NGA GOVERNORS' ADVISORS ENERGY POLICY INSTITUTE | JULY 12, 2021

Emily Wimberger
Climate Economist
ewimberger@rhg.com

US GHG emissions under current policy with uncertainty

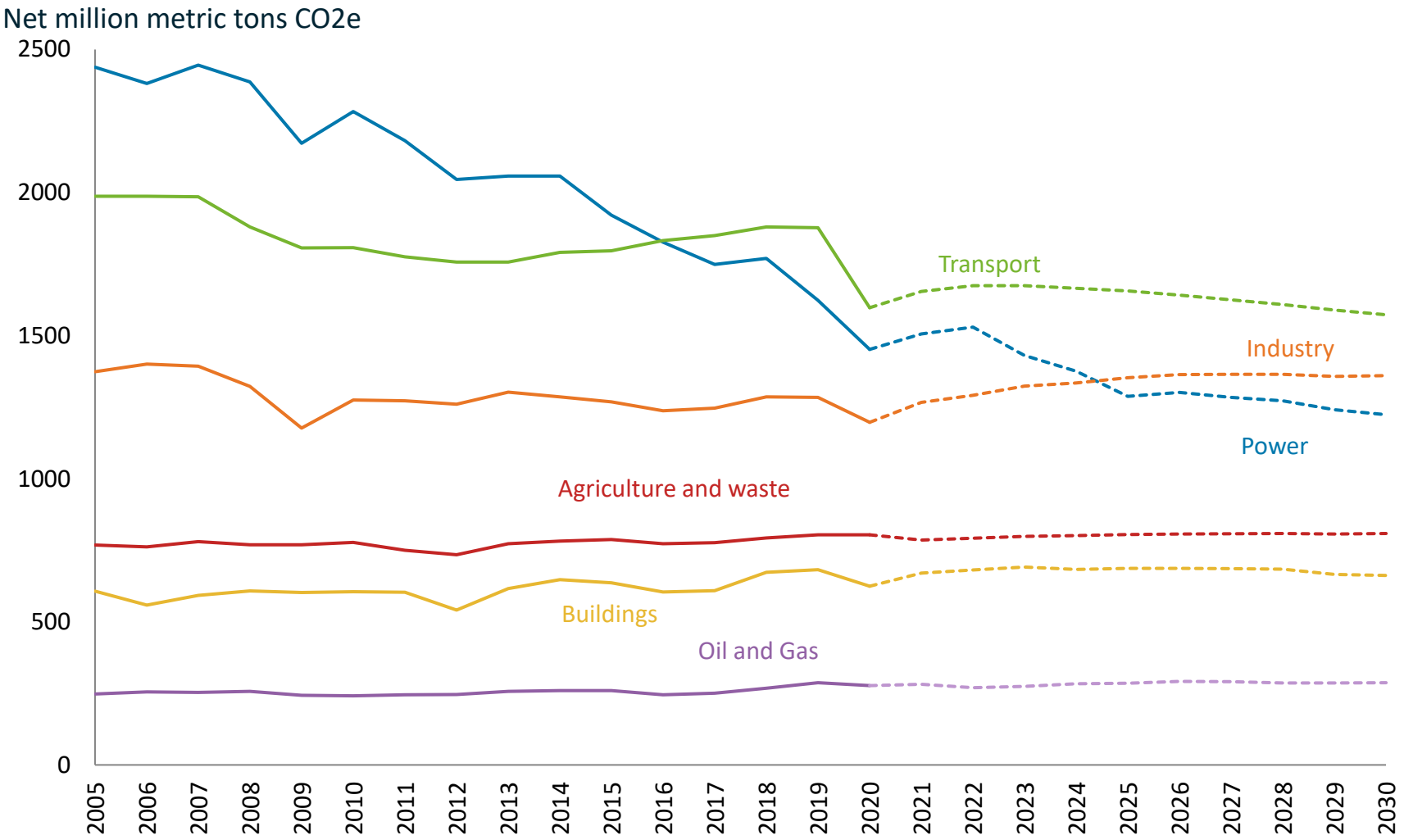
Net million metric tons CO2e (left), percent change from 2005 (right)



Source: Rhodium Group. Targets represent US GHG emission reduction commitments, including the 2015 Paris Agreement pledge to reduce economy-wide US emissions by 26-28% below 2005 levels by 2025, and the updated commitment made in April 2021 to achieve a 50-52% reduction below 2005 levels by 2030.

The power sector remains a leading source of GHG emissions

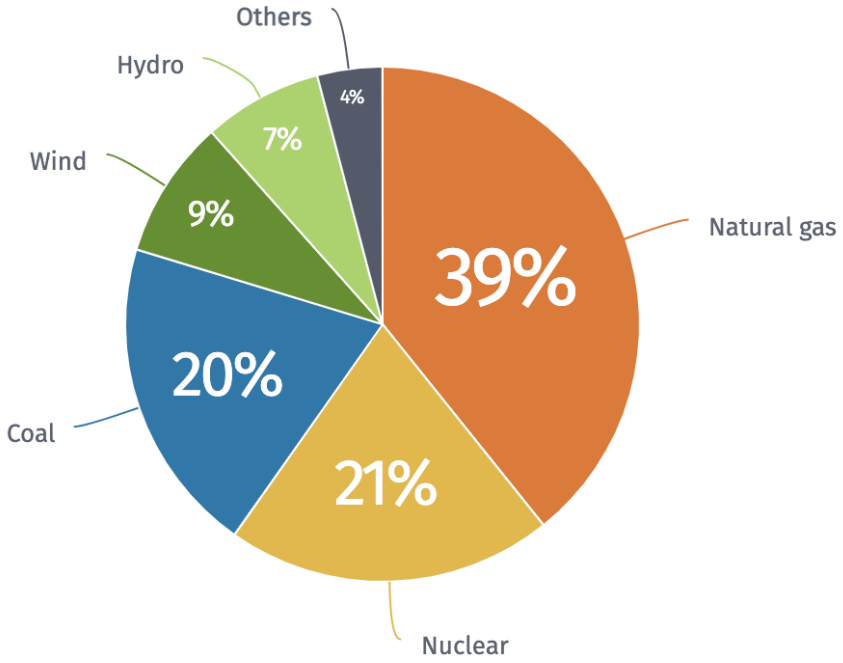
US Emissions by Sector, 2005-2030



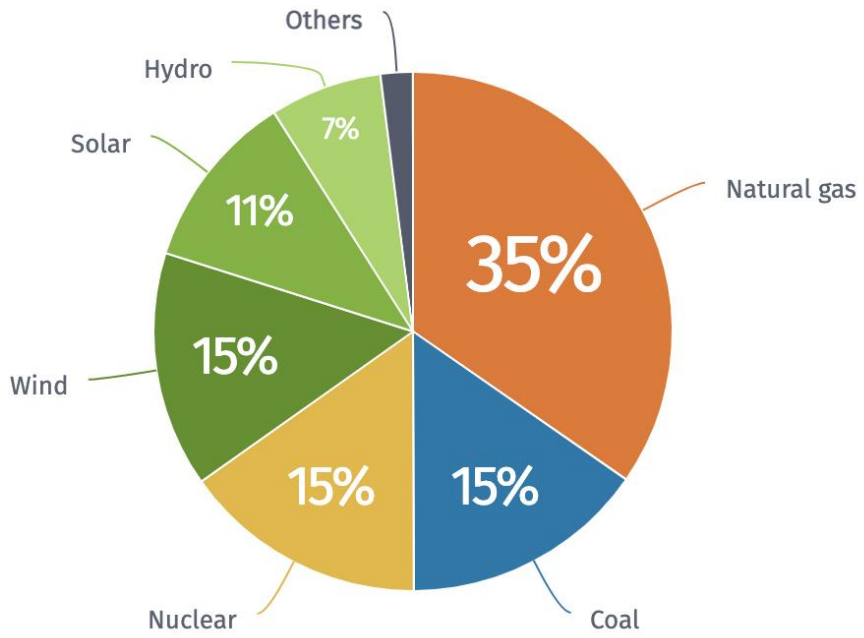
Source: Rhodium Group

US power generation in 2020 and 2030

Electric power sector generation 2020



Projected electric power sector generation 2030



Source: Rhodium Group

Power sector takeaways

- US power sector emissions dropped 40% from 2005 to 2020
- US power sector emissions increase slightly over the next few years as the US recovers from COVID-19 but then continue to decline through 2025
- Wind and solar generation increase through 2030 but natural gas remains the dominant energy source
- Decarbonizing the power sector can amplify GHG reductions in transportation, buildings, and industry as these sectors electrify

Power sector policies to achieve clean energy goals

Federal Policy

- Renewable energy tax incentives
- Tax credit for carbon dioxide sequestration (45Q)
- Judicial vacation of the Affordable Clean Energy (ACE) rule
- Cross-State Air Pollution Rules (CSAPR)
- Mercury and Toxics Standards (MATS)
- New Source Review (NSR)

State Policy

- Renewable Portfolio Standard (RPS)
- Clean Energy Standard (CES)
- Nuclear Zero Emission Credit (ZEC) programs
- Carbon pricing
- Energy storage mandates
- Offshore wind mandates

The role of states in clean energy policy

- Existing state regulatory framework can expedite GHG reductions
- State policy can leverage federal incentives to amplify GHG reductions
- State policy can provide framework for sub-national coordination
- State policy can provide a framework for future federal climate action
- State policy can reduce emissions given federal policy uncertainty

Achieving Clean Energy Goals

The Role of States in Amplifying Federal Climate Policy

NGA GOVERNORS' ADVISORS ENERGY POLICY INSTITUTE | JULY 12, 2021

NEW YORK | CALIFORNIA | HONG KONG | PARIS
TEL: +1 212-532-1157 | FAX: +1 212-532-1162
www.rhg.com

Rhodium Group

Financing the Energy Transition

Speaker:
Karen Fang, Head of Global Sustainable Finance, Bank of America

Moderator:
Jessica Rackley, Program Director, Environment & Energy, NGA Center

1:25-1:45 PM ET

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Planning and Policy Strategies to Achieve Near-Term State Goals

Speakers:

Reice Haase, Senior Policy Advisor, Office of North Dakota Governor Doug Burgum

Marcia Burkey, CFO, TerraPower

Brian Ross, Vice President, Renewable Energy, Great Plains Institute

Moderator:

Jessica Rackley, Program Director, NGA Center

1:45-2:30 PM ET

NATIONAL GOVERNORS ASSOCIATION

NORTH DAKOTA'S PATH TOWARD CARBON NEUTRALITY

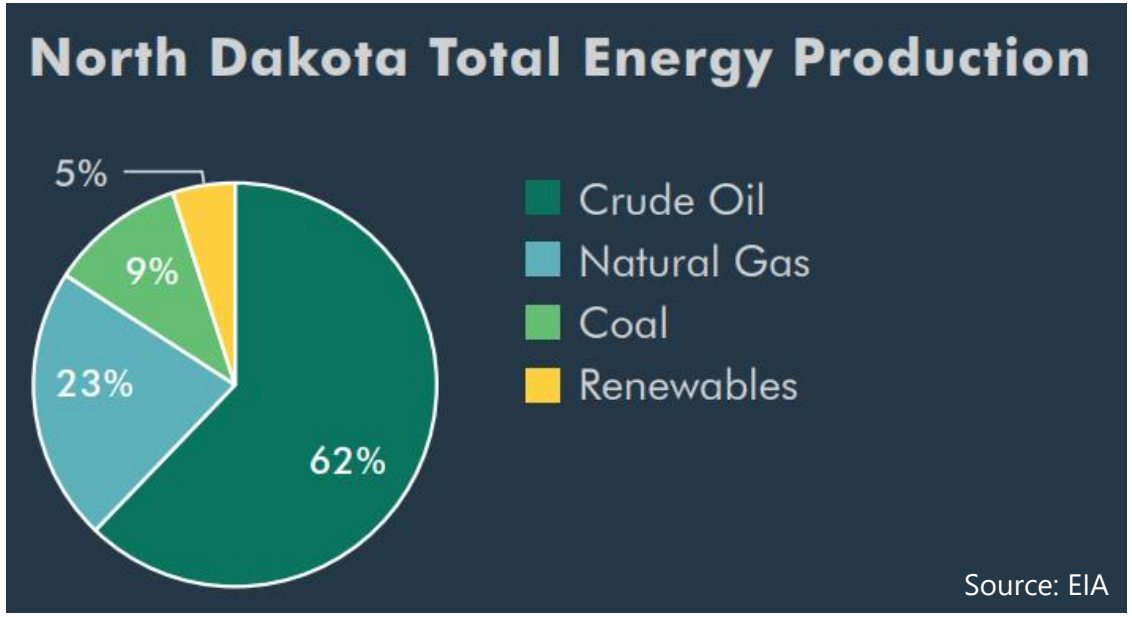
NGA Energy Policy Institute

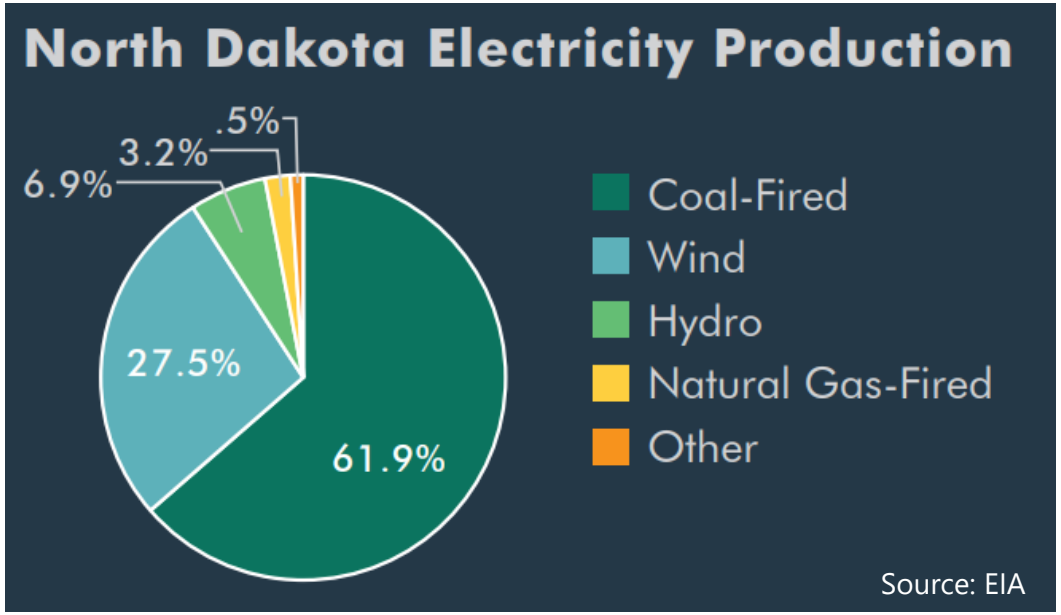
July 13, 2021

NORTH Dakota

Be Legendary.™

NORTH DAKOTA'S ALL-OF-THE-ABOVE ENERGY POLICY SUPPORTS A RESILIENT, DIVERSE PORTFOLIO





POLICY GOAL: NORTH DAKOTA CARBON NEUTRAL BY 2030

Gov. Doug Burgum calls for North Dakota to be carbon neutral by 2030

Speaking before hundreds of oil industry operators and executives, the Republican governor advocated for a path to retain the core place of the state's fossil fuel industries while dramatically reducing their carbon footprint.

Written By: Adam Willis | 6:30 pm, May 12, 2021

North Dakota governor believes state could one day be net carbon negative, sets goal for neutrality by 2030

By Renée Jean rjean@willistonherald.com May 13, 2021 Updated Jun 22, 2021

A Carbon-Neutral North Dakota

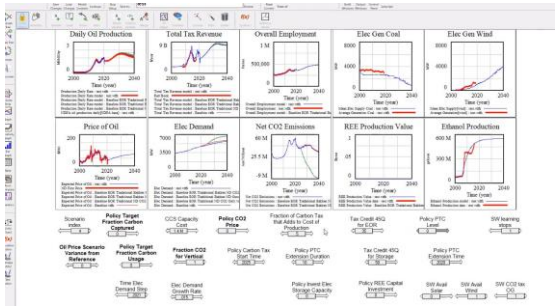
North Dakota Governor Doug Burgum has set a goal to make the nation's second largest oil-producing state carbon-neutral by 2030.

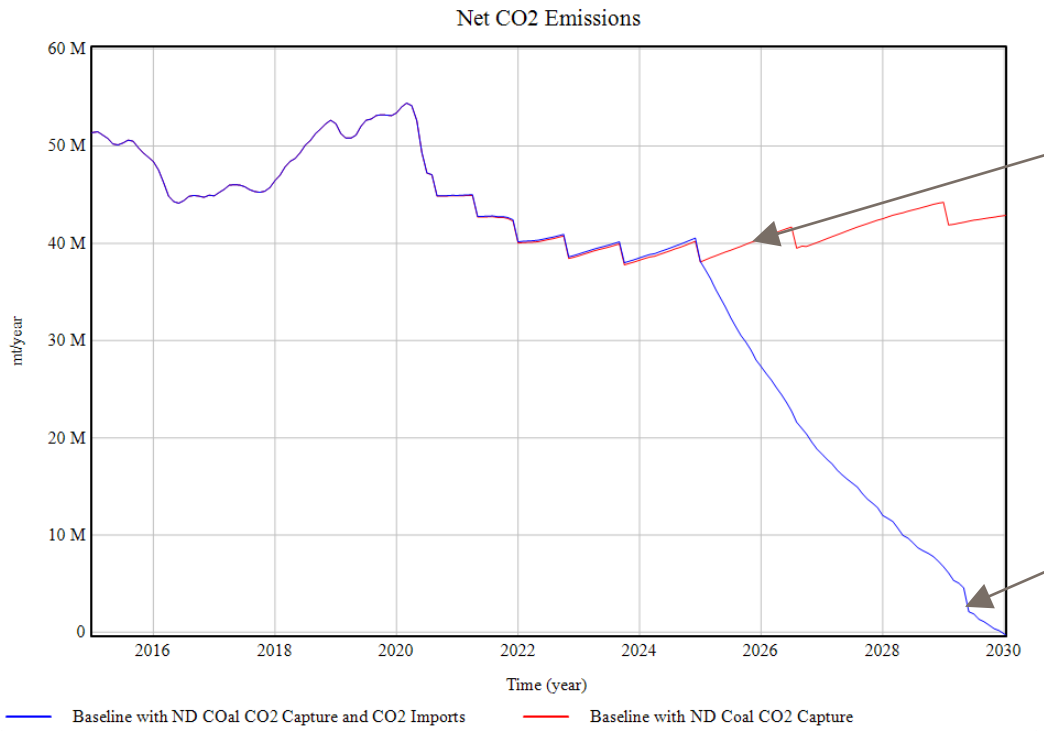
By **ESG Review Staff** - May 19, 2021

North Dakota Carbon Neutral by 2030 through a Just Transition

07 June 2021 | Christine Chow

PATH TO CARBON NEUTRALITY THROUGH INNOVATION, NOT REGULATION





CO_2 Emission Reduction from Coal CO_2 Capture

CO_2 Emission Reduction from Storage/Use of CO_2 Imports

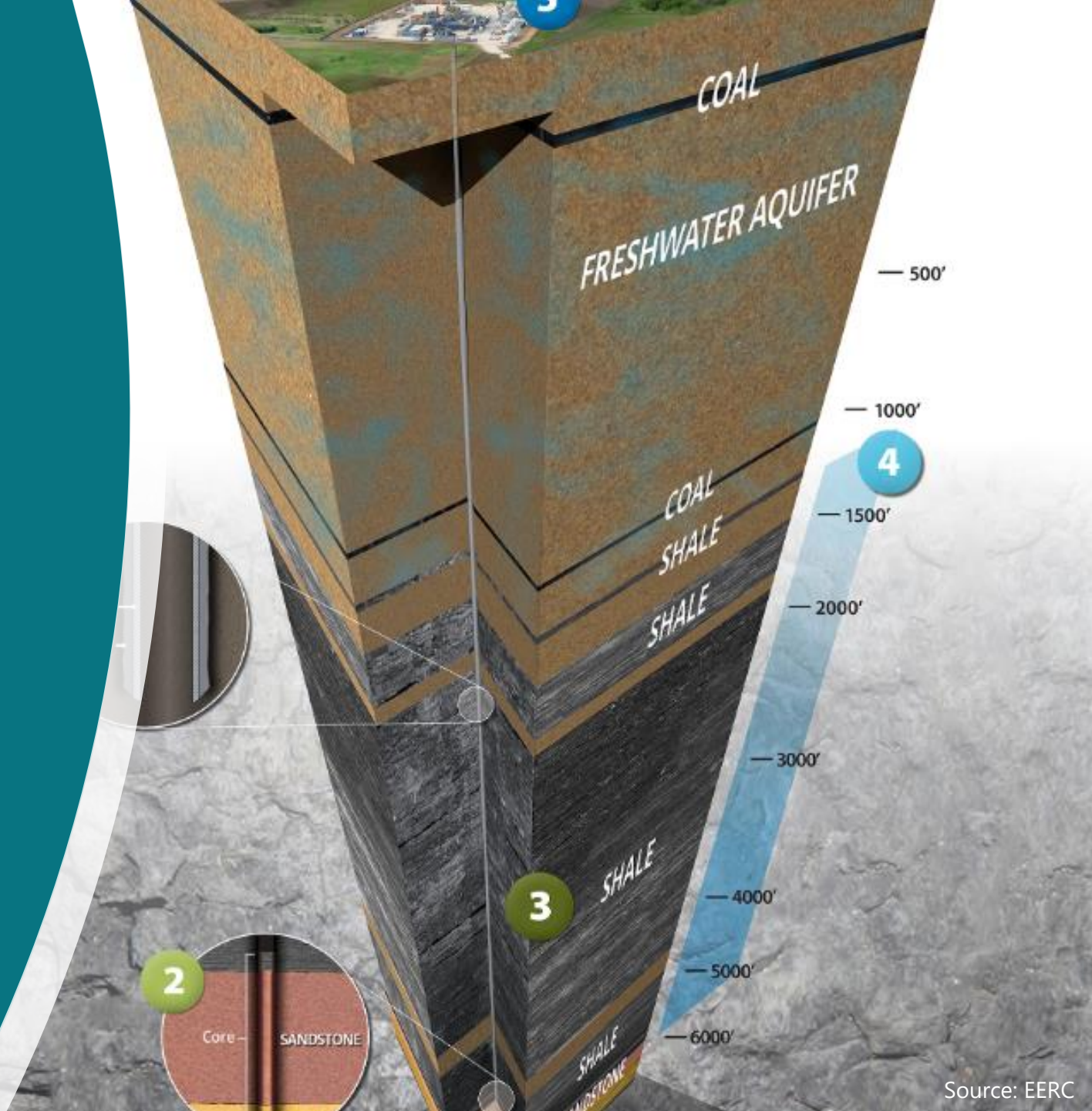
Source: ND EERC Energy System Dynamics Model – Version 2.0.2 (Beta CO2 Emissions Module) - Baseline Conditions

ROADMAP TO CARBON NEUTRALITY

- Subsurface Sequestration
- Markets for Reuse
- Diversify Generation
- Leverage Agriculture Utilization

CARBON SEQUESTRATION

- "Geologic Jackpot": Up to 252 billion tons of storage capacity
  - Over 4,400 years of total ND production
  - Over 50 years of entire US production
- First State with Class VI primacy
  - First Class VI wells permitting this summer
- After 10 years post-injection, State takes permanent liability
  - Per ton fee for Carbon Dioxide Storage Facility Trust Fund
- Interest from surrounding states to sequester their CO2



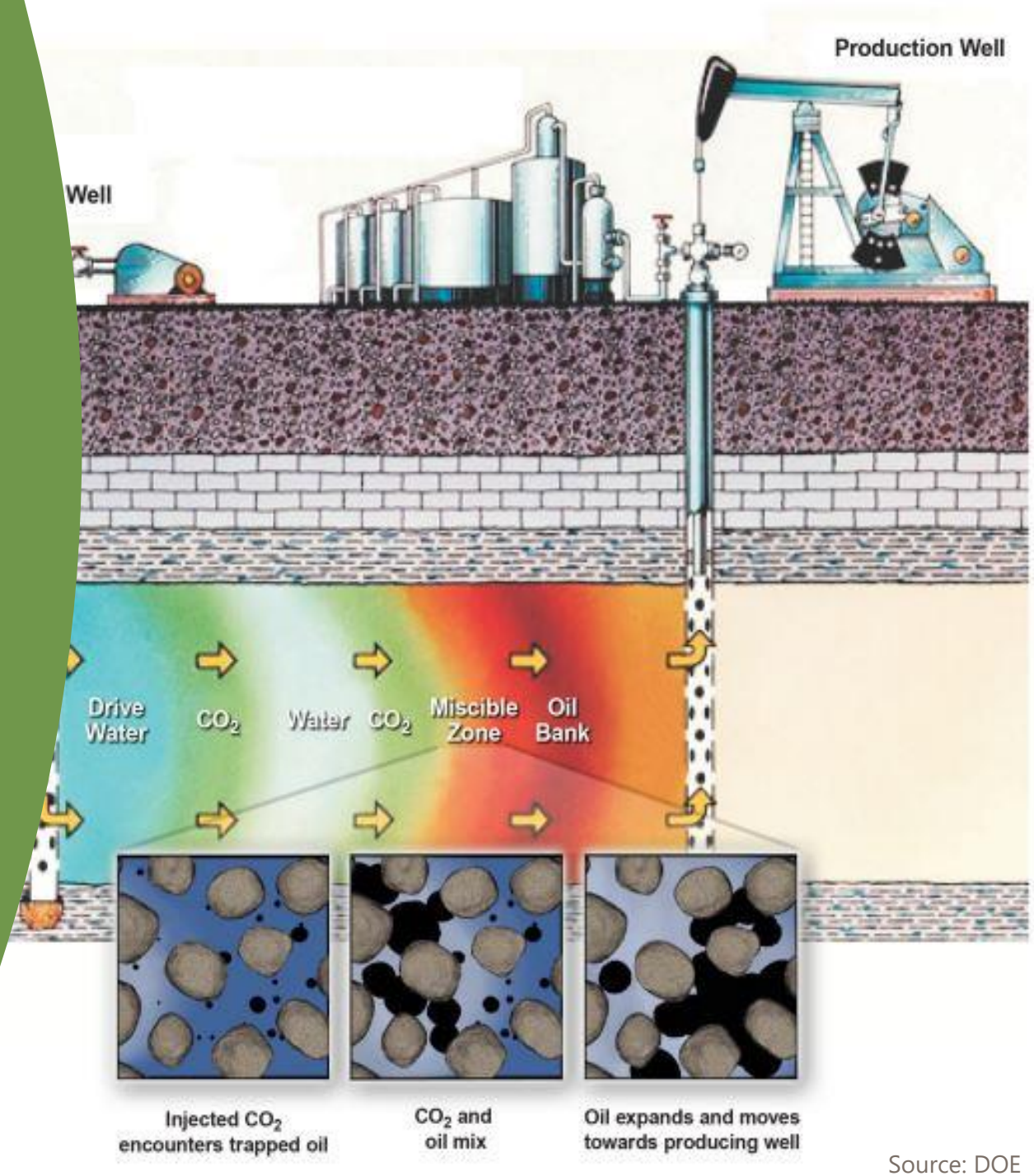
Source: EERC

INVESTMENTS IN SEQUESTRATION

- Reinvesting production and extraction taxes:
  - Lignite Research Fund ($0.10/ton up to $7.5 m)
  - Oil and Gas Research Fund (2% up to $10 m)
  - Renewable Energy Fund (20.5% up to $3 m)
- Clean Sustainable Energy Fund
  - Develop and commercialize low emissions technologies
  - $25 million in grants
  - $250 million Line-of-Credit
- CCUS sales and use tax exemption
- Allow utility rate recovery for CCUS costs

MARKETS FOR CO_2 REUSE

- Co-located greenhouses
- Enhanced oil recovery
  - Produce 8+ billion barrels from depleted fields
  - Need to import 10x ND's annual CO_2 production
  - Net carbon-negative barrel of oil
  - Incremental oil exempt from extraction tax
  - Advocating for equal 45Q federal tax treatment
- Manufacturing
  - Graphene dots
  - Carbon-negative plastics



Source: DOE

DIVERSIFYING ENERGY PORTFOLIO

- Blue hydrogen production
  - Using lignite and natural gas as feedstock
  - Carbon captured for reuse or sequestration
- Green hydrogen production
  - Electrolysis using water and renewable power
- Underground Salt Cavern Storage
  - Could be paired with intermittent sources to firm capacity
  - $9.5 m grant from State for feasibility study
- Opportunities for Agriculture
  - Market for ammonia, fermentation byproduct
  - Nitrogen source for fertilizer

North Dakota could be largest, lowest cost producer of blue hydrogen in North America

By Renée Jean rjean@willistonherald.com Jun 2, 2021 Updated Jun 2, 2021

LEVERAGING AG/ENERGY SYNERGIES

- Co-located Ethanol/Power Generation Plants
  - Using waste steam
  - Sharing carbon capture system
- Renewable Diesel
  - Using soybean oil as feedstock
  - Renewable power source
- Agriculture Best Practices
  - Mandan, ND USDA Research Center, over 100 years
  - Mimicking historic bison migration with grazing practices
  - Increase carbon sink with healthy native grasses
  - No-till farming with crop diversity
  - Cover cropping


NORTH
Dakota
Be Legendary.

U.S. Advanced Reactor Development: The Time for Demonstration is Now

Marcia Burkey, Executive Vice President and Chief Financial Officer
TerraPower, LLC

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Getting to Zero

Nuclear fission: “It’s the only carbon-free energy source that can reliably deliver power day and night, through every season, almost anywhere on earth, that has been proven to work on a large scale.”

Bill Gates in “How to Avoid a Climate Disaster: The Solutions We Have and the Breakthroughs We Need”

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TerraPower

U.S. Commitment to Advanced Reactor Demonstration

- Renewing U.S. leadership in nuclear energy and climate
- Unlocking U.S. national labs' and nuclear technology companies' innovations
- Building on U.S. history of demonstration success

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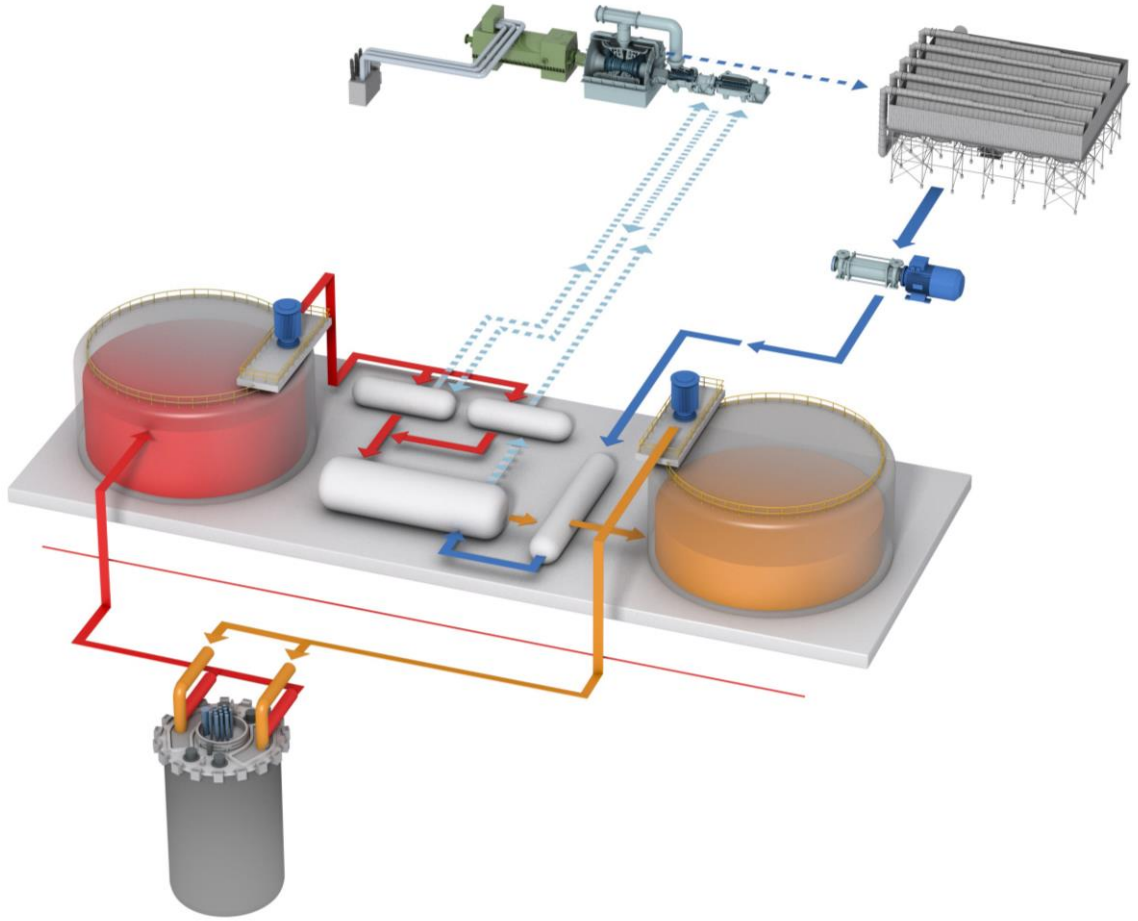
TerraPower

Natrium™ Technology: Flexible, Clean Energy

- Developed through close collaboration between TerraPower and GE Hitachi
- Builds on technology development at TerraPower and GE Hitachi and concentrated solar power technologies with a focus on cost competitiveness
- Integrates on and fortifies grids with high renewables penetrations
- 345 MWe reactor that can flex to 500 MWe for 5.5 hours when needed



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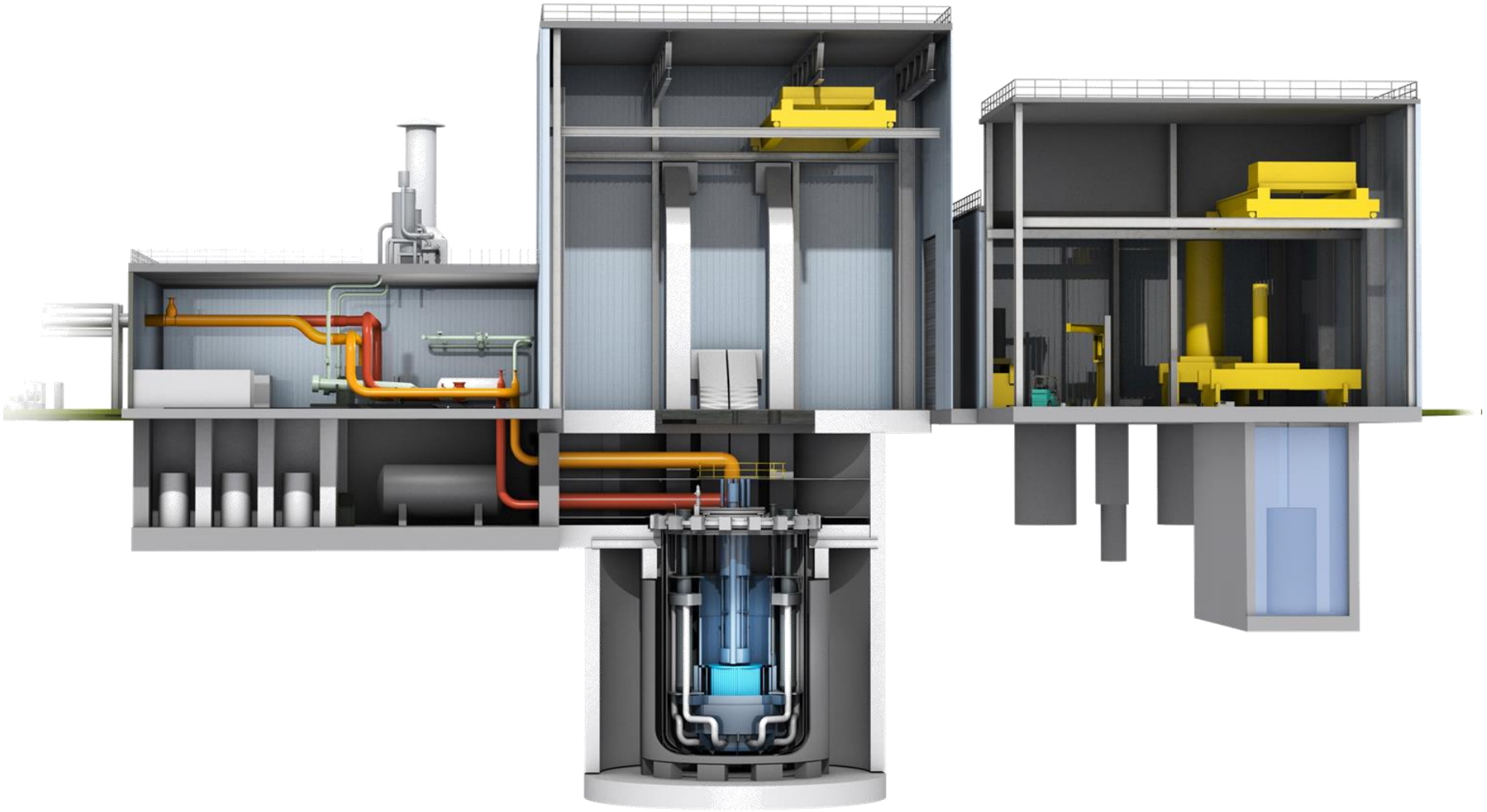
TerraPower

Natrium™ Technology: Reactor Building



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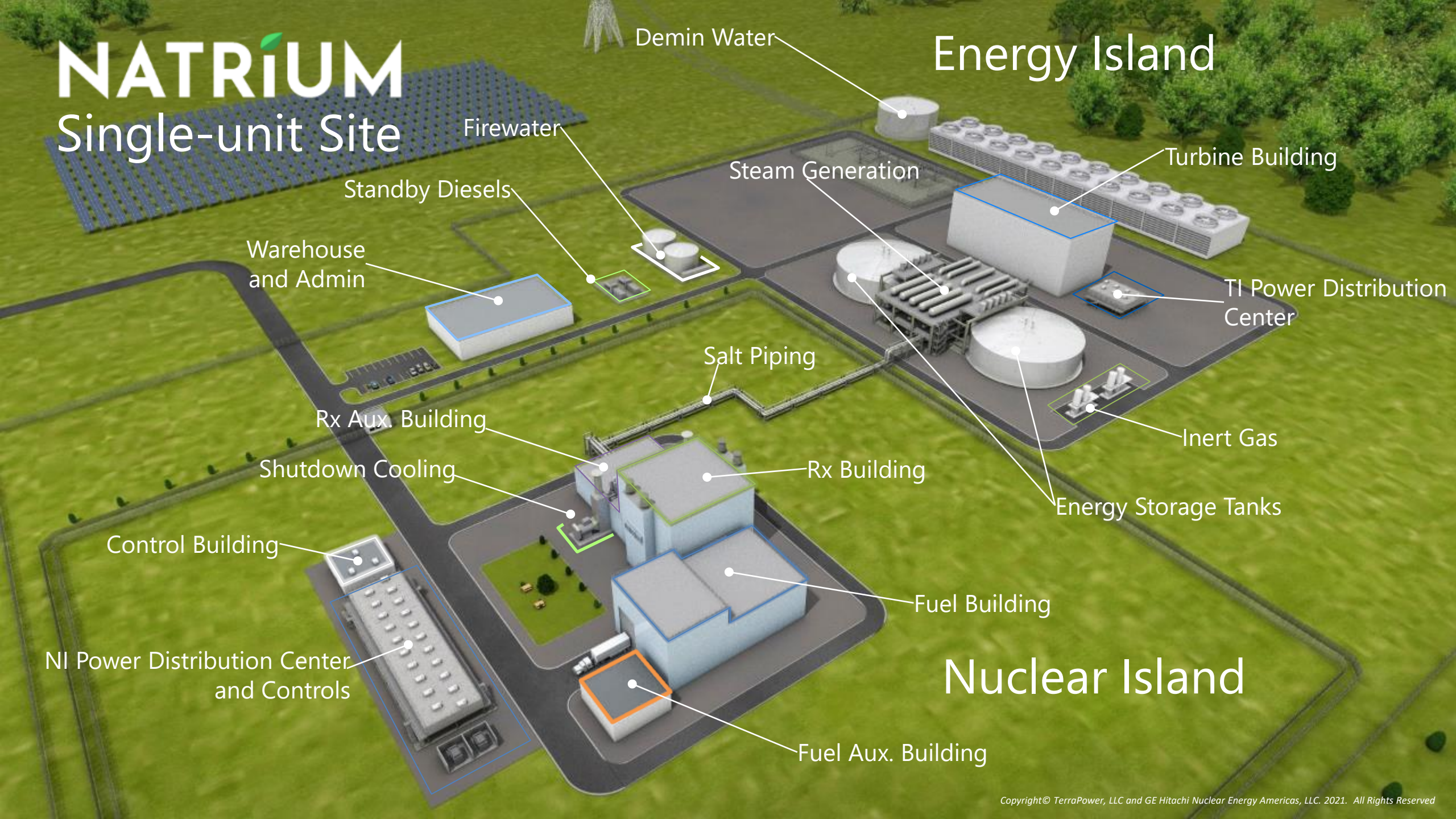

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An Expert Team with Unparalleled Expertise

TerraPower, LLC	Overall plant design, testing, licensing, design integration, procurement and project leadership and administration
GE Hitachi Nuclear Energy Americas, LLC	Plant design, testing, licensing and procurement
Bechtel Power Corporation	Plant design, licensing, procurement and construction
Energy Northwest	Operations programs, commissioning and start-up
Duke Energy Carolinas, LLC	Licensing, operations and engineering support
PacifiCorp, a subsidiary of Berkshire Hathaway Energy	Eventual plant owner and energy sales and integrated resource planning support

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An Expert Team with Unparalleled Expertise continued

Global Nuclear Fuels Americas, LLC	Fuel fabrication
American Centrifuge Operating, LLC (Centrus Energy Corporation)	HALEU supply
Orano Federal Services, LLC	System design and decommissioning support
Battelle Energy Alliance, LLC (Idaho National Laboratory)	Fuel qualification testing
Argonne National Laboratory	Methods development and digital twin support
Los Alamos National Laboratory	Fuel characterization
Oak Ridge National Laboratory	Neutron irradiation testing
Pacific Northwest National Laboratory	Mechanical testing of materials
Oregon State University	Thermal hydraulic V&V testing support
University of Wisconsin	Heat exchanger testing support
North Carolina State University	Support on digital engineering for building/facility construction management

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U.S. Advanced Reactor Development: The Time for Demonstration is Now

Marcia Burkey, Executive Vice President and Chief Financial Officer
TerraPower, LLC

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Solar Siting Best Practices

National Governors Association

Governors' Advisors Energy Policy Institute

July 13, 2021

Brian Ross, AICP, LEED GA

Great Plains Institute

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TRANSFORMING THE ENERGY SYSTEM TO BENEFIT THE ECONOMY AND ENVIRONMENT.

- INCREASE ENERGY EFFICIENCY AND PRODUCTIVITY
- DECARBONIZE ELECTRICITY PRODUCTION
- ELECTRIFY THE ECONOMY AND ADOPT ZERO- AND LOW-CARBON FUELS
- CAPTURE CARBON FOR BENEFICIAL USE AND PERMANENT STORAGE

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If you remember one slide …

1. In the energy system of the future**, nearly everyone will be a host community.**
2. **Most communities have at least some land use jurisdiction over large-scale solar.**
3. **If sited and designed appropriately,** large-scale solar can provide local benefits to host communities - **consistent with community priorities, resources, and development plans.**

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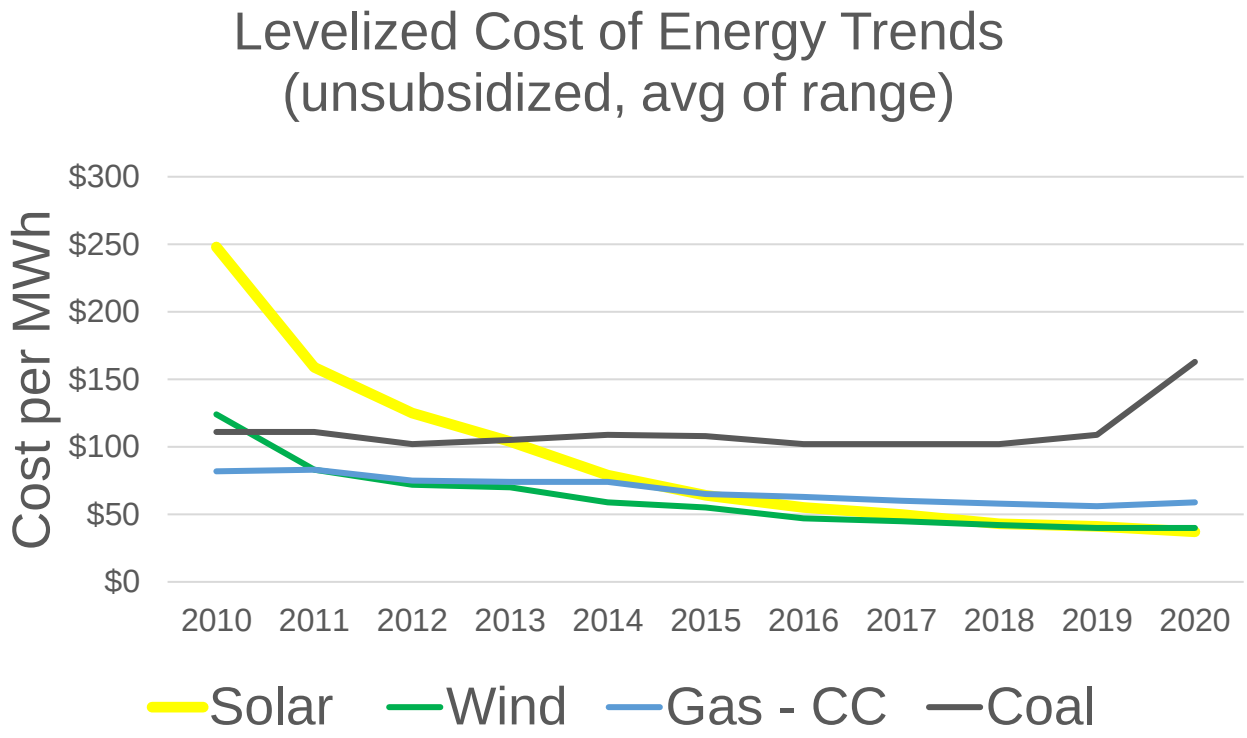
Photo credit: Brian Ross

Why? Cost…

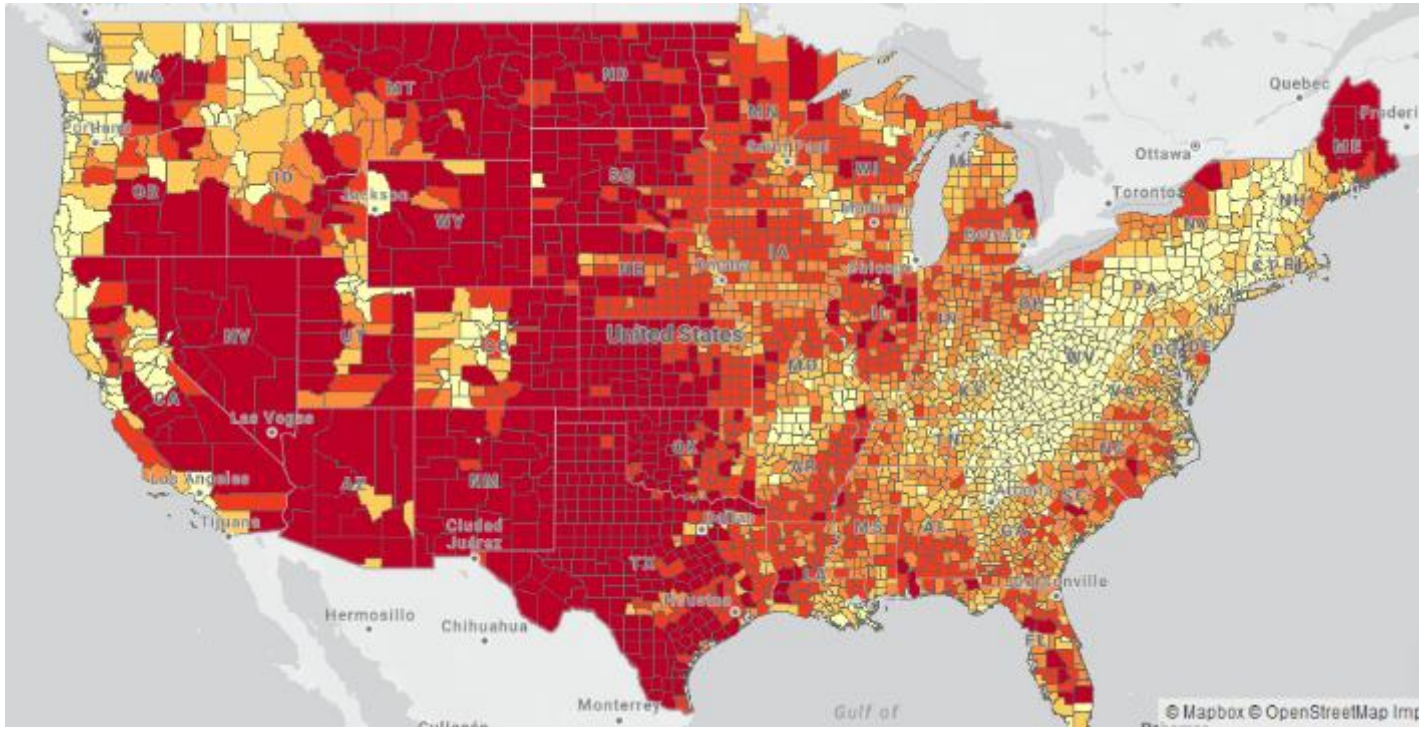
1. Solar energy electric generation is already lower cost than fossil fuel generation.
2. With on-going cost decreases, solar energy is expected to be the cheapest form of wholesale electric energy generation, of any type, within the next couple of years.



Why? Resources…

1. Solar resources that can be economically developed can be found in every jurisdiction in the U.S.
2. Every county and city will have property owners who will want to develop the valuable economic resources on their property.

Modeled Annual Technical Generation Potential - Utility PV

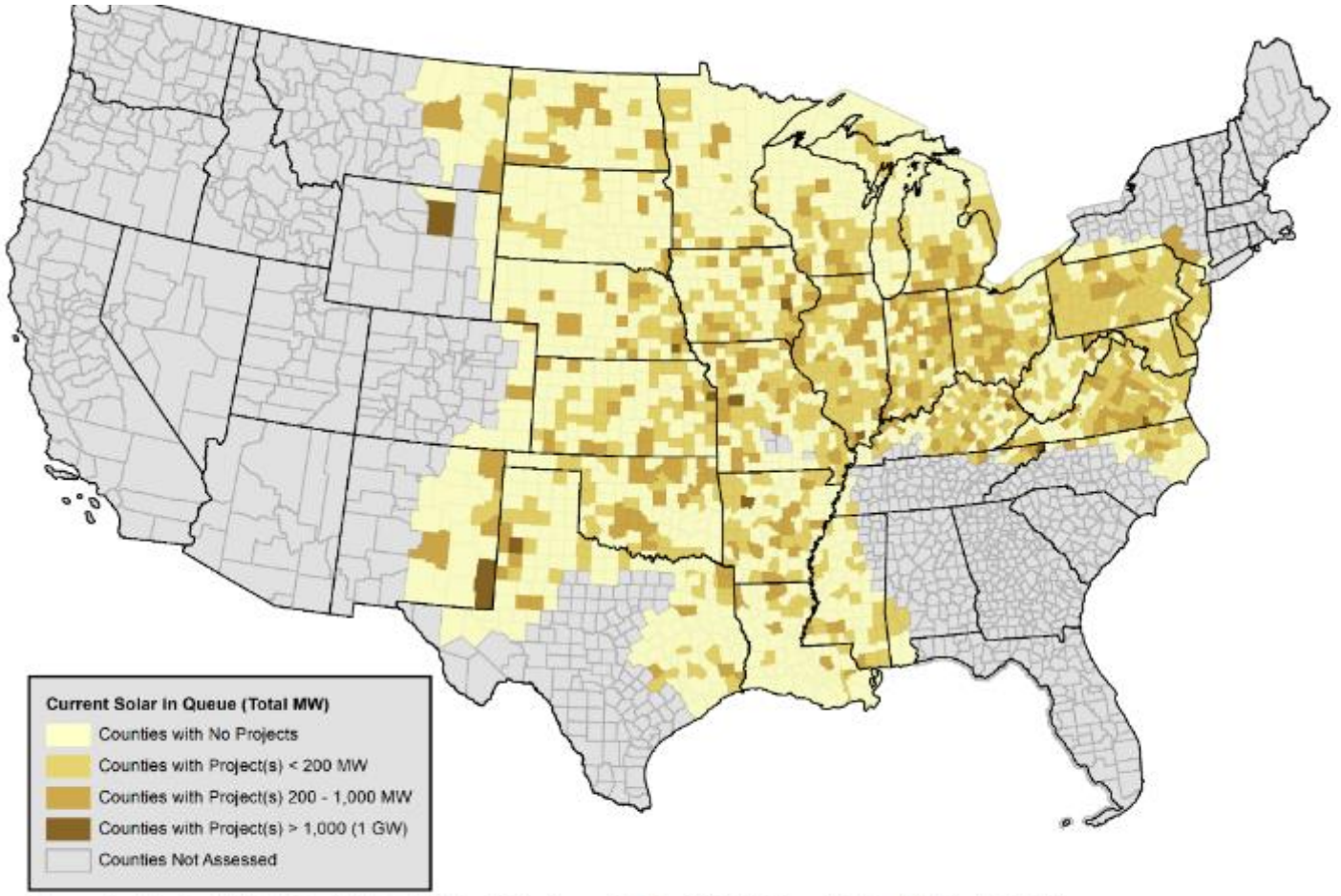


National Renewable Energy Laboratory. "Utility PV," *State and Local Planning for Energy*, accessed 7/11/2021, https://gds.nrel.gov/slope.

Why? Markets ….

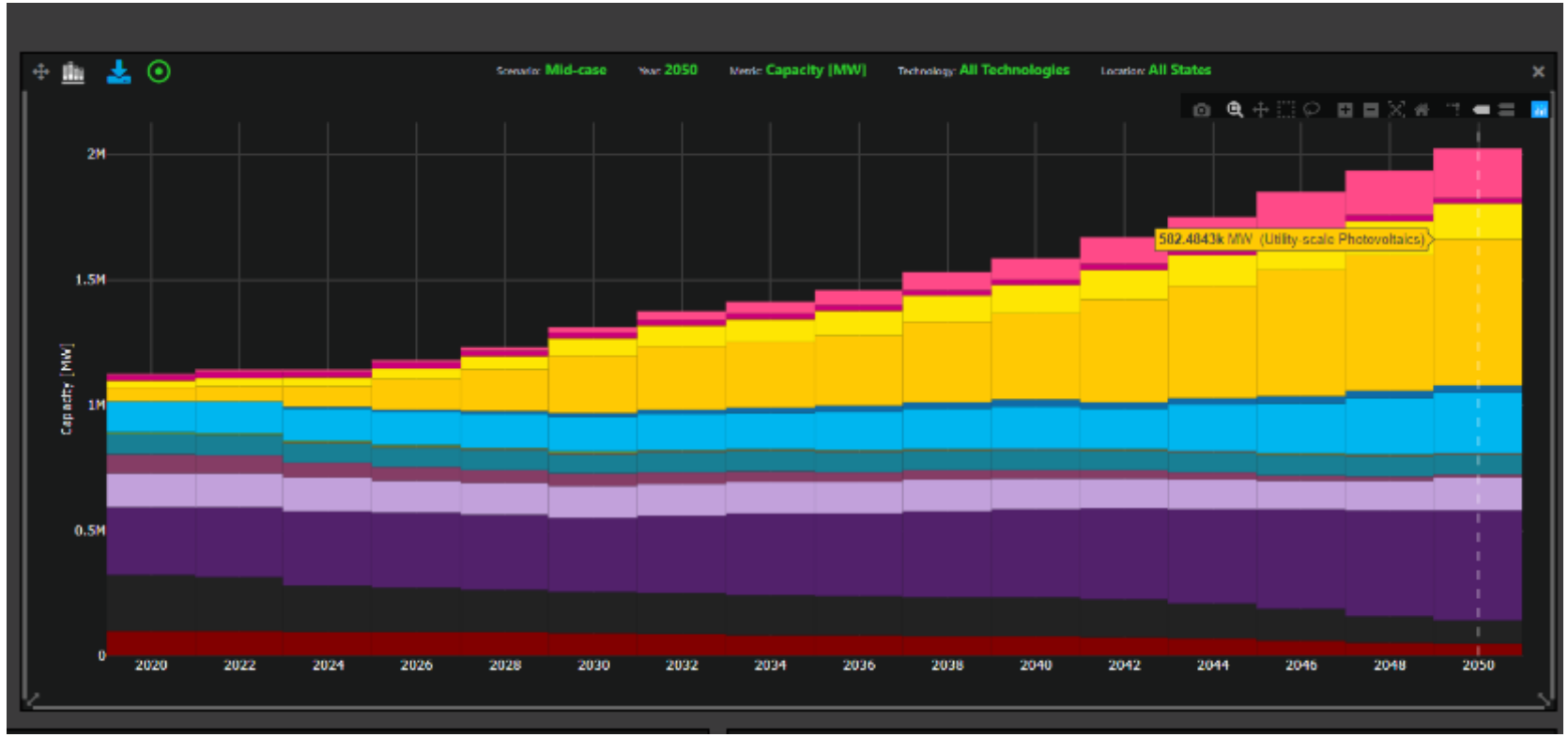
1. Large energy consumers are demanding (and acquiring) inexpensive clean energy.
2. Electric utilities are transitioning: new solar and wind are cheaper than some existing generation.

188 GW of proposed solar projects, affecting 1.3 – 1.8 million acres



Map created by Jessi Wyatt, Great Plains Institute, 2021. Queue data for SPP, MISO, and PJM pulled April 6, 2021.
Note: queue data is frequently changing and this map reflects one snapshot in time.

Utility-Scale PV Deployment Projections



https://cambium.nrel.gov/

By 2050 under a Mid-Case, scenario, NREL's Cambium model projects a total of 583 GW of utility-scale PV in the contiguous 48 states:

- **More capacity than any other generation technology**
- **Needing 3.6 – 3.8 million acres of land**

Slide Credit: M. Day, National Renewable Energy Lab

Land Use Best Practices

Illinois Solar Model Ordinance

Photo by Katharine Chute

Prepared by Great Plai

GREAT PLAIN INSTITUTE

Iowa Solar Model Ordinance

Photo by Katharine Chute

Prepared by Great Plain

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Wisconsin Solar Model Ordinance

Photo by Katharine Chute

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Minnesota Solar Model Ordinance

Photo by Katharine Chute

Prepared by Great Plains Institute with support from Sunshot and the Energy Foundation

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Last Updated August 2020

Model Solar Ordinance

for Indiana local governments

Photo credit: Great Plains Institute

Prepared by Great Plains Institute with support from Sunshot and the Energy Foundation

INDIANA UNIVERSITY ENVIRONMENTAL RESILIENCE INSTITUTE

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Last Updated December 2020

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Communities as Partners

Creating Co-Benefits

- **Siting –** where should large-scale solar go to create synergies and minimize conflicts?
- **Site design** – How should development be designed to meet community priorities and protect community assets?

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Land use best practices for large-scale solar

Define Terms	• Define large-scale solar as a unique land use (not an industrial land use), • Include storage in the definition of large-scale solar • Distinguish between small and large systems by area as needed
Enable Development	Most large-scale solar will be a conditional or interim use in those districts where allowed, although small or community scale development can be a permitted use
Land Use, not Energy Use	Performance or design standards should focus on land use impacts and benefits, not on energy use or performance
Recognize land use differences	• Exempt PV panels from coverage limits • Exempt PV panels from impervious surface standards if ground cover is suitably pervious (see co-benefits below)
Capture Co-Benefits	• Enable habitat-friendly ground cover to be installed, established, and maintained • Enable co-location of agricultural uses (sometimes in place of ground cover) • Enable water quality (surface and ground water) improvements
Screening requirements	• Look to existing screening requirements as a guide, consistency across land uses • Limit screening to residential districts or existing uses • Balance screening against larger setbacks, both are not necessary
Setbacks	• Look to existing setback distances as a guide • Balance setbacks with screening requirements (more screening, less setback) • Measure setbacks from array edge
Glare	Glare studies only needed if adjacent to an airport. On-airport solar will be appropriately regulated by FAA
Decommissioning	Require decommissioning to a reasonable standard and financial risk

Resources

1. **Solar model ordinances and planning guidance** – Five Midwestern model ordinances, planning guidance and informational resources **https://www.betterenergy.org/blog/model-solar-ordinances/ , https://www.betterenergy.org/blog/utility-scale-solar-and-wind-siting-resources-for-states-and-counties/**
2. **PV-Stormwater Management Research and Testing** – Science and best practices around water quality impacts of solar development (National Renewable Energy Lab**)** **https://www.nrel.gov/solar/pv-smart.html**
3. **SolSmart –** National "solar-ready" certification and technical assistance for local governments on large and distributed solar **- https://solsmart.org/**
4. **Solar@Scale** – Large-scale solar best practices for local government (Guidance in draft, National APA, ICMA**)** **https://icma.org/programs-and-projects/solarscale**
5. **Innovative Site Preparation and Impact Reductions on the Environment (InSPIRE**) - Resources on agricultural co-benefits of solar https://openei.org/wiki/InSPIRE
6. **Center for Pollinators in Energy** – Pollinator and habitat-friendly solar certification and guidance, procurement standards **https://fresh-energy.org/beeslovesolar**

Field tests at the InSPIRE test site in Minnesota; *Photo Credit: NREL Flickr- InSPIRE Minnesota Album*

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THANK YOU

Brian Ross | Vice President

612-767-7296 | bross@gpisd.net

Break

2:30-2:45 PM ET

Governor Impact: State Case Study

Speaker:
Trieste Lockwood, Senior Policy Advisor, Office of Governor Ralph Northam, Virginia

Moderator:
Matt Rogotzke, Policy Analyst, NGA Center

2:45-3:05 PM ET

NATIONAL GOVERNORS ASSOCIATION

State and International Areas for Collaboration

Speaker:
Andrew Light, Acting Assistant Secretary, Office of International Affairs, U.S. Department of Energy

Moderator:
Jessica Rackley, Program Director, Environment & Energy, NGA Center

3:05-3:25 PM ET

NATIONAL GOVERNORS ASSOCIATION

Select Upcoming Opportunities

- ***Energy Policy Institute (days 3-4):***
  - July 14 – Energy Resilience & Security
  - July 15 – Energy Workforce & Economic Development

- ***Energy Resilience*** Planning and Funding Workshop (July 28-29; Aug 3-4)

- Learning collaborative on new ***nuclear generation*** (summer & fall 2021)

- ***Electricity markets*** training and resource guide – educational series (August/September 2021)

- ***Legislative Energy Horizons Institute*** *(Oct. 20-23)*

- State support for participation in ***GridEx VI*** (Nov. 16-17)

End of Day 2

3:35 PM ET

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Thank You!