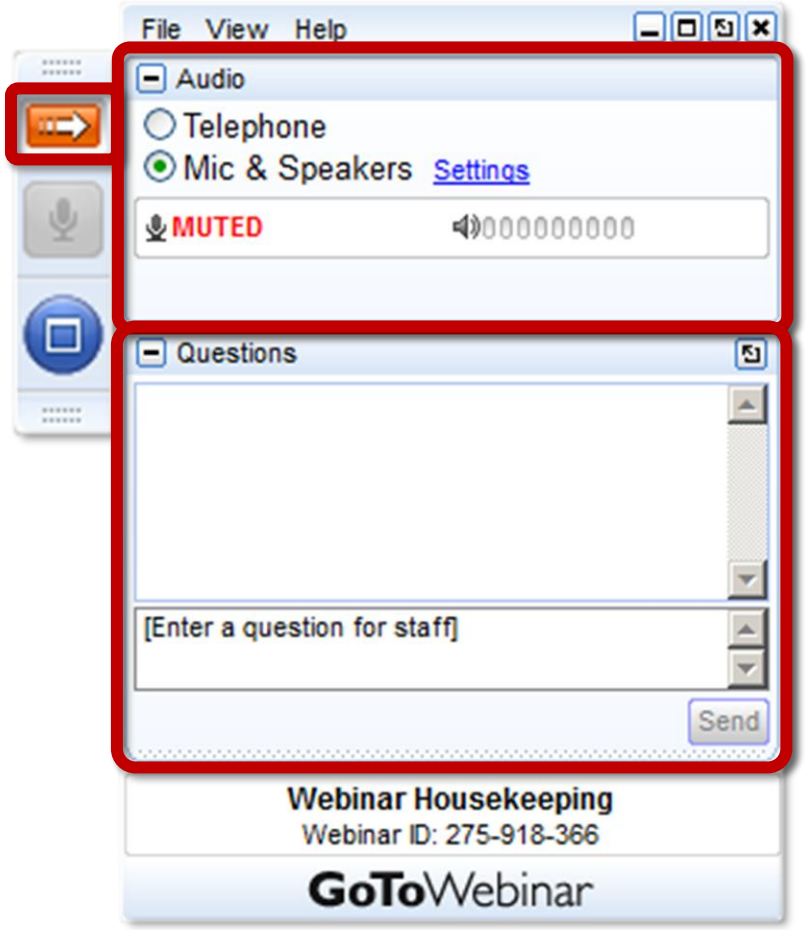
CESA Webinar

Applying New Data from NREL's State and Local Planning for Energy (SLOPE) Platform

January 27, 2021

CleanEnergy States Alliance

Webinar Logistics



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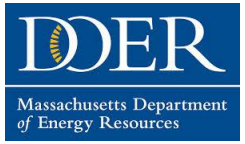
Clean Energy States Alliance



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Webinar Speakers

Megan Day
Project Manager IV-Research,
National Renewable Energy Laboratory

Nate Hausman
Project Director,
Clean Energy States Alliance
(moderator)

U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

The State and Local Planning for Energy (SLOPE) Platform

Megan Day, AICP -- Senior Energy Planner, National Renewable Energy Laboratory

Clean Energy States Alliance, January 27, 2021

What is the State and Local Planning for Energy (SLOPE) Platform?

- A collaboration between **eight** Department of Energy (DOE) **technology offices** and the National Renewable Energy Laboratory
- A tool to enable more **data-driven state and local energy planning** by integrating dozens of distinct sources of energy efficiency, renewable energy, and (coming January 2021) sustainable transportation data and analyses
- An **easy-to-access, online platform** supporting state and local energy planning and decision making

gds.nrel.gov/slope

What questions can SLOPE answer?

gds.nrel.gov/slope

Consumption
What are the current and projected electricity consumption and expenditures by sector in my jurisdiction?

Efficiency
What is the energy efficiency savings potential and what are the most cost-effective measures in my state?

Renewables
What is the comparative generation potential of 14 renewable energy technologies and scales in my jurisdiction compared to surrounding jurisdictions?

Sustainable Transportation (coming soon)
What could future electricity and fuel consumption and vehicle miles traveled look like under different scenarios?

Cost of Energy
How do the costs of utility-scale and distributed renewables, fossil fuel, storage, and efficiency compare in my jurisdiction?

Generation Scenarios
What could the mix of renewables and fossil fuel generation on my grid look like under different scenarios?

Energy Use

Milwaukee, Wisconsin

Net Electricity & Natural Gas Consumption

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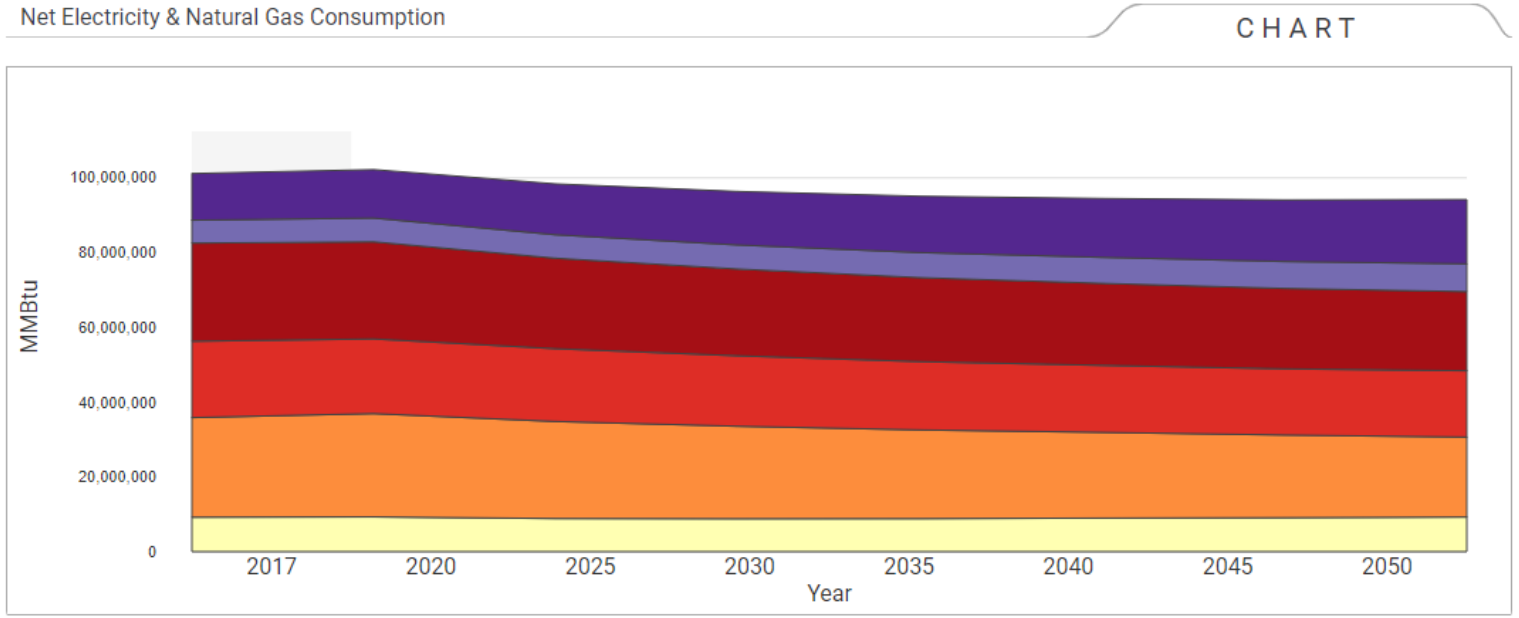

- SLOPE demonstrates that combined electricity and natural gas consumption is highest in the commercial sector, followed closely by the residential sector. Natural gas exceeds electricity consumption in all sectors.
- **Take away**: Natural gas consumption and commercial sector energy are major contributors to community-wide emissions.

NOTE: Estimates are modeled and have a high degree of uncertainty. Projected, business-as-usual electricity and natural gas consumption and expenditures are modeled for the residential, commercial, and industrial sectors using baseline 2016 estimates developed through the Cities Leading Energy Analysis and Planning (Cities-LEAP) methodology. A similar, sector-specific methodology is applied to project annual natural gas and electricity use and expenditures from 2017 to 2050 using historic per household and establishment energy estimates and Energy Information Administration Annual Energy Outlook 2019 projections. A description of the methodology is here.

Electricity & Natural Gas Dollars Spent

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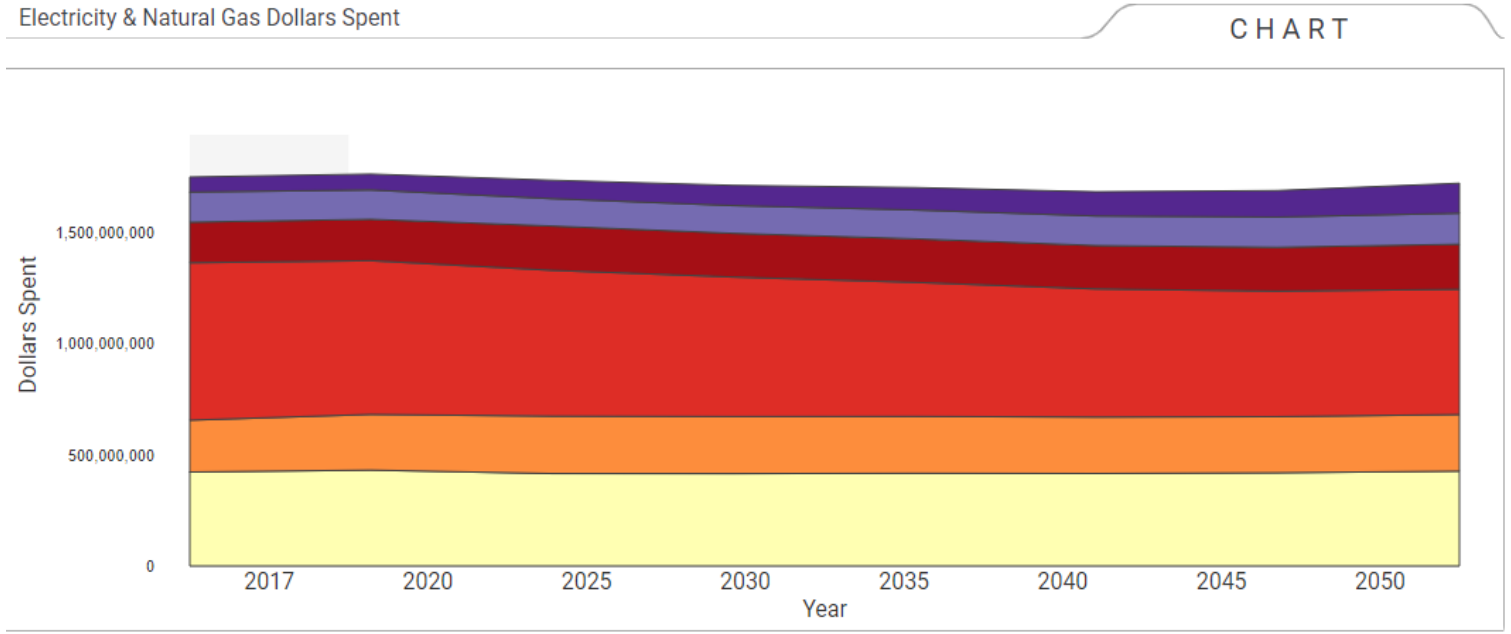

- When translated to dollars spent, however, electricity expenditures exceed dollars spent on natural gas.
- **Take away**: Reducing electricity consumption reduces energy cost, emissions, and energy burden for residents and businesses.

NOTE: Estimates are modeled and have a high degree of uncertainty. Projected, business-as-usual electricity and natural gas consumption and expenditures are modeled for the residential, commercial, and industrial sectors using baseline 2016 estimates developed through the Cities Leading Energy Analysis and Planning (Cities-LEAP) methodology. A similar, sector-specific methodology is applied to project annual natural gas and electricity use and expenditures from 2017 to 2050 using historic per household and establishment energy estimates and Energy Information Administration Annual Energy Outlook 2019 projections. A description of the methodology is here.

Commercial Building Energy

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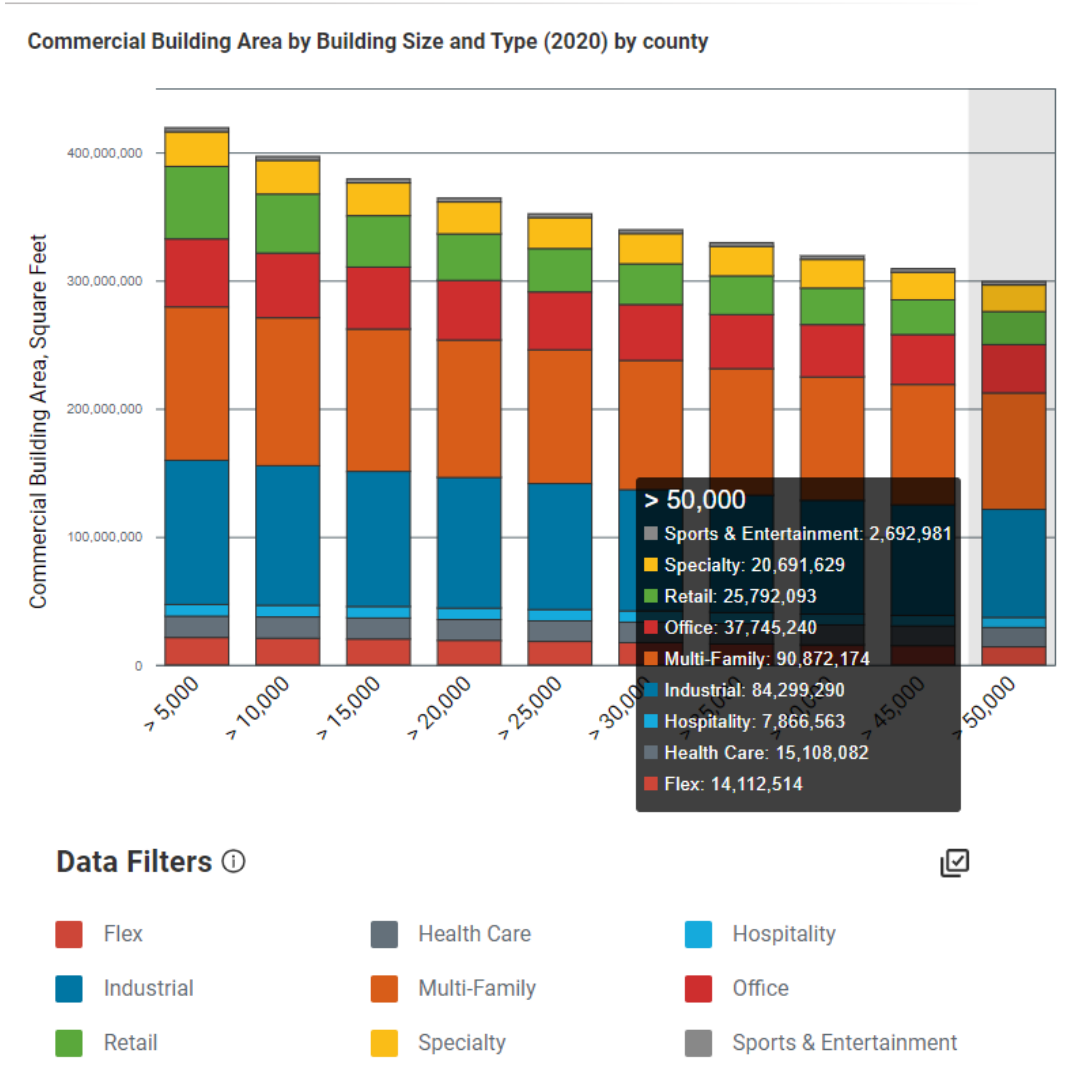
- SLOPE commercial buildings data helps the city see the number and area of buildings by building type that would be impacted by a **building energy disclosure ordinance** or by energy programs or incentives. For instance, over ¾ of Milwaukee's commercial building area lies in buildings >50,000 sq ft.
- Take away:
  - Substantial opportunities exist in targeting large commercial buildings through building ordinances and programs.
  - Multi-family buildings (20+ units) represent a substantial percentage of the commercial building space. Targeting energy efficiency improvements in multi-family buildings, which can be targeted to lower income households and renters, support the city's equity and green jobs goals.



Energy Efficiency

Milwaukee, Wisconsin

Energy Efficiency

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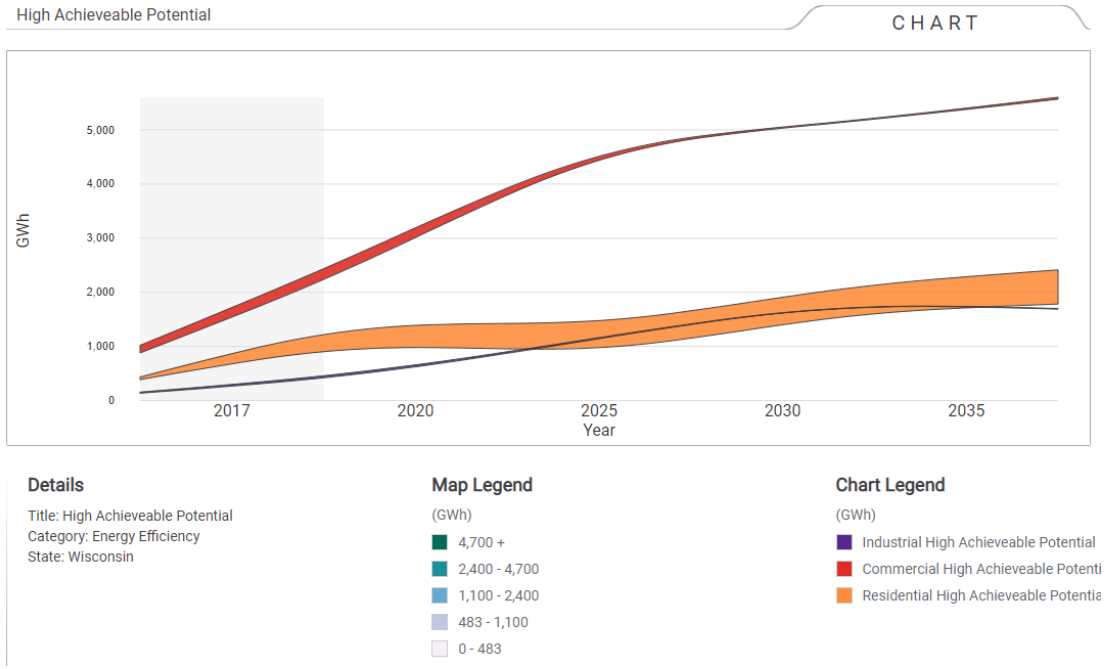
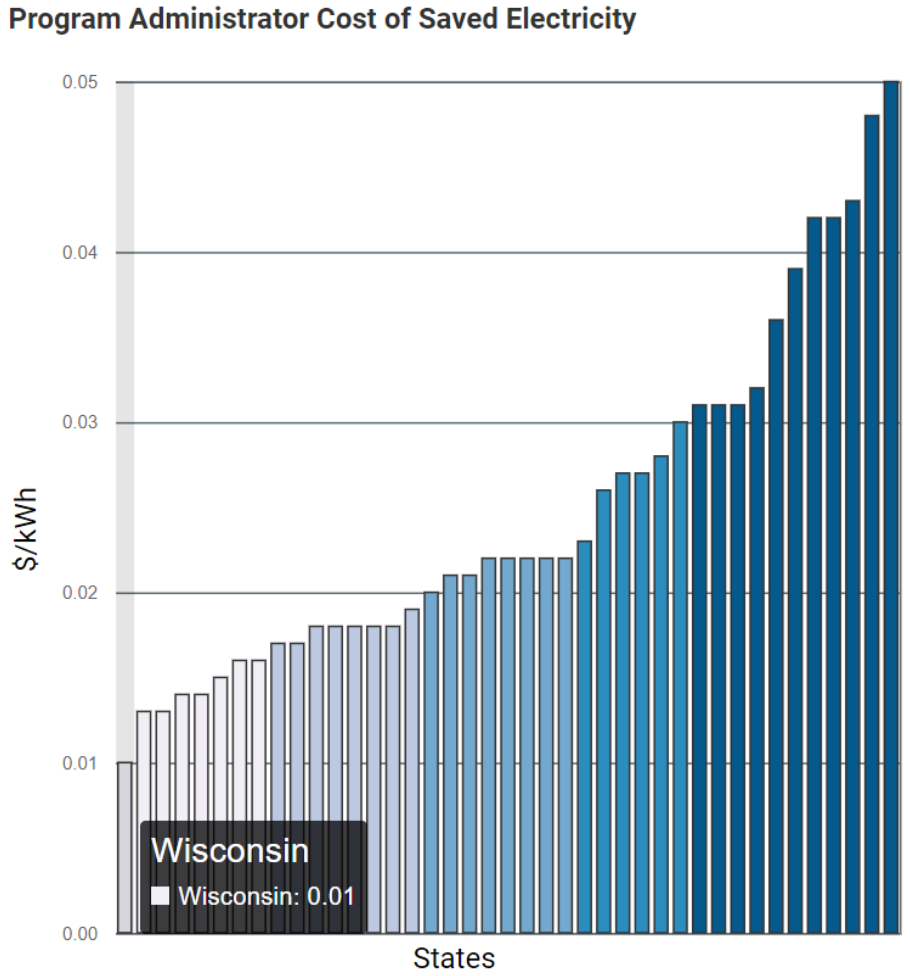
SLOPE shows in Wisconsin, the commercial sector has the highest achievable electricity savings potential with relatively low impact of incentives (the width of the band). Incentives have a higher impact on savings potential in the residential sector.



SLOPE shows Wisconsin has the lowest program administrator cost of saved electricity of 41 states analyzed.



Take away: Saving electricity is more cost-effective than generating new renewable energy, with the highest potential in the commercial sector.

Single Family Home Electricity Savings Potential

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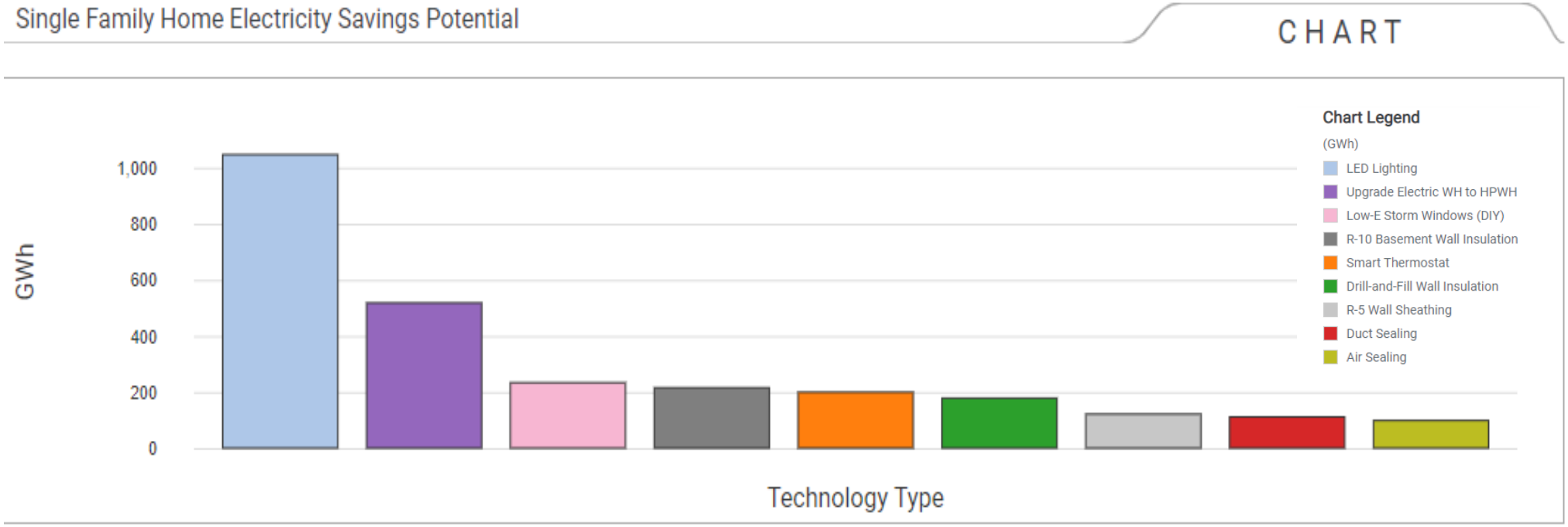
- SLOPE shows the most impactful, cost-effective electricity savings measures in Wisconsin single-family homes from ResStock research.



Single Family Home Fuel Savings Potential

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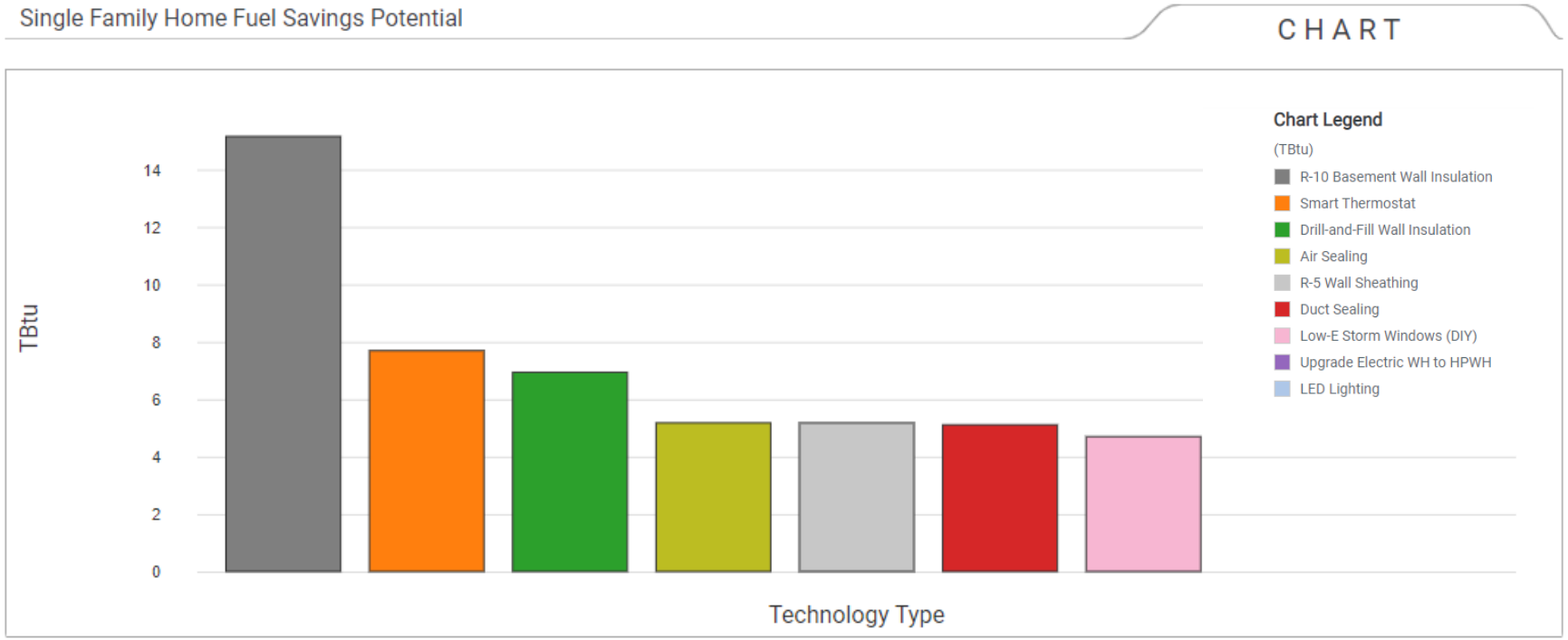
- **SLOPE shows the most impactful cost-effective fuel savings measures in Wisconsin single-family homes ResStock.**

  Take away: The city can use this data to develop:
  - More targeted residential efficiency programs/initiatives
  - More targeted job training programs
  - Educational initiatives



Renewable Energy

Milwaukee, Wisconsin & New Mexico

Renewable Energy Generation Potential

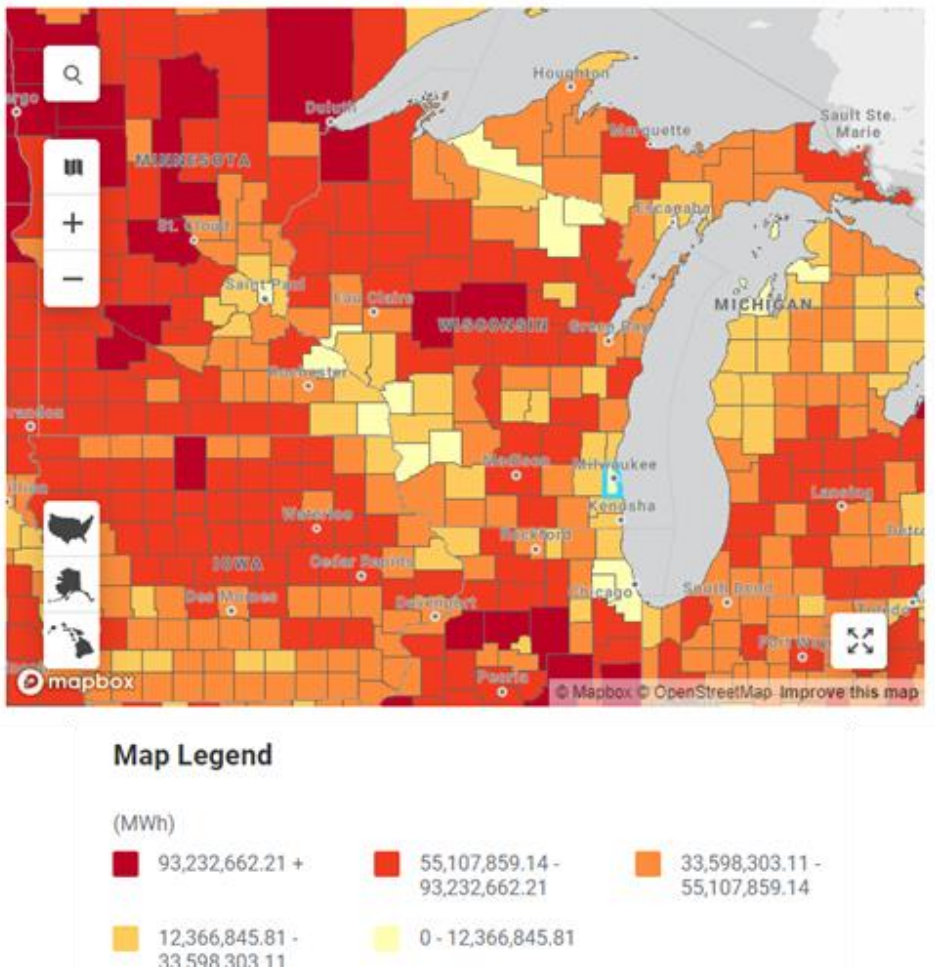
Solar (Milwaukee, WI)

SLOPE indicates that Milwaukee County could generate the equivalent of **up to one-fourth of its annual electricity consumption from utility-scale PV and up to one fourth from rooftop PV**.

Each adjoining county has the potential to generate two to three times Milwaukee County's annual electricity consumption with utility-scale PV.

> *"SLOPE helps us educate elected officials and community groups and paint a clear picture of the scale needed to reach our goals."*
>
> -Matt Donath, Milwaukee Sustainability Program Coordinator

Utility scale solar PV technical generation potential by county in Wisconsin



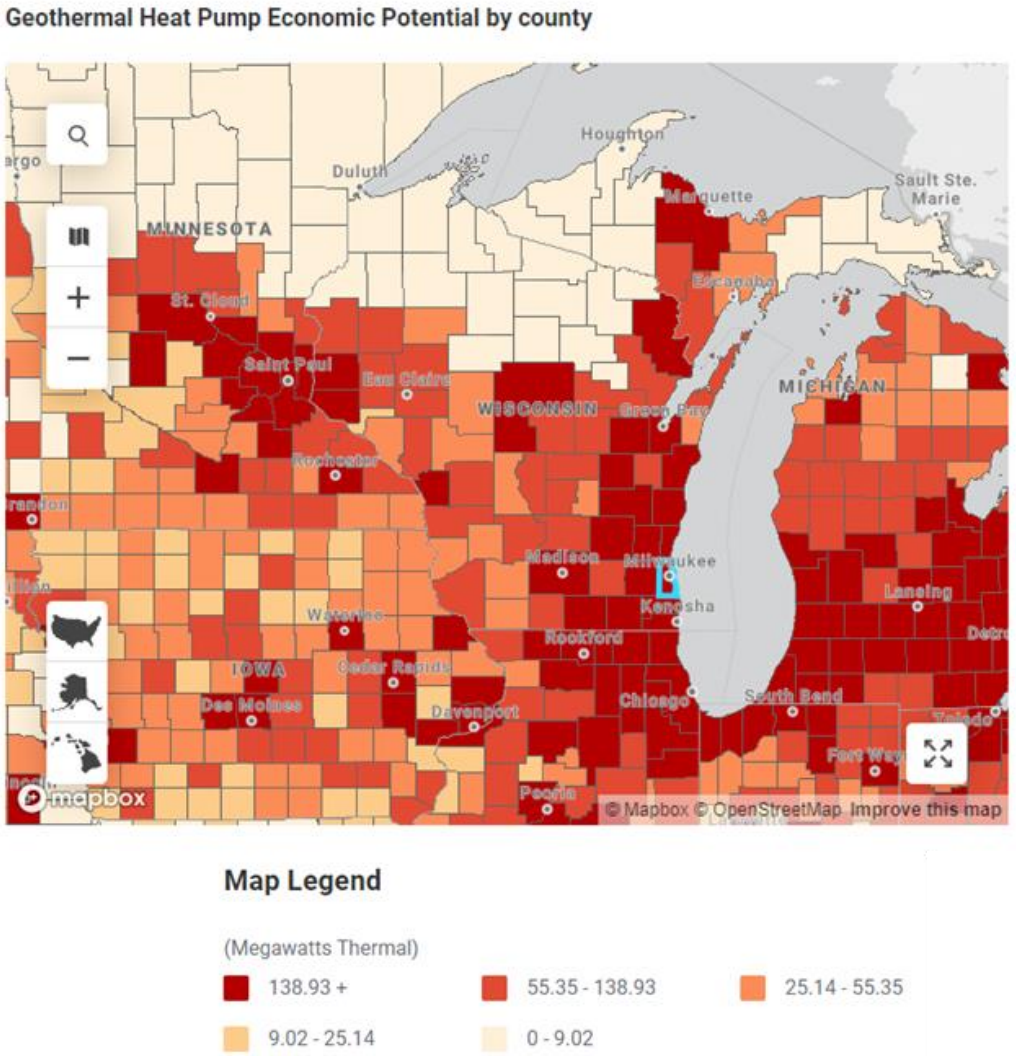
Geothermal Heat Pump Economic Potential

(Milwaukee, WI)

SLOPE indicates that Milwaukee County has comparatively high economic potential for geothermal heat pumps.

Replacing natural gas heating with geothermal heat pumps could support Milwaukee's greenhouse gas reduction goals.

Replacing electric air conditioning with geothermal heat pumps could reduce Milwaukee's high electricity costs.



Renewable Energy Generation Potential

Land-Based Wind (New Mexico)

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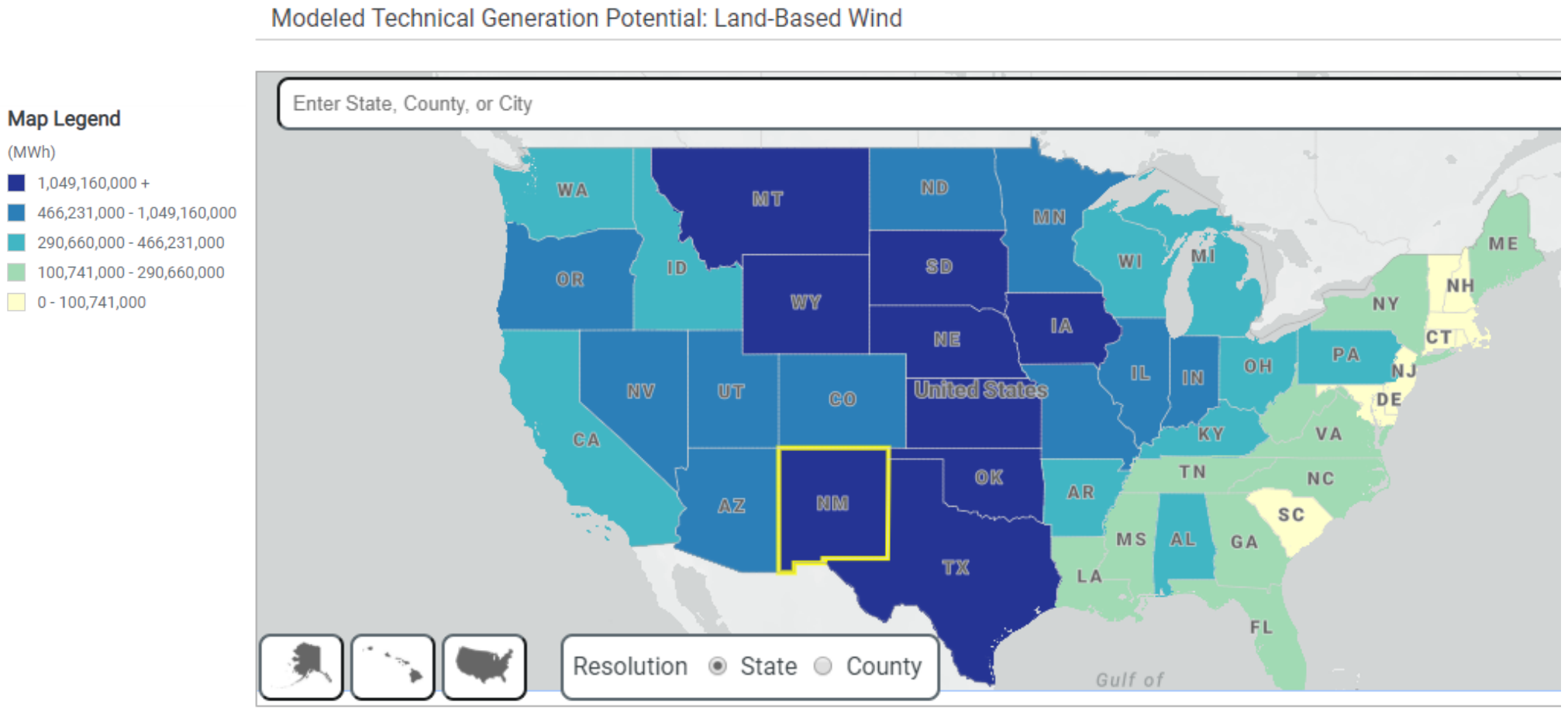
- This SLOPE chart shows technical generation potential for land-based wind in New Mexico is among the highest in the nation



Renewable Energy Generation Potential

Land-Based Wind (New Mexico)

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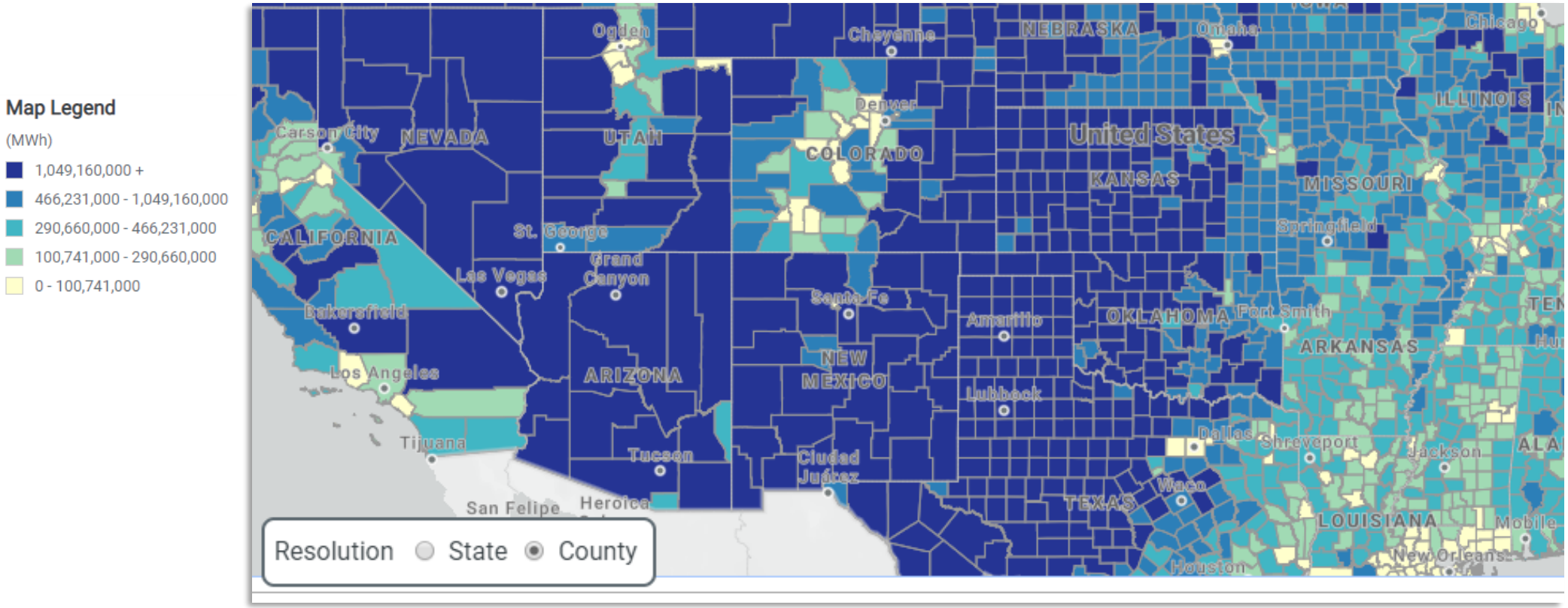
- This SLOPE chart shows technical generation potential for land-based wind in New Mexico is high across most counties in the state.



Renewable Energy Generation Potential

New Mexico

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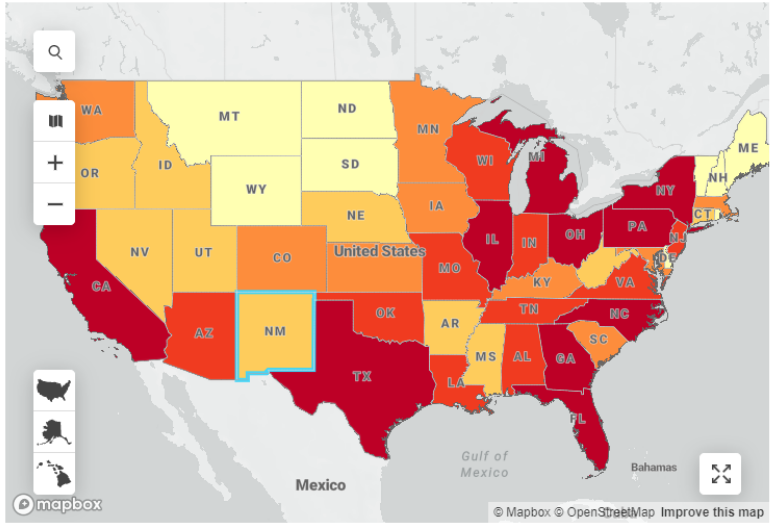
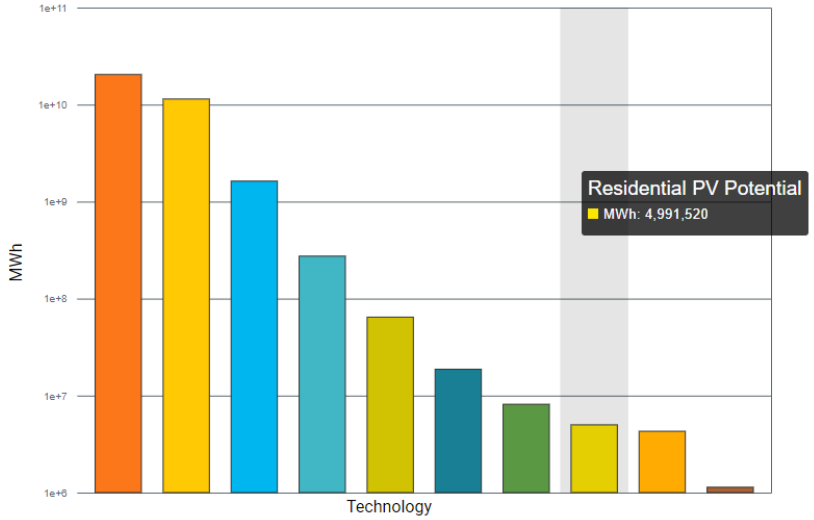
Utility-scale PV and concentrating solar power technical generation potential is higher than wind in New Mexico.

Floating solar and hydropower generation potential is higher than rooftop PV potential in New Mexico.

Modeled Annual Technical Generation Potential - Residential Rooftop PV



Annual Technical Generation Potential - Multiple Technologies



Map Legend

(MWh)

- 16,396,370 +
- 10,548,620 - 16,396,370
- 6,622,480 - 10,548,620
- 2,467,920 - 6,622,480
- 0 - 2,467,920

Data Filters

- Biopower Potential
- Commercial PV Potential
- Concentrating Solar Power Potential
- Distributed Wind Potential
- Floating PV Potential
- Geothermal Potential
- Hydropower Potential
- Land Based Wind Potential
- Offshore Wind Potential*
- Residential PV Potential
- Utility PV Potential

* Item not displayed in chart

Levelized Cost of Energy (LCOE)

New Mexico

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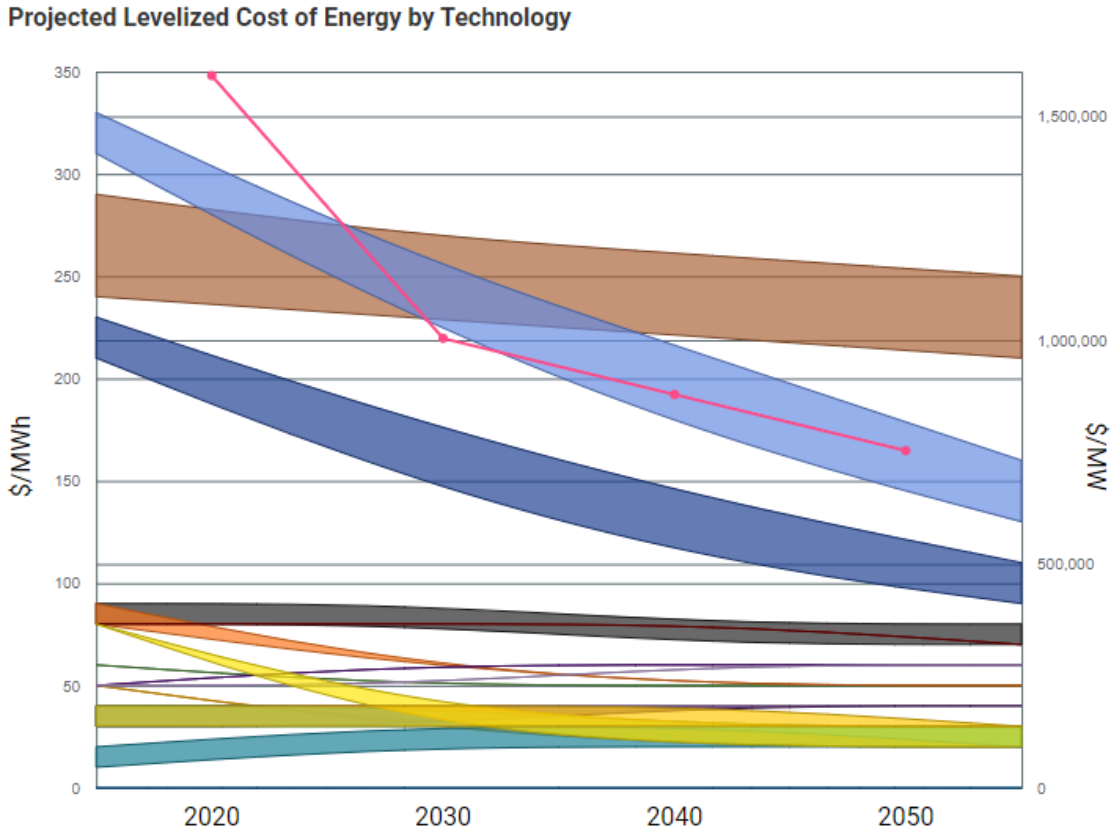
SLOPE data on modeled, projected levelized cost of energy from newly constructed electricity generation in New Mexico show new hydropower generation is potentially the lowest cost generation technology.



NOTE: Estimates are modeled and have a high degree of uncertainty. Levelized cost of energy (LCOE) is a metric that combines technology cost and performance parameters, capital expenditures, operations and maintenance costs, and capacity factors. The map conveys the technology with the lowest modeled LCOE within each balancing area. The chart shows the minimum to median modeled cost range. Costs reflect local conditions such as labor markets and design requirements and spur line costs for connecting wind, PV, and CSP sites to the transmission system. LCOE projections are primarily derived from the Regional Energy Deployment System (ReEDS) and reflect Annual Technology Baseline representative technology assumptions. Fossil fuel technology costs are from the Energy Information Administration Annual Energy Outlook 2019 Reference case. The modeling approach is described here.

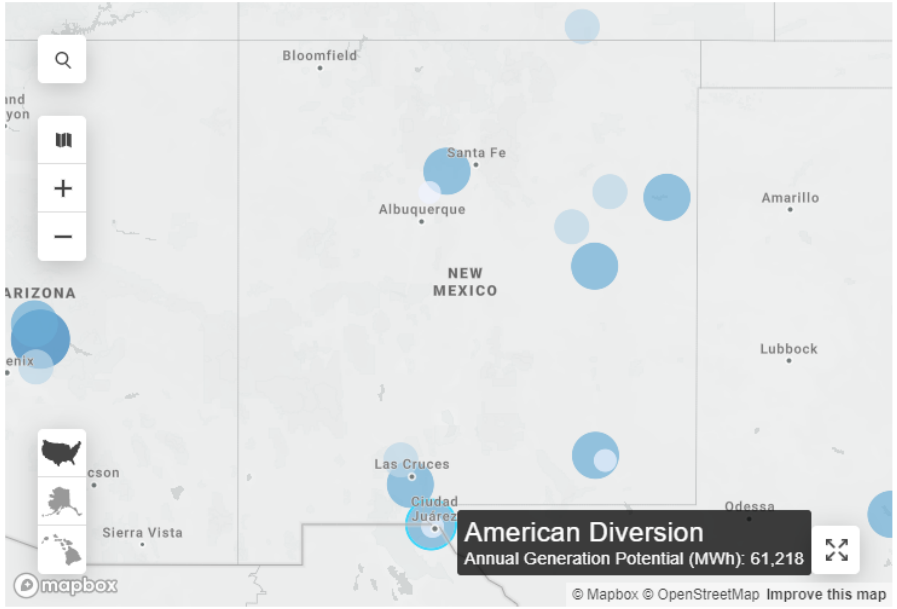
Gas CC CCS = Combined Cycle with Carbon Capture and Sequestration
Gas CT = Combustion Turbine Gas CC = Combined Cycle

Renewable Energy Generation Potential

Non-powered Dams (New Mexico)

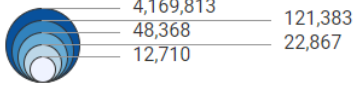
New Mexico has numerous non-powered dams with hydropower capacity potential >1 MW

Hydropower - Non-Powered Dams



Map Legend

(Annual Generation Potential (MWh))

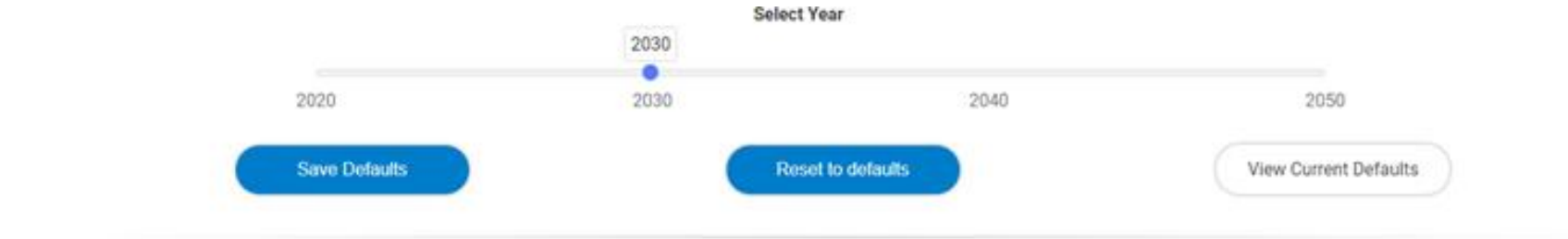


Hydropower - Non-Powered Dams

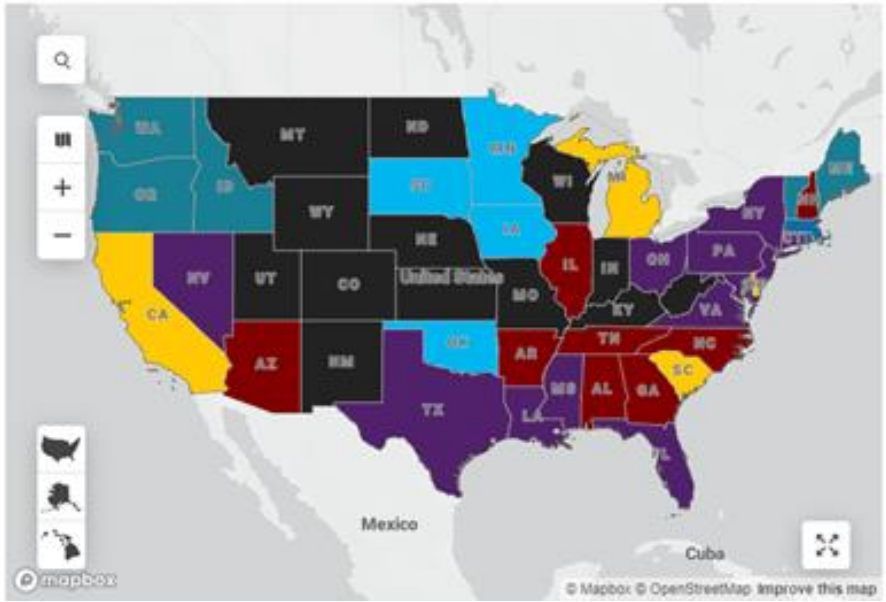
Month	Generation Potential - MWh	Capacity - MW
Annual	30609	12
January	645	
February	1673	
March	3347	
April	3915	
May	4362	
June	4792	
July	4254	
August	3460	
September	1950	
October	1129	
November	521	
December	560	

Electricity Generation Projections
(New Mexico)

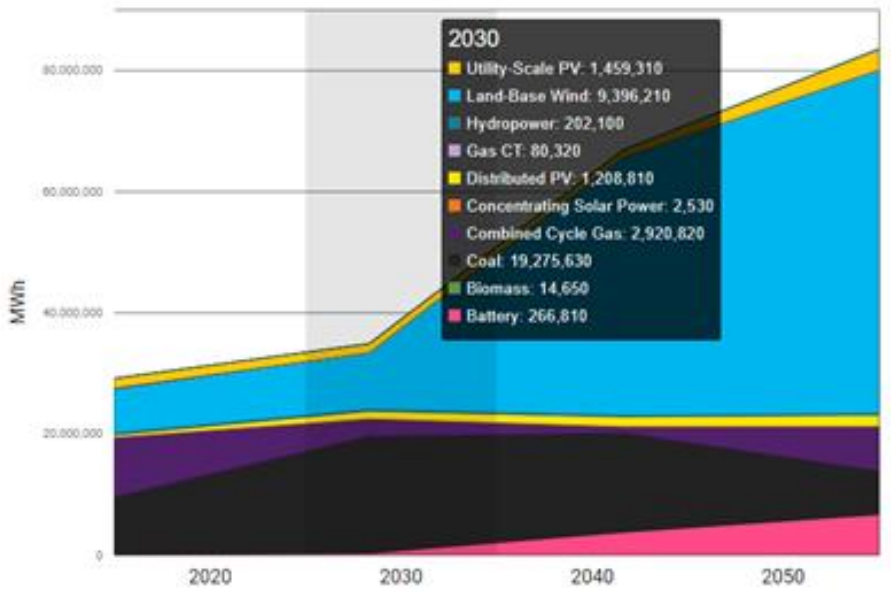
Under a Mid-Case Scenario, New Mexico is projected to continue to generate more electricity from coal than any other technology in 2030.



Technology with Largest Modeled Share of Generation (MWh)



Projected Generation by Technology - Mid-Case Scenario



SLOPE - Phase II New Features

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Generation

- Modeled current and projected electricity generation mix by state

Rooftop PV, Small-Scale Wind

- New analysis on rooftop PV and distributed wind technical generation potential by county
- Levelized cost of electricity from distributed PV and wind

Geothermal

- New analysis: geothermal district heating potential in new construction
- Existing data on geothermal district heating potential in existing buildings, geothermal heat pump economic potential

Waterpower

- New stream reach and non-powered dam generation potential

Efficiency

- Program administration cost of saved electricity

City-Level data

- For ~6,000 cities: Population projections, electricity & natural gas consumption, commercial buildings by type/size, transportation data

Transportation *(coming later in 2021)*

- Current and projected on-road vehicle fuel consumption and vehicle miles traveled by county, state
- Current and projected vehicle registration data by fuel type

Platform Updates

- Ability for users to save individual settings
- Redesign in response to heuristics, user feedback

Questions?

Thank you!

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Thank you for attending our webinar

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Upcoming Webinar

Designing Hybrid Combined Heat and Power Systems: An Introduction to New Features in NREL's REopt Lite Tool

Tuesday, March 2, 2-3pm ET

Funded by the Department of Energy Advanced Manufacturing Office, NREL has added important new features to its free solar+wind+storage online optimization tool, REopt Lite. The new features will help building owners, energy managers, and emergency planners assess opportunities for combined heat and power (CHP) systems to provide economic savings and power essential services with onsite resources during grid disruptions.

Read more and register at: www.cesa.org/webinars