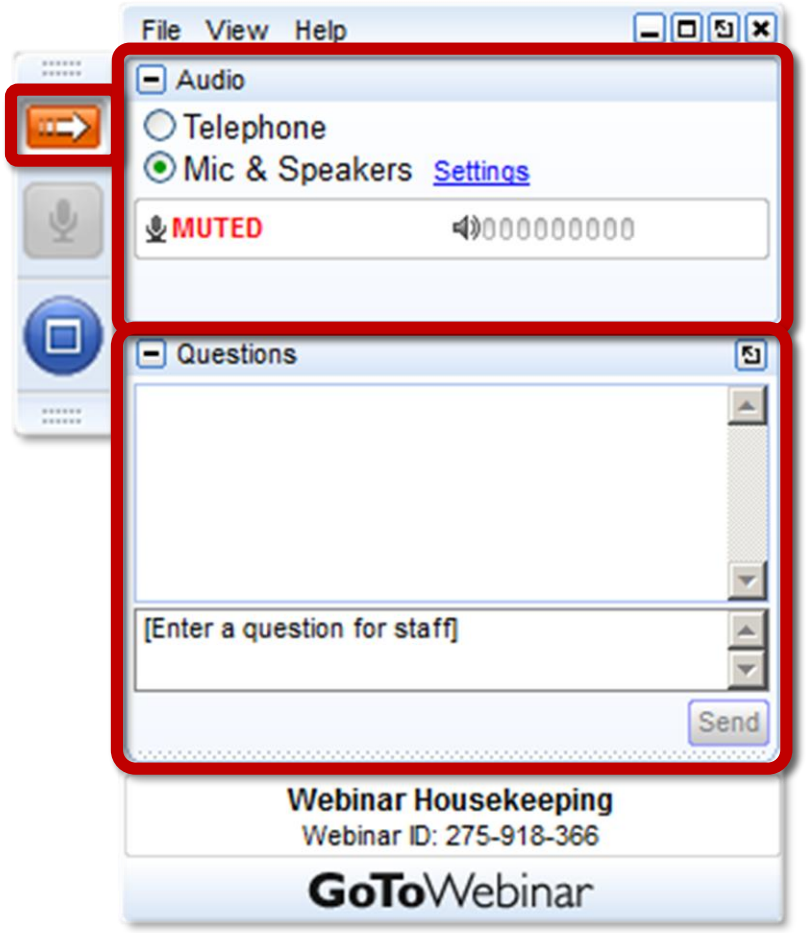
CESA Webinar

Introduction to NREL's State and Local Planning for Energy (SLOPE) Platform

July 14, 2020

CleanEnergy States Alliance

Housekeeping



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- Choose Mic & Speakers to use VoIP
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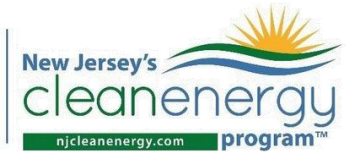
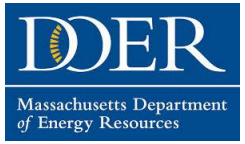
Clean Energy States Alliance





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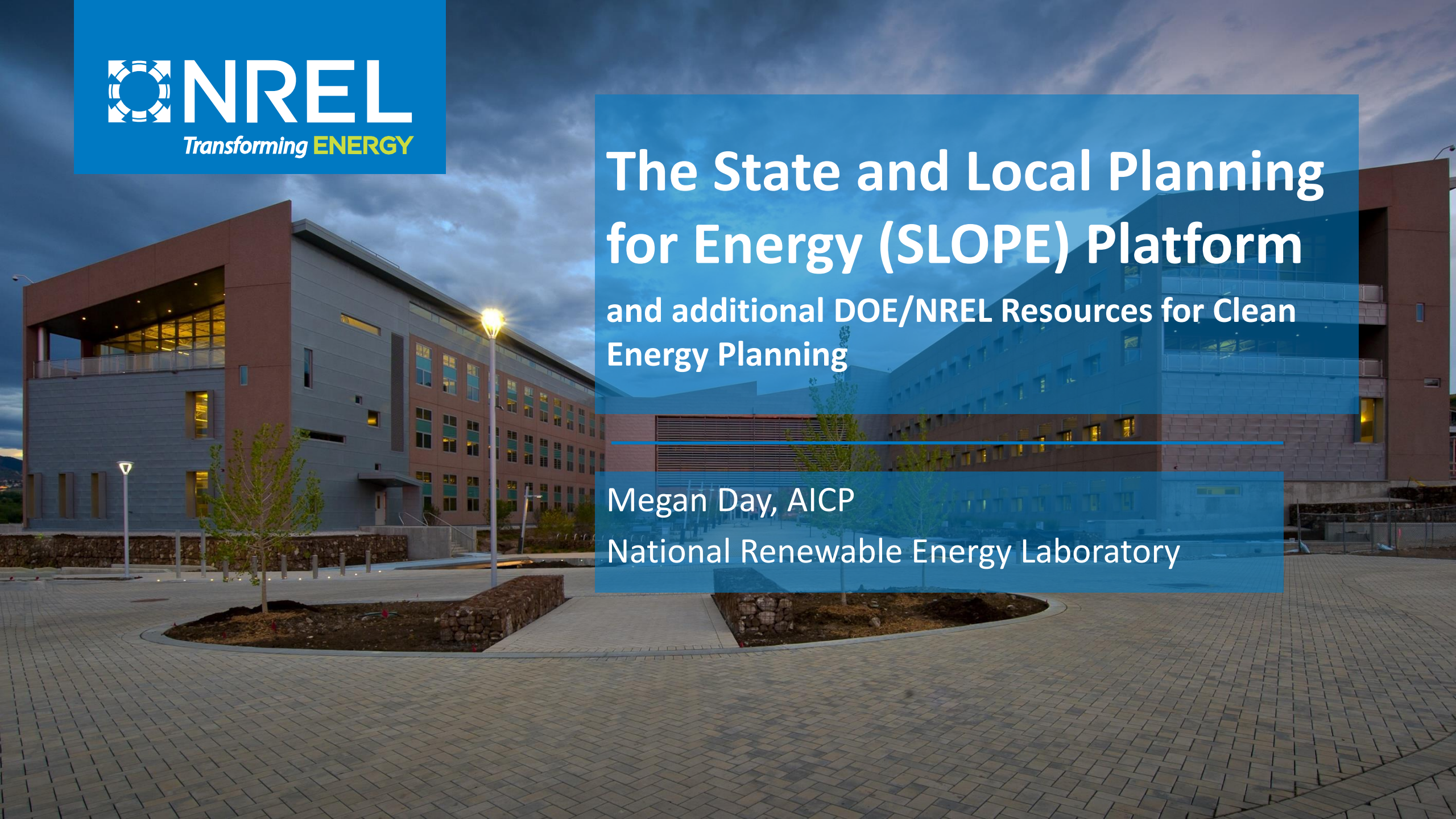
Webinar Speakers

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

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



The State and Local Planning for Energy (SLOPE) Platform

and additional DOE/NREL Resources for Clean Energy Planning

Megan Day, AICP
National Renewable Energy Laboratory

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 in 2020) sustainable transportation data and analyses
- An easy-to-access, online platform that illustrates **clean energy opportunities and potential** at the state and local levels

U.S. DEPARTMENT OF ENERGY
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

NREL
Transforming ENERGY

SLOPE Beta Datasets

SLOPE Beta includes the following datasets:

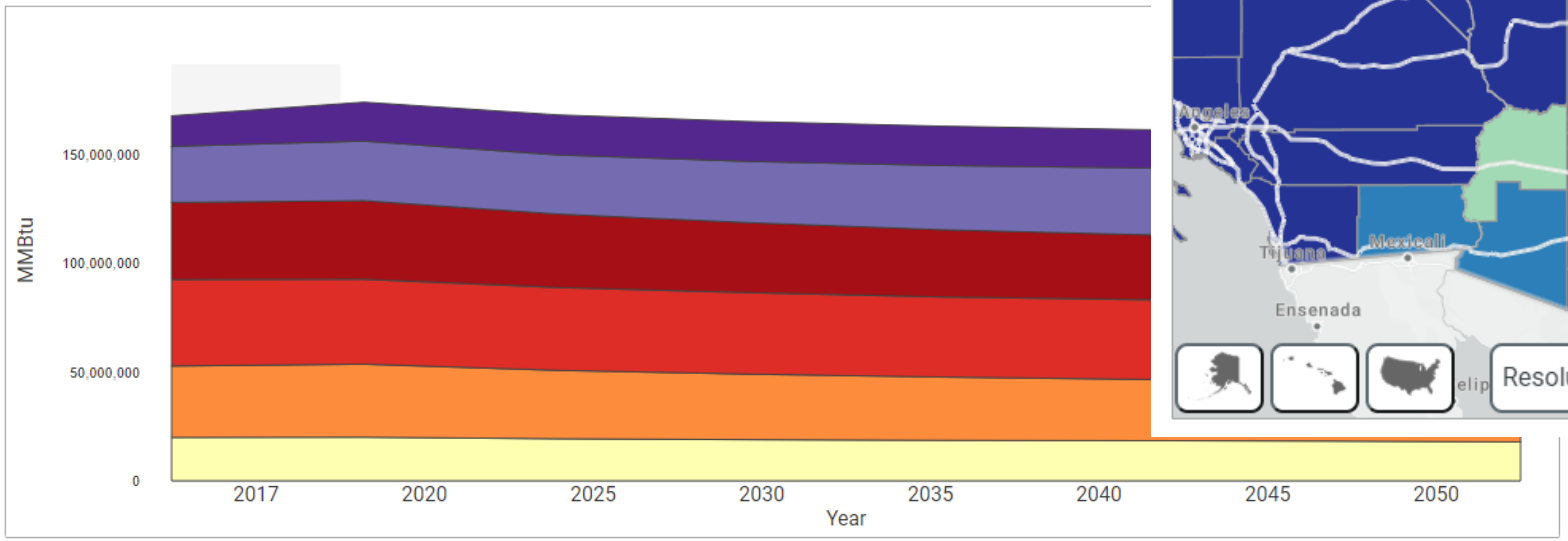
Energy Efficiency Potential	• State-wide residential, commercial, and industrial sector and single-family home energy efficiency potential
Electricity and Natural Gas Consumption	• Projected business-as-usual consumption and expenditures from modeled baseline data for the residential, commercial, and industrial sectors
Renewable Energy Generation Potential	• Technical generation potential for utility-scale, rooftop, and floating solar photovoltaic (PV), concentrated solar power (CSP), onshore and offshore wind, biopower, geothermal, and hydropower
Levelized Cost of Energy (LCOE)	• Projected LCOE by renewable and fossil fuel generation technologies
Population	• Current and projected population from Oak Ridge National Laboratory (ORNL) LandCast model
Commercial Building Stock	• Current and projected commercial building stock counts and area

Electricity and Natural Gas Consumption

New Mexico

Here we can see modeled electricity and natural gas consumption in New Mexico by sector and total consumption by county.

Net Electricity & Natural Gas Consumption



Details

Title: Net Electricity & Natural Gas Consumption
Category: Energy Consumption
State: New Mexico

Map Legend

(MMBtu)

- 828,591,000 +
- 518,039,000 - 828,591,000
- 325,959,000 - 518,039,000
- 121,791,000 - 325,959,000
- 0 - 121,791,000

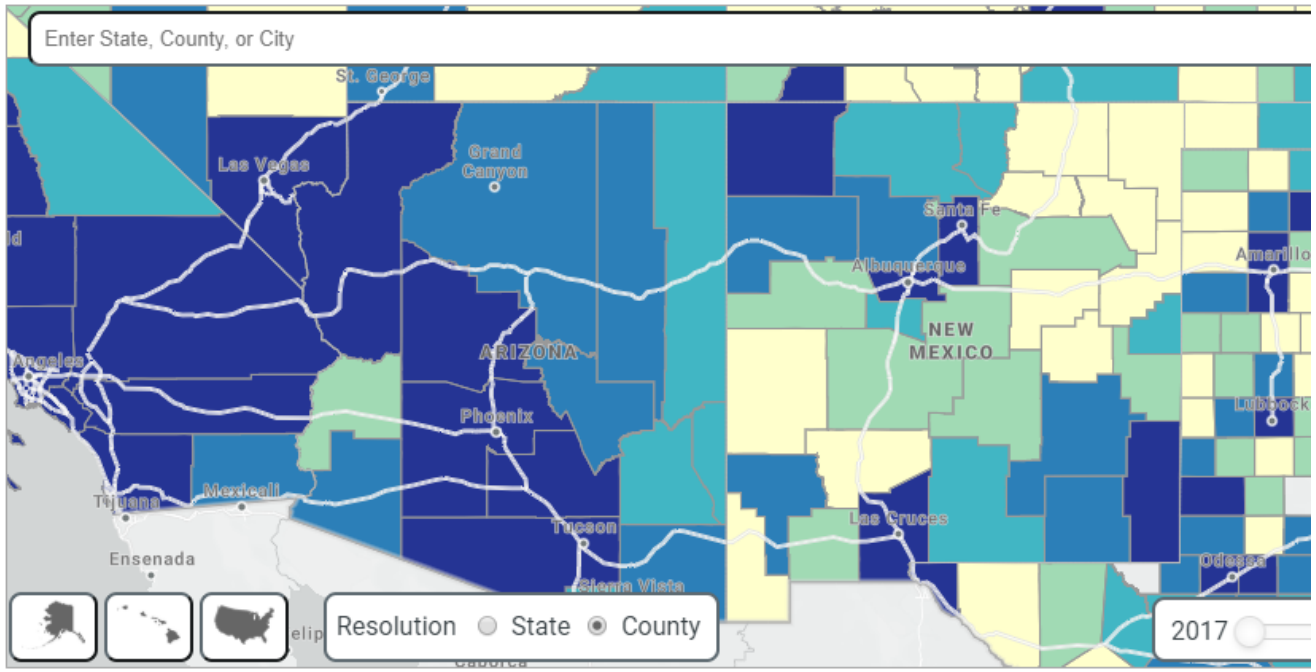
Chart Legend

(MMBtu)

- Industrial Natural Gas
- Industrial Electricity
- Commercial Natural Gas
- Commercial Electricity
- Residential Natural Gas
- Residential Electricity

https://gds.nrel.gov/slope

Net Electricity & Natural Gas Consumption

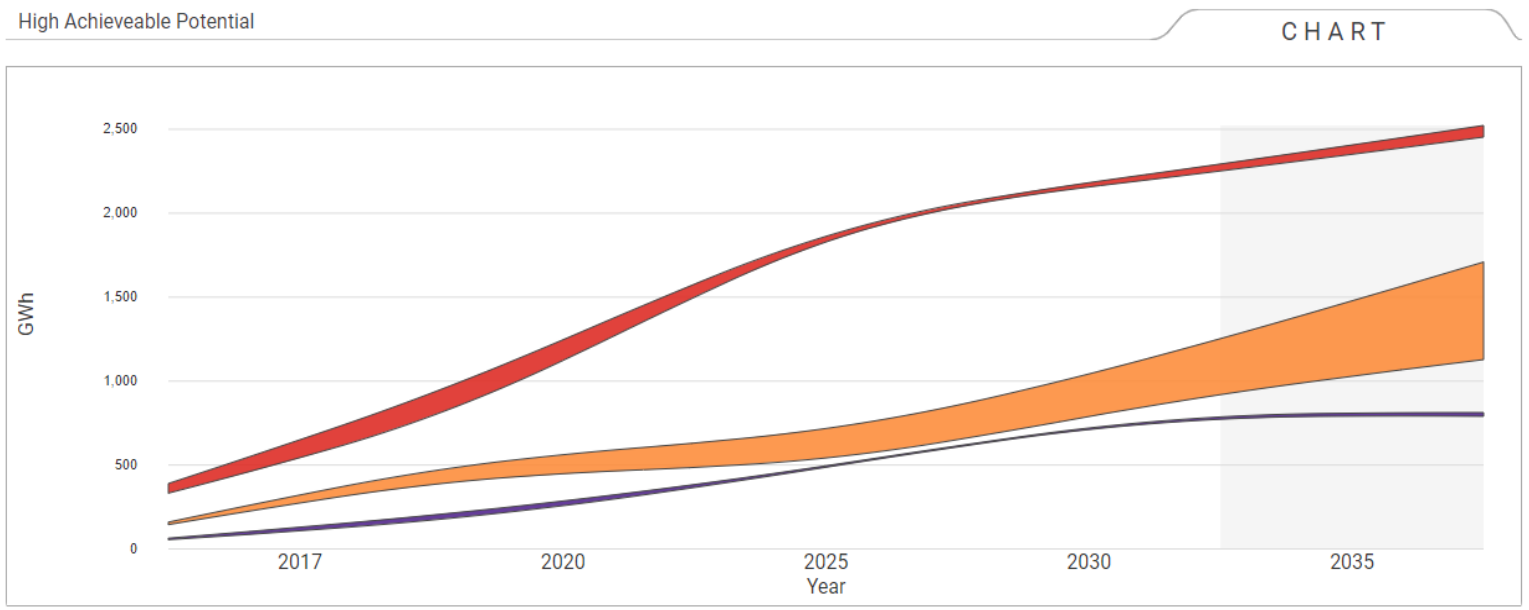


NOTE: Estimates are modeled and have a high degree of uncertainty. Projected, business-as-usual electricity and natural gas consumption and expenditures are modeled for the residential, commercial, and industrial sectors using baseline 2016 estimates developed through the Cities Leading Energy Analysis 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.

Energy Efficiency – Potential by Sector

New Mexico

By 2035, New Mexico has an achievable electricity savings potential of 4,360 GWh with zero incentive and 5,030 GWh with a $20/MWh incentive with the highest potential in the commercial sector.



Details

Title: High Achieveable Potential
Category: Energy Efficiency
State: New Mexico

Map Legend

(GWh)
- 4,700 +
- 2,400 - 4,700
- 1,100 - 2,400
- 483 - 1,100
- 0 - 483

Chart Legend

(GWh)
- Industrial High Achieveable Potential
- Commercial High Achieveable Potential
- Residential High Achieveable Potential

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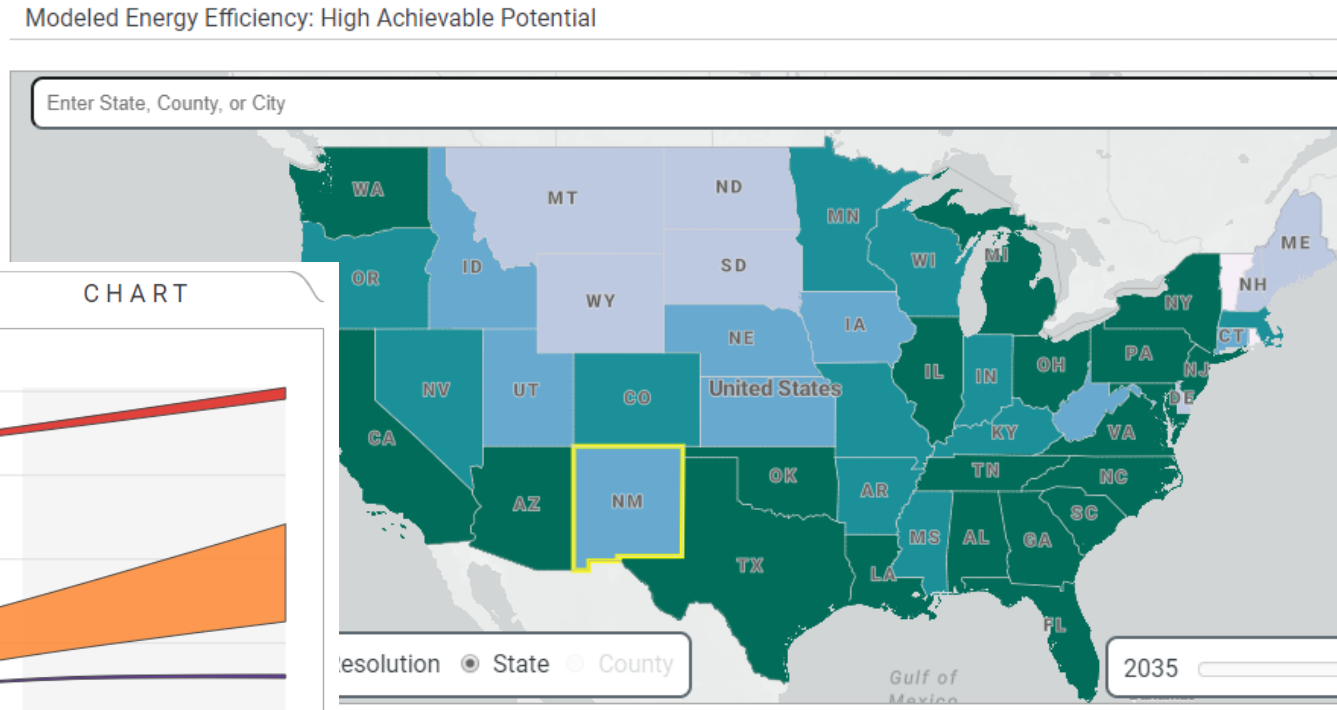


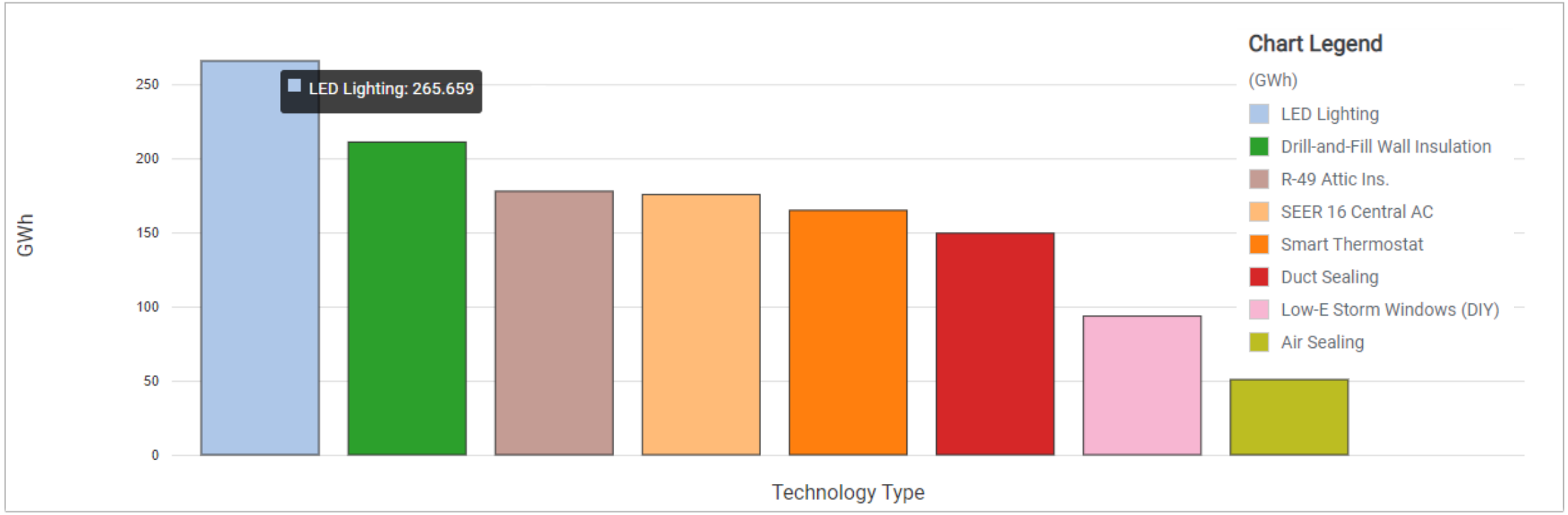
*NOTE: Estimates are modeled and have a high degree of uncertainty. The Electric Power Research Institute State Level Electric Energy Efficiency Potential Estimates model electricity savings achievable through energy efficiency in the residential, commercial, and industrial sectors for a range of no incentive ($0, the lower end of the range shown for each sector) through $20 incentive (the high end of the range shown for each sector) per MWh. Results are shown for **Economic Potential**, resulting if all homes and businesses adopted the most energy efficient, cost-effective, commercially available measures and **High Achievable Potential**, a portion of the economic potential that considers market barriers and is more reflective of historic levels of achieved energy efficiency.*

Energy Efficiency – Single-Family Homes

(New Mexico)

Single Family Home Electricity Savings Potential

CHART



NOTE: Estimates are modeled and have a high degree of uncertainty. Energy savings estimates are calculated using ResStock™, a highly granular model that uses 350,000 physics-based building energy models (OpenStudio®/EnergyPlus™) to statistically represent the diversity of the U.S. single-family detached housing stock (80 million homes) across a range of climates (216 climate regions), vintages, sizes, fuel types, equipment, insulation, occupancy, etc. For details see the report, state fact sheets, and data viewer.

https://gds.nrel.gov/slope

SFD = single-family detached; NPV = net present value; VSHP = variable-speed heat pump; DHP = ductless heat pump; EER = energy efficiency ratio (efficiency rating for room ACs); SEER = seasonal energy efficiency ratio (rating for residential central ACs); WH = water heater; HPWH = heat pump water heater.

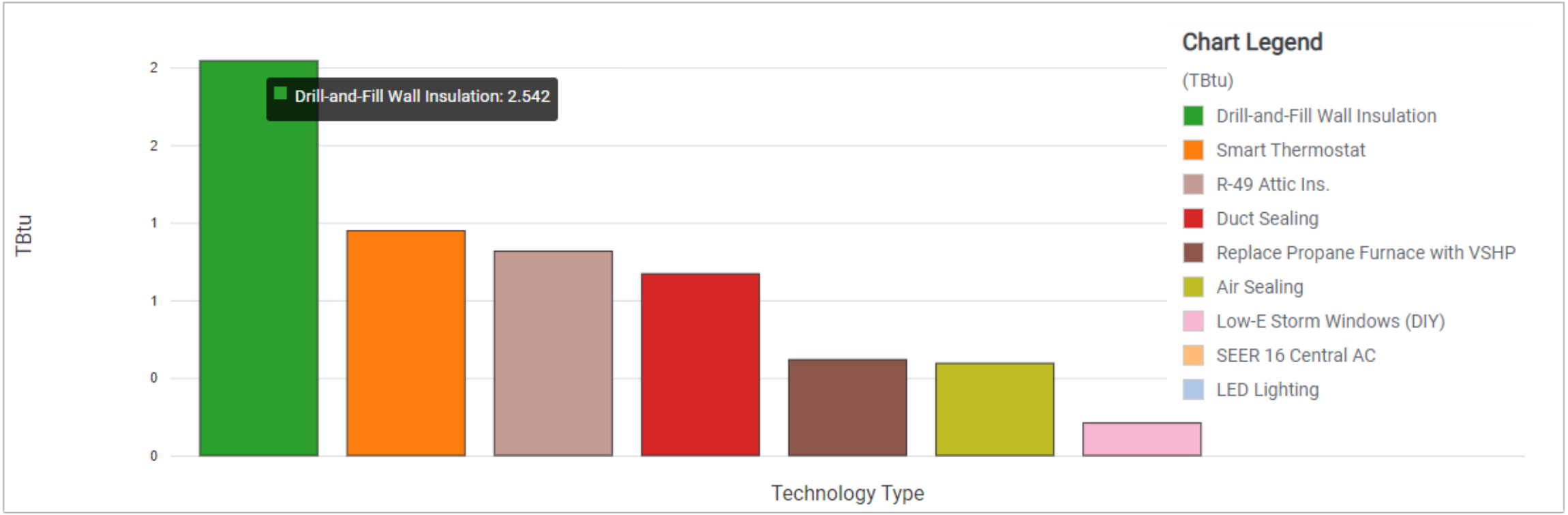
Energy efficiency supply curve. (Source: Data from E. Wilson et al., Electric End-Use Energy Efficiency Potential in the U.S. Single-Family Housing Stock, NREL [2017], https://www.nrel.gov/docs/fy18osti/68670.pdf. See also: https://www.energy.gov/eere/analysis/downloads/city-energy-data-decisions-rochester-new-york

Energy Efficiency – Single-Family Homes

(New Mexico)

Single Family Home Fuel Savings Potential

CHART



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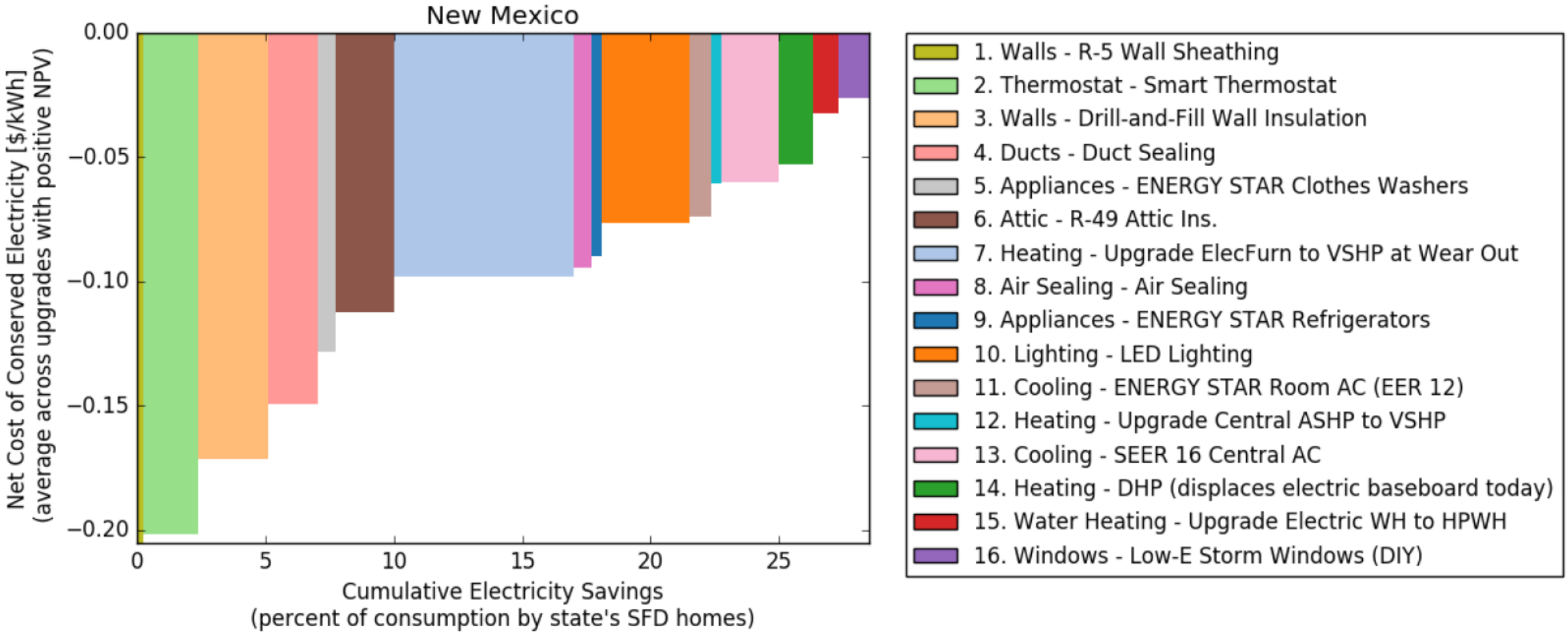
Energy Efficiency – Single-Family Homes

(New Mexico)

Electric Efficiency Supply Curve for New Mexico



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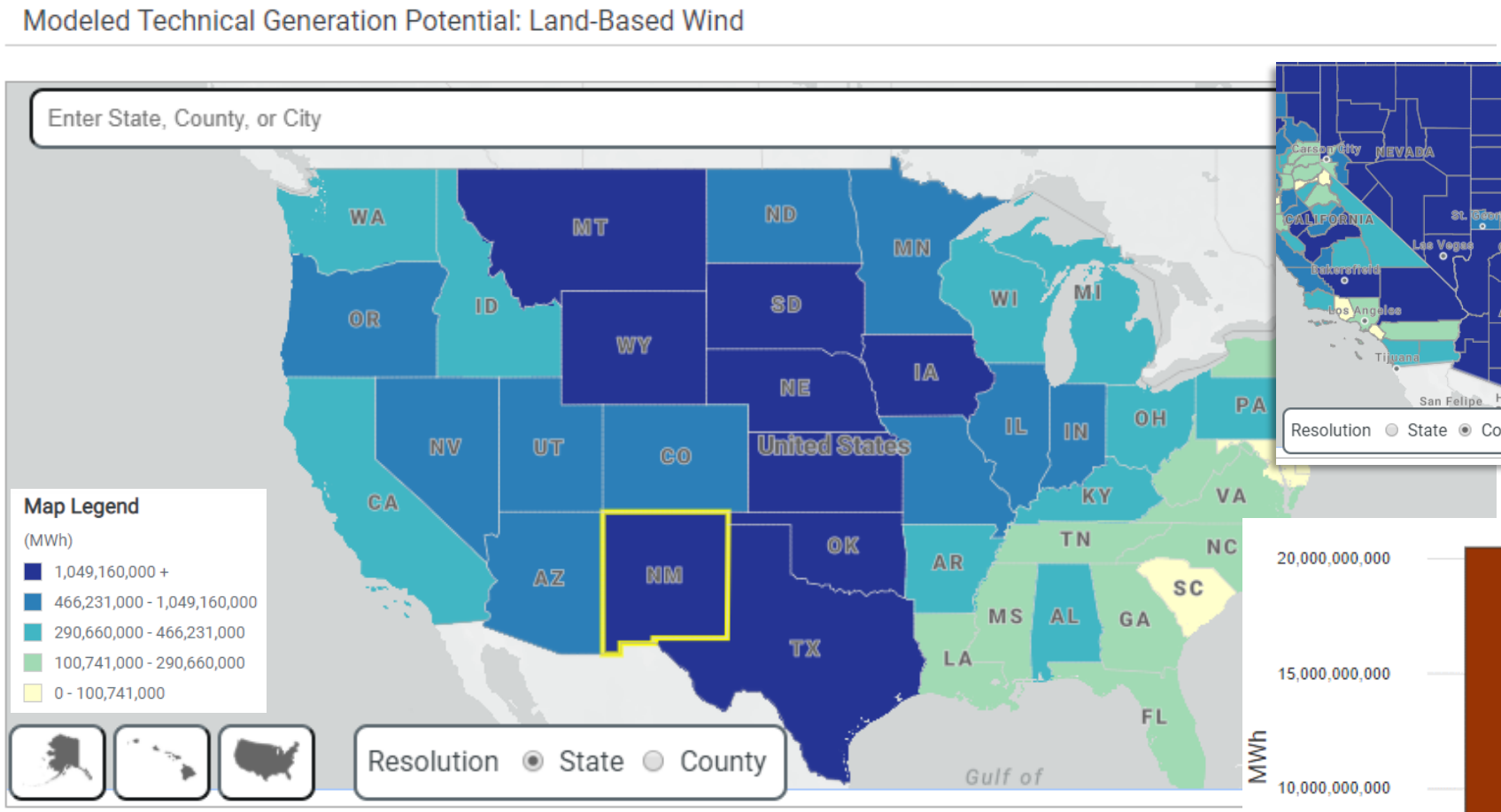
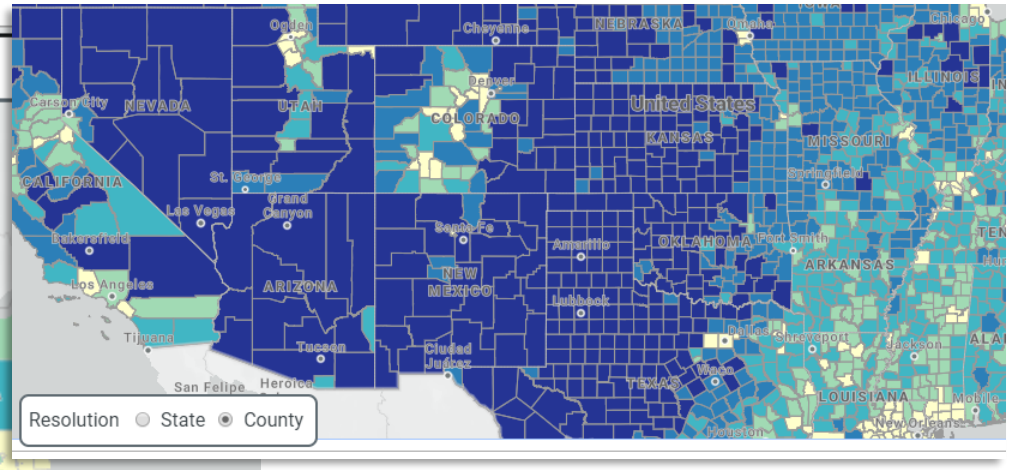
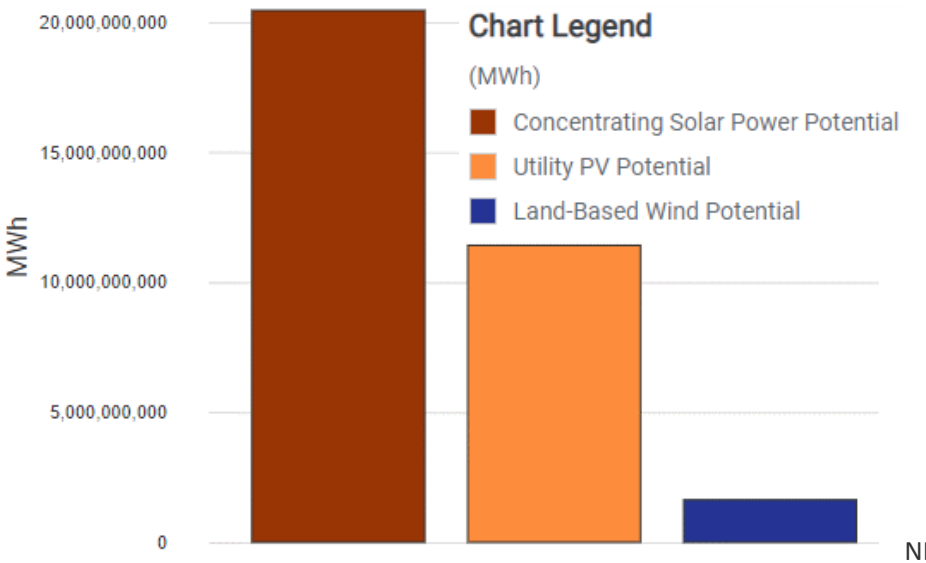
Energy efficiency supply curve for New York State. (Source: Data from E. Wilson et al., Electric End-Use Energy Efficiency Potential in the U.S. Single-Family Housing Stock, NREL [2017], https://www.nrel.gov/docs/fy18osti/68670.pdf. See also: https://www.energy.gov/eere/analysis/downloads/city-energy-data-decisions-rochester-new-york

Renewable Energy Generation Potential

Land-Based Wind (New Mexico)







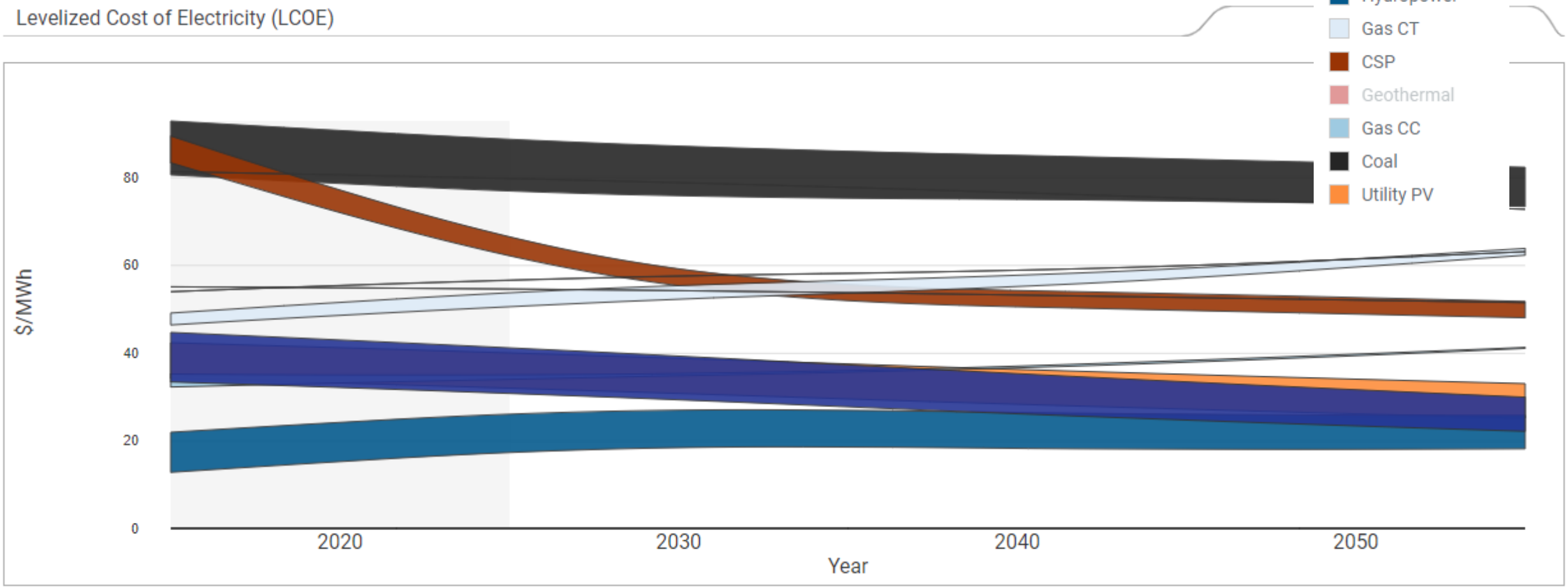
Technical generation potential for land-based wind in New Mexico is among the highest in the nation, with potential throughout the state. Utility-scale PV and concentrating solar power technical generation potential is higher than wind.

https://gds.nrel.gov/slope

Levelized Cost of Energy (LCOE)

New Mexico

Modeled costs for newly constructed electricity generation in New Mexico show new hydropower generation is potentially the lowest cost technology. (Geothermal LCOE is clicked off in the legend here.)



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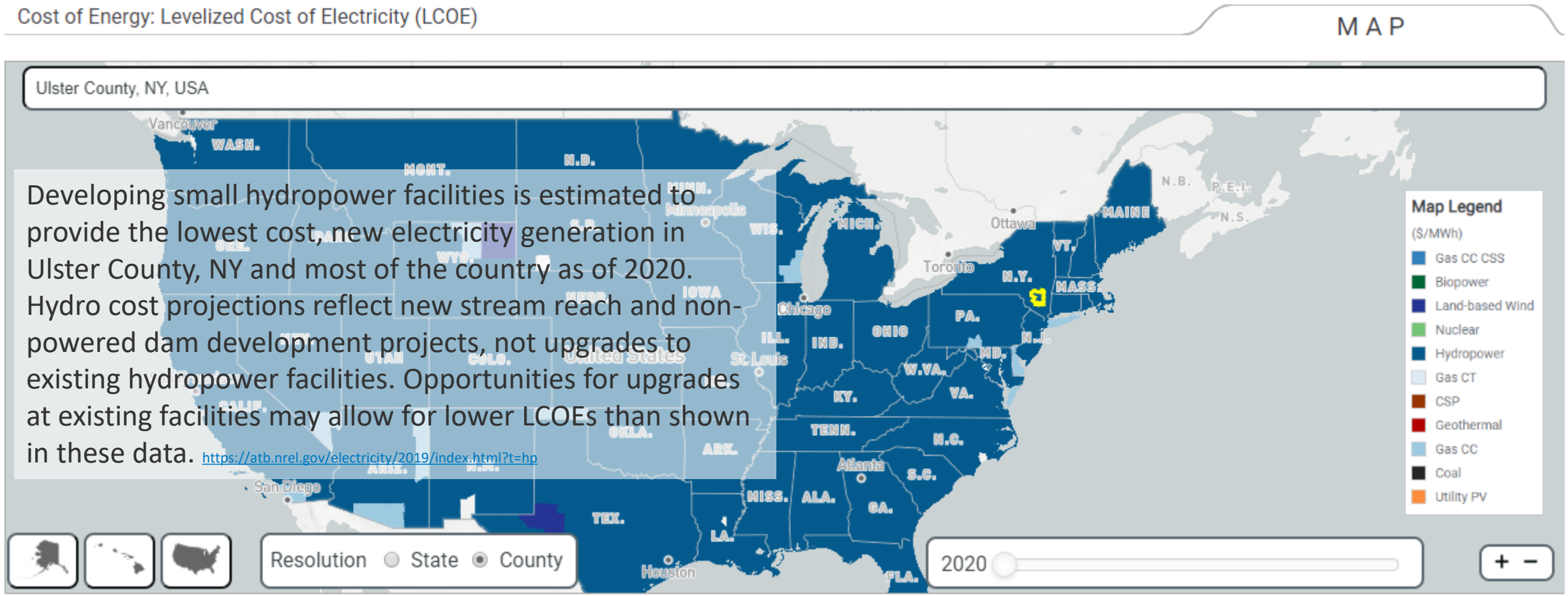
Modeled Lowest Levelized Cost of Energy Generation Technology in each U.S. County (2020)



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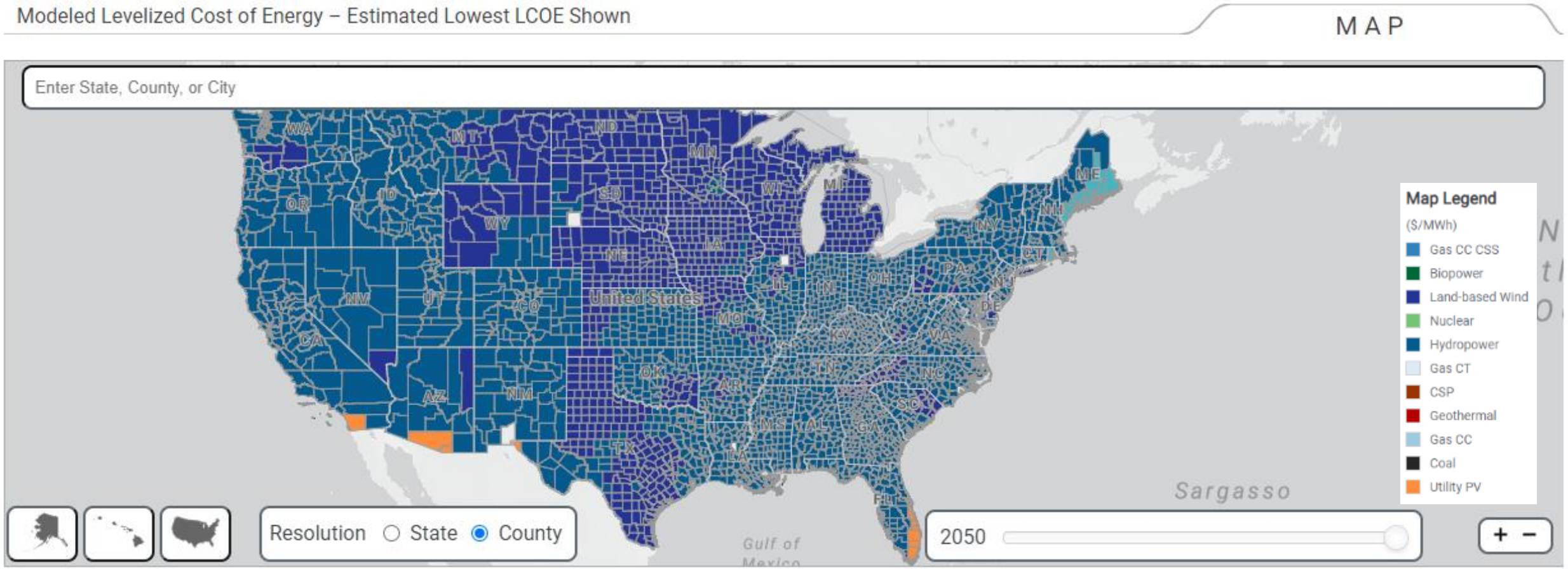
Modeled Lowest Levelized Cost of Energy Generation Technology in each U.S. County (2050)

Modeling indicates that by 2050, land-based wind may be the lowest cost new electricity generation technology in much of the Midwest.



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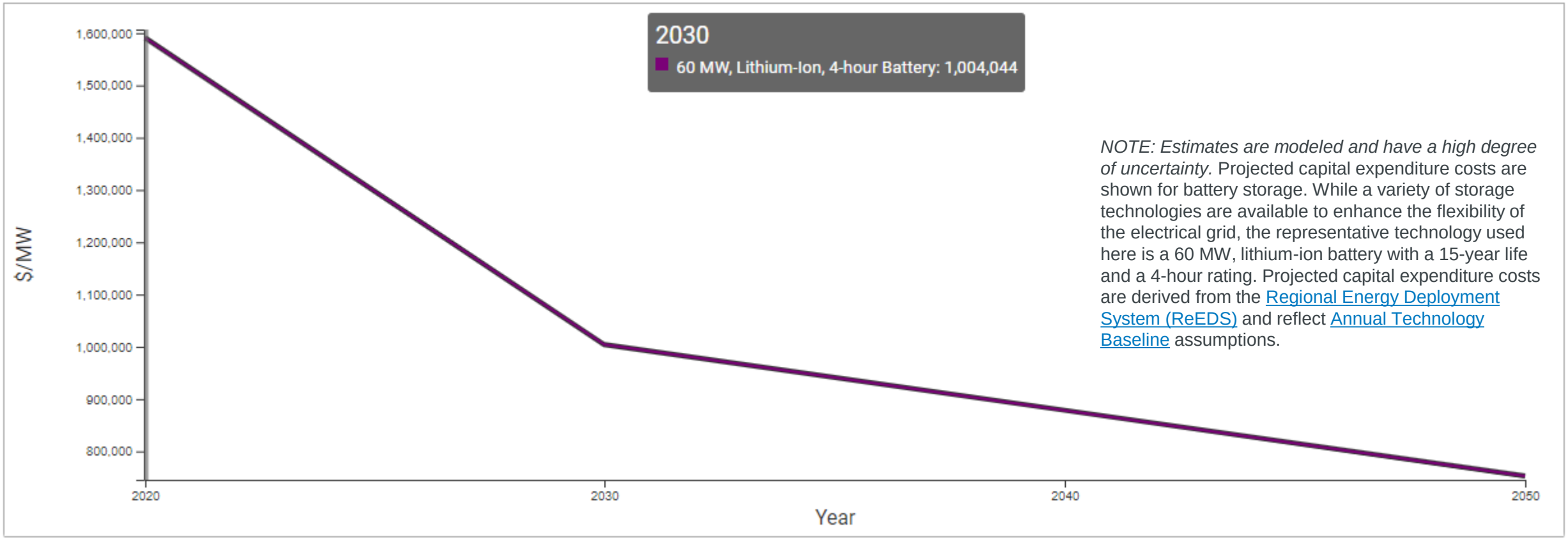
Modeled Capital Costs of Battery Storage

Cost of Energy: Battery Storage Capital Costs

CHART



NOTE: Estimates are modeled and have a high degree of uncertainty. Projected capital expenditure costs are shown for battery storage. While a variety of storage technologies are available to enhance the flexibility of the electrical grid, the representative technology used here is a 60 MW, lithium-ion battery with a 15-year life and a 4-hour rating. Projected capital expenditure costs are derived from the Regional Energy Deployment System (ReEDS) and reflect Annual Technology Baseline assumptions.

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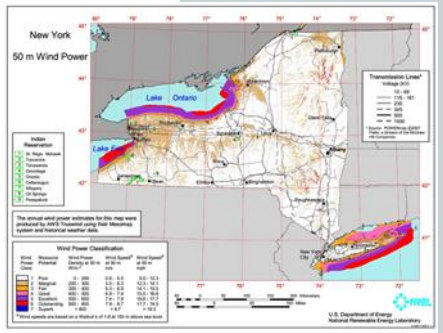
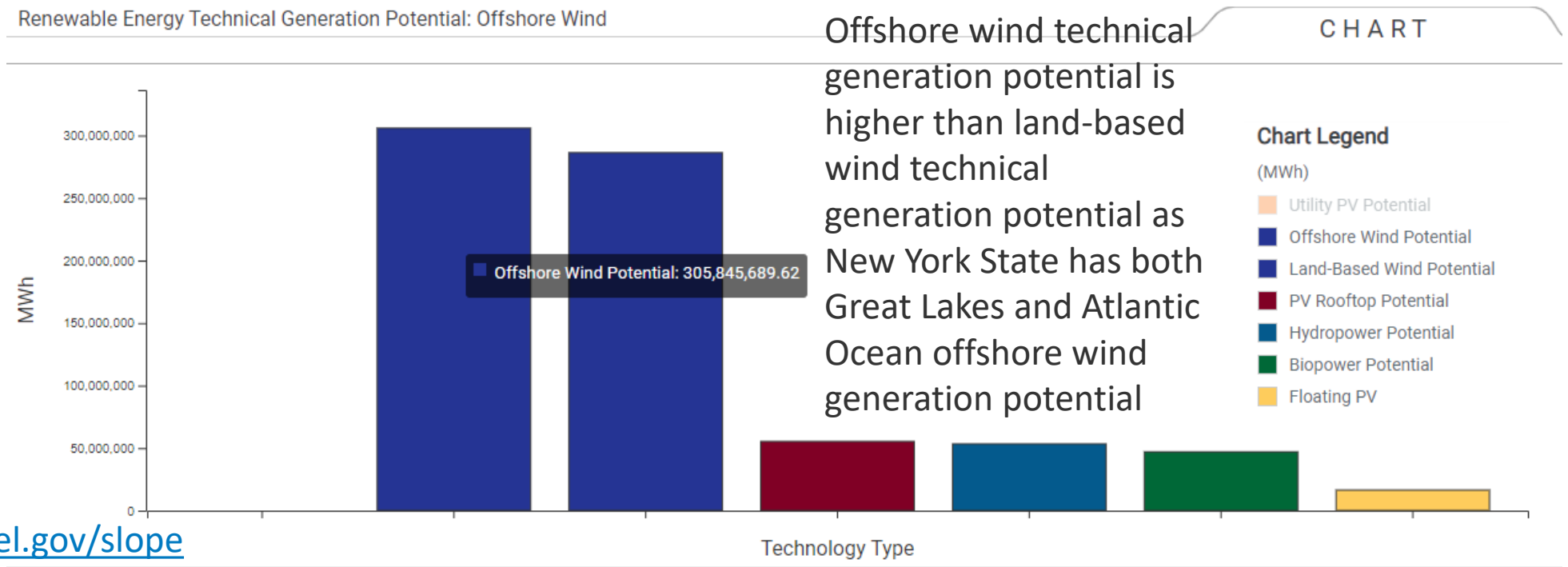
Renewable Energy Generation Potential

Offshore Wind (New York State)



https://windexchange.energy.gov/maps-data/96



Offshore wind technical generation potential is higher than land-based wind technical generation potential as New York State has both Great Lakes and Atlantic Ocean offshore wind generation potential

https://gds.nrel.gov/slope

SLOPE Direction

Phase I
2019

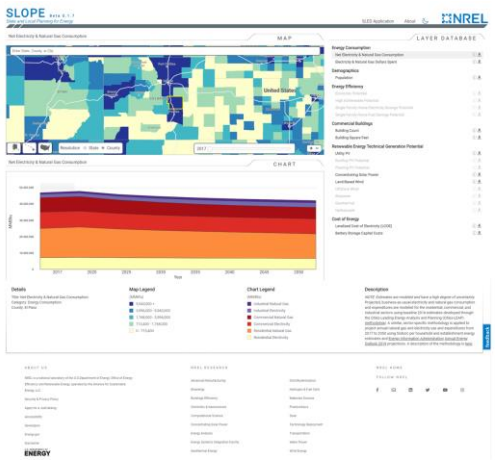
Provide state- and locally-specific projection data integrated w/SLED
(State and Local Energy Database)

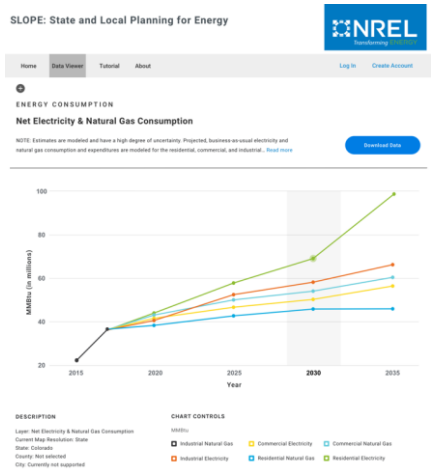
Phase II
2020

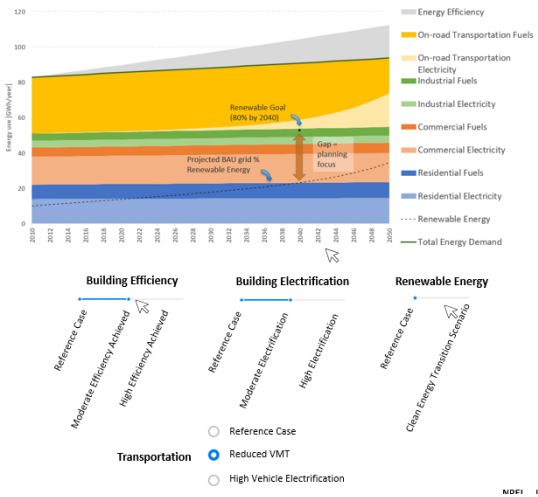
Integrate projected transportation and generation mix data; enable user-saved settings

Phase III
2021+

Deliver customized energy future scenarios

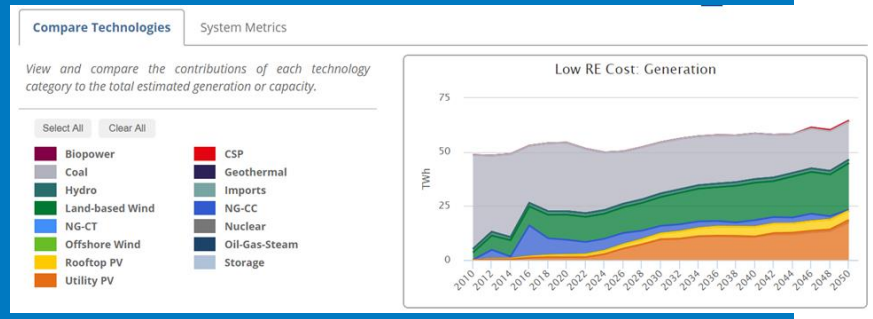






Dynamic, comprehensive energy planning platform

SLOPE Components To be launched 1/1/21



Transportation

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

Generation

- Modeled current and projected electricity generation mix by state

DG wind and PV

- 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

City-level data

- For population, electricity & natural gas consumption, commercial buildings

Platform updates

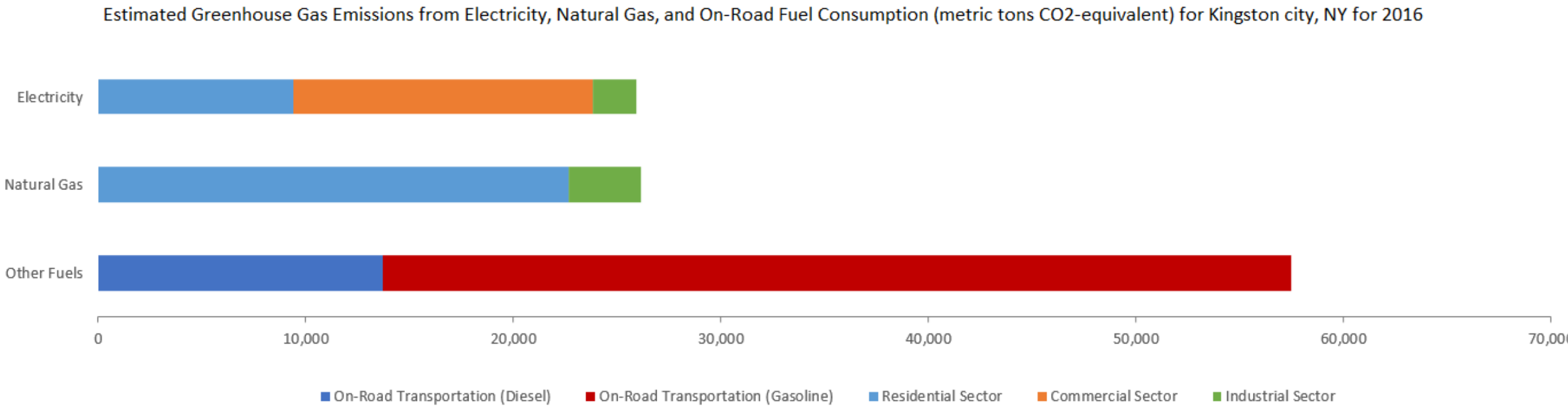
- Ability for users to save individual settings
- Redesign in response to heuristics, user feedback

Use Cases

- State and local use cases published to demonstrate application

Estimated Greenhouse Gas Emissions

Kingston, NY (2016)



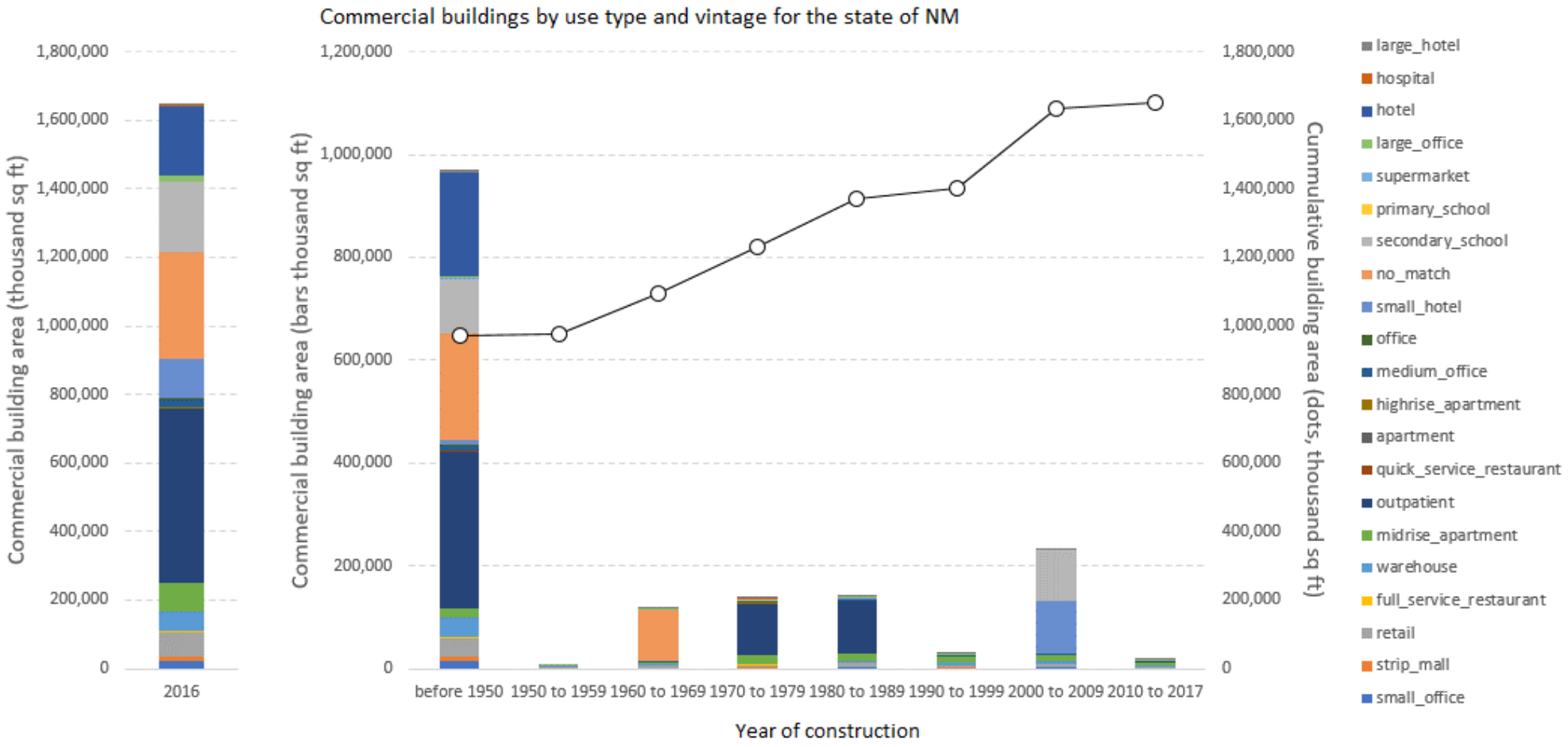
Modeled emissions show on-road vehicle fuel consumption generates higher emissions than electricity and natural gas consumption in Kingston, NY.

https://openei.org/doe-opendata/dataset/city-county-energy-profiles

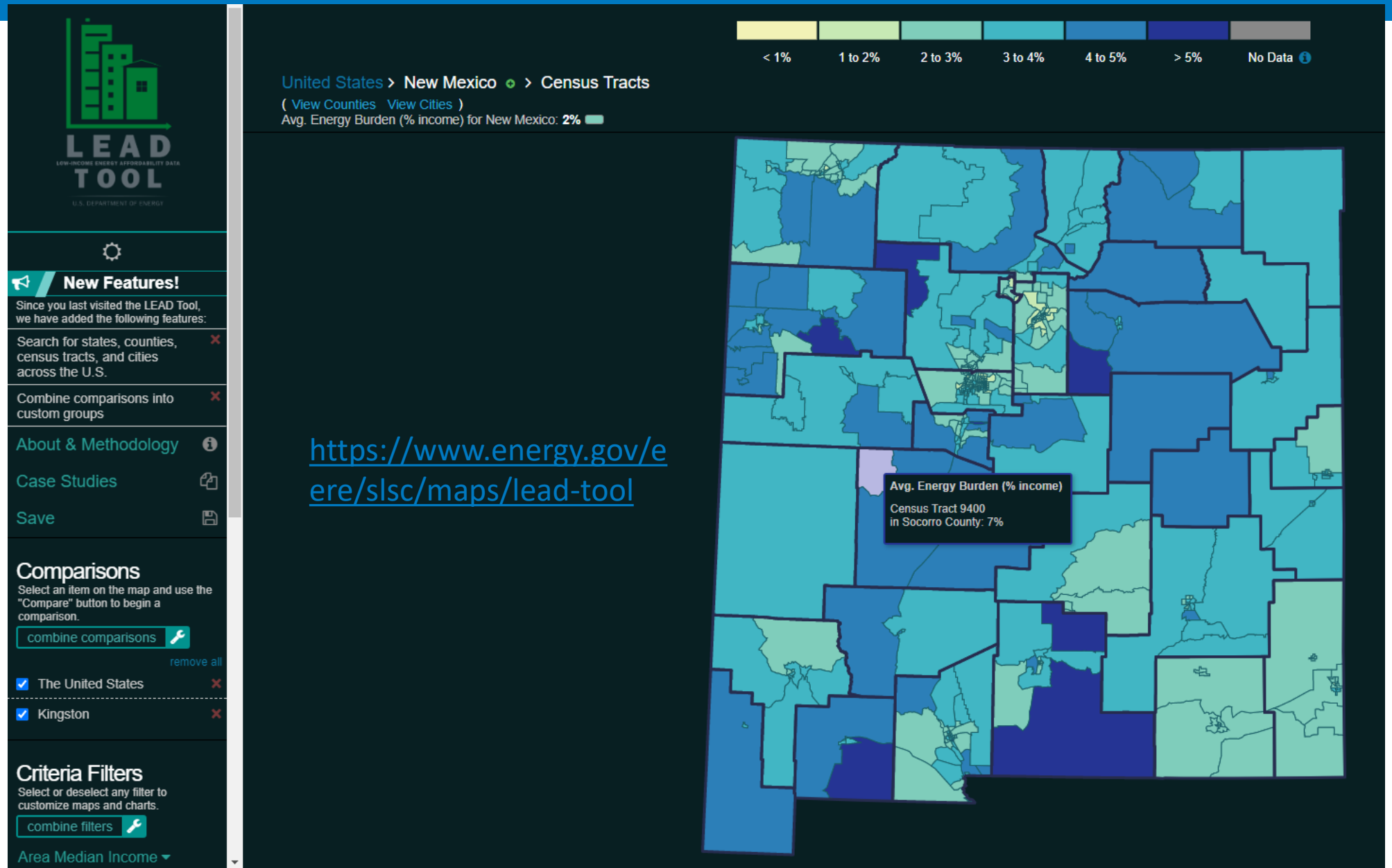
Commercial Building Inventory New Mexico

https://openei.org/doe-opendata/dataset/city-and-county-commercial-building-inventories

Commercial Building Inventories provide modeled data on commercial building type, vintage, and area for each U.S. city, county, and state. Please note this data is modeled and more precise data may be available through county assessors or other sources. Commercial building stock data is estimated using CoStar Realty Information, Inc. and FEMA Hazus building stock data through a process described in Sector-Specific Methodologies for Subnational Energy Modeling: https://www.nrel.gov/docs/fy19osti/72748.pdf.



Low-Income Energy Affordability



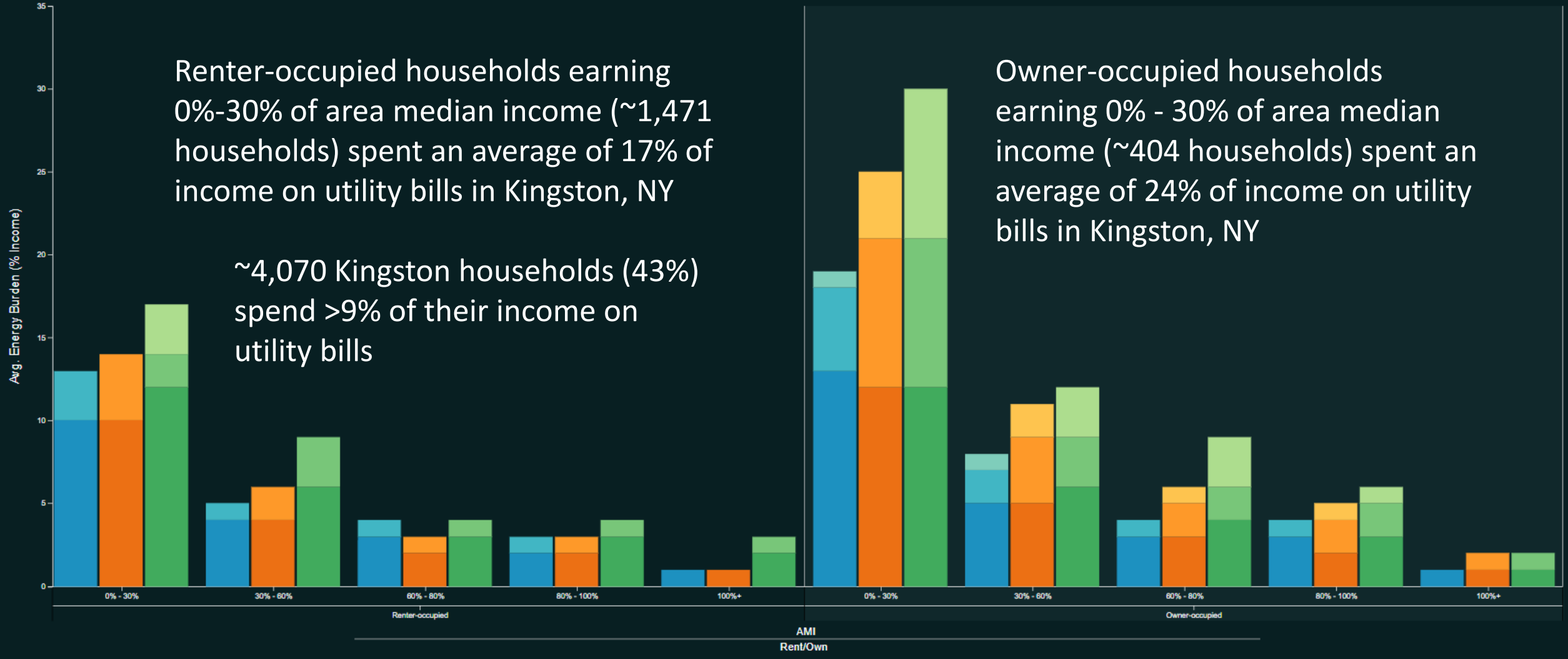
https://www.energy.gov/eere/slsc/maps/lead-tool

Low-Income Energy Affordability

Renter-occupied households earning 0%-30% of area median income (~1,471 households) spent an average of 17% of income on utility bills in Kingston, NY

~4,070 Kingston households (43%) spend >9% of their income on utility bills

Owner-occupied households earning 0% - 30% of area median income (~404 households) spent an average of 24% of income on utility bills in Kingston, NY



https://www.energy.gov/eere/slsc/maps/lead-tool

Access SLOPE:
https://gds.nrel.gov/slope

Share Comments and Questions:
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Q&A

Megan Day, AICP

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SLOPE Recommended Citation

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Upcoming Webinars

State Leadership in Low-and-Moderate-Income Solar Energy, Featuring Massachusetts, Michigan and Oregon
Thursday, July 23, 1-2:30pm ET

New Jersey's Plan for Achieving 100% Carbon-Neutral Electricity
Wednesday, July 29, 3-4pm ET

Expanding Grid Capacity with Energy Storage in Decorah, Iowa
Thursday, July 30, 1-2:30pm ET

NYSERDA's Offshore Wind Program
Tuesday, August 4, 2-3pm ET

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