GEB Working Group Meeting: National Lab Technical Assistance Update

June 25, 2021

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Agenda

- Update on Working Group resources
  - *Estimating Demand Flexibility Potential: Considerations for States*
  - State opportunities to promote demand flexibility
  - *Prioritizing Demand Flexibility Investments: Identifying High-Value Actions for State and Local Decision-makers, Building Owners & Energy Managers*
  - Technical brief on *Pilot Considerations for Grid-interactive Efficient Buildings in Washington* and a similar brief for Hawaii
- Update on technical assistance for Working Group members
  - Arizona Corporation Commission Staff - Review of draft request for proposals filed by Arizona Public Service for aggregated distributed demand-side resources
  - Connecticut Department of Energy and Environmental Protection - Opportunities to incorporate efficiency and demand flexibility into utilities' Conservation and Load Management plans
  - Public Service Commission of Wisconsin - Opportunities to use energy efficiency and demand flexibility toward achieving the state's zero-carbon goal

Estimating Demand Flexibility Potential: Considerations for States

Natalie Frick and Chandler Miller, Berkeley Lab

This work described in this presentation was funded by the U.S. Department of Energy Building Technologies Office under Contract No. DE-AC02-05CH11231.

Estimating Demand Flexibility Potential: Considerations for States

- We also are developing a document to support states interested in estimating DF potential.
  - State or local governments that are interested in estimating DF potential — alongside energy efficiency potential — can use this guide to consider the scope of the study and data needs.
  - The guide will provide a review of current methods and tools that states can consider using in demand flexibility/demand response and efficiency potential studies.
  - We shared summaries of four demand response potential studies in December.
- We are reviewing additional studies to identify:
  - Purpose
  - End uses/technologies
  - Type of potential estimated
  - Scenarios
  - Load forecast approach
  - Analysis approach
  - Modeling tools used
  - Challenges

Poll Question #1: Planning or currently conducting a demand flexibility potential study

- Are you planning to conduct or currently conducting a demand flexibility potential study in your state?
  - Yes
  - No
  - Maybe later
  - I don't know

Poll Question #2: Input or questions about the demand flexibility potential guide

- Do you have input or questions about the demand flexibility potential guide that you would like us to follow-up with you about?
  - Yes
  - No

State Opportunities to Promote Demand Flexibility

Natalie Frick, Berkeley Lab

This work described in this presentation was funded by the U.S. Department of Energy Building Technologies Office under Contract No. DE-AC02-05CH11231.

State Opportunities to Promote Demand Flexibility

- We are developing model language for states and local governments seeking to include demand flexibility in achieving their energy-related goals.
  - We are focused on policies that impact buildings (e.g., resource standards, benchmarking, integrated resource planning, distribution system planning, building energy codes).
  - We are prioritizing model language development based on state needs.
- We shared model language that states can consider using to incorporate demand flexibility in the following policies:
  - Benchmarking, transparency and reporting
  - Building performance standards
  - Peak demand reductions in energy efficiency resource standards

Poll Question #3: Energy efficiency resource standards and demand flexibility

- Are you interested in model legislative or regulatory language to assist your state in incorporating demand flexibility into Energy Efficiency Resource Standards, specifically related to the following ? (Select all that apply)

  - Methodologies (e.g., cost effectiveness test)
  - Interaction with other utility planning processes (e.g., integrated resource planning, distribution system planning , demand response planning)
  - Data access and sharing between planning processes
  - Other specific area of interest (please provide response in chat)
  - I'm not interested in this topic.

Poll Question #4: Energy planning and demand flexibility

- Are you interested in model legislative or regulatory language to assist your state in incorporating demand flexibility into energy planning, specifically related to the following? (Select all that apply)

  - Integrated resource planning
  - Distribution system planning
  - Demand-side management planning
  - Other specific area of interest (please provide response in chat)
  - I'm not interested in this topic.

Poll Question #5: Appliance standards and demand flexibility

- Are you interested in a state peer-sharing webinar on incorporating demand flexibility into appliance standards? (Select all that apply)
  - Heat pump water heaters
  - Electric resistance water heaters
  - ENERGY STAR® appliances with grid communication and demand management capability
  - Other (please provide response in chat)
  - I'm not interested in this topic.

Prioritizing Demand Flexibility Investments:

Identifying High-Value Actions for State and Local Decision-makers, Building Owners & Energy Managers

Preliminary Results: Do not cite

Joyce McLaren and Thomas Bowen, National Renewable Energy Laboratory

Update: June 25, 2021

This work described in this presentation was funded by the U.S. Department of Energy Building Technologies Office under Agreement # 36588.

Presentation Overview

- Goal & Focus of Analysis
- Methodology
- Preliminary Results
- Next Steps & Timeline

Challenges addressed by the analysis

- The main electricity system challenges, according to states, are:
  - summer peaks driven by daytime cooling loads, or
  - winter peaks driven by heating & lighting loads.
- Emissions reduction is increasingly cited as a high state-level energy priority.
- Current information about the potential of demand flexibility measures remains high level or vague.

Goal & Focus of the Analysis

Goal

- Provide actionable information on the potential impact of demand flexibility investments to inform:
  - demand-flexibility program or incentive design (the main mechanism used by states)
  - legislative or regulatory action
  - building owner investment

Outputs

- Impact of implementing energy efficiency and demand flexibility measures in **large office buildings** (500,000 sq. ft)
  - Avoided emissions
  - Electricity system cost savings
  - Building owner bill savings
- Regional potential for deployment, based on existing building stock

Efficiency and Demand Flexibility Measures being modeled

Demand Flexibility Measures

- HVAC (adjusting setpoint temperatures)
- Pre-cooling (prior to peak system demand period)
- Ice-storage (for cooling)
- Lighting (occupancy controls)
- Plug Loads (power management software and hardware + behavioral feedback)

Efficiency Measures

- Envelope Improvements
- Lighting
- Plug Loads
- HVAC
- Refrigeration
- Heat Pump Water Heater

- ✓ Investigate the EE measures and demand flexibility measures individually and in combination.
- ✓ Consider the interplay between the measures when they are implemented together.
- ✓ Identify high value packages of measures for each region.

Methodology

For each EMM region, model office building load before and after implementing efficiency and demand-flexibility measures (Scout model)

Characterize associated emissions reductions & system cost savings (Cambium data)

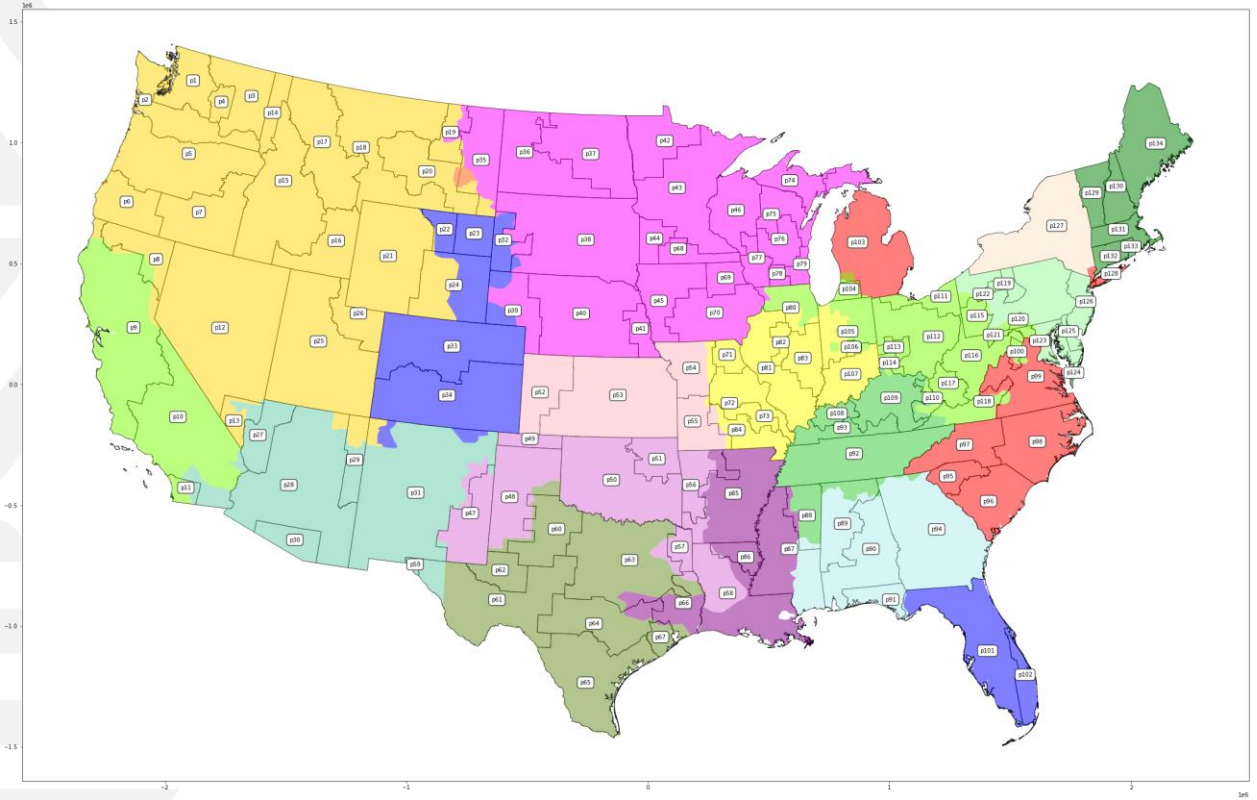
Characterize customer bill savings based on typical demand charges and time-of-use rates (REopt model)

Identify depth of the potential in each region (U.S. building stock data)

Summarize highest value demand-flex measures & key locations for implementation

Data Sets, Tools & Models being used in the analysis

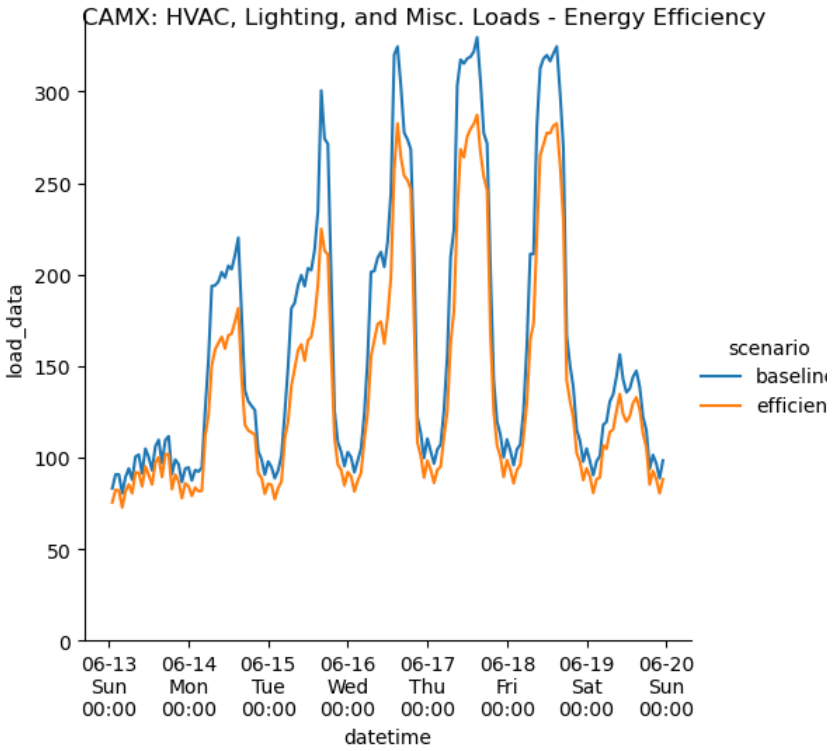
- Scout Tool
  - Building load profiles before and after EE and DF measures
- Cambium marginal power system data
  - Long run marginal emissions rates
  - Short run marginal costs
- ComStock - U.S. commercial building stock data
- REopt Tool
  - Electricity bill calculations



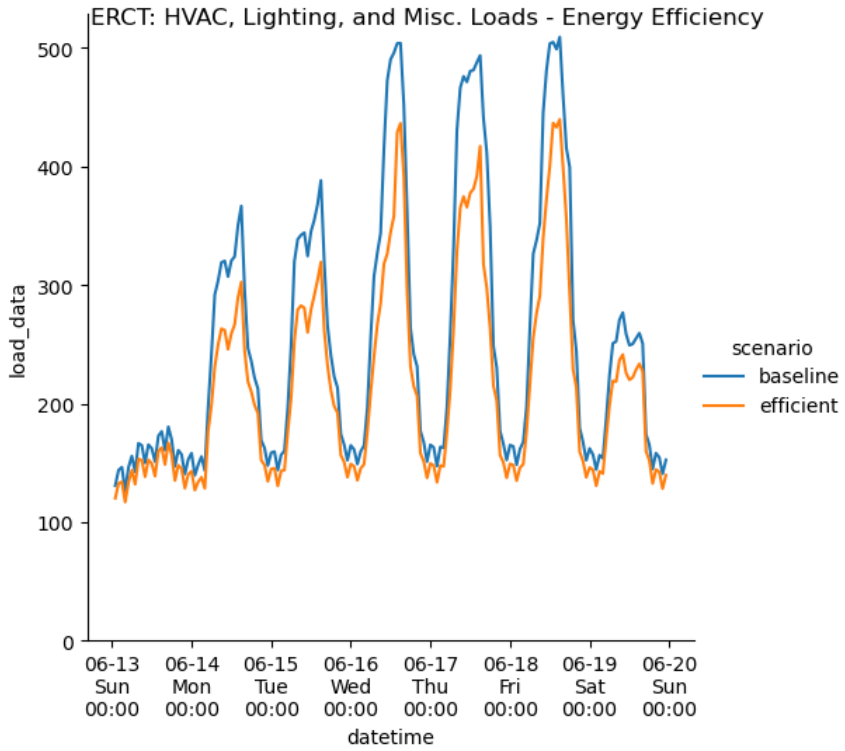
Challenge: The granularity of data being used differs across data sources (EMM regions, ReEDs Balancing Areas, county-level data) & the tools used for modeling are not interconnected.

Impact of HVAC, Lighting + Plug Load Efficiency in Single Large Office

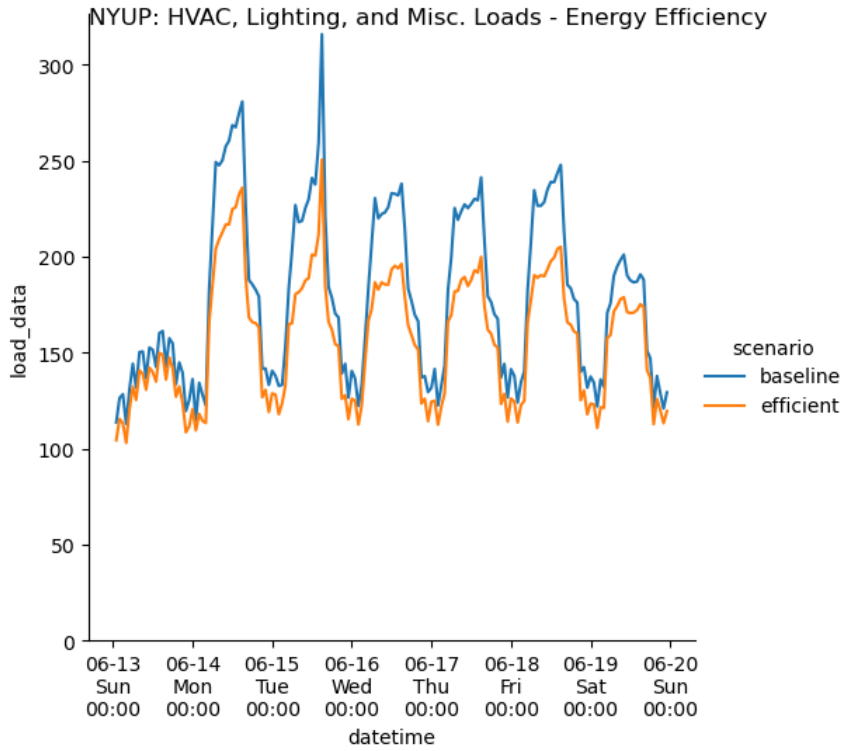
California



ERCOT



Upstate New York

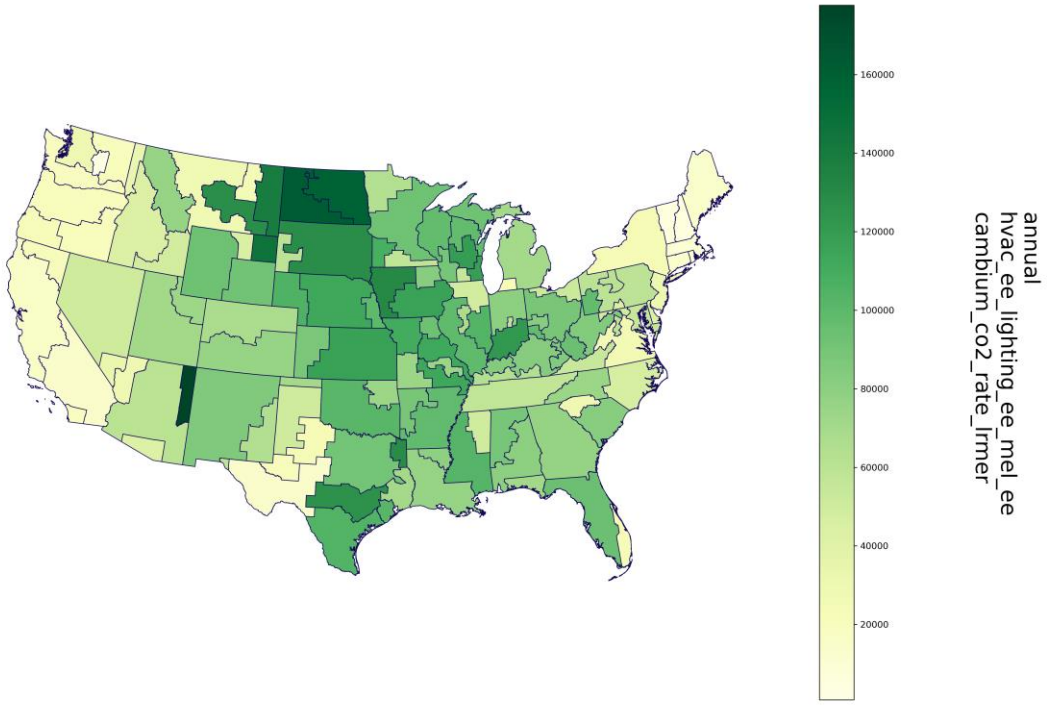


Preliminary Results: do not cite

Impact of HVAC, Lighting + Plug Load Efficiency in Single Large Office

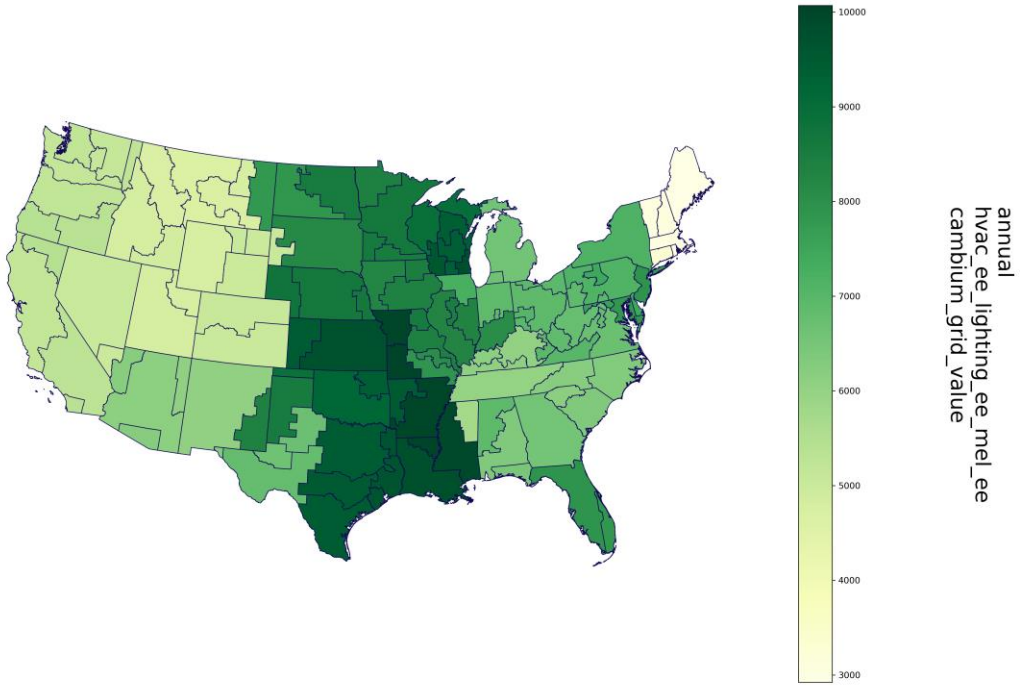
Annual Avoided CO2 Emissions (t)

Preliminary Results



Grid Savings ($)

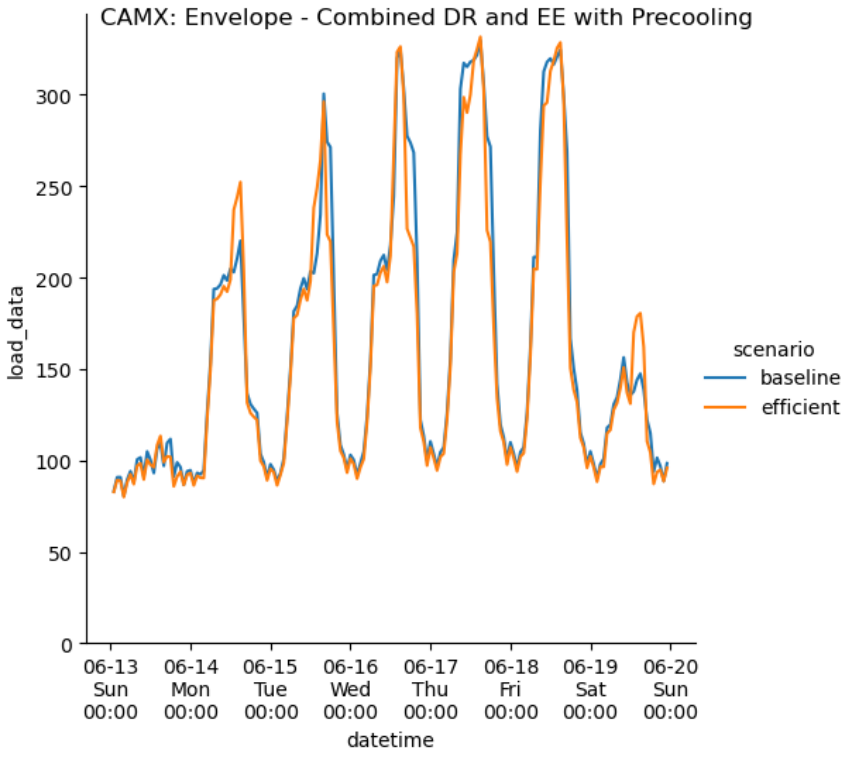
Preliminary Results



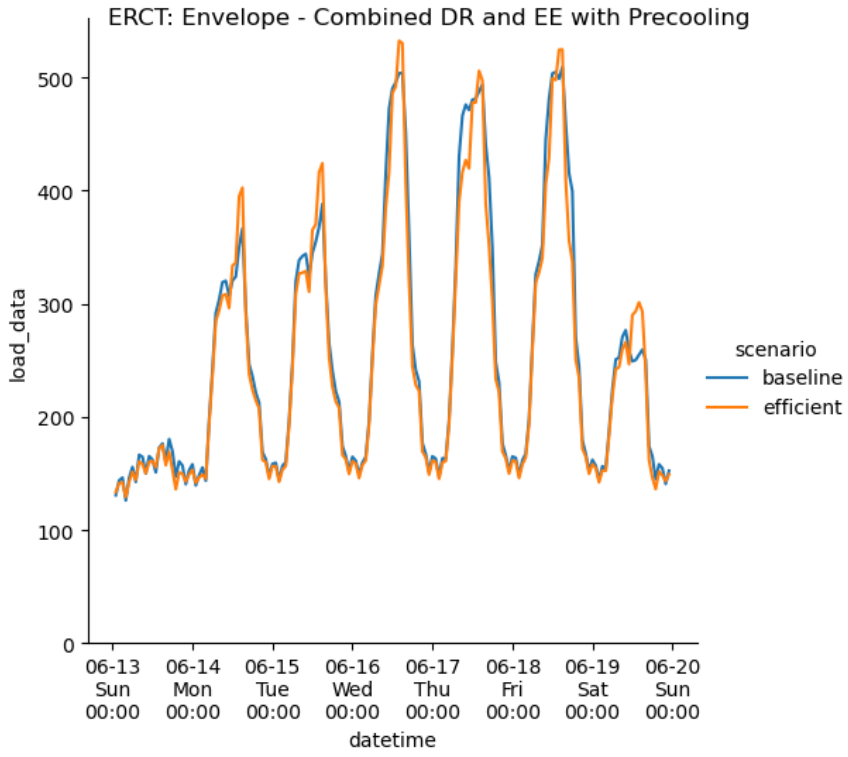
*Avoided grid cost = grid value = energy value + capacity value

Impact of Envelope EE + Precooling in Single Large Office

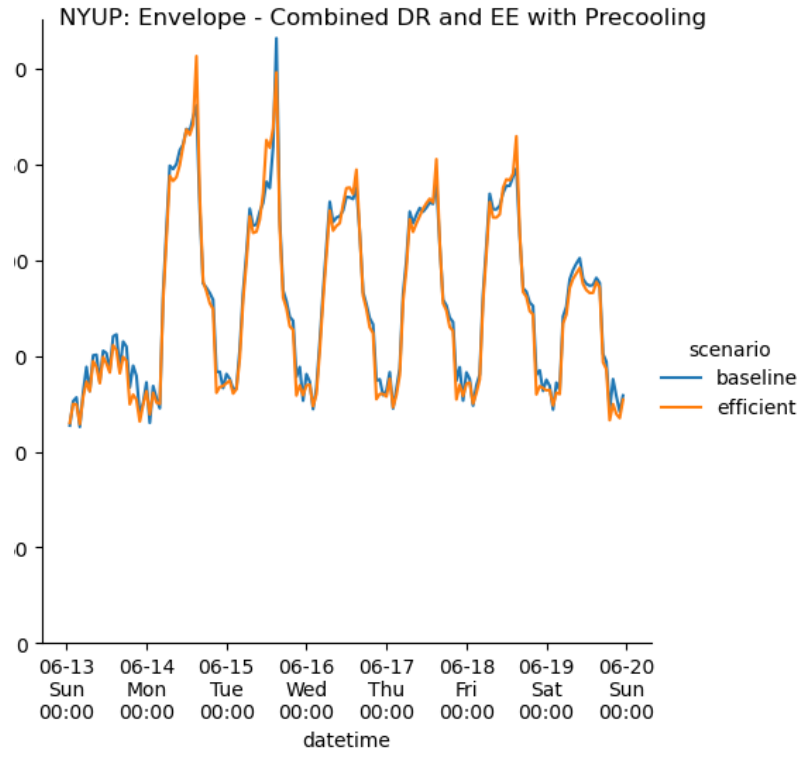
California



ERCOT



Upstate New York

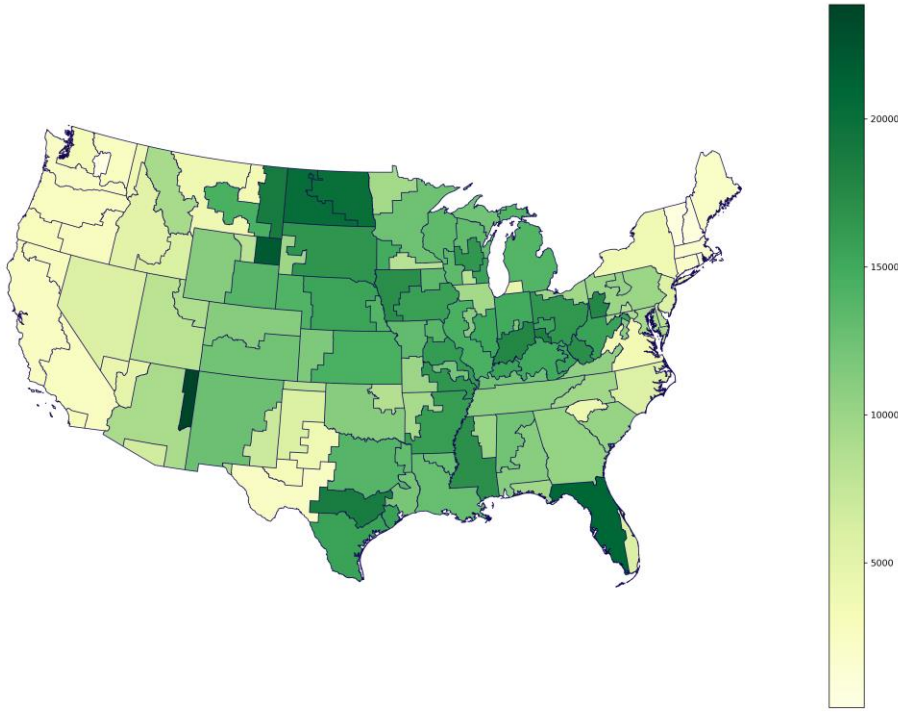


Preliminary Results: do not cite

Impact of Envelope EE + Precooling in Single Large Office

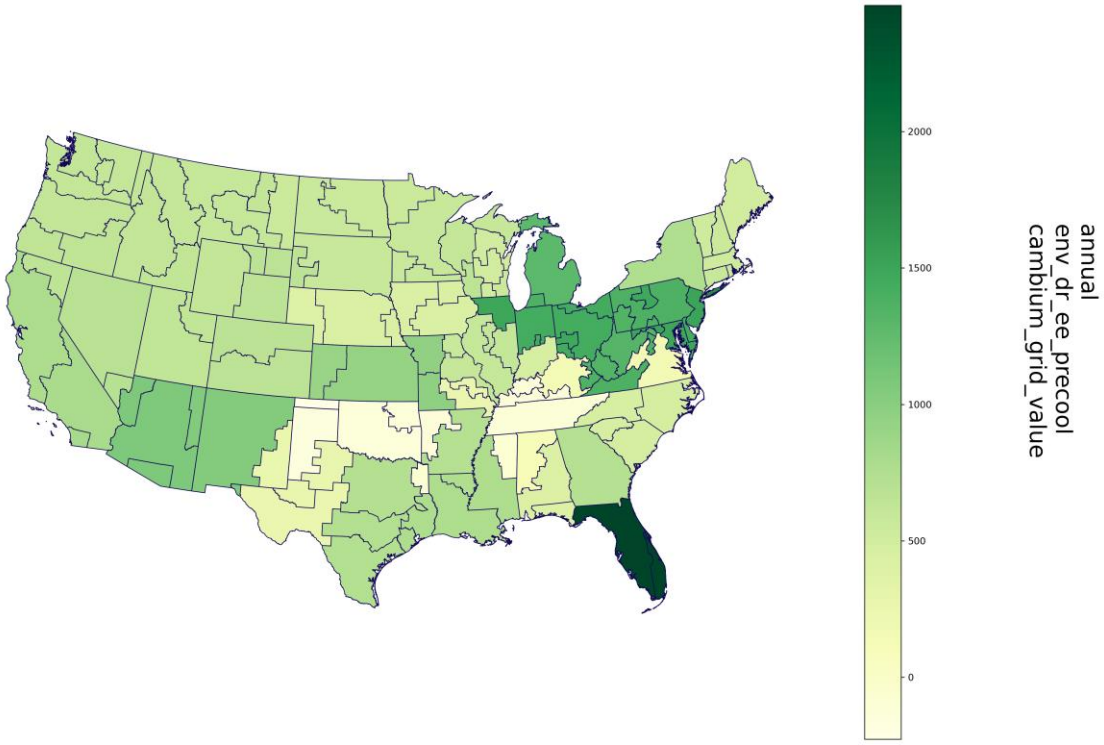
Annual Avoided CO2 Emissions (t)

Preliminary Results



Grid Savings ($)

Preliminary Results



*Avoided grid cost = grid value = energy value + capacity value

Next Steps & Timeline

- Identify the highest-value measures for each region (out of the ~4000 combinations).
- Calculate bill savings at building level for representative utility rates in each region.
- Report the potential savings across all offices in a region.
- Timeline: Full draft end of summer 2021

Contact: Joyce.McLaren@NREL.gov

Pilot Considerations for Grid-Interactive Efficient Buildings

Juliet Homer and Christine Holland, Pacific Northwest National Lab

June 25, 2021

This work described in this presentation was funded by the U.S. Department of Energy Building Technologies Office under Contract No. DE-AC05-76RL01830.

Presentation Overview

- Purpose
- Technical Brief Overview
- Metrics
- Status
  - Washington Brief
  - Hawaii Brief
  - Some observed differences between states
- Next Steps

Purpose

GEBs are potentially very beneficial!

But they're new and complex

- Create clarity and common language on what GEBs are and services they can provide
- Clarify challenges and barriers to GEBs
- Illuminate how GEBs ties to specific state energy goals
  - Energy goals tied to specific GEB metrics to be tested through a pilot
- Highlight state-specific policies that can leverage GEB pilot development
- Provide general considerations for GEB pilots

Technical Brief Overview

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

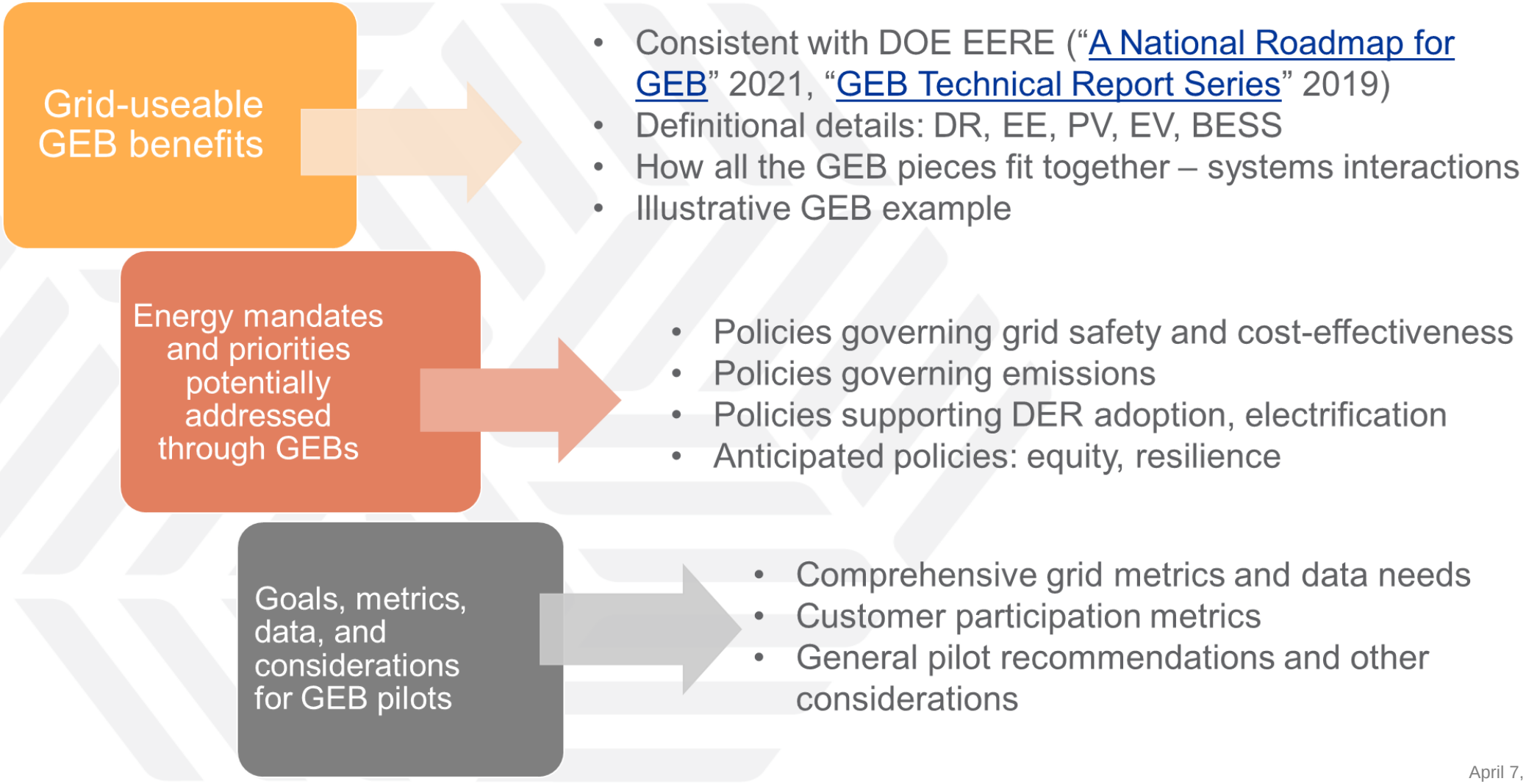
Establish GEB basics

Define grid-useable benefits from GEBs

Identify utility/state energy mandates and utility priorities potentially addressed through GEBs

Summarize goals, metrics, data, and considerations for GEB pilots

Technical Brief Overview, cont.



- Consistent with DOE EERE ("A National Roadmap for GEB" 2021, "GEB Technical Report Series" 2019)
- Definitional details: DR, EE, PV, EV, BESS
- How all the GEB pieces fit together – systems interactions
- Illustrative GEB example

- Policies governing grid safety and cost-effectiveness
- Policies governing emissions
- Policies supporting DER adoption, electrification
- Anticipated policies: equity, resilience

- Comprehensive grid metrics and data needs
- Customer participation metrics
- General pilot recommendations and other considerations

Metrics

Grid Metrics

- Energy savings
- Capacity contributions
- Renewable energy and BTM generation
- Grid carbon alignment
- Short-term/long-term demand flexibility
- Resilience

Metrics Impacting Customer Participation

- Customer retention
- Customer satisfaction
- GEB performance relative to comfort/productivity
- Bill impacts
- GEB technology – first costs, operational costs
- Overall cost-effectiveness
- Messaging impacts

Washington Update

- Request from Washington
  - "Common language" and understanding of GEB benefits
  - Primarily from the perspective of the utility
- Some potential GEB priorities based on state goals:
  - Chapter 19.280 Revised Code of Washington, Electric Utility Resource Plans. http://app.leg.wa.gov/RCW/default.aspx?cite=19.280
  - WA Energy Independence Act (RCW 19.285; I-937)
  - Clean Energy Transformation Act (CETA)
  - 2021 Washington State Energy Strategy https://www.commerce.wa.gov/growing-the-economy/energy/2021-state-energy-strategy/

Hawaii Update

- More extensive list of dockets/policies that Hawaii wants addressed in the Technical Brief
- Attend monthly GEB working group meetings with Hawaii
- Some potential GEB priorities based on state goals:
  - Docket 2018-0165 **Integrated Grid Planning** – "analysis of how DERs (and other solutions) can defer future investments…"
  - Docket 2018-0141 – **Grid Modernization** – "enable customer energy options, including DR, DER, TOU rates, and capabilities to provide customers insight to better manage their energy usage."
  - HB 2182 – **Renewable Energy Targets** – "100% renewable energy in the electricity sector and ZEV from ground transportation by 2045."
- First draft sent to Hawaii by the end of the month
  - Anticipated completion – August 2021

Observed Differences Between States

- States have varying levels of GEB needs or have different levels of potential GEB influence driven primarily by:
  - Carbon targets
  - Electricity prices and rate designs
  - Evolution of DER and grid planning policies
  - Who implements demand flexibility programs: utilities, aggregators, or third-parties

Poll Question #6

- Are you interested in a state peer-sharing webinar on regulatory considerations for utility demand flexibility or grid-interactive efficient building pilot program? If so, which aspects are of interest? (Select all that apply)
  - Developing requirements for utility pilots
  - Reviewing pilot designs
  - Approving pilots
  - Overseeing scaling pilots and demonstrations
  - Addressing cost recovery
  - Not interested

Poll Question #7

- Are you interested in a state peer-sharing webinar on the incorporation of the following considerations into building energy codes? (Select all that apply)
  - Demand flexibility
  - Net-zero energy
  - Decarbonized buildings

Next Steps

- Finalize Washington's Brief by July 2021
- Continue iterating with Hawaii on August 2021 completion date
- Webinar focused on Washington Technical Brief August 3, 2021
- Depending upon funding, engage with Michigan and Minnesota

Technical Assistance for State Working Group Members

Natalie Frick and Lisa Schwartz, Berkeley Lab

This work described in this presentation was funded by the U.S. Department of Energy Building Technologies Office under Contract No. DE-AC02-05CH11231.

Arizona

- Arizona Corporation Commission required Arizona Public Service to file a tariff to permit aggregation of distributed demand-side resources (DDSR) — energy efficiency, demand response and storage.
- The tariff must provide compensation for a wide range of values to the electricity system, including energy, capacity, demand reduction, load shifting, locational value, and voltage support.
- The utility is issuing a request for proposals (RFP, due June 30) to inform tariff design and help determine feasibility and value of aggregated DDSR for providing energy, capacity, non-wires solutions, and ancillary services.
- Berkeley Lab is providing technical assistance to Commission Staff:
  - Reviewing the draft RFP and assisting with determination of any needed changes
  - Supporting stakeholder workshops on how Commission Staff should evaluate the tariff and make recommendations to the Commission — e.g., policy objectives, rate design, operating characteristics, valuation, tariff conditions, impacts on non-participants, and measures of tariff success
  - Assisting with review of the tariff (to be filed May 1, 2022), including modeling impacts on households
    - Estimate *bill impacts* for eligible customers and *load impacts* for eligible customers and the utility system
    - Leverage lab's work developing net load shapes for behind-the-meter storage and assessing dispatch of storage aggregations — in various combinations with solar and demand response and under various types of solar and demand response tariffs (net metering, value of solar, time-varying pricing, direct load control)

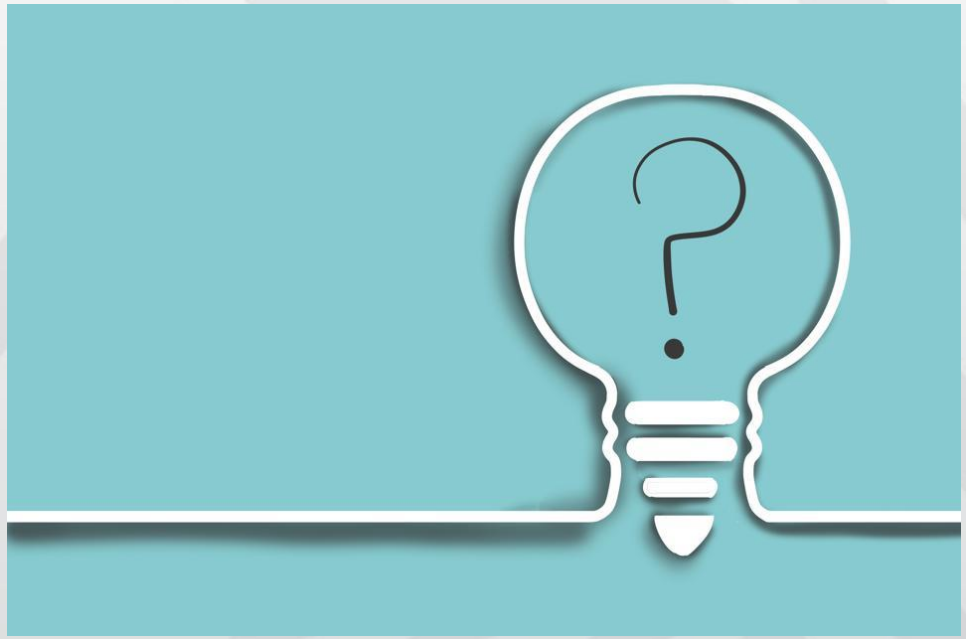
Connecticut

- Berkeley Lab is providing technical assistance to the Connecticut Department of Energy and Environmental Protection (DEEP) on the forthcoming 2022-2024 Conservation Load Management (CLM) Plans.
  - The CLM Plans are created by the utilities and the Connecticut Energy Efficiency Board and approved by DEEP.
- DEEP is interested in opportunities to incorporate demand flexibility programs into the CLM plans.
- Berkeley Lab will provide DEEP with a memo describing utility program opportunities that could be pursued in Connecticut in July.
- We have spoken to the utilities, the Connecticut Efficiency Board consultants (EFG), and DEEP about current and planned demand flexibility program offerings.
- The memo will be sent directly to DEEP, but Berkeley Lab will share the utility demand flexibility opportunities and examples with the working group.
- Currently we are compiling examples of utility offerings that are
  - EE programs that focus on peak demand reduction and time-sensitive value of savings
  - DR programs that focus on smart technologies for energy management
  - Programs that focus on multiple DERs (EE, DR, distributed generation, storage, managed EV charging) to achieve demand flexibility

Wisconsin

- Berkeley Lab is providing technical assistance to the Public Service Commission of Wisconsin on the Roadmap to Zero Carbon investigation.
- The investigation seeks to consider the ongoing transition to zero carbon electricity generation in the state and identified topics that would be evaluated in the investigation. These topics include, but are not limited to:
  - Wisconsin utilities' publicly announced goals to reduce carbon dioxide emissions
  - Recommendations from Wisconsin Energy Distribution Technology Initiative (WEDTI)
  - Governor's Task Force on Climate Change (GTFCC)
  - Executive Order 38, which establishes a goal of achieving 100 percent carbon free electricity consumption in the state by 2050 (Docket No. 5-EI-158)
- Berkeley Lab provided a memo to the PSC of Wisconsin that will be posted on the docket page in upcoming weeks. The memo identifies opportunities to use energy efficiency and demand flexibility toward achieving the goals in Executive Order 38 and the goals established by utilities serving Wisconsin customers.
- The memo is organized around six suggestions: (1) establish an analytical process, (2) align policy goals and metrics, (3) address data needs, (4) identify evaluation metrics, (5) encourage collaboration and innovation and (6) support enabling strategies.

Questions?



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