NEW YORK STATE OF OPPORTUNITY. | NYSERDA

New York's Carbon Neutral Buildings Roadmap

Roundtable Discussion on Grid-Side of Building Electrification: Rate Structure and Other Policy Options to Encourage Grid-Responsive Electric Buildings

December 16, 2019

Housekeeping

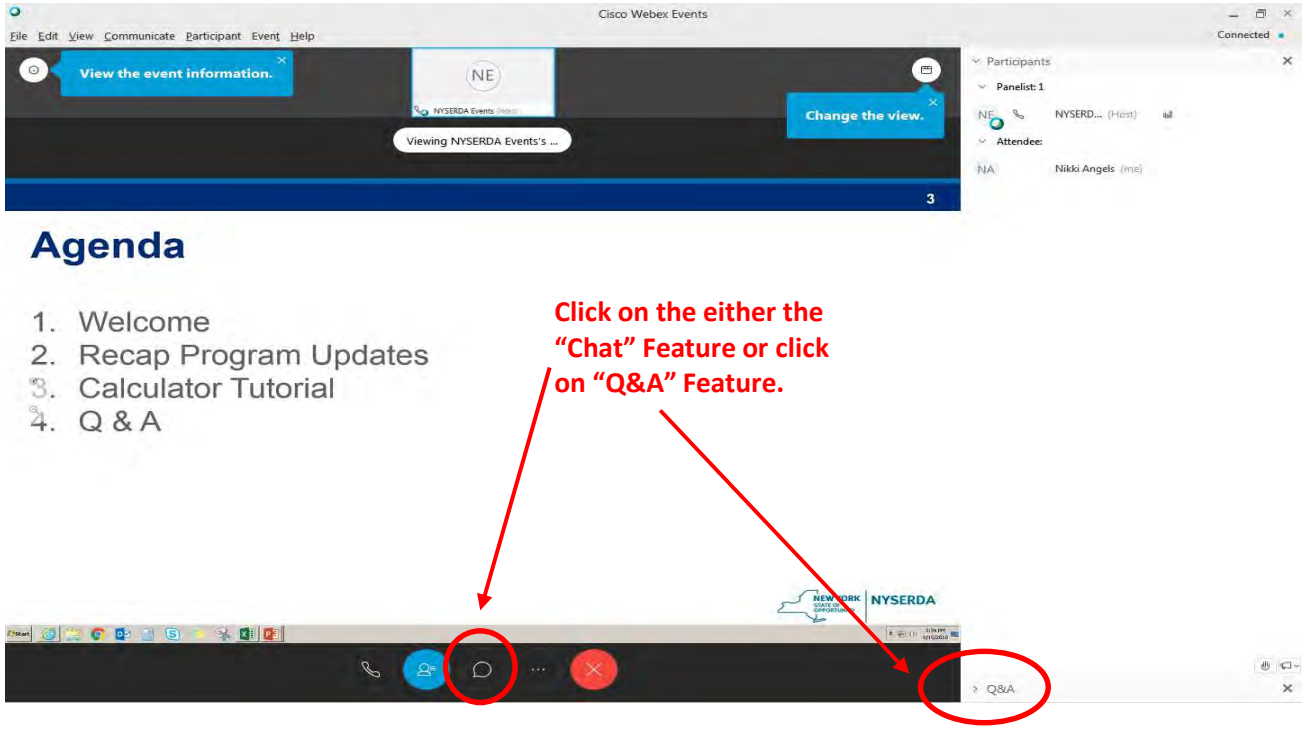
Remote Participants:

- Mute your lines after dialing in until you're ready to contribute to the conversation

All Participants:

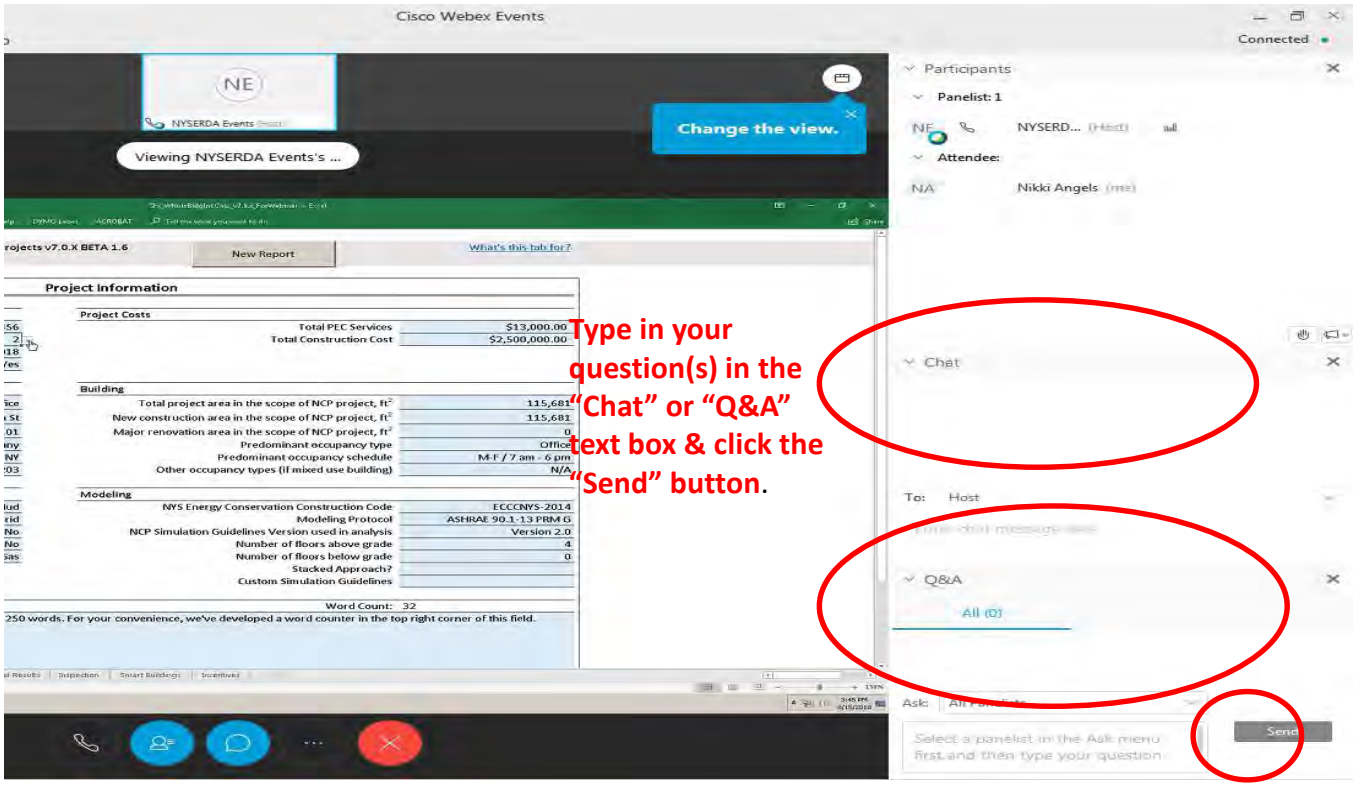
- Before contributing to the conversation, announce your name and organization
- Hear all voices, including those not here
- Patience with the process
- The rule of "ditto" or paraphrase instead of reiterating things that have already been said

WebEx Instructions for Questions



NEW YORK STATE OF OPPORTUNITY. NYSERDA

WebEx Instructions for Questions



Type in your question(s) in the "Chat" or "Q&A" text box & click the "Send" button.

NEW YORK STATE OF OPPORTUNITY. NYSERDA

Time	Agenda item
9:00 AM – 9:20 AM	Welcome, Overview, & Roadmap Update
9:20 AM – 10:00 AM	Lightning Round of Presentations
10:00 AM – 10:50 AM	Discussion: Barriers to and Opportunities for Advancing Grid-Responsive Electric Buildings and Supportive Policy and Rate Structures
10:50 AM – 11:00 AM	Break
11:00 AM – 12:20 PM	Discussion: How Should Utility Rate Design, Programs, Policy and Regulation Play a Role in Paths Forward for NYS today? In 2025? In 2030? And 2035+?
12:20 PM – 12:30 PM	Closing & Next Steps
12:30 PM – 1:00 PM	Lunch

Greg Hale, Senior Advisor for Energy Efficiency Markets & Finance

Greg is leading NYSERDA's creation of a policy roadmap to achieve a statewide carbon neutral building stock. This work includes strategic co-leadership for RetrofitNY, an initiative aimed at developing scalable retrofit solutions that achieve or approach net zero energy for New York's multifamily housing stock.

Prior to NYSERDA, Greg was Senior Advisor to NY's Chairman of Energy & Finance, focused on development and execution of Governor Cuomo's signature energy policy– Reforming the Energy Vision (REV). Greg oversaw the establishment of the $1 billion NY Green Bank and was the lead author of New York's 2015 State Energy Plan.

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Purpose & Intended Outcomes

- Goal: to have a facilitated, in-depth discussion on how rate design and other utility regulatory policy can shape the decarbonization of New York's building stock.

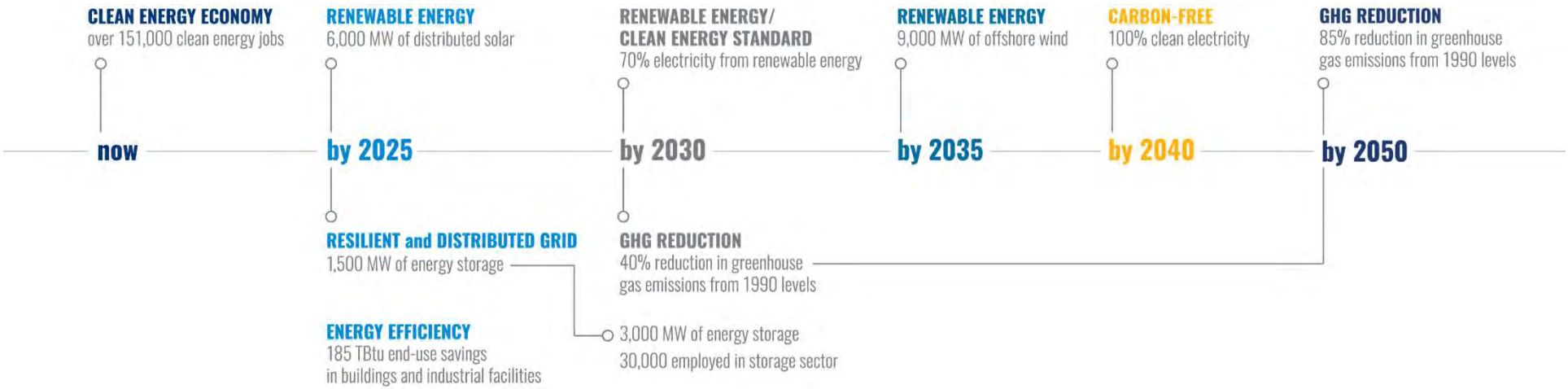
- Presentations and discussion will cover policy and regulatory options to improve the value proposition of buildings that are energy efficient, all-electric, and able ramp energy use up or down to deliver benefits to the grid.

- Participants will also be asked to consider how grid-responsive buildings fit into a wider distributed energy resource (DER) solution set, accounting for opportunities in onsite behind-the-meter generation, battery storage, and electric vehicles (EVs).

- NYSERDA will incorporate stakeholder input to inform the Carbon Neutral Buildings Roadmap

New York State Clean Energy Goals

Climate Leadership and Community Protection Act (CLCPA)



35% - 40% of the benefits of state CLCPA investments must flow to disadvantaged communities

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

NYC: Climate Mobilization Act

What is "CMA"?

> In April 2019, NYC passed a package of legislation to accelerate buildings' progress toward the City's 80x50 target

What's Included

> **Local Law 92 and 94**: requires roofs of certain buildings be covered in green roofs or solar PV systems

> **Local Law 95**: revises the City's energy efficiency grade

> **Local Law 96**: establishes a sustainable energy loan program (i.e. PACE)

> **Local Law 97**: requires certain greenhouse gas emissions reductions by 2050 in buildings greater than 25,000 sq. ft.

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Carbon Neutral Buildings Roadmap

- Explore pathways necessary to achieve a carbon neutral building stock
- Research critical building decarbonization issues
- Engage stakeholders
- Send long-term market signal & mobilize different sectors
- Raise awareness of the benefits of carbon neutrality
  - Energy savings
  - Health, comfort, and productivity
  - Resilience
- Provide guidance for other state agencies and local governments
- Living document

Roadmap Scope

New Construction

- Design and deliver economic, emission-free buildings
- Driving Energy Codes to Zero

Existing Buildings

- Comprehensive vs. Phased Capital Plan

Multiple Sectors

- Single-Family, Multifamily, Office, Higher Education
- Additional sectors in future Roadmap updates

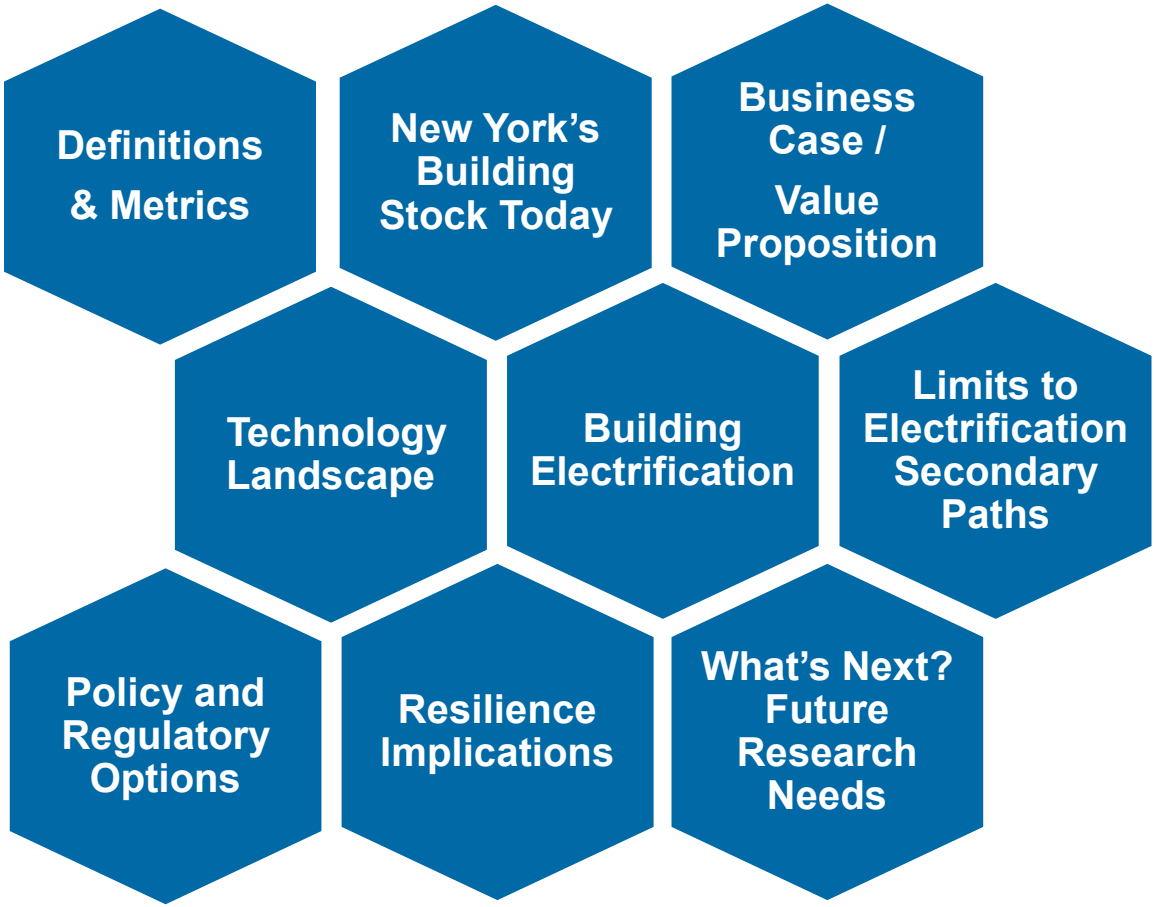
> "All new SUNY buildings will be designed to achieve net zero carbon emissions... We will work to educate and expand the clean energy workforce of New York State."
>
> – Kristina M. Johnson, SUNY Chancellor

> "It's less about cost and more about cash flow. My netZero Village cost more at construction but is delivering net positive income."
>
> – David Bruns, Developer

netZero Village. Credit: EMA for NYSERDA.

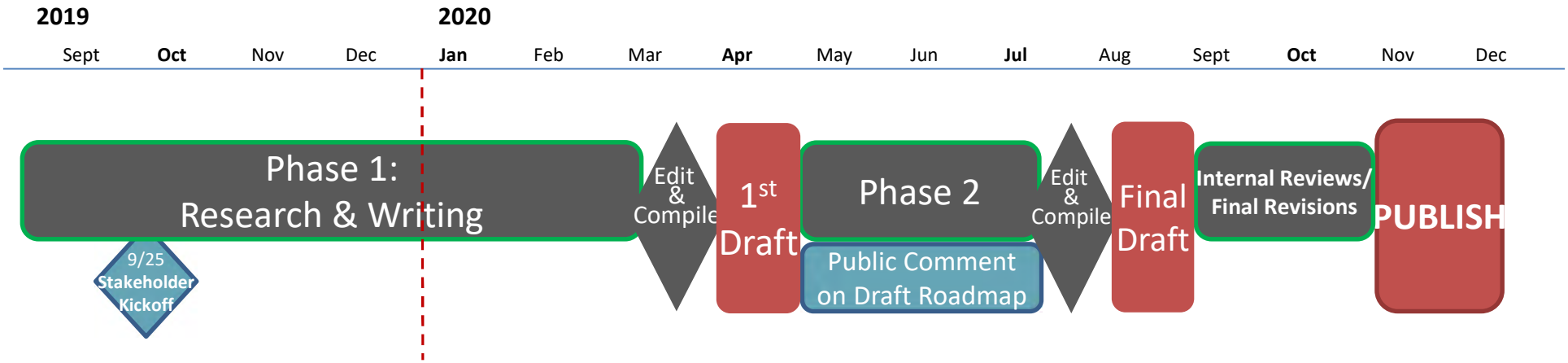
NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Components of the Roadmap



NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Milestone Schedule – Revised Dec. 2019



NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Introduction of Facilitator

Scott Johnstone, New England Energy Market Lead, VHB

Scott Johnstone's career has been centered on creating progress and results at the turbulent intersection of nature, people, and infrastructure. Today he is the NE Energy Market Leader for VHB, an engineering and science services company, where his focus is to provide integrated energy services to clients to enable the transition to our needed clean energy economy.

Prior to that Scott recently led both Packetized Energy, a virtual battery software company, and Vermont Energy Investment Corporation, which is focused on energy efficiency and distributed generation implementation and policy services. He also had the honor of being Secretary of Natural Resources in Vermont and has served as Public Works Director in Conway, NH and Burlington VT.

Keys Definitions

To benefit the discussions, key concepts are defined below:

- **Grid-interactive Efficient Building (GEB):** An energy-efficient building with smart technologies characterized by the active use of DERs and intelligent controls to optimize building energy use for grid services, occupant needs and preferences, and cost reductions in a continuous and integrated way (Source: U.S. Department of Energy Building Technologies Office).
- **Grid modernization:** A modern grid must improve reliability for everyday operations, enhance security from an increasing and evolving number of threats, have additional affordability to maintain our economic prosperity, have superior flexibility to respond to the variability and uncertainty of conditions at one or more timescales, including a range of energy futures, and have increased sustainability through energy-efficient and renewable resources (Source: The Grid Modernization Initiative of the U.S. Department of Energy).

Presenters

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Cara Carmichael, Principal, Rocky Mountain Institute (RMI)

Cara Carmichael is a Principal with Rocky Mountain Institute's buildings practice where she leads RMI's grid interactive buildings work. Cara drives critical research around the value proposition to building owners to adopt grid interactive buildings and market models to scale grid interactive building solutions. She has a depth of experience in net zero carbon and deep energy retrofits in the federal and commercial building sectors. Highlights of her work include creating best practices to achieve zero over time, negotiating one of the first net zero energy commercial leases in the U.S., leading the design and construction for two of RMI's net zero energy offices and guiding the GSA to double their historic energy savings using performance contracting.

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Rebecca Craft, Advisor, Sidewalk Labs

Rebecca Craft is the Founder and Principal of TurnCraft Advisors. She currently serves as an advisor to Sidewalk Labs on affordable electrification, including innovative approaches to electrification, efficiency, demand management, and rate design. She has over 25 years of experience in the energy sector, from financing of independent power generation to design of energy efficiency and demand management programs. In addition to serving as Chief Customer Officer of Essess, Inc., she spent 13 years with Consolidated Edison running several departments including the energy markets policy group that helped design wholesale electric and gas markets, and the energy efficiency and demand management department.

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Dan Egan, Senior Vice President, Sustainability & Utilities, Vornado

Dan's program combines environmental, fiscal and social responsibility for Vornado's national real estate portfolio of over 30 million square feet. Dan works to curate effective relationships with Vornado's tenants, communicating energy goals with them and discovering best practices that can be repeated in tenant spaces. This work is critical to his more recent charge with planning for Vornado's compliance with the NYC Climate Mobilization Act. Dan's role also focuses on Vornado's response to emerging trends in Environmental, Social and Governance (ESG) trends in real estate, occupant health and indoor environmental quality, securing corporate debt in the form of green bonds, and deeper stakeholder engagement.

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Ed Thomas, Executive Director, Peak Load Management Alliance (PLMA)

Ed Thomas has served as Peak Load Management Alliance's (PLMA) Executive Director since January 2013. PLMA was founded in 1999 as a community of experts and practitioners dedicated to sharing knowledge and providing resources to promote inclusiveness in the design, delivery, technology, and management of solutions addressing energy and natural resource integration. It provides a forum for practitioners to share dynamic load management expertise, including demand response and distributed energy resources. PLMA members share expertise and explore innovative approaches to load management programs, price and rate response, regional regulatory issues, and technologies as the energy markets evolve.

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Lightning Round of Presentations

Cara Carmichael, Principal, Rocky Mountain Institute (RMI)

Grid Interactive Buildings

NYSERDA Carbon Neutral Buildings Roadmap Roundtable

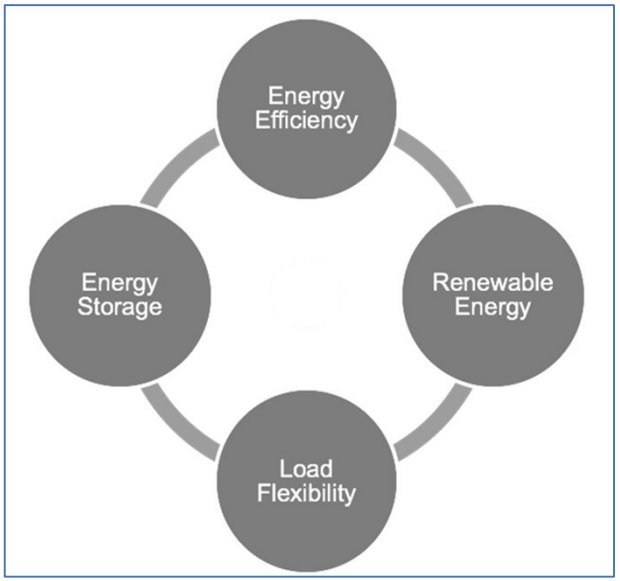
Cara Carmichael
Rocky Mountain Institute
December 16th, 2019

Agenda

1. Grid-interactive Efficient Buildings (GEB) definition and synergy with electrification efforts
2. GEB policy recommendations coming out of a GSA advisory committee
3. Key findings on the value of GEB for GSA based on RMI's recent analysis.

What are Grid-interactive Efficient Buildings (GEBs)?

- Grid interactive buildings leverage energy efficiency, renewable energy, energy storage and load flexibility to benefit building owners, occupants, and the electric grid.
- A GEBs strategy goes beyond traditional demand response, to re-shape a building's energy demand profile and enable load flexibility
- By reacting to utility price signals, the building can reduce costs to the building owner and the utility



Key differentiators of grid interactive buildings

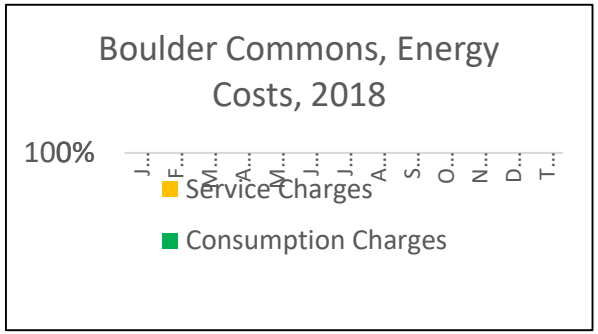
Attribute	Today	Future
1. Interoperability and intelligence from building to grid	• DR programs, often manual, fairly static	• Ability to receive and respond to utility price signals • Ability to send load flex potential
2. Interoperability and intelligence across building systems	• BMS system for major loads (HVAC) • Individual system controls (Lighting, storage)	• Single, overarching integrator to monitor and control all loads, inc. plug loads and storage • Ability to optimize for cost, carbon, reliability, etc.
3. Load flexibility and demand-focused optimization	• Thermal energy storage • Battery storage	• Intelligence to track and map demand, shift or shed rapidly based on inputs such as price, weather, carbon, events, etc.

GEBs are important to building owners/operators AND the grid

Building Owner Value

Cost savings

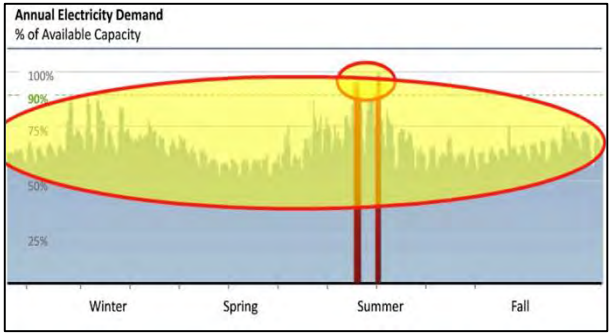
- Demand charges can be up to 60% of annual energy costs
- Most buildings track energy consumption, not necessarily demand
- Shelters buildings against future rate structures changes
- Supports with deep energy retrofits, zero carbon goals



Grid Value

Cost effective, reliable, clean power

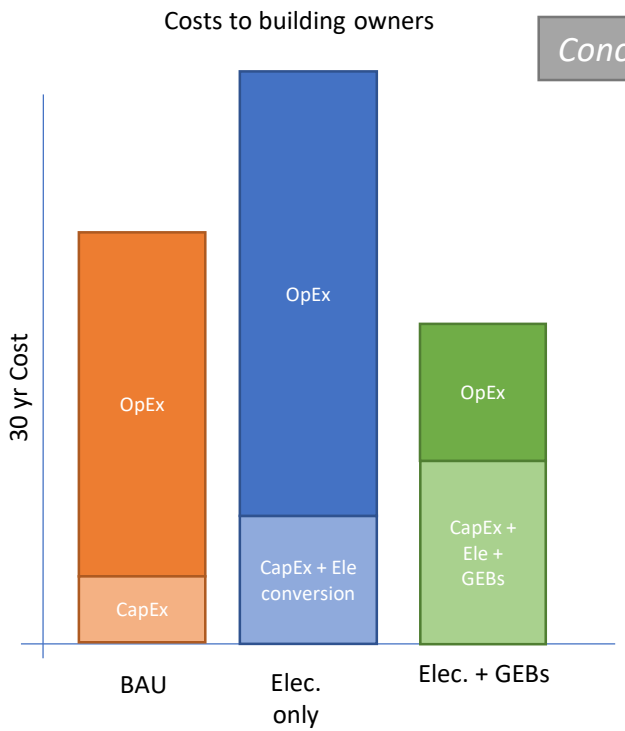
- 80% of grid peak demand is driven by buildings
- >10% of grid infrastructure costs are spent to meet the peak demand that occurs <1% of the time – making those peak times the most expensive, and likely carbon intensive power.



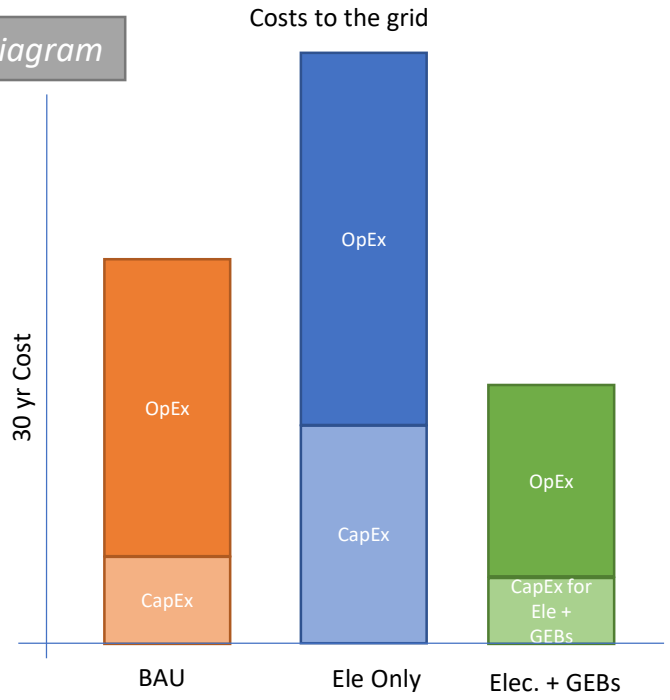
Source: DOE, SEPA

Grid interactive buildings + electrification provide the lowest cost scenario to both owners and the grid

Conceptual Diagram



Increased CapEx to implement Ele + GEB but significantly reduces OpEx.



Potentially significant CapEx to accommodate increased generation, T&D associated with increased demand with electrification only. GEB can avoid major generation and T&D expansion/improvements, while simultaneously supporting increased use of low cost renewables.

GSA Green Building Advisory Committee Task Group

- General Services Administration (GSA), Green Building Advisory Committee, Building-Grid Integration Task Group
- Published December 2018 as advice letter to the Chief Sustainability Officer of GSA
- 13 policy recommendations in total
  - Sorted by high priority, Purpose, mechanisms, difficulty and level of impact.
  - Created by 29 stakeholders from public sector, private sector, NGO's

Proposed Policy	Purpose/Intent	Policy Mechanisms	Difficulty	Impact
	Why is this important? What is the desired outcome?	Suggested mechanisms for policy makers	Once enacted, how easy is it to accomplish? Low-Med-High	How much cost/energy will this save the federal govt? Low-Med-High
A. Policies for All Buildings				
A-1: Modify federal energy goals that	Reflect the benefits of strategies that reap greater	Develop standardized metrics for buildings that include the following targets to build awareness:	Med	High

https://www.gsa.gov/cdnstatic/Bldg%20Grid%20Integration%20Advice%20Letter%202-21-19%20-%20508.pdf

GSA Green Building Advisory Committee Task Group – Highest Priority Recommendations

A. Policies for All Buildings

- A-1: Modify federal energy goals that focus only on energy reduction (in energy use intensity) to also include targets pertaining to demand reduction (in kW), load factor, energy costs, and emissions reduction.
- A-2: Plan grid integration improvements over time (GSA should pilot and implement in the short term while enabling for future flexibility)
- A-3: Investigate how ESPC and UESC projects could better incorporate demand savings; consider and pilot promising approaches

B. Policies for New Buildings

- B-1: Design for Grid Interactivity (Provide for future load flexibility)

C. Collaborating with Utilities and Grid Operator Policies

- C-1: Analyze the grid System (understand regional grid load profiles and opportunities to support grid stabilization)
- C-2: Understand and take advantage of flexible rate structures (Align GSA building characteristics and performance with rate structures to optimize financial returns.

https://www.gsa.gov/cdnstatic/Bldg%20Grid%20Integration%20Advice%20Letter%202-21-19%20-%20508.pdf

The Value Potential For Grid-Interactive Efficient Buildings in the GSA Portfolio
Key Findings: Three Core Values of GEBs

Direct Value to GSA

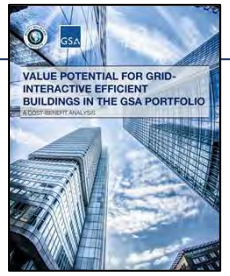
- Portfolio: $50 MM annual cost savings, $206 MM in NPV
- Project: 30% average annual cost savings per project, sub 4 year payback
- Flexibility to accommodate future rate structure changes

Indirect Value to GSA

- Demonstrates federal and real estate industry leadership
- Enables deeper savings in ESPCs and UESCs
- Better building control can improve comfort, health, and productivity
- CO2 savings

Societal Value

- Reduce grid-level T&D and generation costs up to $70MM/yr
- These savings ultimately benefit taxpayers, increase resilience and reliability
- 2x as effective as DR



Assumes GEBs are applied across the GSA portfolio of owned office buildings; Based on bundle of measures modeled by RMI. NPV is based on an 8-year time horizon and a 3% discount rate.

www.rmi.org/gebs

Additional Resources

- Rocky Mountain Institute - Grid interactive buildings and GSA Value analysis: (https://rmi.org/gebs)
- U.S. General Services Administration – Green Building Advisory Committee - GEBs Task Groups
  - 1. Policy recommendations and 2. GEB in ESPC/UESC guidance)
- DOE BTO – GEBs Homepage
- Laurence Berkeley National Lab – FlexLab
- New Buildings Institute – GridOptimal Initiative
- NASEO – NARUC GEB Working group
- More from ASHRAE, NREL, ACEEE…

Rebecca Craft, Advisor, Sidewalk Labs

NYSERDA

Roundtable Discussion on the Grid-Side of Building Electrification

December 16, 2019

Path To Affordable Electrification

1. Green
Energy Sources

Grid Power | Solar Power | Thermal Grid | EV

2. Reduce
Demand of Energy

Passive House | Battery Storage | Thermal Storage | Dynamic Rate

3. Optimize
Energy Use

Advanced Energy Management
(ABco "Perform" and "Schedulers")

=

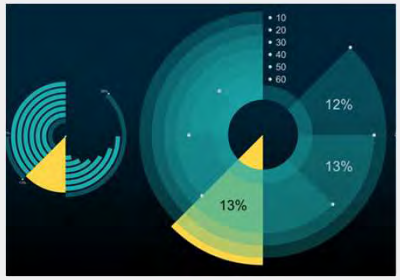
Affordable Electrification

Demand Side Challenges - Residential

Lack of hourly pricing incentives

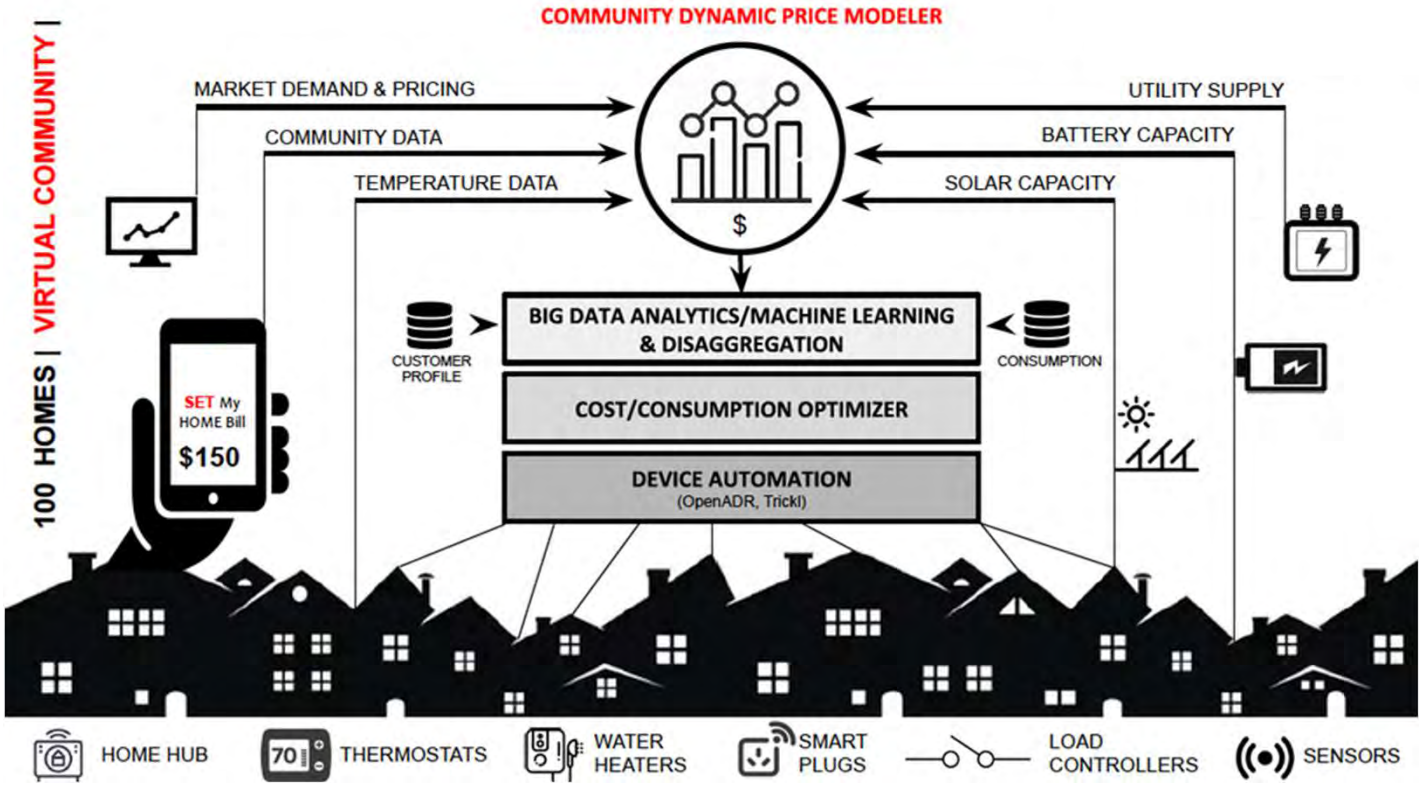
Limited automation of demand management; not continuously applied

Demand management rarely fully integrated with storage and solar

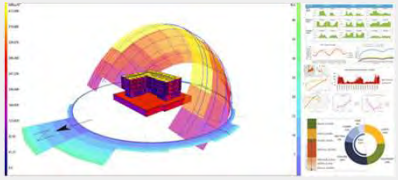


Bills are not transparent and informative

Partnered With A Small Utility To Develop Test Concepts With 100 Customers



Demand Side Challenges - Commercial



Performance is demonstrated in advance through energy model

Demand response is clunky and not fully automated

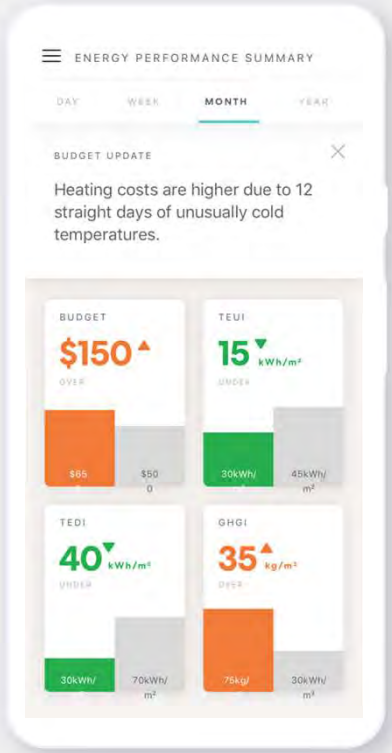
Tenants do not control their energy uses

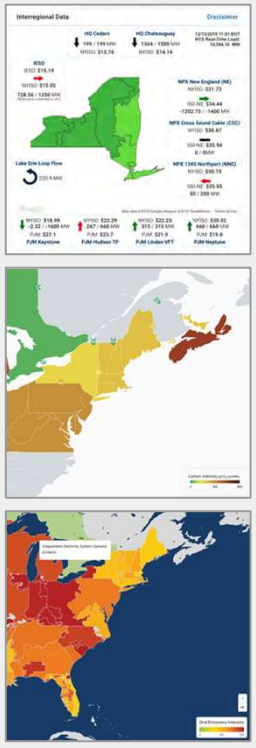
BMS fails to integrate inputs and predict building needs

Achieving Performance: Outcome Based Code

SIDEWALK LABS

PERFORM



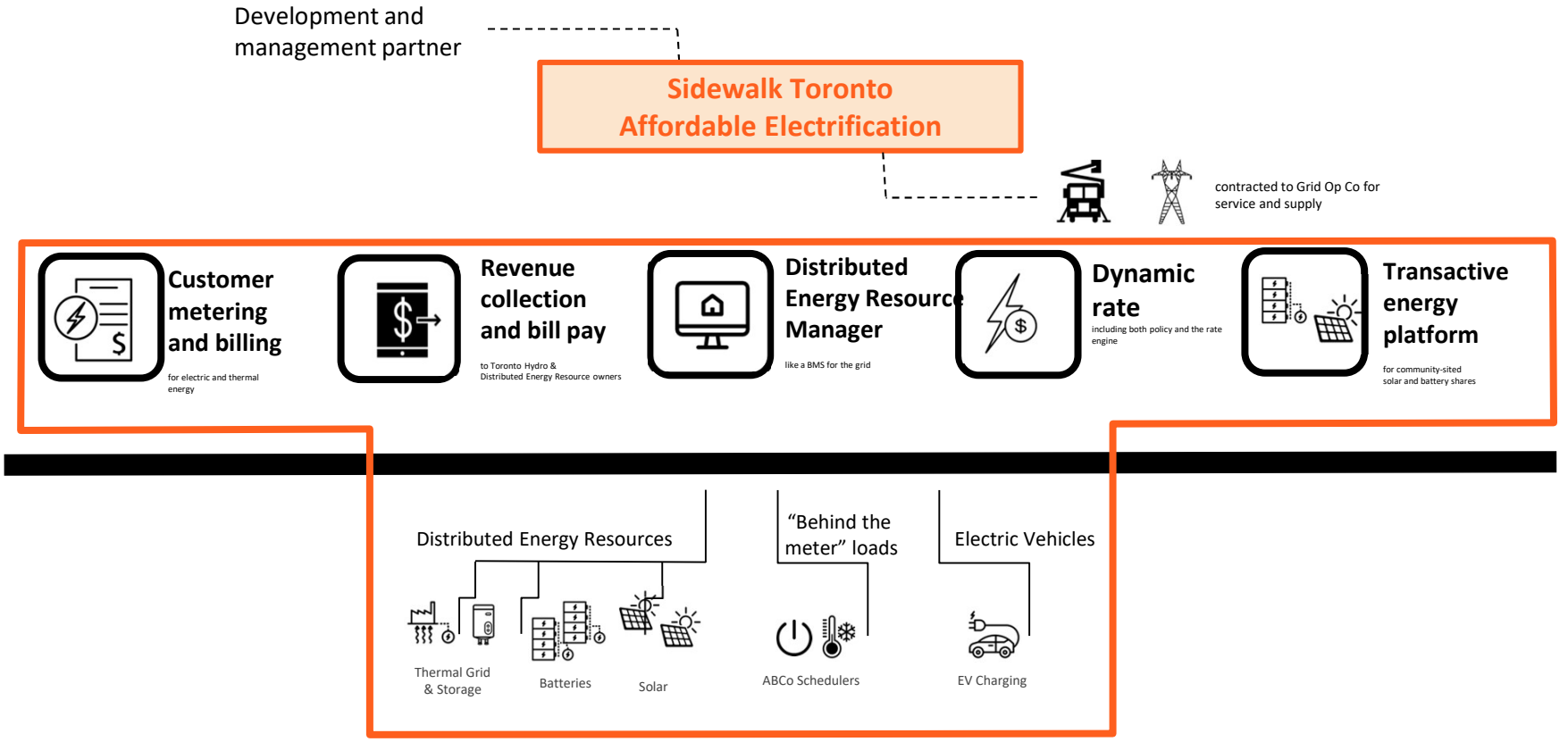


STUDYING OCCUPANCY SENSORS

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

urban green | U.S. GREEN BUILDING COUNCIL CHAPTER SM

Broader Vision



Dan Egan,
Senior Vice President, Sustainability & Utilities, Vornado

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

NYSERDA Discussion
Grid-Side of Building Electrification

Daniel Egan
SVP, Sustainability & Utilities
Vornado Realty Trust
December 16, 2019

Policy Uncertainties

VORNADO REALTY TRUST

CMA and CLCPA are bold policies that will transform the landscape of energy, carbon, and commercial real estate. Leaders in real estate want to act now to appropriately roadmap the next ten years to continue their carbon reduction strategies, while mitigating exposure to LL97 penalties.

Policies concerning the following critical components are presently open-ended:

- Future rates of carbon intensity for electricity delivered to NYCA, NYCW, Zone J
- Ability for end users to purchase Renewable Energy Certificates (RECs) for in-state generation
- Carbon coefficient for natural gas used for cogeneration
- City and State policies concerning Con Edison steam

Each of these uncertainties prevent building owners from committing to building electrification with confidence in its economic and environmental success.

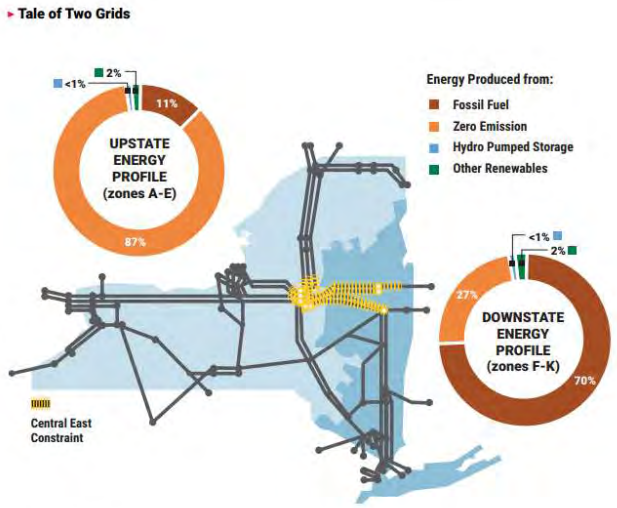
Champlain Hudson Power Express
Empire State Connector
Empire Wind

Data Solutions

VORNADO REALTY TRUST

Each policy uncertainty has an answer found in data. State agencies such as the Public Service Commission and NYSERDA should work towards the following data-driven clarifications:

- Establish a future carbon coefficient that correlates to the success of the renewable energy mandates in the CLCPA. If NY State achieves 70% renewable power by 2030, what will the carbon intensity rates of Zone J, NYCW and NYCA be? What will they be if 100% renewable is achieved in 2040? Or if transmission improvements are achieved, providing relief to the "bottleneck" between upstate and downstate?
- Augment the REC policy to allow end users to purchase RECs. CMA has created a market for end users to underwrite renewable power generation projects in a role that NYSERDA has historically fulfilled.
- Establish a future carbon coefficient for gas used for cogeneration. The State and Con Edison has historically supported DER and cogeneration. We need to know if the future treatment of natural gas for cogen will value cogeneration or penalize it.
- Send clear policy about Con Edison district steam. The utility has an opportunity to strategically plan to de-carbonize steam generation and send signals for future carbon coefficients, akin to what CLCPA has indicated for grid electricity.



Source: NYISO Power Trends 2019, https://www.nyiso.com/power-trends

New York Energy Consumers Council – Estimating the Impact of Carbon Legislation on NYC Electricity Costs

https://www.nyecc.com/city-council-report

US Environmental Protection Agency – Public Health Benefits per kWh of Energy Efficiency and Renewable Energy in the United States: A Technical Report

https://www.epa.gov/statelocalenergy/public-health-benefits-kwh-energy-efficiency-and-renewable-energy-united-states

NYISO: Power Trends 2019 https://www.nyiso.com/power-trends

NYISO: Carbon Pricing Resources https://www.nyiso.com/carbonpricing

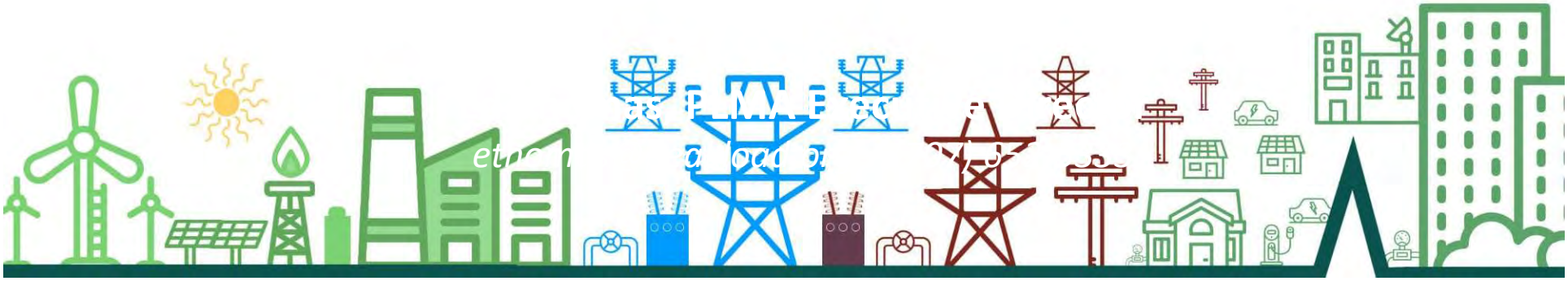
Ed Thomas, Executive Director, Peak Load Management Alliance

PLMA
Load Management Leadership

www.peakload.org

Actionable Policy Considerations for Influencing Building Decarbonization

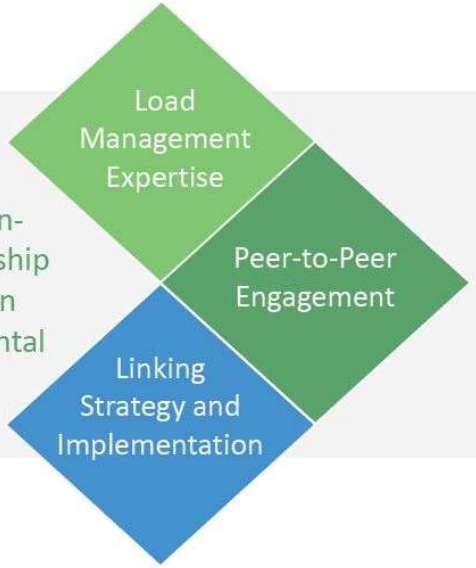
Ed Thomas, PLMA Executive Director
ethomas@peakload.org (707) 652-5333



PLMA is the voice of load management practitioners...

- Over 160 energy utilities, solution providers, and trade allies share expertise in demand response and distributed energy resources.
- PLMA partners with industry allies to work toward a sustainable energy future.
- Events, training, publications and resources to help members exchange lessons learned and best practices.

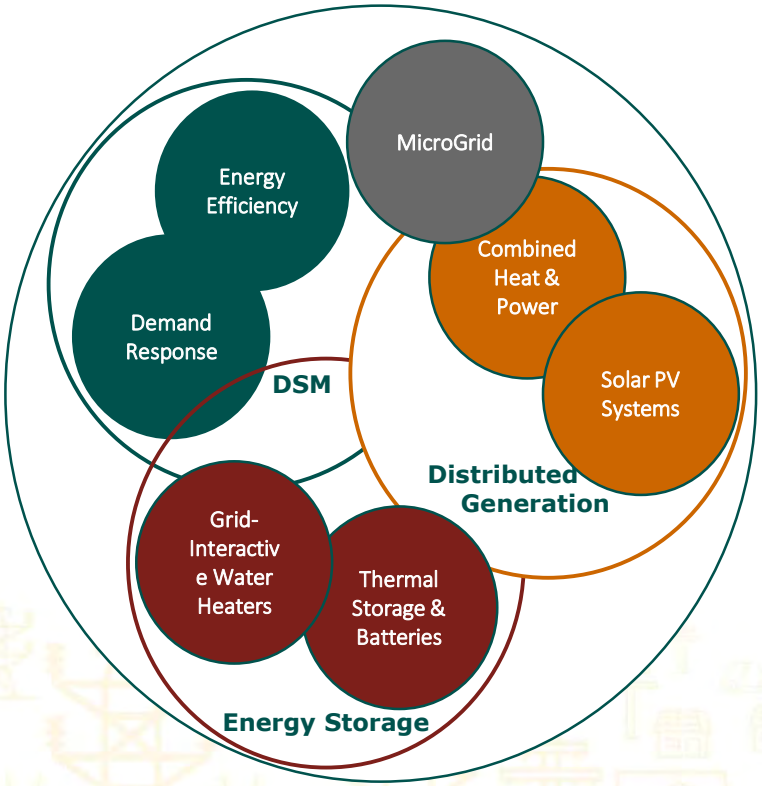
At PLMA, our organization-based membership model is built on three fundamental benefits:



...in a powerful peer-to-peer network.

Demand Response is Part of Integrated Demand Side Management

A program design type that delivers the benefits of Energy Efficiency to customers and Demand Response to the grid using the same technology intervention and/or a linked incentive while leveraging the same program delivery resources and infrastructure.



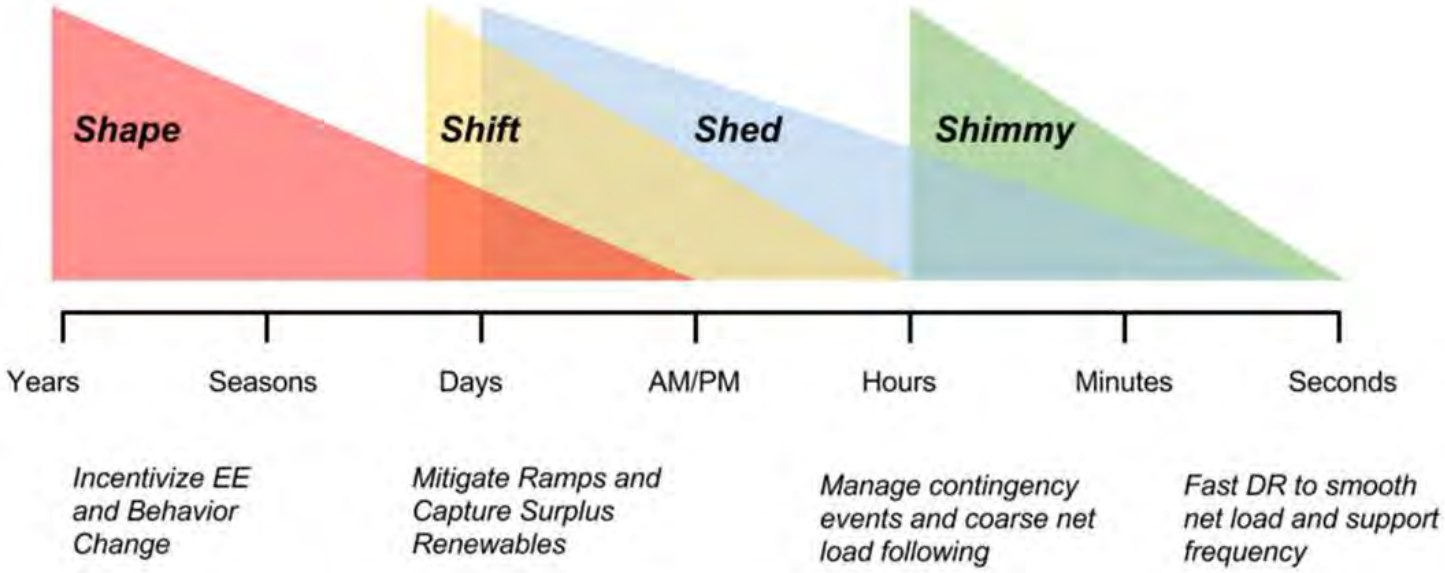
Demand Response Evolution

- Largely manual control
- Interruptible tariffs for large C&I
- 1-way Direct Load Control for Residential
- Used for Capacity Planning & Emergencies

- Introduced To Wholesale Markets
- Increased automation
- Increased Precision
- Eventually Ancillary Services
- Behavioral/voluntary Options
- Smarter Equipment
- 2-way communications
- Some Near Real-Time Visibility

- Provide Multiple Grid Services
- Respond to Controls and/or Price Signals
- Distribution & Transmission Relief
- Introduction of Storage
- Migration to DER

Demand Management Portfolio



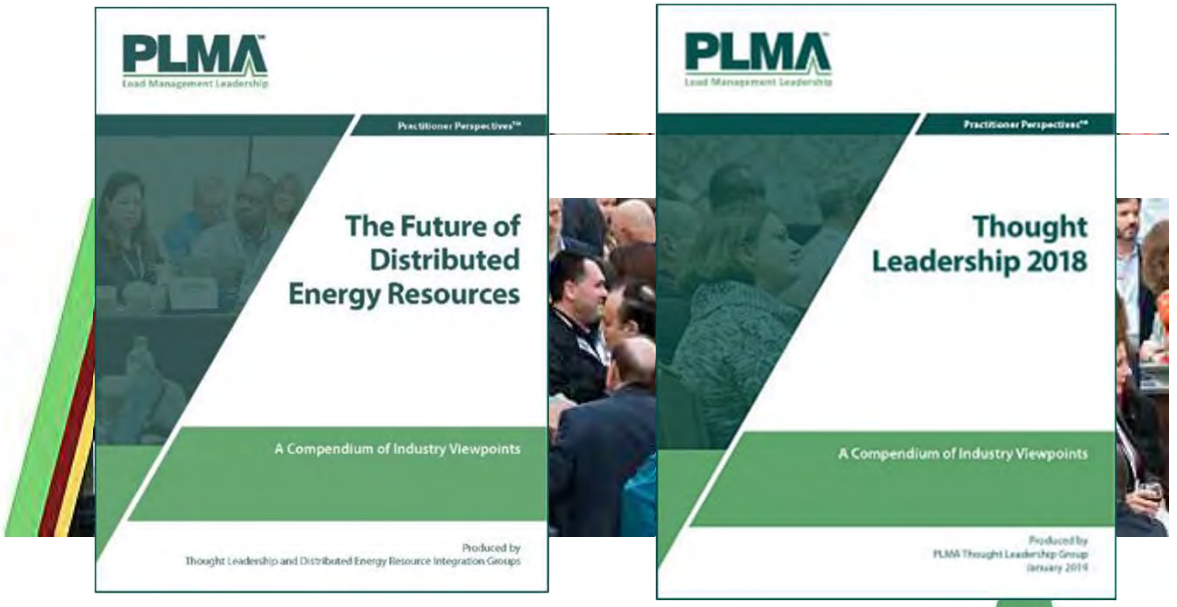
[Lawrence Berkeley National Laboratory California Demand Response Potential Study]

Influencing Building Decarbonization

- Acknowledge that integrated demand side management includes energy efficiency, demand response, load management, and distributed energy resources behind the meter
- Encourage flexible load management strategies that includes both reducing electrical demand as well as possible increasing energy usage
- Recognize value of customer benefits with pricing strategies and behavioral approaches as well as embedded appliance/system load control functions
- Leverage best practices, lessons learned, and technical findings from leading program practitioners nationwide

PLMA™
Load Management Leadership

PLMA™
Load Management Leadership
41ST Conference
Scottsdale, Arizona
April 20-22, 2020



Learn more at www.peakload.org

Facilitated Discussion

Discussion: Barriers & Opportunities for advancing Grid-Responsive Electric Buildings & Supportive Policy & Rate Structures

Potential Barriers to consider:

- Upstate/Downstate divide
- Cost and Value
- Regulation - Uncertainty associated with evolving city sustainability goals; lack of policy mandates or incentives
- Utility Engagement - Misaligned incentives; lack of price signal; resistance to change within utilities

Break

We will reconvene at 11:05 AM.

Discussion: How Should Utility Rate Design, Programs, Policy and Regulation Play a Role in Paths Forward for NYS?

Questions to Consider:

1. How utility rate structures and price signals can facilitate improved building-grid interactivity in the next 5, 10 and 15+ years,

2. Beyond utility rate structures, what other policy options would help improve building-grid interactivity e.g. programs like peak load reduction programs and new “grid-interactive efficient buildings” programs, renewables and storage siting/permitting, interconnection

3. Defining critical data, data security, data sharing, and any needed data standardization,

4. Are there new rate structures or policies that can influence the specific measures and operational choices made by building owners in an ever-increasing electrified building stock to address future peak load and grid utilization rates in positive ways,

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Discussion: How Should Utility Rate Design, Programs, Policy and Regulation Play a Role in Paths Forward for NYS?

Questions to Consider:

5. The market potential to monetize a building's capability to positively contribute to peak load management and grid and network conditions in real time,

6. Consider REC policy, Community Choice Aggregation, Community Solar and Onsite Solar and Storage.

7. What type of incentives and demand response programs would motivate building owners to participate?

8. Are there working models of any of these in the US or Europe?

Closing and Next Steps

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Thank you for your participation.

Please send questions, comments, and concerns to the Carbon Neutral Buildings team at:

CarbonNeutralBuildings@nyserda.ny.gov

NEW YORK STATE OF OPPORTUNITY. | NYSERDA