2025 Transition to the Future Grid in Massachusetts Event Series

Event 3 Report: Power at the Grid Edge

Event Date: October 3, 2025; Report Date: November 18, 2025

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This report was compiled by Cole Triedman, Rapporteur for the 2025 Future Grid Event Series.

Executive Summary

This report summarizes the third event of the 2025 Transition to the Future Grid in MA Event Series ("Future Grid Series"), hosted by the Alliance for Climate Transition (ACT) and Massachusetts Clean Energy Center (MassCEC). The event, titled "Transition to the Future Grid in Massachusetts - Power at the Grid Edge," convened 122 stakeholders spanning expert panelists, innovators, utilities, advocates, academia, municipalities, and others to co-create a vision for the state's electric grid. The event focused on unlocking value at the edge of the grid, where advanced metering infrastructure (AMI) has the potential to enable new optimization and orchestration-based solution sets for Massachusetts' grid needs.

The workshop included opening remarks from the convening entities and state officials; a 'visioning session' to ideate on characteristics of a future grid; two panels focused respectively on unlocking value at the grid edge and the evolution of AMI; a showcase of grid edge innovations that Massachusetts could adopt or learn from; and table discussions about the technologies, processes, and public engagement needed to realize an envisioned future grid. Ideas brought forward throughout panels and table discussions, captured by the event rapporteur and ACT and MassCEC staff, directly inform the four recommended actions synthesized out from the event. The recommended actions are not designed to be prescriptive; rather, they are strategic tools to guide state leaders charged with stewarding the state to an envisioned future grid.

Recommended Actions:

1. **Develop centralized resources proposing state grid edge strategy.** A state grid-edge strategy, potentially guided by additional stakeholder engagement, could benefit the Commonwealth by coordinating the activities of agencies, utilities, industry and other stakeholders and aggregating strategies and actions to drive progress at the grid edge. The strategy, potentially compiled as a central planning document, could address state goals for the grid edge and describe recommended actions from key stakeholders, including state officials, EDCS, and municipalities and communities.
2. **Authorized state stakeholders create a regulatory sandbox.** The legislature could authorize the DPU and EDCs to co-develop a regulatory sandbox to pilot new grid edge technologies, programs, and business models. A regulatory sandbox could competitively solicit applications for and award diverse pilots and embed a process to scale pilots that achieve established success metrics.
3. **Embark on a coordinated state public education campaign about grid edge opportunities.** The statewide deployment of AMI presents a unique opportunity for an educational campaign to drive cross-sectional grassroots participation in the state's envisioned future grid. Campaigns should align around clear and simple messaging, prioritize building trust with communities, and highlight financial benefits of grid edge activities.
4. **Study regulatory innovations to better align EDC incentives with grid edge outcomes.** Other jurisdictions have experimented with alternative regulatory models to better align utility incentives with distributed, flexible solutions, such as the UK and other states. Although

alternative regulatory structures may be addressed in the ESMP process, authorizing the DPU to proactively investigate alternative approaches to regulatory incentives may complement existing efforts to implement flexible grid edge solutions. Ensuring that EDCs are incentivized to pursue grid edge resources in the long-term would support such efforts to scale and extend flexibility offerings beyond finite program terms.

For additional details, please see the “Recommended Actions” section of the full report.

The event marked the conclusion of the 2025 Future Grid Series.

Introduction

This report summarizes the third event of the 2025 Transition to the Future Grid in MA Event Series ("Future Grid Series"), led by the Alliance for Climate Transition (ACT) and Massachusetts Clean Energy Center (MassCEC). The purpose of the series is to convene key Massachusetts stakeholders for critical conversations and collaboration, working towards designing actionable steps to modernize the state's energy grid. This report captures those steps as observations and guidance to be referenced by state policy, regulatory, and business communities. The 2025 events dive deep on priority issues identified in the 2024 Future Grid Series, which addressed incentive-based regulation, fostering the adoption of grid-tech, and grid planning.[1] The October 2025 workshop, hosted at the Federal Reserve Bank of Boston, brought together 122 leading experts, practitioners, and community stakeholders to address questions related to unlocking value at the grid edge in Massachusetts.

This document is organized in sections as follows:

- *Unlocking customer and system value at the grid edge.* This section introduces the workshop theme.
- *Visioning Session.* This section summarizes attendees' visions for unlocking value at the grid edge in Massachusetts, as solicited from a brainstorming exercise.
- *Panels and case studies*. These sections summarize key outcomes of the panel discussions and case study presentations that comprised much of the day.
- *Table Session.* This section summarizes the outcomes of table discussions.
- *Recommend actions and next steps.* This section provides guidance for potential actions to be considered by the state policy community.

Please note*: This document summarizes the content of and discussion during the event among participants. A list of participating organizations is provided in an Appendix. As such, this document is* *not* *intended to represent the position of MassCEC or ACT.*

Unlocking customer and system value at the grid edge

The grid edge is where the grid meets the customer and is often demarcated by a customer's electric meter.[2] This report discusses the grid edge in the context of energy use, production, and optimization at the margin of the electric system. It includes the diverse residential and business customers that the electric system is designed to serve. As customers activate distributed generation, including storage, and load flexibility at the grid edge, customers become dynamic energy system participants and unlock new

[1] Summary of the 2024 Future Grid Series, *MassCEC*. https://www.masscec.com/resources/2024-event-series-transitioning-future-grid

[2] The Department of Energy Office of Electricity, in a 2023 report titled "Communications with the Grid Edge," defines the grid edge as the "boundary zone where the utility ends and customer premises equipment (CPE) starts. Specifically, the grid edge begins at the meter interface (the utility demarcation point). The grid edge contains all equipment, software solutions, and controls owned by the customer. Customers could be homeowners, businesses, and industrial or commercial facilities."

opportunities. **The Power at the Grid Edge event examined how Massachusetts can advance and harness grid edge capabilities to the benefit of customers and the state.**

The workshop kicked off with welcoming remarks by representatives from ACT and MassCEC, followed by table-setting remarks from leadership from the Massachusetts Department of Public Utilities (DPU) and Department of Energy Resources (DOER). In her framing remarks, MassCEC CEO Dr. Emily Reichert introduced Governor Maura Healy's goal to make Massachusetts a global hub for climatetech innovation and made the connection that the grid edge is an area of opportunity to help achieve that goal.

In many ways, Massachusetts has established itself as a national leader in distributed energy resources (DERs), load flexibility, and grid edge innovation. In introductory statements, DPU Commissioner Staci Rubin discussed DPU-approved programs supporting electric vehicle (EV) infrastructure deployment and managed charging, streamlining solar siting and expanding applications of net metering compensation, and creating rate designs to stimulate electric heat pump installation, among other DER-focused regulatory efforts.[3] Commissioner Rubin also discussed the state's Electric System Modernization Planning (ESMP) process, within which the DPU has approved certain grid modernization investments by the state's investor-owned electric distribution companies (EDCs) to better accommodate and orchestrate resources at the grid edge.[4]

DOER Commissioner Elizabeth Mahony further discussed the state's progress promoting affordability via energy efficiency through the Mass Save program,[5] referencing millions of dollars in savings delivered by building efficiency during the hottest day of the summer. She also noted progress in the Mass Save program's ConnectedSolutions, which drives peak demand reduction.[6] Commissioner Mahony emphasized the importance of implementing flexible interconnection as key to deploying capacity (e.g., battery storage) at the grid edge. The Commissioner noted that DOER is updating several state-led distributed energy initiatives to deliver continued impact, such as SMART, the state's primary solar incentive program. DOER continues to develop policies that will advance an affordable, efficient, and responsive grid, such as electric rate reform via the Electric Rates Task Force and a comprehensive load management analysis.[7]

Noting these successes, Massachusetts has a long way to go to activate the full potential of the grid edge. Massachusetts' EDCs are in the early stages of deploying advanced metering infrastructure (AMI) at homes and businesses across the state. Massachusetts is one of the last states in the country to approve AMI. However, the recently approved meters are some of the most sophisticated in the

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3 Power at the Grid Edge event slide 10, *Massachusetts DPU*.

4 Power at the Grid Edge event slide 9, *Massachusetts DPU*.

5 MassSave home page. https://www.masssave.com/

6 ConnectedSolutions is a demand response program offered to both residential thermostats and batteries, as well as commercial and industrial load flexibility and battery storage. For example, see: https://www.masssave.com/residential/rebates-offers-services/connectedsolutions.

7 Rates Task Force: https://www.mass.gov/info-details/massachusetts-electric-rate-task-force; Load Management Study: https://www.mass.gov/info-details/peak-potential-load-management-for-an-affordable-net-zero-grid.

country, featuring next generation capabilities for sensing grid signals and disaggregating inputs from behind the meter.[8] Introductory speakers centered this development as an important step toward enabling behavioral and market opportunities at the grid edge.

Panel 1: The Massachusetts State Approach to Load Flexibility

The first panel focused on how Massachusetts is planning to scale load flexibility as a supplement to new grid capacity and clean energy generation. The panel featured:

- **Liz Mettetal**. Director, Energy + Environmental Economics (E3), a consulting firm focused on providing analysis and expertise on the electricity sector.
- **Charles Dawson**. DOE Energy Innovator Fellow for the Massachusetts Department of Energy Resources (DOER), focused on load management.
- **Tilak Subrahmanian**. Vice President, Eversource, focused on distributed energy and load flexibility initiatives.
- **Larry Chretien** (panel moderator). Executive Director, Green Energy Consumers Alliance (GECA), a regional consumer advocacy nonprofit.

Key guiding questions

1. How do the Grid Services and Load Management studies relate to one another?
2. How do time-of-use rates fit into the grid edge picture?
3. What does successful load management look like?
4. What are the biggest potential roadblocks or challenges to that vision for success?
5. What are the utilities thinking about in terms of short and long-term plans for load management?
6. What does the State need from utilities, and what do utilities need from the State for success?

Massachusetts' electric system faces significant load growth from transportation and building electrification as well as potential new data center integration.[9] Massachusetts policymakers and stakeholders face the challenge of planning the statewide approach to meeting this load growth, in coordination with EDCs and municipal utilities (also called municipal light plants, or MLPs). Infrastructure buildouts at all scales will undoubtedly be necessary, but **grid edge technologies provide the tools to enable alternative resources that depend on energy management.** The panel discussion framed scaled load flexibility – or shifts in customer behavior and resource management based on grid needs – as a key tool to avoid the significant and expensive infrastructure buildout necessary to accommodate new load.[10]

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[8] Refer to dockets D.P.U. 21-80, 21-81, and 21-82, and additional resources summarized here: https://www.mass.gov/info-details/grid-modernization-and-ami-resources.

[9] Future Grid Series Event 1 Report: "Balancing Data Center Energy Use and Climate Goals." *ACT & MassCEC*, 2025. https://www.masscec.com/sites/default/files/documents/rapporteur_act_event_1_report.pdf

[10] Lawrence Berkeley National Laboratory (LBNL) has defined load flexibility, also referred to as demand flexibility, as "the capability provided by on-site distributed energy resources (DERs) to reduce, shed, shift, modulate, or generate electricity."

State agencies, utilities, and other stakeholders are leading efforts to scale load flexibility in Massachusetts. The panel discussed three planning initiatives: DOER's Load Management Study,[11] MassCEC's Grid Services Study,[12] and the Interagency Rates Working Group's (IRWG) Near and Long-term Rate Design Studies.[13] One panelist contextualized how each of these initiatives address questions in Massachusetts' process for advancing load management:

- DOER's forthcoming load management study addresses: **how much flexibility will Massachusetts incorporate in future years and what resources will enable it?**
- MassCEC's grid services study addresses: **how will we use flexibility for distribution-level (rather than bulk system) outcomes like investment deferral and improved reliability?**
- The IRWG's rate design study addresses: **how to enable advanced rate designs that compensate consumers for participating in load flexibility, in alignment with state goals?**

Drawing from the collective knowledge embedded in these policy resources, the speakers reflected on what successful load flexibility might look like in the state. One panelist suggested that load flexibility solutions must be designed around clear problems. At the distribution level, these are often temporal and spatial. In certain locations where the distribution grid is congested, system upgrades may not be cost-effective or physically practical. In cases like this, demand flexibility can provide additional options and delay physical infrastructure investments, reducing costs. However, in other locations, new infrastructure may be the most cost-effective solution.

One panelist explained a **vision for success in three pillars: 1) proactively integrating management capabilities into any newly adopted electric load, 2) integrating programs with utility planning and operations, and 3) designing incentives that ensure reliable customer engagement and benefits.** Another panelist added that successful load flexibility planning must incorporate strong data about resource additions and system needs. Critically, that data must be iteratively refreshed to reflect system peaks that evolve as more of the economy electrifies. Panelists acknowledged that, even considering changes in federal clean energy incentives, Massachusetts will continue stimulating investment in flexible resources like EVs and heat pumps that will both provide and require more peak-reducing load management.

Integrating more load flexibility will require sophisticated program and rate designs. One panelist framed that in theory, programs fill temporal, spatial, or behavioral gaps in organic market dynamics or resource planning decisions. Grid edge programs already exist in Massachusetts. ConnectedSolutions, a

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https://eta-publications.lbl.gov/sites/default/files/2025-05/comparing_simulated_demand_flexibility_against_actual_performance_in_commercial_office_buildings.pdf

11 "Peak Potential: Load Management for an Affordable Net-Zero Grid," *Massachusetts Department of Energy Resources* (DOER). 2025. https://www.mass.gov/info-details/peak-potential-load-management-for-an-affordable-net-zero-grid

12 DER-iving Local Value: Distribution Grid Services in the Commonwealth of Massachusetts," *MassCEC & E3*. 2025. https://www.masscec.com/resources/grid-services-study

13 "Near-Term Rate Design to Align with the Commonwealth's Decarbonization Goals," *Massachusetts Interagency Rates Working Group & E3*. 2024. https://www.mass.gov/info-details/interagency-rates-working-group

virtual power plant (VPP) program offered by utilities to compensate load flexibility among smart thermostats and distributed battery storage, is the most widely enrolled.[14] However, one panelist pointed out that many opportunities for accessing dynamic rates that compensate for load flexibility remain unrealized. For example, one panelist pointed out that in Massachusetts you can still charge an EV at the same price at 5 PM and 2 AM despite opposite levels of demand at these times.

Panelists emphasized that any programmatic or rate design decision has implications, both pros and cons. For example, time-of-use (TOU) rates may be straightforward in theory but in practice often prove to be economically blunt, decrease load diversity during a given TOU period, and do not address neighborhood-level distribution constraints. A decade of load flexibility program design in Massachusetts and nationally also provides specific lessons for policymakers seeking to avoid unintended consequences. One idea generated by the group included mechanisms to avoid demand 'rebounds' for load-shifting programs, and ensuring that policy-aligned rate designs account for the emissions implications of flexible energy management.[15] Another pointed to an example where the monthly cost for EV management software exceeds monthly savings, surfacing obvious program design flaws. Lastly, panelists agreed about the importance of communication and public engagement in meaningful program administration. One panelist noted that customers are looking for ways to manage their energy costs, and load flexibility programs should be framed to quantify and communicate customer benefits.

With these learnings in mind, **Massachusetts expects to leverage future AMI capabilities to develop more programs and advanced electric rates, and must solve for the administrative and engineering challenges involved with managing an expanding resource set at granular temporal and geographic nodes.**[16] One panelist offered that over the next five years, the Grid Services Compensation Fund will enable the EDCs to experiment with calling on grid flexible resources to alleviate system constraints,[17] navigating the challenge of coordinating DERs with planning and operations, and figuring out how to facilitate load flexibility markets at the distribution level. These pilot years will inform additional future program designs to enable grid-edge flexibility.

One panelist suggested that technology is not the limiting factor to scaling load flexibility. Massachusetts hosts a vibrant ecosystem of new enabling tools (a few of which would be featured in the case study session later in the event agenda). **Amidst the system sea change enabled by AMI rollout in Massachusetts, panelists voiced a priority for coordinating state programs and planning to ensure that emerging grid edge opportunities are fully captured.**

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[14] Eversource ConnectedSolutions home page: https://www.eversource-ma.com/connected-solutions/; National Grid ConnectedSolutions home page: https://www.nationalgridus.com/MA-Home/Energy-Saving-Programs/ConnectedSolutions

[15] E.g., marginal emissions of battery storage discharge versus the emissions content of the grid.

[16] Participants noted that certain programmatic load flexibility opportunities do not require AMI. For example, software-enabled EV chargers can enable managed charging programs.

[17] The Grid Services Compensation Fund was approved by the DPU in the ESMP Order, and the Grid Services Study, led by MassCEC, provides a framework for its use.

Visioning Session

To ground and orient the conversation, the event included a "visioning session" to solicit participant perspectives responding to the questions "What does the future relationship between the grid and customer look like?" and "In a word or phrase, what is needed to accomplish your vision for the future relationship between the grid and customer?" The visioning session, led by MassCEC staff, invited participants to record their thoughts on sticky notes that were then grouped on the wall. The emergent (not mutually exclusive) themes from participant responses are summarized below:

Table 1: *What does the future relationship between the grid and customer look like?*

Theme	Description
Interactivity	Infrastructure is set up for behind-the-meter assets to seamlessly communicate and interact bi-directionally with the grid. Real-time two-way flows of power and information enable flexibility, collaboration and mutual feedback.
Automation	Real-time customer energy management is as simple, convenient and automated as possible. Equipment providers and program administrators design interfaces and infrastructure to be opted into, with a 'set it and forget it' mindset to personal preferences.
Customer-centered identity	Customers are empowered to take on new identities as prosumers, decision-makers and direct beneficiaries of a two-way system. Customers become "symbiotic" with grid operators, partners in a flexible system.
Customer choice	Customers are empowered to select the generation and flexibility resources that make sense for them, opt into and out of programs, and make informed financial decisions. Equitable customer participation is cultivated through proactive utility education and transparency.
Engineering stack	Real-time communication and coordination between utility, DER aggregators, meter vendor, energy management interface, DERs. Entities support necessary infrastructure by co-investing in digital and physical networks. Transaction costs and frictions are minimized.
Data availability	Grid and customer data necessary for interactivity is securely available through a standardized and open data ecosystem.
Price-based	Customers are rewarded for the services they provide to the grid, which they execute based on price signals.
Policy alignment	Grid edge resources are renewable and carbon free. Interactions between the grid and customer promote equity, affordability, reliability, resiliency and transparency.

Table 2: *What is needed to accomplish this relationship?*

Theme	Description
Shared vision	Broadly understood commitment to shared vision and goals, for the near and long term. Supported by strong leadership and centering customers as participating prosumers.
Regulatory innovations	Near-term regulatory innovations like improving data access and implementing dynamic rates. Long-term regulatory innovations to better align incentives for grid edge solutions, such as enabling TotEx regulation and utility distribution system operator (DSO) functionalities.
Empowerment, engagement, education	State, utility and community-led engagement and education to generate customer trust, buy-in and adoption. Driven from the bottom up.
Data availability	Thoughtful stewardship of the emerging grid edge data ecosystem. Supported by strong regulation and governance, oversight of the utilities. Data sharing paired with price signals, orchestration and accessibility through user interfaces.
Affordability & equity	Bill reduction to make grid edge capabilities more widely accessible to all customers.. Policy strategies focused on local empowerment and autonomy for income-eligible, environmental justice communities.
Technology	Modern AMI capabilities paired with broad adoption of solar, storage, EVs and smart appliances primed for communication. Affordable edge DERMS and AIs deployed to orchestrate DERs. Home energy management is largely automated, not a burden to customers.

Panel 2: Where the Grid Meets the Customer – Evolution of AMI

The second panel focused on next generation advanced metering infrastructure (AMI) technology and the opportunities it enables for Massachusetts. Panelists discussed strategies to take advantage of the granular data ecosystem facilitated by AMI. The panel featured:

- **Mike Phillips**. CEO and Founder, Sense.
- **Matt Bloom**. Director of Strategic Sales, Landis + Gyr.
- **John Franklin**. Vice President, Network Management, National Grid.
- **Carlos Nouel** (panel moderator). Managing Director, EY.

Key guiding questions

1. How does AMI 2.0 differ from AMI 1.0 in terms of what it offers? How is AMI evolving?
2. What are the immediate, short-term benefits of modern AMI meters in MA?
3. What are the longer-term prospects for other functionality?
4. What is needed to enable the full suite of benefits of modern AMI?

5. What is the future role of the meter for both utilities and households?
6. What regulatory, policy, education, technology developments are needed as metering evolves?

This panel featured officials representing a major AMI vendor (Landis + Gyr), an embedded intelligence software (Sense), and a utility (National Grid). Each of these companies are major players in the planning and ongoing implementation of system-wide advanced meter deployment. The panelists brought hands-on experience with the capabilities of the technology, which one described as resembling a mini-computer or a sensor rather than a billing device.

Compared to analog meters, the meters being installed across Massachusetts produce high-resolution energy consumption and production data – at volumes that are 50 million times that of analog meters. They also integrate with software that can communicate with both utility digital infrastructure and smart appliances behind-the-meter. These pathways allow meters to disaggregate supply and demand inputs in real time and automate optimizations in response to system needs, compensation opportunities, and emissions reduction opportunities.

Panelists underscored that **Massachusetts is in a unique position to create customer and utility value at the grid edge.** Sense software allows customers to monitor and manage the performance of home energy loads including electric vehicle charging, HVAC systems, and smart appliances. Situated between the distribution system and these flexible appliances, AMI can ingest grid signals and drive automated or manual behind-the-meter load shifting. This may enable new programs or new functions in existing programs like ConnectedSolutions. Meanwhile, AMI can allow utility operators to monitor the overall power flow of the grid with significantly more granularity. This visibility can enable utilities to better identify and correct faults and failures, more accurately estimate load, and more proactively plan customer programs. Both customers and utilities will benefit from a future ecosystem where local distribution data allows for creative solutions to neighborhood-level congestion. This optimization vision aligns with the EDCs' visions for grid flexibility and evolving regulatory initiatives like non-wires alternative (NWA) investments in the ESMPs.[18] One panelist called AMI a "step change in how utilities think about running their tech stack."

Taking full advantage of modern AMI in Massachusetts will require an all-hands-on-deck effort to integrate data-enabled gridtech, modernize utility planning and regulation, and position customers with tools to become active participants in a dynamic and interactive system. One participant noted that tech innovation is a space where Massachusetts excels. In Massachusetts' robust innovation landscape, utilities and customers may have many technology options to advance load flexibility, energy efficiency, and other envisioned outcomes at the grid edge. Any technology vendor should face healthy competition to create simple, streamlined, and impactful tools.

[18] ESMP Order, *Massachusetts DPU*. 2024. https://www.mass.gov/doc/final-esmp-order-82924/download

Panelists discussed that utilities and regulators must modernize their planning to ensure that the value of AMI is realized. One such area is deriving more value from existing resources, like EVs, batteries and heat pumps. A panelist noted that many of these assets are deployed across the states but not enrolled on TOU rates. AMI-enabled optimizations in charging and usage can be facilitated by programs or tariffs to the benefit of customers (compensation) and the system (peak load reduction). Another panelist suggested that any newly integrated controllable load should be set up for management and optimization from the outset through mechanisms like program auto-enrollment. Another panelist reiterated that utilities should analyze circuit-level data to identify local optimizations and examine alternatives to major infrastructure upgrades. NWA incentives could drive customer behavioral response during hours or even minutes where local distribution infrastructure is known to be overloaded. One panelist noted that the proliferation of data enabled by AMI simultaneously gives utilities new visibility into their system, while also empowering autonomous customer-participants to leverage their personal energy data. In this duality, third parties like Sense play a significant role both synthesizing the data ecosystem onto a simple interface and ensuring that customer data is privately managed and protected by a non-utility entity. Utilities and regulators are challenged to orient to this complicated new reality and evolve from a role defined primarily as 'service provider' to 'network operator.'

Panelists finally discussed how **empowering customers as active participants at the grid edge will require education, enthusiasm, and trust.** One panelist illustrated a goal where customer-facing home resource management tools are so user-friendly and apparently valuable that they go viral. He noted that, while investors in grid edge technology may not be readily impressed by a use case where customers save $50 monthly, this level of benefit may be incredibly meaningful for lower-income and/or vulnerable customers. The state and utilities should prioritize these demographics for any grid edge engagement strategy. Panelists agreed that ensuring data privacy is an essential component of AMI deployment. To mitigate public concerns, they should specifically focus on strategies that communicate utilities' adherence with best-in-class security standards and communicate the role of third parties like Sense in privately managing sensitive customer usage data without sharing with the utility.

Throughout the discussion, panelists emphasized that it was an explicit choice not to label contemporary AMI as "AMI 2.0", as is common across the industry. The technology is constantly evolving, and today's software-enabled sensors hardly resemble the binary meters of the past. Panelists concluded with optimism about the value stacks poised to be unlocked, challenging each other to reconvene in 2035 to review AMI-enabled progress to a more participatory, networked and distributed grid.

Case Studies: Grid Edge Technology in Action

The third session highlighted the types of grid technologies that will play a role in reshaping the grid edge and enable more participation and optimization of behind-the-meter resources. Several of the featured companies are focused specifically on integrating controllable behind-the-meter loads like EV charging, HVAC systems, and more in communication with signals relayed by AMI. Many of the companies highlighted are Massachusetts-based and/or have been beneficiaries of MassCEC seed funding, investment, or awards. The panel featured:

- **Mike DiRico**, National Sales Director, SPAN
- **Chris Ewings**, Director of Sales, Stepwise
- **James McRoy,** Vice President of Energy Transition Sales, Eaton
- **Jared Lebos**, Co-Founder & CEO, Noble Carbon
- **Michael Rigney**, CEO & Co-Founder, Cala Systems
- **Ben Myers**, SVP Sustainability, BXP
- **Matt Wapples**, Global Head of Customer Growth, KrakenFlex
- **Brian Seal**, Senior Program Manager, DER Integration, EPRI
- **Sarah Cullinan** (panel moderator), Senior Director, Net Zero Grid, MassCEC

Each company delivered five-minute introductions to their products and the problems or opportunities they are solving at the grid edge. The following table summarizes the high-level learnings from these presentations.

Table 3: ***Grid edge case studies***

Company	Representative	Grid edge problem(s)	Solution	Example
SPAN	Mike DiRico	Customers with controllable behind-the-meter loads need a central system to coordinate assets in response to grid needs and compensation opportunities.	Customer-owned in-home *SPAN Panel* combines automation with customer control to orchestrate home assets. *SPAN Edge* provides a utility-facing solution.	SPAN Panels deployed to manage battery assets deployed in Green Mountain Power (GMP) Resilient Neighborhood Pilot
Stepwise	Chris Ewings	Control of behind-the-meter loads has previously limited customers to an on/off binary, limiting homes and business from upsizing circuits.	The Stepwise panel acts as a 'dimmer', modulating EV and appliance electricity consumption.	Management of EV charging circuits allowed homeowners to install an electric heat pump.
Eaton	James McRoy	The energy transition demands innovation across a range of grid hardware and software solutions.	Eaton is developing a range of next generation integrated energy products including microgrids and smart breakers.	Eaton *AbleEdge* smart breaker integrates with Tesla batteries to manage home loads and limit new equipment and wiring.

Company	Representative	Grid edge problem(s)	Solution	Example
Noble Carbon	Jared Lebos	Customers with controllable behind-the-meter loads need a central system to coordinate assets in response to grid needs and compensation opportunities	Noble Carbon's *Alpha Smart Breaker* is a modular control device that helps enable demand response. The product is focused on affordability and tolerance for communication with diverse devices.	Pilot in partnership with MassCEC and Eversource to install 200 smart breakers in homes on key circuits in Berkshire County, monitoring usage and enabling peak reduction.
Cala	Michael Rigney	Typical water heaters have no situational awareness or pattern recognition, and are not controllable assets.	Cala's *High Performance Heat Pump Water Heaters* use home water consumption data to schedule heating, balancing needs with compensation opportunities.	Initial fleet of Cala water heaters are being shipped for installation in October 2025.
BXP	Ben Myers	Building decarbonization plays a major role in the state's climate plan, and green retrofits require complex engineering and project management.	BXP has executed commercial building retrofit solutions in alignment with developer and state decarbonization goals.	BXP planned and executed a net-zero retrofit for a three-story office complex in Needham, MA, including solar and storage installation.
KrakenFlex	Matt Wapples	A diverse ecosystem of controllable devices operate using disparate and incompatible software platforms.	Kraken's platform orchestrates diverse rate designs, data streams, and behind-the-meter assets for utilities.	Kraken acts as a standardization mechanism similar to what USBC accomplished for device charging.
EPRI	Brian Seal	Diverse ecosystem of controllable devices operate using disparate and incompatible software platforms	EPRI's *FlexIt* platform standardizes device and aggregation integration, with utility systems promoting interoperable DER orchestration. The	Participating utilities represent over 50% of U.S. customers

Company	Representative	Grid edge problem(s)	Solution	Example
			Mercury coalition has developed tools and standards to promote open access interoperability.	

Table Session: Next steps for unlocking value at the grid edge

The table session convened fifteen small groups around a set of discussion questions related to unlocking value at the grid edge. Each table featured representatives from diverse stakeholder groups including state and local government, utilities, innovators, non-profits and community advocates, academia and more. Table discussions covered an expansive breadth of grid edge issues; the following section summarizes some of the key emergent themes.

The discussion extended from a shared sense of urgency. The initial 2025 Future Grid "Balancing Data Center Use and Climate Goals" event thoroughly examined the pressures of projected load growth in Massachusetts,[19] a dynamic dually driven by fossil infrastructure retirement and slow development of alternative baseload resources like offshore wind and nuclear. Even if we were to dismiss these supply-side patterns, parallel trends like electrification and DER interconnection are driving the need to dramatically expand distribution capacity. Put simply: we need more grid, and we need that grid capacity to be cheaper and more efficient.

With Massachusetts' statewide advanced metering infrastructure (AMI) deployment underway, most customers will soon have the hardware and software to enable new capabilities at the grid edge. What needs to happen from *technology*, *process* and *people* perspectives to drive demand for grid edge opportunities and do so in an equitable manner? The ideas presented in this section reflect notes captured from discussions at each table, but are not attributed to individual workshop participants.

The following questions guided table discussions, and will provide the structure for the following report section:

Table 4: ***Table session questions***

Technology	- What technologies/capabilities do we have today that are key/game-changing? - What capabilities are we missing (if any)? - How do we provide equitable access and use of the customer-facing enabling technologies? - What technology standards are needed?

19 Event 1 Report: Balancing Data Center Energy Use and Climate Goals, *ACT & MassCEC*, 2025. https://www.masscec.com/sites/default/files/documents/rapporteur_act_event_1_report.pdf

Process	- How far are we from a fully orchestrated/flexible grid edge? - What are the key building blocks to get there? Who is responsible for each building block?
People	- What do we need to do to prepare customers? - How do we prevent undue burdens to those unable to participate in grid-edge responsiveness?

Technology

What technologies/capabilities do we have today that are key/game-changing?

Participants addressed a wide variety of grid edge and DER-enabling technologies. One participant suggested that any of the technologies available today has the potential to be key or game changing – competition for capabilities at the grid edge in the coming years will reveal which widgets or resources have the greatest impact on customers and the system.

Participants specifically discussed:

- *Smart meter rollout.* Modern AMI is a confluence of hardware and software. The sensing technology will generate robust data ecosystems, to be used by operators for customer and system outcomes like dynamic pricing and improved hosting capacity maps.
- *Smart panels, energy management systems, and customer-facing apps.* These systems are enabling customers to interface with and manage their home energy usage, with different options for active versus passive 'set it and forget it' customer profiles. Startup companies are piloting different approaches and are settling on simple interfaces and decision-making architecture.
- *Heat pumps and smart thermostats.* Heat pumps are replacing gas and oil heating at scale in Massachusetts. These loads are flexible by nature, with cycling opportunities that offer grid responsiveness with minimal compromise on residential comfort or commercial efficiency. Many smart thermostats are already enrolled in programs like ConnectedSolutions, and the DPU recently approved a special rate for heat pumps.
- *Battery storage.* Battery storage comes in many scales, technologies and applications. Paired solar and storage is a tested approach to building out clean, distributed energy. Storage is especially beginning to provide value at and below the substation level to alleviate congestion and avoid unnecessary expansion of distribution infrastructure.
- *Electric vehicles (EVs).* Massachusetts has benefitted from high EV adoption compared to other states. AMI integration with modern EV charging equipment will enable Massachusetts utilities to develop managed charging programs that leverage EV batteries as a grid resource.
- *Distributed Energy Resource Management System (DERMS).* Massachusetts utilities are in the early stages of implementing DERMS, a core software suite for orchestrating DERs and load

flexibility at and below the substation level. This includes edge DERMS, software specifically designed to orchestrate at the feeder-level.

What capabilities are we missing (if any)?

Many participants argued that, in Massachusetts' transition to a more distributed system, technology is not the limiting factor. From the household level to grid-scale supply and orchestration, solutions are in place for the envisioned grid of the future to thrive (though sometimes in pilot form rather than at scale). Participants identified barriers related to finance for gridtech, regulation, and customer demand as more impactful than technological limitations.

Finance for gridtech

One missing piece to the grid edge puzzle is AMI. Since the DPU approved cost recovery for AMI, utilities have begun to install new meters at residences and in businesses across Massachusetts. Utilities should gain access to a data ecosystem that allows them to test and consider scaling grid edge applications, and customers should gain additional insight and control over their energy usage. Utilities should be able to leverage existing home smart devices more efficiently, learning customer assets and behaviors and designing solutions around them.

Participants also emphasized the need for scaled orchestration technology like DERMS and Advanced Distribution Management System (ADMS) to allow for visibility, communication, control and value extraction from distributed assets. Utility participants argued that scaling these technologies is feasible if they are allowed to include them in the rate base. Industry and customer advocates emphasized the importance of customers accessing data necessary to drive home energy optimization decisions.

Participants emphasized that economic barriers continue to obstruct adoption of flexible loads like EVs, heat pumps, smart appliances, and distributed batteries. Massachusetts should continue to develop targeted (e.g., income-qualified) subsidies and partnerships to equitably deploy these assets so that they can contribute to load flexibility while bringing more populations into the grid edge transition. This is an increased challenge in the current geopolitical climate, where tariffs affect supply chains for EVs and batteries. The regulatory community must also consider interoperability[20] to ensure that the technology is 'grid-friendly,' or that their flexibility capabilities are put to use.

Regulatory gaps

It is essential that utilities are incentivized to take full advantage of AMI to enable value at the grid edge. One utility participant argued that traditional cost of service regulation does not organically incentivize innovation in the long term. Streamlined utility investment in new programs and technologies could be enabled by performance-based rate (PBR) structures such as a flexibility performance incentive mechanism (PIM), or by exploration of TotEx regulation (to be discussed later). The DPU should also

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[20] As defined on the next page, interoperability refers to the "ability of a system … to work with or use the parts or equipment of another system."

explore a protocol for ensuring that successful pilot projects (including those enabled by the Grid Services Compensation Fund) have a path to scale.

Another missing piece, potentially solvable through a mix of technology and regulatory modernization, is interoperability. Stakeholders envisioned a central AI-enabled open platform that is accessible and reliable for all parties and could facilitate communication between grid-scale data platforms, AMI, and smart appliances. Many argued that strong standards are key to achieving this vision.

A third regulatory gap is a central mechanism to relay price signals and facilitate grid services compensation. Participants were enthusiastic about extracting more value from DERs at and below the substation level, but voiced that we have a long way to go to communicate real-time price signals and facilitate markets. Participants discussed enabling mechanisms or models including the Grid Services Compensation Fund; regulatory changes that solidified utilities' responsibilities as a 'distribution system operator' (DSO);[21] and a hyperlocal co-investment market for 'flexibility credits' modeled from experience with renewable energy credits (RECs). In this third example, an operator would identify targeted locational grid needs, and buildings could pool money to meet the flexibility constraint in a common "zone," distributing credits based on contribution to the flexibility investment.

Customer demand

Participants reported challenges with getting Massachusetts customers broadly excited about contributing to load flexibility. One key theme in the 'what's missing' conversation centered around simple customer interfaces. Participants largely argued that consolidating to simpler technology, fewer apps, and 'set-it-and-forget-it' style automation will help demonstrate financial savings opportunities.

How do we provide equitable access and use of the customer-facing enabling technologies?

Participants discussed subsidies and incentives, rates and programs, and targeted investment as mechanisms for ensuring equitable access to enabling technologies.

The up-front costs of DERs and energy management technology represent an obvious barrier for income-constrained and other disadvantaged customers to participate in the envisioned future grid. Participants generally validated existing state and utility approaches to targeted rebates, grants, and other financial strategies to overcome these barriers. Some brought up specific incentive ideas, like community microgrids at churches and community centers to demonstrate the capabilities of newly accessible technologies and programs; ground-source heat pumps at elementary schools; residential electric appliance incentives based on participation in load flexibility programs; financing for appliances over time in utility bills (also known as "inclusive utility investment" or "IUI"); and grants to equipment providers to optimize installation based on geographic needs. Several tables weighed the pros and cons

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[21] As directed by legislation, a 2024 report commissioned by Maine's Governors Energy Office extensively examined the mechanisms and implications of DSO enablement in Maine. Maine chose not to move forward with the DSO model. https://www.maine.gov/energy/sites/maine.gov.energy/files/2025-01/DSO%20Study%20Final.pdf

of subsidizing such incentives using taxpayer versus ratepayer financing, and others noted an open question about how to ensure that incentives reach renters.

Tiered and dynamic rates offer another approach to bringing disadvantaged customers into the future grid edge. Today, low-income rates target energy affordability outcomes. Time-of-use rates may be effective for lower-income customers willing to monitor their energy usage behavior ahead of the completion of statewide AMI installation, one participant noted. In the future, these rates may be paired with incentives to equip qualifying households with DER technologies to provide load flexibility and other grid services.

Utilities can further plan investments to empower geographically defined communities. Electric Sector Modernization Plans (ESMPs) have a "visionary" potential to integrate reliability, economic and demographic data to identify grid needs and solutions with equity and environmental justice outcomes in mind. Today, however, one participant noted that clean energy and load flexibility is not yet showing up where it is most needed or impactful. Participants hoped that the next round of ESMPs can be more effective in siting and potentially incentivizing non-wires alternatives (NWAs) like battery storage, microgrids, and flexible EV fleets on a circuit-by-circuit basis.

What technology standards are missing?

The ecosystem of diverse technologies at the grid edge has the potential to be complex: smart thermostats, smart appliances, EV charging, solar and storage. For all of these technologies to act in concert with each other and signals from the grid will require great strides in interoperability standards.

Interoperability refers to the "ability of a system … to work with or use the parts or equipment of another system."[22] Current standards exist; participants heard about the innovative Mercury standard being leveraged by Electric Power Research Institute (EPRI).[23] In Massachusetts today, communications protocols between devices are not standard, nor are communications between utility orchestration systems like DERMS and ADMS and these devices. This dynamic is especially challenging because device incompatibility hinders grid edge technologies from scaling, but so might holding up device deployment before better standards are fully fleshed out.

Participants expressed hope that the industry (in Massachusetts and beyond) might naturally coalesce around a central open platform and set of rules for behind-the-meter interoperability. Such a process has happened in other industries, from EV charging (Tesla North American standard) to device charging (USBC). Mercury enthusiasts suggested it might feature the appropriate characteristics to be the agreed

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[22] EPRI leverages the Miriam Webster definition of interoperability in its application to the electric system. EPRI adds that interoperability is closely related but distinct from standardization: standards and standardization are necessary to achieve interoperability, but interoperability requires a degree of collaborative adoption and convergence, as well as the operational decision making to allow (at a policy or regulation level) for those systems to in fact make use of those "parts or equipment." https://www.epri.com/research/products/000000003002029209#:~:text=Abstract,a%20call%20for%20interoperable%20solutions.

[23] Mercury Consortium home page: https://msites.epri.com/mercury-consortium

upon standard – open access, uniform rules, strong customer and cybersecurity, broad buy-in, etc. Improving interoperability standards is a challenging problem that involves federal agencies, equipment manufacturers, utilities, and customers. State regulators have a role to play to steward the industry in Massachusetts towards solutions that are organic, effective and timely.

Process

How far are we from a fully orchestrated/flexible grid edge?

Participants articulated both forces of momentum towards and inertia against a fully orchestrated or flexible grid edge. On one hand, many foundational pieces of technology are in place. Innovators are continuing to generate new grid edge solutions, and AMI deployment is a critical step. On the other hand, participants noted regulatory lag, misaligned incentives, and customer hesitation as forces slowing down the process. Considering these forces, participants across several tables argued that 5-10 years is an ambitious but achievable timeline to achieve an orchestrated grid edge.

Slow distributed energy (DER) adoption is a key gap for realizing a fully orchestrated grid edge. To achieve flexibility at scale, Massachusetts customers and businesses must install far more batteries, heat pumps, smart thermostats and EV charging infrastructure. Financial incentives, regulatory expectations, and orchestration infrastructure must be in place for them to manage these resources flexibly. One participant argued that scaled DER adoption will create ripple effects that drive market maturation: "as more gets online, aggregators get in the game, public awareness goes up," and the transition to capturing value from the grid edge picks up steam.

What are the key building blocks to get there? Who is responsible for each building block?

While participants brainstormed a variety of 'building blocks', Table 5 below summarizes a high-level sequence that incorporates the ideas of multiple tables. One utility official noted that a sequence of building blocks resembling Table 5 is an often-discussed pathway in internal discussions related to grid modernization and grid edge enablement.

Table 5: ***Grid edge vision building blocks***

Building Block	Description	Responsible Party
AMI	Complete AMI deployment	Utilities & DPU
Compensation	Standard, widely used load flexibility compensation engine. Via program (expanded ConnectedSolutions?), rate design (forthcoming Grid Services Compensation Fund?) or other means	Multi-stakeholder
Smart devices	Broad installation of DER and smart devices, supported by state and utility incentives	Multi-stakeholder

Building Block	Description	Responsible Party
Orchestration	Expansion of ADMS and DERMS deployment to more use cases, with expenses recovered from ratepayers	Utilities & DPU
Markets	Market platform for utilities to competitively procure flexible capacity, incentive to grow towards the role of a distribution system operator (DSO)	Multi-stakeholder
Regulation	Regulatory reforms (e.g., via PBR, TotEx regulation) that reward utilities for driving DER capabilities through NWAs, program enrollment, sustained grid services compensation	DPU, multi-stakeholder

While this checklist offers a useful starting point, participants brought ideas for building blocks that varied considerably – some which fit into this framework, and some which added to it. Several of the emergent themes include expanding existing programs and creating new ones; clarifying responsibilities and leadership; building workforce capacity; increasing coordination across the economy and region; considering regulatory innovations; solving for the interoperability challenge; and customer education and motivation.

Programs: Existing programs like ConnectedSolutions and SMART have been an effective start to generating load flexibility and alternatives to building capacity, even in the absence of AMI. Participants urged that these programs must be adaptable and expand with new, always emerging technologies and capabilities. Many participants brought forward the concept of a sandbox program, which one described as ‘a place where you can break stuff with lower stakes, where you can test policies and technologies, and make data-driven decisions that are more radical’. This framing can be especially relevant for utilities, who are often risk-averse by design. Programs in Connecticut[24] and the United Kingdom (UK)[25] serve as strong examples.

Participants had many specific ideas on how to design a future sandbox or other load flexibility programs, covering a range of themes. In no particular order:

- Programs should be designed around real-time rather than historical data.
- Programs should procure aggregated, technology-agnostic load flexibility based on price signals.
- Programs should ‘gameify’ customer interfaces, with toggles and signals that are basic and tied to compensation opportunities.
- Programs should undergo cost-effectiveness tests to ensure that they return more system value than cost to customers.
- Program administrators should collect data about customer resources, demographics, and existing resources to design and market programs to specific groups.

24 PURA Innovative Energy Solutions home page. https://portal.ct.gov/pura/electric/office-of-technical-and-regulatory-analysis/clean-energy-programs/innovative-energy-solutions-program

25 Ofgem Energy Regulation Sandbox home page. https://www.ofgem.gov.uk/energy-regulation-sandbox

- Programs should be designed to opt customers in, with the option of an opt-out.
- Programs should be designed to automate as much as possible based on customer pre-programmed preferences.
- Grid planners should over-procure capacity to hedge against energy accounting discrepancies and provide security from the grid planner's perspective.
- Regulators and utilities should take steps to simplify the expansive and diverse ecosystem of customer interfaces.

Responsibilities: Massachusetts' grid edge transition is a complex, multi-stakeholder effort that could benefit from consolidated, clear leadership. Some participants contemplated the roles of Energy Secretary Tepper, Boston Mayor Wu, or a conceptual 'Grid Modernization tzar' in coordinating a state effort. Others echoed reflections from the second Future Grid workshop emphasizing the role of community organizations to act as ambassadors and customer liaisons. Many agreed that the utilities, who have direct touchpoints with customers, continue to play significant roles across communications, planning, and innovation. A utility official reminded their table that utilities themselves do not have the financial pathways to invest or incubate research & development, so there is a need for the state to coordinate the private sector to ensure that innovations are thoughtfully integrated into the system.

Workforce: Participants emphasized a priority around growing the state's pool of technical talent as grid technology extends into every home and business. This may especially apply to trades professionals and contractors. One participant also argued that the state should provide more resources to the DPU to accelerate regulation in the face of increasing complexity.

Coordination: Participants argued that there will be a need to coordinate beyond even the diverse participants represented in the workshop. Changes to the grid edge will extend to industries like real estate and insurance, and those stakeholders should be brought on board. In parallel, Massachusetts should continue coordinating with ISO-NE and other regional authorities to examine how the value generated at the grid edge may be relevant at the regional scale.

Innovation: Participants brought up more major regulatory changes that Massachusetts policymakers could consider to augment the grid edge transition. One was empowering utilities with tools and incentives to entertain a distribution system operator (DSO) role, or acting as a platform for capacity buyers and sellers to transact via auctions based on distribution-level grid needs.[26] British companies who presented at the event like Octopus Energy and Piclo partner with utilities to advance this model in the UK, but no states have followed the UK's lead in driving major regulatory changes to enable this model. Participants also pointed to the UK's experience modernizing utility cost recovery through the 'TotEx' model, which one described as a mechanism to un-bias where investments happen and investment returns (e.g., capital expenditure vs. deferred investment). Massachusetts may be already moving in this direction via the ESMP process: National Grid recently submitted a filing seeking to institutionalize an incremental cost recovery mechanism for ESMP-related capital and operational

[26] See footnote 22.

expenses including flexibility provider incentives and the Grid Services Compensation Fund.[27] Another mentioned implementing cost recovery mechanisms such as bonds that minimize the burden of a grid edge transition to ratepayers.

Interoperability: As described earlier in this section, there are gaps in what one participant described as the "connective tissue of the grid edge": device interoperability, standards, integrations between systems and data governance and management. Interoperability and data standards are necessary to orchestrate DERs and bring aggregators and other third parties into the transition.

Education: As will be described thoroughly later in this section, residential and business customers must be motivated to participate in the system to effectively derive value from the grid edge. Generating interest and commitment may be driven by personal motivations like altruism or – much more likely – by financial opportunities. These systems and opportunities must be strategically communicated to customers.

People

What do we need to do to prepare customers?

One participant reframed this prompt as 'what problem are you looking to solve that requires the customer to make a lifestyle change?' Activating the grid edge will require buy-in from diverse citizens of the Commonwealth who are used to electricity as passive infrastructure, a one-way interaction, a flip of the switch. Some areas of relative consensus addressed simplicity in program and interface design, strategic messaging and education, and strong vetting for customer-facing third parties.

Utility program officers, equipment providers, and state officials are all faced with simplifying an increasingly complex and heterogeneous grid edge landscape. Practitioner experience has clearly suggested simplicity is key to customer adoption. One participant used an illustrative metaphor: "We have been trying so hard to create a supermarket for consumers and all they really want is a chef." Some participants envisioned that, on the customer end, the smart home is orchestrated through an app (today, most customers must navigate many). Getting such an interface right will require characteristics like consolidation, gamification, straightforward toggles to embed preferences and clear connection to financial outcomes. Regarding an ideal customer interface for home energy management and load flexibility, one participant described "removing every friction point in the customer journey."

Education will be critical to empowering customers to take advantage of grid edge tools and capabilities, but the details will matter. Several tables reported that the scaled deployment of AMI represents a widely relevant educational opportunity. *How can you derive value from the new meter being put outside your house?* Communications around programmatic opportunities, rebates and rates can build

[27] National Grid Comments, Docket No. 24-11. October 1, 2025. https://fileservice.eea.comacloud.net/V3.1.0/FileService.Api/file//aegbjjbbe?AnbWHlcC9HCpCiRCZJq5MZJCYDN/DiDbHsUFX+Vfig6PcSxI+blU344Khxm+qpOeg0hKFj9M9l/xQR8+/8GqPvdGgrFe6XR6ngIfa80wd3rxFD8G4j981M2Rna9aVTXA

on AMI-related messaging. The structure of messages themselves may vary based on population. For example, higher-income customers who already have EVs and smart thermostats may be receptive to detailed programmatic opportunities, while the message to lower-income customers may be structured around bill reduction. One participant argued that across customer types, messages should be consistent across messenger entities and tied to material savings and perks, like program enrollment tied to rebates.

Many participants emphasized that different stakeholders will have a role to play in customer education. Utilities already routinely execute program promotion and other educational campaigns. Their existing network positions them uniquely, but they face trust issues. Some participants highlighted the potential for convening organizations to coordinate a public education campaign, and for community organizations to lead execution and implementation. Citing the community process in Framingham around geothermal infrastructure development, one participant emphasized that 'education' should be bidirectional and prioritize soliciting community input.

How do we prevent undue burdens on those unable to participate in grid-edge responsiveness?

Participants expressed hesitation that inequities at the grid edge were 'preventable' rather than a reality to identify and mitigate. Several participants centered around a challenging dynamic in which utility grid edge-enabling investments would result in bill increases while not directly benefiting vulnerable customers. As a high-level goal, several participants urged Massachusetts to adopt a grid edge strategy that deliberately increases opportunities for low-and-moderate income (LMI) customers to save money. 'Leveling the playing field' should be the responsibility of the DPU and policymakers, one participant noted. Approaches may include equity-focused program design, LMI discounts, equity-qualifying subsidies for equipment installation, and bill impact studies.

Building on previous conversations, participants identified direct engagement as a key towards building trust and communication. Homeowners and businesses that are unable to participate in grid edge responsiveness know their needs and priorities best, and should be consulted in decision-making around investment, program, and rate decisions. Engagement processes designed around MassSave partnerships may be a strong model to this end.[28] Policymakers should also be cautious to assume certain populations' inability or disinterest in equipping themselves for grid responsiveness. Experiments in Holyoke (referenced in Future Grid Series report 2)[29] demonstrated that across income levels, language, and race, customers were motivated by the savings potential of demand response. One participant noted that municipalities will be a useful testbed to experiment with both non grid edge-related equity and affordability measures as well as recruiting diverse customers into municipal aggregations.

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[28] MassSave community strategy home page. https://www.masssave.com/community

[29] Event 2 Report: The Role of DERs in Transitioning to an Equitable Electric Grid, *ACT & MassCEC*, 2025. https://www.masscec.com/sites/default/files/documents/act-masscec_event_2_2025_future_grid_series_-report_for_sharing_w_attendees.pdf

Some participants wondered if other conversations need to happen before meaningfully evaluating the role of vulnerable communities in the grid edge transition. Why might LMI or vulnerable customers not be able to participate in grid responsiveness? Many customers in Massachusetts are living paycheck to paycheck, may not have internet, or may not have an electric bill or banking account in their name. Other customers may be living in old housing stock with problematic leaks, safety concerns, or amperage that rules out smart appliances or other DER installation. As described by one participant working in Chelsea and East Boston, many customers are 'stuck in a loop where they can't get devices at lower cost because getting the house able to handle them is too expensive'. In cases like this, state and utility officials should prioritize funding audits and listening sessions rather than introduce added complexity of unlocking grid edge capabilities.

Recommended Actions

The following recommended actions reflect ideas brought up during table session discussions and in each table's report out to the larger group. While the actions below directly reflect perspectives raised across table discussions at the October 2025 Power at the Grid Edge workshop, several resemble recommendations articulated in the 2024 Future Grid Series report[30] as well as the previous 2025 workshops.[31]Many of the current recommended actions build on prior recommendations, and the recurring themes in stakeholder conversations suggest increasing alignment about potential next steps.

Please note: This document summarizes the content of and discussion during the Event among participants. A list of participating organizations is provided in an Appendix. As such, this document is not intended to represent the position of MassCEC or ACT.

Recommended Action 1: ***Develop centralized resources proposing state grid edge strategy***

Need/gap: Lack of coordinated state strategy for equitably deriving value from the grid edge.

Leading entity(ies): Multi-stakeholder effort led by a state agency.

Description: A state agency can expand upon the information embedded in this report to consolidate a state grid edge strategy. This may include further stakeholder engagement culminating in a central planning document. The strategy could address state goals for the grid edge across topics of technology, regulation and people, and would benefit the state by coordinating the activities of agencies, utilities, industry and other stakeholders. It could describe recommended actions by key stakeholders including the governor's office, legislature, EDCs, DPU, municipalities, and community advocacy groups. It could support the design of specific outcomes like those described in subsequent recommended actions.

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[30] MA Transition to the Future Grid 2024 Event Series: Series Summary & Stakeholder Recommendations, *ACT & MassCEC*, 2024. https://www.masscec.com/sites/default/files/documents/ma_future_grid_event_series_summary_and_recommendations.pdf

[31] Event 1 Report: Balancing Data Center Energy Use and Climate Goals, *ACT & MassCEC*, 2025. https://www.masscec.com/sites/default/files/documents/rapporteur_act_event_1_report.pdf, Event 2 Report: The Role of DERs in Transitioning to an Equitable Electric Grid, *ACT & MassCEC*, 2025. https://www.masscec.com/sites/default/files/documents/act-masscec_event_2_2025_future_grid_series_-report_for_sharing_w_attendees.pdf

Related previous recommended actions:

- 2024 Series, Recommendation 5: More coordinated exploration is needed to define problem statements and solutions to help increase meaningful stakeholder engagement in the grid transition.
- 2025 Series Event 2, Recommended Action 4: Study barriers and solutions to equitable DER access.

Recommended Action 2: ***Authorized state stakeholders create a regulatory sandbox***

Need/gap: EDCs could benefit from a regulatory 'safe space' to test new grid edge technologies, programs and business models

Leading entity(/ies): Legislature, DPU, MassCEC, EDCs

Description: The legislature could authorize the DPU and EDCs to co-develop a regulatory sandbox to pilot new grid edge technologies, programs and business models. Such a program could follow models set by peer jurisdictions, like the Connecticut PURA's Innovative Energy Solutions (IES) program, and national resources, like the Lawrence Berkeley National Laboratories' (LBNL) Regulatory Sandbox guidance document.[32] A regulatory sandbox could competitively solicit applications for and award diverse pilots within defined time-periods (e.g., three years) and embed a process to scale pilots that achieve established success metrics. It could require that hardware and software technologies enabled by the program comply with established interoperability standards such as those developed by the Mercury Coalition.

Related previous recommended actions:

- 2024 Series, Recommendation 3: Develop a program to support gridtech.

Recommended Action 3: ***Embark on a coordinated state public education campaign about grid edge opportunities***

Need/gap: Diverse Massachusetts customers may be unaware or disengaged about emerging grid edge capabilities and the financial opportunities presented by participation in the future grid.

Leading entity(/ies): Multi-stakeholder effort led by state agencies and/or nonprofits.

Description: The statewide deployment of AMI presents a unique opportunity for an educational campaign to drive cross-sectional grassroots participation in the state's envisioned future grid. There is potential for a coordinating entity to align such a campaign around a clear and simple set of messages. The core message would likely center around potential financial benefits of grid edge activities, but campaign leaders could strategize about how to adapt a message to different demographics. Delivery of messaging would be key to such a campaign; a coordinating entity could ensure that messengers including the EDCs, state entities, and community organizations present and repeat consistent information while also adapting details based on their relationships to the audience. Such a campaign would need to prioritize building trust with communities, particularly those that are

[32] Regulatory Sandboxes and Other Processes to Expedite Utility Adoption of Advanced Grid Technologies, *Lawrence Berkeley National Laboratories*. 2025. https://eta-publications.lbl.gov/sites/default/files/2025-06/regulatory_sandboxes_06.10.2025.pdf

currently excluded from participating in grid responsiveness due to cost barriers. Any campaign should also provide information about the suite of income-eligible options available to utility customers.

Related previous recommended actions:

- 2024 Series, Recommendation 6: A statewide strategy is needed to inform and support grid users, such as an energy literacy campaign.
- 2025 Series Event 1, Recommended Action 3: Engage communities to make informed decisions about data centers and leverage potential benefits.

Action 4: ***Study regulatory innovations to better align EDC incentives with grid edge outcomes***

Need/gap: EDCs are not incentivized to take full advantage of a more distributed, flexible grid under traditional cost-of-service regulation.

Leading entity(/ies): Legislature, DPU, EDCs, advocacy stakeholders

Description: Today, utilities are generally incentivized to solve for distribution-level grid needs via capital investments. Other jurisdictions have experimented with alternative regulatory models to better align utility incentives with distributed, flexible solutions. In the UK, 'TotEx regulation' has shifted utility incentives away from capital expenditures and towards maximizing economic efficiency. Similarly, UK policymakers and regulators have steered utilities to facilitate competitive marketplaces for localized capacity resources, acting as distribution system operators (DSOs) that match needs with solutions based on economic signals. Other U.S. jurisdictions have developed performance based regulatory mechanisms (PIMs) that reward utilities for integrating load flexibility and NWAs to meet local grid needs.

It is likely that aspects of this action will be resolved organically by ongoing activities in ESMP filings (see footnote 27). However, authorizing the DPU to proactively investigate these alternative approaches to regulatory incentives may complement existing efforts to drive grid edge solutions for distribution-level needs, such as ESMP planning and the Grid Services Compensation Fund. Ensuring EDCs are incentivized to pursue grid edge resources in the long-term would support such efforts to scale and extend beyond finite program terms.

Related previous recommended actions:

- 2024 Series, Recommendation 1: Develop a straw proposal for a set of grid performance metrics.
- 2024 Series, Recommendation 2: Develop targets for peak demand management.
- 2025 Series Event 2, Recommended Action 4: Study barriers and solutions to equitable DER access

Conclusion

The third event of the 2025 Future Grid Series brought together stakeholders around questions of how to modernize technology and processes in Massachusetts to unlock value at the grid edge, especially in the context of statewide AMI deployment. The full-day event centered the perspectives of community leaders, advocates, academics, the private sector, utilities, and policymakers, whose thoughts were captured in the table session section and resulted in four recommended actions. Key recommendations generated by participants include a central document to articulate the state's vision and plan for the grid edge; a sandbox program to pilot grid edge technologies and business models; a coordinated education campaign around new opportunities at the grid edge; and study of regulatory innovations to align business models with NWAs and grid edge solutions. This workshop concluded the 2025 Future Grid Series, led by the Alliance for Climate Transition (ACT) and Massachusetts Clean Energy Center (MassCEC).