Leading the Charge:
Accelerating the Massachusetts Battery Energy Storage Innovation Ecosystem

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Prepared by
UMass Clean Energy Extension

Clean Energy Extension

UMass Amherst

Contributors

Dwayne Breger, Director, UMass Clean Energy Extension

John Fabel, IDS Consulting and Department of Environmental Conservation, UMass Amherst

River Strong, Associate Director, UMass Clean Energy Extension

Shira Yeskel-Mednick, Special Projects Intern, UMass Clean Energy Extension

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The views and opinions expressed in this report are solely those of the authors.

Cover photo: 1.3 MW/4 MWh lithium-ion battery installed by Borrego at the University of Massachusetts Amherst. Photo courtesy of UMass Amherst.

Executive Summary

The Commonwealth has the critical BES innovation ecosystem elements necessary for the state to become a global center of BES innovation and commercialization.

With the national and global expansion of the grid-scale battery energy storage (BES) sector, there is a significant opportunity to advance the growth of the Massachusetts energy storage industry, create jobs, and maintain and build a state leadership position in this rapidly growing clean-tech industry. The UMass Clean Energy Extension outlined this opportunity and a series of recommendations for moving forward in its 2019 industry report, *Creating Opportunity: Building a Massachusetts Battery Energy Storage Innovation Ecosystem*, which was supported by the Massachusetts Clean Energy Center and the Massachusetts Department of Energy Resources. Since its release, the report's findings and recommendations have attracted significant interest from state legislators, industry circles, and academic institutions. CEE was subsequently allocated funding in 2020 to implement two of the report's six key recommendations:

1. **Create a Leadership Consortium/Steering Group**: CEE organized a BES Innovation Steering Committee composed of stakeholder representatives of the Massachusetts BES Innovation Ecosystem. Primary functions of the Steering Committee are to (1) serve as a leadership consortium for strategic decision-making and related BES initiatives, and (2) increase the profile and visibility of the Massachusetts BES industry.
2. **Convene and Facilitate BES Industry Events, Symposia, and Networking Opportunities**: CEE engaged the Steering Committee in the envisioning, planning, and implementation of a BES industry networking event to facilitate connections among the Massachusetts BES academic, private- and public-sector Ecosystem stakeholders. The outcome of these efforts resulted in a day-long virtual working Symposium entitled *Creating Opportunity: Advancing the Massachusetts Battery Energy Storage Innovation Ecosystem* on December 9, 2020.

The Symposium was attended by 45 industry participants representing a cross-section of Massachusetts BES Ecosystem stakeholder groups. Key themes and outcomes that emerged from the Symposium included:

Opportunities Available

- There is significant value and opportunity in advancing the Massachusetts BES Innovation Ecosystem – and interest among participants in supporting this effort.
- The strength of the Commonwealth's academic resources is well recognized and shows promising signs of connectivity with the commercial sector.
- Massachusetts has the ingredients to lead a national conversation and initiative on BES technology innovation and adoption, and opportunities exist to significantly enhance this Ecosystem.

Opportunities Facing Challenge

- Industry challenges and opportunities often lie at the interface between BES sectors, and there is significant value in facilitating cross-sector connectivity using both formal and informal venues.
- Fostering greater connectivity and collaboration between academic and commercial sectors has particular value.
- Access to funding is a key bottleneck at all Massachusetts BES Innovation Ecosystem levels and sectors.
- There is a significant need and opportunity to address diversity, equity, inclusion, and environmental justice challenges within the Massachusetts BES Innovation Ecosystem.

Opportunities for Action

- Developing dedicated BES research, development, and validation facility(s) is valuable and needed to address key bottlenecks, and will strengthen Massachusetts' competitiveness for BES innovation companies.
- There is a need to expand the coordination of policy and programming across the breadth of the Massachusetts BES Innovation Ecosystem, and a recognition that policy directed towards innovation can have substantial positive impact on the Ecosystem performance.
- There is a need for a database and online anchor portal for creating and maintaining Ecosystem connections, and to establish an Ecosystem identity and presence.

This report provides further details on (1) the composition and aims of the BES Innovation Ecosystem Steering Committee, and (2) the objectives, activities, and outcomes of the 2020 Symposium. In the final section of this report, CEE offers a Concept Proposal entitled *Massachusetts Battery Energy Storage Innovation Ecosystem Action Plan*, which focuses on an actionable plan for further advancing the Massachusetts BES Innovation Ecosystem to the benefit of the BES industry and the Commonwealth as a whole.

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1.0 Introduction

The U.S. energy storage market is undergoing rapid growth and is expected to be a $4.5 billion market by 2023.[1] And for good reasons: Grid-scale battery energy storage (BES) is critical to increasing the percentage of renewable energy providing power to the utility grid. In Massachusetts, widespread adoption of BES is recognized as a key element in meeting carbon-reduction commitments laid out in the 2008 Global Warming Solutions Act and the goals of subsequent climate- and clean energy-related policies and programs.

There is a significant opportunity to advance the growth of the Massachusetts energy storage industry, create jobs, and maintain and build a state leadership position.

With the national and global expansion of the BES sector, there is a significant opportunity to advance the growth of the Massachusetts energy storage industry, create jobs, and maintain and build a state leadership position in this rapidly growing clean-tech industry. This can be achieved by enhancing the innovation environment for emergent BES companies within the state, which will serve to support the Commonwealth's existing BES industry while attracting new ventures to the state. The UMass Clean Energy Extension (CEE) outlined this opportunity and a series of recommendations for moving forward in its 2019 industry report, *Creating Opportunity: Building a Massachusetts Battery Energy Storage Innovation Ecosystem*. This research was an outgrowth of ongoing work by CEE to evaluate and enhance the BES innovation sector in Massachusetts – work supported by the Massachusetts Clean Energy Center (MassCEC) and the Massachusetts Department of Energy Resources (DOER).

To advance these efforts, CEE organized a BES Innovation Ecosystem Steering Committee composed of stakeholders representative of the Massachusetts BES innovation Ecosystem. (Steering Committee members are listed in **Table 2.1** below.) Primary functions of the Steering Committee are to (1) serve as a leadership consortium for strategic decision-making and related BES initiatives, and (2) increase the profile and visibility of the Massachusetts BES industry. A key initial task of the Steering Committee was to envision, plan, and implement a BES industry networking event to facilitate connections among the Massachusetts BES academic, private- and public-sector Ecosystem stakeholders. The outcome of these efforts resulted in a day-long virtual working Symposium entitled *Creating Opportunity: Advancing the Massachusetts Battery Energy Storage Innovation Ecosystem* on December 9, 2020.

The sections below provide:

- Details on the composition and aims of the BES Innovation Ecosystem Steering Committee
- An outline of the objectives, activities, and outcomes of the 2020 Symposium
- A Concept Proposal entitled *Massachusetts Battery Energy Storage Innovation Ecosystem Action Plan*, which focuses on an actionable plan for further advancing the Massachusetts BES Innovation Ecosystem

1.1 Symposium Background

In June of 2019, CEE released its report *Creating Opportunity: Building a Massachusetts Battery Energy Storage Innovation Ecosystem*. Using stakeholder interviews and industry research, the report examined a subset of the state's BES-related academic and commercial sectors to identify the opportunities and barriers associated with developing and accelerating the state's nascent BES Innovation Ecosystem.

[1] https://www.woodmac.com/research/products/power-and-renewables/us-energy-storage-monitor/

The report (1) found that Massachusetts would significantly benefit from a coordinated and multi-stakeholder initiative to advance the Commonwealth's BES Innovation Ecosystem, and (2) provided an outline and series of recommendations for advancing such an initiative. Key findings from the report included:

- The **Commonwealth has the critical BES Innovation Ecosystem elements necessary for the state to become a global center of BES innovation and commercialization**, but several factors are limiting its potential impact.
- The **Commonwealth's colleges and universities have substantial technical, intellectual, and developmental BES resources that are of current and potential value to Massachusetts BES commercial ventures**, but these are not sufficient to support the needs of the BES Innovation Ecosystem.
- **Massachusetts is both generating BES ventures *and* attracting them from outside of the state**.

The report provided a series of actionable recommendations for accelerating the state's emerging BES Innovation Ecosystem, including:

1. Create a Massachusetts BES Leadership Consortium/Steering Group
2. Convene and Facilitate BES Industry Events, Symposia, and Networking Opportunities
3. Develop and Disseminate a Massachusetts BES Innovation Ecosystem Brand
4. Develop a Multi-functional Web-based Platform to Connect Ecosystem Resources and Activities
5. Develop and Support Publicly Accessible R&D and Testing Facilities
6. Support the Massachusetts Academic Sector as the Engine of the BES Ecosystem

Since its release, the 2019 BES industry report's findings and recommendations have attracted significant interest from state legislators, industry circles, and academic institutions. CEE was subsequently allocated funds awarded to the University of Massachusetts Amherst Physical Plant under the MassCEC's and DOER's Advancing Commonwealth Energy Storage (ACES) program for research support to implement recommendations 1 and 2 from the 2019 BES industry report, detailed in **Box 1** below.

Box 1. Recommendations 1 and 2 from *Creating Opportunity: Advancing the Massachusetts Battery Energy Storage Innovation Ecosystem*

Recommendation 1: *Create a Massachusetts BES Leadership Consortium/Steering Committee*

Primary functions of this Leadership Consortium will be to serve as a steering committee for strategic decision-making and related initiatives, and increase the profile and visibility of the Massachusetts BES industry. The Consortium will create and steer actionable agendas for industry forums, advise and promote the functionality and peer participation in the web-based platform (described below), and provide identity and voice for public outreach in and beyond the Commonwealth. Our research underscored the high degree of coupling between various stakeholders, and the importance of engaging all stakeholders to effectively understanding issues and opportunities.

Recommendation 2: *Convene and Facilitate BES Industry Events, Symposia, and Networking Opportunities*

The value of increased opportunities for networking was almost universally agreed upon across both academic and commercial sectors. We are recommending periodic face-to-face events and symposia to facilitate networking among Massachusetts BES academic, and private- and public-sector ecosystem stakeholders. While online platforms and searchable databases are important, the value of face-to-face connections cannot be overstated. This includes facilitated discussions between stakeholders on topics relevant to decision-making and policy.

This funding request was based on CEE's conviction that the implementation of these recommendations would support a more refined, bottom-up understanding of the Massachusetts BES market, specific sector needs and challenges, as well as the formation of critical connections and synergies between BES stakeholders that report operating in relative isolation. Most importantly, the direct involvement of BES industry stakeholders enables a strategic planning process and industry-focused implementation of subsequent steps by and for whom the Ecosystem directly serves.

The funding request was subsequently approved and CEE commenced (1) organizing the BES Innovation Ecosystem Steering Committee, and (2) planning the Symposium itself. Further details on both elements are provided below.

2.0 The BES Innovation Ecosystem Steering Committee

In this section we discuss the formation and activities of the Massachusetts BES Innovation Steering Committee, whose members and organizations are shown in **Table 2.1**.

Table 2.1 Massachusetts BES Steering Committee Members

Member	Institution
Fikile Brushett	Massachusetts Institute of Technology
Mike Condon	Massachusetts Clean Energy Center
Jessica Duston	University of Massachusetts Lowell
Natasha George	SomEV
Katie Geusz	Greentown Labs
Michael Hoff	HoffPower, LLC
Judith Judson	Ameresco
Galen Nelson	Massachusetts Clean Energy Center
Alistair Pim	Northeast Clean Energy Council
Kavita Ravi	BlueWave Solar
Jeffrey Roy	Massachusetts State Representative
Mitch Tyson	Northeast Clean Energy Council and Greentown Labs
Loren Walker	University of Massachusetts Amherst
Yan Wang	Worcester Polytechnical Institute
UMass Clean Energy Extension	
Dwayne Breger	UMass Amherst, UMass Clean Energy Extension
John Fabel	IDS Consulting and UMass Clean Energy Extension
River Strong	UMass Amherst, UMass Clean Energy Extension

The BES Leadership Consortium/Steering Group is composed of 14 BES industry and academic stakeholders, including commercial ventures, academic researchers, state policymakers, and NGO representatives. A key immediate task of the Steering Committee was to guide the development of the agenda for the Symposium, and to develop a representative list of prospective symposium participants. However, the convening of the Steering Committee was also an opportunity to gauge the level of interest in advancing a BES initiative, and to lay the foundation for the Steering Committee to provide longer-term oversight and guidance to such an initiative.

2.1 Steering Committee Composition

The composition of the Steering Committee is intended to reflect representation of key stakeholders from across the Massachusetts BES Innovation Ecosystem. Notably, we were able to attract leaders from across the Ecosystem. Several Steering Committee members were participants in the BES Ecosystem survey that was the basis for the 2019 BES industry report.

A working model of the Ecosystem can be found in **Figure 2.1** below. It should be noted that while the Ecosystem model is inclusive of customers and end-users, the Steering Committee itself is focused on the cohort of Ecosystem stakeholders that represent the core of the *innovation* ecosystem that ultimately serves (but does not primarily include) BES customers and end-users. The sectors focused on BES innovation are shaded in blue in **Figure 2.1** below, and include Commercial Ventures, Academic, Policy, and Investment Capital sectors.

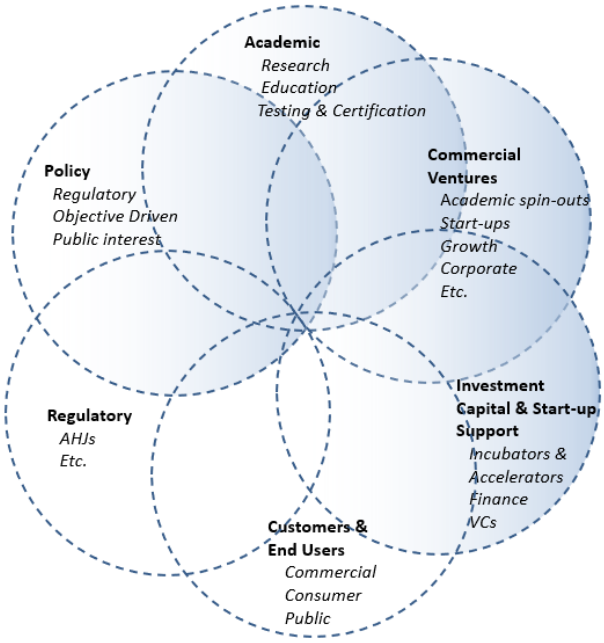

Figure 2.1 Massachusetts BES Innovation Ecosystem model

In general, CEE was able to readily recruit members of the Steering Committee due to the high levels of interest and engagement in contributing to the leadership of this effort. It's worth noting that greater effort was required to recruit representatives from the commercial sector compared to other sectors. One reason for this may have been that a primary task for the Steering Committee was to develop an agenda for the planned Symposium – a somewhat difficult value proposition for time-constrained entrepreneurs.

2.2 Steering Committee Process, Activities, and Findings

CEE organized and facilitated three Steering Committee working sessions between April and September 2020. Each of these meetings lasted approximately two hours, during which the group:

- Refined the Massachusetts BES Innovation Ecosystem working model
- Identified Symposium objectives, core themes, topics, and format
- Developed and refined the Symposium agenda
- Developed a Symposium invitee candidate list

The initial meetings of the Steering Committee included facilitated discussions of issues and opportunities facing the Massachusetts BES Innovation Ecosystem, and identification of topics and issues that would be valuable for the Symposium. Core themes and topics outlined by the Steering Committee generally aligned with the findings of the 2019 BES industry report. This provided some degree of validation of the findings and recommendations of the report, and provided the basis for the Symposiums structure, process, and content.

Steering Committee members also contributed outside of these working sessions and played a significant role in conducting the Symposium itself, including facilitating breakout sessions.

3.0 The Symposium

On December 9, 2020, the Clean Energy Extension convened the online Symposium, entitled *Creating Opportunity: Advancing the Massachusetts Battery Energy Storage Innovation Ecosystem*. The Symposium was initially conceived as an in-person event. However, due to constraints of the Covid-19 pandemic, we developed and conducted a virtual event. The event was conducted using the Zoom platform, with a combination of plenary and breakout sessions.

The Symposium was attended by 45 industry participants representing a cross-section of ecosystem stakeholder groups.

The Symposium was attended by 45 industry participants representing a cross-section of Ecosystem stakeholder groups. Attendees were invited from a curated list of prospective invitees assembled in close collaboration with Steering Committee members. The intent was to optimize representation of key stakeholders from across the Massachusetts BES Innovation Ecosystem, and to manage the size and the quality of working discussion groups.

CEE developed the Symposium agenda in conjunction with the BES Steering Committee. The agenda drew both from the findings and recommendations of the 2019 BES industry report, and from input and guidance from the BES Steering Committee.

3.1 Objectives and Desired Outcomes

Symposium objectives and desired outcomes identified by the Steering Committee included the following:

- The Symposium should be an action-oriented “working event” where participants are engaged in visioning, brainstorming, and planning.
- The Symposium should foster connections across Massachusetts BES Innovation Ecosystem sectors (i.e., commercial, policy, investment, academic) and enable participants to remain connected after the event.
- Symposium participants should discuss ideas and provide guidance for advancing the Massachusetts BES Innovation Ecosystem, including:
    - Identifying and strategizing concrete, actionable next steps relating to specific topics, bottlenecks, and opportunities.
    - Creating working groups and forward-movement around core topics and foster a culture of engagement.
    - Testing and evaluating specific recommendations of the 2019 BES industry report (e.g., development of publicly accessible research and development testing facilities).
- The Symposium should assess the level of interest and “buy-in” among participants for further advancing Massachusetts BES Innovation Ecosystem initiatives.

3.2 Structure, Process, and Content

The specific structure, process and content of the Symposium was informed by CEE's industry research experience that led to the 2019 BES industry report. It was evident from this research that key bottlenecks and opportunities lay at the interface between BES sectors (i.e., commercial, policy, investment, academic), and that developing approaches to addressing these challenges and opportunities would benefit from facilitated cross-sector discussions and consideration. It was also evident that there was considerable need and interest in expanding connections and relationships both within and across BES Ecosystem sectors. Input from the Steering Committee further supported these assessments.

In addition to specific topics previously identified in the 2019 BES industry report and through the Steering Committee, an important aspect of the Symposium was to enable these and other issues to emerge more organically through cross-sector discussion between attendees. Accordingly, the Symposium reflected two underlying findings of our study:

1) That the Ecosystem would benefit from increased connectivity within and across the Ecosystem, and that a desire for greater connectivity was a common theme in interviews; and
2) That there are specific topics – representing both challenges and opportunities – that would benefit from cross-sector discussion regarding how to move forward most effectively.

Broadly speaking, the Symposium was divided into three primary components, outlined in **Box 2** below. A complete Symposium agenda is provided in the **Appendix** and the Symposium presentation slides are provided at the CEE website.

Box 2. Agenda Structure of *Creating Opportunity: Advancing the Massachusetts Battery Energy Storage Innovation Ecosystem*

Symposium – December 9, 2020

Part 1: Opening Plenary

- *Purpose: An introductory session, to provide background and context*
    - Set stage and provide Ecosystem context for the event.

Part 2: Strengthening Connections Across the Ecosystem

- *Purpose: Facilitated networking sessions designed to build connections within and across Ecosystem sectors*
    - Networking breakout sessions
        - Organized by Ecosystem sector, facilitated by CEE and Steering Committee members
        - Participants free to move between breakout sessions

Part 3: Advancing the Ecosystem Working Sessions

- *Purpose: Facilitated working sessions designed to identify and discuss key issues, topics, and next steps*
    - Opportunity to organically identify specific issues, themes, and opportunities
    - Opportunity for cross-sector discussion of specific topics previously identified in report and by Steering Committee
    - Sessions facilitated by CEE and Steering Committee members
    - **Working Session 1**: Specific Sector Challenges, Bottlenecks, and Opportunities
        - Facilitated breakout sessions organized by BES Ecosystem sector
        - Open format to enable topics of highest importance to emerge organically
    - **Working Session 2**: Sector Discussion Topics
        - Breakouts organized by topic:
            - Dedicated BES Facility(s), Centers of Excellence, R&D, Testing/Validation, Grid-scale
            - Facilitating Academic-Industry Connections
            - Commercial/Entrepreneurial Sector: Challenges and Opportunities
            - Policy and Ecosystem Directions
    - **Working Session 3**: Plenary Session: Symposium Wrap-up and Actionable Next Steps

3.3 Findings and Outcomes

As intended, the Symposium generated engaged and substantive discussion. Sessions were recorded and participants also took extensive notes in a shared document created for the purpose of documenting discussions.

It is CEE's overall assessment that the Symposium was successful in meeting its objectives and desired outcomes. Participants spoke of the value of the connections that they were able to make, and the importance of such events to the Massachusetts BES Innovation Ecosystem. Participants engaged in robust cross-sector discussion of core topics, and generated insights to support and actionable steps for moving forward with the continued development of the Massachusetts BES Innovation Ecosystem. Some key takeaways include:

- Participants were very engaged and expressed interest in continued engagement.
- There was clear support for continuing to pursue a Massachusetts BES Ecosystem Initiative, and for the value of such an initiative.
- Additional Ecosystem-level events and gatherings would be valuable to advancing the Massachusetts BES Innovation Ecosystem.

- Discussion validated the prior work of CEE and the Steering Committee, with regards to confirming and/or identifying key themes, topics, and opportunities to be pursued
- Cross-sector discussions enabled additional themes and specific topics to emerge

There is significant value and opportunity in advancing the Massachusetts BES Innovation Ecosystem – and interest among Symposium participants in supporting this effort.

Many themes and specific topics were recurrent throughout the course of the day. Notably, these were cross-cutting themes that emerged regardless of breakout sector or discussion topic. These themes and topics generally mirrored the findings of both the 2019 BES industry report and the Steering Committee discussions. This outcome supports the previous findings and recommendations and provides a general framework for moving forward. The cross-sector nature of the discussions provided nuanced insight, and effective guidance for addressing overarching themes. The tenor of the discussions suggested broad consensus on the topics and themes.

The opening sessions (Parts 1 and 2, and Working Session 1 of Part 3) of the Symposium were structured as facilitated, open-ended discussions, to enable important topics to organically emerge. Some broad themes emerging from these discussions are summarized here:

Opportunities Available

- There is significant value and opportunity in advancing the Massachusetts BES Innovation Ecosystem – and interest among participants in supporting this effort.
- The strength of the Commonwealth's academic resources is well recognized and shows promising signs of connectivity with the commercial sector.
- Massachusetts has the ingredients to lead a national conversation and initiative on BES technology innovation and adoption, and opportunities exist to significantly enhance this Ecosystem.

Opportunities Facing Challenge

- Industry challenges and opportunities often lie at the interface between BES sectors, and there is significant value in facilitating cross-sector connectivity using both formal and informal venues.
- Fostering greater connectivity and collaboration between academic and commercial sectors has particular value.
- Access to funding is a key bottleneck at all Massachusetts BES Innovation Ecosystem levels and sectors.
- There is a significant need and opportunity to address diversity, equity, inclusion, and environmental justice challenges within the Massachusetts BES Innovation Ecosystem.

Opportunities for Action

- Developing dedicated BES research, development, and validation facility(s) is valuable and needed to address key bottlenecks, and will strengthen Massachusetts' competitiveness for BES innovation companies.
- There is a need to coordinate policy and programming across the Massachusetts BES Innovation Ecosystem, and a recognition that policy can have substantial positive impact on the Ecosystem performance.

- There is a need for a database and online anchor portal for creating and maintaining Ecosystem connections, and to establish an Ecosystem identity and presence.

Working Session 2 of Part 3 featured more focused discussion on specific topics identified by the Steering Committee. The specific topics and high-level themes emerging from these facilitated discussions are summarized in **Box 3**.

Box 3. Topics and Emerging Themes from Working Session 2 Breakout Discussions

Dedicated BES Facility(s), Centers of Excellence, R&D, Testing/Validation, Grid-scale • Strong consensus that such facilities would be of value, both at testing/validation and grid scales • Lack of in-state facilities is a bottleneck and accessing facilities in other states has significant costs and inefficiencies	**Facilitating Academic-Industry Connections** • Potential for significant mutual benefit • Strong competitive asset that differentiates Massachusetts • Improving capacity for BES sectors to find each other and connect is critical
Commercial/Entrepreneurial Sector: Challenges and Opportunities • Early-stage and more established ventures have unique needs calling for differentiated approaches • Access to funding and resources related to scaling of production and company management are challenging • Regulatory, policy, and permitting environment has impact on market adoption and should better support new commercial and technology entries	**Policy and Ecosystem Directions** • Policy highly influential to Ecosystem function • Importance of engaging regulatory stakeholders to prepare for emerging technologies • Critical importance to integrate environmental justice and equity into BES industry development and technology adoption

Working Session 3 of Part 3 was a plenary discussion focused on identifying actionable next steps, drawing upon the discussions in the prior working sessions. A sampling of the suggestions included:

- Continue to convene BES Innovation Ecosystem events such as this one.
- Begin exploring what a testing facility could look like and tasks necessary to plan and implement such a facility.
- Create a consortium to identify gaps and opportunities between the academic and commercial sectors.

An overarching theme was a clear interest among participants for active involvement in participating in the advancement of the Massachusetts BES Innovation Ecosystem. Based upon this, CEE subsequently synthesized the outcomes of the Symposium and the 2019 report into a concept proposal for advancing the Massachusetts BES Innovation Ecosystem, entitled the *Massachusetts Battery Energy Storage Innovation Ecosystem Action Plan* and summarized in **Section 4** below.

An important and recurrent new theme to emerge from the Symposium was the importance of recognizing and pursuing the "win-win" opportunities for linking environmental justice to the Massachusetts BES Innovation Ecosystem and climate mitigation investment. Given the major investment that is likely to be coming in climate mitigation, there is an opportunity to not simply proceed along established structures that maintain current inequitable distribution of wealth, resources, and physical infrastructure. Similar themes emerged regarding geographic distribution and utilization of resources across the state, and the importance of engaging the existing advanced manufacturing and technology innovation centers throughout Massachusetts.

4.0 Concept Proposal for a Massachusetts BES Innovation Ecosystem Action Plan

In this section we draw upon the findings and recommendations of the 2019 BES industry report, the work of the Steering Committee, and the collective work of the Symposium participants to outline a concept proposal to transition our research and findings into actionable steps to substantively recast the Massachusetts BES Innovation Ecosystem into a coordinated and purposefully driven research and economic engine for the Commonwealth. The concept proposal, still under development, is entitled the *Massachusetts Battery Energy Storage Innovation Ecosystem Action Plan*. The *Action Plan* comprises of the follow activities:

1. **Maintain and Build on BES Steering Committee and Ecosystem Events**

We will continue to convene and expand upon the strength and motivation of the BES Innovation Ecosystem Steering Committee. We will recruit new members from strategic sectors and establish working groups around key overarching issues and objective. The Steering Committee will contribute to the planning and convening of additional BES Ecosystem events that will provide networking and support topical discussions and connectivity within and between Ecosystem sectors.

2. **Develop and Launch a Massachusetts BES Innovation Virtual Platform**

We will develop an online "virtual platform" to host a range of functions related to the Massachusetts BES Innovation Ecosystem. The web-based platform will have the potential to serve as a "brand" platform to connect and communicate the collective strength of the Massachusetts energy storage sector, and the value proposition Massachusetts offers to prospective energy storage ventures within and outside the Commonwealth.

The web platform will include the following elements and capabilities:

- Resource list of BES Ecosystem sectors: university research, innovation and commercialization, manufacturing, early stage financing, incubators, and industry groups
- Searchable database of Ecosystem participants with contact information, BES sector, expertise, etc.
- Participant exchange capabilities, including needs and offers for equipment and research tasks, discussion groups, networking, etc.
- Business-to-business exchange for investors and early commercial ventures
- Jobs board and exchange for companies and job seekers

3. **Establish the Massachusetts BES Accelerator and Incubator Programs**

We will establish coordinated BES Accelerator and Incubator programs that will provide strong and targeted BES start-up acceleration and incubation services including mentorship, entrepreneurial training, competitive start-up pitch prizes, access to testing and prototyping assistance, access to capital, technology validation, business development, and connections to manufacturers. The Accelerator and Incubator programs will increase the rate at which BES start-ups are launched into commercial ventures, as well as the readiness of those start-ups to access and leverage available investment capital. These programs also have the potential to attract new ventures to the state.

4. **Begin a Voucher Program to Engage Massachusetts Advanced Manufacturers**

We will establish and conduct a competitive Massachusetts BES Innovation Manufacturing Voucher Program to support the early manufacturing needs of commercial ventures and to engage those needs with Massachusetts advanced and

precision manufacturing sector. The program will include coaching companies for their manufacturing plans, program planning with the manufacturing sector, and managing the voucher program and connections.

5. **Prepare Business Plan for BES R&D and Testing Facility(s)**

We will further develop planning for one or more dedicated Regional BES R&D and Testing Facility(s). Our findings suggest that there are two distinct facilities worthy of further consideration: (1) small and mid-scale (i.e., cell- and stack-level) R&D and validation facility, and (2) grid-ready system prototype testing and validation facility. The plan will establish the industry needs, facility design and capabilities, costs and revenue sources, and alternative business structures and feasibilities. Such publicly accessible facilities would also help to further communicate the Commonwealth's BES brand identity and value proposition to current and prospective BES ventures.

6. **Create Fund for University Graduate Research Students and Diversity**

We will create a fund seeded by public money and leveraged with industry and foundation support that will be competitively deployed to support graduate students at Massachusetts universities engaged in BES basic and entrepreneurial research who will be needed for the workforce. Funds will be allocated to 1) university researchers to offset the costs of graduate students, and 2) graduate students meeting diversity metrics to support educational expenses and cost of living.

7. **Establish Pathways for a Diversity of Students and Professionals to Engage in BES Workforce**

We will actively engage with targeted Massachusetts high schools, vocational schools, and higher education to introduce BIPOC students to research, entrepreneurial, and other career pathways in BES. We propose to also establish connections with national research universities, including Historically Black Colleges and Universities (HBCU), to enhance pathways for diversity students to enter our graduate schools and internship programs.

8. **Massachusetts BES Innovation Branding and Outreach**

We will establish a Massachusetts BES Innovation Ecosystem brand identity, and using that brand develop a regional outreach strategy to engage and create identity across the innovation industry sectors. This outreach effort will serve to establish Massachusetts as a global BES hub and bolster regional economic development, strengthen regional innovation capacity, and encourage movement of research and entrepreneurial talent, research funds, and investment capital into the Ecosystem.

Appendix – Symposium Agenda