Energy Storage Study
Status Update as of October 26, 2017

This document includes both recent activities and insights to date. It is divided into the following sections:

1. Summary of PPRP activities in July-October;
2. Insights from recent PPRP activities; and
3. Examples from other states highlighted by stakeholders.

1. Summary of PPRP Activities in Summer/Fall 2017

Stakeholder Meetings/Calls

- *Third-Party Storage Development Community:* Alevo Analytics, Bloom Energy, Edison Energy, Energy Storage Association, Ingersoll Rand and Calmec (IRCO), Flonium, Schneider Electric, Sunverge, Tesla, WindSoHy;[1] and
- *Organizations:* MCEC, MDOT, Edison Electric Institute (EEI), University of Maryland Energy Innovation Institute (UMEEI), PJM

PSC-PPRP-MEA Coordination

- Ongoing monitoring of PC 44 Integration & Energy Storage workgroups;
- Monthly calls with MEA and PPRP;
- Meeting with PSC Staff experts to discuss regulatory sections of Energy Study outline, which Staff has agreed to draft or provide input on; and
- Coordination with Andrew Johnston on meetings/calls with stakeholders.

General Learning

- EPRI webinar for PPRAC/PC 44 WGs;
- Field trip to 10-MW AES storage project; and
- Background reading, news monitoring.

Report Development

- Style guide completed;
- Drafting Chapters: 2. Storage Technologies; 4. Status of Storage in Maryland; and 5. Policies in Other States; and
- Researching/Outlining Chapters: 3. Cost and Value of Storage; 6. Revisions to Existing Regulatory Policies and Definitions; 7. Wholesale Market Factors.

[1] Since the teleconference meeting with Alevo Analytics, the company filed Chapter 7 bankruptcy, which has ended communications with the company.

2. Insights from Recent PPRP Activities

Meetings/Calls with Third-Party Storage Development Community

- **Services** – Desire to provide multiple services, whether BTM or FTM.
- **Justifications for Action by MD** – Learning by doing, kick-starting new technologies/markets, untapped system benefits (e.g., avoiding peakers, avoiding system upgrades, lowering cost of RE integration, etc.). One respondent cautioned that only modeling could determine which use cases would be of value to the State.
- **Barriers** – Barriers cited: costs (high initial outlays, expensive financing, costly technology); lack of customer knowledge (esp. about thermal, CAES); outdated utility planning (optimization and production cost models inadequately model storage and rely upon outdated cost numbers); inability to quantify, monetize, and/or receive value for all storage benefits; rate design (lack of TOU rates or real-time pricing); low solar penetration to pair with storage; lack of competition among storage providers; lack of pilot projects; and utility profits tied to asset investments.
- **Policies** – Strong support for mandates/procurement targets; rate reform (e.g., more TOU, higher demand charges, location-based charges); pilot projects. Also support for incentives (address first costs, use declining blocks, rebates) and requests for technology neutrality among energy storage technologies. Other policies mentioned: a regulatory accounting framework that allows utilities to file for all storage values at once, interconnection reforms, high-level leadership, utility rate-basing, daily demand charges, planning reforms, performance-based incentives, building code credits, coordination with other State programs, and incentives aligned with full value to the utility.
- **PJM** – Not a lot of comments: requests for non-discriminatory rules (DR, regulation); clarity on how storage would compete with transmission projects; incorporation of storage into planning processes (e.g., RTEPP).
- **Utility Ownership** – Some voiced support for/no concerns about utility ownership; others said PSC should specify where on the grid/to what end; one voiced blanket opposition; one noted hybrid ownership models.
- **Mandates** – Many suggestions for diversity within mandate (size of project, size of provider, sector, location on the grid). Also request for technology neutrality.
- **Pilot Projects** – Mostly one-off suggestions: explore many technologies (e.g., ice storage); pilot a cohort of systems; focus on exploring how to scale projects and what business model makes sense; make sure projected performance is achieved; avoid rigid RFPs that prevent innovative small companies from doing larger projects; use open project calls rather than RFPs.
- **System Planning** – Mostly one-off suggestions: consider likely power source for energy storage (may not automatically be RE); allow utilities to rate-base storage investments; consult with successful IOUs; designate a state-level planning authority that can look across utilities' territories; focus on resiliency/reliability (possible tie-in with federal resilience goals).

Meetings/Calls with Other Organizations

- **Services** – Desire for storage to provide multiple services; differing views on best location (from residential to front-of-the-meter).
- **Justifications for Action by MD** – Generating performance data from demo projects; promoting in-state jobs in manufacturing and other sectors; attracting businesses that require a resilient grid; boosting grid resiliency and reliability using solar + storage; beginning the long process of identifying and executing necessary regulatory changes.
- **Barriers** – Barriers cited: outdated regulations (for storage ownership and management) that preclude storage from providing multiple services; lack of certainty regarding utility ownership; technical interconnection issues; cumbersome government contracting requirements (e.g., seven-year limits for project payback periods); physical site constraints; consumer overconfidence in the grid; lack of economic incentives; tax incentives that favor BTM projects; safety concerns about batteries catching fire; permitting staff who are unfamiliar with storage projects; and green building codes that have yet to incorporate storage.
- **Policies** – Support voiced for: incentives; tax breaks; reliance on market forces to drive decisions about storage projects; transparent and technology-neutral rules; compensation based on avoided costs; demonstration projects; staged deployment starting with entities that are most interested (e.g., DOD, NIST, FDA, NIH, etc.); and synergies with other MD programs (EmPOWER Maryland, county/state/utility economic development).
- **Valuation** – Mostly one-off suggestions: EPRI's StorageVET may be useful; cost/benefit analysis should be a full life-cycle analysis that considers the entire expected life and capabilities of a project. One respondent cautioned against assigning value to "unquantifiable benefits" of storage, while another wondered how to capture more environmental benefits in cost/benefit analysis.
- **Location** – Mostly one-off suggestions: establish accurate locational price signals; allow IOU ownership to optimize location decisions; consider microgrid applications. One respondent said that the biggest opportunities for storage are at the distribution level, especially given the tax/reliability advantages of BTM solar+storage projects.
- **Grid Issues** – One respondent noted the potential for storage to create the same issues seen with other DERs—voltage fluctuations, reverse power flows, increases in losses, reactive power fluctuations, power quality issues, overcurrent and overvoltage—unless the location and use of storage projects are well-coordinated.

Monitoring PC 44 Meetings

- **Storage** – Utility Ownership is likely to be focus of PC 44 Energy Storage workgroup for the foreseeable future. Andrew is drafting a memo summarizing the perspectives of interested party to inform PPRP's study.

- **Interconnection** – Exeter will seek input on the aspects of the Interconnection group's work that are most relevant to energy storage, since the group has been considering ~40 individual changes to COMAR.

Meeting with PSC Staff

- **EVs** – PSC agrees that they do not currently need to be in the study.
- **Storage Mandate** – Staff advised against incorporation of any mandate in RPS. Practical challenges, and RPS does not address location of resources, which is important for energy storage. MW-based mandate would make more sense.
- **Interconnection** – Staff does not think this is the most important factor in promoting energy storage. Goal is to make interconnection efficient, fair.
- **Rate Design** - The PSC publicly reviewed the workgroup's two rate design pilot proposals, which had TOU rates with on-peak/off-peak ratios of at least 3:1. Meanwhile, a consultant is studying value of solar to inform a new pilot program rate for net metered customers. Value of solar+storage may be included.
- **System Planning** – Unlikely that the PSC will address before our study is due. BGE distribution improvement plan submitted in June 2017; PEPCO and Delmarva to follow in 2017/2018. These reports will be key references for the PSC moving forward with distribution-level system planning.

3. Examples from Other States Highlighted by Stakeholders

Mandates	
CA	Requiring utilities to generate X MWh from storage helped create a market for storage.
CA	CA's energy storage mandates represent the gold standard for energy storage targets, including energy storage targets set by point of interconnection (i.e., transmission-, distribution-, and customer-sited storage). However, even this progressive mandate does not include sector-specific goal.
MA	A positive example, though the 200-MWh goal is far lower than the energy storage potential in the state.
Incentives	
TX	Texas has had some success with a green bond program.
CA	The program was so successful, the first pool of money was committed very quickly.
Programs	
MA	Allows communities to apply for grants for solar PV, give funding priority to solar+storage projects, maybe a fixed % (carve out).
OR	Has "no pain" pilot programs.
Rate Design	
CA	NEM 2.0 TOU requirement maximizes the value of storage to utilities and customers alike by providing appropriate price signals to customers, mitigating peak demand and reducing outages.
MA	Net metering laws in MA ensure that systems are sized appropriately for on-site needs.

Utility Ownership	
CA	Don't want utilities to own energy storage facilities; in CA, for example, PGE is contracting out to have projects developed.
CO	Xcel Energy of CO received deferred rate base approval from the CO Public Utilities Commission for two customer-sited, solar-storage projects.
System Planning	
FL	Get input from other electric utilities that have been successful in incorporating energy storage into system planning; e.g., Florida Power & Light.
ME	Law that requires utility to study non-transmission alternatives when proposing new transmission, and must deploy those non-transmission alternatives if they are economic. Avoided $2 billion in new transmission lines with storage and solar.
RI OH	Both states have grid modernization efforts worth reviewing.
CA	Has an Energy Storage Agency.
NY	Reforming the Energy Vision (REV) is thinking big picture regarding the future of the grid.
CA	Has a distribution system study.
Avoided Costs	
AZ	Now requires utilities seeking a new peaker plant to research the cost of alternatives such as energy storage; even if they opt for a peaker, they must invest 10% in storage (or something along these lines).
RI	RFI for non-wire solutions.
VT	Green Mountain Power is using residential batteries to avoid annual peak charges (for which they get charged in the wholesale capacity market) and monthly transmission charges, and for energy arbitrage. For every battery, they save $50 a month.
NY	National Grid has 20 "non-traditional" assets.
Performance Metrics	
PA	Look at PA's investigation into alternative ratemaking methodologies, performance-based rates that include efficiency of grid, customer empowerments, etc. (anything but capital investment).
MA	Regulators already had grid modernization program and metrics in place to compare storage against other alternatives.
Valuing Storage Benefits	
CA	The current regulatory accounting structure silos costs into different categories; for example, demand response programs are filed for separate from transmission deferral programs. The CPUC is working toward a regulatory framework that allows a utility to file for all values that a single energy storage project delivers.
NY	The NY State Energy Research & Development Authority's recent solicitation demonstrates an effective means of stacking values for energy storage.
CA	CA is looking at how to value flexibility. See both the CPUC's docket and CAISO's flexible capacity for resource adequacy.
NY	Do not follow NY's footsteps (for solar); too complicated to try to calculate every benefit to the nth degree.
NV	NV is setting cost-of-service rates on a marginal cost basis but allowing utilities to recover embedded costs,

Modeling Storage Potential	
MA	Better to identify the benefits of storage through modeling, as was done in MA. Then you can think about how to promote the specific-use cases *that are shown to be of value to the state* through policy/regulatory action (ask "What does the grid need?", not "What do the vendors want?").
OR	Study by Navigant on behalf of Portland General Electric examines energy storage potential by point of interconnection (i.e., customer-, distribution-, and transmission-sited), as well as for residential, small commercial, and industrial applications. However, the potential study could have more accurately appraised energy storage potential by modeling multiple battery sizes for customer-sited residential and small commercial energy storage units.
Utility Ownership	
MA NY	Both states made decisions to explicitly allow utility ownership in a deregulated context.
Miscellaneous	
CA	"Bring your own battery" program by San Diego Gas and Electric; also, SDG&E's 30-MW storage facility to balance solar generation and manage peak load.
MULT.	Look at states with high utility bills (CA, FL, ME, HI, MA, VT) for innovative ideas.