ESA Comments on Minnesota Department of Commerce

Energy Storage Study Workshop #1

The Energy Storage Association ("ESA") appreciates the opportunity to provide these informal comments on the September 20, 2019, workshop of the Minnesota Department of Commerce on the Minnesota Storage Cost-Benefit Analysis conducted by E3. ESA is the national trade association dedicated to energy storage, working toward a more resilient, efficient, sustainable and affordable electricity grid – as is uniquely enabled by energy storage. With more than 180 members, ESA represents a diverse group of companies, including independent power producers, electric utilities, component suppliers, and integrators involved in deploying energy storage systems around the globe. Further, our members work with all types of energy storage technologies and chemistries, including lithium-ion, advanced lead acid, flow batteries, zinc-air, compressed air, and pumped hydro, among others. In these comments, ESA provides several recommendations for E3's consideration regarding modeling assumptions and outcomes, leaning on best practices from previous cost-benefit studies across the United States.

I. INTRODUCTION

ESA believes Minnesota should be a leader in the deployment of energy storage. There is immense potential for cost savings by deploying energy storage to meet peak demand needs, which is critical considering the volume of new natural gas peakers under consideration in Minnesota. There is significant potential in terms of using storage as an alternative to peaking capacity as noted in the University of Minnesota's study, Modernizing Minnesota's Grid: An Economic Analysis of Energy Storage Opportunities, and the Minnesota's Smarter Grid report by Vibrant Clean Energy. Storage will also be needed to support the State's energy and environmental goals, which are currently being considered by Xcel, the legislature, and the governor's office. However, ESA notes that with only 16.2 megawatts ("MW") of storage deployed and none under contract or development, Minnesota's energy storage deployment is not catching up to other leading states.

According to Wood Mackenzie Power & Renewables, at the end of 2018, 1 gigawatt ("GW") of battery-based energy storage projects were operational in the United States across more than 20 states. Some of the country's leading utilities have chosen battery energy storage systems as a cost-effective tool for meeting their states' environmental and energy policy goals. In fact, since 2016 there have been approximately 4,800 MW of energy storage projects proposed by utilities in their integrated resource plans alone (*see Table 1 below).* These commitments include recent announcements by NV Energy of plans to add 690 MW of energy storage to its system, Arizona Public Service's plan to deploy 850 MW of energy storage, and Xcel Colorado's proposal to build 275 MW of energy storage in its 2018 update to the 2016 Electric Resource Plan.[1] While some of these commitments were driven by state policy

[1] Arizona Public Service announcement, February 2019, of 300 MW of energy storage contracts, as well as a commitment to include 550 MW of energy storage in its upcoming integrated resource plan, (available at: https://www.aps.com/en/ourcompany/news/latestnews/Pages/aps-customers-get-solar-after-sunset-with-major-clean-energy-projects.aspx); NV Energy announces 590 MW in its 2019 update to its 2018 IRP, which included a 100 MW energy storage project that has been approved by the Nevada Public Utilities Commission, June 2019 (available at:

guidance that recognizes the importance of including energy storage considerations in utility resource plans, many of these announcements can be attributed to the utility's recognition that energy storage can provide a cost-effective alternative to traditional investment.

Table 1: Energy Storage Proposed in Utility Resource Plans (2016-2019)

State	Utility	IRP Year	Storage Proposed	Timeline
OR	PGE	2016	39.8	2020
HI	HECO	2016	535	2020
KY	Kentucky Power	2016	10	over 10 years
IN	IPL	2016	833	over 20 years
WA	Puget Sound	2017	75	2029
NC	Duke Carolinas	2017	75	2019-2021
OR	PacifiCorp	2017	4	2020
WA	Avista	2017	5	2029
AZ	UNS Energy Corp	2017	20	2028
CO	Xcel	2016 (2018 update)	275	2030
VA	Dominion	2018	30	2025
VA	Appalacian Power	2018	10	2025
FL	FPL Energy	2018	50	2020
MI	Consumers	2018	450	2040
NV	NVE	2018	100	2021
NC	Duke Carolinas & Duke P	2018	290	2026
NM	El Paso Electric	2018	115	2035
AZ	APS	2019	500	2025
IN	NIPSCO	2018	92	2023
GA	Georgia Power	2019	80	2024
MI	Indiana Michigan Power	2019	50	2028
FL	FPL Energy	2019	409	2022
NV	NVE	2019	590	2023
OR	Idaho Power	2019	60	2034-2038
PNM	New Mexico	2019	130	2023
Total			**4,858**	

Note: Does not include TVA's recent 2019 IRP (5,300 MW by 2038 in preferred plan)

II. COMMENTS ON ASSUMPTIONS AND MODELING

i. Modeling must include statewide deployment scenarios and quantify sources of value

ESA underscores that this modeling exercise must include a statewide optimal deployment number that provides the greatest value for the state, as well as quantify the benefits that provide the most value to Minnesota specifically. For example, in the Massachusetts State of Charge report, they note that the top 10% of hours accounted for 40% of the annual electricity spending; once this was known, they were able to develop a Clean Peak Standard program based on a quantifiable benefit. The analytical modeling that was conducted for the study facilitated an effective program designed that understood what the compensation structure should be, as well as the number of megawatts needed to realize those savings.

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http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2015_THRU_PRESENT/2019-6/39888.pdf); Xcel Colorado's 2018 update to its 2016 IRP included 275 MW of energy storage, June 2018, (available at: https://t.co/4JTOU99UTn).

Much can be gleaned from the cost-benefit studies of energy storage that have already been done.[2] Across the board, cost-benefit studies in New York, Massachusetts, Nevada, North Carolina, and Virginia have found that the quantifiable values of energy storage systems far outweigh the costs of those systems. Some of the most notable savings quantified in these studies came from the reduced need for excess capacity to meet peak demand and from the deferral or complete avoidance of transmission and distribution investments. These cost-benefit studies systematically quantify a variety of potential savings and values that are delivered by energy storage.

ESA strongly supports E3's proposal to model various future energy scenarios in recognition of the various policies under consideration both at some of Minnesota's utilities but also at the Minnesota state legislature and Governor Walz.

ii. Modeling stacking of services accurately is critical to finding optimal deployment scenario

The pathway to providing customers, utilities and the electric grid with the greatest benefits and savings from the deployment of energy storage comes from the optimization of storage to provide as many services as the asset can provide, rather than just one application. "Stacking" the revenues from these services ensures that the deployed storage assets are used efficiently at the least cost to consumers. It also means that more energy storage assets are cost-effective because they can secure additional revenues for the services they are providing.

ESA is concerned with several statements made in the September 20 webinar that suggest that the assumptions going into the modeling exercise may underestimate the overall value of energy storage. For example, ESA would appreciate additional information about the preliminary findings modeled by E3 on storage as an alternative to peaker plants. Specifically, does that analysis incorporate additional value streams from batteries when they were not being used for peaking capacity? One important consideration when comparing an energy storage system with a combustion turbine plant on a cost basis is whether the assets can provide additional services to the system when they are not being used to meet peak demand.

Additionally, the graphic on Slide 37 of the September 20 webinar appears to underestimate the service stacking potential of various storage project types by modeling use cases that can be achieved by the same asset. This poses the risk of not finding as many resources that are cost-effective. ESA respectfully requests further clarity on how the use cases will interact with each other in the modeling exercise. We note the following two use cases on Slide 37 seem to underestimate the potential for multiple application of energy storage.

- Behind-the-meter resources can provide distribution deferral (e.g. bring-your-own-device programs) and power quality improvements.
- Distribution deferral projects can provide power quality improvements, as well as potential bill savings if they are in fact behind-the-meter or deployed by a co-op.

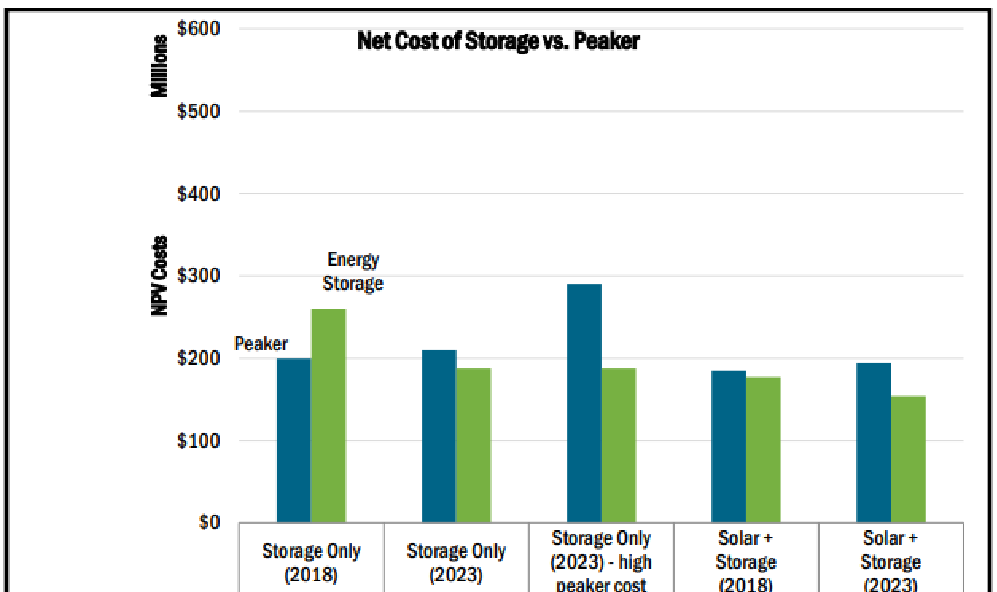
[2] The Massachusetts *State of Charge* report found that 1,766 MW of storage provides net benefits to ratepayers with a benefit-cost ratio ranging from 1.7 to 2.4 (available at https://www.mass.gov/files/2017-07/state-of-charge-report.pdf); New York *Energy Storage Roadmap*, modeled nearly $1.2 billion in net benefits from the deployment of 3,000 MW by 2030 (available at: http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b2A1BFBC9-85B4-4DAE-BCAE-164B21B0DC3D%7d); both Nevada and Virginia's cost-benefit studies identified that the deployment of 1,000 MW by 2030 would provide a net benefit to the state (Nevada study available at http://energy.nv.gov/uploadedFiles/energynvgov/content/Home/Features/EconomicPotentialForStorageInNV.pdf).

Finally, although regulatory constructs or utility programs might not currently exist to facilitate a complete stacking of services from one storage asset, that regulatory construct is likely to be reformed in the future, and as such ESA hopes that E3 is incorporating that as a consideration in its scenarios.

iii. Further stakeholder discussion is needed on storage as peaking capacity

Given its potential for cost savings and increase in efficiency, the ability of energy storage to address peak demand is a critical component of this study. ESA would appreciate further information about how E3 plans to model this value. Specifically, E3's preliminary analysis regarding energy storage's ability to replace combustion turbine technology for peaking capacity needs (Slide 22) appears to focus on 6-hour duration energy storage. As noted earlier in our comments, there has been significant work on energy storage's ability to compete with natural gas peaker plants. Below we include findings from Strategen Consulting's report, which was based off of the costs of a 3-hour and 4-hour lithium ion energy storage system. In addition to the work conducted by Strategen Consulting, the NREL report, The Potential for Battery Energy Storage to Provide Peaking Capacity in the United States, is particularly relevant given that it included a range of energy storage durations. ESA recommends that the Minnesota study include a range of short to long duration energy storage systems.

Table 2: Strategen Consulting Peaker Replacement Modeling Results for Minnesota



	Storage Only (2018)	Storage Only (2023)	Storage Only (2023) - high peaker cost	Solar + Storage (2018)	Solar + Storage (2023)
Peaker	$199,421,299	$209,625,391	$290,535,140	$184,992,561	$194,176,243
Energy Storage	$259,765,849	$187,939,386	$188,060,560	$177,384,119	$154,230,487
B/C Ratio	0.77	1.12	1.54	1.04	1.26

Figure 3. Summary results for cost comparison of energy storage to natural gas peakers. With the exception of the storage-only project in 2018, all projects including storage are more cost-effective than comparable gas-fired peakers.

iv. Further clarity is needed on how renewable integration is valued

It is ESA's understanding from the September 20 webinar that the E3 believes the benefits energy storage provides to integrating renewable energy is already be captured through various other cost components (for example, energy costs) and therefore does not merit quantifying on its own. ESA is concerned with this approach for several reasons. First, there are system efficiency and environmental values to foregoing curtailment of renewable energy generation that would not necessarily be captured if the current market structure is assumed. ESA would like to understand better how E3 plans to address the value of carbon emissions and avoided curtailment in the modeling exercise. Additionally, higher levels of penetration of renewable energy will require not only capacity, but flexible capacity that facilitates ramping up and ramping down. ESA is uncertain where the value of system flexibility would be captured in E3's analysis, as it is uncertain that there is no market mechanism to ensure ramping capacity is available. Finally, ESA hopes that the modeling will capture the sub-hourly value of energy storage, which is particularly relevant in a system with high penetration of renewable energy. Without sub-hourly modeling, the benefits of energy storage may be underestimated since the modeling will not be granular enough to capture the changes in system needs driven by the greater deployment of intermittent supply.

III. CONCLUSION

ESA appreciates the opportunity to provide these preliminary comments ahead of E3's modeling for the Minnesota cost-benefit study. Given that Minnesota is the eighth state to embark on a cost benefit study[3], we hope that Minnesota can benefits from the lessons learned and best practices from the previous studies. There is immense value in the exercise E3 will conduct to demonstrate the state specific values energy storage can provide to Minnesota, and we look forward to working with all stakeholders to ensure that this report serves as an effective tool in the toolbox for the State's policymakers as they consider the future of the electric system.

[3] Massachusetts *State of Charge* (September 2016), New York Energy Storage Roadmap report and modeling (June 2018), Nevada Report (October 2018), North Carolina Final Report (December 2018), Maryland Final Report (December 2018), New Jersey Final Report (May 2019), and Virginia Draft Report (July 2019).