July 31, 2020

Jeffrey R. Gaudiosi, Executive Secretary
Public Utilities Regulatory Authority (PURA)
10 Franklin Square
New Britain, CT 06051

Re: Docket No. 17-12-03RE03, *PURA Investigation into Distribution System Planning of the Electric Distribution Companies – Electric Storage*

Dear Mr. Gaudiosi:

The Northeast Clean Energy Council ("NECEC" or "the Council") and the U.S. Energy Storage Association ("ESA") appreciate the opportunity to provide a response to the Request for Program Designs in the above-referenced docket.

NECEC is a clean energy business, policy, and innovation organization whose mission is to create a world-class clean energy hub in the Northeast, delivering global impact with economic, energy, and environmental solutions. NECEC is the only organization in the Northeast that covers all of the clean energy market segments, representing the business perspectives of investors and clean energy companies across every stage of development. NECEC members span the broad spectrum of the clean energy industry, including energy efficiency, wind, solar, energy storage, microgrids, fuel cells, electric vehicles, and advanced and "smart" technologies. Many of our members are already doing business in Connecticut, and many more are interested in doing so in the near future.

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 190 members, ESA represents a diverse group of companies, including independent power producers, electric utilities, energy service companies, financiers, insurers, law firms, installers, manufacturers, 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, liquid air, and pumped hydro among others.

NECEC and ESA commend the Public Utilities Regulatory Authority ("PURA" or "the Authority") for its recognition of the importance of deploying energy storage systems at the distribution level and for exploring with stakeholders the programmatic designs that will overcome the barriers to energy storage deployment in Connecticut. In the comments below, NECEC and ESA advance an energy storage program design that will help jumpstart Connecticut's clean energy economy by accelerating energy storage deployment in the state, while maximizing net benefits to all Connecticut customers. The proposed program is a cost-effective pay-for-performance program modelled on successful programs in the region.

In this proposal, NECEC and ESA put forth a program based on compensation of services for the Authority's consideration. In doing so, we note that in addition to compensation for energy storage services, *incentive* programs may be necessary to achieve the levels of deployment

envisioned in HB5351.[1] NECEC and ESA testified in support of HB5351 and we reiterate our support for the development of incentive programs.[2] Incentive programs can reduce the soft costs of energy storage development, are critical to fostering the sustained, orderly development of a state-based electric energy storage industry, and ultimately make the technology more affordable for Connecticut residents, while contributing to peak reduction savings. The instant proposal we file today is designed to be complementary to an incentive program construct.

I. General Comments

Energy storage is uniquely positioned to provide multiple services to the grid that enhance grid efficiency, increase grid resilience, and accelerate Connecticut's transition to an affordable clean energy economy. However, a lack of policy support has inhibited meaningful deployment in the state to date. The Authority clearly recognizes the need to develop a program that drives the deployment of energy storage in a cost-effective manner by opening this docket and by requesting proposals for program design. NECEC and ESA's proposed program design seeks to meet these goals.

One of the primary benefits that energy storage can provide to Connecticut ratepayers is reducing energy usage during peak hours. Peak hour usage drives high system costs and high emissions; studies have found the top 1% of hours drives 8%-10% of costs.[3] The peak reduction benefits of energy storage can lower wholesale, transmission, and distribution costs, reduce greenhouse-gas emissions (GHG) and potential Regional Greenhouse Gas Initiative compliance payments, and increase public health benefits through the reduction of local NOx and SOx emissions.

Energy storage resources can facilitate higher penetrations of clean energy resources, enabling Connecticut to meet its crucial state goals and Governor Ned Lamont's Executive Order regarding climate change mitigation.[4] Storage interconnected at the distribution level can provide much-needed distribution flexibility by charging when there is excess electricity on the grid and discharging when electricity demand is at its highest. Energy storage can facilitate the additional interconnection of clean energy at the distribution level and prevent an over-generation event that would result in curtailment by shifting the energy to peak hours. However, in Connecticut, there is currently no effective market mechanism or program to incent that behavior. An energy storage program can specifically target peak demand in a way that supports and leverages the State's decarbonization efforts, while delivering benefits to

[1] The Request for Program Designs states that one of the purposes of its issuance is to "To better position the Public Utilities Regulatory Authority (Authority or PURA) to implement Raised House Bill (H.B.) 5351…." Our proposal is designed with that intent in mind.

[2] NECEC's testimony is available at: https://www.cga.ct.gov/2020/etdata/tmy/2020HB-05351-R000305-McDiarmid,%20Jeremy,%20VP%20of%20Policy%20and%20Government%20Affairs-NECEC-TMY.PDF. ESA testified orally, and a copy of testimony is available at: https://energystorage.org/wp/wp-content/uploads/2020/03/2020.3.5-CT-HB-5351-ESA-Testimony-in-Support-of-Storage-Target.pdf

[3] *See*, for instance, Massachusetts State of Charge Report, at 28.

[4] Executive Order No. 3, available at https://portal.ct.gov/-/media/Office-of-the-Governor/Executive-Orders/Lamont-Executive-Orders/Executive-Order-No-3.pdf

ratepayers. Nearly all New England states now have so-called “Bring Your Own Device” or “Daily Dispatch” programs that leverage energy storage systems to manage electricity demand and reduce emissions. Connecticut will pay a larger share of system peak costs if a similar program is not adopted in the state.

Table 1, below, summarizes the key program design elements, which are discussed in greater detail throughout the comments.

TABLE 1:

Energy Storage Program Design Elements	
Brief Description	Pay for performance tariff for behind-the-meter or distribution-connected resources, compensating them for grid and system benefits.
Program Length & Deployment Targets	Cumulative target: 2022: 80 MW 2024: 180 MW 2026: 300 MW 2028: 440 MW 2030: 580 MW
Requested Flexibility or Scalability Triggers	Program would undergo review every three years, to review and make refinements to annual program offerings and refine charging and discharging requirements.
Program Eligibility	Any front-of-the-meter (“FTM”) or behind-the-meter (“BTM”) resource located in a Distribution Company territory that can store electricity at one point for use at a later time. Co-located or standalone configurations. Up to 20 MW. Consider annual set-aside quantities for behind-the-meter and residential projects. Revisit set aside every three years.
Compensation Structure	Compensation would be determined based on performance of a resource (e.g., the resource’s ability to respond to an EDC call or scheduled dispatch and address the specific system need). Expectations for performance will be set out in the tariff. Compensation would be based on a forecasted value for peak capacity reduction, marginal cost of service, and transmission avoidance savings (see proposed methodology below), and any other applicable benefits captured in the Value of DER study.
Compensation Level & Calculation Methodology	Compensation will be provided on an average $/kW basis to the asset based on performance during designated call periods by the EDC as described under the contract terms. Compensation will be based on a forecasted value for peak capacity reduction, marginal cost of service, and transmission avoidance savings (see proposed methodology below), and any other benefits.
Ownership Model	Third-party owned resources only (EDC-owned asset would not be eligible for a performance tariff, as EDCs have pre-existing authority to apply for cost recovery).
Operational Control Model	Third-party operated assets.

Program Administration	EDCs would make tariffs available and establish communication process akin to “Demand Response” or “Daily Dispatch” programs.
Evaluation, Measurement & Verification Plan	Similar to Eversource’s existing Daily Dispatch programs, EM&V should directly meter the output of the battery, rather than measure at a customer’s retail delivery point.
Evaluation Metrics	Total MW interconnection for the program; performance ratio of projects (e.g. how many responses to calls); reduced peak demand and avoided T&D costs; decreased greenhouse gas emissions and other particulate matter based on actual GHG profile for hours (retrospective).
Reporting Requirements & Frequency	Data should be collected annually from each project owner. If multiple projects are owned by one developer, one report shall be submitted for all owned projects. The report should include information on hours charged, hours discharged, size of the system, system duration, technology type, and commercial operation date. EDCs shall report once a year on program participation, overall peak demand reduction, avoided costs, and GHG impacts of load shifting, administrative costs, and remaining available capacity.
Ratepayer Cost-Benefit (by year)	Resources will only be paid according to actual performance of storage services during pre-defined peak periods, called on individual days to meet grid needs. The total quantified benefits to ratepayers from each hour of performance would be known ahead of time, and compensation would not exceed these benefits. The program delivers additional ratepayer benefit through the values that are non quantified (and not compensated for), but that nonetheless deliver a tangible benefit.
Administrative Costs	This proposal aims to limit administrative costs by leveraging existing EDC-administered energy efficiency program infrastructure.
Compensation Costs	Value of compensation is based on the savings produced and therefore does not require additional costs.
Other Costs (by category)	N/A
Total Program Costs	TBD
Benefits (by category)	Avoided wholesale capacity and energy cost, transmission cost avoidance, distribution investment savings.
Total Program Benefits	TBD
Program NPV	TBD
Other Benefits	Non-quantified benefits: Renewable integration/curtailment avoidance, economic and workforce benefits, land use benefits, greenhouse gas emissions reductions, resilience, reliability, SOx/NOx reductions.
Data Privacy and Security Plan	N/A
Technology Eligibility	Standalone and co-located energy storage resources are eligible to participate in this program.

Other Program Considerations	Tariff would be available for a resource for up to twenty years, with the compensation level set over a ten-year term, subject to performance.
Other Program Design Elements	N/A

In order to assist in the Authority's analysis of appropriate compensation levels, below please find current program payment levels from around New England.

TABLE 2:

New England Bring-Your-Own Device/Daily Dispatch Program Payments
(as of July 24, 2020)

State	Utility	Payment Detail
Vermont	Green Mountain Power	$850/kW (up to 10 kW, 3-hour duration)[5] $950/kW (up to 10 kW, 4-hour duration) Additional $100/kW (up to 10 kW) for systems in load-constrained areas.
New Hampshire	Eversource Energy	BYOD: $225/kW (June 1 – September 30, 3-hour duration)[6] Daily Dispatch: $200/kW-season: (June 1 – September 30, 3-hour duration) [7] Targeted Dispatch: $50/kW-season (December 1-March 30)[8]
Connecticut	Eversource Energy	BYOD: $225/kW (June 1 – September 30, 3-hour duration)[9] BYOD: $50/kW (December 1 – March 31, 3-hour duration)

[5] Note that the Green Mountain Power offerings include an up-front incentive. Available at: https://greenmountainpower.com/wp-content/uploads/2020/06/BYOD-Terms-and-Conditions.pdf

[6] Available at: https://www.eversource.com/content/nh/residential/save-money-energy/manage-energy-costs-usage/demand-response/battery-storage-demand-response

[7] All Eversource MA, CT, and NH Daily and Targeted Dispatch programs available at https://www.eversource.com/content/docs/default-source/save-money-energy/demand-reduction-application.pdf?sfvrsn=7bb2ca62_6

[9] Available at https://www.eversource.com/content/ct-c/residential/save-money-energy/manage-energy-costs-usage/demand-response/battery-storage-demand-response

		Daily/Targeted Dispatch: Same as NH
Massachusetts	National Grid	BYOD: $225/kW (June 1 – September 30, 3-hour duration)[10] BYOD: $50/kW (December 1 – March 31, 3-hour duration) Daily Dispatch: Same as NH and CT Targeted Dispatch: $25/kw-season (December-March)[11]
Massachusetts	Eversource	Daily/Targeted Dispatch: Same as NH and CT
Rhode Island	National Grid	BYOD: $400/kW (June 1 – September 30, 3-hour duration)[12]

II. Program Design Elements

NECEC and ESA propose that the Authority develop a pay-for-performance tariff on a first-come, first-served basis for a minimum number of megawatts (MW). This program would be open to FTM and BTM resources and would provide the Authority the opportunity to cost-effectively demonstrate the value and use cases for both types of resource. The projects would receive compensation only for services delivered by responding to performance criteria outlined by an Electric Distribution Company ("EDC") tariff.

The program would be designed to reduce peak demand and provide additional grid benefits. The tariff would determine performance criteria and a process by which the EDCs will call on resources. For the peak demand reduction benefit, the assets would likely be called on approximately 30-60 times, generally in the summer months between June and September each year, for multi-hour windows to be determined by analysis of system need. We note that throughout its service territory, Eversource currently also has in place "Targeted Dispatch" programs for winter months that dispatch for up to eight events and up to three hours per event. NECEC and ESA expect the system benefits to differ between summer and winter, but to the extent that a winter program can deliver ratepayer value, we recommend a program that compensates for that value provided. Moreover, the MA Clean Peak program provides a 4x multiplier for summer and winter months (up to $180/MWh if Clean Peak Credits trade at the Alternative Compliance Payment price)[13] and the Eversource ConnectedSolutions program provides compensation of $50/kw for winter savings, demonstrating the value placed on storage during winter hours.

[10] Available at: https://www.nationalgridus.com/MA-Home/Connected-Solutions/BatteryProgram

[11] https://www.nationalgridus.com/media/pdfs/bus-ways-to-save/connectedsolutions-ciprogrammaterials.pdf

[12] https://www.nationalgridus.com/RI-Home/ConnectedSolutions/BatteryProgram

[13] 225 CMR 21.05(6)(a)

During the course of the year, participants would be required to perform (i.e., discharge) during those periods on days they are "called" (with advance notice provided by 12 PM the previous day).), For example, pre-approved participants would be told over 24 hours in advance of an anticipated peak demand event that they should discharge during specified hours during the evening, or to be pre-scheduled for certain hours during certain months. Given that ISO-NE Market Participants need to submit day-ahead energy offers by 1 PM and that demand response resources cannot re-offer after 1 PM day-ahead, a 12 PM day-ahead dispatch is necessary for behind-the-meter storage in order to optimize and reduce wholesale energy costs for Connecticut consumers. Participants would only be paid for their actual performance in response to these calls during this period. The Authority should consider performance standards to ensure resource participation in call events and penalties for continuous non-performance.[14] The program design would identify project eligibility, window duration, and, if necessary, charging times.

Compensation for the resources should be based on three primary values, with other secondary values considered. *First*, since the projects provide electricity and peak demand reduction at the distribution level, compensation would include the marginal avoided kilowatt-hour on the distribution grid. *Second*, compensation would include avoided ISO-NE transmission-related costs, including but not limited to the benefits of avoided line losses (i.e., distribution-connected storage will not experience the same line losses as transmission-connected generation, thereby reducing energy costs for consumers), reduced cost allocation via Regional Network Service ("RNS"), and any avoided savings through lower depreciation or deferred or eliminated transmission build-out. Green Mountain Power's storage program includes pay-for-performance during the EDC's monthly peak, which determines the RNS payments. For simplicity sake, we did not include this feature in the base program, but a monthly pay-for-performance option could be included. *Third*, compensation would include avoided wholesale capacity costs, including capacity cost allocation to EDCs and capacity DRIPE, as well as avoided wholesale energy costs, including the benefits of shifting demand from peak to off-peak and energy DRIPE.[15]

This program design draws upon templates from several existing programs and distribution-connected proposals for energy storage projects in or near the ISO-NE footprint. These include several components for the Eversource application to construct a 1.7 megawatt ("MW") Westmoreland Energy Storage Project in New Hampshire;[16] Liberty Utilities' Bring Your Own Device program[17] also in New Hampshire; the Massachusetts Daily/Targeted Dispatch

[14] For example, the tariff could require annual performance of at least 50%. Resources that do not meet the performance requirement in a given year could be removed from the tariff, unless they could cure the issue and demonstrate adequate performance in the following year. If a resource is removed from the tariff, the capacity could be reoffered the next time the tariff is made available.

[15] We acknowledge that PURA and the Department of Energy and Environmental Protection have recently released the Draft Value of Distributed Energy Resources in Connecticut Study. However, as the study is in draft form and the values may yet be revised, and as the use cases evaluated in the study do not align with the likely operational profiles of resource participating in this program, we did not include the values from that study.

[16] Docket No. DE 19-057: https://www.puc.nh.gov/Regulatory/Docketbk/2019/19-057/INITIAL%20FILING%20-%20PETITION/19-057_2019-05-28_EVERSOURCE_DTESTIMONY_ANCEL_SCHILLING.PDF

[17] Docket No. DE 17-189, available at: https://puc.nh.gov/Regulatory/Docketbk/2017/17-189.html

programs[18] offered through the energy efficiency programs; and the Maryland Public Service Commission's cost-benefit framework for its energy storage pilot program.[19] In Vermont, Green Mountain Power also offers a bring-your-own-device program for energy storage.[20] Across the region, states are increasingly recognizing the value of energy storage, and we urge Connecticut to do the same through this proposal.

Eversource has also developed a Daily / Targeted Dispatch program in its energy efficiency plans in Connecticut. NECEC and ESA believes this program design is complementary to this proposed program leading to administrative cost reductions and ensuring scalability of the system efficiency program. While NECEC and ESA applaud Eversource for developing the program in Connecticut, its current form will not be scalable to stimulate a meaningful storage market or generate meaningful ratepayer benefits, as is clearly the Authority's intent.

The program should be reviewed every three years to review the success of the program and to refine program design elements. This review cadence provides predictability to the market and flexibility for the Authority.

Program Length

To reach the scale of energy storage deployment that both meets the needs of Connecticut and aligns with the energy storage targets considered in the General Assembly, NECEC and ESA recommend that the program be made available each year until 2030, when the cumulative installed projects participating in the program are anticipated to reach at least 580 MW. To encourage participation, projects should be given clarity that the tariff and compensation structure will be made available for a duration of twenty (20) years and should also have the option to guarantee the level of compensation for at least ten (10) years. Given the scalability and cost-effectiveness of this program, twenty (20) years with a ten-year price guarantee strikes the right balance between ratepayer cost protections and the clarity of revenue streams necessary to secure project financing. Many of the avoided costs that will drive the value consumers receive from the program, including avoided transmission and distribution costs, should hold reasonably steady during the tariff offering. The ten-year compensation guarantee aligns with New York's VDER program (which includes storage that injects to the grid) and the ten-year guarantee that participants receive for the distribution component of that program, which comprises the highest value stream. While a new project could set its specific compensation level for ten years, the levels for new entrants would change over time, such that a project built in 2022 may receive different compensation than a project built in 2027.

[18] Targeted Dispatch programs are dispatched for 3-8 events per summer for three hours each with compensation of $100/kW-yr, subject to performance. Daily Dispatch programs are dispatched for 30-60 events per summer for three hours each with compensation of $200/kw-yr, subject to performance. More info can be found at "Mass Save. Active Demand Reduction: Demonstration & Initiative Update. March 20, 2019. Page 25." http://ma-eeac.org/wordpress/wp-content/uploads/March-Demand-Presentations_EEAC_3-8-19_Final_corrected.pdf

[19] "Submission of the PC 44 Energy Storage Working Group" in Case No. 9619, In the Matter of the Maryland Energy Storage Pilot Program, 31 Dec 2019, available at https://webapp.psc.state.md.us/newIntranet/Casenum/NewIndex3_VOpenFile.cfm?FilePath=//Coldfusion/Casenum/9600-9699/9619/2.pdf

[20] https://greenmountainpower.com/bring-your-own-device/battery-systems/

NECEC and ESA respectfully recommend that the program set the following cumulative minimum MW targets for each biennial period. Tariffs would be offered until at least the cumulative MW number is reached.

Cumulative targets:

Program years	Cumulative target	Equivalent % of 2018 Summer Peak	Equivalent % of Highest Demand Summer Hours
2021-2022	80 MW	1.2%	0.1%
2023-2024	180 MW	2.7%	0.3%
2025-2026	300 MW	4.5%	0.4%
2027-2028	440 MW	6.7%	0.9%
2029-2030	580 MW	8.9%	2.0%

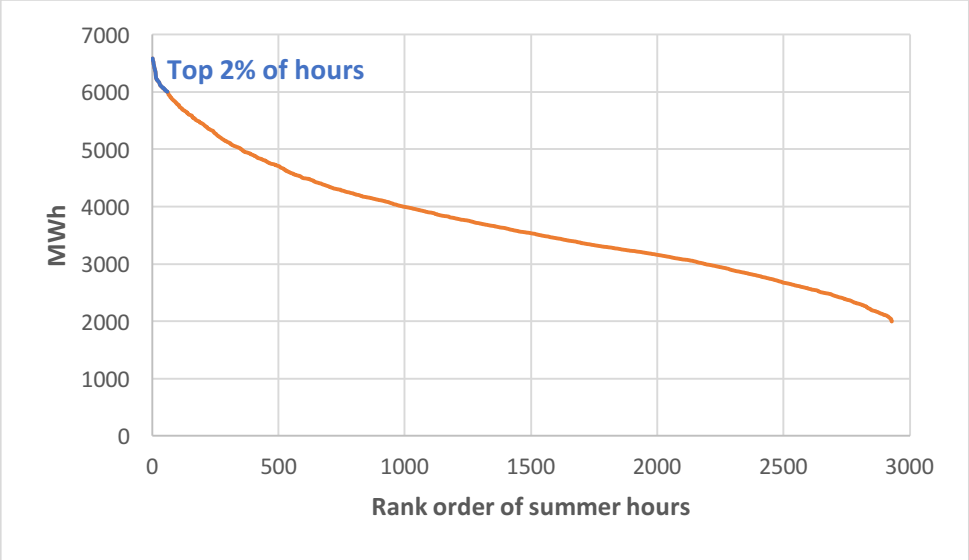
The MW deployment targets would be specifically set for the nameplate rating of the energy storage device. Energy storage systems co-located with renewable energy resources such as photovoltaics would also be eligible for the program, but the nameplate capacity of the generating resource would not be counted towards the overall biennial energy storage target.

Each biennial period, the tariff would be made available on a first come, first serve basis until at least the MW target is met. The targets would be cumulative, building up to 580 MW of energy storage systems deployed along the distribution system. NECEC and ESA propose a 580 MW target for several reasons. First, an analysis of Connecticut's 2018 summer peak demand indicates that the top two percent of hours June-September account for approximately 580 MW of capacity (see Figure 1).[21] Given that the "State of Charge" report found that the top 1% of hours is responsible for 8% of total costs and the top 10% is responsible for 40% of costs,[22] targeting the top 2% of hours should provide a strong Return on Investment for all consumers in Connecticut.

[21] Connecticut system peak hourly demand in 2018 was 6,591 MW; the peak hourly demand once top 2% of hours (i.e., top 60 hours) are accounted for was 6,004 MW. Historical data on Connecticut load zone real-time demand extracted 28 July 2020 from ISO-NE webpage "Energy, Load, and Demand Reports," available at https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/demand-by-zone

[22] STATE OF CHARGE Massachusetts Energy Storage Initiative Study. https://www.mass.gov/media/6441/download. Page i.

Figure 1 Connecticut Load Duration Curve, Jun-Sep 2018



Additionally, when examining overall state storage targets (expressed in installed MW capacity) as a percentage of overall summer peak demand, a 1,000 MW energy storage target for Connecticut would translate to approximately 13% of summer peak demand. This would align with other states' energy storage targets: New Jersey's 2,000 MW target by 2030 translates to approximately 15% of summer peak demand, Nevada's 1,000 MW energy storage target by 2030 translates to nearly 12%, and Virginia's goal of 3,100 MW by 2035 translates to nearly 14%. Given the large load served by California and New York, the storage targets in those states are a lower proportion, at 2.5% and 7%, respectively. At 580 MW, the proposed Connecticut program supports reaching a measurable 58% of the state target by 2030, as proposed in House Bill 5351, and therefore aligns with the state's energy storage policies.[23] This provides an avenue for compensating resources for satisfying a portion of the 2030 target, while providing flexibility for the state to meet the rest of the target through other policy options. Moreover, a MA DOER presentation[24] suggests that storage production could comprise nearly 60% of the generation necessary to meet their Clean Peak Standard requirements. The same presentation notes a target of 2,750 MW by 2030, which would translate to 1,650 MW of storage if that expected proportion of storage holds. Although Connecticut has a lower load and a Clean Peak Standard is not under consideration, the scope of the MW for potential development in a neighboring state under a "Pay-for-Performance" program is illustrative here.

Program Eligibility

NECEC and ESA propose the definition of Energy Storage Resources to be "a technology that stores generated energy for use at a later time." Program eligibility for the distribution grid program would include energy storage resources up to 20 MW, located in the territory of the EDC offering the tariff. Existing resources would be able to participate in the tariff program, but the ten-year price lock should only be offered to new resources in order to secure financing.

[23] H.B. 5351

[24] Massachusetts Department of Energy Resources. Presentation on Clean Peak Standard Draft Regulation Summary. August 7 and 9, 2019. Slide 29.

Both co-located storage and standalone energy storage would be eligible to participate. If deemed necessary, the tariff can provide clear guidelines on the charging windows the resource must adhere to in order to receive compensation.[25] Eligibility language should clarify that energy storage resources may charge and discharge during periods outside the window for participation in other programs or services, but the tariff would not compensate the storage asset for those periods. Energy storage resources would be eligible in all configurations, i.e., standalone or co-located with generation.

To ensure that larger projects do not prevent smaller resources from participating in this program, and recognizing the financial and resilience benefits that energy storage projects provide to commercial & industrial (C&I) customers, NECEC and ESA recommend the program include a 20% biennial set-aside for resources between 25kW and 1 MW; if not subscribed fully by the end of each biennial period, the unsubscribed MW will be available in the following biennial procurement targets for all resources. This will provide the necessary certainty for non-residential developers that there will be tariff capacity available for their resources once they get through the interconnection queue, and is similar to the allocation that the Massachusetts Department of Energy Resources recently incorporated into its SMART solar program.[26] Additionally, ESA and NECEC recommend a 20% biennial set-aside for BTM resources under 25kW (i.e., residential customers), with a maximum of 35% of program capacity available for residential projects; if not subscribed fully by the end of each biennial period, the unsubscribed MW will be available in the following biennial procurement targets for all resources. This is comparable to the allocation used in the Massachusetts SMART Program.[27] Both of these set-asides should be reviewed as part of the regular review process and refined, if necessary.

Ownership Model & Operational Control

The program proposed in this response is intended to complement EDC storage programs currently being developed in Connecticut and focused on leveraging private capital through third-party owned resources. The proposed tariff-based approach contained in these comments will allow customers and third parties to invest private sector funds to install storage in Connecticut in a way that aligns with the utilities' system needs.

For EDC-owned storage, Public Act 19-35 provides clarity and guidance on proposals to employ storage as distribution assets supported by ratepayer funds.[28] Given that pathway for EDC-owned storage, we therefore recommend that utility-owned projects be considered separately and not participate in this program.

Given the complexity of program terms and importance of stakeholder engagement, NECEC and ESA respectfully recommend that the Authority require that the terms of service and

[25] For reference, the Massachusetts Clean Peak Standard provides for seasonally-specific charging windows. Those windows are Spring: twelve (12) a.m. until six (6) a.m. and eight (8) a.m. until four (4) p.m.; Summer: twelve (12) a.m. until six (6) a.m. and seven (7) a.m. until two (2) p.m.; Fall: twelve (12) a.m. until six (6) a.m. and nine (9) a.m. until three (3) p.m.; Winter: twelve (12) a.m. until six (6) a.m. and ten (10 a.m. until three (3) p.m. Code of Massachusetts Regulations 225 CMR 21.05(1)(a)2.c.

[26] 225 CMR 20.05(3)(c)

[27] 225 CMR 20.05(3)(a)

[28] Public Act 19-35, Section 13(c)

participation in the program be described in the tariff developed by the EDCs and reviewed by the Authority and stakeholders. Since the pay-for-performance program is designed to stimulate private market development and innovation and since non-performance results in non-payment, ESA and NECEC do not see a need for an EDC to take operational control of the assets when called upon.

III. Benefit Cost Analysis

Program Costs

Before delving into the specifics of Benefit-Cost Analysis, it is worth noting that the Massachusetts Department of Public Utilities ("MA DPU") approved, on July 28, 2020, the "Daily Dispatch" programs in MA that have very similar design to the "Pay-for-Performance" programs we're recommending in this proceeding.[29] In order for the MA DPU to approve the "Daily Dispatch" programs, they needed to pass a rigorous cost-effectiveness screen. While the MA DPU did not specify the cost-effectiveness of the program, a recent paper from the "Clean Energy Group" estimated $3.40 in benefits for every $1.00 in spending on the "Daily Dispatch" storage offerings in Massachusetts.[30] The same paper reported that the utilities found a cost-effectiveness range of $1.70-$6.20 in benefits for every $1.00 in spending.[31]

In their filing for Daily Dispatch program approval, Eversource stated: "A key element to this statewide demand reduction approach is the pay-for-performance program design. Customers only receive incentives for verified performance. Therefore, the Program Administrators only pay for the benefits achieved, allowing the PAs to maintain cost-effective programs while minimizing ratepayer costs and risks."[32] Here in Connecticut, ESA and NECEC are recommending this Pay-for-Performance design.

This Pay-for-Performance program will compensate participating customers by evaluating the savings their services are providing. While this proposal includes a list of program benefits for the Authority's consideration, we recommend that the compensation be based, at a minimum, on the following three quantifiable savings for ratepayers: (1) avoided distribution costs, (2) avoided transmission costs, and (3) avoided wholesale capacity and energy costs.

In the remainder of this section, ESA and NECEC will provide detail on avoided cost values from similar programs in the region.

In New Hampshire, both Liberty Utilities' Bring Your Own Device program and Eversource's cost-benefit analysis for their proposed storage pilots included a value for avoiding capacity payment obligations in the ISO-NE Forward Capacity Market. In Docket No. DE 17-189 and Docket No. DE 19-057, Liberty and Eversource, respectively, include a Forward Capacity Market rate consistent with the Avoided Energy Supply Costs ("AESC") 2018 Wholesale

[29] Order from the Massachusetts Department of Public Utilities. Dockets 20-33 – 20-36. July 28, 2020.

[30] Energy Storage: The New Efficiency How States can use Energy Efficiency Funds to Support Battery Storage and Flatten Costly Demand Peaks. Todd Olinsky-Paul. Clean Energy Group. April 2019. Appendix A, Page 3 of 22. https://www.cleanegroup.org/wp-content/uploads/energy-storage-the-new-efficiency.pdf.

[31] Ibid, Page 10

[32] NSTAR Electric Company d/b/a Eversource Energy. D.P.U. 20-36. Exhibit ES. March 16, 2020 Page 11 of 19

Capacity Value pricing. This forecast includes Forward Capacity Auction ("FCA") prices ranging from $57.6/kW-year to $100/kW-year[33] NECEC and ESA recommend using the average of the last five FCAs with an escalation rate of 2% moving forward to adjust for inflation, consistent with Eversource's cost-benefit analysis. This would ensure compensation is tied to the long-term average cost of capacity throughout ISO-NE. Furthermore, using the rolling five-year average promotes fairness by insuring consumers against individual years of high pricing, while insuring developers against individual years of low pricing.

If a storage asset clears the ISO-NE Forward Capacity Market, then they could still participate in this pay-for-performance program but would not be compensated for avoided capacity costs. Storage resources participating in ISO-NE would also not receive compensation for avoided energy costs since they would receive credit for that performance through wholesale LMP payments.[34]

Avoided ISO-NE transmission related costs driven both by monthly peak load and by generation that is located far from the load it serves (e.g., line losses), is a second value stream that the storage asset should be compensated for delivering. Eversource's energy storage application in New Hampshire proposes using bulk transmission system savings (through Regional Network Service or "RNS") and local transmission network (through Local Network Service or "LNS") to capture the savings and benefits of transmission cost reductions. In Docket No. DE 17-189, Liberty too proposed using these two price points to forecast the benefits of its BYOD program.[35] Liberty used a forecast of RNS through 2022 and then increase the value by 4.66% year-over-year for the post-2022 years. Eversource's energy storage pilot application proposed the exact same assumptions for the transmission savings in the BCA. Alternatively, the Authority may consider using the avoided Pool Transmission Facility ("PTF") costs in NE-ISO, which are highly driven by summer peak system load. The Massachusetts Energy Efficiency Advisory Council used these costs in evaluating the cost-effectiveness of its utilities' 3-year Energy Efficiency plans, which includes Eversource's MA Daily Dispatch program for storage. These costs were estimated by Synapse Economics to equal $94/kW-year.

An energy storage resource that reduces demand on the grid has an embedded distribution system value that is different than a specific storage asset deployed for a non-wires alternative or deferral of a capital investment in an alternative distribution asset. Savings in the form of avoided line losses and the avoided marginal cost of adding an additional kilowatt-hour of demand on the distribution system have been incorporated into distributed energy resources ("DER") tariffs, such as New York's Value of Distributed Energy Resources (VDER). The marginal cost of service developed by the EDCs has been used as a proxy for avoided distribution system costs for use in this program to determine a dollar per kilowatt-year ($/kW-year) component of compensation for resources. The Authority might also refer to avoided distribution costs identified in Synapse Economics' "Avoided Energy Supply Costs in New

[33] Docket No. DE 19-057. Direct Testimony of Charlotte B. Ancell and Jennifer A. Schilling, at 29. Available at: https://www.puc.nh.gov/Regulatory/Docketbk/2019/19-057/INITIAL%20FILING%20-%20PETITION/19-057_2019-05-28_EVERSOURCE_DTESTIMONY_ANCEL_SCHILLING.PDF

[34] It may still be appropriate to compensate storage for Capacity and Energy DRIPE given that storage is not compensated for this through the wholesale market.

[35] Docket No. DE 17-189. Direct Testimony of Heather M. Tebbetts, at 013. Available at: https://puc.nh.gov/Regulatory/Docketbk/2017/17-189/INITIAL%20FILING%20-%20PETITION/17-189_2017-12-01_GSEC_DTESTIMONY_TEBBETTS.PDF

England" study, which included Connecticut-specific data provided by both United Illuminating (UI) and Eversource. That study examines multiple questions regarding the methodology used by each utility to calculate its marginal distribution costs, and suggests that UI's marginal distribution costs may be $90/kW-year or higher, and that Eversource's marginal distribution costs may range from $14/kW-year to $315/kW-year.[36] Pulling from the same study, the Massachusetts energy efficiency Program Administrators used avoided distribution costs ranging from $100/kW-year to $220/kW-year across its utilities for their 2019-2021 energy efficiency planning cycle.[37]

The proposed program is a compensation program, and therefore a benefit-cost analysis should incorporate an understanding that the compensation provided to the resources is based on savings delivered by those assets, and that compensation is not provided unless the asset performs under the tariff terms. These values are quantifiable and provide savings to all ratepayers through reduced costs in terms of capacity payments, bulk transmission costs, and distribution spending.

Other Benefits

There are several other benefits that the Authority might consider to quantify the cost-effectiveness of the program. The Maryland Public Service Commission PC 44 Energy Storage Working Group developed a benefit cost analysis for a storage pilot program that could be leveraged for this purpose, including the following benefits and proposed methodology.[38]

- *Reducing price paid for electricity consumption:* By reducing the overall need to supply customers during periods of peak demand, the EDCs will save ratepayer money by reducing the overall need to serve the system during period of high demand. The avoided cost of procuring those kilowatt-hours is another potential savings realized through the program.

- *GHG Emissions Reduction Value:* This value stream captures the value of reducing GHG emissions through the use of energy storage to shift load from periods of high emissions to periods of low emissions. The calculation would include identifying the dollar value of the net tons of greenhouse gas emissions reductions based on an assumption of pounds per megawatt hour (MWh) of load shifted from an on-peak hour to an off-peak hour in Connecticut. This metric requires tracking the amount of load shifted by storage and incorporating an assumption about roundtrip losses. This value

[36] Avoided Energy Supply Components in New England: 2018 Report, at 217

[37] MA DPU 18-110 through 18-119. Three Year Plan 2019-2021, Exhibit 1, Appendix C, at 36. Available at: https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/9998898

[38] "Submission of the PC 44 Energy Storage Working Group" in Case No. 9619, In the Matter of the Maryland Energy Storage Pilot Program, 31 Dec 2019, available at https://webapp.psc.state.md.us/newIntranet/Casenum/NewIndex3_VOpenFile.cfm?FilePath=//Coldfusion/Casenum/9600-9699/9619/2.pdf

separates the GHG benefits of peak demand reduction from the savings of peak demand reduction (e.g., Capacity Obligation Reduction described above).[39]

- *Economic benefits:* NECEC and ESA submit that the program could provide meaningful economic benefits to Connecticut. A program that drives the deployment of energy storage and stimulates private investment can attract businesses to the state and increase job opportunities. As a point of reference, a study conducted for New York determined that a 3,000 MW storage target by 2030 will result in 27,400 manufacturing and installation jobs.[40]

- *Values for Public Health Benefits from Load Shifting:* Separate from the dollar value (in compliance terms) of the GHG, SOx and NOx emissions reduction benefits, the Authority may wish to consider the public health benefits from reducing emissions. The Maryland Storage Pilot leverages the U.S. Environmental Protection Agency's (EPA) new public health quantification tool Public Health Benefits, at $1.30 for each MWh of load shifted from an on-peak hour to an off-peak hour in Maryland.[41]

- *Reliability / Value of Avoided Outages:* Energy storage, if leveraged effectively, can provide EDCs with the ability to improve reliability at the distribution level. For the sake of being able to quantify this value, reliability can be defined as the avoidance of outages. The value could be determined using cost information provided by the Lawrence Berkeley National Laboratory (Outage Cost Evaluation) for affected customers.[42]

- *Land Use / Avoidance of Impacts:* By increasing the efficiency of the electric system through the deferment of infrastructure build-out and the creation of stored inventory, energy storage can reduce the impact of Connecticut's electricity needs on natural resources (i.e., EDCs might be able to avoid acquiring and/or developing land, currently used for other purposes or unused). Energy storage can also avoid the curtailment of intermittent energy resources and therefore reduce the land area needed for clean energy assets to meet the State's clean energy objectives. Lastly, given its modular nature, advanced energy storage tends to have a small land use footprint relative to other resources providing similar benefits.

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[39] See MD PSC PC 44 Storage Working Group proposal, page 5 (https://webapp.psc.state.md.us/newIntranet/Casenum/NewIndex3_VOpenFile.cfm?FilePath=//Coldfusion/Casenum/9600-9699/9619/2.pdf)

[40] The New York Jobs Project, A Guide to Creating Jobs in Energy Storage, December 2018, available at: http://americanjobsproject.us/wp/wp-content/uploads/2018/12/The-New-York-Jobs-Project.pdf.

[41] The MD PSC PC 44 Storage Working Group used this EPA tool for calculating public health benefits of energy efficiency and renewable energy (the tool can be accessed here on pg. 26: https://www.epa.gov/statelocalenergy/public-health-benefits-kwh-energy-efficiency-andrenewable-energy-united-states.

[42] Lawrence Berkeley National Lab (2015), Updated Value of Service Reliability Estimated for Electric Utility Customers in the United States;, available at: https://emp.lbl.gov/sites/all/files/lbnl6941e.pdf

IV. Conclusion

NECEC and ESA commend the Authority for laying out a clear and thoughtful framework by which it will develop and adopt potential programs and appreciate the opportunity to provide this energy storage program design proposal. NECEC and ESA look forward to working with the Authority and all stakeholders to further develop these initial recommendations and cost-benefit framework.

Respectfully submitted this 31st day of July, 2020.

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APPENDIX

ISO-NE Summer 2018 Connecticut Load Zone Data
June 1 – September 30, 2018
Top 60 Hours of Demand

Date	Hour Ending	Real-Time MW	Difference from Peak MW	% of Peak MW	% of Highest Demand Hours	Cumulative # of Days with Peak Hours
8/29/2018	17	6591.3				1
8/29/2018	18	6556.1	35	0.5%	0.0%	1
8/29/2018	16	6542.6	49	0.7%	0.1%	1
8/29/2018	15	6533.6	58	0.9%	0.1%	1
8/28/2018	17	6491.1	100	1.5%	0.1%	2
8/28/2018	18	6474.8	117	1.8%	0.2%	2
9/6/2018	16	6454.9	136	2.1%	0.2%	3
8/28/2018	16	6423.8	168	2.5%	0.2%	3
8/29/2018	14	6415.4	176	2.7%	0.3%	3
8/28/2018	15	6396.7	195	3.0%	0.3%	3
9/6/2018	15	6373.2	218	3.3%	0.3%	3
8/29/2018	19	6367.7	224	3.4%	0.4%	3
8/28/2018	19	6328	263	4.0%	0.4%	3
8/28/2018	14	6271.9	319	4.8%	0.4%	3
7/2/2018	17	6245.3	346	5.2%	0.5%	4
8/29/2018	20	6233.6	358	5.4%	0.5%	4
8/29/2018	13	6221.8	370	5.6%	0.5%	4
7/2/2018	18	6221.5	370	5.6%	0.6%	4
9/6/2018	14	6219.3	372	5.6%	0.6%	4
8/28/2018	20	6202.9	388	5.9%	0.6%	4
7/2/2018	15	6198	393	6.0%	0.7%	4
7/2/2018	16	6195.9	395	6.0%	0.7%	4
8/6/2018	18	6193.6	398	6.0%	0.8%	5
8/7/2018	15	6187.4	404	6.1%	0.8%	6
8/6/2018	17	6180.5	411	6.2%	0.8%	6
7/3/2018	16	6176.1	415	6.3%	0.9%	7
8/7/2018	16	6168.3	423	6.4%	0.9%	7
9/6/2018	17	6158.2	433	6.6%	0.9%	7
9/4/2018	17	6144.7	447	6.8%	1.0%	8
7/3/2018	15	6133.7	458	6.9%	1.0%	8
7/16/2018	17	6121.9	469	7.1%	1.0%	9
8/8/2018	17	6115.1	476	7.2%	1.1%	10
8/8/2018	16	6110.6	481	7.3%	1.1%	10
7/16/2018	18	6110.3	481	7.3%	1.1%	10

9/4/2018	16	6106.7	485	7.4%	1.2%	10
8/6/2018	16	6098.4	493	7.5%	1.2%	10
7/2/2018	14	6094.4	497	7.5%	1.2%	10
7/2/2018	19	6092.7	499	7.6%	1.3%	10
8/8/2018	18	6087.8	504	7.6%	1.3%	10
7/16/2018	16	6081.1	510	7.7%	1.3%	10
9/4/2018	15	6077.7	514	7.8%	1.4%	10
8/7/2018	14	6077.1	514	7.8%	1.4%	10
9/4/2018	18	6068.6	523	7.9%	1.4%	10
8/6/2018	19	6067.3	524	7.9%	1.5%	10
8/7/2018	17	6066.2	525	8.0%	1.5%	10
7/3/2018	17	6064.9	526	8.0%	1.5%	10
8/30/2018	17	6053	538	8.2%	1.6%	11
8/29/2018	21	6050.4	541	8.2%	1.6%	11
7/5/2018	17	6047.4	544	8.3%	1.6%	12
7/1/2018	18	6038.5	553	8.4%	1.7%	13
7/5/2018	18	6037.6	554	8.4%	1.7%	13
7/5/2018	16	6029.1	562	8.5%	1.7%	13
8/6/2018	15	6028.7	563	8.5%	1.8%	13
8/28/2018	21	6023.2	568	8.6%	1.8%	13
8/30/2018	16	6018.8	573	8.7%	1.8%	13
7/1/2018	19	6016.3	575	8.7%	1.9%	13
8/28/2018	13	6015.9	575	8.7%	1.9%	13
9/5/2018	17	6012.3	579	8.8%	1.9%	14
7/3/2018	14	6004.8	587	8.9%	2.0%	14
7/16/2018	15	6004.4	587	8.9%	2.0%	14