



**Department of
Public Service**

Public Service Commission

John B. Rhodes
Chair and
Chief Executive Officer

Diane X. Burman
James S. Alesi
Tracey A. Edwards
John B. Howard
Commissioners

Thomas Congdon
Deputy Chair and
Executive Deputy

Robert Rosenthal
General Counsel

Michelle L. Phillips
Secretary

Three Empire State Plaza, Albany, NY 12223-1350
www.dps.ny.gov

Via Electronic Mail

Secretary Michelle Phillips
Department of Public Service
3 Empire State Plaza
Albany, NY 12223

April 1, 2020

Dear Secretary Phillips,

Pursuant to Public Service Law §74 and the Public Service Commission's Case 18-E-0130, In the Matter of Energy Storage Deployment Program, the Department of Public Service Staff submit this first annual "State of Storage" Report.

Sincerely,

/s/ Bridget M. Woebbe

Bridget M. Woebbe, Esq.
Assistant Counsel
Department of Public Service
3 Empire State Plaza, Albany, NY 12223
(518) 473-6176 ||
bridget.woebbe@dps.ny.gov
www.dps.ny.gov



**Department of
Public Service**

STATE OF STORAGE IN NEW YORK

ANNUAL ENERGY STORAGE DEPLOYMENT REPORT
PURSUANT TO PUBLIC SERVICE LAW §74

April 1, 2020

TABLE OF CONTENTS

INTRODUCTION 1

ENERGY STORAGE DEPLOYMENT PROGRESS..... 3

 Range of Use Cases 6

 Progress in Reducing Installed Costs, including Soft Costs 8

SPECIFIC ENERGY STORAGE POLICIES 10

 Utility Procurement Process 10

 Wholesale Market Design Changes 11

 Utility Rate Design Actions 14

 Data Platform Development 15

 Retail and Wholesale Market Coordination..... 17

 Other Relevant Issues 18

CONCLUSION..... 21

EXECUTIVE SUMMARY

On December 13, 2018, the Public Service Commission (Commission) established a statewide energy storage goal of installing up to 3,000 megawatts (MW) of qualified energy storage systems by 2030, with an interim objective of deploying 1,500 MW by 2025. In the Energy Storage Order, the Commission also adopted a suite of energy storage deployment policies and actions to achieve these goals. Public Service Law (PSL) §74 directed the Commission to establish a statewide energy storage target for 2030 and programs that will enable the State to meet such target. Amongst other actions, PSL §74(4) requires annual reports on the achievements and effectiveness of the Commission's qualified energy storage system deployment policy be submitted annually to the Governor, the Temporary President of the Senate, and the Speaker of the Assembly. By the Energy Storage Order, the Commission further required that the Department of Public Service Staff (DPS Staff) file the first "State of Storage" annual report by April 1, 2020 for calendar year 2019, and by April 1 of each year thereafter.

The Commission's energy storage deployment policy has effectively strengthened the market for developing and installing qualified energy storage systems in New York. Total deployed or awarded/contracted projects at the end of 2019 totals 706 MW in capacity, or about 47% of the 2025 target of 1,500 MW and 24% of the 2030 target of 3,000 MW. The number of energy storage projects in various interconnection queues, which reflects some of the awarded/contracted projects noted above as well as potential projects in the pipeline, also indicates robust activity in the industry. Approximately 9,779 MW of energy storage projects are presently in New York utility interconnection queues and the New York Independent System Operator (NYISO) interconnection queue, though it is likely that some of these projects may not be built due to unfavorable project-specific economics and for other reasons.

Due to the technology's declining costs and the ability to pair with solar photovoltaic (PV) and capture additional revenue streams, energy storage is increasingly being used to augment the existing pipeline of utility-connected solar PV projects being developed in the State. These types of projects that combine energy storage with solar PV and use a Community Distributed Generation (CDG) configuration, reported installed costs as low as \$300-400 per kilowatt hour (kWh) in 2019. Bulk-level projects above 5 MW that are intending to provide wholesale market services averaged installed costs of \$416 per kWh. Soft costs, such as customer or site acquisition, project siting, interconnection, financing, engineering, and

construction averaged 30% of total installed costs for CDG-paired energy storage. Energy storage systems sized up to 5 MW are eligible for Value of Distributed Energy Resource (VDER) compensation, and recent changes to that methodology by the Commission that have allowed projects to obtain easier financing, have also contributed to the healthy growth in energy storage development in New York. VDER is now the most common compensation mechanism chosen by developers, and coupling energy storage with a renewable generator allows developers to maximize this compensation in many cases.

DPS Staff submits this State of Storage report in compliance with PSL §74 and the directives of the Commission. DPS Staff recommends that no corrective actions to the Commission's energy storage deployment policy are necessary at this time. Many of the energy storage deployment programs approved by the Commission in 2018 are in the formative stages, and results of these actions will become clearer in 2020.

INTRODUCTION

On December 13, 2018, the Commission established a statewide energy storage goal of installing up to 3,000 MW of qualified energy storage systems by 2030, with an interim objective of deploying 1,500 MW by 2025.¹ The Commission also adopted a suite of energy storage deployment policies and actions intended to accelerate cost reductions, reduce barriers to realizing revenue streams for energy storage services that would otherwise go uncompensated, and improve project economics by sending appropriate price signals to the marketplace. These measures include financial incentives, competitive energy storage procurements, soft cost reduction efforts, and a host of other actions that are cost-effectively contributing to the accelerated deployment of energy storage in New York today. The resulting public benefits of deploying up to 3,000 MW of energy storage are expected to include over \$3 billion in gross lifetime benefits to New York's utility customers, approximately 30,000 new jobs, eliminating approximately 2 million metric tons of greenhouse gas (GHG) emissions, and avoiding criteria air pollutant emissions such as nitrogen oxides (NO_x), sulfur oxides (SO_x), and particulate matter.²

The Commission's actions were in response to the enactment of PSL §74, which directs the Commission to establish a statewide energy storage target for 2030 and programs to support that goal. PSL §74 complements a number of State policies intended to increase the use of renewable energy and reduce GHG emissions and criteria air pollutants. The State has committed to an economy-wide GHG emissions reduction target of 80 percent by 2050,³ and the 2019 Climate Leadership and Community Protection Act (CLCPA) requires, among other things, that at least 70% of New York's electricity come from renewable energy sources by 2030 and 100% be carbon neutral by 2040.⁴ The CLCPA codified the Commission's goal established in

¹ Case 18-E-0130, In the Matter of Energy Storage Deployment Program, Order Establishing Energy Storage Goal and Deployment Policy (issued December 18, 2018) (Energy Storage Order). The energy storage targets are in addition to 1,400 MW of traditional pumped hydro storage that is already deployed.

² Case 18-E-0130, New York State Energy Storage Roadmap and Department of Public Service / New York State Energy Research and Development Authority Staff Recommendations (filed June 21, 2018).

³ See Executive Order No. 24 (2009) 9 NYCRR §7.24.

⁴ See Chapter 106 of the Laws of 2019. The CLCPA is available at: <https://legislation.nysenate.gov/pdf/bills/2019/S6599>.

the Energy Storage Order of deploying 3,000 MW of energy storage by 2030.⁵ Energy storage is a critical component in enabling renewable energy to be deployed in sufficient quantities to satisfy these targets, and may contribute to avoiding or deferring costs associated with electric transmission, distribution, or generation needs.

PSL §74(4) requires reports on the achievement and effectiveness of the energy storage deployment policy be submitted annually to the Governor, the Temporary President of the Senate, and the Speaker of the Assembly. The Commission further required in the Energy Storage Order that DPS Staff, in consultation with the New York State Energy Research and Development Authority (NYSERDA), the Long Island Power Authority (LIPA), and the NYISO, file the first State of Storage report by April 1, 2020 for calendar year 2019, and by April 1 of each year thereafter.⁶

The Commission directed the State of Storage report to include: (1) progress towards achieving the energy storage targets, total MW deployed, locations of installations, projects in the queue, solutions deployed and the ranges of use cases; (2) impediments and proposed solutions to these impediments that may slow deployment, including corrective paths for reallocating bridge incentive funds and other measures as needed; (3) the status of and recommended adjustments to the utility procurement process, wholesale market design changes, utility rate design actions, data platform development, retail and wholesale market coordination, and any other relevant issues; and (4) average total installed cost of energy storage systems and major progress during the year in reducing soft costs.⁷ DPS Staff submits this State of Storage report in compliance with PSL §74 and the directives of the Commission.

Beginning in 2020 and each third year thereafter, the Commission will conduct a review of the progress towards achieving the energy storage deployment goals and the effectiveness of the deployment policies and actions in meeting those goals.⁸ The triennial review will enable the Commission to determine whether and how such policies should be adjusted based on market conditions. If significant variances occur from anticipated progress, the Commission is expected

⁵ The CLCPA also requires a minimum percentage of storage projects be deployed: (1) in disadvantaged communities, and (2) to reduce the usage of combustion-powered peaking facilities in those communities.

⁶ Energy Storage Order, Ordering Clause 13.

⁷ Energy Storage Order, p. 107.

⁸ Energy Storage Order, p. 12.

to consider taking corrective actions based on this review. This annual report should serve as the basis for the Commission’s first triennial review in 2020.

ENERGY STORAGE DEPLOYMENT PROGRESS

The portfolio of programs and actions approved by the Commission in the Energy Storage Order has effectively accelerated New York’s energy storage market. Total deployed or awarded/contracted systems at the end of 2019 includes projects equaling 706 MW in capacity, or about 47% of the 2025 target of 1,500 MW. The breakdown of these figures is described in Table 1. Of that total, approximately 536 MW have been approved for funding under NYSERDA’s Market Acceleration Bridge Incentive (Bridge Incentive) program as authorized in the Energy Storage Order. The Bridge Incentive offers financial incentives to install energy storage systems for three categories of projects: (1) bulk energy storage projects larger than 5 MWs providing wholesale services, listed as Bulk in Table 1;⁹ (2) commercial retail energy storage systems up to 5 MWs, listed as Commercial Retail in Table 1;¹⁰ and (3) single-family residential energy storage systems installed with solar PV on Long Island, listed as Long Island in Table 1.

Table 1: Total Energy Storage in New York

TOTAL ENERGY STORAGE IN NEW YORK (Deployed, Contracted/Awarded)	
Bridge Incentive Program	535.6 MW
Bulk	360 MW
Commercial Retail	175 MW
Long Island	0.6 MW
Renewable Energy Standard	71 MW
NYPA North Country Project	20 MW
Utility Demonstration and NWA Projects	37.4 MW
Other Projects	42 MW
2019 TOTAL	706.6 MW
% of 2025 Goal	47%
% of 2030 Goal	24%

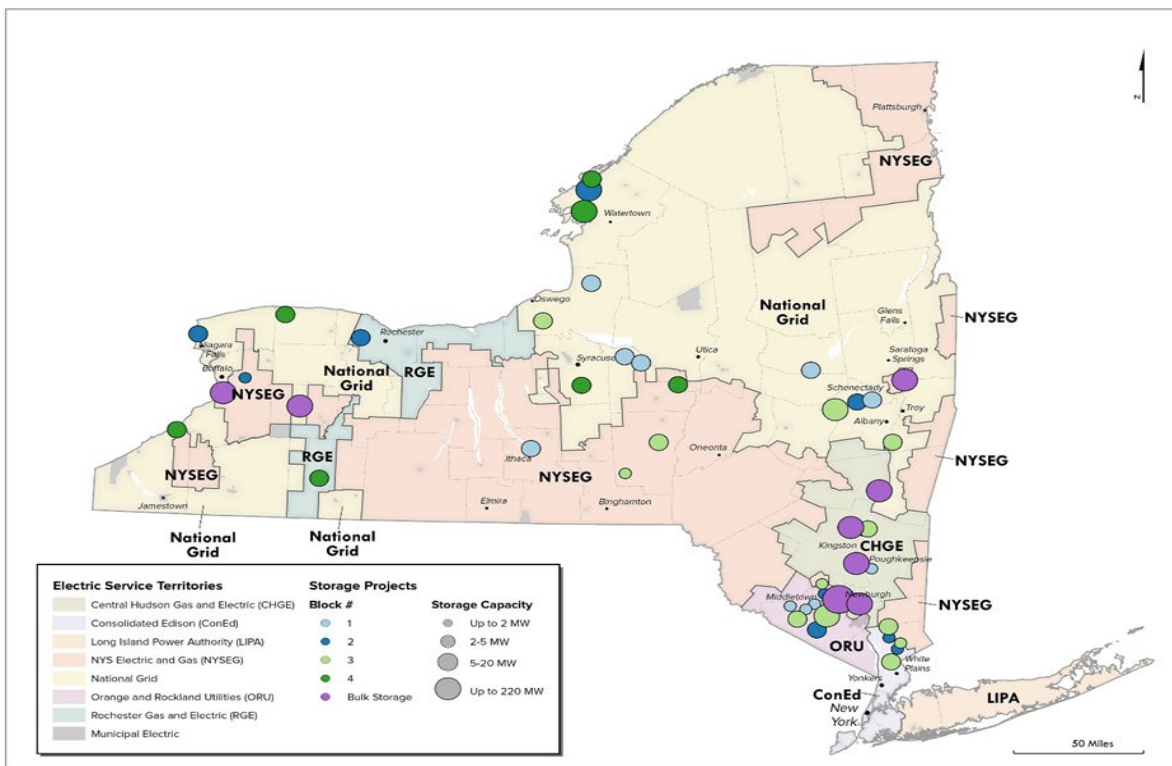
Source: NYSERDA and DPS Staff

⁹ Bulk projects are those interconnected with the transmission system, through the NYISO Open Access Transmission Tariff.

¹⁰ Retail projects are those interconnected with the distribution system, through the New York State Standardized Interconnection Process.

Of the 535.6 MW of projects receiving awards under the NYSEERDA program, approximately 360 MW is dispersed throughout the State and interconnected with the bulk wholesale market, 0.6 MW is located on Long Island within the LIPA service territory, and the rest is dispersed throughout investor-owned utility (IOU) service territories.¹¹ The locations of both Bulk and Commercial Retail projects awarded NYSEERDA incentives under its Bridge Incentive program are illustrated in Figure 1 below. Central Hudson has 9 projects, Con Edison has 4 projects in its Westchester County service territory and none in its New York City service territory, National Grid has 29 projects, NYSEG has 7 projects, O&R has 11 projects, and RG&E has 1 project in its service territory. LIPA has 59 residential, single-family energy storage projects that have received funding under the program, which are not shown in Figure 1.

Figure 1: Location of Energy Storage Projects receiving Bridge Incentives



Source: NYSEERDA Staff

¹¹ New York’s IOUs are: Central Hudson Gas & Electric Corporation (Central Hudson), Consolidated Edison Company of New York, Inc. (Con Edison), New York State Electric & Gas Corporation (NYSEG), Niagara Mohawk Power Corporation d/b/a National Grid (National Grid), Orange and Rockland Utilities, Inc. (O&R), and Rochester Gas and Electric Corporation (RG&E).

The rest of the approximately 706 MW of deployed or contracted/awarded projects includes approximately: 71 MW procured by NYSERDA under the Renewable Energy Standard (RES); 20 MW from NYPA's North Country Energy Storage project; 37.4 MW through utility demonstration projects and "Non-Wires Alternatives" (NWAs), as directed by the Commission under the Reforming the Energy Vision (REV) proceeding; and 42 MW of other energy storage projects in operation.

Approximately 9,779 MW of proposed energy storage projects are presently in either distribution-level or wholesale-level interconnection queues in New York. These interconnection queues reflect projects in the pipeline that are being considered but have not yet been built. These include projects that have received State incentives, as well as projects that have not been awarded any funding and are developing on a merchant basis only. These projects must undergo interconnection studies for permission to interconnect to the grid, and the developers are responsible for any fees for interconnection studies and infrastructure upgrades their project may trigger. In New York City, Con Edison has 135 MW of energy storage projects in its interconnection queue, and in its Westchester County service territory it has 39 MW. LIPA has 195 MW of projects in its interconnection queue. An additional 910 MW are in interconnection queues administered by the other IOUs throughout the State. Approximately 8,500 MW of projects are presently in the NYISO queue.¹²

An indeterminate number of these projects may never be built, however, due to the expense of interconnection, permitting, financing, or for other reasons. Respondents to a recent NYSERDA survey of energy storage developers mentioned known challenges with permitting requirements in New York City in particular, which has been the focus of significant NYSERDA efforts. The survey also indicates that, in the developer's experience, about 47% of prospective distribution-level projects eventually become contracted and are therefore likely to be built, whereas only 25% of prospective customer-connected projects are eventually contracted. Total cycle time, or period between proposal and contract date, for storage projects averages 20-22 months for distribution-connected projects, according to the survey.¹³ (These figures are only estimates of a small sample size since the number of energy storage deployments in New York is still modest, and this data primarily represents contracted but not yet built projects.

¹² A small number of projects are in interconnection queues not regulated by the State, and therefore are not included in this figure.

¹³ There is not yet adequate data to provide average cycle times for bulk storage projects.

Range of Use Cases

Driven by the Commission-approved VDER compensation methodology, the federal Investment Tax Credit (ITC) extension, exemptions from certain distribution-level charges, and utility demand response programs, energy storage is increasingly being deployed to augment the existing pipeline of solar PV projects being developed. Out of the 52 projects approved for NYSERDA incentives in the commercial retail category in Table 1, 48 projects (or 95%) are paired with a solar PV CDG project to time shift the injection of renewable generation to times with a more valuable distribution grid value under VDER compensation. On Long Island, residential storage systems are increasingly being paired with solar PV to help LIPA relieve grid demands during peak summer days. During a grid outage, these systems can also be used to provide emergency backup power for critical loads.

The VDER compensation methodology is now highly financeable¹⁴ as a result of recent Commission changes to the methodology, and is the most common compensation mechanism chosen by developers for monetizing the value of energy storage today.¹⁵ An observable trend in solar PV has been for larger projects to divide into smaller components in order to qualify for VDER compensation, which is capped at 5 MW, instead of interconnecting as a larger project at the bulk wholesale level and receiving compensation in those markets. Project development in more rural areas is also being observed, most likely due to lower land costs which offset the lower VDER compensation in those regions, in contrast to areas downstate where land costs are very high but grid congestion is more prevalent and VDER compensation is therefore more valuable.

Under the Commission's REV initiative, 37.4 MW of energy storage systems have been installed, or are in the process of being installed, to defer costs associated with electric transmission, distribution, or generation needs, and to allow utilities to acquire valuable insight into how best the resource can contribute to providing various services. In 2018, for example, NYSEG was approved to enroll and aggregate up to eight customers in a battery storage offering, with a total capacity ceiling of 4 MW. Customers participating in NYSEG's offering receive a guaranteed bill savings benefit from the installed energy storage system without having to pay

¹⁴ Financeable refers to the ability of developers to secure financing for prospective projects based on the relative certainty of projected revenues.

¹⁵ See Case 15-E-0751, In the Matter of the Value of Distributed Energy Resources, Order Regarding Value Stack Compensation (issued April 18, 2019).

any upfront costs of the installation. Utilities are also procuring batteries in projects using NWAs. For example, Con Edison avoided a traditional \$1.2 billion substation upgrade by deploying 52 MW of demand reductions from non-traditional customer-side and utility-side solutions, including a 2 MW (12 MW hours) battery installed at a substation.

A number of energy storage installations will provide wholesale market services within the NYISO markets. Nine bulk energy storage projects comprising 360 MW and 1,385 MW hours were awarded a total of \$78 million in NYSERDA incentives for projects targeting downstate capacity or ancillary services revenues in the wholesale market. NYPA's North Country Energy Storage project is a 20 MW facility adjacent to an existing substation in Northern New York, which is intended to provide frequency regulation service in the wholesale market and help reduce transmission constraints that can prevent renewable energy from being delivered downstate. An additional 42 MW of legacy energy storage projects are also operational, including thermal batteries, NY-Prize smart grid recipients, residential batteries, and a 20 MW flywheel that provides frequency regulation service in the wholesale market.

Approximately 71 MW of energy storage projects have been procured under NYSERDA's Tier 1 RES procurements, which provide large scale renewable projects the option to augment their development with energy storage and receive additional consideration during the procurement evaluation process. Developers have the option of including collocated or separately located energy storage components with their renewable generators. If a project with energy storage is selected, it may receive up to a 20-year contract for the sale of its Renewable Energy Certificates (RECs), which are generated by the eligible Tier 1 resource (e.g., solar PV or wind generation). The projects awarded under the solicitations may use energy storage to store renewable generation for sale at times when wholesale prices are higher, or to address curtailment issues when generation occurs during congested periods on the grid.

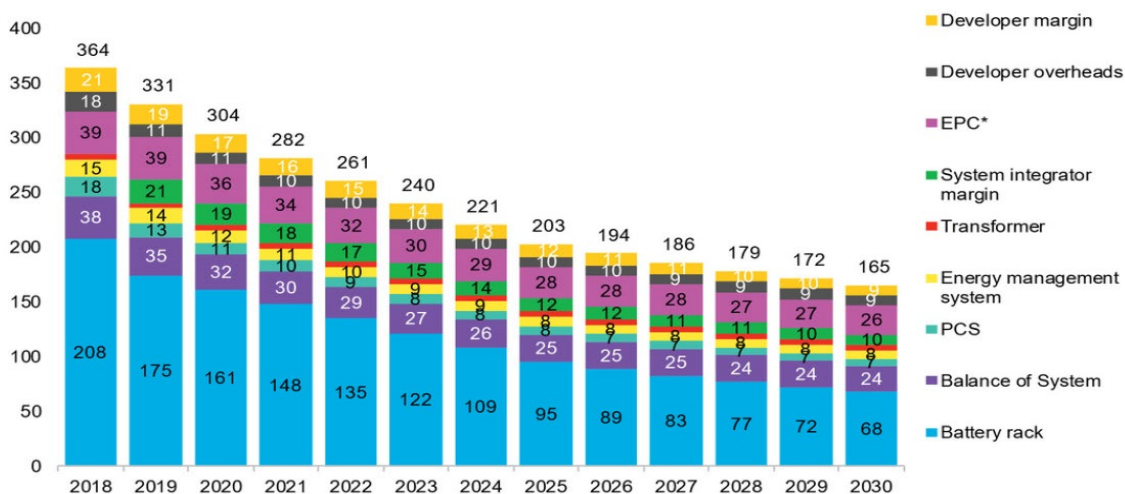
Two NYPA-owned pumped hydroelectric storage facilities participate in the NYSIO wholesale markets: the 1,160 MW Blenheim–Gilboa Pumped Storage Power Station in Schoharie County, and the 240 MW Lewiston Pump-Generating Plant in Niagara County. These traditional pumped hydro storage projects that preexisted the adoption of the Energy Storage

Order and the enactment of PSL §74, are not being counted towards fulfilling the State’s energy storage deployment goals.¹⁶

Progress in Reducing Installed Costs, including Soft Costs

While storage costs continue to decline, the relatively high cost of the resource today, combined with uncertainties in monetizing its various value streams, has resulted in a slow pace of deployment until recently. The Commission recognized these challenges in the Energy Storage Order and approved initiatives to address these issues, including utility procurements and up-front incentives that can help achieve economies of scale and long-term revenue certainty, and efforts to reduce soft costs and other non-hardware costs that can hamper deployment by reducing the attractiveness of the investment’s business case.

Figure 2: Installed Cost for a 20 MW/80 MWh Energy Storage System¹⁷



Source: BloombergNEF. Note: Excludes warranty costs, which are often paid annually rather than as part of the initial capital expenditure. These costs do not explicitly include any taxes, although due to a lack of transparency in the market, some may be unknowingly included. This is for a brownfield development so excludes grid connection costs. Includes a 5% EPC margin. Does not include salvage costs or project augmentation. 2018 figures adjusted for inflation to convert to real 2019 \$. 2018 battery rack figures may include submissions for nameplate, rather than usable capacity figures due to participant approach in the 2018 survey.

¹⁶ Pumped hydro, using two water reservoirs at different elevations, generates and injects power to the system (discharge) as water moves from the upper reservoir to the lower reservoir down through a turbine, and withdraws system power as it pumps water (recharge) back to the upper reservoir.

¹⁷ The costs are for an existing site and do not include land costs or interconnection costs.

While total installed costs for commercial energy storage projects that are used to offset load remain relatively high, the costs of projects providing grid or bulk-level services are declining consistently, as is illustrated in Figure 2. The average total installed costs for Commercial Retail projects that were awarded Bridge Incentives, mainly energy storage paired with a CDG-eligible solar PV system, averaged \$435 per kWh for installations in 2020 and 2021. For Bulk projects above 5 MWs that received an award and will provide wholesale market services, the total installed costs averaged \$416 per kWh for installations between 2020-2023.¹⁸ The costs for these types of projects are expected to continue decreasing into the \$150-\$200 per kwh range by 2030, according to Figure 2. The average total installed cost for customer-sited projects configured behind the customer's utility meter and used for peak load reduction remains relatively high at \$1,000 per kWh in 2018 and \$1,279 per kWh in 2019. For these customer-sited systems, the average hardware costs as a percentage of total installed costs declined from 55% of total costs in 2018 to 45% in 2019.¹⁹

Soft costs associated with engineering and construction, customer acquisition, siting and permitting, interconnection, and higher cost of capital due to uncertain revenue streams are largely driven by factors that can be directly impacted by State efforts. While there is currently insufficient survey data to provide a breakout of soft costs for bulk storage projects, soft costs are averaging 30% for CDG-paired solar PV systems and 55% for customer-sited systems configured behind the customer's meter.²⁰ The Commission's approach to reducing soft costs, largely through NYSERDA initiatives, is a multiprong effort, including technical assistance available to municipalities to assist permitting agencies when considering energy storage installations, reducing the cost of site identification and customer acquisition, educating developers on storage solutions, economics, and market rules, improving interconnection rules, increasing confidence in deployed systems and project economics, and developing appropriate

¹⁸ These figures represent contracted projects and estimated installation costs provided by the developer. Due to the very small number of systems contracted for, these installed cost figures should be cautiously used or relied upon since higher installation costs on one project quickly affects the average cost. Actual installed costs and components of costs will become more accurate in time as the number of deployed systems increases.

¹⁹ Hardware costs include the battery module, inverter, and other costs such as fire controls, power electronics, communication system, containerization, insulation, meter, control system, and outdoor containerization when necessary.

²⁰ Since these customer-sited systems currently represent a small number of projects, average soft cost figures can quickly increase or decrease because of a single project's characteristics.

decommissioning and end-of-life processes. As deployments increase, more reliable data will allow for a better understanding of soft costs and more targeted strategies can be initiated.

SPECIFIC ENERGY STORAGE POLICIES

In the Energy Storage Order, the Commission directed DPS Staff to include in the annual State of Storage report the status of and recommended adjustments to: (1) the utility procurement process; (2) wholesale market design changes; (3) utility rate design actions; (4) data platform development; (5) retail and wholesale market coordination; and (6) other relevant issues. The Commission also directed DPS Staff to evaluate impediments and proposed solutions that may affect deployment of energy storage in the State, and any needed adjustments to the Bridge Incentive.²¹

Utility Procurement Process

In the Energy Storage Order, the Commission directed the electric IOUs to hold competitive procurements for energy storage dispatch rights, in order to provide utility grid operators and system planners real-world experience using qualified energy storage systems to meet system needs. Each utility is required to procure a minimum amount of storage to be operational by December 31, 2022, with Con Edison required to procure at least 300 MW and each of the other electric IOUs required to procure at least 10 MW each, provided that bids do not exceed a utility-specific defined ceiling. NYSERDA's Bridge Incentive provides partial funding for these projects, if necessary, at or below the current rate of NYSERDA's incentives for bulk projects. Each of the electric IOUs held their initial procurement in 2019, and project bids are now being evaluated separately by each of the utilities. Results are likely to be announced in the 2nd or 3rd quarter of 2020.

LIPA intends to meet its share of the State energy storage deployment goals, which amounts to approximately 187 MW out of the 2025 statewide goal of 1,500 MW, through a combination of existing energy storage contracts, a bulk energy storage solicitation, and distribution-level storage projects proposed in LIPA's Utility 2.0 Long Range Plan. There are presently two utility-scale battery storage projects, each with 5 MW capacity and 8 hours

²¹ Energy Storage Order, p. 107.

duration, and approximately 59 small residential, single-family energy storage projects on Long Island.

Wholesale Market Design Changes

The NYISO market rules have historically been structured for large fossil generators that can run regularly and for long periods, are interconnected to the transmission system, and participate only in the wholesale market. Qualified energy storage systems, such as electrochemical batteries, are highly responsive and accurately dispatchable for electric grid functions, yet wholesale market participation options and revenue streams are presently limited. The Commission evaluated these issues in the Energy Storage Order, and directed DPS Staff to continue its efforts to work with NYISO and its stakeholders to appropriately compensate energy storage for the benefits it provides to the grid.

Some improvements at the NYISO level have occurred since the passage of PSL §74 and the adoption of the Energy Storage Order. For example, the Federal Energy Regulatory Commission (FERC) accepted the NYISO's Order Number 841 energy storage resource compliance filing in December 2019, which allows energy storage resources to participate in the wholesale markets. FERC has authorized NYISO to implement its energy storage resource participation model no later than September 30, 2020. Consistent with DPS Staff's recommendation that this proposal be implemented as quickly as possible, NYISO is working to implement the proposal before September 30, 2020. Following implementation, DPS Staff will monitor the program to ensure that energy storage resources are able to fully participate in the market, and to identify additional participation opportunities for energy storage resources.

FERC also accepted the NYISO's Distributed Energy Resources (DER) filing in January 2020, which will allow aggregated resources of at least 100 kilowatts and under 20 MW that are behind a single interconnection point to sell into NYISO markets beginning in 2021. In December 2019, the NYISO filed with FERC revisions to its tariffs to enhance the interconnection process such that deliverability studies will be performed more frequently and expediently. FERC accepted the changes in January 2020 for implementation in February 2020, which should allow energy storage the ability to proceed through the interconnection process in a timelier manner.

In January 2020, the NYISO proposed to develop a hybrid storage participation model that provides wholesale market participation opportunities for energy storage resources that are co-located with other generation resources, including renewables. The hybrid storage model

initiative, which will provide additional participation opportunities for energy storage resources, should be ready for a stakeholder vote by the end of 2020. Implementation of the hybrid storage model will depend on the final market design that stakeholders agree to, and DPS Staff continues to endorse its expeditious development to ensure the full technical capabilities of energy storage are reflected in the market.

Despite these improvements, recent actions by the FERC have threatened to negate some of these efforts and potentially imperil the achievement of other clean energy goals in the State. The NYISO applies buyer-side mitigation (BSM) in Zones, G, H, I, and J, which comprise the Lower Hudson Valley and New York City, the densest part of the State where clean energy resources like energy storage are the most valued. BSM is a capacity market measure applied in these mitigated capacity zones that was originally implemented to prevent large purchasers of capacity from artificially suppressing capacity prices and distorting competitive market outcomes. In recent years the NYISO has applied BSM to resources receiving State incentives that are primarily designed to compensate for environmental attributes and public policy benefits that are not recognized nor compensated within the competitive market design. In July 2019, NYSERDA and the Commission filed a complaint with FERC under Section 206 of the Federal Power Act (FPA) to exempt all energy storage resources from BSM. In a series of decisions on February 20, 2020, FERC denied the complaint, which leaves energy storage resources larger than 2 MW subject to BSM determinations.²² FERC also directed the NYISO to apply BSM to special case resources, a form of demand response.²³

On February 20, FERC rejected a complaint by the Independent Power Producers of New York (IPPNY) and others that sought to expand BSM statewide. While FERC's decision preserves the status quo of no resources being subject to BSM in load zones A-F and K, the decision was narrowly focused on specific issues that were raised in the original complaint (i.e., the Commission's Reliability Support Service Agreements). Therefore, while this means that any renewable or clean energy resource outside of the mitigated capacity zones will currently be exempt from BSM, IPPNY or other generators may still seek to expand mitigation by filing a new complaint with FERC, which would present considerable risk that these resources may become subject to BSM.

²² FERC Docket No. EL19-86-000.

²³ FERC Docket No. EL16-92.

In response to a FERC Order that resolved a complaint by DPS, NYSERDA, and NYPA, the NYISO filed tariff revisions to exempt up to 1,000 MW of Installed Capacity, or ICAP, for purely intermittent renewable generation seeking to interconnect within the mitigated capacity zones within each class year. While FERC accepted an exemption for renewables, it found that the NYISO's proposed 1,000 MW class year limit failed to comply with prior Commission directives. FERC directed the NYISO to recalculate the limit in terms of unforced capacity (UCAP) rather than ICAP.²⁴ The NYISO will submit a compliance filing that narrowly tailors the exemption limit to the mitigated capacity zones in terms of UCAP, and limits the risk that the entry of exempt renewable resources significantly impacts market prices.

Currently all new resources that are greater than 2 MW that are seeking to sell installed capacity within a mitigated capacity zone are subject to BSM unless they qualify for a specific exemption. In addition to its conditional acceptance of an exemption for purely intermittent renewable resources, FERC has conditionally accepted a self-supply exemption, and the NYISO's tariff currently contains a competitive entry exemption for new entry that is purely merchant, as well as two exemptions, Part A and Part B, that may apply when the market is forecast to be short of resources and where an individual project is forecasted to be economically beneficial, respectively. The BSM rules, however, will continue to be a deterrent for new resources contemplating entry in New York since mitigated areas include the greatest concentrations of load in the State, and development of new renewable resources, energy storage, and demand response is expected to be widespread in those regions.

The NYISO is undertaking a comprehensive mitigation review throughout 2020 to conduct a holistic evaluation of the BSM rules and methodology as part of a broader effort to modify NYISO market structures to reflect the passage of the CLCPA. This effort includes several options aimed at improving wholesale market opportunities for state sponsored resources. Specifically, NYISO expects to file with FERC several BSM improvements to its Part A tests that would recognize the entry of new public policy resources and improve the likelihood that these resources would be able to competitively participate in the wholesale capacity market as existing resources retire.

DPS Staff continues to advocate for changes to the current BSM rules at the NYISO, while considering all available resource adequacy procurement options in the Commission's

²⁴ FERC Docket No. ER16-1404.

Resource Adequacy Proceeding.²⁵ This proceeding was instituted in August 2019 to evaluate resource adequacy options in light of the State’s clean energy goals. In the meantime, some energy storage projects may be cancelled or choose distribution level interconnections and compensation, instead of proceeding with the uncertainties of providing wholesale bulk-level services. As previously discussed, in the short-term, projects could potentially split into multiple 5 MW projects in order to qualify for VDER compensation. However, such configurations are not always optimal and may prevent some benefits of certain larger energy storage configurations from being realized.

Utility Rate Design Actions

Incentivizing energy storage deployment at the distribution level is highly dependent on the amount of compensation and grid charges that a project would be subject to based on utility tariffs. In terms of compensation, most energy storage applications would receive VDER compensation for projects under 5 MW. Larger projects can either be compensated through utility rates that are linked to avoided wholesale costs, or sell directly into the NYISO markets. Due to various exemptions that have been applied over the years, most renewable energy applications like solar PV with collocated energy storage have generally not been required to pay certain charges that would compensate the utility for grid availability, called Standby Rates, although stand-alone energy storage systems do not qualify for these exemptions.

The Energy Storage Order addressed a number of rate design issues that are applicable to certain non-exempt energy storage applications like stand-alone energy storage, energy storage systems paired with consumption load, and regenerative braking systems. The Commission determined that these non-exempt applications are subject to Standby Rates, but that these charges need to be updated to reflect the operating characteristics of newer resources like stand-alone energy storage. In May 2019, the Commission adopted the Standby Rate Order, which required the electric IOUs to file revised Standby Rates based on a more granular cost allocation approach to more accurately reflect the impacts on the system associated with a customer’s

²⁵ Case 19-E-0530, Proceeding on Motion of the Commission to Consider Resource Adequacy Matters, Order Instituting Proceeding and Soliciting Comments (issued August 8, 2019) (Resource Adequacy Proceeding).

usage, considering the different operating characteristics of technologies such as energy storage.²⁶ Those filings are currently under review by the Commission.

As DER deployment increases and the potential for cost-shifting expands due to Standby Rate exemptions when colocated with renewable generation, the applicability of these charges is being addressed in a comprehensive fashion for all DER, not just energy storage. Continued work to refine cost allocations between shared (e.g., costs incurred to serve all ratepayers) and local costs (e.g., costs incurred to serve only that particular customer) that comprise various utility charges is ongoing in those proceedings. Improvements to the VDER methodology are also ongoing, and recent changes, particularly in setting the Distribution Relief Value for the first 10 years, have created a highly financeable compensation mechanism for energy storage installations.

In the Energy Storage Order, the Commission also directed the electric IOUs to hold competitive procurements for dynamic load management (DLM) resources for a minimum three-year term for the 2020 Summer capability period and thereafter.²⁷ DLM resources, including energy storage, can provide grid relief services to utilities in these programs, avoiding the need to deploy more equipment to serve peak loads. This program is expected to provide more revenue certainty for energy storage and other resources that participate and allow the utilities to have greater confidence that these contracted load relief solutions will be available when needed. The electric IOUs have each filed proposals that are currently being evaluated by the Commission.

Data Platform Development

New York's IOUs have continued their efforts to provide needed data to DER developers as described in their Distributed System Implementation Plan (DSIP) filings.²⁸ Nevertheless,

²⁶ Case 15-E-0751, In the Matter of the Value of Distributed Energy Resources, Order on Standby and Buyback Service Rate Design and Establishing Optional Demand-Based Rates (issued May 16, 2019) (Standby Rate Order).

²⁷ On November 15, 2019, the Secretary to the Commission extended the deadline for the IOUs to implement the longer-term DLM programs until the first practicable summer capability period after 2020. In their subsequent filings, the IOUs proposed to implement these programs for the summer capability period in 2021. See Case 18-E-0130, In the Matter of Energy Storage Deployment Program.

²⁸ See Case 16-M-0411, In the Matter of Distributed System Implementation Plans.

developers and other stakeholders need more and better access to both customer and distribution system data to better target locations on the electric grid where grid needs are the greatest and sufficient hosting capacity is available. In the Energy Storage Order, the Commission noted that IOUs should increase and improve the customer and distribution system data provided to DER developers and operators, and directed the IOUs to develop a Pilot DER Data Platform for a third-party to develop and implement.²⁹ Per the Commission's directives, the Pilot DER Data Platform contains both anonymized customer and system data useful to developers for planning and developing energy storage and other types of DER. The Commission anticipated that the Pilot DER Data Platform would allow DER developers to query the anonymized data to identify potential candidates for energy storage and other DER. The coordination effort to develop the Pilot DER Data Platform has also been helpful in determining the extent of system data that is already available to developers, and DPS Staff, the selected third-party vendor, stakeholders, and the IOUs continue to identify additional data needs.

The Pilot DER Data Platform was activated and made accessible via the web on December 31, 2019. The utility partner, O&R, has so far delivered several types of data, including interval consumption data, for over 10,000 customers. This data is presented anonymously in the platform and only released to a developer after customer approval. Plans are underway to expand the dataset to include all O&R customers. O&R has also provided several types of grid data for their entire electric system. The DER platform developer, Trove Predictive Data Science (Trove), successfully developed and implemented several innovative data protection features and analytical tools that effectively demonstrate the viability and value of a statewide integrated energy data resource. O&R and Trove jointly developed and implemented policies, procedures, and tools for obtaining and acting on customer responses to data access requests from DER vendors/developers. Close to 20 DER developers and stakeholders have established access and begun using the platform. Initial user reactions have been positive, and several suggestions for expansion and enhancements have been suggested. Aside from various

²⁹ Energy Storage Order, p. 84.

minor enhancements to administrative, operational, and user functions that DPS Staff and stakeholders are evaluating, no significant modifications are recommended.³⁰

Retail and Wholesale Market Coordination

In the Energy Storage Order, the Commission noted that energy storage in the distribution system should be allowed to provide separate and distinct services to both the utility and the NYISO if technically capable of doing so. This “dual-participation” model will allow resources that have the capability to participate in both wholesale and retail markets to earn additional revenue streams for these resources, and bolster the reliability and resilience of the transmission and distribution systems.

The recently FERC-accepted DER NYISO filing allows for dual participation in wholesale and retail markets. NYISO will coordinate with transmission owners for scheduling and dispatch of dual-participating resources, retain the authority to schedule and dispatch all wholesale resources, and require those resources to bid in a manner that ensures they can meet wholesale obligations. DPS Staff is currently participating in working group meetings with the NYISO and the IOUs to develop protocols and procedures for DER operation and coordination between the retail and wholesale markets.

The Commission also directed DPS Staff and NYSERDA, with appropriate contributions from the electric IOUs and NYISO, to convene and prepare a work plan and schedule for a Market Design and Integration Working Group (MDIWG) by March 1, 2019.³¹ The MDIWG’s purpose is to: (1) establish market coordination between utilities, DER operators, and the NYISO; (2) determine technical and economic requirements for efficient planning, dispatch, measurement, and compensation of DER; and (3) identify necessary industry roles, responsibilities, and interactions to achieve the State energy deployment goals. The MDIWG is also to consider the effects of actions at the federal level, and was tasked with identifying and evaluating possible alternative approaches to energy resource integration, cost allocation, and compensation methods. It is expected that the MDIWG will develop priorities and a roadmap for

³⁰ On March 19, 2020, the Commission initiated a proceeding to evaluate the use of energy related data. The proceeding will evaluate the availability and use of utility data for all DER, including energy storage. See Case 20-M-0082, Proceeding on Motion of the Commission Regarding Strategic Use of Energy Related Data, Order Instituting Proceeding (issued March 19, 2020).

³¹ Energy Storage Order, p. 103.

distributed system platform implementation by October 2020, and a Staff whitepaper will be issued for stakeholder input by the second quarter of 2021.

Other Relevant Issues

Per the Commission's directive in the Energy Storage Order, this State of Storage report also addresses other relevant issues, including adjustments to the Bridge Incentive and any other impediments and proposed solutions that may slow deployment.

DPS Staff and NYSERDA continually monitor market developments and deployment progress to ensure that the Bridge Incentive is fulfilling its purpose. The total budget for the Bridge Incentive is \$405 million, with \$187.2 million committed during 2019 and \$217.4 million remaining at the end of 2019. On Long Island, \$235,000 of Regional Greenhouse Gas Initiative (RGGI) funds is currently committed out of \$2.5 million allocated for single-family residential energy storage projects collocated with a renewable resource. In 2020, NYSERDA created a new incentive of \$14.9 million at \$175/kWh in Con Edison's Westchester County service territory using unallocated Bridge Incentive funds to ensure project development continues in this high value location. Beyond this, DPS Staff and NYSERDA recommend no new Commercial Retail incentives for energy storage be considered until mid-2020 due to the saturation of projects in more rural areas where energy storage is not providing the most benefits.

NYSERDA and DPS Staff also made minor modifications to the Bridge Incentive program in January 2020, including increasing the project maturity requirements (e.g., planning and zoning board approval, an approved special use permit, and a negative declaration under the State Environmental Quality Review Act), and reducing the incentive levels by 75% for hours 5 and 6 of duration with no incentive for any duration beyond 6 hours.³² In the Bulk category, projects located in Con Edison's New York City service territory that choose not to participate or are not selected in a Con Edison's Bulk solicitation, will become eligible to directly apply for NYSERDA Bridge Incentives beginning April 1, 2020.

New York City, where energy storage has the opportunity to provide significant grid benefits, has no projects currently awarded NYSERDA incentives, although 135 MW of standalone storage is in the Con Edison interconnection queue. Owing to the high-density urban

³² This change is consistent with NYISO rules, which value capacity at 90% for 4-hours duration and 100% to 6-hours duration until 1,000 MWs of storage is deployed, at which time the incentive compensation drops to 75% and 90% respectively.

environment of New York City and resulting space limitations, collocation of energy storage systems with renewable generation is often not possible, thereby precluding projects from qualifying for the materially valuable ITC that requires direct charging of batteries from renewable generators. Therefore, standalone energy storage projects are more likely to be deployed in New York City, but they face high delivery charges under current Con Edison tariffs.

Several other factors contribute to the delayed development of retail energy storage projects in New York City that are particular to this area. These include siting barriers such as uncertain permitting schedules, and regulatory impediments such as the prohibition against indoor battery systems and the physical constraints imposed on outdoor commercial systems. Other regulatory impairments include high interconnection costs and network characteristics put in place for reliability purposes that can limit the ability to export electricity (known as high-load density secondary spot networks).

One significant opportunity that exists largely in New York City is the ability to use energy storage and other DER to help meet shorter-duration peak electric demand needs as the grid becomes less carbon intensive, and as existing fossil peaking power plants determine how they will comply with the new Department of Environmental Conservation NO_x and SO_x emission regulations designed to reduce smog.³³ Under New York State's Real Property Tax law, as amended in December 2018, New York City residents who install solar generating systems or electric energy storage systems in their homes or buildings are eligible for a real property tax abatement to recoup some of their project-related costs until March 15, 2021.³⁴ This property tax abatement can also help limit the impact of higher development costs there, but this abatement is currently limited to \$62,500. Efforts are underway by developers and stakeholders to increase this abatement and also to seek a statewide sales tax exemption on energy storage systems. Impediments to the energy storage market in New York City can be overcome with a citywide focus on permitting and siting changes and solutions for reducing interconnections costs.

³³ 6 NYCRR Subpart 227-3, Ozone Season Oxides of Nitrogen (NO_x) Emission Limits for Simple Cycle and Regenerative Combustion Turbines, available at: <http://www.dec.ny.gov/regulations/116185.html>.

³⁴ See New York State Real Property Tax Law Exemptions at: <https://www.nysenate.gov/legislation/laws/RPT/A4T4-C>.

In February 2020, NYSERDA filed the Energy Storage Workforce Development Report, which summarizes workforce development needs and available resources for the energy storage industry in New York.³⁵ By the Energy Storage Order, the Commission required NYSERDA to “facilitate an industry partnership to develop an inventory of workforce development needs and a blueprint for addressing potential skilled talent shortages.”³⁶ NYSERDA worked with the Department of Labor, Empire State Development Corporation, and other stakeholders to: (1) inventory specific worker skills that will be required by businesses throughout the energy storage supply chain; (2) map required skills to existing training resources and the labor pool to identify gaps and shortages; (3) work with stakeholders to develop a blueprint that will ensure a talent pipeline of workers with the necessary skills; (4) identify gaps in training infrastructure and capacity in areas such as curriculum, trained trainers, training equipment, job placement initiatives, on-the-job training, internships, apprenticeships, career pathway training, certifications, etc.; and (5) identify plans to support disadvantaged workers, including youth (18-24), displaced and dislocated workers, women, minorities, and veterans.

NYSERDA concludes that it has the resources necessary to serve anticipated training needs for the energy storage workforce over the next three to five years. A significant number of energy storage training opportunities are currently available in the State, and several programs are in place to provide funding to expand existing training, develop new training offerings and content/curriculum, and support the hiring of interns and new workers to support the energy storage industry. At this time, NYSERDA anticipates that market demand for energy storage training will increase in 2020/2021; particularly for design, installation and operation, and maintenance practitioners. NYSERDA will continue to engage with stakeholders to access skills gaps and training needs over time; facilitate partnerships between training providers and businesses throughout the supply chain, including manufacturers; continue to promote relevant funding opportunities; and assess gaps that may require new funding opportunities.

During the required consultations for this report, LIPA identified two types of barriers to energy storage deployment on Long Island. The first barrier identified is that locations where storage may be of the greatest value does not have adequate hosting capacity or available physical space. LIPA has identified several substation locations where batteries could help defer traditional utility investments, and additional locations where there is hosting capacity available

³⁵ See Case 18-E-0130, In the Matter of Energy Storage Deployment Program.

³⁶ Energy Storage Order, p. 80.

for bulk energy storage. LIPA continues to conduct system studies to identify optimal locations. The second barrier identified is financial. The NYISO market design does not yet fully value the attributes of energy storage, and recent FERC orders present a risk of reduced wholesale revenues should BSM be applied on Long Island in the future. LIPA is currently surveying storage developers on their views regarding barriers to deployment via a recently issued Request for Information.³⁷

CONCLUSION

The portfolio of programs and actions approved by the Commission in the Energy Storage Order, pursuant to PSL §74, have been effective in building the foundations of a competitive market for qualified energy storage systems in New York. Total deployed or awarded/contracted energy storage systems at the end of 2019 includes projects approximately 706 MW in capacity, or about 47% of the 2025 target of 1,500 MW and 24% of the 2030 target of 3,000 MW. The number of energy storage projects in the various interconnection queues also indicates robust growth in the industry. DPS Staff recommends that no corrective actions to the Commission's energy storage deployment policy are necessary at this time. Some of the initiatives adopted in the Energy Storage Order are still in the formative stages and results of these actions will become clearer in 2020.

³⁷ For more information, visit: <https://www.psegliny.com/aboutpseglongisland/proposalsandbids>.