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December 14, 2023

Via Electronic Mail

Hon. Michelle L. Phillips
Secretary to the Commission
New York State Public Service Commission
Agency Building 3
Albany, NY 12223-1350

Re: Case 18-E-0130 – In the Matter of Energy Storage Deployment Program.

Dear Secretary Phillips,

On December 28, 2022, Staff from the Department of Public Service (DPS) and New York State Energy Research and Development Authority (NYSERDA) published “New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage” (6 GW Roadmap). The 6 GW Roadmap builds upon the programs established in the Order Establishing Energy Storage Goal and Deployment Policy (Energy Storage Order), issued on December 13, 2018, and recommends strategies for attaining New York State’s goal of achieving six gigawatts of energy storage by 2030.

As part of the process for promulgating the Energy Storage Order an analysis pursuant to the State Environmental Quality Review Act (SEQRA) was undertaken. In the Order Accepting Draft Generic Environmental Impact Statement as Complete, issued June 25, 2018 in this proceeding, the Public Service Commission (Commission) stated “[i]f a capacity target higher than 3,600 MW of increased energy storage deployment is adopted, additional potential environmental impacts shall be analyzed.” As the 6 GW Roadmap recommends the adoption of a capacity target higher than 3,600 MW, DPS and NYSERDA staff have undertaken a supplemental review pursuant to SEQRA, as previously required by the Commission.

On September 14, 2023, the Commission accepted the Draft Supplemental Generic Environmental Impact Statement (Draft SGEIS) as complete. Following Commission acceptance, the Draft SGEIS was noticed for public comment. Two sets of comments were received in response to the Draft SGEIS.

Attached, for filing in the above-referenced case, is the Final Supplemental Generic Environmental Impact Statement (Final SGEIS), which has been accepted as complete by the Commission. The Final SGEIS considers the statewide environmental impacts of the recommendations in the 6 GW Roadmap and incorporates public comments received in response to the Draft SGEIS.

Please feel free to contact me at (518) 408-1441 or Stephanie.McDermott@dps.ny.gov should you have any questions.

Sincerely,
/s/ Stephanie S. McDermott



Final Supplemental Generic Environmental Impact Statement

Prepared for:

New York State Department of Public Service and
New York State Energy Research & Development Authority

Prepared by:

Industrial Economics, Incorporated

Area Affected by Action: New York State

Date of Issuance: December 14, 2023

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LIST OF ACRONYMS AND ABBREVIATIONS

3 GW Roadmap	New York State Energy Storage Roadmap and Department of Public Service / New York State Energy Research and Development Authority Staff Recommendations
6 GW Roadmap	New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage
APS	Arizona Public Service
BESS	Battery Energy Storage System
BMPs	Best Management Practices
BMS	Battery management system
Bridge Incentive	NYSERDA’s Market Acceleration Bridge Incentive
CAA	Clean Air Act
CAFO	Combined Animal Feeding Operation
CEF	Clean Energy Fund
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CJWG	Climate Justice Working Group
CLCPA	Climate Leadership and Community Protection Act
CO	Carbon monoxide
CO ₂	Carbon dioxide
Commission	New York State Public Service Commission NYSDEC Commissioner Policy 29 on Environmental Justice and Permitting
CP-29	Permitting
CPCN	Certificate of Public Convenience and Necessity
CRF	Cost Recovery Fee
CRRA	Community Risk and Resiliency Act
CWA	Clean Water Act
DHSES	Division of Homeland Security and Emergency Services
DOT	U.S. Department of Transportation
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EJ	environmental justice
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EVs	electric vehicles
FCZMA	Federal Coastal Zone Management Act
FDNY	New York City Fire Department
GEIS	Generic Environmental Impact Statement
GHG	greenhouse gasses
GW	gigawatt
GWh	gigawatt hours
Hg	mercury
HMR	Hazardous Materials Regulations

IESO	Independent Electricity System Operator
IFC	International Fire Code
IOU	investor-owned utility
IRA	Inflation Reduction Act of 2022
ISO	Independent System Operator
ITC	Investment Tax Credit
kg	kilogram
kV	Kilovolts
kWh	Kilowatt-hour
LCRs	local capacity requirements
Li-ion	Lithium-Ion
LIPA	Long Island Power Authority
MW	megawatt(s)
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standard
NaS	Sodium-sulfur
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NO ₂	Nitrogen dioxide
NO _x	Nitrous oxides
NREL	National Renewable Energy Laboratory
NYC	New York City
NYCA	New York Control Area
NYCRR	New York Codes, Rules and Regulations
NYGB	New York Green Bank
NYISO	New York Independent System Operator
NYP&A	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
NYS&PS	New York State Department of Public Service
NYSERDA	New York State Energy Research and Development Authority
OTR	Ozone Transport Region
PG&E	Pacific Gas & Electric
PM	particulate matter
PRM	planning reserve margin
PSL	Public Service Law
PTFE	polytetrafluoroethylene
RCRA	Resource Conservation and Recovery
RES	Renewable Energy Standard
REV	Reforming the Energy Vision
SEQRA	New York's State Environmental Quality Review Act
SGEIS	Supplemental Generic Environmental Impact Statement
SO ₂	Sulfur dioxide
SO _x	Sulfur oxides
SPDES	New York State Pollutant Discharge Elimination System
UL	Underwriters Laboratories
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

On January 2, 2018, the New York State Governor (the Governor) announced an initiative to deploy 1,500 megawatts (MW) of energy storage by 2025 as a part of the broader effort to transform New York State's (the State) energy system. As part of this Energy Storage Deployment initiative, the Governor tasked the New York State Public Service Commission (the Commission) and New York State Energy Research and Development Authority (NYSERDA) with the development of a roadmap to identify policies, regulations, and initiatives that would accelerate the growth of the State's energy storage market to achieve the 2025 goal and also establish a supplemental energy storage target for 2030, leading to the publication of New York State Energy Storage Roadmap and Department of Public Service / New York State Energy Research and Development Authority Staff Recommendations (the 3 gigawatt [GW] Roadmap) in 2018. The results of the 3 GW Roadmap led to the codification of the 1.5 GW by 2025 target, as well as the goal of 3 GW by 2030. In September 2018, New York State Department of Public Service (NYSDPS) and NYSERDA finalized and published a Generic Environmental Impact Statement (2018 GEIS¹) to explore the potential environmental impacts associated with the roadmap and these energy storage targets.²

The Climate Leadership and Community Protection Act (CLCPA), signed into law in 2019, increases the State's clean energy goal from 50 percent renewables to 70 percent renewables by 2030 and calls for 100 percent zero-emissions electricity by 2040. The CLCPA codifies the 3 GW storage target and directs full decarbonization of the electricity sector, including a focus on utilizing storage for the integration of renewables and offsetting highly polluting peaking facilities. The CLCPA complements a number of New York State policies that have established goals aimed at substantially increasing the use of renewables and reducing greenhouse gas (GHG) emissions over the past several years. To accelerate the deployment of storage and support the transition to a clean electric grid, the Governor directed NYSDPS and NYSERDA to update the 3 GW Roadmap to double storage targets, achieving at least 6 GW of energy storage deployments by 2030. New York's 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (6 GW Roadmap) was published in 2022 to recommend a pathway to achieving sufficient energy storage in the State.

This Supplemental GEIS (SGEIS) evaluates the environmental impacts associated with the recommendations in the 6 GW Roadmap. This SGEIS builds upon and incorporates by reference relevant material from the 2018 GEIS.

¹ Available at: <https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={2D2304AA-857E-429A-B17D-7335AB6D58DA}>

² All documents related to the matter (18-E-0130) are available at: <https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=55960>

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.9(a)(7), an SGEIS is the appropriate mechanism for assessing environmental impacts in this matter. The proposed deployment of additional energy storage represents a change in circumstances from the 2018 GEIS. This SGEIS, therefore, evaluates the potential effects of the additional deployment of energy storage pursuant to the directive from the Governor.

Description of the Proposed Action

The Proposed Action under consideration is the implementation of the 6 GW Roadmap recommendations to double the deployment of the State's energy storage from the currently legislated 3 GW to 6 GW by 2030. The 6 GW Roadmap proposes the implementation of NYSERDA-led programs towards procuring an additional 4.7 GW of new storage projects (in addition to the State's current energy storage commitments of approximately 1.3 GW; see **Chapter 2** for a discussion of current energy storage in the State) across the bulk, retail, and residential energy storage sectors in New York State. To maximize the feasibility of these procurements, diversify technology options, and take advantage of the unique benefits provided by different market segments, the 6 GW Roadmap recommends new programs be developed for bulk, retail, and residential storage projects across the State.

The scope of this SGEIS addresses issues either not addressed in the 2018 GEIS or issues that need further analysis based on the expansion of the State's energy storage goals. Impacts receiving additional attention in this SGEIS include public health and safety (e.g., fire safety), climate and air quality, waste management, land use, and environmental justice concerns.

Environmental Impacts

This SGEIS identifies the types of impacts that could result from the approval and implementation of the Proposed Action, compared to the No Action alternative defined in **Chapter 4**. As in the 2018 GEIS, the evaluation of environmental impacts in this SGEIS is largely qualitative. A quantitative assessment of the potential environmental impacts would require information that is not available at this stage, such as information on the location of specific projects or developments.

Chapter 5 provides a largely qualitative discussion of the environmental impacts of the Proposed Action; as with the 2018 GEIS, these discussions do not substitute for project-specific environmental reviews, which may result in the identification of site-specific impacts. The deployment of additional energy storage may increase potential adverse environmental impacts compared to the 2018 GEIS. This SGEIS focuses on the direct environmental impacts of specifically lithium-ion (Li-ion) batteries, which constitute the majority of all energy storage in the State, with further discussions primarily on fire safety and waste management. While Li-ion battery systems are susceptible to various thermal, electrical, and mechanical hazards that can lead to fire or explosion, strong regulations (discussed in **Chapter 6**) can mitigate these risks and minimize damage. Recycling Li-ion batteries is important for creating a sustainable energy storage economy (i.e., making scarce materials available for reuse and minimizing waste), in addition to mitigating environmental damage from the extraction of metals for the battery and from the end-of-life disposal. The SGEIS also discusses the greenhouse gas emissions footprint of Li-ion batteries in addition to their potential impact on water resources and land use. Similar to the 2018 GEIS, this SGEIS also discusses the indirect and cumulative impacts of energy storage

technologies. Indirect benefits include public health benefits from reduction in criteria air pollutants and greenhouse gas emissions, as well as improvement of natural, ecological, and cultural resources from the replacement of fossil fuel plants.

Chapters 7 and 8 of this SGEIS consider the unavoidable impacts and irreversible and irretrievable commitment of resources of the Proposed Action respectively. Since the SGEIS does not address site- or project-specific actions, there are no unavoidable adverse impacts or irreversible and irretrievable commitments of resources associated with the Proposed Action. Any resulting development of energy storage encouraged by the Proposed Action would consider site- or project-specific potential impacts during applicable federal and state approval processes.

Chapter 9 discusses growth-inducing and socioeconomic aspects of the Proposed Action. In addition to the electric system benefits, the Proposed Action is expected to generate environmental and public health benefits by reducing greenhouse gas emissions and criteria pollutants. The Proposed Action is also expected to have positive environmental justice impacts through the expedient replacement of polluting peaker plants that disproportionately affect Disadvantaged Communities, though local communities should be engaged during the process of siting new storage facilities to minimize negative impacts.

Finally, **Chapter 10** considers the effects of the Proposed Action on energy consumption and finds that while the Proposed Action may affect the State's electric generation portfolio, it is not expected to directly or indirectly affect the amount of electricity used in the State or the amount of energy conserved in the State.

CHAPTER 1 | SEQRA AND DESCRIPTION OF THE PROPOSED ACTION

In 2014, New York State (the State) launched Reforming the Energy Vision (REV), an energy policy intended to transform the ways in which the State generates, distributes, and manages energy. The 2015 New York State Energy Plan (the 2015 State Energy Plan), in combination with the reforms called for in REV, set forth long-term energy goals, further driving the transformation of the State's energy system. Acknowledging that energy storage will play a key role in meeting these goals, on January 2, 2018, the State's governor (the Governor) announced a new initiative to deploy 1,500 megawatts (MW) of energy storage by 2025.

As part of this Energy Storage Deployment initiative, the Governor tasked the New York State Public Service Commission and New York State Energy Research and Development Authority (NYSERDA) with the development of a roadmap to identify policies, regulations, and initiatives that would accelerate the growth of the State's energy storage market to achieve the 2025 goal and also establish a supplemental energy storage target for 2030, resulting in the publication of New York State Energy Storage Roadmap and Department of Public Service / New York State Energy Research and Development Authority Staff Recommendations (the 3 gigawatt [GW] Roadmap).

The results of the 3 GW Roadmap led to the codification of the 1.5-gigawatt (GW) by 2025 target, as well as the goal of 3 GW by 2030. In September 2018, New York State Department of Public Service (NYSDPS) and NYSEDA finalized and published a Generic Environmental Impact Statement (GEIS) to explore the potential environmental impacts associated with the roadmap and these energy storage targets.

The Climate Leadership and Community Protection Act (CLCPA), signed by the Governor in June 2019, increased the State's clean energy goal from 50 percent renewables to 70 percent renewables by 2030 and mandated full decarbonization of the electricity system by 2040. To accelerate the deployment of storage and support the transition to a clean electric grid, the Governor directed NYSDPS and NYSEDA to update New York State's Energy Roadmap to double storage targets, achieving at least 6 GW of energy storage deployments by 2030. This Supplemental GEIS (SGEIS) evaluates the environmental impacts associated with the updated 6 GW Roadmap.

The remainder of this chapter provides further background and context concerning the development of an SGEIS. This chapter is organized in the following sections:

- **Section 1.1** describes the purpose of New York's State Environmental Quality Review Act (SEQRA) and the requirement to prepare an SGEIS for an action or plan that has a state-wide application.
- **Sections 1.2 and 1.3** provide an overview of the public need, purpose, and actions proposed under the 6 GW Roadmap.

- **Section 1.4** provides a summary of the public benefits anticipated from the successful implementation of the Roadmap. This chapter concludes with a brief overview of other energy programs that are intertwined with the Roadmap.

1.1 COMPLIANCE WITH THE NEW YORK STATE ENVIRONMENTAL QUALITY REVIEW ACT

New York’s SEQRA, which is contained in Article 8 of the Environmental Conservation Law, declares that it is the State’s policy to:

... encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and enhance human and community resources; and to enrich the understanding of ecological systems, natural, human and community resources important to the people of the state.

The basic purpose of the SEQRA regulations is to incorporate the consideration of environmental factors into the existing planning, review, and decision-making processes of State, regional, and local government agencies at the earliest possible time. Consistent with this intent, the SEQRA requires all State and local government agencies to analyze and mitigate potentially significant environmental impacts when deciding to approve or undertake an action. To accomplish this overarching goal, agencies are required to assess the environmental significance of all actions they have discretion to approve, fund, or directly undertake, unless exempt or excluded by the SEQRA statute or regulation, which may include development of an Environmental Impact Statement (EIS).

1.1.1 Preparation of a Supplemental Generic Environmental Impact Statement

The 2018 GEIS was prepared in compliance with SEQRA to address the environmental impacts of the proposed actions and goals outlined in the 3 GW Roadmap. SEQRA also addresses circumstances that may require a supplemental EIS, including changes proposed for the project, newly discovered information, or a change in circumstances. The proposed deployment of additional energy storage capacity pursuant to the directive laid out by the Governor represents a change in circumstances from the prior SEQRA analysis. As a result of this change, consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.9(a)(7), an SGEIS is the appropriate mechanism for assessing environmental impacts. This SGEIS therefore evaluates the potential effects of the additional deployment of energy storage.

Consistent with Title 6 of NYCRR §617.9(a)(7), this SGEIS evaluates the potential for significant adverse environmental impacts arising from the expansion of deployment from 3 GW of energy storage to 6 GW. The scope of this SGEIS addresses issues either not addressed in the prior SEQRA analysis or issues that need further analysis based on the expansion of the State’s energy storage deployment target.

1.2 PURPOSE AND OBJECTIVES OF THE ENERGY STORAGE ROADMAP

Consistent with Title 6 of NYCRR §617.9(b)(5)(1), this section provides a concise description of: (1) the need and purpose of the 6 GW Roadmap, and (2) the actions proposed to achieve the 6 GW Roadmap goals. This section builds on and references material from section 1.2 of the 2018 GEIS, with a particular focus on describing the changes from the 3 GW Roadmap. Accordingly,

this section is not intended to be an exhaustive or definitive discussion of the 6 GW Roadmap, but rather a targeted discussion of the 6 GW Roadmap for the purposes of the SGEIS, as required under SEQRA.

1.2.1 Energy Storage Roadmap Background, Purpose, and Need

The 3 GW Roadmap initiated a process of developing policies, market mechanisms, and funding programs to support energy storage projects in New York State. The results of the 3 GW Roadmap led to the creation of the 1.5 GW by 2025 target, as well as the goal of 3 GW by 2030, which were supported by a set of Market Acceleration Bridge Incentive programs administered by NYSERDA.

Since the publication of the 3 GW Roadmap, several public policy and economic changes have taken place. Specifically, the CLCPA was passed in 2019, codifying the 3 GW storage target and directing full decarbonization of the electricity sector, including a focus on utilizing storage for the integration of renewables and offsetting emissions from peaking facilities. Furthermore, other resource-specific targets have affected the value and need for storage resources, including the 9 GW offshore wind target, the 70 percent by 2030 renewable energy target, and the expansion of the NY-Sun program to 10 GW. Supply chain constraints and inflation arising from the coronavirus pandemic are also likely to impact energy storage project costs and development. More recently, passage of the Inflation Reduction Act at the Federal level has created a new support mechanism for standalone energy storage projects in the form of an Investment Tax Credit (ITC) to spur energy storage development.

The 6 GW Roadmap highlights that a new 2030 target of 6 GW will play an important role in achieving decarbonization and other goals of the CLCPA. The revised 6 GW target will put the State on a more sustainable trajectory toward full decarbonization by supporting grid reliability and accelerating the integration of renewable generation. It is also projected to reduce the projected future electric system costs by approximately \$2 billion, in addition to public health benefits resulting from reduced exposure to harmful pollutants from fossil fuel resources.³

1.2.2 Energy Storage Roadmap Proposed Action

The Proposed Action doubles the deployment of the State's energy storage from the currently legislated 3 GW to 6 GW by 2030. The State's current energy storage commitments total approximately 1.3 GW.⁴ Therefore, at least 4.7 GW of new projects will need to be procured in time for deployment by 2030. To maximize the feasibility of these procurements, diversify technology options, and take advantage of the unique benefits provided by different market segments, the 6 GW Roadmap recommends new programs be developed for bulk, retail, and residential storage projects across the state. The 6 GW Roadmap recommends procurement of

³ NYSERDA. 2022. New Framework Announced to Achieve Nation-Leading Six Gigawatts of Energy Storage by 2030. Accessed on June 30, 2023 at: <https://www.nyserdera.ny.gov/About/Newsroom/2022-Announcements/2022-12-28-Governor-Hochul-Announces-New-Framework-to-Achieve-Nation-Leading-Six-Gigawatts-of-Energy>

⁴ NYSERDA. Energy Storage. Accessed on June 30, 2023 at: <https://www.nyserdera.ny.gov/All-Programs/Energy-Storage-Program>

3,000 MW of bulk storage projects through a new Index Storage Credit mechanism and proposes 1,500 MW of new retail storage and 200 MW of new residential storage.

1.2.3 From 3 GW to 6 GW Storage Target

To achieve the goals of the CLCPA, the New York State electricity system faces a two-pronged challenge: (i) the generation and transmission system must expand significantly to meet rapidly growing electricity demand as a result of the electrification of the building, transportation, and industrial sectors; and (ii) the system must transform to become powered primarily by variable renewable energy.

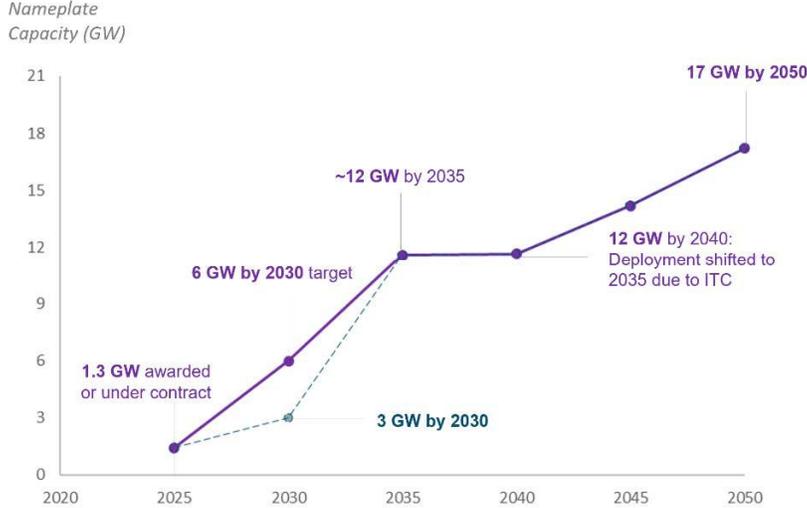
Energy storage can play a critical role in supporting the integration of such quantities of variable renewable energy, as well as providing reliable capacity to meet growing peak demand. The analysis performed for the 6 GW Roadmap suggests that about 12 GW of short-duration storage by 2040 and more than 17 GW by 2050 will be core elements of a cost-effective decarbonized electric grid. Compared to current statewide storage deployments of around 292 MW, these projections reflect the need for significant increases in storage capacity.⁵ New York has recognized the need to help industry scale to such levels, including gaining operating experience with multiple use cases and building and interconnecting storage resources at a feasible pace. Interim targets such as New York's 2025 target of 1.5 GW and 2030 target of 3 GW play a role in providing the glide path towards the levels of storage needed for the longer term; however, maintaining the 3 GW target by 2030 could have the unintended effect of inducing a challenging (or unsustainable) pace of storage deployments between 2030 and 2040.

Accelerating the pace of storage deployments over the next decade to achieve a 6 GW target by 2030 would place the State on a more sustainable trajectory and would ensure that the resources needed to integrate renewables are online and operational at a timing that better matches with expected increases in the deployment of renewable resources.

Furthermore, the 6 GW Roadmap highlights the opportunity to leverage federal incentives to build out most of the expected 2040 storage deployments earlier, given that these credits could phase down as early as 2032. For example, as shown in **Exhibit 1-1**, to meet system needs and maximize cost-effectiveness by capturing the federal ITC, the 6 GW Roadmap finds that nearly 12 GW of energy storage be fully deployed as early as 2035. This context underscores the importance of an increased 2030 target of 6 GW to position the State to pursue such an accelerated opportunity.

⁵ NYSERDA. 2023. Statewide Energy Storage Projects. Accessed on July 27, 2023 at: <https://www.nyserd.ny.gov/All-Programs/Energy-Storage-Program/Storage-Data-Maps/Statewide-Energy-Storage-Projects>

Exhibit 1-1: Statewide Battery Storage Capacity Targets and Storage Deployment to Meet System Needs



Note: The 3 GW Roadmap established a 1.5 GW target for 2025. 1.3 GW has been awarded or contracted as of 2022.

Source: NYSERDA/NYSDDS, 2022. New York's 6 GW Energy Storage Roadmap.

1.3 LOCATION OF STORAGE DEPLOYMENT AND STORAGE MARKET SEGMENTS

Storage is expected to provide value to the New York electric grid in each region of the state. The ability of downstate storage (particularly in New York City and Long Island) to integrate offshore wind, and to help meet local capacity requirements, makes downstate storage builds attractive. In the long run, the larger potential for cheaper land-based wind and solar development upstate and the lower cost of storage construction upstate are expected to drive storage builds in upstate New York.

Analysis carried out for the 6 GW Roadmap found that two-thirds of all energy storage in a least-cost scenario will be developed in downstate New York, including New York City and Long Island, where the electricity system is constrained and where the majority of peaker plants are located. Developing storage capacity where fossil fuel peaker plants exist would provide an alternative source of clean peak energy to the state. See **Chapter 4** for more discussion of the location of proposed storage capacity.

The bulk storage segment is expected to deliver the most significant increase in deployment. The bulk segment currently has over 10 GW of energy storage in the New York Independent System Operator (NYISO) pipeline, with additional projects at earlier stages of development. The 6 GW Roadmap therefore proposes relying on bulk storage for a significant proportion of new projects, with at least 3 GW of bulk storage procured over three annual procurements starting in 2024.

For retail and residential programs, deployment amounts depend on market demand over time. **Exhibit 1-2** illustrates the annual procurement amounts consistent with the total target allocation of 3 GW of bulk, 1.5 GW of retail, and 200 MW of residential storage. The expected deployment dates of retail and bulk projects are several years after their procurement dates, hence the reason for the planned procurements early in the program term. These trajectories for retail and residential storage are illustrative and may vary depending on the timing of new programs and

specific project commissioning dates. As necessary, target allocations can be adjusted over time according to deployments in other programs.

Exhibit 1-2: Illustrative New Program Procurement Schedule

NEW PROGRAM PROCUREMENTS	2023	2024	2025	2026	2027	2028	2029	2030
Bulk (3,000 MW)	0	1,000	1,000	1,000	0	0	0	0
Retail (1,500 MW)	0	375	375	375	375	0	0	0
Residential (200 MW)	13	27	27	27	27	27	27	27
Annual Total	13	1,402	1,402	1,402	402	27	27	27
Cumulative Total	13	1,415	2,817	4,218	4,620	4,647	4,673	4,700

Source: NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap.

1.4 RELATIONSHIPS TO OTHER PLANS AND PROGRAMS

The 2018 GEIS discusses a range of plans and programs, including the REV and Clean Energy Fund (CEF) programs, that have directly or indirectly supported energy storage technologies and deployment in the State. The 6 GW Roadmap is a part of a broader suite of policies and initiatives designed to achieve the goals of CLCPA, which calls for the State to achieve 70 percent renewable electricity by 2030 and 100 percent zero-emissions electricity by 2040.

On August 16, 2022, President Biden signed the Inflation Reduction Act of 2022 (IRA) into law. The IRA includes a range of incentives aimed at accelerating the deployment of emissions-free electricity including modification of a tax credit applicable to energy storage.

Overall, the enactment of the IRA – specifically, its extension and modification of the ITC as it relates to standalone storage – is anticipated to have a positive effect on the deployment of energy storage by improving project economics. In particular, these provisions will help to mitigate equipment and installed cost increases experienced in 2021 and 2022 and expand the siting and benefits of storage to disadvantaged and low-income communities.

CHAPTER 2 | THE ELECTRIC INDUSTRY IN NEW YORK STATE

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) § 617.9(b)(5)(ii), this chapter provides information on changes to the New York State (the State) energy industry as it relates to the implementation of the Proposed Action. The 2018 Generic Environmental Impact Statement (GEIS) discussed the state of the energy storage market in the State and the contemporary regulatory environment. In addition, it provided detailed information on the State's electric industry, including its history and the trend of diversifying energy capacity and decreasing net electricity usage. This chapter builds upon and incorporates reference material from Chapter 2 of the 2018 GEIS. This Supplemental GEIS (SGEIS) provides a description of the changes in those conditions relevant to evaluating the potential environmental impacts of the Proposed Action.

This chapter is organized into the following sections:

- **Section 2.1** introduces the existing regulatory environment underlying the State's electricity industry;
- **Section 2.2** discusses the current trends in electricity demand and generation in the State;
- **Section 2.3** discusses the current state of energy storage deployment in the State.

2.1 REGULATORY ENVIRONMENT

The 2018 GEIS describes the regulatory apparatus governing the electricity industry in the State, including the 2015 State Energy Plan that describes the coordination of agencies required to advance the State's energy goals.

Since the 2018 GEIS, the State's Governor signed the Climate Leadership and Community Protection Act (CLCPA) in June 2019, which increases the State's clean energy goal from 50 percent renewables to 70 percent renewables by 2030 and calls for 100 percent zero-emissions electricity by 2040. The CLCPA complements several New York State policies over the past several years that have established goals aimed at increasing renewables use and reducing greenhouse gas (GHG) emissions. The CLCPA codifies the 3-gigawatt (GW) storage target and directs full decarbonization of the electricity sector, including a focus on utilizing storage for the integration of renewables and offsetting highly polluting peaking facilities. The CLCPA also increases the offshore wind procurement goal from 2.4 GW by 2030 to 9 GW by 2035 and increases the distributed solar energy goal from 3 GW by 2023 to 6 GW by 2025.

The Department of Environmental Conservation's Peaker Rule, adopted at the end of 2019, reduces ozone-contributing pollutants associated with New York State-based peaking unit generation. Compliance obligations phased in between 2023 and 2025 will affect approximately 3,300 megawatts (MW) of electricity generation.

2.2 CURRENT ELECTRICITY DEMAND AND CAPACITY

Electricity consumption in the State has been declining for over two decades, with some variability year-to-year. According to the U.S. Energy Information Administration (EIA), the State has the third lowest energy consumed per capita (as of 2020)⁶ but the eighth highest average residential retail price of electricity (as of February 2023).⁷ The economic and behavioral changes stemming from the COVID-19 pandemic further affected 2020 and 2021 load levels and load shapes relative to a typical year. The impact of the pandemic on total energy consumption in 2020 was significant, whereas impacts on total load were much smaller in 2021. In 2021 and 2022, remaining load reductions tied to the pandemic were concentrated in New York City (New York Independent System Operator [NYISO] Zone J). The remainder of the state has largely recovered to, or exceeded, pre-pandemic expected load levels.⁸ Forecasts assume continued load recovery in Zone J through 2024 (both energy and peak demand levels), along with increasing demand due to strong economic growth and impacts from electric vehicles and building electrification.⁹

As shown in Exhibit 2-1, peak electrical demand reached 30,505 MW in 2022 with annual energy usage at 152,681 gigawatt hours (GWh). Peak demand is forecasted to reach 32,048 MW in 2023.¹⁰ Forecasts generally show a continued increase in annual energy use as well as peak electrical demand for the foreseeable future. As illustrated in **Exhibit 2-1** and **Exhibit 2-2**, the majority of the state's electrical demand is located in downstate areas, while most of the state's power supply is located in upstate areas. The geographical distribution of electricity demand is forecasted to remain consistent for the foreseeable future.

⁶ EIA. 2020. Rankings: Total Energy Consumed per Capita. Accessed on June 30, 2023 at: <https://www.eia.gov/state/rankings/?sid=NY#/series/12>

⁷ EIA. 2023. Rankings: Average Retail Price of Electricity to Residential Sector. Accessed on June 30, 2023 at: <https://www.eia.gov/state/rankings/?sid=NY#/series/31>

⁸ NYISO. 2023. 2023 Load & Capacity Data “Gold Book.” Accessed on June 29, 2023 at: <https://www.nyiso.com/documents/20142/2226333/2023-Gold-Book-Public.pdf/c079fc6b-514f-b28d-60e2-256546600214>

⁹ Ibid.

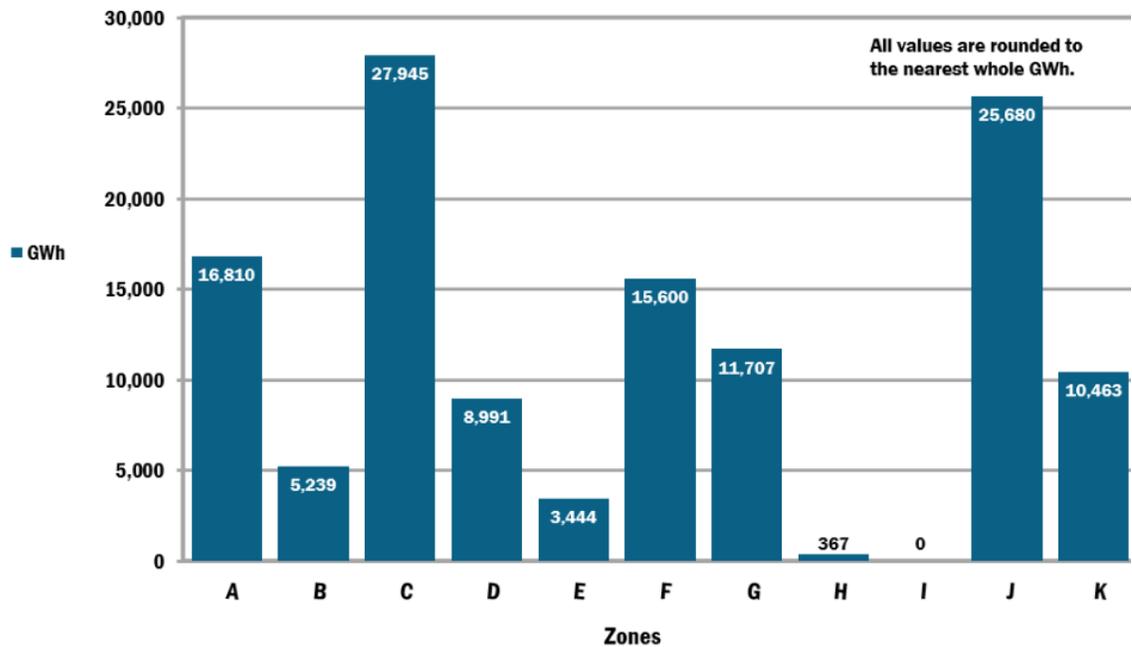
¹⁰ NYISO. 2023. 2023 Load & Capacity Data “Gold Book.” Accessed on June 29, 2023 at: <https://www.nyiso.com/documents/20142/2226333/2023-Gold-Book-Public.pdf/c079fc6b-514f-b28d-60e2-256546600214>

Exhibit 2-1: 2022 Peak Electricity Demand, by New York Control Area Load Zone

STATE SUB-AREA	NEW YORK CONTROL AREA LOAD ZONE	2022 ANNUAL ENERGY USAGE (GWH)	PEAK DEMAND (MW)	
			SUMMER	WINTER
Upstate	A (West)	14,687	2,489	2,087
	B (Genesee)	9,616	1,921	1,566
	C (Central)	15,365	2,689	2,637
	D (North)	5,884	733	721
	E (Mohawk Valley)	7,357	1,269	1,344
	F (Capital)	11,935	2,292	1,927
	G (Hudson Valley)	9,325	2,133	1,580
Downstate	H (Milwood)	2,902	631	487
	I (Dunwoodie)	5,775	1,301	872
	J (New York City)	49,740	9,934	7,070
	K (Long Island)	20,095	5,113	3,078
Upstate Subtotal		74,169	13,526	11,862
Downstate Subtotal		78,512	16,979	11,507
Total		152,681	30,505	23,369

Source: NYISO. 2023. 2023 Load & Capacity Data “Gold Book.” Accessed on June 29, 2023 at: <https://www.nyiso.com/documents/20142/2226333/2023-Gold-Book-Public.pdf/c079fc6b-514f-b28d-60e2-256546600214>

Exhibit 2-2: 2022 New York Control Area (NYCA) Energy Production by Zone



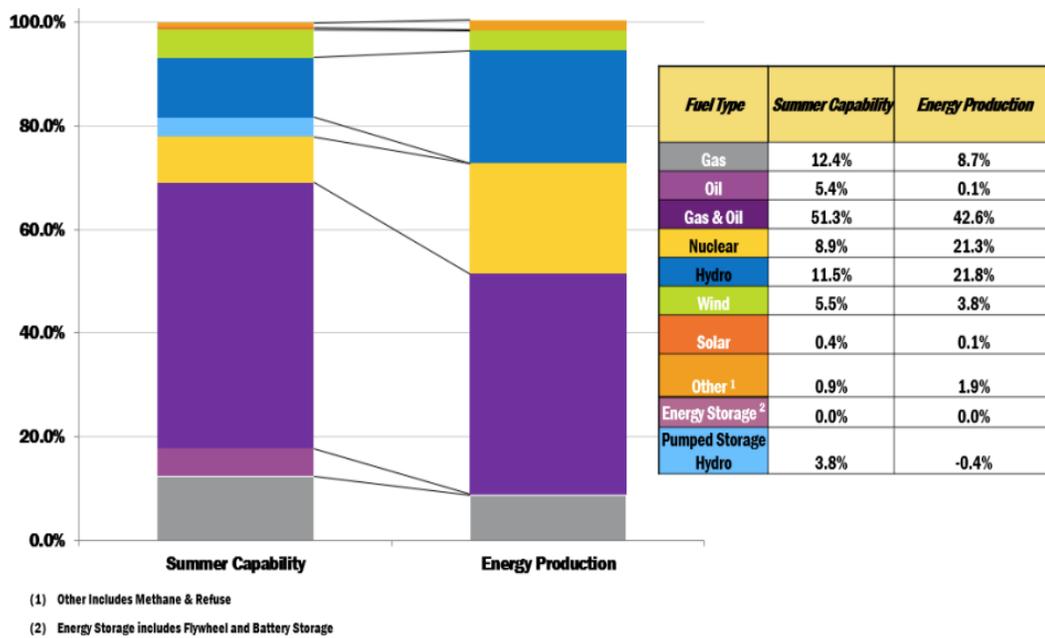
Source: NYISO. 2023. 2023 Load & Capacity Data “Gold Book.” Accessed on June 29, 2023 at: <https://www.nyiso.com/documents/20142/2226333/2023-Gold-Book-Public.pdf/c079fc6b-514f-b28d-60e2-256546600214>

Exhibit 2-3 details the State’s power generation and capacity by fuel type. The majority of the state’s generation continues to come from three fuel types: dual-fuel (gas and oil) facilities,

nuclear, and hydropower. Dual-fuel facilities also constitute more than half of the state’s total capacity (based on 2022 summer capability). Since the 2018 GEIS, the percentage of capacity and generation of dual fuel gas has increased modestly, while the percentage of capacity and generation of nuclear facilities has decreased considerably. Nuclear generation declined after the Indian Point facility, which accounted for nearly two-fifths of the State's nuclear generating capacity in 2019, was retired at the end of April 2021.¹¹

Renewables accounted for about 28 percent of generating capacity in 2022 with hydropower constituting almost 22 percent of the total electricity generation. Energy generation through wind stands at just four percent and is forecasted to continue expanding in the future. Renewables supplied a larger share of the state’s net generation than nuclear power for the first time in 2020.

Exhibit 2-3: 2022 NYCA Energy Production and Summer Capability by Fuel Type



Source: NYISO. 2023. 2023 Load & Capacity Data “Gold Book.” Accessed on June 29, 2023 at: <https://www.nyiso.com/documents/20142/2226333/2023-Gold-Book-Public.pdf/c079fc6b-514f-b28d-60e2-256546600214>

In 2019, the New York State Department of Environmental Conservation adopted the Peaker Rule, which affects approximately 3,300 MW of dispatchable and flexible electricity generation, primarily downstate.¹² The rule, which imposes stricter nitrogen oxide emission rate caps, takes effect in 2023. As of May 2023, the Peaker Rule resulted in the closure of 950 MW of generation in environmental justice areas that include low-income or minority communities located in the

¹¹ EIA. 2022. Profile Analysis. Accessed on June 30, 2023 at: <https://www.eia.gov/state/analysis.php?sid=NY>

¹² NYISO. 2023. 2023 Power Trends: A Balanced Approach to a Clean and Reliable Grid. Accessed on June 29, 2023 at: <https://www.nyiso.com/documents/20142/2223020/2023-Power-Trends.pdf/7f7111e6-8883-7b10-f313-d11418f12fbf?t=1686132123808>

City of New York (Zone J).¹³ To ensure that reliability margins are not at risk, the Peaker Rule includes provisions which allow generation to remain in operation for limited timeframes to address reliability needs arising from their deactivation.

2.3 CURRENT STATUS OF ENERGY STORAGE DEPLOYMENT

The 2018 GEIS discussed the contemporary energy storage market, focusing on the technology, regulatory environment, and market demand/capacity for energy storage in the State. The document described the benefits of energy storage technologies and the four types of energy storage technologies: chemical, electrical, thermal, and mechanical. Furthermore, it described the policy and regulatory environment for energy storage at both the federal and state levels, in addition to NYISO's vision of the energy storage market in the State.

2.3.1 Progress in Energy Storage Deployment

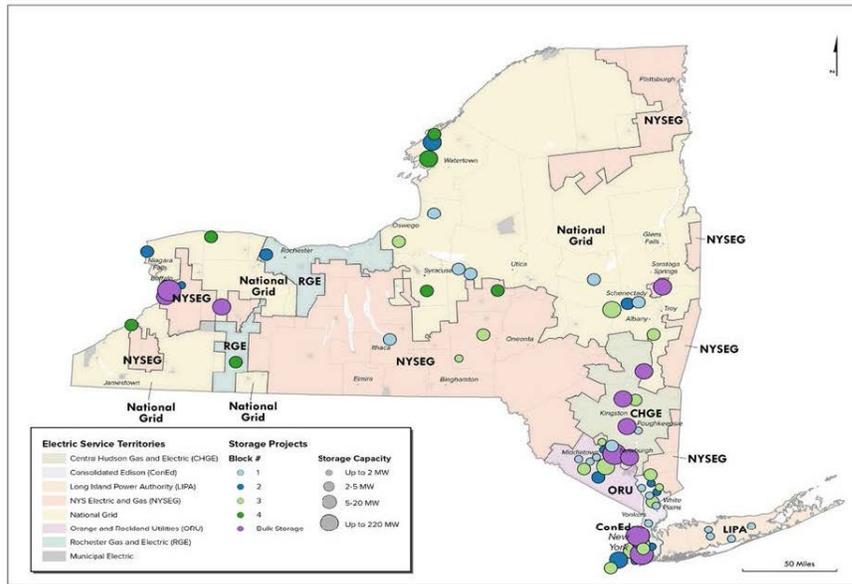
The portfolio of programs and actions approved by the New York State Public Service Commission (the Commission) in the 2018 Energy Storage Order endeavored to support New York's then-nascent energy storage market. As of August 2023, 1,267 MW of energy storage projects have been installed/awarded/contracted.¹⁴ This represents 84 percent of the 2025 target of 1,500 MW. Of the awarded or contracted projects, approximately 774 MW have been approved for funding under the New York State Energy Research and Development Authority's (NYSERDA) 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 MW providing wholesale services; (2) commercial retail energy storage systems up to 5 MW; and (3) single-family residential energy storage systems installed with solar photovoltaic on Long Island. **Exhibit 2-5** presents the breakdown of installed, awarded, and contracted project. Of this total, 297 MW are currently installed across the state.¹⁵

¹³ NYISO. 2023.2023 Power Trends: A Balanced Approach to a Clean and Reliable Grid. Accessed on June 29, 2023 at: <https://www.nyiso.com/documents/20142/2223020/2023-Power-Trends.pdf/7f7111e6-8883-7b10-f313-d11418f12fbf?t=1686132123808>

¹⁴ NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap. Additional discussions of NYSERDA staff for updates after the Roadmap publication.

¹⁵ NYSERDA. Statewide Energy Storage Projects. Accessed on August 30, 2023 at: <https://www.nyserda.ny.gov/All-Programs/Energy-Storage-Program/Storage-Data-Maps/Statewide-Energy-Storage-Projects>

Exhibit 2-4: Energy Storage Projects Receiving Bridge Incentives



Source: NYSERDA/NYSDDPS. 2022. New York’s 6 GW Energy Storage Roadmap.

Exhibit 2-5: Energy Storage Installed, Contracted, or Awarded

PROGRAM	STORAGE (MW)
NYSERDA Bridge Incentive Program	777
<i>Bulk</i>	480
<i>Commercial Retail</i>	283
<i>Long Island Residential</i>	14
Utility Bulk Storage Dispatch Rights Procurement	120
Renewable Energy Standard	240
NYPA North Country Project	20
Utility Demonstration and NWA Projects	56
Other Projects	54
TOTAL	1,267
% of 2025 Goal	84%
% of 2030 Goal	42%

Source: NYSERDA/NYSDDPS. 2022. New York’s 6 GW Energy Storage Roadmap, with updates from NYSERDA.

As of December 2022, approximately 12.3 GW of proposed energy storage projects are presently in either distribution-level or wholesale-level interconnection queues in New York.¹⁶ Con Edison has 676 MW of energy storage projects in its distribution-level interconnection queue, LIPA has 222 MW of projects in its interconnection queue, and an additional 691 MW are in interconnection queues administered by the other IOUs throughout the State. These interconnection queues reflect projects in the pipeline that are being considered but have not yet been built, and the vast majority are not expected to proceed to completion without further economic support.¹⁷

¹⁶ NYSERDA/NYSDDPS. 2022. New York’s 6 GW Energy Storage Roadmap. p. 12.

¹⁷ Ibid.

CHAPTER 3 | ENVIRONMENTAL SETTING

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.9(b)(5)(ii), this chapter provides a “concise description of the environmental setting of the areas to be affected, sufficient to understand the impacts of the proposed action and alternatives.” This Supplemental Generic Environmental Impact Statement (SGEIS) incorporates reference material from the Generic Environmental Impact Statement (GEIS) and provides relevant updates whenever necessary. The environmental setting described in this chapter serves as a baseline of the existing environmental conditions against which **Chapter 5** through **Chapter 10** evaluate and compare the potential impacts of New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap).

Because the environmental setting is largely unchanged since the original GEIS, this chapter primarily directs readers to the original GEIS for detailed information and summarizes the key points previously identified (**Section 3.1**). The exceptions to this are climate and air quality (**Section 3.2**) and socioeconomic and environmental justice (**Section 3.3**), for which the substantive changes that have occurred since the original GEIS are described in more detail here.

3.1 SUMMARY OF UNCHANGED ENVIRONMENTAL SETTING COMPONENTS

The following components of the environmental setting are described in detail in the original GEIS. The bullets below summarize key information relevant to the 6 GW Roadmap; more details can be found in the original GEIS.

- **Physical Geography:** New York State (New York or the State) is the 27th largest state in the U.S. by size, covering more than 47,000 square miles (30.1 million acres),¹⁸ including approximately 1,600 square miles (1.0 million acres) of inland water bodies.¹⁹ Approximately 40 percent of the State has an elevation of more than 1,000 feet above sea level. However, elevation on Manhattan does not exceed 265 feet above sea level and averages 33 feet above sea level.²⁰
- **Land Use:** Existing land uses are largely a function of local topography. For example, the highlands of eastern New York form natural barriers to transportation and settlement. As such, most New Yorkers live in the lowland areas, including the Lake Champlain and Hudson River Valleys, and south of the Hudson Highlands, where the topography slopes down to sea level in New York City and Long Island. The majority of land in New York City is developed for residential, mixed use, commercial, institutional, and industrial.

¹⁸ U.S. Census Bureau. State & County Quick Facts – New York. Accessed on April 27, 2018 at: <https://www.census.gov/quickfacts/fact/table/US,NY/PST045216>.

¹⁹ Cornell University. The Climate of New York. Accessed on April 27, 2018 at: <http://archive.today/UGwJ>.

²⁰ Ibid.

However, New York City’s system of parks and open spaces – in all five boroughs – covers 14 percent of the city, totaling approximately 29,000 acres.²¹

- **Water Resources:** The southern part of the State sits on the shore of the North Atlantic Ocean. New York includes nearly 1.2 million acres of salt and brackish water in the marine and coastal areas, and more than 2,800 miles of shoreline.²² The U.S. Geological Survey (USGS) estimates the total acreage of wetlands in the State at approximately 2.4 million acres (or eight percent of the State’s total land area), including over two million acres of freshwater wetlands and 25,000 acres of tidal wetlands.²³ In terms of drinking water, approximately three quarters of the population rely on surface water and one quarter relies on groundwater.²⁴ Water is used in electric power generation to spin turbines directly (hydropower) or indirectly (steam-electric power) or for cooling generation equipment.
- **Species Biodiversity:** The biodiversity of the State includes all different species of animals, plants, fungi, microorganisms, and bacteria. According to the U.S. Fish and Wildlife Service (USFWS) database, the State has 24 federally-listed threatened and endangered animal species, of which 18 species are endangered and six species are threatened.²⁵
- **Culture and Historic Resources:** New York is home to a number of cultural and historical resources including 24 National Parks, 273 National Historical Landmarks, 6,411 National Register of Historic Places Listings, and numerous locally designated historic sites and archaeological resources.²⁶
- **Waste Management:** The total waste stream in the State included 42.2 million tons in 2018, including construction and demolition debris (46%), municipal solid waste (45%), non-hazardous industrial waste (5%), and biosolids (4%). A third of the total waste stream

²¹ City of New York. 2013. A Stronger More Resilient New York: Chapter 11 Parks. Accessed on May 7, 2018 at: http://www.nyc.gov/html/sirr/downloads/pdf/final_report/Ch_11_Parks_FINAL_singles.pdf.

²² NYSDEC. Oceans and Estuaries. Accessed on April 30, 2018 at: <http://www.dec.ny.gov/lands/207.html>.

²³ USGS. National Water Summary on Wetland Resources. State Summary Highlight. Water Supply Paper 2425. Accessed on April 30, 2018 at: http://water.usgs.gov/nwsum/WSP2425/state_highlights_summary.html.

²⁴ New York State Department of Health. Drinking Water Program: Facts and Figures. Accessed on April 30, 2018 at: https://www.health.ny.gov/environmental/water/drinking/facts_figures.htm. The population count includes the population served by the New York City Water System, which includes a transient sub-population of approximately 2.8 million people.

²⁵ U.S. Fish and Wildlife Service. Federally Listed, Proposed, and Candidate Endangered and Threatened Species in New York. Accessed on May 14, 2018 at: <https://www.fws.gov/northeast/nyfo/es/SELIST10-15-2015.pdf>.

²⁶ National Park Service. 2020. Find a Park: New York. Accessed on July 21, 2023 at: <https://www.nps.gov/state/ny/index.htm>

is disposed of in landfills in the State, and 43 percent is recycled; the remaining waste is exported or combusted.²⁷

- **Public Health:** The GEIS summarizes various relevant health stressors and outcomes in the state including asthma prevalence, which is exacerbated by pollutants such as particulate matter (PM) produced by fossil fuel electricity generation. As of 2020, an estimated 8.2 percent of children in the State had asthma. Black children are almost twice as likely to have asthma than white children (7.0% versus 13.9%).²⁸
- **Community Character:** A community's character is defined by a combination of elements, including local natural features, land uses, development patterns, population growth and density, and regional socioeconomic patterns. Population density varies widely across the State, from 2.5 people per square mile in Hamilton County to 71,151 people per square mile in New York County.²⁹ Community types across the state include rural agricultural, rural hamlet, village, suburban, urban, industrial, and developed shoreline.³⁰

3.2 CLIMATE AND AIR QUALITY

The GEIS provides a brief overview of the climate in the State, including a discussion of the effects of climate change on the State and its energy infrastructure. Climate change continues to impact the State, and future climate projections for the State include:³¹

- Historically unprecedented warming during this century, even under a low-emission scenario;
- Increase in sea level rise more than global projections;
- Increase in tidal flood days;
- Increased winter precipitation falling as rain rather than snow; and
- Increased intensity and frequency of precipitation events.

These impacts interact with the energy sector and the 6 GW Roadmap in a number of ways. Warmer temperatures are related to increased demand for energy for cooling (i.e., air conditioning). As temperatures increase, particularly in the summer months, demand for electricity

²⁷ New York State Department of Environmental Conservation. 2023. New York State Solid Waste Management Plan. Accessed July 21, 2023 at: https://www.dec.ny.gov/docs/materials_minerals_pdf/draftsswmpmainplan.pdf

²⁸ New York State Department of Health. 2022. Behavioral Risk Factor Surveillance System (BRFSS) as of August 2022. Accessed July 21, 2023 at: https://webb1.health.ny.gov/SASStoredProcess/guest?_program=/EBI/PHIG/apps/asthma_dashboard/ad_d_ashboard&p=sh

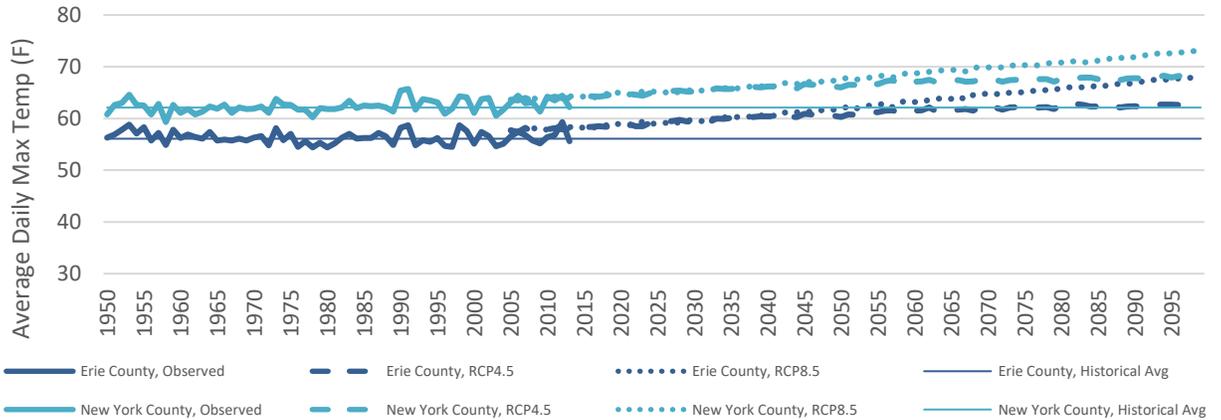
²⁹ New York State Department of Health. 2023. Vital Statistics of New York State 2020. Accessed on July 21, 2023 at: https://www.health.ny.gov/statistics/vital_statistics/2020/

³⁰ Chapter 4.14 of the Indian Point Contingency Plan Draft Generic Environmental Impact Statement. DPS and Ecology and Environment Inc. 2013. Indian Point Contingency Plan Final Generic Environmental Impact Statement. Prepared for New York State Public Service Commission. July 2013. Accessed on May 7, 2018 at: <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B1CFCC090-1E99-4A8C-BC0C-56764C8985AD%7D>.

³¹ New York State Department of Environmental Conservation. Climate Change Effects and Impacts. Accessed on July 21, 2023 at: <https://www.dec.ny.gov/energy/94702.html>

will continue to rise.³² **Exhibit 3-1** shows projected temperatures for two locations in New York: New York County (New York City) and Erie County (Buffalo).

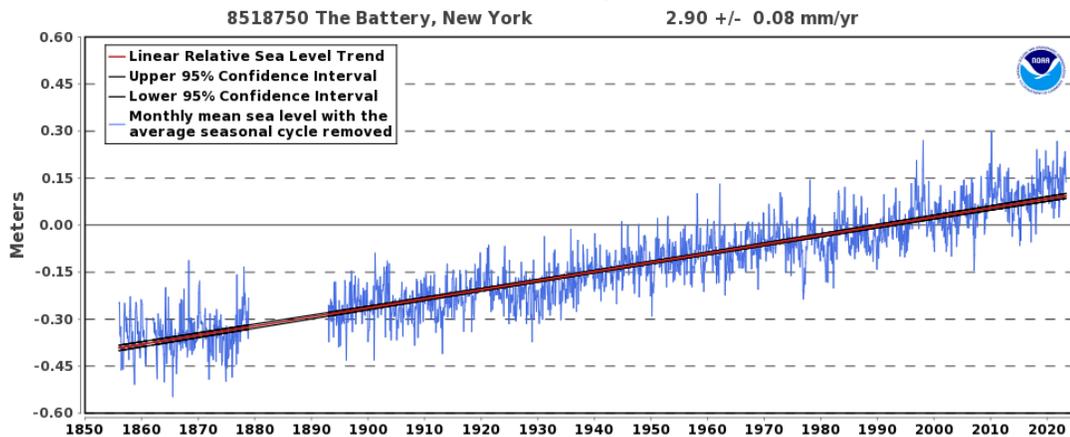
Exhibit 3-1: Average Daily Maximum Temperatures: Observed and Projected Values



Source: The Climate Explorer. Accessed July 21, 2023 at: https://crt-climate-explorer.nemac.org/climate_graphs/

Sea level rise could also impact where energy storage facilities are located based on flood risk. **Exhibit 3-2** presents sea level rise trends in New York City. Future capacity expansions will have to consider flood risk in siting decisions.

Exhibit 3-2: Observed Sea Level in New York City



Source: NOAA. Tides & Currents. Mean Sea Level Trend 8518750 The Battery, New York. Accessed on July 21, 2023 at: https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8518750.

Extreme precipitation is also expected to occur more frequently with climate change. In addition to increasing inland flood risks, which could damage storage infrastructure, associated lightning could cause power surges and further damage. The frequency of lightning strikes across the U.S. is

³² Note that decarbonization policies promoting electrification of heating systems could also result in increased electricity demand during winter months (Energy and Environmental Economics, Inc. 2020. Pathways to Deep Decarbonization in New York State. Available at: <https://climate.ny.gov/-/media/Project/Climate/Files/2020-06-24-NYS-Decarbonization-Pathways-Report.pdf>)

projected to increase by 12 percent for each degree (Celsius) of warming.³³ “Storm-related issues” were cited as the cause for two recent fire events at the Convergent Energy lithium ion battery storage site in Warwick, NY.³⁴

Information on air quality is discussed further in the GEIS.

3.3 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

As discussed in the GEIS, the socioeconomic setting that may be affected by the approval of the 6 GW Roadmap comprises several factors: employment levels; housing requirements; municipal revenues; and electricity rates. Depending on the geographic footprint of energy storage and potential effects on electricity rates, environmental justice issues may also emerge. The GEIS briefly discussed the general demographics, employment characteristics, income and wage characteristics, housing characteristics, municipal revenue, and environmental justice in the State. Many of these characteristics have not changed since the publication of the GEIS except for the regulatory framework regarding environmental justice in the State, which is the sole focus of this section of the SGEIS.

The Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.³⁵ Environmental justice efforts focus on improving the environment in communities that face disproportionate adverse environmental impacts.

As discussed in the GEIS, the New York State Department of Environmental Conservation (NYSDEC) promulgated regulations at 6 NYCRR Part 487 for incorporating environmental justice consideration into proceedings before the New York State Board on Electric Generation and the Environment for determining whether to site major electric generating facilities pursuant to Article 10 of the Public Service Law.³⁶ For matters overseen by the NYSDEC, for example NYSDEC’s environmental permit review process and NYSDEC’s application of New York’s State Environmental Quality Review Act (SEQRA), NYSDEC Commissioner Policy 29 on Environmental Justice and Permitting (CP-29) provides guidance to NYSDEC staff on environmental justice issues. More recently, the Climate Leadership and Community Protection

³³ Romps, D.M., Seeley, J.T., Vollaro, D. and Molinari, J., 2014. Projected increase in lightning strikes in the United States due to global warming. *Science*, 346(6211), pp.851-854.

³⁴ Gorman-Jones, Jessica. 2023. As 2 lithium-ion battery site fires smolder in Warwick, more questions raised over Staten Island facilities. SI Live. Published July 9, 2023. Accessed July 31, 2023 at: <https://www.silive.com/news/2023/07/as-2-lithium-ion-battery-site-fires-smolder-in-warwick-more-questions-raised-over-staten-island-facilities.html>

³⁵ EPA. 2013. Environmental Justice-Related Terms As Defined Across the PSC Agencies. Accessed on July 21, 2023 at: <https://www.epa.gov/sites/default/files/2015-02/documents/team-ej-lexicon.pdf>

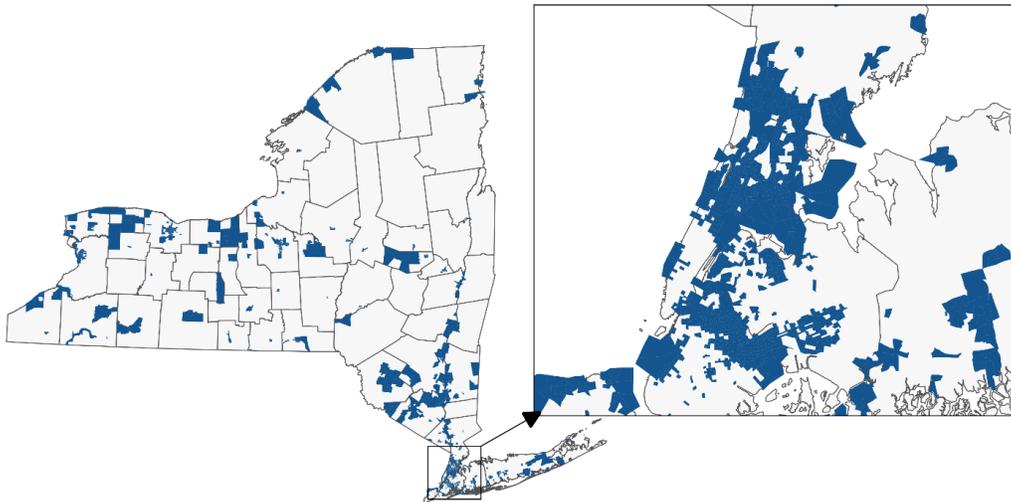
³⁶ NYSDEC. 2018. Environmental Justice. Accessed on May 7, 2018 at: <http://www.dec.ny.gov/public/333.html>.

Act (CLCPA), signed into law in 2019, aims to address the disproportionate impacts from climate change and environmental pollution on Disadvantaged Communities. Under the CLCPA:³⁷

Disadvantaged Communities shall be identified based on geographic, public health, environmental hazard, and socioeconomic criteria, which shall include but are not limited to: (i) areas burdened by cumulative environmental pollution and other hazards that can lead to negative public health effects; (ii) areas with concentrations of people that are of low income, high unemployment, high rent burden, low levels of home ownership, low levels of educational attainment, or members of groups that have historically experienced discrimination on the basis of race or ethnicity; and (iii) areas vulnerable to the impacts of climate change such as flooding, storm surges, and urban heat island effects.

The CLCPA directed the Climate Justice Working Group (CJWG) to establish criteria for defining Disadvantaged Communities. **Exhibit 3-3** identifies areas throughout the State that meet the final Disadvantaged Community definition as voted on by the CJWG. The Disadvantaged Communities criteria will be used for four statutory purposes: co-pollutant reductions, greenhouse gas emissions reductions, regulatory impact statements, and allocation of clean energy and energy efficiency investments. Specific to the final purpose, the state is directed to provide no less than 35 percent of benefits, with a goal of 40 percent of benefits, to Disadvantaged Communities.³⁸

Exhibit 3-3: Final Disadvantaged Communities, 2023



Source: Disadvantaged Communities from NYSERDA. Final Disadvantaged Communities (DAC) 2023. Accessed on July 19, 2023 at <https://data.ny.gov/Energy-Environment/Final-Disadvantaged-Communities-DAC-2023/2e6c-s6fp>

³⁷ New York State Climate Justice Working Group. 2022. Accessed on July 20, 2023 at: <https://climate.ny.gov/-/media/Project/Climate/Files/Disadvantaged-Communities-Criteria/Technical-Documentation-on-Disadvantaged-Community-Criteria.pdf>

³⁸ New York State Climate Justice Working Group. 2022. Draft Disadvantaged Communities Criteria and List Technical Documentation. Accessed July 21, 2023 at: <https://climate.ny.gov/-/media/Project/Climate/Files/Disadvantaged-Communities-Criteria/Technical-Documentation-on-Disadvantaged-Community-Criteria.pdf>

Across the state, 36 percent of the population lives in Disadvantaged Communities. The population is split relatively evenly between New York City and the rest of the state (59% of the total population living in Disadvantaged Communities lives in New York City). However, people living in New York City are more likely to live in Disadvantaged Communities than people living in the rest of the state (49% of New York City residents live in Disadvantaged Communities versus 26% of residents of other parts of the state).³⁹

³⁹ New York State Climate Justice Working Group. 2022. Draft Disadvantaged Communities Criteria and List Technical Documentation Appendix: Disadvantaged Communities Indicators Workbook. Accessed July 21, 2023 at: <https://climate.ny.gov/-/media/Project/Climate/Files/Disadvantaged-Communities-Criteria/Technical-Documentation-Appendix-Final-Disadvantaged-Communities-Indicator-Workbook.xlsx>

CHAPTER 4 | ALTERNATIVES CONSIDERED

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.9(b)(5)(v) of New York’s State Environmental Quality Review Act (SEQRA), this chapter characterizes the regulatory and market alternatives that could arise in response to the approval and implementation of New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap). The chapter is organized into two sections.

- **Section 4.1** describes the baseline or “no action” scenario developed as a point of reference for the comparison of alternatives. In addition, it identifies the alternatives as defined for purposes of this Supplemental Generic Environmental Impact Statement (SGEIS) and summarizes their characteristics.
- **Section 4.2** presents summary electrical system impacts data for the alternatives by type of energy storage resource. These results facilitate the discussion of broader environmental and socioeconomic impacts in subsequent chapters.

4.1 BASELINE AND ALTERNATIVES DEFINITION

Defining a baseline or “no action” condition is necessary to provide a common point of reference to which each of the alternatives considered can be compared. This baseline should represent the most likely state of resources, activities, markets, and behaviors that would exist absent any efforts to achieve or accomplish one of the alternatives. In this case, because the 6 GW Roadmap expands upon the existing 3 GW Roadmap, the baseline case is defined as no additional action beyond the original 3 GW Roadmap. Identifying the increment of additional storage resources driven by the new Roadmap over the original and summarizing the related operational and market outcomes is the focus of this chapter.

The “alternative” case represents actions to meet 6 GW of storage by 2030, as proposed in the 6 GW Roadmap. To support the 6 GW Roadmap development, an analysis was conducted to model the least-cost electricity generation portfolio that achieves the Climate Leadership and Community Protection Act’s (CLCPA) goals with the new 6 GW storage target by 2030 and meets New York State’s (the State) long-term goals by 2050. The analysis was performed using RESOLVE, E3’s capacity expansion model, and RECAP, a loss of load probability model. The modeling is based on annual and hourly load projections from 2025 to 2050 corresponding to Scenario 2: Strategic Use of Low Carbon Fuels (Scenario 2) from the Climate Action Council Integration Analysis for the Draft Scoping Plan.⁴⁰ The models incorporate storage cost projections that account for recent increases in commodity prices, projected declines in costs starting in 2025, and tax credits passed in the Inflation Reduction Act in August 2022 (assumed to phase down starting in 2032). The

⁴⁰ For more information on the Draft Scoping Plan and the RESOLVE and RECAP models, see: <https://climate.ny.gov/Resources/Draft-Scoping-Plan>

model also incorporates improvements to 8-hour storage reliability over 4-hour storage and improves on earlier versions of the model by disaggregating peaking thermal units by technology type (e.g., combustion turbine and steam turbine resources).

The models are configured for five regions within New York State and four regions outside of the state that include markets connected to New York State’s energy market (ISO-NE, PJM, Hydro-Quebec, and IESO). The regions within New York represent aggregated control area load zones, shown in **Exhibit 4-1**:

- Zones A-E, which include the majority of area in upstate New York
- Zone F, around the Capital District
- Zones GHI, including Hudson Valley
- Zone J, New York City, and
- Zone K, Long Island.

The models identify the optimal location (among the five zones) and duration (4-hour or 8-hour) for new energy storage.

Exhibit 4-1: New York Control Area Load Zones



Source: NYDPS and NYSEDA. 2021. Initial Report on the New York Power Grid Study. Available at: <https://documents.dps.ny.gov/public/MatterManagement/MatterFilingItem.aspx?FilingSeq=259215&MatterSeq=62480>

4.2 RESULTS

As shown in **Exhibit 4-2**, the model indicates most near-term deployment (through 2030, within the timeframe of the 6 GW Roadmap) will carry a 4-hour duration. More substantive deployment of 8-hour duration storage is projected to start in 2035 reflecting innovation and improving cost-effectiveness.

Exhibit 4-3 reports the distribution of deployment by zone. Zones G-K (Hudson Valley through Long Island, the most densely populated parts of the state) are expected to host 4 GW of the 6 GW

deployed through 2030 to meet local capacity requirements (LCRs) and offshore wind energy storage needs. After 2035, the majority of deployment is expected to occur in upstate zones to balance land-based renewables and meet statewide planning reserve margins (PRM) most efficiently (costs downstate are assumed to be 25 percent more expensive than upstate). Note that the model provides only general location results by the five zones and not site-specific information (location, technology type, etc.).

Exhibit 4-2: Distribution of Energy Storage Deployment by Duration

DURATION	2025	2030
4 hours	1,500	5,600
8 hours	0	400
Total	1,500	6,000

Source: NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap.

Exhibit 4-3: Distribution of Energy Storage Deployment by Zone

LOAD ZONE	2025	2030
A-E	519	1,954
F	60	60
GHI	430	430
J	275	2,005
K	216	1,551
Total	1,500	6,000

Source: NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap.

The trajectories above represent increment storage of 3.2 GW above the alternative measured in the 3 GW Roadmap. **Exhibit 4-4** shows the incremental storage by zone. The majority of the incremental storage deployment is modeled downstate, with deployments on Long Island particularly increased. Note that the previous analysis used a different model and was based on conditions at the time of the analysis, therefore not all incremental changes are driven directly by the new action.

Exhibit 4-4: Distribution of Incremental Storage Over "No Action" (3GW Roadmap)

LOAD ZONE	2030
A-E	1,297
F	-83
GHI	42
J	894
K	1,057
Total	3,207

Source: Analysis of figures from Exhibit 4-3 and Acerelex. 21 June 2018. Energy Storage Study.

CHAPTER 5 | ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.10(a) of New York's State Environmental Quality Review Act (SEQRA), state and local agencies are required to assess the potential of their actions to change the use, appearance, or condition of the environment. Specifically, this chapter evaluates the impacts that could arise from actions taken in response to the approval and implementation of the New York's 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap). As previously discussed, the 6 GW Roadmap is designed to increase the deployment and integration of energy storage technologies within New York State's (the State's) electrical grid. In considering how to implement the 6 GW Roadmap, it is also necessary to assess the potential for energy storage technologies to directly or indirectly change (or impact) other aspects of the environment. In particular, such changes include those that may not be the primary goal of the State or local agency's proposed action, but nonetheless could result in significant and/or adverse impacts on the environment.

Overall findings suggest that adverse direct environmental impacts of the 6 GW Roadmap are likely to be minimal and a variety of mitigation measures exist to minimize such impacts. The Supplemental Generic Environmental Impact Statement (SGEIS) considers three types of energy storage technologies: batteries, thermal, and mechanical storage. Risks exist across all three technology types, most notably: public safety risks from battery fires and risk of soil and groundwater contamination due to improper disposal of battery-related waste. Section 5.2 provides a summary of the environmental impacts across the three technology types. Because battery storage is expected to be the technology deployed to cover the majority of new storage, this chapter focuses on the environmental impacts of battery storage.

The analysis of environmental impacts is largely qualitative because the 6 GW Roadmap is technology agnostic and, as a result, the exact mix and location of energy storage technologies that will be implemented under the 6 GW Roadmap is uncertain. Energy storage's flexibility, in terms of modularity, potential multi-use applications, and in some cases mobility, further complicates projecting the likely types, sizes, and application of energy storage into the future.

5.1 FRAMEWORK FOR EVALUATING THE ENVIRONMENTAL IMPACTS OF THE ENERGY STORAGE ROADMAP

Consistent with the State's overarching clean energy strategies, the 6 GW Roadmap is not designed to rely on one prescriptive pathway. Rather, the 6 GW Roadmap seeks to use and leverage a range of mechanisms, tools, and approaches to achieve its objectives. The goal of the 6 GW Roadmap will not be achieved by one or two large actions, but by numerous separate individual projects over several years. The 6 GW Roadmap also does not prescribe the scope and

scale of these transactions – that is, the 6 GW Roadmap is technology agnostic in that it does not establish standards or targets for specific types of energy storage technologies. Instead, the 6 GW Roadmap is focused on designing and establishing a framework and incentive structure that will drive new investment and activities in the energy storage market.

The extent to which each type of energy storage technology will be used (or activated) in response to the 6 GW Roadmap is uncertain. However, based on the goals and actions of the 6 GW Roadmap, discussion of environmental impacts considers three categories of energy storage technologies that would likely be deployed within the study period: batteries, thermal, and mechanical storage, with battery storage the most likely technology deployed to meet the majority of new storage capacity.

Further, because the exact mix and location of energy storage technologies that will be implemented under the 6 GW Roadmap is uncertain, the evaluation of environmental impacts in this chapter is largely qualitative. That is, a quantitative assessment of the potential environmental impacts would require site-specific information concerning those energy storage technologies and facilities that will be implemented in response to the 6 GW Roadmap. However, as discussed, such information is not available because the 6 GW Roadmap does not prescribe the development of specific energy storage projects or facilities.

The qualitative assessment presented in this chapter utilizes a broad definition of environmental impacts (impacts and effects are synonymous in this context), including the resource areas described in **Chapter 3**. The analysis focuses on two types of effects: direct and indirect. In promulgating regulations under the National Environmental Policy Act (NEPA) at 40 Code of Federal Regulations (CFR) §1508.8, the Council on Environmental Quality defines direct effects as those occurring at the same time and in the same place as the action itself; indirect effects are those occurring later in time and farther away, but which are still reasonably foreseeable.

The remainder of this chapter is organized in four parts:

- **Section 5.2** summarizes the analysis of the direct and near-term environmental impacts of the three energy storage technology categories likely to be affected by the recommendations of the 6 GW Roadmap;
- **Section 5.3** summarizes the analysis of the indirect, longer-term environmental impacts;
- **Section 5.4** considers the potential cumulative impacts of the 6 GW Roadmap when added to other past, present, and reasonably foreseeable future actions.

Measures to mitigate the environmental impacts identified in this chapter are presented in **Chapter 6**. The economic and social impacts of the 6 GW Roadmap are discussed in **Chapter 9**.

5.2 DIRECT AND NEAR-TERM EFFECTS

This section presents an analysis of the direct environmental effects of the recommendations within the 6 GW Roadmap. The 6 GW Roadmap does not require any particular technologies and it is possible, if not probable, that additional technologies will become technically and commercially viable during this time period. Therefore, this section focuses on the direct and near-term effects of battery storage, the energy storage technology expected to be deployed most frequently. As of June 2023, all completed deployments through the New York State Energy

Research and Development Authority's (NYSERDA) retail and bulk energy storage incentive programs have been lithium-ion (Li-ion) batteries.⁴¹ Direct effects applicable across thermal and mechanical storage type are also summarized; further information on the effects of these technologies is provided in the previous Generic Environmental Impact Statement (GEIS).

Overall, the energy storage technologies considered in this GEIS (i.e., battery storage, thermal storage, and mechanical storage) have relatively few direct environmental impacts and mitigation measures exist to address existing impacts. Battery storage systems convert electricity into chemical energy for later release. Li-ion batteries are the most popular battery storage option today and constitute more than 90 percent of the global grid battery storage market.⁴² Thermal storage technology harnesses the energy created during heat exchanges. There are two primary methods to accomplish this: sensible heat storage, which uses a medium to exchange heat without the use of phase changes or chemical changes, and latent heat storage, which uses phase changes (e.g., from a solid state to a liquid state). Mechanical storage (e.g., flywheels) involves storage of energy by applying force to an appropriate medium to deliver acceleration, compression, or displacement. **Exhibit 5-1** on the following page summarizes direct environmental impacts by technology type.

⁴¹ NYSERDA. 2023. Retail and Bulk Energy Storage Incentive Programs Reported by NYSERDA: Beginning 2019. Available at: <https://data.ny.gov/Energy-Environment/Retail-and-Bulk-Energy-Storage-Incentive-Programs-/ugya-enpy>

⁴² EESI. 2019. Fact Sheet | Energy Storage (2019). Accessed on August 30, 2023 at: <https://www.eesi.org/papers/view/energy-storage-2019>

Exhibit 5-1: Summary of Environmental Impacts by Energy Storage Technology Type

	BATTERIES (Li-ion)	THERMAL STORAGE	MECHANICAL STORAGE⁴³
Public Health and Safety	× Fire safety risk	× Storage materials such as molten salt can be corrosive or toxic.	× Equipment safety risk
Climate Change and Air Quality	× Emissions from resources extraction, manufacturing, system operation, and transportation	- Minimal emissions from system operation; may be offset by reductions in overall consumption	- Minimal emissions from system operation; may be offset by reductions in overall consumption
Waste Management	× Resource extraction × End-of-life, recycling limitations	--	✓ Long lifespan (20 years or more); little turnover waste. × Magnetic bearings must be replaced periodically
Land Use and Space Requirements	- Project footprint variable based on project size. Utility scale installations may require larger areas.	✓ Latent heat storage solutions require minimal additional space for water tanks	- Project footprint minimal and variable based on project size and technology. Utility scale installations may require larger areas
Water Resources	✓ Minimal siting-related risk during construction × Risk at end of life without proper disposal	✓ Minimal siting-related risk during construction × Increase in demand for water resources to conduct and store energy	✓ Minimal siting-related risk during construction
Transportation	× Manufacturing and recycling facilities currently out-of-state	--	--
Community Character	✓ Minimal - low noise and visual profile	✓ Minimal - low noise and visual profile	✓ Minimal - low noise and visual profile
Socioeconomic	✓ Reduces the cost of renewable energy ✓ Reduces peak demand	✓ Reduces the cost of renewable energy ✓ Reduces peak demand	✓ Reduces the cost of renewable energy ✓ Reduces peak demand
Key: ✓ Benefit × Risk - Situation specific/neutral			

⁴³ Impacts presented primarily reflect flywheel storage, which was the focus of the GEIS.

5.2.1 Impacts Across Energy Storage Technologies

This section discusses direct effects applicable across all types of energy storage technologies including potential impacts on land use, water resources, species biodiversity, climate and air quality, community character, and socioeconomics. Due to the largely modular nature of energy storage, it is not expected that these effects will vary across New York Independent System Operator (NYISO) zones in a significant way. Further, the key findings discussed below are not substantively changed based on the storage capacity deployed; therefore, this section draws heavily from the GEIS. Additional discussion of the indirect effects of the 6 GW Roadmap is included in **Section 5.3**.

- **Land Use:** As discussed in the prior GEIS, energy storage technologies have a relatively small land use footprint, and it generally increases as the size of a project increases. The development of utility-scale energy storage facilities may have site-specific impacts on land use. Factors influencing the siting of utility-scale energy storage facilities are based on the intended use for the energy storage. For example, energy storage facilities intended to meet the needs of frequency regulation are best situated at the point of interconnection.⁴⁴ This requirement would increase the amount of land dedicated to utility services directly adjacent to the substation. Energy storage intended to reduce the intermittency of electricity supply from renewable energy sources is typically co-sited with the renewable energy facility, in some cases expanding the footprint of the overall facility.⁴⁵ Large-scale storage facilities are likely to be based within areas already supporting commercial, industrial, or utility uses, or co-located with existing electric substation, switchyard locations, or renewable energy-generating sites.⁴⁶ However, it is possible that construction of new energy storage facilities may result in the conversion of undeveloped lands to developed lands, although this is dependent on the site-specific characteristics of each facility.
- **Water Resources:** Surface water resources may be potentially affected by the construction of an energy storage facility through storm water runoff if site-soils are disturbed during construction. The potential degree of environmental impact would depend on the size of the impacted area and the site's proximity to protected waters, among other site-specific factors.
- **Species Biodiversity:** As discussed in the prior GEIS, storage associated with intermittent generation sources (i.e., co-located with wind energy projects) may enable impact-reduction strategies for protection of vulnerable species (e.g., bats and birds) that are susceptible to operational impacts. For example, energy storage can enable the curtailment of wind turbine operation to avoid periods of peak wildlife activity in close proximity to

⁴⁴ Overton, Thomas, W. 2016. Practical Considerations for Siting Utility Scale Battery Projects. Power Magazine. May. Accessed on May 10, 2018 at: <http://www.powermag.com/practical-considerations-siting-utility-scale-battery-projects/>.

⁴⁵ NYSERDA. 2017. Clean Energy Fund Investment Plan: Renewables Optimization Chapter. Portfolio: Innovation & Research. Matter Number 16-00681, In the Matter of the Clean Energy Fund Investment Plan. Revised November 1.

⁴⁶ EIA. 2021. Battery Storage in the United States: An Update on Market Trends. Accessed on July 17, 2023 at: <https://www.eia.gov/analysis/studies/electricity/batterystorage/>

wind turbines (e.g., feeding or migratory passage). Energy storage is likely to play a role in curtailment considerations of both on-land and offshore wind generation developments.

- Climate and Air Quality:** When evaluating the environmental impacts of energy storage, such impacts are influenced by the efficiency of the technology and the original source of electricity. A storage device outputs less energy than the charging input.⁴⁷ The overall emissions impacts to the grid are highly case-dependent. The energy loss between the electricity generator and an energy storage system increases with the distance between the two. Physically remote electricity generators have to account for the transmission losses by producing more electricity. As such, energy storage devices may result in increased electricity demand from the existing grid, which may result in greater emissions when considered on a standalone basis (i.e., not taking into account displacement of other forms of energy generation).⁴⁸ When energy storage technologies complement cleaner generation – as envisioned under the existing Reforming the Energy Vision (REV)⁴⁹ framework – such technologies can contribute to lower levels of both local (i.e., criteria pollutants) and global (i.e., greenhouse gas [GHG]) emissions.⁵⁰ One of the goals of the 6 GW Roadmap is specifically aimed at avoiding carbon dioxide (CO₂) emissions over the lifetime of storage assets, particularly as the amounts of renewable generation on the grid increase and curtailment becomes a more significant occurrence. On a large scale, the use of storage as part of a broader strategy to increase the responsiveness of demand will facilitate greater development of low-carbon energy generation. Where system efficiency is measured in terms of average heat rate, storage that complements low-carbon off-peak generation will reduce total carbon output.
- Community Character:** The installation of energy storage systems is not likely to impact the community character of an area.⁵¹ During the construction phase, movement of heavy machinery may create noise pollution, which could potentially have a short-term impact on community character. However, the operational phase of energy storage technologies is generally quiet. For example, batteries create minimal noise, but some noise pollution from the cooling units that prevent the batteries from overheating could potentially have

⁴⁷ Denholm, P. et al. NREL. The Value of Energy Storage for Grid Applications. May 2013. Accessed on May 9, 2018 at: <https://www.nrel.gov/docs/fy13osti/58465.pdf>.

⁴⁸ Lin, Y., J. X. Johnson, J.L. Mathieu. 2016. Emissions impacts of using energy storage for power system reserves. Applied Energy 168 p. 444-456. Accessed on May 9, 2018 at: <http://dx.doi.org/10.1016/j.apenergy.2016.01.061>.

⁴⁹ DPS. Reforming the Energy Vision. Accessed on July 25, 2023 at: <https://www3.dps.ny.gov/w/pscweb.nsf/all/cc4f2efa3a23551585257dea007dfe2>

⁵⁰ Lin, Y., J. X. Johnson, J.L. Mathieu. 2016. Emissions impacts of using energy storage for power system reserves. Applied Energy 168 p. 444-456. Accessed on May 9, 2018 at: <http://dx.doi.org/10.1016/j.apenergy.2016.01.061>.

⁵¹ EGI. 2016. Final Supplemental Environmental Impact Report for the Campo Verde Battery Energy Storage System. December. Prepared for County of Imperial. Accessed on May 9, 2018 at: <http://www.icpds.com/CMS/Media/SFEIR.pdf>.

an impact on community character if not mitigated.⁵² The efficiency of the cooling units can be increased (and therefore the noise impacts decreased) by focusing them directly on the battery racks as opposed to cooling the entire battery casing. This method of cooling can also use up to 70 percent less power for the cooling units.⁵³ For thermal storage, compared to a traditional chiller operation, thermal energy storage minimizes daytime noise pollution.⁵⁴ Thermal energy storage systems avoid “chiller vibration” and similar noise associated with traditional systems.⁵⁵ While mechanical storage systems generate operational noise, the noise levels are relatively low, compared to conventional technologies (e.g., cooling fans).⁵⁶ For example, the Stephentown New York flywheel facility uses flywheels, but the mechanisms taken to mitigate safety risks also work to reduce ambient noise levels.⁵⁷

- Socioeconomics:** Socioeconomic impacts of energy storage are generally similar across technologies, with some exceptions for thermal energy storage, which does not supply electricity to the grid. The cost of producing and supplying renewable energy such as wind and solar may be reduced through battery or flywheel energy storage.⁵⁸ For example, a cost model of the Maui Electric Company system found that employing battery storage systems is effective at lessening wind curtailment as well as the annual cost of power production.⁵⁹ The study found that replacing the diesel-fired power generation with wind generation provided some savings, but energy storage systems accounted for the majority of the savings due to increased operational efficiencies of the conventional units, such as the spinning reserve.⁶⁰ Batteries and flywheels can also recycle energy to the grid (i.e., receive excess energy and redistribute it to the grid when needed), leading to reductions in

⁵² Most battery technologies, including lithium-ion, risk overheating. Although researchers have designed lithium-ion batteries with a mechanism that prevents overheating, it is not yet in mass production. Humphries, M. Stanford invents lithium-ion battery that can’t overheat. ExtremeTech. February 2. Accessed on May 24, 2018 at: <https://www.extremetech.com/extreme/222290-stanford-invents-lithium-ion-battery-that-cant-overheat>.

⁵³ Ibid.

⁵⁴ CALMAC. Thermal Energy Storage is Key for Modern Building Designs. December 23, 2014. Accessed on May 22, 2018 at: <http://www.calmac.com/energy-storage-articles-thermal-energy-storage-is-key-for-modern-building-designs>

⁵⁵ Buildings.com “4 Benefits of Thermal Energy Storage.” Accessed on May 2, 2018 at: <https://www.buildings.com/buzz/buildings-buzz/entryid/282/4-benefits-of-thermal-energy-storage>.

⁵⁶ Beacon Power. “Environmental Benefits.” Accessed on May 22, 2018 at: <http://beaconpower.com/environmental-benefits/>.

⁵⁷ NY PSC. Case 09-E-0628 – Petition of Stephentown Regulation Services LLC for a Certificate of Public Convenience and Necessity for Authorization Pursuant to PSL 68 to Construct and Operate an Energy Storage Facility of Up to 20-megawatts and Related Facilities to be Located in the Town of Stephentown, Rensselaer County; Order Granting a Certificate of Public Convenience and Necessity, Approving Financing and, Providing for Lightened Regulation, Issued and Effective October 16, 2009.

⁵⁸ Ellison, J. Bhatnagar, D., and Karlson, B. for Sandia National Lab, Maui Energy Storage Study, December 2012. Accessed on May 22, 2018 at: <http://www.sandia.gov/ess/publications/SAND2012-10314.pdf>.

⁵⁹ Ibid.

⁶⁰ Ibid.

energy costs. Thermal energy storage systems do not supply electricity to the grid, but similar to other types of energy storage, they reduce demand during peak hours. As a result of this reduction in peak demand, individuals' energy costs are often reduced. Utility charges are reduced from the overall reduction in usage during peak hours, but also from avoidance of demand charges. These demand charges are extra fees associated with usage during peak hours and can be substantial (up to an 80 percent surcharge). In some cases, utilities run demand response programs, in which customers are compensated (or their bill is reduced) if they reduce their peak consumption. Thermal energy storage systems also decrease utility charges as they generate the stored energy when prices are low (i.e., at night).⁶¹

5.2.2 Battery Storage Impacts

Similar to the previous GEIS, this section focuses on the discussion of impacts on Li-ion batteries as they represent the overwhelming majority of energy storage deployments to date.⁶² In addition to on-site direct environmental impacts such as fire, batteries can also indirectly generate life-cycle environmental impacts during manufacturing, transportation, and end-of-life product disposal. Battery energy technologies may be composed of toxic materials; methods that exist for the collection and recycling of batteries can mitigate the public and environmental health consequences associated with improper disposal. Due to the lack of deployment at scale, land requirement estimates for battery storage are limited, but generally these deployments require minimal space. Battery storage in combination with renewable energy such as wind and solar may also reduce costs of supplying renewable energy and further the displacement of fossil fuel-based generation.

A battery works by exchanging its energy between an electrical and a chemical state; **Exhibit 5-2** presents the common types of battery storage technologies.

Exhibit 5-2: Types of Battery Storage Technologies⁶³

TYPE OF BATTERY STORAGE	DESCRIPTION
Lithium-ion (Li-ion) battery	<ul style="list-style-type: none"> • Typically uses nonferrous metals and minerals such as lithium, cobalt, nickel, manganese, graphite, copper, and aluminum.⁶⁴ • Currently the dominant rechargeable battery on the market.

⁶¹ CALMAC. Lower Cooling Costs. Accessed on May 22, 2018 at: <http://www.calmac.com/lower-cooling-costs>.

⁶² NYSDERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap.

⁶³ NYISO. 2017. The State of Storage: Energy Storage Resources in New York's Wholesale Electricity Markets. December 2017. Accessed on May 9, 2018 at: https://home.nyiso.com/wp-content/uploads/2017/12/State_of_Storage_Report_Final_1Dec2017.pdf.

⁶⁴ Roskill Information Services. 2017. Raw Materials in Focus as Lithium-ion Battery Market Development Moves up a Gear. January 27. Accessed on May 17, 2018 at: <https://www.prnewswire.com/news-releases/raw-materials-in-focus-as-lithium-ion-battery-market-development-moves-up-a-gear-611953095.html>.

TYPE OF BATTERY STORAGE	DESCRIPTION
Sodium-sulfur (NaS) battery ⁶⁵	<ul style="list-style-type: none"> • Molten sodium acts as the anode and molten sulfur acts as the cathode. • The electrodes are separated by the electrolyte, solid sodium alumina, which allows only positively charged sodium ions through.
Flow battery (e.g., zinc-bromine hybrid flow)	<ul style="list-style-type: none"> • Contains liquid electrolytes separated by a membrane. Recharges when the liquid electrolytes are exchanged.
Zinc-air battery	<ul style="list-style-type: none"> • Oxygen reacts with a carbon cathode to produce hydroxyl, which subsequently reacts with a zinc anode to generate electricity. • Difficult to recharge.⁶⁶
Fuel cell	<ul style="list-style-type: none"> • An alternative chemical storage technology that converts hydrogen and oxygen into water and energy. While not technically a battery, a fuel cell has many similar features as a flow battery.

Li-ion batteries offer energy and power densities that are superior to most other battery types due to several factors, including: the low atomic mass of lithium; the development of positive and negative electrodes that are capable of reversibly storing lithium ions at high mass and volume concentrations and with large differences in electrode potential; and the development of high conductivity electrolytes, supporting components, cell designs, and manufacturing methods.⁶⁷

As the size of the Li-ion battery market has grown over the last three decades, prices of Li-ion batteries have also dropped significantly. Li-ion batteries are expected to continue to account for the majority of all energy storage deployments in the near-to-medium term due to them being cost-effective for short-duration storage.⁶⁸ While Li-ion batteries could be economically feasible to replace fossil fuel peaker plants in the near term, in the longer term these batteries might not be suitable for long-duration storage that may be needed to support reliable decarbonized grids.⁶⁹ A 2016 study found steeply diminishing returns when a lot of battery storage is added to the grid.⁷⁰ As a result, Li-ion technology could be too expensive to support the heavily decarbonized grids in the long term. In addition, the limited battery life of Li-ion batteries makes it unsuitable for long-

⁶⁵ Energy Storage Association. Sodium Sulfur (NaS) Batteries. Accessed on May 22, 2018 at: <http://energystorage.org/energy-storage/technologies/sodium-sulfur-nas-batteries>.

⁶⁶ Irving, M. 2017. Rechargeable zinc-air batteries zero in on lithium. August 14. Accessed on May 22, 2018 at: <https://newatlas.com/rechargeable-zinc-air-batteries-catalyst/50899/>.

⁶⁷ MIT. 2022. The Future of Energy Storage. Accessed on July 24, 2023 at: <https://energy.mit.edu/wp-content/uploads/2022/05/The-Future-of-Energy-Storage.pdf>

⁶⁸ The New York Times. Falling Lithium Prices Are Making Electric Cars More Affordable. March 20, 2023. Accessed on July 18, 2023 at: <https://www.nytimes.com/2023/03/20/business/lithium-prices-falling-electric-vehicles.html>

⁶⁹ MIT Energy Initiative. 2022. The Future of Energy Storage. Accessed on July 24, 2023 at: <https://energy.mit.edu/research/future-of-energy-storage/>

⁷⁰ MIT Technology Review. 2018. The \$2.5 trillion reason we can't rely on batteries to clean up the grid. Accessed on July 31, 2023 at: <https://www.technologyreview.com/2018/07/27/141282/the-25-trillion-reason-we-cant-rely-on-batteries-to-clean-up-the-grid/>

duration storage that can fill gaps during days, weeks, and even months when renewable energy dwindles.

The analysis done for the Roadmap focuses on short-duration storage, in the form of 4-hour and 8-hour storage, and through 2030, 4-hour storage is expected to be the most common storage deployed. The analysis done for the Roadmap, however, acknowledges the benefit of longer duration storage and even identifies a need for a glide-path requiring 400 MW of the 6 GW by 2030 to carry 8 hours in duration.⁷¹ While Li-ion batteries have emerged as the foremost choice for short duration storage, longer duration storage will be needed for a cost-effective transition to fully decarbonized grid.⁷² Novel electrochemical technologies, such as redox-flow and metal-air batteries that use inexpensive charge-storage materials and battery designs, are better suited for long-duration applications.⁷³ For instance, while Li-ion batteries usually discharge electric power for about four hours, iron-air batteries can store and then discharge power for as long as 100 hours.⁷⁴ Iron-air batteries, a type of metal-air battery, also have the potential to store energy at low cost as iron is inexpensive and abundant thereby reducing the strain on extraction of other relatively rarer minerals needed for Li-ion batteries. Similarly, redox-flow batteries, which decouple power and energy, offer advantages in terms of scaling to larger systems and longer storage durations compared to Li-ion batteries.⁷⁵

The requirements of future applications with regard to specific energy density, power capabilities, cost and sustainability may require going beyond Li-ion batteries, and many viable alternatives exist already or are under development.⁷⁶ Many of these novel technologies, however, are nascent and face challenges in terms of costs, efficiency, or scalability, and the durability of these technologies in utility-scale applications has not yet been demonstrated. Therefore, for the time horizon of the Roadmap, the majority of the battery storage deployed in the State is expected to be Li-ion battery technology. As such, this analysis focuses on the impacts of Li-ion batteries. The GEIS discussed the environmental impacts specific to battery storage technologies including land use, water resources, climate and air quality, waste management, public health, and transportation. This SGEIS revisits these categories of environmental impact and furthers the discussion when relevant.

⁷¹ NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap. p. 78.

⁷² MIT Technology Review. 2018. The \$2.5 trillion reason we can't rely on batteries to clean up the grid. Accessed on November 3, 2023 at: <https://www.technologyreview.com/2018/07/27/141282/the-25-trillion-reason-we-cant-rely-on-batteries-to-clean-up-the-grid/>

⁷³ MIT Energy Initiative. The Future of Energy Storage. Accessed on November 3, 2023 at: <https://energy.mit.edu/wp-content/uploads/2022/05/The-Future-of-Energy-Storage.pdf>

⁷⁴ Scientific American. Rusty Batteries Could Greatly Improve Grid Energy Storage. Accessed on November 3, 2023 at: <https://www.scientificamerican.com/article/rusty-batteries-could-greatly-improve-grid-energy-storage/>

⁷⁵ MIT Energy Initiative. The Future of Energy Storage. Accessed on November 6, 2023 at: <https://energy.mit.edu/wp-content/uploads/2022/05/The-Future-of-Energy-Storage.pdf>

⁷⁶ MIT Science Policy Review. Beyond lithium-ion batteries: Shaping the transition to sustainable electrochemical energy storage. Accessed on November 3, 2023 at: <https://sciencepolicyreview.org/wp-content/uploads/securepdfs/2022/08/MITSPR-v3-191618003015.pdf>

Public Health and Safety

This section discusses public health and safety impacts directly attributable to battery storage including toxicity and fire risks. Many types of battery storage technologies contain toxic and hazardous chemicals that can cause damage to humans when exposure occurs. Key risks from exposure include irritation to skin and eyes, damage to the respiratory system from inhalation of dangerous vapors, damage to digestive tract from swallowing, and severe burns and blindness. Exposures generally occur when the battery has been damaged or tampered with, therefore the risk can be reduced following instructions from the manufacturer.⁷⁷

As batteries, and Li-ion batteries in particular, are flammable, fire risk associated with battery storage is an important safety consideration. In recent years, reported fires and explosions associated with e-bikes and e-scooters have brought Li-ion batteries under increasing public scrutiny.⁷⁸ Battery Energy Storage Systems (BESS), however, operate under a controlled regulatory regime with oversight at federal, state, and local levels, and must go through several layers of testing in a multi-year permitting process to mitigate fire risk.

Li-ion batteries contain flammable electrolytes and are susceptible to overheating, swelling, electrolyte leakage and venting, fires, smoke, and explosions in scenarios involving thermal runaway.⁷⁹ A thermal runaway is a positive-feedback incident where excessive heat released in an exothermic process triggers other processes that release even more heat, thus resulting in an uncontrollable increase in temperature. The gases produced as a result of a fire, smoke, or thermal runaway can accumulate to a combustible level in the installation location and cause an explosion. Thermal runaway events are generally rare. The risk of thermal runaway is about 0.0001 percent for a single cell; the probability of a cell initiating thermal runaway in larger installations with thousands of cells is relatively higher at 0.1 percent.⁸⁰ Adequate preventive measures can decrease the chances of thermal runaway and limit the impact of such events.

Hazards associated with large-scale Li-ion batteries can be categorized into electrical, thermal, and mechanical types.

- **Electrical hazard:** Charging Li-ion cells at a very high rate or to a voltage above recommended specifications can lead to thermal runaway. Cathode destabilization, lithium dendrite formation, electrolyte decomposition, and the heat produced due to the high

⁷⁷ NYSERDA. 2014. Behind-the-Meter Battery Storage: Technical and Market Assessment. December. Accessed on May 24, 2018 at: <https://www.nyscrda.ny.gov/-/media/Files/Publications/Research/Electric-Power-Delivery/Behind-Meter-Battery-Storage.pdf>.

⁷⁸ The New York Times. The Growing Risk of Battery Fires in New York. Feb 21, 2023. Accessed on July 12, 2023 at: <https://www.nytimes.com/2023/02/21/nyregion/lithium-ion-battery-fires.html>

⁷⁹ ACS. 2022. Battery Hazards for Large Energy Storage Systems. Accessed on July 12, 2023 at: <https://pubs.acs.org/doi/pdf/10.1021/acseenergylett.2c01400>

⁸⁰ Shurtz et al. 2019. Evaluating Safety Characteristics of Lithium-Ion Battery Systems Through Cascading Thermal Runaway Experiments and Modeling. Accessed on July 25, 2023 at: [https://www.osti.gov/servlets/purl/1643422#:~:text=For%20lithium%2Dion%20batteries%20this,of%20cells%20\(%2D0.1%25\).](https://www.osti.gov/servlets/purl/1643422#:~:text=For%20lithium%2Dion%20batteries%20this,of%20cells%20(%2D0.1%25).)

voltage or high charge rate can lead to hazardous events like fire and explosion.⁸¹ Additionally, as batteries age and experience use, an individual cell's electrochemical characteristics such as capacity and internal resistance change, which can result in deviations in characteristics between the cells in the battery that can result in voltage beyond safe limits. Battery management systems, discussed later in this chapter, can help monitor batteries and mitigate such hazards.

- **Thermal hazard:** Extreme temperatures can lead to unsafe conditions in Li-ion batteries and result in hazardous events. High temperatures can lead to decomposition of the electrolyte and the solid-electrolyte interface layer, as well as destabilization of the cathode and anode, that eventually lead to venting, fire, and thermal runaway. Low temperatures can also result in hazardous conditions. Increases in the viscosity of the electrolyte in a Li-ion cell due to low temperatures reduce ionic conductivity, resulting in the deposition of the ions as “dendritic” lithium metal. Lithium dendrites can in turn lead to increased internal cell temperatures and thermal runaway.⁸² While the specific temperature range for safely operating Li-ion batteries can vary depending on the design, the safe operating temperature is typically between -20 °C and 60 °C.⁸³ In addition, temperature differences larger than 3 °C within a battery pack configuration can lead to deviations in the internal resistance of the cells that can eventually lead to an unsafe condition of the battery. Thermal management systems are therefore important for large batteries.⁸⁴
- **Mechanical hazard:** Vibration, shock, or impact to the battery can lead to disturbances in the internal construction of the cells, induce breakage of cell tab or intercell connections, or create defects that can lead to an internal short circuit or high temperatures, both of which can lead to a thermal runaway.⁸⁵ Mechanical hazards typically occur due to natural disasters such as seismic events as well as during transportation of the battery to its final destination.

As the number of installed storage systems has grown, incidents of battery-related fires and explosions have occurred in the U.S. In 2019, Arizona Public Service's (APS) McMicken battery energy storage facility caught fire and eventually exploded due to an internal cell failure, causing

⁸¹ ACS. 2022. Battery Hazards for Large Energy Storage Systems. Accessed on July 12, 2023 at: <https://pubs.acs.org/doi/pdf/10.1021/acsenergylett.2c01400>.

⁸² Ibid.

⁸³ Wells, A. 2023. Thermal Management Solutions for Battery Energy Storage Systems. Accessed on July 25, 2023 at: <https://www.ien.com/operations/article/22820306/thermal-management-solutions-for-battery-energy-storage-systems#:~:text=The%20safe%20operating%20temperature%20range,%C2%B0C%20lead%2Dacid%20batteries>.

⁸⁴ ACS. 2022. Battery Hazards for Large Energy Storage Systems. Accessed on July 12, 2023 at: <https://pubs.acs.org/doi/pdf/10.1021/acsenergylett.2c01400>

⁸⁵ Ibid.

injuries to firefighters.⁸⁶ Subsequent investigation led by APS found that the fire-suppression system, which activated as designed, was insufficient to prevent the cascading thermal runaway. In 2022, a fire broke out at Pacific Gas & Electric (PG&E) Corp’s energy storage facility in California after a Tesla Megapack battery malfunctioned, resulting in road closures and a shelter-in-place advisory for nearby areas.⁸⁷ More recently, in May 2023, a fire erupted at a battery storage facility in East Hampton, New York due to overheating but was quickly contained within the site by the water-based fire suppression systems.⁸⁸ According to Electric Power Research Institute (EPRI)’s BESS failure event database (also referred to as a fire event database), 14 failure events have occurred in the U.S., and there have been no fatalities.⁸⁹ The database includes all battery fires, not only Li-ion batteries, but 13 of the 14 U.S. fires have been with Li-ion batteries. Three of the events, all occurring in 2023, took place in New York State (two events in Warwick on June 26 and 27, 2023 and an event in East Hampton in May 2023).⁹⁰ The database does not include a more recent battery fire which occurred on July 27, 2023 at a solar farm in Jefferson County, New York, which emitted large amounts of smoke, prompting a shelter-in-place order for residents within a one-mile radius.⁹¹ A review study of this database concluded that worldwide there have been over 50 utility-scale battery failures, representing a one to two percent failure rate.^{92,93}

Due to the existence of various hazards, several mitigation measures are necessary for safely transporting and operating battery storage systems. Strong regulations can mitigate these risks and make fire hazards less likely. Regulations can also ensure that appropriate safety systems exist to mitigate damages in the event of a fire. These regulations are discussed in **Section 6.1.1**.

Climate and Air Quality

Battery storage systems emit GHGs during all stages of their life cycle (materials production, manufacturing, operation, end of life) and during transportation, which has direct effects on the

⁸⁶ APS. 2020. McMicken Battery Energy Storage System Event Technical Analysis and Recommendations. Accessed on July 12, 2023 at: <https://www.aps.com/-/media/APS/APSCOM-PDFs/About/Our-Company/Newsroom/McMickenFinalTechnicalReport.ashx?la=en&hash=50335FB5098D9858BFD276C40FA54FCE>

⁸⁷ Reuters. 2022. Fire at PG&E's California Tesla battery facility fully under control. September 21. Accessed on July 12, 2023 at: <https://www.reuters.com/world/us/fire-tesla-powered-pge-facility-shuts-down-part-highway-1-california-2022-09-20/>

⁸⁸ The East Hampton Star. July 6, 2023. After Fire at Substation, New Battery Worries. Accessed on July 12, 2023 at: <https://www.easthamptonstar.com/government/202376/after-fire-substation-new-battery-worries>

⁸⁹ EPRI. BESS Failure Event Database. Accessed on July 26, 2023 at: https://storagewiki.epri.com/index.php/BESS_Failure_Event_Database

⁹⁰ Ibid.

⁹¹ WNYTV. Residents told to shelter in place due to potentially toxic smoke from solar farm fire. July 27. Accessed on July 31, 2023 at: <https://www.wnytv.com/2023/07/27/residents-told-shelter-place-due-potentially-toxic-smoke-solar-farm-fire/>

⁹² Warren, C. 2022. As lithium-ion batteries scale, mitigating the risk of fires becomes more important. Accessed on July 11, 2023 at: <https://eprijournal.com/a-focus-on-battery-energy-storage-safety/>

⁹³ The database does not report mitigation measures in place at the time of the failure so it is not possible to identify the efficacy of particular measures in reducing risk.

climate and air quality. A life cycle assessment of utility-scale energy storage systems found Li-ion storage systems, which represent the majority of all stationary and mobile storage deployments in the State, have the lowest GHG emissions of five electro-chemical energy storage systems assessed (sodium-sulfur, lithium-ion, valve-regulated lead-acid, nickel-cadmium, and vanadium redox flow).⁹⁴ Emissions during a battery storage system’s lifecycle include:

- **Materials production and manufacturing**, which often involve complex value chains and require sourcing various metals from around the world that are then subject to several refining stages. Currently, most lithium used for batteries is extracted from hard rock mines or underground brine reservoirs, and much of the energy for the extraction is currently derived from fossil fuels. Every ton of lithium mined generates approximately 15 tons of CO₂ emissions.⁹⁵ Similarly, other metals used in the production of these batteries, such as cobalt, are based on energy-intensive mining processes that contribute to a battery’s GHG footprint.⁹⁶ As of 2020, the total mineral demand for clean energy technologies was approximately 7 million metric tons, of which only about 0.4 million metric tons was for batteries and EVs.⁹⁷

The manufacturing process is also energy-intensive and contributes to the battery’s overall GHG footprint. To synthesize the materials needed for production, heat between 800 to 1,000 degrees Celsius is needed—a temperature that can only cost-effectively be reached by burning fossil fuels, which further adds to GHG emissions.⁹⁸ Emissions from manufacturing depend on the energy sources and emissions factors in the location of manufacturing. The vast majority of lithium-ion batteries, about 77 percent of the world’s supply, are manufactured in China, where coal is the primary energy source.⁹⁹ Currently, the majority of Li-ion battery manufacturing does not occur in the State, though more capacity could expand in the future, particularly as a result of recent federal incentive programs (for example, the capacity expansion of Anovion’s battery grade synthetic graphite plant in Sanborn, NY).¹⁰⁰ China and East Asia will likely continue to dominate

⁹⁴ Rahman et al. 2021. The greenhouse gas emissions’ footprint and net energy ratio of utility-scale electro-chemical energy storage systems. Accessed on July 14, 2021 at: <https://www.sciencedirect.com/science/article/abs/pii/S0196890421006737>.

⁹⁵ Iris Crawford. 2022. How much CO₂ is emitted by manufacturing batteries? Accessed on September 8, 2023 at: <https://meche.mit.edu/news-media/how-much-co2-emitted-manufacturing-batteries>

⁹⁶ Mining.com. 2021. CO₂ emissions from cobalt production expected to soar. Accessed on September 8, 2023 at: <https://www.mining.com/co2-emissions-from-cobalt-production-expected-to-soar-report/>

⁹⁷ IEA. Mineral requirements for clean energy transitions. Accessed on November 3, 2023 at: <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-energy-transitions>

⁹⁸ MIT Climate Portal. How much CO₂ is emitted by manufacturing batteries? Accessed on September 8, 2023 at: <https://climate.mit.edu/ask-mit/how-much-co2-emitted-manufacturing-batteries>

⁹⁹ Ibid.

¹⁰⁰ U.S. Department of Energy. 2022. Bipartisan Infrastructure Law Battery Materials Processing and Battery Manufacturing & Recycling Funding Opportunity Announcement (DE-FOA-0002678) Selections. Accessed on July 14, 2023 at: <https://www.energy.gov/sites/default/files/2022-11/DOE%20BIL%20Battery%20FOA-2678%20Selectee%20Fact%20Sheets.pdf>

production as the demand for Li-ion batteries climbs, though incentive programs in place aim to increase domestic production.^{101,102}

- **Operations.** During the operation phase, emissions are generated as the batteries are charged. Emissions in this phase are highly dependent on the portfolio of energy resources used to generate stored electricity and the efficiency of the power conversion system. The 6 GW Roadmap is designed to support a statewide transition to renewable energy, which will in turn significantly reduce GHG emissions during energy storage operations compared to current emissions while fossil fuels are used to charge batteries.
- **End of life** includes dismantling the battery mechanically for disposal or recycling. Data on emissions during this phase are limited, but they are discussed further in the Waste Management section below.
- **Transportation.** The amount of energy needed for transportation depends on the mode and distance traveled between all stages from material production to end of life and typically has minimal contributions to lifecycle emissions.

Life cycle GHG emissions range from 624.96 kilograms (kg)-CO₂eq/megawatt hour (MWh) for the Li-ion to 800.19 kg-CO₂eq/MWh for the vanadium redox flow, assuming an operations energy resource mix similar to that currently installed in New York State.¹⁰³ Emissions from the operations stage are the primary source of GHG emissions (over 60 percent) while material production (up to 25 percent), manufacturing (up to 10 percent), and transportation (less than one percent) contribute less significantly.¹⁰⁴

In addition, Vandepaer et al. (2017) found that the use of polytetrafluoroethylene (PTFE) as a binder in Li-ion batteries can also contribute to ozone layer depletion.¹⁰⁵ Additional discussion of indirect changes in climate and air quality due to the 6 GW Roadmap overall is included in **Section 5.3**.

Water Resources

Impacts of battery energy storage on water resources may occur at the battery's end of life. If Li-ion batteries are handled improperly, lithium – which is highly flammable when it contacts water –

¹⁰¹ The Economist. 2017. After electric cars, what more will it take for batteries to change the face of energy? August 12. Accessed on May 21, 2018 at: <https://www.economist.com/briefing/2017/08/12/after-electric-cars-what-more-will-it-take-for-batteries-to-change-the-face-of-energy>.

¹⁰² See The Office of Energy Efficiency and Renewable Energy's Battery Policies and Incentive Search at: <https://www.energy.gov/eere/vehicles/battery-policies-and-incentives-search/>.

¹⁰³ Rahman et al. 2021. The greenhouse gas emissions' footprint and net energy ratio of utility-scale electrochemical energy storage systems. Accessed on July 14, 2023 at: <https://www.sciencedirect.com/science/article/abs/pii/S0196890421006737>.

¹⁰⁴ Ibid.

¹⁰⁵ Vandepaer et al. 2017. Environmental impacts of Lithium Metal Polymer and Lithium-ion stationary batteries. Accessed on July 18 at: <https://www.sciencedirect.com/science/article/abs/pii/S1364032117305580#:~:text=The%20production%20of%20polytetrafluoroethylene%2C%20used,source%20of%20global%20warming%20emissions>.

could flow into surface water or leach into groundwater and cause combustion.¹⁰⁶ Other battery storage systems that do not contain lithium are much less combustible; the general fire risks associated with all batteries are discussed in the Public Health and Safety sub-section.¹⁰⁷ Proper disposal of Li-ion batteries and recycling opportunities are discussed in the Waste Management sub-section below.

Waste Management

As noted in the GEIS, battery-based energy storage could cause substantive environmental impacts during the material extraction and end-of life disposal phases. Sourcing battery metals and minerals may cause local site-specific environmental impacts, and improper disposal at the end of a battery's life may cause land and groundwater pollution.¹⁰⁸ The GEIS also discussed the role of recycling batteries in limiting the environmental impacts, along with the barriers that exist for recycling utility-scale Li-ion batteries. One such barrier is the high cost of spent battery transportation, given its hazardous nature.¹⁰⁹ Globally, only five percent of Li-ion batteries were recycled as of 2019, though that number could be rising more recently as Li-ion batteries become more popular, particularly with individual consumers.^{110,111} Many batteries are not recycled because of the associated energy and labor costs. With the increase in deployment of Li-ion batteries for energy storage in the State (as well as nationally), along with growth in usage of Li-ion batteries for Electric Vehicles (EVs) and other uses, more recycling facilities will be needed to limit the adverse environmental effects of these batteries.

Due to their complexity and the variety of materials used, Li-ion batteries must be subjected to multiple processes before they can be recycled. Recycling also has its own environmental impacts including transportation, preparation, and high energy use. Compared to a typical lead-acid battery, Li-ion batteries' more heterogeneous chemistry requires labor-intensive or chemical reagent-intensive processes, which are rarely cost effective. Li-ion batteries must be first classified and most often pretreated through discharge or inactivation, disassembly, and separation before they can be subjected to direct recycling, pyrometallurgy, hydrometallurgy, or a combination of methods as shown in **Exhibit 5-3**.¹¹²

¹⁰⁶ Warren, C. 2016. EPRI Examines Environmental Aspects of Grid-Scale Battery Deployment. January 18. Accessed on May 8, 2018 at: <http://eprijournal.com/ensuring-a-clean-grid-batteries-not-excluded/>.

¹⁰⁷ NYSERDA. 2014. Behind-the-Meter Battery Storage: Technical and Market Assessment. December. Accessed on May 24, 2018 at: <https://www.nysERDA.ny.gov/-/media/Files/Publications/Research/Electric-Power-Delivery/Behind-Meter-Battery-Storage.pdf>.

¹⁰⁸ Gaustad, G. 2018. Lifecycles of Lithium-Ion Batteries: Understanding Impacts from Material Extraction to End of Life. March 14. Spring Bridge on International Frontiers of Engineering (2018) 48:1. Accessed on July 13, 2023 at: <https://www.nae.edu/Publications/Bridge/180760/181102.aspx>.

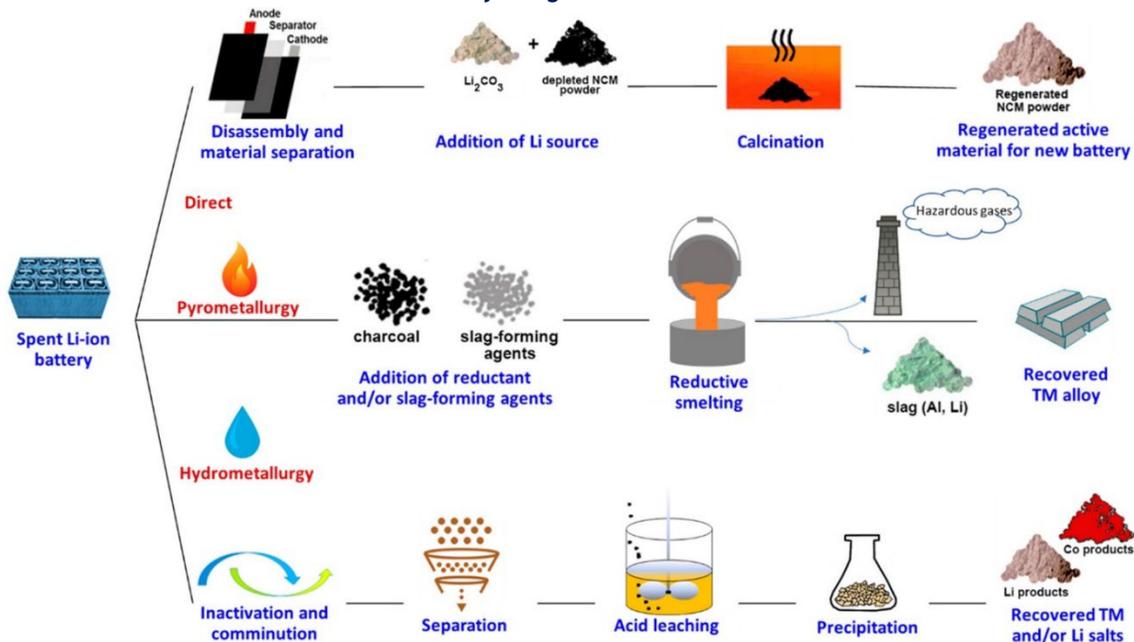
¹⁰⁹ MIT Energy Initiative. 2022. The Future of Energy Storage. Accessed on July 18, 2023 at: <https://energy.mit.edu/wp-content/uploads/2022/05/The-Future-of-Energy-Storage.pdf>

¹¹⁰ Huang, Y. and Li, J. 2022. Key Challenges for Grid-Scale Lithium-Ion Battery Storage. Accessed on July 13, 2023 at: <https://onlinelibrary.wiley.com/doi/full/10.1002/aenm.202202197#aenm202202197-bib-0069>

¹¹¹ Call2Recycle. 2022. Call2Recycle Releases 2022 U.S. National Battery Collection & Recycling Data. Accessed on August 31, 2023 at: <https://www.call2recycle.org/2022-battery-collections/>

¹¹² Baum, J. et al. 2022. Lithium-Ion Battery Recycling—Overview of Techniques and Trends. Accessed on July 13, 2023 at: <https://pubs.acs.org/doi/10.1021/acseenergylett.1c02602>

Exhibit 5-3: Different Methods of Recycling Li-ion Batteries



Source: Baum, J. et al. 2022. Lithium-Ion Battery Recycling—Overview of Techniques and Trends. Accessed on July 13, 2023 at: <https://pubs.acs.org/doi/10.1021/acseenergylett.1c02602>

Pyrometallurgy and hydrometallurgy (the second branch of **Exhibit 5-3**) are the primary methods of recycling today that both aim for the extraction of valuable metals such as cobalt and nickel in their metallic form. Pyrometallurgy uses heating to convert metal oxides used in battery materials to metals or metal compounds while hydrometallurgy use primarily aqueous solutions to extract and separate metals from batteries. Both of these methods are energy-consuming and not very cost-effective. They also do not significantly reduce life-cycle greenhouse gas emissions.¹¹³ Direct recycling (the top branch of Exhibit 5-3), which repairs the active materials that have undergone lithium loss or structural transformation, instead of extracting constituent elements, has emerged as more environmentally friendly and economically viable in the last few years. Compared to pyrometallurgy and hydrometallurgy, direct recycling methods consume only about 15 percent of the energy, produce 25 percent of the CO₂, and cost 50 percent less.¹¹⁴

Technology advances have made recycling Li-ion batteries more sustainable and cost-effective. To create a sustainable, circular energy storage economy and prevent the adverse effects of lithium extraction, many more recycling facilities will be needed in the near future. As of 2022, North America has four battery recycling facilities operating with a total capacity of 20,500 tons. Canada and the United States have two facilities each, with similar total capacities. In addition, there are

¹¹³ Ciez, R.E., Whitacre, J.F. Examining different recycling processes for lithium-ion batteries. Accessed on July 13, 2023 at: <https://www.nature.com/articles/s41893-019-0222-5#citeas>

¹¹⁴ Huang, Y. and Li, J. 2022. Key Challenges for Grid-Scale Lithium-Ion Battery Storage. Accessed on July 13, 2023 at: <https://onlinelibrary.wiley.com/doi/full/10.1002/aenm.202202197#aenm202202197-bib-0069>

three facilities with a total of 40,000 tons capacity planned for the U.S. (in Alabama, Nevada, and Arizona) and one planned facility in Mexico (capacity unknown at this time).¹¹⁵

One of the established U.S.-based facilities is located in New York. In 2020, Ontario-based Li-Cycle Corp. established a Li-ion battery recycling facility in Rochester, New York. Li-Cycle's New York Spoke is a fully operational lithium-ion battery recycling facility that can currently process up to 18,000 metric tons of Li-ion batteries and battery manufacturing scrap per year through its main line and ancillary processing capabilities.^{116,117} Li-Cycle's process yields an up to 95% recycling efficiency rate to recover valuable materials in lithium-ion batteries back to the supply chain, including lithium, nickel, and cobalt.¹¹⁸ The metals extracted from the recycling process can then be used in the production of new batteries. Li-Cycle's in-state capabilities will help to provide qualified end of life service to BESS operators operating in the State.

To achieve a sustainable energy storage economy, further advancements in recycling technologies and expansion of recycling facilities, along with appropriate regulatory oversight, are needed. Such expansion and operation may be challenging and will need to consider current and future regulations and siting restrictions. Current New York State regulations require Li-ion battery recycling (Article 27, Title 18 of the Environmental Conservation Law), but this regulation is intended to address smaller batteries weighing fewer than 25 pounds commonly used in personal electronic devices, and therefore would not be applicable to most utility-scale operations that use batteries weighing greater than 25 pounds.¹¹⁹ Utility-scale Li-ion batteries may fall under regulations governing hazardous waste (6 CRR-NY Part 374-3, Universal Waste Rule) if they exhibit characteristics of a hazardous waste (e.g., ignitability, corrosivity, reactivity, or toxicity). In May 2023, the EPA generally classified Li-ion batteries as hazardous waste at end of life under the Resource Conservation and Recovery Act (RCRA). Regulations related to waste management are further discussed in **Section 6.1.3**.

Land Use

Land use requirements for battery storage vary based on site-specific attributes, but overall, land use requirements are relatively small. Battery systems are heavy, and even the relatively lightweight technologies tend to exceed the standard safe weights for regular floors, meaning they must be installed on concrete or otherwise reinforced floors. It is possible to install battery storage systems in areas such as parking garages, storage rooms, and closets, assuming all code requirements are met. Residential storage systems are typically installed in existing homes and garages. **Exhibit 5-4** shows the distribution of existing energy storage facilities.

¹¹⁵ Baum, J. et al. 2022. Lithium-Ion Battery Recycling—Overview of Techniques and Trends. Accessed on July 13 at: <https://pubs.acs.org/doi/10.1021/acseenergylett.1c02602>

¹¹⁶ Li-cycle. Interim Environmental, Social and Governance Report 2022. Accessed on December 12, 2023 at: <https://li-cycle.com/wp-content/uploads/2023/03/Li-Cycle-Interim-ESG-Report-2022.pdf>

¹¹⁷ Li-cycle. Accessed on November 3, 2023 at: <https://li-cycle.com/new-york-spoke/>

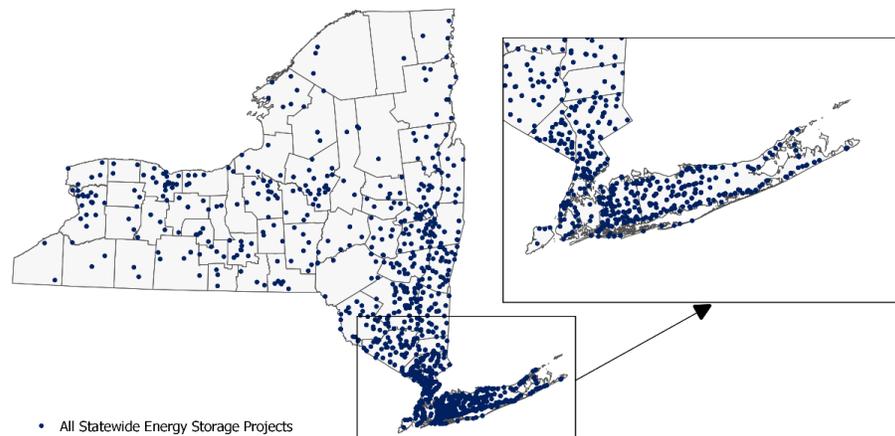
¹¹⁸ Li-cycle. Li-Cycle: Lithium Battery Recycling Efficiency and Recovery Rates. Accessed on November 3, 2023 at: <https://li-cycle.com/blog/li-cycle-lithium-battery-recycling-efficiency-and-recovery-rates/>

¹¹⁹ NYSDEC. Rechargeable Battery Recycling. Accessed on May 17, 2018 at: <https://www.dec.ny.gov/chemical/72065.html>.

Of the battery storage technologies discussed, Li-ion has a substantially smaller footprint (considering the total battery system including power electronics, conditioning equipment, and walkways): a 500-kW battery requires 367 square feet, which is almost half of the next smallest, sodium sulfur at 642 square feet. Lead acid batteries have the largest footprint at 1,976 square feet for 500 kW.¹²⁰ The 6 GW Roadmap calls for an additional deployment of 3.2 GW above the previous roadmap (see **Chapter 4**). Although the technology mix to achieve this objective is uncertain, using the footprints cited above, the area required could range from 0.08 square miles (all Li-ion) to 0.45 square miles (all lead acid batteries). Although these areas are small relative to the State, it could be more of a concern in downstate areas with high population densities, where more than half of the incremental storage is expected to be deployed by 2030. For reference, the calculated storage area required in Zones J (New York City) and K (Long Island) for full deployment of Li-ion batteries would be less than four percent of the area of Central Park. In the future, storage footprints could be reduced with technology improvements.

Zoning regulations can limit where battery storage systems are deployed. Public concerns about fire safety and possible air and groundwater contamination have triggered zoning reviews, though a number of municipalities have recently adopted regulations allowing for energy storage in certain use zones.¹²¹

Exhibit 5-4: Location of Existing Energy Storage Capacity



Source: Energy storage project locations from NYSERDA. 2023. All Statewide Energy Storage Projects. As of May 16, 2023.

5.3 INDIRECT EFFECTS

As noted in the previous GEIS, energy storage technologies discussed in this chapter serve and generate one common long-term, indirect effect: reducing the use of energy generated from fossil

¹²⁰ NYSERDA. 2014. Behind-the-Meter Battery Storage: Technical and Market Assessment. December. Accessed on July 11, 2018 at: <https://www.nyserdera.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Electic-Power-Delivery/Behind-Meter-Battery-Storage.pdf>

¹²¹ Butler, P. 2023. To BESS, or Not to BESS? The Emergence of Battery Storage Systems on Long Island. Available at: <https://www.lilanduseandzoning.com/2023/01/25/to-bess-or-not-to-bess-the-emergence-of-battery-storage-systems-on-long-island/>

fuels. Energy storage technologies improve the reliability and stability of the grid, particularly when paired with intermittent renewable generation. The costs of producing and supplying renewable energies can be reduced when flywheel or battery energy storage technologies are employed. These technologies can supply electricity to the grid to meet demand and can withdraw electricity from the grid to alleviate excess supply. This ability helps enable other clean energy technologies, programs, and resources to achieve greater impacts on the electric grid in terms of stability, resilience, and efficiency. Energy storage technologies can also reduce peak demand on the grid, which lowers the costs of energy through usage reduction and avoidance of demand charges and reduces reliance on peaker plants, which tend to have the highest levels of emissions. In this capacity, energy storage technologies may be considered as a form of mitigation, providing a means by which the environmental impacts of other technologies and processes can be avoided. The extent to which energy storage avoids adverse impacts and generates benefits, however, is complex and is influenced by a variety of factors, including the current mix of fuel sources used in generation.

By aiding a transition to renewable energy production, energy storage supports indirect benefits such as reduced criteria air pollutants and reduced GHG emissions, which in turn create benefits to human health, the natural environment, and cultural resources.

Criteria Air Pollutants

Fossil fuel electric generation is a major source of criteria air pollutants, including CO₂, carbon monoxide (CO), and heavy metals. The release of sulfur dioxide (SO₂) and nitrous oxides (NO_x) from fossil fuel generated power plants also leads to the formation of particulate matter (PM_{2.5}), ozone, and other acidic compounds. Mercury (Hg) compounds are another pollutant from fossil fuel energy generation. Criteria air pollutants are particularly important factors influencing local and regional air quality. These pollutants can negatively affect air quality, visibility, and public health.

Energy storage deployed due to the New York State Public Service Commission's adoption of the 6 GW Roadmap will allow New York to meet its peak power needs without solely relying on the oldest and dirtiest peak-generating plants, many of which lay idle and are approaching the end of their useful lives. Many of the dirtiest peaking units are expected to retire due to the new constraints and regulations; however, some of these units may stay online if there is not sufficient capacity to provide necessary grid services. Over 1 GW of peaker capacity is expected to remain on the system even after the New York Department of Environmental Conservation (NYDEC)-promulgated NO_x limits become binding.¹²² Energy storage will play an important role in ensuring that peaker plants, many of which are located in Disadvantaged Communities (see **Exhibit 9-5**), retire on schedule, thus making the transition to clean energy smoother.

Greenhouse Gases

The Climate Leadership and Community Protection Act (CLCPA) establishes a target of limiting statewide GHG emissions to 60 percent of 1990 levels and 15 percent of 1990 levels, both by

¹²² NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap. p. 24.

2050.¹²³ Deployment of energy storage as laid out in the 6 GW Roadmap will be important in achieving these reductions. GHGs such as CO₂ contribute to the global trend of rising average temperatures, changes in precipitation patterns, and rising sea levels. As temperatures continue to rise and climate change further intensifies, the negative impacts of climate change on the State's residents, economy, and natural ecosystems will also increase.¹²⁴ Actions (like those proposed in the 6 GW Roadmap) that stem the further rise of atmospheric GHG levels and prepare the State for the impact of climate change can reduce the magnitude of such impact both within the State and globally.

Public Health

Emissions from fossil fuel-based electric generation can negatively affect human health. Exposure to ozone can aggravate lung diseases including asthma, emphysema, and chronic bronchitis, as well as increase the risk of premature mortality from heart or lung disease. Health effects from PM_{2.5} include aggravated asthma, irregular heartbeat, decreased lung function, nonfatal heart attacks, and premature mortality in those with heart or lung disease.¹²⁵ NO_x can increase the risk of respiratory diseases and exacerbate existing respiratory symptoms, especially in children, elderly people, and people with low incomes. Individuals with asthma may experience aggravated symptoms when exposed to NO_x.¹²⁶ Additionally, exposure to NO_x can cause irreversible structural changes to the lungs. Machol and Rizk (2012) estimated health impacts from fossil fuel energy sources at \$362 to \$886 billion in economic value annually, based on premature mortality, workdays missed, and direct costs to the U.S. healthcare system resulting from PM_{2.5}, NO_x, and SO₂. The same study estimated that the economic value of negative health impacts was equal to approximately \$0.14 to \$0.31 per kWh.¹²⁷ These costs may be even higher if the climate impacts associated with GHG emissions are included. NYSERDA's 2011 ClimAid report estimates the public health impacts of climate change in New York to be \$3 to \$6 billion by mid-century.¹²⁸ Increased deployment of energy storage is expected to contribute to further reductions in such air emissions and the related costs.

¹²³ Department of Environmental Conservation. Statewide Greenhouse Gas Emissions Report. Accessed on July 14 at: <https://www.dec.ny.gov/energy/99223.html>

¹²⁴ Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grahborn (Eds). 2011. Responding to Climate Change in New York State. Synthesis Report prepared for NYSERDA. November 2011. Accessed on July 14, 2023 at: <https://www.nyserdera.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/EMEP/climaid/ClimAID-Report.pdf>

¹²⁵ EPA. Particulate Matter (PM) Pollution: What are the harmful effects of PM? Accessed on July 14, 2023 at: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#effects>.

¹²⁶ EPA. Nitrogen Dioxide (NO₂) Pollution: What are the harmful effects of NO₂? Accessed on July 14, 2023 at: <https://www.epa.gov/no2-pollution/basic-information-about-no2#Effects>.

¹²⁷ Machol, Ben and Rizk, Sarah. 2013. "Economic Value of U.S. Fossil Fuel Electricity Health Impacts." Environment International. February 2013. Volume 52. Pp 75-80.

¹²⁸ Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation. Technical Report. New York State Energy Research and Development Authority (NYSERDA), Albany, New York. www.nyserdera.ny.gov

Water, Land, and Ecological Resources

Avoided fossil fuel emissions should also reduce water demand and improve the health of aquatic ecosystems. For natural gas combustion, boilers and combined cycle systems require water for cooling processes.¹²⁹ If process or cooling water comes from a surface water source, water intake structures are required to withdraw the necessary water for the plant's operation. Such intake structures can stress or directly take aquatic organisms held against or passed through intake screens.¹³⁰

Natural gas boilers, and natural gas combined cycle systems all release wastewater with excess heat and hazardous chemicals during plant operation. Thermal water discharges elevate water temperatures, which can harm organisms, destroy or degrade habitat, or form barriers to existing migratory routes. Hazardous substances in wastewater can impair water quality, as can deposition of acidic air pollutants (i.e., acid rain).¹³¹

Aesthetic, Visual, Cultural, and Historical Resources

Reduced emissions of NO_x and SO₂ and associated reductions in particulate matter due to avoided fossil fuel use would also improve visual and cultural resources in the State.¹³² Fine particles are the primary cause of reduced visibility in some areas in the U.S., including national parks and wilderness areas. Reduced particle pollution will also help to protect stonework, including culturally important monuments, from staining and other damage.¹³³

5.4 CUMULATIVE IMPACTS

SEQRA Section 617.9(b)(5)(iii)(a) requires agencies to consider the “reasonably related short-term and long-term impacts, *cumulative impacts*, and other associated environmental impacts” of actions on the environment and existing natural resources. SEQRA does not expressly define “cumulative impacts;” however, it is useful to note that NEPA regulations at 40 CFR §1508.7 define cumulative impacts as the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

Several court cases in the late 1980s and early 1990s provide additional direction on the appropriate approach for assessing cumulative impacts. Of particular relevance, *North Fork Environmental Council, Inc. v. Janoski* (196 AD2d 590 (2d Dept. 1993)) holds that: “in evaluating the potential environmental effect of a project before it, the lead agency must consider cumulative

¹²⁹ Union of Concerned Scientists. “How it Works: Water for Natural Gas.” Accessed on July 14, 2023 at: <https://www.ucsusa.org/clean-energy/energy-water-use/water-energy-electricity-natural-gas#.WvU59u-Uv0M>.

¹³⁰ NYSDEC. Aquatic Habitat Protection. Accessed on May 10, 2018 at: <http://www.dec.ny.gov/animals/32847.html>.

¹³¹ Manjuntha, S.G., Bobade, K.B, Kudale, M.D. “Pre-Cooling Technique for a Thermal Discharge from the Coastal Thermal Power Plant.” *Procedia Engineering*, Vol. 116, 2015, pp. 358-365.

¹³² EPA. “Acid Rain. Effects of Acid Rain.” Accessed on May 10, 2018 at: <http://www.epa.gov/acidrain/effects/forests.html>.

¹³³ EPA. Particulate Matter (PM) Pollution. Health and Environmental Effects of Particulate Matter (PM). Accessed on July 14, 2023 at: <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>.

impacts of other simultaneous or subsequent actions which are included in any long-range plan of which the action under consideration is a part.”

In this case, the 6 GW Roadmap is part of and related to several other ongoing, state energy initiatives, including but not limited to: (1) the CLCPA, (2) the 2015 New York State Energy Plan, (3) REV (Case 14-M-0101); (4) the Clean Energy Fund (CEF; Case 14-M-0094); (4) the New York Green Bank (NYGB; Case 13-M-0412); (5) the NY-Sun Initiative; and other energy-related technology and market development programs, including a number of incentive programs. In addition to State-level clean energy initiatives, a number of energy-related efforts at the federal level may interact with the 6 GW Roadmap. **Exhibit 5-5** summarizes the past, present, and reasonably foreseeable future actions that are likely to interact with the 6 GW Roadmap.

By considering cumulative impacts, the intent of SEQRA is to identify actions that may be insignificant by themselves, but which can degrade environmental resources over time when considered together. These considerations of potential cumulative effects include:

- The recommendations in the 6 GW Roadmap are anticipated to engender overall positive environmental and social impacts, primarily by improving grid resiliency, reducing the State’s CO₂ emissions, and promoting jobs growth.
- Certain cumulative negative impacts (e.g., potentially hazardous waste generation from battery storage facilities), however, may constrain the overall positive impacts of the 6 GW Roadmap. As discussed further in **Chapter 6**, a number of regulations, policies, and best practices serve as measures that will mitigate adverse impacts that may arise from activities undertaken in response to the 6 GW Roadmap.
- Cumulative site-specific impacts of the 6 GW Roadmap are not known at this time and are beyond the scope of this SGEIS. This SGEIS provides a generic description of the potential environmental impacts of the 6 GW Roadmap on land and water resources, agriculture, cultural and aesthetic resources, and other individually relevant impacts. Appropriate federal, state, and local permitting and environmental review processes will identify, evaluate, and mitigate potential site-specific impacts.

Exhibit 5-5: Summary of Past, Present, and Reasonably Foreseeable Future Actions that Interact with the Proposed Energy Storage Roadmap

	PAST	PRESENT/NEAR-TERM
STATE/REGIONAL	<ul style="list-style-type: none"> • Office Petroleum Overcharge Restitution Fund • 1988 System Benefit Charge • New York Energy Smart Program • Electricity Restructuring • Revenue Decoupling • Energy Efficiency Portfolio Standards (EEPS) • Renewable Portfolio Standard (RPS) • Climate Action Council • NY Energy Highway 	<ul style="list-style-type: none"> • Climate Leadership and Community Protection Act (CLCPA) • Regional Greenhouse Gas Initiative (RGGI) • Technology and Market Development Programs • 2018 Energy Storage Order • New York State Energy Plan • NY-Sun Initiative • Green Bank • Climate Smart Communities • Transportation and Climate Initiative • ReCharge NY & Charge NY • Five Cities Energy Program • Build Smart NY • Cleaner Greener Communities • DEC Peaker Rule • Market Acceleration Bridge Incentive programs • Retail Storage Incentive Program • Long Island Residential Incentive • PSEG-Long Island's Dynamic Load Management (DLM) program • Reforming the Energy Vision (REV) • Renewable Energy Standard (RES)
FEDERAL	<ul style="list-style-type: none"> • Energy Policy Act (1992, 2005, 2007) • Kyoto Protocol • Energy Independence and Security Act of 2007 • Emergency Economic Stabilization Act of 2008 • Production, Investment, and Advanced Energy Manufacturing Tax Credits • CAA Section 111(d) Clean Power Plan 	<ul style="list-style-type: none"> • Inflation Reduction Act • National Standards Strategy for Critical and Emerging Technology (USG NSSCET) • U.S. Department of Energy (DOE) Battery Workforce Challenge • White House American Battery Materials Initiative • Battery and Critical Mineral Manufacturing Production Tax Credit • EPA Greenhouse Gas Reporting Rule • Renewable Fuel Standard (RFS) • EPA Energy Star • Executive Order 13783: Promoting Energy Independence and Economic Growth

CHAPTER 6 | REGULATORY FRAMEWORK AND MITIGATION OF POTENTIAL ADVERSE IMPACTS

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §§617.9(b)(5)(iv) and 617.11(d)(5) of New York’s State Environmental Quality Review Act (SEQRA), this chapter describes the variety of measures available to minimize or avoid, to the maximum extent practicable (incorporating all practicable mitigation measures), potentially adverse environmental impacts that may result from energy storage activities that may be implemented under New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap). Specifically, this chapter discusses mitigation in two parts:

- **Section 6.1** introduces key federal and state regulations that may apply to energy storage activities during construction, operation, and closure of a specific project; and
- **Section 6.2** provides an overview of site-specific project design and planning which serves as a primary mitigation measure for many site-specific issues.

This chapter is not intended to provide an exhaustive list of potentially applicable regulations or mitigation measures, but rather a general overview of the key regulations and means by which adverse environmental impacts may be mitigated for a specific project or groups of similar projects.

6.1 POTENTIALLY APPLICABLE FEDERAL AND STATE REGULATION

The Generic Environmental Impact Statement (GEIS) discussed potentially applicable federal and state regulations designed specifically to protect human health and the environment from activities that could otherwise result in significant and/or adverse impacts from the 3 GW energy storage target. This section of the Supplemental GEIS (SGEIS) discusses those regulations and additional federal and state regulations coming into effect in recent years that might interact with the Roadmap’s 6 GW storage target.

6.1.1 Public Health and Safety

A number of regulations exist to limit risks to public health and safety from lithium-ion (Li-ion) batteries. Lithium batteries (including Li-ion and lithium polymer batteries) are regulated as a hazardous material under the U.S. Department of Transportation’s (DOT) Hazardous Materials Regulations (HMR; 49 C.F.R., Parts 171-180) and therefore are subject to a number of requirements to promote safe transport. At the state level, the New York State Uniform Fire Prevention and Building Code (Uniform Code), amended in 2020 to include the latest safety considerations for energy storage systems, prescribes mandatory statewide minimum standards for building construction and fire prevention. The 2020 Fire Code of New York State (the Fire Code) has extensive codes and regulations in place to help mitigate fire safety issues related to battery

storage systems.¹³⁴ Section 1206 of the Fire Code requires energy storage systems employing Lithium-ion batteries above 20-kilowatt hour (kWh) capacity to comply with multiple regulatory requirements. This includes mandatory installation of battery management systems and automatic fire suppression systems that meet strict requirements. Approved automatic smoke detection systems or radiant energy-sensing fire detecting systems must be installed in indoor areas containing electrochemical energy storage systems. Large-scale fire testing is also mandated to ensure that fire is contained to a storage system or a room. In terms of vegetation control, areas within ten feet on each side of an outdoor energy storage system are required to be cleared of combustible vegetation and other combustible growth to prevent fires from readily spreading. Large-scale fire testing is also mandated for storage exceeding 600 kWh and projects in New York City, in accordance with UL 9540A standards or approved equivalent safety standards. In addition, the Fire Code includes several other measures such as requiring installation of gas detection systems and compliance with seismic design requirements to ensure that battery storage systems remain safe. New York State Energy Research and Development Authority (NYSERDA) created a Model Law for local governments to adopt legislations and regulations to their communities when regulating battery energy storage. The Model Laws include safety requirements such as UL 9540A and other standards specific to battery types, among other requirements.¹³⁵

In New York City (NYC), Battery Energy Storage Systems (BESS) must meet NYC Fire Code requirements, which include a review of the product-level technology, a site-specific installation review and approval, and multiple additional approval processes from the Fire Department and the Department of Buildings, all dictated by section the New York City Fire Department (FDNY) Rule 3RCNY 608-01.¹³⁶ In addition, NYC Department of City Planning (DCP) has proposed updates to existing zoning regulations for energy storage systems as part of the “City of Yes for Carbon Neutrality” initiative.

Following multiple fire incidents at energy storage facilities in Jefferson, Orange and Suffolk counties between May and July 2023 (described in **Section 5.2.2**), on July 28, 2023, the Governor announced the creation of a new Inter-Agency Fire Safety Working Group (the Working Group) charged with ensuring the safety and security of energy storage systems across the State.¹³⁷ The group will be led by members of five State agencies, including the Division of Homeland Security and Emergency Services (DHSES) Office of Fire Prevention and Control, NYSEDA, the New York State Department of Environmental Conservation (NYSDEC), the Department of Public Service (NYS DPS), and the Department of State (NYS DOS). The Working Group will leverage

¹³⁴ NYSDPS/ICC. 2020 Fire Code of New York State. Accessed on July 12, 2023: <https://dos.ny.gov/system/files/documents/2020/09/2020-fcnys-november-2019.pdf>

¹³⁵ NYSEDA. Battery Energy Storage System Guidebook for Local Governments. Accessed on July 26, 2023 at: <https://www.nyserda.ny.gov/-/media/Project/Nyserda/files/Programs/clean-energy-siting/model-law.pdf>

¹³⁶ NYC Fire Department. 2019. Notice of Adoption of New Fire Department Rule 3 RCNY 608-01. Accessed on July 25 at: <https://www.nyc.gov/assets/fdny/downloads/pdf/codes/3-rcny-608-01.pdf>

¹³⁷ New York State. Governor Hochul Convenes Inter-Agency Fire Safety Working Group Following Fires in Jefferson, Orange, and Suffolk Counties. July 28, 2023. Accessed on August 7, 2023 at: <https://www.nyserda.ny.gov/About/Newsroom/2023-Announcements/2023-07-28-Governor-Hochul-Convenes-Inter-Agency-Fire-Safety-Working-Group>

expertise on energy storage fires, community impacts, and emergency response, and will collaborate with first responders and local leaders to identify best practices, address potential risks to public safety, and ensure energy storage sites across the State are both safe and effective. As part of its charge, the Working Group will also thoroughly investigate the recent energy storage fires in the State and based on its findings, develop a list of recommendations for stationary energy storage equipment and installations. The Working Group will also review energy storage operations to examine the condition of batteries, adherence to design parameters, on-site fire suppression, fire suppression plans with local fire departments, and other best practices. Energy storage projects in the State will be subject to any future requirements that come out of the Working Group's review and recommendations.

6.1.2 Air Resources

The GEIS discussed a number of federal and state regulations addressing air pollution, including hazardous air pollutants, that may occur as the result of constructing energy storage facilities.

The GEIS identifies the Clean Air Act (CAA) as the primary federal statute governing air quality and air pollution.¹³⁸ Within the CAA, air quality is determined based on ambient air concentrations of specific pollutants that the U.S. Environmental Protection Agency (EPA) has identified as potentially harmful to public health and the environment.¹³⁹ EPA has defined primary (and in some cases secondary) standards for six "criteria" pollutants, defined at levels necessary to protect the public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Areas that do not meet National Ambient Air Quality Standards (NAAQS) as set forth in the CAA for specific criteria pollutants are designated as being in "nonattainment" for specific criteria pollutant standard(s). Most air quality control regions in New York State (the State) are in attainment with NAAQS. However, as of 2018 two regions are designated 8-hour ozone (2008) NAAQS nonattainment areas – the upstate county of Chautauqua and downstate counties including Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, and Westchester.¹⁴⁰ All of the State is considered part of the Ozone Transport Region (OTR) and is required at a minimum to implement measures required in moderate ozone nonattainment areas.

As discussed in **Chapter 5**, energy storage systems are not expected to emit criteria pollutants. However, during the operations stage of energy storage facilities, integration of energy storage technologies into the electricity grid may potentially increase overall grid CO₂ emissions, particularly if the energy stored is supplied through fossil fuel generation. To mitigate this effect (and potentially obtain a net reduction in CO₂ emissions), energy storage facilities may employ operational patterns that reduce overall grid CO₂ emissions while minimizing operational costs.¹⁴¹

¹³⁸ 42 U.S.C. 7401 et seq., amended in 1977 and 1990.

¹³⁹ The surrounding atmosphere, usually the outside air, as it exists around people, plants, and structures.

¹⁴⁰ EPA. Greenbook. Nonattainment Status for Each County by Year for Criteria Pollutants as of July 02, 2014. Accessed on May 8, 2018 at: https://www3.epa.gov/airquality/greenbook/anayo_ny.html.

¹⁴¹ Arciniegas, Laura M. and Eric Hittinger. 2018. Tradeoffs between revenue and emissions in energy storage operation. *Energy* 143, p 1-11. Accessed on May 8, 2018 at: <https://doi.org/10.1016/j.energy.2017.10.123>.

In May 2023, EPA proposed a rule under the CAA to limit CO₂ emissions from fossil fuel-fired power plants, but at this time, no such regulations exist for energy storage systems.¹⁴²

Construction of energy storage facilities may involve the use of heavy construction equipment such as excavators, forklifts, or on-site generators. EPA regulates emissions from heavy equipment through 40 Code of Federal Register (CFR) Part 1048 and 40 CFR Part 1039. Further, the State’s Environmental Conservation Law 6 NYCRR, Subpart 217-3 addresses heavy duty vehicles that may be traveling to or working on an energy storage construction site by prohibiting idling for more than five minutes at a time. This idling restriction is aimed at reducing air pollution, noise, and fuel use.

6.1.3 Waste Management

Energy storage projects may generate hazardous waste during construction or decommissioning processes and regular facility use. The manufacture and use of battery energy storage technologies may also involve generation and disposal of federal- and state-regulated wastes. As discussed in the GEIS, the primary federal waste management regulation is the Resource Conservation and Recovery Act (RCRA), which regulates the transport and management of solid and hazardous wastes. EPA delegated authority to the State to implement and enforce hazardous waste regulations under RCRA. On May 24, 2023, the EPA issued a guidance memorandum on the potential applicability of the nation’s hazardous waste regulatory program under RCRA to the collection and recycling of lithium-ion batteries.¹⁴³ The memorandum concludes that under RCRA, most Li-ion batteries qualify as hazardous waste at their end of life due to their ignitability and reactivity characteristics. Accordingly, EPA recommends that all lithium batteries be managed with care during all life cycle phases, including end of life, and that businesses consider managing all used lithium batteries as hazardous waste under the federal “universal waste” regulations in Title 40 of the Code of Federal Regulations (CFR) part 273.¹⁴⁴ Through Part 373 permits, the New York State Department of Environmental Conservation (NYSDEC) ensures that environmentally protective design and operational standards are maintained at facilities that treat, store, or dispose of hazardous waste materials.¹⁴⁵ Anyone that transports regulated waste on the roads of the State, if the waste originates or is disposed in the state, must have a New York State Part 364 waste transporter permit.¹⁴⁶

6.1.4 Public Service Law

As discussed in the GEIS, New York State’s Public Service Law (PSL) authorizes the NYSDPS and the New York State Public Service Commission (the Commission) with primary missions to ensure safe and reliable access to utility services including electricity, gas, steam,

¹⁴² US EPA. 2023. Docket ID: EPA-HQ-OAR-2023-0072

¹⁴³ US EPA. 2023. Accessed on September 8, 2023 at: <https://rcrapublic.epa.gov/files/14957.pdf>

¹⁴⁴ Ibid.

¹⁴⁵ NYSDEC. Hazardous Waste Management. Accessed on May 8, 2018 at: <http://www.dec.ny.gov/chemical/8486.html>.

¹⁴⁶ NYSDEC. Waste Transporters. Accessed on May 8, 2018 at: <https://www.dec.ny.gov/chemical/8483.html>.

telecommunications, and water, at just and reasonable rates, while protecting the natural environment. By the authority granted through the PSL, the Commission also seeks to stimulate innovation, infrastructure investment, consumer awareness, and competitive markets in utility provision, including electric utilities. Energy storage facilities are considered in regulatory provisions of the PSL and its implementing regulations, including PSL Articles 4, 7 and 10, which discuss requirements for electricity transmission and generation facility siting. Each article and its applicability to the 6 GW Roadmap are discussed below.

Article 4, Section 68 (PSL §68) Certificate of Public Convenience and Necessity (CPCN), requires electric corporations to obtain permission and approval of the Commission prior to construction of an electric plant. The Commission has determined that standalone energy storage facilities up to 80 megawatts (MW) capacity are “alternate energy production facilities” (PSL §2(b)) that are not “electric plant[s]” (PSL §12) and therefore not subject to PSL §68.

Article 7, Siting of Major Utility Transmission Facilities, requires review of siting, construction, and operation of major electricity transmission facilities. Specifically, this article requires project developers to obtain a Certificate of Environmental Compatibility and Public Need from the Commission before a new facility may be constructed. In instances when controversial issues arise, a formal evidentiary hearing where evidence and testimony are presented may be required. Major electric transmission facilities include systems greater than 125 kilovolts (kV) extending a distance of one mile or longer, or of 100 kV or more and less than 125 kV extending a distance of ten miles or more. Applicants for such major facilities must publish notice of the proposed construction and discuss in the application any environmental impact studies and consideration of alternate routes. Transmission lines that intersect the boundaries of a critical environmental area also require a specific environmental review. Article 7 does not impose the same requirements on small electric or distribution lines, substation additions, or simple upgrades; these minor projects may require local permits as well as selected state approvals under other statutes and regulations.

Commission Article 10, Siting of Major Electric Generating Facilities, establishes a regulatory framework for the New York State Board on Electric Generation Siting and the Environment (Siting Board) to review (and approve or deny) a Certificate of Environmental Compatibility and Public Need for a proposed new generating facility or repowered or modified major electric generating facility with a nameplate generating capacity of 25 MW or more (i.e., major electric generating facility). The Siting Board has determined that standalone energy storage facilities not associated with development of new electric generating facilities are not considered “major electric generating facilities” and thus not subject to siting provisions of Article 10.¹⁴⁷ However, in some cases where energy storage facilities are paired with proposed major electric generating facilities, energy storage components are considered “ancillary features” and may be subject to siting requirements of Article 10 as such. Article 10 requires review of environmental and public health impacts, environmental justice issues, and public safety. Facilities not subject to Article 10

¹⁴⁷ New York State Public Service Commission. Case 13-F-0287 – Petition of AES Energy, Storage, LLC for a Declaratory Ruling that Battery-Based Energy Storage Facilities are not Subject to Article 10 of the PSL; Declaratory Ruling on Applicability of Article 10 Of The Psl to Battery-Based Energy Storage Facilities Issued and Effective January 24, 2014.

would be subject to other relevant permitting and review procedures, including provisions of SEQRA as appropriate to specific project parameters.

6.1.5 Water Resources

The GEIS discussed key federal and state regulations that may mitigate impacts to water resources from activities implemented under the 6 GW Roadmap.

The primary federal statute governing water quality and water resources is the Clean Water Act (CWA). Any new infrastructure, including infrastructure associated with development of energy storage, that either crosses or occurs near navigable water may trigger federal review and permitting requirements under the CWA.¹⁴⁸ Projects for which construction occurs near navigable waters or could otherwise obstruct or alter navigable waters must obtain a permit from the U.S. Army Corps of Engineers (USACE) under Section 10 of the Rivers and Harbors Act. As part of such processes, project developers are required to propose and implement measures to avoid impacts to wetlands, streams, and other regulated water resources in accordance with the environmental criteria from CWA Section 404(b)(1). In cases where impacts are unavoidable, 33 CFR Parts 325 and 332 and 40 CFR Part 230 govern the framework under which developers may be able to compensate for (or offset) permanent impacts. EPA and USACE require compensatory mitigation to replace the loss of wetland, stream, and other aquatic resource functions from unavoidable impacts, which is usually accomplished through prior restoration or enhancement projects (“mitigation banks”), fee payments, or new restoration, establishment, enhancement, or preservation activities required in the permitting process.

Under CWA Section 401, projects applying for any federal licenses or permits must obtain New York State certification that any discharges into navigable waters will comply with New York State water quality standards. In most cases, NYSDEC reviews and issues state certifications.

Regulations at the state level provide further protection for the State’s water resources. For example, energy storage projects whose activities disturb stream banks, impound water, require the construction (or reconstruction or repair) of docks or mooring, or excavate and fill navigable waters or wetlands are required to obtain permits from NYSDEC under 6 NYCRR Part 608. Activities occurring in coastal areas are overseen by the State’s Coastal and Inland Waterways Program, which is responsible for implementing the Federal Coastal Zone Management Act (FCZMA) and state-level coastal regulations under 19 NYCRR Part 600. While neither program requires permits or licenses for activities occurring in coastal areas, proposed activities must be consistent with the state’s coastal policies that guide the appropriate use and protection of the State’s coasts and waterways. An assessment of the potential impacts of such activities is required as part of project planning. Such assessments are designed to support economic development, but in a manner that avoids or minimizes, to the extent possible, loss or degradation of the unique natural and cultural resources that exist along the State’s coastline. These include marine resources and wildlife, open space, shoreline erosion, and scenic beauty through the consideration of Significant Coastal Fish and Wildlife Habitats and Scenic Areas of Statewide Significance designations.

¹⁴⁸ CWA Section 404(f) provides exemptions for some activities associated with ongoing farming, ranching, and forestry activities that do not represent new uses of water that result in flow reduction.

In some cases, federal and state regulations work cooperatively to protect water resources. In particular, some federal programs require permittees to maintain compliance with applicable state regulations. One example is a key state regulatory program: the New York State Pollutant Discharge Elimination System (SPDES). This program, established under Article 17 of the ECL, is authorized by EPA for the control of wastewater and stormwater discharges in accordance with the CWA. Broader in scope than the CWA, New York’s SPDES program controls point source discharges to both surface water and groundwater, including, for example, Concentrated Animal Feeding Operations (CAFOs). SPDES permits are required for any activity discharging wastewater into surface water or ground water.¹⁴⁹

6.1.6 General Environmental Review Requirements

As discussed in the GEIS, under the National Environmental Policy Act (NEPA), federal agencies must consider environmental impacts when making permitting decisions. When a project may have significant potential impacts, agencies must also prepare an environmental impact statement (EIS) that discusses the significant environmental impacts and reasonable alternatives that would avoid or mitigate such adverse impacts. Thus, projects requiring other federal approvals may also trigger review under NEPA, such as wind plus energy storage projects involving federal agency authority over federal lands or federal waters (e.g., offshore wind facilities).

Similarly, the GEIS also discussed SEQRA, which requires an environmental review for an action that is directly undertaken, *funded*, approved, or permitted by state or local government agencies. SEQRA requires the sponsoring or approving governmental authority to identify and avoid or minimize any significant or adverse environmental impacts generated by the proposed action. That agency may avail itself of mitigation measures if actions cannot otherwise be avoided or minimized, and under 6 NYCRR §617.11(d)(5), must present a findings statement certifying that all other reasonable alternatives have been considered. After completing an initial environmental assessment, the lead agency determines the significance of an action’s environmental impacts and then decides whether a full EIS and/or public hearing are required.

Accordingly, any projects under the 6 GW Roadmap requiring federal, state, or local approvals, including those below the 25 MW threshold defined in Article 10, may trigger further environmental review under SEQRA or NEPA.¹⁵⁰ For example, in New York, the environmental impacts of a proposed utility-scale solar plus energy storage project must go through siting approvals from local government, which would trigger further environmental review. Residential rooftop solar plus small-scale energy storage projects generally only require county-level permits.

Minor sources of pollutants that do not exceed thresholds under other statutes (this includes most energy storage projects covered in the 6 GW Roadmap) may be permitted under SEQRA administrative procedures that serve to coordinate impact assessments, permits, and local

¹⁴⁹ SPDES permits are not required for a facility whose treatment system discharges less than 1,000 gallons/day and does not contain any industrial or other non-sewage waste streams. Those systems, such as a septic system, may still require local approval.

¹⁵⁰ “Type II” actions listed in statewide and agency SEQR regulations do not require review, as they have been specifically determined not to have a significant adverse impact on the environment. As details of future activities under Energy Storage Roadmap are not known at this time, it is possible that the type, small size, or location of certain energy storage projects may not trigger any discretionary environmental review process (i.e., a generator proposed at a site already zoned to allow such generation).

requirements. For example, minor sources seeking permits in the jurisdiction of New York City are permitted under joint or coordinated SEQRA and City Environmental Quality Review (CEQR) requirements.

The Community Risk and Resiliency Act (CRRRA), signed into law on September 22, 2014, requires local and state funding and permitting decisions to consider risks from climate change and extreme weather impacts, such as storm surges and flooding, for proposed projects.

6.1.7 Environmental Justice

Environmental justice (EJ) communities have historically been overburdened by a high density of air pollution sources, particularly those associated with transportation and energy. To minimize disproportionate environmental impacts on EJ communities, community involvement is required as part of energy siting and permitting review processes and in the development of transportation projects.

As discussed in the GEIS, 6 NYCRR Part 487 establishes a regulatory framework for incorporating EJ issues into proceedings before the Siting Board for determining whether to approve a major electric power plant pursuant to Article 10 of the Commission.¹⁵¹ The GEIS also discussed NYSDEC Commissioner Policy 29 on Environmental Justice and Permitting (CP-29), which provides further direction to NYSDEC staff on screening projects for possible EJ issues.

Since the publication of the GEIS, several federal and state regulations have been introduced that apply to energy storage activities in the State. In particular, the Climate Leadership and Community Protection Act (CLCPA), signed into law in 2019, aims to address the disproportionate impacts from climate change and environmental pollution on Disadvantaged Communities. Under the CLCPA:¹⁵²

Disadvantaged Communities shall be identified based on geographic, public health, environmental hazard, and socioeconomic criteria, which shall include but are not limited to: (i) areas burdened by cumulative environmental pollution and other hazards that can lead to negative public health effects; (ii) areas with concentrations of people that are of low income, high unemployment, high rent burden, low levels of home ownership, low levels of educational attainment, or members of groups that have historically experienced discrimination on the basis of race or ethnicity; and (iii) areas vulnerable to the impacts of climate change such as flooding, storm surges, and urban heat island effects.

Any program arising out of the 6 GW Energy Storage Roadmap process will be expected to comply with Disadvantaged Community requirements as outlined in the CLCPA.¹⁵³ Because the benefits of energy storage projects often occur locally (in terms of improved electricity reliability and health benefits, particularly when energy storage replaces peaker plant operations), the 6 GW

¹⁵¹ NYSDEC. 2018. Environmental Justice. Accessed on May 8, 2018 at: <http://www.dec.ny.gov/public/333.html>.

¹⁵² New York State Climate Justice Working Group. 2022. Accessed on July 20, 2023 at: <https://climate.ny.gov/-/media/Project/Climate/Files/Disadvantaged-Communities-Criteria/Technical-Documentation-on-Disadvantaged-Community-Criteria.pdf>

¹⁵³ NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap.

Roadmap recommends that at least 35 percent of program funding be utilized to support projects in areas of the state with the highest benefits to Disadvantaged Communities and peaker reductions. These areas can be found in various locations across the state, but Zone J (New York City) is expected to receive particular focus in program design. Although energy storage projects may provide more local benefits than other energy projects, the required community engagement is still a critical risk-mitigating action to ensure projects do not cause disproportionate impacts.¹⁵⁴

These efforts are further supported by the Environmental and Climate Justice Program (ECJ Program), created by the Inflation Reduction Act (IRA) under Clean Air Act (CAA) Section 138, which serves as another source of funding for financial and technical assistance to implement environmental and climate justice activities that benefit underserved and overburdened communities.¹⁵⁵

6.2 SITE-SPECIFIC MITIGATION AND BEST MANAGEMENT PRACTICES

The 6 GW Roadmap may result in actions that fall outside the scope of existing federal, state, and local regulatory review, permitting, and licensing programs. In such cases, proper project planning, design and siting, and application of best management practices during all project phases will serve to mitigate environmental impacts not addressed by existing regulatory programs. This section discusses general best practices with regards to project siting, design, and operation.

As discussed in the previous GEIS, appropriate project planning and siting have the ability to avoid or minimize many environmental impacts. For example, proper siting considerations should avoid placing structures in sensitive resources such as mature forests, wetlands, and other important wildlife or critical environmental areas. Early consultation with the appropriate resource protection agency should take place to develop plans to protect resources such as soils, streams and wetlands, agricultural lands, and cultural, archeological, or scenic resources. In instances where siting of energy storage may require facilities near population centers and residential development, adhering to appropriate setbacks from houses, property lines, roads, and other structures will help to avoid or minimize operational noise and visual concerns. Projects and associated transmission and distribution infrastructure can also reduce visual impacts by using existing transmission corridors, minimizing clearing, incorporating vegetative screening, and using low profile structures. Additionally, projects can use appropriately colored transmission towers, non-reflective finishes, vegetative screens, and context-sensitive architectural treatments to address site-specific impacts. Pre- and post-construction studies can be used to monitor for potential operational impacts on ecological resources, and communities.

During the design phase, project planners should consider a project's compatibility with local land use and zoning ordinances, comprehensive plans, and the character of the host community. Project planners should also consider incorporating inherent project elements that can reduce environmental impact during operation.

¹⁵⁴ EPRI. 2022. Environmental Justice and Renewable Energy and Storage. Accessed on July 19, 2023 at: <https://www.epri.com/research/products/000000003002024572>

¹⁵⁵ EPA. 2023. Inflation Reduction Act Environmental and Climate Justice Program. Accessed on July 19, 2023 at: <https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-environmental-and-climate-justice-program>

Project planning and design can also consider upstream and downstream impacts. Battery storage technologies produce potentially hazardous waste at end of life; identifying a facility for recycling the batteries prior to project commencement can ensure proper disposal and reduce waste impacts.

Projects should also employ Best Management Practices (BMPs) throughout project construction and operation. In addition to consultation with relevant resource agencies, project planners should engage with local communities to develop BMPs that are appropriate and compatible with the local land use context. During construction, projects should limit construction activity at specific times (e.g., rush hour, daytime hours) or specific seasons/months to reduce impacts on noise, vegetation, sensitive habitats, and/or seasonal recreational activities. Reducing slopes near wetland areas will minimize grading effects and protect aquatic habitat. Utilizing existing access roads when possible and locating new roads along field edges can help to avoid impacts on agricultural and natural resources. Post-construction re-vegetation of disturbed areas with native species can speed recovery and reduce the potential for long-term impacts on plants and animals. Other practices can minimize impacts from dust associated with construction activities, including using a truck wash station at the project fence line; periodic spraying of haul roads with water; or street cleaning to control dirt and dust on public roadways, depending on local site conditions. Following EPA's Clean Air Non-road Diesel Emissions Rule will reduce the sulfur content of diesel fuel used during construction activities. To reduce light pollution at night, projects can minimize illumination during facility operations. Designating an environmental monitor during construction can further help ensure compliance with all permit requirements and environmental protection commitments.

CHAPTER 7 | UNAVOIDABLE ADVERSE IMPACTS

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.9(b)(5)(iii)(b) of New York’s State Environmental Quality Review Act (SEQRA) requires an analysis of unavoidable adverse impacts. Unavoidable adverse impacts are impacts that, if the Proposed Action is implemented, cannot be avoided or adequately mitigated. **Chapter 5** discusses the potential impacts that may result from implementation of New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap). The purpose of this Supplemental Generic Environmental Impact Statement (SGEIS) is not to evaluate specific energy storage projects and their site-specific impacts. As previously discussed, significant environmental impacts could result from individual but as yet unidentified projects implemented in the future pursuant to the 6 GW Roadmap. However, the review presented in **Chapter 5** does not identify any unavoidable environmental impact of a type that cannot be mitigated through one or more of the techniques discussed in **Chapter 6** (Regulatory Framework and Mitigation of Potential Adverse Impacts). Unavoidable impacts of the “no action” alternative (i.e., following the 3 GW deployment outlined in the 3 GW Roadmap but not the incremental storage deployment of the current Roadmap) are discussed in **Chapter 1** and **Chapter 4**.

CHAPTER 8 | IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §§617.9(b)(5)(iii)(c) of New York’s State Environmental Quality Review Act (SEQRA), this chapter discusses irreversible and irretrievable commitments of resources associated with the proposed action. Approval of New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap) would not in itself result in irreversible or irretrievable commitment of resources because no particular energy storage project, project site, or regulatory modification will be approved or endorsed by approval of the action. The construction of new energy storage projects in the future in response to the 6 GW Roadmap may raise such concerns, but these will be identified in site-specific environmental analyses and avoided or minimized in accordance with SEQRA and other applicable laws and regulations (as discussed in **Chapter 6**). The principal commitment of resources for the construction and operation of energy storage projects is described in **Chapter 5** (Environmental Impacts of Proposed Action). However, actual impacts and resource commitments are currently and will remain unknown until specific projects are proposed.

CHAPTER 9 | GROWTH-INDUCING ASPECTS AND SOCIOECONOMIC IMPACTS

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.9(b)(5)(iii)(d) of New York’s State Environmental Quality Review Act (SEQRA), this chapter discusses the potential growth-inducing aspects and socioeconomic impacts of the proposed New York’s 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap). Specifically, the chapter proceeds through the following sections:

- **Section 9.1** introduces the analytic framework for the analysis of growth-inducing aspects and socioeconomic impacts of the 6 GW Roadmap;
- **Section 9.2** discusses the potential benefits of actions proposed in the 6 GW Roadmap;
- **Section 9.3** outlines the program costs associated with energy storage deployment;
- **Section 9.4** compares the identified costs and benefits of the 6 GW Roadmap;
- **Section 9.5** identifies potential environmental justice impacts associated with actions proposed in the 6 GW Roadmap.

9.1 ANALYTIC FRAMEWORK

This chapter provides qualitative information on the types of changes expected to occur from implementation of the 6 GW Roadmap and the potential resulting growth-inducing aspects and socioeconomic impacts associated with those changes. As previously discussed, the exact mix of energy storage technologies that will be implemented under the 6 GW Roadmap has some uncertainty, although the general magnitude is known. As such, this review is being conducted generically based on what is reasonably foreseeable.

Project-specific impacts analysis will be required only when specific actions are proposed that trigger applicable federal, state, or local approval processes and that exceed thresholds that trigger site-specific environmental impact reviews. This chapter, therefore, does not attempt to predict or speculate on the possible impacts of project-specific actions but focuses instead on qualitative descriptions of overall potential growth-inducing aspects and socioeconomic impacts.

9.2 POTENTIAL BENEFITS

There is broad consensus that energy storage is a critical resource for enabling the vision of a cleaner, more resilient and affordable energy system in New York State (the State). This Roadmap assesses needed market reforms and cost-effective procurement mechanisms to achieve the increased storage target, identifies research and development needs to accelerate technology innovation, particularly for long-duration energy storage, and recommends approaches to storage deployments in a manner that furthers the state’s efforts in replacing New York’s most polluting fossil fuel facilities. **Exhibit 9-1** summarizes the overall potential benefits of the 6 GW Roadmap

across five categories: energy system, public health, climate change, ecosystem services, economic benefits, and technological innovation.

Exhibit 9-1: Summary of Potential Benefits for the Energy Storage Roadmap

BENEFIT CATEGORY	PERSPECTIVE	
	COST REDUCTIONS	SOCIETAL BENEFITS
ENERGY SYSTEM¹⁵⁶		
Improved power quality and the reliable delivery of electricity to customers.	✓	✓
Improved stability and reliability of transmission and distribution systems.	✓	✓
Increased use of existing equipment, thereby deferring or eliminating costly upgrades.	✓	✓
Improved availability and increased market value of distributed energy resources.	✓	
Increased use and improved value of renewable energy generation.	✓	✓
Cost reductions through capacity and transmission payment deferral.	✓	
CLIMATE CHANGE		
Climate change is expected to increase air temperatures, in turn intensifying water cycles through increased evaporation and precipitation. Greater energy storage deployment can reduce the State’s reliance on fossil fuel energy.	✓	✓
ECOSYSTEM SERVICES		
Land and water quality improvements could result from a switch to renewable energy sources supported by storage, including less cooling water used and fewer pollutant releases from fossil fuel generated energy.		✓
PUBLIC HEALTH		
Increased use of renewable energy resources results in avoided emissions of GHG and criteria air pollutants.		✓
Increased air quality results in a reduction of state health care expenditures for treatment of asthma, acute bronchitis, and respiratory conditions.		✓
ECONOMIC BENEFITS		
Increased manufacturing of energy storage and renewable energy equipment.		✓
Jobs and revenue creation.		✓
Effects of spending throughout local economy.		✓
TECHNOLOGICAL INNOVATION		
Investment in the energy storage market spurred by the Proposed Action is expected to contribute to significant cost reductions for the underlying technology.	✓	

¹⁵⁶ U.S. Department of Energy. Energy Storage. Office of Electricity Delivery & Energy Reliability. Accessed on April 27, 2018 at: <https://www.energy.gov/oe/activities/technology-development/energy-storage>.

Energy storage directly provides a number of different services at all levels of the electricity system, including meeting capacity (reliability) requirements, providing distribution system relief (load reduction during critical periods), reducing the cost caused by peak electric periods, and integrating large-scale wind and solar generating facilities so they provide electricity when and where it's most needed. These energy system benefits in turn generate additional benefits, which can be broadly organized into four categories:

- **Environmental benefits** (i.e., benefits related to climate change and ecosystem services) generated by the reduction in fossil-fuel based generation. As discussed in **Section 5.3**, the 6 GW Roadmap is part of a statewide strategy intended to shift generation from fossil fuels to low-carbon resources. As the fossil fuel-based generation decreases, the associated adverse impacts to air, water, land, and ecological resources decrease. Of these benefits, reductions in greenhouse gas (GHG) emissions are especially important to mitigate the adverse impacts of climate change.
- **Public health benefits** stem directly from environmental benefits, the most significant being a reduction in criteria air pollutants from reduction in fossil fuel-based generation, which can cause multiple adverse human health impacts.
- **Economic benefits**, directly generated through energy cost savings and indirectly through the creation of jobs, additional spending in the economy, increased productivity, reduced physical damage during extreme weather events, and/or redistributed resources for more productive economic uses. A 2022 study by the National Renewable Energy Lab (NREL) estimates between 4,700 and 9,000 jobs will be needed for stationary, grid-connected battery storage by 2030 based on low and high scenarios defined by national renewable energy capacity.¹⁵⁷ Both scenarios reflected state-level policies as of June 20, 2020; therefore, these estimates reflect the 3 GW target and likely underestimate the number of jobs created under the 6 GW target. Nationally, about half of the jobs in battery energy storage will be in construction, with the remaining half consisting of manufacturing, wholesale trade, professional and business services, and other occupations.¹⁵⁸
- **Technological innovation** spurred by the incentives designed to promote capacity expansion and improve the cost effectiveness of storage technologies. Energy storage developed for the 6 GW Roadmap can provide the glide path towards the levels of storage needed for the longer term. Accelerating the pace of storage deployments over the next decade to achieve a 6 GW target by 2030 would place the State on a more sustainable trajectory and would ensure that the resources needed to integrate renewables are online and operational at a timing that better matches with expected increases in the deployment of renewable resources.

Driven by the cost-effective integration of renewables and reductions in firm zero-carbon capacity (e.g., hydrogen-based generation, which is more expensive and uncertain), the analysis completed for the 6 GW Roadmap finds that storage yields a potential net saving of \$1.94 billion through

¹⁵⁷ National Renewable Energy Lab (NREL). 2022. New York's Clean Energy Jobs Potential Through 2030. Accessed on July 21, 2023 at: <https://www.nrel.gov/docs/fy22osti/82207.pdf>

¹⁵⁸ NREL. 2022. State-Level Employment Projections for Four Clean Energy Technologies in 2025 and 2030. Accessed on July 21, 2023 at: <https://www.nrel.gov/docs/fy22osti/81486.pdf>

2050 (2022 net present value). This estimate considers storage capacity expansion through 2050 of over 17 GW of storage, therefore it includes benefits beyond the direct impacts of the 6 GW Roadmap. However, the value does not include other societal benefits, including those resulting from reductions in emissions of harmful pollutants, nor the other benefits listed in **Exhibit 9-1** (e.g., economic benefits or benefits stemming from technological innovation).

9.3 POTENTIAL COSTS

This section describes estimates of the cost of implementing the storage target and program proposals discussed in the 6 GW Roadmap. An additional 4.7 GW of new projects are required to be procured in time for deployment by 2030 to bridge the gap between the commitment of 1.3 GW (as of October 2022) and the 6 GW target. The total cost includes both program costs and administrative costs.

Retail and Residential Storage Program

The residential program is estimated to cost \$72 million to procure 200 megawatts (MW) of residential energy storage across the state. The retail program is estimated to require \$438 million to procure 1,500 MW of retail energy storage. As shown in **Exhibit 9-2**, the retail and residential programs, taken in combination, are estimated to cost \$510 million (net present value) for incentive payments for 1,700 MW of energy storage, paid out between 2023 and 2030.

Exhibit 9-2: Retail and Residential Program Costs

PROGRAM	MW	ESTIMATED PROGRAM COST (2022\$ NET PRESENT VALUE)
Retail	1,500	\$438,000,000
Residential	200	\$72,000,000
Total	1,700	\$510,000,000

Source: NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap

Bulk Storage Program

Bulk storage program costs are estimated to range between \$474 million and \$1.19 billion (net present value in 2022 dollars) to procure 3,000 MW of bulk storage. The range of these projections reflects future uncertainties, most notably those associated with energy and capacity prices.

Exhibit 9-3: Bulk Procurement Program Cost Estimates

PROGRAM	MW	ESTIMATED PROGRAM COST (2022\$ NET PRESENT VALUE)
Bulk - Low estimate	3,000	\$474,000,000
Bulk - High estimate	3,000	\$1,186,000,000

Source: NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap

Administrative Costs

In addition to the program costs involved in procuring bulk, retail, and residential programs, the 6 GW Roadmap identifies the following four categories of administrative costs:¹⁵⁹

Program Administration: This includes fully loaded labor costs, overhead, and the technology costs necessary to design, launch, implement, and scale up storage initiatives to successfully implement the 6 GW Roadmap. The New York State Energy Research and Development Authority's (NYSERDA) project planning indicates that a total of approximately \$29.0 million (\$24.5 million for residential and retail programs and \$4.5 million for the bulk storage program) should be budgeted for program administration.

Implementation Support: This includes costs associated with technical consultant support, quality assurance, measurement and verification, and business system and data warehousing development related to the implementation of the proposed bulk and retail and residential programs. NYSEDA's project planning indicates that a total of approximately \$15 million should be budgeted for implementation support.

Program Evaluation: This includes costs associated with impact assessments, market characterization, and process evaluation towards assessing the effectiveness, efficiency, and impact of the proposed NYSEDA-administered programs. NYSEDA's project planning indicates that a total of approximately \$3 million should be budgeted for program evaluation needs.

New York State Cost Recovery Expense: This includes a fee assessed to NYSEDA and other public authorities by New York State for an allocable share of state governmental costs attributable to the provision of services to public benefit corporations pursuant to Section 2975 of the Public Authorities Law. For the past six fiscal years, the New York State Cost Recovery Fee (CRF) assessment has averaged approximately 1.1 percent of NYSEDA's annual expenses, and NYSEDA allocates CRF across its programs by the weighted average of programmatic expenditures. Based on this, at 1.1 percent of the additional budget requested related to the proposed residential and retail storage procurement programs, NYSEDA requests \$8.9 million in new funding relating to the CRF.

Total Costs

The total cost for the three incentive programs procuring up to 4,700 MW of energy storage, inclusive of administrative costs and provided on a net present value basis (2022 dollars), is expected to be between \$1 billion to \$1.7 billion, paid out over 22 years.¹⁶⁰ This equates to an estimated increase in customer electric bills of 0.32 to 0.54 percent (or \$0.34 – \$0.58 per month for the average residential customer) on average across New York for the 22-year period of payments under these programs. The range of these projections reflects future uncertainties, including within energy and capacity prices.

Exhibit 9-4 below summarizes these projected program costs (including requested administrative and other non-program funding) and associated bill impacts, both for the retail/residential and bulk storage programs. Bill impacts are shown both levelized over the program period and for the peak

¹⁵⁹ NYSEDA/NYSDDS. 2022. New York's 6 GW Energy Storage Roadmap.

¹⁶⁰ NYSEDA/NYSDDS. 2022. New York's 6 GW Energy Storage Roadmap.

bill impact year. Retail and residential project payments will begin soon after the start of any new programs and end in 2030, since incentive payments for these projects are paid out at commissioning. Bulk project payments are spread out over 15 years, beginning when projects are operational, which may not occur for four to five years after procurement, and ending in 2044 at the latest for projects operational in 2030.

Exhibit 9-4: Program Cost Estimates

	LIFETIME PROGRAM COST, NPV (2022\$ MILLION)	LIFETIME LEVELIZED BILL IMPACT (%)	PEAK YEAR BILL IMPACT (%)
Bulk	\$474 - \$1,186	0.15% - 0.37%	0.63% - 0.91% (2030)
Retail/Residential	\$535	0.17%	0.69% (2027)
Total	\$1,009 - \$1,721	0.32% - 0.54%	1.32% - 1.60% (2030)

Source: NYSERDA/NYS DPS. 2022. New York's 6 GW Energy Storage Roadmap.

9.4 COMPARISON OF COSTS AND BENEFITS

Because the costs and benefits quantified above are not comprehensive and cover different time frames, a direct, quantitative comparison of costs and benefits is not possible. In general, upfront costs produce benefits, some of which occur in the near-term (e.g., job creation, peaker demand reductions) and some of which accrue over the longer-term (e.g., environmental benefits, particularly as storage is paired with renewable energy generation).

9.5 ENVIRONMENTAL JUSTICE IMPACTS

Actions taken in response to the 6 GW Roadmap may occur in environmental justice (EJ) communities and may have the potential to affect low-income and minority populations within these communities. Any program arising out of the 6 GW Roadmap process will be expected to comply with Disadvantaged Community requirements, as outlined in the Climate Leadership and Community Protection Act (CLCPA).¹⁶¹ The relevant regulations pertaining to disproportionate impacts to EJ communities are described in **Section 6.1**.

Because the EJ implications of any storage projects will be highly site-specific, further evaluation of EJ impacts should occur during the project review stage. Regulations at 6 NYCRR Part 487 establish a framework for evaluating the potential EJ issues associated with siting a major electric generating facility (as defined by Public Service Law [PSL] Article 10). EJ issues are also addressed on a case-by-case basis as part of the New York State Department of Environmental Conservation's (NYSDEC's) environmental permit review process as well as its application of SEQRA.

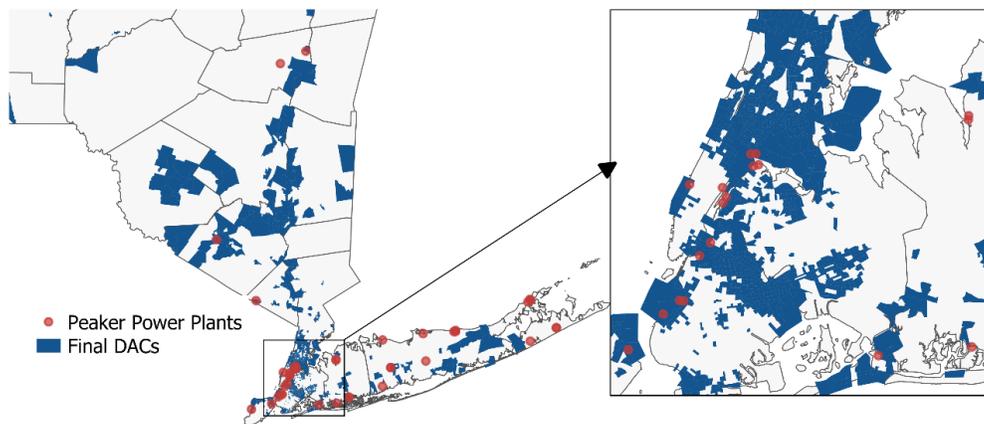
Commissioner Policy 29 on Environmental Justice and Permitting (CP-29) specifies the process for analyzing environmental justice impacts in the context of SEQRA, though the definition of Disadvantaged Communities was recently updated as directed in the CLCPA. In order to comply with the requirements in the CLCPA, both in terms of Disadvantaged Community benefits and the requirement to specify a proportion of projects targeting the reduction of peaker plant emissions, the 6 GW Roadmap recommends that at least 35 percent of program funding be utilized to support

¹⁶¹ Ibid.

projects in areas of the state with the highest benefits to Disadvantaged Communities and peaker reductions. These areas can be found in various locations across the state, but Zone J (New York City) is expected to receive particular focus in program design.

Exhibit 9-5 presents the location of current peaker plants in relation to Disadvantaged Communities, which reflect areas where energy storage capacity could be deployed to replace peaker plants. These downstate peaker plants are only activated during extreme weather events but produce twice the carbon emissions per unit of energy generated compared to fossil fuel plants of similar capacity—emitting sulfur oxides (SO_x), nitrous oxides (NO_x), and particulate matter (PM), and contributing to ground-level ozone which causes asthma and other health impacts.¹⁶² Replacement of the peaker plants is expected to reduce both the overall and site-specific environmental impacts associated with fossil fuel-based energy generation.

Exhibit 9-5: Peaker Plants and Disadvantaged Communities



Source: Peaker plant locations from PSE Health Energy. 2020. Opportunities for Replacing Peaker Plants with Energy Storage in New York State. Accessed on July 19, 2023 at <https://www.psehealthenergy.org/our-work/energy-storage-peaker-plant-replacement-project/new-york/> and Disadvantaged Communities from NYSERDA. Final Disadvantaged Communities (DAC) 2023. Accessed on July 19, 2023 at <https://data.ny.gov/Energy-Environment/Final-Disadvantaged-Communities-DAC-2023/2e6c-s6fp>

¹⁶² NYSERDA/DPS. 2018. New York State Energy Storage Roadmap and DPS/NYSERDA Staff Recommendations.

CHAPTER 10 | EFFECTS ON ENERGY CONSUMPTION

Consistent with Title 6 of New York Codes, Rules and Regulations (NYCRR) §617.9(b)(5)(iii)(e) of New York's State Environmental Quality Review Act (SEQRA), this chapter considers the potential impacts of New York's 6 GW Energy Storage Roadmap: Policy Options for Continued Growth in Energy Storage (the 6 gigawatt [GW] Roadmap) on the use and conservation of energy. The 6 GW Roadmap seeks to facilitate the deployment of additional energy storage in New York State (the State). This Supplemental Generic Environmental Impact Statement (SGEIS) considers the impacts resulting from a range of incremental energy storage of approximately 3,207 megawatts (MW) in capacity, to a total of 6 gigawatts (GW) by 2030.

As discussed in prior chapters, penetration and adoption of energy storage could affect the electrical system in a number of ways, at the generation, transmission, and distribution levels. In particular, expansion of energy storage may facilitate the deployment of renewable generation resources and relieve system pressures during periods of peak demand. These potential changes to the structure of the electrical system are not expected to directly affect the amount of electricity used or the amount of energy conserved in the State; rather, energy storage is expected to change how this demand is met.

To the extent energy storage does not change net retail prices in a material way, the 6 GW Roadmap is not expected to indirectly affect the amount of energy consumed or conserved in the State.

APPENDIX A | RESPONSE TO COMMENTS ON THE DRAFT SGEIS

A.1 INTRODUCTION

This appendix summarizes comments submitted on the Draft Supplemental Generic Environmental Impact Statement (SGEIS) on October 27, 2023. A Notice of Completion of the Draft SEIS was published in the Environmental Notice Bulletin on September 15, 2023, and comments were requested to be provided through October 27, 2023.

Written comments were received from two entities. Responses to each substantive comment raised are presented below presented in alphabetical order by filer. Copies of individual comment letters are available through the Energy Storage Deployment Program Matter, Case 18-00516.

A.2 FORM ENERGY

Comment: We encourage the Commission to revise the SGEIS to reflect that battery energy storage is a diverse resource class that includes many non-lithium-ion energy storage resources, such as multi-day iron-air storage technology, that are likely to play a significant role in achieving New York's policy goals while maintaining a reliable, safe, least-cost electric system. We hope the final SGEIS will provide due consideration to alternative battery chemistries and their benefits to New York communities and residents, from fire safety to waste management and recycling, socioeconomic costs borne by ratepayers, and beyond.

Response: The Draft SGEIS briefly discusses different types of battery storage technologies. Specifically, Exhibit 5-2 identifies five different types of battery storage technologies, including Li-ion battery, sodium-sulfur battery, flow battery, iron-air battery, and fuel cell. As noted by the commenter, the SGEIS, however, focuses on Li-ion batteries because they are currently and expected to continue to be the most dominant type of battery storage, especially short-duration storage, which was the focus of the analysis underpinning the Roadmap. With that said, there are other types of battery storage technologies, some of which are well suited for other types of battery storage uses and if deployed, would generate benefits to the State and its residents. In response to this comment, the final SGEIS has been updated to include additional discussion of novel electrochemical technologies, specifically iron-air and redox-flow batteries, that have the potential to support fully decarbonized grids cost-effectively and sustainably.

A.3 CLEAN ENERGY INDUSTRY

Comment: The Clean Energy Industry appreciates the discussion in the Draft SGEIS of public health and safety, particularly in relation to lithium-ion batteries. As discussed in the SGEIS, batteries, and Li-ion batteries in particular, are flammable, and fire risk associated with battery storage is an important safety consideration that must be managed. Battery Energy Storage Systems (BESS), operate under a controlled regulatory regime with oversight at federal, state, and

local levels, and must go through several layers of testing in a multi-year permitting process to mitigate fire risk.

Thermal runaway events are generally rare and adequate preventive measures can decrease the chances of thermal runaway and limit the impact of such events. Battery management and thermal management systems, proper installation, safe transport, compliance with codes, standards and regulations can mitigate these hazards. The energy storage industry is committed to safely deploying BESS and is continuously working to develop and strengthen standards and best practices for BESS deployment. International, national and state codes and standards related to BESS are regularly reviewed and updated based on increased research, scientific findings, field experience and lessons learned. To that end, the Clean Energy Industry supports the Inter-agency Battery Safety Working group established by Governor Hochul in response to battery storage fires in New York this past summer. We look forward to working with the Working Group to review its key findings and implement recommendations to support the continued safe deployment of BESS in New York. In the interim, the industry has re-doubled its efforts to ensure full compliance with all applicable codes and standards in the safe operation of BESS systems.

Response: Section 6.1 of the Draft SGEIS discusses the key federal, state, and local regulations that mitigate the various adverse impacts associated with energy storage technologies, including BESS. Section 6.1.1 of the Draft SGEIS specifically identifies the existing federal, state, and local regulations that limit the risks to public health and safety from BESS-induced fire, including discussions on the New York State Uniform Fire Prevention and Building Code, the 2020 Fire Code of New York State, and NYC Fire Code requirements among others. The Draft SGEIS also discusses the creation of the new Inter-Agency Fire Safety Working Group by the Governor.

Comment: The Draft SGEIS briefly discusses the complex value chains involved in sourcing metals and materials for lithium-ion batteries and includes references to various studies quantifying life cycle associated with lithium mining. Missing from the analysis is the larger context within which battery mineral extraction is occurring. In a 2020 Report, the International Energy Agency estimated clean energy technologies, including wind turbines, solar panels, energy storage, EVs and other clean energy infrastructure required 7 million tons of minerals and approximately half of this was for batteries and EVs. The IEA also projects that clean energy related minerals extraction will grow to more than 28 million tons by 2040. Notably, the oil, gas and coal industry, by contrast, collectively extracted the equivalent of 15 billion metric tons in 2019. And importantly, these industries will need to extract these levels annually into the future to keep supplying energy. Clean energy technologies, on the other hand, can typically use extracted materials in their products for several years to decades or, if recycled, even longer. Further, the Inflation Reduction Act and other Federal initiatives, such as the Department of Energy's Li-Bridge program, are working to incentivize and secure the mineral supply chain for clean energy technologies and batteries. Battery manufacturers are also advancing new battery chemistries and committing to the use of recycled minerals to limit certain mineral extractions.

Response: Section 5.2.2 of the Draft SGEIS discusses the various environmental impacts of grid-scale battery storage, including a discussion of the impact of minerals extraction associated with Li-ion batteries under "Climate and Air Quality". This section of the Draft SGEIS focuses solely on the impact of battery storage technology without attempting to

separately characterize the extraction process associated with the fossil fuel-based energy generation. Comparing the impact of energy storage technology to corresponding impacts associated with fossil-fuel based energy generation is beyond the scope of this SGEIS. Furthermore, the Draft SGEIS discusses the recycling of metals used in Li-ion batteries in detail in the same section under “Waste Management.” The Draft SGEIS also mentions the general role of IRA in incentivizing deployment of energy storage in addition to discussing the scope of alternative electrochemical storage technologies.

Comment: The Draft SGEIS includes a full discussion on battery recycling and includes a reference to the battery recycling facility operated by the global company, Li-Cycle Corp in Rochester. Li-Cycle is an industry leader in lithium-ion battery resource recovery and the leading lithium-ion battery recycler in North America. Li-Cycle’s process yields an up to 95% recycling efficiency rate to return valuable materials in lithium-ion batteries back to the supply chain. Li-Cycle’s New York Spoke is a fully operational lithium-ion battery recycling facility. The facility can currently now process up to 18,000 metric tons of lithium-ion batteries and battery manufacturing scrap per year through its main line and ancillary processing capabilities. Li-Cycle’s in-state capabilities help to provide qualified end of life service to BESS operators operating in NYS.

Response: The final SGEIS has been updated to reflect the latest details about the recycling capacity and efficiency of Li-Cycle Corp’s Rochester facility.