PSEG Long Island

Request for Information

For the Development of PSEGLI's 2020 Bulk Energy Storage RFP

March 2020

Issued by

PSEG Long Island LLC

Through its operating subsidiary,

Long Island Electric Utility Servco LLC

As agent of and acting on behalf of

Long Island Lighting Company d/b/a LIPA

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1. Information

PSEG Long Island LLC, on behalf of the Long Island Power Authority, is planning to issue a Request for Proposals ("RFP") for bulk energy storage resources that will be interconnected to the Long Island electric grid. To help achieve a productive RFP process, PSEGLI is issuing this Request for Information ("RFI") to entities experienced in developing (including financing) and operating energy storage resources ("Respondents").

1.1. Background

The Long Island Lighting Company d/b/a LIPA ("LIPA" or "Company"), a corporation organized and existing under the laws of the State of New York, is a wholly owned subsidiary of the Long Island Power Authority, a corporate municipal instrumentality and political subdivision of the State of New York. LIPA, by and through its agent, PSEG Long Island LLC, provides electric service to approximately 1.1 million LIPA customers in its service area, which includes Nassau County, Suffolk County, and the portion of Queens County known as the Rockaways, in the State of New York.

Pursuant to the Amended and Restated Operation Services Agreement ("A&R OSA") dated December 31st, 2013, as it may be restated, amended, modified, or supplemented from time to time, between LIPA and PSEG Long Island LLC, through its operating subsidiary, Long Island Electric Utility Servco ("Servco"), assumed the responsibility as LIPA's service provider, to operate and manage the Long Island transmission and distribution electric system ("T&D System"), and other utility business functions as of January 1, 2014. PSEG Long Island LLC and Servco (collectively referred to as "PSEG Long Island" or "PSEG LI"), as agent of and acting on behalf of LIPA per the A&R OSA, will administer this RFI on behalf of LIPA.

PSEGLI provides a wide range of energy-related services to LIPA's customers through various energy efficiency & renewable programs in its service territory, with the exception of customers located in the villages of Rockville Centre, Freeport, and Greenport.

New York State, through its Climate Leadership and Community Protection Act ("CLCPA")[1] enacted last year, has set a target that 70% of its electricity be produced from renewable resources by 2030 with the additional expressed goal of achieving a 100% carbon free grid by 2040. Included in the CLCPA targets is a 3,000 MW 2030 energy storage goal. This goal was preceded by a December 2018 New York Public Service Commission ("PSC") order establishing 1,500 MW target for 2025.

LIPA intends to meet its share of these goals, which amounts to approximately a 200 MW share of the 2025 statewide goal. A portion of this 200 MW goal is expected to be met through existing energy storage contracts and PSEGLI/LIPA initiatives outside of the RFP including behind-the meter programs and distribution-level storage projects proposed in PSEGLI's Utility 2.0 Long Range Plan[2]. PSEGLI's 2020 Bulk Energy Storage RFP (the "RFP") is expected to have a goal to obtain between 155 MW and 175 MW.

[1] See https://legislation.nysenate.gov/pdf/bills/2019/S6599.
[2] See https://www.lipower.org/wp-content/uploads/2019/07/2019-06-28-PSEG-Long-Island-Utility-2.0-2019-Annual-Update.pdf.

1.2. RFI Purpose

The purpose of this RFI is to gather information and obtain input from the energy storage community to assist PSEGLI in preparing the RFP and should not be construed as the final document on timing or scope of an RFP to be issued later in 2020. The issuance of this RFI is an opportunity for PSEGLI to learn about different storage technologies, operational capabilities, and stages of development. The RFI will help PSEGLI to establish a better understanding of the storage technologies that could bid into the RFP. Developers should not rely on or use information herein, or developers' own submissions in response to this RFI, as a guideline for what may be included in or required by the final RFP. Responses to this RFI may be used by PSEGLI to help develop the contents of the RFP, but will not be used for prequalification of RFP bidders, or for any purposes other than those expressly stated in this RFI.

In sum, this RFI seeks relevant input from Respondents about:

- Specific details of the energy storage products or services to be procured, as set forth in Appendix A below.
- Respondents' knowledge and/or experience with different storage technologies, projects and use cases that have provided value to utility customers and how PSEGLI's evaluation should account for different technologies.
- Respondents' experience with developing and financing energy storage projects and a listing of energy projects they have developed and/or participated in developing (including energy storage projects).
- Identification of barriers to energy storage project development and how the RFP could address those barriers.
- Respondents' preferences for alternative contract structures and contract terms (periods). Several alternative contract structures being considered by PSEGLI are set forth in Appendix A.
- Respondents' ideas on how PSEGLI should evaluate proposals and what benefits can/should be quantified.
- Respondents' comments on how PSEGLI's evaluation should account for proposals that may propose differing contract terms (periods).
- The appropriate structure for improving market certainty to promote bulk energy storage development on Long Island.
- What information on LIPA's system requirements and performance criteria would be helpful to developers in assisting them to formulate their energy storage proposals.
- Respondents' interest in developing a project on LIPA-owned property with a property lease-arrangement.
- What types of information on potential LIPA host sites should be provided in an RFP for bulk energy storage.
- Any additional locations and/or use cases for energy storage projects that would interconnect to the T&D System that are not listed in Appendices B and C below that would provide value to LIPA's customers.
- Respondents' willingness to possibly attend a post-RFI interview for information exchange should LIPA/PSEGLI deem this worthwhile.
- Any other suggestions on energy storage that PSEGLI could include in the RFP that would assist developers to propose energy storage projects that would provide value to LIPA's customers.

1.3. General Guidelines

PSEGLI reserves the right to make changes to this RFI, at any time, by issuance of one or more addenda or amendments and to distribute additional clarifying or supporting information relating thereto. Any such addenda, amendments, and/or information shall be, posted on the PSEGLI website https://www.psegliny.com/aboutpseglongisland/proposalsandbids.

PSEGLI may ask any or all Respondents to elaborate or clarify specific points or portions of their submission. Clarification may take the form of written responses to questions or phone calls or in-person meetings for the purpose of discussing the RFI, the responses thereto, or both. It is solely the responsibility of each Respondent to

ensure that all pertinent and required information is included in its submission. PSEGLI reserves the right to determine at its sole discretion whether a submission is complete or eligible for consideration.

While PSEGLI has endeavored to provide accurate information to Respondents, PSEGLI makes no such warranty or representation of accuracy. Respondents should clearly state all assumptions they make about the meaning or accuracy of information contained in this RFI. Any exceptions to the terms, conditions, provisions, and requirements herein must be specifically noted and explained by a Respondent in its response to the RFI. If PSEGLI does not receive any questions concerning this RFI, it is assumed that the Respondent agrees with and understands the requirements in the RFI.

In order to better understand the substance and origin of a Respondent's response, PSEGLI requests all Respondents to state their respective company/organization affiliation, and relevant experience in developing (including financing) of energy storage projects in general. More details can be found in Section 2.

This RFI shall not be construed to create an obligation on the part of PSEGLI or LIPA to enter into any contract or, serve as a basis for any claim whatsoever for reimbursement of costs for efforts expended by Respondent firms. The issuance of this RFI and the submission or a response by any person or entity does not obligate PSEGLI or LIPA to qualify the person or entity in any manner whatsoever. A legal obligation on the part of PSEGLI or LIPA to engage in any business transaction with a Respondent will only arise if and when a formal written contract is entered into between or among LIPA and such Respondent.

PSEGLI shall not be obligated by any responses or by any statements or representations, whether oral or written, that may be made by PSEGLI or its employees, principals or agent.

Information that any interested party wishes to submit as part of this RFI will be provided voluntarily with the understanding that this RFI is for information gathering purposes only and is not a formal solicitation. RFI responses should not include a proposal or any information about proposal pricing.

Any information the Respondent provides to PSEGLI that it deems to be confidential under the Freedom of Information Law ("FOIL") should be clearly marked as confidential in the response. By responding to this RFI, Respondents are deemed to agree to keep confidential all information that is directly or indirectly provided by PSEGLI to a Respondent in connection with this RFI, provided that the foregoing confidentiality obligation shall not apply to any information that PSEGLI has previously made generally available to the public or information that must be disclosed pursuant to law. Subject to the foregoing, PSEGLI reserves the right, in its sole discretion and without liability, to utilize any or all of the submissions, responses and materials received in connection with this RFI, in PSEGLI's planning efforts and otherwise.

1.4. RFI Schedule

Activity	Date
RFI Issuance	March 03, 2020
Last day to submit Clarifying Questions	March 17, 2020
Target PSEGLI Response to Questions	March 24, 2020
RFI Response Submission Deadline	April 15, 2020

2. Response Requirements

The sub-sections below outline the requirements for responses to the RFI, which were developed so that responses received would be in a similar format that would facilitate a timely evaluation. Responses to this RFI should conform to the sections and format outlined below. If necessary, additional information may be included in other attachments.

2.1 Table of Contents

Include a clear identification of the RFI response by section and by page number.

2.2 Executive Summary

Respondents should provide a summary of their RFI response.

2.3 Professional Background and Experience

Respondents should describe their Industry Experience in the following areas:

A. If readily available, provide a brief outline of their company, its history, leadership, financial position and the products and/or services offered.

B. Highlight where their company has performed industry-specific work that is similar in nature and relevant to the RFP enhancement information with particular emphasis on implementation at other utilities, large municipalities, co-ops, or any other applicable facilities

C. Provide a detailed list of the portfolio of electrical energy projects they have developed including, but not limited to, energy storage projects including the year they achieved COD (or if they have not achieved COD, the estimated COD), the location, the technology type, the MW size, and the buyer. Industry trade groups should provide similar information about the membership of the organization. Manufactures should provide a list of products they provide for the electric utility industry.

D. Other entities should provide their background and experience with energy storage and provide details of any products or services they offer that can further the goals of the RFP. Examples include:

    a. An entity that has an interest in providing available property for lease for project development use.

    b. An entity that provides control equipment for energy storage projects to allow them to participate in the ancillary services market can list any services and products it can provide.

2.4 Answers to Questions in Appendix A

This section is for the Respondent to provide answers to each of the questions it decides to answer in Appendix A.

Respondents may choose to address only a subset of the topics identified in Appendix A. Each response should be identified separately. For each response, please provide the following:

A. Response Topic. Identify the topic number and question letter being addressed (See list of topics in Appendix A).

B. A description of the response.

C. Describe whether the technology has been implemented elsewhere and has been successful, tested and proven or is innovative.

D. When applicable, Respondents should address any estimated costs associated with implementing the proposed application, including customer and utility costs, as well as any other relevant costs. Respondents should also describe in detail all benefits associated with the proposed response.

E. Information about environmental impacts, recyclability, other life-cycle consideration such as toxicity and other material hazards (including fire), vulnerability to floods and other externalities and non-

cost impacts associated with the topic of response that may be relevant to the technology of energy storage you are considering.

F. Any other relevant information that you deem appropriate and noteworthy that supports and validates the proposed response.

3. Instructions to Respondents

Respondents are requested to prepare the RFI response in accordance with the instructions outlined below, with the response focused on meeting the requirements and format set forth in Section 2 above. All responses to this RFI must be submitted via the email address provided in Section 3.1 below.

3.1 RFI Response and Submittal Instructions

Responses and supporting attachments are to be submitted in an email to:
PSEGLI2020_ENERGYSTORAGE_RFI@pseg.com **. Please format the email subject line as "PSEGLI Bulk Energy Storage RFI".** Where possible, attachments should be in **Microsoft Word** format. If necessary, alternative standard formats such as searchable pdf or Microsoft Excel may be used. PSEGLI will not be responsible for late, lost, illegible or misdirected submissions. Review of responses submitted to this RFI will be coordinated through the PSEGLI Power Markets Department and will include other company departments, LIPA staff, and consultants, as appropriate. PSEGLI may, at its option, contact Respondents with additional questions or information requests. Additional action by PSEGLI related to this RFI is solely at PSEGLI's option, and as such, PSEGLI has no obligation whatsoever to address questions, comments, or information requests related to this RFI after receipt of Respondents responses.

Any questions or needed clarifications concerning this RFI should be sent to PSEGLI2020_ENERGYSTORAGE_RFI@pseg.com **.** The deadline to submit clarifying questions via email is 5:00 PM EDT on March 17, 2020. Emailed questions received after this date may not receive a response. PSEGLI will not respond to any questions received in-person, by mail, by fax, or by phone.

3.2 Review Approach

Respondents should note that while PSEGLI intends to review and carefully consider the information in the responses received, it is not a guarantee that the information will be implemented or included in the RFP. **PSEGLI has issued this RFI for information gathering purposes to improve the procurement process and the contracts. This RFI is not a formal solicitation**.

Appendix A--Topics for Discussion

1. Energy Storage Technologies

PSEGLI is interested in learning if any new energy storage technologies are available in the market that can provide value to its customers. Consequently, it currently intends to place no restrictions on energy storage technologies that can be submitted in proposals by Respondents in the RFP. By allowing proposals to include any energy storage technology, PSEGLI recognizes that this has impacts on its evaluation criteria, as for example roundtrip efficiencies can vary greatly between different technologies. Therefore, PSEGLI contemplates not imposing a minimum roundtrip efficiency requirement in the RFP. There are likely to be other impacts on evaluation criteria as a result of allowing submittals using all types of energy storage technologies.

Please provide comments on the following questions:

a. What energy storage technologies are recommended? Is the technology commercially viable for bulk system applications? Is the technology in widespread use with multiple vendors? Give examples/statistics demonstrating typical technology deployment in bulk energy systems.
b. If the technology is still in the R&D stage, what technical challenges must be addressed to overcome the challenges related to operating within the NYISO generally and the LIPA power system specifically (e.g., system reliability, security)?
c. What is the recommended deployment strategy for a given energy storage technology?
d. Has the technology been deployed in commercial operation at a scale that mitigates further technology risks? Has it been proven successful in commercial applications? Is the technology suitable for bulk energy applications? Provide examples.
e. If the storage technology is not commercially available and/or not suitable for bulk energy applications, what is the rationale for submitting the technology?
f. What are the barriers to deployment of energy storage technologies (e.g., economic, regulatory, market, non-market)?
g. How will regulatory uncertainty impact the responses to the RFP? What approaches could be taken in the RFP to mitigate any negative impacts?

2. Technical Requirements

PSEGLI wishes to obtain Respondents' comments on several technical requirements that it is considering including in the RFP. These requirements are as follows:

a. Minimum MW size of 5 MW at one location for an energy storage project
b. Capability to operate at least 350 cycles per year, limited to one cycle per day
c. Capability to operate for at least four hours in duration
d. Maintain 98% availability for dispatch in each calendar year
e. Average state of charge[3] of 50-80%
f. Must be at 100% usable state of charge approximately x[4] days/year for a given period
g. Must maintain a dispatchable capacity rating at least equal to the offer's guaranteed capacity over the term of the contract

3. Locations, MW Amounts & Use Cases

Although PSEGLI plans to allow Respondents to propose energy storage projects to interconnect at any location on its T&D System, it also plans to identify "LIPA Preferred Locations" and maximum MW amounts at those locations for energy storage projects that provide increased benefits to LIPA's customers. PSEGLI is considering several alternative use cases for energy storage at the "LIPA Preferred Locations" and would like Respondents to provide their comments: A preliminary list of these LIPA Preferred Locations are set forth in Appendix B.[5] A table of potential use cases, their descriptions, and their value streams is shown in Appendix C.

a. Are there other locations on the T&D System that you believe should be preferred locations? If so, please state your reasons in detail, explain what use cases would be applicable at those locations, and what system and LIPA customer benefits they would provide.
b. What operational characteristics are provided by the storage technology (e.g., bulk energy services such as electric energy time-shift, ancillary services such as spinning reserves, voltage support, black start)?

[3] Average state of charge defined as ratio of average stored energy capacity available throughout PPA period divided by total useable energy storage capacity at 100% state of charge.
[4] PSEGLI is considering requiring a specific usable state of charge period. Respondents should describe the range of days/year that could reasonably be required without a significant change in costs.
[5] This is a preliminary list of LIPA Preferred Locations which may change during the course of the RFI/RFP process.

c. What benefits are anticipated (e.g., production cost savings, integration of intermittent renewable energy, reduced fossil-fueled power plant operation flexibility/cycling, improved T&D system capacity/performance, avoided capital costs for T&D expansion etc.)?
d. What methodologies or tools are required for evaluating the benefits of the bulk energy storage system? What metrics should be used and what data are required?
e. Are there benefits of economies of scale (e.g. larger projects at fewer sites) or levels of maturity that PSEGLI should consider in formulating its RFP requirements?
f. What property characteristics of potential host sites, such as a LIPA substation or customer-owned facility, are needed to address integration and operational issues for energy storage system deployment (e.g., spare/vacant property, property ownership, potential lease arrangements for LIPA-owned vacant property, standards for security access for facilities within/adjacent to LIPA-owned facilities)? What such information would you suggest we include in an RFP for bulk energy storage?
g. What other characteristics of a host site are needed to address integration and operational issues for energy storage system deployment (e.g., facility capacity headroom for energy import/export, identification of local load pockets, locational value of capacity/energy/ancillary services, electrical interconnection standards etc.)? What such information would you suggest we include in an RFP for bulk energy storage?

4. <u>Contractual Arrangements</u>

Below are four alternative contract arrangements that PSEGLI is considering for the RFP. Under Cases 1-3, PSEGLI would include a preferred contract with the RFP that developers would be expected to review and either accept or clearly take exceptions in writing to any terms or conditions in the preferred contract in their proposal submittal. Any exceptions taken would be considered in PSEGLI/LIPA's evaluation of the proposal. Please review these four cases and answer the questions below:

Case 1 ("Traditional Contract"):

This contract would provide for LIPA's purchase of the entire output of the energy storage project from the developer/owner. The developer/owner could take exceptions to the terms and conditions of the preferred contract in their submittals and the parties would negotiate a final contract. Operational control of the energy storage project would be by PSEGLI as LIPA's agent during the contract's term. Following the term of the contract which could be in 7, 15, or 20 years[6], the output and operational control of the project would revert to the developer owner (or its successor in interest).

Case 2 ("Traditional Contract with LIPA Ownership Option at End of Term"):

Same as Traditional Contract except that following the expiration of the contract term, LIPA would have the option to purchase the project from the developer/owner under the terms and conditions set forth in the contract. If LIPA decided not to purchase the project, then operational control of the project would revert to the developer/owner (or its successor in interest).

Case 3 ("Hybrid Contract"):

In this case, the contract would provide for LIPA's purchase of the output from the developer/owner and its operational control of the energy storage project during part of each contract year and for the developer/owner to have entitlement to operational control of the output of the project during the remainder of the year. Following the term of the contract which could be in 7, 15, or 20 years[7], the output and operational control of the project would revert to the developer owner (or its successor in interest).

Case 4 ("Turn-Key Contract"):

[6] Please provide comments on the term length in "h" below.
[7] Please provide comments on the term length in "h" below.

This contract would provide for the developer's construction of the proposed energy storage project and, upon completion of the project to PSEGLI's/LIPA's satisfaction, transfer of ownership to LIPA under the terms and conditions of an engineering, procurement, construction ("EPC") contract.

Please respond to the following general questions applicable to all contract Cases:

a. PSEGLI is interested in Respondents' comments, information, and interest in each of the four contract Cases. Please provide your views on each one.
b. What are the pros and cons of each Case?
c. How would each Case impact your financing options?
d. How would each Case impact your risks?
e. Are there changes that could be made in each Case to better align with your constraints?
f. Which Case do you prefer? Why?
g. PSEGLI/LIPA is considering different contract terms of 7, 15, or 20 years. What contract term would allow your proposed project technology to provide the best value to LIPA's customers? Why?
h. If the RFP allows energy storage projects to propose different contract term lengths, what comments do you have on how to compare projects with different contract lengths given changes in such things as falling prices in technology costs over time.

5. <u>Proposed Procurement Schedule</u>

The tentative schedule for the RFP, which is expected to be issued later in 2020, includes 3 months for developing proposals, and 4 years between selection and project COD.

1. Is the time provided for developing proposals too short, about right, or too long?
2. Is the time between selection and expected COD date adequate for the permitting, procurement and development of the energy storage project?

Appendix B—LIPA Preferred Locations

A preliminary list of "LIPA Preferred Locations" includes the following substations with preliminary MW values indicated for each location. Please note that the LIPA Preferred Locations and the corresponding MW are preliminary and may change during the course of the RFI/RFP process with or without notice. Comprehensive studies are required to assess interconnection feasibility and MW values including, but not limited to, charging limitations, load-curve analysis, thermal impact on underground cables, resource deactivations, resource interconnections, performance requirements, field surveys, constructability, engineering design, property rights/easements, and environmental restrictions. These studies will be conducted as applicable for the RFP phase.

LIPA Preferred Location	**Estimated Hosting Capacity MW**
Barrett	100
Ruland Road	100
Holbrook	100
East Garden City	50
Brookhaven	50
Edwards Avenue	50
Holtsville	50
Port Jefferson	50
Rockaway Beach	40
Glenwood 4XH	25
Glenwood 4YH	25
West Babylon	25
Shoreham	25
Canal	20
Tiana	10
Southold	5
Orient Point	5

Appendix C—Potential Use cases

Use Case	Use Case Description	Use Case Value Streams
Transmission Deferral	Using energy storage projects rather than making traditional capital investments on the transmission system	**Why?** • Defer or eliminate the need for new projects including substation additions and new transmission lines or upgrades such as reconductoring • Reduce or eliminate operational constraints • Reduce transmission congestion charges • Minimize network losses **How?** • **Peak shaving:** Installed at or near the location of a component overload, reduces the peak load on a system component and thus the need for an upgrade. LI Energy Storage Projects in the South Fork are intended examples of this use. • **Peak shifting:** changing the time of day when the peak would occur can reduce congestion charges at peak times • When deployed at strategic geographic locations such as at load pockets, can provide power flow management, minimizing network losses
Distribution Deferral/Demand Response	Using energy storage projects to improve reliability of the distribution system	**Why?** • Defer distribution investment • Reduce frequency and duration of distribution circuit outages (applicable to microgrids) • Reduce the number of customers interrupted (applicable to microgrids) • Improve power quality **How?** • Provide **back-up power** during outages for PSEGLI's customers • **Increase hosting capacity** of distribution circuits • **Reduce peak load** on distribution circuits
Energy & Capacity	Energy & Capacity is the most basic use case of Energy Storage. It is when the energy storage provides necessary energy or capacity to the grid to meet demand	**Why?** • Defer/reduce the need for new generation or gas-fired/diesel "peaker" plants • Aid in restoration in storms and outages • Reduce energy costs **How?** • For short duration demand "peaks," peak shaving would reduce the amount of generation capacity needed on the system by new or existing plants • Provide back-up power during outages and storms for PSEGLI's customers • Capacity (via NYISO capacity market) plays a role to maintain system reliability by meeting expected peak capacity demands plus a target reserve margin.
Wind Integration Associated Performance	Energy storage system coupled with wind projects	**Why?** • Smooth out intermittent resources • Many offshore wind projects are expected to interconnect to the onshore system through PSEGLI due to its proximity to prime offshore wind lease areas • Complementary with added ancillary services applications which are described below • Provide **power quality** assistance • Allow for **energy arbitration** • **Avoid curtailment** of wind resources

Use Case	Use Case Description	Use Case Value Streams
		How?
		• Energy Storage can help meet renewable energy requirements by co-location or hybrid installations with solar and wind to meet grid stability requirements. • Controls the export of intermittent generation onto the network. Wind energy is typically high at night when energy demand on the system and energy prices are low. The wind energy project can charge the battery during these times of low energy prices and discharge when it is high.
Ancillary Services	Energy Storage can provide ancillary services such as frequency support, voltage support, and black-start	**Why?**
		Maintain reliable operation of New York's transmission system
		How?
		• Stabilize and **regulate frequency** with rapid charge and discharge of energy. Especially useful with intermittent power generation • Provide **voltage support** by supplying or absorbing **reactive power**. Inverter based generation (wind and solar) does not have as much reactive power capabilities as traditional generation. Energy storage is a way to provide the additional reactive power support to the system • Provide **black start** support to restore the system after a blackout or forced outage such as being able to restart a generator • Source of **spinning reserve** to limit the need of idle back-up generators or idle capacity for spinning reserve
Qualitative Improvements	Use of energy storage as a qualitative benefit (non-quantifiable benefits)	**Why?**
		Improves system reliability
		How?
		• Short project timeframe from conception to operation allows for a project to be installed quickly and meet system needs quickly. Relatively small footprint of projects and can be stacked.
Microgrid	Energy storage as a component in a microgrid with or without renewable sources	**Why?**
		For system recovery and reliability
		How?
		• Microgrids can be used post storm, during recovery, or in an outage to keep isolated or weak systems, such as on the north or south fork of Long Island or the Far Rockaways, online • Energy storage can be used to isolate the PSEGLI electric grid to avoid cascading blackouts Ability to black-start, provide power quality and store intermittent in weak areas of the system