# BULK POWER ENERGY STORAGE PROCUREMENT OF SCHEDULING AND DISPATCH RIGHTS – REQUEST FOR PROPOSAL

National Grid September 30, 2019

## CONTENTS

## APPENDIX E – LOCATIONS & USE CASES

### OVERVIEW

National Grid has identified three (3) locations within its service territory where the Company is seeking scheduling and dispatch rights to bulk energy storage systems ("Projects") to mitigate reliability concerns while allowing for participation in New York Independent System Operator ("NYISO") wholesale markets and in one (1) location exclusively for NYISO wholesale market participation. In the sections below, National Grid has provided information on the background of the distribution/sub-transmission need in these locations, the solution requirements to meet the need, and any location-specific interconnection information.

Additional information regarding the locations such as: 1) available hosting capacity in the area, 2) distributed generation ("DG") projects in the Company's interconnection queue and 3) feeder data, can be found on the National Grid System Data Portal via the following link:
https://ngrid.apps.esri.com/NGSysDataPortal/NY/index.html.

Immediately below are several common solution requirements that are applicable to all locations in this RFP. The sections that follow will describe planned use cases and solution requirements specific to each location.

***Common Solution Requirements***

| | |
|---|---|
| *Commercial Operation Date* | Before December 2022 |
| *Power and Energy* | System must be capable of providing Guaranteed Storage Power Capacity and Storage Energy Capacity over the Term of the Contract |
| *ESSA Term* | Up to seven (7) years |
| *Sizing Flexibility* | Flexibility to provide increased power and energy capacity over time (*i.e.*, to meet any unforeseen load growth)[1] |
| *NYISO market requirements* | Meet supplier eligibility criteria for the NYISO market participation models (energy, 10-minute operating reserve, and/or frequency regulation) specified in each location description |

### LOCATION #1 – OLD FORGE

Five (5) substations, serving an area in Central New York north of the City of Utica, have experienced distribution reliability performance and substation and feeder capacity issues. The substations in this area are supplied by a single 46kV line that begins at National Grid's Boonville 46 kV Substation, continues through the Town of

[1] Subject to the Parties executing the necessary ESSA amendment(s).

Forestport and into the Adirondack Park, and follows State Route 28 to National Grid's Raquette Lake Substation before supplying the New York State Electric & Gas Corporation ("NYSEG") system. This line traverses through some of the more remote communities in New York State. National Grid is seeking dispatch rights for a new energy storage system installation with intentional islanding capabilities to mitigate this reliability concern. See solution requirements specific to the Old Forge location in Table 1 below:

**Table 1 – Old Forge Solution Requirements**

| | |
|---|---|
| *Solution Objective* | Black-start capability (upon forming an intentional island/microgrid) and support of up to five (5) substations downstream of the Boonville Substation given a loss of supply and following fault isolation |
| *Maximum MW Requirement* | 20 MW |
| *Maximum MVA Requirement* | 25 MVA |
| *Maximum MWh Requirement per Day* | 40 MWh |
| *Interconnection Voltage* | 46kV |
| *VAR need (PF) Leading and Lagging* | Up to 25 MVAR (Zero to Unity Power Factor) |
| *Estimated Annual MWh Discharge Throughput*[2] | 6,000 MWh per year |
| *Estimated Average Discharge Active Power* | 20 MW |
| *Estimated Average Resting State of Charge* | 99% |
| *Estimated Average Depth of Discharge* | 100% |
| *Estimated Minimum Ramp Rate Capability* | 10 MVA per minute |
| *Estimated Phase Imbalance (%)* | 5% |
| *Estimated Fault Current Contribution (short circuit MVA)* | 75 short circuit MVA |

## USE CASES

The energy storage system is to provide three functions listed in order of priority and described in more below:

[2] Discharge throughput is the total electrical energy withdrawn (*i.e.*, discharged) from the energy storage project annually. *E.g.*, for locations where the energy storage project participates in the NYISO frequency regulation market, the discharge throughput requirement is the aggregation of all the predicted shallow energy discharge cycles over one year.

1. N-1 Reliability (intentional island)
2. 10-minute Spinning Reserve Wholesale Market
3. VAR Support

The primary function for the energy storage system at this location will be to provide sub-transmission contingency support through the supply of real (MW) and reactive (MVAR) power from the storage system. The Bidder is to supply a four-quadrant PQ (P is active power and Q is reactive power curve) for the proposed energy storage solution to demonstrate its capability to inject and withdraw real and reactive power. This support would reduce the outage exposure on over 50 miles of radial 46 kV supply line serving distribution substations and circuits in the Old Forge area after a contingency has occurred anywhere along the line and the fault has been isolated. More traditional solutions are very challenging and expensive due to the nature of the location within the Adirondack State Park. The primary and priority function of the storage is to form a "dynamic microgrid" where the island boundaries are formed and change depending on where a fault occurs. Per Figure 1 below, by way of an example, in the event of an outage between the Town of Boonville and the Hamlet of Alder Creek (red X), the system would be required to create a microgrid that serves all five (5) distribution stations, following fault isolation. As a second example, in the event of an outage due to a fault between the Hamlets of Old Forge and Eagle Bay (orange X), the island would only serve the Hamlets of Eagle Bay and Raquette Lake, whereas the Hamlets of Alder Creek, White Lake, and Old Forge would continue to be served by the Boonville Substation following fault isolation. The proposed energy storage system and associated Storage Management System will be required to support this microgrid operation, including:

- Black-start capability;
- Voltage[3] and frequency regulation of the island (grid-forming);
- Four-quadrant inverter capable of providing full leading and lagging power factor sufficient to support the reactive loads and manage voltage within the Company's limits;
- Sufficient fault current for fault detection for all possible fault types and locations, coordination, cold load pickup, and in-rush currents; and
- Phase balancing

The Winning Bidder shall provide validated steady state, fault and transient software simulation models for PSCAD,[4] PSS®E, and ASPEN software programs for National Grid testing of the storage and grid-facing systems to ensure the ability to provide the requirements described above.

[3] May be able to operate to ANSI C84.1 range B during island mode as is during a contingency event.
[4] Or equivalent multi-sequence electromagnetic transient software simulation software.

It is expected the energy storage system will be re-synchronized to the grid via a "drop and pick-up"[5] approach[6] to simplify the re-synchronization scheme. In addition, to the equipment and systems required to facilitate the interconnection of the storage system, several new remotely controllable and switchable protection devices will need to be added to the existing protection scheme to provide isolation of faults either side of each substation,[7] along with the appropriate communications[8] and controls between them and shall be included in the interconnection costs and paid for by the storage owner. The Company will determine any necessary upgrades on the Sub-Transmission system following bid selection and completion of an interconnection study.

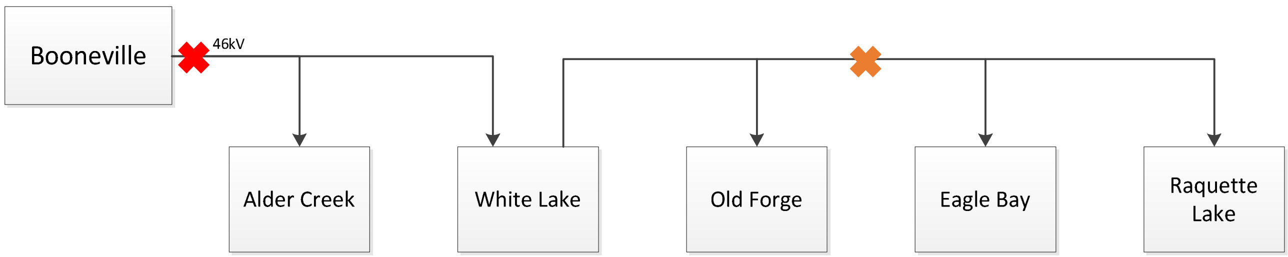


**Figure 1: Simplified one-line diagram displaying the Sub-Transmission Lines and Distribution Substations served out of the Boonville Substation (the 46kV source for the radial system). Arrows represent typical power flow direction during normal system configuration.**

The secondary function for the energy storage system is to participate in the NYISO 10-minute spinning reserve wholesale market during times that the Company does not foresee any conflicts with the primary function for the storage system (*i.e.*, to provide contingency support throughout the year). Over time other/new markets products such as day-ahead energy arbitrage, real-time energy arbitrage, and frequency regulation service may be considered within the constraints of the energy storage system capabilities and associated warranties. The annual load in this area varies significantly from season to season with peak load occurring in early summer (4th of July week for the last five (5) years, see Figure 2 below) and lightest load during the spring season. As such, it is likely the energy storage system may bid greater capacity into the NYISO market during the lighter seasonal loads and the opposite during the peak seasonal load. The Raquette Lake Substation is located in NYISO Zone F, however the areas surrounding the substation are on the borders of the NYISO Load Zones D, E, and F.

[5] Will likely need to be automatically operated based on pre-determined switching logic and sensing.
[6] After line repairs are made, de-energize the energy storage system, switch back in line sections and re-energize energy storage system with grid voltage at the storage terminals.
[7] The following 46kV line breakers/reclosers exist today: Alder Creek (downstream), White Lake (downstream), Old Forge (downstream) and Eagle Bay (downstream) Substations. Switching isolation to the NYSEG section of the 46kV line will also be required (either through a new National Grid-controlled switching device or a transfer trip system to the existing NYSEG Raquette Lake Substation circuit breaker)
[8] Will need to be hardwired (copper or fiber) due to cellular communication limitations in the area.

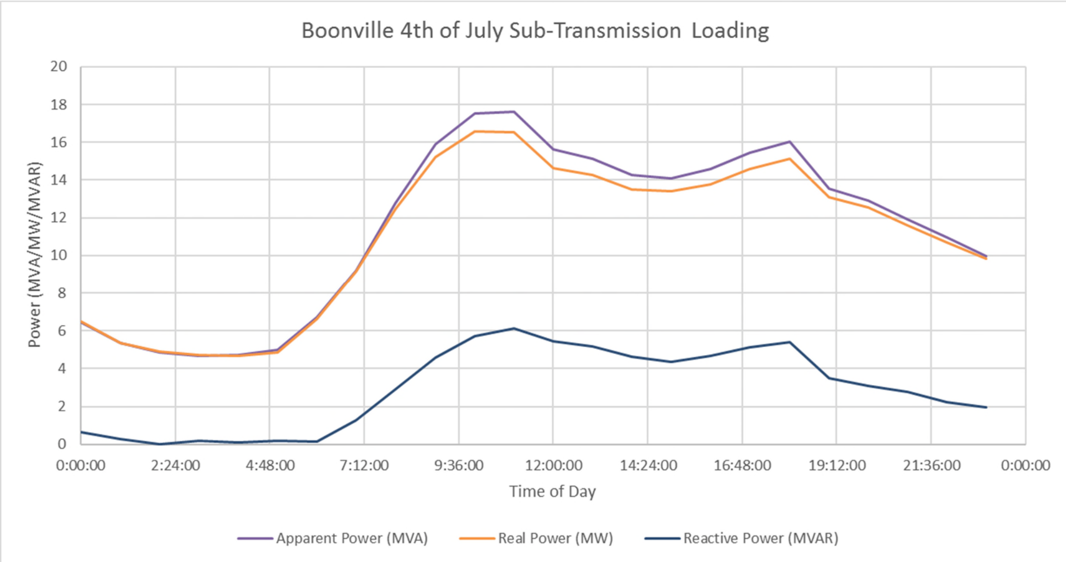


**Figure 2: Typical load curve for a peak day (typically during the 4th of July week) on the targeted Sub-Transmission Line. Real, reactive, and apparent power are shown as measured by the meter at the head of the 46kV line (as it leaves Boonville Substation).**

The third function is to provide VAR support during grid-connected (*i.e.*, blue sky) conditions to minimize system losses and improve voltage support. This will likely require a smart inverter (or other VAR generating device) with associated Storage Management System and Marketer functionality to automatically optimize line power factor, while optimizing participation in the NYISO market.

Please specify how the energy storage system and associated Storage Management System and communications[9] will be designed to meet the three previously defined use cases.

## PREFERRED LOCATIONS FOR OLD FORGE

The energy storage system must be located near the end of National Grid's radial 46kV Sub-Transmission line to maximize the potential reliability improvements. The ideal location for the storage system is near the Raquette Lake Substation along the 46kV line (which runs along State Route NY-28). Figure 3 below shows the area near Raquette Lake Substation circled in red, and Figure 4 provides a closer look at the area surrounding Raquette Lake Substation while Figure 5 shows the Reference location of Old Forge - Raquette Lake Sub- Transmission Line.

There is no National Grid-owned surplus land available for this location.

[9] Energy storage system owner is responsible for the direct control and communication integration with National Grid's Energy Management System ("EMS")/Advanced Distribution Management System ("ADMS") and the Storage Management System and between the NYISO and the Storage Management System.


**Figure 3: Old Forge - Raquette Lake 46kV line (light blue) that runs along State Route NY-28 highway. This line runs between Old Forge Substation (purple circle) and Racquette Lake Substation (red circle)**


**Figure 4: Area surrounding existing and potential future locations of Raquette Lake Substation (Raquette Lake Substation is planned to be relocated prior to 2023 as part of National Grid's Capital Investment Plan).**

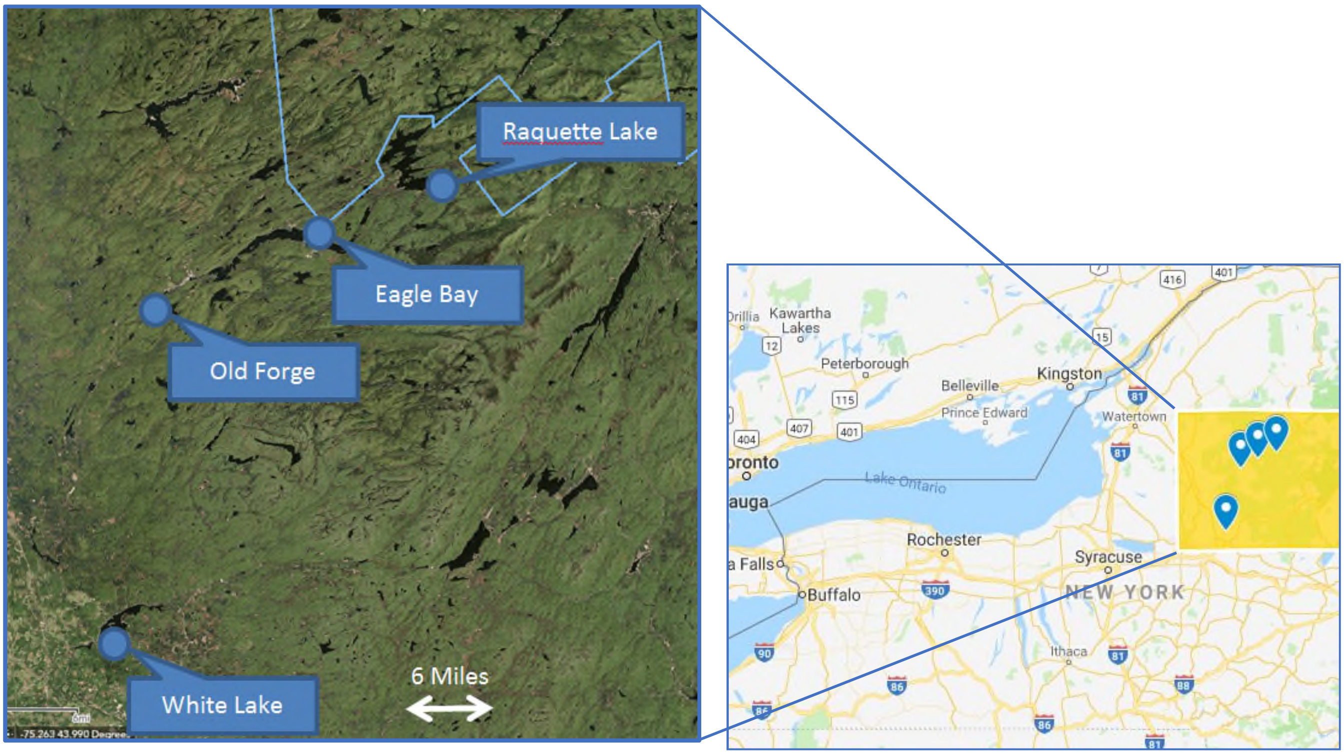


**Figure 5: Reference location of Old Forge - Raquette Lake Sub-Transmission Line**

## LOCATION #2 – NORTH LAKEVILLE

A rural area in Western New York and south of the City of Rochester is exposed to reliability issues that are attributable to the area's expansive radial sub-transmission and distribution circuits. National Grid is seeking dispatch rights from a new energy storage system to mitigate the area reliability concerns and participate in wholesale markets. See solution requirements specific to the North Lakeville location in Table 2 below:

**Table 2 - North Lakeville Solution Requirements**

| | |
|---|---|
| *Solution Objective* | Provide N-1 load relief and voltage support |
| *Maximum MW Requirement* | 10 MW |
| *Maximum MVA Requirement* | 10 MVA |
| *Maximum MWh Requirement per Day* | 20 MWh |
| *Interconnection Voltage* | 34.5kV |

| | |
|---|---|
| *VAR (PF) Need (Leading and Lagging)* | 10 MVAR (Zero to Unity Power Factor) |
| *Estimated Annual MWh Discharge Throughput* | 15,000 MWh per year (primarily attributable to frequency regulation dispatch)[10] |
| *Estimated Average Discharge Active Power* | 5 MW |
| *Estimated Average Resting State of Charge* | 45-55% |
| *Estimated Average Depth of Discharge* | 35% |
| *Estimated Minimum Ramp Rate Capability* | 10 MW per minute |

## USE CASES

The North Lakeville energy storage system shall provide the following three (3) use cases in order of priority and described in more detail below:

1. Reliability (N-1 voltage issue mitigation);
2. Ancillary market participation (frequency regulation) and energy arbitrage; and
3. VAR Support

The primary use case of this energy storage system is to maintain system reliability in an N-1 (contingency) condition, which will primarily require reactive support from the storage system. An outage on one of the transmission circuits supplying the area, Golah-North Lakeville Line 116, or an outage on the transmission-supplied transformer at North Lakeville Substation, may result in low-voltage conditions on four (4) 34.5kV circuits: Golah - North Lakeville Lines 216 and 217, North Lakeville - Ridge (RG&E service territory) Line 218, and North Lakeville - Richmond Line 224 (see Figure 6 below) beyond the Company's post-contingency voltage criteria. The local distribution system is of radial configuration with N-0 criteria and transfers to neighboring

[10] Alternative proposals that provide spinning reserve support and not frequency regulation with an associated reduction in MWh throughput and associated warranty will be considered.

substations are limited. The storage system would need tol dispatch sufficient VARs pre-contingency (and potentially some real power support) to prevent a low-voltage violation from occurring on the 34.5kV system post N-1 contingency. The Bidder is to supply a four-quadrant PQ curve for the energy storage system to demonstrate its capability to inject and withdraw real and reactive power. Coordination between the energy storage VAR control and existing voltage regulation devices will be determined during the interconnection study.

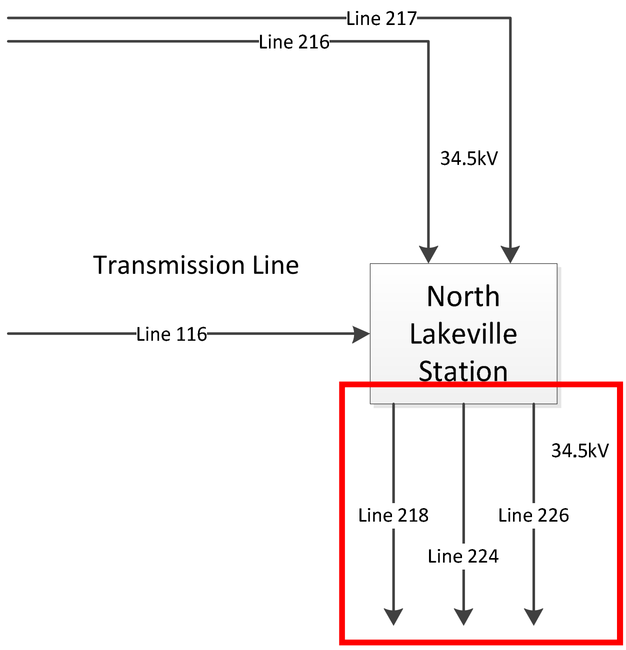


**Figure 6: Simplified one-line of North Lakeville Substation. Arrows represent typical power flow direction during normal system configuration. Ideal locations for the storage system are directly downstream but close to the North Lakeville Substation or on Lines 218, 224, or 226 (see red square).**

The secondary function of the energy storage system, when not being used for the primary function, is to participate in the NYISO frequency regulation market, to the extent that it does not compromise the distribution system due to rapid ramping of the storage system (to be evaluated in the interconnection study). In addition, and to the extent possible, the energy storage system shall also bid into the day-ahead energy market. These market products have been identified to best complement the distribution contingency support needs. Over time other/new markets products, such as real-time energy arbitrage and spinning reserve, may be considered within the constraints of the storage capabilities and associated warranties. The annual load in this area varies significantly on a seasonal basis, as shown in Figure 7 below, with peak load occurring in early summer (typically July) and lightest load during the spring season. As such, it is likely the storage system may bid greater capacity into the NYISO market during the lighter seasonal loads and bid less capacity into the NYISO market during the peak seasonal load. This location is within NYISO Load Zone B.

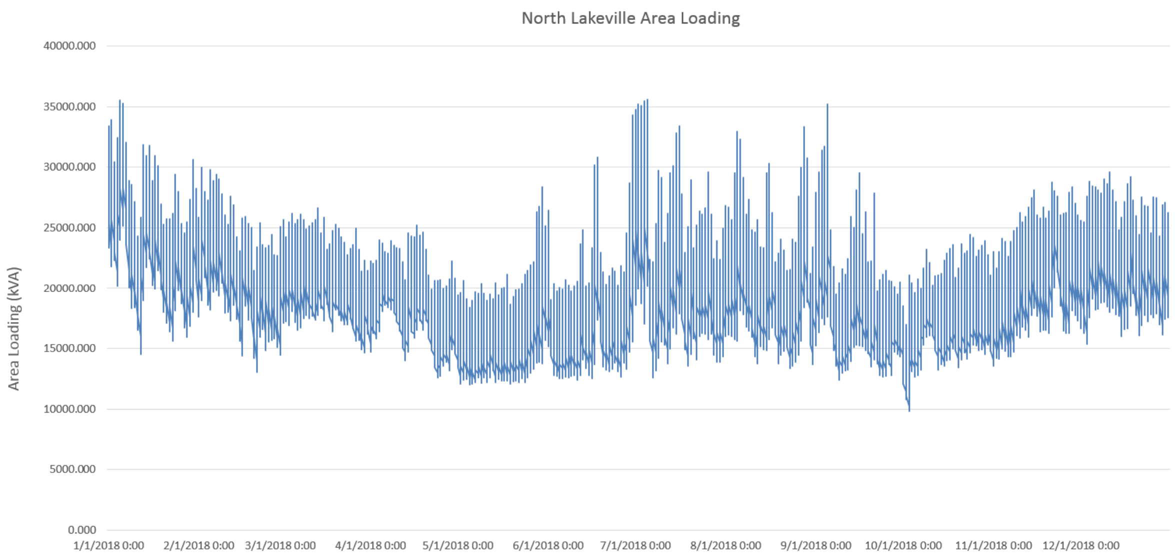


**Figure 7: North Lakeville Area Loading (2018)**

The third function is to optimize power factor to minimize losses and provide voltage support during normal grid conditions. This will likely require a smart inverter (or other VAR generating device) with associated Storage Management System and Marketer functionality to automatically optimize line power factor, while optimizing participation in the NYISO market.

The Bidder is to specify how the proposed energy storage system and associated Storage Management System and communications[11] will be designed to meet the three use cases defined above.

## PREFERRED LOCATIONS FOR NORTH LAKEVILLE

The energy storage asset should be located downstream and electrically close to the North Lakeville Substation to maximize the potential reliability improvements. The ideal location for the storage asset is immediately downstream of the North Lakeville Substation, on one of the 34.5kV lines served by the substation (see figures below of substation and sub- transmission lines 218, 224, and 226).[12] Figure 8 below shows a trace of the sub-transmission lines where the storage asset must be located and Figure 9 below shows the area surrounding the North Lakeville Substation. Note that locating the storage asset as near to the North Lakeville Substation as

[11] Will need to be hardwired (copper or fiber) due to cellular communication limitations in the area. Energy storage system owner is responsible for the direct control and communications integration between National Grid's EMS/ADMS and the Storage Management System and between the NYISO and the Storage Management System.

[12] If connected on lines 218, 224 or 226, the energy storage asset will likely need to coordinate with an existing National Grid Distribution Automation ("DA") scheme.

possible will likely reduce interconnection costs compared with locating the storage asset further downstream of the lines shown in Figure 8 below.

There is no National Grid owned land available for this location.

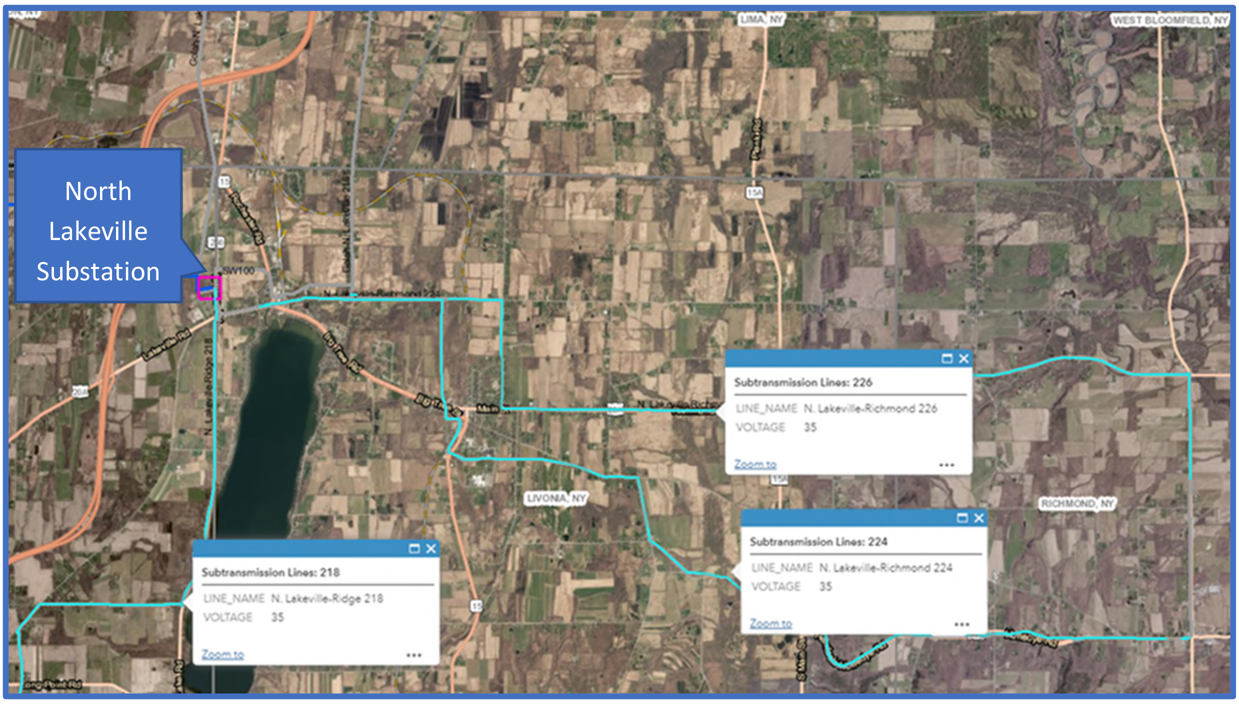


**Figure 8: North Lakeville Area Map. The North Lakeville Substation is highlighted by the pink square, and the sub-transmission lines served out of that Substation (Lines 218, 224, 226) are highlighted in blue**


**Figure 9: North Lakeville Substation (left) and Sonora Way Distribution Substation (right)**

## LOCATION #3 – MENANDS

An area north of the City of Albany in the Capital Region of New York is experiencing reliability issues. The Menands Substation serves 34.5kV, 13.2kV, and 4.16kV circuits and is fed by multiple transmission supply lines (see Figure 10**)**. The Menands 13.2kV feeders are supplied by two transformer banks. In the event of a single transmission fed 13.2kV transformer bank outage at the substation over the next seven (7) years, the loading on the remaining transformer bank is forecasted to exceed its Summer Emergency rating during peak load days after the 13.2kV bus tie closes and the in-service bank picks up the load dropped by the bank outage. National Grid is seeking to secure dispatch rights for two (2) new energy storage installations for up to a term of seven (7) years (with a Commercial Operational Date of 2022 or before) to mitigate this reliability concern and participate in wholesale markets. These storage systems will be located on two (2) separate 13.2kV feeders served by the common bus (post-bus tie switching)[13] and must be used in aggregate to meet the defined solution requirements. See solution requirements specific to the Menands location in Table 3 below:

[13] To reduce the loading on the remaining transformer bank (either transformer bank depending on the outage) post-transformer bank outage, it is desirable to have each storage system be located on feeders served from the two (2) different pre-bus tie switched buses (*i.e.*, storage A served from bus A and storage B served from bus B).

**Table 3 - Menands Solution Requirements**

| | |
|---|---|
| *Solution Objective* | Provide N-1 load relief and voltage support |
| *Maximum MW Requirement* | 14 MW |
| *Maximum MVA Requirement* | 14 MVA |
| *Maximum MWh Requirement per Day* | 33 MWh |
| *Interconnection Voltage* | 13.2kV |
| *VAR (PF) Need (Leading and Lagging)* | 11 MVAR (Zero to Unity Power Factor) |
| *Estimated Annual MWh Discharge Throughput* | 17,000 MWh per year (primarily attributable to frequency regulation dispatch)[14] |
| *Estimated Average Discharge Active Power* | 7 MW |
| *Estimated Average Resting State of Charge* | 45-55% |
| *Estimated Average Depth of Discharge* | 35% |
| *Estimated Minimum Ramp Rate Capability* | 10 MW per minute |

[14] Alternative proposals for provide spinning reserve support and not frequency regulation with an associated reduction in MWh throughput and associated warranty will be considered.

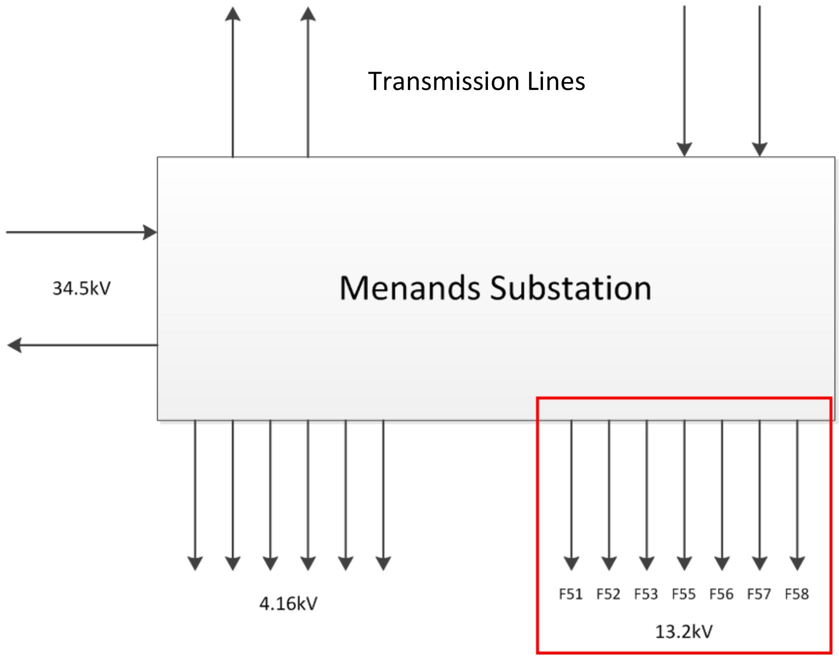


**Figure 10: Simplified one-line of Menands Substation. Arrows represent typical power flow direction during normal system configuration. Ideal locations for the storage assets are directly at the Menands Substation 13.2kv bus or on the seven 13.2kV feeders served off that bus (surrounded by red square, see Preferred Locations section for details).**

## USE CASES

The Menands energy storage systems would need to serve three (3) use cases in order of priority and described in more detail below:

1. Reliability (N-1 voltage and thermal issue mitigation);
2. Ancillary market participation (frequency regulation) and energy arbitrage; and
3. Volt/VAR Optimization ("VVO").

The primary function for the energy storage systems at this location will be to provide distribution contingency support through active power (MW) and reactive power (MVAR), mitigating the overload exposure on the remaining substation transformer bank after an outage has occurred on either transmission-fed 13.2kV transformers at the Menands Substation. The storage systems will function as an alternative to the traditional wired solution of replacing both transmission-fed 13.2kV transformer banks with higher capacity banks such that the post-contingency loading during peak days does not exceed the Summer Emergency rating of either transformer bank. The Bidder is to supply a four-quadrant PQ curve for the energy storage systems to demonstrate capability to inject and withdraw real and reactive power in a controllable fashion (*i.e.*, smart inverter). The storage systems shall dispatch sufficient VARs to reduce MVA/MVAR flow pre-contingency when the station load is forecast to exceed the Summer Emergency rating of the remaining transformer bank and provide additional MVARs and MW support as necessary post N-1 contingency to prevent the thermal violation from occurring. Coordination between the storage VAR control and existing voltage regulation devices will be determined during the interconnection study. Figure 11 below shows how the system shall operate using real and reactive power to maintain system reliability (dispatching real and reactive power pre and post contingency optimally).

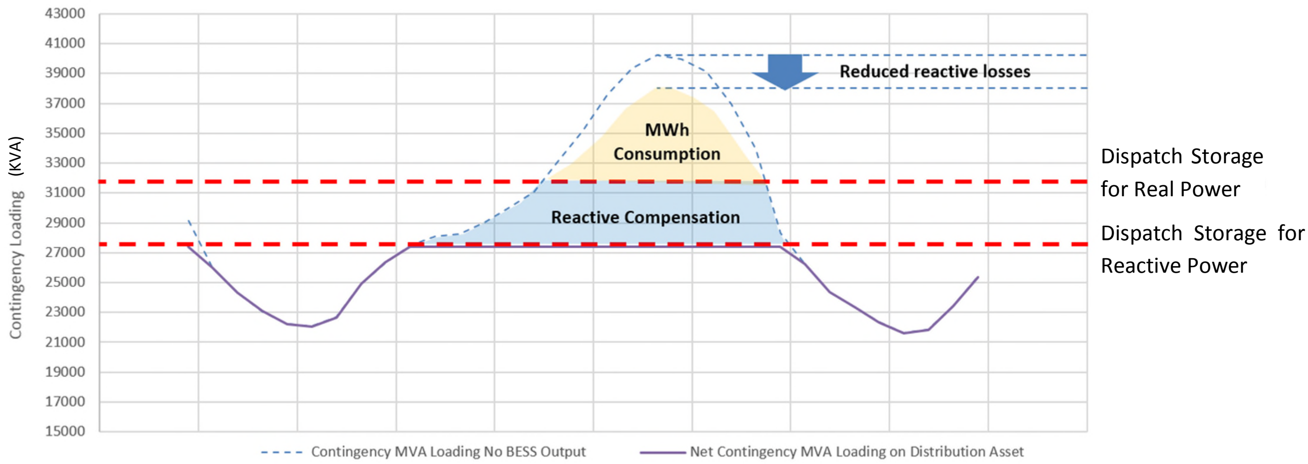


**Figure 11: Loading chart representing the forecasted load profile on the lower capacity bank (TB2) given an outage of the higher capacity transmission fed 13.2kV bank (TB1). The chart shows operation of the storage systems to provide reactive (blue shading) power and real (yellow shading) power pre-contingency to maintain system reliability. Note this figure does not represent actual loading nor operational guidance, but rather acts as an example.**

The secondary function of the storage systems when not being used for the primary function is to participate in the NYISO frequency regulation market, to the extent that it does not compromise the distribution system due to rapid ramping of the storage systems (this will be evaluated in the interconnection study). In addition, and to the extent possible, the storage systems shall be bid into the day-ahead energy market. These market products have been identified to best complement the distribution contingency support needs. Over time other/new markets products, such as real-time energy arbitrage and spinning reserve, may be considered within the constraints of the storage capabilities and associated warranties. As shown in Figure 12 below the annual load in this area varies significantly from season-to-season with peak load occurring in the summer (typically July - September) and lightest load during the spring season. As such, it is likely the storage systems may bid greater capacity into the NYISO market during the lighter seasonal loads and lower capacity into the NYISO market during the peak seasonal load. The Menands location is within NYISO Load Zone F.

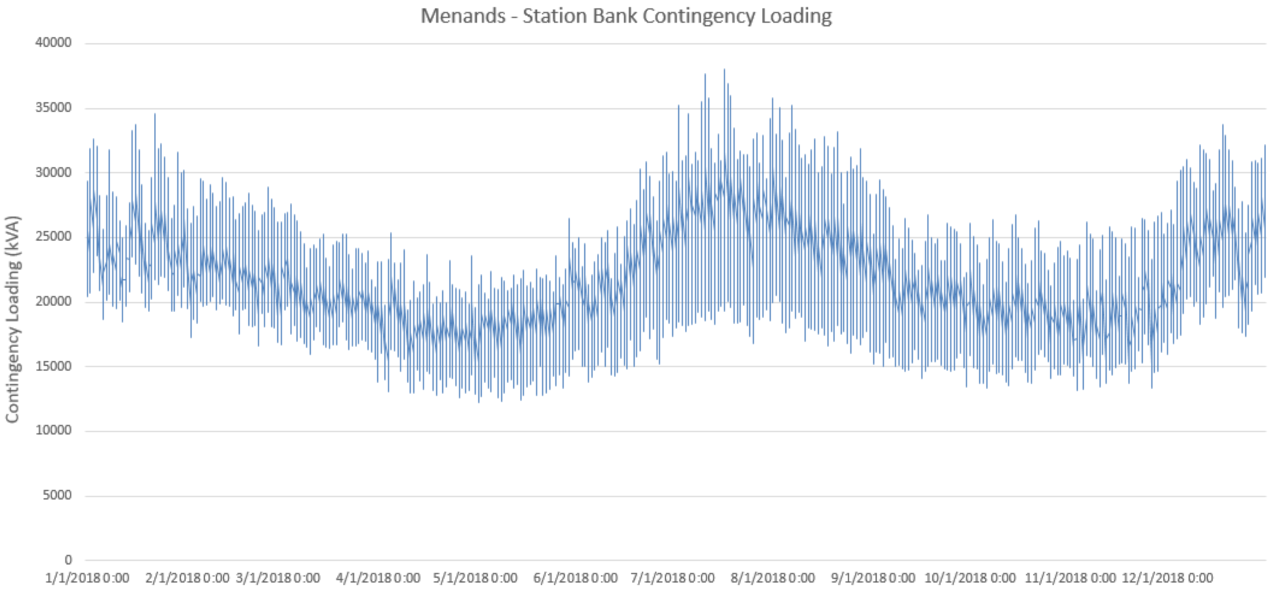


**Figure 12: Menands Contingency Loading (2018)**

The third function is to optimize power factor to minimize losses and provide voltage support during non-peak normal grid conditions. This will likely require a smart inverter (or other VAR generating device) with associated Storage Management System functionality to automatically optimize the substation power factor, while optimizing participation in the NYISO market.

The Bidder shall specify how the energy storage systems and associated Storage Management System and communications[15] will be designed to meet the three previously defined use cases.

## PREFERRED LOCATIONS FOR MENANDS

The storage systems must be located on or electrically downstream of the Menands 13.2kV bus to maximize the potential reliability improvements. The ideal location for the storage systems are immediately downstream of the 13.2kV bus, on one or several of the 13.2kV distribution feeders served by the substations. Given the power capacity of the storage (14MVA), it is not feasible to interconnect to any one 13.2kV distribution feeder; the system will have to be split to interconnect to two separate feeders. The first 7MVA/14MWh must be

[15] Energy storage system owner is responsible for the direct control and communications integration between National Grid's EMS/ADMS and the Storage Management System and the NYISO to the Storage Management System.

interconnected to the Menands 57 as that feeder has the highest peak load. The second can be located on any other Menands 13.2kV feeder (51, 52, 53, 55, 56, or 58). Figure 13 below shows the topography of the 13.2kV feeders. Given the proximity of several other feeders to the targeted Feeder 57 (see Figure 14 below), there may be an opportunity to locate both storage systems on one sub-divided parcel while still interconnecting to two separate feeders.[16]

There is no National Grid-owned land available for this location.

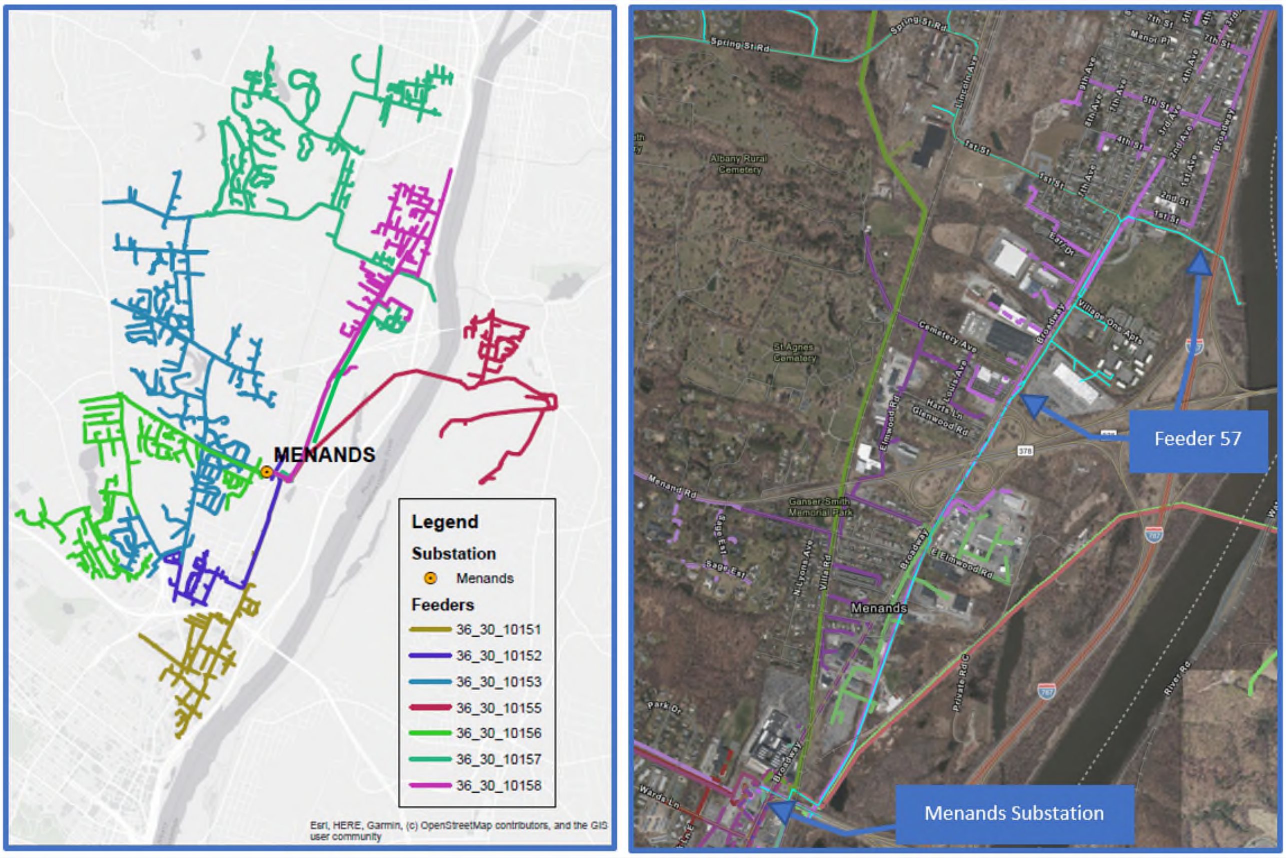


**Figure 13: Menands Substation 13.2kV Feeder map (left) and satellite map (right) highlighting a target feeder (Feeder 57) in light blue**

[16] However, locating the storage systems in this manner is not a requirement.

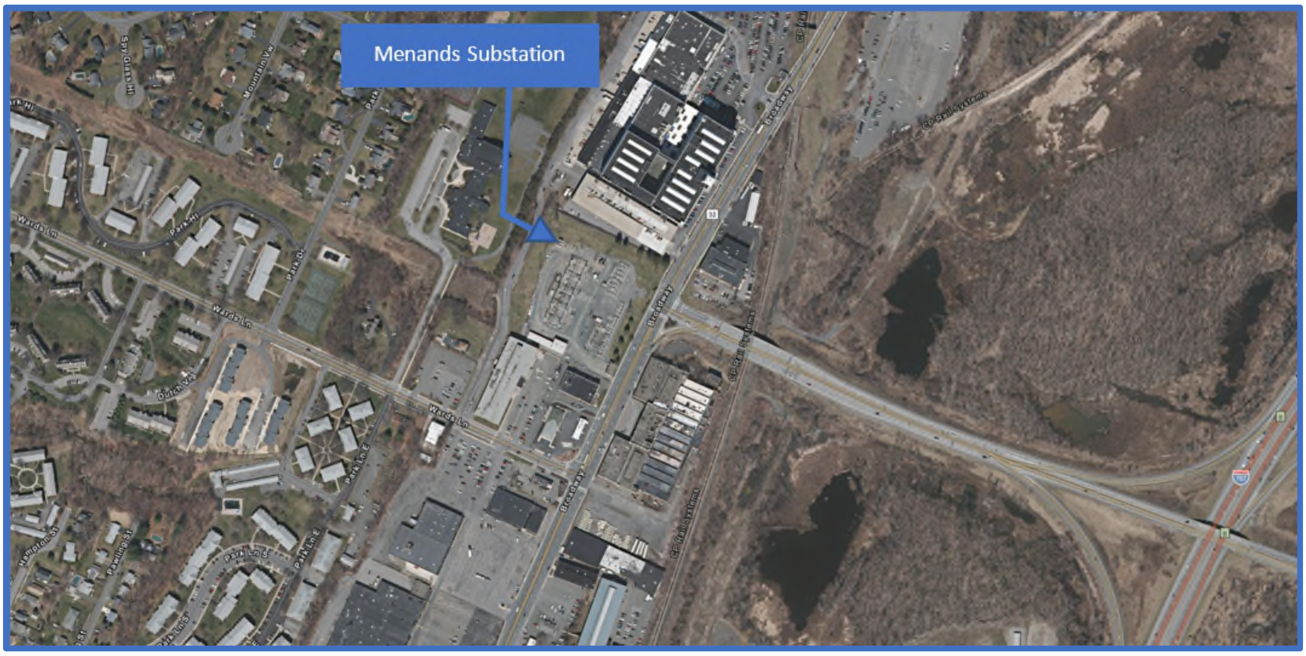


**Figure 14: Satellite view of Menands Substation within the City of Albany near the intersection of Broadway and Wards Ln.**

## LOCATION #4 – ZONE F

The final location being targeted is anywhere practical within NYISO Zone F, which generally encompasses much of Eastern New York (Figure 15 below shows the NYISO load zones). The primary reason for targeting Zone F is that it historically has similar or higher wholesale energy and ancillary service market prices to the other NYISO load zones within National Grid's service territory. National Grid is seeking to secure dispatch rights for a new energy storage system for up to seven (7) years (with a Commercial Operational Date of 2022 or before) to participate in one or several NYISO wholesale markets. See solution requirements specific to NYISO Zone F location in Table 4 below:

**Table 4 - Zone F Solution Requirements**

| | |
|---|---|
| *Solution Objective* | Participate in one or several wholesale markets |
| *MW Requirement* | 10 MW |
| *MVA Requirement* | 10 MVA |
| *MWh Requirement per Day* | 10 MWh |

| | |
|---|---|
| *Interconnection Voltage* | Up to 69kV (Sub-Transmission or Distribution) |
| *Estimated Annual MWh Discharge Throughput* | 15,000 MWh per year (primarily attributable to frequency regulation dispatch)[17] |
| *Estimated Average Discharge Active Power* | 5 MW |
| *Estimated Average Resting Stage of Charge* | 45-55% |
| *Estimated Average Depth of Discharge* | 35% |
| *Estimated Minimum Ramp Rate Capability* | 2 MW per minute |

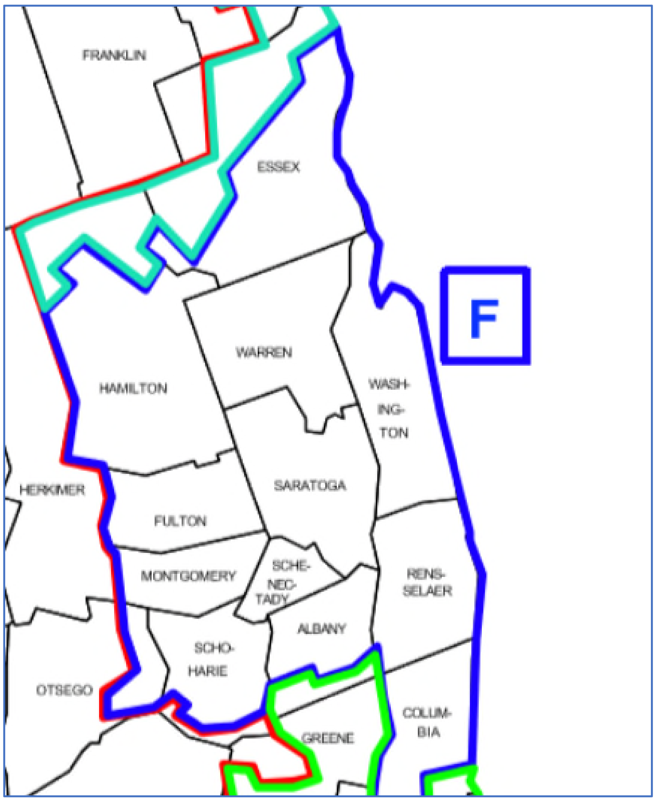


**Figure 15: NYISO Load Zones F**

## USE CASES

[17] Alternative proposals to provide spinning reserve support and not frequency regulation, with an associated reduction in MWh throughput and associated warranty, will be considered.

The primary and only use case for this location is wholesale market participation. Among the wholesale capacity, energy, and ancillary service markets, the Company has assessed that participation in the regulation service market would likely derive the most wholesale revenue based on historical market data. Therefore, the Company expects that the energy storage asset will primarily focus on regulation service participation to the extent that it does not compromise any distribution assets (*e.g.*, load tap changer ("LTC") operations, regulator tap operations, etc.) or quality of service to its customers. The Company expects to mitigate any of these issues that may arise by either limiting the ramp rate (*i.e.*, response rate) of the energy storage system that is registered with the NYISO, utilizing reactive power support, or shifting wholesale market participation toward the operating reserve market. Bidders should offer solutions that consider that the energy storage system may be fully committed and scheduled in the regulation service market or in the operating reserve market. The Bidder shall clearly define any operational limitations in its solution to operate by these expectations.

The energy storage owner is responsible for the direct control and communications integration with National Grid's EMS/ADMS to the NYISO.

## PREFERRED LOCATIONS FOR ZONE F

The energy storage system can be located anywhere in Zone F (pending an interconnection study) as shown on Figure 15 above. Additionally, Bidders can access the National Grid System Data Portal,[18] navigate to the 'Hosting Capacity' tab, and search for the distribution feeder nearest to the proposed interconnection location(s). After clicking on a feeder, Error! Reference source not found. below shows where to find which NYISO load zone the feeder falls within. This ESRI-based map only provides Hosting Capacity information about the distribution system (15kV and below).

[18] *Available at* https://ngrid.portal.esri.com/SystemDataPortal/NY/index.html

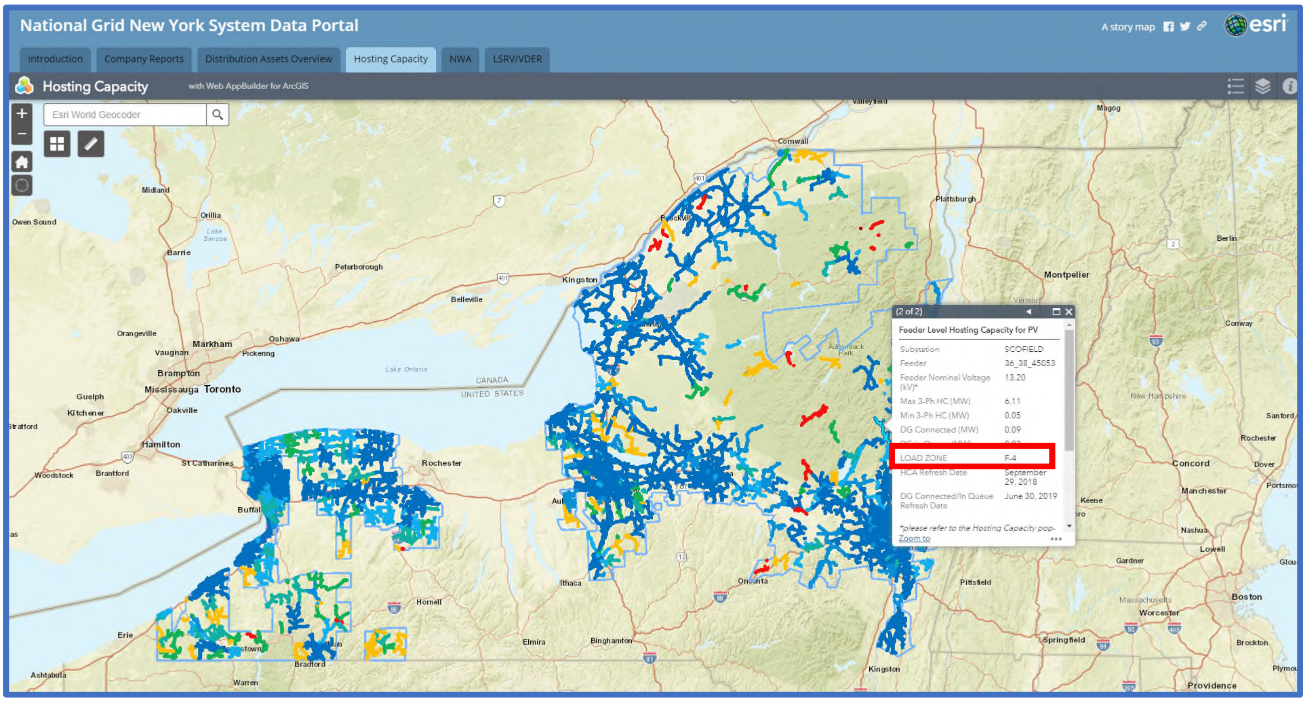


**Figure 16: National Grid System Data Portal - Hosting Capacity tab with the load zone date highlighted in red for a specific feeder that falls in Zone F**

When evaluating a candidate location for a proposed storage system, Bidders should consider areas where the storage system would benefit from higher wholesale energy market revenues, such as an analysis of historical and forecasted NYISO day-ahead and real-time locational-based marginal prices (LBMP). Historical LBMP data can be found on the NYISO website: https://www.nyiso.com/energy-market-operational-data.

National Grid has identified several National Grid-owned land parcels within the NYISO Zone F area that could potentially be used to site the storage system. The Bidder may choose to locate their solution at this property or specify an alternative location on land not owned by National Grid. National Grid will consider the lease of these properties, subject to internal review of the Bidder’s proposal and determination that the proposal is a compatible use of the property and subsequent evaluation of the lease price. If Bidders provide an alternative location to site the proposed storage system, the Bidder must be able to demonstrate existing site control as part of their proposal.

There are is one National Grid currently owned land pocket identified for potential lease:

- Moreau (located in Town of Moreau)

**Moreau**

National Grid currently owns a 4.9-acre plot of land in the Moreau area of upstate NY located near 203-213 Potter Road (see Figure 17 below) that could potentially be used to site a storage system. Below is a list of items for consideration:

- Area is heavily forested and that should be factored in regarding tree clearing and clearances for potential fire risks.
- Access to the property would need to be gained from a third party for any proposed use as the property is not accessible directly from Potter Road.
- There is a single-family home adjacent to one of the boundary lines that should be considered, otherwise this is a remote area.
- Potential challenges in gaining road access to the property.
- There is a transmission line that runs close to the property and all physical storage components must be at least 75 feet away from the line.
- The Town currently has a solar PV moratorium on non-industrial zoning land, pending new solar PV regulation that might impact ability to locate storage.
- Area is listed as part of Habitat Conservation Plan and as a Hemlock Northern Hardwood Forest and a New York Natural Heritage Program (”NHP”) Significant Natural Community.


**Figure 17 – General Location of the National Grid Owned Land**

**General Zoning and Permitting Guidance**

It is recommended that Bidders consult with a New York licensed attorney/planner to review the applicable municipal zoning regulations relevant to the site, to ensure a straightforward approval/permitting process. Before securing a site, National Grid recommends the completion of a municipal code review related to a site's applicable use, setback, fence, residential buffer, noise and lighting regulations. Bidders should additionally be aware of a site's proximity to other potentially sensitive uses, including schools, residential communities, and places of public assembly.

In addition, the New York State Fire Prevention and Building Code Council recently adopted a rule that amends the current version of the Uniform Code, specifically 19 NYCRR Sections 1220.1, 1221.1, 1225.1, and 1227.1, by adding provisions that incorporate by reference the publication entitled 2019 Energy Storage System Supplement. The 2019 Energy Storage System Supplement adds provisions to the Uniform Code relating to the installation, use, and maintenance of Energy Storage Systems ("ESS"). The amended rule can be found at https://www.dos.ny.gov/DCEA/pdf/2019-6-20%20Final%202019%20ESS%20Supplement.pdf.

**DISCLAIMER:** The information above is provided for informational purposes only and is not legal advice or a legal opinion on any specific facts or circumstances. Because the law changes rapidly, National Grid cannot guarantee that the information herein is up-to-date, complete or correct. Bidder should not rely on this information or its applicability to any specific circumstances without first speaking with the Bidder's own attorney or other professional advisors. Transmission of the information is not intended to create, and receipt does not constitute, an attorney-client relationship between the sender and receiver. Finally, National Grid disclaims all liability for actions the Bidder takes or fails to take based on any content above.