NEW JERSEY ENERGY STORAGE ANALYSIS

COMMENTS BY

ROCKLAND ELECTRIC COMPANY

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I. Introduction

Rockland Electric Company ("RECO" or the "Company") supports New Jersey's clean energy goals and appreciates the opportunity to submit comments in response to the Board of Public Utilities' ("BPU" or "Board") request for comments, dated March 6, 2019, in preparation for an Energy Storage Analysis. Energy storage will play an integral role in the operation of the energy grid, supporting grid operations, reliability, and the integration of intermittent distributed resources. However, it is still a relatively new market in which costs remain high. Therefore, as discussed in detail below, the Company supports the development of a cost-effective approach to meet the State's goals of 600 MW of energy storage by 2021 and 2,000 MW of energy storage by 2030 that benefits all customers. In its efforts to achieve these goals, the Board should be guided by the following two overarching principles:

- First, in calculating the performance associated with these goals, the Board should include both electric distribution company ("EDC") and third-party ownership models. As discussed in more detail below, this will allow the State to maximize storage deployment opportunities in a cost-effective manner to meet New Jersey's energy storage goals. In particular, EDCs, as operators of the energy grid, are in a position to identify grid needs and deploy storage solutions for the benefit of all customers, including for reliability and deferral of traditional distribution grid investments.
- Second, energy storage programs should prioritize the deployment of energy storage resources in a way that benefits all customers. This may include deploying storage as part of solutions to defer traditional distribution system investment, developing bulk storage to integrate large-scale renewables such as offshore wind to the grid, and deploying retail storage in a manner that reduces demand on the grid, such as when combined with participation in demand response programs. Energy storage programs should be coupled with the appropriate rate design to provide the appropriate incentives and effectively manage costs to all customers.

By incorporating these considerations into an energy storage program, the Board will develop a program that engages multiple market sectors and prioritizes energy storage use-cases that benefit all customers, resulting in a more cost-effective energy storage program. The Company looks forward to working with the Board and other stakeholders as the State develops the plan to achieve these goals.

1. **How might the implementation of renewable electric energy storage systems benefit ratepayers by providing emergency back-up power for essential services, offsetting peak loads, providing frequency regulation and stabilizing the electric distribution system;**

   Response: Energy storage has the potential to transform how EDCs plan and operate their electric distribution systems. The value of energy storage systems is in their ability to provide benefits across the bulk and electric distribution systems, as well as directly to customers. A single energy storage system may be able to provide peak load management, resiliency benefits and frequency regulation services simultaneously, thereby enhancing the cost-benefit relationship.

   In addition, storage technology is dispatchable, allowing energy to be discharged when required, *e.g.*, during peak load relief for both in front of the meter and behind the meter ("BTM") applications. For example, customers on demand rates with BTM storage assets can manage their peak usage thereby lowering their energy costs by managing their demand charges. Moreover, customers with BTM storage systems can discharge the stored energy to support emergency needs. Likewise, both BTM and in front of the meter storage assets may allow deferral of an EDC's distribution system infrastructure upgrades, thereby providing cost savings and resiliency for all customers. In addition, reducing peak usage by dispatching energy storage during high system load conditions provides system-wide and societal benefits by reducing overall capacity obligations.

   The Company recommends that the Board seek energy storage deployments that provide benefits to all customers by focusing initial programs and incentives on bulk and distribution level energy storage deployments. To encourage retail uses, the State should develop programs that tie retail BTM storage with demand response programs and the appropriate rate design. At the same time, the Board should consider allowing EDCs to deploy storage technologies in a sampled manner in order to test novel business models, learn valuable lessons, and support the progress towards reaching the State's Clean Energy Act goals. Results achieved from this demonstration-type approach can be used to evaluate the validity of defined hypotheses and apply lessons learned in order to inform State regulatory policy.

2. **How might the implementation of renewable electric energy storage systems promote the use of electric vehicles in New Jersey, and what might be the potential impact on renewable energy production in New Jersey;**

   Response: Electrification of transportation is critical to achieving the State's clean energy goals. The evolving electric vehicle ("EV") market requires significant near-term investments to yield both immediate and longer-term benefits. To stimulate EV adoption, the EDCs should take a leading role in deploying EV charging infrastructure based upon customer needs balanced with system requirements.

If EV charging is unmanaged, there is potential for increased costs to EDC customers, especially if charging occurs coincident with peak demand. EDC rates have proven to be an effective way to encourage EV drivers to charge at preferred times.[1] As the EV population grows, this shift could also help improve system efficiency. With EV deployment in its early stages, EDCs can begin to explore effective rate design considerations, *e.g.*, rates that send proper price signals to guide EV charging away from system peak time periods. For these reasons, the use of time-varying rates for EV charging, as well as the retention of demand-based rates for EV charging, should be considered to encourage EV drivers to charge at preferred times. Along with effective rate design considerations, pairing EV charging with both solar and storage minimizes grid impacts and provides more flexibility to the customer.

Enhanced planning and operations capabilities are necessary to accommodate EV growth and the corresponding charging activity. Integrating storage with EV chargers should be explored as it has the potential to lower the overall load consumption of the charging site and is especially true when the storage is paired with solar resources. Storage systems can be discharged during times of high demand (*i.e.,* during an EDC's peak loading conditions) and recharged during off-peak times. Using a storage system with EV chargers may also help EDCs to avoid the need to build additional infrastructure required to support the additional load from the EV charging location.

In the future, EVs may have the potential to provide a variety of services back to the power grid, whether as a single EV providing backup power to a home (vehicle-to-home ("V2H")) or as an aggregation of EVs acting like a virtual power plant serving the grid in times of system need. In addition, each EV may act as a mobile energy storage system through vehicle-to-grid ("V2G") applications. Electric system reliability and resiliency may be enhanced due to the number of EVs interconnected with the grid.

3. What types of energy storage technologies are currently being implemented in New Jersey and elsewhere;

To date, RECO is aware of only two batteries installed in its service territory – both on residential customer premises. Less than a dozen more – also located at residential customer premises - are in various stages of the interconnection process. All of these are lithium-ion ("Li-ion") battery systems.

[1] *See, e.g.*, New York State Energy Research and Development Authority ("NYSERDA") (M.J. Bradley & Associates, LLC), *Electricity Pricing Strategies to Reduce Grid Impacts from Plug-in Electric Vehicle Charging in New York State*, NYSERDA Report 15-17 (June 2015).

RECO's New York affiliate, Orange and Rockland Utilities, Inc. ("O&R"), is currently working with energy storage developers to build energy storage systems in its service territory. To date, these proposed systems are also Li-ion battery systems, driven primarily by the low cost of Li-ion batteries and the short-to-medium length duration of the storage applications. O&R's experiences are resulting in valuable knowledge that will provide a foundational base from which RECO can draw to deploy energy storage systems in a more cost-effective and efficient manner. For example, O&R is collaborating with storage vendors and local authorities having jurisdiction ("AHJ") to site the storage assets in optimal locations. In addition, O&R is working with these vendors so that the batteries have the ability to meet the distribution system need, while providing adequate levels of visibility and control to O&R's distribution system operators, thereby enhancing the safety and reliability of the power system.

When deploying storage technologies, it is important to consider the applications for which the systems are intended. For instance, short- and medium-duration applications such as peak shaving, demand charge management, and distribution system upgrade deferral traditionally have been served by Li-ion batteries due to their low cost. However, Li-ion batteries may not be as well-suited for long-duration applications such as providing reserve capacity. Rather, long-duration assets such as flow batteries or even pumped hydro-electric storage may provide more cost-effective solutions. Finally, residential solar plus storage systems can provide resiliency benefits and EDCs may be able to operate those assets in aggregate as a virtual power plant to provide system benefits and grid services that benefit a broad customer base.

Through research and development efforts, the Company is also exploring the safety, performance, and operation of a variety of energy storage technologies, including: emerging electrochemical based storage (*e.g.*, zinc-based chemistries, lithium batteries with safer electrolyte alternatives); electromechanical systems such as flywheels; and thermal storage.

4. What might be the benefits and costs to ratepayers, local governments, and electric public utilities associated with the development and implementation of additional energy storage technologies;

Response: As previously discussed, energy storage has the potential to provide a wide range of benefits to a variety of stakeholders including EDCs and customers. When analyzing the benefits and costs of an energy storage system, it is important to consider the full range of benefits that energy storage can provide. It is also necessary to prioritize those deployments that provide the most net benefits to both the energy grid and all customers to offset the still relatively high cost of energy storage deployment.

Benefits of energy storage can include avoidance of capacity obligation and generation capacity infrastructure costs, avoidance of line losses, distribution and transmission infrastructure upgrade deferrals, energy consumption savings, and others. Intangible benefits such as increased resiliency and increased operational flexibility, while currently difficult to monetize, may also be considered in the analysis of energy storage projects. With the appropriate changes for energy storage participation in wholesale markets, energy storage resources may have the potential to earn revenues in capacity, energy and ancillary services markets, such as frequency regulation and spinning reserve.

It is important to provide for various ownership models, including both EDC and third-party, to realize the benefits of energy storage deployment. EDC ownership and operation of energy storage systems may unlock the ability to realize a broader range of storage benefits for all customers due to the EDC's knowledge and operation of the distribution system, paired with the understanding of the electric grid's needs and insight into the integration of the storage asset with the grid.

Costs of additional storage would include the cost of potential distribution and transmission system upgrades, any incentives that would be provided to the storage developers, the socialization of any incentive-based rate design, and the costs of compensation for the energy dispatched. As previously stated, these costs must be considered along with the benefits provided to assess the storage system's cost-effectiveness and efficiency.

5. **What might be the optimal amount of energy storage to be added in New Jersey over the next five years in order to provide the maximum benefit to ratepayers;**

Response: Determining the optimal amount of storage that can be added to the electric distribution and transmission systems requires detailed studies to establish the ideal amount of energy storage that can be added in order to maximize the benefits to customers. This in turn must be weighed against the costs of any upgrades to the transmission and distribution system to accommodate the increased amount of energy storage.

One way to determine the optimal amount of energy storage is to "test the waters" with projects that test a specific, defined hypothesis designed to help EDCs and the Board understand customers' needs, evaluate novel business models, develop effective ways to implement storage, learn valuable lessons, and support the progress towards reaching the State's Clean Energy Act goals. These test projects would be run by the EDC, in partnership with third parties, to test the capabilities of various technologies, as well as new approaches to assessing the value provided by such technologies, all while working within unique and novel business models. Lessons learned from these projects can be used to inform future State policies and regulations. Projects like these, that are ratepayer funded, will evolve into the development of long-term models and strategies that benefit all customers.

In addition, appropriate rate design can encourage the deployment of energy storage that provides benefits to the electricity grid while balancing the costs borne by all customers. Such rate design can be used in conjunction with test projects or implemented separately to apply to all storage systems.

The Company is anticipating continued growth in energy storage deployment on its electric transmission and distribution systems driven by the State's energy storage goals, potential changes in wholesale market rules, and the addition of community solar. Support for increased energy storage deployment can be found in the implementation of alternative solutions to an EDC's traditional infrastructure upgrades/expansion. Moreover, partnerships between EDCs and third parties may allow for the deferral of traditional infrastructure upgrades/expansion while also providing additional benefits from technologies, such as storage.

6. What might be the optimum points of entry into the electric distribution system for distributed energy resources (DER);

Response: A key to unlocking the potential of energy storage is to locate systems where the maximized revenue streams of the investment (*e.g.*, distribution capital investment deferral; aggregation or wholesale opportunities; and peak shaving / reduction for both customers and EDCs) may be realized. Therefore, the optimum point of entry of DER into the distribution system will vary depending on the use case being deployed. For example, to realize distribution system benefits, DER may be most useful when interconnected as close as possible to the load being relieved. This approach reduces system electrical losses and allows the greatest flexibility in capturing multiple benefit streams. By locating a DER source close to the distribution load, load reduction on the distribution circuit can relieve equipment constraints and/or provide contingency relief.

7. What might be the calculated cost to New Jersey's ratepayers of adding the optimal amount of energy storage;

Response: Although the cost of energy storage has declined significantly in recent years, it has not experienced the significant market growth/maturity as other resources (*e.g.*, solar). Therefore, energy storage must be viewed in terms of the benefits it provides relative to the costs. Prioritization must be given to the deployment of energy storage systems that provide the greatest benefit to customers.

RECO's affiliate, O&R, has experience with non-wire alternative projects to traditional transmission and distribution system expansion project solution(s). In some cases, battery systems may be more expensive than the traditional solution. However, the overall societal benefits provided by energy storage systems may surpass those provided by a traditional solution.

As a result, a cost-benefit framework is necessary to understand both the costs and benefits of energy storage provided to customers and EDCs. Although storage is not a Class I renewable asset subject to the cost cap on customer bill increases set forth in the Clean Energy Act, the Board must be cognizant of the cost burden placed on all customers by the deployment of energy storage systems.

8. What might be the need for integration of DER into the electric distribution system;

Response: EDCs, as operators of the energy grid, are in a position to identify grid needs and deploy storage and other DER solutions for the benefit of all customers, including for reliability and deferral of traditional distribution grid investments.

Dispatchable energy storage can play a role in managing the integration of intermittent renewable or variable sources of energy, absorbing excess generation on feeders and circuits to reduce system voltage during light load conditions and allowing excess generation to be dispatched at peak times mitigating demands on the electric delivery system. Integrating DER with the electric distribution system will also facilitate the efficient use of EDC infrastructure, because it will reduce power loss in the EDC's transmission and distribution system.

As the penetration of DER increases across the Company's service territory, the requirements, opportunities, impacts, and challenges generated by DERs continue to expand. There will be an increased and ongoing need for situational awareness and control which will require systems and applications to acquire data and produce actionable information in a near real-time environment. Establishing the appropriate level of monitoring and control is critical to realizing optimization of the grid and gaining the highest value from interconnected DERs. EDCs will need to be able to invest in the systems and applications needed to facilitate the increase in DER and provide visibility into the grid.

9. How might DER be incorporated into the electric distribution system in the most efficient and cost-effective manner.

Response: As discussed above, it is important to understand the costs and benefits of DERs in the context of the services and capabilities they can provide. Of particular interest is the identification of whether those benefits are tangible, such as revenues or cost savings, or intangible, such as increased resiliency and operational flexibility.

Investments in DERs should recognize the value being provided relative to the investment and prioritize those investments that provide greater value to all customers. Today's electric delivery systems are built to perform under peak conditions. Understanding the impact of DERs on system peak, and the ability of energy storage to increase coincidence of renewable generation during peak load conditions, is critical to understanding the broader value of DERs including storage for customers and for the electric grid. It will be important to prioritize the deployment of BTM retail energy storage systems in conjunction with programs such as demand response that provide a peak load reduction benefit to the energy grid as well as incorporate the appropriate rate design. Further, the appropriate level of compensation must be provided to customers with storage systems for the energy dispatched so that the storage asset owner and all other customers bear the appropriate costs of the storage systems while recognizing the benefits provided by the system.

EDCs understand their distribution systems and the needs of and locations where energy storage systems can provide a great deal of value. EDC ownership and operation of energy storage systems may unlock the ability to realize a broader range of storage benefits for all customers due to the EDC's knowledge of, planning for, and operation of its distribution system. As such, EDCs should be permitted to own storage assets, especially in the near-term to assist in meeting the State's 2021 storage deployment goal.

Moreover, an interconnection process that is transparent and lays out a clear, well-defined set of rules and procedures is the first step to incorporating DER into the electric distribution system. Developing rules and processes for interconnection standards, metering, asset configuration, and other operational characteristics will provide certainty to developers and the EDCs alike. For example, development of a process for interconnecting a storage system at a location where solar is already present will allow for a more efficient interconnection process. The current regulations should be reviewed to determine whether they adequately guide storage systems.

10. In the context of the ESA, what might be the definition of Energy Storage?

Response: RECO defines energy storage as any technology capable of charging from the grid or DERs and storing that energy through electrochemical, thermal, kinetic or other means for discharge at a later time.

11. What discharge time duration could be applied to the State goals of 600 MW of energy storage by 2021 and 2,000 MW of energy storage by 2030? Four hours? Ten hours? Other?

Response: Storage duration should be considered in terms of the intended application. Discharge times for a frequency response asset may be considerably shorter in duration than for a distribution deferral asset. It is the Company's experience that energy storage systems are best considered both in terms of capacity and energy (*i.e*., MW and MWh). To meet the State goals, RECO recommends that the storage capacity be sustained for a period of a minimum of four hours. This period will accommodate durations for most use cases where energy storage is being deployed.

12. What storage systems should be counted towards the achievement of the State's goal? Existing systems? Those systems placed into operation after the May 23, 2018 enactment date of the statute?

Response: The Board should count toward achievement of the State's goal, all energy storage that exists on the system regardless of when it was installed. However, incentives or other policy drivers of energy storage that result from the Board's Energy Storage Analysis should be applied solely to new energy storage systems. EDC customers should not pay for increased compensation to owners and developers of existing, financed, and operational energy storage systems for risks already taken and costs already sunk.

13. How might Federal Energy Regulatory Commission's (FERC) Order 841 and the associated PJM compliance filing affect the foregoing?

Response: Order 841 and PJM's compliance filing have done much to clarify the rules for battery storage participation in wholesale markets. However, some of these clarifications limit the opportunity for batteries to receive meaningful wholesale revenues. For instance, PJM proposes that participation in its capacity market be based on ten hours discharge duration. Opportunities for dual participation may also be limited for BTM resources.