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New Jersey Energy Storage Analysis Comments

Prepared for the New Jersey Board of Public Utilities, Office of Clean Energy

EXECUTIVE SUMMARY

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- Energy storage is a prudent investment
- NJ can deploy over 2GW by 2030 with a positive benefit cost ratio for the rate payers
- This amount is in addition to the existing 400MW of existing hydro-storage
- The above are simply to address the top 1% of peak hours and not including storage required to firm up renewables which require additional storage
- The sooner energy storage is deployed the sooner the rate payers start to reap the benefits
- Energy storage is a cornerstone of the mix to arrive at 100% of clean energy by 2050
- Over 2.4 GW of new energy storage is needed to shave 1% of the peak hours. Significantly more GW's are needed to achieve 100% clean energy goals
- Our comments include high level analyses of the benefit cost ratio of shaving 1% of NJ peak hours.

- **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?**

  Peak shaving is the most valuable and beneficial energy storage service as it reduces the costs attributed with peak generation and T&D infrastructure build-out.

- **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?**

  EV charging infrastructure, especially fast chargers, will cause an increase in customer demand charge in addition to overall grid challenges, both issues can be addressed through the deployment of energy storage alongside chargers or on circuits serving chargers.

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

Currently, battery storage is the most economical on a $/kWh basis. Lithium Ion is the most dominant technology due to its reliability, performance and bankability.

- **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?**

  Energy storage has a net reduction of cost to the rate payers and a strong payback/benefit-cost ratio. Please see attached analysis.

- **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?**

  1GW. Current target of 600MW by 2021 only addresses system peak reduction. Additional storage will be needed beyond 2000MW by 2030 for renewable management and firming.

- **What might be the optimum points of entry into the electric distribution system for distributed energy resources (DER)?**

  DER's can be optimally connected at the distribution level. However, transmission and bulk generation level connections are also applicable.

- **What might be the need for integration of DER into the electric distribution system?**

  Acceleration of energy storage adoption in three markets; BTM, IPP and utility owned/operated.

  Need more cost data on transmission and distribution expenditure for management of load pockets.

  Expedited interconnection studies.

  More utility filings for energy storage.

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

  Utility owned or dispatched storage for FTM projects due to the following:

  A- Utility has low cost of financing

  B- Rate payers ownership is most socially fair

  C- Utility deployments address grid challenges that are aggregated for many customers in a load pocket.

  D- Utilities can procure through professionally run and managed RFP's ensuring low cost of supply.

- **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?**

  Four hours

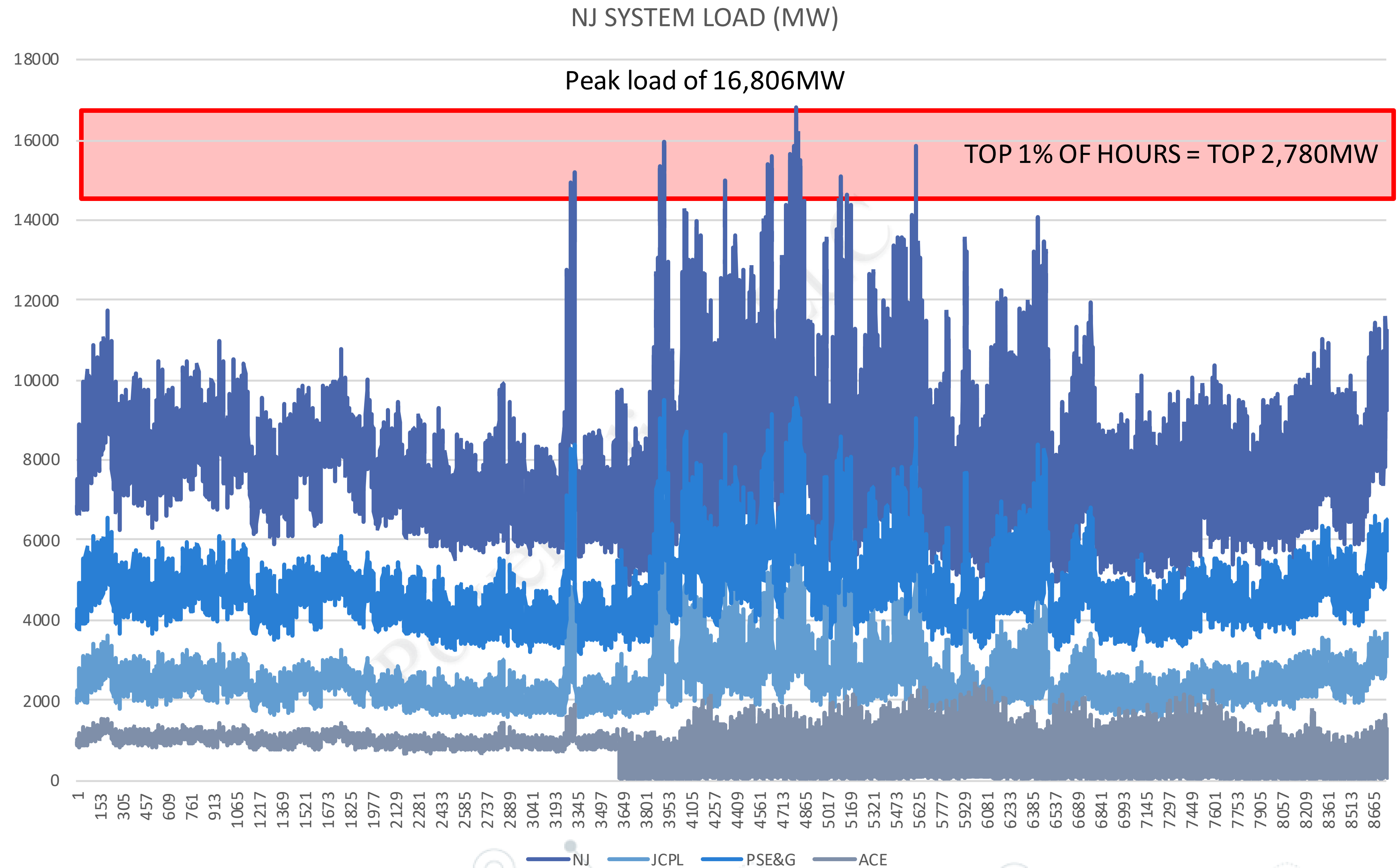
- **What storage systems should be counted towards the achievement of the State's goal? Existing systems? Those systems placed into operation after the May 23, 2018 enactment date of the statute?**

  After May 23, 2018

- **What might be the calculated cost to New Jersey's ratepayers of adding the optimal amount of energy storage?**

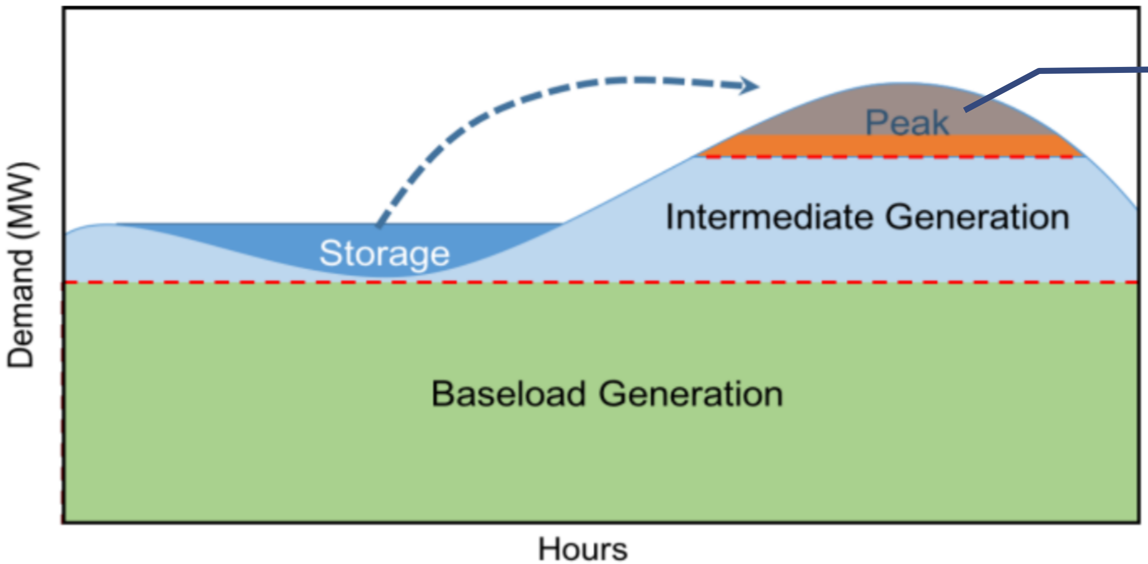
  Please see attached analysis

NJ LOAD



Source: PJM Hourly Load Data

SHAVING THE NJ PEAK



Source: State of Charge Report

Top 1% of peak hours (2.78GW) contributes to $1,316,995,264 of NJ ratepayer spend every year comprising of wholesale market, transmission and distribution costs.[1]

NJ ratepayers can avoid this payment by shaving the peak.

Additional benefits of shaving peak: emissions reduction and increase lifespan of Generation, Transmission & Distribution assets

1. PJM Hourly Data, State of the Market Report for PJM, Utility Investor Summary.

Storage Analysis

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1% of peak hours = top **2.78GW**

Existing large-scale energy storage in NJ: **420MW** Yard's Creek (Hydropower)

2.36GW of new energy storage required to shave peak

Assume Pricing of **$2,400/kW** (4-hr)[2]

Storage Cost = $5.66B

Hard Benefits of peak shaving = **$1.3B/year**

Simple payback of **4.3 years** for NJ ratepayers

2. In order to effectively shave the peak, energy storage systems should have a discharge time duration of 4 hours and above

Conclusions

- 4.3 year breakeven for storage assets that have a life of ~15-20 years
- Soft benefits not included in analysis and can add significant benefits to NJ rate-payers
- 2.36GW of new energy storage required aligns well with NJ target of 2GW by 2030
- Utility procurement is the most prudent form of acquisition and the most socially fair

ASSUMPTIONS

- 1% of peak hours contributes to 8% of wholesale energy costs (Ref: State of Charge Report)
- 50% wholesale energy cost premium taken for NJ compared to PJM average costs
- 1% of peak hours contributes to 5% of T&D annual capital costs
- ACE T&D annual capital deployments not included in analysis
- Analysis does not account for future growth of the electrification of the transportation sector leading to higher energy demand.
- Only utility capital expenditures are included in the analysis, OpEx is not.