Storage as Transmission (SAT)

Northern NY Use Case

November 27, 2023 ICAP/MIWG/PRLWG Meeting

nationalgrid

Agenda

- NYISO's 9/18 Presentation on SAT – Slide 13
- Recap of National Grid's Study on ESRs as SAT and Conclusions
- Energy Storage Markets Discussion

From NYISO September 18, 2023 presentation on SAT

Curtailment Reduction

- In this proposed use case, the storage would be used to unbottle renewables and reduce curtailment, primarily focused in Northern New York
  - The assets would charge and discharge daily during set time periods that vary by season, with the storage charging during periods of high renewable generation and discharging during periods of low renewable generation
- However, this use case could be addressed by a market-based resource

New York ISO

Goal of the Presentation

National Grid submits that wholesale market economics may not support “Curtailment Reduction” dispatch from market-based ESRs. Optimizing RE curtailment reductions is not aligned with optimizing market revenue.

National Grid believes there is a unique transmission use case for utility-owned SAT deployed to maximize reduction of RE curtailments from Northern NY. These SAT resources would not bid into the energy market, nor compete against market-based ESRs. The SAT resources would be located on NMPC’s local transmission network and therefore would not seek cost recovery through the NYISO planning process.

Our ask(s) of NYISO stakeholders:

1. What are the additional market or operational considerations, if any, that need to be addressed?
2. How would these SAT resources be modeled and scheduled by the NYISO?
3. What tariff changes would be necessary to accommodate this SAT use case?

Problem Statement

- Abundant intermittent renewable generation in areas away from load centers is subject to bulk transmission constraints. Land use issues prevent LSR from developing close to load.
- When persistent curtailments of renewables in an area exist, the transmission system is “over-subscribed” and future renewables are likely to be developed in another *land-use-constrained* area or increase REC offers to compensate for the loss of energy production
- Insufficient market revenue streams for SAT are realized under the “Curtailment Reduction” dispatch schedule discussed by the NYISO
- Unlike profit optimizing dispatch (*e.g.*, arbitrage) – a deterministic dispatch protocol of ES is agnostic to market prices but nonetheless can mitigate RE spillage and provide enhanced grid reliability services

Quanta Study Overview

- National Grid performed production cost simulations using assumptions from the utilities' Areas of Concern Study, which examined a 2030 system where policy goals are nearly achieved, and found that congestion in zones west of the Center-East interface remains and is attributable to bulk constraints
- Quanta Technology was retained by National Grid to study how battery storage solutions could further reduce curtailments of non-bulk connected renewable energy and improve system reliability when combined with Phase 2A Transmission projects
- Multiple scenarios with eight distributed storage interconnection locations with a total capacity of 1,300 MW were developed to address 100% renewable penetration in Northern NY with the goal to minimize number of interconnections and maximize the capability of the storage to reduce system curtailment, while ensuring energy storage does not cause local congestion issues or create a new system peak

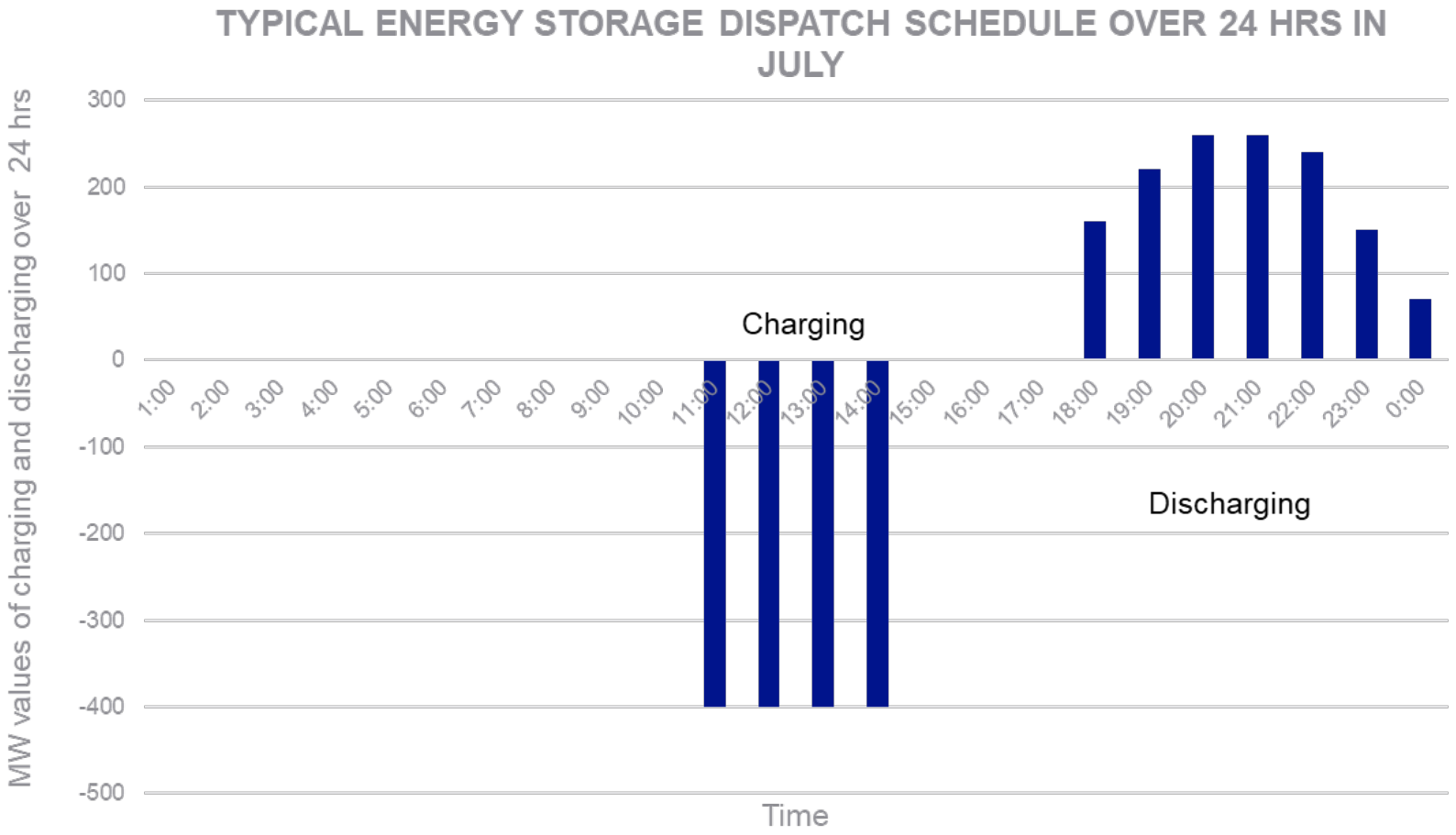
Study Purpose

- Understand the Source of Residual Congestion
- Best Ways to Mitigate Residual Congestion with Storage/Transmission Alternative
- Optimal Site Selection and Prioritization Based on the Max. Benefits
- Compare Curtailment Mitigation Performance from a Deterministic Dispatch Protocols vs. Profit Maximizing Protocol
- Reliability Benefits From Deterministic Dispatch Protocol
- Compare Curtailment Mitigation Performance of Local Tx vs. Bulk Tx Connected Storage
- ESRs Co-located with Renewables vs. Centrally Deployed

Key Findings

- Centrally located batteries—300 MW and 400 MW at two different sites—within a renewable generation rich area is the most cost effective configuration for eliminating bulk transmission induced curtailments
- A deterministic dispatch protocol provides better curtailment reduction than profit optimization protocol
- Potential to eliminate significant Center-East induced congestion without adding additional bulk power transmission lines
  - A 400 MW x 4-hour system and a 300 MW x 6-hour system in Northern NY unbottles 164 GWh/yr in Northern NY (enough to power 23,000 homes) and 227 GWh/yr in Zones A-E (enough to power 31,500 homes)
- Provides **production cost savings** in the range of $24M/yr; however, the Curtailment Reductions dispatch provides just $3M/yr in energy market revenue (***Note***: *this was done to test the profitability of the ideal Curtailment Mitigation Protocol. It does not produce sufficient market revenue*.)
- **Emissions Reduction**: Eliminates 200,000 tons of CO_2 production
- **Grid Reliability Services**: Under Curtailment Reduction dispatch, ES can also be re-dispatched to address emergency pickups and used to serve load during evening peaks

Depiction of Curtailment Reduction Dispatch (400 MW X 4hr battery)



24-Hour Charge/Discharge Cycle

(Charging during peak renewable generation; discharging when production is low)

Value Proposition of Utility Energy Storge vs. New Tx Line

Energy Storage for mitigating curtailment of renewables

- Some transmission services such as curtailment and congestion mitigation are not procured in wholesale or retail markets
- Would not participate in the energy market
- Integrated in utilities' local transmission planning
- Identify constructable sites
- Optimize storage location and size to minimize interconnection costs
- Prioritize sites based on performance
- Mitigate cybersecurity threat and bolster energy security
- Minimize cycle frequency to maximize life of batteries & warranties
- Bridge to Tx Upgrades

New Tx Line for mitigating curtailment of renewables

- Higher impact on land
- Long time to permit and construct
- Doesn't help with state energy storage goals
- Will be moderately utilized
- Not as effective controlling voltage and reactive power
- Costly