20-166 - NH PUC STORAGE INVESTIGATION STAKEHOLDER SESSION

January 25, 2021

Agenda

- **Energy Storage BYOD Program**
- **NWA Framework & Screening Tool**

20-166 - NH PUC Storage Investigation Stakeholder Session

BYOD ENERGY STORAGE PROGRAM

Typical Costs for BYOD Storage Program

Cost Type	Description
Customer Incentives	These incentives cover an upfront portion (optional) of the battery cost and an annual pay-per-performance fee.
Start-Up Costs	These costs include software integration, third-party engineering, program management, marketing and customer acquisition.
Program Administration	These costs include: DERMS, program management, EM&V, customer acquisition, OEM/integrator fees.
Performance Management Fee	These costs cover company management compensation to recruit and dispatch customer's assets.
Interest Rate Buy Down	Interest rate subsidies to encourage customer's participation (optional).
Participant Cost	These are net costs incurred by customers

Typical Benefits for BYOD Storage Program

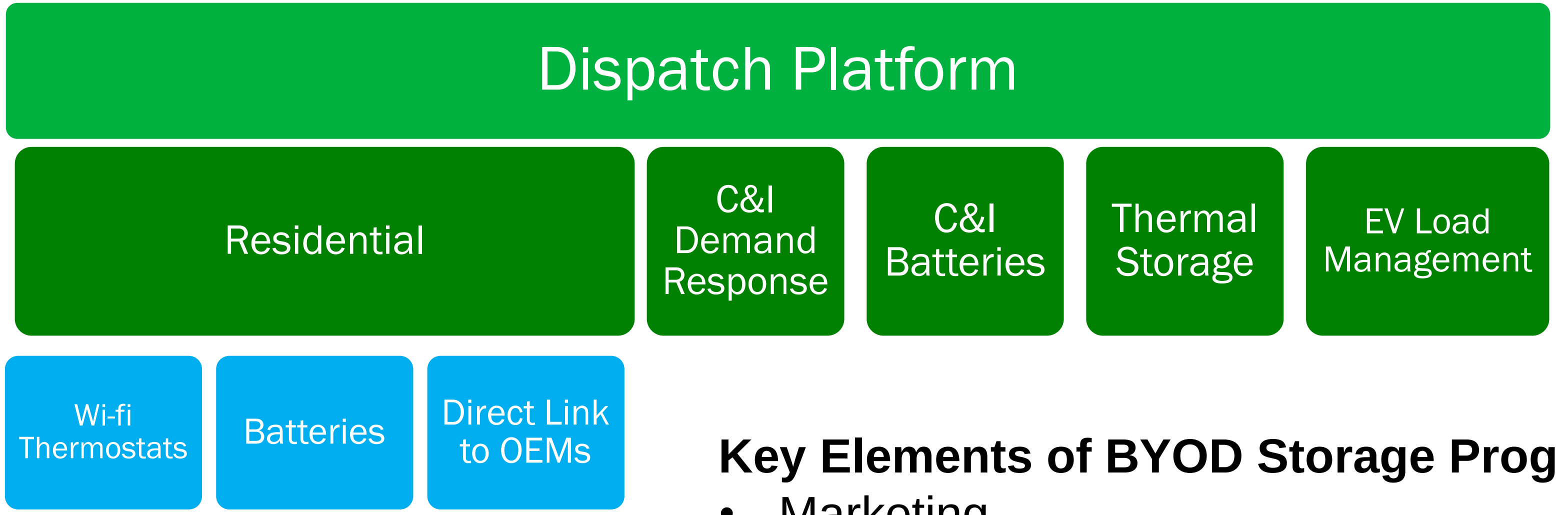
Claimable benefits are quantified in Avoided Energy Supply Cost Study

Benefit Type	Description
Energy	Energy benefit is the avoided energy cost represented in $/kWh.
Energy DRIPE	Energy DRIPE benefit is the energy demand reduction induced price effect which represents the reduction of energy prices due to the reduction of energy demand represented in $/kWh.
Capacity	Capacity benefit is the avoided capacity cost represented in $/kW.
Capacity DRIPE	Capacity DRIPE benefit is the capacity demand reduction induced price effect which represents the reduction of capacity prices due to the reduction of the capacity requirement represented in $/kW.
Transmission & Distribution (T&D)	T&D benefit is avoided cost associated with generic deferral or avoidance of T&D upgrades cost represented in $/kW.
Reliability	Reliability benefit is associated with increased generation reliability due to reducing or shifting load.
Non-Energy Impact "NEI"	These are benefits that are not associated with energy such as increased customer property values, outage reductions, capital, and O&M costs from avoided purchase of back-up generator, non-embedded emissions, avoided collections and terminations, and federal tax credits.
Other	There are other benefits that may not be claimable or are already subsumed in the above categories like customer resiliency or rate management.

How a BYOD Storage Program Might Be Implemented in NH

Eversource has been running BYOD storage programs for multiple years across its service territories

Dispatch Platform Serves as "Hub" for Storage and DR Programs



Key Elements of BYOD Storage Program:

- Marketing
- Customer Enrollment, Application Intake
- Vendor Management
- Dispatch/Manage Dispatch Platform
- Data Management
- EM&V/Performance Calculation/Pay Incentives

ConnectedSolutions in MA

- Program is administered by Eversource through its Energy Efficiency portfolio
  - It is a BYOD, Pay-for-Performance program design
  - Customers have two dispatch options: Daily Dispatch or Targeted Dispatch
- Governance structure ensures internal alignment throughout the Company
- Currently enrolled residential partners

TESLA sonnen solaredge GENERAC

- Expansion of partner network is critical in order to scale
  - Grow cloud-to-cloud APIs
  - Provide "open adapter" protocol to market

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NWA FRAMEWORK & NWA SCREENING TOOL

Agenda

1. Overview

The NWA Framework *outlines all assumptions, calculations, and values taken into consideration when evaluating the value of an NWA solution for a specific capital deferral.*

2. Demonstration

The NWA Screening Tool *is the codification of the NWA Framework to allow repeatable, scalable, and transparent screening of capital projects for their NWA feasibility. It does not replace a full technical and financial study, but ensures that these more extensive, costly, and time-consuming studies are done only on high profile candidates.*

1. Overview - NWA Framework

- Reliability Model
- Dispatch Model
- Cost Model
- Revenue Model
- Revenue Requirements Model

2. Demonstration – NWA Screening Tool

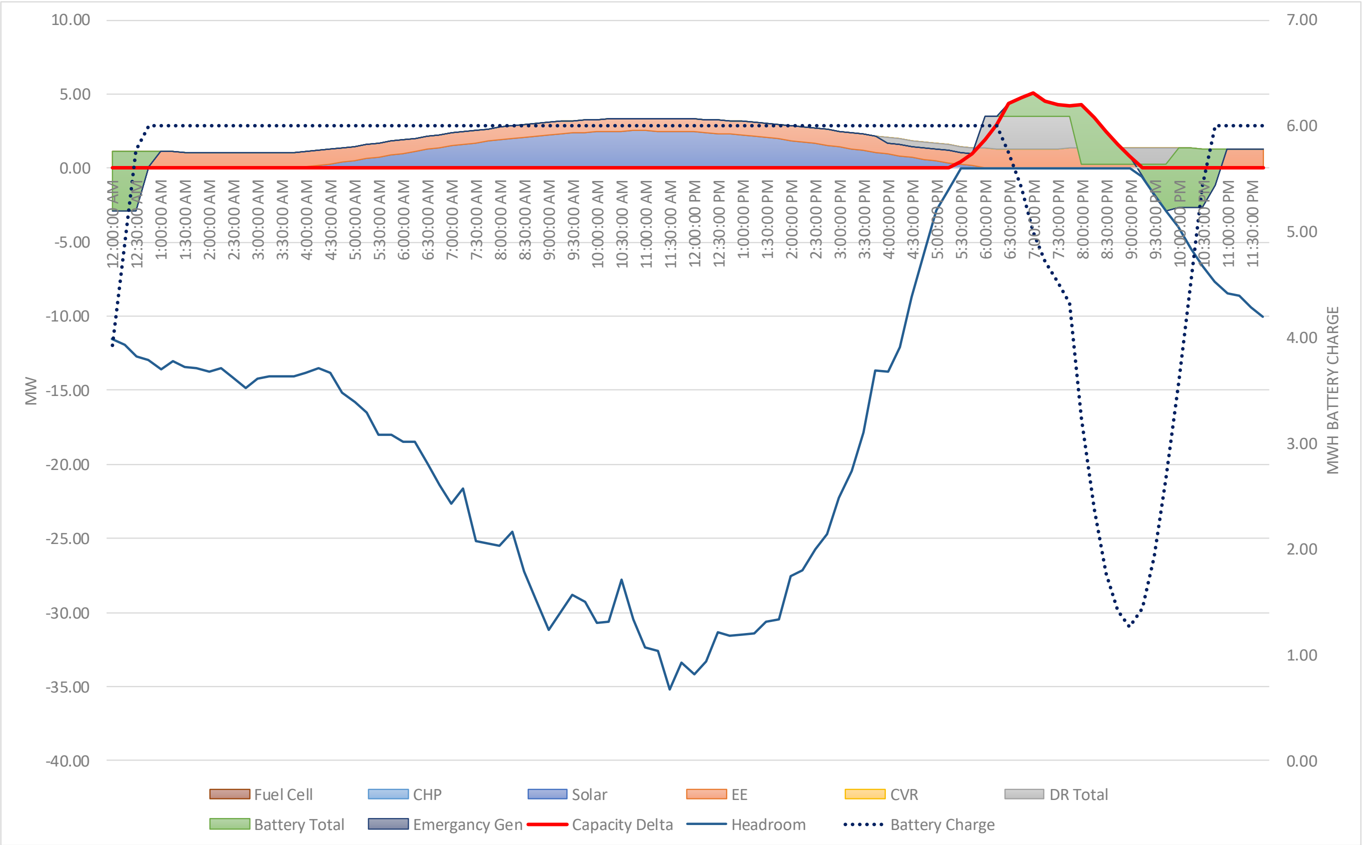
EVERSOURCE ENERGY

Sample Scenario Definition

- 2 Transformer Station at 40.5 MVA
- Current Firm Rating 40.5 MVA
- High Solar Forecast
- Evening Peak Conditions

Sample Project Proposed

- Addition of Third Transformer
- Total new Firm Rating 70 MVA



All examples are based on fictious data sets

THANK YOU – QUESTIONS?

Unitil

IR 20-166: Energy Storage Technical Session

01/25/2021

Overview

- Introduction
- Enabling/Intelligent Distribution System Platform
- Energy Storage Project Configurations
- Enabling Value from ESPs
- How Public Policy Can Best Help Establish Accurate and Efficient Price Signals
- How to Compensate Energy Storage Projects that Participate in Wholesale Electricity Markets for Avoided T&D Costs
- How Best to Encourage both Utility and Non-utility Investments in Energy Storage Projects
- The Costs and Benefits of a Potential Bring Your Own Device Program
- Recommended Statutory Changes

Introduction

- Energy storage enables:
  - Electricity production to occur at times when it is least expensive, including from non-dispatchable sources of renewable generation, such as solar and wind
  - Enhanced value of power through instantaneous dispatch, or meeting peak demand
  - Increased resiliency
  - The transition to clean energy resources, beneficial electrification, and innovation in energy services
- Reducing electricity supply costs provides benefits for all customers, not only those customers that have incorporated storage

Introduction

- Unitil seeks to promote energy storage innovation and customer choice by:
- Ensuring the delivery of reliable, safe, and affordable electricity and related services;
- Continuing to implement grid modernization, anticipating continued evolution of energy and systems technologies, customer preferences, and business models;
- Designing and implementing efficient processes to support storage integration into planning, operations, and market functions;
- Developing a platform that will facilitate engagement of customers and DER developers with the utility and with each other; and
- Coordinating with ISO-NE to implement Federal Energy Regulatory Commission ("FERC") Order 2222, including providing access to wholesale energy markets for storage and other DER and coordinating planning of transmission and distribution ("T&D") networks.

Enabling/Intelligent Distribution System Platform

- Adopted DOE vision of grid modernization since 2007
- Electric Grid – enabling platform which integrates customers, competitive markets, and new technologies
- Guided implementation – ADMS, AMI, GIS, OMS, DER Integration, SCADA, AVL
- Not all technological innovations should be implemented by the utility if the competitive markets are better suited to provide
- Primary role for Unitil:
  - Provide safe and reliable service for all customers
  - Enabling Platform to support diverse activities by different types of customers and third parties
  - Implement enabling technologies and programs to make the grid more efficient, economic and secure
  - Open, flexible platform which supports traditional operations and emerging smart grid capabilities

Objectives

Unitil has identified a series of eight objectives that together ensure support of a modern energy ecosystem. Our objectives were crafted with guidance from the United States Department of Energy, Massachusetts Department of Public Utilities and New Hampshire Public Utilities Commission and are used to identify the investments and technologies that best serve this new era.

Environmentally Friendly - We must firmly support the region's goals in reducing emissions in the battle against climate change.

Safety and Reliability – We must continuously improve safety, reliability and resilience while reducing the effects of outages.

Customer Enablement - We must improve and embrace customer empowerment, engagement, and education. We must give the customer the tools they need to understand and control both their own energy usage and energy matters in the region.

Security – We must ensure the cyber and physical security of the grid remains strong.

Flexibility – We must ensure the grid remains flexible enough to accommodate and integrate all types of new energy sources.

Affordability – Energy for life must remain affordable for all.

Demand and Asset Optimization – The grid must be designed to get the most out of the tools and resources interconnected in order to best serve the region.

Technology Innovation – The grid must enable the easy adoption of new technologies as they are developed to further support customer choice and system operations.

Categories

The roadmap to the future is a journey that must be planned carefully and executed in a precise manner. It is not a sprint to implement technology just to have that technology become obsolete in two years. Some technology will serve as a foundation to other technologies. Implementing the building block of the advanced grid in a well thought out manner creates the enabling platform that is the basis for the company's vision.

The Company has identified six categories of technologies required to develop the grid as an enabling platform.

Advancing the Grid

Grid Resiliency

Non-Wires Alternatives

Electric Vehicles

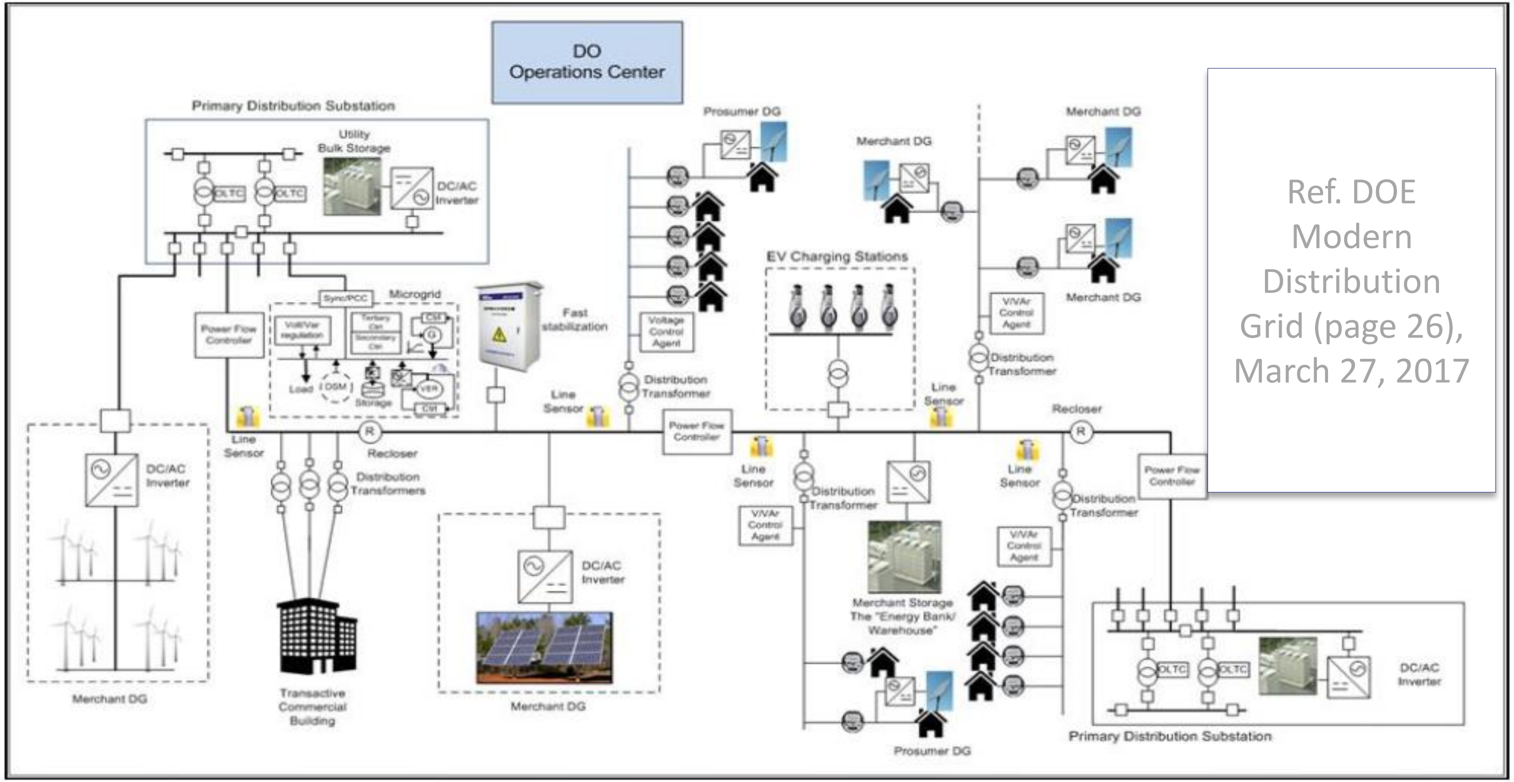
Behind the Meter

Distributed Energy Resources

Data

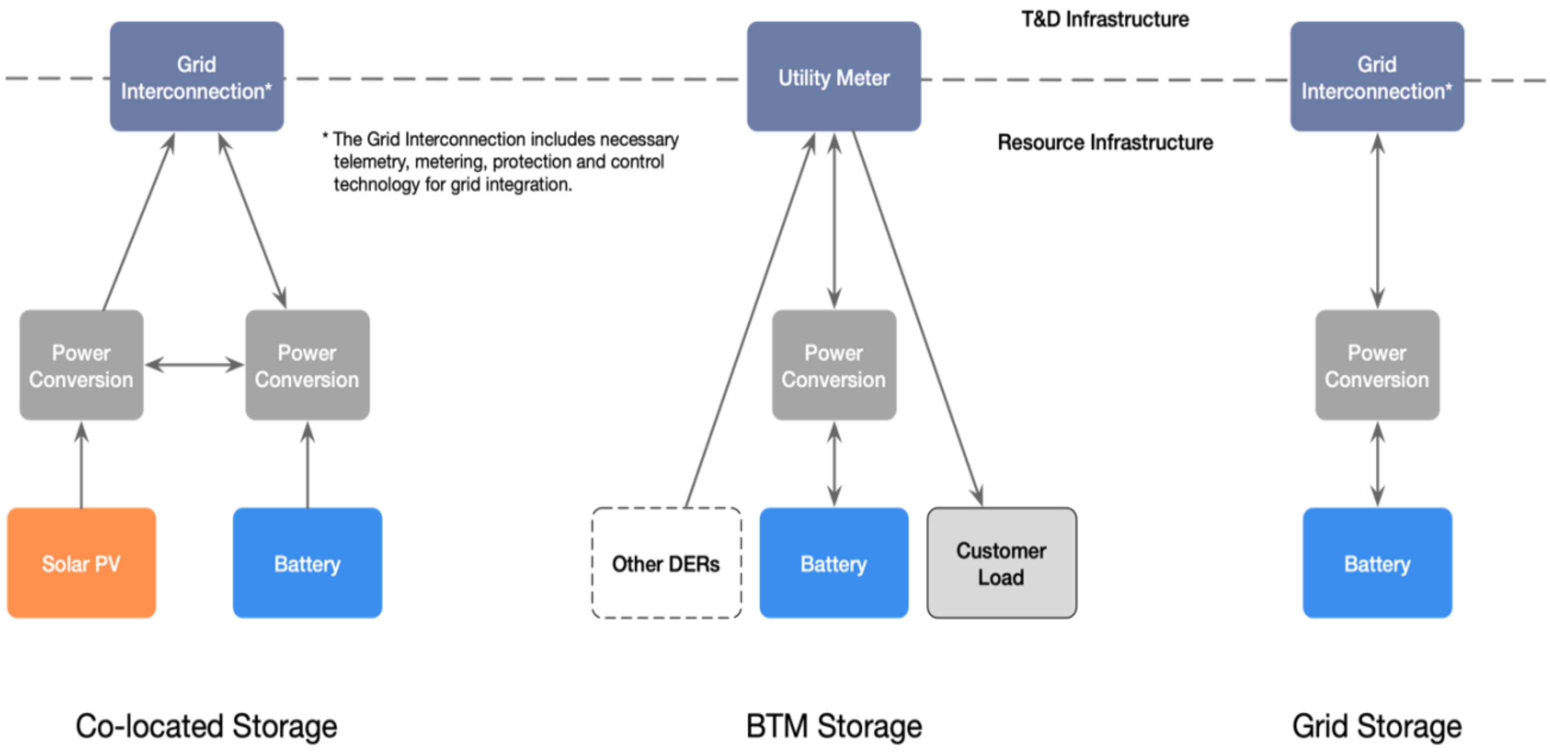
Grid Modernization

Advancing the Grid



Ref. DOE Modern Distribution Grid (page 26), March 27, 2017

Energy Storage Project Configurations



Enabling Value from ESPs

- Establish Accurate Rate Designs and ESP Compensation
  - Value depends on accurate price signals
- Integrate ESPs with an Intelligent Distribution System Platform
  - Distribution system unlocks storage value and provides access to markets
- Integrate ESP with Wholesale and Retail Markets
  - Wholesale and retail markets continue to develop through FERC Order 2222 and intrastate services

How Public Policy Can Best Help Establish Accurate and Efficient Price Signals

- Establish efficient utility rate designs based on cost causation among classes
- Consideration for avoided T&D costs
- Access to wholesale market value benefitting all customers
- Transition from net metering philosophy to a pricing model with accurate price signals

How to Compensate Energy Storage Projects that Participate in Wholesale Electricity Markets for Avoided T&D Costs

- Establish cost-based rates that would apply to Co-located and Grid Storage ESPs owned by third parties for access to and use of the grid
  - Generally require project-specific interconnection studies that determine whether distribution and/or transmission infrastructure investments are required
- Grid storage projects that are owned or controlled by the utility (e.g., a non-wires solution that incorporates energy storage) may be designed to participate in wholesale energy markets
  - Ownership of Grid Storage is necessary when a third-party NWA is not a viable alternative

How Best to Encourage both Utility and Non-utility Investments in Energy Storage Projects

- Unitil proposes stating this important objective as “how best to encourage <u>optimal</u> utility and non-utility investments in energy storage projects.”
  - Market forces should determine the amount, technology configuration, and timing of energy storage that is developed
- Rate Design and Ratemaking: TOU rates, transition away from NEM for new projects
- Grid Modernization: enhancements to grid planning and ops
- Develop a retail market for DER and ESP participation
- Encourage investment and ESP financing

The Costs and Benefits of a Potential Bring Your Own Device Program

- Customers can choose to purchase and install their own equipment, or work with a third-party service provider
- Expand access of battery storage solutions to more customers
- Reduce the cost and risk to rate base by encouraging cost sharing between utilities and program participants through a combination of rate design and incentives
- Participation cap and enrollment time frames to establish clear boundaries for program scope and cost
- Include targets that encourage participation by customers that can most readily contribute to T&D cost savings
- Establish technology guidelines that encourage standards

Recommended Statutory Changes

- **NH RSA 374-G:2, Definition of "Distributed energy resources":** the statute should be amended, if necessary, to clarify that energy storage is not "generation"
- **Utility Ownership of Energy Storage:** the statutes should be amended, if necessary, to clarify that a utility can own Grid Storage in accordance with regulations to be established by the Commission
- **Other suggestion RSA 374 Revisions:** the statutes should be amended to consistently reference "distributed energy resources" and "electric generation equipment"

Liberty Battery Storage Pilot

Liberty™

Pilot Overview

- Behind-the-meter battery deployment to NH customers in Liberty's territory (Salem, Lebanon and Charlestown areas)
- 2 phases, 2.5 MW total, 250 customers
- Batteries used for backup power and peak reduction
  - Phase 1: 100 customers, each customer receiving 2 Tesla Powerwall 2 batteries
  - Phase 2: additional 150 customers, predicated on success in Phase 1
  - Customer contribution of $50/month for 10 years or $4866 upfront
- TOU rates: critical peak, mid peak, off peak M-F, mid peak and off peak S-S
- Batteries charge from grid for customers without solar off peak; customers with solar charge from their PV only when solar is producing

Customer Compensation

- Batteries dispatch power during critical peak hours to offset customer load in home (M to F: 3P-8P)
  - Provides shield during critical peak periods from high prices
  - Customer doesn't import kWh during these hours – savings realized through lower usage
  - TOU rates during mid and off peak periods are lower than average kWh rate for all other residential customers
- Batteries dispatch power to the grid during ISO NE peak events
  - Batteries offset load at home, then dispatch rest of available energy to the grid
  - If energy is dispatched back to the grid during these periods, meter spins backwards, lower usage realized
- Annual reconciliation of transmission charges – RNS & LNS
  - Liberty pays annual ISO NE transmission charges based on peak load each month
  - Reduction of load = reduction of transmission charges, reconciled annually means lower costs for all customers
  - Example: 200 MW load at peak, reduction to 197.5 MW, 2.5 MW savings translated to $$$ reduction in charges to Liberty customers

Thank you

IR 20-166: Energy Storage Investigation

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Benefits of Energy Storage

Comprehensive Approach to Valuation

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Benefits of Energy Storage

- Peak Shaving
- Congestion relief
- Grid reliability benefits
  - Improved frequency and voltage regulation
  - Increased resiliency

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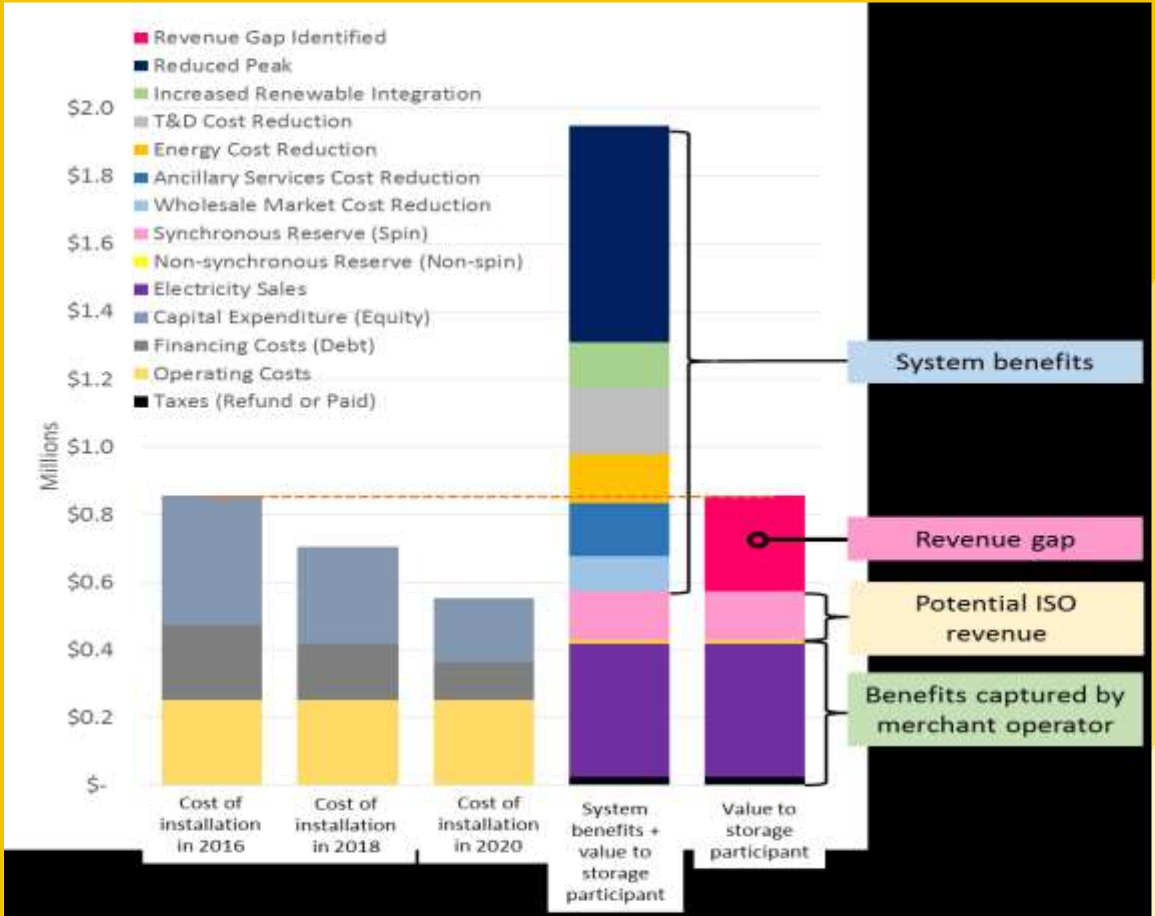
Additional Benefits

- Improves integration of distributed energy resources into the grid
- Facilitates increased reliance on renewables
- Environmental benefits
  - Reduces use of most polluting generating resources that are used to meet peak load

Illustrative Example of Cost-Benefit Analysis for 1MW/1MWh Energy Storage Paired with Merchant Solar Plant



Source: State of Charge: Massachusetts Energy Storage Initiative, MASS. DEP'T OF ENERGY RES. & MASS. CLEAN ENERGY CTR., at 37, 44-45, 48, September 2016, *available at* https://www.mass.gov/media/6441/download.

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Least Cost Integrated Resource Planning

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Energy Storage and Integrated Resource Planning

- Utilities should increase their consideration of energy storage in Least Cost Integrated Resource Plans (LCIRPs)
- Utilities should consider energy storage non-wire solutions as an alternative to traditional transmission and distribution upgrades
- LCIRP statutes do not explicitly require consideration of energy storage

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Energy Storage and Integrated Resource Planning

- LCIRP statutes require consideration of distributed energy resources (DERs)
- LCIRP statutes do not define DERs
  - However, RSA 374-G:2 defines DERs as including energy storage that is 5MW or less
- This potentially limits consideration of large-scale energy storage in LCIRPs

Encouraging Energy Storage Development in New Hampshire

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Encouraging Energy Storage Development

- Monetizing the system benefits resulting from energy storage can be a challenge for developers
- Means for encouraging development and closing the revenue gap:
  - Inclusion of energy storage in the RPS when paired with renewables
  - Energy storage procurements

NH Should Not Follow the MA Approach

- MA Clean Peak Energy Standard has not worked as intended:
  - Program lacks transparency
  - Overly complex; challenging and time consuming for DPU to design program
  - Inadequately funded
  - Unlikely to incentivize large-scale storage

Proposal for Enabling NWS Storage Projects to Capture Wholesale Market Revenue

Ian R. A. Oxenham, Esq.

Goals

- Stimulate energy storage deployment
- Reduce cost of meeting T&D needs to ratepayers by leveraging wholesale market revenue to offset NWS project costs
- But do so while also:
  - Ensuring wholesale market participation does not compromise project's ability to act as an NWS
  - Insulating ratepayers from wholesale market risks
  - Avoiding or at least minimizing conflict with restructuring principles
  - Preserving utility earning opportunities

Wholesale Market Revenue Can Cover a Significant Fraction of NWS Storage Project Costs

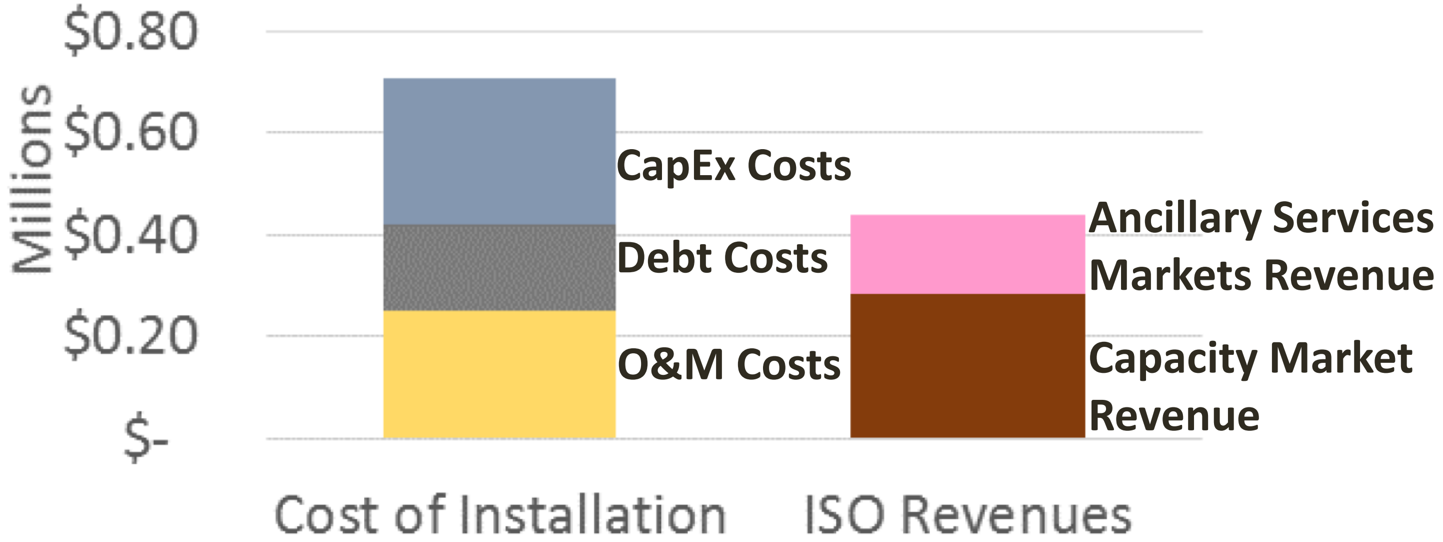


Figure 5-4: Cost of IOU Use Case with Potential ISO Market Revenue

Source: Mass. Dep't of Energy Res. et al., *State of Charge: Massachusetts Energy Storage Initiative* 118 (2016), https://www.mass.gov/doc/state-of-charge-report/download

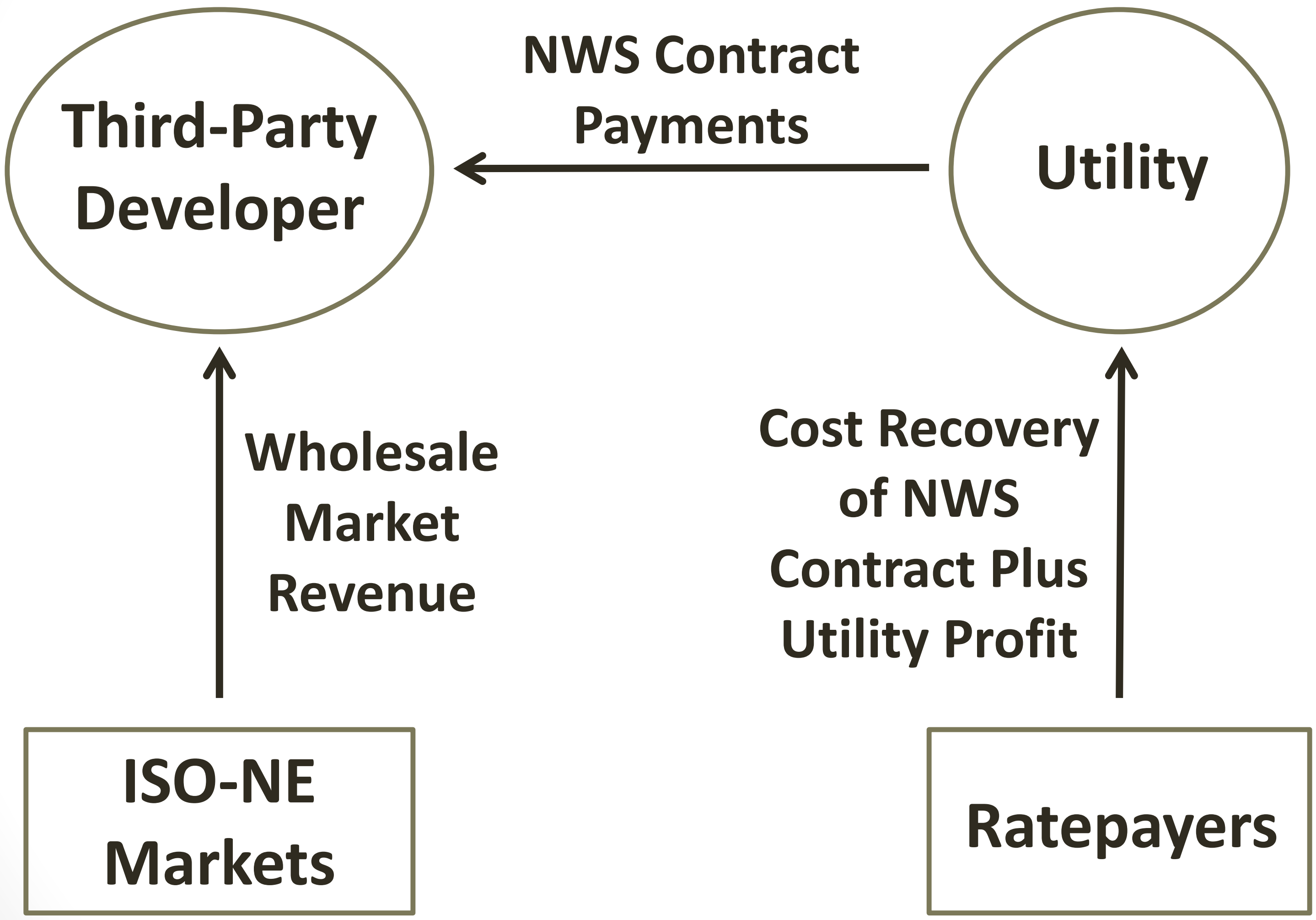
Competitive RFP Bidding Process

- Utilities issue RFPs for NWS storage projects as part of the LCIRP process
- Prospect of wholesale market revenue streams reduce NWS contract bids
- Utilities can compete with third-party proposals to build and operate NWS storage projects
- Winning proposal is the one which will result in the lowest cost to ratepayers

Two Scenarios

- If at least one NWS storage proposal costs less than a traditional solution, the competitive RFP process will result in one of two scenarios:
  - A third-party-owned storage project under contract with a utility, or
  - A utility-owned storage project

Scenario 1: Third-Party-Owned Project



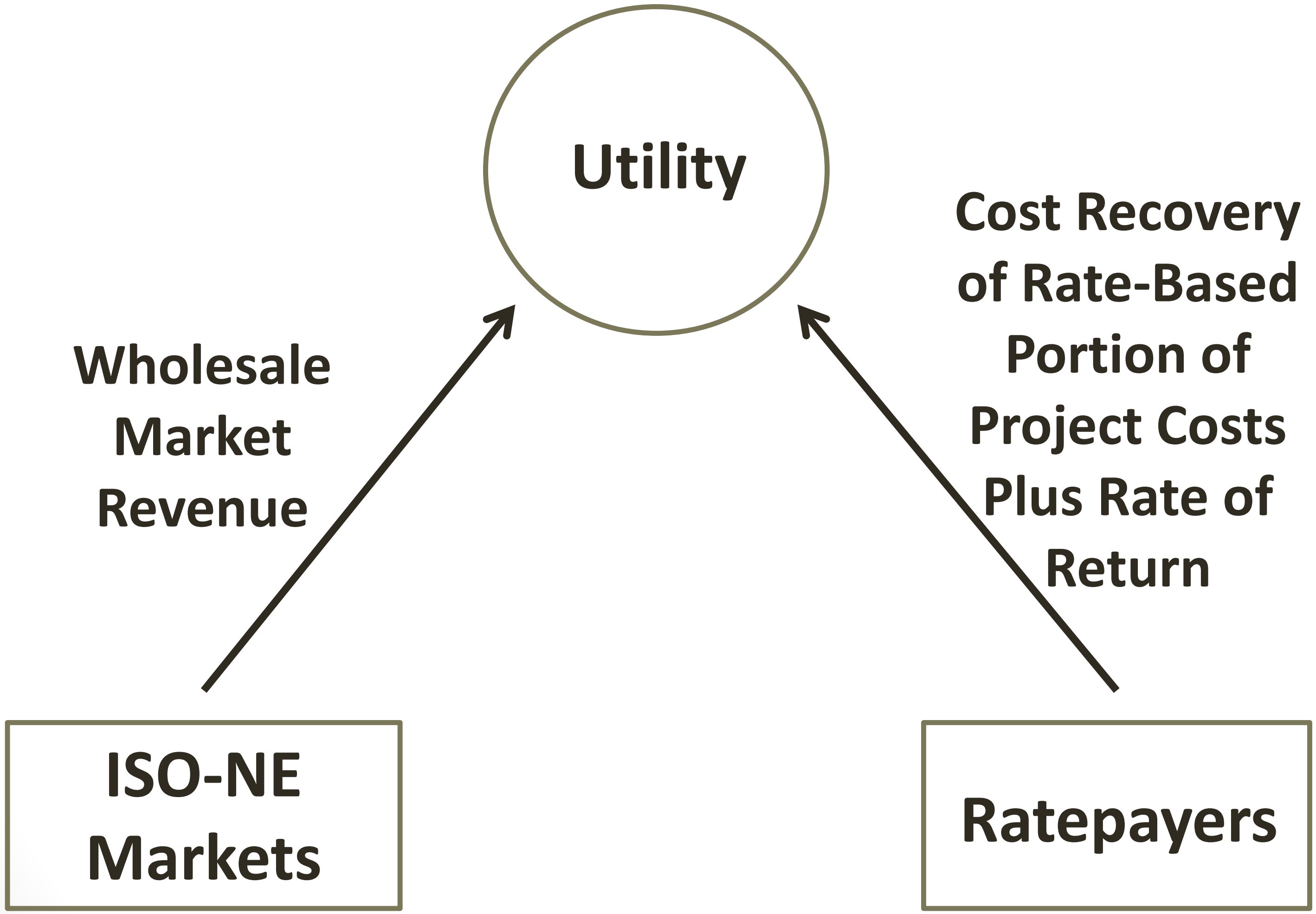
- Third party contracts with utility to give the latter dispatch control over storage project
  - Utility dispatches project to serve distribution system needs and reduce RNS/LNS charges
  - Utility control over dispatch may be limited to pre-defined time periods
- Third party participates in wholesale markets to the extent consistent with NWS contract
  - Third party contractually required to ensure project is able to perform NWS functions
  - Must default on wholesale market obligations in the event of conflict with NWS contract obligations
  - Third party compliance enforced via financial penalties stipulated in NWS contract

- Third party makes money via combination of NWS contract and wholesale market revenue
  - Wholesale market revenue plus competitive RFP bid process means ratepayers do not need to cover full cost of NWS storage project
  - Third party bears all wholesale market risks
- Utility recovers NWS contract costs from ratepayers plus a profit margin
  - Preserves utility earning opportunity
  - Commission could adjust utility ROE on contract, or use a shared savings mechanism, to address utility incentive problems

An Example:

- Winning bid to avoid $5 million traditional distribution upgrade is a $4 million, third-party NWS storage project contract that will also reduce RNS/LNS charges by $1 million
  - Total revenue third party needs is $7 million, but it bids $4 million because it projects it can make at least $3 million in wholesale markets
- Contract saves ratepayers $2 million, while:
  - Shielding ratepayers from wholesale market risks
  - Fully preserving the utility's earning opportunity
    - The utility earns as much as it would on traditional solution via adjusted ROE and/or shared savings mechanism

Scenario 2: Utility-Owned Project



- A utility wins competitive bidding process by proposing a NWS storage project that will cost its ratepayers less than any third-party proposal
- The cost of the project to the utility’s ratepayers, including the utility’s rate of return, must also be less than avoided T&D costs
- These requirements likely mean a utility must propose to only rate base a portion of the NWS storage project’s costs to win a bid

- The utility recovers NWS project costs and earns a rate of return through a combination of traditional cost recovery from ratepayers and wholesale market revenue
- However, the utility’s shareholders rather than its ratepayers bear all wholesale market risks
  - The utility only recovers a fixed amount from its ratepayers that is not tied to the project’s wholesale market performance
  - This prevents the utility from using its captive ratepayers to cross-subsidize its wholesale market activity and thereby distort market outcomes

An Example:

- Winning bid to avoid $5 million traditional distribution upgrade is a utility-owned NWS storage project that will also reduce RNS/LNS charges by $1 million and add $3.9 million to the utility's rate base
  - Not enough to cover the entire cost of the project, but the utility projects it can more than make up the remainder with wholesale market revenue and still earn its usual rate of return
- Project saves ratepayers $2.1 million, while:
  - Shielding ratepayers from wholesale market risks
  - Fully preserving the utility's earning opportunity
    - The utility earns as much as it would have on a traditional solution via a combination of rate-based project costs and wholesale market revenue

Conclusion

- This proposal:
  - Allows NWS storage projects to capture wholesale revenue in ways that reduce costs to ratepayers
  - Shields ratepayers from wholesale market risks
  - Provides both third parties and utilities with opportunities to own NWS storage projects
  - Addresses utility incentive problems by preserving utility earning opportunities regardless of who ultimately owns an NWS storage project

KEY CAPTURE ENERGY

January 2021

Compensation of Energy Storage for Avoided T&D

NEW HAMPSHIRE PUC IR 20-166 TECHNICAL SESSION

KEY CAPTURE ENERGY

Key Capture Energy

- Founded in 2016 as a utility-scale energy storage company – engaged in development, procurement, construction, contracting, and operations
- Operating 50 MWs of battery storage projects in New York and Texas
- Developed & built a 4.4 MW distribution-deferral Non-Wires Alternative (NWA) project in New York
- 200 MW of front-of-the-meter storage under construction in Texas
- Have developed in New England since 2017

Prioritize simple approaches to storage compensation

E.g., direct procurement of non-wires or a fixed-price program

- Storage can provide significant benefits:
  - E.g., peak demand reduction and infrastructure avoidance
- VDER compensation mechanisms are a worthy long-term goal
- In the near-term, RFPs can prove the value proposition and facilitate learning by doing
- Competitively-bid solicitations will surface the most cost-effective solutions
- Recommend transparent planning and commitment to competition in LCIRPs, including third-party participation in non-wires procurements

Institute appropriate rates for storage charging

Recognize that storage is a flexible and controllable load

- Rate design should reflect cost-causation and incentivize storage behavior based on grid needs
    1. Rates should avoid non-coincident peak (NCP) demand charges, which are a significant barrier for storage and fail to incentivize charging during off-peak
    2. Existing large industrial rates based on typical industrial users are unsuitable for storage

        - Ex: $15 NCP demand charges = $3.6MM per year for a 10MW storage project

KEY CAPTURE ENERGY

Update interconnection procedures for storage

Storage is a generator and a load, but not a variable resource

1. Applicability: Include storage in interconnection standards
2. Study assumptions: Use realistic assumptions for discharge and charge under light/peak load conditions
3. Thermal loading: Allow storage to adhere to pre-defined dispatch schedules and operational limits (e.g., max charge or discharge)
4. Communications: Explore potential for real-time communication of loading conditions
5. Voltage control: Consider allowing storage to operate in voltage control mode to manage flicker

KEY CAPTURE ENERGY

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