

SolarCity



SolarCity and NYISO DER Practical Use Cases

*NYISO DER Roadmap
Market Issues Working Group (MIWG) Meeting*

November 21st, 2016

Executive Summary

- **Assets In the Ground: Solar and solar + storage**
 - Residential focus with commercial scale projects in the pipeline
 - Aggregation portfolio of batteries at community and commercial solar sites
- **Experience and Feasibility: SolarCity is a national leader in solar + storage**
 - Dozens of commercial scale solar + storage systems installed nationally, plus pipeline of 100+ projects
 - Active pipeline of community solar and commercial storage in New York
 - Successful collaborations with utilities in innovative projects to use distributed resources for grid services
- **Practical Use Cases: SolarCity solar + storage assets can provide distinct and incremental use cases that benefit customers and the grid**
 - SolarCity is engaged with utilities/ISOs across the country on numerous pilots that demonstrate multiple use cases
 - SolarCity's PowerTrading desk enables optimization framework for multiple services

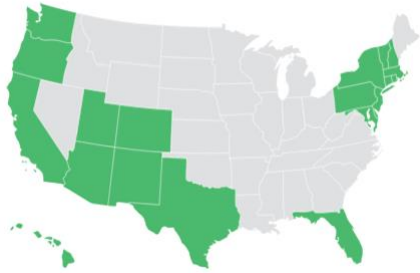
Agenda

Assets in the Ground

Deployment Experience

Practical Use Cases

SolarCity is a national leader in solar, storage, and grid services, with increasing NY presence



- 2,450+ MW of installed solar with 300,000+ customers
- 40+ MW of commercial and utility storage over 140+ active projects
 - Dozens of systems installed
- Ramping up storage deployments nationally, and in New York
- SolarCity has 100+ MW of C&I projects in the NY queue
- Partnering with utilities on innovative projects to deliver customer, distribution, and transmission benefits from storage and other DERs



- Six NY Regional Warehouses
 - Albany (2)
 - Long Island (2)
 - Orange County
 - Westchester
- >800 NY employees
- Residential, Commercial, Community, Municipal, Educational Markets
- SolarCity Buffalo Manufacturing Plant under construction; 1GW annual production target

Agenda

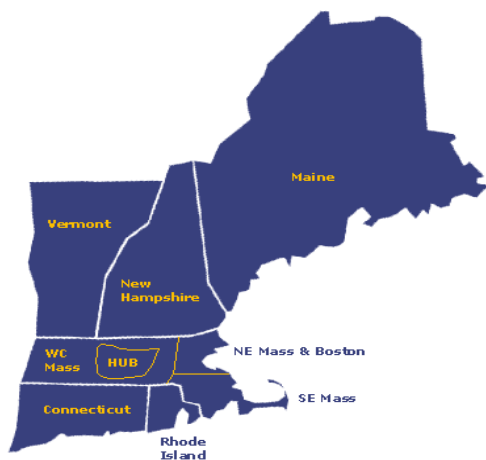
Assets in the Ground

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Community Solar + Battery Deployment

CMEEC solar + battery deployment within ISO New England



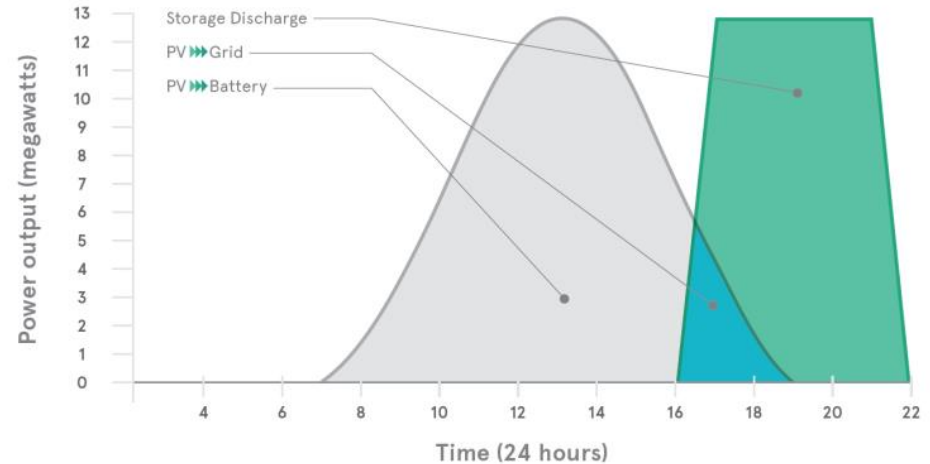
- 13 MW solar + 1.5 MW / 6 MWh battery storage
- Installation at distribution feeders across 5 sites
- Largest PV-paired storage system in Northeast
- Use Cases:
 - CMEEC peak demand reduction
 - ISO-NE coincident peak load reduction
- Other benefits include:
 - Reduction in capacity tags
 - Opportunity to integrate as a microgrid

Utility-Scale Solar + Battery Deployment

Kaua'i Island Utility Cooperative (KIUC) 52 MWh battery



- Includes 13 MW_{AC} solar + 13 MW / 52 MWh battery storage
- Enables more efficient load balancing
- Provides grid resiliency
- Reduces the need for petroleum-based power and fossil fuel imports



Agenda

Assets in the Ground

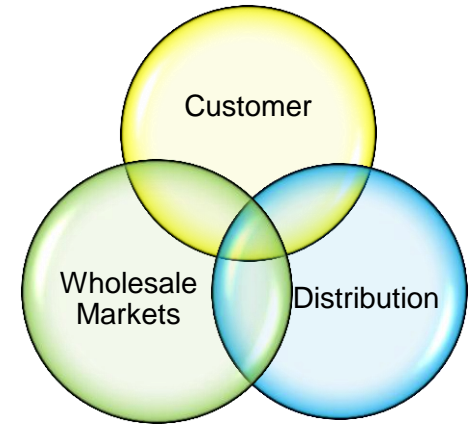
Deployment Experience

Practical Use Cases

DER Practical Use Cases

Overview

- DERs can provide services to multiple entities including customer, utility and ISOs
- Multi-use coordination is key to optimize value stack



Customer

Reliability/Backup Power

Demand Charge Reduction

TOU arbitrage

Increase solar self consumption

Utility

T&D deferral value

Voltage support

Reactive power

Reliability

• Circuit contingency relief

Wholesale Market

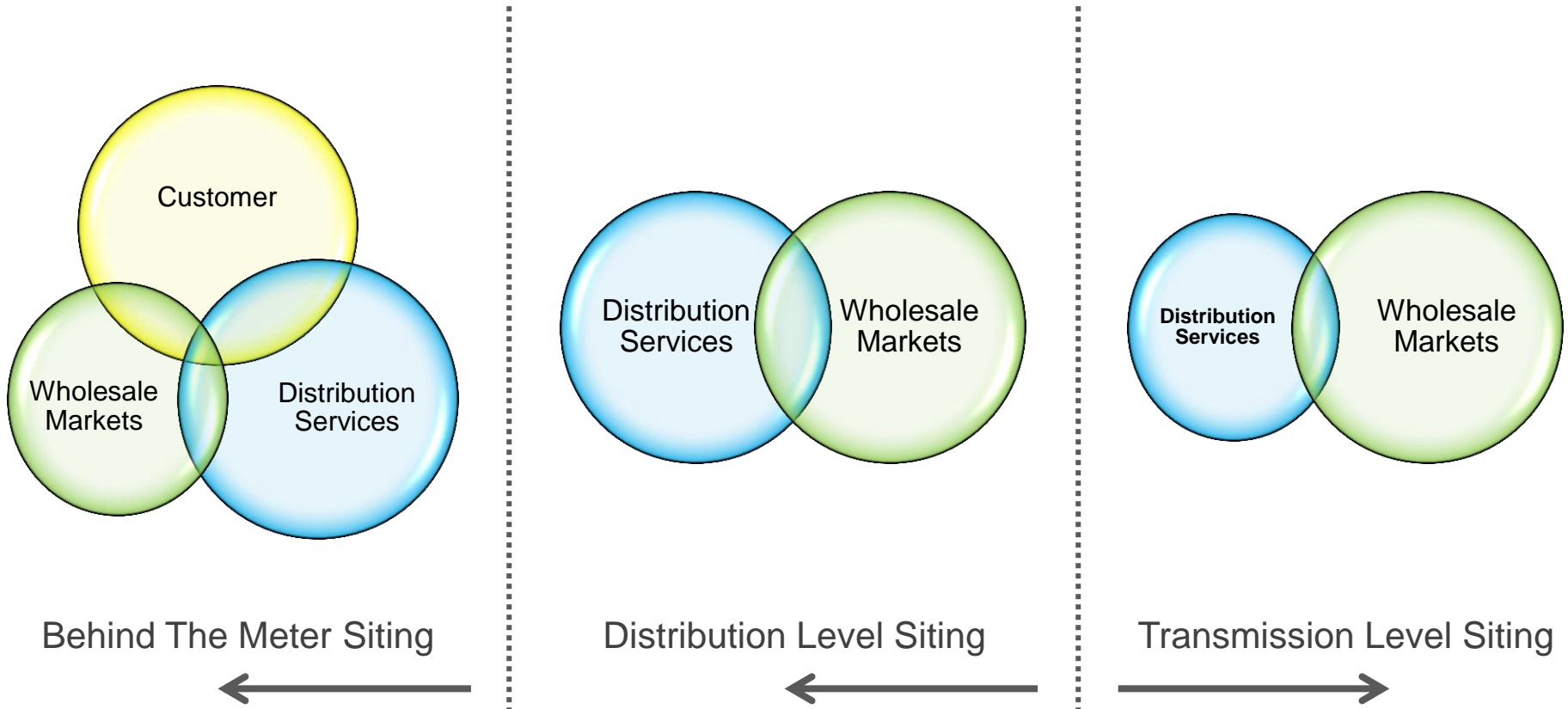
Energy

Ancillary service

Capacity markets

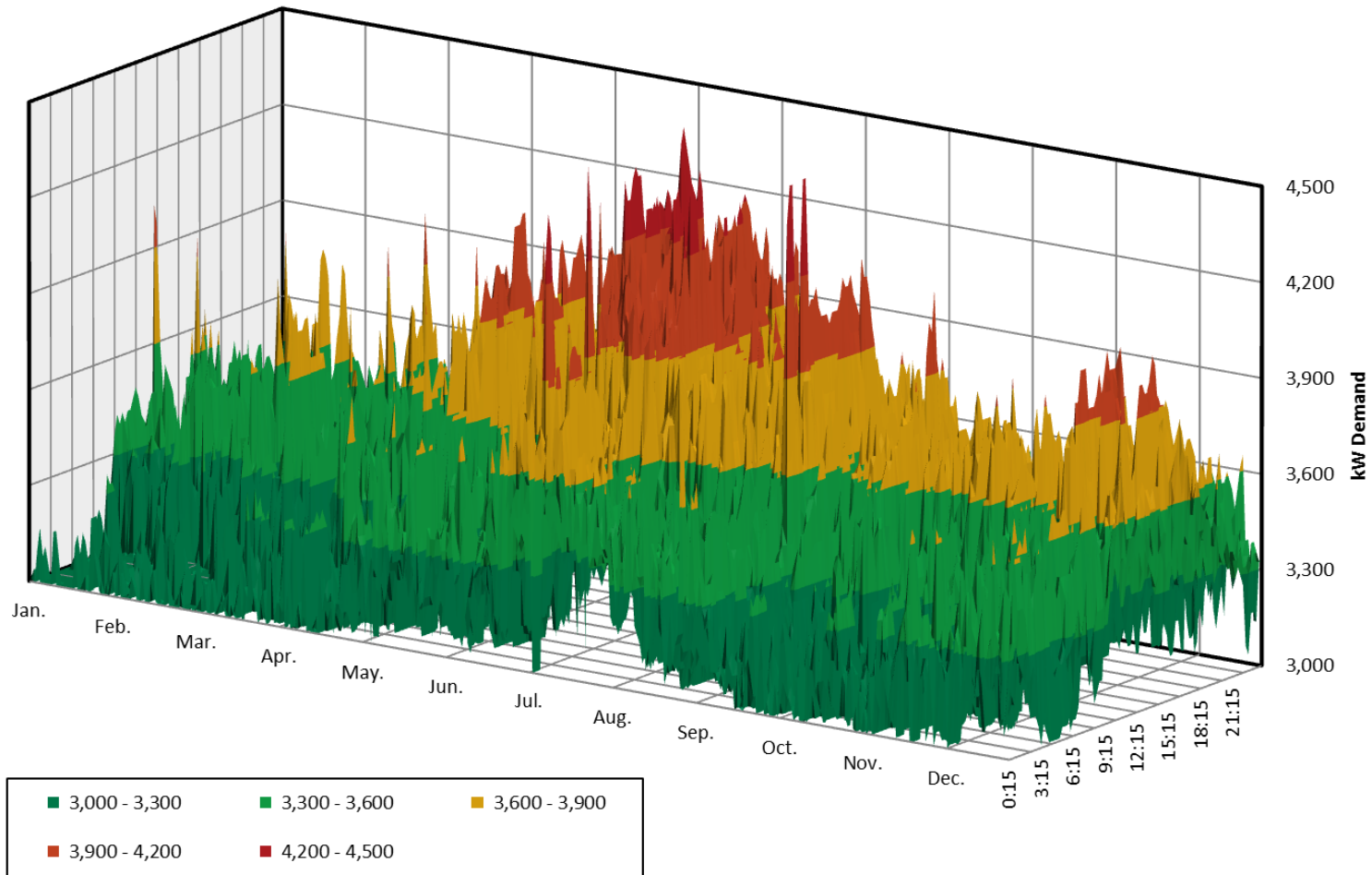
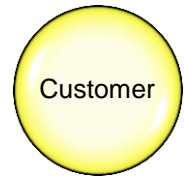
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Behind the Meter Provides Multiple Use Opportunities



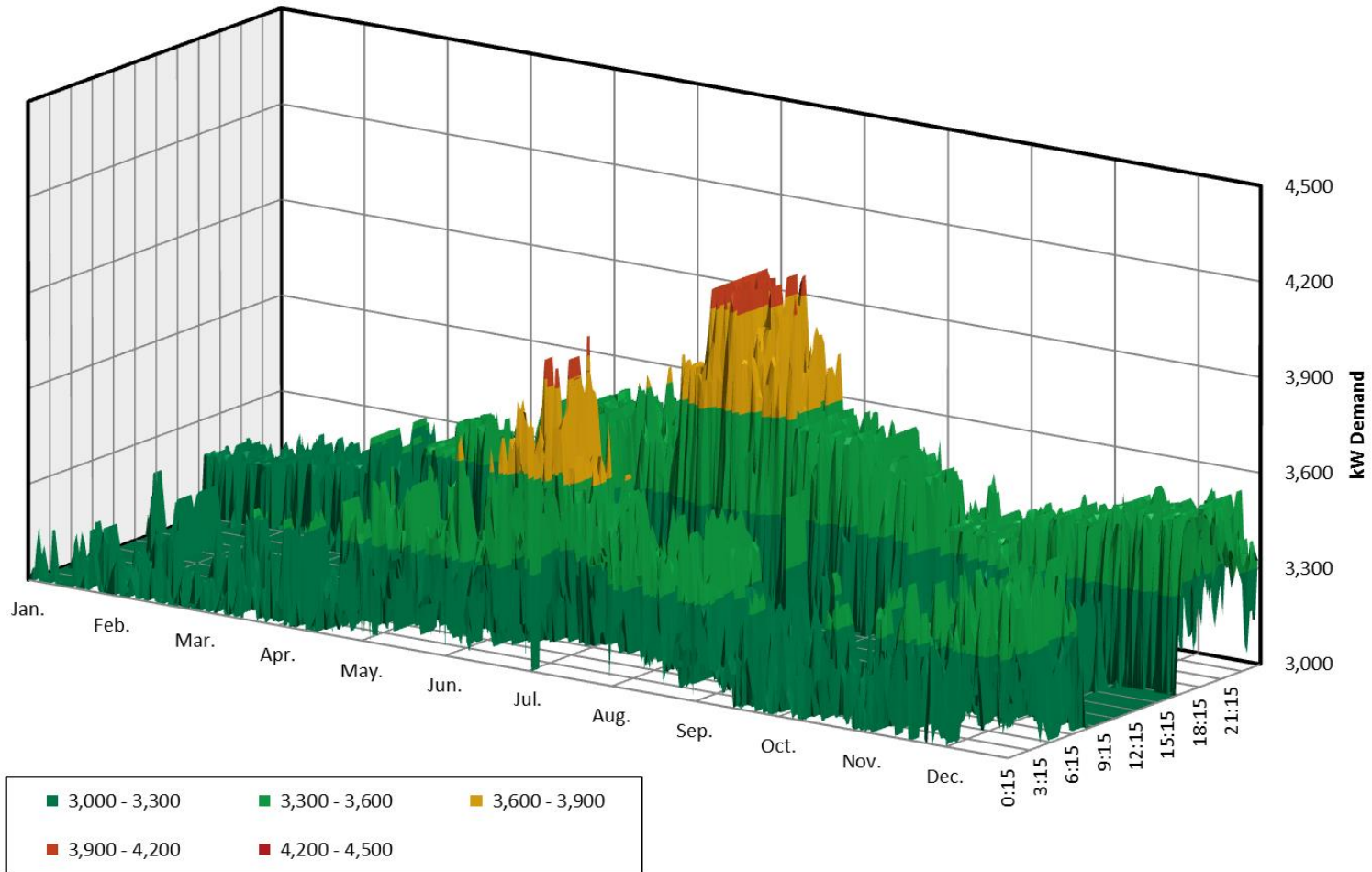
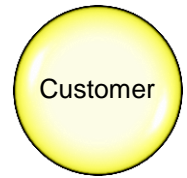
DER Practical USE Cases

Customer Use Case - Demand Charge Reduction



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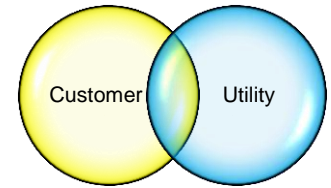
Customer Use Case - Demand Charge Reduction



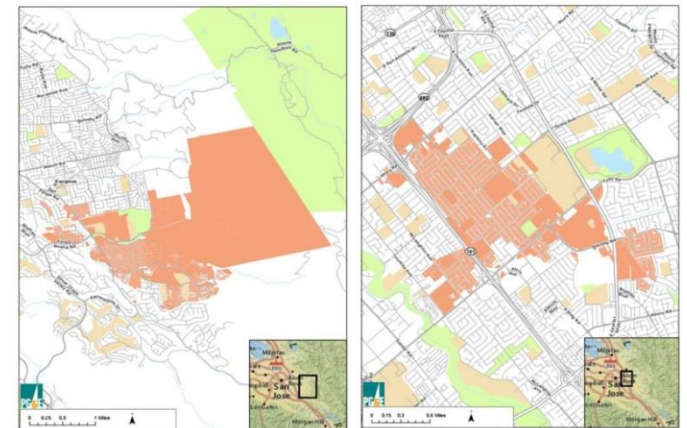
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Customer + Utility Use Case

Smart inverters + 100 residential solar-plus-storage systems

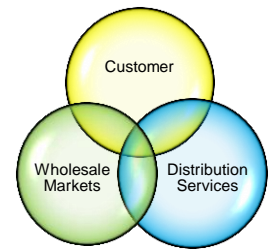


- Deploy and aggregate 100 residential batteries paired with smart inverters and PV at residential customer sites
 - Target two specific feeders in San Jose
 - PG&E pays for batteries and provides customer incentive for participation
 - Offering batteries alongside standard PV loan
- Demonstrate distribution grid services
 - Volt/VAR support and dynamic capacity
- Integrate into PG&E DERMS platform to demonstrate transactive distribution marketplace capabilities
 - Integrate standard comms protocol (SEP 2.0)
 - Submit economics bids, discharge based on awarded bids, and settle transactions

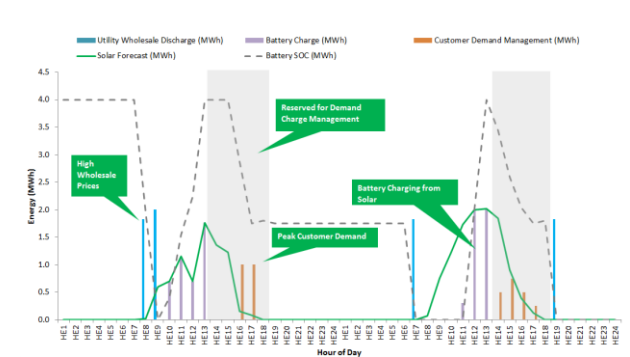


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Customer + Utility + Wholesale Market Use Case

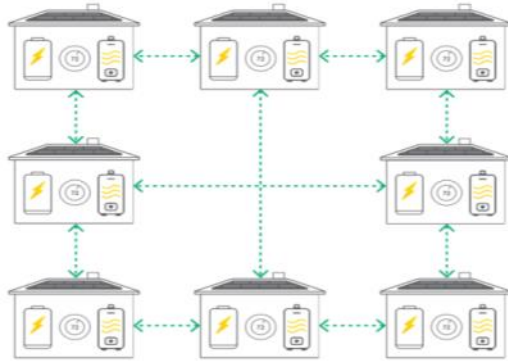


- Deploy and aggregate batteries paired with PV at community and commercial solar sites
 - Flexibility in project size and mix between commercial and community
- Demonstrate multi-use optimization that delivers value to transmission, distribution, wholesale markets, and customers
 - Demonstrate success in delivering grid services and participating in wholesale markets with an aggregated storage portfolio
- Demonstrate and evaluate mechanisms for wholesale market-participation revenue
 - MBEs to potentially include shared savings, platform service revenues, and customer acquisition fees

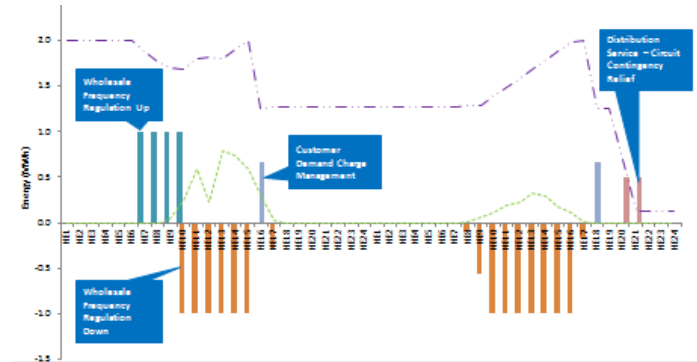


Additional Grid Services Projects

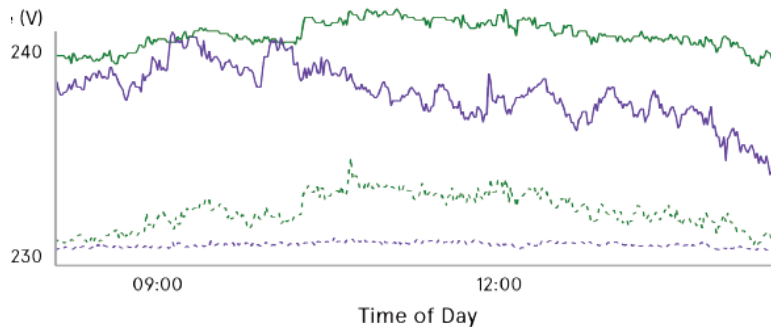
DER Aggregation for Grid Services



Wholesale Bidding Optimization for BTM Battery Portfolio



Smart Inverter Dynamic Reactive Power Support



Aggregated BTM Storage for Dynamic T&D Capacity



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Thank you