CESA Webinar

Storage as Wires

May 28, 2021
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Storage as Wires

**Webinar Speakers**

**John Fernandes**
Senior Consultant – Emerging Technologies
Customized Energy Solutions

**Ariel Horowitz**
Senior Program Director
Massachusetts Clean Energy Center

**Val Stori**
Project Director
Clean Energy States Alliance (moderator)
Established in 1998, Customized Energy Solutions (CES) is a consulting and services company that assists clients in managing and staying ahead of the changes in the wholesale and retail electricity and natural gas markets. Serving hundreds of clients, Customized Energy Solutions offers best-in-class hosted energy market operations platforms and a wide spectrum of consulting services. CES is committed to promoting economic development through the advancement of transparent, efficient, and non-discriminatory wholesale and retail electricity and natural gas markets.

### Resources
- >11000 MW assets under Active Management
- >300 MW Energy Storage assets under Management

### Awards and Recognitions
- 2016 Energy Storage Association Brad Roberts Award Winner

### Clients
- 500+ Clients Worldwide

Over 200 Associates across 9 Regional offices in United States, Canada, India, Japan & Mexico. We support clients in all 7 US ISOs and RTOs.

Our consulting services enables competitive suppliers, technology providers, marketers, utilities and customers to prosper through change, by turning knowledge into value.
CES Business Lines

**Market IQ**
- ISO Reporting
- Executive Summary
- Monthly Conference Calls
- Rule Changes
- Regulatory Updates
- Alerts
- Market Analysis

**Wholesale Services**
- Gen Dispatch
- Scheduling
- Monitoring
- Bidding
- Telemetry
- Settlements
- 24 Hour Desk
- Congestion Analysis
- Financial Transmission Rights
- REC Sales

**Retail Services**
- Market Entry
- Compliance
- EDI/Billing
- Forecasting
- Scheduling
- Settlements
- Pricing
- Congestion Management
- Headroom Analysis
- Managed Portfolio Services
- Renewable Portfolio Management

**Future Grid**
- Distributed Resource Market Integration (DRMI)
- Storage IQ
- CoMETs Valuation Models
- PowerGREEN
- Forecasting Storage Market Size
- Market Entry & Business Strategies
- Technology Due Diligence
- Demand Response Management
- Ancillary Services
RETAIL SERVICES
Enabling power and gas retailers’ growth and profitability with end-to-end solutions through our state-of-the-art hosted software and service platform, CES | BLUE.

GENERATION SERVICES
Supporting the market entry and optimal operations of power generation with comprehensive hosted software and service solutions through CES | GOLD.

The End-to-End Comprehensive Retail Solution

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Hosted Data Management

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24/7 Market Operations Center

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Full Life-Cycle Generation Services

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CES Operational Services
CES Emerging Technologies practice offers a range of consulting, software and services around Energy Storage Systems (ESS), their technology and market applications, to help project developers, investors, technology companies and other clients understand the evolving market rules and the value proposition of new technologies.

**Market Advisory Services**
- Our market advisory services help clients understand energy market opportunities, developments and policies
  - Market Overview
  - Market Forecast
  - Bid Advisory
  - StorageIQ
  - Policy Support
  - Trainings

**Financial Services**
- Our financial services help clients understand business trends, estimate revenues and cash flows, optimize investments and abate risks
  - Financial Modeling
  - Due Diligence
  - Risk Analysis
  - Investment Advisory

**Software Services**
- Our software services and analytical tools help clients simulate dispatch of energy storage projects and make critical investment decisions
  - CoMETS
  - In-Front of the Meter
  - Behind-the-Meter
  - RE Integrated Layouts
  - Microgrid
  - Bespoke Solutions

**Strategy Consulting**
- Our strategy consulting services help clients successfully enter and navigate the energy storage market to achieve key objectives
  - Market Potential
  - Market Entry
  - Investor Search
  - Business Accelerators

Backed by our practical experience of running day-to-day operations of over 300 MW of energy storage facilities in competitive markets, our team brings unparalleled value to customers via our consulting services.
Quick Background
Wholesale-Retail / Bulk-Distributed

NWA T&D; Asset deferral, storage as Tx

WS Energy Storage opportunities
✓ Energy
✓ Capacity
✓ Ancillary Services

Retail Energy Storage Opportunities
✓ Peak shaving (Demand Charges)
✓ TOU energy arbitrage
✓ Power quality/resiliency
✓ Back up power

ISO LSE
Policy Milestones for Storage-as-Wires
• Western Grid’s Projects will be used to provide voltage support and to address thermal overload situations at the CAISO’s instruction
  • *Submitted as economic projects*

• According to Western Grid, the NaS batteries are similar to substation equipment, such as large electricity capacitors, used in many wholesale transmission system facilities
  • *The Commission previously concluded that capacitors are transmission facilities*

• CAISO Says...
  • Allowing Western Grid to recover costs and a ROE through rolled-in transmission rates will distort the CAISO’s markets and give Western Grid an economic advantage insofar as the energy from the Projects would be the lowest-price energy available and therefore always selected when offered
  • Energy produced by the Project would either be bid into the market at zero dollars as a price-taker or would be injected into the CAISO grid like must-take energy
To the extent that an electric storage resource seeks cost-based rates for a particular service, that resource may need to compete at least in part on cost against other alternatives that could provide the service.

- In some cases, an electric storage resource may only be cost competitive for the cost-based service if expected market revenues are considered in the evaluation of the electric storage resources.

Allowing electric storage resources to recover costs through both cost-based and market-based rates concurrently has raised issues that must be addressed:

- Double recovery of costs to the detriment of cost-based ratepayers
  - Double recovery can be addressed by appropriate market revenue crediting
- Potential for adverse competitive impacts in wholesale electric markets to the detriment of other competitors
  - Many assets that participate in RTO/ISO markets receive some form of cost-based rate recovery
- The need for independence of regional grid operators from market participants
  - Transmission operation vs. market participation

- Reduce, up-front recovery vs. full recovery + crediting
Early Successes

- Puget Sound Energy – Glacier
  - Outage Mitigation / Resiliency, Capacity Flexibility, Ancillary Services

- ConEd – BQDMP
  - Program-Level Storage; system upgrade deferral with straightforward arbitrage

- Presidio
  - ...ok, not Presidio
• MTEP planning models will test and ensure the ability of the system to absorb the corresponding charge (and discharge) at other non-critical system condition periods

• MISO will evaluate the appropriateness of SATOA or SATA such devices as solutions to transmission issues comparably to any other transmission (wires) solution. Considerations may / will include
  • Ability of the facility to address the transmission issue (e.g. loading, voltage, stability) in all hours that the reliability issue is identified to exist.
  • The minimum and maximum capacity required to address the Transmission Issue to ensure that excess storage capacity is not treated as a transmission asset.
  • Assurance of sufficient energy and/or reactive capability (Mwh/MVar) to maintain injection capacity for the period identified as necessary in the reliability study
  • Comparable expected availability (forced outage rates as available) compared to alternatives or other facilities.
  • Life-cycle based cost comparisons including consideration of period that is required to address the Transmission Issue identified which may be less than the comparable life cycle of alternatives
  • Other considerations that may support comparative evaluation among various solution alternatives, such as lead-time to develop, right of way or substation impacts, expandability, operational flexibility, system capacity, or others

MISO SATA / SATOA
Attachment O of the MISO Tariff sets forth the formula rate templates and protocols under which [TO] and other MISO transmission owners recover their respective annual transmission revenue requirements (ATRR), and through which they establish charges for transmission service for facilities they own that are under MISO’s functional control.

There are plenty of participants in this sector that face high hurdles or are completely precluded from becoming a Transmission Owner.

A number of protests to FERC asserted that MISO’s Tariff changes were discriminatory or were unduly favorable towards MISO’s incumbent TOs.
A single storage facility providing a reliability service (acting as “wire”) while also offering product into an organized market

- Impacts of Western Grid and the FERC Policy Statement

Some loss of clarity from wires-only

- Must now be subject to the GIQ
- Must now be settled in the market
- ISO/RTO cannot operate the asset in the market

Key Dilemma

- Storage-as-wires-only is not to be settled in the market; all charging and discharging happens regardless of economic signals
- Storage charging and discharging when participating in the market is fully dependent on market signals
- Is it even possible to make these activities mutually exclusive on a single asset?
Thank You

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OUR MISSION

Grow the economy and help meet the state’s clean energy and climate goals.

PRESENTED BY
Ariel Horowitz, PhD
Senior Program Director
AGENDA

About MassCEC

Defining “Wires-Type” Value Streams

ACES Program

ACES Case Studies

IOU Case Studies

Takeaways and Themes
MassCEC’s mission is to accelerate the clean energy and climate solution innovation that is critical to meeting the Commonwealth’s climate goals, advancing Massachusetts’ position as an international climate leader while growing the state’s clean energy economy.

**Focus Areas:**

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<th><strong>High-Performance Buildings</strong></th>
<th><strong>Net-Zero Grid</strong></th>
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<td>Accelerate impactful, resilient, and cost-effective electrification technologies and approaches to decarbonizing the building sector.</td>
<td>Support technologies for a modernized and smarter grid and demonstrate innovative business models and market development policies for delivering resiliency, risk management, and clean energy.</td>
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<th><strong>Clean Transportation</strong></th>
<th><strong>Offshore Wind</strong></th>
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<td>Foster development of clean technologies, enable new models for electric vehicle deployment, and accelerate growth of clean transportation companies in Massachusetts.</td>
<td>Reduce risk, maximize economic development opportunities, train a workforce to meet the industry’s specialized needs, and ensure supply chain opportunities for Massachusetts’ businesses.</td>
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STATE OF CHARGE REPORT: ANTICIPATED BENEFITS FROM ENERGY STORAGE

Which of these value streams are “wires-type”?

- Function could not be performed solely with traditional generation
- Function serves to avoid *incurring* capital rather than avoid *allocation* of undepreciated capital

**Benefits to MA Ratepayers from System Cost Savings** = $2.3B

**Revenues to Storage Resource** = $1.1B

**Total Storage Cost** = $967M - $1.35B
Advancing Commonwealth Energy Storage (ACES)

26 Proposals selected for award

9 Use cases – 8 from State of Charge, one new use case

32 MW/85 MWh Energy storage proposed

$20 MM/$32 MM Grant funding request / Cost share leveraged

- Behind the Meter - C&I Solar Plus Storage
- Municipal Light Plant (MLP) Asset
- Merchant - Solar Plus Storage
- Resiliency/Microgrid
- NEW USE CASE - Transit
- Behind the Meter - Residential Storage Dispatched by Utility
- Merchant - Co-Located with Traditional Generation Plant
- Investor Owned Utility (IOU) Grid Mod Asset
- Load Serving Entity (LSE)/Competitive Electricity Supplier Portfolio Optimization
CASE STUDY 1: UNITIL

- 2 MW/4 MWh BESS
- Installed at utility-owned substation
- ACES grant: $1.225M
- Total project cost: $4.16M

Electricity Providers by Municipality
Commonwealth of Massachusetts

Source: Massachusetts Department of Public Utilities, September 2015
CASE STUDY 1: UNITIL

Transformer deferral:
$1.7M savings over 10 years
(wires-type value stream)

ISO-NE ICAP savings:
$2.1M savings over 10 years
(non-wires-type value stream)
CASE STUDY 2: ASHBURNHAM

- Ashburnham Municipal Light Plant (one of 51 MLPs in Massachusetts)
- ~2800 residential customers
- ACES grant: $600,000
- Total project budget: $2.7 million
- 3 MW/5 MWh BESS at MLP-owned substation
CASE STUDY 2: ASHBURNHAM

- Ashburnham MLP was saturated on solar hosting capacity prior to BESS installation
- Major risk of backflow onto transmission network during low load conditions
- Addition of BESS enables ~1 MW additional solar in MLP territory
- Use case during April/May only – does not conflict w/summer peak-focused dispatch

**April Load Min Load Curve (AMLP 2013-2017)**

- BESS charges to buffer excess PV
CASE STUDY 3: WH BENNETT

- Customer-owned BESS
  - 500 kW / 1140 kWh
- Adjacent to PV, same owner
  - 650 kW
- ACES grant: $382k
- Total project budget: $764k
CASE STUDY 3: WH BENNETT

• Use case is focused on power quality
  • “We are running into significant technical constraints with DG interconnections on the Vineyard. It may be possible that there are no possible conventional system upgrades that Eversource could offer, and you may have to investigate a battery storage solution as part of their interconnection”

• Only requires ~10% swing in BESS SOC on a daily basis

• System is front-of-the-meter and cannot defray customer load or participate in peak-focused DR

• No value stacking!
OUTSIDE OF ACES: UTILITY-OWNED STORAGE-AS-WIRES

• Avoiding peak-focused upgrades:
  • National Grid – Nantucket project
  • Eversource – Martha’s Vineyard project
  • Unclear deferral timeline given Massachusetts policies encouraging electrification of load

• Avoiding reliability-focused upgrades:
  • Eversource – Outer Cape project
  • 25 MW/ 13 MWh BESS in Provincetown, MA
  • Poor performing circuit (>25,000 customer-hours per year of outage)
  • 1.5 – 10 hour duration depending on load conditions
### Common Themes and Takeaways

<table>
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<tr>
<th><strong>Storage can serve wires-type purposes, but with limits</strong></th>
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<td>• Deferral is not the same as elimination of need</td>
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<tr>
<td>• Ownership and regulation remain complex</td>
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<td>• Limited duration = limited used</td>
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<th><strong>Economic model: teamwork can make the dream work</strong></th>
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<td>• Combining wires and non-wires value streams may lead to strong ROI</td>
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<td>• Strategy depends on temporal separation of value streams – time of day or seasonal</td>
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<th><strong>Cost is important — but reliability is king</strong></th>
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<tr>
<td>• Wires-type use for service quality may eliminate opportunity to pursue additional value streams</td>
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<tr>
<td>• But, reliability is worth paying for</td>
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THANK YOU!  
ahorowitz@masscec.com
Thank you for attending our webinar

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Learn more about the Clean Energy States Alliance at www.cesa.org

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Upcoming Webinar

An Introduction to Community Resilience Hubs

Wednesday, June 16, 1-2pm ET

This webinar will introduce the Resilience Hub concept, explain how the development of Hubs can strengthen local resilience in the face of climate impacts, and discuss the process of conceptualizing and implementing a community Resilience Hub, with a focus on energy resilience measures.

Read more and register at: www.cesa.org/webinars