Private Sector Investments in Storage and V2G Technologies are Emerging as the 21st Century Grid's Mechanisms for Promoting Grid Resiliency

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Building Resilience into a Decarbonized US Grid with Storage Technology October 21st, 2021



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Session 1: Role of storage technologies in providing grid resiliency

OCTOBER 21ST 2021 09:00 PDT / 12:00 EDT



U.S. Grid Resiliency Challenged by Policy Shortcomings

Current regulatory and market changes in the U.S. are moving in the right direction but are still lagging in terms of pace and magnitude, complicating investment decisions.

- Despite what is still a mostly natural gas-based regulatory and wholesale markets regime, interconnection
 queues all around the United States are overflowing with planned investments in storage projects
 - Acelerex's proprietary data and analytics platforms reveal that the economics of currently planned storage assets vary greatly depending on the node on which it is placed
 - Much of the planned investment is unlikely to finally materialize because of policy shortcomings
- Policies have not yet adequately addressed the need for resiliency and reliability within the context of clean energy transition
- Regulatory recognition like FERC Order 2222 should facilitate convergence of BTM and FTM trends
 - Directionally correct but not holistic enough as state policies and regulatory are needed as well
- Standard Market Design remains flawed and incapable of properly assimilating renewables supply

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• ITC will provide a bridge for investor confidence which will mitigate policy and regulatory shortcomings

Standard Market Design Creating an Arbitrage Opportunity

Increasing penetration of renewables can create distortions in power pricing, penalizing producers and creating a significant arbitrage opportunity for investors in storage and V2G

- Prices of power can go to zero or negative for high penetrations of renewables
- The cost of power and the value of power does not go to zero during these periods



Value of Lost Load



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Stacked Services Technologies Bolster Standard Market Design

Cale

ROOATS

Network

Policies

Project

Settings

Views.

Outputs

\$1.00

Mexnapes

Job Saved!



Energy \checkmark Grid ✓ Reserves Century Regulation Capacity ✓ Voltage Services 20th Black Start ✓ Ramping Services Peaker Replacement / Peak Shaving \checkmark Economic Renewable Shifting \checkmark Clean Peak \checkmark ✓ Renewable Firming Load Services \checkmark Coincident Peak Management \checkmark Demand Charge Management \checkmark Time-of-use Rate Management \checkmark ✓ V2G ✓ VPP ✓ Resiliency Reliability \checkmark

✓ PQ Following

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- Curtailment Services \checkmark
- ✓ Hosting Capacity Services



Source: Acelerex Grid Automation Platform

Regulation: ITC is the "Saving Grace" in the Medium Term

Current wholesale market structures lack mechanisms for resiliency needs in line with future clean energy targets.

Service	Challenge
Reliability and Flexibility	New Reserve/Flexibility Products
Emerging Technologies	Reliability Services with growing VRE
Resource Adequacy	Reliability Assessment and Implementation
Price Formation	Zero Marginal Cost World
T&D Coordination and Wholesale-Retail Interactions	Grid Services Provision From DERs
Transmission Planning	Long Run Grid Planning Uncertainties

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- Qualified kW in capacity markets are treated equal despite having fundamentally different characteristics
- ✓ ELCC and Minimum-State-of-Charge mechanisms for Energy Storage capacity will support resiliency and reliability
- ✓ identifying reliability and flexibility capabilities of storage shines light on monetization
- ✓ FERC 2222 aims to enable dual participation of Energy Storage for BTM and FTM services and that's great for resiliency



Policy Shortcomings in Action: The "Duck Curve"

Private sector investments in storage and V2G technologies will provide the medium-term cover for regulatory inertia and emerge as the natural balancing mechanism for grid resiliency



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Duck Curve 01-01

Drivers of the "Duck Curve"

- Net load down ramping
- Net load up ramping
- Curtailment risk
- V2G services during belly of duck
- Storage to stabilize grid for V2G
 growth
- Storage for off peak demand hours

Source: Acelerex Grid Data Services Platform





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