Energy Storage Data and Analysis Needs: Industry Perspective

EIA Energy Storage Workshop

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www.energystorage.org
Data/Analysis Questions for Industry

• From policymakers
  • How much storage is deployed? How much is planned?
  • What is the cost of storage?
  • How much storage do we need?
  • What is the emissions impact of storage?
  • What are the system / ratepayer benefits of storage deployment?

• From grid operators
  • What is the contribution of storage to resource adequacy?
  • What is the value of storage services?

• From others
  • What is the cost structure of storage?
Deployment Data Sources

- Deployment data
  - EIA 860-M
  - WoodMackenzie
  - Platts
  - Utility IRPs
  - State Program Results
  - RTO Interconnection Queues

- Key issues
  - Lack of capture of key details
    - MWh
    - Hybridization
  - DER storage often overlooked
    - BTM hard to capture
    - Dx infrastructural storage not “generation”
    - Unclear reporting lines for leased projects

- Recommendations
  - Include MWh in reporting
  - Develop methods for estimating DER storage via state energy offices, utility interconnection, other sources
  - Track utility IRPs and RTO interconnection queues for forward estimates

<table>
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<tr>
<th>State</th>
<th>Utility</th>
<th>IRP Year</th>
<th>Storage Proposed</th>
<th>Timeline</th>
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Total: 7,658

Note: All battery sizing data is from SPP.

Sources: SGF Global Market Analysis

Battery Capacity and Projects in ISO Connection Queues

* MWh and AC, battery and PV refer to the order PV capacity

** Monitoring data as of April

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Note: Interconnection queues use of May 2018. Partial coverage of FL, AZ, CO, IL, MA, MI, NC, AL, FL, PA, TX, TX, NE, SD, IA, MN, IA, CO, NM, WI, MN, MA, PA, and WA is currently tracked by projects. Projects are reported by capacity but not by number of projects.
Cost Data Sources

Cost series data
- NREL ATB
- WoodMackenzie
- Lazard
- BloombergNEF
- Utility IRPs
- Utility RFP Results
- State Program Results
- Published PPAs

Key issues
- Lack of empirical data series
- Lack of standard reporting
  - Hardware vs. installed
  - Project boundary (e.g., interconnection)
  - Price vs. cost
  - Capex vs. LCOE
- Insufficient reflection of variety of characteristics
  - Lithium variants
  - BTM vs. Dx-connected vs. Tx-connected
  - Standalone vs. hybrid
- Lack of data on early techs (e.g., Zn, V, etc)

Recommendations
- Create empirical report (similar to Tracking the Sun, etc)
- Establish methods for breaking out storage costs from hybrid projects
Analysis of System Need

• Different rationales for “need”
  • For an X% clean power system?
  • For economic replacement of retiring capacity?
  • For avoiding curtailment?
  • For electrification of transportation / T&D infrastructure?

• Assumptions affect “need”
  • What price/duration/functions of storage are assumed available?
  • What substitute technologies are assumed available?

• Recent analyses of note
  • NREL
  • Utility IRPs
  • NGO (GridLab, UCS)
  • Academic

• Recommendations
  • Study storage in a standalone context, not only as renewable hybrid
  • Study storage in different clean energy mixes (not just high RE)
Analysis of Reliability Contribution

Recent analyses
- NREL
- NYISO, SPP, CAISO ELCC studies

Key issues
- Existing analytical methods can capture storage but may be computationally intensive (e.g., ELCC)
- Significant assumptions involved in analytical methods
  - Sensitive to dispatch assumptions
  - Contribution of storage changes with supply mix, load profile → requires forecasting of system
- Lack of hybrid resource approach
  - Hybrids not “standard”
- Utility planning models still catching up
  - Rarely use sub-hourly modeling (or not even chronological hourly)
- Characteristics may not be captured in reliability analyses (e.g., response time / availability)

Recommendations
- Undertake ELCC analysis across grid regions, determine need for longer-duration storage
- Develop hybrid resource capacity qualification guidelines
- Develop metric to reflect system flexibility needs for reliability, akin to LOLE convention
Valuation Methods

Quantification robustness varies
- Established
  - Wholesale Services (Energy / Capacity / Ancillary Services)
  - Demand charge management
- Less established
  - Avoided Tx/Dx
  - Avoided emissions
  - Price effects
  - Voltage/local reliability
- Not yet established
  - Resilience
  - Option value

Many actors working to establish methods
- State PUCs / Energy Offices
- EPRI
- NSPM for DER

Recommendations
- Collect catalogue of valuation methods for core power system benefits
- Develop menu of methods & guide for selecting appropriate method for valuing resilience
- Develop option value method for storage as non-wires alternative
Emissions Analysis

- **Storage can reduce emissions via several paths**
  - Avoiding fossil generation (peakers) & related infrastructure
  - Integrating higher levels of renewables with deliverability
  - Enabling more rooftop solar, EVs, and other DERs
  - Making the grid more efficient

- **Recent studies on negative emissions impacts**
  - Often based on unchanging system (no coal retirements)
  - Round-trip losses offset by enabling greater RE deployment
  - Models assume arbitrage behavior that may not reflect actual operations

- **Recommendations**
  - Conduct empirical study of storage impact on system dispatch and emissions
  - Create datasets on marginal unit GHG emissions for energy deliveries by location/hour/season
  - Develop analytical methods for non-GHG impacts (NOx, SOx, PM)
System Benefit Analyses

- Recent analyses to note
  - Massachusetts DOER (2016)
  - NYSERDA (2018)
  - Virginia DMME (2019)
- Can identify gap between system cost and value to system/ratepayers
  - Informs state policy interventions
- Can include non-traditional power sector considerations
  - Jobs/economic development
  - Public health/environment
- Recommendations
  - Develop more robust data on jobs & economic activity from grid storage sector
  - Fund states to undertake and/or develop supporting methods for system benefit analyses
Cost Structure

- **Understanding components can inform policy**
  - Focus of applied R&D
  - Better inform trade and industrial policies
  - Assist with standardizing cost reporting

- **Not yet well understood for non-battery technologies**
  - Critical for longer-duration storage technology analysis/planning
Questions? Feedback?

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