Energy Storage Impacts in Critical Infrastructure: An Assessment Guide for Developers and Practitioners

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PROJECT PROFILE

Topic Area: Analytics & Tools
Vertical: Analytics
Strategic Pathway: Optimize/Grow
Project Start and Finish: FY25-FY26

PROBLEM

Why this work is needed

Battery energy storage systems (BESS) deployed at resilience hubs and other critical infrastructure can provide both resilience benefits during outages and economic/infrastructural values during normal operations. Existing evaluation approaches often focus on:

- Technical performance only (e.g., system availability) or
- Broad impact assessment methods that are not tailored to facility-scale BESS applications.

As a result, project developers, facility operators, and other interested parties often lack a practical, consistent way to:

- Define project success and measure outcomes and
- Compare pre- and post-deployment conditions
- Use results to improve system performance and future project design

Project objective

Develop a practical, defensible impact assessment framework for BESS deployed at resilience hubs and other critical infrastructure to quantify benefits and support accountability

APPROACH

Guide development approach

- Organize the guide around five core components and design it for real-world constraints (limited staffing/budget, uneven data availability)
- Specify different measurement scenarios (baseline & post-deployment; post-deployment only; longitudinal monitoring) and provide guidance for data collection, consistent calculations, and reporting
- Include guidance on interpreting results (compare pre/post-deployment, explain drivers, assess gaps, incorporate stakeholder input) and audience-specific dissemination

Figure 1. Five–step assessment framework developed in the guide

RESULTS

Main outputs completed

- Produced a draft assessment guide for BESS impacts in resilience hubs and other critical infrastructure, developing a five-component impact assessment structure
- Assessment metric architecture organized into six impact categories
- Toolkits/data collection and source guidance/case studies/templates

Table 1. Six Key Impact Categories & Example Indicators

Category	What it captures	Example indicators
Economic Benefits	Cost savings & local economic value	Energy Bill change; avoided outage losses
Energy Access	Reliable access to energy services	Users served; critical services enabled
Energy Resilience	Ability to withstand & recover from disruptions	Backup duration (hrs); residents served
Energy Security	Reliability under physical/cyber threats	Reduced risk; safety mechanisms
Infrastructural Benefits	Reduced grid stress / grid support	Peak demand reduction; demand response
Workforce Development	Jobs & training	Trainees certified; jobs supported

CONCLUSIONS & IMPACT

This guide provides a practical framework to evaluate, compare and communicate the real-world impacts of behind-the-meter BESS at resilience hubs and critical infrastructure. By standardizing how impacts are measured and reported, the framework supports more informed planning, investment, operational, and deployment decisions.

Impacts

- *Facility owners/operators:* evaluate energy savings, outage performance, and operational benefits
- *Funders/program managers:* compare project outcomes and guide future investments
- *Utilities/regulators/planners:* support planning with standardized evidence of economic and resilience impacts
- *Communities:* better understand local benefits related to affordability, reliability, and preparedness

FUTURE DIRECTIONS

Explore opportunities to:

- Apply the framework to additional BESS deployment contexts
- Strengthen cross-cutting reporting across future assessments
- Develop additional templates and user-facing tools for implementation

References

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