

Financing Emerging Applications of Energy Storage

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Background

- Energy Storage can serve emerging grid roles, which presents opportunities to unlock new revenues and challenges associated with meeting the needs of risk-adverse investors
- All energy projects require development capital, and those that do not secure financing will not proceed
- A wide variety of stakeholders, particularly state and local regulators, do not have expert knowledge of the finance system, and require education on the impacts that changes in financing structures can have on project costs passed onto ratepayers
- Efficient financing has the potential to lower system costs and support efficient outcomes

Prior Work and Project Goals

- Previous work focused on financing local resiliency projects
- Explored business models that could stack grant funding with loans or leverage third-party ownership mechanisms to support locally focused storage projects
- Current work examines the implications of financing storage as a transmission or multi-use asset and how storage can be financed in novel finance configurations
- Financing storage as a transmission asset can potentially lower system costs through lower risk profiles
- Storage hybrids have various challenges and opportunities related to technology risk and revenue capture

Financing Storage as a Transmission Asset

- Energy storage can be deployed quickly and cost-effectively to support transmission system needs
- Storage can also be put to productive use when it's not needed to provide transmission services
- Despite the technology's strengths, SATA has not gained significant traction
- Fully or partially regulated assets can be rate-based and have access to lower costs of capital
- Regulated assets also have a lower risk profile than market assets
- When all things are equal with capital structures and creditworthiness, a SATA project will likely have a lower overall cost of capital than a market storage project, and a dual-use project will lie somewhere between the two

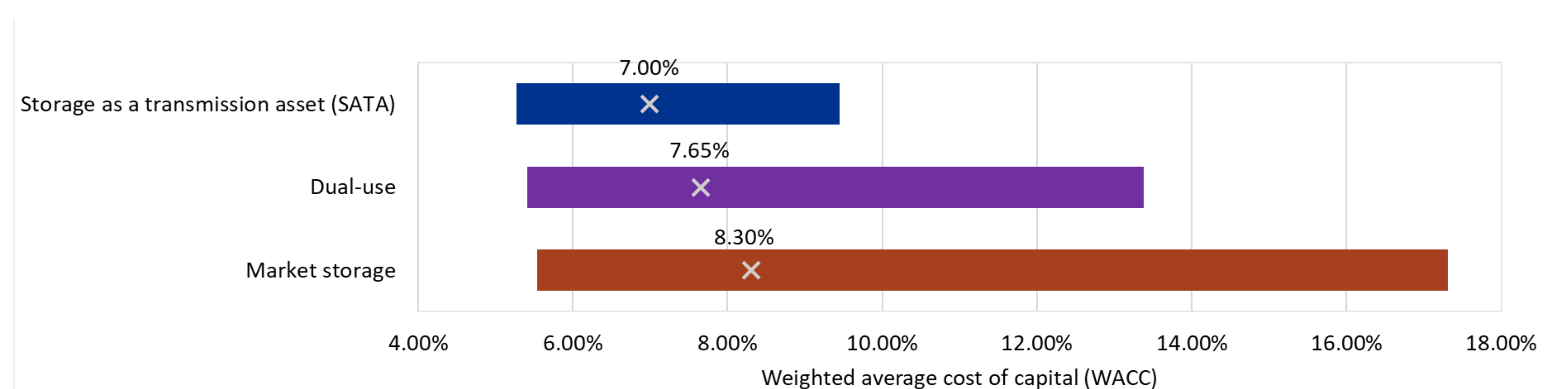
Storage as a transmission asset (SATA)

- Supports transmission system
- Regulated rate-of-return revenues
- Lower cost of capital generally expected

Dual-use storage

Market storage

- Operates in electricity markets
- Merchant or contracted revenues
- Higher cost of capital generally expected



Financing Energy Storage Hybrids

Hybrid Configuration	Benefits	Risks Mitigated	Financing Implications
Storage + Gas Peaker	Improved operational efficiency; reduced fuel demand	Unforced outage risk; revenue risk	Potential to raise debt service coverage ratios (DCSRs)
Storage + Small modular reactor	Ability to modulate load and arbitrage	Technology risk	Potentially lower cost of debt
Storage + Variable generation	Load shaping; system integration; access to additional markets; balance of system savings	Basis risk; diversified revenue sources	Potential to raise DSCRs; access to additional markets

- Energy storage can be hybridized with generators to meet varying operator goals
- Hybridization can influence how projects are financed as it changes costs, revenues and risk structures
- Hybrid projects are likely to use the same overall financing mechanisms as stand-alone plants, but the costs and relative share of capital types will vary
- We examine three types of generation: baseload (small modular reactors), flexible (natural gas peakers), and variable
- In most cases storage can provide additional opportunities for revenues
- If revenues increase relative to costs, the project may be able to take on additional debt, which can lower costs overall
- Storage can reduce operating costs associated with peaking plants by limiting the need for starts for short-duration power needs and by providing voltage and frequency support
- Storage also has the potential to mitigate technology risks associated with emerging generation types like small modular nuclear reactors
- A hybrid plant can likely continue to operate even if there are unforced outages, mitigating some revenue risk
- Regulators and other key stakeholders can consider these potential impacts when evaluating potential projects and setting program goals