Pacific Northwest
NATIONAL LABORATORY

Emerging Financing Models

August 6, 2025

Dan Boff, Jay Barlow

2025 OE Energy Storage Program Peer Review

U.S. DEPARTMENT of ENERGY BATTELLE

PNNL is operated by Battelle for the U.S. Department of Energy

Acknowledgment

This material is based upon work supported by the U.S. Department of Energy, Office of Electricity (OE), Energy Storage Division

Agenda

- Why focus on finance?
- Financing storage as a transmission asset
- Financing emerging storage hybrids
- In progress work

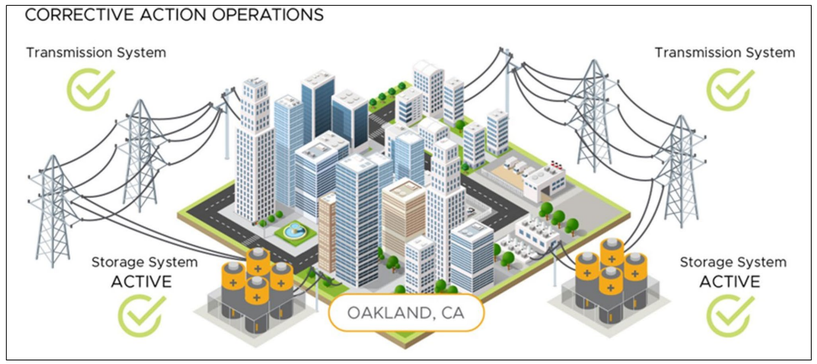
Why focus on finance?

- Regulators and other energy-sector stakeholders often focus on what gets built and how it will be use, but not the decisions that bring an approved project into fruition
- Beginning with a risk informed mindset can result in lower costs of capital improving ***project affordability***
- Ensuring that projects can attract capital can help projects reach operations ***more quickly***
  - Projects that ***do not get financed do not get built***
- Regulators may be unfamiliar with novel project applications, limiting potential system savings

Pacific Northwest
NATIONAL LABORATORY

Financing Storage as a Transmission Asset

SATA and Dual-Use Storage

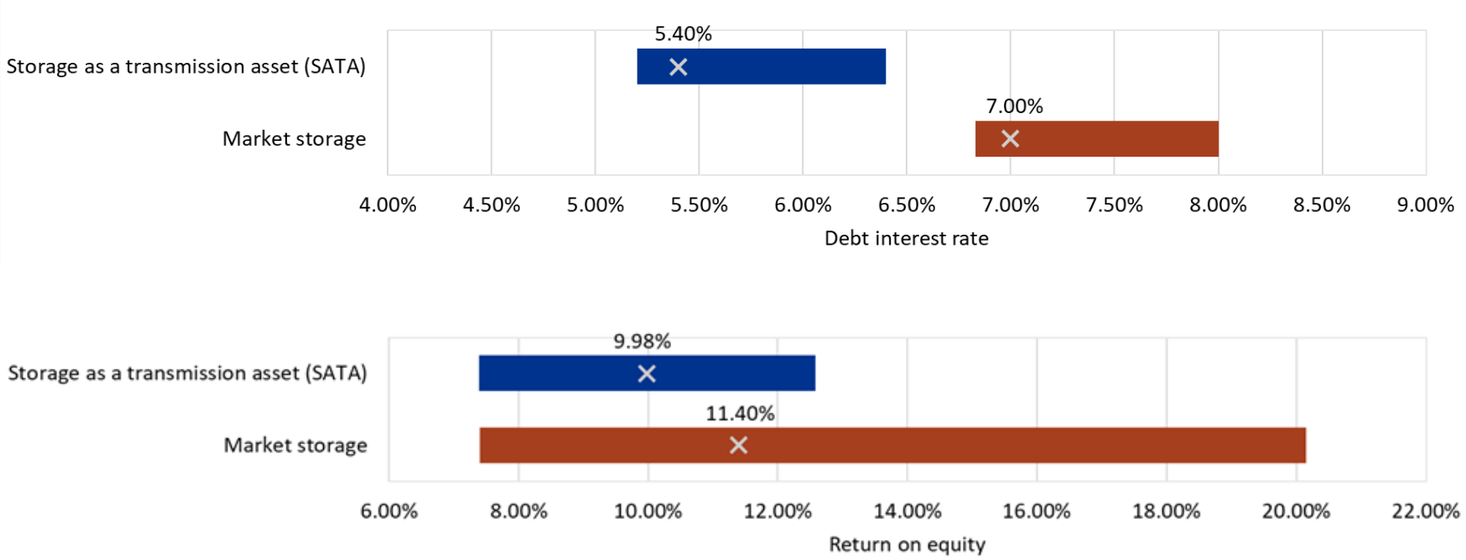


- Energy storage can be deployed quickly and cost effectively to support transmission system needs
  - Storage can also be put to productive use when it's not needed to provide transmission services
  - Despite the technology's strengths SATA has not gained significant traction
- Fully or partially regulated assets can be rate based and have access to lower costs of capital
  - Regulated assets also have a lower risk profile than market assets
- Projects with multiple revenue streams also carry less risk than those reliant on a single source of revenue

Applications and Implications

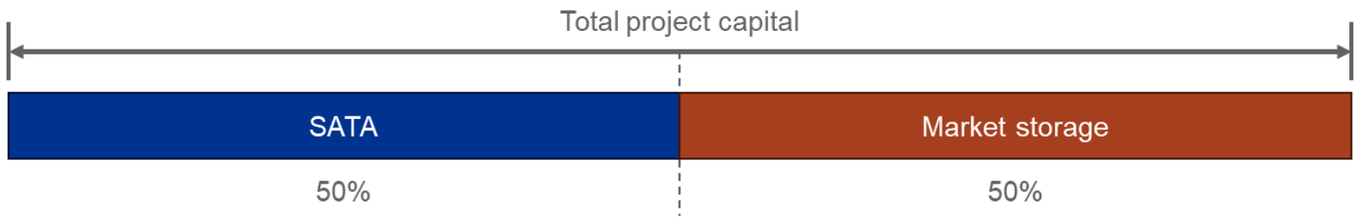
Storage as a transmission asset (SATA)	Dual-use storage	Market storage
• Supports transmission system • Regulated rate-of-return revenues • Lower cost of capital generally expected		• Operates in electricity markets • Merchant or contracted revenues • Higher cost of capital generally expected

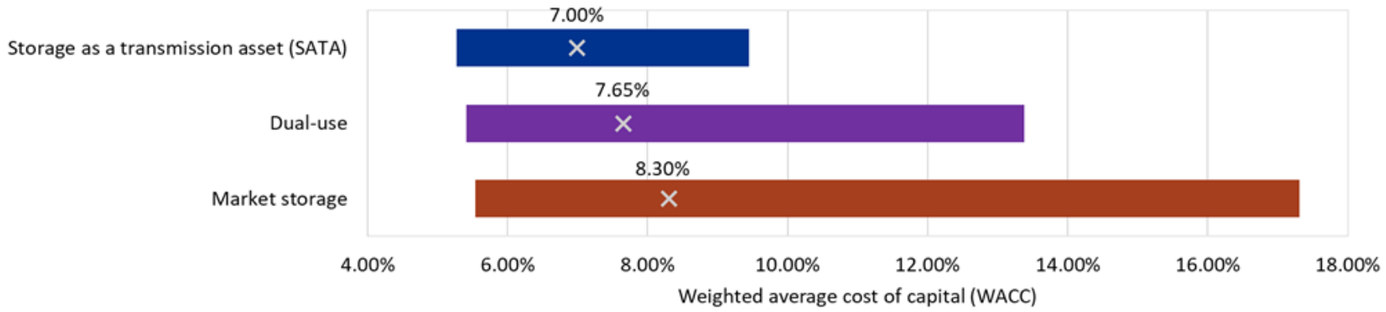
Debt and Equity Returns



- Regulated assets see lower rates of return than market assets
- Utility debts are generally 160 basis points lower than projects seeking revenues for energy markets
- Equity returns for utility projects are generally capped, whereas market returns can vary significantly

WACC and Dual Use Storage



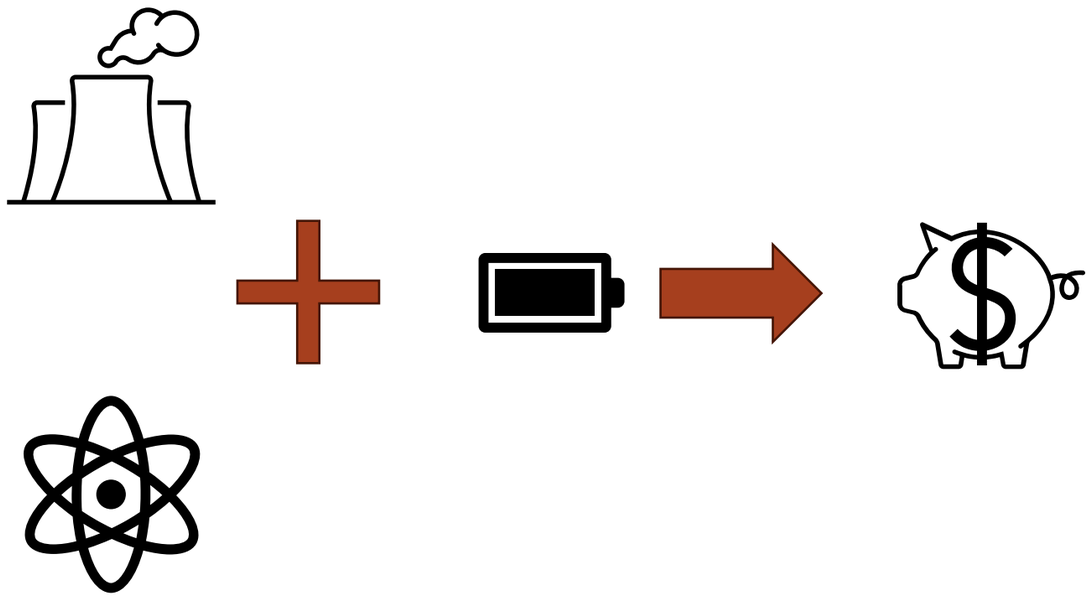


- Weighted average cost of capital (WACC) shows the blended rate that a project will pay for financing
  - SATA assets can expect to pay 130 bps less in financing rates
- Dual-use storage (which seeks market revenues in addition to providing transmission services) can see middling WACC as they blend regulated and unregulated capital
  - Additional revenue from market activities may offset additional financing costs

Pacific Northwest
NATIONAL LABORATORY

Financing Energy Storage Hybrids

The Role of Battery Storage Hybrids



- Interest is growing in pairing established technologies like natural gas peakers and emerging ones like SMRs with batteries
  - Batteries can help new and existing facilities operate more efficiently and access additional revenue
- These features can be leveraged to mitigate risk and improve financing terms

Potential Impacts of Hybridization

Hybrid Configuration	Benefits	Risks Mitigated	Financing Implications
Storage + Gas Peaker	Improved operational efficiency; reduced fuel demand	Unforced outage risk; revenue risk	Potential to raise DSCRs
Storage + SMR	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

- Hybridization mitigates different risk for different technologies
  - SMRs may benefit from batteries alleviating some technology risk
- Hybridization creates different revenue and income opportunities
  - Increased revenues can improve DSCRs, allowing projects to take on more low-cost debt
  - Variable generation and SMRs can benefit from load shaping services provided by storage
  - Storage allows peaker plants to operate more efficiently lowering O&M costs

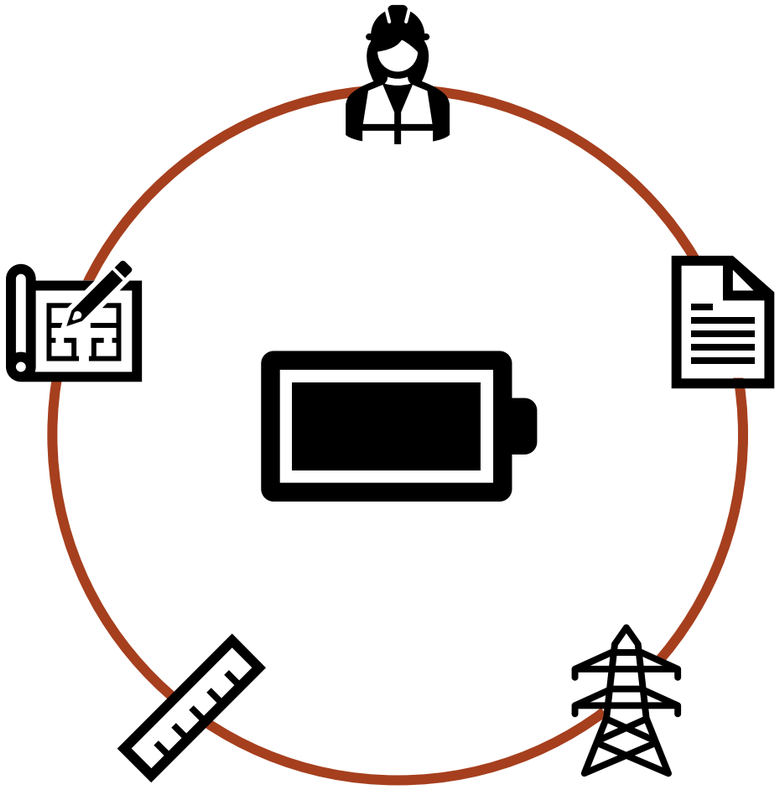
Conclusions

- Focusing on project risk and financing costs has the potential to lower system costs and speed deployment
- Regulated rates of return can make SATA and dual use storage an affordable option
  - SATA could see WACCs as much as ***130 bps lower*** than market storage
- Pairing storage with other technologies can enhance revenues and limit risks
  - Natural gas peaking plants can use storage to operate more efficiently, potentially ***improving DSCRs***, and lowering costs
  - Small modular reactors could integrate storage to help mitigate ***technology risk***

Pacific Northwest
NATIONAL LABORATORY

What About Other Non-hardware costs?

Other Process Related Costs Have an Impact



- Financing is not the only non-hardware costs that impacts storage
- PNNL is in the process of surveying developers to understand costs associated with factors like
  - Interconnection
  - Design
  - Permitting
  - Labor
- By understanding how and why these costs occur we can provide transparency and continue to inform our regulatory research

Pacific Northwest
NATIONAL LABORATORY

Thank you

Dan Boff
daniel.boff@pnnl.gov
509-375-5956