The Law of Averages: Energy Storage and Affordability

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Topic: Stakeholder Developments & Industry Trends
Vertical: Analytics
Strategic Pathway: Stabilize
Project start and finish: FY25-FY26

PROBLEM

- The electric grid is planned, built, and operated to satisfy peak demand.
- Peak demand only occurs for a few hours per year, but customers pay full price year-round.
- This is increasingly expensive as peak demand continues to grow and require more infrastructure.
- By averaging out demand, energy storage can reduce operational costs throughout the grid.
- These benefits are often not well documented or publicized; this work provides that documentation

APPROACH

We began by developing an analogy to help illustrate the unique, real-time nature of the electric grid, by asking the reader to imagine a world in which all groceries go bad at the end of the day:

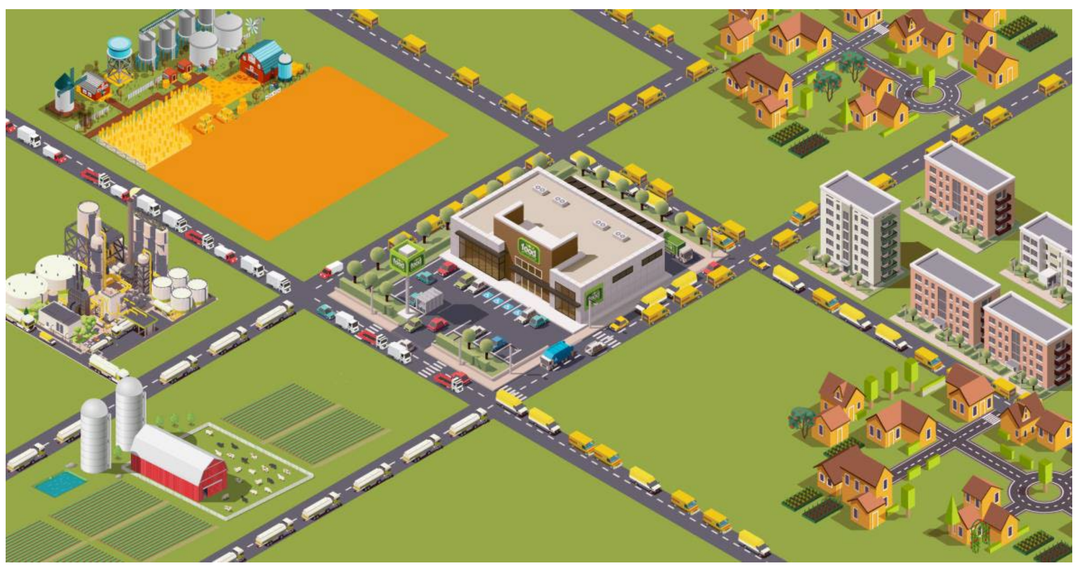

Fig. 1. A world in which groceries cannot be stored helps illustrate grid operations and the importance of storage

This helps illustrate the electric grid because it would require:

- Lots of food production facilities (generators)
- Shipping trucks to bring the food in (transmission)
- Delivery drivers (distribution)
- Gardens (distributed generation)
- A grocery store to manage it all (utility)

Electricity is the <u>only</u> commodity we buy that does not have storage built into its supply chain, and that has profoundly impacted electric system design and operations.

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FINDINGS

Generation Savings:

Ancillary Services	**PJM**: Saved $1.2 million on ancillary services and freed up generators for the capacity market with energy storage
Arbitrage	**Texas**: Energy storage reduced energy market prices by almost 50% during an August 2023 heat wave
Peak Shaving	**California:** Behind-the-meter energy storage will save between $28 million and $206 million/year by 2028

Transmission Savings:

Transmission Deferral	**Massachusetts**: Saved >$120 million with storage and diesel instead of a third line on Nantucket Island
Outage Mitigation	**Wisconsin:** Saved $3 million by using storage to prevent potential outages during contingencies near Waupaca
Generation Avoidance	**California:** Storage helped support local reliability after a generator retirement while saving more than $400 million

Distribution Savings:

Voltage Support	**Utah:** Storage saves $300,000 while supporting voltage in a rural area while a long-term solution was developed
Uncertainty Hedging	**Maine:** Storage, distributed generation, and efficiency saved $12 million when forecasted growth did not occur
Peak Management	**California:** Storage provides cost-effective support on a strained feeder while deferring a reconductoring project

Customer Savings:

Demand Management	**Virginia:** Onsite generation and storage save Richmond Medical Center about $460,000/year
Peak Shaving	**Vermont:** Fleet of behind-the-meter storage saves customers $3 million
Backup Power	**Maryland:** Storage and onsite generation at an affordable housing facility save $100,000 per year and provide resilience

CONCLUSIONS AND NEXT STEPS

This project identified 13 projects that collectively saved hundreds of millions of dollars by averaging out supply and demand. Now, imagine the savings that could be unlocked if storage were deployed at scale across the electric grid. Future research will work on identifying pathways for making that possible.

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