# Energy Storage – Is it Right for Your Building?

IFMA Webinar

November 8, 2016

# Introduction and Agenda

- Meeting Objectives:
  - Understand types of energy storage available and what may work on your building
  - Identify use cases for energy storage that provide you value
  - Learn about potential business models and procurement strategies
  - Identify additional resources to help you make decisions on energy storage

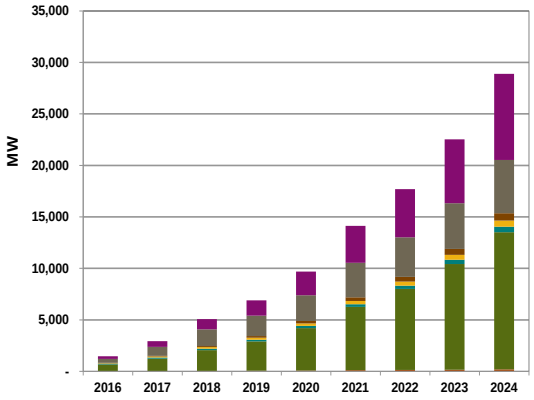
# Why Energy Storage Now?

**Industry changes are driving demand for energy storage, while policy, technology, and cost advances are making it a more attractive option.**

## Strong Demand for Energy Storage

- Increasing Intermittent Renewable Generation
- Increased Customer Expectations and Engagement
- Aging Infrastructure
- Utility Transformation from Centralized to Networked Grid

## Increased Energy Storage Adoption




## Increased Performance at a Decreased Price

- Policy Initiatives
- Technology Performance Advancements
- Technology Demonstration Validations
- Cost Reductions

# What Can Energy Storage Do for You?

**Energy storage has many applications, but only a few are relevant to commercial and institutional buildings.**

### Electricity Cost Optimization

- **Peak/Off-Peak Price Management**
- **Demand and Power Factor Charge Management**
- **Renewable Energy Shifting**

### Capacity

- Generation Resource Adequacy (e.g., capacity markets, capacity contracts, operating reserves, demand response programs)
- T&D Infrastructure Adequacy

### Routine Grid Operations

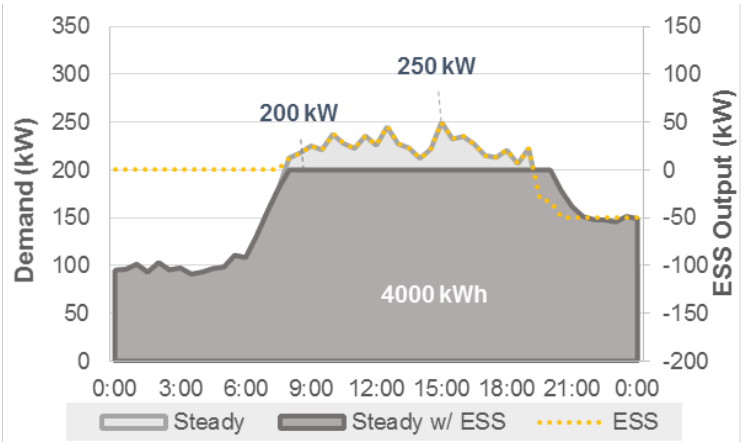
- Frequency Regulation
- Voltage/VAR Support
- Renewable Energy Ramping
- Renewable Energy Smoothing

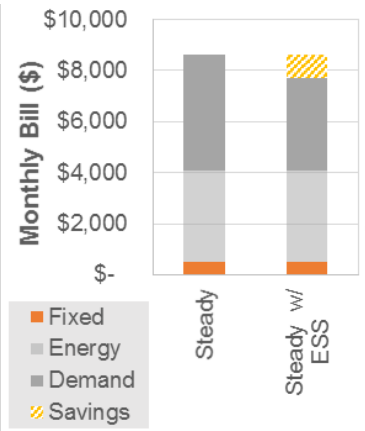
### Contingency Situations

- Black Start
- **Sustained Outages**
- **Momentary Outages**

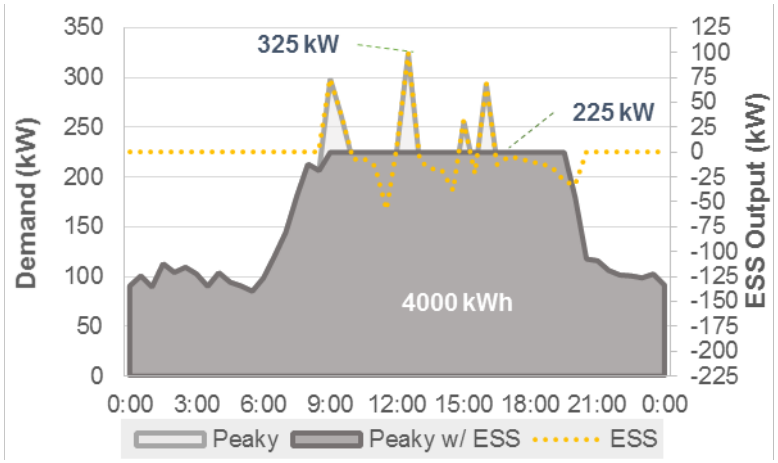
# Current Use Cases

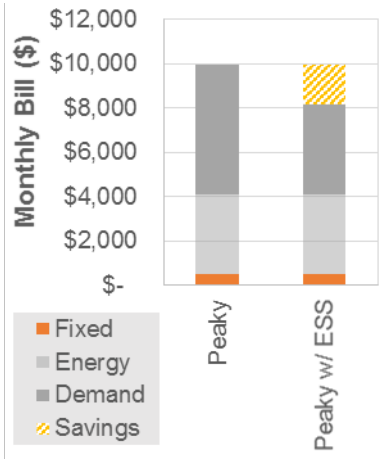
**Demand charge management is the leading use case being adopted right now.**




Double the savings between load profiles

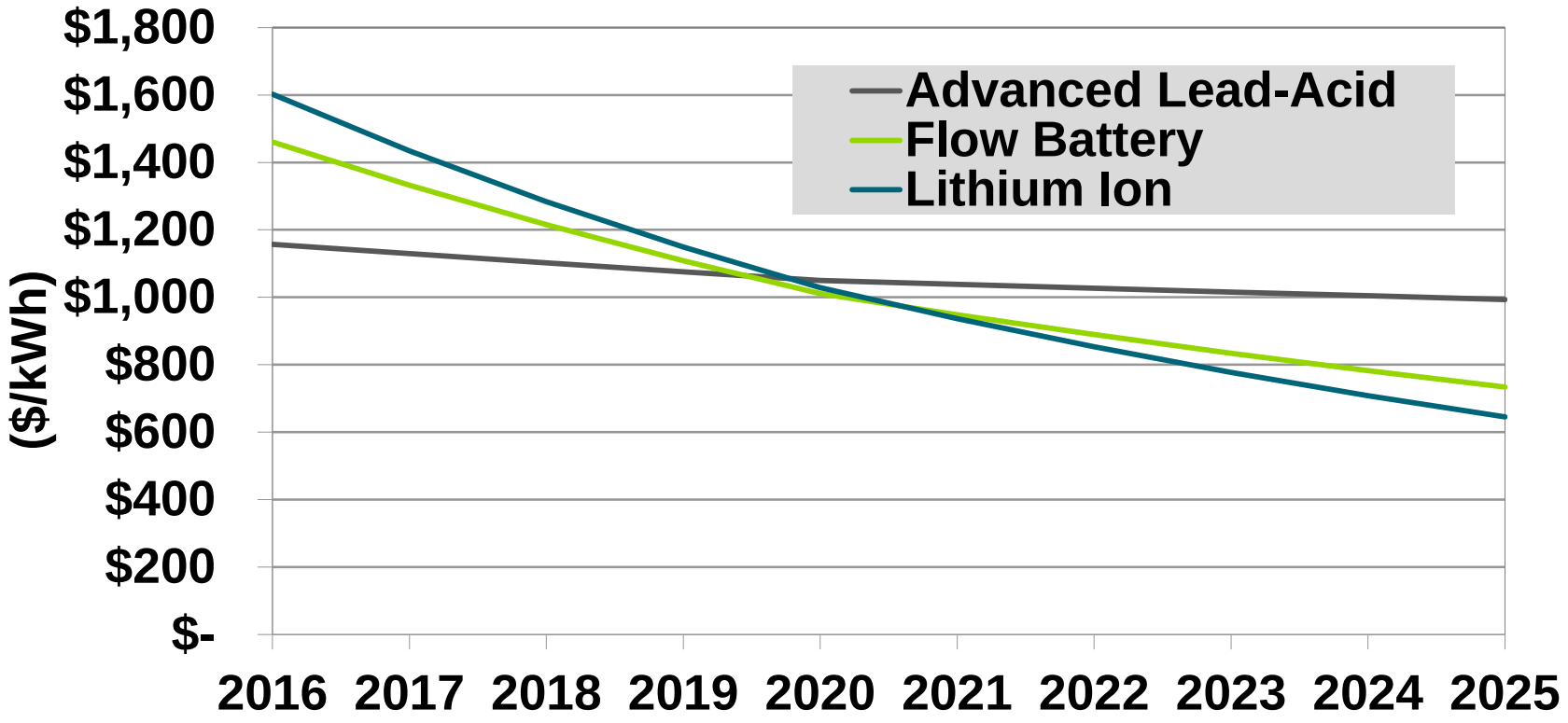



Source: Navigant Consulting, 2016

# Costs

**There is significant variability in installed cost by technology and by application, and costs are falling rapidly.**




Source: Navigant Research, Q2 2016

# Technology Options

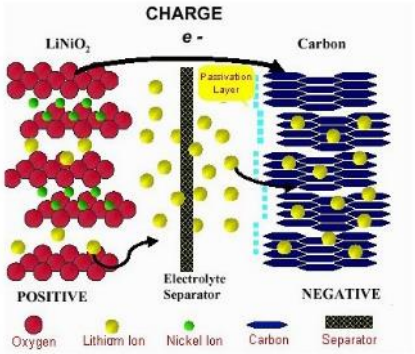
**Electrical energy storage comes in many forms and only some of them are practical for commercial and institutional buildings.**

## Mechanical

Source: Beacon Power

- Pumped Hydro Storage (PHS)
- Compressed Air Energy Storage (CAES)
- Flywheel

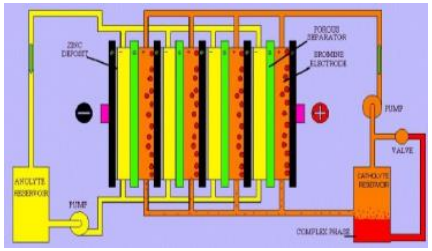
## Batteries




Source: SAFT

- **Lead Acid**
- **Advanced Lead Acid**
- **Zinc Air**
- **Sodium Sulfur**
- **Sodium Metal Halide**
- **Sodium Ion**
- **Lithium - Ion**

## Flow Batteries



Source: www.ZBBenergy.com

- **Zinc Bromine**
- **Vanadium Redox**
- **Iron Chromium**
- **Other**

## Other

Source: www.smartgrid.gov

Thermal
- **Ice Based**
- Thermal Molten Salt

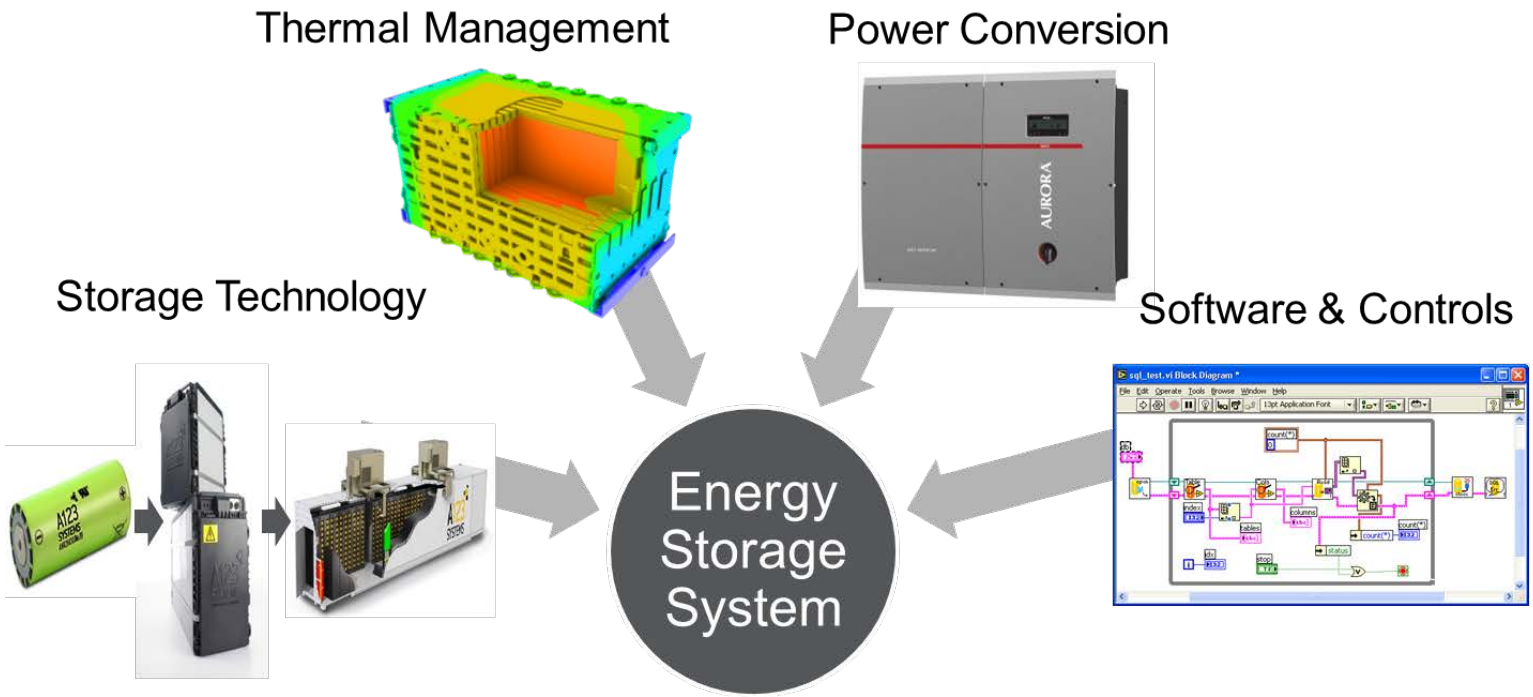
Power To Gas
- Hydrogen
- Synthetic Natural Gas

Capacitors
- **electric double-layer capacitors, or "supercapacitors" or "ultracapacitors"**

# Primary Components

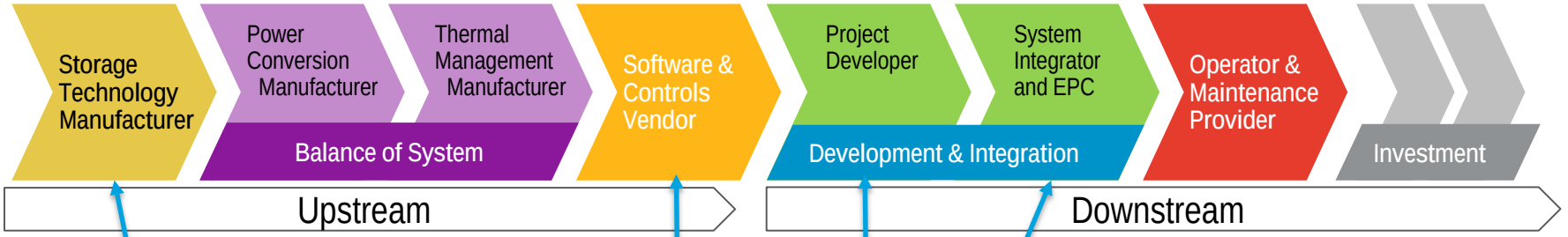
**The storage technology is not the only component that drives performance.**

- Storage Technology – to stores and releases energy
- Thermal Management – to keep the storage technology within the required operating temperature range
- Power Conversion - to convert the form of the incoming and outgoing energy
- Software & Controls - to monitor and control the flow of energy



# Industry Chain

**The storage industry value chain has many players and is evolving rapidly.**




As a commercial building owner/operator, you may be contacted by people all along the value chain.

# Procurement Options

**Business models are still evolving, with the most typical options shown below.**

| Storage Developer - Offers | System Ownership |
|---|---|
| Shared Savings Model | Third-Party Owner (TPO) |
| Sale/Lease + Host Control | Host Owned |
| Utility Procurements | Third-Party Owner (TPO)<br>Utility-controlled |
| Sale/Lease + Utility Tariff Rate | Host Owned<br>Utility-controlled |

- Due to differences in tax treatment for owned assets vs. leased assets, some businesses may prefer an operational lease instead of a capital lease.
- Many customers prefer TPO owned systems for other reasons, including ease of financing, and operation and maintenance services.
- Some utilities are offering special tariffs and pay for systems if they are allowed to control them and able to use them for investment deferrals and during emergencies.

# Case Study

The Mountain View High School District in Los Altos partnered with Green Charge Networks to install EV chargers and energy storage at their facility. The system was installed at no cost to the school, and uses shared savings to pay for the equipment. The net benefit is expected to be over $1million over the life of the project.

Situation: High School with 4,300 students, faculty and staff

Solution:

- Four Level 2 EV Chargers
- 1.08 MW li-ion storage
- No upfront cost

Source: Green Charge Networks

Benefits:

- $86,000 in demand charge savings annually
- Flat-fee EV charging for faculty and staff
- Additional income through California wholesale energy market

# How to Evaluate if Storage is Right for You

- Do you already have a back up generator?
- Do you have demand charges in your electric rates?
- If so, are they in the mid to high teens?
- Do you have a “peaky” or flat load profile?
- How predictable is your load?
- Are any state, local or utility incentives available for energy storage?

# Where to Go for More Information

**Energy Storage Decision Guide**

Forthcoming and will be available at https://betterbuildingsinitiative.energy.gov/alliance/technology-solution/renewables-integration

**Cost Benefit Tool**

https://www.smartgrid.gov/recovery_act/analytical_approach/energy_storage_computational_tool.html

**Industry Information**

www.energystorage.org

# Thank you!

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