

2ND ANNUAL ENERGY STORAGE
GRAND CHALLENGE SUMMIT

Strategy Keynotes: Experiences with Energy Storage

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SPRIN-D

ENABLING

LONG-DURATION ENERGY STORAGE

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WHAT IF ENERGY WOULD BE TOO CHEAP TO METER?

SPRIND

CHALLENGES

LONG-DURATION
ENERGY STORAGE

BRIDGING THE GAP

FROM EXCELLENT BASIC
AND APPLIED RESEARCH

MARKET-SHAPING
PRODUCTS AND SERVICES



A HOME FOR PEOPLE WITH RADIACAL NEW IDEAS

INDEPENDENT*
FEDERAL AGENCY

HIGH RISK
HIGH REWARD

TECHNOLOGY- BASED



CHALLENGES

FINDING THE BEST SOLUTIONS TO TACKLE
THE GRAND CHALLENGES OF OUR TIME

BET ON THE RACE, NOT THE
HORSE

A COMPETITIVE APPROACH

STAGED CHALLENGE

2.5 YEARS
MULTI-MILLION FUNDING

COACHING
BUILDING AN ECOSYSTEM

AN EASY & FAST PROCESS

The background consists of a series of overlapping, three-dimensional rectangular blocks in various shades of red and pink. The blocks are arranged in a way that creates a sense of depth and perspective, with some blocks appearing to be in front of others. The overall effect is a textured, geometric pattern.

THE CHALLENGE

LONG-DURATION ENERGY STORAGE



ACT ON CLIMATE
CHANGE

ENERGY INDEPENDENCE

INVIGORATING
ECONOMICAL GROWTH

>10 HOURS STORAGE

EXTREMELY LOW COST

EXCELLENT SCALABILITY

NO CRITICAL RAW
MATERIALS

HIGH
ROUND-TRIP
EFFICIENCY

A TEAM,
READY TO DO
WHATEVER IT TAKES

HOW CAN WE ENABLE A
CARBON-FREE, RELIABLE ENERGY SUPPLY?

HIGH RISK, HIGH REWARD
BET ON THE RACE, NOT THE HORSE
EASY AND FAST
A GREAT TEAM

SPRIN-D

FEDERAL AGENCY FOR DISRUPTIVE INNOVATION
A HOME FOR PEOPLE WITH RADICAL NEW IDEAS

POWERED BY:



Strategy Keynotes: Experiences with Energy Storage



Mike Gravely

Team Lead and Senior Electrical
Engineer, Energy Systems
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California Energy Commission



The Role of Non-Lithium-Ion Energy Storage Technologies in California's Future

2022 Energy Storage Grand Challenge Summit

Mike Gravely, Energy Storage Technical Lead
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California Energy Commission Major Research Programs

- **Electric Program Investment Charge (EPIC)—Administered by the CPUC**
 - Ratepayer-funded program to benefit ratepayers
 - Administered by the Energy Commission and three Investor-Owned Utilities (PG&E, SCE, and SDG&E)
 - Energy Commission Program ~ \$130 M/year for research
 - In 2020 the EPIC Program was extended by the CPUC for an additional 10 years



CALIFORNIA'S INVESTMENT IN CLEAN ENERGY INNOVATION

EPIC is California's premier public interest research program investing over \$130 million annually to unleash innovation.



Entrepreneurial Ecosystem

\$143 million invested

Through EPIC, the CEC is building a world-class ecosystem supporting clean energy entrepreneurship.



Grid Decarbonization & Decentralization

\$154 million invested

Improving the cost competitiveness and performance of key technologies.



Resiliency & Safety

\$106 million invested

Helping communities, businesses, and public agencies build a safer, more resilient energy system.



Industrial & Agricultural Innovation

\$113 million invested

Scaling specialized technology solutions to drive energy efficiency without compromising production.



Building Decarbonization

\$170 million invested

Improving the affordability, health, and comfort of buildings.



Transportation Electrification

\$33 million invested

Supporting advances that reduce the cost of electric vehicle ownership and support the grid.

**Total investment, 2012-2019*



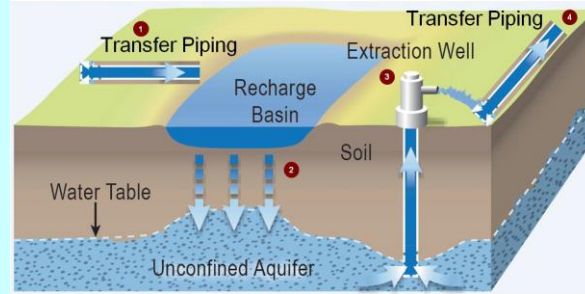
Energy Storage in California

Energy storage contributes to California's clean energy future:

- 3.3 GWs currently installed
- 15 GWs needed by 2032 (per CPUC)
 - 1 GW for long duration energy storage
- 40-50 GWs needed by 2045



EPIC Program has Funded Energy Storage Research for More than a Decade



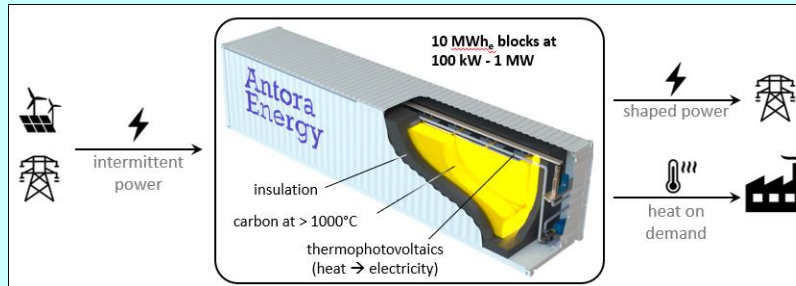
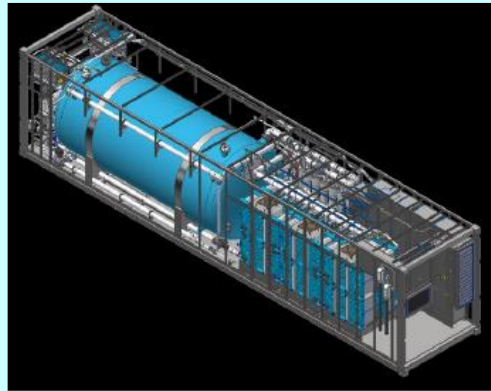
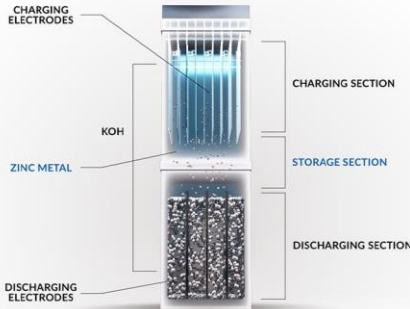


2020 was Pivotal Year for Long Duration Energy Storage Research

- CEC invested \$100 million+ in energy storage in 2020
- Field demonstrations of non-Lithium-ion long duration storage
 - **8 sites** demonstrating **10+ hours** of energy storage duration
 - **3 early-stage grants** providing **up to 100+ hours** of energy storage duration



Examples of Promising Non-Lithium-ion Energy Storage Technologies





Opportunities for Non-Lithium-ion Technologies

- **Supply chain security:** Not reliant on Lithium-ion supply chain elements
- **Safety:** Reduce thermal runaway and improve safety
- **Cost and performance:** Improve \$/kWh, energy density, charge time, and cycle life
- **Demonstrate Field Performance:** Validate performance and stability, enabling future financing opportunities



Investments in California's State Budget

- \$140M in 2022-23 for non-lithium-ion long-duration energy storage
- 3 grants in development based on prior experience:
 - 1. Viejas Native American Tribe Microgrid (June 2023)**
 - 60MWh hybrid system (flow battery and Zinc hybrid system)
 - 2. Camp Pendleton Marine Core Base resiliency/commercial enterprise system (June 2023)**
 - 80MWh Zinc hybrid system
 - 3. Utility front-of-the-meter system**
 - First-of-its-kind 5MW / 100Hr Iron-Air Technology System (late 2024/early 2025)



Future Funding Opportunity

- \$240M in 2023-24 for non-lithium-ion long-duration energy storage
- Competitive solicitation to install new systems at 5-7 sites in Summer 2023
 - Preselected sites
 - Open to all that can meet the requirements
- Federal cost share to leverage additional funding
- Second solicitation in 2024 if funding is available



Open Discussion