



Item 4: Information item on Current Activities of the Long Duration Energy Storage (LDES) Program

June 16, 2023, Business Meeting

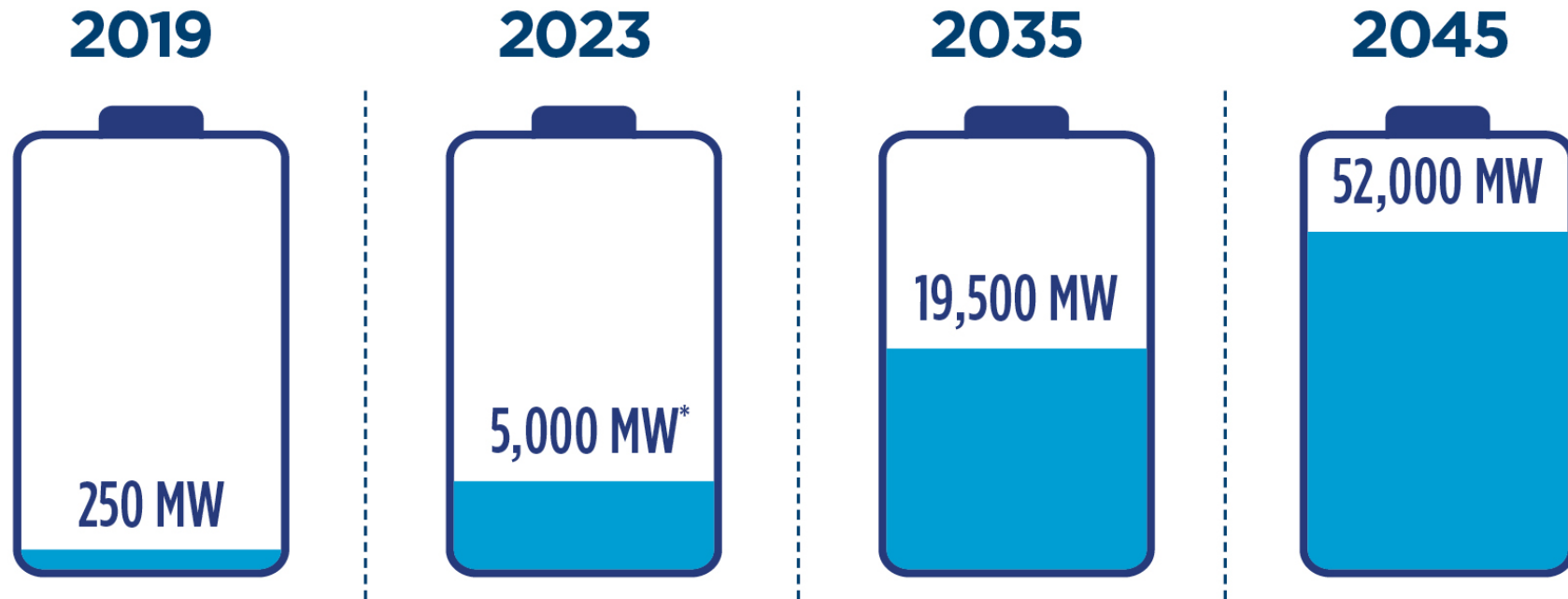
Mike Gravely, Energy Storage Team Lead
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Energy Systems Research Branch



Benefits to California

California's growing battery storage capacity

captures the state's abundant renewable resources

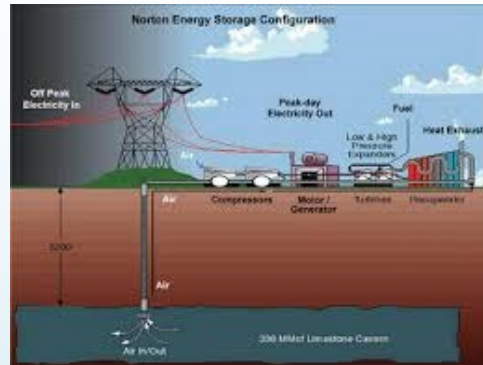
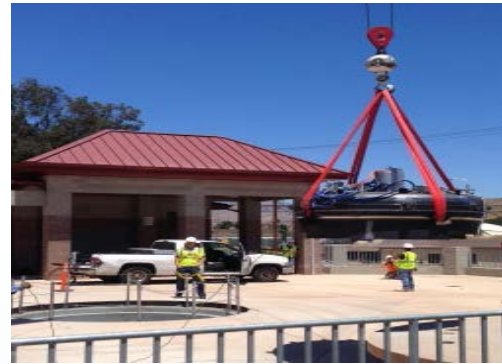


*Projected as of June 1, 2023 based on California ISO interconnection queue.

EPIC Program has Over a Decade of Experience Funding Energy Storage Technologies



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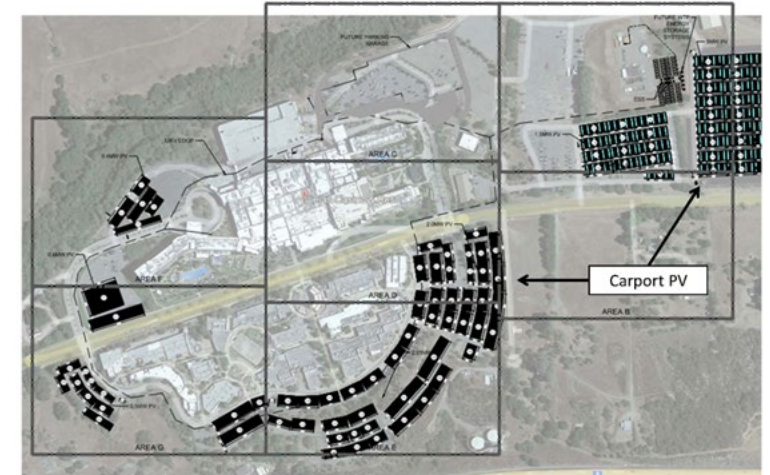
State Investments in Non-Lithium-Ion Solutions

- \$140M in 2022-23 for non-lithium-ion long-duration energy storage
- 3 projects in development:
 - 1. Viejas Band of Kumeyaay Indians Microgrid in San Diego**
 - 60MWh hybrid system (flow battery and Zinc hybrid system)
 - 2. Paskenta Band of Nomlaki Indians Microgrid in Northern CA**
 - 20MWH flow battery energy storage systems
 - 3. PG&E Front-of-the-meter System in Bay Area**
 - First-of-its-kind 5MW / 100Hr Iron-Air Technology System
- \$190M currently programmed for in 2023-24 State Budget



Viejas Band of Kumeyaay Indians Microgrid

- 35MWH in Fall of 2023, 60MWH in 2024
- Demonstrate LDES performance and reliability
- Bring down the overall installed cost of LDES.
- Demonstrate islanding/seamless utility grid support.
- Support under-resourced communities
- Help accelerate interconnection timelines





Paskenta Band of Nomlaki Indians Microgrid

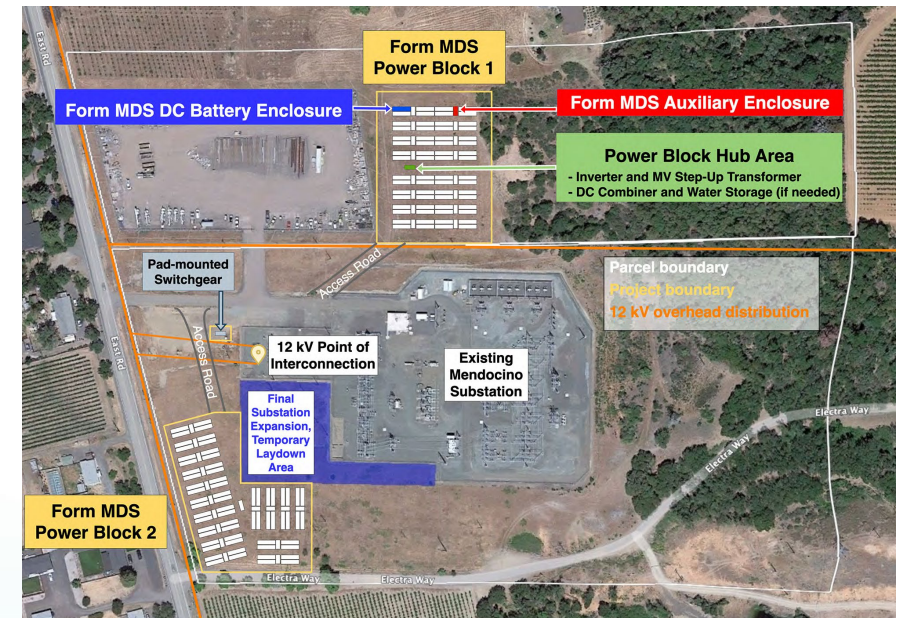
- 20 MWH flow battery system with 3MWs solar
- Support extended tribal operations during grid outages
- Expanded emergency services operations
- Provide key services to grid
- Reduce tribal energy expenditure over 50%





Front-of-the-Meter System in PG&E Territory

- 100-hour, 5 MW, iron-air system
- Demonstrate benefit of 100 hours LDES
- Demonstrate cost and performance improvements of LDES
- Participated in ISO markets



Source: Form Energy, Inc.



Investments in Different Technical Solutions

- Four Non-Lithium-Ion technologies in initial field demonstrations
 - Zinc hybrid
 - Vanadium redox flow battery
 - Zinc bromine flow battery
 - Iron air
- Future LDES program will add 4-6 additional technologies
- Initial system 20-40 MWhs with desire to advance to 200-400 MWhs



Funding Technical Analysis Research

- Defining what LDES energy storage duration mix is needed
 - 8hrs, 24hrs, 48hrs. 100hrs, seasonal energy storage
- Developing new proposed tariffs to ensure future financial stability
- Developing metrics on performance, safety and costs improvements
- Addressing first responder training due to introducing unfamiliar technologies



LDS Program Implementation

- Demonstrating early field success
- Maximizing federal cost share opportunities – DOE proposals
 - \$120M in LDES funds
 - \$240M in DOE funds received
 - Over \$500M in business value to California
- Competitive solicitation to open access to other promising technologies
 - RFP in late Fall 2023 (\$60M to \$80M)
- Working on first 100MW / 800 MWH non-LI system in CA