The Role of Energy Storage in California's Clean Energy Future and How Energy Storage Safety Impacts the Ability of California to Meet that Future Clean Energy Goal

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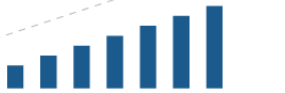
Moving California to 100% Clean Energy

PRIMARY FUNCTIONS OF THE

CALIFORNIA ENERGY COMMISSION



Advancing State Energy Policy

Investing in Energy Innovation

Developing Renewable Energy

Preparing for Energy Emergencies

Achieving Energy Efficiency

Transforming Transportation

Overseeing Energy Infrastructure

Intergovernmental Collaboration

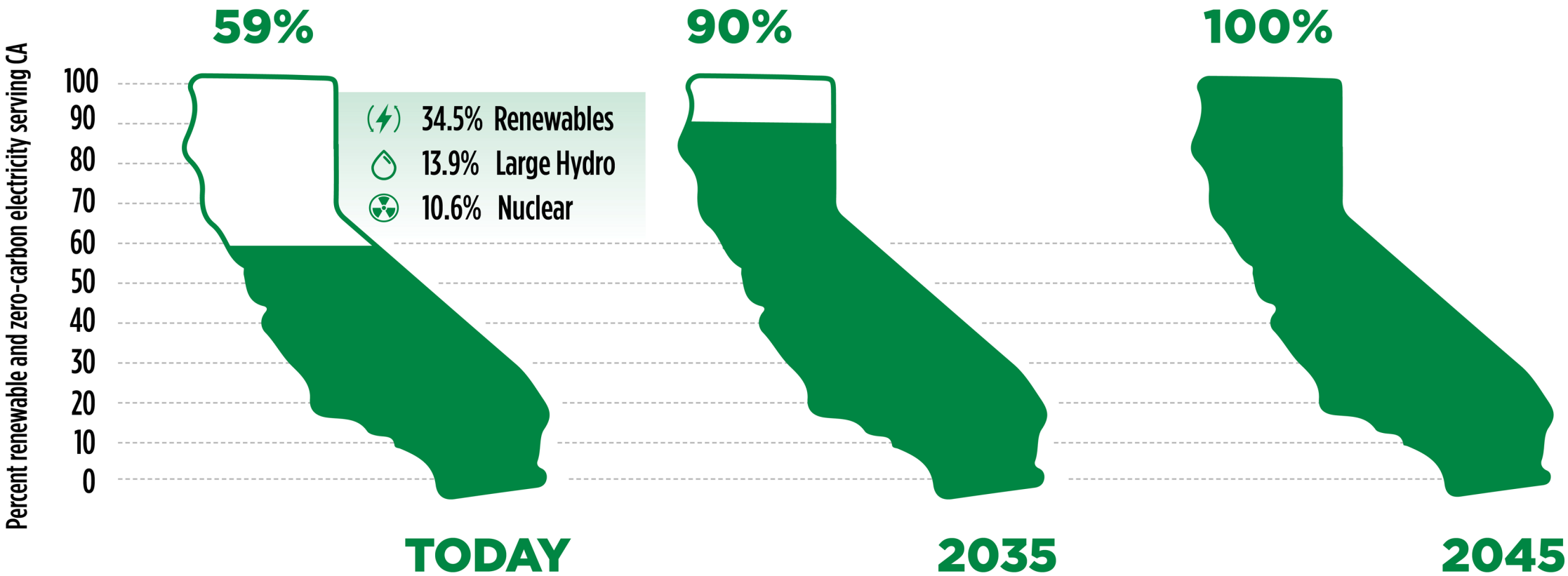
OTHER ENTITIES ENGAGED ON ENERGY

Public Utilities Commission (CPUC)

Independent System Operator (CAISO)

Air Resources Board (CARB)

California Progress Toward 100% Clean Electricity by 2045



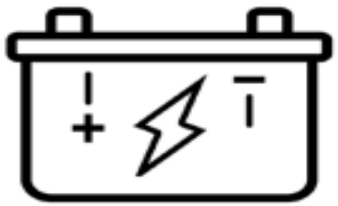
To Achieve Clean Energy

Development Needs To Rapidly Accelerate

Solar & Wind

3X

Solar and wind build rates need to nearly triple*



Battery

8X

Battery storage build rates need to increase by nearly eightfold**

**Based on 10-year average | **Based on 2020*

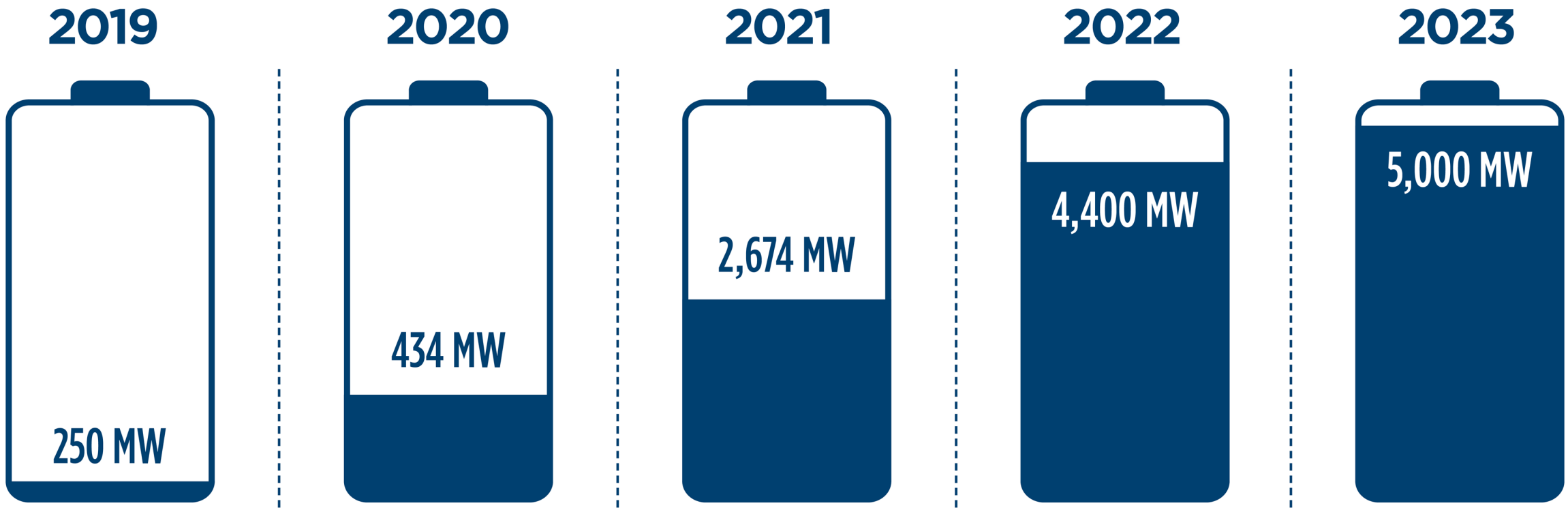
Offshore Wind: The New Renewable Resource

California's Offshore Wind Goals

- 5 GW by 2030
- 25 GW by 2045

Enough electricity to power up to 25 million homes by mid-century.

Growth in California's Battery Storage Resources

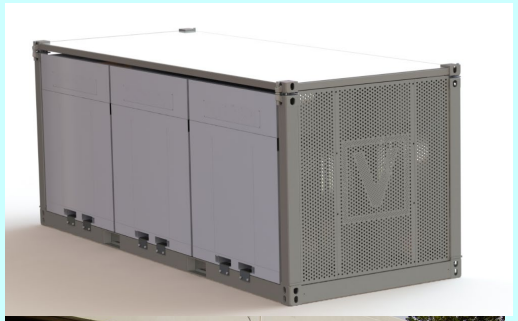


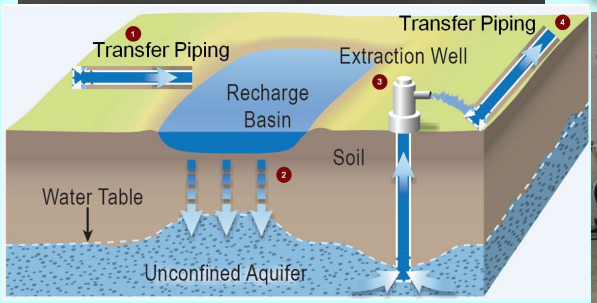
As of April 2023

Electric Program Investment Charge (EPIC Program)

- Ratepayer-funded program
- Administered by CEC, PG&E, SCE, and SDG&E
- ~$130 M/year invested in CEC Program
- EPIC 4 (2021-2025)
  - Storage included (early-stage focus)

A Decade History of EPIC Energy Storage R&D





Energy Storage is a Big Part of California's Future

- 6 GW battery storage currently installed
- 15 GWs battery storage needed by 2032 (per CPUC)
  - 1 GW identified for Long Duration Energy Storage
- 40 – 50 GWs of energy storage needed by 2045

Energy Storage Safety Incidents can Impact California's Energy Storage Future

System Operating Safely on Military Base

Arial View of Building where System Testing was Ongoing

World's Largest Battery Storage Project

Moss Landing Energy Storage Facility
400 MW / 1600 MWh
Monterey County, CA

Energy Storage Safety Incidents can Impact California's Energy Storage Future

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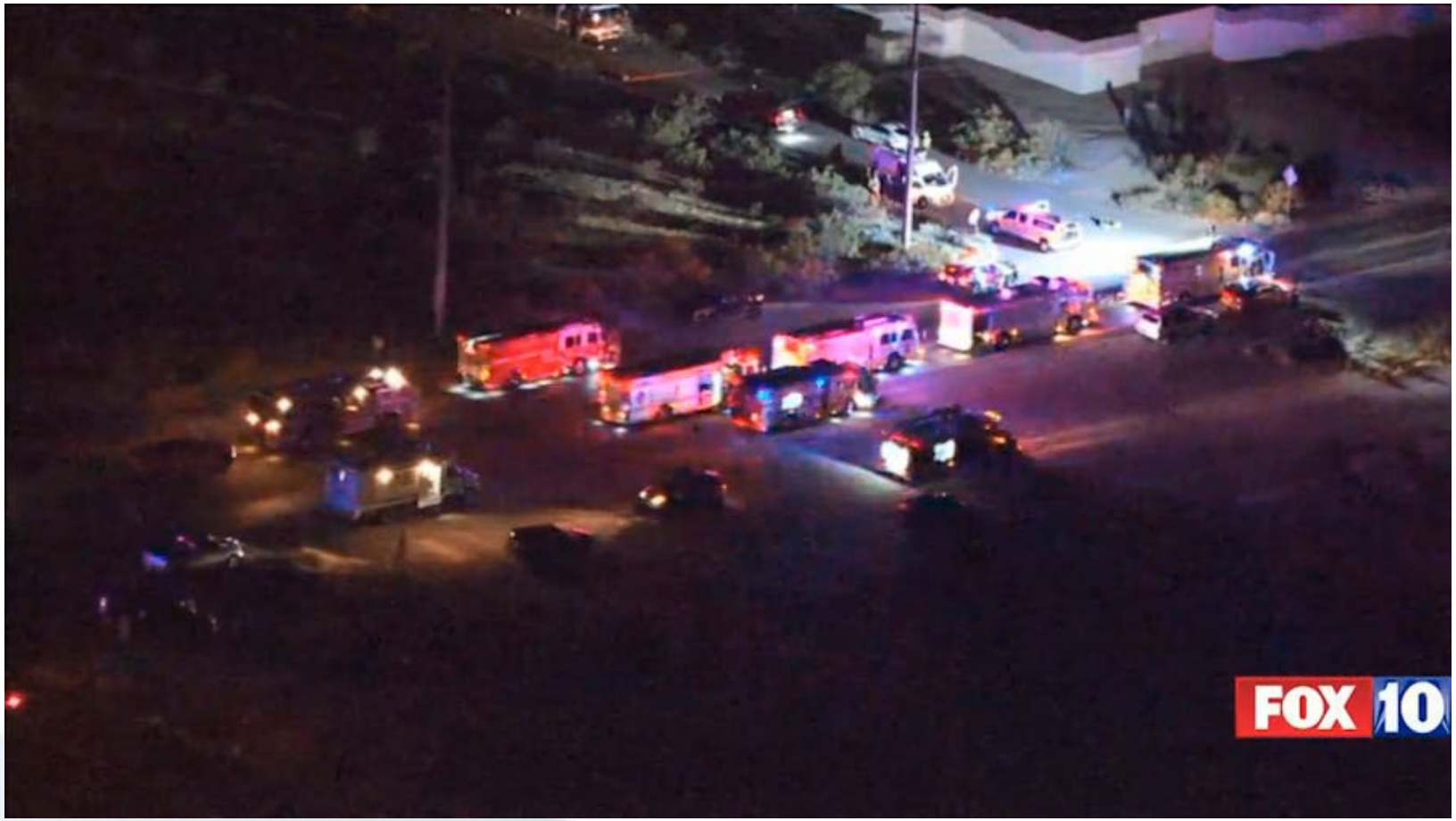
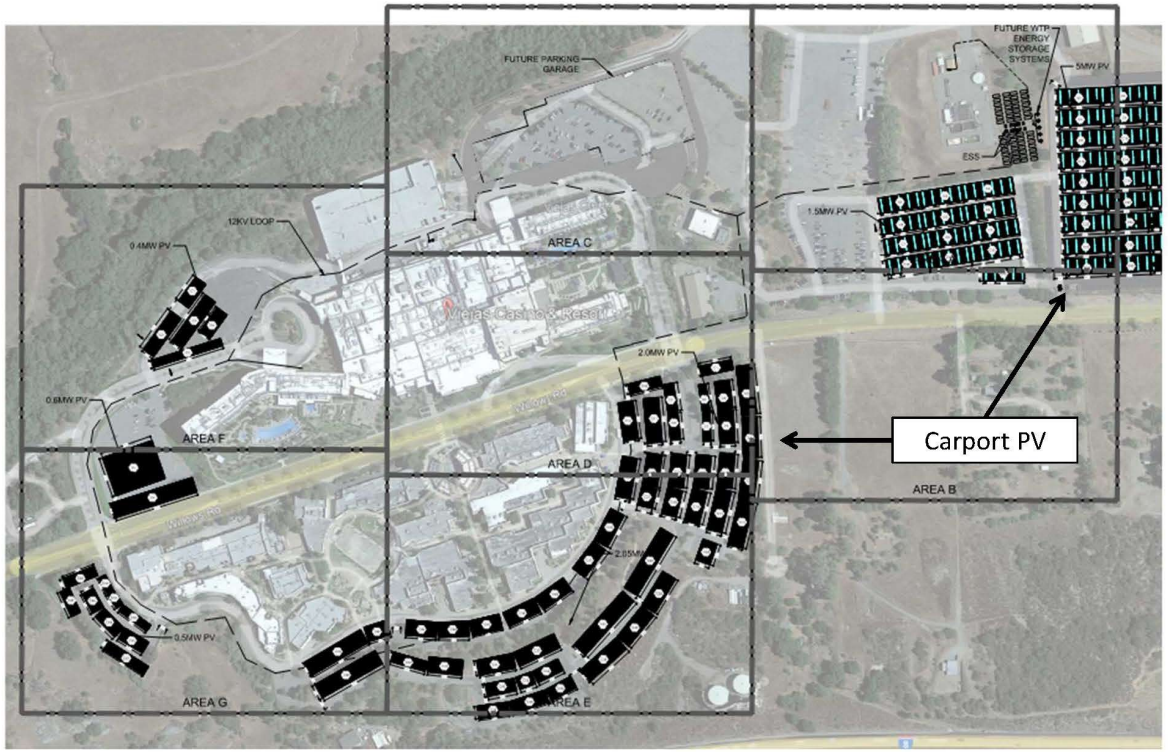


Investments in California's State Budget in Non-Lithium-Ion Solutions

- $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**
        - 60MWh hybrid system (flow battery and Zinc hybrid system)
    2. **Paskenta Native American Tribe Microgrid**
        - 20MWH flow battery energy storage systems
    3. **PG&E front-of-the-meter system**
        - First-of-its-kind 5MW / 100Hr Iron-Air Technology System
- $190M programmed for in 2023-24 State Budget

Viejas Tribe LDES Site Concept Drawing
Large Microgrid



Investments in California's State Budget in Non-Lithium-Ion Solutions

- Four Non-Lithium-Ion Technologies for Initial Field Demonstration
  - Zinc Hybrid Technology
  - Flow Battery Technology
    - Vanadium
    - Zinc Bromine
  - Iron Air Technology
- Future demonstration will add 4-6 additional technology solutions

Investments in California's State Budget in Non-Lithium-Ion Solutions

- Completing Detailed Energy Storage Analysis
  - What is the energy storage duration mix needed for 2045
    - 4hrs, 8hrs, 12hrs, 24hrs, 48hrs. 100hrs, Seasonal Energy Storage
    - What types of financial rates are needed to ensure installed systems remail solvent when state reached 50,000 MWs of energy storage

- What types of first responder training is needed to ensure system is ready for so many different energy storage technologies

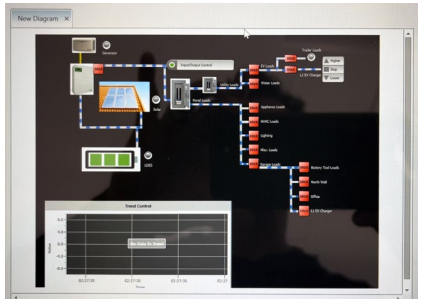
Rapid Integration and Commercialization Unit (RICU)

Spring 2023

- Final inspections
- Integration
- Equipment placement

Winter 2022

- LDES arrival
- Electrical installations



Open Discussion