Lessons Learned from CEC EPIC Microgrid Research Activities

California Energy Commission

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
- **Natural Gas RD&D—Administered by the CPUC**
  - Approximately $24 M/year
- **Special Funds** (e.g., climate vulnerability, transportation research)

A Decade of Microgrid Research

Developing Commercially Viable Technology

2009 – 2015

Early Stage Microgrid Development

- Supported microgrid controller development
- Developed approaches to integrating multiple resources
- Hardware testing for integrated systems

2015 – 2019

Overcoming Integration Challenges

- Demonstrated resiliency value of microgrids for critical facilities
- Integrated large number of resources and refined controller designs

2018 – 2023

Developing Commercialization Pathways

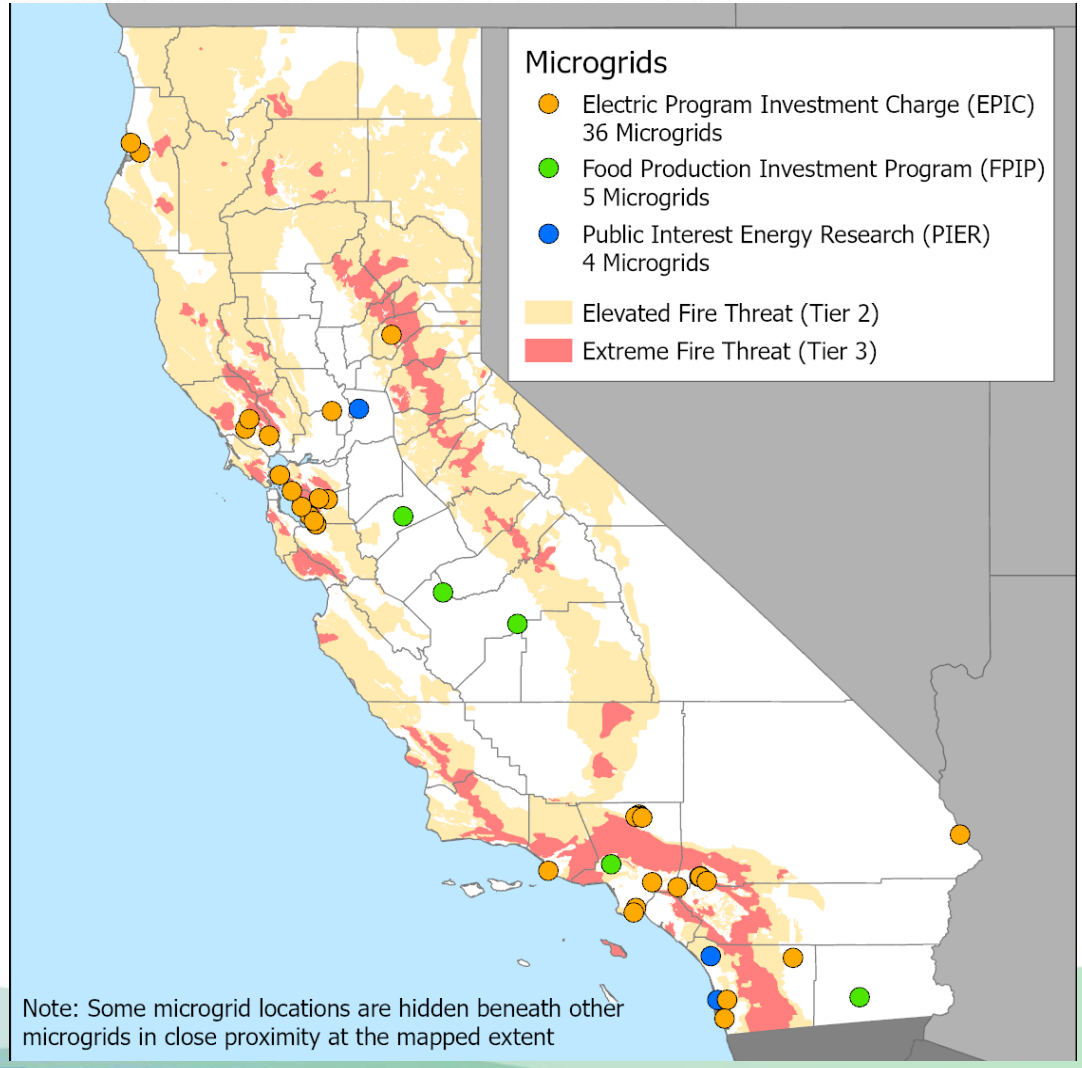
- Creating business plans and commercialization pathways for microgrids in California

A Decade of Microgrid Research

Deploying the Largest Number of Installed Microgrids

45 microgrids | $136M invested | $101M match funding

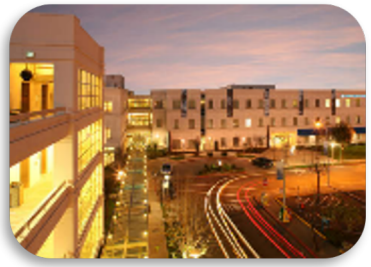
- Increasing resiliency
- Maturing microgrid control technologies
- Learning best approaches to integrating multiple resources
- Sharing lessons learned and best practices
- Driving down costs and establishing deployment norms



Microgrid Demonstration Projects by End Use

Critical Facilities

Shelter



Medical Center

Fire Stations

City Hall, Police HQ, and Community Centers

Waste Water Treatment Plant

Airport

Ports

Military

Communities

Industrial

Digester

Distribution Center

Site Level Lesson learned

PRE-DESIGN	DESIGN/BUILD	OPERATIONS & MAINTENANCE
• Customers are motivated by financial, environmental, and resiliency benefits • Customer needs and site characteristics must be well understood • The microgrid integrator role is critical, along with good partnership between vendors and communication between all stakeholders	• Interconnection processes and permitting can pose schedule and cost risks without significant up-front preparation and coordination with utility • Testing and thoroughly vetting emerging technologies – typically microgrid controllers and energy storage – remains important	• O&M responsibility must be pre-planned: site staff or third-party service agreement • Microgrids are successfully achieving utility bill savings and optimizing demand charge reductions • Microgrids are successfully running islanding tests and in some cases have already islanded during power outages

Program Level Lessons Learned

Key Takeaways:

- Microgrids have Huge Potential
- Clear Business Case still under development
- Need Clarifications on How Microgrids Best Fit
- Desired Ownership Models Vary with End User
- Grant and Incentive Funding Key in Microgrid Decision
- Need Clear Benefits and Value Streams
    - How to you value Reliability, Resilience, Social Value, etc.
    - Need to open more markets or service opportunities
- Need Government or Regulatory Guidance

Data Request For All Clean Energy Microgrids In California—Regardless of Funding Source

The Energy Commission would like to track and report on all clean energy microgrids in California. If you are willing to provide your microgrid information and location to be used in a publicly available data base, please send the information to the IEPR Docket address in the Public Announcement:

> Visit the CEC Electronic Add Comment page or visit https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-IEPR-04 , which links to the comment page for this docket. Enter your contact information and a comment title describing the subject of your comment(s). Comments may be included in the "Comment Text" box or attached as a downloadable, searchable in Microsoft® Word (.doc, .docx) or Adobe® Acrobat® (.pdf) file. Maximum file size is 10 MB

Technical questions about the providing information to this data base should be directed to Mike Gravely at Mike.Gravely@energy.ca.gov or (916) 704-4339. A checklist on the desired data elements is available upon request from Mike Gravely.