Tools for Energy Resilience

Flexible supply and demand solutions for California

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Ongoing Climate-Related Policy Drivers

- Double energy efficiency savings by 2030
- Clean electricity: 60% by 2030; 100% by 2045
- Equitable low-carbon solutions for low-income residents & disadvantaged communities
- Electrify transportation
- Decarbonize buildings & industry

Carbon-neutral economy by 2045

A Decade of Microgrid Research

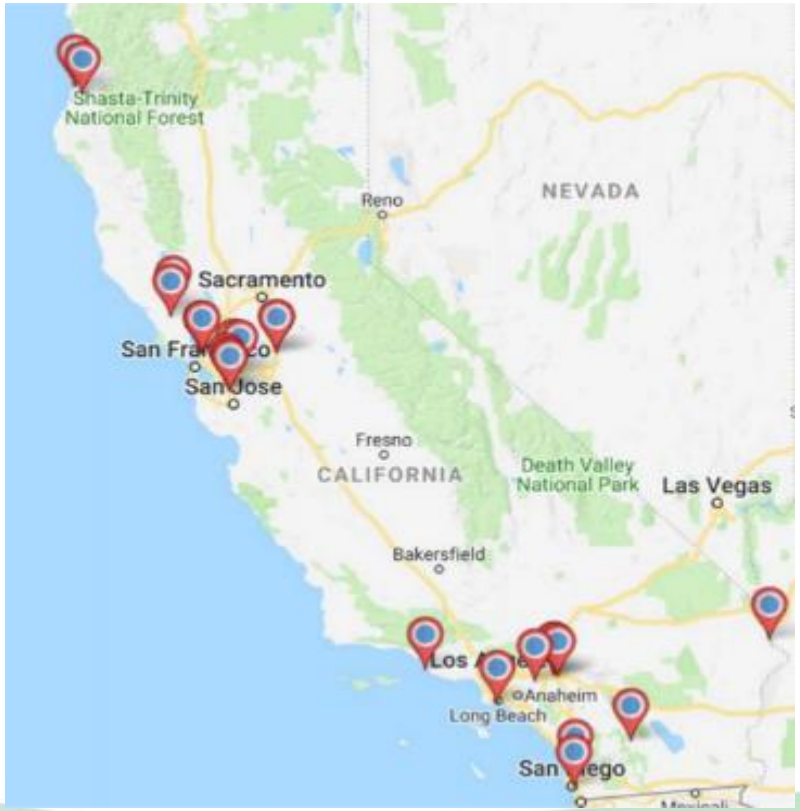
Early Stage Microgrid Development	Overcoming Integration Challenges	Developing Commercialization Pathways
2009 – 2015	**2015 – 2019**	**2018 – 2023**
• Supported controllers development • Developed approaches to integrating multiple resources	• Demonstrated resiliency value of microgrids for critical facilities • Integrated large number of resources and refined controller designs	• Creating business plans and commercialization pathways for microgrids in California

Deploying the Largest Number of Installed Microgrids

- 39 microgrids
- $90M invested
- $71M match funding

- Increasing resiliency
- Maturing microgrid control technologies
- Learning best approaches to integrating multiple resources
- Sharing lessons learned and best practices

Locations of EPIC funded Microgrid Projects



Increasing Energy Reliability, Resiliency, and Security

Blue Lake Rancheria Microgrid

- Integration of solar electric power with battery energy storage and conventional generators
- Seamlessly "islanded" during the Oct. 9, 2019 wildfire-caused power outage and maintained critical operations and services during wildfires
- Reduced power costs **$160k+** per year – a **25%+** reduction – and **158** metric tons of CO_2 per year

Source: Siemens USA

First commercial project to test Siemen's Advanced Microgrid Software

CEC Awarded: $5M

Equipping Firefighters with Reliable Energy

Fremont Fire Station Microgrid

- Microgrids achieved **4 – 12 hours** of islanding for three fire stations
- 1st solar microgrid with battery back-up for fire stations
- **$250,000** savings over the 10-year PPA term
- Decreases GHGs by 142,000 lb annually

CEC Awarded: $1.45 M

Powering Fuel Stations in Wildfire Areas

Humboldt State University

- Optimization and demonstration of integrated solar, storage, load controls, and microgrid isolation hardware
- Extending microgrid technology to smaller sites
- Provides reliability for critical services in remote communities when grid is disabled
- Annual savings of **$12k** and **25** metric tons CO_2

CEC Awarded: $1.5 M

Example Microgrid Demonstrations

Critical Facilities

Shelter

Medical Center

Fire Stations

City Hall, Police HQ, and Community Centers

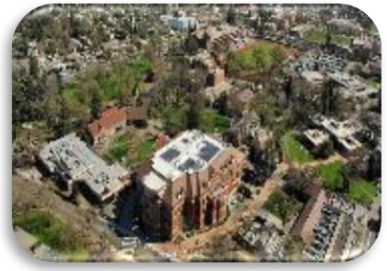
Waste Water Treatment Plant

Airport

Ports

Military

Communities

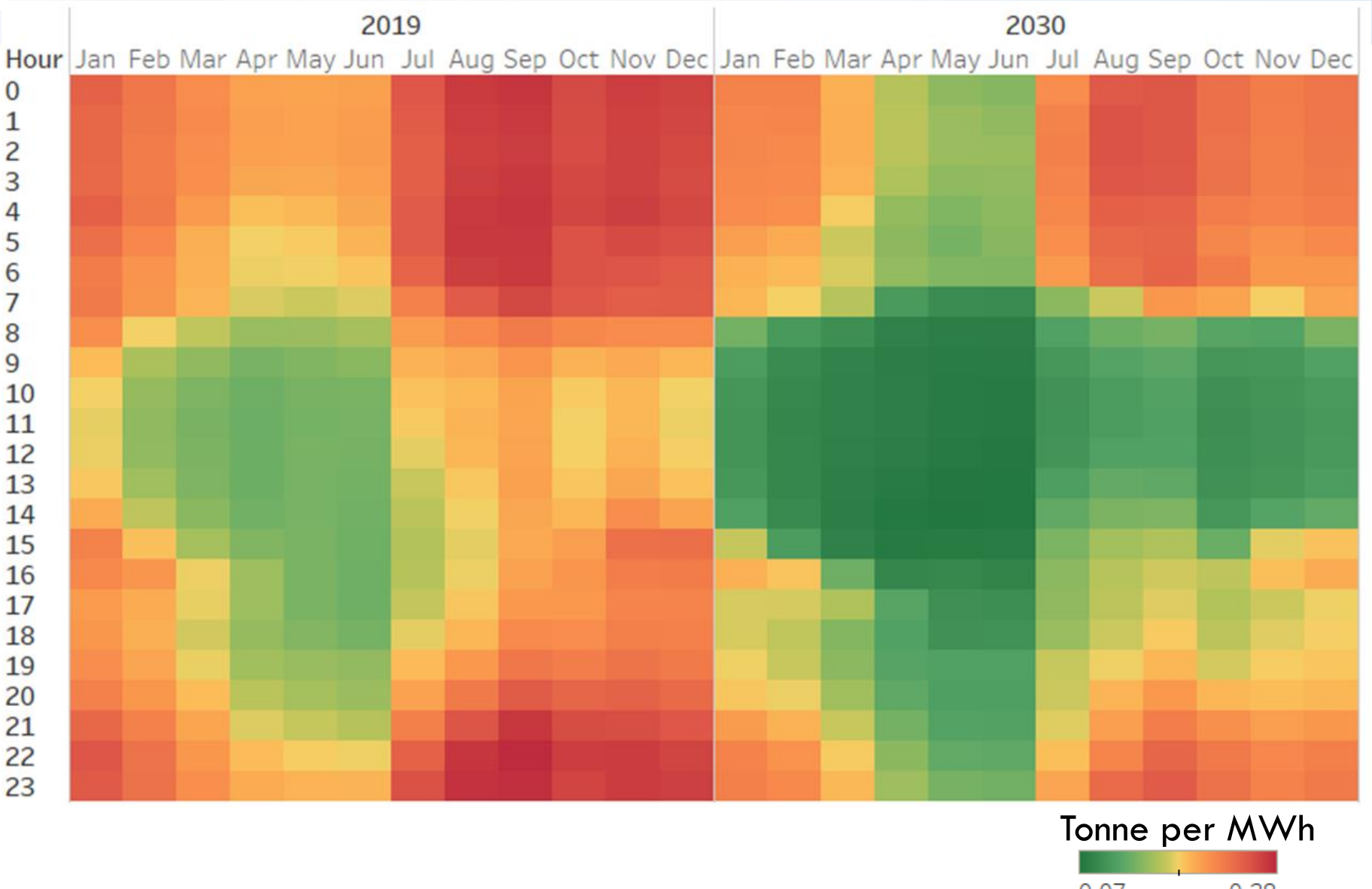


Industrial

Digester

Distribution Center

Electricity CO_2 Emission Intensities



Buildings: 2019 T24 Energy Code

- High performance envelopes
- On-site PV requirements to offset expected annual electricity (of a dual-fuel home)
- All-electric performance baseline (optional) for low-rise residential & performance credits for high performance HPWHs
- Performance credit for behind-the-meter batteries

Load Management Standards

Warren-Alquist Act (1974): "…the commission shall consider, **but need not be limited to**, the following load management techniques:

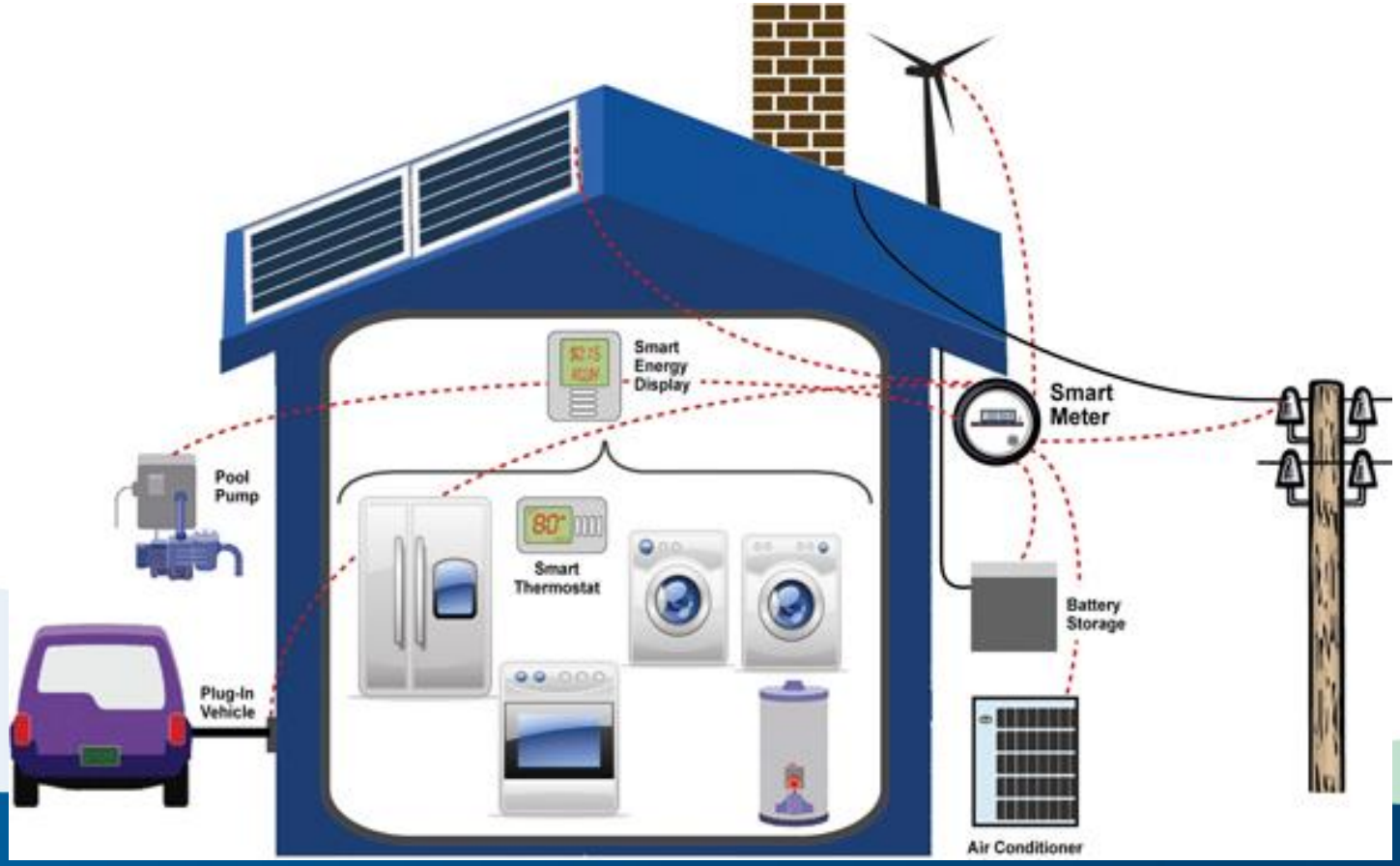
(1) Adjustments in **rate structure** to encourage use of electrical energy at off-peak hours or to encourage control of daily electrical load….

(2) End use **storage systems** which store energy during off-peak periods for use during peak periods.

(3) Mechanical and **automatic devices** and systems for the control of daily and seasonal peak loads."

Appliance Standards for Demand Flexibility

Legislation Signed 10/10/19 – AB 49 (Skinner) grants CEC authority to develop & implement Demand Flexibility Standards for Appliances



Thank You