



CEERT

Race Against Time: California Renewable Revival

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CENTER FOR ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES, SACRAMENTO, CALIFORNIA

"Providing global warming solutions for California and the West"

Benefits of Renewable energy



Creating Economic
growth/Jobs

Reducing GHG



Estimates for Renewable Generation Capacity Needed to Reach 33% RPS

- Solar needed 7,454 - 9,487 MW
- Wind needed 2,086 – 6,135 MW
- Geothermal needed 578 - 1393 MW
- Biomass Needed ~ 214 - 469 MW

Challenges Facing Renewables Projects

Permitting

Transmission

Financing



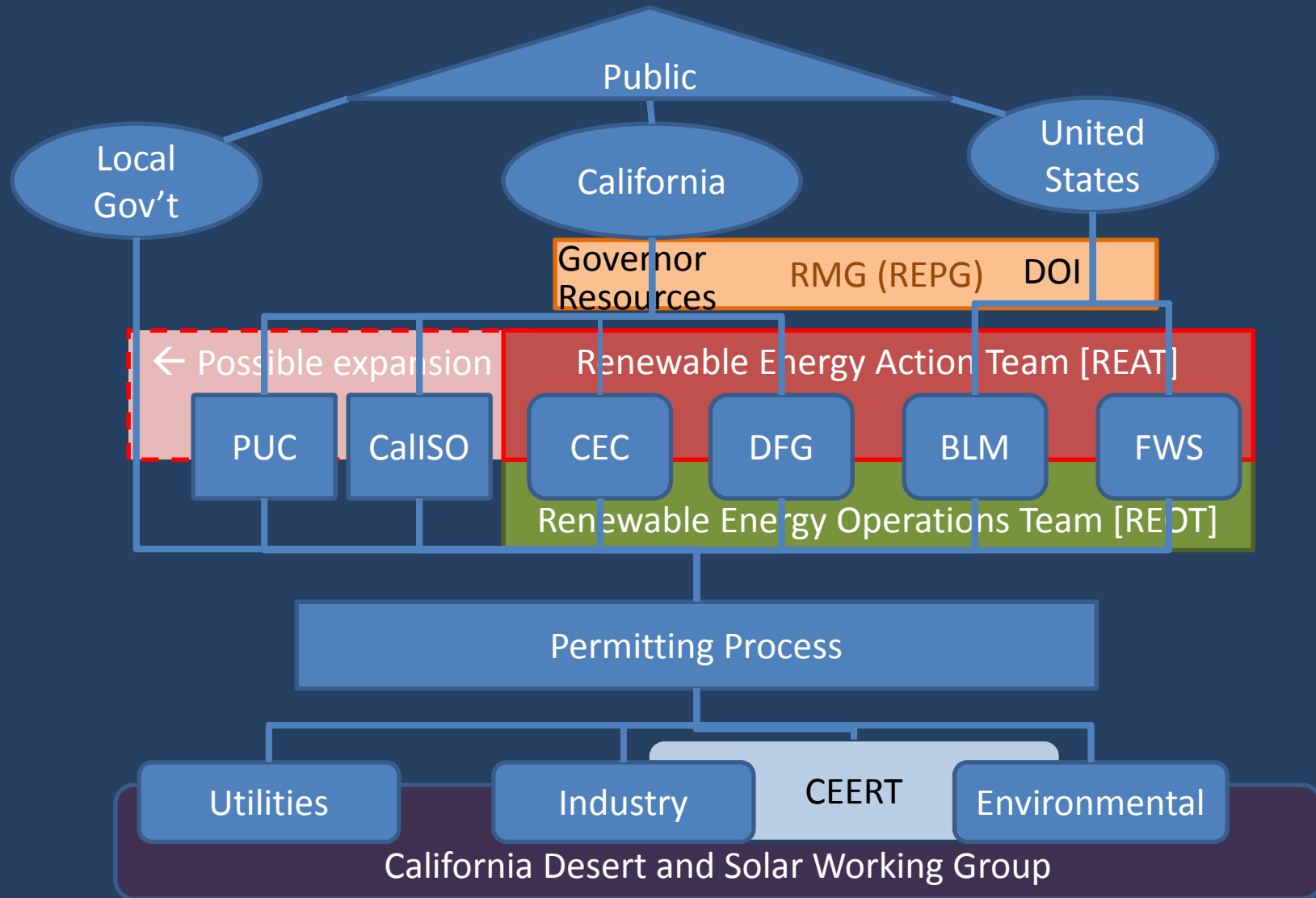
FPL Group's concentrated solar generation station in California's Mojave Desert.
(Hank Morgan/Rainbow/Getty Images)



Permitting Challenges

- Wildlife habitat protection
- Developer acquisition of habitat
- Water/dry cooling
- Competing land uses
- Local government entitlements/fees

Permitting in California



INBOUND INVESTMENTS
Typical Powerplant
\$250M - \$1.4B

CONSTRUCTION
Typically 12-40
Month Sched's

SITE LABOR
Avg Powerplant
Employs
100s-1000s
Per Month
to Build

SKILLED & NON-SKILLED LABOR
Carpentry-Ironwork
Operators-Electrical
Cement-Millwright
Etc.

OPERATIONS
Typically 20-30
Years

TAXES & FEES
Local, State,
Federal
Sales, Property,
Tx-CUP Fees

JOBS & ECONOMIC BENEFITS

Renewables

- All Renewable energy sources have unique role in displacing fossil fuels



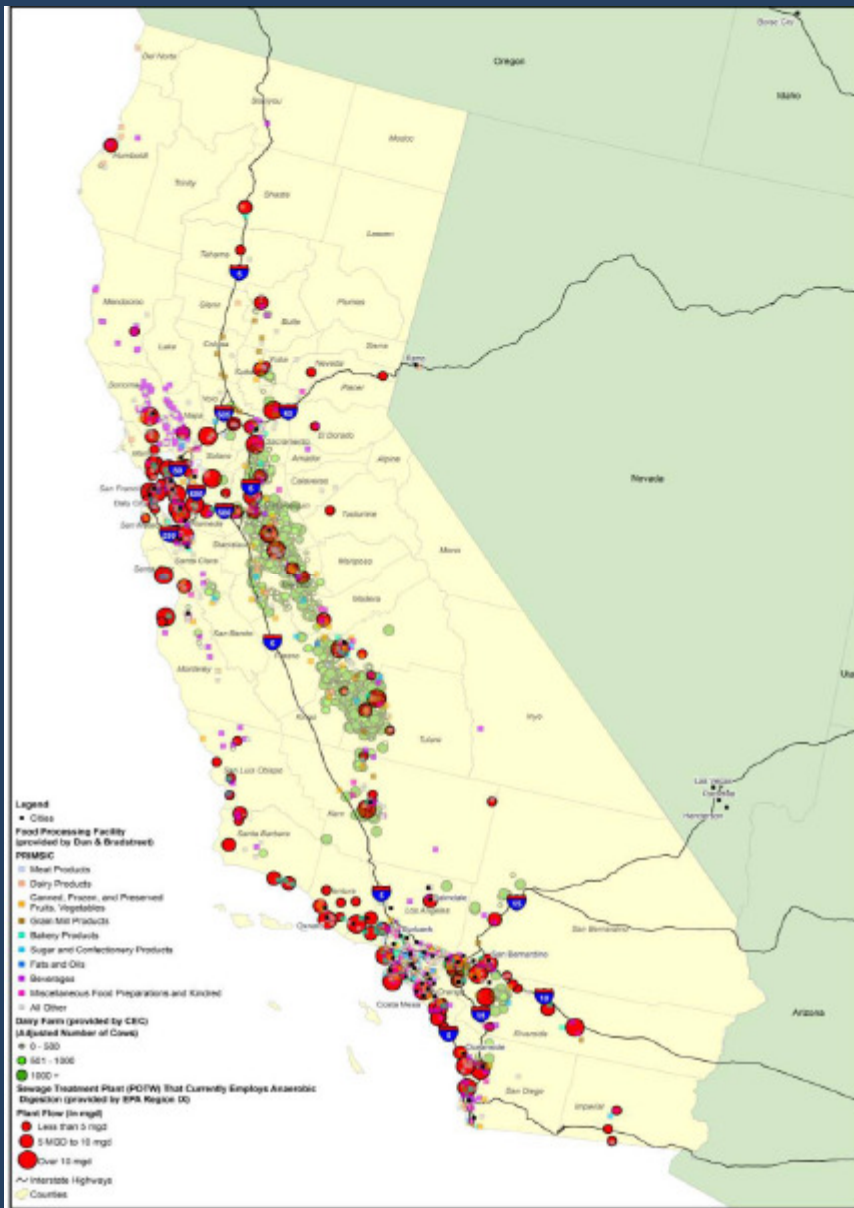
Renewable energy

- Not all renewables displace fossil in the same way.
- Biogas fuel cells have added benefits.
 - Reduce dependence on traditional energy generation
 - Reduce short lived pollutants.

Why Encourage Biogas Fuel Cells?

- Problem: Methane acts as a greenhouse gas with 20+ times the global warming effect of carbon dioxide. Combustion of methane (non fuel cell) creates air pollutants such as Black Carbon and NOx.
- California is largest Dairy State. There are over 1.8 million producing cows.
- Solution: Biogas production and use in fuel cell can reduce the CO₂E released by 95%. It is a “low hanging” renewable energy.
- Renewable energy produced by biogas digester/fuel cell projects is predictable and can be baseload or scheduled to complement other renewables.
- 1000 MW of Potential (including wastewater and dairy waste manure)

Potential for Synergies?



- Locations of California's**
- 1) Large Waste Water Treatment Plants
 - 2) Dairy Operations, and
 - 3) Food Processing Facilities

2008 GHG Emissions

(million tonnes of CO2 equivalent)

Manure Management (<u>predominantly methane</u>)	7.6
Wastewater Treatment (<u>methane</u>)	1.9
Industrial (Food) Wastewater Treatment (<u>methane</u>)	0.7

Source: CARB GHG Inventory

Biogas Feed-in-Tariff

- Biogas provides significant economic and environmental benefits that justify cost same as that given to Solar.
- Through a pair of approved Power Purchase Agreement programs that act like FiT, SCE and PG&E will each purchase up to 250 MW of solar power at an average base load equivalent price of approximately 19-20 cents/kWh. This is nearly (double what is currently offered to biogas)
- This is existing technology and potential, LETS GO!

Examples of Fuel Cells using Digester Gas in California



Los Angeles County Sanitation District,
Palmdale Water Reclamation Plant



Dublin San Ramon Services District,
Pleasanton, CA



City of Riverside Water Quality
Control Plant



Sierra Nevada Brewery, Chico



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