

Energy, Climate, and Storage in California



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Chief of Staff, Commissioner David Hochschild

California Energy Commission

UC Solar Symposium

October, 2015

1974: Jerry Brown elected Governor



California Today



Oil crisis in the 1970's



Future electricity crisis

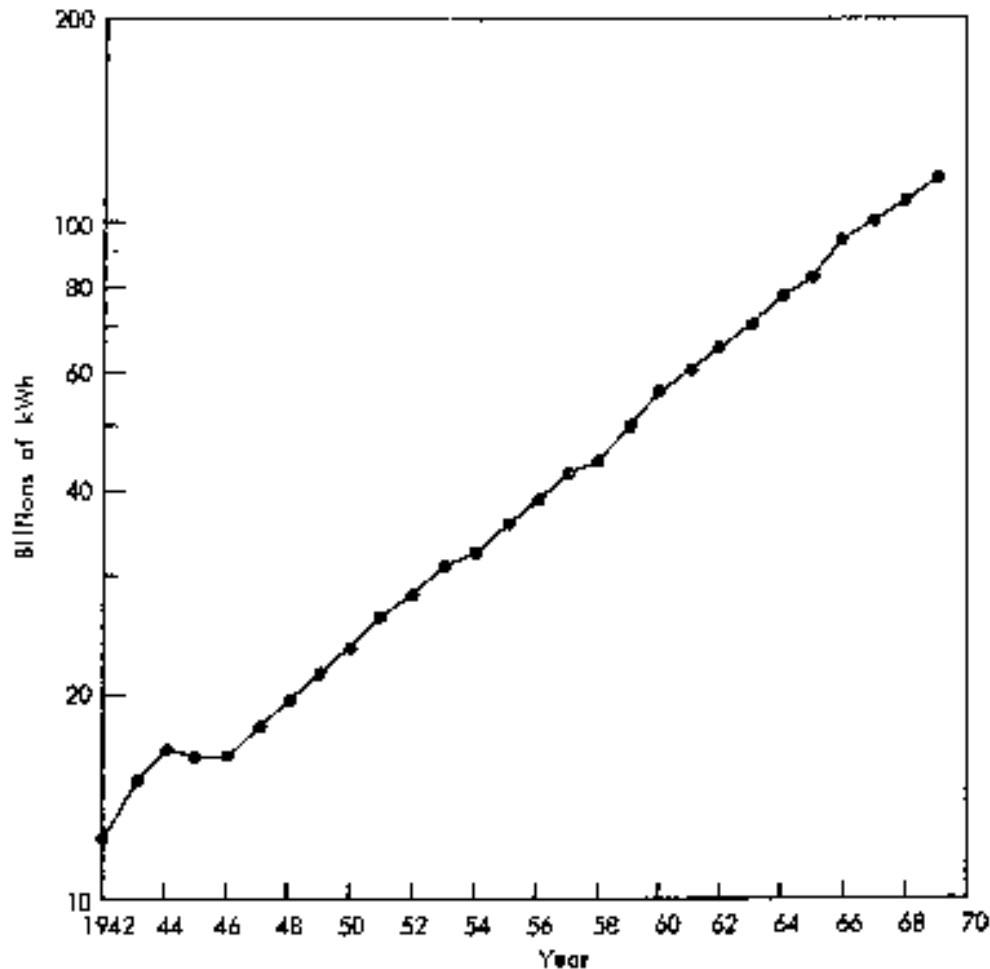
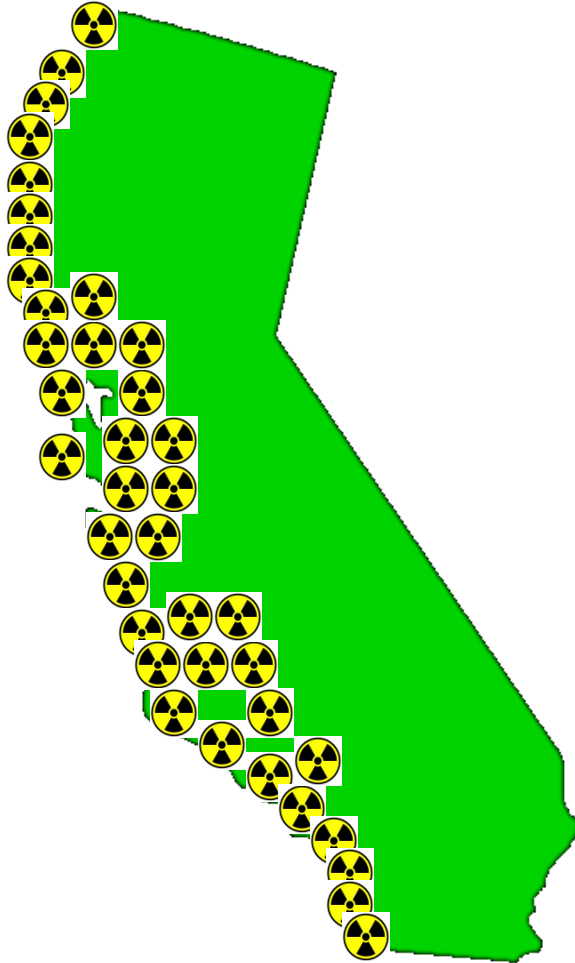


Fig. 1—Electrical energy consumption in California, 1942-1969 (from W. E. Mooz and C. C. Mow, *California's Electricity Quandary: I. Estimating Future Demand*, The Rand Corporation, R-1084-NSF/CSRA, September, 1972, Fig. 11)

If California
had 40 nuclear
plants...



California
today...



Energy Commission Responsibilities



Forecasting



Efficiency Standards



Power Plant Licensing



Renewables & Alternative Technologies



Research, Development & Deployment



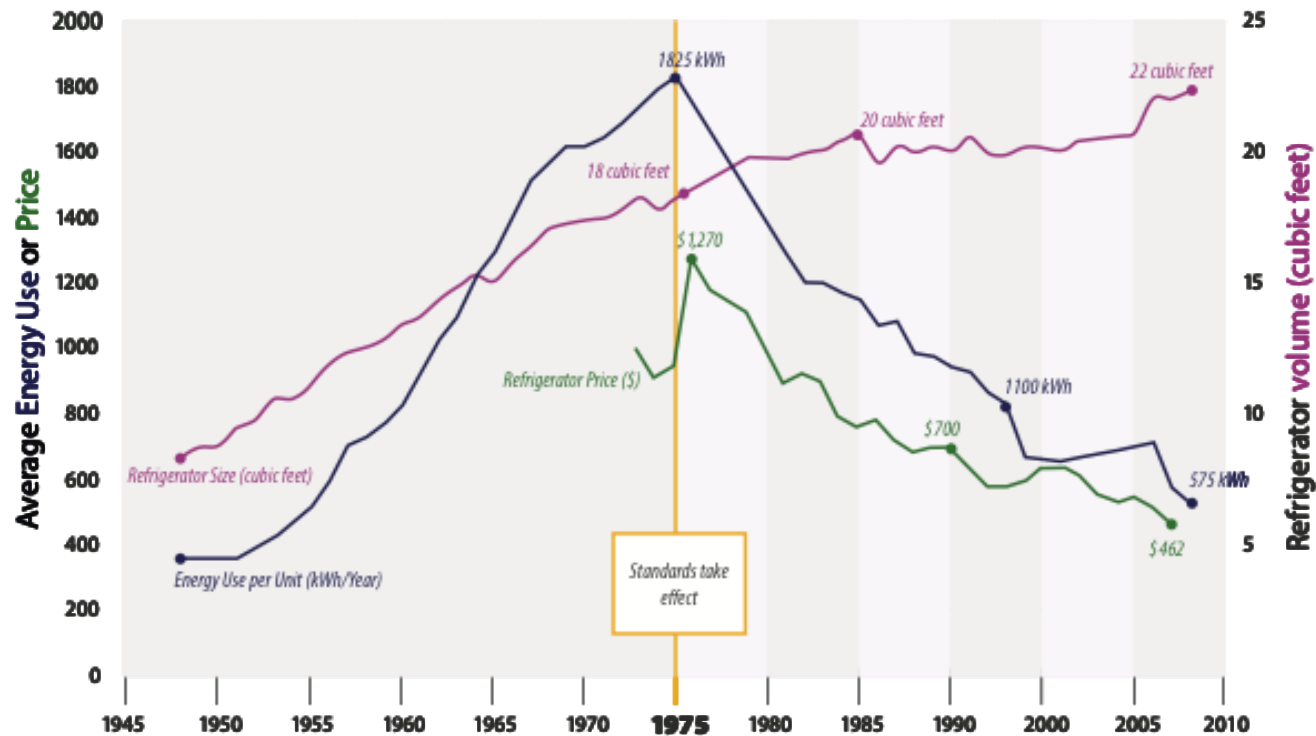
Emergencies



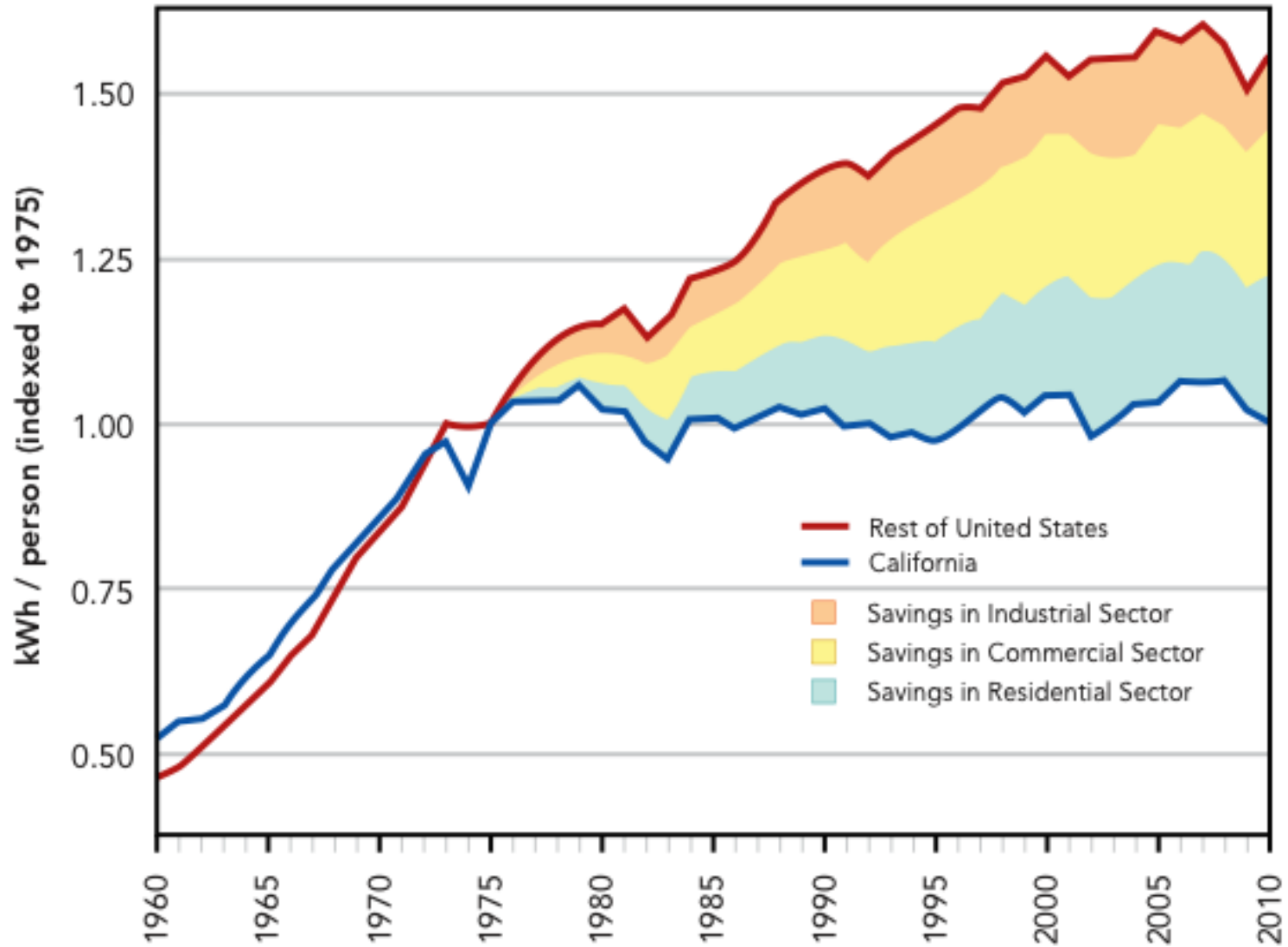
Appliance standards



New Refrigerator Use v. Time and Retail Prices



California Advancing Energy Efficiency



California Renewable Energy Tour

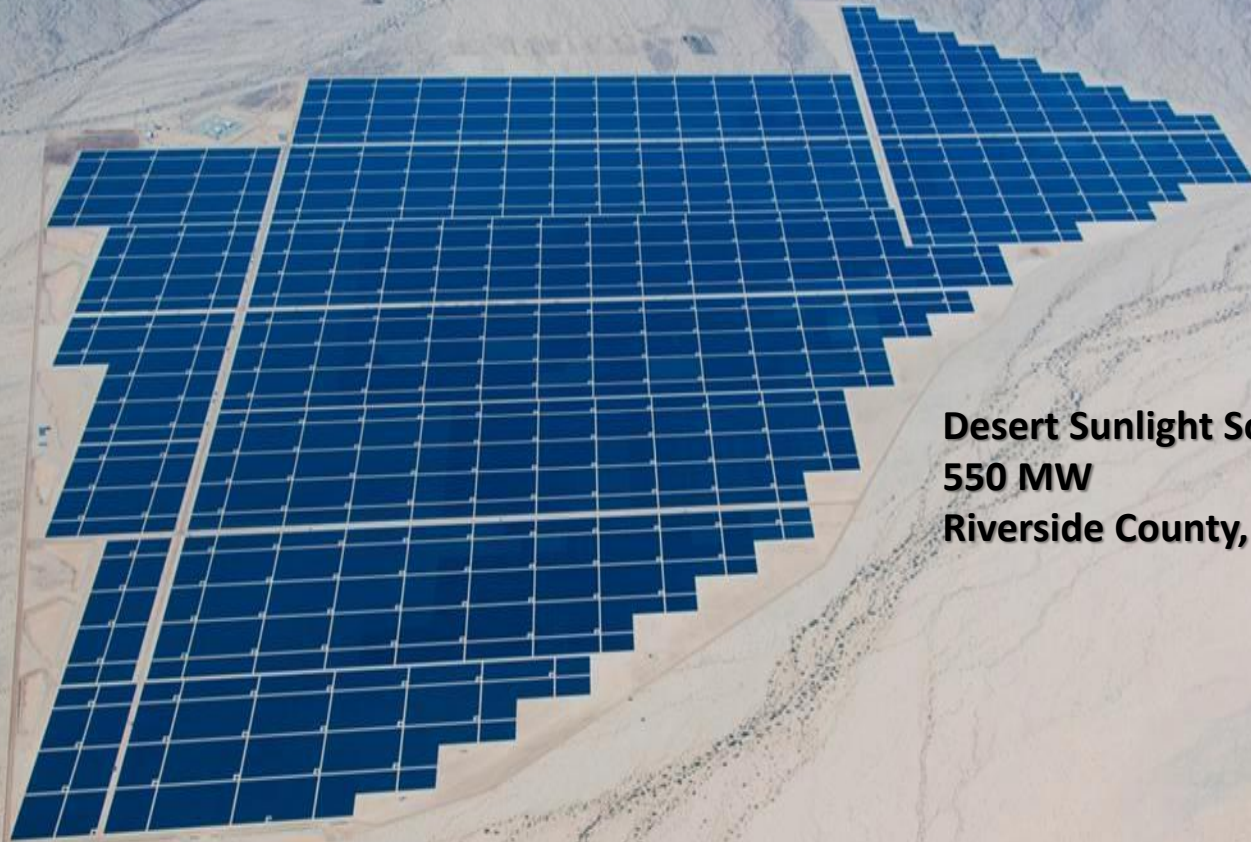


The World's Largest Wind Project

Alta Wind Energy Center
1550 MW
Kern County, CA



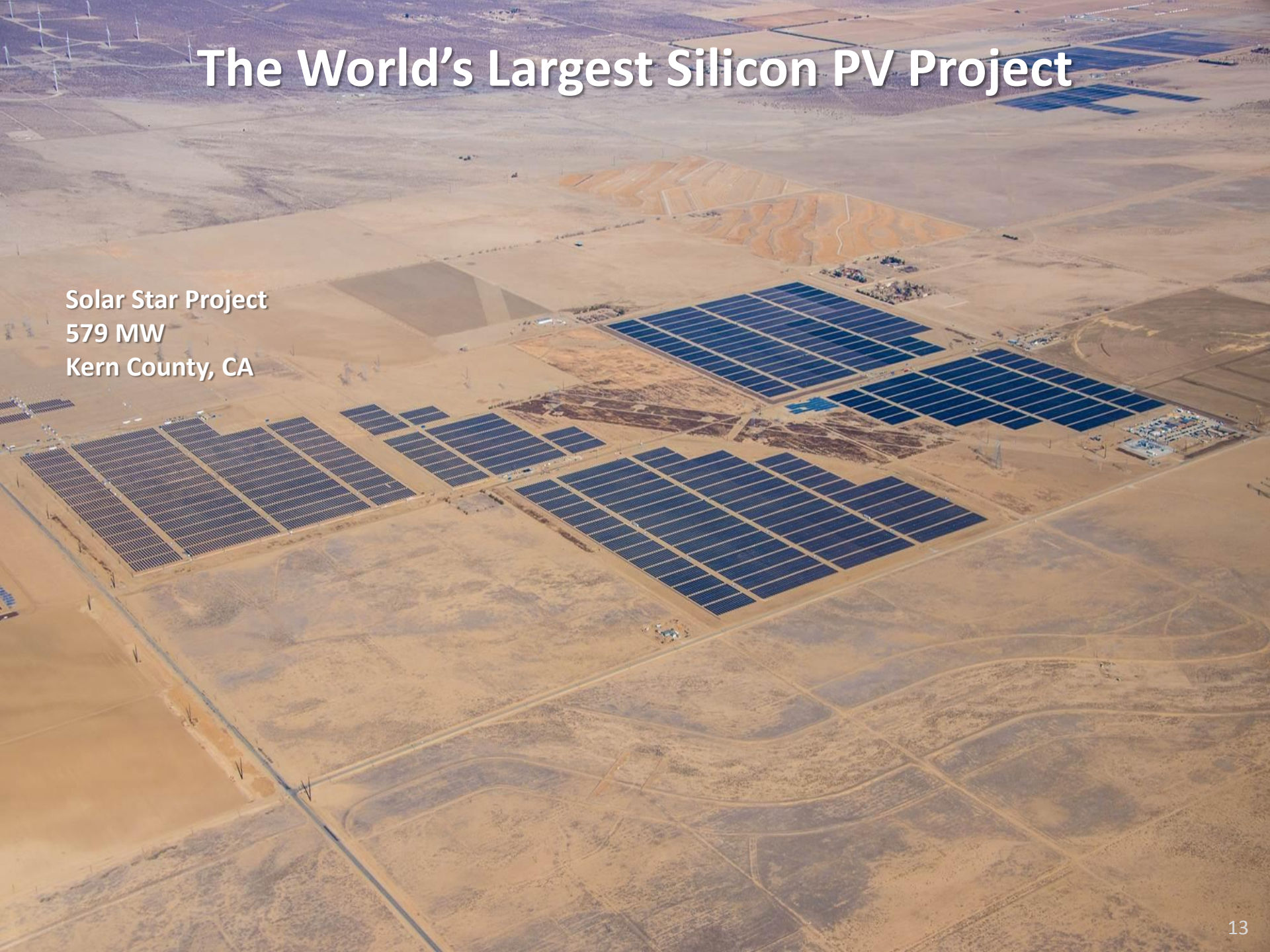
The World's Largest Thin Film Solar PV Project



Desert Sunlight Solar Project
550 MW
Riverside County, CA

The World's Largest Silicon PV Project

Solar Star Project
579 MW
Kern County, CA



The World's Largest Solar Thermal Power Plant (Tower)

Ivanpah Solar Thermal Project
393 MW
San Bernardino County, CA



The World's Largest Solar Thermal Power Plant (Trough)

Solar Energy Generating System (SEGS)

354 MW

San Bernardino County, CA



The World's Largest Iron-Chromium Flow Battery

EnerVault Iron-Chromium Technology
1 MW-hr capacity at 250 kW (4 hour duration)
Turlock, CA

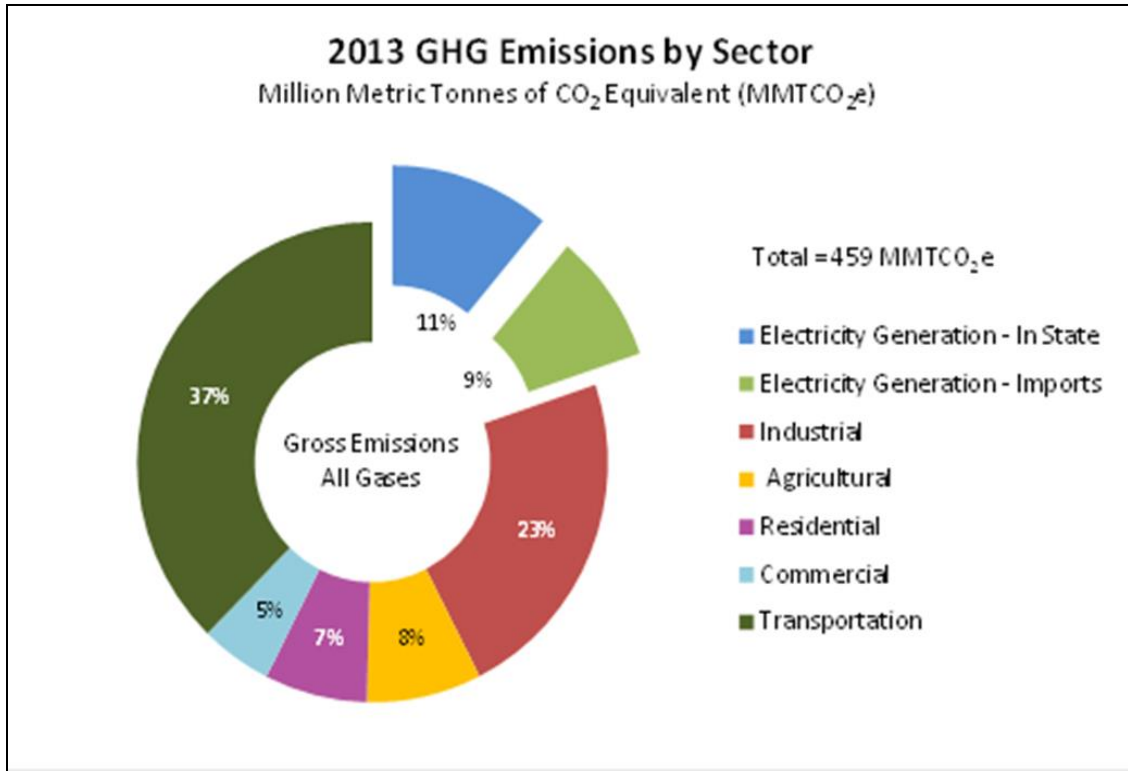


California's mission to address a crisis

Climate Change

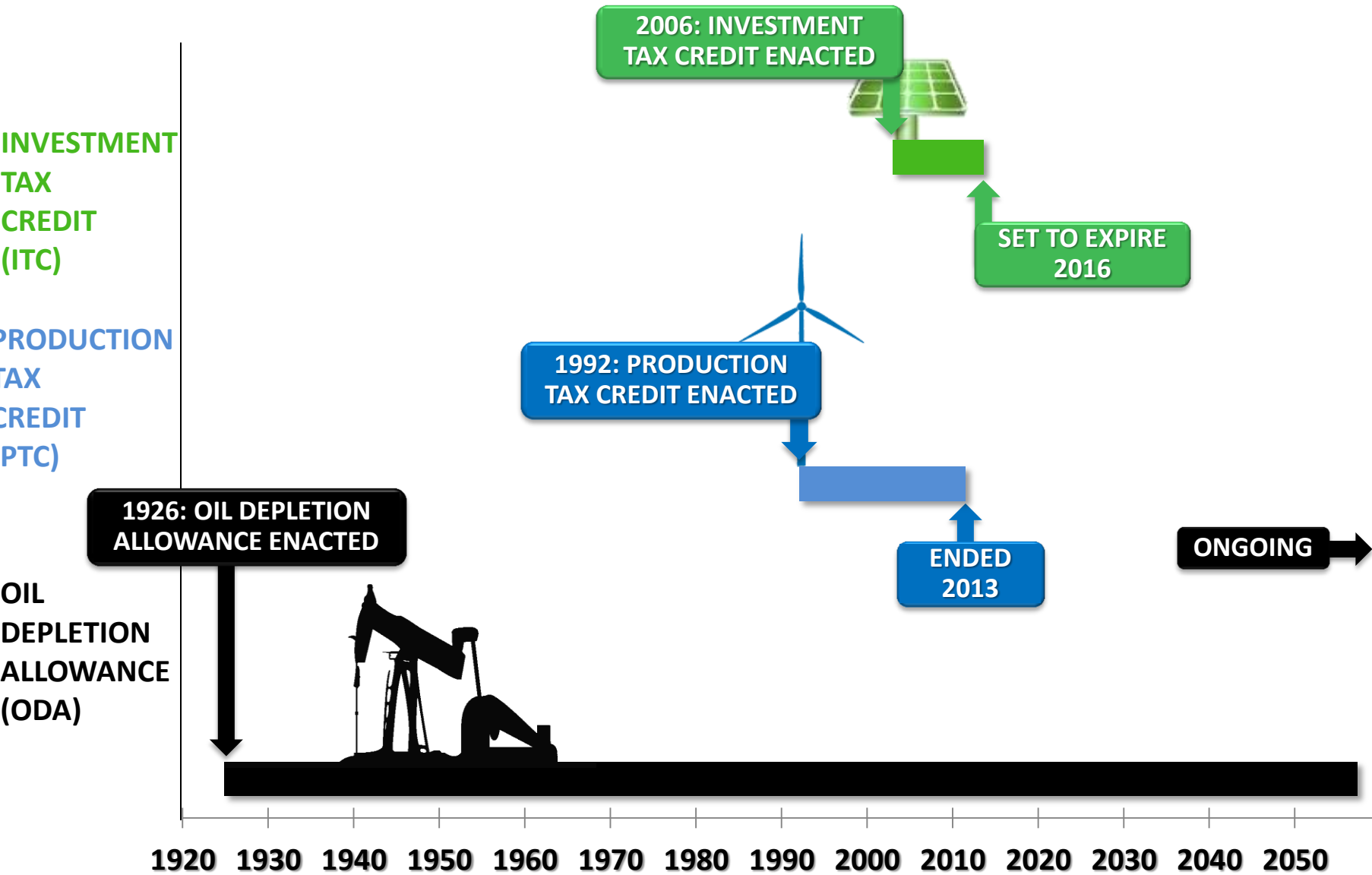


GHG Emissions Statewide



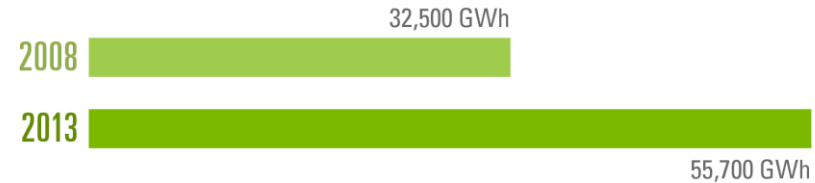
- 20% from electricity sector
- About ½ from out-of-state electricity
- 37% from transportation

Federal Energy Subsidies

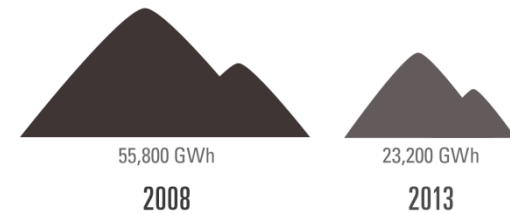


Electricity sector is at 20% below 1990 GHG emission levels

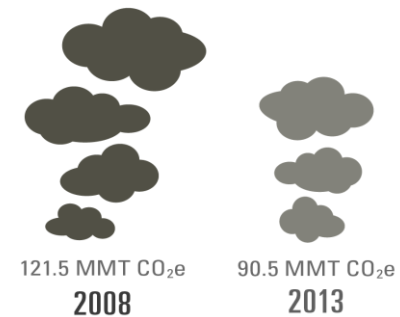
- In just five years - 2008 to 2013:
 - Renewable capacity almost doubled
 - Coal generation reduced by more than half
 - GHG emissions reduced by a quarter



RENEWABLE GENERATION



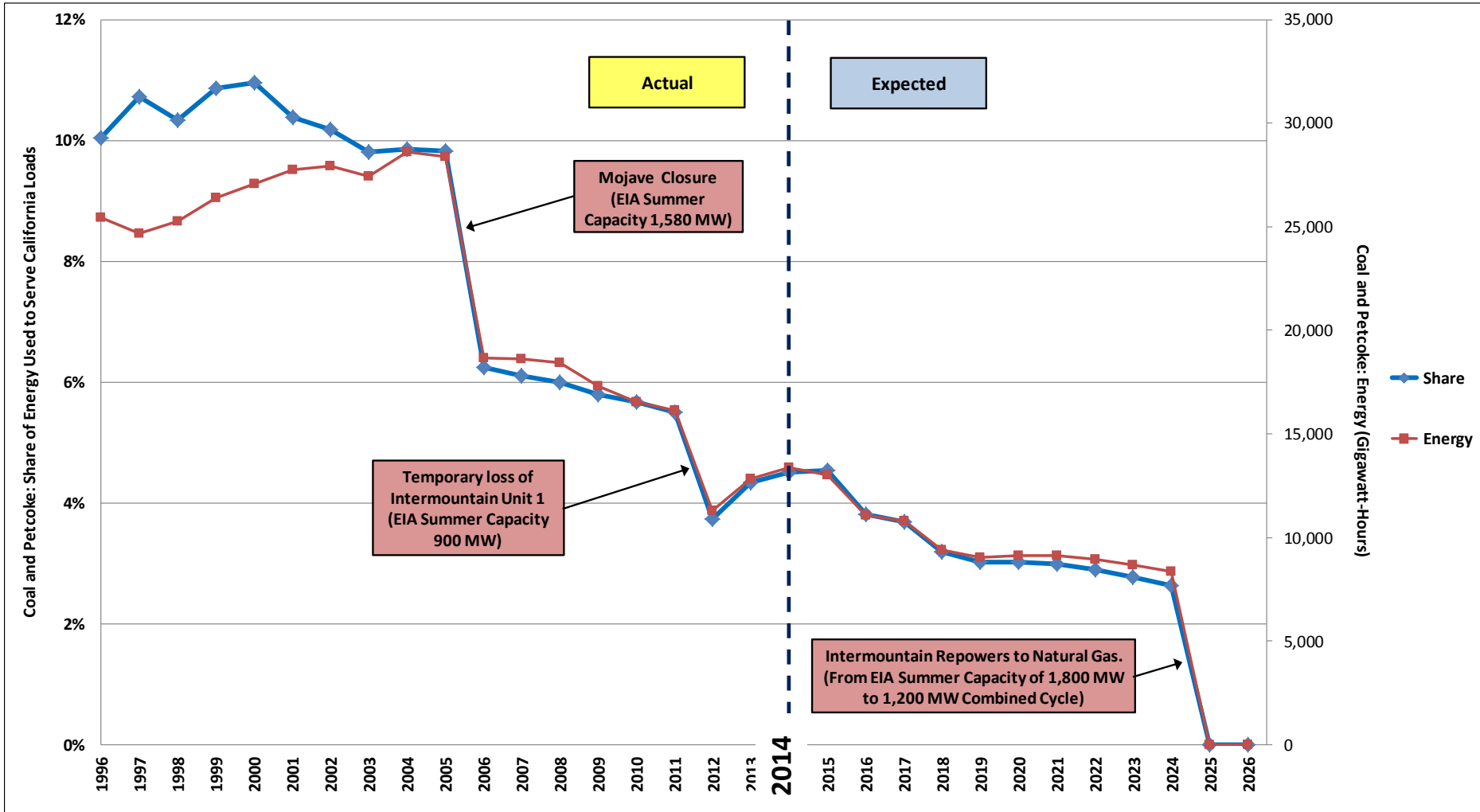
COAL GENERATION



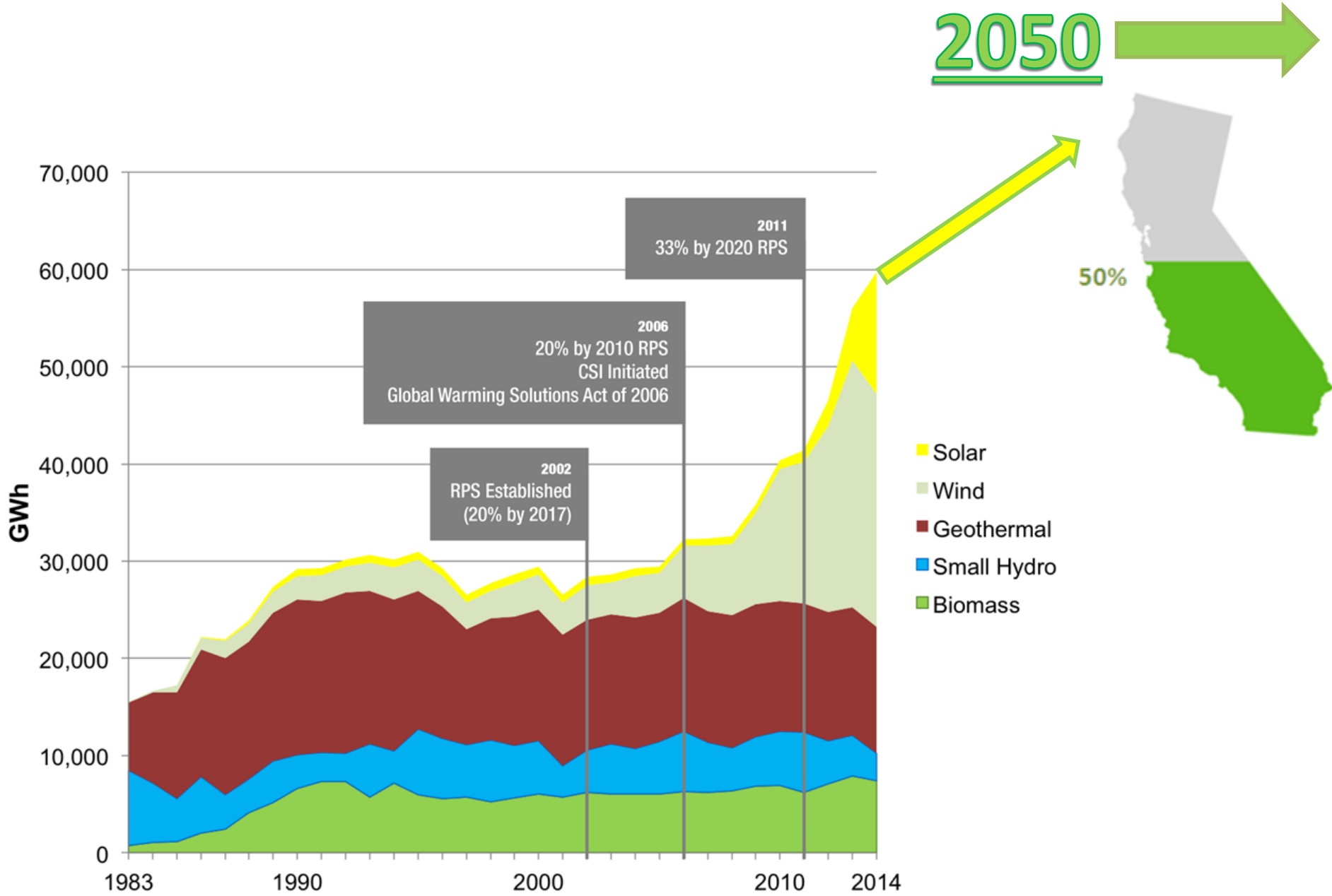
GHG EMISSIONS

California Coal Use 1996 - 2026

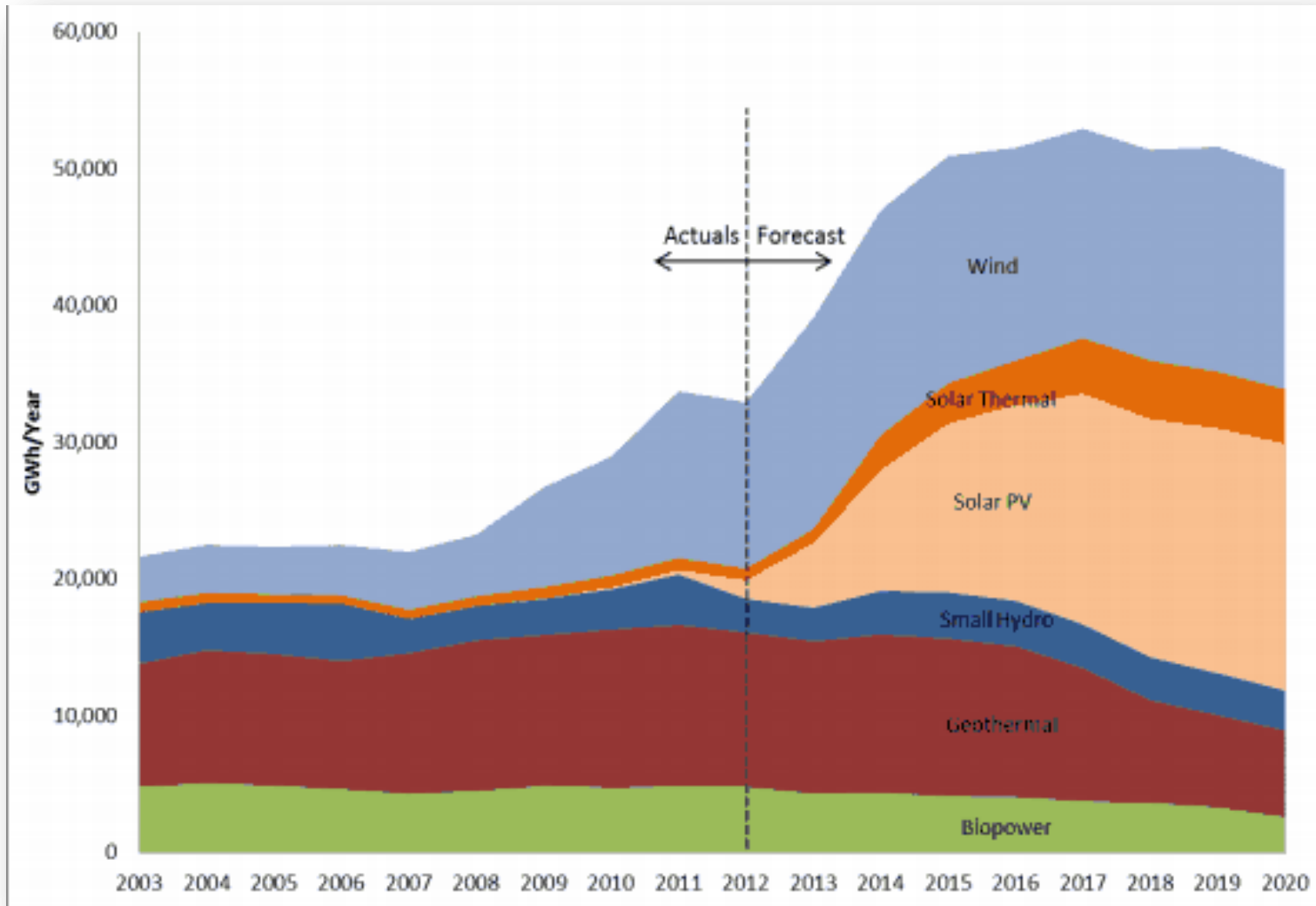
Includes Imports



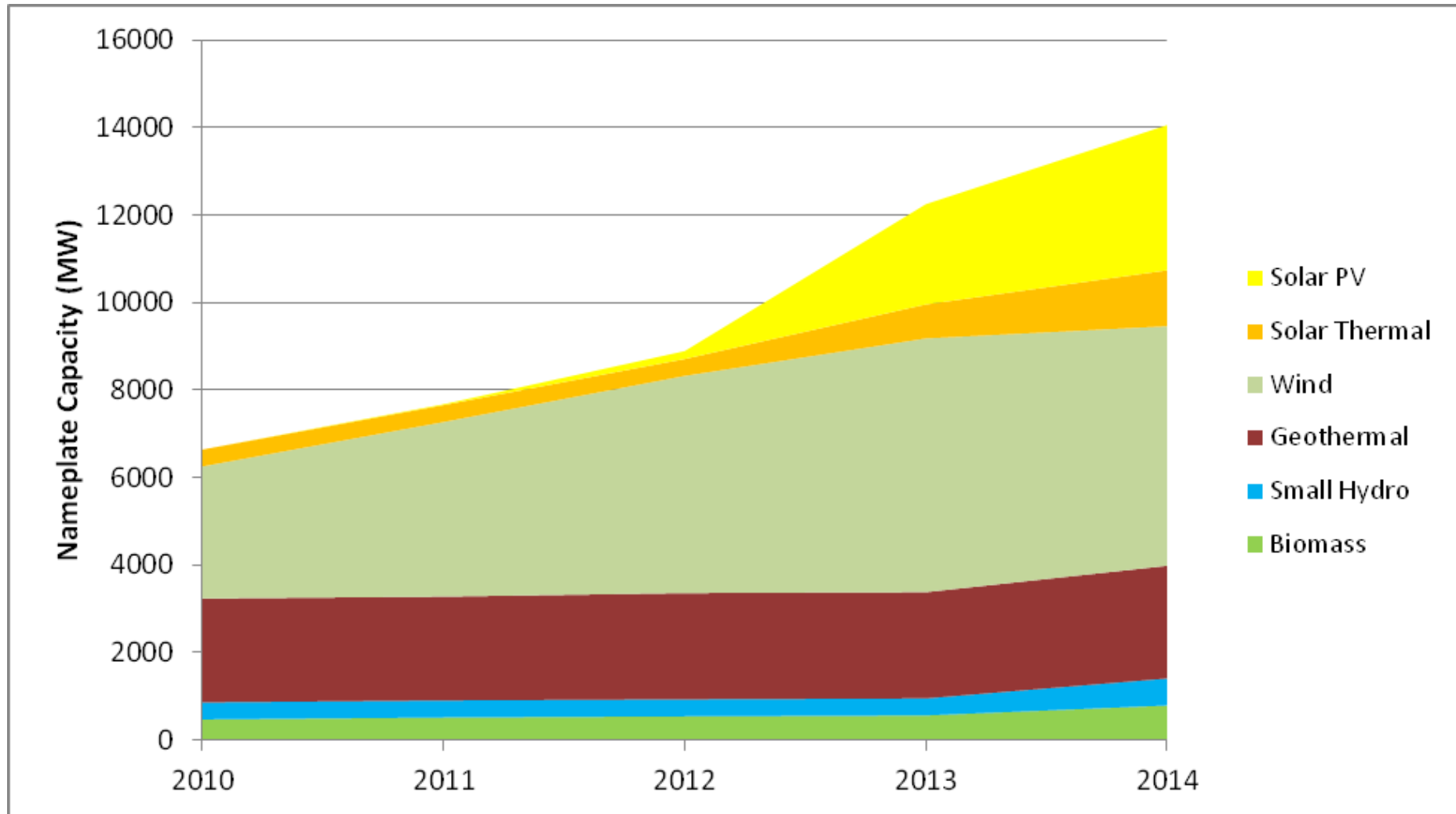
California Policies Send Powerful Market Signals



Solar Expected to be half of all Renewable Energy in California by 2020

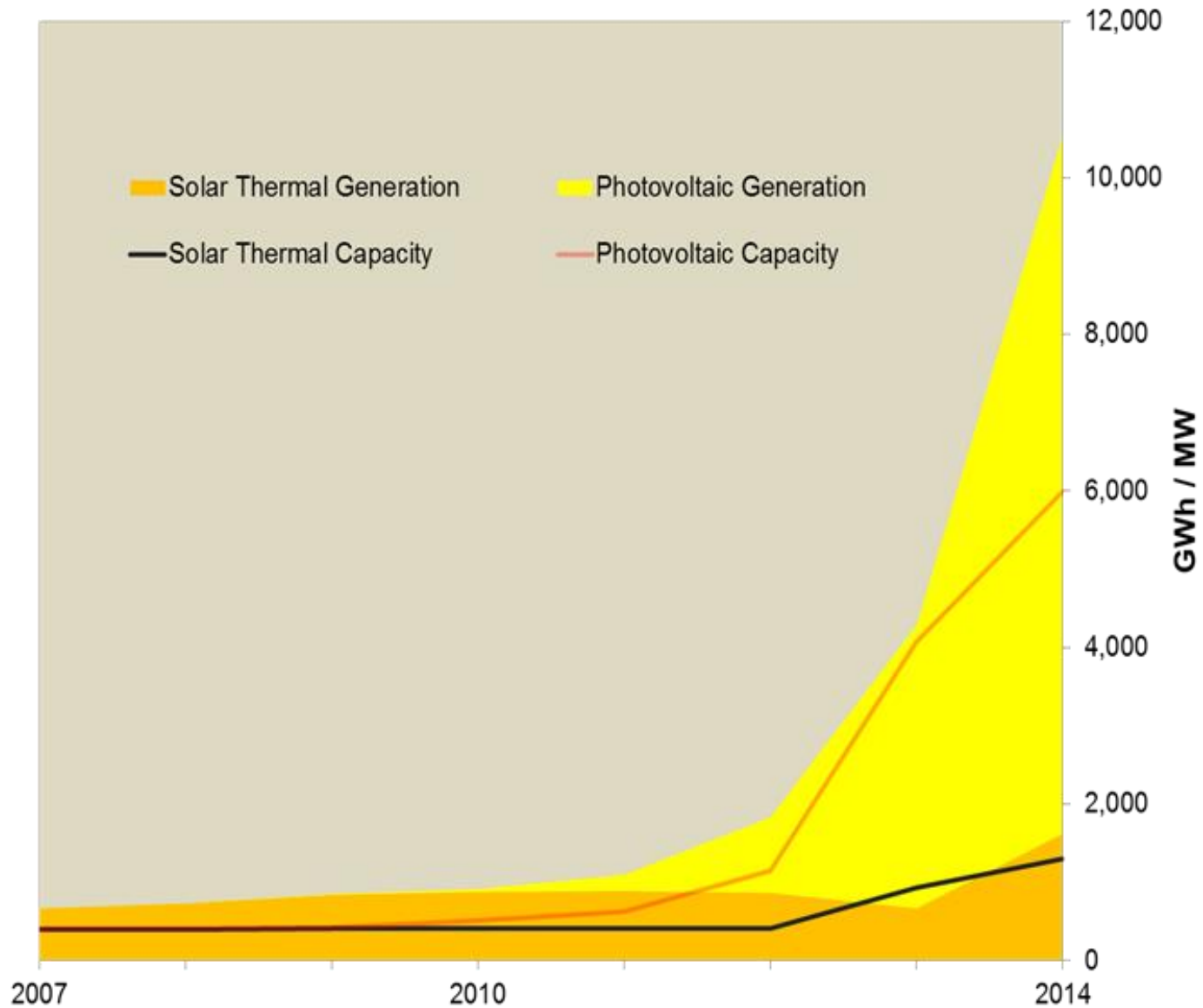


UTILITY-SCALE RENEWABLES OPERATING IN CALIFORNIA FROM 2010 THROUGH 2014

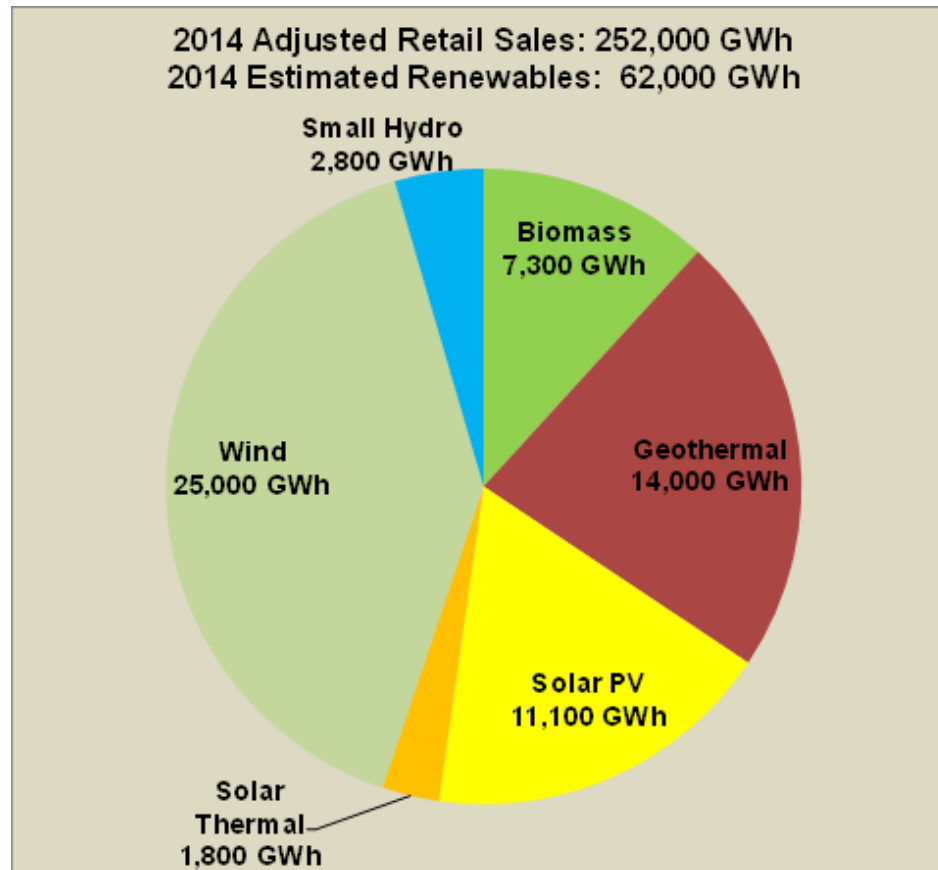


Sources: Energy Commission staff using QFER, source [8]; CPUC RPS contract database [D1]; California SO facility interconnections; and POU S-2 and S-5 Forms for 2014 [D2]. QFER collects data 45 days after each calendar quarter for power plants 10 MW and larger and annually for plants from 1-10 MW. Plants under 1 MW are not required to report under QFER. The data depict facilities on-line as of December 30, 2014. Updated June 30, 2015

CALIFORNIA SOLAR GENERATION AND CAPACITY ADDITIONS 2007 THROUGH 2014



ESTIMATED GENERATION FROM OPERATING RENEWABLE FACILITIES



Source Energy Commission staff based on Quarterly Fuels and Energy Report (QFER) [8], 2014 Power Source Disclosure Filings [11], and S-2 Filings [D2].

RENEWABLE DG IN CALIFORNIA

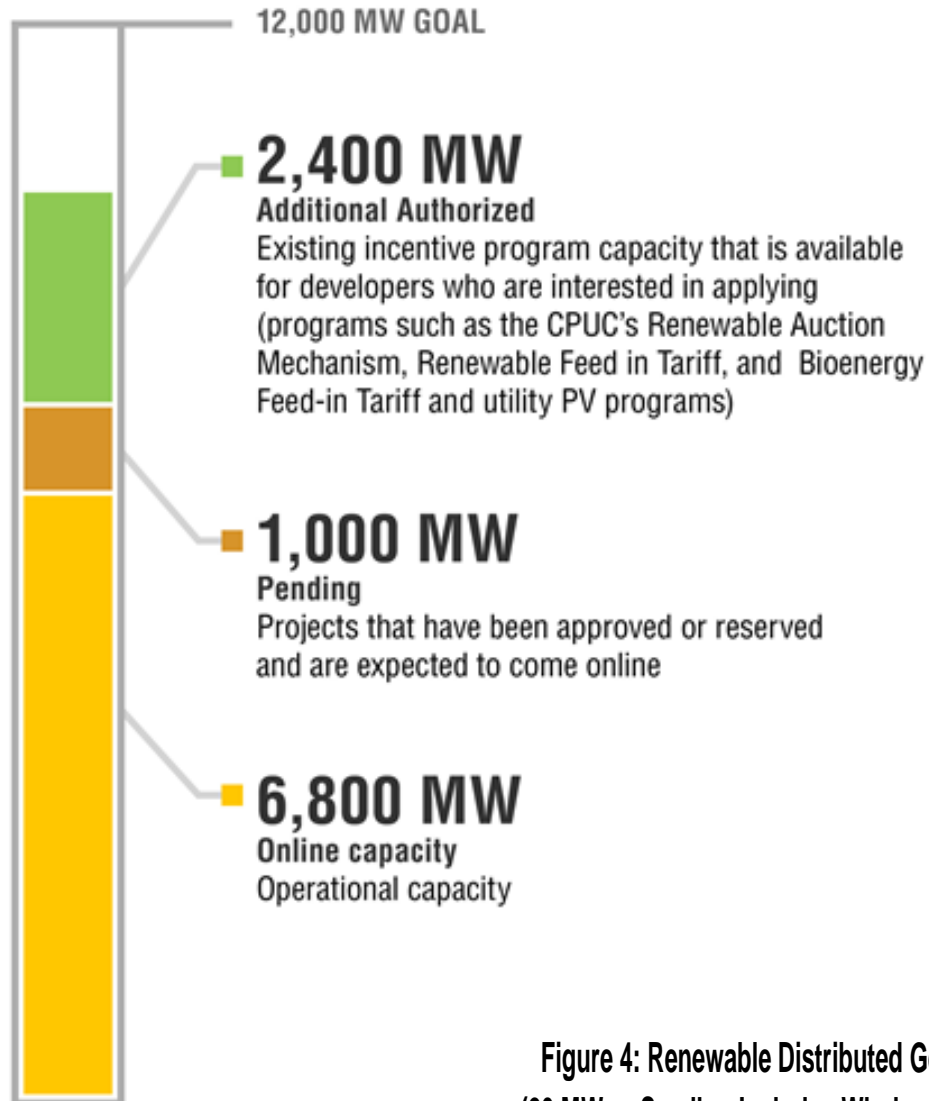


Figure 4: Renewable Distributed Generation in California
(20 MW or Smaller, Includes Wholesale and Self-Generation)

CA Leads in New Solar Home Construction

27% of New Homes in Southern CA Being Built with Solar

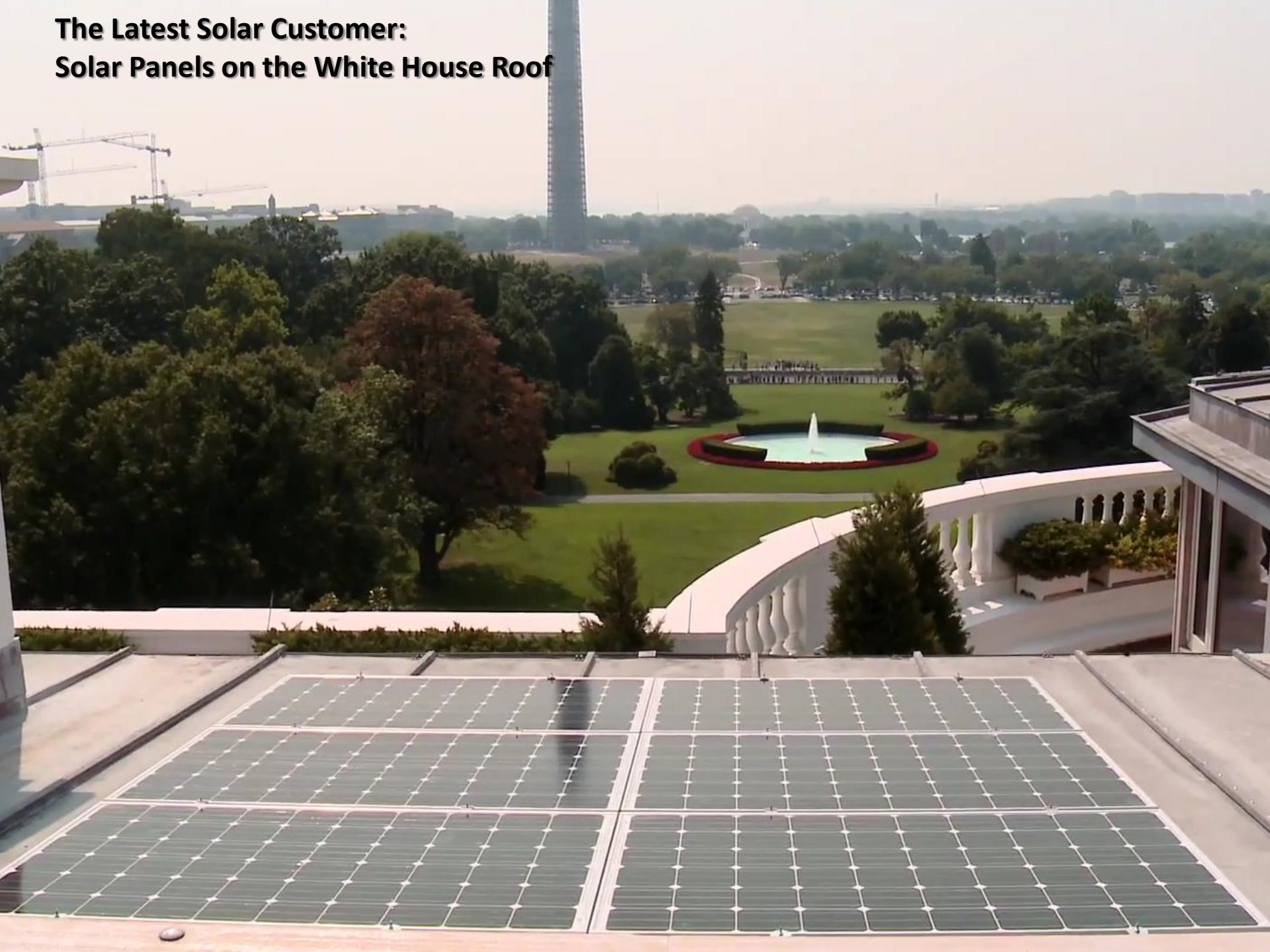


Zero Energy Community
Rocklin, CA

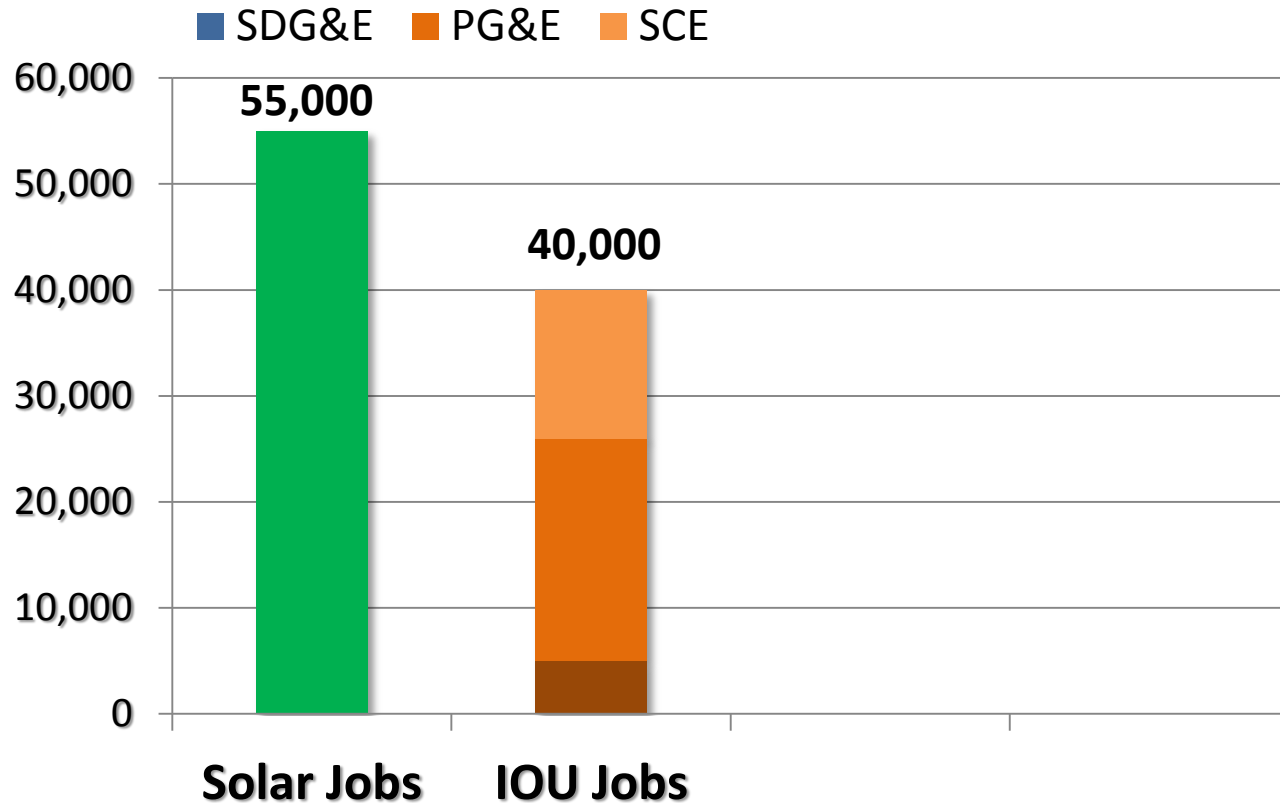
Lancaster, CA: The first city in the US to mandate solar on new construction



The Latest Solar Customer: Solar Panels on the White House Roof



More Solar Jobs in California Than the 3 Investor Owned Utilities Combined



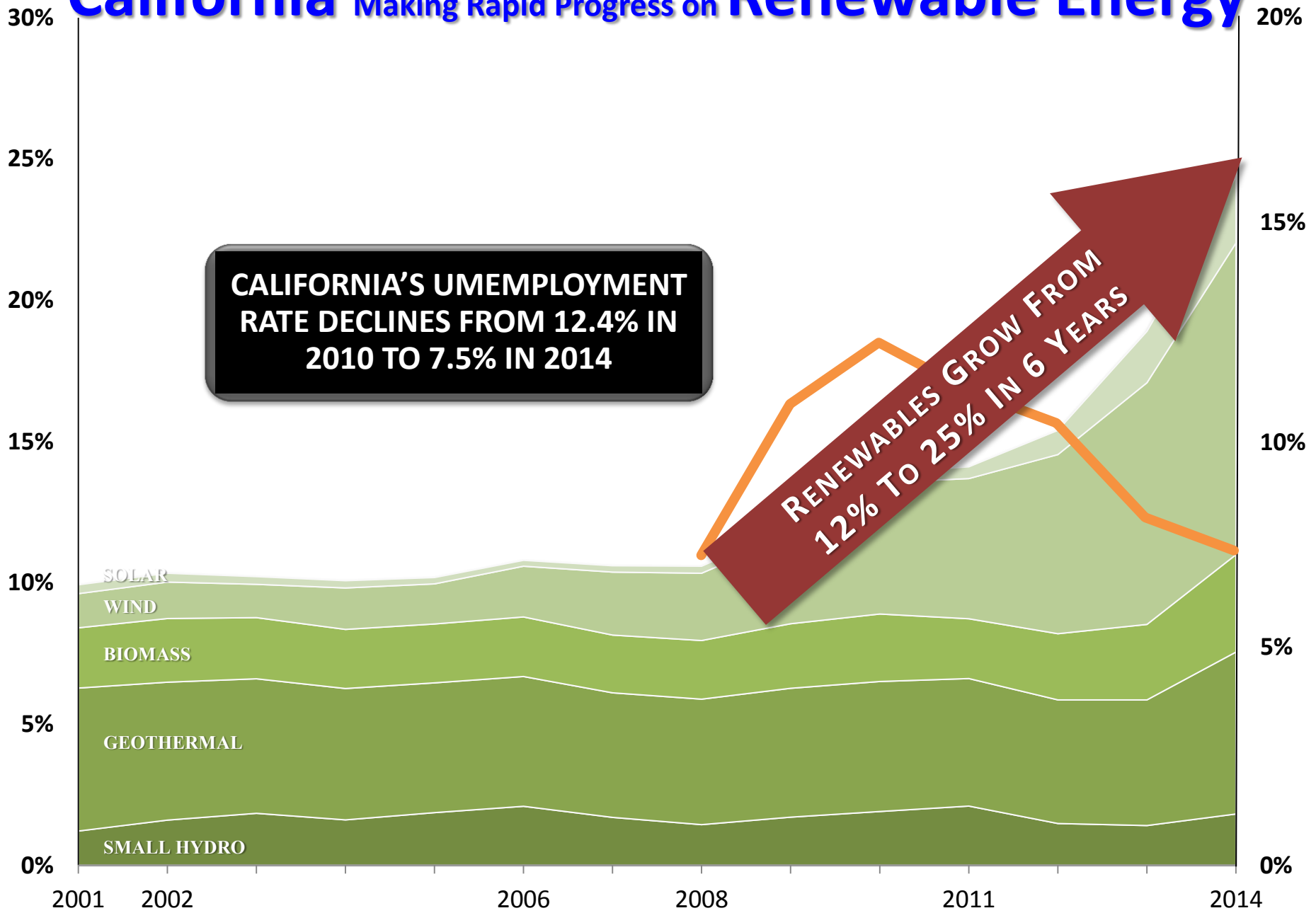
Sources:

Solar Foundation, 2014 Solar Jobs Census

U.S. Securities and Exchange Commission, Form 10-K, 2014

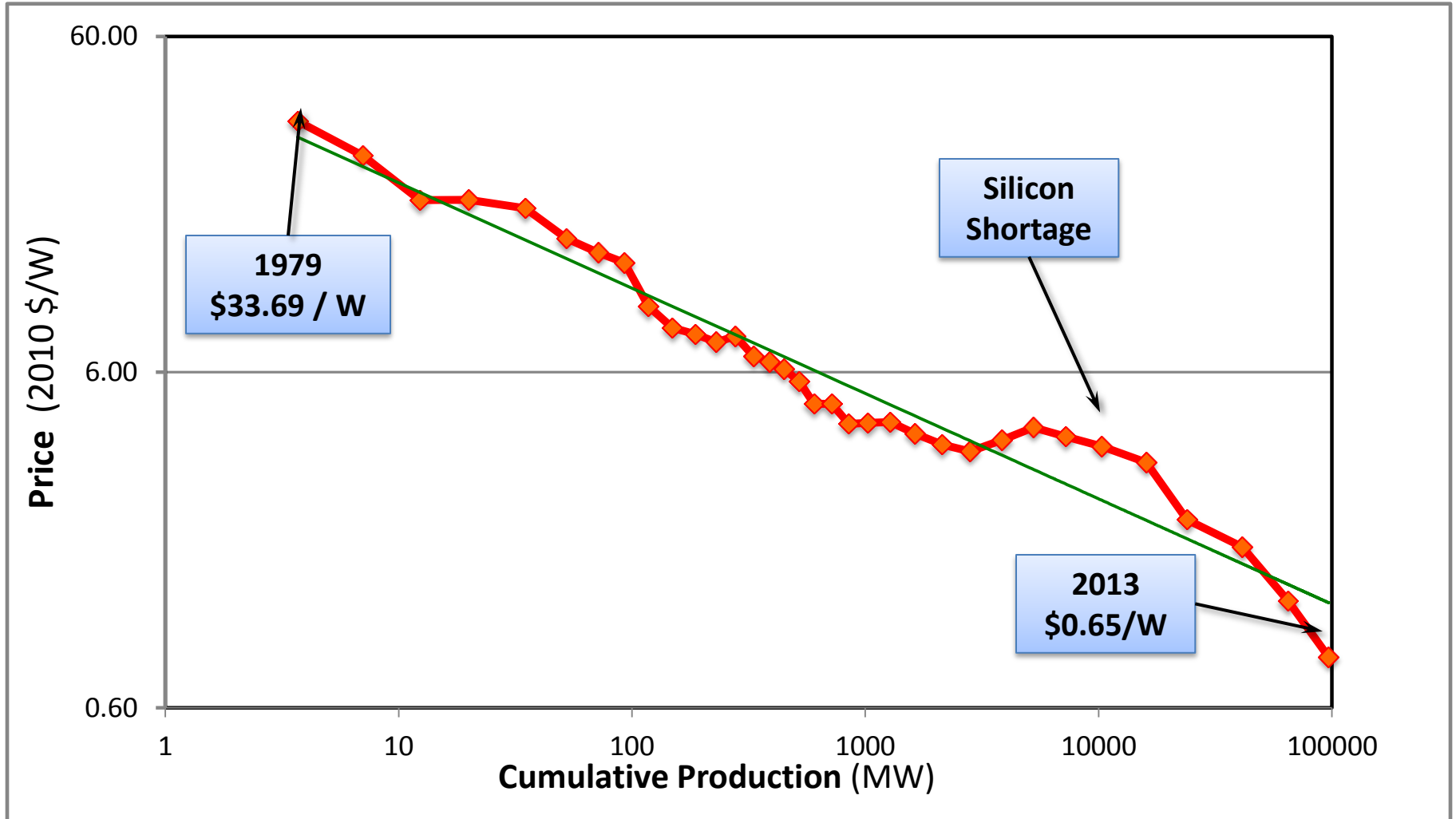
<http://www.sec.gov/edgar/searchedgar/companysearch.html>

California Making Rapid Progress on Renewable Energy



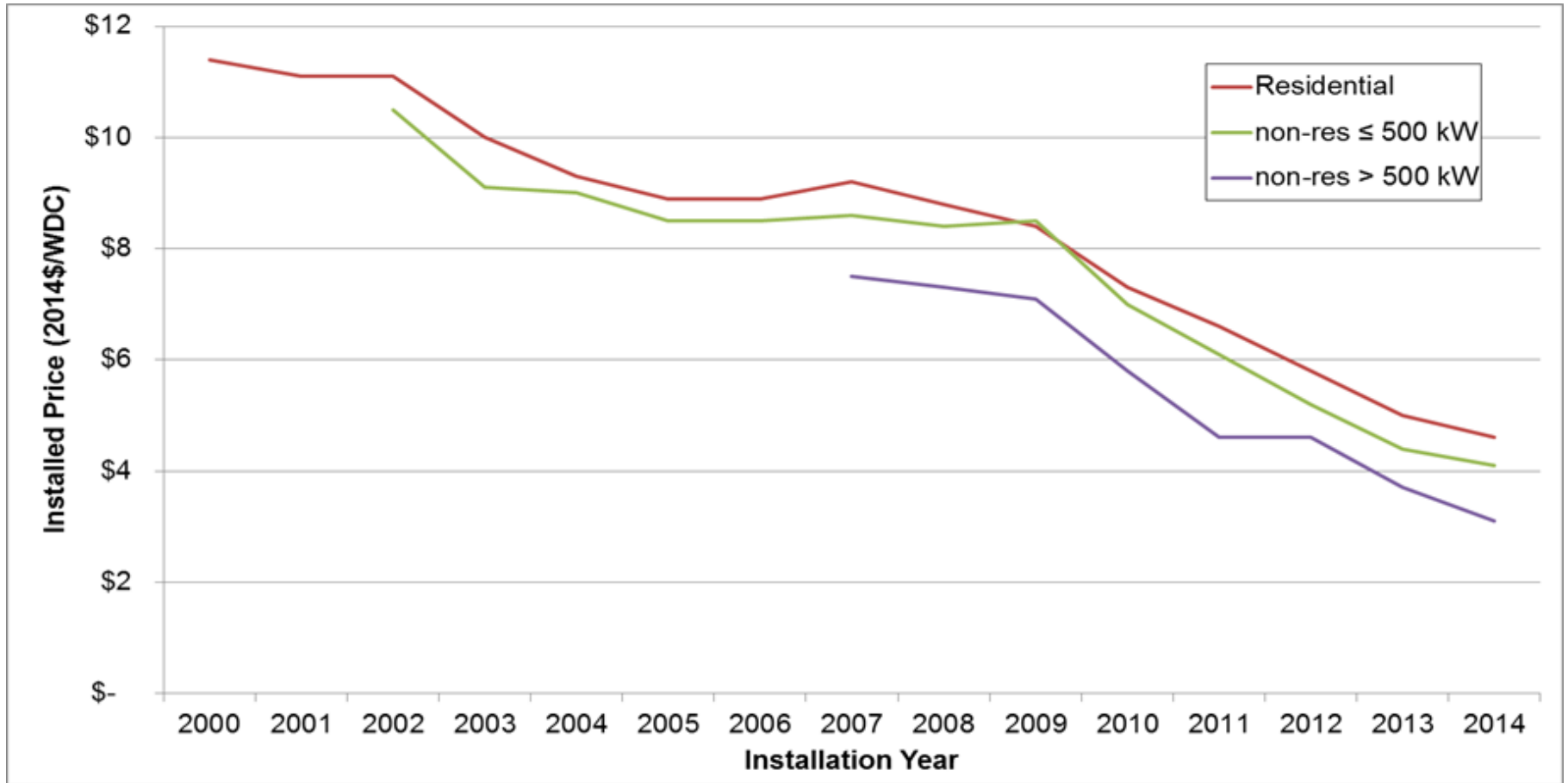
*Unemployment statistics provided by the United States Department of Labor, Bureau of Labor Statistics

Solar Panel Prices Have Dropped 98% Since 1980

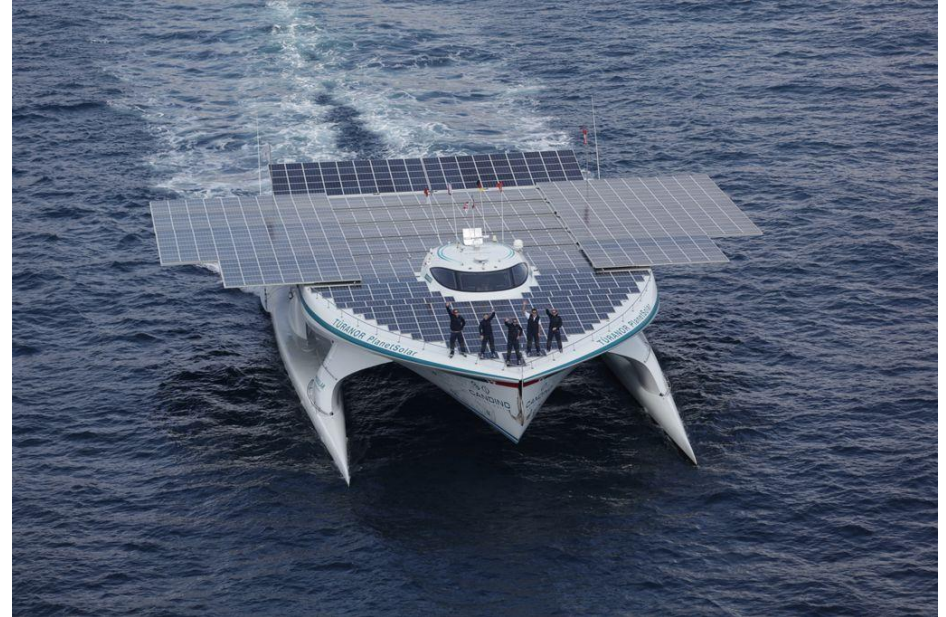


Every Time Demand for Solar Doubles, Prices Go Down about 20%

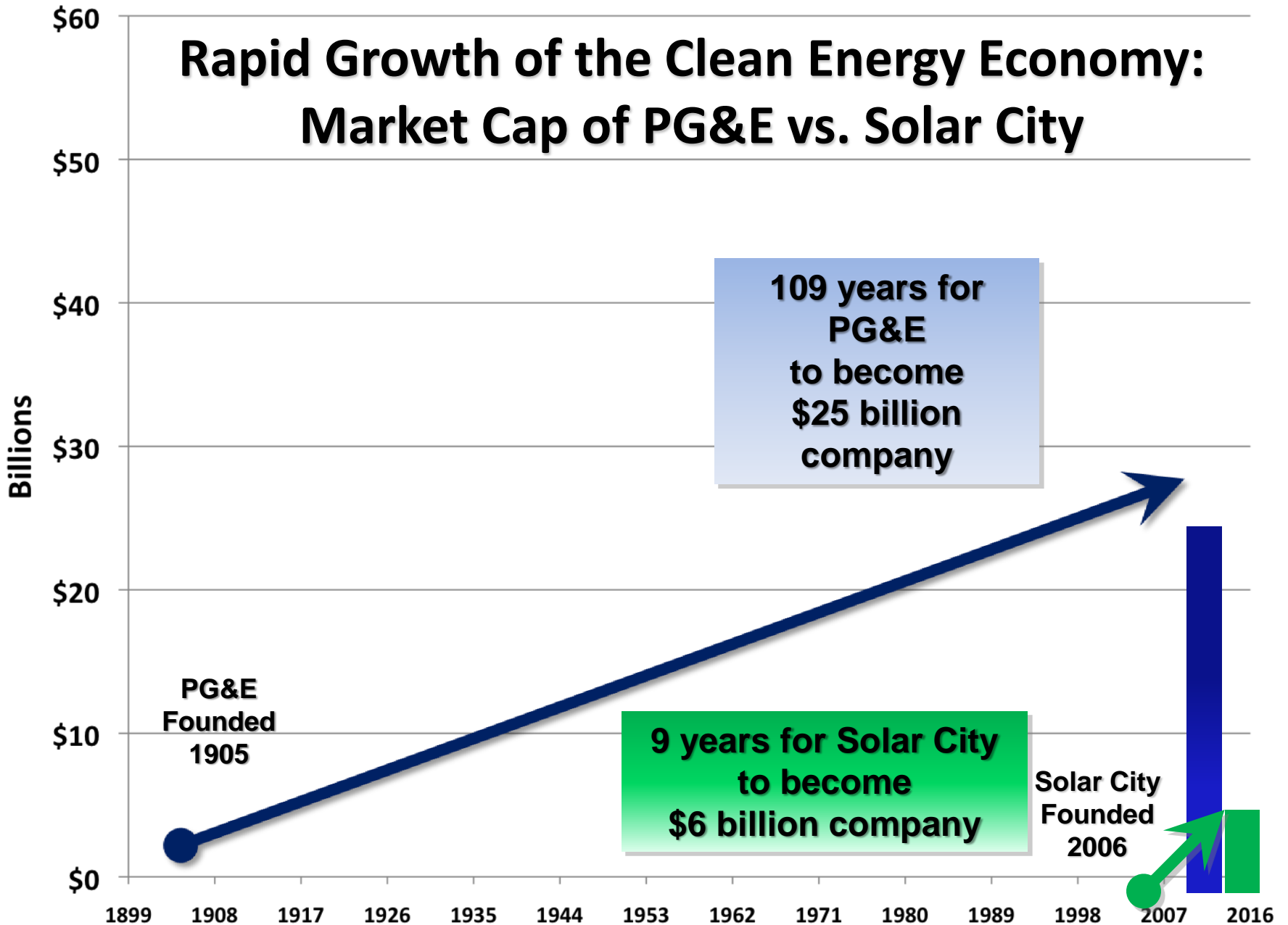
Residential and Non Residential PV System Sample and Median Installed Price



Is there a solar-transportation nexus?



Rapid Growth of the Clean Energy Economy: Market Cap of PG&E vs. Solar City



Largest Manufacturing Plant in CA is Now Electric Vehicles

Tesla employs over 12,000 people

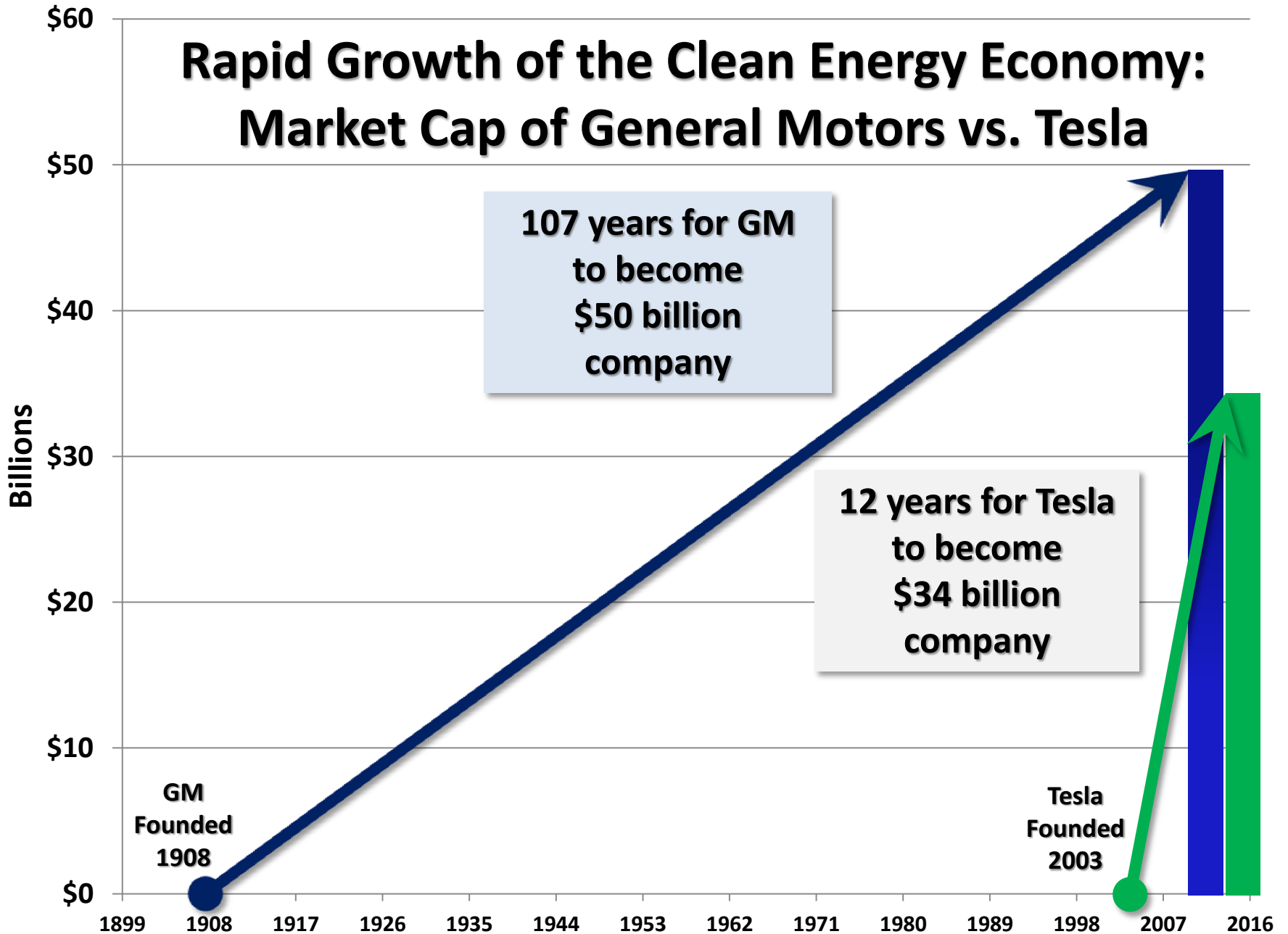


Tesla Factory
Fremont, CA



**150,000
ELECTRIC VEHICLES
IN CALIFORNIA
TODAY**

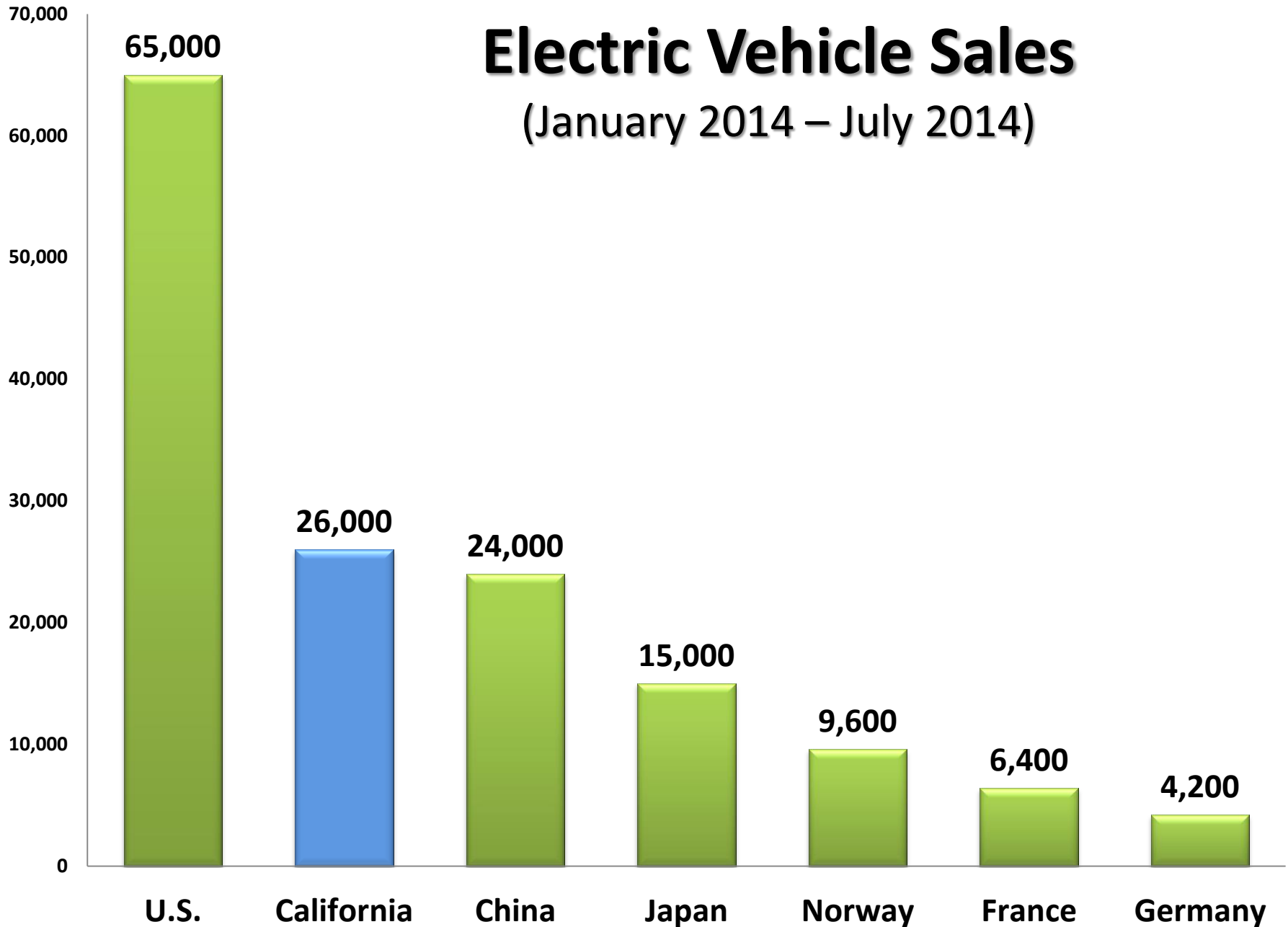
Rapid Growth of the Clean Energy Economy: Market Cap of General Motors vs. Tesla



Based on market value as of 8/5/15

Electric Vehicle Sales

(January 2014 – July 2014)



Source: EV Obsession (<http://evobsession.com/>), 2014
Alan Baum, Baum & Associates, 2014

High speed rail is coming to California and it will be 100% powered by renewables...

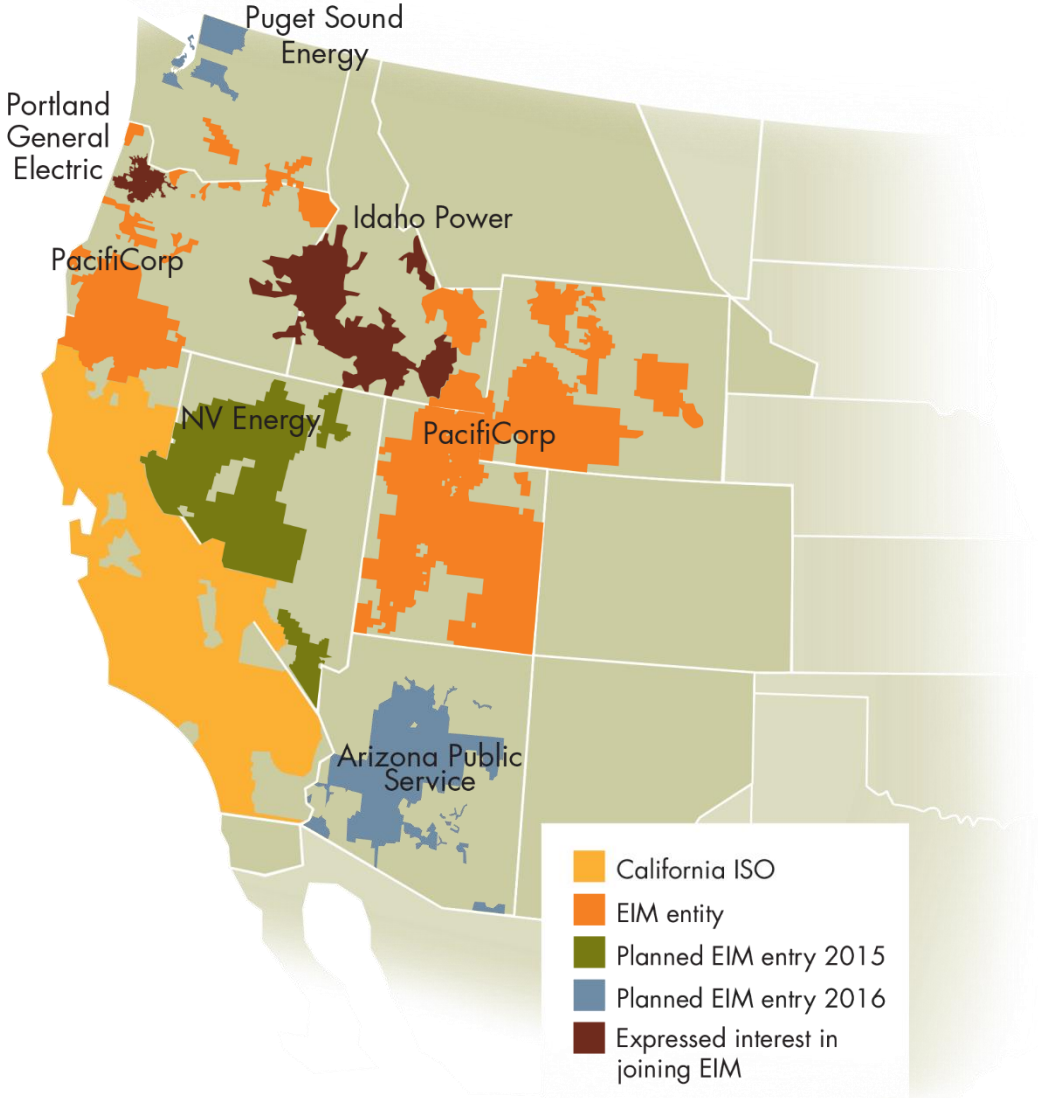


Companies Committing to 100% Renewable Energy

Google



EIM Laying the Foundation for Regional Resource Management



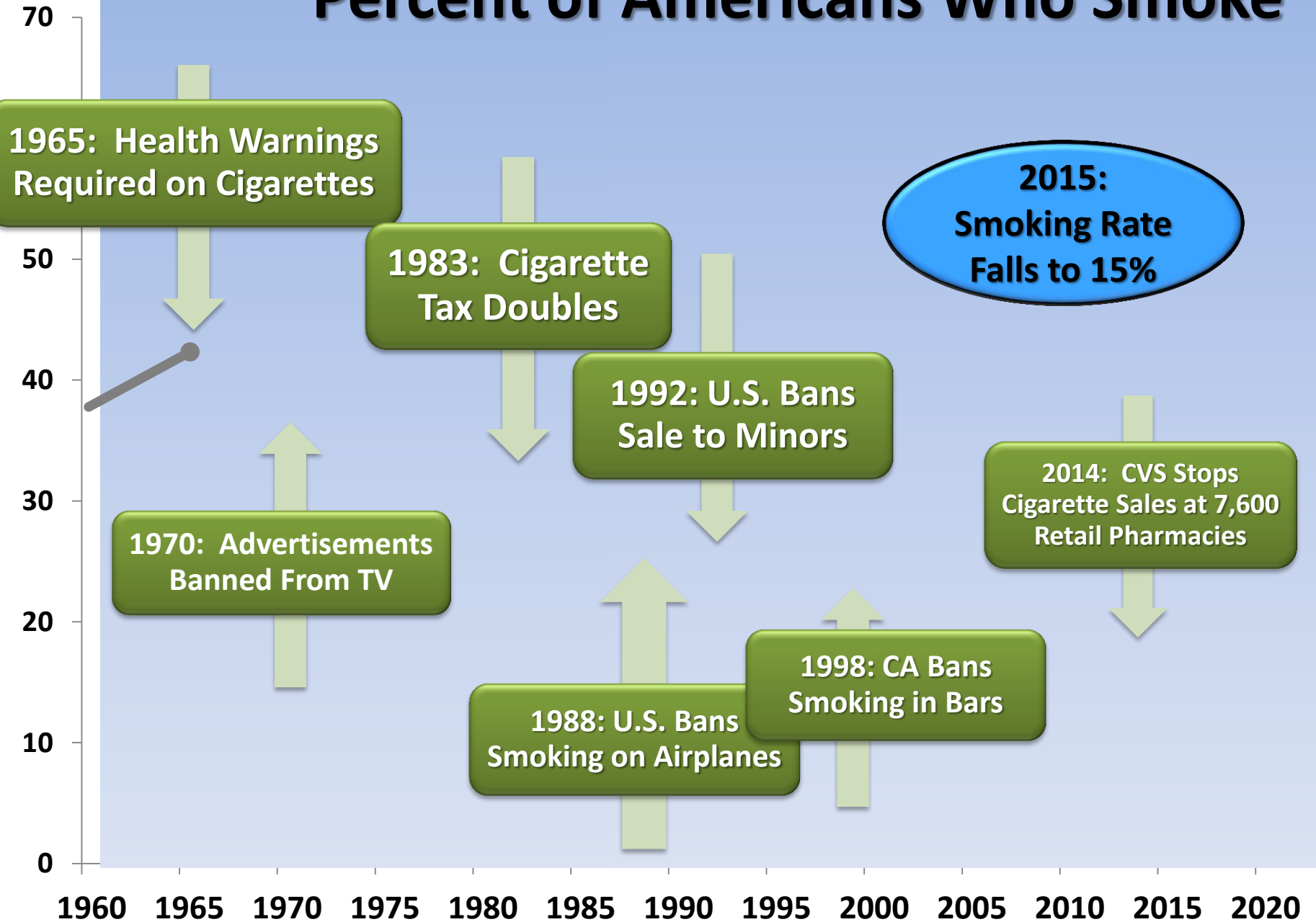
Smoking in the US



According to repeated nationwide surveys,
**More Doctors
Smoke CAMELS
than any other
cigarette!**



Percent of Americans Who Smoke



Source: Centers for Disease Control and Prevention (CDC), 2014

http://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/index.htm

Thank you

