1974: Jerry Brown elected Governor
Oil crisis in the 1970’s
Future electricity crisis

Fig. 1—Electrical energy consumption in California, 1942-1969 (from W. E. Moore and C. C. Mow, California’s Electricity Quandary: 1. Estimating Future Demand. The Rand Corporation, R-1084-NSF/CSRA, September, 1972, Fig. 11)
If California had 40 nuclear plants...

California today...

Diablo Canyon Nuclear Plant
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

- Energy Use per Unit (kWh/Year)
- Refrigerator Size (cubic feet)
- Refrigerator Price ($)

- Standards take effect
- 20 cubic feet
- 22 cubic feet
- 1100 kWh
- $1270
- $700
- $462

Average Energy Use or Price

Refrigerator volume (cubic feet)
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
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

- **1926: Oil Depletion Allowance Enacted**
- **1992: Production Tax Credit Enacted**
- **2006: Investment Tax Credit Enacted**
- **2013: Ended 2013**
- **2016: Set to Expire 2016**
- **Ongoing**

**Timeline:**
- 1920: Oil Depletion Allowance Enacted
- 1992: Production Tax Credit Enacted
- 2006: Investment Tax Credit Enacted
- 2013: Ended 2013
- 2016: Set to Expire 2016

**Categories:**
- **Investment Tax Credit (ITC)**
- **Production Tax Credit (PTC)**
- **Oil Depletion Allowance (ODA)**
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
California Policies Send Powerful Market Signals

- 2002: RPS Established (20% by 2017)
- 2011: 33% by 2020 RPS

Graph showing the increase in GWh from 1983 to 2014, with projections to 2050. The graph indicates a significant increase in renewable energy sources, including solar, wind, small hydro, and geothermal. The map of California highlights the potential for achieving 50% of energy goals.
Solar Expected to be half of all Renewable Energy in California by 2020

Source: CPUC RPS Report
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

- Solar Thermal Generation
- Photovoltaic Generation
- Solar Thermal Capacity
- Photovoltaic Capacity

GWh / MW

2007 2010 2014
ESTIMATED GENERATION FROM OPERATING RENEWABLE FACILITIES

RENEWABLE DG IN CALIFORNIA

12,000 MW GOAL

2,400 MW
Additional Authorized
Existing incentive program capacity that is available for developers who are interested in applying (programs such as the CPUC’s Renewable Auction Mechanism, Renewable Feed in Tariff, and Bioenergy Feed-in Tariff and utility PV programs)

1,000 MW
Pending
Projects that have been approved or reserved and are expected to come online

6,800 MW
Online capacity
Operational capacity

Figure 4: Renewable Distributed Generation in California
(20 MW or Smaller, Includes Wholesale and Self-Generation)
CA Leads in New Solar Home Construction

Zero Energy Community
Rocklin, CA

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

California’s unemployment rate declines from 12.4% in 2010 to 7.5% in 2014.

Renewables grow from 12% to 25% in 6 years.

*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%

1979 $33.69 / W
2013 $0.65/W
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

Based on market value as of 10/1/15

PG&E
Founded 1905

Solar City
Founded 2006

109 years for PG&E to become $25 billion company

9 years for Solar City to become $6 billion company

Based on market value as of 10/1/15
Largest Manufacturing Plant in CA is Now Electric Vehicles

Tesla employs over 12,000 people

150,000 ELECTRIC VEHICLES IN CALIFORNIA TODAY
Rapid Growth of the Clean Energy Economy: Market Cap of General Motors vs. Tesla

107 years for GM to become $50 billion company

12 years for Tesla to become $34 billion company

Based on market value as of 8/5/15
Electric Vehicle Sales
(January 2014 – July 2014)

- **U.S.**: 65,000
- **California**: 26,000
- **China**: 24,000
- **Japan**: 15,000
- **Norway**: 9,600
- **France**: 6,400
- **Germany**: 4,200

*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
EIM Laying the Foundation for Regional Resource Management
Percent of Americans Who Smoke

- **1965**: Health Warnings Required on Cigarettes
- **1970**: Advertisements Banned From TV
- **1983**: Cigarette Tax Doubles
- **1988**: U.S. Bans Smoking on Airplanes
- **1992**: U.S. Bans Sale to Minors
- **1998**: CA Bans Smoking in Bars
- **2014**: CVS Stops Cigarette Sales at 7,600 Retail Pharmacies
- **2015**: Smoking Rate Falls to 15%

Source: Centers for Disease Control and Prevention (CDC), 2014
http://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/index.htm
Thank you