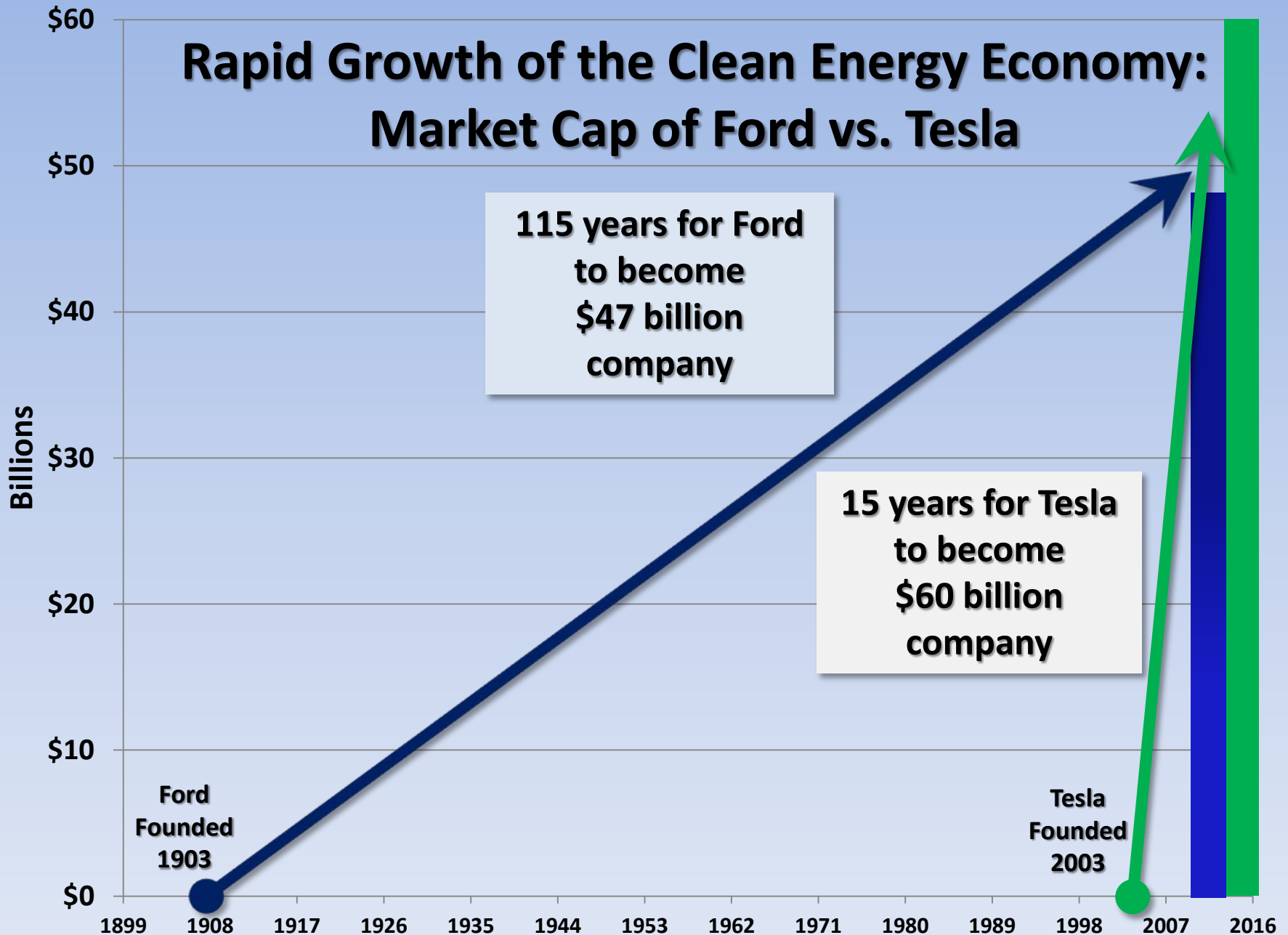


# **SUNRISE FROM THE WEST: CALIFORNIA AND THE DAWN OF THE CLEAN ENERGY ERA**



**David Hochschild**  
**Commissioner**  
**California Energy Commission**

# Rapid Growth of the Clean Energy Economy: Market Cap of Ford vs. Tesla

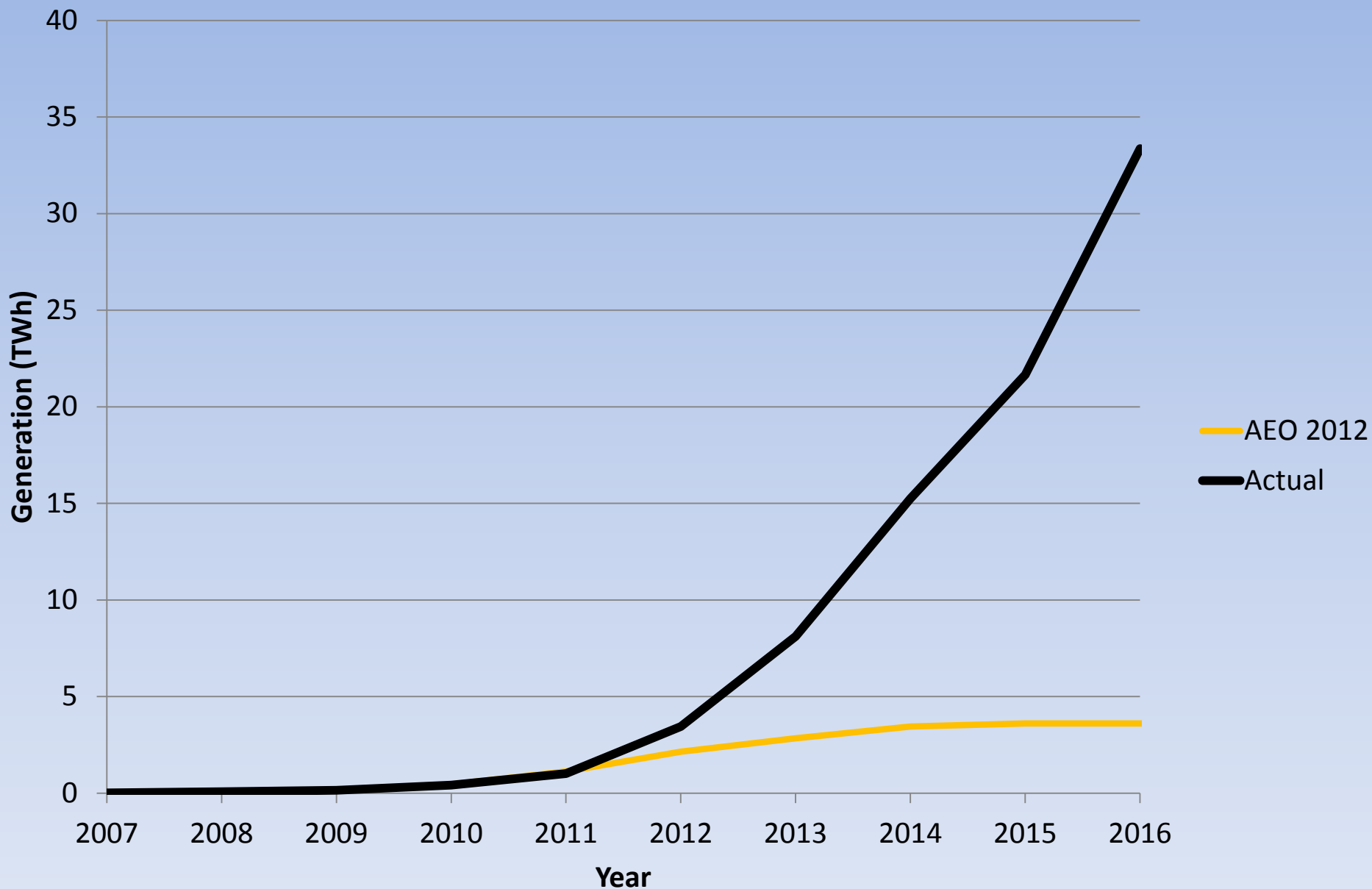


Based on market value as of 8/5/15



**iPhone was first released in 2007**

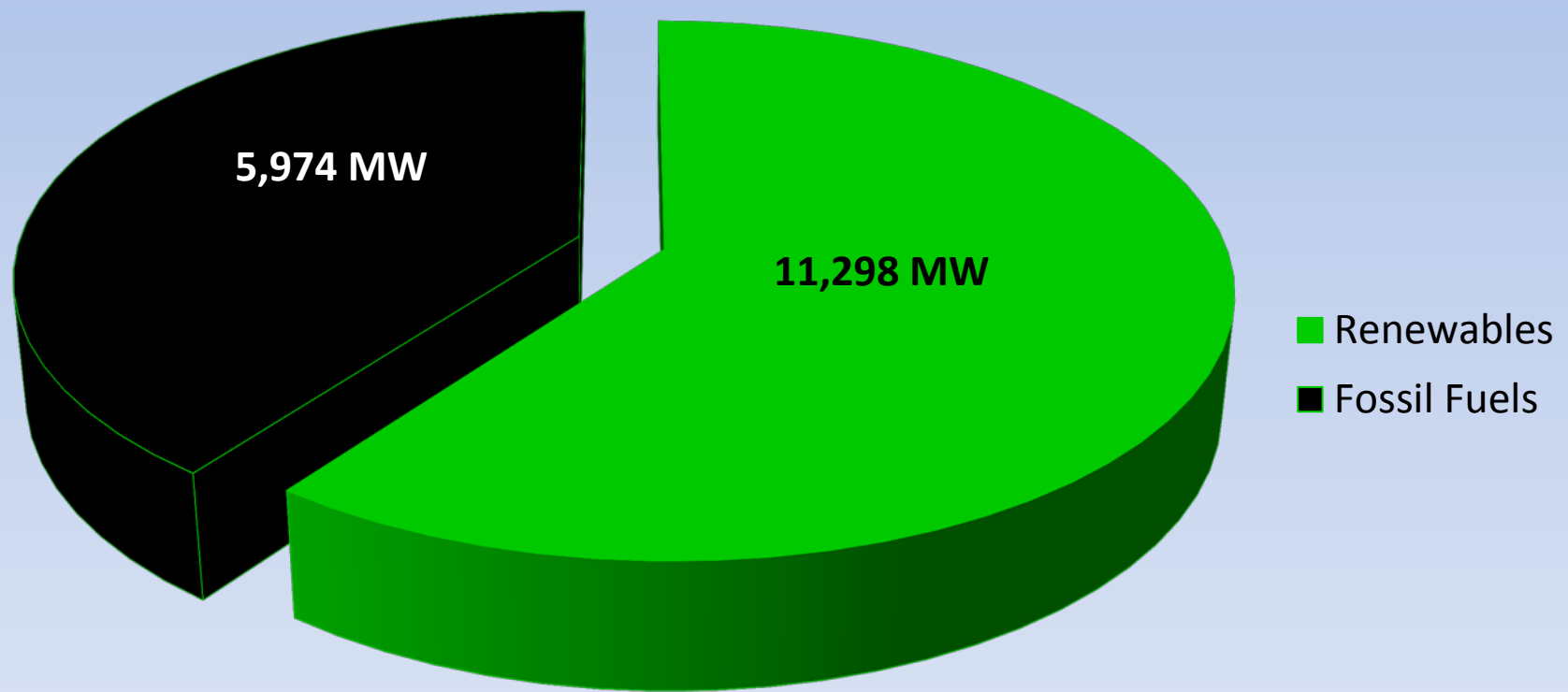
# US Solar PV Generation



Source: EIA *Annual Energy Outlook* 2004-2017, EIA *Electric Power Monthly* July 25, 2017

# Most of the New Generation Added to the Grid is Renewable Energy

Renewables = 65% of New US Electric Generation Capacity in 2015

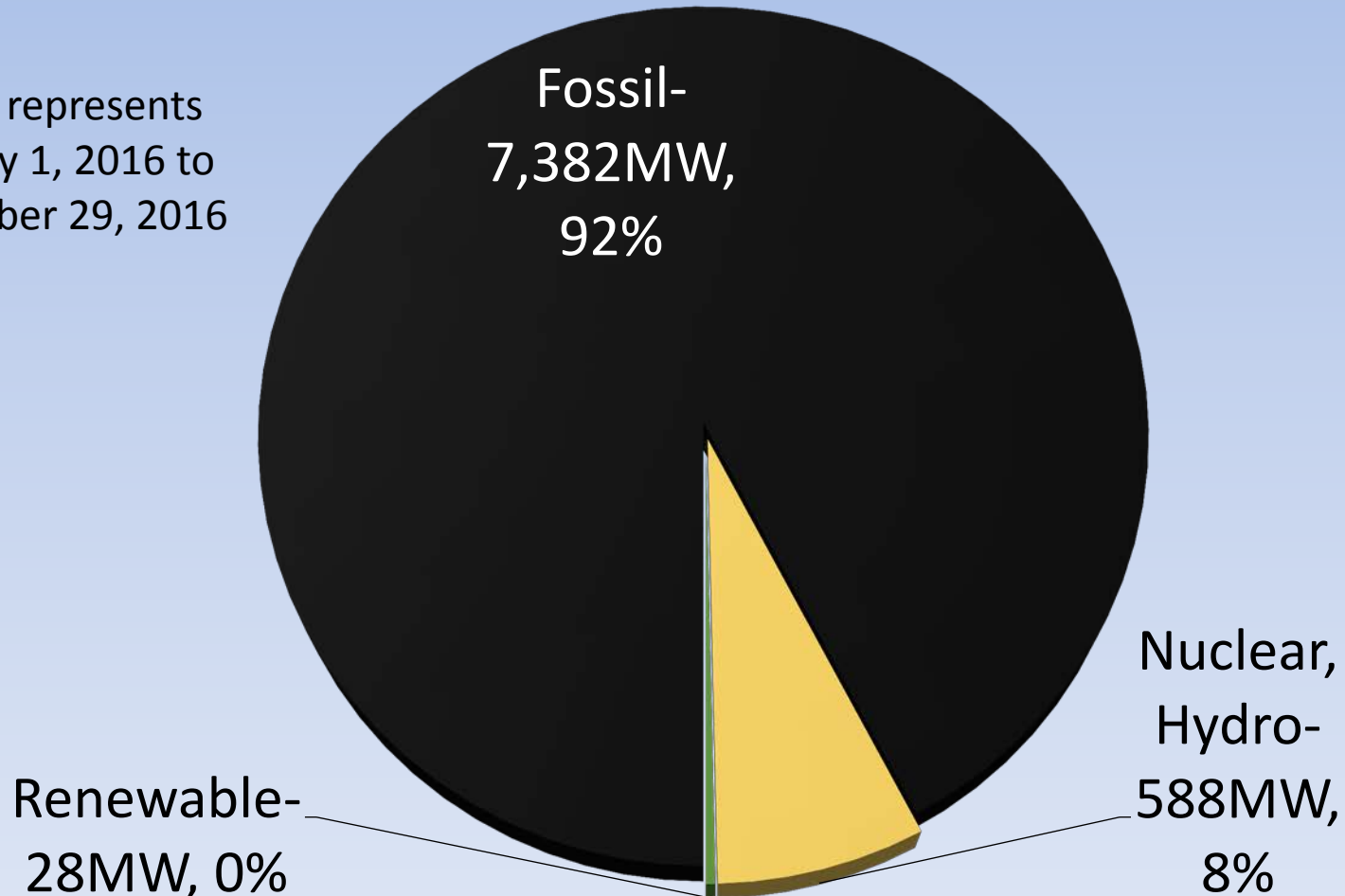




# Most of the Retirements are Fossil Energy

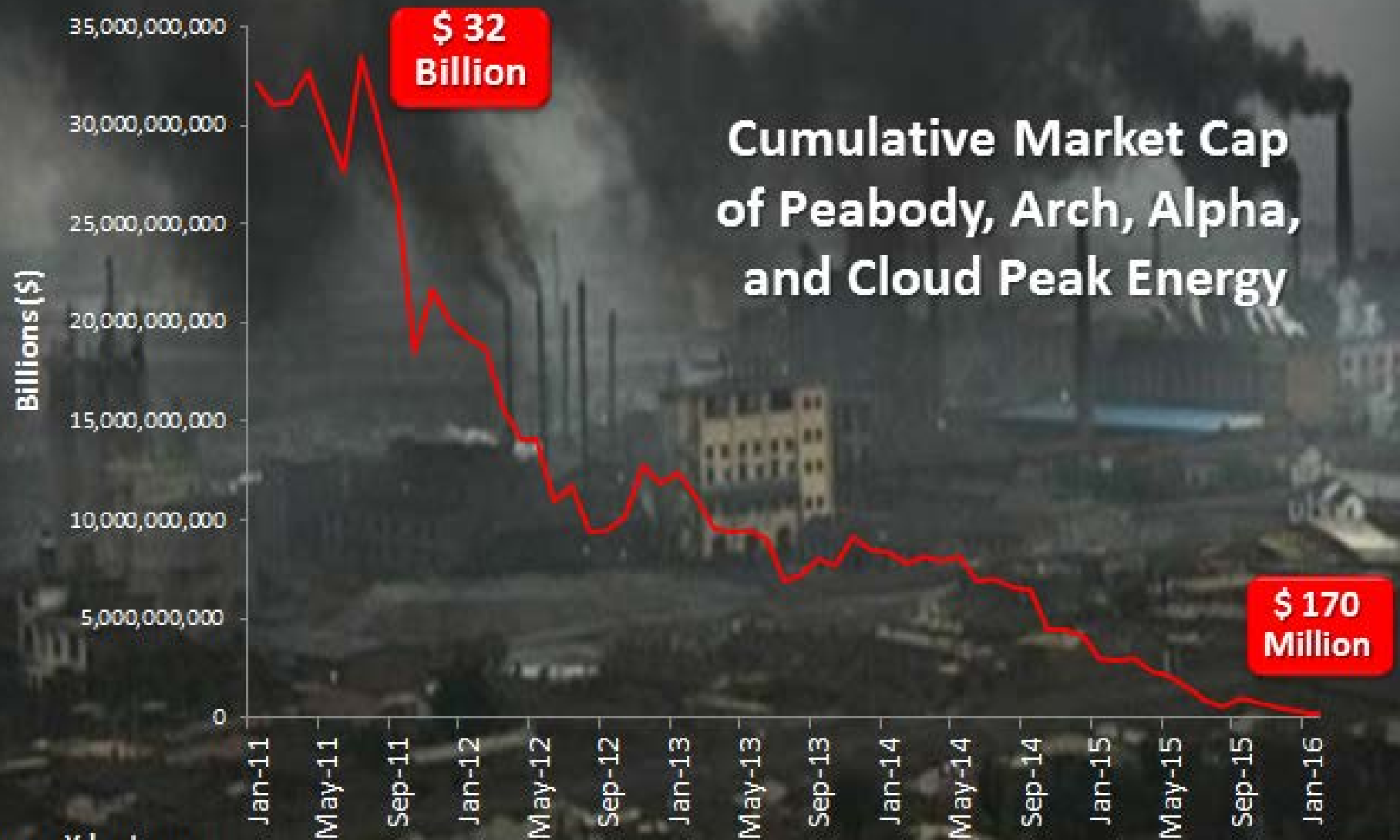
Fossil fuels = 92% of Retired US Electric Generation Capacity in 2016\*

\*Data represents  
January 1, 2016 to  
November 29, 2016

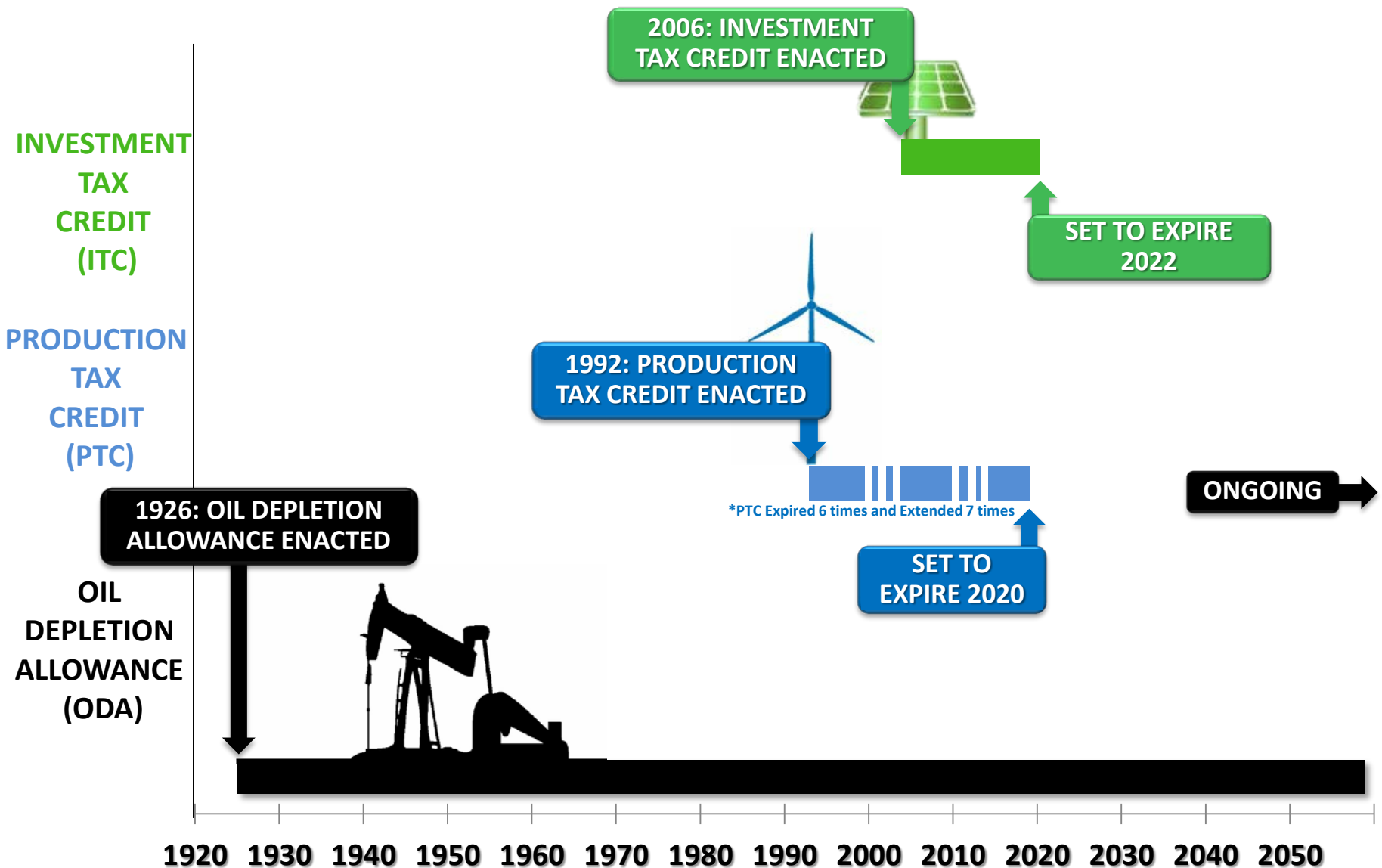


Source: EIA Electric Power Monthly, November 29, 2016. MW represent summer capacity.

# Value of Top 4 US Coal Companies Has Declined 99% Since 2011

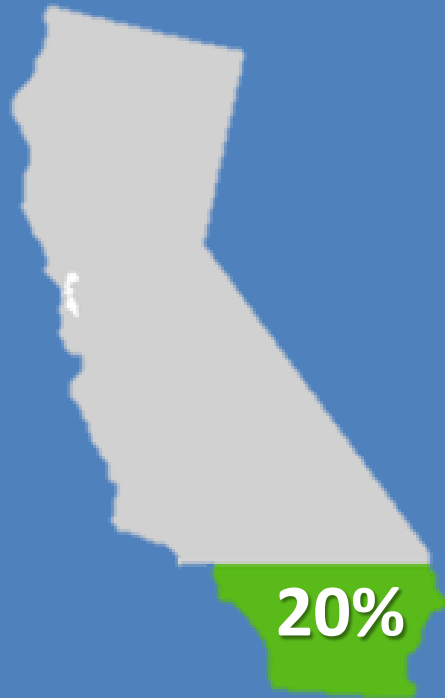


# Federal Energy Subsidies

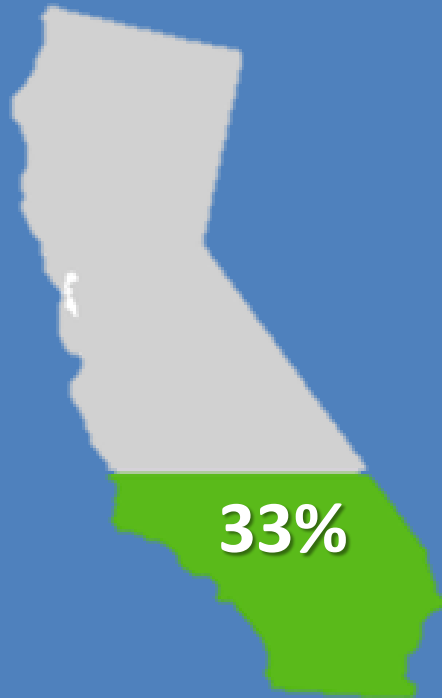




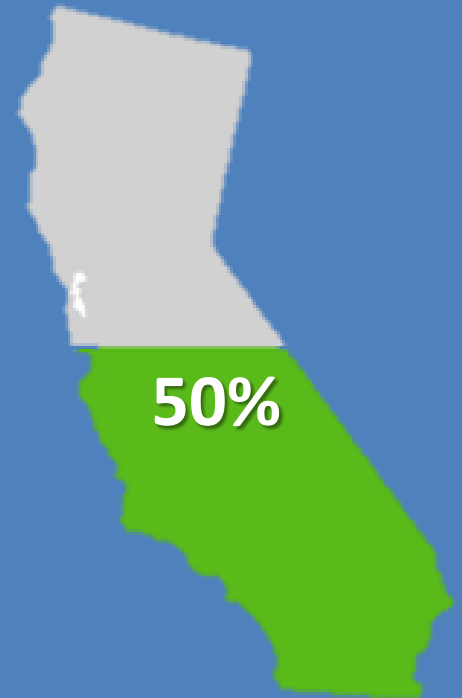
# California Moves to 50% Renewables



**2013**



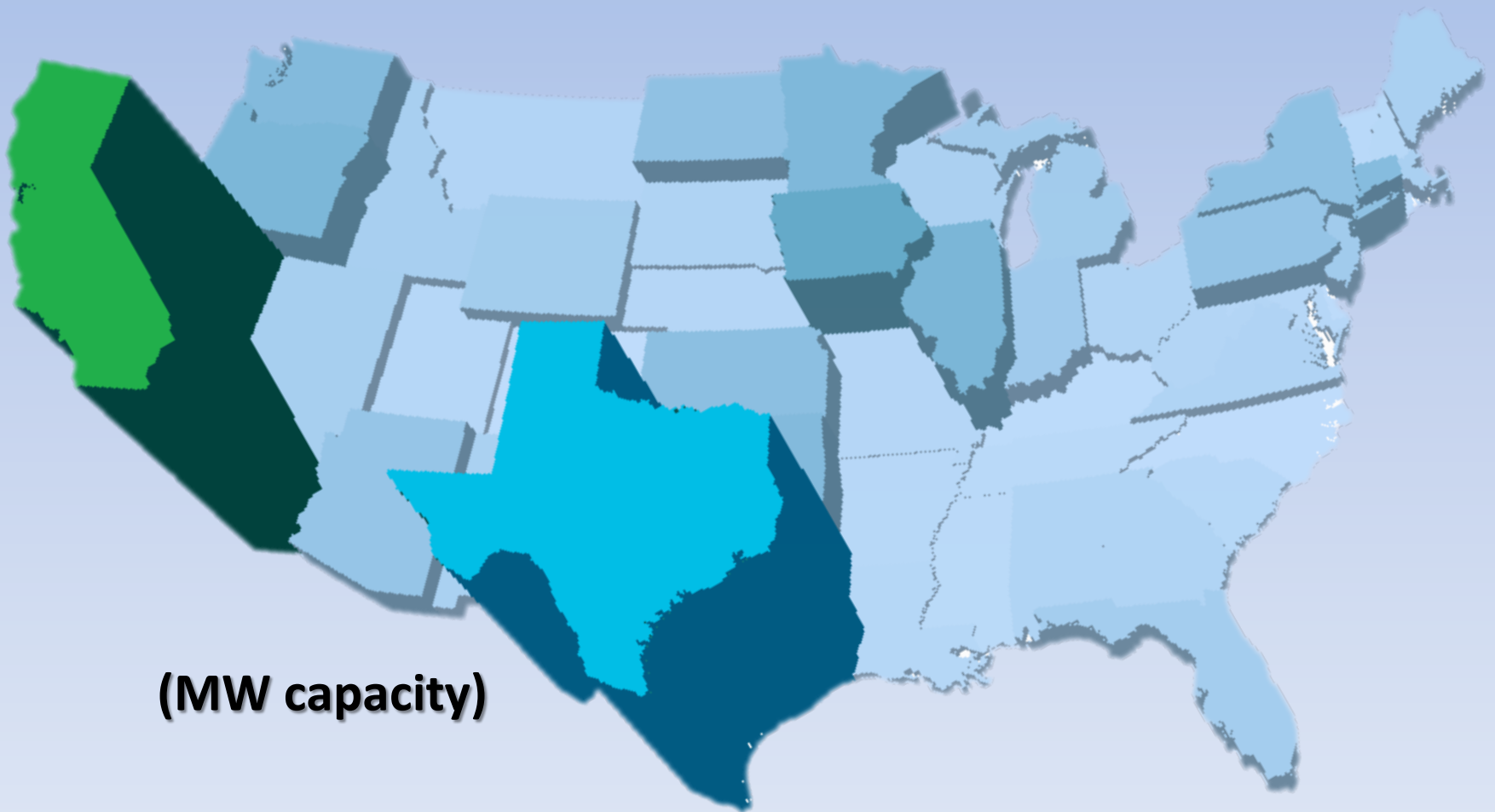
**2020**



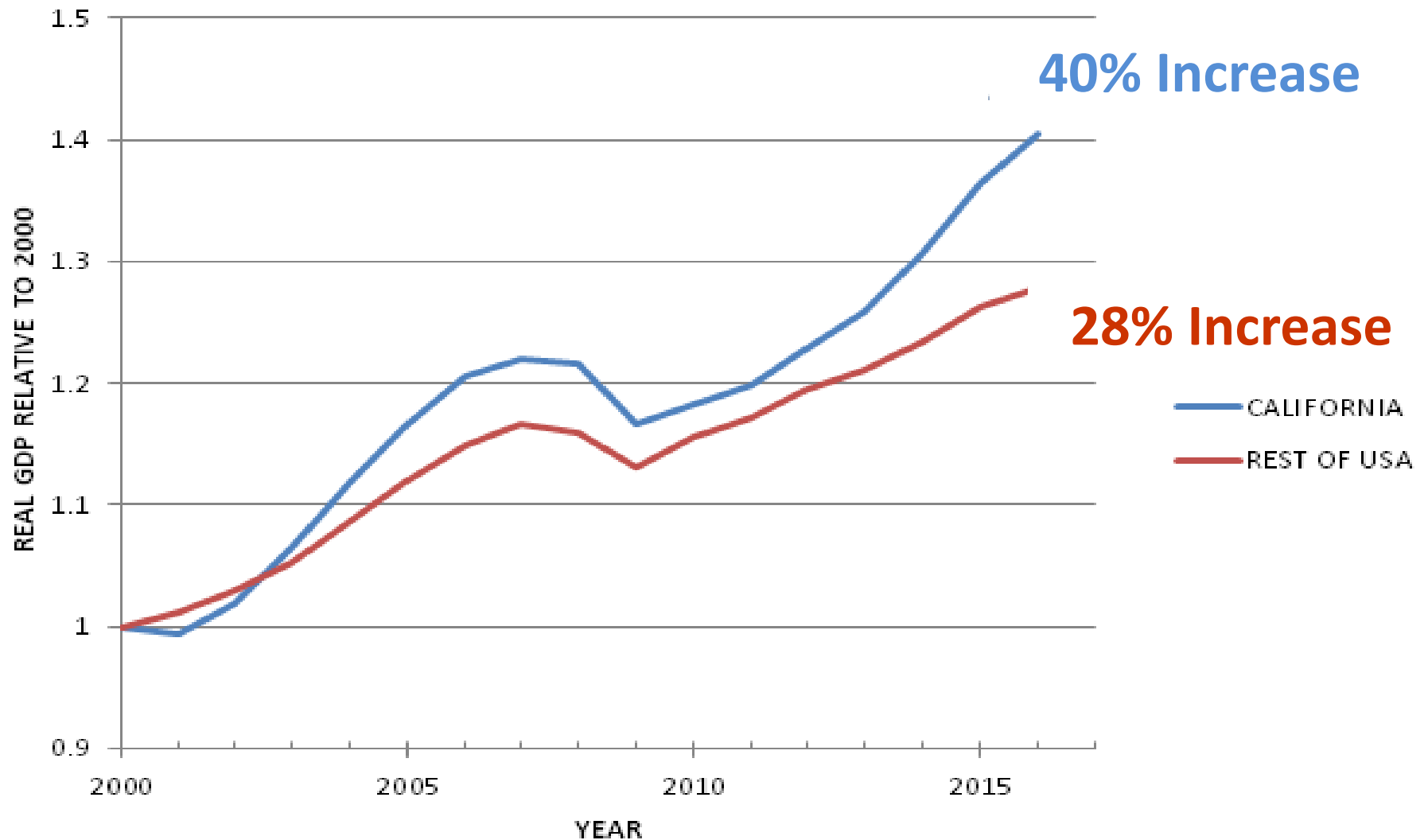
**2030**

# California Leads the US in Renewables Installed.

## What lessons have been learned?

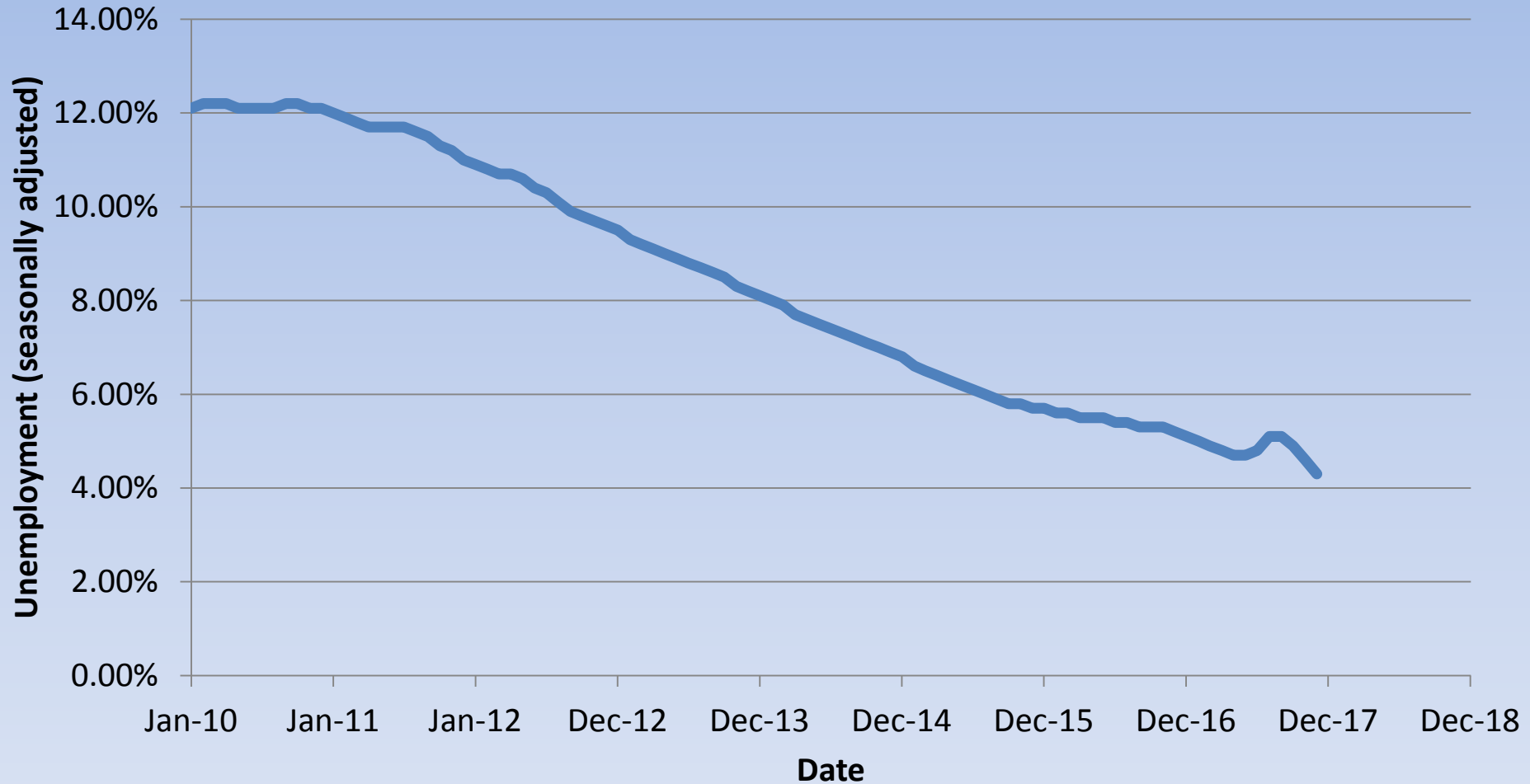


# California's GDP is growing faster than the Nation's



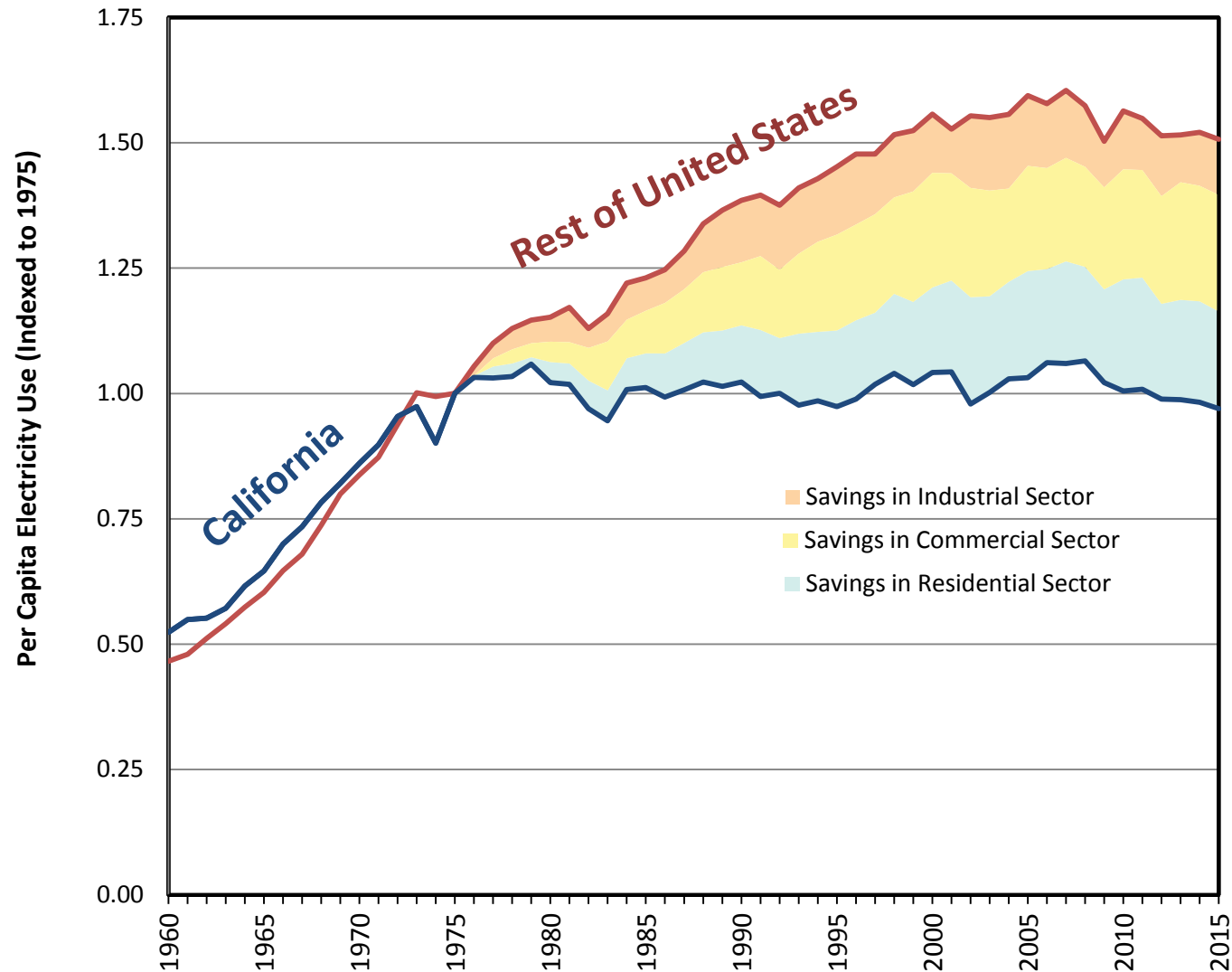
Source: California Department of Finance, Real GDP by state (millions of chained 2009 dollars)  
[http://www.dof.ca.gov/Forecasting/Economics/Indicators/Gross\\_State\\_Product/documents/BBGDPbyState.xlsx](http://www.dof.ca.gov/Forecasting/Economics/Indicators/Gross_State_Product/documents/BBGDPbyState.xlsx)

# California Unemployment Falls to 4.3%



Source: “Unemployment Rate and Labor Force Data Table,” State of California Employment Development Department, Jan 22, 2018. <http://www.labormarketinfo.edd.ca.gov/data/unemployment-and-labor-force.html>

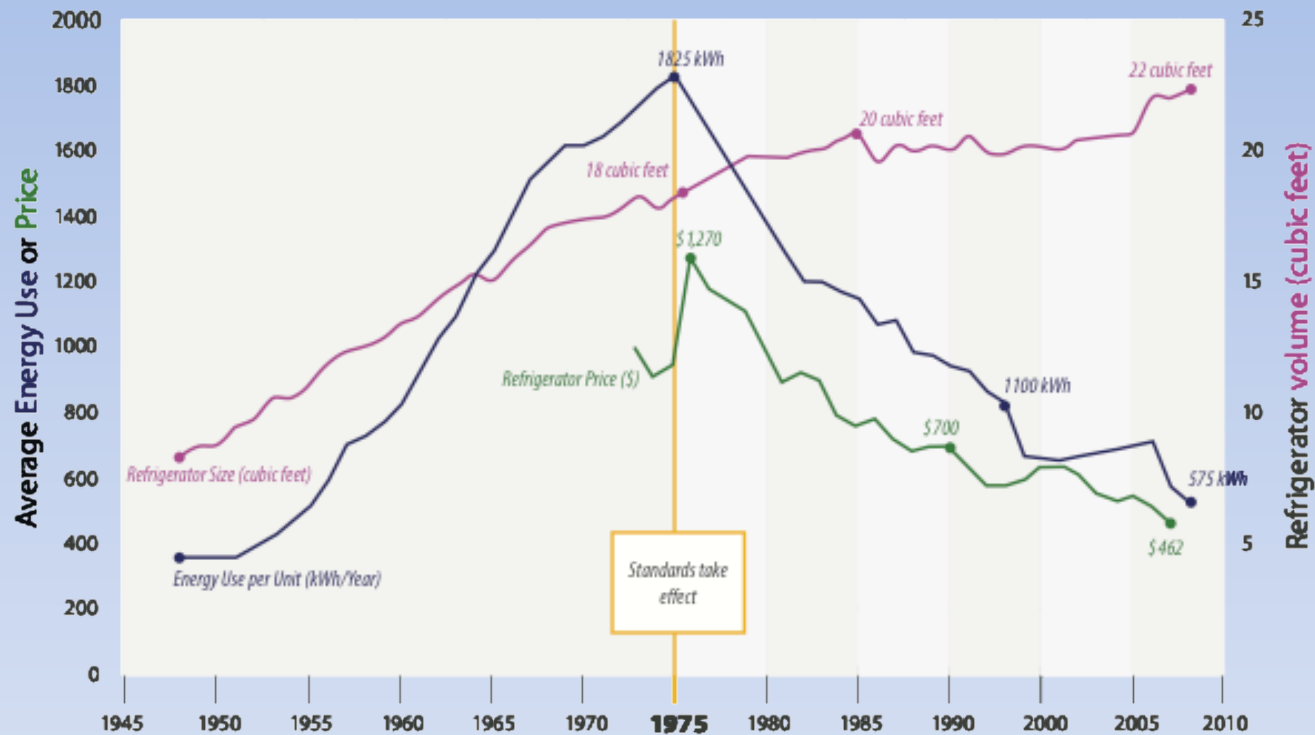
# California Advancing Energy Efficiency



Source: EIA, SEDS database (2017)

# California Advancing Energy Efficiency

New Refrigerator Use v. Time and Retail Prices







**2009:** The Energy Commission's  
TV efficiency standards  
take effect, saving Californians  
**\$1 billion / year**



**2012:** The Commission's  
plug-in charger  
efficiency standards begin  
saving Californians **\$300M / year**

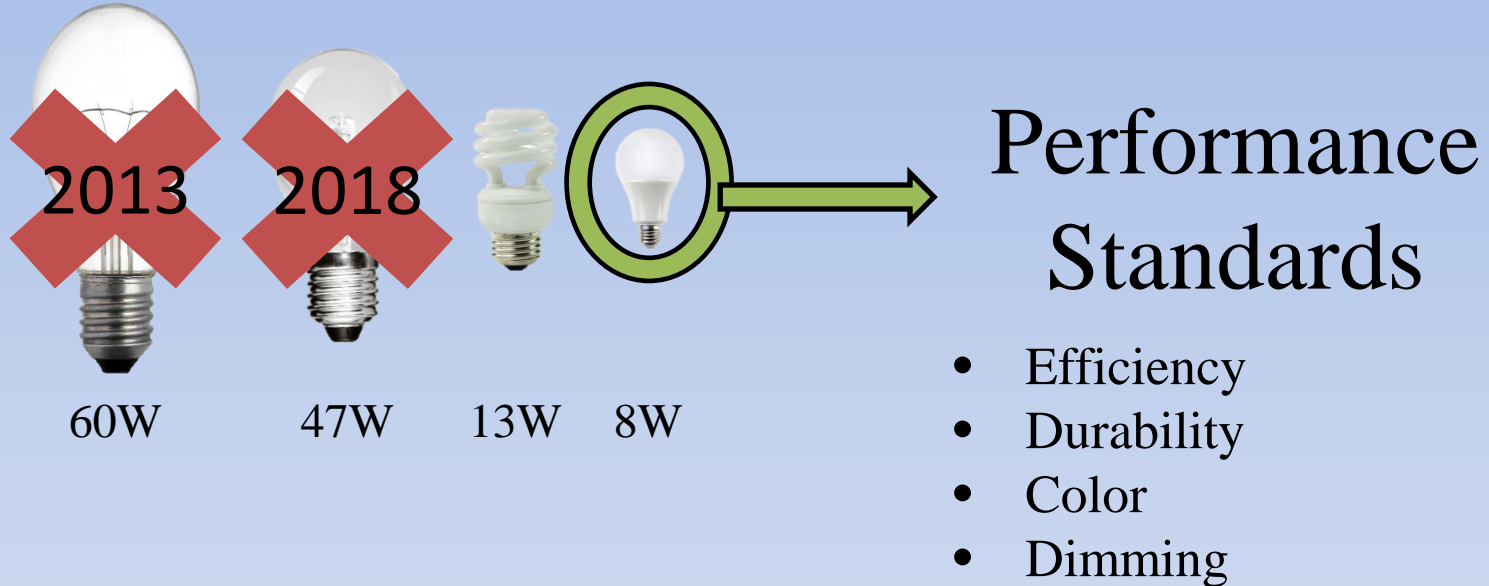


# **CEC'S CURRENT PORTFOLIO OF WATER PROJECTS**

- 20 active projects
- Approximately \$34 million in investment
- Example projects highlighted:
  - Water or wastewater treatment
  - On-site water reuse
  - Agriculture irrigation improvements
  - Water demand side management

# California Light Bulb Standards

Incandescent   Halogen   CFL   LED

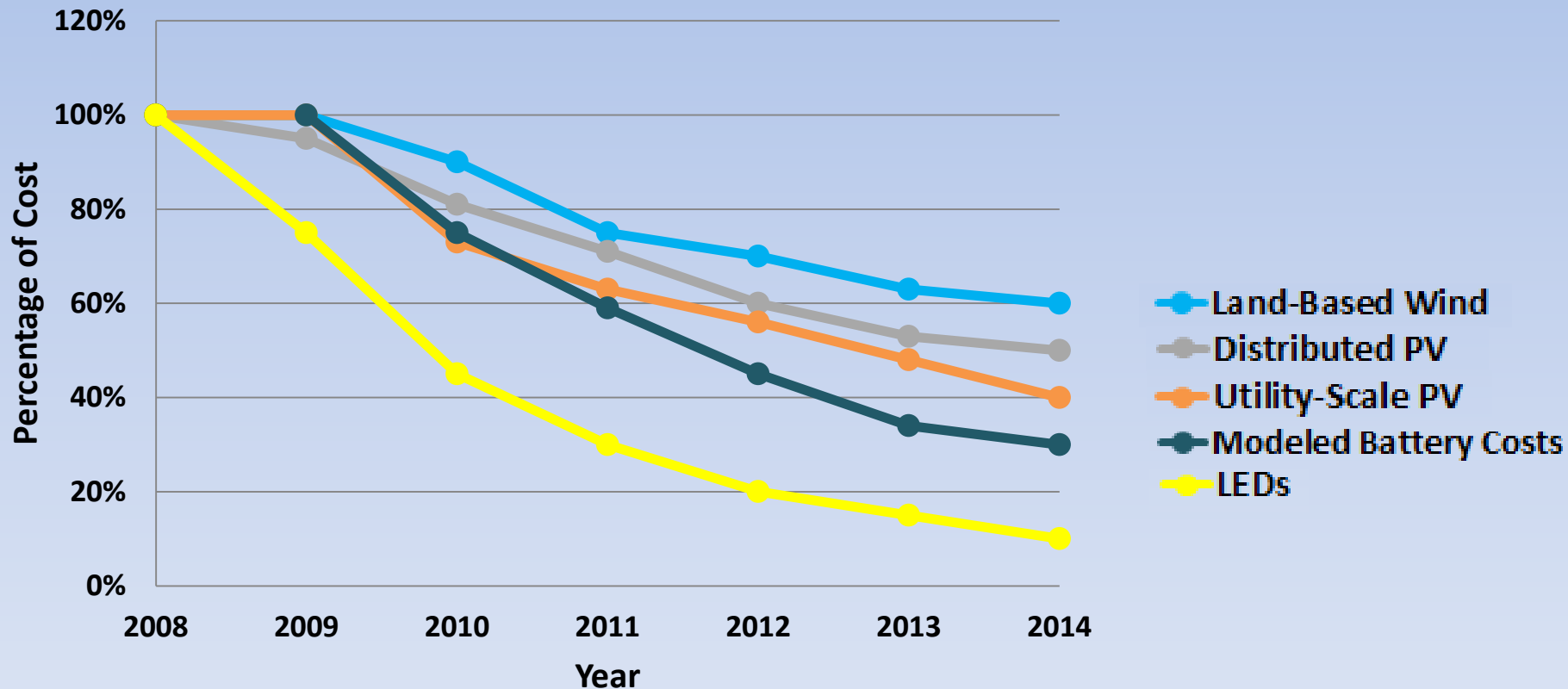


“Once all of these sockets switch over to a more efficient alternative – CFL or LED light bulbs – California consumers and businesses will save an estimated \$1 billion every year on their electric bills.”

Source: “California to Get New Light Bulb Efficiency Standards Jan 1,” Natural Resources Defense Council, Dec 19, 2018. <https://www.nrdc.org/experts/noah-horowitz/california-get-new-light-bulb-efficiency-standards-jan-1>

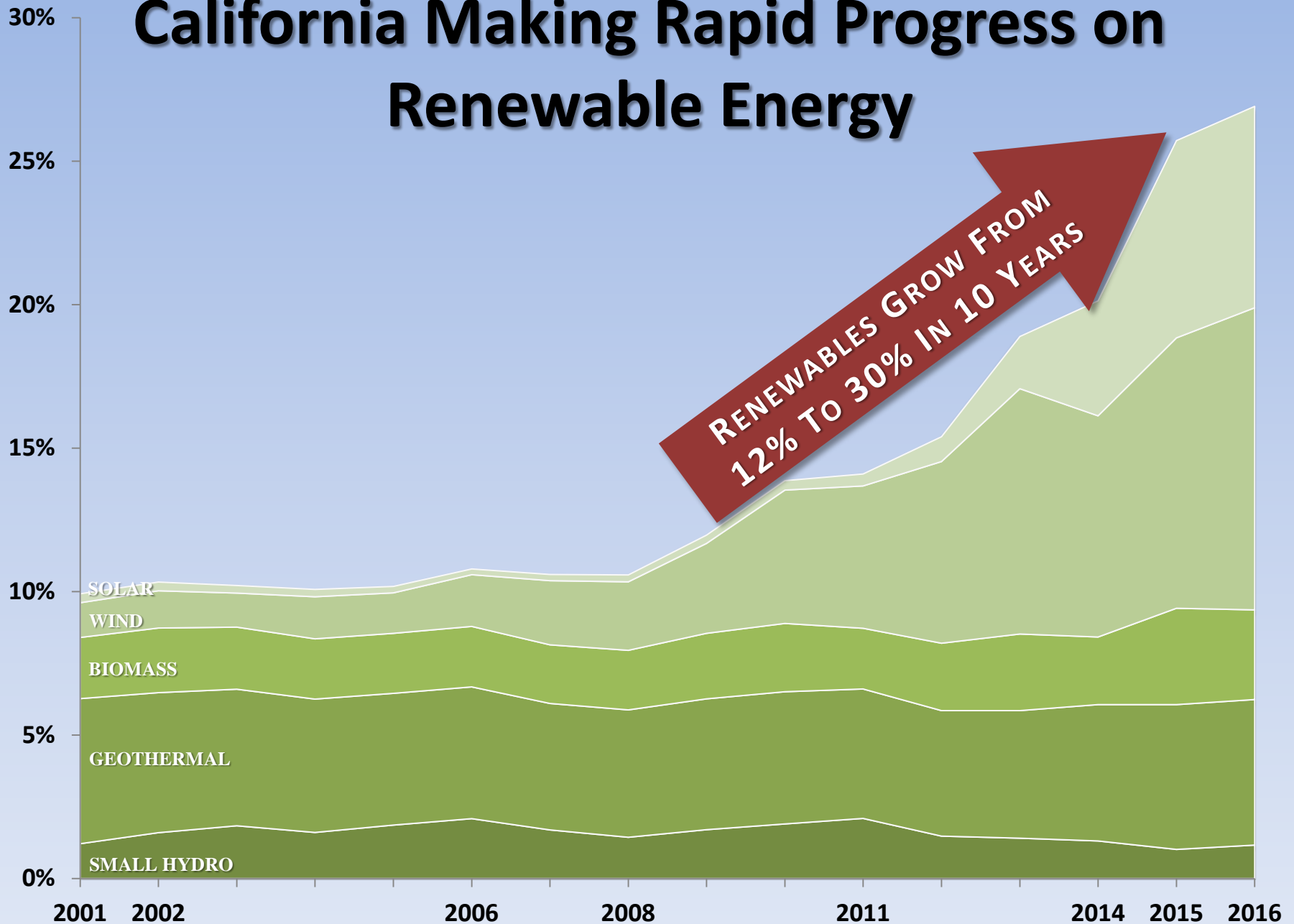
# The Falling Cost of Clean Energy Technologies

Indexed Cost Reductions Since 2008



Source: DOE Report, Revolution Now,  
The Future Arrives for Five Clean  
Energy Technologies, 2015

# California Making Rapid Progress on Renewable Energy



**“The people who say it can’t be done  
should get out of the way of the people  
who are doing it”**

**- Chinese proverb**



# The World's Largest Thin Film Solar PV Project

An aerial photograph of the Desert Sunlight Solar Project in Riverside County, California. The image shows a massive, rectangular grid of blue thin-film solar panels covering a large area of arid, sandy desert. The panels are arranged in a precise, repeating pattern, with white lines separating the individual modules. The surrounding landscape is dry and hilly, with some sparse vegetation and a few small structures visible in the distance. The sky is clear and blue.

**Desert Sunlight Solar  
Project  
550 MW  
Riverside 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 Geothermal Power Plant

**Geysers Geothermal Power Plant**  
**955 MW**  
**Lake County, CA**





# The World's Largest Wind Project

**Alta Wind Energy Center**  
**1550 MW**  
**Kern County, CA**



# World's Largest Solar Rooftop

Apple HQ  
Cupertino, CA  
17MW





# World's 2<sup>nd</sup> Largest Lithium-Ion Battery Storage Project



Escondido Storage Project  
120 MWh  
San Diego, CA



# California Leads the Nation in Biomass Energy Generation

Honey Lake Biomass Plant  
Lassen County, CA



# Offshore Wind: CA's New Renewable Resource?

**Rhode Island's 30MW Deepwater Wind Project is the first offshore wind project completed in the US.**



# **New technology now enables deep water installations**





# Largest Manufacturing Plant in CA Produces Electric Vehicles

Tesla employs 38,000  
people



Tesla Factory  
Fremont, CA



**398,000  
ELECTRIC VEHICLES  
IN CALIFORNIA  
TODAY**

1900. Where is the first car?

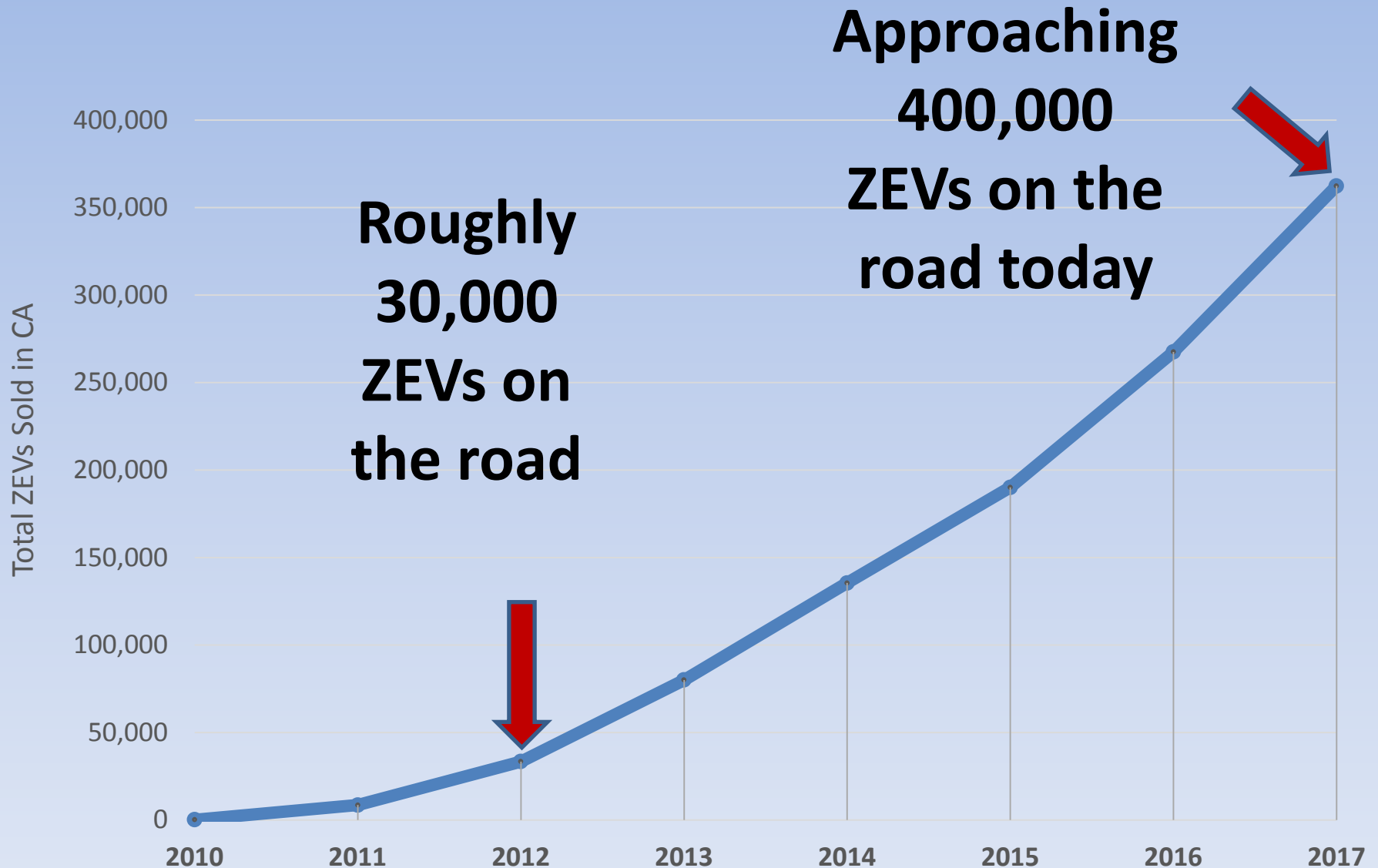




# 1913. Where is the last horse?



# Zero Emission Vehicles in CA



Includes PHEVs, BEVs, and FCEVs

Source: [www.hybridcars.com](http://www.hybridcars.com). Veloz, assumes CA sales are 48% of US sales

# California Requires Zero Net Electricity for all New Homes by Jan 1, 2020

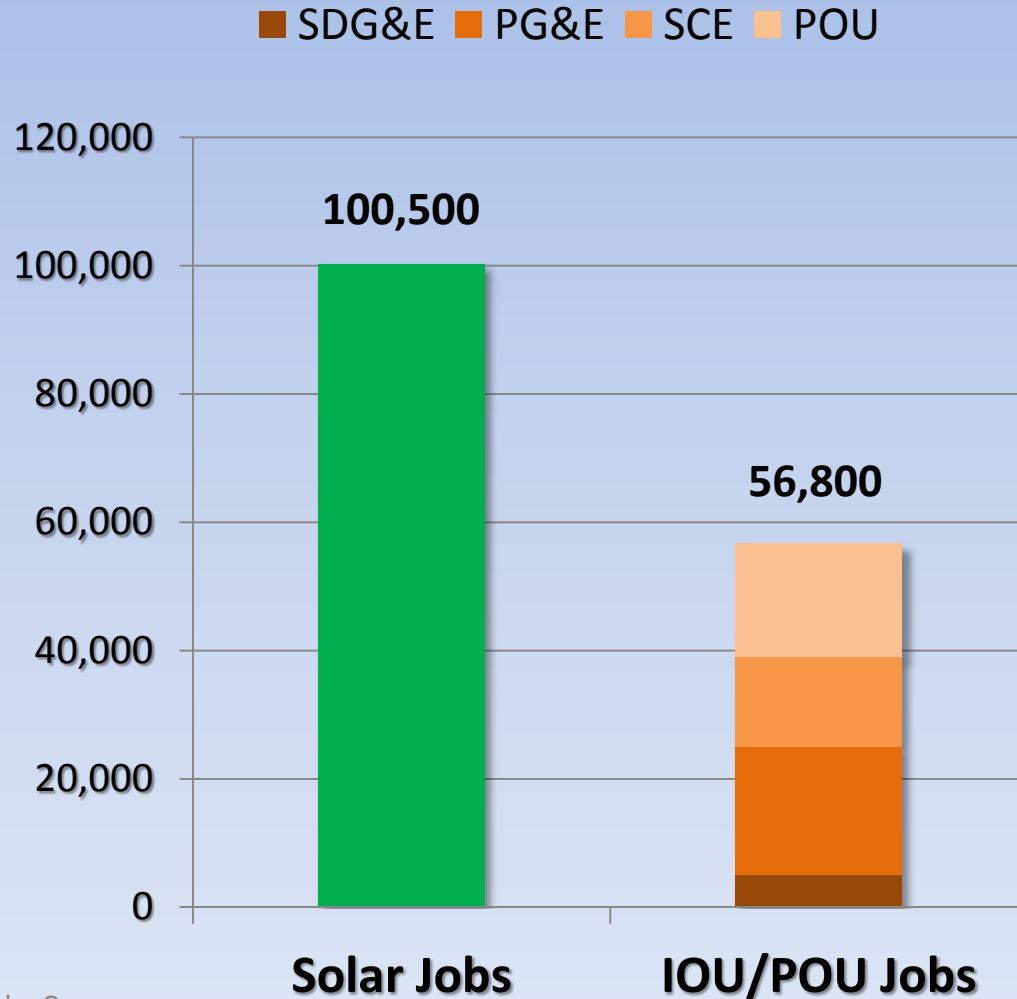


**Zero Energy Community  
Rocklin, CA**





# More Californians Work in the Solar Industry Than for All Utilities Combined



## Sources:

Solar Foundation, 2016 Solar Jobs Census

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

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

# The Future of Energy Storage: 1.3 GW by 2020



\$5 B Tesla Battery Factory under construction

# Toward the Electrification of Almost Everything and 100% Renewables





# 14,000 Electric Vehicle Charging Stations in CA

Map of Level 2 charging stations  
(not including privately owned  
chargers)



**Source:** PlugShare.com, US Department of Energy  
Alternative Fuels Data Center

**Map Source: PlugShare  
(June 2016)**

# **Stanford University Converts Space and Water Heating from Natural Gas to Electricity**



**Reduces water use and GHG emissions by  $\frac{2}{3}$   
and annual energy bills by  $\frac{1}{3}$**



# Now Selling: The All-Electric Home



CityVentures all-electric homes  
Bellflower, CA

# High Speed Rail is Coming to California and it will be 100% Powered by Renewables...



# **New Private Sector Leadership to Move Beyond Fossil Fuels**

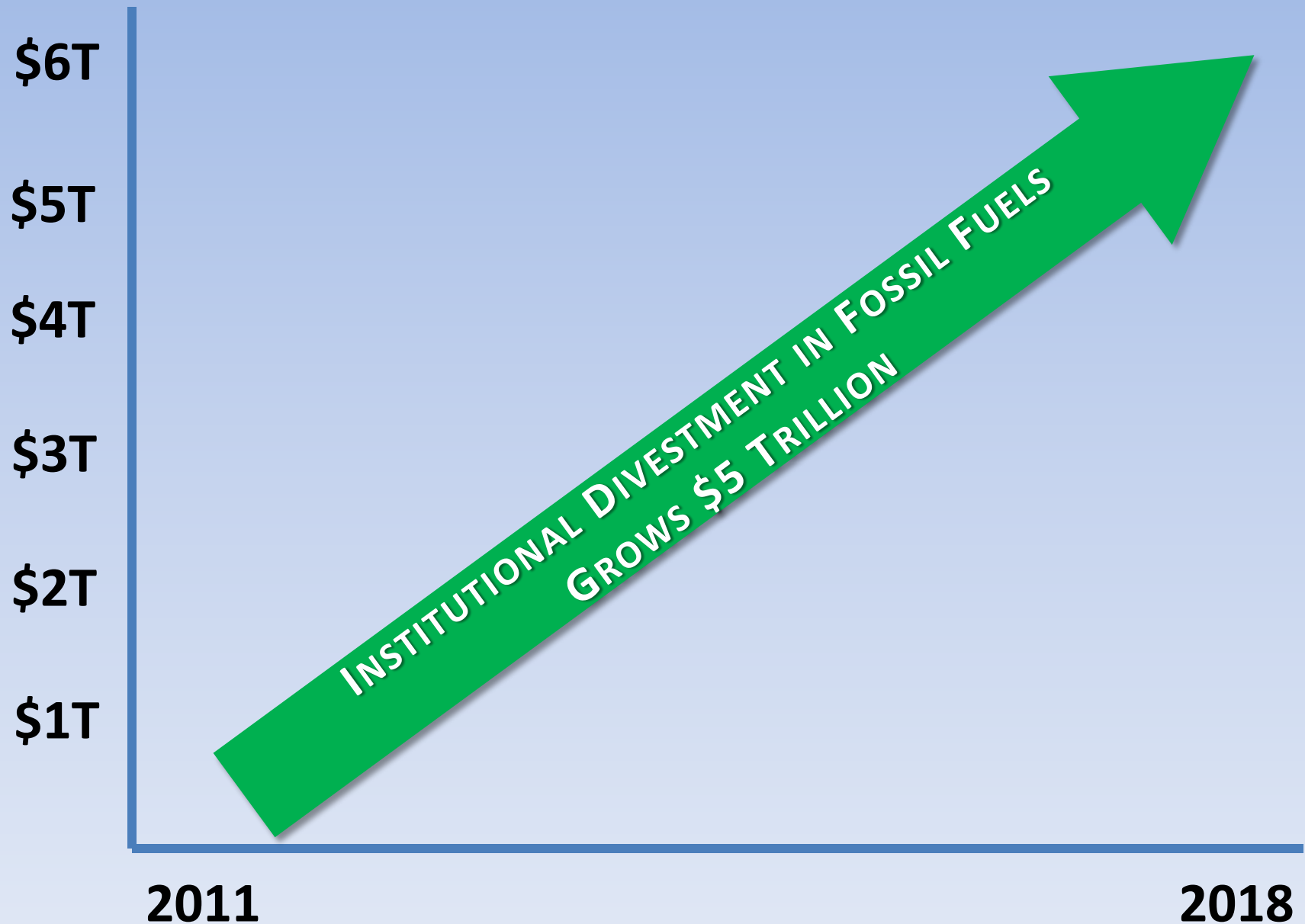


# Companies Committing to 100% Renewable Energy

Google



# Divestment of Fossil Fuels Reaches \$6 Trillion

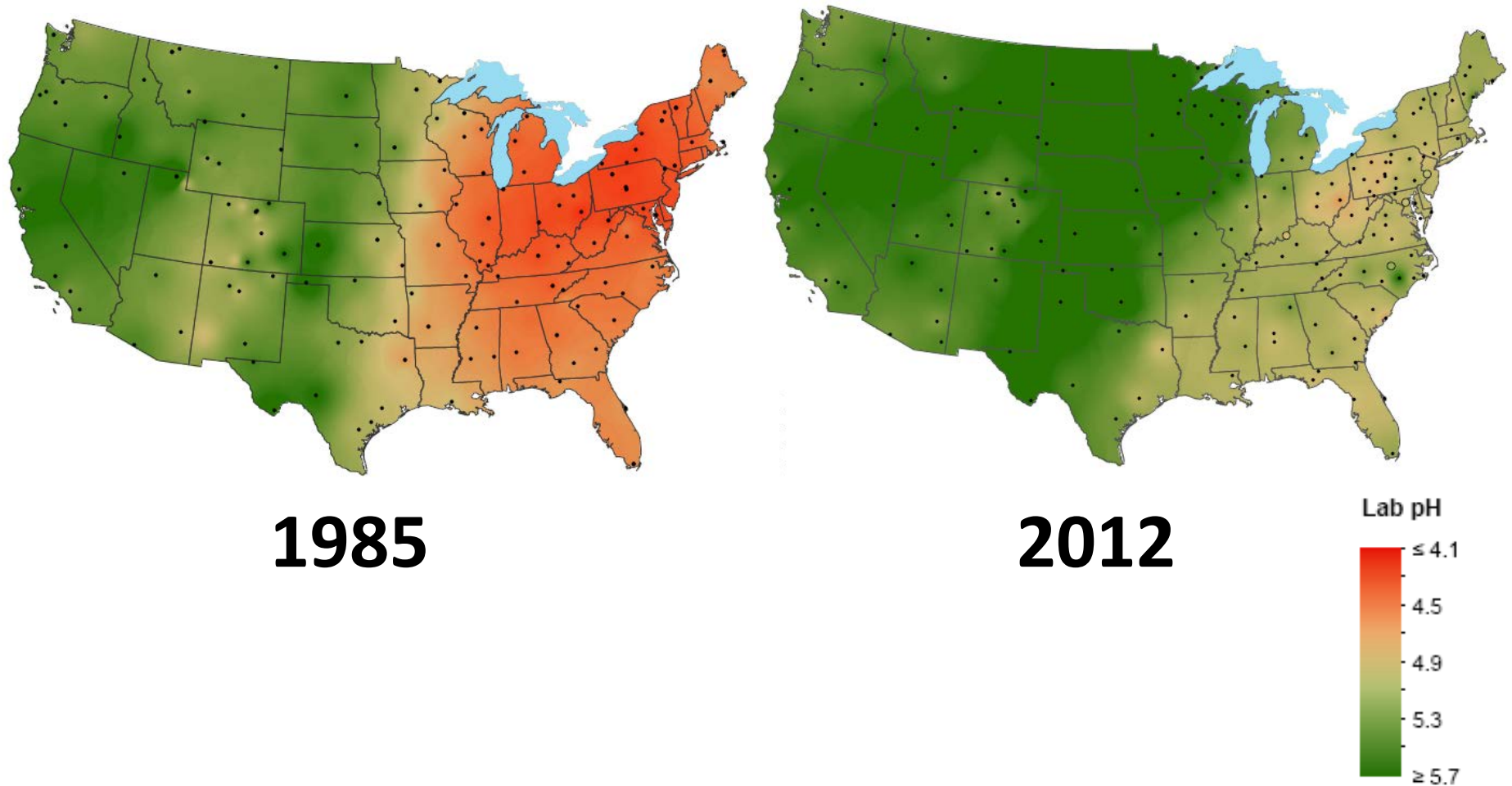




# Drawing Lessons From Successful Campaigns: The Story of Acid Rain



# Reduction in Acid Rain



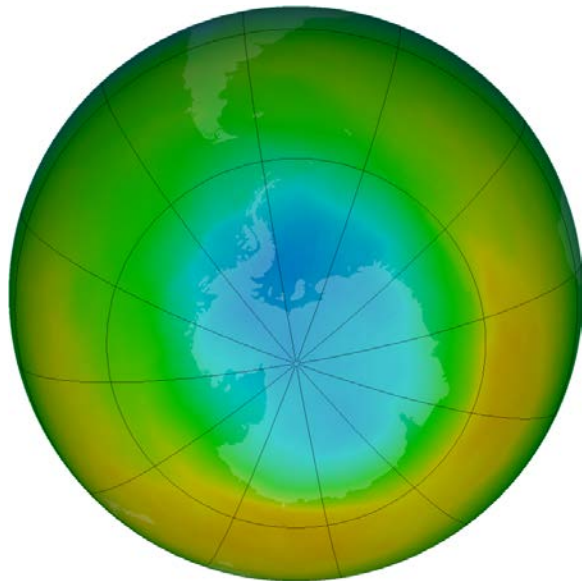
**1985**

**2012**

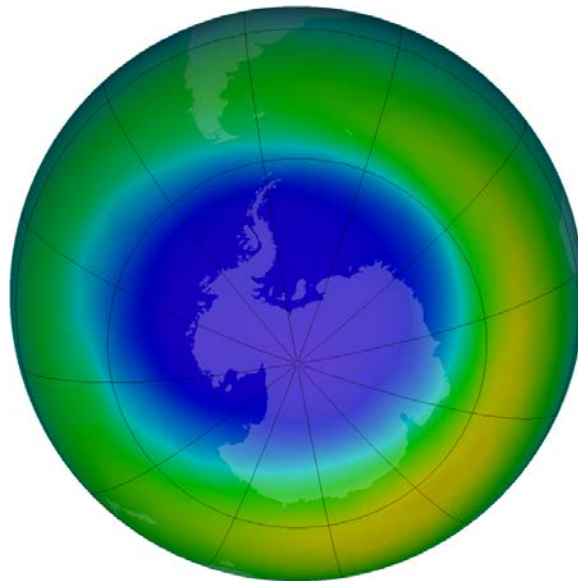
Source: National Atmospheric Deposition Program, 2014

<http://nadp.sws.uiuc.edu/ntn/annualmapsByYear.aspx>

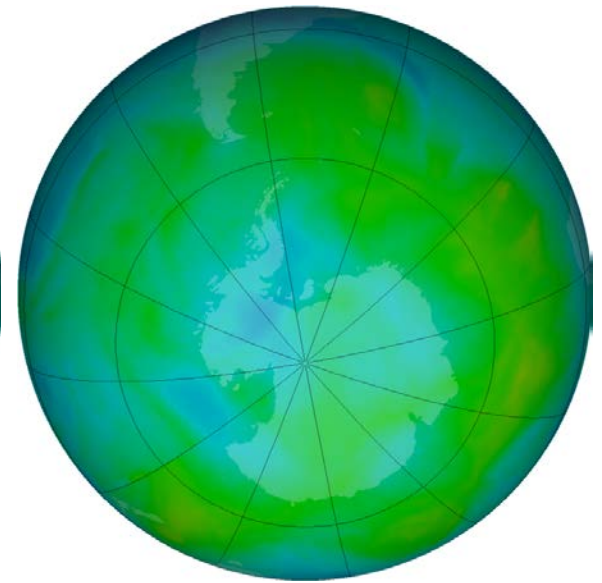
# The Ozone Hole



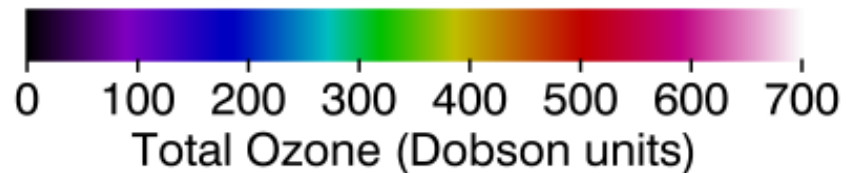
**1979**



**2013**



**2050  
(expected)**





# Smoking in the US



According to repeated nationwide surveys,

## More Doctors Smoke **CAMELS** than any other cigarette!

Doctors in every branch of medicine were asked, "What cigarette do you smoke?" The brand named most was Camel!

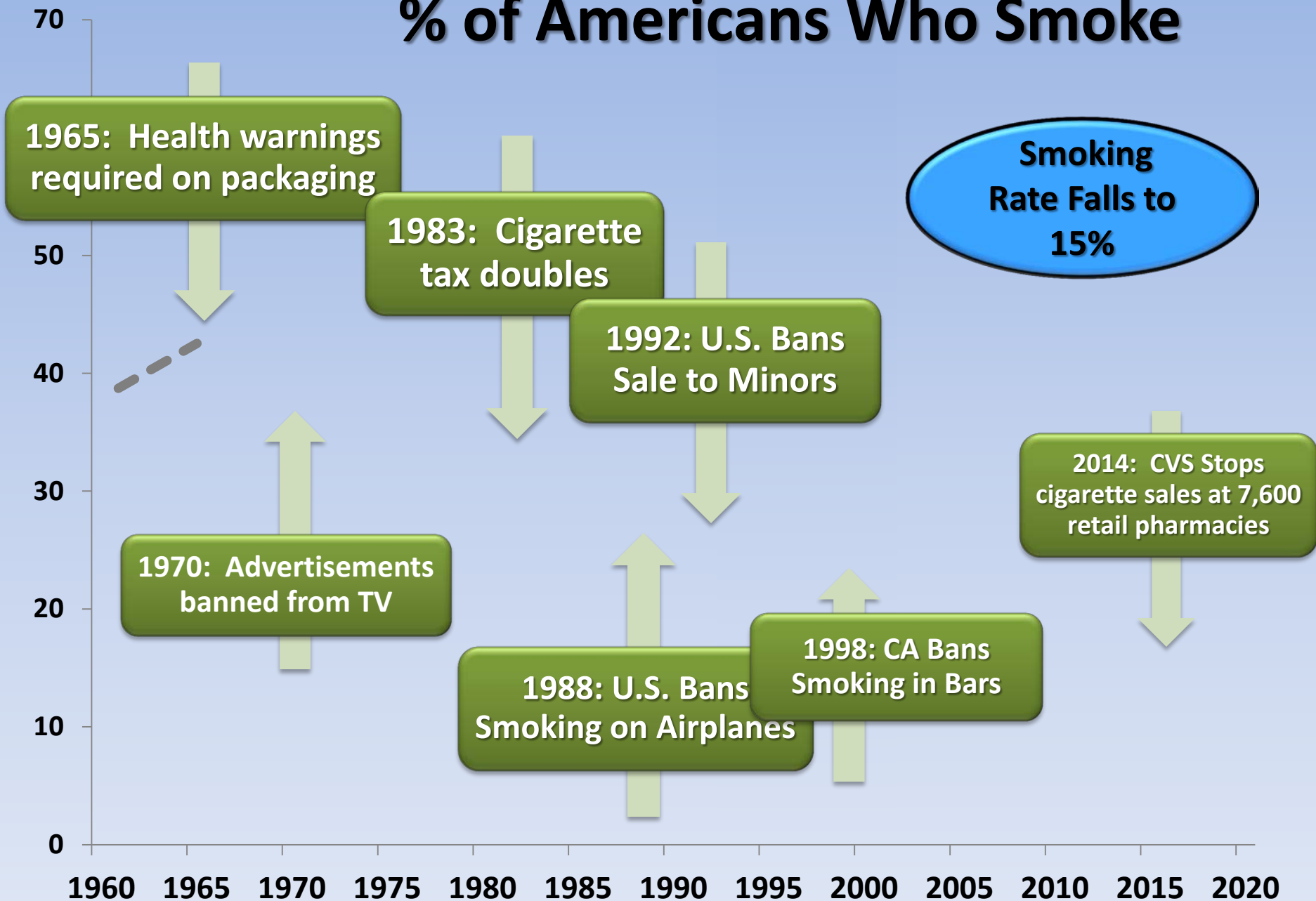
You'll enjoy Camels for the same reasons so many doctors enjoy them. Camels have cool, cool *mildness*, pack after pack, and a flavor unmatched by any other cigarette. Make this sensible test. Smoke only Camels for 30 days and see how well Camels please your taste, how well they suit your throat as your steady smoke. You'll see how enjoyable a cigarette can be!

THE DOCTORS' CHOICE IS AMERICA'S CHOICE!

For 30 days, test Camels in your "T-Zone" ("T" for Throat, "T" for Taste).



# % 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](http://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/index.htm)

# The Largest Tree in the World



**Sequoia National Park  
California**







# Thank you



**David Hochschild**  
**California Energy Commission**  
**[David.hochschild@energy.ca.gov](mailto:David.hochschild@energy.ca.gov)**