

SUNRISE FROM THE WEST: DRIVING CALIFORNIA INTO THE CLEAN ENERGY ERA



David Hochschild
Commissioner
California Energy Commission

Electric

FOR



ALL





Transportation is the state's top source of emissions

50% of GHG emissions

80% of nitrogen oxide emissions

90% of diesel PM emissions

Rapid decarbonization of transportation is imperative to achieve economy-wide carbon neutrality by 2045, as other sectors will take more time for technologies to develop

14 countries representing 43% of the world's population are phasing out sales of traditional internal combustion engine (ICE) vehicles



Austria
2020



Costa Rica
2021



Norway
2025



South Korea
30% by 2030



Germany
2030



Ireland
2030



Israel
2030



Netherlands
2030



India
2030



Denmark
2030



U.K.
2040



China
2040



Taiwan
2040



France
2040

Largest Manufacturing Plant in CA Produces Electric Vehicles

Tesla employs 38,000
people



Tesla Factory
Fremont, CA



**580,000
ELECTRIC VEHICLES
IN CALIFORNIA
TODAY**

1900. Where is the first car?



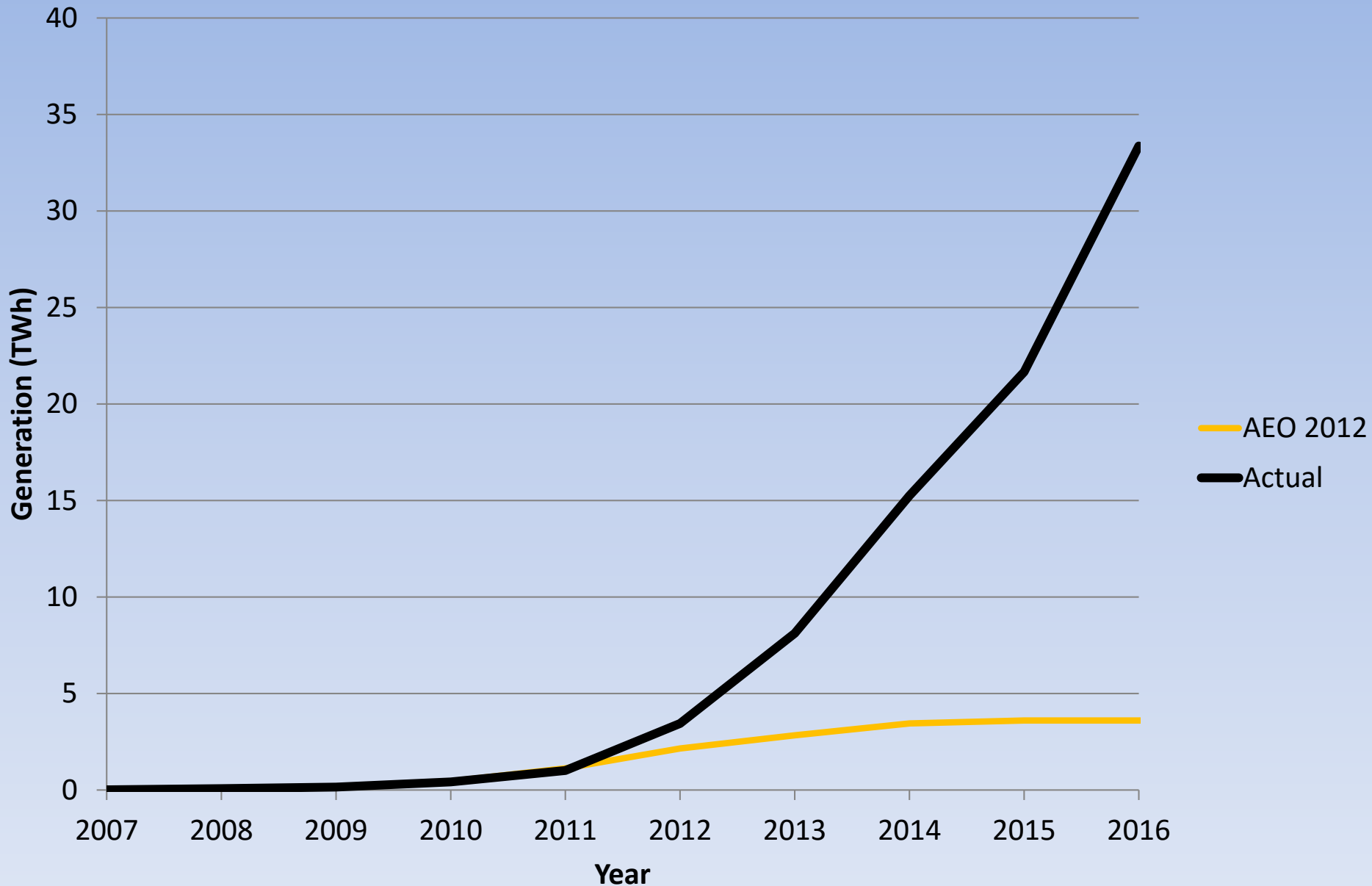
1913. Where is the last horse?



ZEV Manufacturers *in California*



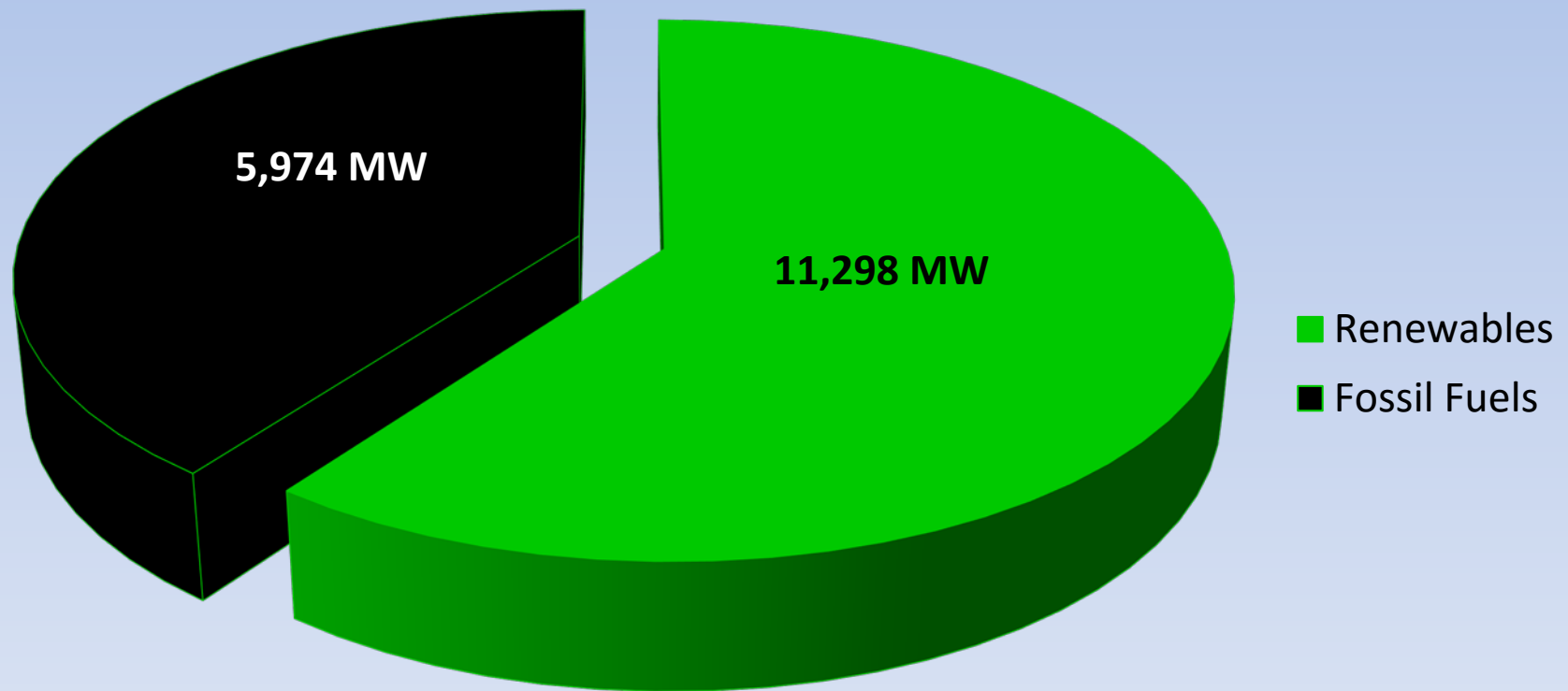
US Solar PV Generation



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

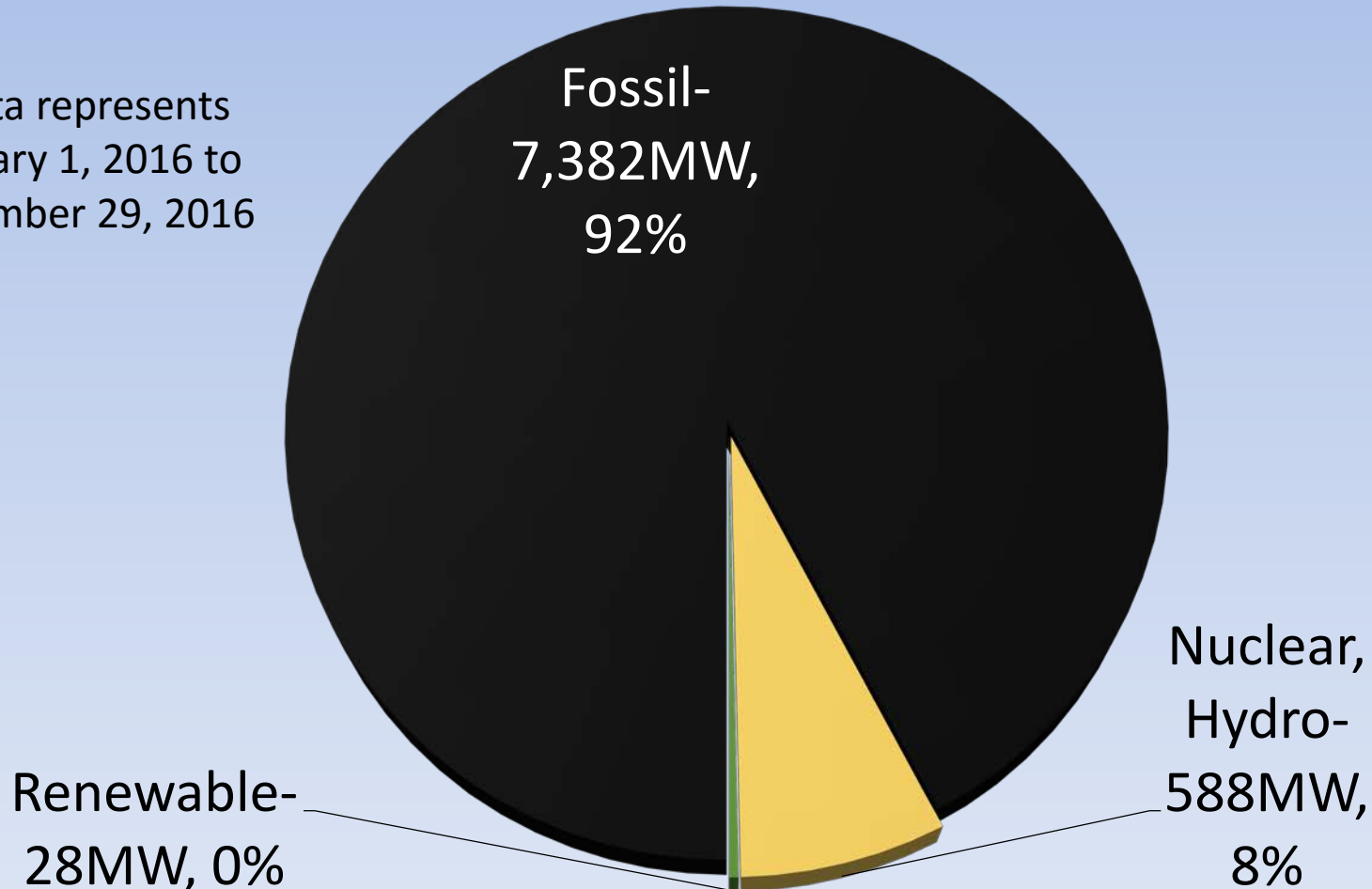
Renewables = 65% of New US Electric Generation Capacity in 2015



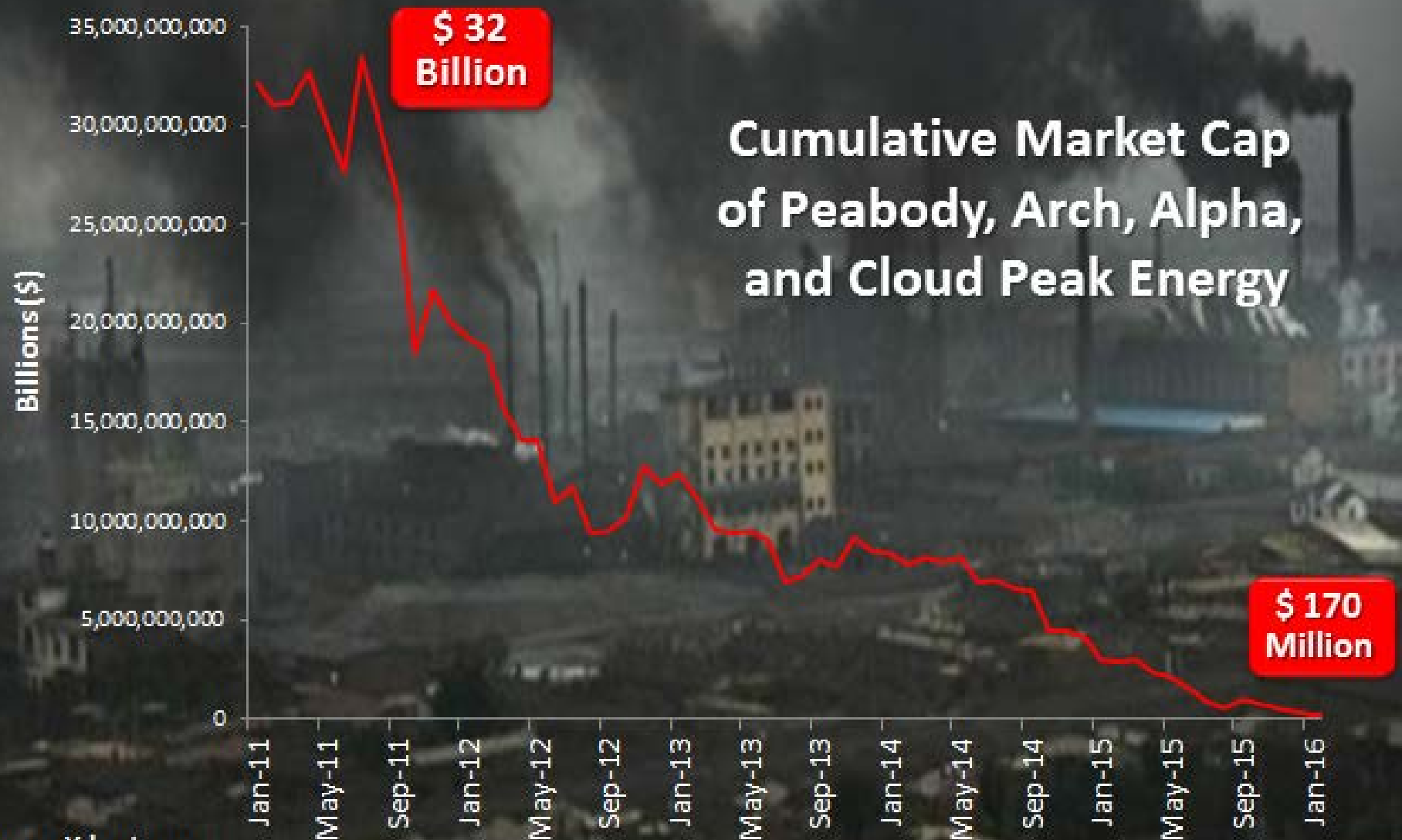
Most of the Retirements are Fossil Energy

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

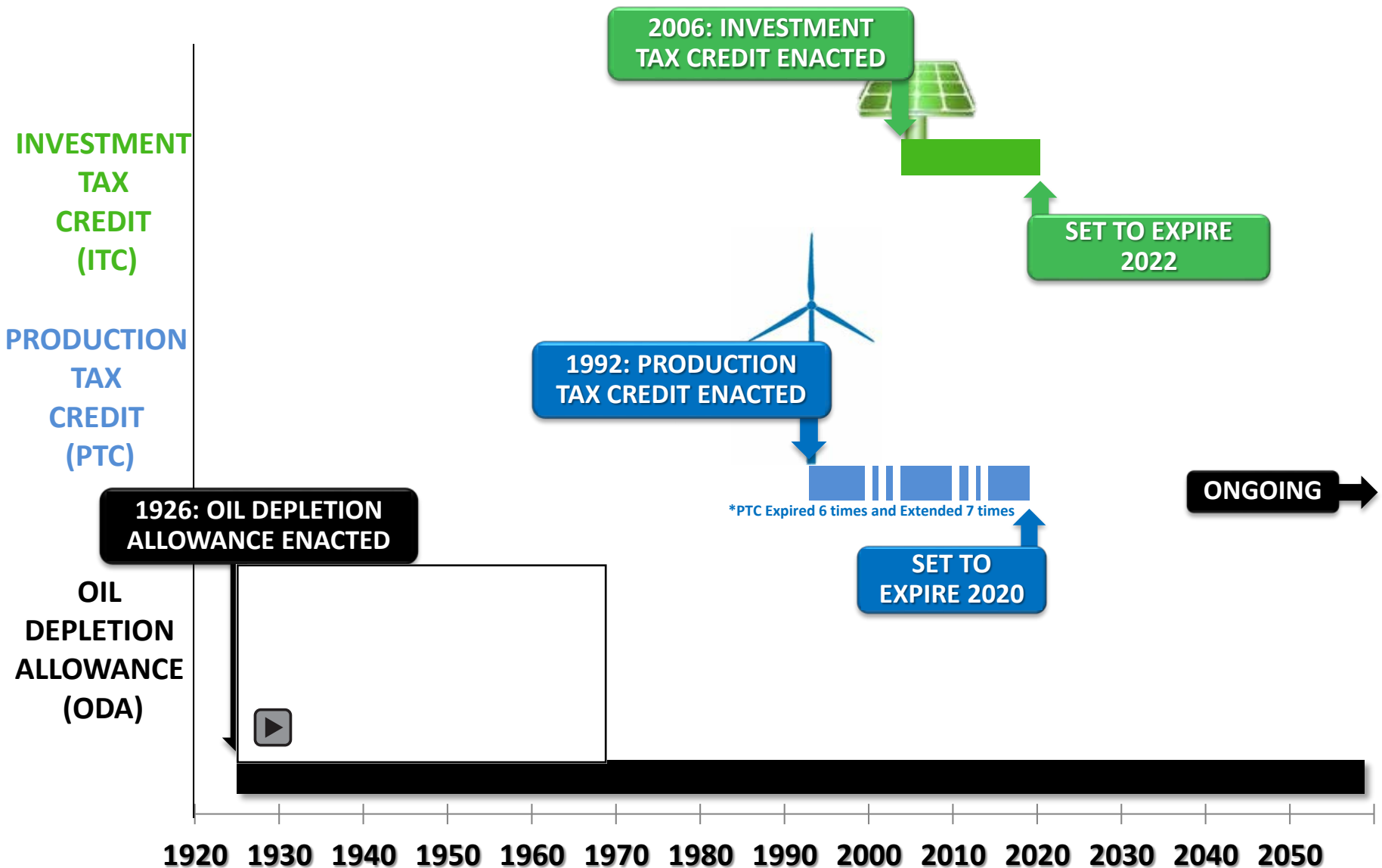
*Data represents
January 1, 2016 to
November 29, 2016



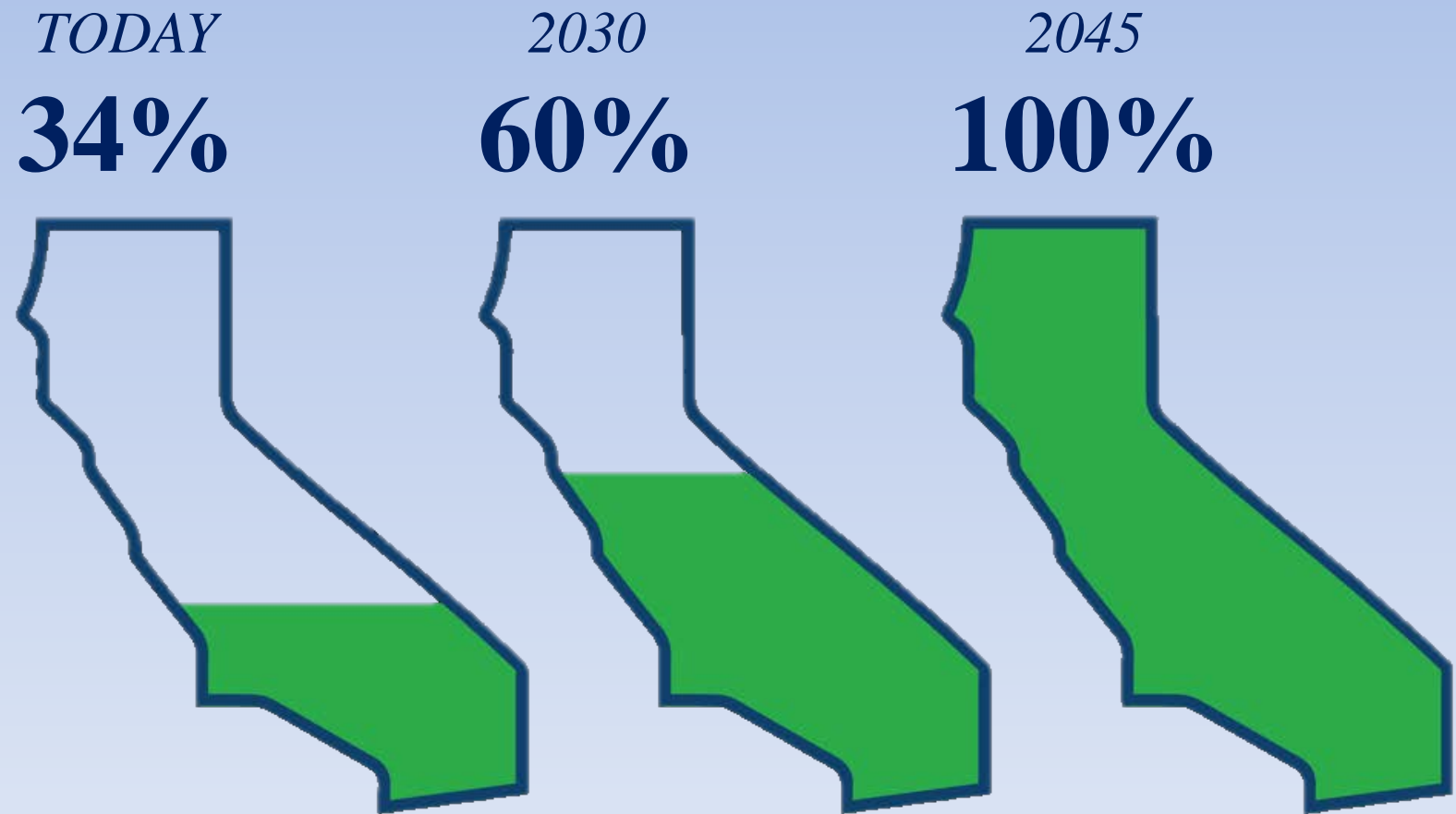
Value of Top 4 US Coal Companies Has Declined 99% Since 2011



Federal Energy Subsidies



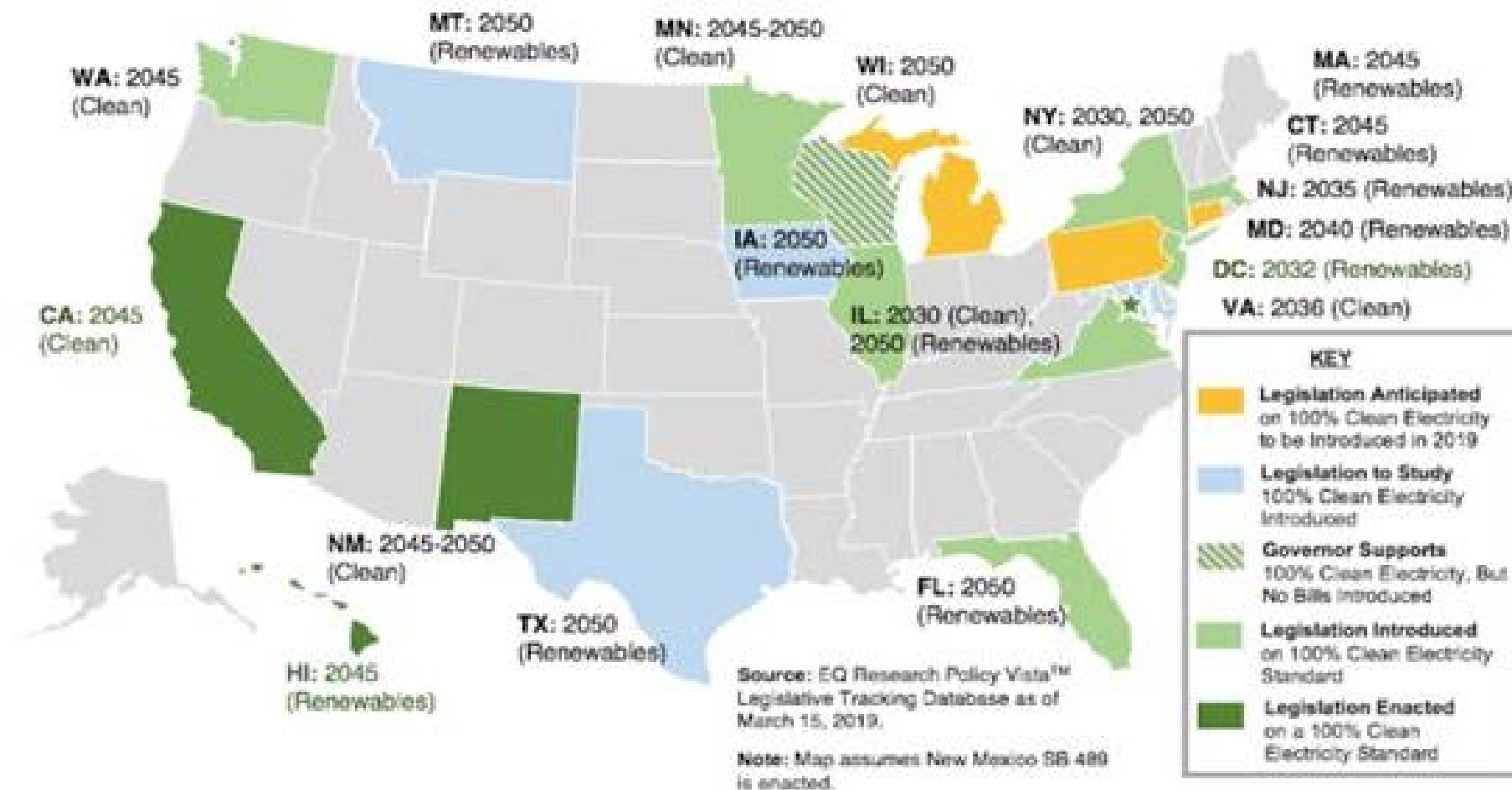
California Moves to 100% Clean Energy by 2045



100% Mandates Passed in DC, HI, NM, WA, CO, CA 12 Other States Now Proposing 100%

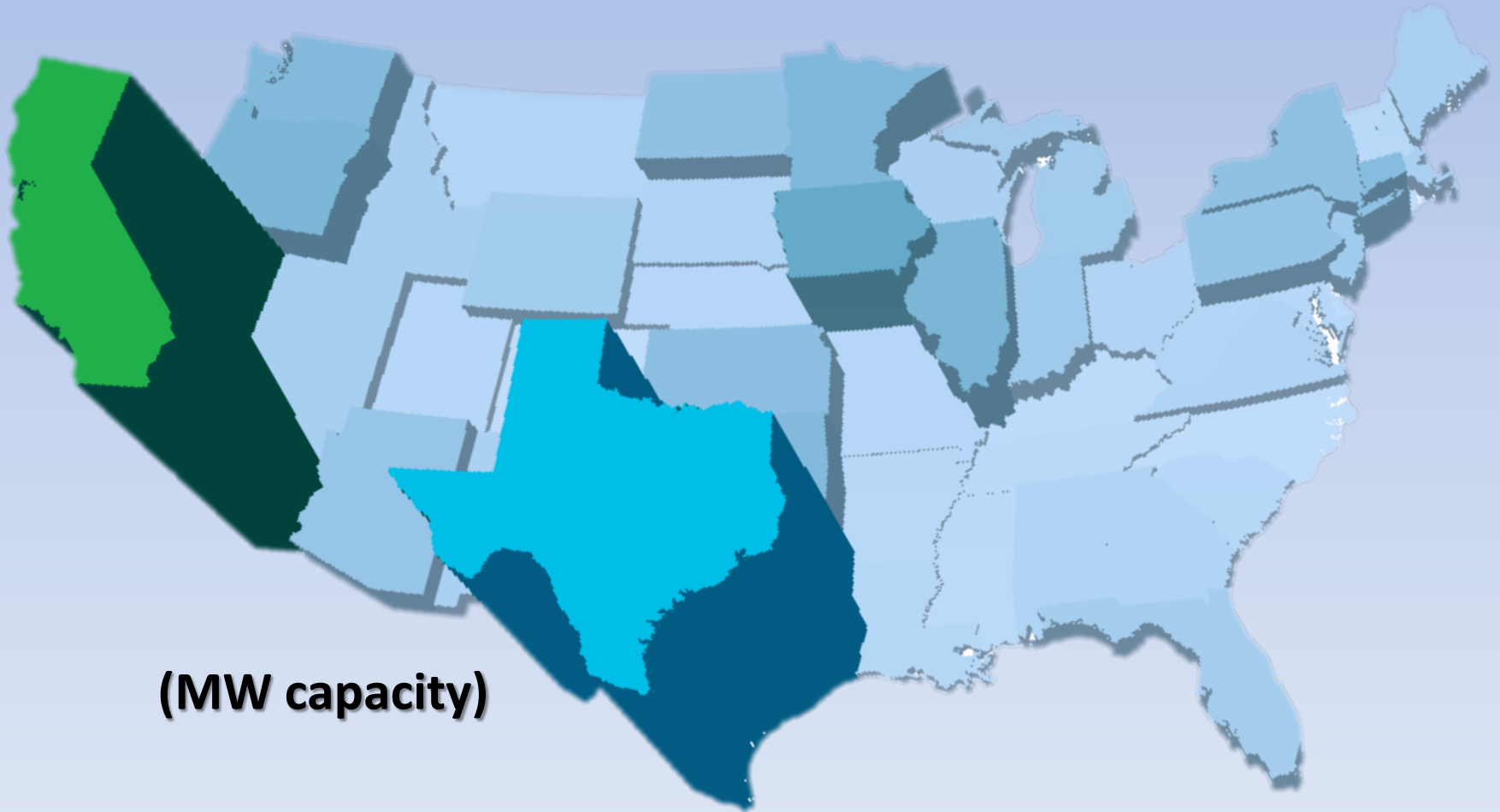
100% Clean or Renewable Electricity Targets

Anticipated, Proposed or Enacted 100% Standards and Studies

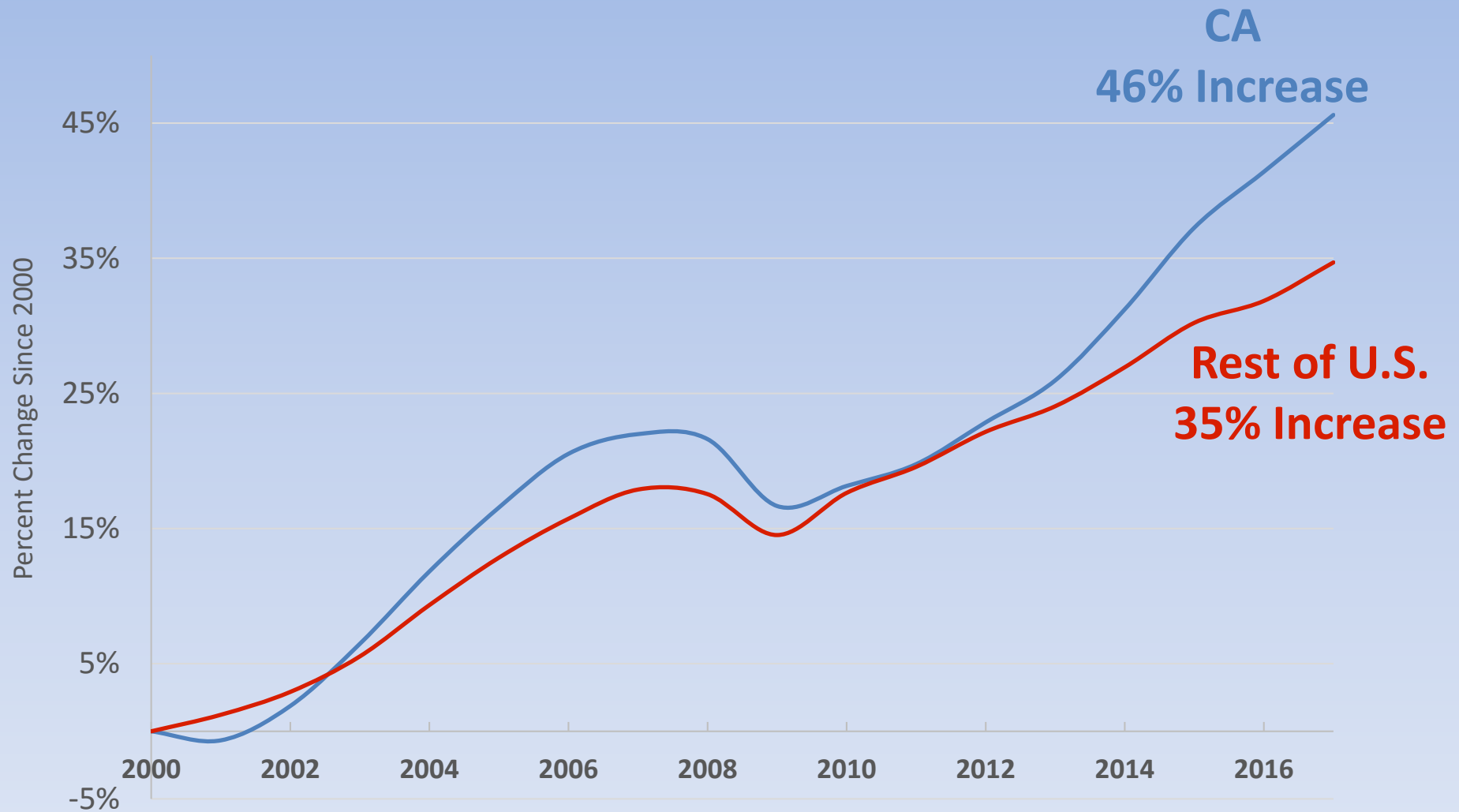


California Leads the US in Renewables Installed.

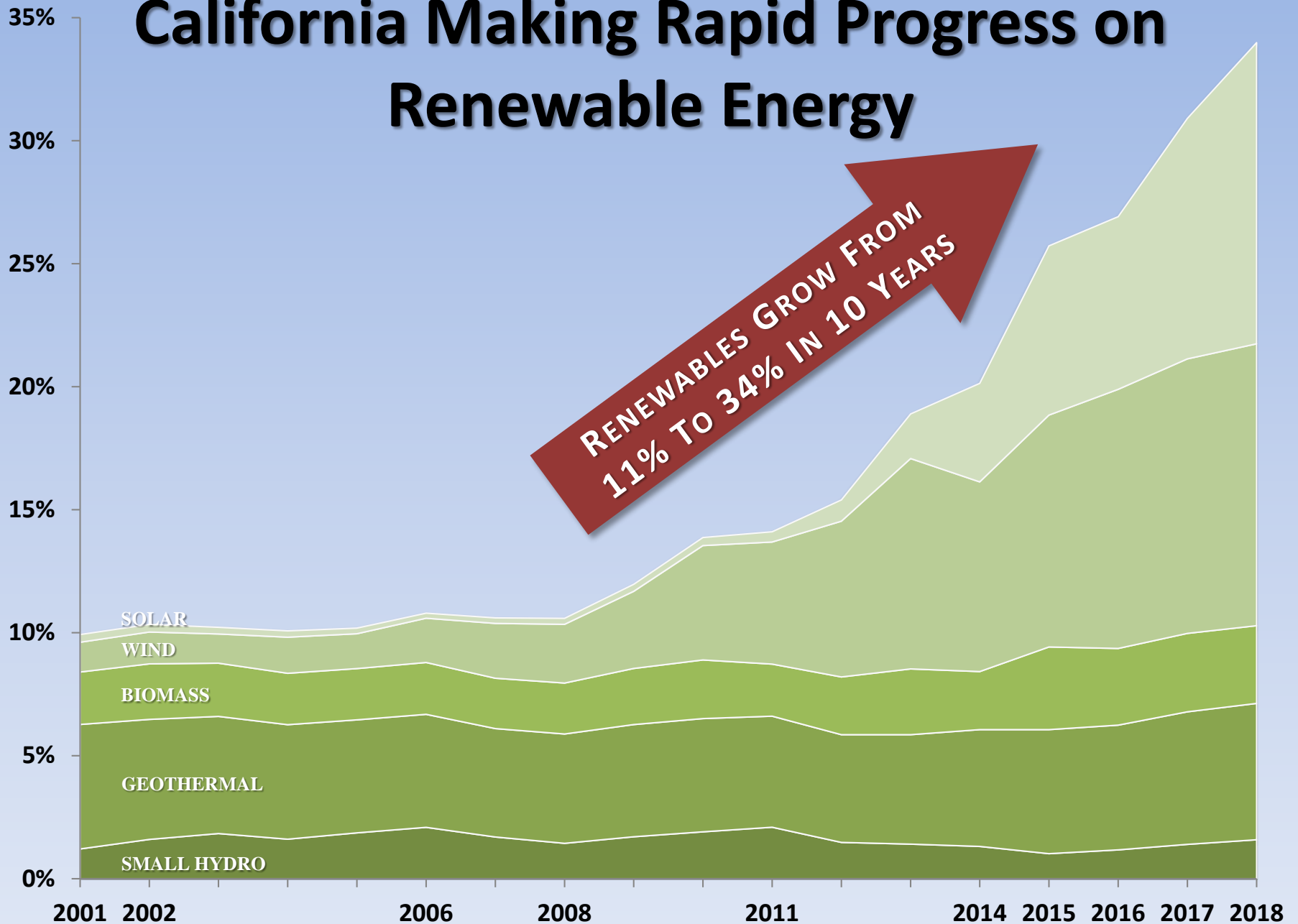
What lessons have been learned?



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



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 array of blue solar panels, each with a white grid pattern, laid out in a desert landscape. The panels are arranged in a stepped fashion, following the contours of the land. The surrounding terrain is arid 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 2nd Largest Lithium-Ion Battery Storage Project



Escondido Storage Project
120 MWh
San Diego, CA

California Leads the Nation in Biomass Energy Generation

An aerial photograph of the Honey Lake Biomass Plant. The facility is situated in a vast, arid, brown landscape. A long, white, curved conveyor belt system dominates the middle ground, transporting material from a large, angled hopper on the left towards a complex processing structure on the right. The processing structure features multiple levels, metal scaffolding, and various mechanical components. In the background, a range of dark, rugged mountains stretches across the horizon under a clear blue sky. The foreground shows some industrial equipment, including a large white tank and several long pipes.

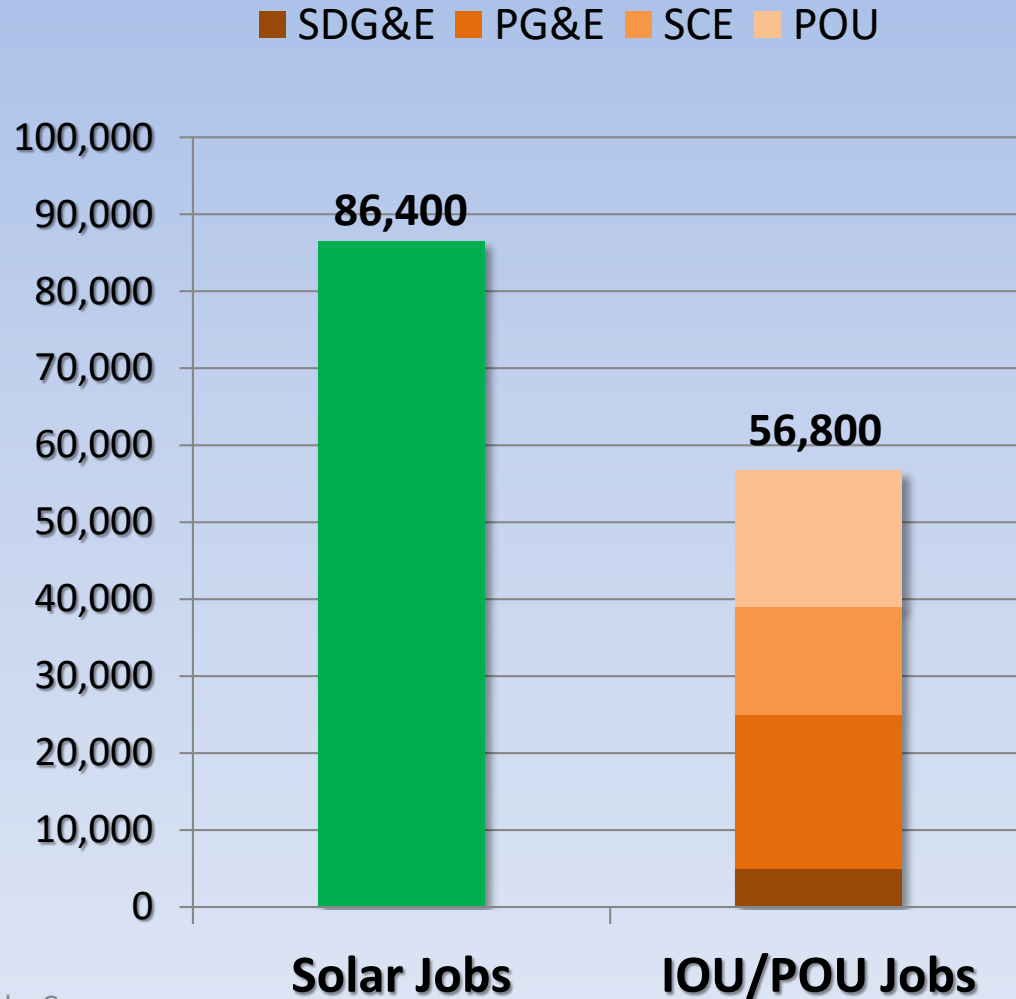
Honey Lake Biomass Plant
Lassen County, CA

Offshore Wind: CA's New Renewable Resource?

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



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



Sources:

Solar Foundation, 2017 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

California Requires Solar for all New Homes by Jan 1, 2020



**Zero Energy Community
Rocklin, CA**



The Electrification of Almost Everything



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...



FOSSIL FUEL DECLINE: ONLY ONE OIL COMPANY REMAINS IN THE TOP TEN LIST COMPANIES....

1978	1988	1998	2008	2018
General Motors \$3337.5M	IBM \$5258.0M	General Motors \$178.17B	Exxon Mobil \$466.28B	Walmart \$500.34B
IBM \$2719.4M	Exxon Mobil \$4840.0M	Ford Motors \$153.62B	Walmart \$378.48B	Exxon Mobil \$244.36B
Exxon Mobil \$2423.0M	Ford Motors \$4625.0M	Exxon Mobil \$122.38B	Texaco \$267.64	Berkshire Hathaway \$242.14B
Ford Motors \$1672.8M	Texaco \$4407M	Walmart \$119.30B	Conoco Phillip \$246.18B	Apple \$229.23B
General Electric \$1088.2M	General Motors \$3551.0M	General Electric \$90.84B	General Electric \$181.58B	UnitedHealth \$201.16B
Chevron \$1016.4M	General Electric \$2915.0M	IBM 78.51B	General Motors \$148.98B	McKesson \$198.53B
Mobil \$1004.7M	AT&T \$2044.0M	Chrysler \$61.15B	Ford Motors \$145.11B	CVS Health \$184.77B
Texaco \$930.8M	DuPont \$1786M	Mobil \$59.98B	AT&T \$124.03B	Amazon.com \$177.87B
Gulf Oil \$752.0M	Chrysler \$1290M	Altria Group \$56.11B	Bank of America \$75.70B	AT&T \$160.55B
Chrysler \$163.2M	Mobil \$1258M	AT&T \$53.26B	Citigroup, Inc. \$51.60B	General Motors \$157.31B

Source: Forbes Fortune 500 list, top ten companies by revenue

World's 5 Largest Companies Have Committed to 100% Renewable Energy

Google



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!

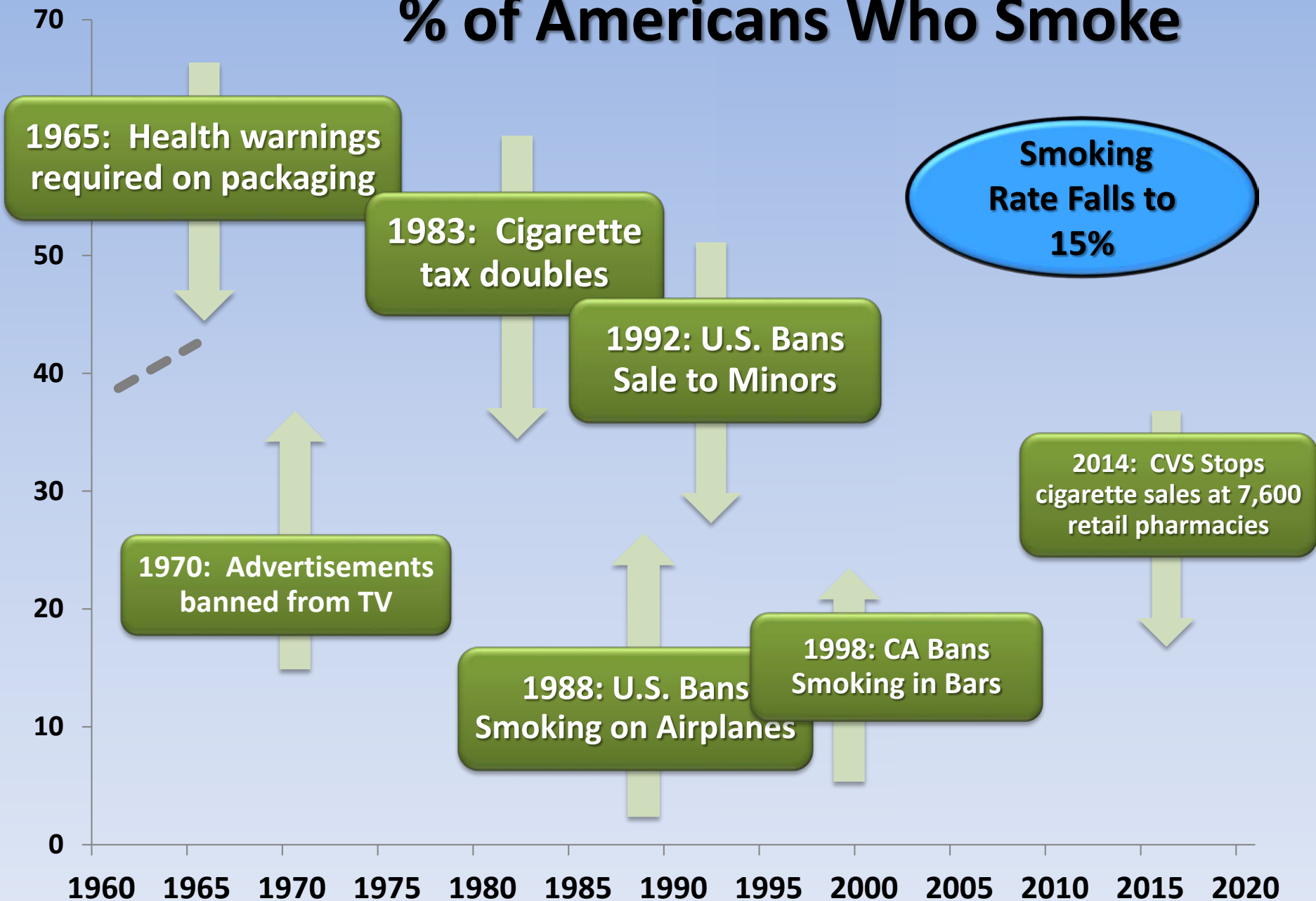
THE DOCTORS' CHOICE IS AMERICA'S CHOICE!

 <small>DR. J. EDGAR HOOVER, Director, Federal Bureau of Investigation, "Camels. They taste good, and they're just what I need."</small>	 <small>DR. WILLIAM W. STEWART, Secretary of the U.S. Navy, "Camels. They're just what I need."</small>	 <small>DR. WILLIAM W. STEWART, Secretary of the U.S. Navy, "Camels. They're just what I need."</small>	 <small>DR. WILLIAM W. STEWART, Secretary of the U.S. Navy, "Camels. They're just what I need."</small>
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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

Thank you



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