



Toward a 100% Clean Energy Future

Chair David Hochschild

January 2020

WHAT THE ANTI-APARTHEID MOVEMENT TEACHES US ABOUT FIGHTING CLIMATE CHANGE





Port Alfred Township, Eastern Cape











From Prisoner to President

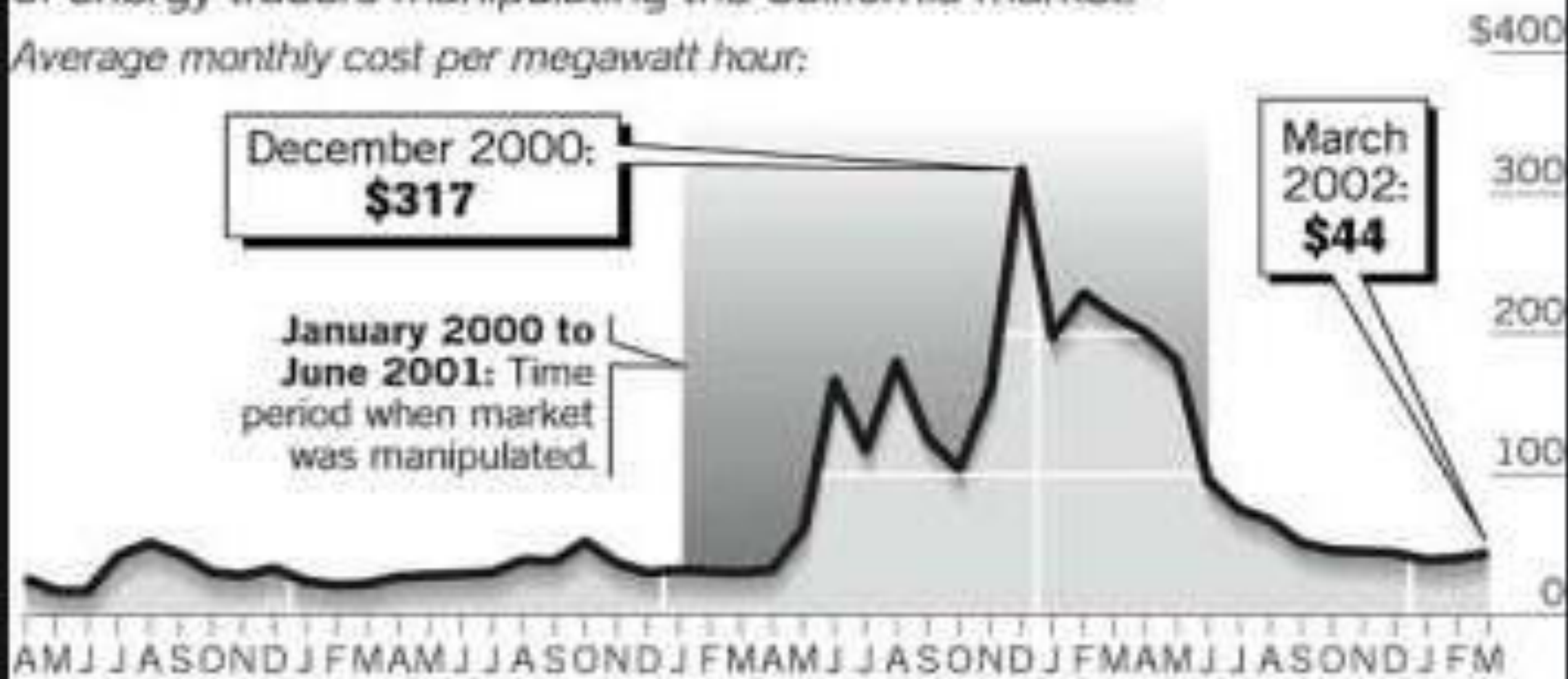




The California energy crisis

The monthly wholesale price for electricity shows in part the effects of energy traders manipulating the California market.

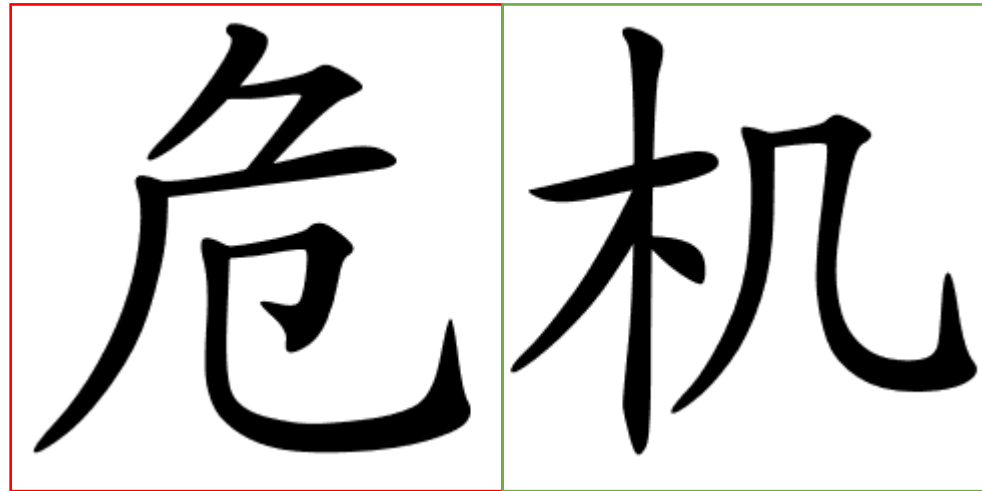
Average monthly cost per megawatt hour:



Finding Opportunity Inside Crisis

Danger

Opportunity



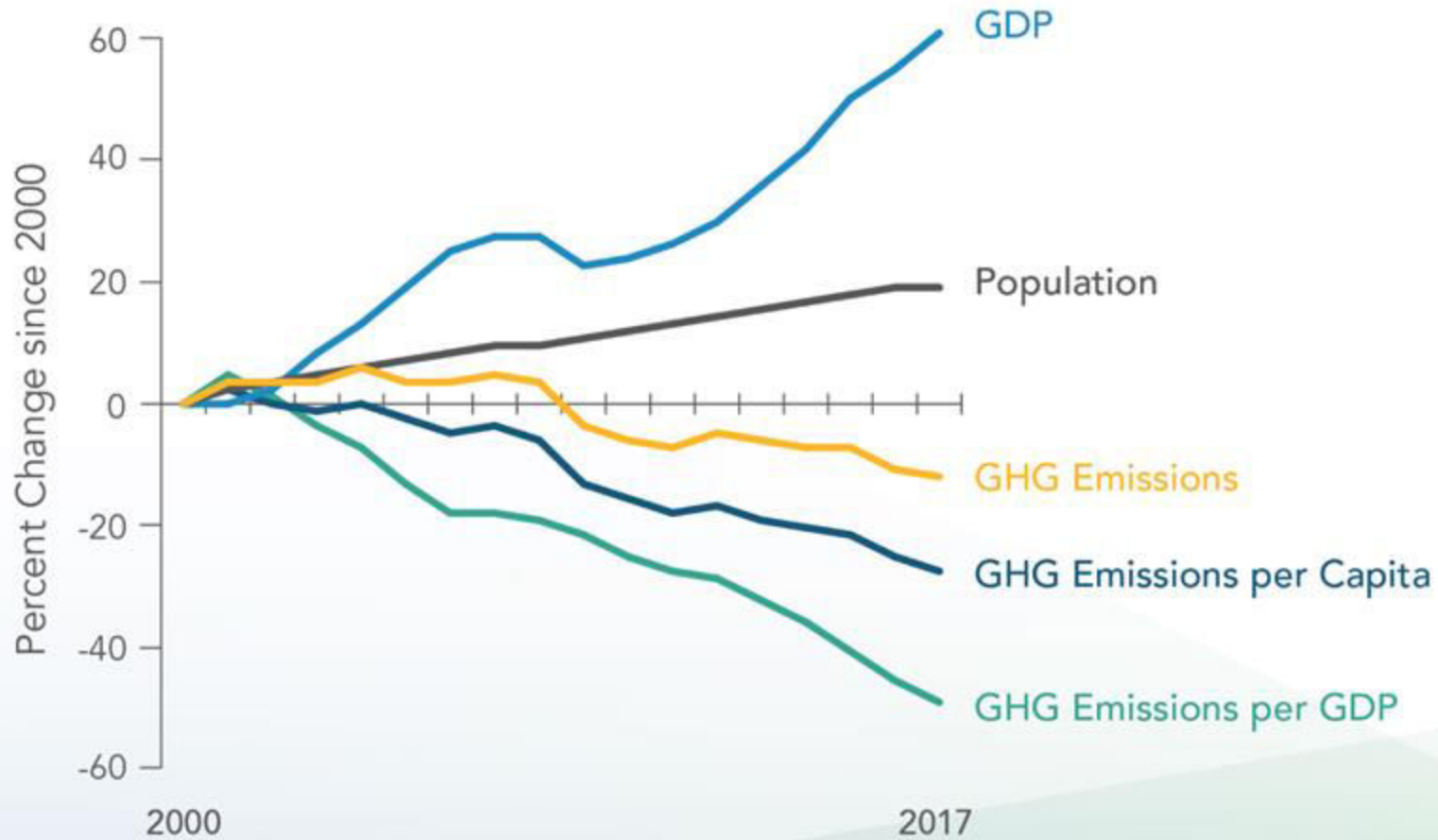
Crisis

Toward 100% Renewables



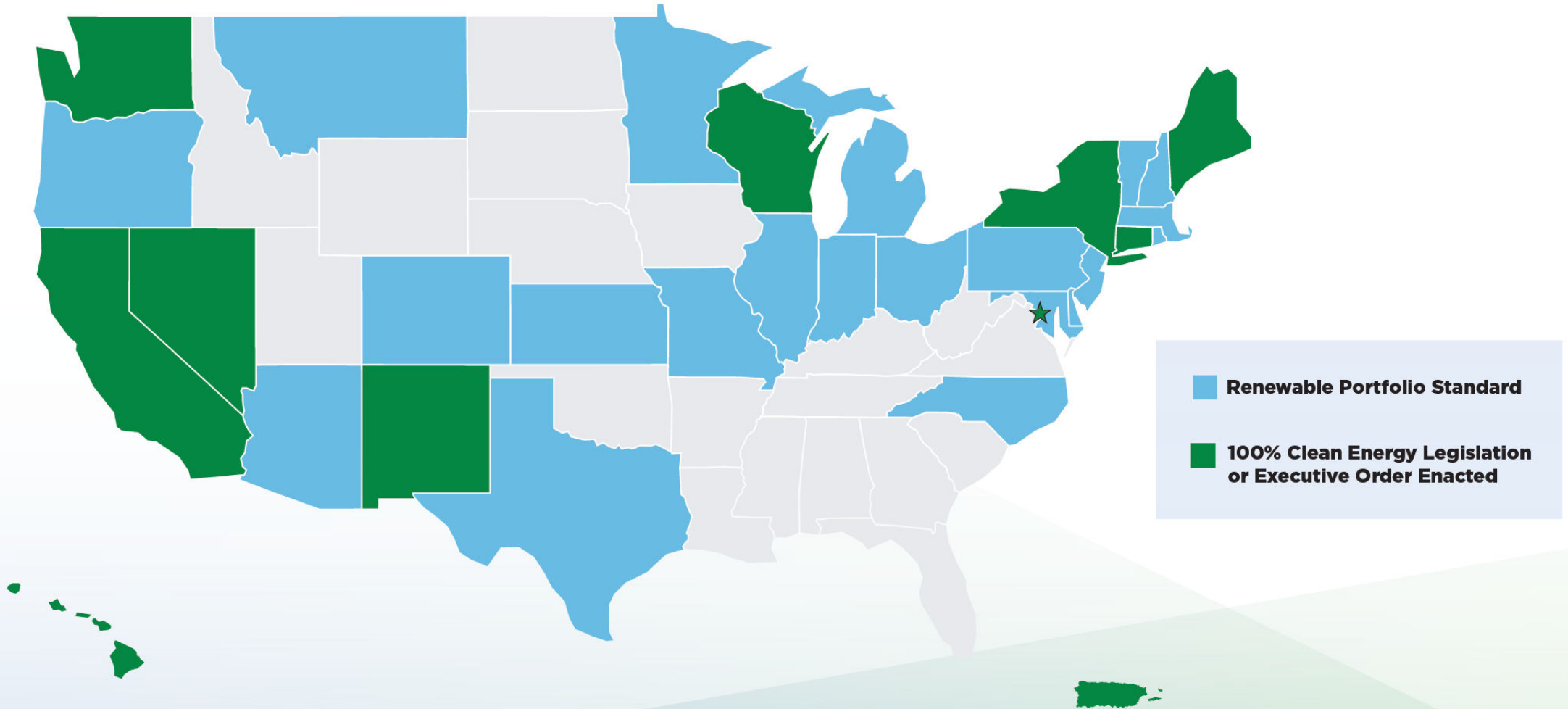


DECOUPLED GHG EMISSIONS FROM GDP



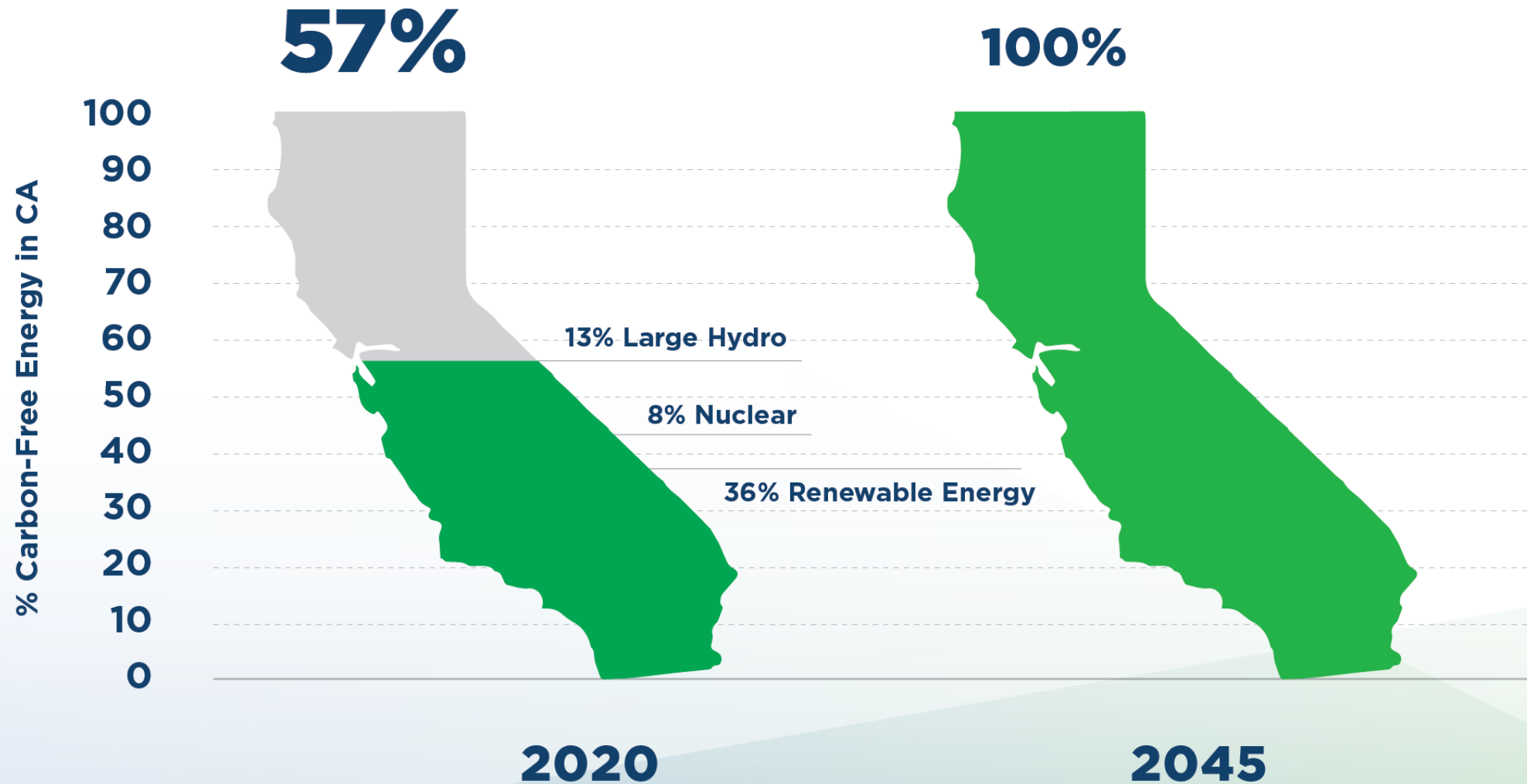


Progress toward 100%





Progress toward 100%: Fossil Fuel is the Alternative Energy Now...



200 OF THE
WORLD'S LARGEST
COMPANIES HAVE
COMMITTED TO
100% RENEWABLE
ENERGY



200
COMPANIES

WITH



US\$5.4 TRILLION
COMBINED REVENUE

MORE THAN

140

MARKETS
WORLDWIDE

AND

220

TWH/YR

RENEWABLE
ELECTRICITY DEMAND

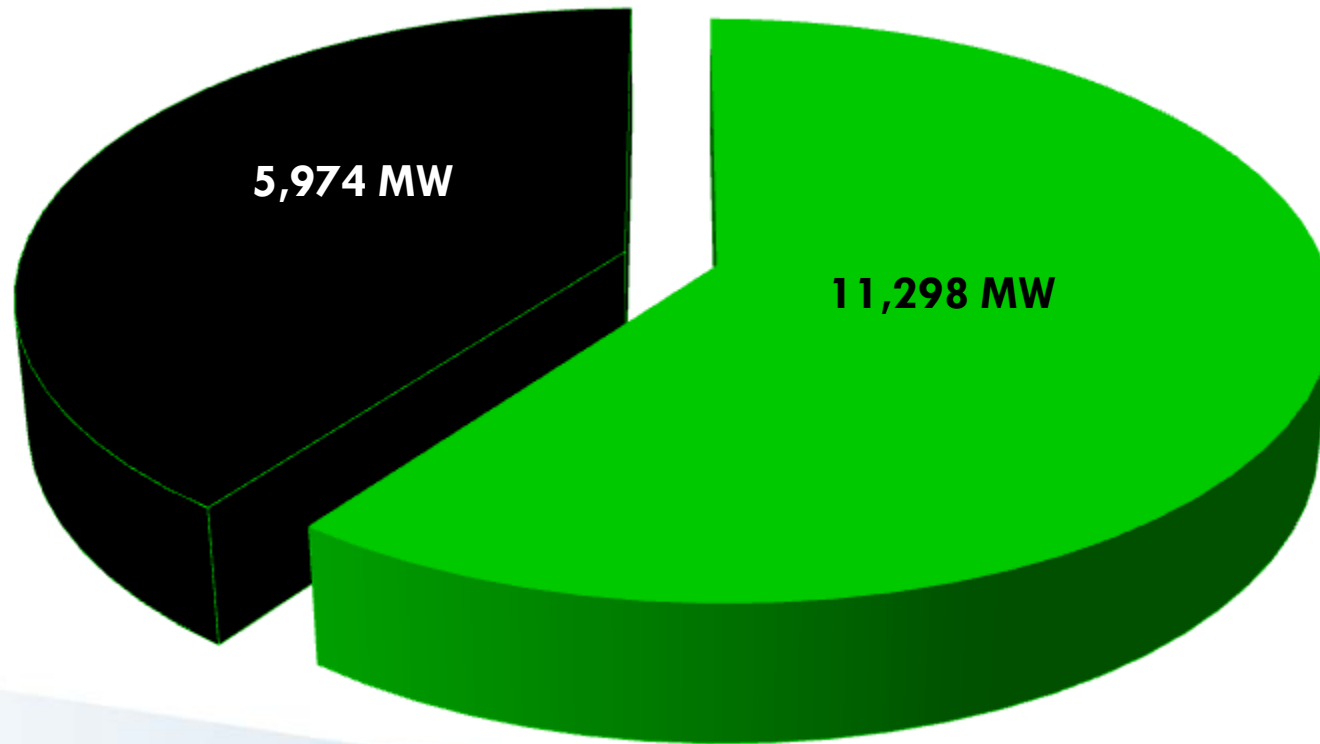
IN
OVER

RE 100

THE CLIMATE GROUP



MOST OF THE NEW GENERATION ADDED TO THE GRID IS RENEWABLE ENERGY



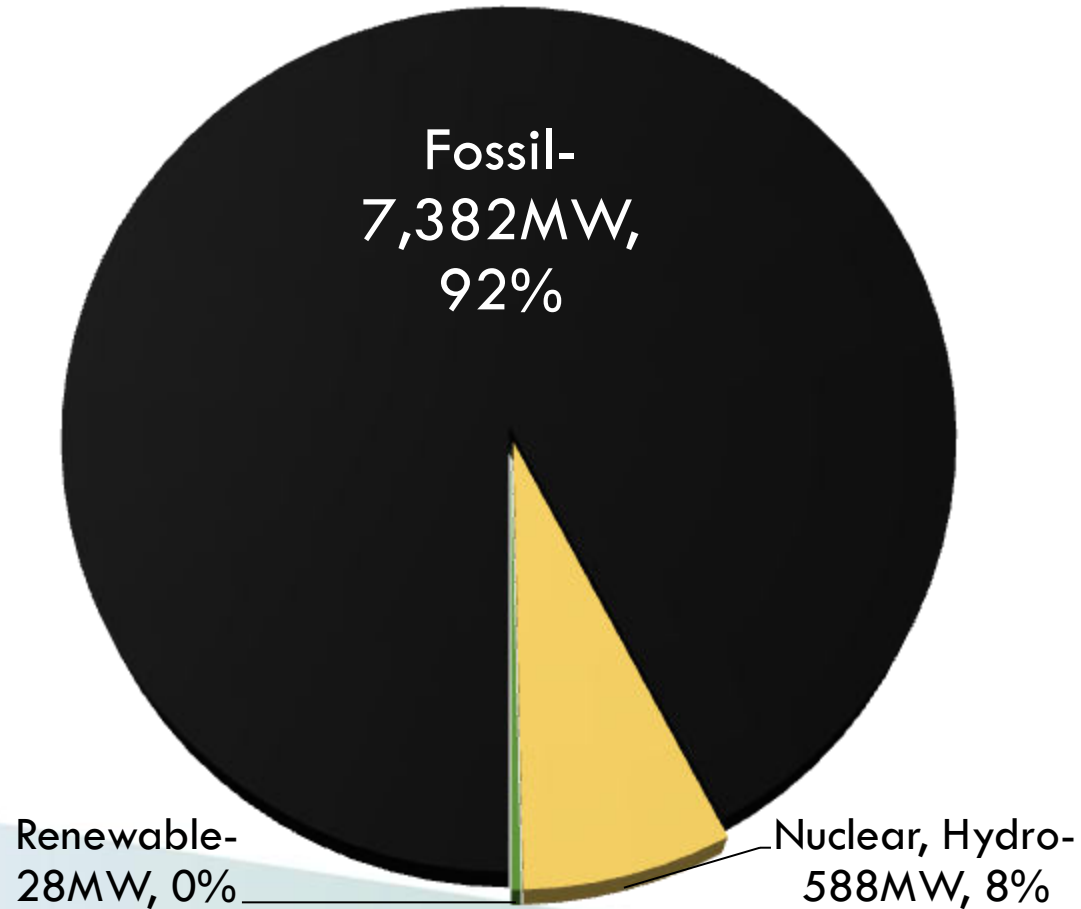
Renewables = 65% of new U.S. Electric Generation Capacity

- Renewables
- Fossil Fuels

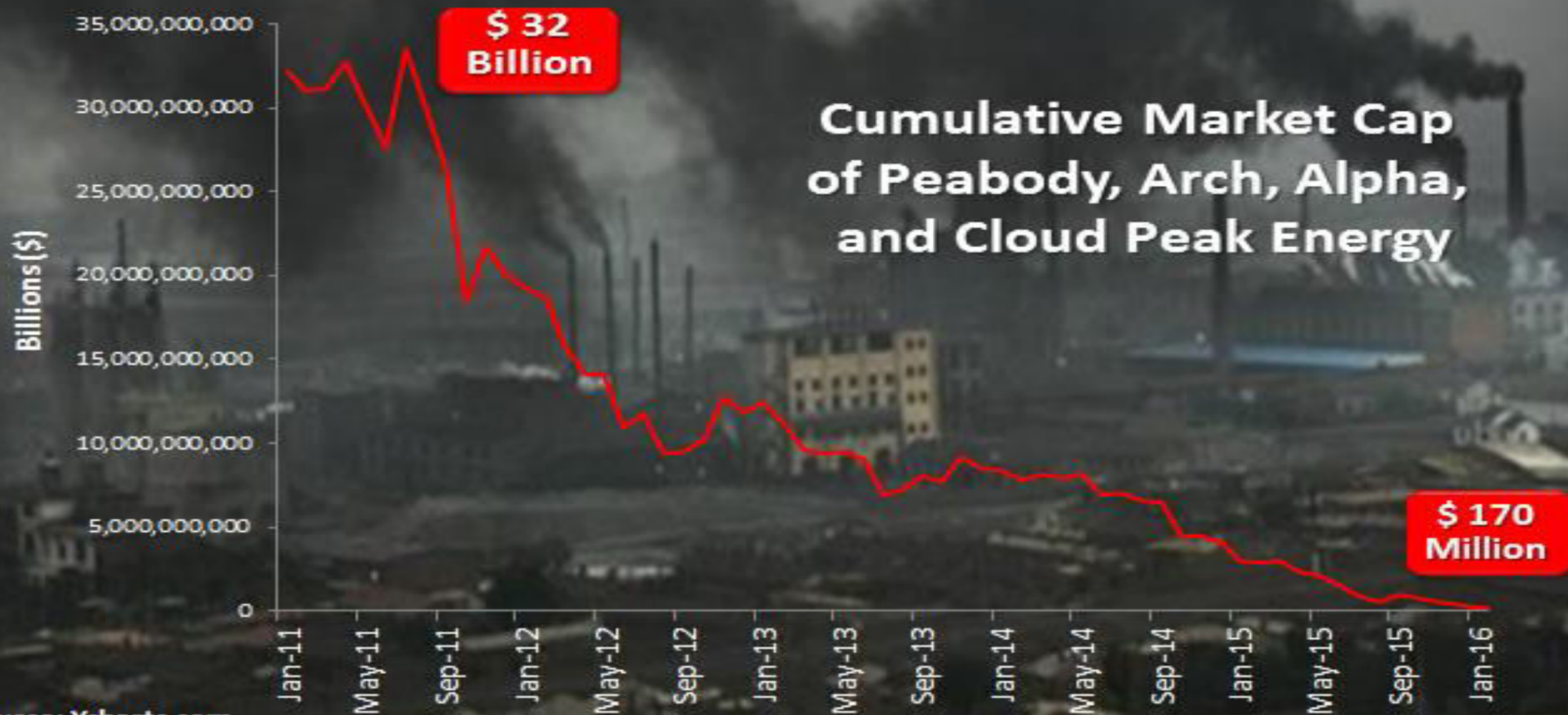
MOST OF THE RETIREMENTS ARE FOSSIL ENERGY

Fossil Fuels = 92% of retired US Electric Generation Capacity in 2016*

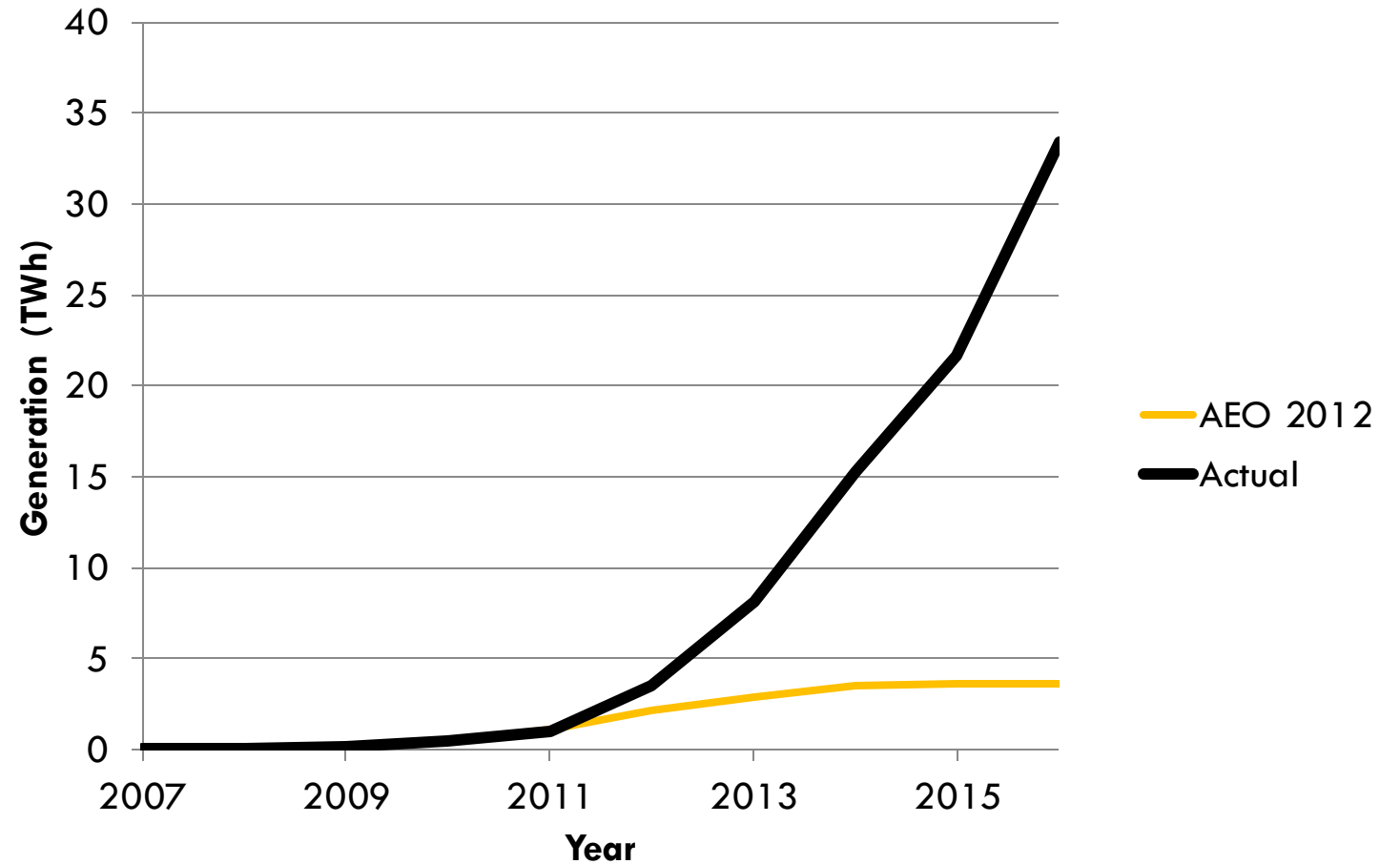
*Data represents January 1, 2016 to November 29, 2016



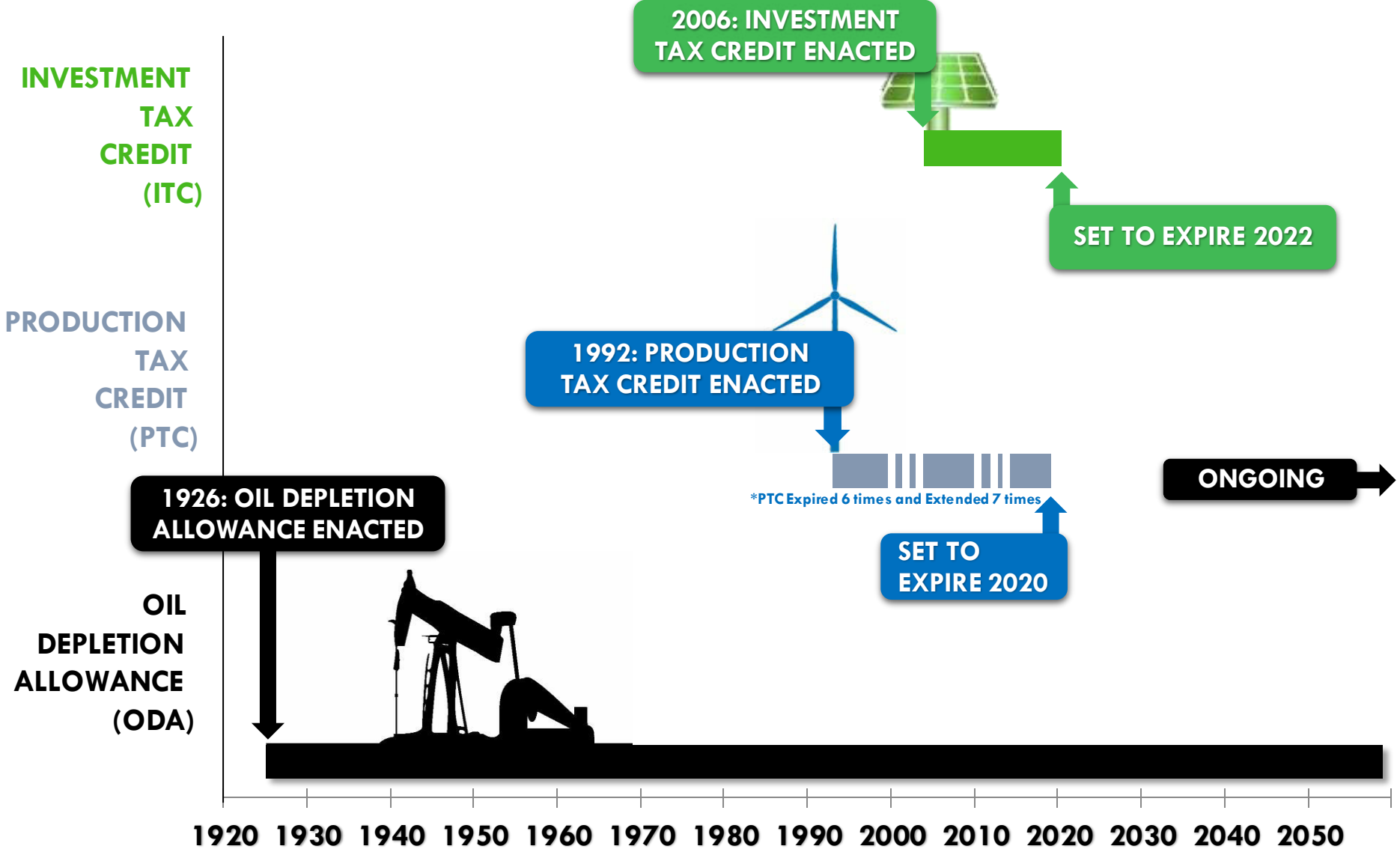
Value of Top 4 US Coal Companies Has Declined 99% Since 2011



US SOLAR PV GENERATION



FEDERAL ENERGY SUBSIDIES



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

University of California CIO and treasurer declare fossil fuels “financial risk”

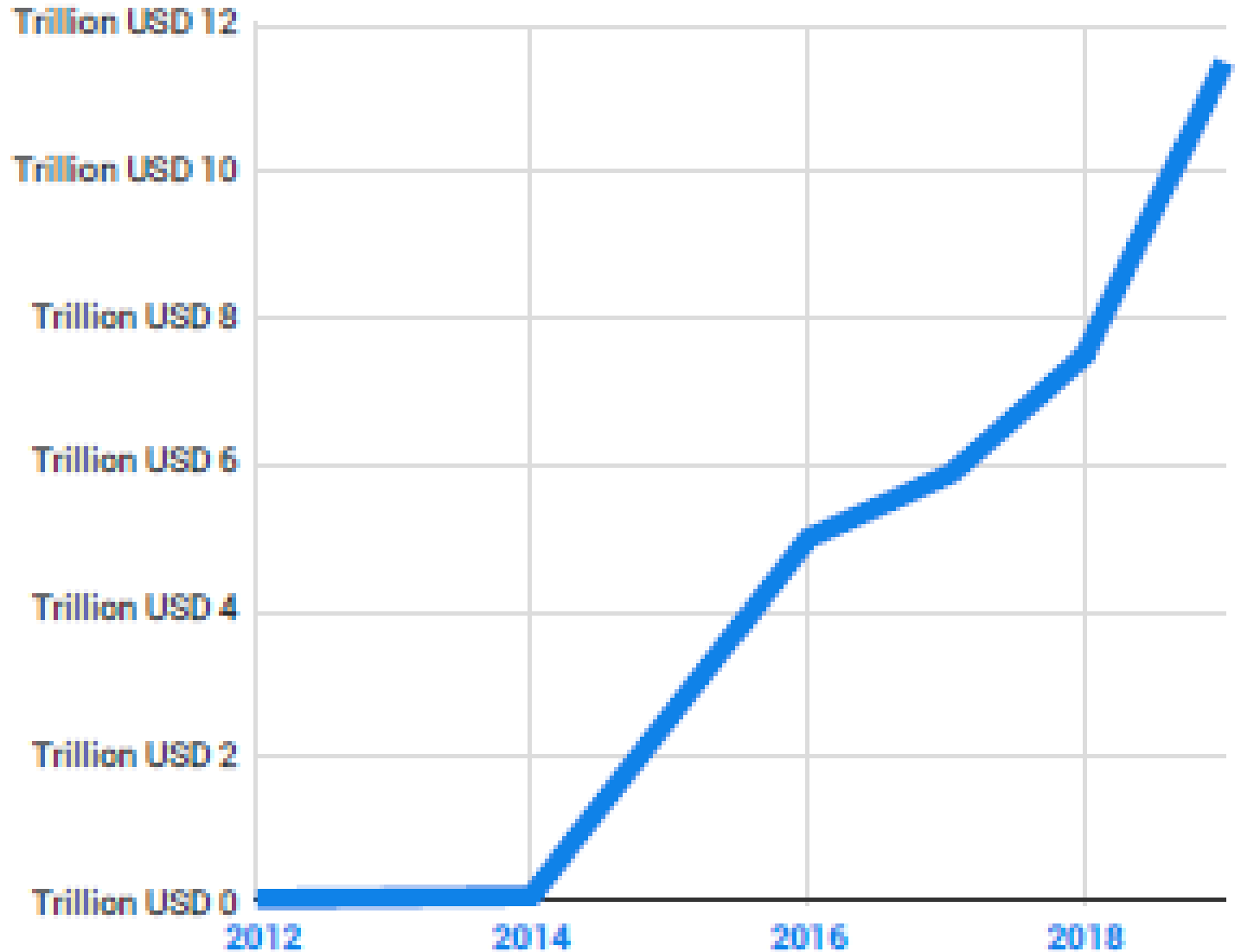


UC's \$13.4 billion endowment fossil free

September 2019

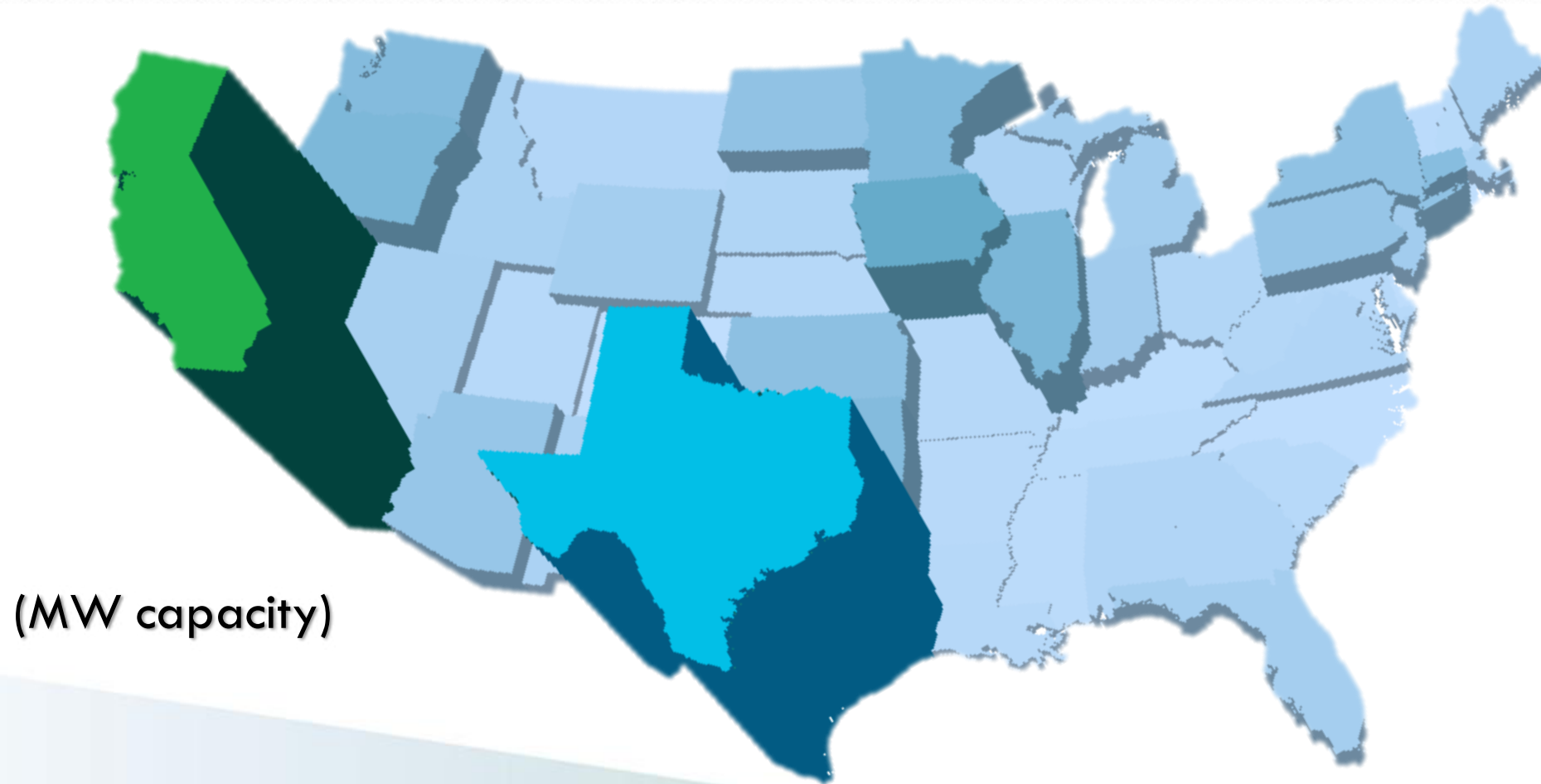
UC's \$70 billion pension to be fossil free

GLOBAL FOSSIL FUEL DIVESTMENT EXCEEDS \$11 TRILLION



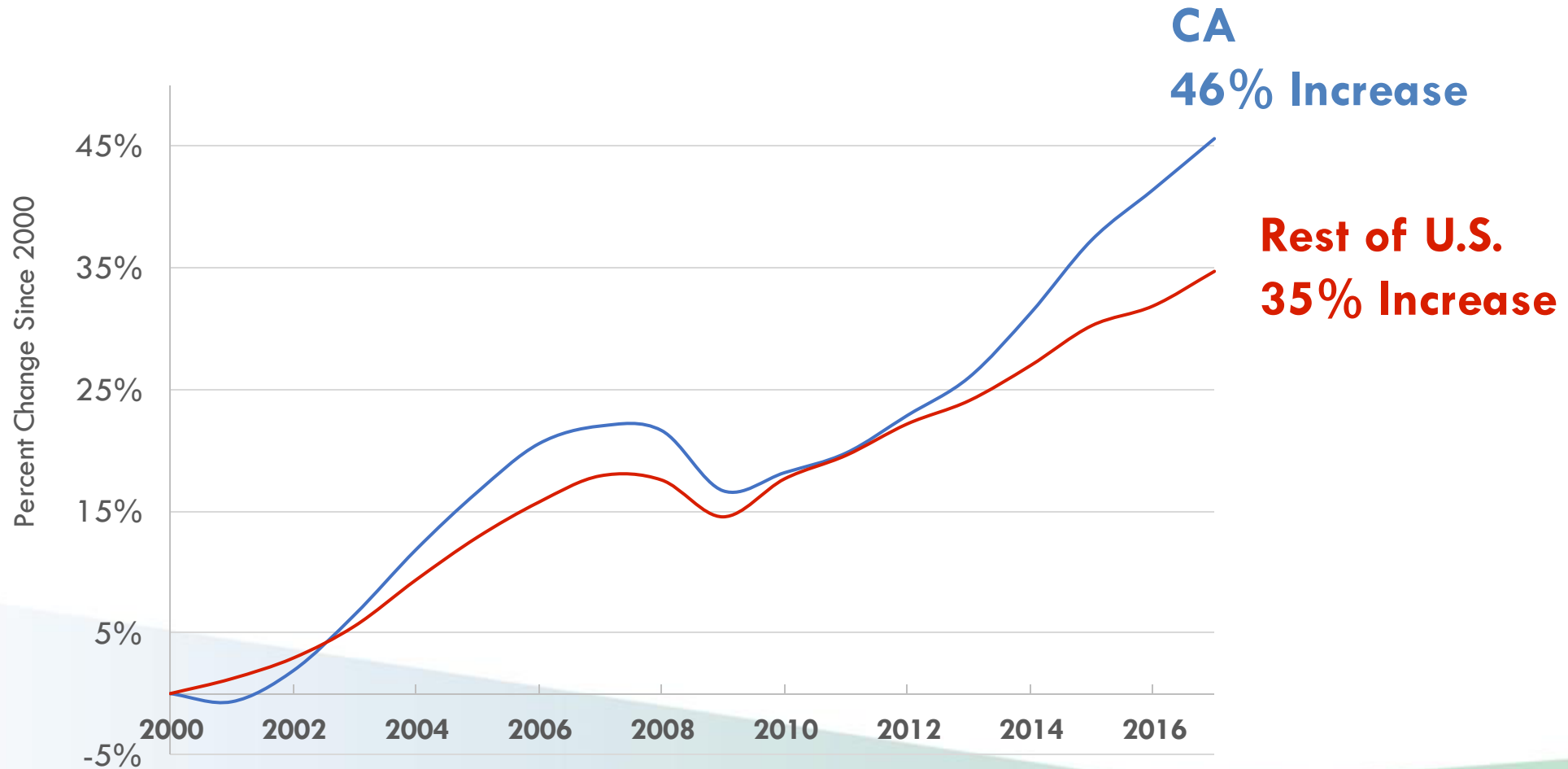
Source: 350.org, https://financingthefuture.platform350.org/wp-content/uploads/sites/60/2019/09/FF_11Trillion-WEB.pdf

CALIFORNIA LEADS THE U.S. IN RENEWABLES INSTALLED. WHAT LESSONS HAVE BEEN LEARNED?

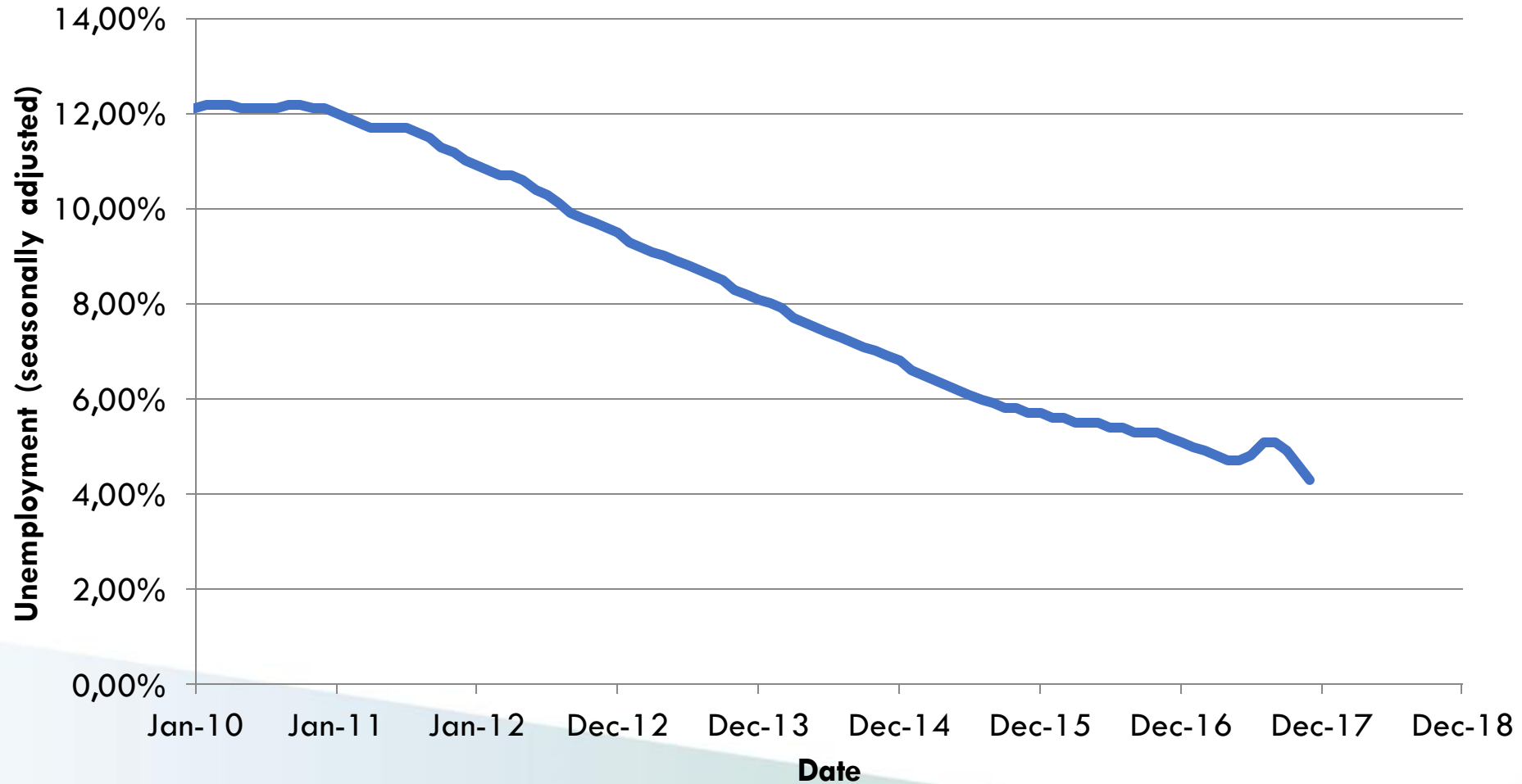


Source: Graphics based on data from the American Council On Renewable Energy (ACORE)
Renewable Energy in the 50 States (2013/2014 Editions)
<http://www.acore.org/publications/50states/>

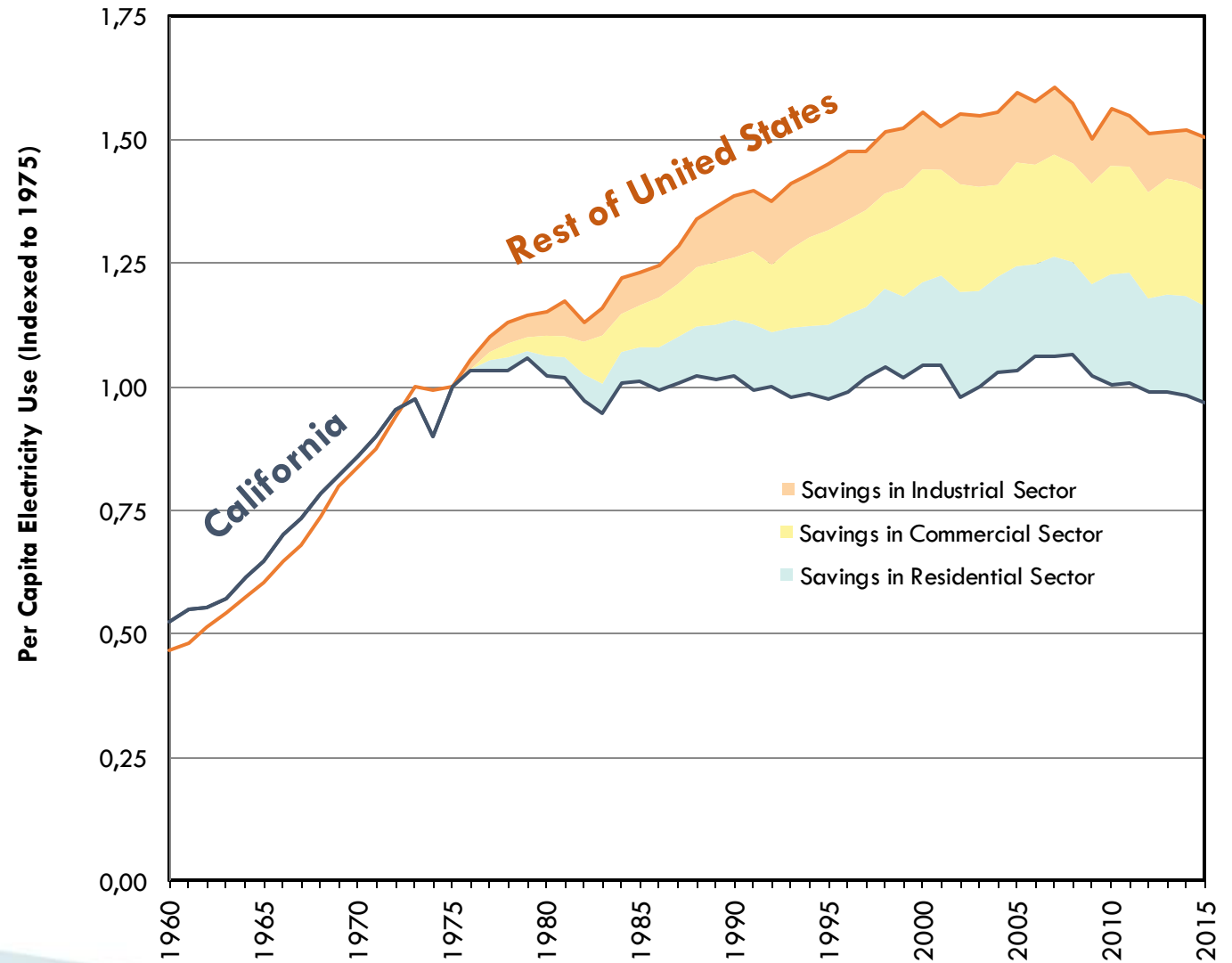
CALIFORNIA'S GDP IS GROWING FASTER THAN THE NATION'S



CALIFORNIA UNEMPLOYMENT FALLS TO 4%

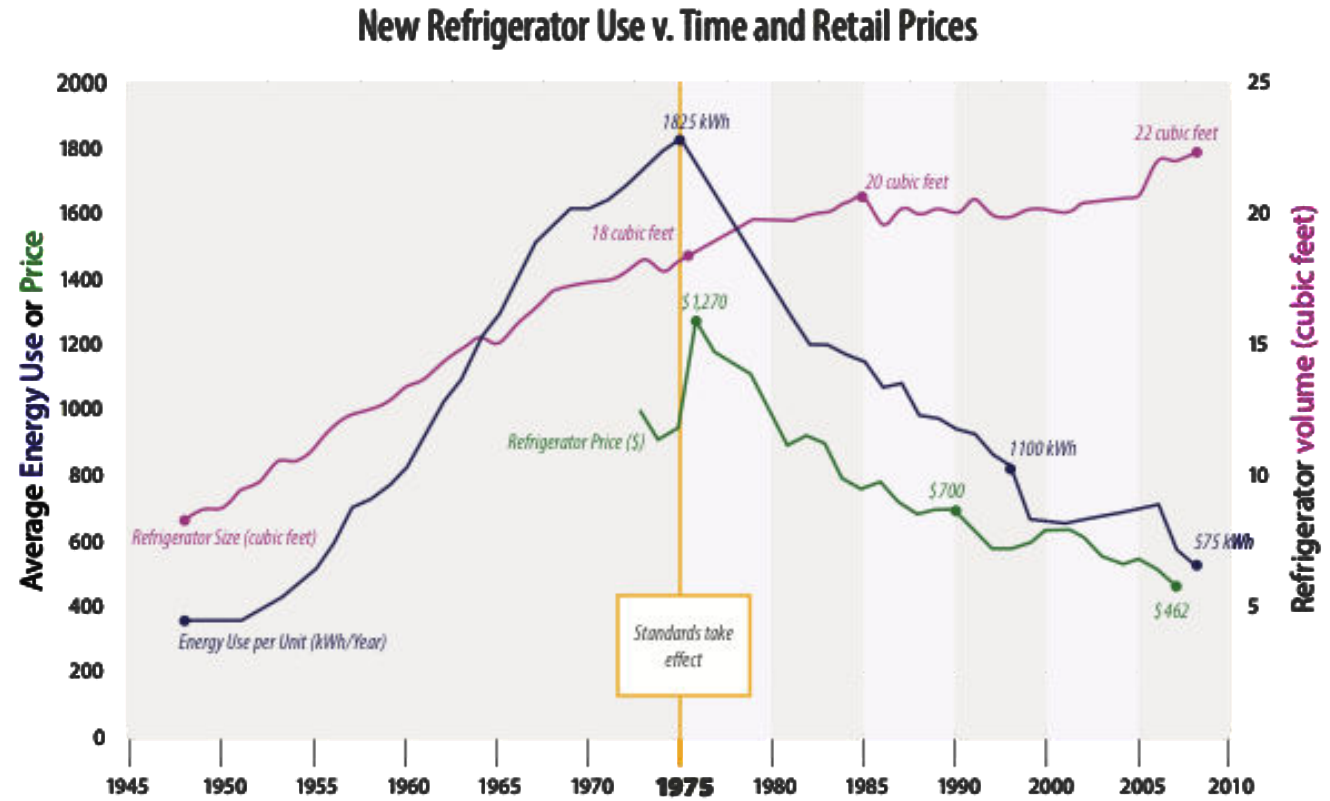


CALIFORNIA ADVANCING ENERGY EFFICIENCY



Source: EIA, SEDS database (2017)

CALIFORNIA ADVANCING ENERGY EFFICIENCY





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**



Evolution of Lighting

Incandescent



CFL



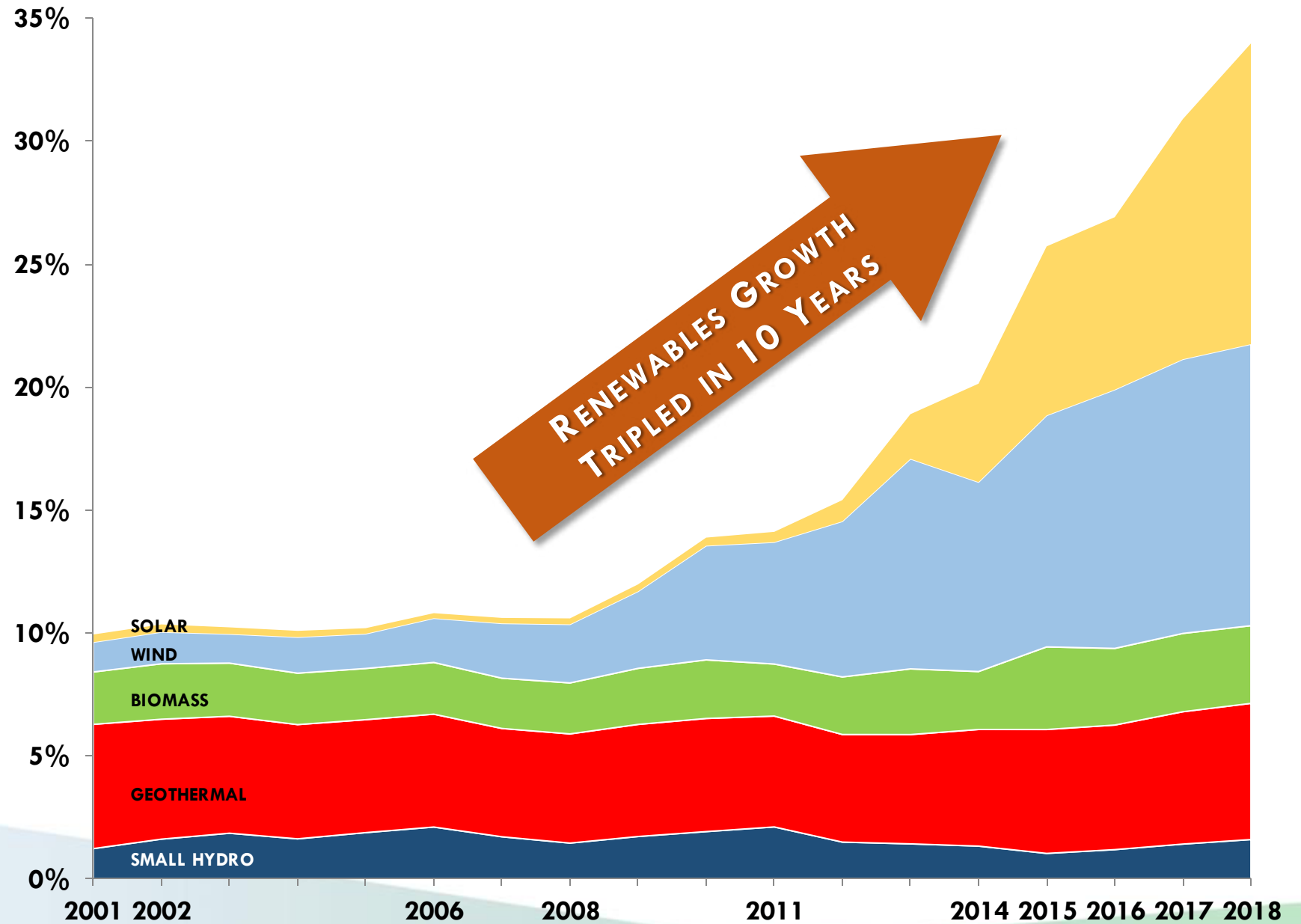
LED



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

- Chinese proverb

CALIFORNIA MAKING RAPID PROGRESS ON RENEWABLE ENERGY



THE WORLD'S LARGEST GEOTHERMAL POWER PLANT

Geysers Geothermal Power Plant
955 MW
Lake County, CA

The World's Largest Thin Film Solar PV Project



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 2ND LARGEST WIND PROJECT

Alta Wind Energy Center
1550 MW
Kern County, CA



THE WORLD'S 2ND LARGEST SOLAR THERMAL POWER PLANT (TROUGH)

Solar Energy Generating System (SEGS)

354 MW

San Bernardino 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

OFFSHORE WIND: CA'S NEW RENEWABLE RESOURCE?

**One rotation of an offshore wind turbine
powers a house for a day**



2019: CA REACHES 1M SOLAR ROOFS

2020: SOLAR REQUIRED FOR ALL NEW HOMES



**Zero Energy Community
Rocklin, CA**

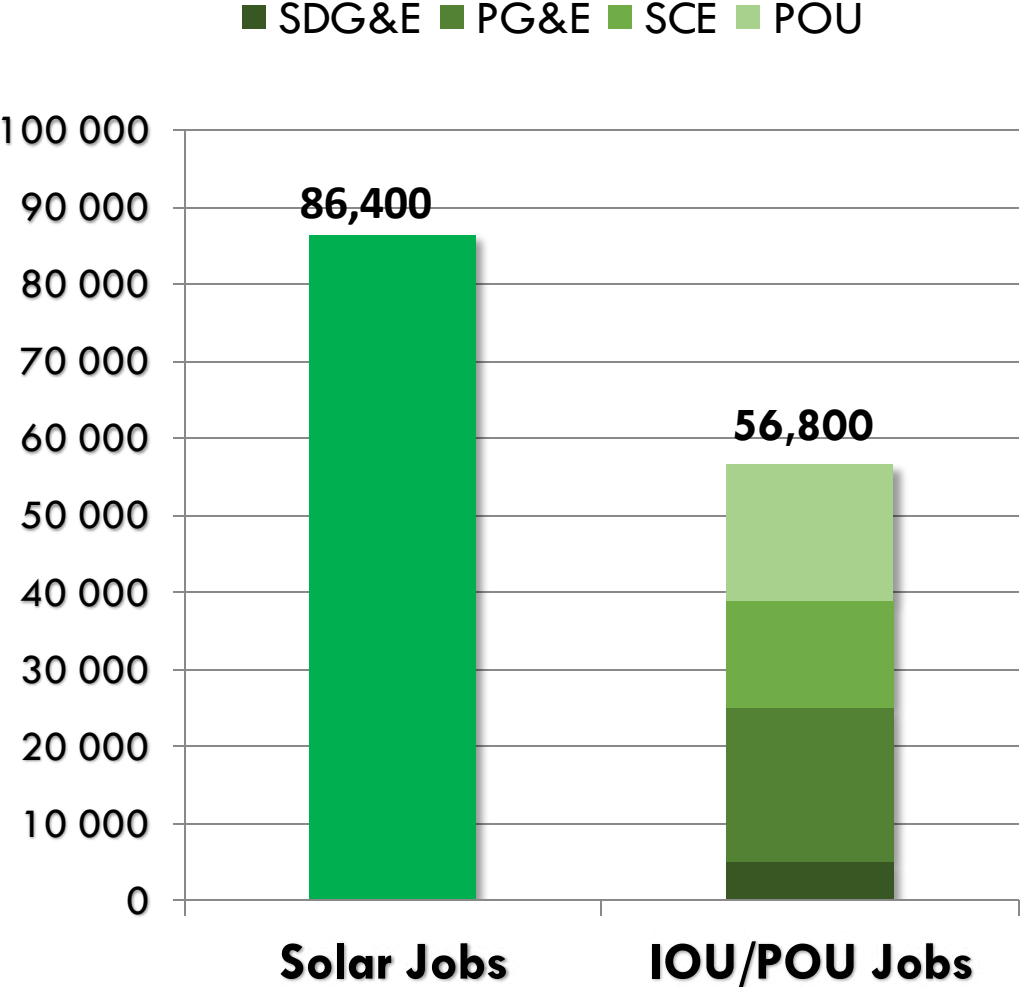


MORE CALIFORNIANS WORK IN THE SOLAR INDUSTRY THAN FOR ALL CA ELECTRIC UTILITIES COMBINED

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>



TOWARD THE ELECTRIFICATION OF ALMOST EVERYTHING: GOOD CITIZENS OF THE GRID



Now Selling: The All-Electric Home



CityVentures all-electric homes
Bellflower, CA



From Diesel to Electric by 2022



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



LARGEST MANUFACTURING PLANT IN CA PRODUCES ELECTRIC VEHICLES

Tesla employs 45,000 people worldwide



**700,000
ELECTRIC
VEHICLES IN
CALIFORNIA
TODAY**

Tesla Factory
Fremont, CA

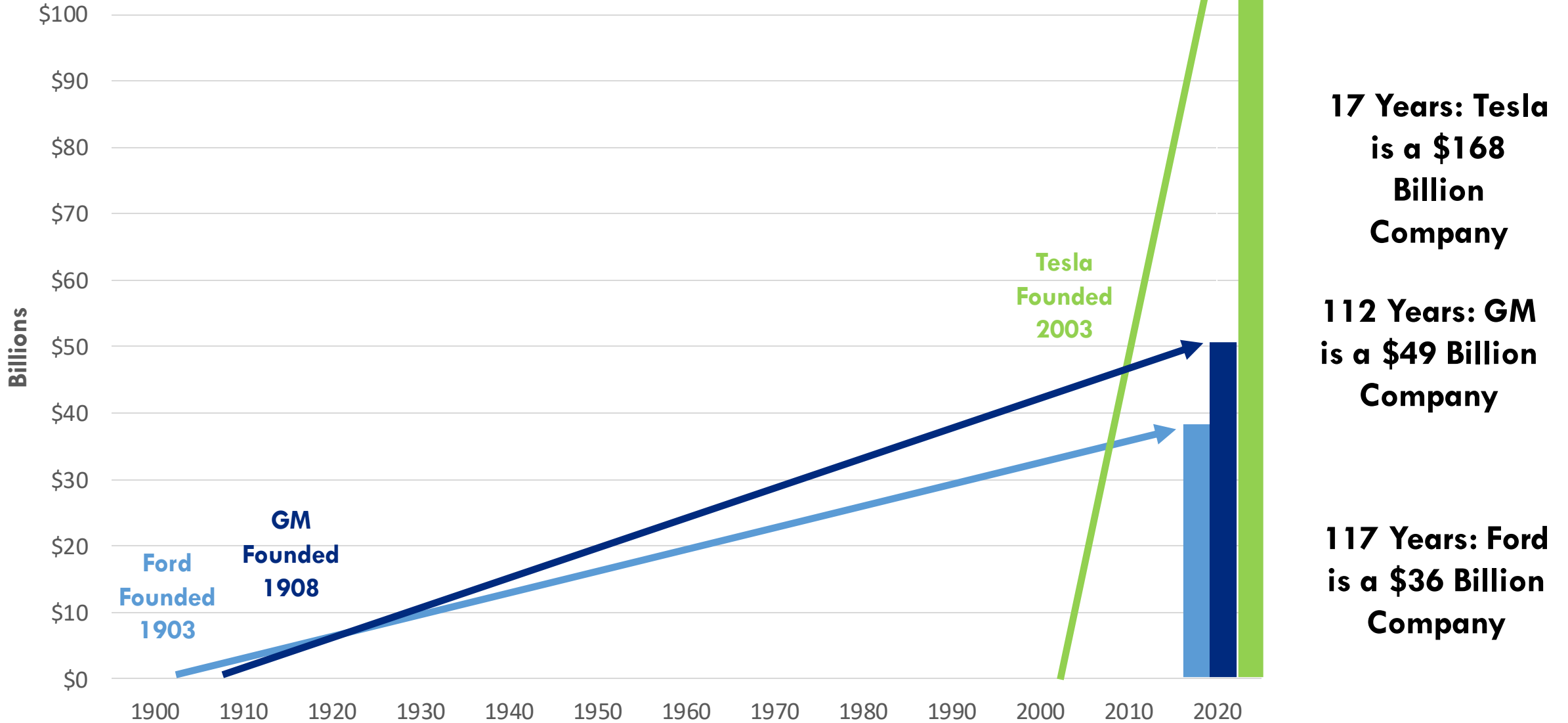
Tesla Inc.'s Model 3 plug-in electric car is the third most-purchased vehicle in the state

CA Vehicle sales, first half of 2019

1. Honda Civic	39,000
2. Toyota Camry	33,600
3. Tesla Model 3	33,000
4. Ford F-series	25,000



Tesla vs Ford and GM



17 Years: Tesla is a \$168 Billion Company

112 Years: GM is a \$49 Billion Company

117 Years: Ford is a \$36 Billion Company

1900. Where is the first car?



1913. Where is the last horse?



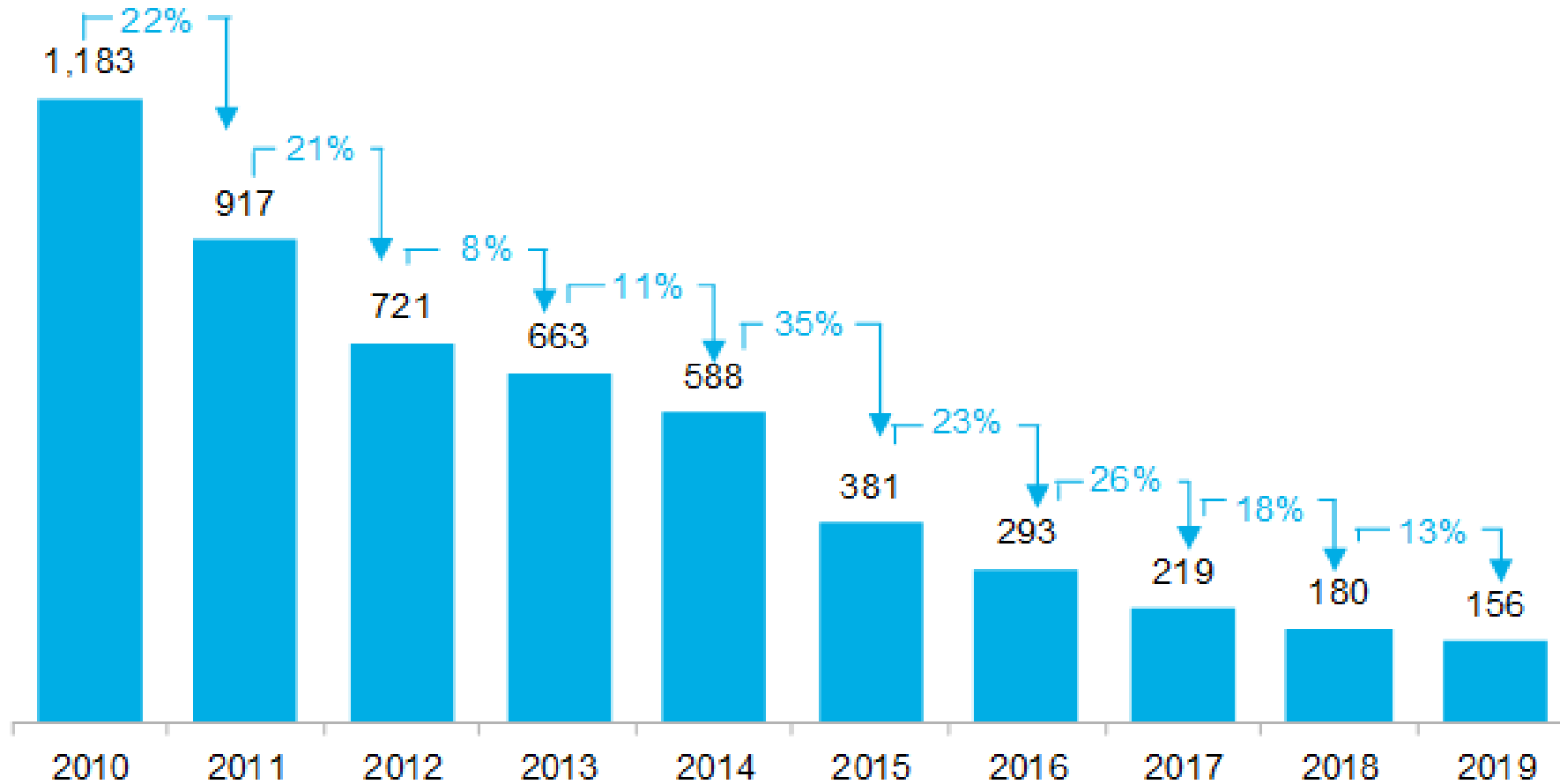
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Electric Vehicles Were California's Most Valuable Export in 2019

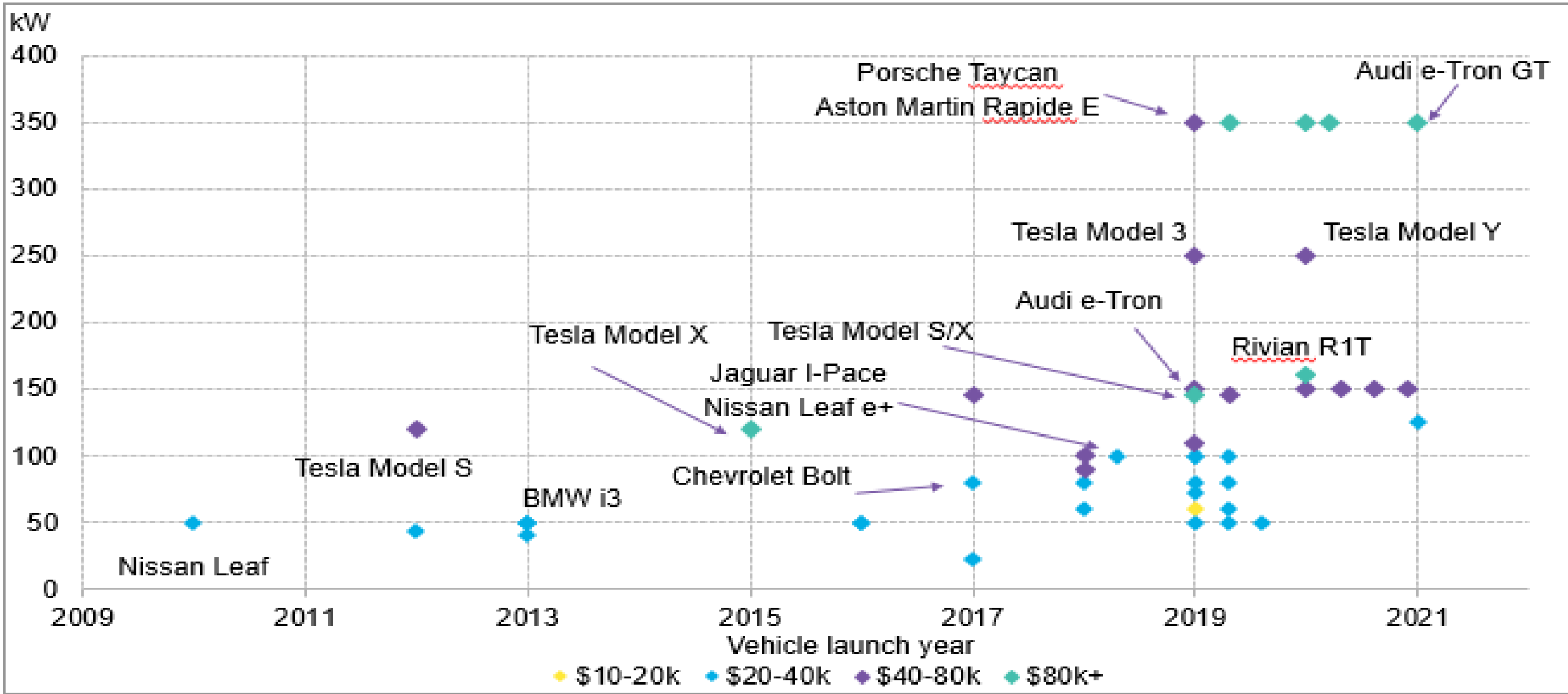
- 1) Electric Vehicles (\$7B)**
- 2) Civilian Aircraft, Engines and Part (\$6.5B)**
- 3) Diamonds (\$4.3B)**
- 4) Broadband technology (\$3.9B)**
- 5) Almonds (\$3.2B)**

Lithium-ion battery prices have fallen 87% since 2010

Battery pack price (real 2019 \$/kWh)



Average EV charging speed is increasing



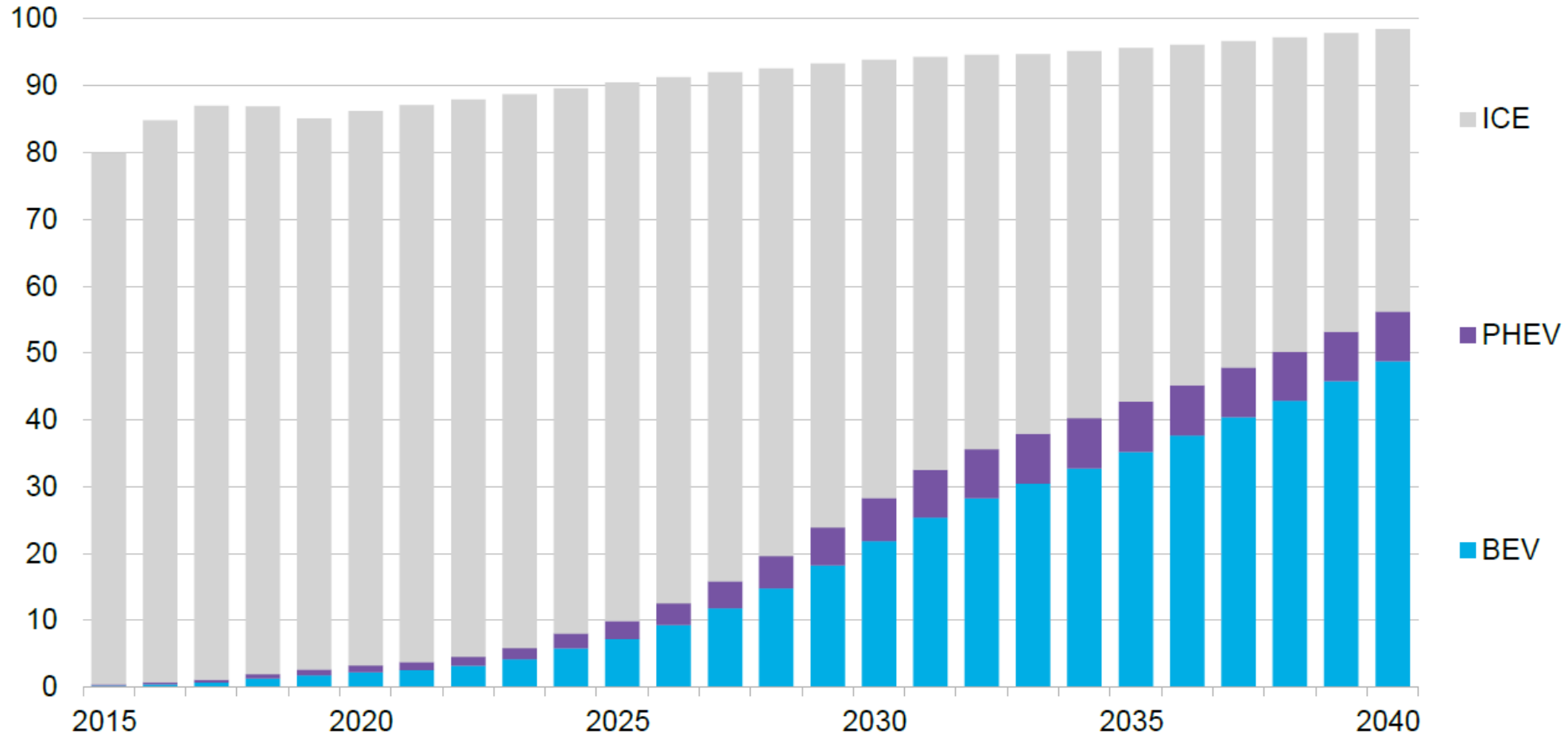
Source: BNEF

Demand outlook

Electric vehicles will make up the majority of new passenger vehicle sales by 2040

Global long-term passenger vehicle sales by drivetrain

Million vehicles



LITHIUM: The Next California Goldrush?

1849

Sutter's Mill



2019

Salton Sea



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

CALIFORNIA CLEAN JOBS

California has

5x

more clean energy jobs
than fossil fuel jobs.

Nearly

4 in 10

solar jobs in America
are in California.

Statewide, there were

512,934

jobs in the clean
energy industry in 2018.

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!

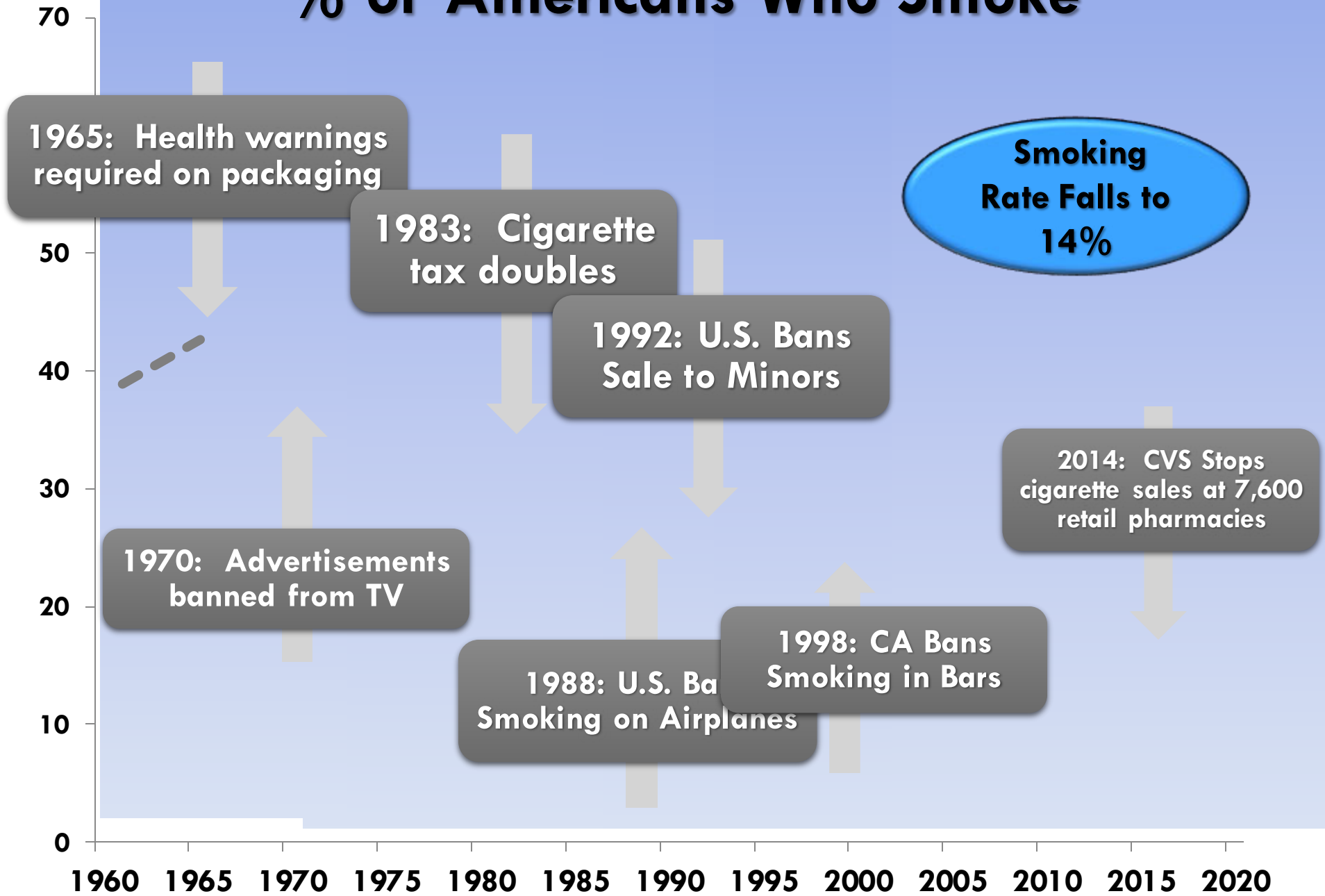
You'll enjoy Camels for the same reasons so many doctors enjoy them. Camels have cool, cool mildness, pack after pack, and a flavor unmatched by any other cigarette. Make this sensible test. Smoke only Camels for 30 days and see how well Camels please your taste, how well they suit your throat as your 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 "it-Zone" ("it" for Throat, "it" for Taste).



% of Americans Who Smoke



Smoking Rate Falls to 14%

The Largest Tree in the World



**Sequoia National Park
California**





Thank you

David Hochschild

Chair

California Energy Commission

David.Hochschild@energy.ca.gov