Natural Gas in California

Challenges and Opportunities for Decarbonization

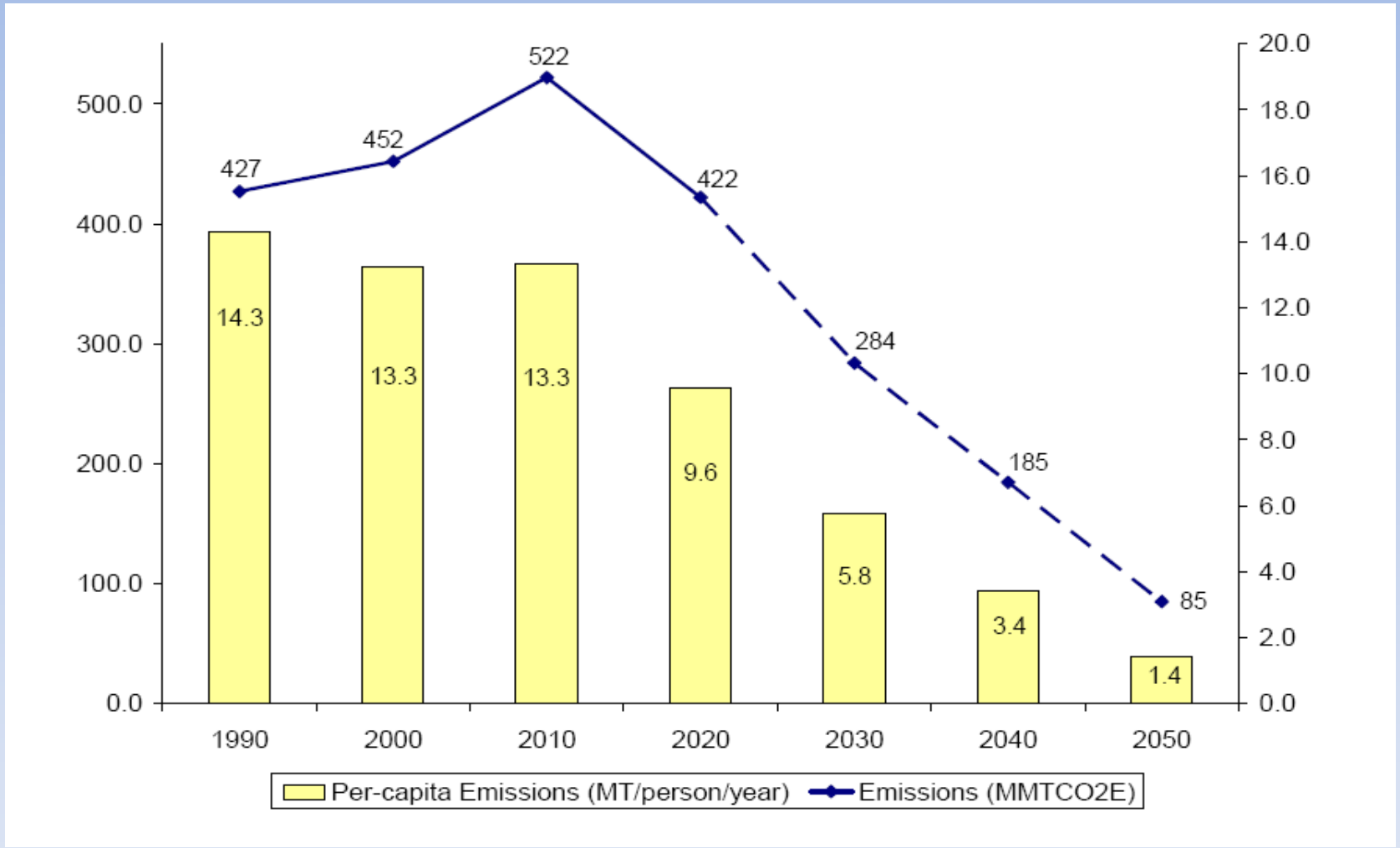
Rob Oglesby, Executive Director

Decarbonizing California

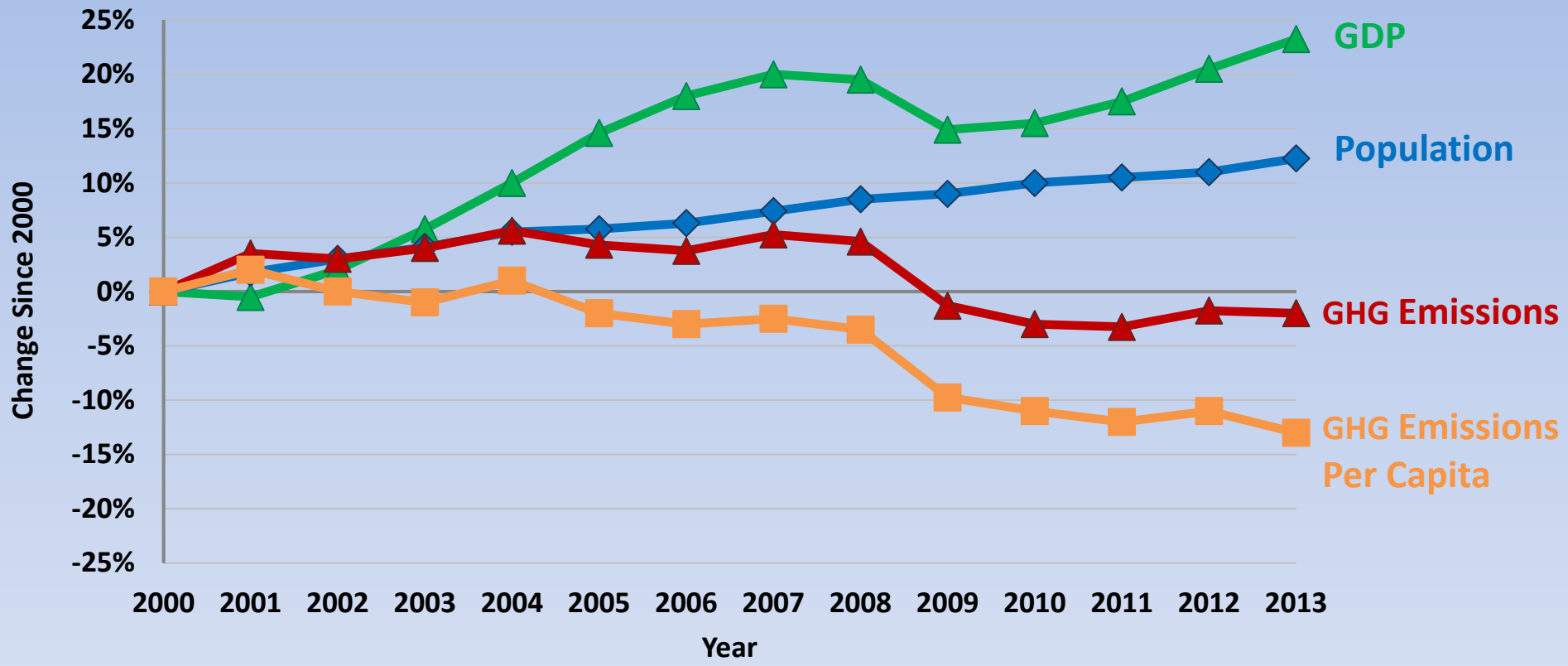
Greenhouse Gas (GHG) policies and goals:

- GHG below 1990 levels – 40% by 2030 and 80% by 2050
- 50% renewable generation by 2030
- Double energy efficiency savings in electricity and natural gas end uses by 2030
- Zero Emission Vehicle Action Plan – 1.5 million ZEVs by 2025
- Low Carbon Fuel Standard – reduce vehicle fuel intensity 10% by 2020

Emissions Trajectory Toward 2050



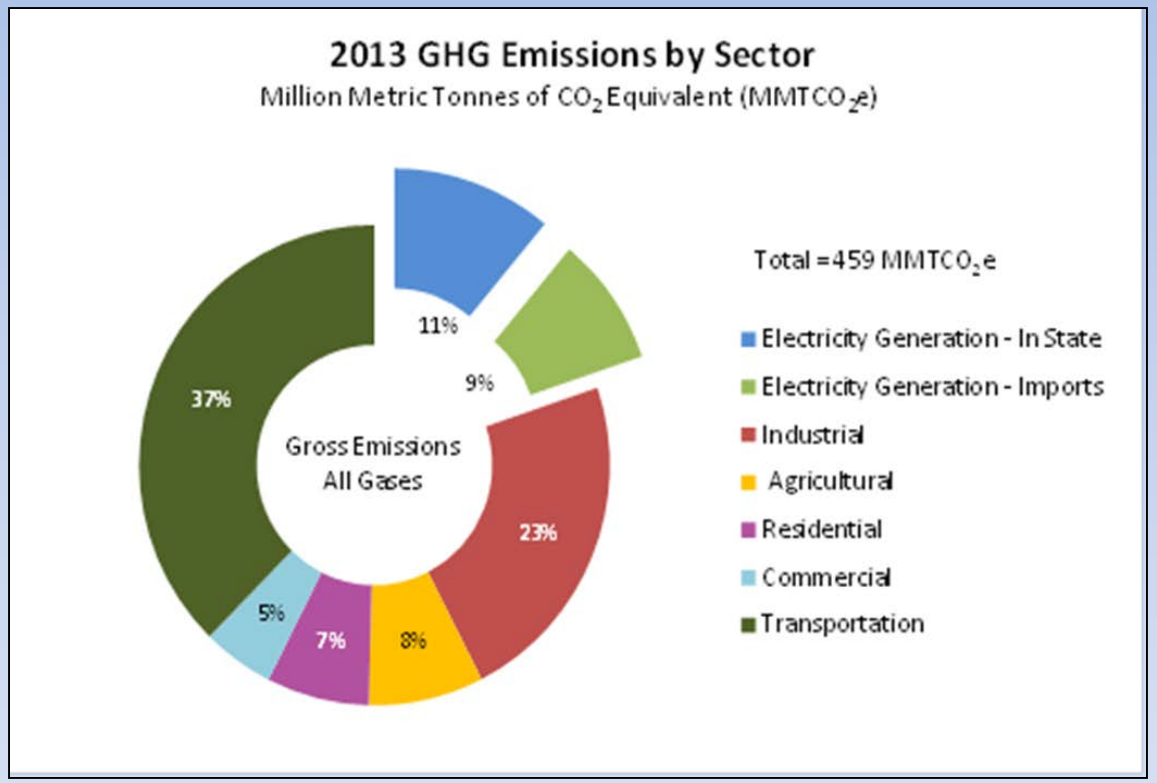
Change in California GDP, Population and GHG Emissions since 2000



Metric	Associated 2013 Value
GDP	2.05 trillion (2009 $)
Population	38.2 million
GHG Emissions	459.3 MMTCO$_2$e
GHG Emissions Per Capita	12 metric tons CO$_2$e per person

Source: *CA Air Resources Board*

GHG Emissions Statewide

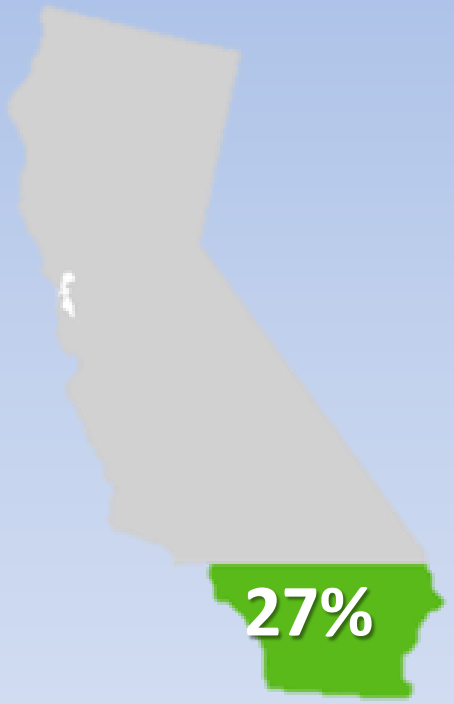


- 20% from electricity sector
- About ½ from out-of-state electricity
- 37% from transportation

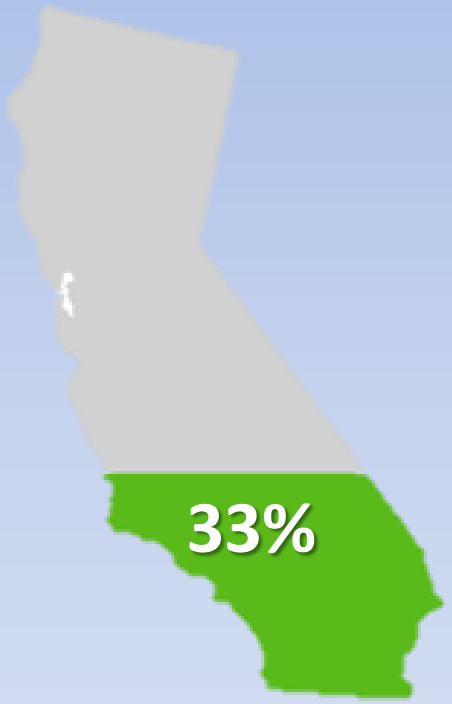
Sources: California Energy Commission IEPR

CA IMPORTS 33% GWH

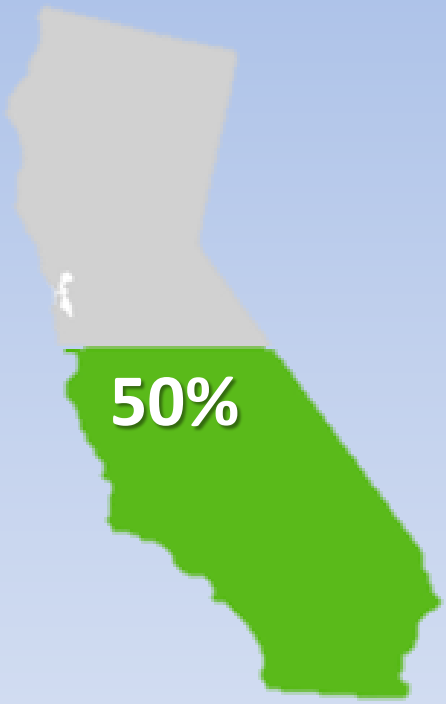
Renewable Energy
Where we are,
and where we are going….



2016



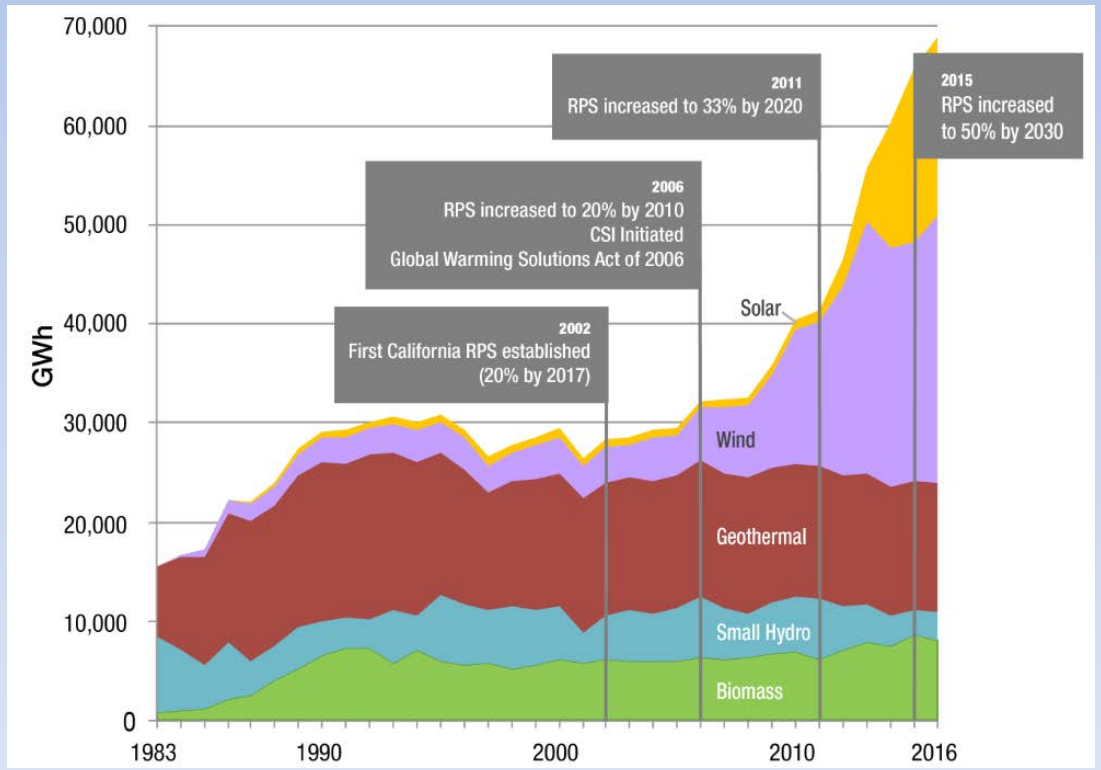
2020



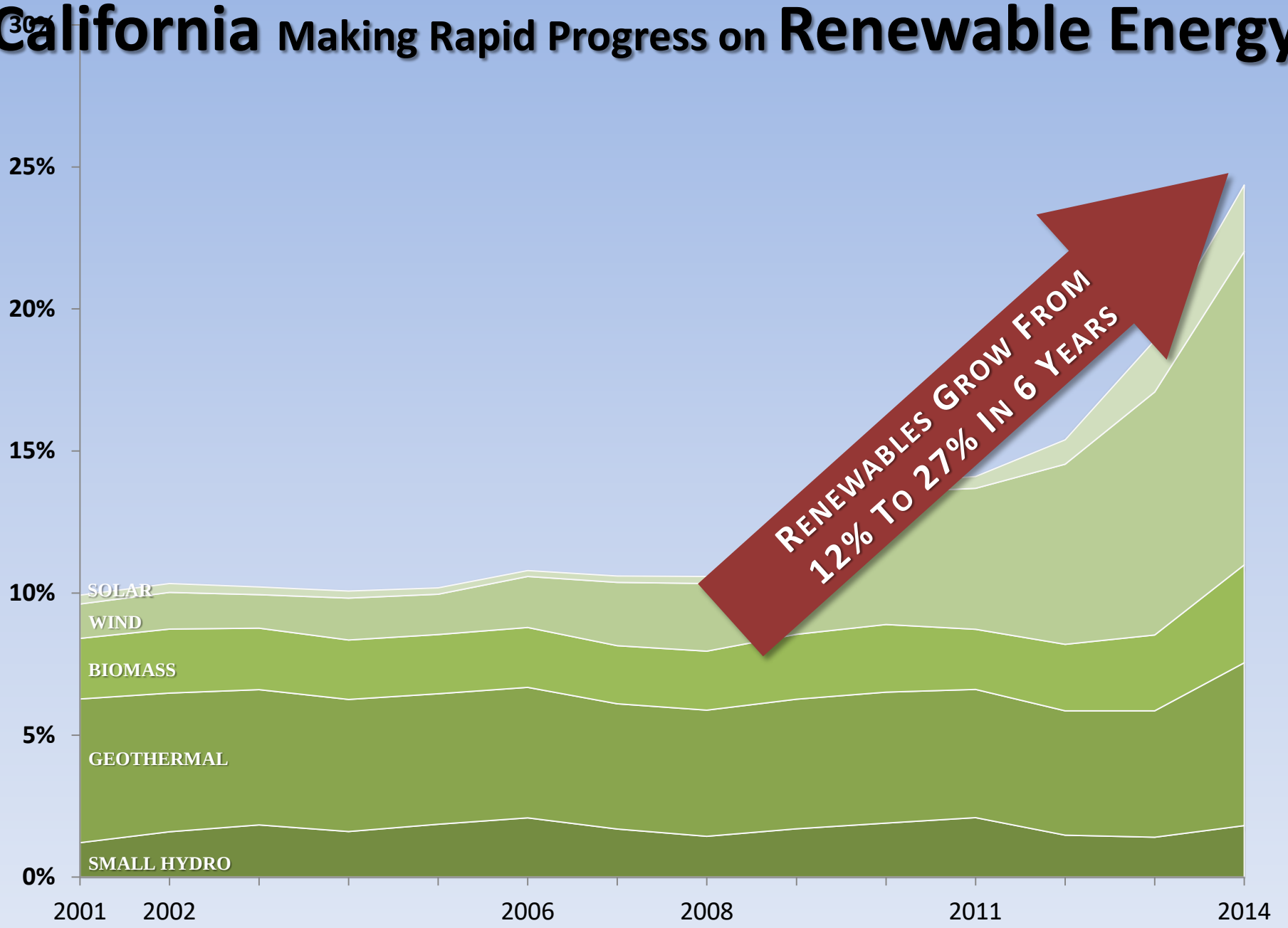
2030

Transformation of California's Electricity System: Renewables Growth

- 2014 GHG emissions were 20% below 1990 levels (AB 32 goal)
- Renewable capacity grew from 6,800 MW in 2001 to 26,300 MW in 2016 (including self-gen)

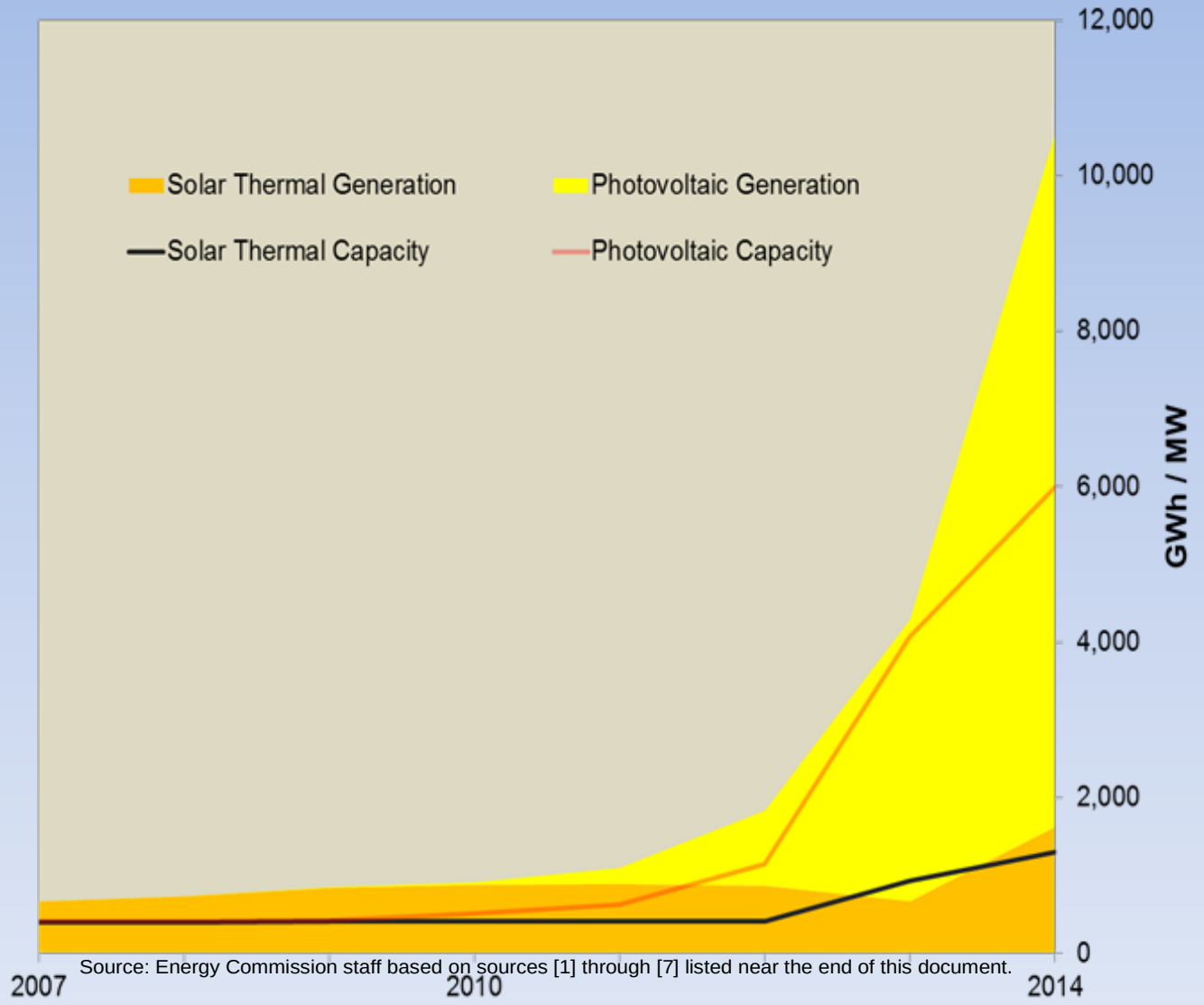


California Making Rapid Progress on Renewable Energy



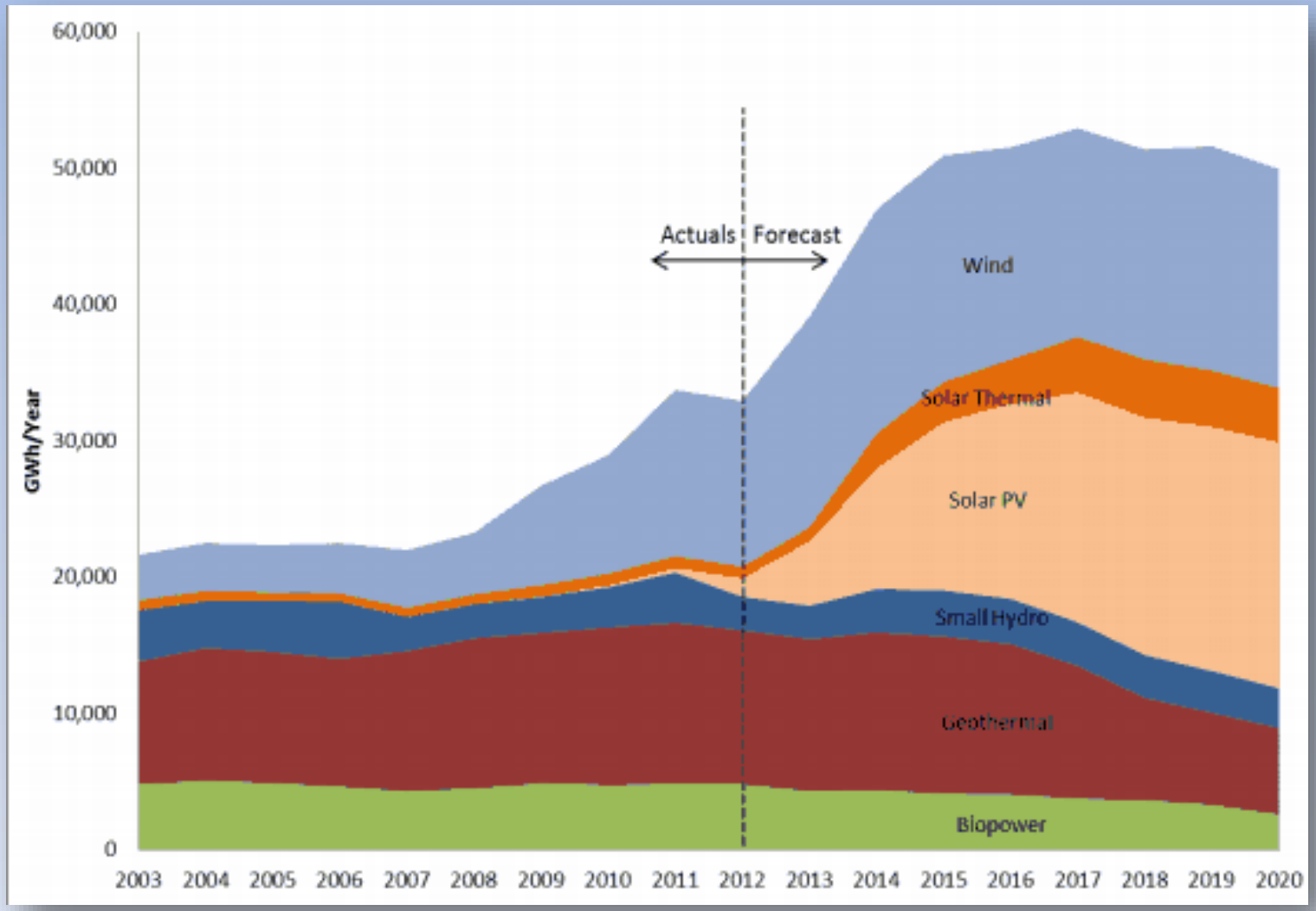
Source: California Energy Commission, Tracking Progress Report

CALIFORNIA SOLAR GENERATION



Source: Energy Commission staff based on sources [1] through [7] listed near the end of this document.

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



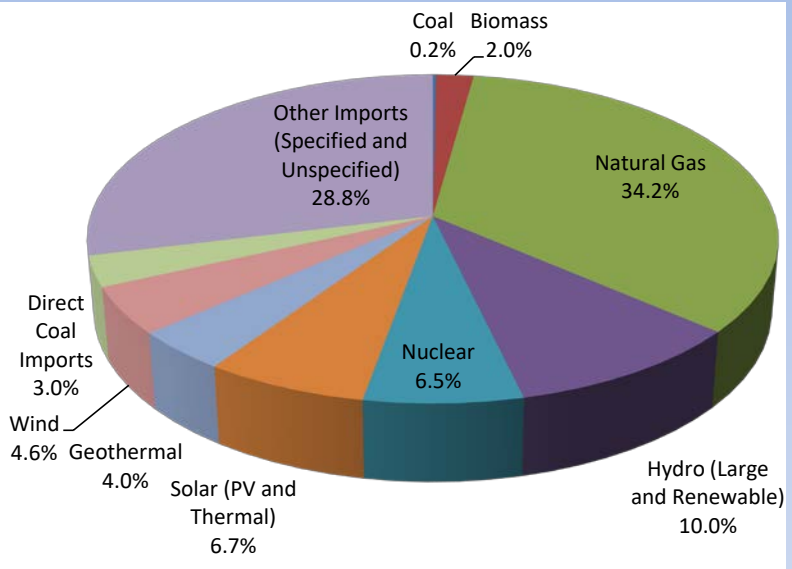
Source: CPUC RPS Report

Declare victory and go home?

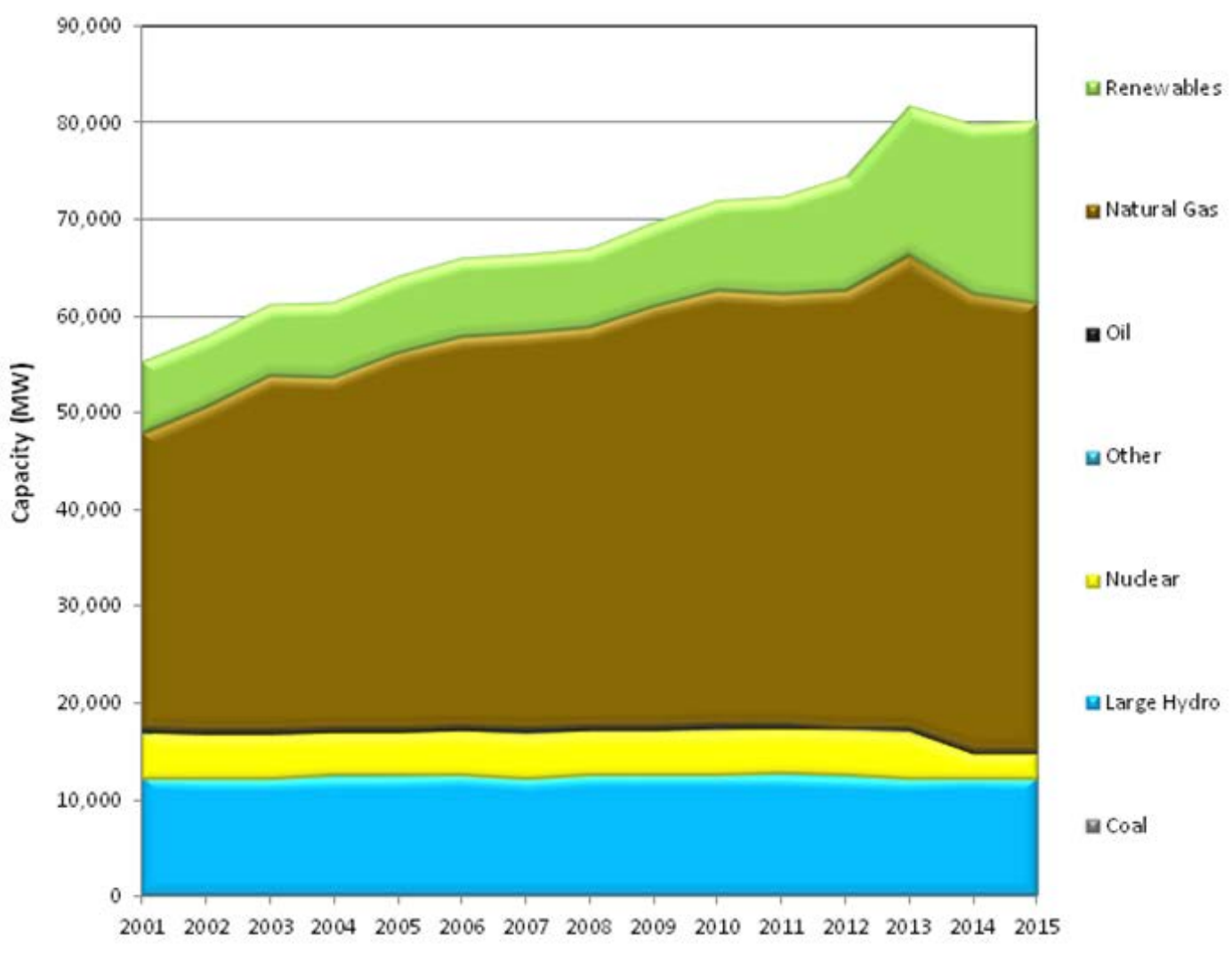
Not so fast….

CA's Generation Mix: Largely Natural Gas

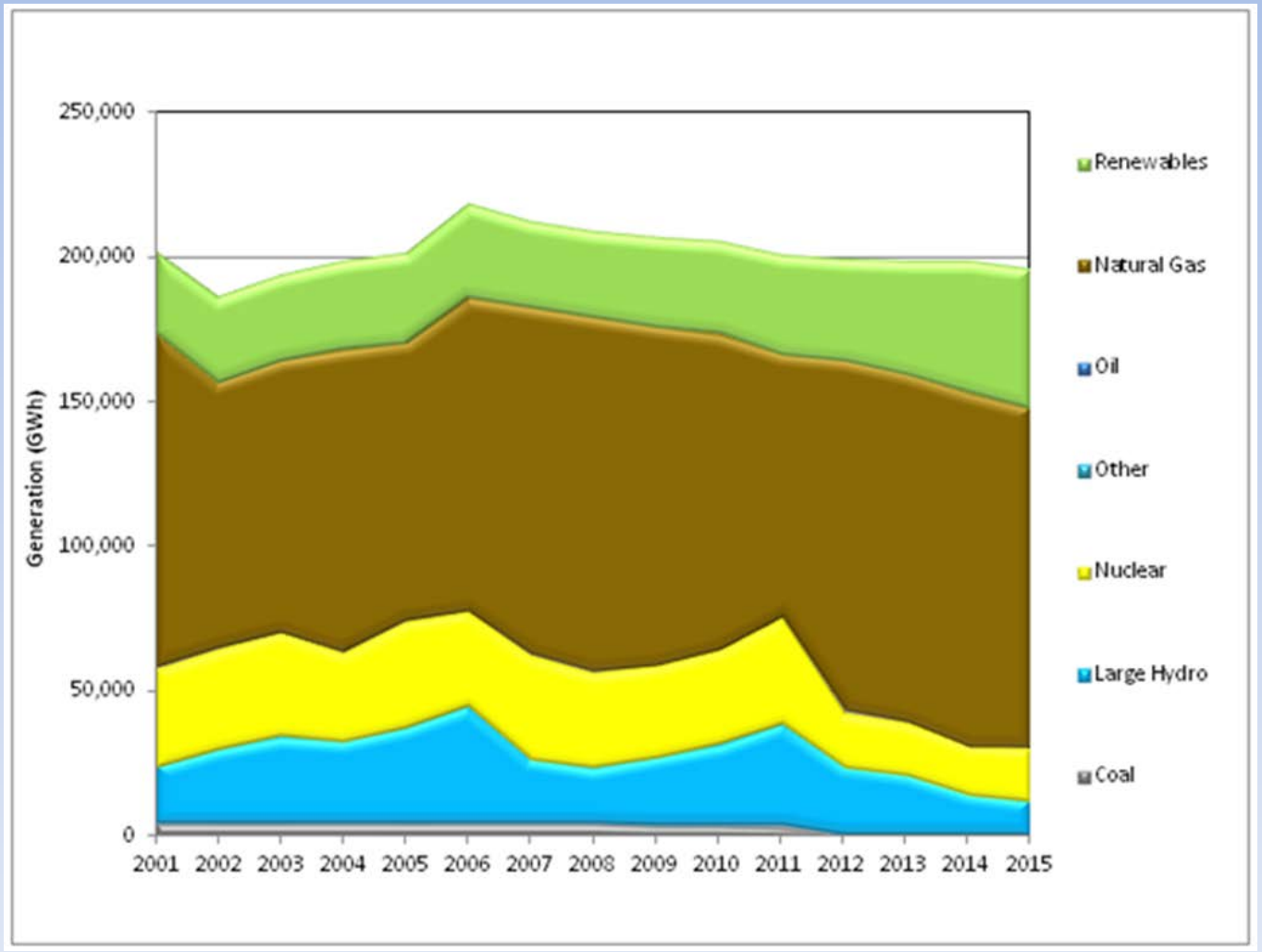
- **California currently relies on natural gas electric generation to meet the following demand:**
  - Baseload
  - Load following
  - Peak
- **Natural gas generation benefits include:**
  - *It addresses intermittent generation issues associated with renewables*
  - *It is dispatchable and can quickly respond to demand if required*



Installed In-State Electric Generation Capacity by Resource Type (2001-2015)

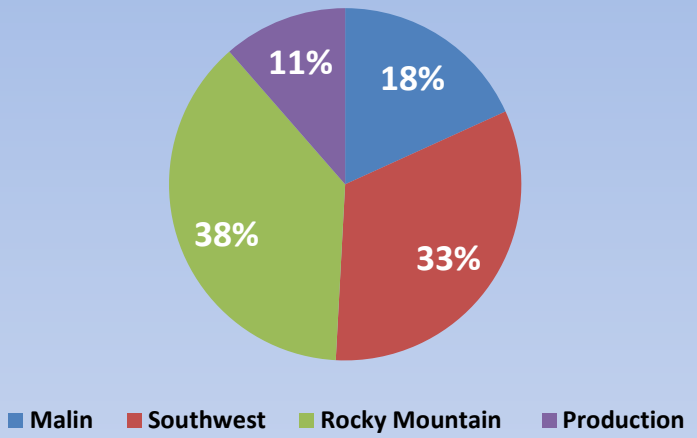


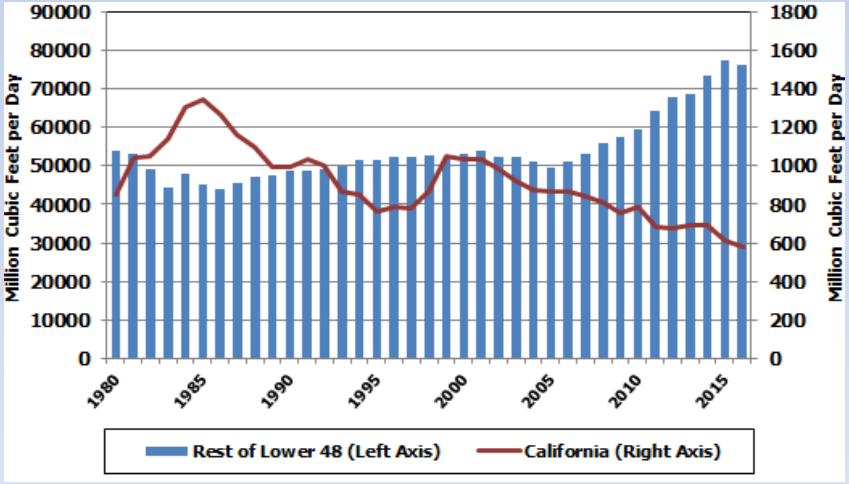
Electric Generation by Resource Type (2001-2015)



Sources of CA's Natural Gas

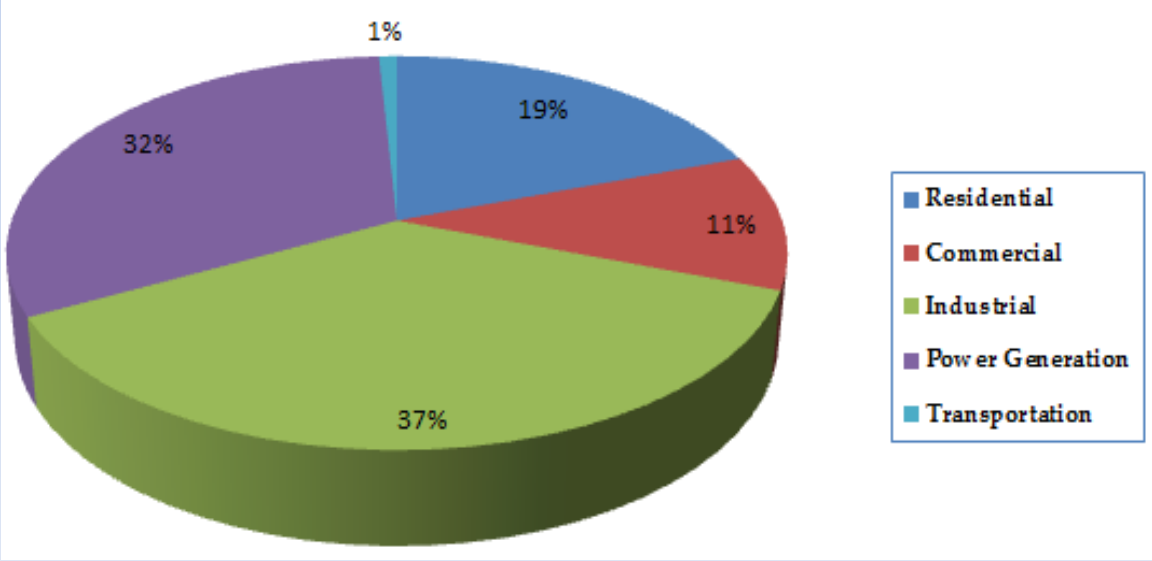
- **The majority of CA's Gas is imported:**
  - **Only 11% of from CA**
- **Overall U.S. natural gas production is increasing**
- **California's natural gas production expected to decline due to:**
  - Lessening performance in existing wells
  - Little or no new development of new wells (*Potential seismic activity is a contribution factor)*





CA's End-Use Consumption of Natural Gas

- **In 2016, California consumed of 5.8 Bcf of natural gas *per day***
- **Largest end-use consumption is the industrial sector**
- **Second largest end-use consumption is power generation**
- **The residential sector consumes 19%**
  - This is mostly for heating and cooking purposes
  - *Fuel switching/electrification could impact this sector in the future*



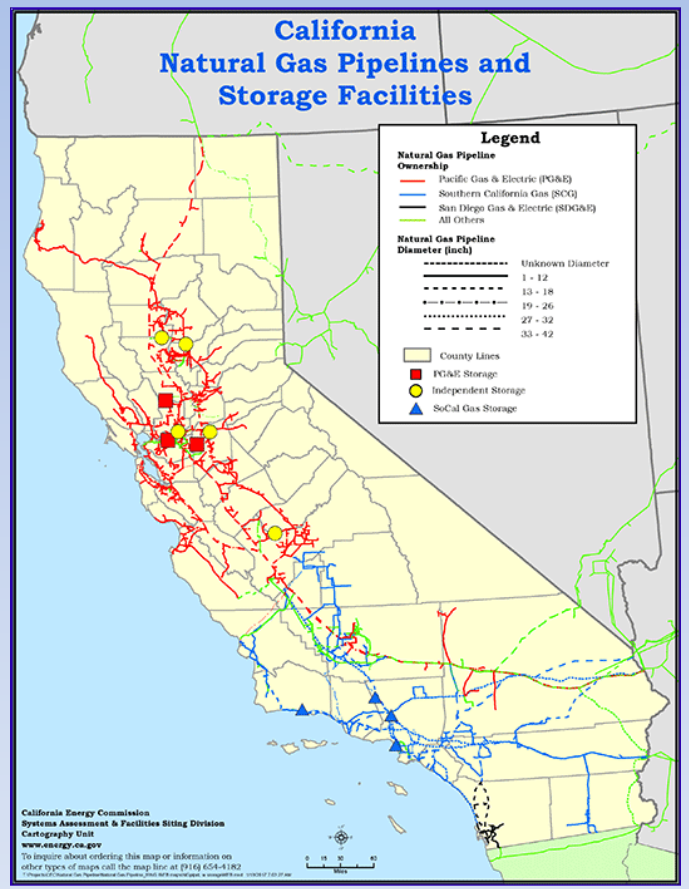
Natural Gas Infrastructure and California

- **California has vast interstate and intrastate natural gas infrastructure**
- **The majority of California's natural gas is imported from out-of-state**
- **California is the end recipient of interstate pipelines**
  - Upstream events create deliverability and market uncertainty
  - New demand sources upstream may impact California

Role of Natural Gas Storage in California

Storage serves several purposes:

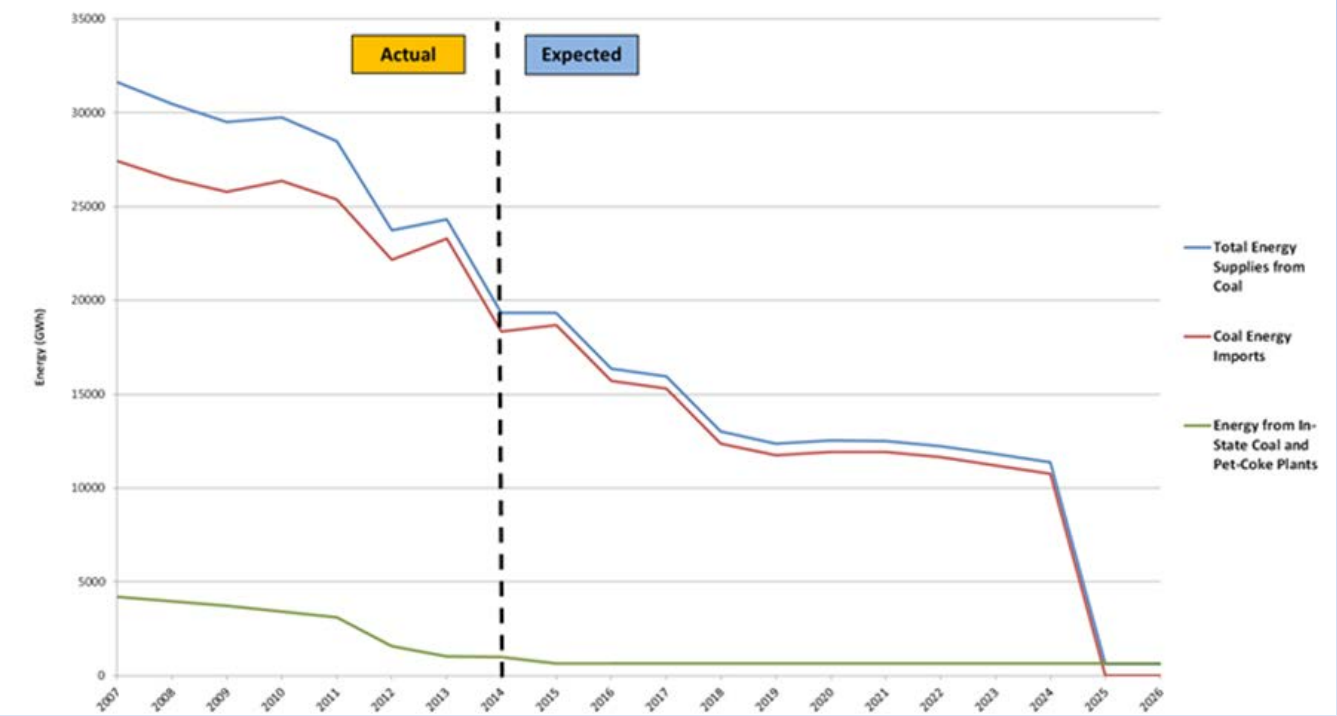
- **Keeps purchase costs down** - *Operators can stock-up on gas when prices are lower for use when demand is high*
- **Maintains gas system reliability** – *California's gas system was not designed to meet winter peak demand only using flowing supplies. Withdrawal or injection of gas stored locally can help maintain adequate system pressures and flow*
- **Provides liquidity** – *having natural gas stored near demand during peak periods mitigates spot-market purchases*



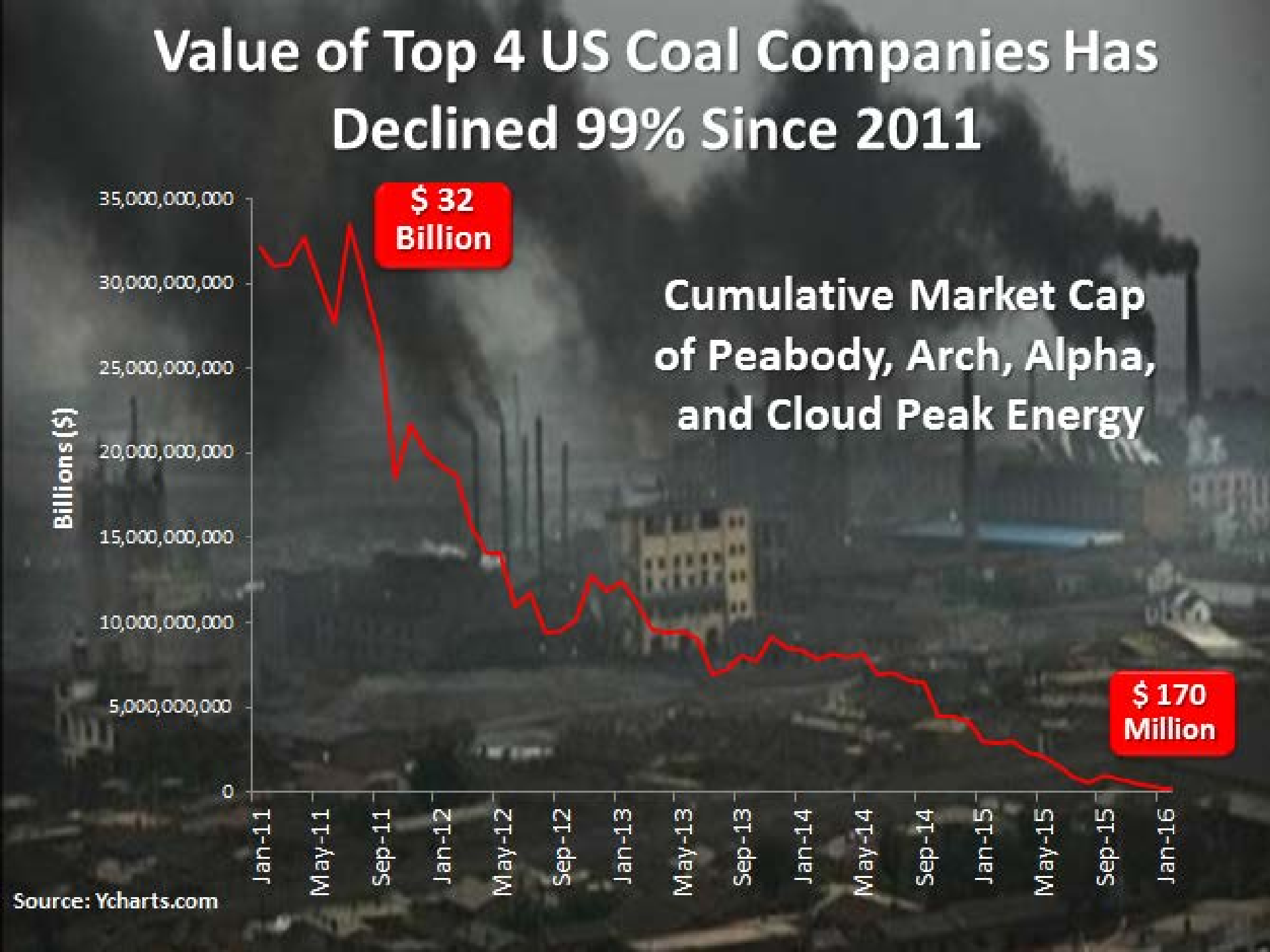
Will natural gas power plants go the way of coal?

Transformation of California's Electricity System: Coal has Declined

- Coal-fired electricity used in California was 11% in 2000 and has dropped to 6% by end of 2015, almost entirely from out-of-state.

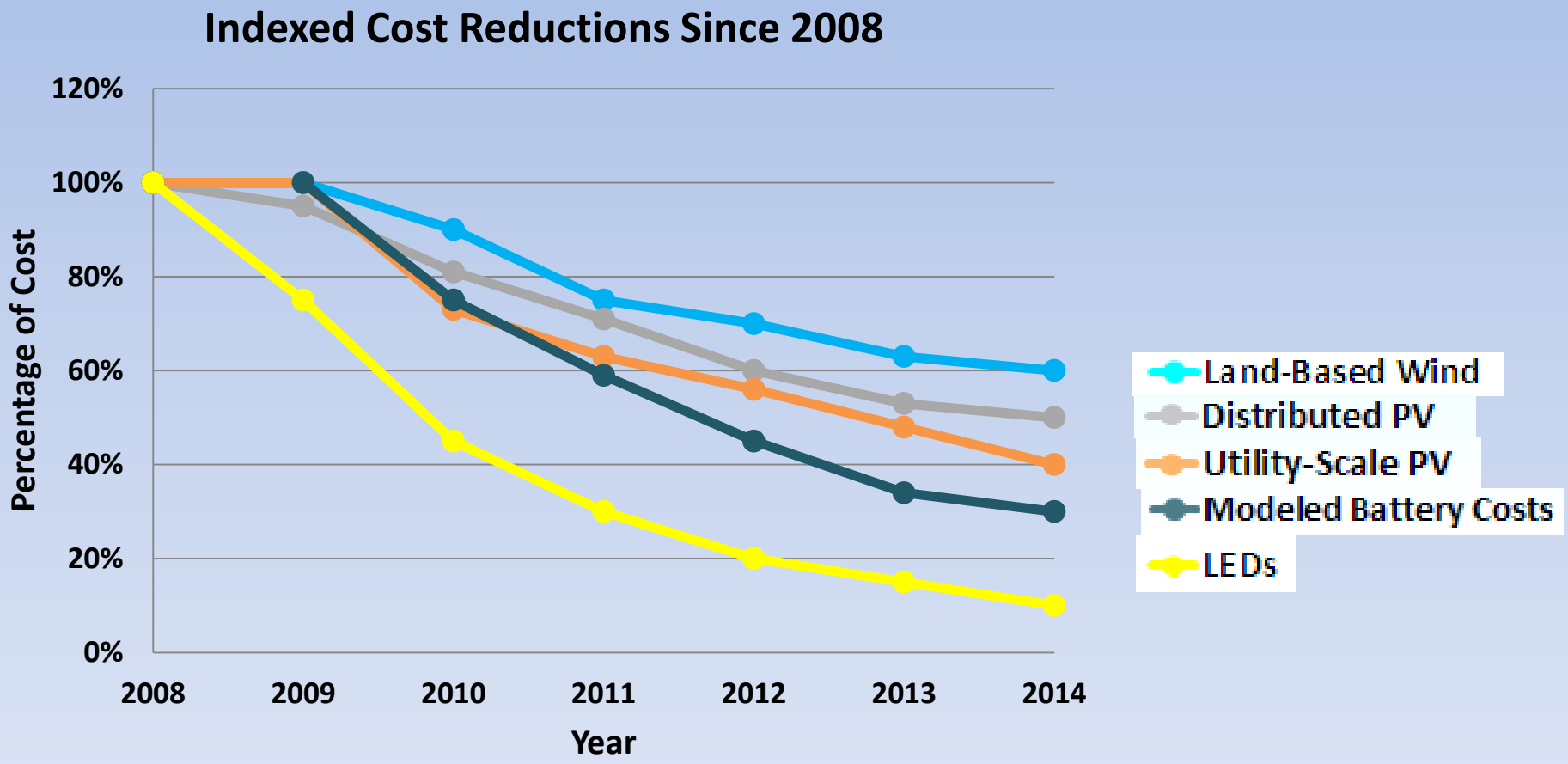


Value of Top 4 US Coal Companies Has Declined 99% Since 2011



Source: Ycharts.com

The Falling Cost of Clean Energy Technologies



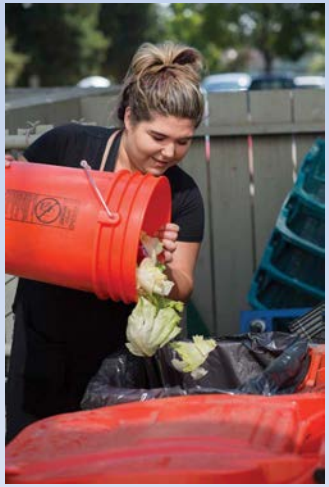
Source: DOE Report, Revolution Now, The Future Arrives for Five Clean Energy Technologies, 2015

California and Renewable Gas

Renewable Gas (aka biomethane or biogas) is typically derived from organic fuel sources such as biomass, digester gas, or landfill gas.

Opportunities for Renewable Gas:

- Transportation fuel
- Onsite generation
- Pipeline injection (for RPS)



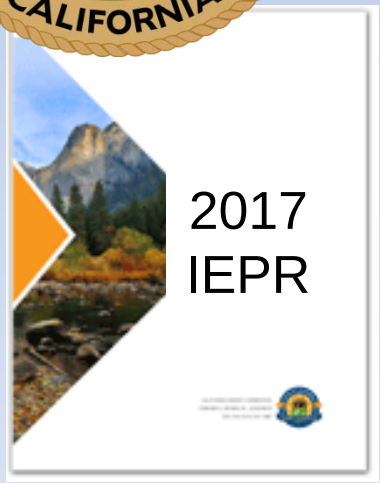
Barriers to using renewable gas include:

- Cost - Equipment and interconnection
- Removing impurities
- Supply

California's Renewable Gas Policy

Senate Bill 1383 (Lara, 2016) requires the Energy Commission's *2017 IEPR* to include recommendations for the development and use of renewable gas in:

- The Renewables Portfolio Standard
- Low-Carbon Fuel Standard regulations
- State's waste diversion goals
- The market-based compliance mechanisms



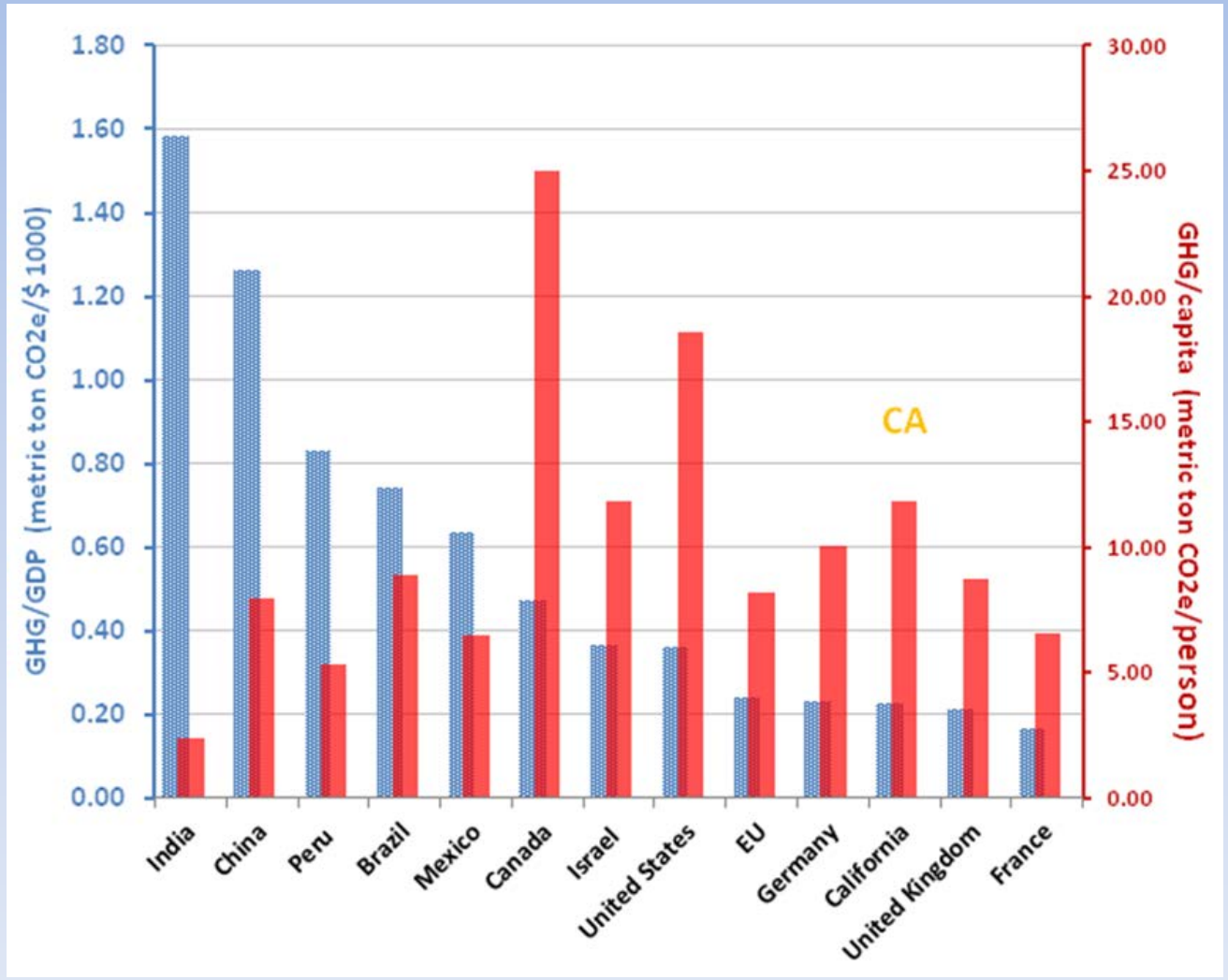
California Renewable Gas Policy: Future

SB 1383 also requires the future development of:

- A short-lived climate pollutant strategy to reduce statewide emissions of methane and anthropogenic black carbon. Energy infrastructure and procurement policies specific to promote dairy projects
- Pilot programs and incentives that reduce economic uncertainty of renewable gas projects

Thank You!

California GHG Emissions per GDP and per Capita in Comparison With Other Countries



Energy Commission Natural Gas Forecasts

- **Energy Commission staff forecasts California's natural gas supply, demand, hub prices, and flows:**
  - California is part of the North American market for natural gas
  - Prices at California's hubs are tied to Henry Hub in Louisiana *(the North American benchmark price)*
- **Staff's forecasts and analysis will be incorporated into the Energy Commission's *2017 Integrated Energy Policy Report* (IEPR) and the *2017 Natural Gas Outlook Report:***
  - Includes three scenarios: High Demand, Mid Demand, and Low Demand
  - Preliminary results presented at April 25th *2017 IEPR* Workshop
  - *2017 IEPR* Workshop to review final forecast and analysis scheduled for September 20, 2017