



2021 SB 100 Joint Agency Report Summary

# Achieving 100% Clean Electricity in California

An Initial Assessment



# Senate Bill 100

Officially titled “The 100 Percent Clean Energy Act of 2018,”  
Senate Bill 100 (SB 100, De León):

- 1** Sets a 2045 goal of powering all retail electricity sold in California and state agency electricity needs with renewable and zero-carbon resources.
- 2** Updates the state’s Renewables Portfolio Standard to ensure that by 2030 at least 60 percent of California’s electricity is renewable.
- 3** Requires the CEC, CPUC, and CARB to use programs under existing laws to achieve 100 percent clean electricity and issue a joint policy report on SB 100 by 2021 and every four years thereafter.



# California's

## Clean Electricity Goals



2020

33%

Under the Renewables Portfolio Standard, eligible resources include solar, wind, geothermal, biomass and small hydroelectric.



2030

60%

2045

100%



Under SB 100 which expands eligibility to include additional carbon-free resources

# California's

Climate Imperative



**BY 2100**

## ***AVERAGE ANNUAL MAXIMUM DAILY TEMPERATURE***

**IS PROJECTED TO INCREASE BY**

**5.6–8.8° F**

Depending on greenhouse gas emissions reductions. The greatest increase is seen with business-as-usual emissions levels.

Source: California's Fourth Climate Change Assessment





# California's Climate Imperative

More Acres Burned From Wildfires in 2020 Than the Last Four Years Combined

2016-'19



**3.7**

**MILLION**

Estimated Acres Burned

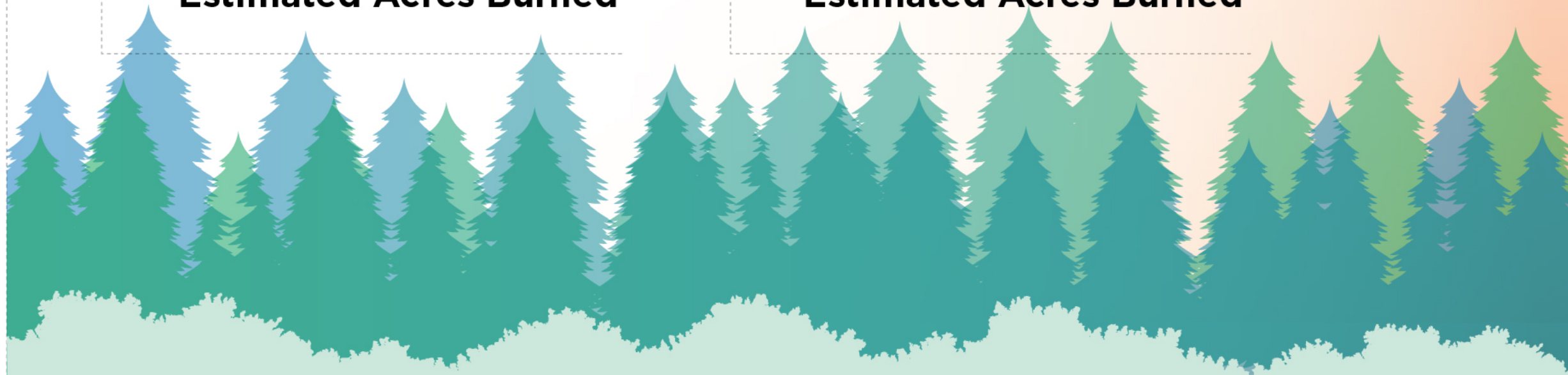
2020



**4.2**

**MILLION**

Estimated Acres Burned



In 2019,

**63%**

of California's electricity retail sales came from non-fossil fuel sources:

**RENEWABLES**



**HYDROELECTRIC**



**NUCLEAR**



# Continuing a Legacy of Bold Leadership



Carbon emissions from generating electricity have dropped 43 percent since 1990, and in 2017, for the first time ever, the state drew most of its power from carbon-free sources. These gains are largely attributable to:



California's energy efficiency standards for buildings and appliances



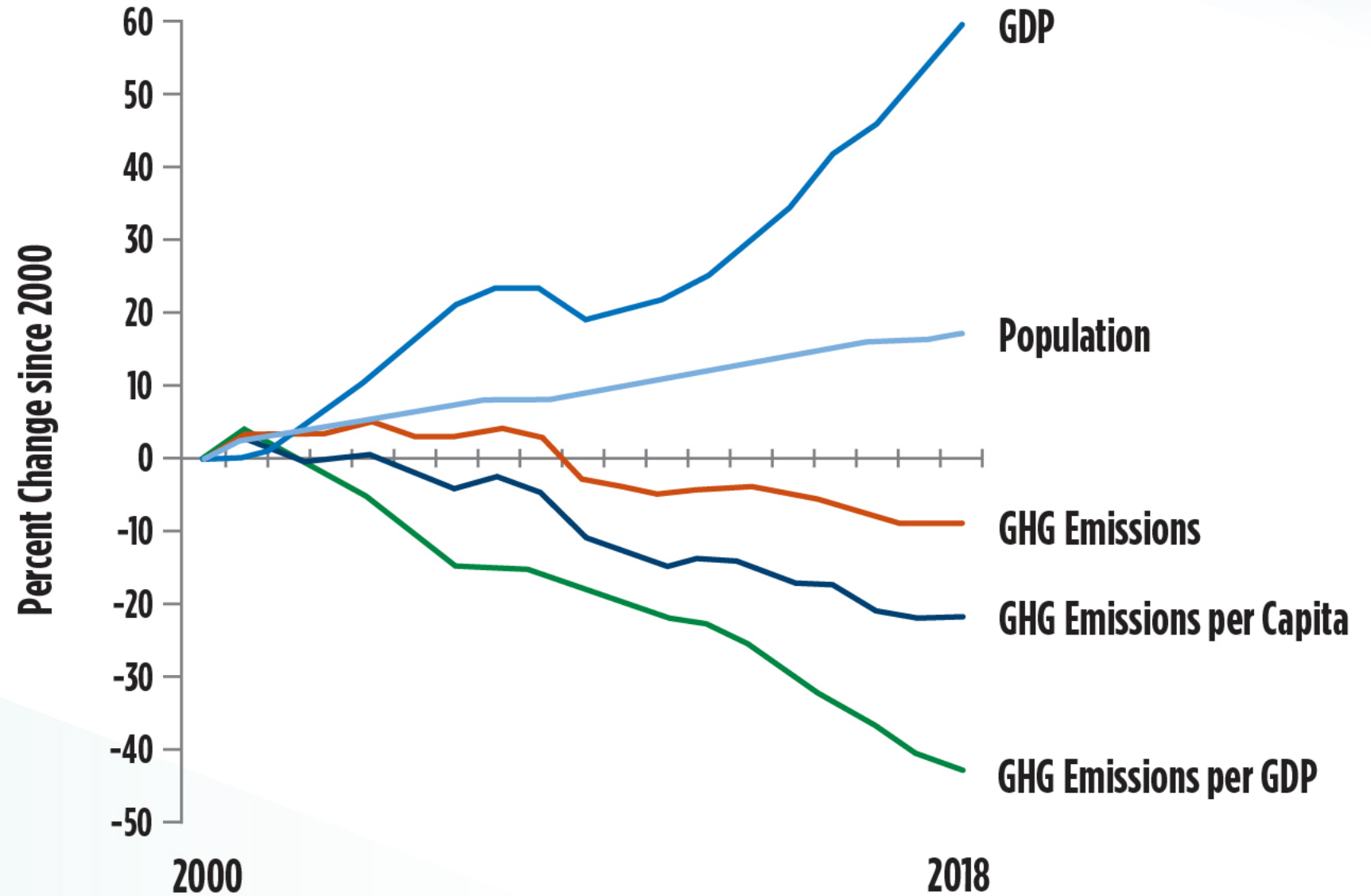
The state's Renewables Portfolio Standard



Greatly reduced use of coal-fired power plants

# Statewide Trends

of Emissions and Indicators  
(2000-2018)

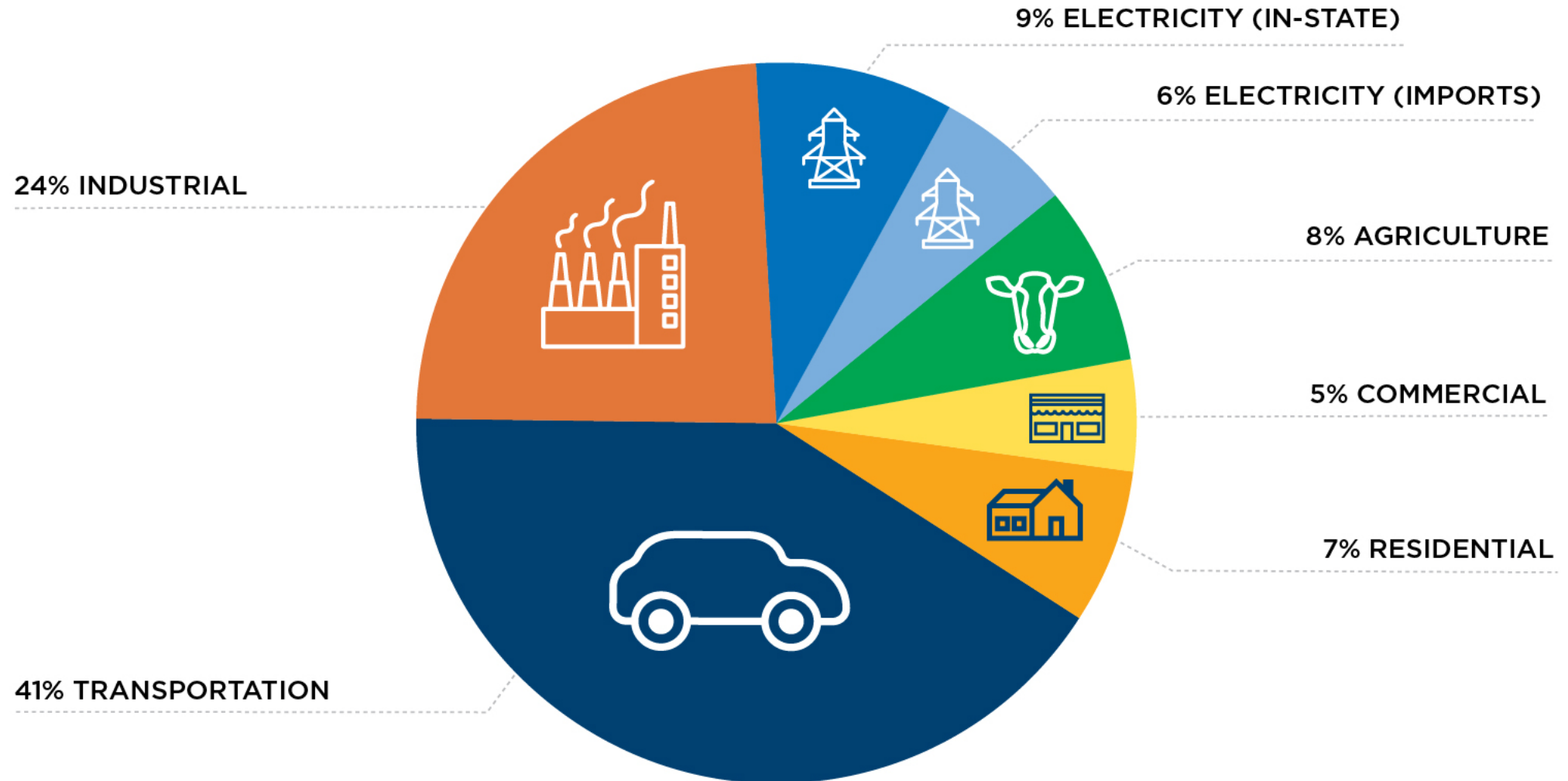






# California's

## 2018 Greenhouse Gas Emissions



Source: California Air Resources Board

# Related Clean Energy Efforts



## Transportation electrification

California is moving toward having 100 percent of new cars and passenger trucks sold in the state be zero-emission by 2035, powered by increasingly clean electricity.



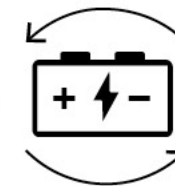
## Energy efficiency

Improved energy efficiency will reduce the economic and environmental costs of expanding California's clean electricity generating capacity.



## Building decarbonization

Electrifying more building energy uses is environmentally more effective if the power comes from zero-carbon sources.



## Load flexibility

Increased load flexibility is critical to maintaining a reliable power supply at a low cost.

# Benefits

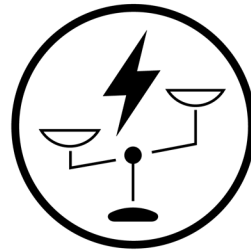
## of 100% Clean Energy

### Achieving 100% Clean Electricity in California



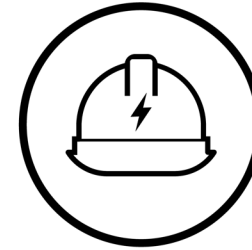
#### Improves Public Health

The phaseout of fossil fuel-generated electricity is expected to reduce criteria air pollution and related deaths and illnesses.



#### Advances Energy Equity

Disadvantaged communities—low-income neighborhoods that have historically suffered poor health, dirty air and other burdens — will reap the highest health benefits from clean electricity.



#### Restores and Creates Clean Energy Jobs

SB 100-driven growth will restore thousands of clean energy jobs lost during the pandemic and create thousands of new high-quality clean energy jobs.



# The 2021 SB 100 Joint Agency Report

The 2021 report is a first step to evaluate the challenges and opportunities in implementing SB 100.

**It includes an initial assessment of the additional energy resources and the resource building rates needed to achieve 100 percent clean electricity, along with the associated costs.**

**The estimates in this report will change over time as additional factors, such as system reliability, land use, energy equity, and workforce needs, are more closely examined.**



# Public Outreach



**A diverse array of interests informed this report through a year-long series of public workshops and comment opportunities. Participants included:**

Community leaders

Energy experts with utilities, technology companies and trade groups

University researchers

Environmental groups

Environmental justice organizations

**The joint agencies also consulted with:**

The California Balancing Authorities

The Disadvantaged Communities Advisory Group

# Renewable/Zero-Carbon Technologies Modeled:



Solar, photovoltaic and thermal (existing only)



Wind, onshore and offshore



Geothermal



Bioenergy



Fuels cells



Hydroelectric, existing large and small operations only



Nuclear, existing power plants only



# California

## Clean Electricity Resources

**Projected to increase annual costs  
6% above a 60% RPS baseline**













\* Includes in-state

\*\* Includes in-state and out of state capacity

† New hydro and nuclear resources were not candidate technologies for this round of modeling and could not be selected

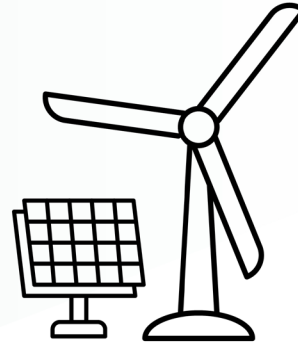


Achieving 100% Clean Electricity in California

	Existing Resources		Projected New Resources	
	2019*	2030**	2045**	
 Solar (Utility-Scale)	12.5 GW	16.9 GW	69.4 GW	
 Solar (Customer)	8.0 GW	12.5 GW	28.2 GW	
 Storage (Battery)	0.2 GW	9.5 GW	48.8 GW	
 Storage (Long Duration)	3.7 GW	0.9 GW	4.0 GW	
 Wind (Onshore)	6.0 GW	8.2 GW	12.6 GW	
 Wind (Offshore)	0 GW	0 GW	10.0 GW	
 Geothermal	2.7 GW	0 GW	0.1 GW	
 Biomass	1.3 GW	0 GW	0 GW	
 Hydrogen Fuel Cells	0 GW	0 GW	0 GW	
 Hydro (Large)	12.3 GW	N/A†	N/A†	
 Hydro (Small)	1.8 GW	N/A†	N/A†	
 Nuclear	2.4 GW	N/A†	N/A†	

# To Achieve Clean Energy

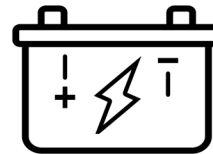
Development Needs To Rapidly Accelerate



Solar & Wind

3X

Solar and wind build rates need to nearly triple\*



Battery

8X

Battery storage build rates need to increase by nearly eightfold\*\*

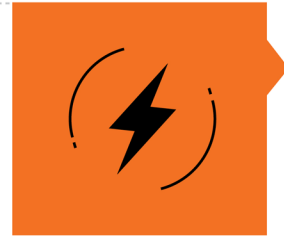


\*Based on 10-year average | \*\*Based on 2020





## Additional Scenarios: Preliminary Findings



### High Demand Flexibility:

Increased flexibility may lower overall resource needs and systems costs

## Study Scenarios

The agencies also explored scenarios outside their interpretation of SB 100 to inform broader state planning efforts



### No-Combustion:

Reduces criteria air pollution but results in higher costs



### Zero-Carbon Firm Resources:

Commercialization of emerging technologies or cost decreases in existing firm resources may lower overall system costs



### Accelerated Timeline:

These targets may be achievable but may increase overall costs

# Key Takeaways from Modeling

This initial analysis suggests SB 100 is technically achievable through multiple pathways.

Construction of clean electricity generation and storage facilities must be sustained at record-setting rates.

Diversity in energy resources and technologies lowers overall costs.

Retaining some natural gas power capacity may minimize costs while ensuring uninterrupted power supply during the transition to 100 percent clean energy.

Increased energy storage and advancements in zero-carbon technologies can reduce natural gas capacity needs.

Further analysis is needed.



# Recommendations for Further Analysis



- 1** Verify that scenario results satisfy the state's grid reliability requirements.
- 2** Continue to evaluate the potential effects of emerging resources, such as offshore wind, long-duration energy storage, green hydrogen technologies, and demand flexibility.
- 3** Assess environmental, social, and economic costs and benefits of the additional clean electricity generation capacity and storage needed to implement SB 100.
- 4** Hold annual workshops to support alignment among the joint agencies and continuity between SB 100 reports.



## SB 100 Joint Agencies



California Energy Commission (CEC): leads the state to a 100 percent clean energy future by investing in clean energy and transportation innovation, forecasting energy demand, setting the state's appliance and building energy efficiency standards, and directing the state's response to energy emergencies.



California Public Utilities Commission (CPUC): regulates services and utilities, protects consumers, safeguards the environment, and assures Californians' access to safe and reliable utility infrastructure and services.



California Air Resources Board (CARB): leads the state's climate change programs and oversees all air pollution control efforts in the state.