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# Key Challenges for California's Energy Future

An Energy Primer for California's Policymakers

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# CCST

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# The Objective

Provide an accessible resource for policymakers and their staff who are new to working in energy policy.

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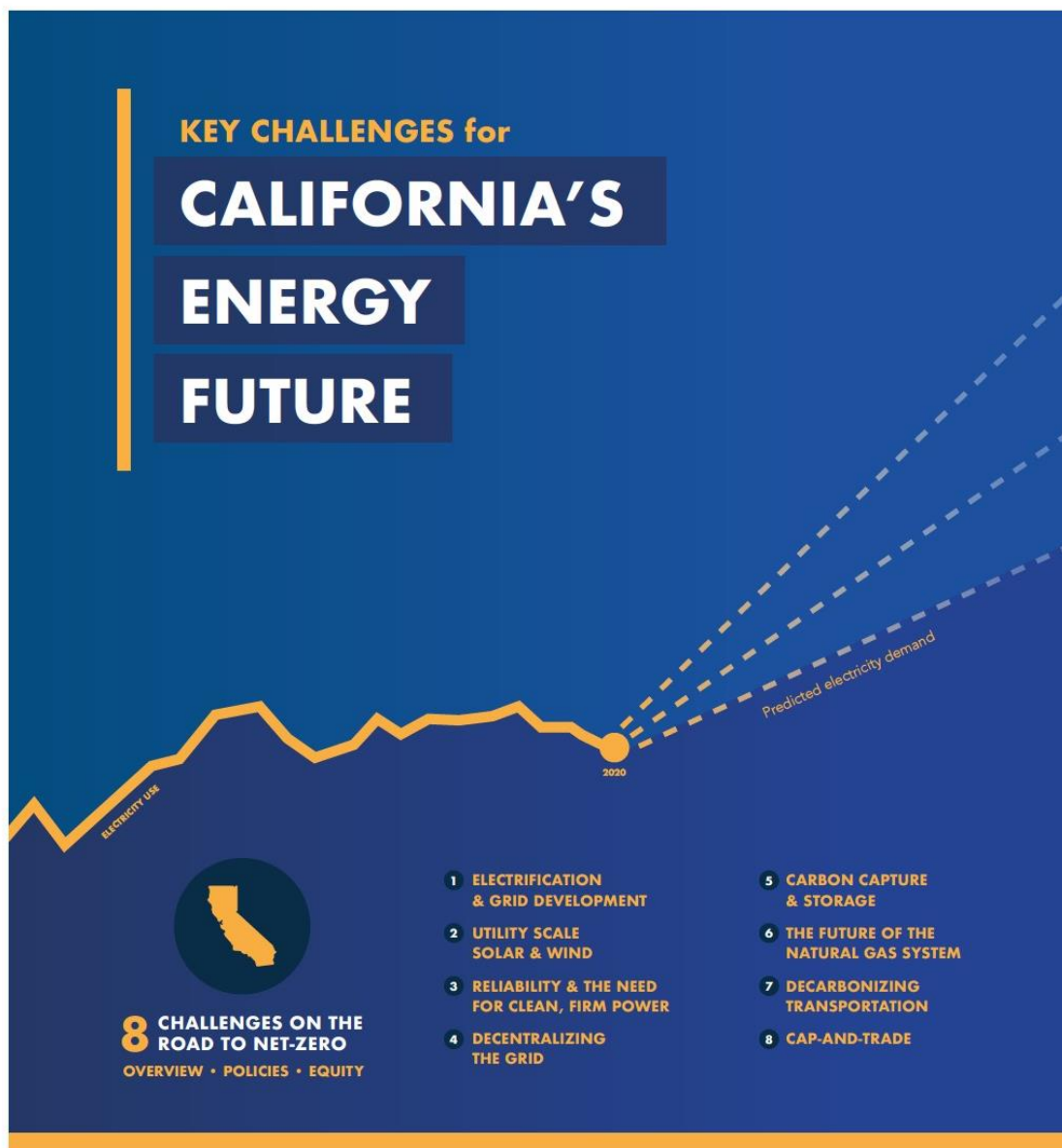
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# Structure

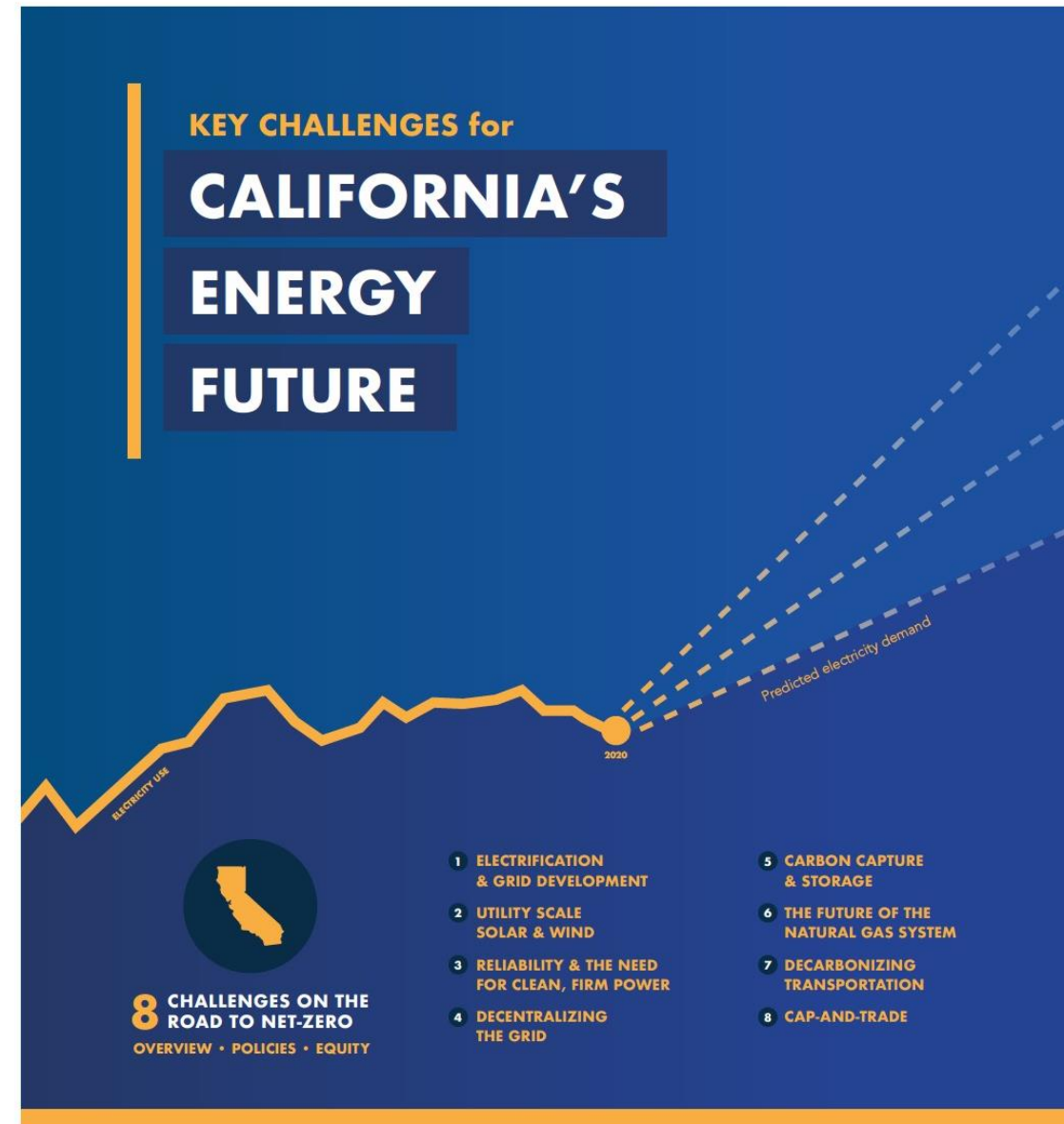
- Overview of the Energy Transition
- 8 Key Challenges
  - High level summaries
  - Policies
  - State Institutions
  - Environmental Justice & Equity
- Glossary



# Content

## Overview of California's Energy Transition

1. Electrification and Grid Development
2. Utility-Scale Solar and Wind Development
3. Reliability and the Need for Clean Firm Power
4. Decentralizing the Grid
5. Carbon Capture and Storage
6. The Future of the Natural Gas System
7. Decarbonizing Transportation
8. Cap-and-Trade



# Overview of California's Energy Transition:

## Key Takeaways

**The Challenge:** Decarbonize the state's economy.

1. Maximize efficiency and electrify energy use across sectors to the greatest extent possible.
  2. Provide affordable, accessible, and reliable carbon-free electricity for a highly electrified economy.
  3. Decarbonize activities that cannot be electrified by using clean fuels, efficiency, conservation, and better land use planning and infrastructure.
- Attention must be paid to who bears the costs to ensure equitable and affordable access.
  - Strong, rapid action guided by careful, evidence-based, and inclusive planning can help minimize the impacts of climate change while securing a safe, prosperous, and equitable future for all Californians.



## Section 1

# Electrification and Grid Development:

## Key Takeaways

**The Challenge:** Grappling with an aging power grid and a rapidly expanding demand for electricity.

1. New and increasing demands require upgrades and expansion of a grid already challenged by wildfires, extreme heat, and other weather events.
2. The scale of this challenge is monumental: CAISO estimates that adding and upgrading the necessary transmission lines will cost \$30.5 billion over the next 20 years. Many distribution networks will also require costly upgrades to accommodate more distributed energy resources (like electric vehicles and rooftop solar).
3. Transmission projects can take 8-10 years to complete. These planning horizons are in tension with the necessary build out pace.

## Section 2

# Utility-Scale Solar and Wind Development: Key Takeaways

**The Challenge:** Dramatically scaling California's capacity to produce renewable energy without compromising the State's natural and working lands.

1. Meeting the mandate established by SB 100 (de León, 2018) will require unprecedented construction of utility-scale solar and wind facilities.
2. In siting these facilities, the State must consider clean energy needs, while also supporting other land use priorities such as agriculture, wildlife conservation, and recreation.
3. More work is needed to estimate the maximum amount of solar and wind power possible by mid-century given all the factors that affect development.
4. Early and ongoing community engagement can help address concerns and ensure projects maximize local benefits.

## Section 3

# Reliability and the Need for Clean Firm Power:

## Key Takeaways

**The Challenge:** Managing the intermittency of renewable resources.

1. Solar and wind power are central to California's carbon-free electricity strategy but present intermittency challenges from day to night and on a seasonal basis that can impact grid reliability if not effectively managed.
2. California is deploying energy storage, demand response, and other strategies to manage the shorter-term intermittency of these resources.
3. A diverse energy portfolio that includes clean firm power would help manage the longer-term intermittency of renewable energy, for example, in winter periods when renewable energy supply is at a minimum.
4. Currently, the most considered clean firm power options to support California achieving a net-zero economy by 2045 are geothermal energy, nuclear power, hydropower, natural gas with carbon capture and storage, and renewable hydrogen. There are benefits and costs to all choices.

# Thank you!

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**Download the Energy Primer:**  
<https://ccst.us/reports/key-challenges-for-californias-energy-future>

