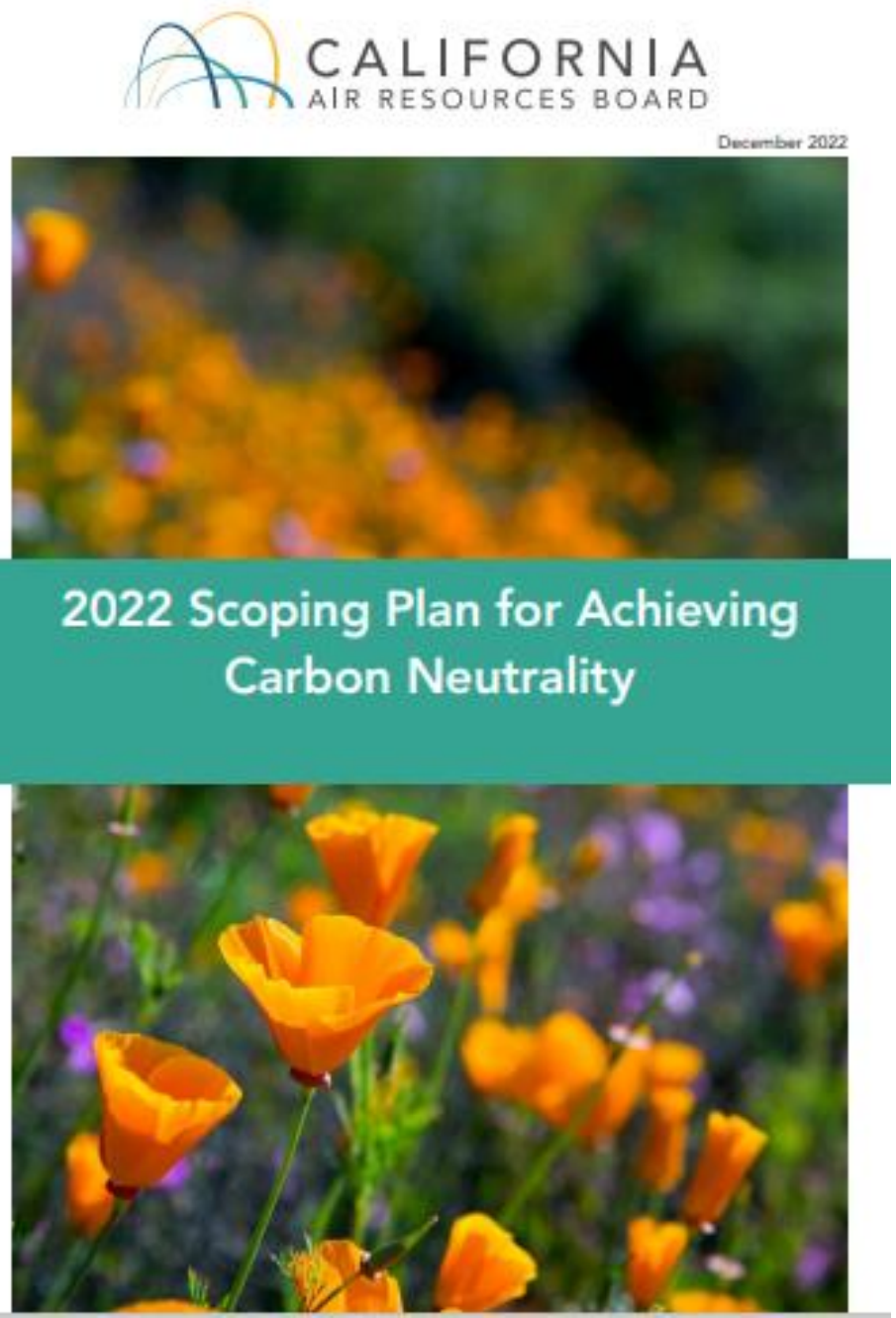


Scoping Plan Overview

California's Strategy for Achieving Carbon Neutrality

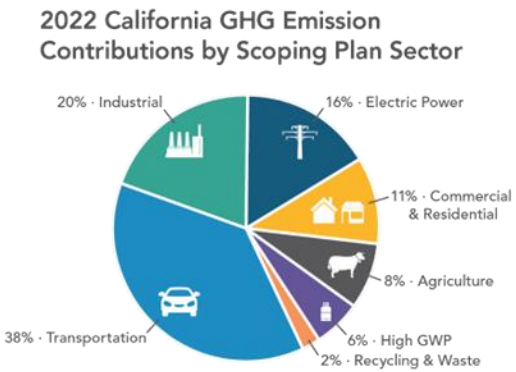
CPUC LONG-TERM GAS SYSTEM PLANNING WORKSHOP

NOVEMBER 14, 2024

California's Climate Policy Framework

GHG Targets & Goals

Legislation & Executive Orders: Total GHGs (AB 32/SB 32) or sector targets (SB 1383/SB 100), etc.



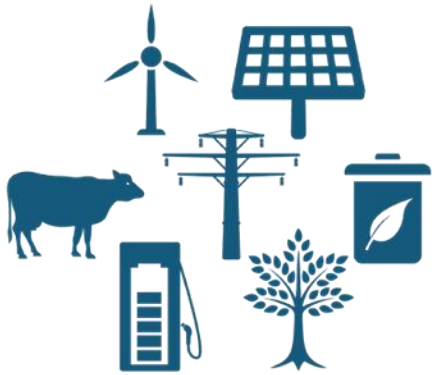
Scoping Plan

Actionable plan across all sectors

Updated every 5 years

Action

Regulations & Incentives: Advanced Clean Cars, climate change investments, Integrated Resource Plan (IRP), etc.

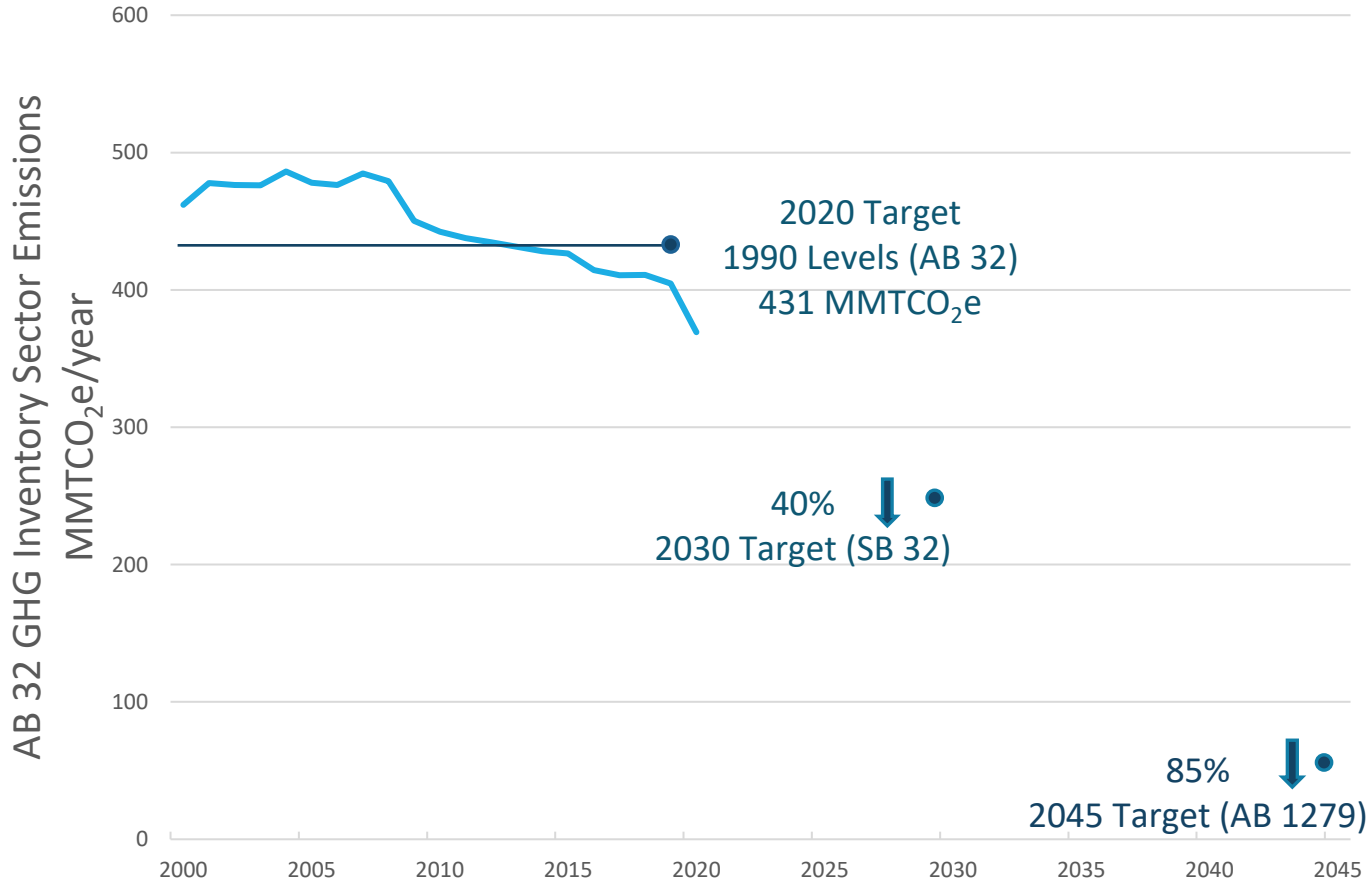


Projects

Examples: Zero-emission trucks, energy infrastructure and renewables, compost facilities, digesters, etc.

GHG Reduction Targets

Achieved AB 32 Target in 2014



ACHIEVING

CARBON

NEUTRALITY

BY **2045**

GHGs included in statute: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur hexafluoride (SF_6), Nitrogen trifluoride (NF_3)

The Scoping Plan Scenario

The path to build our way out of over a 100 years of existing fossil energy and the built environment landscapes

AB 32 GHG Inventory Sectors

Carbon neutrality by 2045, deploy a broad portfolio of existing and emerging fossil fuel alternatives and clean technologies, and align with statutes and Executive Orders

Natural and Working Lands (NWL)

Land management activities that prioritize restoration and enhancement of ecosystem functions to improve resilience to climate change impacts, including more stable carbon stocks

Ambitious Action Delivers Huge Benefits

Unprecedented Deployment of Clean Technology and Nature-Based Climate Solutions

- 37x total on-road ZEVs
- 6x electric appliances in residences
- 1700x hydrogen supply
- 4x installed wind/solar generation capacity
- 9x battery storage
- > 2.5 Million acres of NWL climate action per year

Significant GHG Reductions

- 94% decrease in liquid petroleum fuel demand
- 91% decrease in fossil gas used in buildings
- 66% decrease in methane emissions from agriculture
- 10% reduction in wildfire emissions

In 2045 relative to 2022

Role and Scaling of Carbon Dioxide Removal (CDR)

AB 32 GHG Inventory Sectors: Significantly reduced, but some emissions remain

NWL a modest source

Need carbon dioxide removal to compensate for AB 32 GHG Inventory and NWL sectors

- **Role of CDR is reduced if:**
  - We reduce the emissions from the AB 32 GHG Inventory Sectors faster
  - NWL are able to become a sink

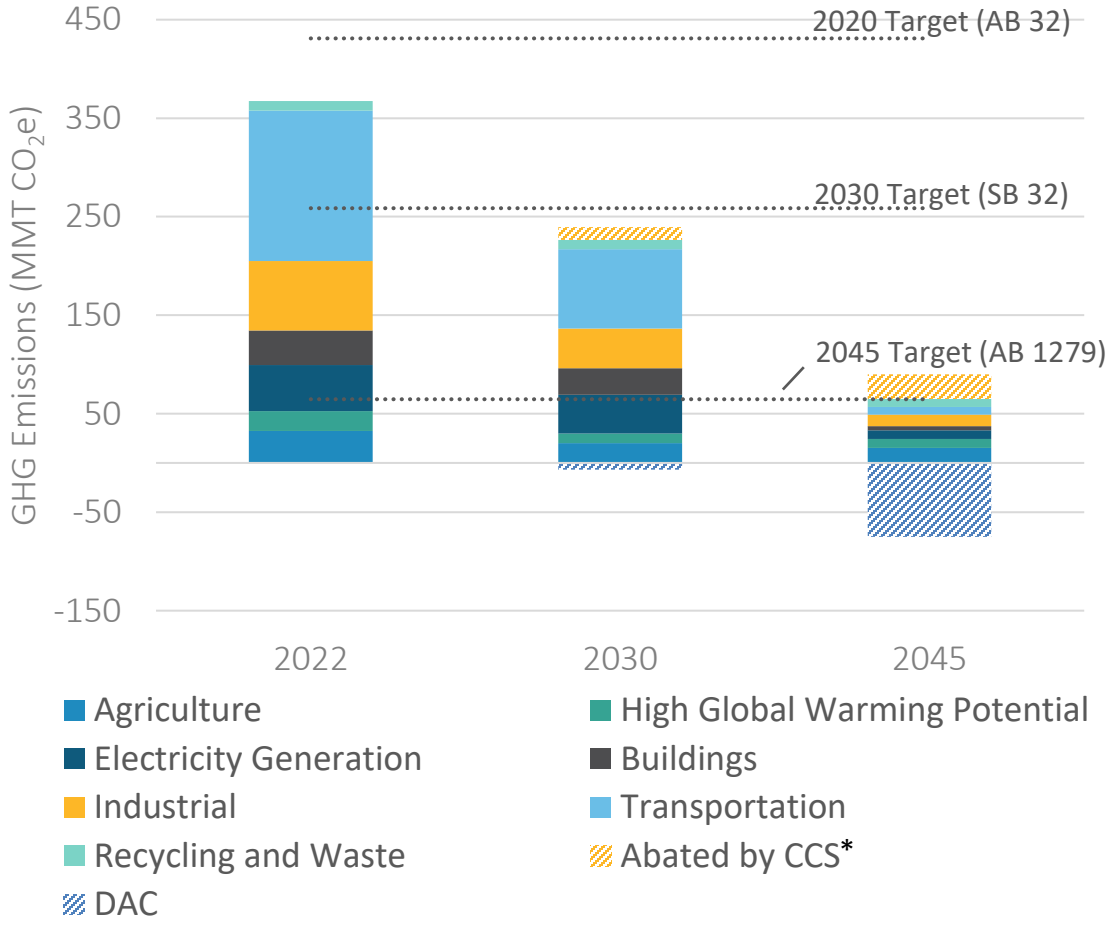
2022 Scoping Plan Update
A Plan for Science-Driven Climate Action

2030: 48% reduction below 1990

- Increased ambition from SB 32 40% target
- SP scenario incorporates 20 $MMTCO_2e$ of mechanical carbon dioxide removal (CCUS/DAC*) in 2030
- 462x increase in renewable hydrogen

2045: 85% reduction below 1990

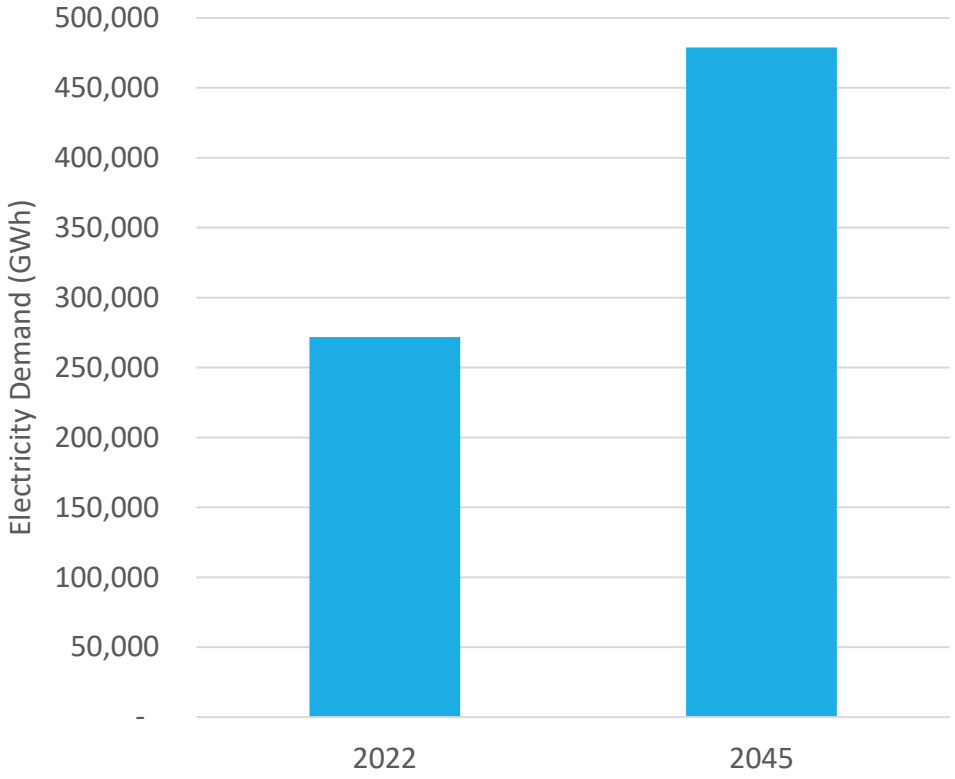
- Need CCUS and carbon dioxide removal to compensate for residual emissions to achieve carbon neutrality



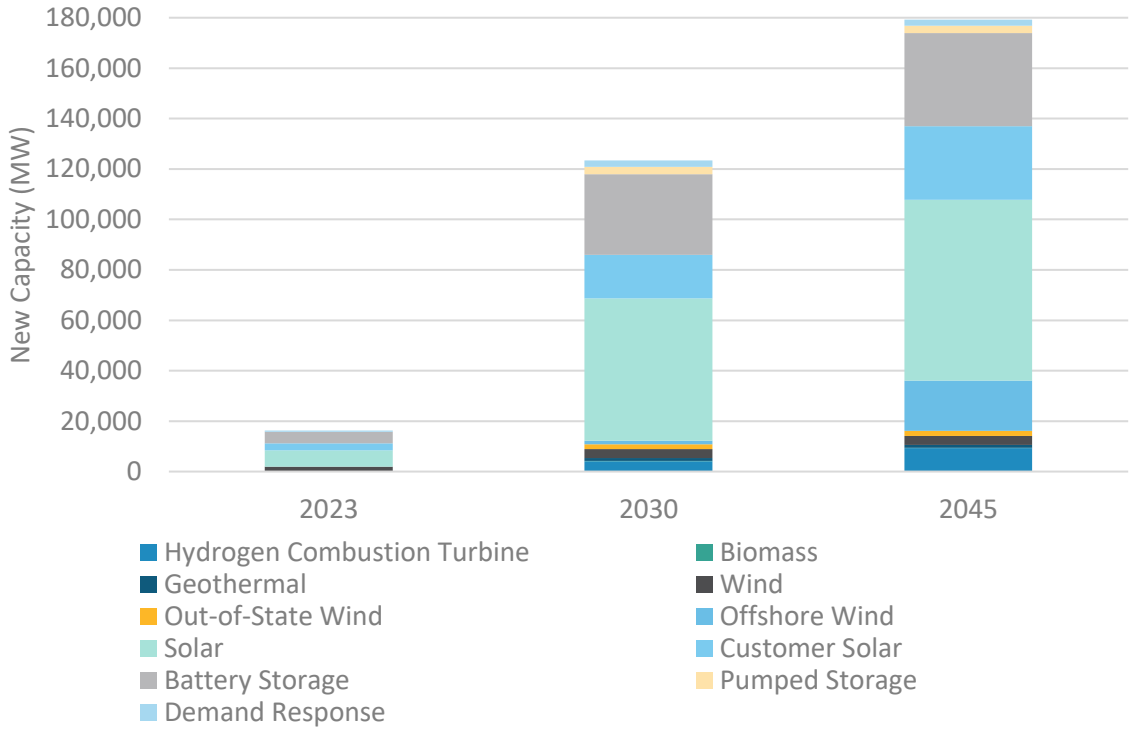
*CCUS: carbon capture, utilization, and storage; DAC: direct air capture; CCS: carbon capture and sequestration

Building a Clean, Affordable, Reliable Grid

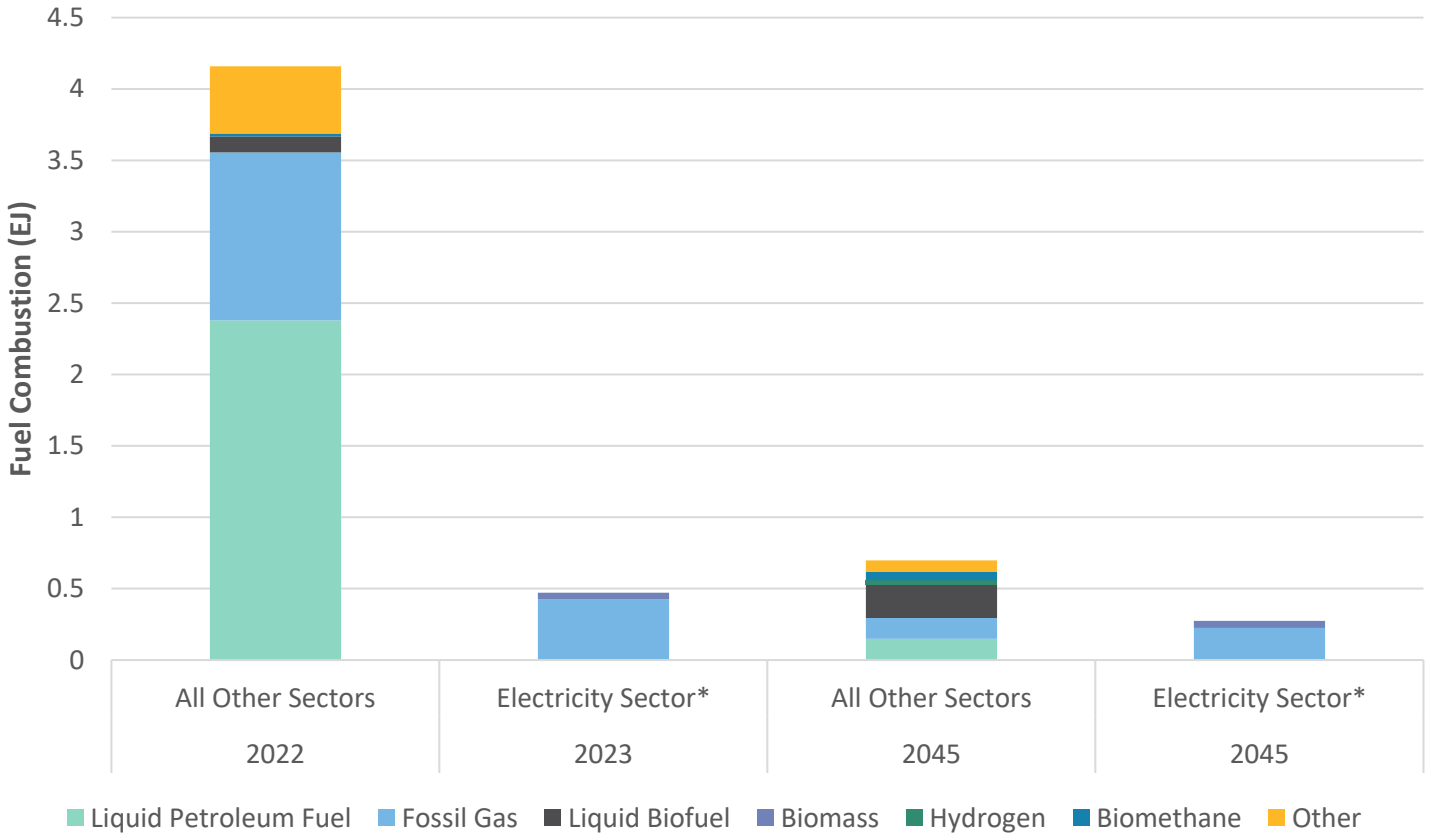
2x existing electricity generation



4x existing wind and solar capacity in 2045



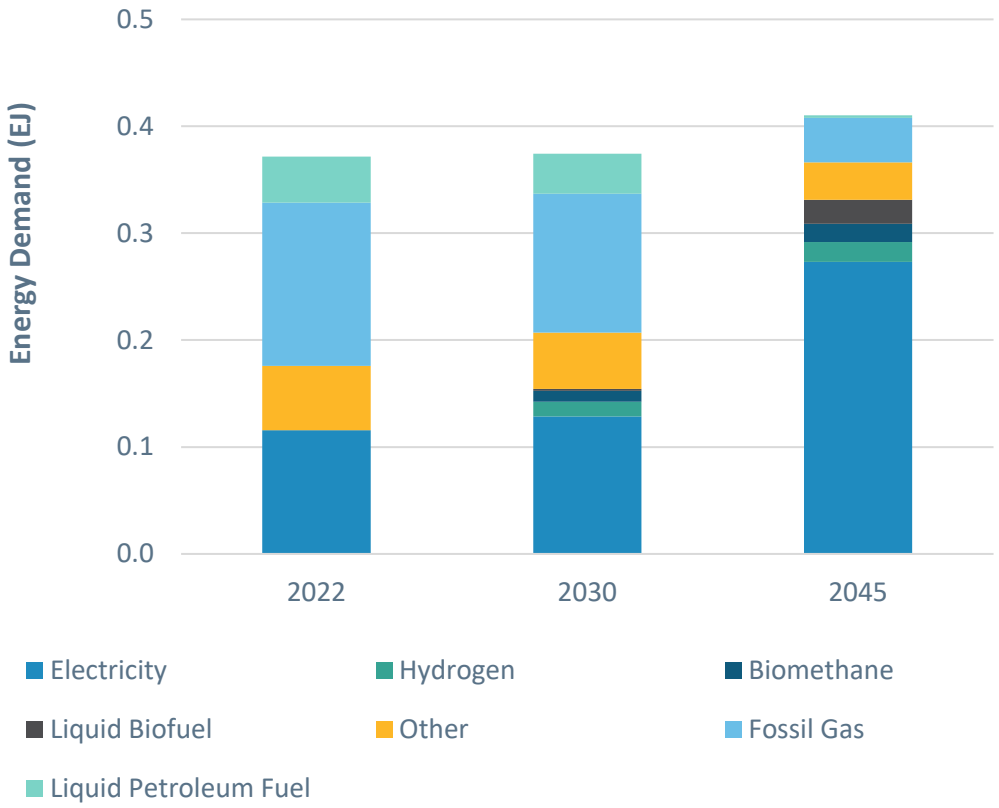
Fossil Fuel Combustion Declines Significantly Across all Sectors



- Fossil gas use in all non-electricity sectors decreases by 88% in 2045 compared to today
- Fossil gas use in electricity sector decreases by 47% in 2045 compared to today

*RESOLVE outputs start with 2023. Excludes fuel combustion from imported electricity.

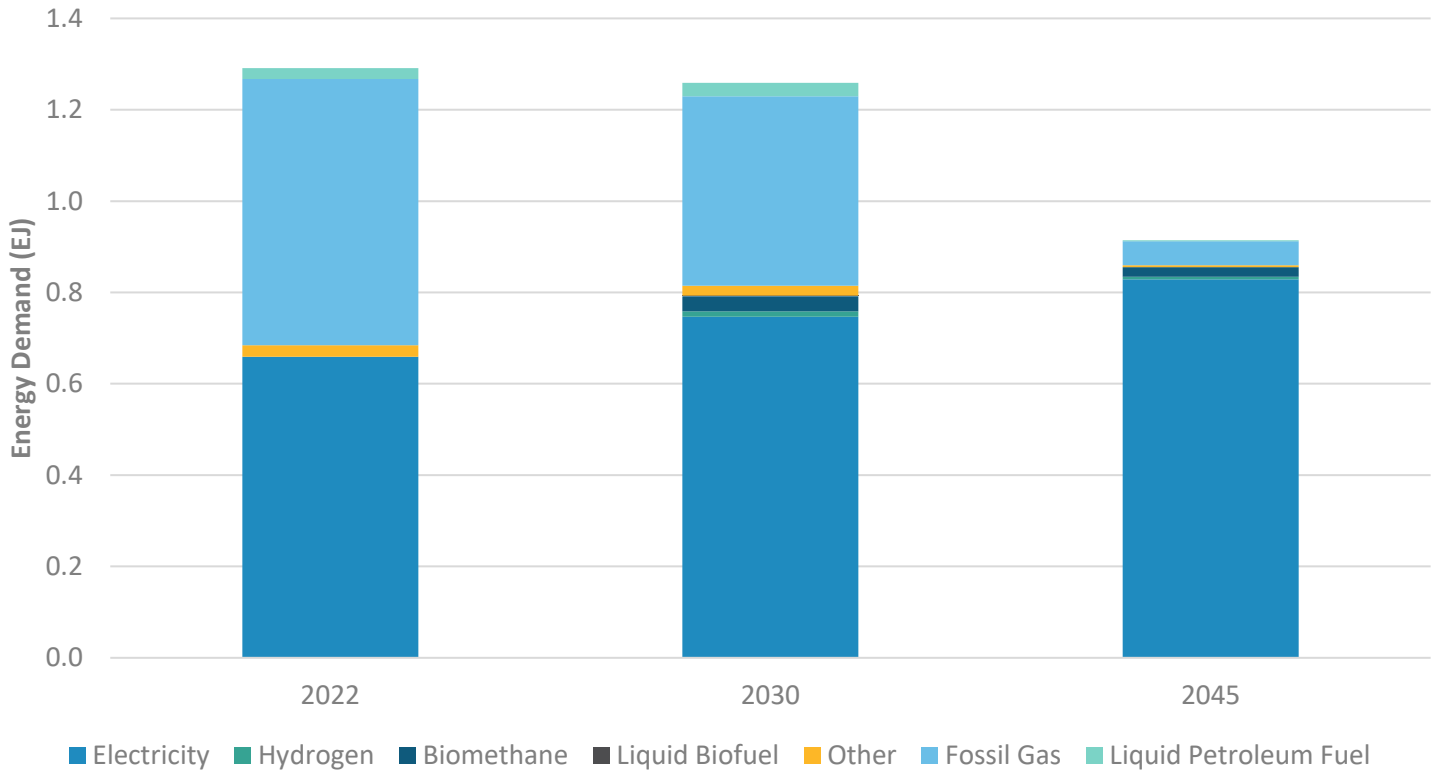
Decarbonizing Industrial Manufacturing



- 73% reduction in fossil gas demand*
- Low heat industrial processes transition to electric equipment
- Some higher heat industrial processes substitute hydrogen, biomethane, and other low-carbon fuels

*In 2045 relative to 2022

Decarbonizing Buildings



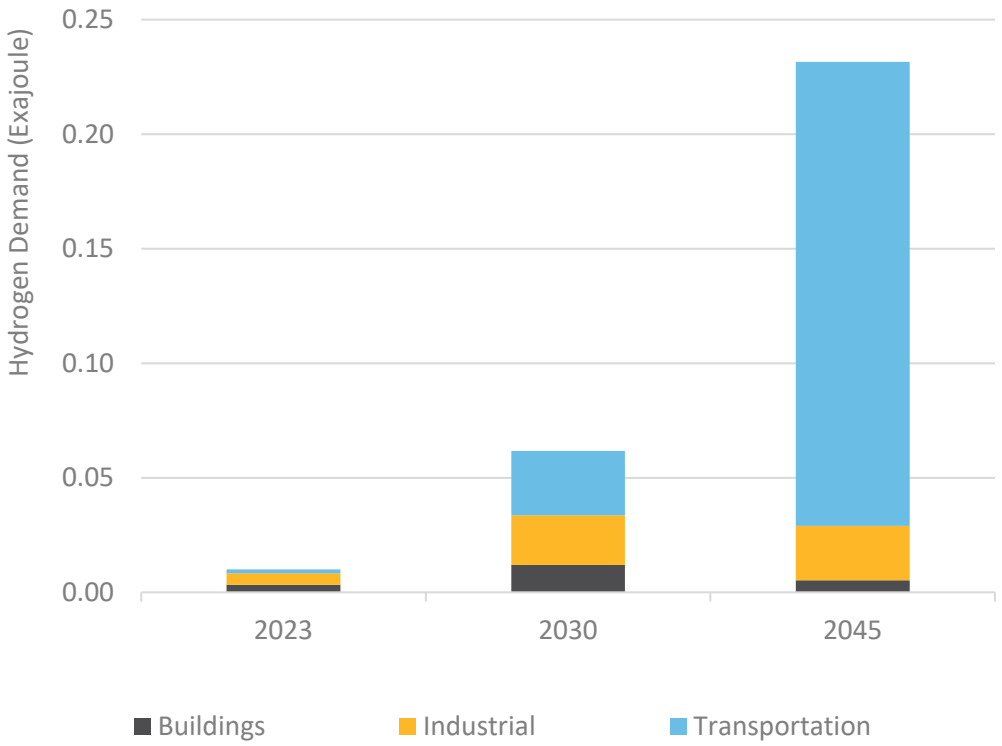
- 91% reduction in fossil gas demand*
- Improved outdoor and indoor air quality
- 3 million all-electric and electric ready buildings by 2030, 7 million by 2035
- 6 million heat pumps by 2030

*In 2045 relative to 2022

Building Electrification

- Strengthen California's building standards to support zero-emission new construction
  - Modeled as all electric appliances beginning 2026 (residential) and 2029 (commercial)
- Existing Residential Buildings
  - 80% of appliance sales are electric by 2030
  - 100% of appliance sales are electric by 2035
- Existing Commercial Buildings
  - 80% of appliance sales are electric by 2030
  - 100% of appliance sales are electric by 2045

Hydrogen Use by Sector in the Scoping Plan



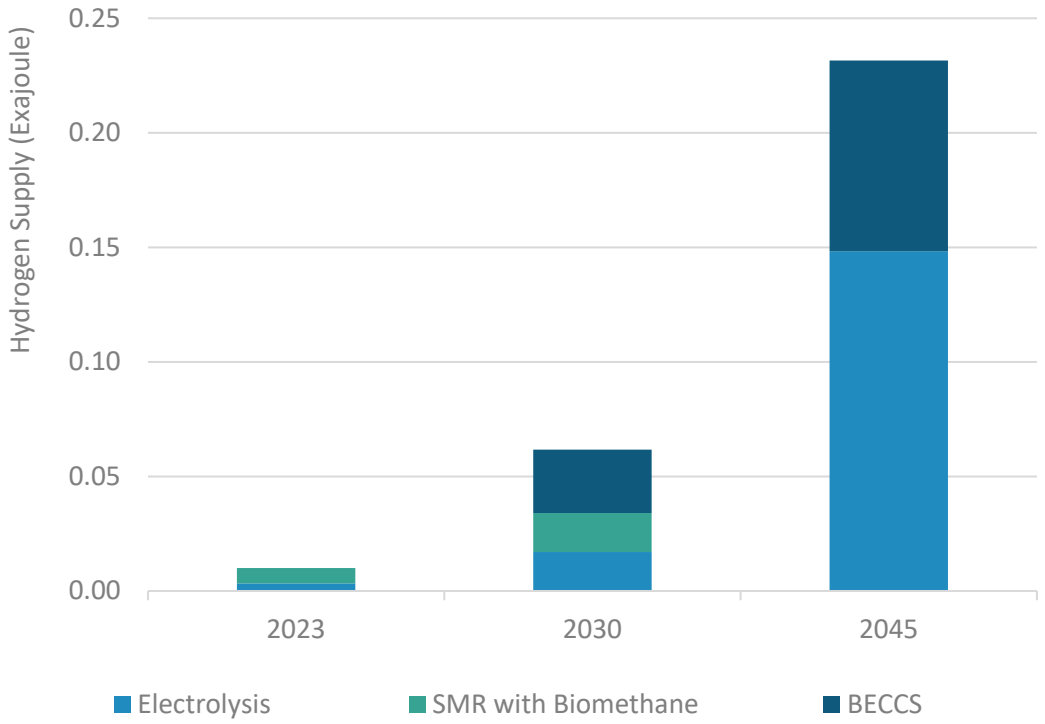
Hydrogen demand largely driven by non-combustion uses in transportation sector:

- Fuel cells for light-, medium-, and heavy-duty vehicles, aviation, ocean-going vessels, freight and passenger rail

Other end-uses with relatively smaller volumes include:

- Gas replacement to reduce fossil gas use in buildings and industrial sectors
- Hydrogen turbines in electric sector

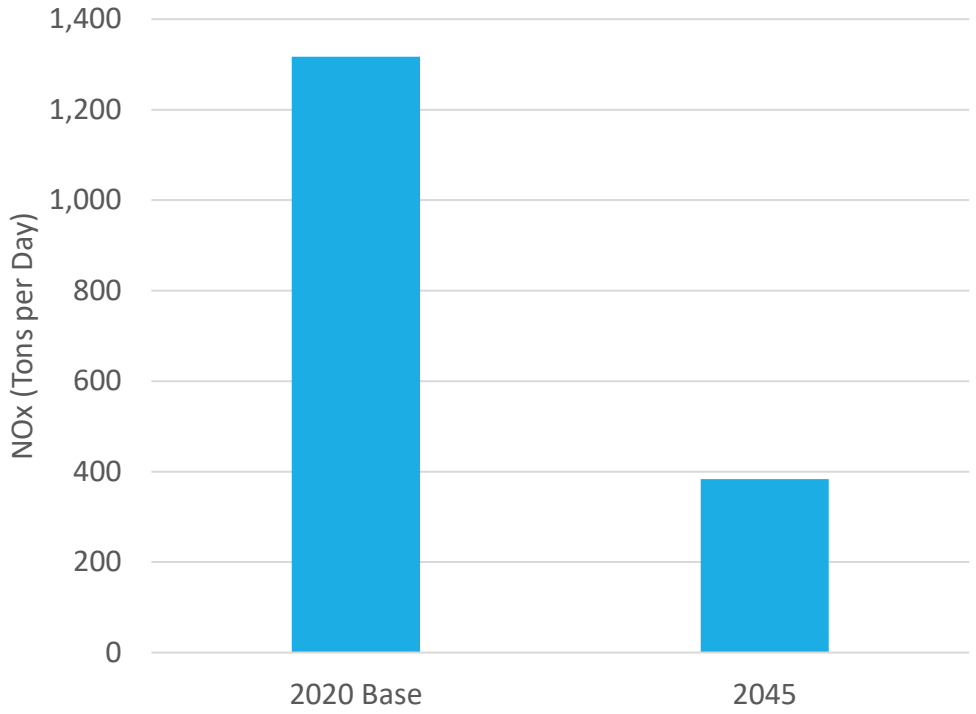
Hydrogen Supply in the Scoping Plan



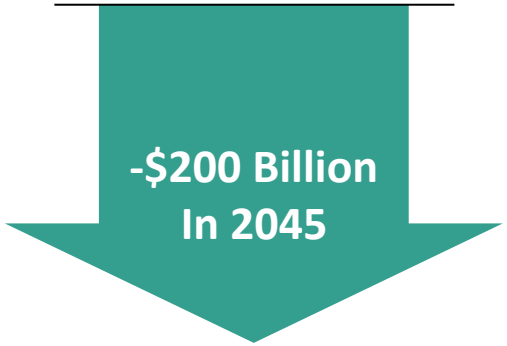
- Hydrogen identified as important tool to displace fossil fuel use
- Assumed hydrogen supplied by 3 methods: electrolysis from zero-carbon electricity, steam methane reformation (SMR) of biomethane, and biomass gasification with CCS (BECCS)
- Electrolytic hydrogen modeled as additional ~21 GW of off-grid solar capacity in 2045
- Hydrogen production will be further studied through Senate Bill 1075 Report

Air Quality Benefits of Reduced Fossil Fuel Combustion

71% reduction in NOx



$200 Billion in health cost savings from decreased fuel combustion



References

- California Greenhouse Gas Emissions from 2000 to 2022: Trends of Emissions and Other Indicators
- 2022 Scoping Plan for Achieving Carbon Neutrality
- Appendix F: Building Decarbonization
- Appendix H: AB 32 GHG Inventory Sector Modeling
- AB 32 GHG Inventory Sectors Modeling Data Spreadsheet

- All 2022 Scoping Plan Update documents may be found here: https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents

Thank You