

INTRODUCTION

This is one of five briefing papers intended to provide policy background information supporting adoption and implementation of the 2022 Air Quality Management Plan (AQMP). This paper specifically addresses decarbonization and climate policy development and its role in achieving the 2015 Ozone standard.

Climate policy addresses climate change/global warming by, for example, reducing CO₂ emissions. Decarbonization is the reduction of carbon in our fuel sources to reduce CO₂ emissions from energy sources (i.e., both stationary and mobile sources). Utilization of wind and solar energy to produce electricity are examples of decarbonization efforts and a part of climate policy.

Many states have committed to 80 percent or more carbon emissions reduction by 2050. This common policy goal serves as the basis for decarbonization. A 2020 law commits Washington to limits of 45 percent below 1990 levels by 2030, 70 percent below 1990 levels by 2040 and 95 percent below 1990 levels with net zero emissions by 2050. Washington 2021 State Energy Strategy provides a roadmap for meeting the state's greenhouse gas emission limits. New York State developed Carbon Neutral Buildings Roadmap in 2021, which identifies pathways to reach carbon neutrality by 2050. The Carbon Neutral Buildings Roadmap will be updated approximately every three years to account for policy, market, and technological developments.

Reduction of fossil fuel combustion can reduce both GHGs and other pollutants such as NO_x and PM, resulting in public health benefits and helping the region achieve state and federal ambient air quality standards. California has a successful history of fighting climate change. Over the last 20 years, California has passed legislation to reduce the emissions of greenhouse gases (GHG) and impacts of climate change. To achieve GHG reductions, various regulations, market mechanisms, and incentive programs are being implemented in California. As sources of GHG are typically sources of criteria pollutants, these GHG reduction efforts implemented across all sectors will also reduce criteria pollutants.

STATE'S DECARBONIZATION GOALS AND PATHWAYS

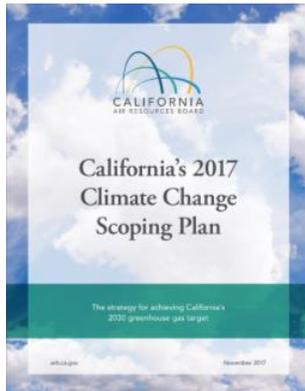
California's energy and transportation sector are on a transformative path to cleaner energy. As the efforts to reduce GHG emissions continue, the market penetration for energy efficiency, energy storage, low carbon fuels, and renewable power will increase to further accelerate the deployment of carbon free technologies in various sectors.

Significant efforts are underway to further reduce GHG under the State's 2030, 2045, and 2050 targets. The highlights of the California State Legislation and Executive Orders adopted since 2015 are summarized in Table 1 below.

TABLE 1
SUMMARY OF STATE LEGISLATION AND EXECUTIVE ORDERS ADOPTED SINCE 2015 FOR GHG REDUCTION

Adoption Year	Executive Orders	Goal
2015	Senate Bill 350	Increase renewable electricity procurement to 50 percent and double the energy efficiency savings in electricity and natural gas end uses by 2030
2016	Senate Bill 32	Reduce GHG emissions by 40 percent below 1990 levels by 2030
2016	Senate Bill 1383	Reduce methane and HFCs emissions to 40 percent below 2013 levels by 2030 and anthropogenic black carbon by 50 percent below 2013 levels by 2030
2018	Governor's Executive Order B-55-18	Achieve carbon neutrality no later than 2045
2018	Senate Bill 100	Increase renewables Portfolio Standard (RPS) to 60 percent by 2030, and achieve 100 percent carbon-free energy by 2045
2018	Assembly Bill 3232	Assess the potential to reduce GHG emissions from residential and commercial buildings by at least 40 percent of 1990 levels by 2030
2018	Senate Bill 1477	Establish building Initiative for Low-Emissions Development (BUILD) and Technology and Equipment for Clean Housing (TECH) programs
2021	Assembly Bill 33	Provide grants and loans to local governments and public institutions to maximize energy use savings, expand installation of energy storage systems, and expand the availability of electric vehicle charging infrastructure in existing and planned buildings.
2021	Senate Bill 68	Provide information, guidance and best practices to building owners, the construction industry, and local governments to help overcome the barriers to electrification of buildings and installation of electric vehicle charging equipment

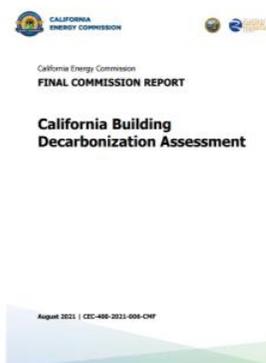
CALIFORNIA AIR RESOURCES BOARD (CARB)'S SCOPING PLAN



In 2006, the Legislature passed the California Global Warming Solutions Act of 2006 [Assembly Bill 32 (AB 32)], a comprehensive, multi-year program to reduce GHG emissions to 1990 levels by 2020. The goal was achieved 4 years earlier than the due date, demonstrating the achievability of the GHG reduction goal. Under AB 32, CARB is required to develop a Scoping Plan that describes the approach California will take to reduce GHGs to meet the State's GHG targets. A Scoping Plan was first released in 2008 and is required to be updated at least every 5 years. The Scoping Plans rely on a suite of climate policies to address emissions across all sectors. The 2017 Scoping Plan identifies how the State can reach the 2030 climate target to reduce GHG emissions by 40 percent from 1990 levels, and substantially advance toward

the 2050 climate goal to reduce GHG emissions by 80 percent below 1990 levels. CARB updated the 2017 Scoping Plan and released the draft 2022 Scoping Plan in May 2022, which assesses progress towards achieving the 2030 target and lays out a path to achieve carbon neutrality no later than 2045.

CALIFORNIA ENERGY COMMISSION (CEC)'S AB 3232 ASSESSMENT



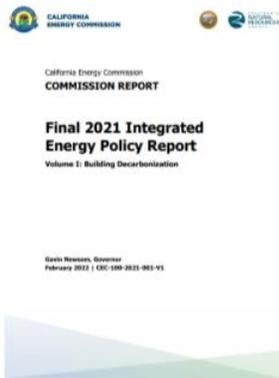
In 2021, the CEC released the 2021 Building Decarbonization Assessment to address the mandates from AB 3232. The report analyzed ways to reduce GHG emissions by at least 40 percent by 2030 and identified seven pathways to reduce GHG emissions from buildings.¹ Barriers and challenges to accomplishing these emission reductions include installation cost and public outreach to educate consumers with financing availability.

1. Efficient Electrification of End Uses
2. Clean Electricity
3. Energy Efficiency
4. Refrigerant Conversion and Leakage Reduction
5. Distributed Energy Resources
6. Gas System Decarbonization
7. Demand Flexibility

¹ Kenney, Michael, Nicholas Janusch, Ingrid Neumann, and Mike Jaske. 2021. California Building Decarbonization Assessment. California Energy Commission. Publication Number: CEC-400-2021-006-CMF. <https://www.energy.ca.gov/publications/2021/california-building-decarbonization-assessment>.

The assessment shows that efficient electrification of space and water heating in California’s buildings combined with refrigerant leakage reduction is the most readily achievable pathway to achieve a 40 percent reduction of GHG by 2030.

CEC’S INTEGRATED ENERGY POLICY REPORT

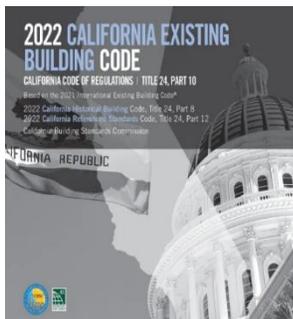


CEC is responsible for developing the Integrated Energy Policy Report (IEPR) every two years, an integrated assessment of major energy trends and issues facing California’s electricity, natural gas, and transportation fuel sectors. The 2021 Integrated Energy Policy Report provides information and policy recommendations on advancing a clean, reliable, and affordable energy system for all Californians. The 2021 Integrated Energy Policy Report covers a broad range of topics, including building decarbonization, energy efficiency, challenges with decarbonizing California’s gas system, quantifying the benefits of the Clean Transportation Program, and the California Energy Demand Forecast. It concludes that decarbonization of buildings, industry, and agriculture is critical to meeting the State’s climate goals. Heat pumps are a

critical enabling technology for achieving building decarbonization. As such, the CEC is recommending a goal of installing at least 6 million heat pumps by 2030 in the 2021 Integrated Energy Policy Report.

CEC’S TITLE 24 BUILDING CODE UPDATE

CEC’s Title 24 is the Energy Efficiency Standards for Residential and Non-Residential Buildings in California.



Title 24 addresses the energy efficiency of construction projects in the state (including new construction, remodeling, addition, and commercial buildings). Title 24 building code is updated every three years. The last update was adopted in August 2021 with an effective date of January 1, 2023. The 2022 update encourages inclusion of market-ready electric products in new construction, such as electric heat pumps and electric water heating. The standards require new single-family homes to be electric-ready, including electrical circuits for space heating, water heating, cooking/ovens, and clothes dryers. That means new buildings with gas furnaces must have the electrical

panels and wiring to support a switch to electric heat pumps. The 2022 update also extends solar panel requirements and introduces battery storage standards to building types such as high-rise multi-family units (apartments and condos), hotels and motels, offices, medical offices, retail and grocery stores, restaurants, and schools.

CALIFORNIA CITIES AND COUNTIES ENERGY CODES FOR BUILDING ELECTRIFICATION



According to an article by Sierra Club (July 22, 2021, California’s Cities Lead the Way to A Gas-Free Future)² over 50 California cities and counties have adopted local energy codes to support all-electric new construction, as part of their effort to help the State meet its 2045 climate target. Among them, over 40 cities and counties mandate all-electric appliances for new residential buildings and some for new commercial buildings. Some other cities require all-electric readiness and higher energy efficiency standards, beyond CEC’s Title 24 requirements. Most of those cities are near the Bay Area.

2022 SOUTH COAST AQMP

The 2022 AQMP identifies measures to meet the 2015 8-hour ozone NAAQS by 2037 for the South Coast Air Basin and the Coachella Valley. The most significant challenge is the magnitude of the NO_x emission reductions needed, which is about 71 percent beyond the 2037 baseline emissions and about 83 percent below current levels.³ To achieve these reductions, widespread adoption of zero emission (ZE) technologies across all stationary point, area, and mobile source sectors is needed. Low NO_x technologies are also needed for equipment where ZE technologies are not technically feasible or not cost-effective. Implementation of ZE technologies, increased energy efficiency, and the transition to cleaner fuels will reduce NO_x emissions to achieve ozone NAAQS and GHG emissions climate goals. Close collaboration with federal, state, local, and regional agencies, businesses, energy providers, manufacturers, and the public is needed to achieve these goals.

FUTURE WORK PLANS

CARB has authority under AB 32 and other provisions within state law to regulate GHG emissions, and state law makes CARB the lead agency for developing the State Implementation Plan and approving air quality management plans developed by regional air districts based on relevant air quality authorities. As the State transitions to ZE and low NO_x technologies in various sectors, collaboration with local utilities is also critical to increase the reliability and resiliency of California’s energy system. The primary electricity provider within South Coast AQMD jurisdiction, Southern California Edison, has been working actively on forecasting and planning to accommodate the need for increasing electricity demand. Policy and regulatory certainty will enable utilities to make strategic investments to accommodate the grid for a high electrification future and develop new infrastructure – e.g., distributed energy resources, microgrids – to

² Sierra Club. California’s Cities Lead the Way to a Gas-Free Future.

<https://www.sierraclub.org/articles/2021/07/californias-cities-lead-way-gas-free-future>

³ The preliminary baseline (business-as-usual with existing regulations) NO_x emissions inventory in the South Coast Air Basin is 220 tons per day in 2037. The carrying capacity, maximum allowable NO_x emissions to attain the standard, is approximately 60 tons per day.

ensure grid resilience and reliability. South Coast AQMD will work closely with local utilities to provide adoption plan and regulatory timelines to ensure grid investments are made at the right location and right time. In addition to the resilience in grid infrastructure, South Coast AQMD will continue working with developers and other agencies to deploy other types of clean energy such as hydrogen fuel cells. Further emission reductions will be pursued through energy efficiency and demand flexibility.

INITIATE INNOVATIVE SOLUTIONS AND NEW PARTNERSHIPS

A key element of 2022 AQMP implementation is deployment of ZE and low NO_x technologies through a combination of regulatory and incentive approaches. To implement zero and low NO_x emission technologies in a cost-effective manner, incentive funding programs for stationary sources should align with and compliment other local, state, and federal initiatives. For building decarbonization, California regulators have a powerful array of tools in the building decarbonization toolbox to advance building decarbonization, including the Building Energy Efficiency Standards, the California Green Building Standards Code, and other programs and efforts at the CEC. Most or all of these tools will be needed to realize the public benefits of shifting to clean technologies. As part of the State's efforts to reduce GHG emissions, the California Public Utilities Commission (CPUC) instituted a new rulemaking in 2019 on building decarbonization (R.19-01-011) including implementation of incentive programs and establishing a building decarbonization policy framework. In 2020, the CPUC has implemented or reviewed 16 separate building electrification programs incentivizing heat pumps or related equipment – 15 of which fund Heat Pump Water Heaters. Eleven programs have received CPUC approval, and the other five programs are at various stages of CPUC review. The combined CPUC-approved and proposed building electrification funding is approximately \$435 million through 2024. Further, the CEC commits to working with stakeholders to accelerate the market toward comprehensive migration to heat pumps for space and water heating.⁴ CEC has also recently launched the Building Initiative for Low-Emissions Development (BUILD) Program, which is designed to provide incentives for new all-electric low-income residential buildings that reduce GHG emissions. In the proposed 2022–2023 California budget, Governor Gavin Newsom called for \$22.5 billion to combat climate change, including \$2 billion for clean energy. Of this funding, about \$1 billion would be directed to equitable building decarbonization, which describes an effort to improve older buildings not equipped adequately to withstand extreme heat.

Phasing down of fuel combustion reduces both GHG and criteria air pollutions, which supports the State's ambitious GHG reduction goals as well as South Coast AQMD's clean air goals. For example, for building appliances, CPUC has approved fuel substitution energy efficiency measures as part of building

⁴ CEC 2021 IEPR. <https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report>.

decarbonization effort.⁵ As seen in Table 2, the same appliances are also the target emission source categories in the 2022 AQMP.

TABLE 2
CPUC ENERGY EFFICIENCY-APPROVED APPLIANCES AND THEIR RESPECTIVE CONTROL MEASURES FOR THE 2022 AQMP

CPUC Energy Efficiency-approved Appliances ⁶	2022 AQMP Control Measures
Residential Heat Pump Water Heater (to replace Natural Gas Water Heater)	R-CMB-01
Ductless Mini-split HVAC (to replace window AC and gas wall furnace)	R-CMB-02 and C-CMB-02
Heat Pump HVAC (to replace AC and gas furnace)	R-CMB-02 and C-CMB-02
Induction Cooktop (to replace gas range)	R-CMB-03 and C-CMB-03
Heat Pump Clothes Dryer (to replace natural gas Clothes Dryer)	R-CMB-04

Co-benefit would be achieved by cross-agency coordination for incentives. Currently, incentive programs with different goals and objectives (energy efficiency vs. load shifting vs. GHG reductions vs. home comfort and safety vs. NOx reductions) have different program requirements, evaluation methodologies, and application process. Finding and understanding program information is difficult for the consumers. To overcome this barrier and implement these incentive programs in a more cost-effective manner, programs could be designed to address multiple goals and allow consumers to take advantage of multiple financial incentives offered by different programs. Incentive layering also has the potential to improve the customer’s experience and help explore long-term market transformation approaches.

⁵ <https://www.cpuc.ca.gov/about-cpuc/divisions/energy-division/building-decarbonization/fuel-substitution-in-energy-efficiency>

⁶ https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/building-decarb/incentive-layering-workshop_06302020_final.pdf

ENVIRONMENTAL JUSTICE AND DISADVANTAGED COMMUNITIES

In its first annual affordability report released in April 2021, the CPUC found that 13.3 percent of California’s lower-income households spend more than 15 percent of their income on electricity service. The CPUC also found that 6 percent of lower income households spend more than 10 percent of their income on gas service. The specific areas where affordability is a significant concern are similar for both electricity and gas service.⁷ For implementation of the 2022 AQMP, incentive funding for stationary sources can be pursued and best applied where controls are cost-effective, but not necessarily affordable, especially when controls are considered for smaller businesses or residences in economically disadvantaged communities. It is imperative that incentive programs prioritize the region’s most vulnerable people in its efforts to reach air quality and climate goals.

CONCLUSION

Overall, there are numerous ongoing efforts statewide to continue to reduce GHG emissions from various sectors. The State’s research and development efforts are supporting the development of innovative technologies and methods to deepen emission reductions and reduce costs. Meanwhile, energy programs are adapting to the state’s transition to clean and carbon free energy. The South Coast AQMD will collaborate with agencies, utilities, and other stakeholders to coordinate incentives with similar existing programs to maximize emission reduction opportunities in a cost-effective manner.

⁷ CPUC. 2021. 2019 Annual Affordability Report. <https://www.cpuc.ca.gov/-/media/cpuc-website/industries-andtopics/reports/2019-annual-affordability-report.pdf>.