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# The California Cap-and-Trade Program: Overview and Considerations for Congress

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# The California Cap-and-Trade Program: Overview and Considerations for Congress

California's cap-and-trade program, launched in 2013, is one example of a market-based, greenhouse gas (GHG) emissions reduction policy adopted and implemented in the United States. Insights into the design and results of California's cap-and-trade program may be informative for federal policymakers considering market-based climate policies. Additionally, Congress may be interested in certain aspects of the cap-and-trade program, such as the state's Greenhouse Gas Reduction Fund (GGRF) or the state's program for issuing offset credits.

By establishing a limit or "cap" on total emissions and a market for entities to "trade" emissions allowances, "cap-and-trade" creates an economic incentive to reduce emissions. California's cap-and-trade program is part of the state's broader strategy to reduce (i.e., mitigate) GHG emissions and meet its GHG targets. The California legislature has established GHG targets for 2020, 2030, and 2045—and requires the state to achieve net-zero GHG emissions, a status where human-caused GHG emissions to the atmosphere are balanced by removal of GHGs from the atmosphere. California's program is often referred to as the first "economy-wide" GHG cap-and-trade program due to its broad scope: It covers the majority—approximately 80%—of statewide GHG emissions from multiple sectors of the economy, including electric power, industry, transportation, and buildings.

California state policymakers have historically described the role of the state's cap-and-trade program as a "backstop" to other climate policies, with the emissions cap providing a measure of certainty for the state to achieve its GHG targets. Further, the cap-and-trade program creates a financial incentive for entities to identify and implement emissions reduction opportunities—at the lowest cost—and provides a signal to the market to transition to an economy that emits fewer GHG emissions. According to California policymakers, the role of the program may evolve as the state works toward its GHG targets for 2030 and 2045.

The economic impacts of cap-and-trade are largely driven by emissions allowance prices. Allowance prices have generally been at or near the price floor until 2021. California's program design includes a number of elements to contain costs for covered entities; these elements have likely helped mitigate cost impacts on consumers. For example, the state allocates approximately half of emissions allowances to industry and utilities at no cost, and a portion of these allowances are used to fund a statewide dividend for customers' energy bills.

GHG emissions have decreased in California, and the state met its GHG target for 2020 ahead of schedule. It is uncertain what level of emissions reductions can be attributed solely to the cap-and-trade program. California estimates that GHG reductions from projects funded by cap-and-trade allowance auctions total nearly 110 million metric tons of carbon dioxide equivalence. The revenue the state has received from auctioning allowances—approximately \$28 billion to date—has provided a new source of funding for the state's programs. California created a new fund, the GGRF, for these monies and requires at least 35% of GGRF appropriations to be directed to projects located in and benefiting disadvantaged and low-income communities and projects that benefit low-income households.

The California cap-and-trade program has broadened its impact by linking with Québec's cap-and-trade program. It also provides a model for others to consider. New York, Washington, and Oregon have adopted similar programs.

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## Introduction

The concentration of greenhouse gases (GHGs) in the atmosphere is increasing, primarily due to emissions from the combustion of fossil fuels and other human-related activities, increasing the average surface temperature of the earth and changing the climate.<sup>1</sup> A variety of efforts seeking to reduce GHG emissions are underway on the international, national, and subnational levels. Policymakers and stakeholders have different viewpoints regarding whether to address climate change and, if so, how to address it.

Several laws enacted by the 116<sup>th</sup> and 117<sup>th</sup> Congresses aim to reduce GHG emissions. These laws include the American Innovation and Manufacturing (AIM) Act of 2020 (P.L. 116-260, Division S, §103), the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), a budget reconciliation measure commonly referred to as the Inflation Reduction Act of 2022 (IRA; P.L. 117-169), and P.L. 117-167 (often referred to as the “CHIPS and Science Act”).<sup>2</sup>

Members of Congress have expressed a wide range of views regarding what, if any, additional policies should be enacted at the federal level to mitigate GHG emissions. Some Members have introduced legislative proposals that would enact a price on carbon through either a carbon tax or a cap-and-trade program.<sup>3</sup> Other Members have introduced legislation stating that carbon pricing approaches are not in the economic interests of the United States.<sup>4</sup>

At the state level, there have been numerous developments in climate policy, including establishing emissions targets and enacting various policies to mitigate GHG emissions. For example, California established GHG emissions reduction targets for 2020, 2030, and 2045 and adopted a statewide strategy to achieve these targets. This strategy includes a price on carbon in the form of a cap-and-trade program (see the text box “What Is Cap-and-Trade?”).

California has been operating its cap-and-trade program for over a decade. The first auction was held in 2012 (see “Allowance Auctions”), and the program is considered to have officially launched in 2013 when the emissions cap first took effect.<sup>5</sup> California’s experiences designing and implementing an economy-wide cap-and-trade program in one of the world’s largest economies—currently ranked fifth in the world<sup>6</sup>—may provide insights for federal policymakers considering legislation to further address GHG emissions.

In addition to insights into designing and managing a market-based GHG mitigation policy, Congress may be interested in certain aspects of California’s cap-and-trade program. For example, Congress may be interested in the state’s offset credit program and the state’s process

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<sup>1</sup> A.R. Crimmins et al., eds., *Fifth National Climate Assessment*, U.S. Global Change Research Program, 2023, <https://nca2023.globalchange.gov/>.

<sup>2</sup> For more information, see CRS Report R46947, *U.S. Climate Change Policy*, coordinated by Richard K. Lattanzio; and CRS Report R47262, *Inflation Reduction Act of 2022 (IRA): Provisions Related to Climate Change*, coordinated by Jonathan L. Ramseur.

<sup>3</sup> For more information on market-based GHG reduction legislation in recent and past Congresses, see CRS Report R45472, *Market-Based Greenhouse Gas Emission Reduction Legislation: 108th Through 118th Congresses*, by Jonathan L. Ramseur; and CRS Report R47167, *Border Carbon Adjustments: Background and Developments in the European Union*, by Jonathan L. Ramseur, Brandon J. Murrill, and Christopher A. Casey.

<sup>4</sup> For example, see H.Con.Res. 86 in the 118<sup>th</sup> Congress.

<sup>5</sup> In a cap-and-trade system, an “allowance auction” is a process whereby a government agency sells a limited number of emissions allowances to companies through a bidding system. The bidding system allows companies to purchase the right to emit a certain amount of greenhouse gases, with the highest bidder acquiring the allowances. This essentially creates a market where the price of emissions is determined by supply and demand through the auction process.

<sup>6</sup> Governor Gavin Newsom, “California Remains the World’s 5<sup>th</sup> Largest Economy,” press release, April 16, 2024, <https://www.gov.ca.gov/2024/04/16/california-remains-the-worlds-5th-largest-economy/>.

for issuing offset credits for compliance with the cap-and-trade program. In addition, the cap-and-trade auctions have created a new source of state revenue, which the state has generally used to fund climate-related activities—through appropriations from California’s Greenhouse Gas Reduction Fund (GGRF). Further, the state has a framework for directing funding and associated benefits to communities it considers most vulnerable to climate impacts.

This report describes California’s cap-and-trade program. It begins with a description of the history and development of the program. The second section discusses program design and implementation. The third and fourth sections discuss the impact of the program on GHG emissions and California’s economy. The final section provides some observations that may be informative to policymakers.

### **What Is Cap-and-Trade?**

Cap-and-trade is a policy approach generally used to address air emissions, including greenhouse gas (GHG) emissions. By establishing a limit or “cap” on total emissions and a market for entities to trade emissions allowances, a cap-and-trade program creates an economic incentive for those entities to reduce emissions and invest in low-emitting technologies.

A GHG cap-and-trade program creates an overall limit (i.e., a cap) on GHG emissions from the emissions sources covered by the program. The covered sources—also referred to as *covered entities* or *regulated entities*—may vary, but they often include major emitting sectors (e.g., power plants), fuel producers/processors (e.g., petroleum refineries), or some combination of both.

The emissions cap is partitioned into emissions allowances. Typically, in a GHG cap-and-trade program, one emissions allowance represents the authority to emit one (metric) ton of carbon dioxide-equivalent (MTCO<sub>2e</sub>). This measure is used because GHGs vary by global warming potential (GWP)—an index of how much a GHG may contribute to global warming relative to an equivalent amount of carbon dioxide (CO<sub>2</sub>) over a set time period, typically 100 years.<sup>7</sup>

Policymakers may decide to distribute the emissions allowances to covered entities at no cost (based on, for example, previous years’ emissions), sell the allowances (e.g., through an auction), or use some combination of these strategies. The distribution of emissions allowance value is typically a source of significant debate during a cap-and-trade program’s development.

At the end of each established compliance period (e.g., a calendar year or multiple years), covered sources surrender emissions allowances to an implementing agency to cover the number of tons emitted. If a source did not provide enough allowances to cover its emissions, the source would be subject to penalties. Other mechanisms, such as the ability to bank allowances or use offset credits, may be included to increase the flexibility of the program.

Under an emissions cap, covered entities with relatively low emissions reduction costs have a financial incentive to make emissions reductions beyond what is required (i.e., not use all of their emissions allowances): These further reductions could be sold (i.e., traded) as emissions credits to entities that face higher costs to reduce their facility emissions.

Cap-and-trade is often described as a market-based mechanism because, like an emissions fee or carbon tax, the price and availability of emissions allowances provide incentives for participants to make economically efficient decisions for GHG emissions reduction.<sup>8</sup> Compared with more traditional approaches—for example, requiring specific performance standards or technologies at particular facilities—market-based mechanisms are generally considered more cost-effective in terms of MTCO<sub>2e</sub> reduced per dollar spent. An example of a national market-based emissions program is the sulfur dioxide emissions trading system (known as the Acid Rain Program) established by the Clean Air Act Amendments of 1990.

<sup>7</sup> For more details, see U.S. Environmental Protection Agency (EPA), “Understanding Global Warming Potentials,” last updated August 8, 2024, <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>.

<sup>8</sup> CRS Report R45625, *Attaching a Price to Greenhouse Gas Emissions with a Carbon Tax or Emissions Fee: Considerations and Potential Impacts*, by Jonathan L. Ramseur and Jane A. Leggett.

## Program Background and History

The California program launched in 2013 when the emissions cap first took effect. It was the second mandatory cap-and-trade program for GHGs in the United States, after the Regional Greenhouse Gas Initiative (RGGI). The RGGI emissions cap took effect in 2009 and applies only to carbon dioxide (CO<sub>2</sub>) emissions from the power sector in a number of northeastern states.<sup>9</sup>

The California Air Resources Board (CARB) established the cap-and-trade program pursuant to Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006.<sup>10</sup> AB 32 established the state's first legally binding GHG reduction target, created a comprehensive program to reduce statewide GHG emissions, and authorized the use of a market-based mechanism, among other provisions.<sup>11</sup>

AB 32 required California to reduce statewide annual GHG emissions to 1990 levels by 2020.<sup>12</sup> Subsequent legislation requires additional reductions in statewide GHG emissions—to 40% below 1990 levels by 2030, and 85% below 1990 levels by 2045—and achievement of net-zero emissions by 2045.<sup>13</sup> Net-zero emissions refers to a status where GHG emissions to the atmosphere are balanced by removals of GHG emissions over a period of time within a defined jurisdiction.

The California cap-and-trade program is a key element in the state's broader strategy to mitigate GHG emissions. This broader strategy is referred to as the "Scoping Plan."<sup>14</sup> CARB's public process to develop the cap-and-trade program dates back to at least 2008, with the development of the first Scoping Plan, which included a preliminary framework for the cap-and-trade program.

Prior to establishing the cap-and-trade program, CARB adopted its Mandatory Reporting of Greenhouse Gas Emissions Regulation (MRR or Reporting Regulation).<sup>15</sup> The Reporting Regulation was originally adopted in 2007, and CARB updated it in 2011 to align with the requirements of the cap-and-trade program.<sup>16</sup> The data from the Reporting Regulation provide the foundation for estimating baseline emissions, determining individual entities' compliance obligations, and setting the annual emissions caps.

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<sup>9</sup> For more information, see CRS Report R41836, *The Regional Greenhouse Gas Initiative: Background, Impacts, and Selected Issues*, by Jonathan L. Ramseur.

<sup>10</sup> Cal. Health & Safety Code §38500 et seq.

<sup>11</sup> California Air Resources Board (CARB), *Climate Change Scoping Plan: A Framework for Change*, December 2008, [https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/adopted\\_scoping\\_plan.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/adopted_scoping_plan.pdf).

<sup>12</sup> California Executive Order S-03-05 first established targets for reducing statewide GHG emissions, including reducing emissions to 1990 levels by 2020. Because the targets were established in an executive order, the targets were not legally binding. The 2020 target became legally binding with the enactment of Assembly Bill (AB) 32. AB 32 also directed CARB to develop and implement regulations to achieve this target; prepare a scoping plan to achieve the maximum feasible and cost-effective reductions in GHG; identify the statewide level of GHG emissions in 1990 to serve as the emissions limit to be achieved by 2020; identify and adopt early action measures; convene an Environmental Justice Advisory Committee; and appoint an Economic and Technology Advancement Advisory Committee.

<sup>13</sup> Senate Bill (SB) 32 requires a reduction in GHG emissions to 40% below 1990 levels by 2030, a goal established by California Executive Order B-30-15. Further, AB 1279 requires a reduction in GHG emissions to 85% below 1990 levels and net-zero GHG emissions no later than 2045—a goal first established by California Executive Order B-55-18.

<sup>14</sup> Cal. Code Regs. tit. 17, §§95100-95163.

<sup>15</sup> Cal. Code Regs. tit. 17, §§95100-95163.

<sup>16</sup> The Regulation for the Mandatory Reporting of Greenhouse Gas Emissions has been amended a number of times. For more information, see CARB, "Mandatory Greenhouse Gas Reporting Regulation," <https://ww2.arb.ca.gov/mrr-regulation>.



In 2011, CARB adopted the Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms—also referred to as the “Cap-and-Trade Regulation.” The Cap-and-Trade Regulation governs the “establishment, administration, and enforcement of the California Greenhouse Gas Cap-and-Trade Program.”<sup>17</sup> The California program is often referred to as the first “economy-wide” GHG cap-and-trade program due to its broad scope—the program addresses GHG emissions from multiple sectors of the economy, including electric power, industry, transportation, and buildings.<sup>18</sup> According to CARB, the program covers approximately 80% of GHG emissions in the state’s GHG Emissions Inventory.<sup>19</sup>

In addition to covering CO<sub>2</sub> emissions, the California program addresses other GHGs: methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, nitrogen trifluoride, and other fluorinated GHGs.

In the first compliance period (2013-2015), the program covered electricity generation (including electricity generated from outside of California as well as from within the state) and industrial facilities with annual GHG emissions at or above 25,000 MTCO<sub>2</sub>e. Imported electricity accounts for 30% of California’s electricity supply. By including electricity imports, the California program effectively includes a state-level border carbon adjustment mechanism.<sup>20</sup>

In the second compliance period (2015-2027), the program expanded to include transportation fuel and natural gas suppliers.<sup>21</sup> By including transportation fuel and natural gas suppliers as covered sources, the scope of the program expanded to address GHG emissions from transportation, residential buildings, and commercial buildings. According to CARB, the program covers approximately 350 facilities.<sup>22</sup>

The program was originally authorized to 2020. In 2017, AB 398 extended the program’s authorization through 2030.<sup>23</sup> CARB has amended the regulations eight times since its inception to incorporate revised statutory emissions targets, lessons learned through implementation, linkages with other similar programs, and other statutory direction. In 2024, CARB initiated a

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<sup>17</sup> Cal. Code Regs. tit 17, §§95800-96022.

<sup>18</sup> CARB reported the total 2022 emissions subject to a compliance obligation in cap-and-trade as 76% (282 million metric tons of carbon dioxide-equivalent [MMTCO<sub>2</sub>e]) of total emissions for that year in the GHG Inventory (371 MMTCO<sub>2</sub>e). See CARB, “Mandatory GHG Reporting – Reported Emissions,” <https://ww2.arb.ca.gov/mrr-data>; and CARB, “2000–2022 GHG Emissions Trends Report Data,” 2024, data file downloadable at <https://ww2.arb.ca.gov/ghg-inventory-data>.

<sup>19</sup> The approximately 20% of GHG emissions remaining are from sources that are covered by the program but do not meet the emissions threshold for inclusion, and from sources that are not covered by the program (i.e., *uncapped sources*) including agricultural activities (e.g., methane from livestock and manure management), waste management (e.g., methane from landfills and water treatment facilities), and sources of short-lived climate pollutants (e.g., hydrofluorocarbons leaking from air conditioning and refrigeration appliances).

<sup>20</sup> A border carbon adjustment is a fee or a tariff on selected imported materials, often based on the GHG emissions associated with the imported material’s production or end use. For more information on California’s treatment of imported electricity, see C. Kardish et al., *Carbon Leakage and Competitiveness: California’s Treatment of Imported Electricity and New Zealand’s Synthetic Greenhouse Gas Levy*, International Carbon Action Partnership, October 25, 2021. For more information on border carbon adjustments, see CRS Report R47167, *Border Carbon Adjustments: Background and Developments in the European Union*, by Jonathan L. Ramseur, Brandon J. Murrill, and Christopher A. Casey.

<sup>21</sup> “Supplier” means a producer, importer, exporter, position holder, interstate pipeline operator, or local distribution company of a fossil fuel or an industrial GHG. Cal. Code Regs. tit. 17, §95802.

<sup>22</sup> CARB, *Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms 2024 Amendments: Standardized Regulatory Impact Assessment (SRIA)*, April 9, 2024, p. 52, [https://ww2.arb.ca.gov/sites/default/files/2024-04/nc-Cap-and-Trade\\_SRIA2024.pdf](https://ww2.arb.ca.gov/sites/default/files/2024-04/nc-Cap-and-Trade_SRIA2024.pdf) (hereinafter CARB, *Cap-and-Trade Regulation 2024 Amendments: SRIA*).

<sup>23</sup> Cal. Health & Safety Code §38562 et seq.

rulemaking to consider potential changes to the program, including changes that would remove allowances from the cumulative 2025-2030 budgets and revise post-2030 allowance budgets.<sup>24</sup>

The California program was designed to link to similar programs in other jurisdictions to create a larger multijurisdictional carbon market (see “Linkage with Markets in Other Jurisdictions”). The California program is currently linked to a program in the Canadian province of Québec.<sup>25</sup>

## Program Design and Implementation

The California program includes a variety of mechanisms intended to maximize cost-effectiveness by limiting price volatility and containing costs, while supporting environmental and public benefits. These mechanisms are discussed in the following sections.

### The Emissions Cap

The emissions cap represents an enforceable limit on the amount of GHG emissions covered entities can emit each year. The emissions cap applies to the aggregate emissions from all covered sources, rather than setting individual caps for each covered source. The cap is intended to provide a measure of certainty that the state would achieve a certain amount of GHG emissions reductions to meet its GHG targets.<sup>26</sup> CARB sets an annual emissions budget that decreases over time to meet California’s GHG reduction goals.<sup>27</sup>

The California emissions cap is partitioned into emissions allowances. One emissions allowance equals one (metric) ton of carbon dioxide-equivalent according to a global warming potential (GWP) based on a 100-year time period.<sup>28</sup> Regulated entities must surrender allowances, or a limited number of offset credits (see “Offsets”), to cover their emissions. According to CARB, the emissions cap is based on historical emissions data and economy-wide emissions modeling.

CARB determined an initial emissions cap and corresponding quantity of available allowances from 2013 to 2020. The future of the program after 2020 was uncertain—until legislation extended the program to 2030.<sup>29</sup> CARB developed annual emissions caps by first determining 1990 level emissions—the state’s target for 2020 (427 million metric tons of CO<sub>2</sub> equivalent or MMTCO<sub>2</sub>e).<sup>30</sup> CARB set an annual emissions cap for covered entities for 2020 in proportion to

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<sup>24</sup> CARB, *Cap-and-Trade Regulation 2024 Amendments: SRIA*; CARB, *Information Regarding Cap-and-Trade Regulation Updates*, October 2024, [https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/nc-CT\\_Notice\\_Oct\\_2024.pdf](https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/nc-CT_Notice_Oct_2024.pdf).

<sup>25</sup> In 2018, California linked with Ontario’s cap-and-trade program for six months. In 2024, California, Québec, and the State of Washington announced their interest in linking cap-and-trade programs. For more information see CARB, “Program Linkage,” <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-linkage>; State of Washington, Department of Ecology, “California, Québec and Washington Agree to Explore Linkage,” news release, March 20, 2024, <https://ecology.wa.gov/about-us/who-we-are/news/2024-news-stories/mar-20-shared-carbon-market>.

<sup>26</sup> CARB, *Climate Change Scoping Plan: A Framework for Change*, December 2008, [https://ww3.arb.ca.gov/cc/scopingplan/document/adopted\\_scoping\\_plan.pdf](https://ww3.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf).

<sup>27</sup> CARB, *Cap-and-Trade Regulation 2024 Amendments: SRIA*, p. 1.

<sup>28</sup> A 100-year global warming potential (GWP) is an index of how much a GHG may contribute to global warming over a hundred years. GWPs are used to compare the impact of different GHGs on global warming. For more details, see EPA, “Understanding Global Warming Potentials,” last updated August 8, 2024, <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>.

<sup>29</sup> Assembly Bill (AB) 398 extended the state’s cap-and-trade program from 2020 to 2030 and provides additional direction regarding certain design features of the post-2020 program.

<sup>30</sup> CARB, “GHG 1990 Emissions Level and 2020 Limit,” <https://ww2.arb.ca.gov/ghg-2020-limit#:~:text=Setting%20the%20Original%202020%20Limit,IPCC%20second%20assessment%20report%20GWPs>.



the percentage of economy-wide emissions they represented (334 MMTCO<sub>2</sub>e).<sup>31</sup> CARB estimated emissions from covered sources at the beginning of the program and established a linear trajectory for the decline of the cap.<sup>32</sup> CARB established the caps for 2021 through 2030 taking a similar approach.

The GHG emissions from covered entities have been consistently below the emissions cap (see **Figure 1**)—thus far, covered entities have reduced their GHG emissions reductions at a faster rate than anticipated. Some stakeholders have been critical of the program design, stating that the market is oversupplied with allowances and recommending that changes should be made to increase the “environmental stringency” of the program.<sup>33</sup> In particular, California’s Legislative Analyst’s Office (LAO) and Independent Emissions Market Advisory Committee (IEMAC) and other stakeholders have expressed concerns about the number of banked allowances (see below) and their potential impact on the state’s 2030 and 2045 GHG targets.<sup>34</sup>

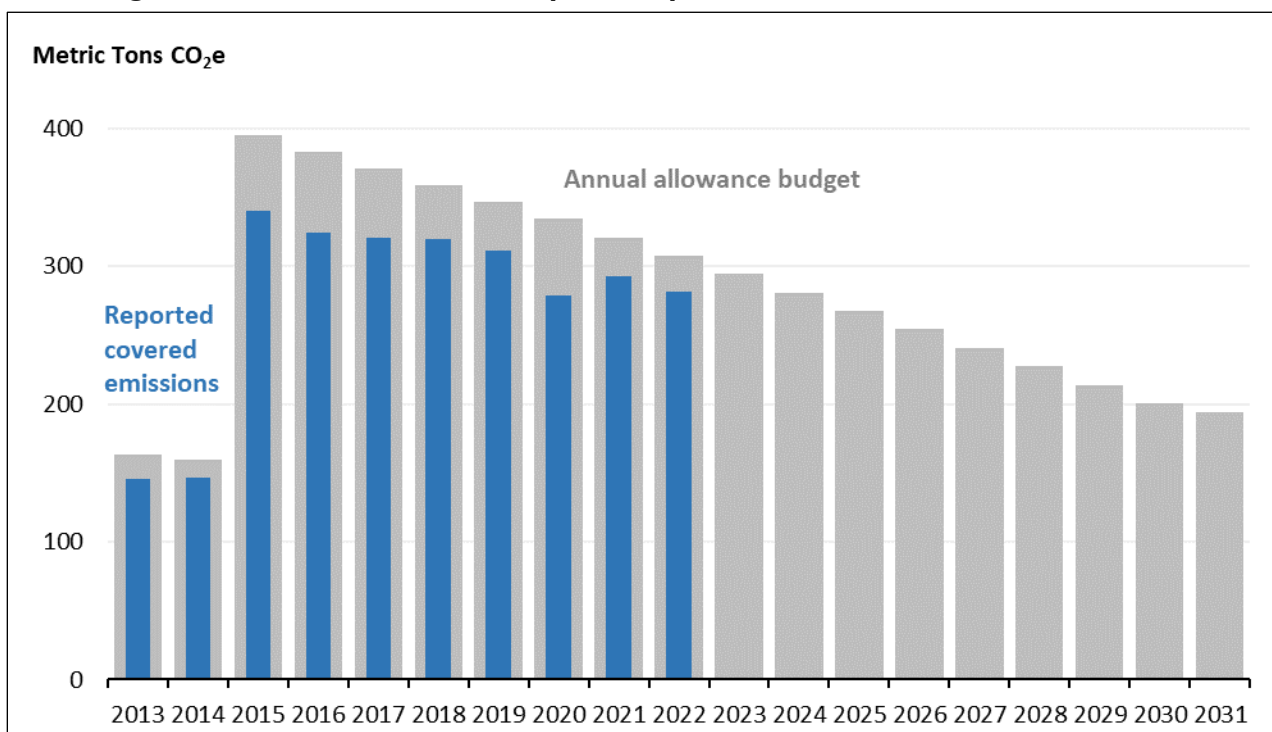
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<sup>31</sup> The economy-wide target is CARB’s estimate of the state’s 1990 emissions, as required by AB 32; see Cal. Health & Safety Code §38550. CARB later revised the economy-wide target for 2020 to be 431 MMTCO<sub>2</sub>e; see CARB, “GHG 1990 Level Emissions Level and 2020 Limit,” <https://ww2.arb.ca.gov/ghg-2020-limit#:~:text=The%202020%20GHG%20emissions%20limit,the%201990%20level%20by%202030>.

<sup>32</sup> CARB, *Proposed Regulation to Implement the California Cap-and-Trade Program, Part I, vol. I, Staff Report: Initial Statement of Reasons*, October 28, 2010, <https://www.arb.ca.gov/regact/2010/capandtrade10/capisor.pdf> (hereinafter CARB, *Proposed Cap-and-Trade Regulation: Staff Report*).

<sup>33</sup> “Environmental stringency” is a term sometimes used by stakeholders. Recommendations to increase environmental stringency include changes that may increase emissions reductions and changes that could improve transparency in measurement and verification. Severin Borenstein et al., *California’s Cap-and-Trade Market Through 2030: A Preliminary Supply/Demand Analysis*, Energy Institute at Haas, Working Paper no. 281, July 2017, <https://ei.haas.berkeley.edu/research/papers/WP281.pdf>; Danny Cullenward and Andy Coghlan, “Structural Oversupply and Credibility in California’s Carbon Market,” *Electricity Journal*, vol. 29, no. 5 (June 2016), pp. 7-14, <https://www.sciencedirect.com/science/article/abs/pii/S1040619016300707>; Danny Cullenward and Michael Wara, “Carbon Markets: Effective Policy?” *Science*, vol. 344, no. 191 (June 2014), p. 1460, <https://www.science.org/doi/full/10.1126/science.344.6191.1460-b>.

<sup>34</sup> Sarah Cornett, *California’s Cap-and-Trade Program: Frequently Asked Questions*, Legislative Analyst’s Office (LAO), 2023, <https://lao.ca.gov/Publications/Report/4811> (hereinafter Cornett, *California Cap-and-Trade FAQs*); Ross Brown, *Cap-and-Trade Extension: Issues for Legislative Oversight*, LAO, December 2017, <https://lao.ca.gov/Publications/Report/3719>; Dallas Burtraw et al., *2021 Annual Report of the Independent Emissions Market Advisory Committee*, California Environmental Protection Agency (CalEPA), February 4, 2022, p. 12, <https://calepa.ca.gov/wp-content/uploads/sites/6/2022/02/2021-IEMAC-Annual-Report.pdf> (hereinafter Burtraw et al., *2021 IEMAC Annual Report*).

**Figure 1. California Emissions Cap and Reported Emissions, 2013-2031**

**Sources:** Prepared by CRS. Annual allowance budget data from Title 17, Section 95841, of the *California Code of Regulations*. Reported covered emissions data from the California Air Resources Board, available at <https://ww2.arb.ca.gov/mrr-data>.

**Notes:** The scope of the program expanded in 2015 to include fossil fuel distributors. The emissions cap does not include offset credits.

CARB allows covered entities to “bank” allowances, meaning that entities can save unused allowances for future use. Allowances do not expire, but banked allowances are subject to a holding limit. The holding limit refers to the maximum number of allowances that an entity or a group of entities with a direct corporate association may hold at once.<sup>35</sup> The holding limit is calculated based on the annual allowance budget and decreases annually.

Banking introduces some complexity in that a particular year’s emissions budget does not represent a limit on emissions for that year, but rather the number of allowances CARB is introducing into the market in a given year. Banking provides covered entities some flexibility—for example, to help contain costs—by allowing them to adjust their level of emissions across different years. For example, if an unexpected shortage in emissions allowances caused allowance prices to rapidly increase, entities that had banked allowances would have an incentive to sell their banked allowances to other covered sources, putting downward pressure on prices.

Since the annual cap on emissions becomes more stringent in later years, banking gives firms an incentive to reduce emissions and obtain extra allowances in early years as a way to protect against the risk of higher prices in later years. While cumulative emissions are still capped over the life of the program, banking can shift the timing of emissions reductions. When GHG reduction targets are annual—the California Legislature has established *annual* GHG targets—banking creates a risk of not meeting annual targets. For example, covered entities can meet their

<sup>35</sup> CARB, *Facts About Holding Limit for Linked Cap-and-Trade Programs*, April 2024, [https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/holding\\_limit.pdf](https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/holding_limit.pdf).

cap-and-trade compliance obligations by using banked allowances from earlier years, even if their actual emissions in 2030 collectively exceed the state's annual limit. Over the years, covered entities and investors have banked a number of unused allowances. CARB has identified approximately 310 million unused or banked allowances in circulation.<sup>36</sup>

Stakeholders and policymakers may have varied perspectives about whether the annual allowance budgets are stringent enough and about the accumulation of banked allowances. To date, the annual allowance budgets have been above reported emissions (see **Figure 1**). On the one hand, covered entities with unused banked allowances have reduced their emissions, in aggregate, below the emissions caps in prior years—and the state achieved its GHG target for 2020. On the other hand, some argue that the surplus of banked allowances undermines the program's ability to achieve additional emissions reductions to meet the state's GHG goals for future years, including for the 2030 target.<sup>37</sup> As part of the rulemaking underway, CARB is considering adjusting the annual emissions caps and therefore the allowance supply.<sup>38</sup>

## Emissions Reporting and Compliance Periods

The cap-and-trade program relies on the Reporting Regulation as the primary mechanism for emissions reporting. Covered entities are required to report facility-level data to CARB annually and to have their GHG emissions data reports verified by an CARB-accredited verification body under the Reporting Regulation.

At the end of a compliance period, covered entities must submit one compliance instrument (i.e., an allowance or offset credit) for each ton of covered GHGs emitted during the compliance period.<sup>39</sup> The cap-and-trade program uses three-year compliance periods to mitigate potential emissions allowance price swings brought on by short-term market volatility.<sup>40</sup> CARB also requires covered entities to submit compliance instruments annually for a portion of their reported emissions. This requirement is to mitigate potential impacts in the event an entity emits GHGs and then declares bankruptcy before the end of a multiyear compliance period.

## Emissions Allowance Allocation

The emissions cap creates a new asset—the emissions allowance. The distribution of emissions allowance value is typically a source of debate during a cap-and-trade program's development. Policymakers may decide to distribute the emissions allowances to covered sources at no cost, sell the allowances (e.g., through an auction), or use some combination of these strategies.

In California's cap-and-trade program, CARB distributes emissions allowances through a combination of direct allocation and quarterly auctions.

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<sup>36</sup> California Legislature, Senate Environmental Quality Committee and Senate Budget and Fiscal Review Subcommittee No. 2 on Resources, Environmental Protection, and Energy Committee, *Background Information for Joint Oversight Hearing on Cap-and-Trade Rulemaking*, February 13, 2024, [https://senv.senate.ca.gov/sites/senv.senate.ca.gov/files/cap\\_trade\\_rulemaking\\_hearing\\_-\\_final\\_backgrounder.pdf](https://senv.senate.ca.gov/sites/senv.senate.ca.gov/files/cap_trade_rulemaking_hearing_-_final_backgrounder.pdf).

<sup>37</sup> Ross Brown, *Assessing California's Climate Policies: The 2022 Scoping Plan Update*, LAO, January 2023, <https://www.lao.ca.gov/Publications/Report/4656>.

<sup>38</sup> CARB, *Cap-and-Trade Regulation 2024 Amendments: SRIA*; CARB, *Information Regarding Cap-and-Trade Regulation Updates*, October 2024, [https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/nc-CT\\_Notice\\_Oct\\_2024.pdf](https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/nc-CT_Notice_Oct_2024.pdf).

<sup>39</sup> The amount of emissions for which an entity must submit compliance instruments is referred to as the entity's *compliance obligation*.

<sup>40</sup> An exception was the first compliance period, which was two years in duration (2013-2015) instead of three.

## Direct Allocation of Allowances

CARB directly allocates allowances to industrial facilities and to utilities at no cost—these allowances are sometimes referred to as *free allowances*. CARB directly allocates allowances to certain industries to protect business competitiveness and minimize emissions leakage. Emissions leakage occurs when covered sources move operations outside of the state to avoid compliance with the cap-and-trade program. Under such a scenario, GHG emissions in California would decrease, but GHG emissions would increase (“leak”) in a covered source’s new location, thus undermining the objectives of the cap-and-trade program. AB 398 directs CARB to consider all covered industries as being at high risk for emissions leakage.<sup>41</sup>

CARB determines the number of allowances to allocate to industrial facilities based on a formula. The formula accounts for several factors, including an industry-wide product efficiency benchmark, the decreasing annual allowances budget, and annual production levels at the facility. The more products a facility manufactures, the more allowances it receives at no cost.

CARB directly allocates allowances to utilities—electrical distribution utilities and natural gas suppliers—at no cost to benefit their ratepayers (i.e., utility customers).<sup>42</sup> CARB requires these allowances to be used to mitigate increased energy and electricity costs to consumers resulting from the emissions cap.<sup>43</sup> Depending on the entity type (i.e., investor-owned or publicly owned or co-operative, natural gas supplier or electricity distributor), the utility may be required to consign all or a portion of the allowances for sale at the CARB-run auctions.<sup>44</sup> For example, investor-owned electrical distribution utilities are annually required to consign all allocated allowances to auction. To cover their emissions, these utilities must purchase allowances at auction.

The requirements for how the auction revenue from the sale of consigned allowances must be used varies depending on utility type, but generally the allowable uses include on-bill credits (i.e., dividends) for utility customers, energy efficiency programs, renewable energy, building electrification, and transportation electrification. To date, the majority of the allowance value from allowances allocated to electric distribution utilities and natural gas suppliers was returned to utility customers through on-bill credits.

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<sup>41</sup> AB 398 directs CARB to “[s]et industry assistance factors for allowance allocation commencing in 2021 at the levels applicable in the compliance period of 2015 to 2017, inclusive. The state board shall apply a declining cap adjustment factor to the industry allocation equivalent to the overall statewide emissions declining cap using the methodology from the compliance period of 2015 to 2017, inclusive.” According to CARB, “Assistance factors for the period 2015 to 2017 were 100 percent for all sectors. As such, the proposed amendments revise Table 8-1 in the Regulation to set assistance factors for all [industrial] sectors to be 100 percent for the period 2021 to 2030.” CARB, *Public Hearing to Consider the Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Staff Report: Initial Statement of Reasons*, September 4, 2018, p. 60, <https://www.arb.ca.gov/regact/2010/capandtrade10/capisor.pdf> (hereinafter CARB, *Proposed Cap-and-Trade Regulation Amendments: 2018 Staff Report*).

<sup>42</sup> By design, a GHG emissions cap would increase certain energy prices, namely energy produced from fossil fuels, as well as the prices of goods and services produced using these materials, such as electricity.

<sup>43</sup> For more information on direct allocation of allowances to electrical distribution utilities and to natural gas suppliers, as well as requirements around how the value of the allocated allowances may be used, see Cal. Code Regs. tit 17, §§95892-95893. CARB also allocates allowances to public wholesale water agencies and to legacy contract generators for transition assistance—see Cal. Code Regs. tit 17, §§95895 and §95894, respectively.

<sup>44</sup> For definitions of these terms, using the electric utility sector as an example, see CRS Report R47521, *Electricity: Overview and Issues for Congress*, by Ashley J. Lawson, p. 4.

## Allowance Auctions

Once per quarter, CARB auctions a supply of allowances that can be purchased by covered entities.<sup>45</sup> In addition to covered entities, outside participants are also able to purchase allowances at auctions to resell to covered entities or other investors at a future date, or to retire the allowances. Auctions provide price discovery—the market determines the price of GHG emissions—for stakeholders and regulators and promote an open and transparent market.

The auctions are hosted by CARB and are joint auctions with the government of Québec as part of the linkage between the California's and Québec's cap-and-trade programs (discussed below). The auctions are conducted using a single-round, sealed-bid, uniform prices format. Participants submit bids indicating the number of allowances they wish to purchase and the price they are willing to pay. The price is determined by the highest price at which the total number of allowances offered equals the demand. This highest bid that clears the market is known as the *clearing price* or *settlement price*. Each bidder receives the quantity of allowances specified in their winning bids at the uniform settlement price.

For example, if Participant A bids for 50 allowances at \$25 per allowance, Participant B bids for 100 allowances at \$20 per allowance, and Participant C bids for 75 allowances at \$15 per allowance, and the total supply of allowances is 150, the clearing price would be \$20 per allowance. Participant A would receive their requested 50 allowances, and Participant B would receive their requested 100 allowances; both participants would receive their allowances at the uniform price of \$20. Participant C, however, would not receive any allowances, as their bid price of \$15 falls below the clearing price. This process ensures that allowances are allocated to the highest bidders until the supply is exhausted, with all winning participants paying the same settlement price.

## Price Floor and Price Ceiling

The California cap-and-trade program includes design features that address situations of both low and high demand for allowances. CARB sets an auction *floor price*, which is the minimum acceptable bid price for which an allowance can be sold at auction. The floor price at the beginning of the program in 2012 was \$10 per ton of CO<sub>2</sub>e.<sup>46</sup> Each year, the floor price increases by 5% plus inflation. In the May 2024 auction, CARB set the per-allowance floor price at \$24.04, and allowances sold for \$38.35 as the settlement price.<sup>47</sup>

CARB also sets a maximum limit on the price of emissions allowances sold at auction, referred to as a *price ceiling*. Pursuant to AB 398, CARB established a “hard” price ceiling in 2021. A hard price ceiling provides a limit on allowance prices, allowing CARB to sell an unlimited supply of additional emissions allowances to meet auction demand. There is a strict limit on the maximum price of allowances regardless of market demand. In comparison, a “soft” price ceiling would set a limit on the number of additional allowances that could be sold to meet auction demand. If demand were higher than the amount allowed under a soft price ceiling, prices could theoretically increase without limit, depending upon demand. In summary, a hard ceiling means there is a strict maximum *price* for allowances, whereas a soft ceiling means there is a strict limit on the *number of allowances*. The primary trade-off associated with a hard price ceiling is that the program

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<sup>45</sup> CARB auctions allowances for the current year and also holds advance auctions, in which 10% of each annual allowance budget is available for sale three years before the vintage of allowances becomes current.

<sup>46</sup> CARB, “Auction Notices and Reports,” <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/auction-information/auction-notice-and-reports> (hereinafter CARB, “Auction Notices and Reports”).

<sup>47</sup> CARB, “Auction Notices and Reports.”

would no longer cap emissions if prices reach the ceiling. Entities could purchase an unlimited number of additional compliance instruments at the ceiling price. To address this issue, California's state legislature specified that the revenue from selling the additional compliance instruments sold at the ceiling must be expended to achieve an equivalent number of emissions reductions.<sup>48</sup>

The price ceiling in 2024 was \$88.22.<sup>49</sup> Each year, the price ceiling increases by 5% plus the rate of inflation.<sup>50</sup>

Allowance prices generally hovered at or near the price floor until 2021 (see **Figure 2**). To date, auction settlement prices have not reached the price ceiling.

### ***Allowance Price Containment Reserve***

CARB sets aside a certain number of allowances from the cap each year into an Allowance Price Containment Reserve (Reserve). A percentage of these allowances is held in strategic reserve by CARB in two tiers with different prices and a price ceiling. Allowances that go unsold from past auctions are held in the Reserve and gradually released for sale at auction after two consecutive auctions are held in which the clearing price is higher than the minimum price.

CARB offers reserve sales in the event auction settlement prices from the preceding quarter are greater than or equal to 60% of the lowest Reserve price tier. In 2024, the Reserve Tier 1 Price was \$56.20, and Reserve Tier 2 price was \$72.21.<sup>51</sup> These prices grow at 5% per year in addition to an adjustment for inflation. No reserve sales have been held to date. CARB offered a reserve sale in September 2024 but did not hold the sale as there were no qualified applicants or qualified bidders.<sup>52</sup>

CARB would offer a reserve sale if no allowances remain at the two lower Reserve tiers and a covered entity demonstrates that it does not have sufficient compliance instruments in its accounts for that year's compliance event. In the event that allowances at the price ceiling are exhausted, a covered entity can purchase price ceiling units up to the amount of its current unfulfilled emissions obligation (see "Price Floor and Price Ceiling").

### ***Auction Results***

The California program has held 48 auctions as of November 2024.<sup>53</sup> As illustrated in **Figure 2**, allowance prices started at the floor price of \$10 per MTCO<sub>2</sub>e emissions in 2013 and increased to more than \$30 per MTCO<sub>2</sub>e in 2023. Prices increased to nearly \$42 per MTCO<sub>2</sub>e at the February

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<sup>48</sup> CARB, *Proposed Cap-and-Trade Regulation Amendments: 2018 Staff Report*, p. 47.

<sup>49</sup> CARB, "Cost Containment Information," <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/cost-containment-information> (hereinafter CARB, "Cost Containment Information").

<sup>50</sup> CARB, "Cost Containment Information." According to Title 17, Section 95915(f)(1)(B), of the *California Code of Regulations*, "After 2021, the purchase price will increase annually by five percent plus the rate of inflation as measured by the most recently available 12-month value of the Consumer Price Index for All Urban Consumers."

<sup>51</sup> CARB, "Auction Notices and Reports."

<sup>52</sup> CARB determines eligibility criteria and an application is required before an entity can bid. CARB, "Reserve Sale Information," <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/cost-containment-information/reserve-sale-information> (hereinafter CARB, "Reserve Sale Information").

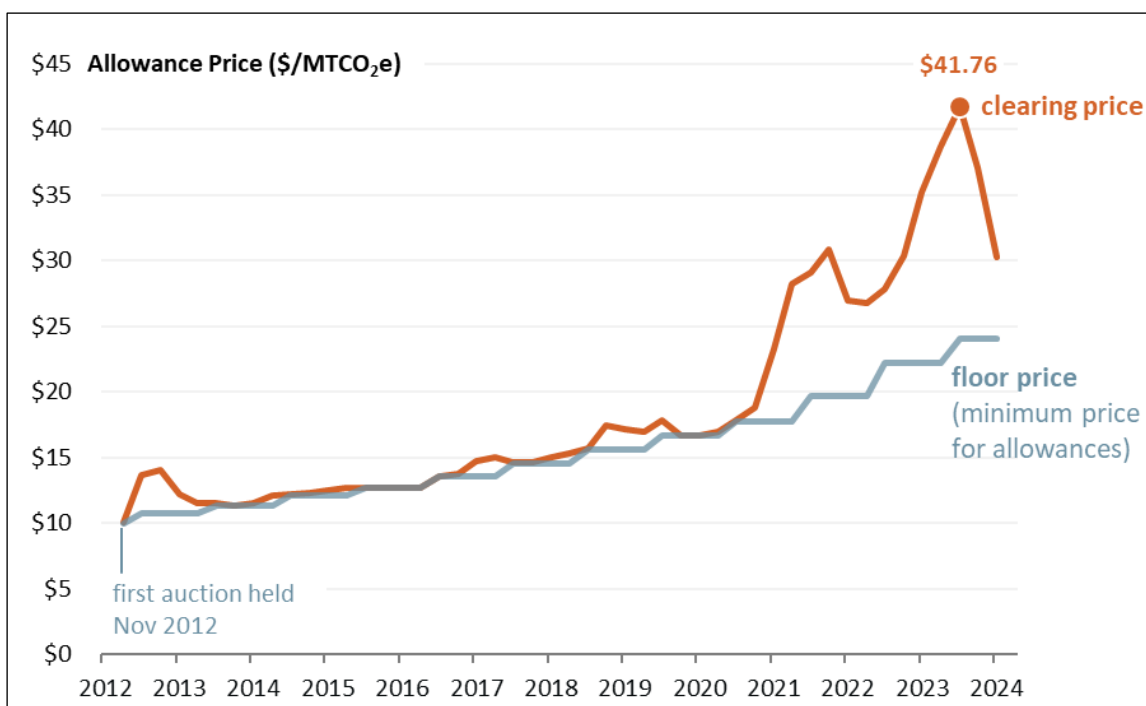
<sup>53</sup> CARB, "Reserve Sale Information."



2024 auction and then decreased to \$37 per MTCO<sub>2</sub>e at the May 2024 auction and \$32 per MTCO<sub>2</sub>e at the November 2024 auction.<sup>54</sup>

After an initial period of volatility within the first year of the program, prices stabilized and then remained at or close to the price floor. Prices first moved above the floor price in 2017 after the program was extended to 2030. Allowance prices have increased to over \$30 in recent years as the economy recovered from a recession and as CARB proposed changes to the program that would increase its stringency.<sup>55</sup> Although some prior auctions did not sell all of the allowances offered, the last 17 auctions have sold all of the emissions allowances offered for sale.

**Figure 2. Quarterly California Emissions Allowance Auction Prices, November 2012 to November 2024**



**Source:** Prepared by CRS; data from the California Air Resources Board at <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-data/cap-and-trade-program-data-dashboard>.

**Notes:** Prices are for the current vintage allowances sold in each auction. “Current vintage” refers to allowances that can be used to meet compliance obligations in the year they are auctioned.

## Offsets

An offset is a measurable reduction or sequestration of GHG emissions from a source not covered by the cap-and-trade program. Covered entities can purchase offset credits. Only offset credits issued by CARB to qualifying projects can be used for compliance with the California cap-and-trade program. Each CARB offset credit is equal to one MTCO<sub>2</sub>e GHG emissions reduced, sequestered, or avoided. Offset credits can provide flexibility for entities and reduce the overall

<sup>54</sup> CARB, *California Cap-and-Trade Program Summary of California-Quebec Joint Auction Settlement Prices and Results*, last updated November 2024, [https://ww2.arb.ca.gov/sites/default/files/2020-08/results\\_summary.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-08/results_summary.pdf).

<sup>55</sup> U.S. Energy Information Administration (EIA), “Price of Carbon Allowances in California’s Cap-and-Trade Program Fell in Latest Auction,” *Today in Energy*, July 31, 2024, <https://www.eia.gov/todayinenergy/detail.php?id=62644>.

cost to comply with the program. Offsets are intended to counterbalance the effects of an entity's GHG emissions. As sources outside of the cap-and-trade program—such as forestry and agriculture—may not otherwise be incentivized to reduce emissions, offsets can provide financial incentives to implement projects that reduce emissions from those sources. Currently, covered entities may use offset credits (in lieu of allowances) to meet up to 4% of their compliance obligations under cap-and-trade; they must submit allowances for the remainder of their compliance requirements.<sup>56</sup>

AB 32 set a number of standards for offsets to qualify for use under the cap-and-trade program. Offsets are required to meet criteria that demonstrate that the emissions reductions are real, permanent, verifiable, enforceable, quantifiable, and additional to what is required by law or regulation or would otherwise have occurred (the final criterion is often referred to as *additionality*).

Offsets must comply with CARB-approved protocols. The protocols include specific quantification methodologies that must be used to monitor carbon stocks—or the total amount of carbon that is stored within a selected area (e.g., forested lands, shrub-dominated lands)—and calculate the emissions reductions. CARB-approved protocols currently exist for the following project types:<sup>57</sup>

- projects that capture and destroy methane emissions from manure management systems;
- projects that capture and destroy methane emissions from mines;
- projects that destroy ozone-depleting substances;
- projects that prevent methane emissions from rice cultivation;
- forest sequestration projects, including reforestation, improved forest management, and avoided conversion; and
- urban forest projects, including tree planting and maintenance activities to increase carbon storage in trees.

All offset projects developed under a CARB protocol must be listed with a CARB-approved Offset Project Registry.<sup>58</sup> Offset projects can be located anywhere in the United States. Beginning in 2021, at least half of the offsets used for compliance must come from projects that directly benefit air or water quality in California. CARB is allowed to invalidate an offset credit up to eight years after its issuance. Offset credits would be subject to invalidation if the offset project violated a local, state, or federal regulation or was being counted “twice” as an offset credit for another program.

Stakeholder opinions differ on the use of offsets in California's cap-and-trade program. Some stakeholders question the extent to which offset projects represent real, additional, and verifiable emissions reductions.<sup>59</sup> Some stakeholders object to the use of offsets in general on the basis that they allow companies to avoid making direct emissions reductions at their own operations, which

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<sup>56</sup> Covered entities were allowed to use offset credits to meet up to 8% of their compliance obligation for emissions from 2013 to 2020. Covered entities are allowed to use offset credits to meet up to 4% of their compliance obligation for emissions from 2021 to 2025 and 6% of their compliance obligation for emissions from 2026 to 2030.

<sup>57</sup> CARB, “Compliance Offset Protocols,” <https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/compliance-offset-protocols>.

<sup>58</sup> Offset registries are third-party systems for reporting and tracking offset project information, including credits generated, ownership, sale, and retirement. For more information, see CARB, “Offset Project Registries,” <https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-project-registries>.

<sup>59</sup> Burtraw et al., *2021 IEMAC Annual Report*, p. 27.

can continue to operate and emit GHGs and other air pollutants that affect the environment and human health of local communities. In addition, some stakeholders are concerned about particular types of offset projects, such as forestry projects. As the risk of wildfires has increased, some question the permanence of forestry offset projects.<sup>60</sup>

Other stakeholders argue that offsets provide an important source of funding for projects that offer additional environmental benefits. For example, conservation and nature-based projects may also provide habitat for wildlife, increase biodiversity, and improve water quality. Some stakeholders also note that because offsets are intended to help lower compliance costs for emitters, they could mitigate price increases for energy products and consumer goods.

## Trading

Allowances and offset credits enter the market when CARB first distributes allowances (either via direct allocation or quarterly auctions) and issues offset credits.

Entities can purchase and sell allowances and offset credits on an open market—the “trade.” The introduction of emissions allowances and offset credits designed to be tradable gives rise to what is referred to as a *carbon market*. These are “trading markets,” where trading activity related to compliance instruments takes place. These trading markets include the secondary market (where compliance instruments are traded directly) and the derivatives market (which involves the trading of financial contracts, primarily for hedging and investment, the value of which depends on the market behavior of compliance instruments). In addition to covered entities, participants in these markets include traders, brokers, offset providers, and financial institutions.

## Linkage with Markets in Other Jurisdictions

The California cap-and-trade program was designed with the intention of linking to other compatible programs to create larger markets.<sup>61</sup> *Linking* refers to integrating one GHG cap-and-trade program with another. When programs are linked, compliance instruments are mutually recognized: Allowances and offsets issued by one jurisdiction can be used for compliance with the other jurisdiction and vice versa.

CARB has identified collaboration and linking with other jurisdictions as an important avenue for California to play a leadership role and pave the way for additional climate action at the subnational, national, and international levels.<sup>62</sup> Notably, AB 32 requires CARB to “facilitate the development of integrated and cost-effective regional, national, and international greenhouse gas reduction programs.”<sup>63</sup>

California began working with a number of U.S. states and Canadian provinces in 2009 through the Western Climate Initiative to determine best practices, envisioning linking the various jurisdictions’ programs.<sup>64</sup> California and Québec linked programs in 2014.<sup>65</sup> Since linking

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<sup>60</sup> Burtraw et al., *2021 IEMAC Annual Report*, pp. 27-36; CARB, *California’s Compliance Offset Program*, October 27, 2021, [https://ww2.arb.ca.gov/sites/default/files/2021-10/nc-forest\\_offset\\_faq\\_20211027.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-10/nc-forest_offset_faq_20211027.pdf).

<sup>61</sup> CARB, *Proposed Cap-and-Trade Regulation*, p. II-40.

<sup>62</sup> CARB, *Proposed Cap-and-Trade Regulation*, pp. ES-1, I-2, and VIII-2; and CARB, *Proposed Cap-and-Trade Regulation*, “Appendix I. Western Climate Initiative Detailed Program Design,” p. I-4.

<sup>63</sup> Cal. Health & Safety Code §38561 (b).

<sup>64</sup> For more information, see the Western Climate Initiative’s website at <https://wci-inc.org/>.

<sup>65</sup> CARB, “Program Linkage,” <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-linkage>, hereinafter CARB, “Program Linkage”; Government of California, Government of Ontario, and Gouvernement du (continued...)

programs with Québec, CARB has hosted its quarterly auctions jointly with Québec. California also linked to a program in Ontario for the first half of 2018, until Ontario announced the end of the province's cap-and-trade program.<sup>66</sup> In 2024, CARB, the Government of Québec, and the Washington State Department of Ecology issued a joint statement expressing interest in forming a shared carbon market.<sup>67</sup>

Linking programs can provide benefits to program participants. Large, multijurisdictional markets can potentially provide additional opportunities for emissions reductions and reduce emissions leakage risk. Linking programs can increase the liquidity of allowances, reduce cost impacts, and encourage retention of local businesses.<sup>68</sup>

Creating an interdependent carbon market can also expose program administrators to additional risks. For example, linking programs can be a drawback if the linkage exposes one jurisdiction to price fluctuations driven by external factors in another jurisdiction. In addition, if the programs' goals are not aligned, the linkage has the potential to undermine the ability of the programs to achieve their respective goals.

California's Cap-and-Trade Regulation and the California state legislature have established certain requirements that must be met to link to other trading programs.<sup>69</sup> To link programs, CARB must promulgate a regulation to amend the Cap-and-Trade Regulation and receive approval from California's governor prior to voting to add any new partner jurisdiction.

## **Oversight, Monitoring, and Enforcement**

Periodic review of the cap-and-trade program occurs as part of California's Scoping Plan process. CARB is required to update the GHG emissions mitigation plan at least every five years. In addition, the California legislature established the Independent Emissions Market Advisory Committee (IEMAC), which publishes regular reports on the performance of the program.<sup>70</sup> CARB convenes an Environmental Justice Advisory Committee (EJAC) to advise on the Scoping Plan and any other policies, such as the cap-and-trade program.<sup>71</sup> Further, California's Legislative Analyst's Office identifies issues for legislative oversight and recommendations related to the cap-and-trade program as well as the investment of auction revenue and related policy topics.<sup>72</sup>

CARB conducts market oversight and enforcement for the cap-and-trade program. Market manipulation or "gaming" in emissions trading can be a concern in designing cap-and-trade programs.<sup>73</sup> Examples of potential market manipulation include attempts to corner the market,

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Québec, *Agreement on the Harmonization and Integration of Cap-and-Trade Programs for Reducing Greenhouse Gas Emissions*, September 22, 2017, [https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/linkage/2017\\_linkage\\_agreement\\_ca-qc-on.pdf](https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/linkage/2017_linkage_agreement_ca-qc-on.pdf).

<sup>66</sup> Government of Ontario, "Premier Doug Ford Announces the End of the Cap-and-Trade Carbon Tax Era in Ontario," news release, July 3, 2018, <https://news.ontario.ca/en/release/49699/premier-doug-ford-announces-the-end-of-the-cap-and-trade-carbon-tax-era-in-ontario>.

<sup>67</sup> CARB, "Program Linkage."

<sup>68</sup> CARB, "FAQ Cap-and-Trade Program," <https://ww2.arb.ca.gov/resources/documents/faq-cap-and-trade-program>.

<sup>69</sup> CARB, "Program Linkage."

<sup>70</sup> For more information, including annual reports, see CalEPA, "Independent Emissions Market Advisory Committee," <https://calepa.ca.gov/independent-emissions-market-advisory-committee/>.

<sup>71</sup> CARB, "Environmental Justice Advisory Committee," <https://ww2.arb.ca.gov/environmental-justice-advisory-committee>.

<sup>72</sup> For more information, see LAO, "About Our Office," <https://lao.ca.gov/About>.

<sup>73</sup> W. Bowman Cutter et al., *Rules of the Game: Examining Market Manipulation, Gaming and Enforcement in* (continued...)

fraud, price manipulation, and insider trading. California's cap-and-trade program includes provisions aimed at ensuring the allowance trading market operates fairly and transparently. For example, the program includes several requirements that support market integrity and oversight, such as purchasing and holding limits, registration and disclosure requirements, a tracking system, and financial penalties for violations.

Failure to surrender sufficient compliance instruments on time would subject an entity to financial penalties for noncompliance. In addition, violations of the regulation can result in civil or criminal penalties. Separate penalties apply to misreporting or nonreporting under the Reporting Regulation.<sup>74</sup> According to CARB, the program has achieved nearly 100% compliance rates for every compliance event to date.<sup>75</sup>

## **Distribution of Auction Revenue**

Policymakers can distribute auction revenue to support a range of objectives, including to advance climate or environmental goals, to reduce cost impacts of the program on consumers, or for other policy priorities. Congress may be interested in how California has chosen to spend the auction revenue and what requirements the state put in place to track and report on the status and benefits of funded projects.

## **Revenue from the Auction of Utility Allowances**

Allowances allocated to electric and natural gas utilities at no cost must be used for the primary benefit of utility customers.<sup>76</sup> Depending on the entity type, the utility may be required to consign all or a portion of the allowances for sale at the CARB-run auctions. In the case where utilities are required to consign all of their allowances, the utilities must purchase additional compliance instruments (allowances and offsets) to cover their emissions; however, the revenue from the sale of the consigned allowances must be used to benefit ratepayers.

The Cap-and-Trade Regulation specifies how utilities can use their allocated allowances and the proceeds from consigning them at auction. Requirements vary depending upon the type of entity, but generally the allowable uses of the auction revenue from the sale of consigned allowances include on-bill credits for utility ratepayers, energy efficiency programs, and investments in renewable energy, building electrification, and transportation electrification. The majority of the allowance value from allowances allocated to utilities is returned to electricity and natural gas ratepayers through on-bill credits (see **Figure 3**).

Twice a year, residential and small business customers of investor-owned utilities receive a credit on their utility bill called the "California Climate Credit." From 2014 to 2023, California households have received an average of \$971 total from climate credits on their utility bills, totaling more than \$14 billion statewide.<sup>77</sup> According to the California Public Utilities Commissions, total payments exceeded \$1.6 billion for electric customers, \$1 billion for natural

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*California's Cap-and-Trade Program*, UCLA School of Law, Research Paper no. 12-14, August 2011, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2089626](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2089626).

<sup>74</sup> CARB, "Market Monitoring," <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/market-monitoring>.

<sup>75</sup> CARB, "MRR Enforcement," <https://ww2.arb.ca.gov/resources/documents/mrr-enforcement>.

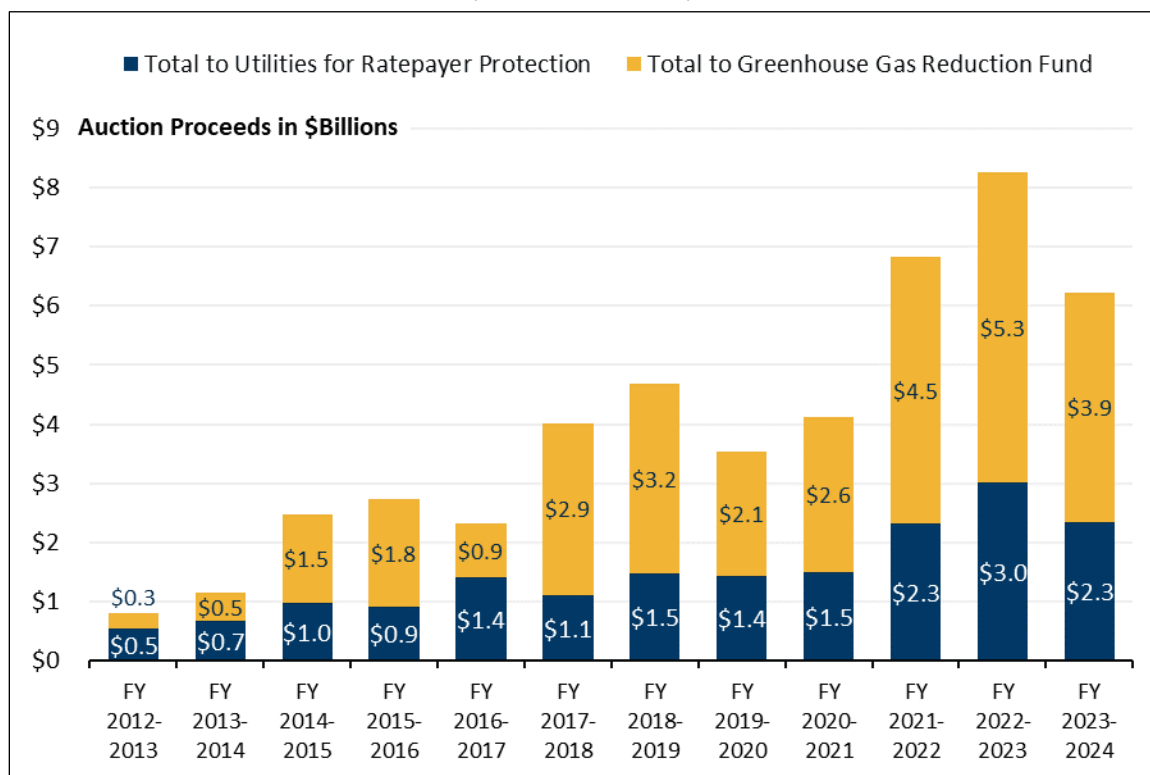
<sup>76</sup> Cal. Code Regs. tit. 17, §§95892-95893.

<sup>77</sup> California Public Utilities Commission (CPUC), "April Energy Bills to Include Climate Credit for Millions of Californians," press release, February 29, 2024, <https://www.cpuc.ca.gov/news-and-updates/all-news/april-energy-bills-to-include-climate-credit-for-millions-of-californians-2024>.

gas customers, and \$160 million for small businesses.<sup>78</sup> While the value of the credits varies by utility, in April 2024 residential customers received bill credits ranging from \$32 to \$174 on their electricity bills and natural gas customers received \$59 to \$86 (with an average credit of \$146 combined).<sup>79</sup> In October 2024, residential electricity customers received an identical credit; the natural gas credit is typically issued once in April. Both the residential and small business credits are currently flat credits as opposed to volumetric credits that are proportional to usage.<sup>80</sup>

For context, in 2023 the average residential monthly electricity bill in California was estimated to be \$145 and the average monthly natural gas bill was reportedly \$88—a combined \$233 a month.<sup>81</sup>

**Figure 3. Nominal Auction Proceeds by California Fiscal Year**  
(in billions of dollars)



**Source:** Prepared by CRS; data from California Air Resources Board, “Cap-and-Trade Program Data Dashboard,” <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-data/cap-and-trade-program-data-dashboard>.

<sup>78</sup> CPUC, “Over 11.5 Million Californian Households to Receive Climate Credit on Fall Electricity Bills,” press release, October 2, 2024. <https://www.cpuc.ca.gov/news-and-updates/all-news/over-11-million-californian-households-to-receive-climate-credit-on-fall-electricity-bills#:~:text=Financial%20Rewards%20for%20Carbon%20Reduction,their%20electricity%20bills%20in%20October> (hereinafter CPUC, “Fall Electricity Bills”).

<sup>79</sup> CPUC, “Fall Electricity Bills.”

<sup>80</sup> CPUC, “Greenhouse Gas Cap-and-Trade Program,” <https://www.cpuc.ca.gov/industries-and-topics/natural-gas/greenhouse-gas-cap-and-trade-program>.

<sup>81</sup> EIA, “Table 5A. Residential Average Monthly Bill by Census Division, and State,” [https://www.eia.gov/electricity/sales\\_revenue\\_price/pdf/table\\_5A.pdf](https://www.eia.gov/electricity/sales_revenue_price/pdf/table_5A.pdf); and Brianna Taylor, “California Energy Prices Are Among the Highest in the US, New Study Says. Heat Wave Won’t Help,” *Sacramento Bee*, July 9, 2024.



**Notes:** The California fiscal year begins on July 1 and ends on June 30 of the following year. The total to utilities for ratepayer protection represents the auction revenue utilities receive from consigning their free allowances to auction.

## The California Greenhouse Gas Reduction Fund

Revenues from the auction of allowances that are not directed to utility ratepayer support are deposited into California's Greenhouse Gas Reduction Fund. The California GGRF is separate from the federal GGRF administered by the Environmental Protection Agency and established by the law commonly referred to as the Inflation Reduction Act of 2022 (IRA; P.L. 117-169). The California legislature established the state's GGRF in 2012 as a special fund to receive cap-and-trade auction proceeds.<sup>82</sup>

As of May 2024, California's cap-and-trade auctions have generated approximately \$28 billion in total revenue for the state's GGRF.<sup>83</sup> The majority of the auction revenue deposited into the GGRF has been appropriated by the state legislature to climate-related programs administered by state agencies.

The amount raised by auctions annually for California's GGRF can be variable and difficult to predict. In recent years, cap-and-trade auctions have raised between \$3 billion and \$4.7 billion annually for the GGRF.

A number of statutory provisions govern the use of GGRF monies.<sup>84</sup> For example, one provision commits approximately 65% of annual GGRF revenue on an ongoing basis to selected programs for transportation, transit, housing, and safe and affordable drinking water.<sup>85</sup> In addition, \$200 million from the GGRF revenue each fiscal year is committed to forest health and wildfire prevention.<sup>86</sup> Other specific transfers and obligations from the GGRF include an offset for a suspended manufacturing and use tax as well as a fire prevention fee.<sup>87</sup> After accounting for these ongoing spending commitments, the remaining annual GGRF revenues are appropriated by the state legislature as a part of the annual budget process.

The portfolio of state programs that receive appropriations from the GGRF are referred to as "California Climate Investments." CARB manages and oversees California Climate Investments. CARB provides guidance to administering agencies, aggregates project-level data, and reports annually to the state legislature on the status of funding, cost-effectiveness, and project benefits.<sup>88</sup>

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<sup>82</sup> Cal. Gov't Code tit. 2, §16428.8.

<sup>83</sup> CARB, "California's Cap-and-Trade Program Funds \$28 Billion in Climate Investments in Last Decade," press release, May 8, 2024, <https://ww2.arb.ca.gov/news/californias-cap-and-trade-program-funds-28-billion-climate-investments-last-decade>.

<sup>84</sup> CARB, "California Climate Investments Legislative Guidance," <https://ww2.arb.ca.gov/resources/documents/california-climate-investments-legislative-guidance>.

<sup>85</sup> SB 862 established "continuous appropriations" totaling 60% of California's Greenhouse Gas Reduction Fund (GGRF) monies beginning in Fiscal Year (FY) 2015-2016 for the following programs: California's High-Speed Rail Project (receiving 25% of GGRF revenues), Affordable Housing and Sustainable Communities (20%), Transit and Intercity Rail (10%), and Low Carbon Transit Operations (5%). SB 200 committed 5%, or up to \$130 million, of the annual proceeds of the GGRF to the Safe and Affordable Drinking Water Fund until June 30, 2030.

<sup>86</sup> SB 901 and SB 155 committed \$200 million of the annual proceeds of the GGRF until and through the end of FY2028-2029; This \$200 million is taken "off the top" before calculating the other continuous appropriation percentages.

<sup>87</sup> AB 399. The California Legislative Analyst's Office estimates annual transfers for the manufacturing tax and use fee to be approximately \$70-\$90 million and the replacement for the fire prevention fee in State Responsibility Areas to be approximately \$70-\$90 million. Cornett, *California Cap-and-Trade FAQs*.

<sup>88</sup> For more information, see CARB, "Reports and Data," <https://www.caclimateinvestments.ca.gov/annual-report>.

CARB develops quantification methodologies and tools for administering agencies to estimate GHG emissions reductions and other benefits, including reductions in emissions of air pollutants, fuel and energy savings, waste diverted from landfills, and other metrics.<sup>89</sup>

California's GGRF has funded a number of programs since the fund was established over 10 years ago—89 different programs across 24 state agencies. Some GGRF-funded programs receive substantial funding from other sources; for others, the GGRF represents the majority their funding.

Much of GGRF funding has been appropriated to a relatively small number of programs. California's High-Speed Rail Project has received over 20% (\$6.5 billion) of the \$28 billion that has been appropriated from the GGRF, as of November 2023.<sup>90</sup> In addition, over 40% of the appropriations from the GGRF have gone to programs designed to reduce GHG emissions and air pollution from transportation, the state's largest GHG-emitting sector.<sup>91</sup>

California law requires a minimum of 35% of GGRF monies to be invested in projects that benefit and are located in disadvantaged and low-income communities and projects that benefit low-income households. These communities and households are referred to as *priority populations* in California's program.<sup>92</sup> Disadvantaged communities are designated by California's Environmental Protection Agency using CalEnviroScreen, a tool that evaluates census tracts according to over 20 different measures of pollution exposure, environmental effects, health sensitivities, and socioeconomic factors.<sup>93</sup> CARB reports that 76%, or more than \$8.1 billion, of implemented California Climate Investments projects are benefiting priority populations.<sup>94</sup>

Some stakeholders, including environmental groups and environmental justice advocates, have identified lessons learned from the last 10 years of implementing the GGRF—areas for improvement as well as best practices and policies that could be replicated in other jurisdictions.<sup>95</sup>

## Emissions Impacts of Cap-and-Trade

### GHG Emissions

Since the emissions cap first took effect in 2013, California's statewide GHG emissions have decreased by approximately 18%, as of 2022 (the most recent year for which emissions data are

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<sup>89</sup> For more information, see CARB, "CCI Quantification, Benefits, and Reporting Materials," <https://ww2.arb.ca.gov/resources/documents/cci-quantification-benefits-and-reporting-materials>.

<sup>90</sup> CARB, *Annual Report to the Legislature on California Climate Investments Using Cap-and-Trade Auction Proceeds*, May 2024, [https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/cci\\_annual\\_report\\_2024.pdf](https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/cci_annual_report_2024.pdf) (hereinafter CARB, *2024 Annual Report*).

<sup>91</sup> Lolly Lim et al., *A Call to Invest in Community Power: Lessons from 10 Years of California Climate Investments for the State and the Nation* (full report), The Greenlining Institute and USC Dornsife Equity Research Institute, June 2024, p. 49, <https://greenlining.org/wp-content/uploads/2024/06/GI-CCI-Full-Report-FINAL.pdf> (hereinafter Lim et al., *A Call to Invest* [full report]); CARB, *2024 Annual Report*, pp. 68-75.

<sup>92</sup> For more information, see CARB, "Priority Populations," <https://www.caclimateinvestments.ca.gov/priority-populations>.

<sup>93</sup> California Office of Environmental Health Hazard Assessment (OEHHA), "SB 535 Disadvantaged Communities," <https://oehha.ca.gov/calenviroscreen/sb535>.

<sup>94</sup> This estimate excludes expenditures for California's High-Speed Rail Project. For more information on how CARB defines "implemented projects," see CARB, *2024 Annual Report*.

<sup>95</sup> Lim et al., *A Call to Invest* (full report).

available); see **Figure 4**.<sup>96</sup> The state met the AB 32 emissions reduction target for 2020 ahead of schedule.<sup>97</sup>

It is uncertain to what extent the cap-and-trade program is contributing to this result. According to some researchers, it is likely that California's cap-and-trade program has not been the main driver of GHG reductions to date and that other policies and market forces—the 2008-2009 economic recession, for example—explain more of the reductions observed in recent years.<sup>98</sup>

According to the Legislative Analyst's Office,

The complex interactions between cap-and-trade and other state climate change efforts—as well as the many technological and economic factors that affect emissions in California—make it difficult to quantify the level of emissions reductions attributable to the program alone. To our knowledge, no studies have produced a reliable estimate of the emission reductions achieved by the cap-and-trade program so far.<sup>99</sup>

In the first Scoping Plan and subsequent updates, state policymakers have described the role of the state's cap-and-trade program as “filling the gap”—complementing other climate policies and providing an increased measure of certainty that the state would meet its 2020 GHG target—while other policies deliver the majority of emissions reductions.<sup>100</sup> The state's portfolio of climate and energy policies includes sector-specific standards for renewable energy, low carbon fuels, vehicle emissions, and energy efficiency, as well as incentive programs and other policies.

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<sup>96</sup> CARB, *California Greenhouse Gas Emissions from 2000 to 2022: Trends of Emissions and Other Indicators*, September 20, 2024, [https://ww2.arb.ca.gov/sites/default/files/2024-09/nc-2000\\_2022\\_ghg\\_inventory\\_trends.pdf](https://ww2.arb.ca.gov/sites/default/files/2024-09/nc-2000_2022_ghg_inventory_trends.pdf).

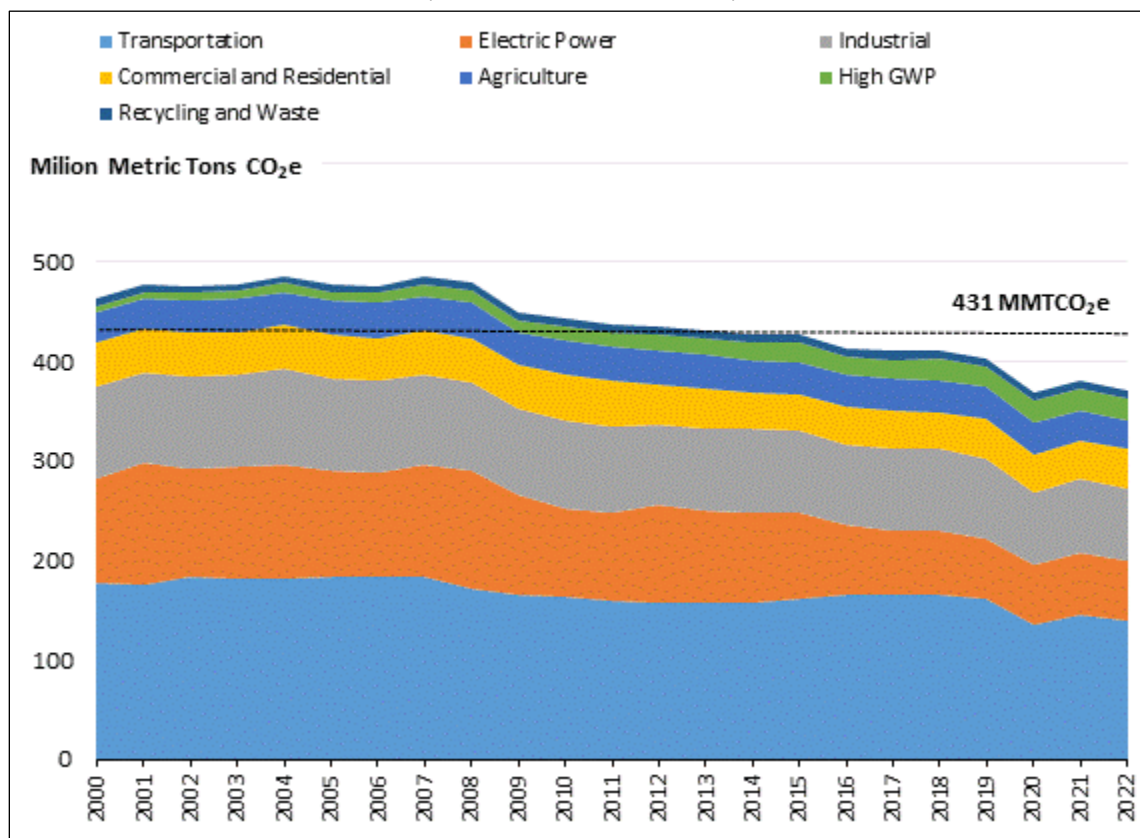
<sup>97</sup> According to CARB, California met the 2020 target in 2014, six years ahead of schedule. CARB initially reported that the state met its 2020 target in 2016, but later revised this statement based on updated data. Governor Gavin Newsom, “California Releases World's First Plan to Achieve Net Zero Carbon Pollution,” press release, November 16, 2022, <https://www.gov.ca.gov/2022/11/16/california-releases-worlds-first-plan-to-achieve-net-zero-carbon-pollution/>.

<sup>98</sup> Michael D. Mastrandrea et al., “Assessing California's Progress Toward Its 2020 Greenhouse Gas Emissions Limit,” *Energy Policy*, vol. 138, Article no. 111219 (March 2020).

<sup>99</sup> Cornett, *California Cap-and-Trade FAQs*.

<sup>100</sup> CARB, *Climate Change Scoping Plan Appendices, Volume I: Supporting Documents and Measure Detail*, December 2008, pp. C-41 to C-49, [https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/appendices\\_volume1.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/appendices_volume1.pdf); CARB, *First Update to the Climate Change Scoping Plan: Building on the Framework Pursuant to AB 32, the California Global Warming Solutions Act of 2006*, May 2014, p. 93, [https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013\\_update/first\\_update\\_climate\\_change\\_scoping\\_plan.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf); CARB, *California's 2017 Climate Change Scoping Plan: The Strategy for Achieving California's 2030 Greenhouse Gas Target*, November 2017, pp. 23 and 29, [https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping\\_plan\\_2017.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf).

**Figure 4. California Greenhouse Gas (GHG) Emissions by Sector, 2000-2022**  
(in million metric tons CO<sub>2</sub>e)



**Source:** Prepared by CRS; data from California Air Resources Board (CARB), "Current California GHG Emission Inventory Data," <https://ww2.arb.ca.gov/ghg-inventory-data>.

**Notes:** MMTCO<sub>2</sub>e = million metric tons carbon dioxide-equivalent. GWP = global warming potential. *High GWP* in the legend refers to GHG emissions from releases of substitutes for ozone-depleting substances (e.g., hydrofluorocarbons) and sulfur hexafluoride. For more information regarding CARB's statewide GHG emissions inventory, including information about the methodology, see Source above. CARB set the economy-wide target for 2020 to be 431 MMTCO<sub>2</sub>e.

Researchers have assessed the potential for unintended consequences from emissions leakage and resource shuffling in California's program.<sup>101</sup> When emissions leakage and resource shuffling occur, it may *appear* that emissions have been reduced within the scope of the cap-and-trade program within a jurisdiction when in fact there is no net change in emissions to the atmosphere.

Emissions leakage occurs when businesses leave a jurisdiction to avoid compliance with the program. Providing allowances at no cost to industry mitigates the risk of emissions leakage. Some researchers and stakeholders contend that the program is overcompensating for this risk—

<sup>101</sup> Danny Cullenward and David Weiskopf, *Resource Shuffling and the California Carbon Market*, Stanford Law School, Environmental and Natural Resources Law & Policy Program Working Paper, July 18, 2013, <https://law.stanford.edu/index.php?webauth-document=publication/440262/doc/slspublic/Resource%20Shuffling%20-%20Cullenward%20and%20Weiskopf.pdf>.

at the direction of the legislature—by providing allowances at no cost to entities that are not at relatively high risk for leakage.<sup>102</sup>

Resource shuffling occurs when a utility appears to have reduced its GHG emissions as a result of changing its energy contracts to lower-carbon-emitting sources, but no reduction in GHG emissions has actually occurred. Instead, another buyer not regulated by the California cap-and-trade program has purchased the energy. According to IEMAC, some evidence exists that resource shuffling may be occurring in California’s carbon market; IEMAC has recommended further investigation into this issue.<sup>103</sup>

CARB is considering changes to the program as part of a rulemaking underway in 2024.<sup>104</sup> As part of this rulemaking, state policymakers are considering revising the emissions caps, among other changes.

As part of the Scoping Plan process, California policymakers have stated that the program could play a different role than it has in the past as the state works to achieve its GHG targets for 2030 and 2045.<sup>105</sup> As a result, the program may result in different emissions outcomes in the future.

## **Environmental Justice and Local Air Quality**

Many of the sources that emit GHGs also co-emit air pollutants, such as particulate matter. As a result, reducing GHG emissions can also reduce these pollutants, providing public health benefits at a local level. California’s cap-and-trade program is not designed to address such localized impacts. Some stakeholders have recommended that CARB establish facility-specific GHG emissions caps—to ensure that emissions at all facilities in disadvantaged communities decline at least at the same rate as the state average—or that the state establish “no-trade zones.”<sup>106</sup> CARB is not proposing either approach in its 2024 cap-and-trade rulemaking.<sup>107</sup>

Some environmental advocates have expressed concerns that cap-and-trade exacerbates existing environmental disparities by prolonging or worsening exposure to air pollution compared with other forms of regulation such as traditional command-and-control measures.<sup>108</sup> Academic

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<sup>102</sup> Meredith Fowlie and Danny Cullenward, *Report on Emissions Leakage and Resource Shuffling*, IEMAC, September 10, 2018, [https://calepa.ca.gov/wp-content/uploads/sites/6/2018/09/6e.-IEMAC\\_Meeting\\_Materials\\_9-21-18\\_Fowlie\\_and\\_Cullenward\\_Report\\_on\\_Emissions\\_Leakage.pdf](https://calepa.ca.gov/wp-content/uploads/sites/6/2018/09/6e.-IEMAC_Meeting_Materials_9-21-18_Fowlie_and_Cullenward_Report_on_Emissions_Leakage.pdf).

<sup>103</sup> Meredith Fowlie and Danny Cullenward, *Report on Emissions Leakage and Resource Shuffling*, IEMAC, September 10, 2018, [https://calepa.ca.gov/wp-content/uploads/sites/6/2018/09/6e.-IEMAC\\_Meeting\\_Materials\\_9-21-18\\_Fowlie\\_and\\_Cullenward\\_Report\\_on\\_Emissions\\_Leakage.pdf](https://calepa.ca.gov/wp-content/uploads/sites/6/2018/09/6e.-IEMAC_Meeting_Materials_9-21-18_Fowlie_and_Cullenward_Report_on_Emissions_Leakage.pdf).

<sup>104</sup> For more information regarding the rulemaking underway in 2024, including potential amendments to the Cap-and-Trade Regulation, see CARB, “Cap-and-Trade Meetings and Workshops,” <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/cap-and-trade-meetings-workshops>.

<sup>105</sup> CARB, *2022 Scoping Plan for Achieving Carbon Neutrality*, December 2022, p. 117, <https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf>; CARB, “What Is the Role of Cap-and-Trade Program Moving Forward?” in *California’s 2022 Climate Change Scoping Plan Fact Sheet*, June 16, 2022, <https://ww2.arb.ca.gov/resources/fact-sheets/californias-2022-climate-change-scoping-plan-fact-sheet#:~:text=What%20is%20the%20role%20of%20Cap>.

<sup>106</sup> Dallas Burtraw et al., *2022 Annual Report of the Independent Emissions Market Advisory Committee*, CalEPA, February 3, 2023, <https://calepa.ca.gov/2022-iemac-annual-report/>; Nicholas Roy et al., *Designing for Uncertainty: Amendments to California’s Cap-and-Trade Market, Resources for the Future*, Report no. 24-08, May 2024, [https://www.rff.org/documents/4498/Report\\_24-08.pdf](https://www.rff.org/documents/4498/Report_24-08.pdf); Dallas Burtraw and Nicholas Roy, *How Would Facility-Specific Emissions Caps Affect the California Carbon Market?, Resources for the Future*, Report no. 23-09, July 2023, [https://www.rff.org/documents/4094/Report\\_23-09v3.pdf](https://www.rff.org/documents/4094/Report_23-09v3.pdf).

<sup>107</sup> CARB, *Cap-and-Trade Regulation 2024 Amendments: SRIA*, pp. 19-20.

<sup>108</sup> In “command-and-control” or “direct regulation” environmental policy, the government sets specific legal limits and requirements for pollution emissions from industries or activities, often dictating the exact level of pollution allowed (continued...)



researchers have reached different conclusions regarding the relationship between cap-and-trade and local air quality and whether the program has resulted in better, unchanged, or worsened air pollution disparities for vulnerable communities.<sup>109</sup> For example, some researchers found that the program has in some cases contributed to greater disparities in exposure to air pollution near covered entities.<sup>110</sup> Other researchers found that air pollution disparities decreased as a result of the program.<sup>111</sup>

## Economic Impacts

Cap-and-trade can lead to increased costs for covered entities. Some portion of these costs is generally passed on to consumers in the form of higher prices for goods and energy, including higher energy bills and transportation fuel prices (i.e., gasoline and diesel prices). Because fuel prices are affected by multiple factors—including energy markets, energy infrastructure investment, other state policies, and broader economic conditions—it can be challenging to determine the effect of the cap-and-trade program on fuel prices. However, the California program includes mechanisms (such as free allowances, the California Climate Credit, and other state programs) that are designed to reduce the potential cost increases encountered by consumers and businesses.

California's electricity rates are typically among the highest in the country.<sup>112</sup> Average bills are close to the national average of \$136.84 per month.<sup>113</sup> California's relatively mild climate and high energy efficiency compared with other states (among other factors) likely contribute to keeping bills on par with the national average, despite higher rates. Electricity rates have nearly doubled in California over the last decade and are increasing at a faster rate than the national average.<sup>114</sup>

According to state energy regulators, the cap-and-trade program is not among the primary drivers of increased electricity prices. A recent report issued by the Public Advocates Office at the California Public Utilities Commission lists wildfire mitigation, transmission and distribution

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and sometimes even the specific technologies companies must use to achieve those limits; essentially, the government “commands” companies to reduce pollution to a certain level and “controls” how they achieve it through mandated methods. For examples of issues raised by environmental justice advocates regarding cap-and-trade and environmental disparities, see James K. Boyce et al., “Environmental Justice and Carbon Pricing: Can They Be Reconciled?,” *Global Challenges*, vol. 7, no. 4 (April 2023); Central Valley Air Quality Coalition, *Legislative Hearing Handout*, for Subcommittee No. 2 on Resources, Environmental Protection, and Energy and Standing Committee on Environmental Quality, hearing on Cap and Trade Rulemaking, February 13, 2024, [https://sbud.senate.ca.gov/sites/sbud.senate.ca.gov/files/CVAQ%20Handout%20for%20Senate%20Cap%20%20Trade%20Rulemaking%20Hearing\\_2.13.2024\\_.pdf](https://sbud.senate.ca.gov/sites/sbud.senate.ca.gov/files/CVAQ%20Handout%20for%20Senate%20Cap%20%20Trade%20Rulemaking%20Hearing_2.13.2024_.pdf); Manuel Pastor et al., “California Dreaming: Why Environmental Justice Is Integral to the Success of Climate Change Policy,” *Proceedings of the National Academy of Sciences*, vol. 121, no. 32 (2024).

<sup>109</sup> Cornett, *California Cap-and-Trade FAQs*.

<sup>110</sup> Manuel Pastor et al., *Up in the Air: Revisiting Equity Dimensions of California's Cap-and-Trade System*, USC Dornsife Equity Research Institute, February 2022, <https://dornsife.usc.edu/eri/publications/up-in-the-air-revisiting-equity-dimensions-of-californias-cap-and-trade-system/>.

<sup>111</sup> Danae Hernandez-Cortez and Kyle C. Meng, “Do Environmental Markets Cause Environmental Injustice? Evidence from California's Carbon Market,” *Journal of Public Economics*, vol. 217, no. 104786 (January 2013); OEHHA, *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities: Progress Toward Reducing Inequities*, February 2022, <https://oehha.ca.gov/media/downloads/environmental-justice/impacts-of-ghg-policies-report-020322.pdf>; Cornett, *California Cap-and-Trade FAQs*.

<sup>112</sup> EIA, “2023 Average Monthly Bill – Residential,” table, [https://www.eia.gov/electricity/sales\\_revenue\\_price/pdf/table\\_5A.pdf](https://www.eia.gov/electricity/sales_revenue_price/pdf/table_5A.pdf) (hereinafter EIA, “2023 Average Monthly Bill”).

<sup>113</sup> EIA, “2023 Average Monthly Bill.”

<sup>114</sup> CPUC, “Q1 2024 Electric Rates Report.”



investments, and rooftop solar incentives—which have been funded by ratepayers—as the primary drivers of retail electricity rate increases statewide.<sup>115</sup>

Retail gasoline prices in California are often the highest in the country and are consistently higher than U.S. national average gasoline prices. Retail gasoline prices are influenced by many factors beyond allowance prices, such as global events, seasonal variations, refinery disruptions, and pricing strategies by fossil fuel producers. According to analysis by the California state government, in July 2024 the total cost of environmental programs (including cap-and-trade) accounted for \$0.51 of the then-\$4.49-per-gallon statewide average gasoline price.<sup>116</sup> According to CARB estimates, cap-and-trade added \$0.27 per gallon to the cost of retail gasoline in October 2023, assuming all costs are fully passed on to consumers.<sup>117</sup>

Energy and transportation fuel costs are a general concern and are especially a concern for low-income households, which typically spend a relatively greater share of their income on energy use and fuel.<sup>118</sup> California has a number of state programs intended to address this issue.<sup>119</sup> In addition, the GGRF supports a number of programs that aim to lower fuel costs and that focus on low-income and disadvantaged communities.<sup>120</sup>

## Considerations for Congress

In the 118<sup>th</sup> Congress, some legislation considered market-based approaches to reducing GHG emissions.<sup>121</sup> California’s experience with cap-and-trade could inform other legislative proposals.

One challenge in cap-and-trade programs is balancing costs and GHG reductions. As the costs of a cap-and-trade program are generally passed on to consumers through higher gas prices and higher energy bills, policymakers may consider including cost-containment options in the design of a program, such as the inclusion of price ceilings, offsets, no-cost allowances, and banking.

Policymakers may also consider that, even with robust data to inform annual emissions allowance budgets, inherent uncertainty in future economic conditions (e.g., economic recession or pandemic) can impact the market. The addition of cost-containment options can further introduce complexity and increase uncertainty. Banking and distributing allowances at no cost can also add complexity in meeting GHG emissions reduction targets or other targets that reference a certain year.

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<sup>115</sup> CPUC, “Q1 2024 Electric Rates Report.”

<sup>116</sup> Other costs included crude oil commodity prices (\$2.04/gallon), industry costs and profits (\$1.04), the state excise tax (\$0.60), the federal excise tax (\$0.18), state and local sales taxes (\$0.10), and the state underground storage tank fee (\$0.02). California Energy Commission (CEC), “California Gas Price Gouging and Transparency Law Update,” <https://www.energy.ca.gov/news/2024-07/california-gas-price-gouging-and-transparency-law-update>.

<sup>117</sup> Cornett, *California Cap-and-Trade FAQs*.

<sup>118</sup> Severin Borenstein et al., *Paying for Electricity in California: How Residential Rate Design Impacts Equity and Electrification*, Next 10, September 22, 2022, <https://www.next10.org/publications/electricity-rates-2>.

<sup>119</sup> For example, a portion of the GGRF appropriations have been allocated to programs that aim to lower energy bills by increasing energy efficiency (e.g., the Low-Income Weatherization Program and the Equitable Building Decarbonization Program). See CEC, “Equitable Building Decarbonization Program,” <https://www.energy.ca.gov/programs-and-topics/programs/equitable-building-decarbonization-program>; and California Department of Community Services and Development, “Low-Income Weatherization Program,” <https://www.csd.ca.gov/Pages/Low-Income-Weatherization-Program.aspx>.

<sup>120</sup> California Climate Investments, “Transportation Programs,” <https://www.caclimateinvestments.ca.gov/transportation>.

<sup>121</sup> See, for example, H.R. 5744, H.R. 6622, H.R. 6665, and S. 3422.

A key element of California's cap-and-trade program is the data collection and reporting requirements implemented through CARB's Reporting Regulation. Some other cap-and-trade systems, such as the European Union's Emissions Trading System (ETS), have experienced issues such as an oversupply of allowances and price collapses.<sup>122</sup> California's cap-and-trade program has avoided such issues, largely because the design and implementation of the program has been informed by data from emissions reporting.<sup>123</sup> Congress may consider the availability of reported data if considering policies that would establish an industry benchmark or emissions reduction targets.

Congress may be interested in the economic and environmental results in California as a case study of how GHG mitigation policies may impact both economic growth and emissions outcomes. California is an example of a jurisdiction that is growing its economy while reducing GHG emissions. According to CARB, California's Gross State Product (GSP) grew by approximately 35% between 2013 and 2019, while its GHG emissions per GSP decreased by approximately 20%.<sup>124</sup> This decline in the GHG emissions intensity of California's economy reflects a shift toward less GHG-intensive energy sources, increased energy efficiency, and the implementation of state climate policies.

It is uncertain to what extent the cap-and-trade program alone is contributing to observed emissions reductions. The cap-and-trade policy is one component and was designed to complement a broader portfolio of climate policies in California. These policies include the state's Renewable Energy Portfolio Standard, energy efficiency standards, building codes, Low Carbon Fuel Standards, and Zero-Emission Vehicle Mandates, among other policies and incentive programs.

If Congress were to consider enacting a national market-based policy to address GHG emissions, policymakers may deliberate on the intended role of the policy: to complement other policies or deliver a larger share of the GHG emissions reductions desired. In addition, federal policymakers may consider the policy's evolution over time. Congress may be interested in how the role of California's program evolves, the impacts on the state's economy and emissions, and whether the program plays a larger or lesser role as the state works toward its more ambitious climate targets for 2030 and 2045.

California's cap-and-trade program and related GHG emissions reduction activities may also provide examples or approaches for consideration of other applications in climate policy. For example, some may propose that California's climate policies can serve as a model for other jurisdictions looking to establish similar climate policies, such as programs to certify carbon offsets, climate funding initiatives, or policies to direct funding and other forms of assistance to communities considered vulnerable to climate impacts.

CARB's offset program may be of interest to Congress as the program provides a certification model and a public process for developing offset protocols, among other requirements. California's approach is intended to ensure that offset credits represent real, additional, quantifiable, and verifiable emissions reductions that would not have occurred without the program. California's experience could inform how federal agencies might play a role in the establishment of a voluntary offset market by developing or vetting protocols, providing

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<sup>122</sup> Patrick Bayer and Michaël Aklin, "The European Union Emissions Trading System Reduced CO<sub>2</sub> Emissions Despite Low Prices," *Environmental Sciences*, vol. 117, no. 16 (April 2020), pp. 8804-8812.

<sup>123</sup> Richard Schmalensee and Robert N. Stavins, "Lessons Learned from Three Decades of Experience with Cap and Trade," *Review of Environmental Economics and Policy*, vol. 11, no. 1 (Winter 2017).

<sup>124</sup> Data available at CARB, "Current California Emissions Inventory Data," <https://ww2.arb.ca.gov/ghg-inventory-graphs>.

certification, and working with accredited third-party verifiers and registries. Moreover, the lessons learned from California's verification and monitoring process, particularly in ensuring that offsets do not undermine overall emissions goals, could provide valuable insights for Congress in designing transparent and accountable offset programs at the federal level.

California law requires that a minimum of 35% of GGRF monies be invested in projects that benefit and are located in disadvantaged communities and low-income communities and projects that benefit low-income households. Congress may consider to what extent federal funding initiatives for GHG emissions reductions could incorporate similar targeting of selected communities and households and whether such prioritization would be effective in meeting potential project goals.<sup>125</sup>

Federal policies—such as the IRA (P.L. 117-169) and IIJA (P.L. 117-58), enacted by the 117<sup>th</sup> Congress—may impact state-level climate policies. The IRA and IIJA provided authorizations and funding to programs that could increase deployment of low carbon energy sources and associated infrastructure. As these laws are implemented and funded projects are deployed, California's progress toward GHG reduction goals could accelerate or the cost of meeting its goals could become less expensive.<sup>126</sup> CARB has estimated that funded projects could reduce GHG emissions by nearly 110 MMTCO<sub>2</sub>e over the life of the projects.<sup>127</sup> Should industries transition to low-carbon energy sources and technologies, the demand for emissions allowances under California's cap-and-trade program could decrease. This could reduce allowance prices and compliance costs for participants.

Several states have enacted a number of climate policies, such as setting GHG reduction targets, enacting renewable energy portfolio standards, and establishing clean energy standards, among other policies. Washington state has also adopted an economy-wide cap-and-trade program, largely modeled on California's program. The two states have announced their intention to link programs.<sup>128</sup> In addition, New York and Oregon both have rulemakings underway to establish cap-and-trade programs.<sup>129</sup> Their collective efforts to address their GHG emissions may be of interest to Congress as federal policymakers consider climate change policies.<sup>130</sup>

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<sup>125</sup> For example, a recent analysis by The Greenlining Institute and the USC Dornsife Equity Research Institute identifies lessons learned from 10 years of implementing California Climate Investments that could be applied to other state and federal programs. Lolly Lim et al., *A Call to Invest in Community Power: Lessons Learned from 10 Years of California Climate Investments for the State and the Nation* (abridged version), The Greenlining Institute and USC Dornsife Equity Research Institute, February 2024, p. 35, <https://greenlining.org/2024/a-call-to-invest-in-community-power-lessons-from-10-years-of-california-climate-investments-for-the-state-and-the-nation/>.

<sup>126</sup> For more information on incentive programs within P.L. 117-169, see CRS Report R47262, *Inflation Reduction Act of 2022 (IRA): Provisions Related to Climate Change*, coordinated by Jonathan L. Ramseur.

<sup>127</sup> CARB, *2024 Annual Report*.

<sup>128</sup> State of Washington Department of Ecology, "Washington's Cap-and-Invest Program," <https://ecology.wa.gov/air-climate/climate-commitment-act/cap-and-invest>.

<sup>129</sup> New York Department of Environmental Conservation, "Cap-and-Invest Outline and Affordability Study Released," press release, December 20, 2023, <https://www.nysed.gov/About/Newsroom/2023-Announcements/2023-12-20-DEC-and-NYSERDA-Release-Cap-and-Invest-Preproposal-Outline-and-Climate-Affordability>; Oregon Department of Environmental Quality, "Climate Protection Program 2024," <https://www.oregon.gov/deq/rulemaking/Pages/CPP2024.aspx>.

<sup>130</sup> Climate Watch, *Historical GHG Emissions*, interactive online tool, [https://www.climatewatchdata.org/ghg-emissions?end\\_year=2020&source=US&start\\_year=1990](https://www.climatewatchdata.org/ghg-emissions?end_year=2020&source=US&start_year=1990).

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