

California's 2022 Climate Change Scoping Plan

What is the Scoping Plan?

This update to the Scoping Plan is a roadmap to achieving the SB 32 (Pavley, Chapter 249, Statutes of 2016) target in 2030 and a carbon neutral future for the world's fifth largest economy.

The package of actions described in the Scoping Plan calls for a transformation on an unprecedented, economy-wide level to significantly address climate change, protect communities, and further establish California as the hub for clean energy investments.

Under AB 32 (The Global Warming Solutions Act of 2006), the California Air Resources Board (CARB) must release an updated Climate Change Scoping Plan at least every five years. 2022 will be the fourth update.

The first Scoping Plan (2008) laid out the goal of reducing greenhouse gas (GHG) emissions back down to 1990 levels by 2020.

The 2013 update measured progress and fine-tuned programs toward the 2020 goal and highlighted the need to focus on short-lived climate pollutants.

The 2017 update shifted focus to the SB 32 goal of a 40 percent reduction below 1990 levels by 2030 by laying out a detailed cost-effective and technologically feasible path to this target and assessed progress towards achieving the AB 32 goal of returning to 1990 GHG levels by 2020. The 2020 goal was ultimately reached in 2016—four years ahead of the schedule called for under AB 32.

The 2022 update both assesses progress towards achieving the State's 2030 emissions reduction goal and draws on a decade and a half of proven regulations, incentives, and carbon pricing policies alongside new approaches to outline a balanced and aggressive course of effective actions to achieve carbon neutrality by 2045 or sooner. This includes an unprecedented pace of actions to develop the clean energy foundation on which to build the low-carbon economy.

How does the 2022 Scoping Plan differ from previous plans?

Each Scoping Plan has included a suite of policies to help the State achieve its GHG emissions reduction targets while leveraging new and existing programs, many of which have a primary goal of reducing harmful air pollution.

The 2022 update presents the scenario recommended by CARB staff out of four scenarios that were analyzed for achieving California's ambitious goals. The proposed scenario builds on existing programs for the deployment of clean fuels and technologies, and for the first time brings California's forests, wetlands, and agricultural lands into the process with the potential to leverage sustainable management to use these landscapes for carbon storage. The scenarios also reflect the need for additional methods of capturing carbon dioxide that include pulling it from the smokestacks of facilities, or drawing it out of the atmosphere, and then safely and permanently storing it.

This update aims to more effectively integrate equity and environmental justice throughout, and to ensure that vulnerable communities are not disproportionately impacted by climate change. The draft incorporates five dozen [recommendations from the AB 32 Environmental Justice Advisory Committee](#).

What happens after the draft is released?

Development of the draft plan involved robust public engagement, including over a dozen workshops, webinars or public meetings over the past year. Public engagement continued following release of the draft plan in May including a formal 45-day public comment period. That will be followed by the first of two CARB board hearings on the plan on June 23, 2022. At that meeting the board will make comments and provide staff additional direction.

CARB will also hold several public listening sessions to hear feedback from Californians throughout the summer and will hold a joint meeting with the Environmental Justice Advisory Committee in September. A final draft of the Scoping Plan, reflecting Board direction as well as stakeholder comments, where appropriate, will be released in the fall for public comment. A final board hearing and vote is expected later in the fall.

How will the Scoping Plan reduce emissions to meet our GHG goals?

Emission reductions come from effective development and implementation of the actions called for in the plan. As has been the case with previous Scoping Plans, approval of the plan marks the beginning of the process to develop and implement policies and programs to achieve the outcomes outlined in the Scoping Plan. That is why it is so critical to monitor the ongoing implementation of the plan towards meeting California goals as well as periodically updating the Scoping Plan to make any necessary adjustments to the state's integrated strategy for addressing climate change.

What is the recommended draft scenario?

CARB staff is recommending a scenario that will keep California on track to reach its 2030 GHG reduction target as well as achieve carbon neutrality by 2045. This Proposed Scenario deploys a broad portfolio of existing and emerging fossil fuel alternatives and clean technologies, and aligns with current statutes and Executive Orders.

Of the other three alternative scenarios that were modeled, two theoretically achieve carbon neutrality by 2035, and the final alternative achieves carbon neutrality by 2045 with deployment of a broad portfolio of existing and emerging fossil fuel alternatives, slower deployment and consumer adoption rates than the Proposed Scenario, and a higher reliance on carbon dioxide (CO₂) removal.

While the Alternatives that reach carbon neutrality in 2035 present significant health benefits, they also incur significant social and economic costs, including the largest number of projected job losses and a massive demand on the electricity sector to build out renewables at a rate of 10 Gigawatts a year. Specifically, these scenarios require a pace and magnitude of investments and actions that is likely unachievable.

California has been installing renewables at a rate of 2.7 Gigawatts a year. Alternative 1, for example, would quadruple that pace to roughly 10 Gigawatts a year. For context, 1 Gigawatt is generally equal to the output from two natural gas plants.

Even with the addition of important offshore wind turbine construction, there would also need to be a massive increase in storage capability to ensure reliability into the evening hours.

What is in the Proposed Scenario?

The Proposed Scenario:

- Identifies a path to keep California on track to meet its SB 32 GHG reduction target of at least 40% below 1990 emissions by 2030
- Identifies a technologically feasible, cost-effective path to achieve carbon neutrality by 2045 or earlier
- Focuses on strategies for severing California's dependency on petroleum in order to provide consumers with clean energy options that address climate change, improve air quality, and support economic growth
- Integrates equity and protection of California's most impacted communities as a driving principle throughout the document with a focus on considerations such as affordability, air quality and health benefits from a dramatic reduction in petroleum combustion
- Incorporates the contribution of natural and working lands (NWLs) to the state's greenhouse gas emissions, as well as their role in achieving carbon neutrality
- Reduces emissions from the industrial, energy, and transportation sectors by 80% below 1990 levels by 2050 in accordance with [Executive Order](#)
- Relies on the most up-to-date science and emphasizes the need to deploy all viable tools to address the crisis that climate change presents, including carbon capture and sequestration as well as direct air capture

How did staff determine that the Proposed Scenario is the most feasible?

AB 32 requires that GHG emissions be achieved by "the maximum technologically feasible and cost-effective reductions."

In assembling the 2022 Scoping Plan, staff considered input from multiple state agencies, as well as from members of the environmental justice community, industry, NGOs, and the public.

After receiving that input, staff reviewed four specific scenarios for achieving state and federal climate and air quality goals and ultimately, carbon neutrality. The first two scenarios would theoretically achieve carbon neutrality by 2035 and scenarios three and four hit that target no later than 2045.

While the Alternative 1 scenario had the greatest public health benefit, it was economically and technically infeasible due to the current lack of low-carbon energy infrastructure, unavailability of technology, large job loss and high implementation costs.

Alternatives 2 & 3 had similar public health benefits, but Alternative 2 had the second highest job losses and implementation costs.

Alternative 3 has the lowest implementation costs and minimal reduction in job growth. It also reduces GHG emissions 80% below 1990 levels by 2050.

Alternative 4 had lower health benefits than Alternative 3 and the third highest implementation and employment costs.

What other considerations did staff use to choose among the different alternatives?

Staff used the following consideration to evaluate the scenarios:

- To what extent does an alternative scenario meet the statewide GHG emissions reduction targets, as well as any sector targets, and also deliver clean air benefits (especially in the near term) by addressing ongoing air pollution disparities, prioritizing reductions for mobile and large stationary sources, and emphasizing continued investment in disadvantaged communities?
- Does an alternative support California in building on efforts to collaborate with other jurisdictions and include exportable policies based on robust science?
- Does an alternative provide for flexibility for regulated entities and a cost-effective approach to reduce GHG emissions as quickly as possible?
- Does an alternative present a realistic and ambitious path forward consistent with statute and science and that supports economic opportunities, particularly in anticipated growth sectors?

Are we on track to achieve the 2030 target?

The Proposed Scenario lays out a path not just to carbon neutrality by 2045 but also to our 2030 GHG emissions reduction target. The modeling indicates that, if the plan described in the Proposed Scenario is fully implemented, and done so on schedule, we are on track to reduce our emissions to 260 MMT by 2030.

Notably, the analysis done for the Draft Scoping Plan provides an updated picture of the trajectory to the 2030 target: the Plan's modeling indicates that GHG emissions are lower this decade than predicted in the previous modeling done for the 2017 Scoping Plan Update. This difference in the modeling projections is due to a number of factors that have emerged since the 2017 Scoping Plan Update was published and that were thus not taken into account in the last round of modeling, including:

- The passage of SB 100, which requires a more ambitious Renewable Portfolio Standard for 2030
- Implementation of a more stringent Low Carbon Fuel Standard
- Passage of SB 596, which requires specific GHG emissions reductions from the cement sector
- Pandemic related impacts

As seen in the reduced emissions projected in the current Plan's modeling compared to the analyses done in 2017, these tools are already helping propel us towards the 2030 target. In addition, multiple recent and upcoming policies and regulations will further drive emissions reductions:

- In the transportation sector, Governor Newsom's ZEV Executive Order has set clear deadlines to transition the sector to zero-emissions, and CARB is developing regulations to meet those targets, including the Advanced Clean Cars II, Advanced Clean Trucks, Advanced Clean Fleets, Ocean-Going Vessels, and Commercial

Harbor Craft regulations. The GHG emissions reductions that will be achieved by 2030 under these and other transportation-related regulations will play an important role in meeting the 2030 target.

- The investments that the State is making in zero-emission vehicles and related infrastructure - a combined \$10 billion between last year's Budget and this year's proposed Budget - will accelerate development and adoption of zero-emission transportation options.
- Other recent policies will drive emissions reductions beyond the transportation sector. The Short-Lived Climate Pollutant Strategy, for example, targets potent GHGs like methane, hydrofluorocarbons, and black carbon.

It is important to note that we are not yet seeing the impact of many of these policies, regulations, and investments because they have only recently come into effect or are still in development, and they are thus not yet reflected in the AB 32 emissions inventory. However, their effects will begin to be reflected in the inventory soon.

There remain uncertainties that it will be important to track as we implement our strategy to achieve the 2030 target. For example, we will need to monitor how emissions rebound as part of the economic recovery from the pandemic over the early part of this decade. Many key actions will also need to be taken outside the jurisdiction of the State government, such as siting and permitting decisions at the local level. The annual GHG emissions inventory will be a key tool in tracking our progress on reducing GHG emissions in aggregate and across individual sectors.

Will this plan phase out oil production?

The Draft 2022 Scoping Plan modeled a phasedown in oil and gas extraction and refining by 2045 in line with the reduction in demand for in-state, on-road petroleum fuel demand. The draft recognizes two primary sources of GHG emissions from the oil industry: oil and gas extraction, and refining.

In the Proposed Scenario, successful deployment of zero carbon fuels and non-combustion technology can reduce petroleum demand, with the potential to reduce oil and gas extraction GHG emissions from 2020 levels by approximately 85% in 2045 levels if extraction decreases in line with in-state fuel demand.

How does the Scoping Plan address environmental justice?

The Draft 2022 Scoping Plan centers a focus on communities that continue to be burdened by air pollution and that will be hardest hit by the impact of climate change and rising temperatures. These communities—primarily low-income and communities of color—are often located adjacent to major roadways and large stationary sources that not only emit GHGs but also contribute to harmful local air pollution.

The major benefit to these communities accrues from the 2022 Draft Scoping Plan is in the development and implementation of measures that support phasing out the extraction, refining, and use of fossil fuels, especially in the transportation sector. The combustion of fossil fuels contributes to the majority of harmful pollution in many of these communities that are located near or adjacent to heavily travelled freeways and goods corridors, rail yards, distribution centers or ports.

These communities and neighborhoods will benefit from accelerated pollution reductions from the traffic-related emissions they are exposed to. These reductions will also be fully supported by CARB incentive programs in the Governor's 2021-2022 Budget to accelerate the decarbonization of the transportation system. These reductions will also be supported by increased availability of zero-emission cars for low-income families and consumers.

State climate and air regulations and efforts that build off of this plan should include components specifically intended to reduce and eliminate air pollution disparities, remove barriers that can prevent frontline communities from accessing benefits, lower costs for low-income Californians, and promote high-quality jobs. CARB's incentive programs, for instance, treat statutory equity targets as a floor which they substantially exceed as they seek to extend access to clean transportation to all.

In addition, proceeds from Cap-and-Trade program auctions (one of the many programs discussed in the draft to help California reach its emissions reduction goals) are supporting low-carbon and sustainable mobility solutions in these communities. Cumulatively, approximately \$5.1 billion of all implemented funds – 50% of all funds distributed by California Climate Investments – directly benefit California's most impacted areas, which include disadvantaged and low-income communities and low-income households statewide.

What is the role of the Environmental Justice Advisory Committee (EJAC)?

AB 32 requires the appointment of an Environmental Justice Advisory Committee (EJAC) to ensure that environmentally and financially overburdened communities have a voice in the Scoping Plan process and in development of state regulations and incentive programs. The EJAC plays the critical role of informing the development of each Scoping Plan and helps ensure environmental justice is integrated throughout the plan.

CARB reconvened the EJAC in early 2021 to advise on the development of the 2022 Scoping Plan. In their advisory role, EJAC members have worked together to provide inputs to CARB to inform the development of scenarios and the associated modeling. And in April 2022, the EJAC provided over 200 draft preliminary recommendations in advance of the release of the draft Scoping Plan to help ensure the draft plan meaningfully addresses environmental justice. About 5 dozen of the recommendations provided by the Environmental Justice Advisory Committee have been reflected in the Draft Scoping Plan.

How did the EJAC recommendations influence CARB's choice for the Proposed Scenario – and how did their recommendations shape this scenario and the alternative scenarios?

EJAC recommendations guided Scenarios 1 and 2 with a focus on achieving a zero-carbon electricity grid by 2035 and adopting the SB 100 no-combustion scenario.

EJAC recommendations that guided the Proposed Scenarios include:

- Drastically reduce or eliminate fossil fuel combustion across sectors
- Reduce refining and oil and gas extraction activity with demand decline
- Evaluate phasing out all refining activity by 2045
- New residential and commercial buildings have all electric appliances by 2030
- Ambitious VMT reduction targets

What is the impact of the Administration’s unprecedented budget investments?

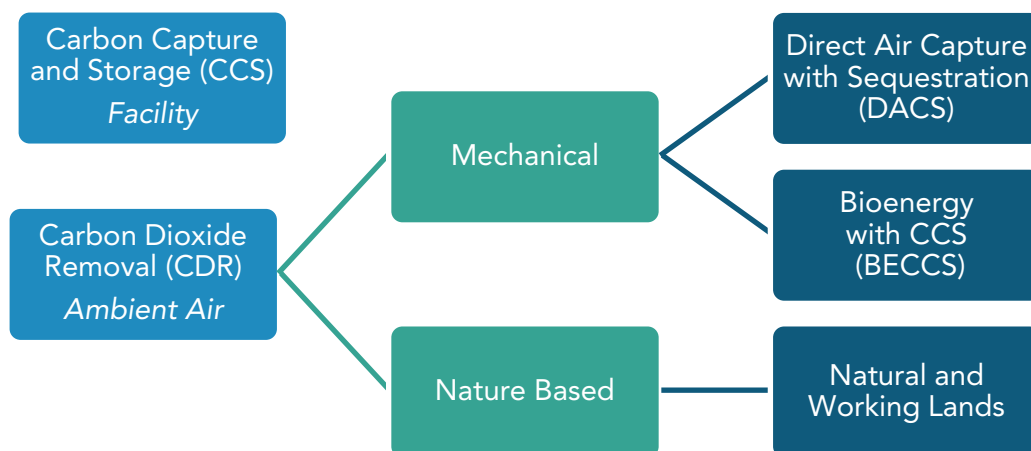
The scale of transformation needed over this decade to both avoid the worst impacts of climate change and meet our ambitious climate goals is extraordinary. This is why Governor Newsom and the Legislature invested over \$15 billion in climate action through the 2021–2022 California Comeback Plan and why the Governor has proposed investing over \$22 billion through the 2022–2023 California Blueprint for a total of \$47 billion! Together, these budgets would represent investment of a historic scale. Creating the types of whole-of-society changes needed requires whole-of-government approach, and that’s precisely what the enacted 2021–2022 and proposed 2022–2023 climate budgets advance.

These investments are incredibly important in the context of the 2022 Scoping Plan in that they accompany and help ease implementation of the many regulations that will continue to be necessary to achieve our 2030 and carbon neutrality targets. In addition, these incentive programs jump-start emission reduction strategies for priority sectors, sources, and technologies, leveraging private-sector investment and building sustainable, growing markets for clean and efficient technologies. These investments also help advance equity goals by prioritizing support for priority communities, such as by targeting transportation investments to ensure that California’s most disadvantaged communities have access to clean vehicles and alternative mobility options.

What does the plan say about the use of carbon dioxide removal strategies?

Based on our current trajectory and modeling, California will not reach its GHG emissions reduction targets without deploying carbon dioxide removal measures of which there are several types as indicated in the figure below. It is anticipated that both mechanical removal (e.g., direct air capture, CCS) as well a nature-based removal (e.g., increased forest carbon stocks) will be needed to achieve carbon neutrality.

Figure 1: Types of Carbon Dioxide Removal



Direct Air Capture (DAC): To achieve carbon neutrality, mechanical removal of carbon dioxide from the atmosphere will also be needed. Mechanical carbon dioxide removal (CDR) refers to a range of technologies that capture and concentrate ambient CO₂. Direct Air Capture (DAC) is one available option that is under development today and could be widely deployed. DAC technologies are not designed to be attached to a specific source or smokestack. The technologies include chemical scrubbing processes that capture CO₂ through absorption as well as adsorption separation processes. Another carbon removal option that involves rapid mineralization of CO₂ at the Earth's surface is called mineral carbonation. As is the case with CCS, mechanical CDR technologies will need government or other incentive support to get over technology and market barriers.

Carbon Capture & Sequestration (CCS) is a mechanical process by which large amounts of CO₂ are captured, compressed, transported, and sequestered. CCS projects are paired with a source of emissions from which the CCS project captures CO₂ as it leaves a smokestack on a facility. CARB adopted a CCS protocol in 2018 as an amendment to the Low Carbon Fuel Standard (LCFS).

To minimize emissions leakage and address ongoing GHG emissions, the Proposed Scenario assumes CCS will account for 4MMT of CO₂ emissions from cement plants and petroleum refineries in 2045, which is less than 1 percent of GHG reductions to achieve carbon neutrality. The plan also envisions a role for CCS to reduce the carbon impacts of the declining levels of gas-fired electricity generation that will be required to provide grid reliability while renewable and storage capabilities are rapidly set in place. CCS can play a similar role in curtailing carbon emissions from hydrogen production as we transition to generating hydrogen from low-carbon feedstocks, such as renewable natural gas.

The State is committed to engaging with communities to ensure reliable and safe deployment of CCS.

What role does CCS play in achieving the 2030 target?

The path to achieving the 2030 GHG emissions reduction target that was laid out in the 2017 Scoping Plan does not rely on a role for CCS. However, as we looked at carbon neutrality in the 2022 Draft Scoping Plan, it became clear that in order for CCS to scale and help achieve the 2045 goal, we needed to start deploying CCS in this decade. So, while the 2030 target does not rely on CCS in this decade, success for achieving the carbon neutrality target by 2045 requires us to initiate well-designed CCS projects in this decade to allow the time for scaling of the technology and for costs to come down post-2030. The initial modeling had aggressive start times for CCS in the middle of this decade, but as part of the revisions over the summer, CCS deployment will be pushed out towards the end of this decade to align with the longer timeframes of permitting.

How did CARB determine the amount of CDR needed by 2045?

To evaluate the Proposed and alternative scenarios, CARB modeled a Reference Scenario – what GHG emissions would look like in 2035 and 2045 if we did nothing beyond existing policies that are required and are already in place to achieve the 2030 target. The Reference Scenario modeling indicates that the State's AB 32 Inventory sectors would still have 265.8 MMTCO₂e emissions in 2045. To get to net zero, the modeling includes actions to reduce emissions at the emissions sources and from NWLs as well as using CCS and CDR, as reflected in the Proposed Scenario. The modeling indicates 167.9 MMTCO₂e

reductions at sources, 3.4 MMTCO_{2e} from CCS, and 94.5 MMTCO_{2e} from CDR (roughly 1/3 of the needed reductions.) The reductions assigned to these categories, however, are illustrative only and may change as the actual reductions occur as a result of subsequent policies and actions anticipated over the next two decades.

How did we calculate the contribution of Natural and Working Lands?

For the Draft Scoping Plan modeling, a placeholder of 15 MMTCO_{2e} of annual sequestration in the NWL sector was included in the CDR category. The initial NWL modeling indicated that over a 5-year time span between the years of 2040 and 2045, NWLs could result in average annual GHG sequestration of at least 15 MMTCO_{2e}. NWLs however, operate on a much longer timescale than 5 years and have high annual variability in emissions and sequestration. Further analysis of the NWL modeling showed that, if a 20-year time span from 2025 to 2045 was assessed, NWLs were projected to result in average net emissions of 8 MMTCO_{2e} annually.

For the draft we released on May 10, we decided to use the longer averaging time of 20 years for the NWLs modeling. This variability in the NWL modeling outcomes depending on the assumptions used illustrates and underscores the statement in the Draft Scoping Plan that the ultimate role played by mechanical CDR will depend on how much we are able to reduce emissions at the AB 32 GHG Inventory sources and the ability of our NWL sector to become either a carbon sink or carbon neutral by 2045. The Final Scoping Plan will reconcile any changes to the modeling for the AB 32 GHG Inventory and NWL sectors to estimate a final role for mechanical CDR.

Even with this reconciliation, however, it is important to remember that these are estimates of the amount of CDR needed by 2045 to achieve carbon neutrality. Over the next 20 years, many factors – including the pace of technology deployment, regulatory development and implementation timelines, economic conditions, impacts of climate change on NWLs, and new technology and tools being developed – will ultimately affect the final amount of CDR needed for California to become carbon neutral by 2045. As part of the statutorily required 5-year Scoping Plan update cycle, we will have an opportunity to re-evaluate the amount of CDR needed to achieve carbon neutral.

Why isn't there an exact match between the actual GHG emissions inventory of the emissions modeled under the scenarios?

The agreement between the verified GHG emissions inventory and the modeling inventories reflected in the Scoping Plan scenarios is over 95 percent. Due to the variables described below exact agreement with the modeled scenarios is not expected or necessary to inform the plan and its recommendations. Rather, the goal is to ensure significant consistency between the inventories to provide confidence the plan and its recommendations can achieve the goals. As indicated above there is a high level of agreement between the actual and modeling emission inventories.

As further background, the AB 32 GHG Inventory modeling is done using a model called PATHWAYS. The model is an economy-wide energy and GHG emissions model used to identify long-term GHG mitigation challenges in California through analysis and comparison of different scenarios. PATHWAYS provides a detailed technology representation of all sectors of the economy (using CARB AB 32 Scoping Plan categories), including explicit modeling of building device and vehicle stock turnover. Through sector-

specific emission-reduction strategies called “actions,” each modeled scenario explores different rates and scales of clean technology adoption and changes in energy supply and demand.

CARB worked with our consultant E3 to use our inventory data to “calibrate” PATHWAYS. That entails taking sector level fuel data used to calculate the inventory categories, which are then summed and used to produce sector and aggregate GHG emissions for the State each year, and using those fuel data to map to specific types of technologies, such as light duty vehicle counts, gas heaters, etc. This allows incorporation of a more detailed account of fuel use by technology across the economy in the model.

When we summed up the total fuel use modeled in PATHWAYS, there was not an exact match to the fuel use in the AB 32 GHG Inventory at the sector level. This difference is because of assumptions made in the modeling. For instance, because we only have high-level data for gas use in the commercial and residential building sectors, we had to make estimates for the purposes of the modeling, such as the type and number of gas water heaters currently in use and how much fuel they use. As a result of needing to rely on these sorts of estimates in the modeling, the modeled fuel use and, thus, the modeled GHG emissions differ somewhat from the actual emissions in the AB 32 GHG inventory. There is 96.5% agreement between the modeled GHG emissions and those in the Inventory.

What is the role of Cap-and-Trade Program moving forward?

In line with requests from stakeholders and the Legislature, the Scoping Plan evaluates the role of Cap-and-Trade relative to the 2030 GHG reduction target.

Initial modeling shows that the Cap-and-Trade Program may play a reduced role in achieving the 2030 target compared to that projected in the 2017 Scoping Plan if other planned measures, as described in the Plan, are fully and successfully implemented. This is largely due to the draft Plan projecting additional reductions from programs such as a more stringent LCFS and Renewables Portfolio Standard. Cap-and-Trade will remain a critical part of the portfolio of strategies for continuing to reduce GHG emissions across the economy to meet the 2030 target. Several changes that took effect in 2021 in response to Legislative direction will ensure the Cap-and-Trade Program’s role in supporting reductions to achieve the 2030 target. These include a doubling of the annual emissions caps to a 4% reduction year-over-year and a reduction of the allowable carbon offsets by half to just 4% of compliance, per AB 398.

What progress has been achieved since the last Scoping Plan in 2017?

The 2017 Scoping Plan laid out adjustments necessary to achieve the GHG emissions reduction target of 40% below 1990 levels by 2030.

Since then, the stringency of Cap-and-Trade has been doubled, as mentioned above, as has that of the LCFS. CARB has also put in place the Advanced Clean Trucks regulation, the Short-Lived Climate Pollutant Strategy, focused on reducing powerful global warming chemicals such as methane, HFCs and black carbon; and new rules requiring ocean-going vessels in California ports to plug into shore power instead of burning petroleum while docked.

Coming up is the Advanced Clean Cars II regulation, which will achieve Governor Newsom's Executive Order to end sales of all new internal combustion passenger vehicles by 2035. And for the first time, the Scoping Plan includes a range of strategies to restore the state's forests and other wildlands as well as agricultural lands so that they can act more as carbon sinks that sequester vast amounts of carbon.

How will the power grid change under this Scoping Plan?

Much of the state's success to date in reducing GHG emissions is due to decarbonization of the electricity sector with the Renewables Portfolio Standard, integrated resources planning, and the Cap-and-Trade Program's price signal to dispatch clean energy to meet load. Moving forward, a 100% clean, affordable, and reliable electricity grid will serve as a backbone to support deep decarbonization across California's economy. Additionally, unprecedented load growth must be met to achieve the outcomes called for in the Draft 2022 Scoping Plan. At the same time, other types of clean energy, such as hydrogen and renewable natural gas must remain options as we transition away from fossil fuels. Under the Proposed Scenario, the load growth is expected to grow by 68%.

The most critical difference in the draft 2022 Scoping Plan compared to previous plans is the focus on a much more rapid rate of deployment for clean technology and energy in every sector. As a result, specific actions – including accelerated rates of deployment of clean technology and fuels – must be translated into both new and amended regulations, policies, and incentive programs. And steps must be taken to protect reliability in an economy that will be increasingly electrified. The availability of solar and wind power can vary greatly depending on the season and time of day. To help address this challenge, resource installations that pair solar with batteries, as well as more battery build-out, are coming online currently and over the next five years.

The Proposed Scenario incorporates SB 350's energy efficiency doubling goal, the California Public Utilities Commission's Integrated Resources Planning 2030 GHG target, and SB 100's 2030 Renewable Portfolio Standard and 2045 zero-carbon retail sales targets to reduce dependence on fossil fuels in the electricity sector by transitioning substantial energy demand to renewable and zero-carbon resources. Continued transition to renewable and zero-carbon electricity resources will enable electricity to become a zero-carbon substitute for fossil fuels across the economy.

The Proposed Scenario also includes the following characteristics:

- Between 2020 and 2045 the emissions from the electricity sector continue to decline.
- In the Proposed Scenario, electricity load growth increases by approximately 68 percent in 2045. The modeling optimizes for costs and builds ~90 GW of solar and ~40 GW of batteries to meet SB100 retail sales targets. All gas remains online and ~10 GW of new gas is built (not baseload, but peaker plants) to ensure continued reliability related to the massive build-out of renewables and the challenge of intermittent power from solar and wind generation. Note: overall use of gas generation drops over time. (see graph below)
- The RESOLVE model builds new gas capacity to meet electric reliability (resource adequacy) needs.

- The increase in resource adequacy needs is driven, in large part, by peak demand increases by 2045 due to higher electric demand from electrification, particularly transportation electrification.
- Electric vehicle charging assumptions are based on the California Energy Commission Integrated Energy Policy Report, which assumes a mix of off-peak and on-peak electric vehicle charging. For example, some public charging is assumed to occur during peak demand hours, and not all customers are assumed to respond to, or participate in, time-of-use rates.
- The cost assumptions lead to combined cycle gas units being selected to meet resource adequacy needs; the input assumptions show that combustion turbines (“peakers”) are more expensive. The new units run more than the older existing gas plants, which are lower efficiency and thus more expensive to operate.

Figure 2: Proposed Scenario: Fossil Fuel Combustion Declines Significantly across All Sectors

