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Greenhouse gas emissions are dropping in key sectors, but California still not on pace to achieve 2030 climate goal as emissions rebound following lockdown

15th annual California Green Innovation Index notes economic growth has become less dependent on fossil fuels, but decarbonization must increase threefold to meet climate targets

A significant increase in in-state power sector pollution is offsetting emissions reductions in transportation and residential sectors

SAN FRANCISCO — California has pledged to cut greenhouse gas emissions far beyond the record low seen during the pandemic, but new data shows this goal will prove challenging amid an emissions upswing following the lifting of lockdown restrictions. A staggering increase in power sector emissions, particularly from in-state generation, in recent years is offsetting progress made in the transportation sector, and threatening the state's goals overall, according to the 15th annual [California Green Innovation Index](#), released today by the nonpartisan nonprofit Next 10 and prepared by Beacon Economics.

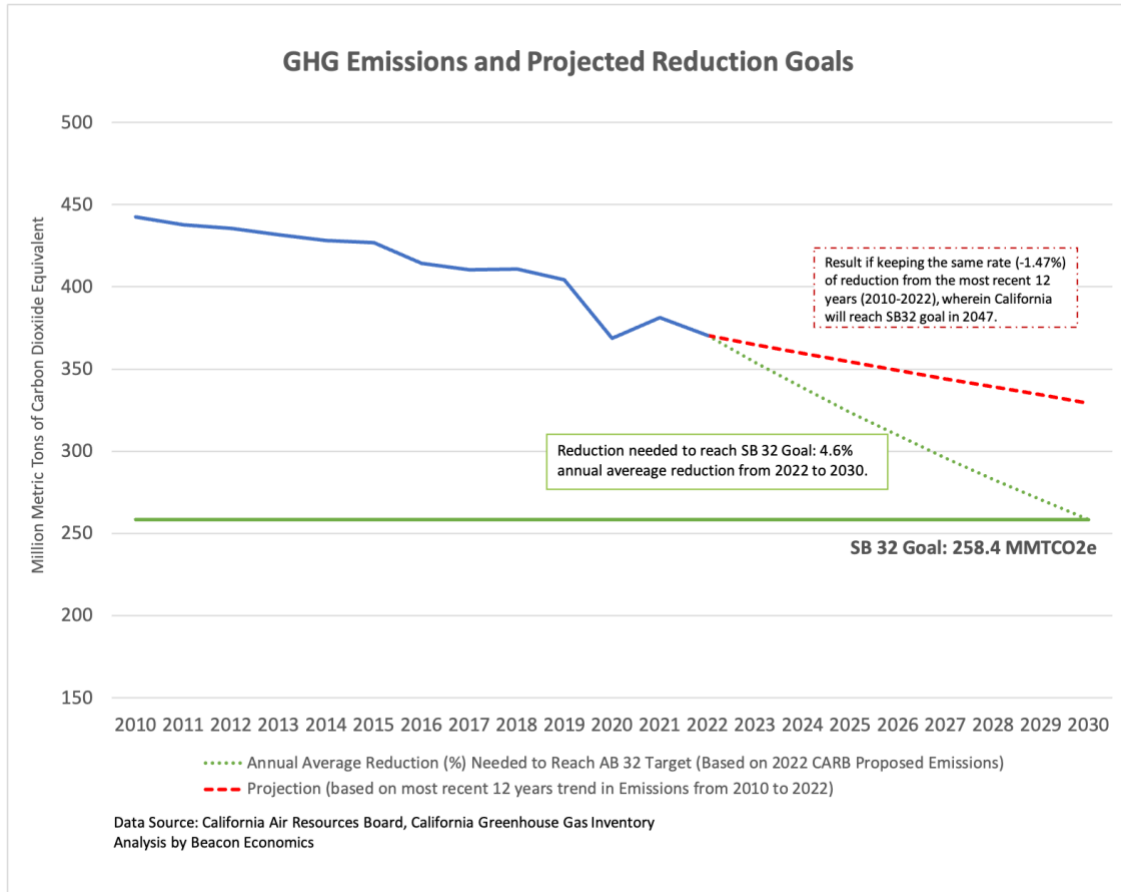
California has worked hard to decouple its economy from the burning of fossil fuels, resulting in some of the lowest per-capita emissions in the United States, but annual greenhouse gas jumped 3.4% in 2021, a rebound following the pandemic, according to the latest data from the California Air Resources Board (CARB). A preliminary estimate from the agency shows the state's emissions started trending downward again in 2022, but the 2021 emissions remained 121.3 MMTCO₂e above the 2030 target of nearly 260 MMTCO₂e.

“The increase in emissions following the pandemic makes it all the more difficult for California to meet its climate goals on time,” said F. Noel Perry, Founder of Next 10. “In fact, we may be further behind than many people realize. If you look at the trajectory since 2010, California won’t meet our 2030 climate goal until 2047. We need to triple the rate of decarbonization progress each year to hit that target.”

Efforts to promote renewable power as well as zero-emission buildings and vehicles will have to dramatically accelerate in order to achieve the state's goal of slashing greenhouse gas emissions by 40% below 1990 levels by 2030, according to the new report. To meet that



benchmark, California would need to **triple the rate of emissions cuts we've made** since 2010—going from the actual average annual reduction of about **1.5%** a year to about **4.6%** a year, according to an analysis of CARB data by Beacon Economics. That percentage could be even higher as emissions data for 2023 isn't available yet.



But it's not all bad news. California's economy is getting significantly cleaner. Among the 50 states, only New York and Massachusetts have lower per-capita emissions compared to California, and the carbon intensity of the state's economy (emissions compared to gross domestic product) has been cut in half over the last two decades.

Emissions from the transportation sector—which accounts for nearly 40% of the state's carbon footprint—increased by 7.4% from 2020 to 2021 following the easing of pandemic travel restrictions. But overall, greenhouse gas emissions from passenger cars, heavy-duty trucks, and other vehicles were more than 10% lower in 2021 compared to 2019. This shows the state is making considerable progress cutting its largest source of pollution. Emissions from heavy-duty vehicles have consistently decreased every year since 2018, resulting in a 14.1% reduction in 2021 compared to that year.



Zero-emission vehicle adoption is now at an [all-time high in California](#), accounting for a quarter of new vehicle sales in 2023. New light-duty electric vehicle sales in all classes rose by 61.7% in 2022 compared to the previous year, and the state met its 2025 goal of 1.5 million ZEVs on-road two years early in April 2023. At the current trajectory (an increase in sales of 25.6% on average per year from 2018 to 2023), California is on track to meet the 2030 target of 5 million ZEVs one year ahead of schedule as well.

Buildings are slowly getting cleaner too, especially with the adoption of electric heat pumps, induction stoves, and efficiency upgrades that lower demand for fossil gas. Emissions from the commercial and residential sectors declined by roughly 4.5% and 4.4%, respectively, in 2021 compared to pre-pandemic levels in 2019. However, while residential emissions fell (-2.3%), commercial emissions increased from 2020 to 2021 (+3.7%), as anticipated post-pandemic.

Electricity generation experienced the largest increase in planet-warming emissions among all economic sectors from 2019 to 2021, jumping 3.5%. This was driven by a substantial increase in emissions from in-state power generation, which jumped 10.3% between 2019 and 2021. Despite these increases, in February 2024, the California Public Utilities Commission (CPUC) adopted a more [ambitious goal](#) for decarbonizing the electricity sector, calling for 58% fewer emissions by 2035 compared to 2020. To achieve this target, Beacon Economics estimates that California must reduce power sector emissions by an average of 6.3% annually between 2021 and 2035 – nearly double the 3.5% annual average decrease rate observed from 2011 to 2021. Moreover, recent trends indicate an upward trajectory, with a 4.8% year-over-year increase in emissions from 2020 to 2021.

“While California is moving in the right direction in many ways, renewable electricity generation must greatly increase in the coming years in order to reach the state’s goal,” said Stafford Nichols, Research Manager at Beacon Economics. *“To meet our upcoming target of 50% of electricity from renewable sources by 2026, we need to double the speed we are adding RPS-eligible renewables to our power mix, from 4.3% per year to 8.7% per year.”*

Additionally, new industrial-scale solar and wind projects are having a hard time connecting to the grid because many transmission lines are already at capacity or do not connect to remote renewable power installations. The typical project built in 2022 took five years from the interconnection request to commercial operation, compared to three years in 2015 and less than two years in 2008.

California has been the leader in U.S. rooftop solar for decades, but recent changes at the CPUC related to compensation for solar generation has significantly reduced the installation of



residential panels. The state has 1.8 million installations capable of generating a total of more than 15 gigawatts (GW) at peak capacity, but the utilities have seen a [66% to 83% drop](#) in residential rooftop-solar interconnection applications in the five months after the new rules went into effect in April 2023. Comparatively, utility-scale solar capacity in California was roughly 18.2 GW at the end of 2021.

“While California is well-positioned as a leader on climate, there are substantial obstacles to accelerating our decarbonization efforts in an equitable way that benefits all Californians,” said Perry. “These are not insurmountable, but we need to act urgently in order to achieve these goals on time.”

Other Key Findings:

- Total GHG emissions in California increased by 3.4% from 2020 to 2021, which was still 5.7% lower than the pre-pandemic level in 2019.
- There has been a notable decline in the consumption of non-electricity natural gas, which has decreased by 3.4% from 2016 to 2021— this decline has been largely offset by increased adoption of renewable energy.
 - Natural gas non-electricity consumption in California was still 24.4% higher than electricity consumption in 2021 and fossil fuels make up the majority of energy consumed in California, accounting for 69.2%.
- California’s cement plants account for two percent of total statewide carbon emissions and almost 10 percent of industrial emissions.
- Although California’s cement plants are marginally more emissions-efficient on a per-ton basis than the average American plant, they emit more CO₂e per ton of cement than plants in the rest of the world. For example, they emit about 33% more than plants in China and India.
 - Rapid adoption of alternate processes and technologies to make the manufacturing of cement less carbon-intensive could reduce emissions from cement in California by up to 24% by 2035 compared to business-as-usual.

Power Sector

- In 2022, the share of renewable sources in California's power mix (including imports) increased to 35.8%, a rise of only 2.2% compared to 2021 in absolute terms and the largest increase since 2019. Historically, the rate of increase in the share of renewables was at its peak between 2016 and 2018, with an annual average growth rate of 11% during this period.
 - To meet the goal of 50% of electric load from RPS-eligible renewable sources by 2026, California’s share of electricity generation from renewables would need to



increase by 8.7% each year from 2022 to 2026, revised upward from the 8.3% projected in 2021.

- During the last five years (from 2017 to 2022), the renewables share in the power mix has grown annually by an average of 4.3%, climbing from 29% in 2017 to 35.8% in 2022. Consequently, California must double its renewable energy share to reach the 50% target set for 2026.
- Solar and wind are the largest renewable sources, making up 17% and 10.8%, respectively, of the state's total power mix.
- In 2021, the rated power of utility-scale lithium-ion battery storage more than quadrupled from 2020 levels, increasing by a factor of 4.3 over the amount reported in 2020.
- Battery storage (all types) capacity in California grew from about 500 megawatts (MW) in 2020 to 5,000 MW in May 2023, increasing by a factor of 10.
- In 2022, the California Independent System Operator (CAISO) interconnected grid added 674 MW of solar plus storage generation capacity and only 2.8 MW of natural gas—a promising development when it comes to reducing emissions from electricity generation.

Transportation Emissions

- Despite light-duty vehicles emissions increasing 10.6% (+10.0 MMTCO_{2e}) from 2020 to 2021, overall transportation emissions are trending downward in California.
- Between 2018 and 2021, transportation emissions dropped by close to 12%, driven by strong reductions in the heavy duty (-14.1%), passengers (-10.7%) and off-road vehicle sectors (-20.6%).
- Trips on public transit in California increased by 28.1% in 2022 compared to 2021 but remained 40% below the pre-pandemic 2019 level.

Energy Efficiency

- California's once-held advantage of having a lower average residential electricity bill compared to the rest of the U.S. vanished in recent years. In 2011, the margin stood at 15.9% below the national average, but as of 2021, it had shifted to 2.2% higher than the U.S. average.
 - California's residential electricity price per kilowatt-hour (kWh) has increased by 54.4% from 2011 to 2021 compared to 16.6% increase in the U.S. overall over the same time period.
- California's average monthly commercial electricity bill has also become considerably more expensive relative to the U.S. average during the last decade, from 31.3% higher in 2011 to 52.7% higher in 2021.



- California's commercial electricity price per kWh has also increased by 47% from 2011 to 2021 compared to 9.6% in the U.S.
- California has consistently maintained its price advantage over the U.S. in industrial electricity bills, with the gap widening nearly fourfold from 8.7% lower in 2011 to 32.8% lower in 2021.

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About Next 10

Next 10 is an independent, nonpartisan, nonprofit organization that educates, engages and empowers Californians to improve the state's future. With a focus on the intersection of the economy, the environment, and quality of life, Next 10 employs research from leading experts on complex state issues and creates a portfolio of nonpartisan educational materials to foster a deeper understanding of the critical issues affecting our state.

About Beacon Economics

Founded in 2007, Beacon Economics, an LLC and certified Small Business Enterprise with the state of California, is an independent research and consulting firm dedicated to delivering accurate, insightful, and objective economic analysis. Leveraging unique proprietary models, vast databases, and sophisticated data processing, the company's specialized practice areas include community and economic development, real estate and land use analysis, economic and revenue forecasting, industry analysis, economic policy analysis, and economic impact studies.