



2024 California
**Green Innovation
Index** **16TH EDITION**

2024

California Green Innovation Index

16TH EDITION

This marks the release of the 16th edition of Next 10's California Green Innovation Index. The 2024 edition continues the shift in format for our readers that we introduced in 2021: a fully online, immersive experience for the Index that allows our readers to dig deep into the data, jump straight to the issues most important to their work, and easily find, interact with, and share the most critical climate and clean energy trends facing the state. This year's edition also features more interactive graphics, allowing readers to dig even deeper into the data.

This overview provides a snapshot of some of this year's key takeaways. You can learn more about these trends and others at GreenInnovationIndex.org. We're excited for you to experience our third online edition of the California Green Innovation Index, and we hope it can be useful to your work.



KEY FINDING 1
PG. 2

While California is unlikely to meet 2030 climate goal at the current emissions reduction rate, progress has been made.

KEY FINDING 2
PG. 3

Emissions from transportation remain below pre-pandemic levels.

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Emissions from in-state generation of electricity have increased in recent years.

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Energy storage capacity in California continues to skyrocket.





KEY FINDING 1

While California is unlikely to meet 2030 climate goal at the current emissions reduction rate, progress has been made.

After emissions rose by 3.4% from 2020 to 2021, emissions decreased by 2.4% from 2021 to 2022. While 2022 emissions remained 8.8% below 2019 emissions, the state still needs to reduce emissions much faster in order to meet the SB 32 goal of 40% below 1990 levels by 2030.¹ To meet the goal, California would need to reduce emissions by 4.2% annually between 2023 and 2030. From 2018 to 2022, emissions fell at an average annual rate of only 2.5%. Using this rate of reduction, California would meet the 2030 goal in 2037. However, the state wouldn't have met the goal until 2047 using last year's emissions data which indicates progress.

2021 → 2022

CALIFORNIA GHG EMISSIONS DECREASED BY:

2.4%

2006 → 2022

22%

REDUCTION IN GREENHOUSE GAS EMISSIONS SINCE AB 32 PASSED

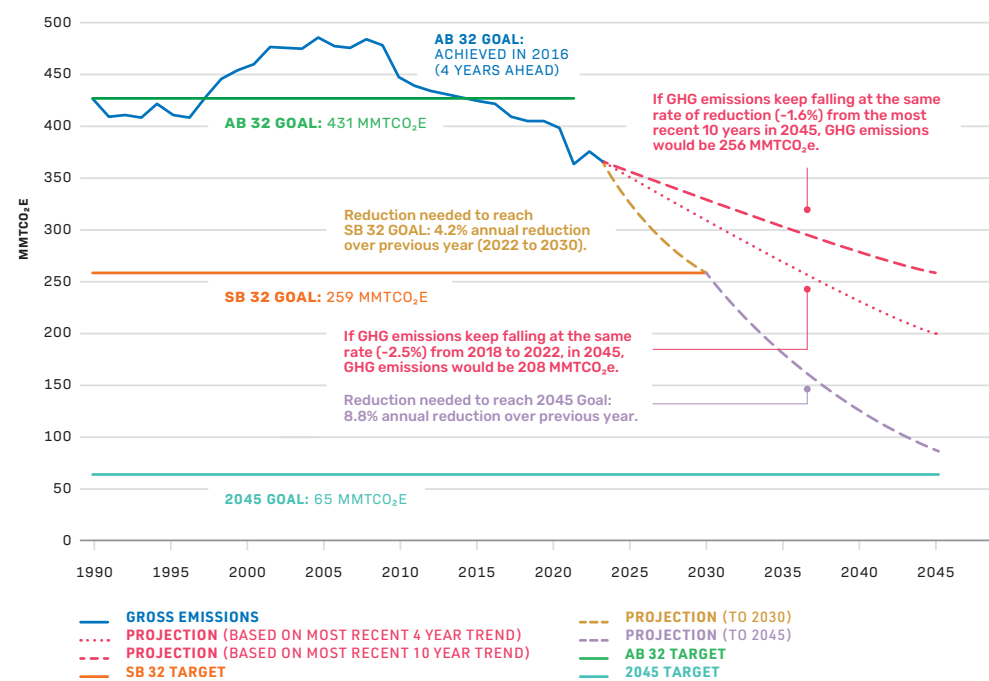
THE STATE NEEDS TO REDUCE EMISSIONS BY

4.2%

EACH YEAR TO MEET 2030 GOAL

Figure 1. GHG Emissions and Projected Reduction Goals

CALIFORNIA, 1990-2045



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Historical emissions data was re-calculated in the 2022 update to the CARB GHG Inventory. Data Source: California Air Resources Board, California Greenhouse Gas Inventory. NEXT 10 / SF · CA · USA

Even though emissions decreased in 2022, California now needs to reduce emissions at a greater rate to meet the 2030 goal. In 2021, emissions only need to be reduced by 4% each year and by 3.3% in 2020. During the 16-year period from 2006 to 2022, California reduced emissions more during the second half of this period (-57 MMTCO₂e from 2014 to 2022), surpassing the 48 MMTCO₂e during the first half of the period (from 2006 to 2014). This indicates that the pace of emissions reductions has ticked up in recent years.

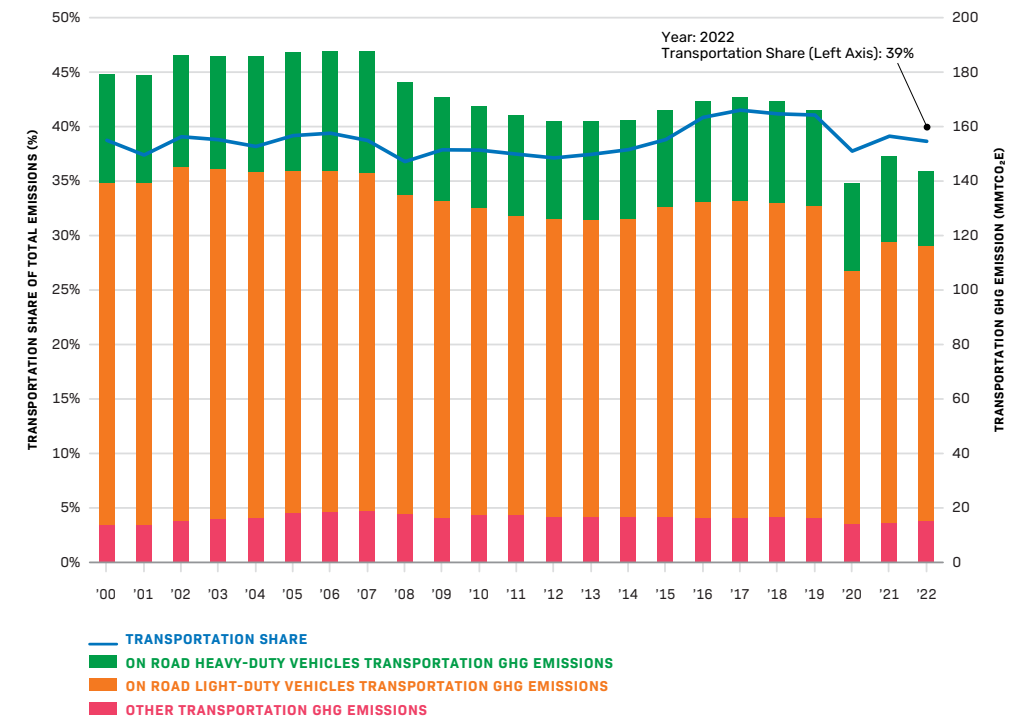
KEY FINDING 2

Emissions from transportation remain below pre-pandemic levels.

While emissions from the transportation sector increased by 7.4% from 2020 to 2021 as travel restrictions eased, emissions from transportation remained below pre-pandemic levels in 2022. In 2022, transportation emissions were 13.5% lower than in 2019 and 3.6% lower than in 2021. The transportation sector continues to be the largest emitter in California, comprising 38.7% of the total emissions in 2022 – roughly the same as in 2021. The reduction in emissions in 2022 compared to 2019 was driven by both the passenger vehicles (-14%) and heavy-duty vehicles (-22.1%) sub-sectors.

Figure 2. GHG Emissions from the Transportation Sector and as a Share of Total GHG Emissions

CALIFORNIA, 2000-2022



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After a year of supply chain issues and vehicle production cutbacks in 2022, new vehicle registration rebounded by 11.9% in 2023. In 2023, light-duty pickup trucks, mini-vans, and SUVs made up 69.5% of new light-duty vehicle registrations – up from 68.3% in 2022. This continues a trend of consumers preferring these types of vehicles more than cars and sedans. Total new light-duty pickup trucks, mini-vans, and SUVs registrations rose 13.9% from 2022 to 2023, while registrations for smaller cars also increased by 7.7% over the same period.

2022
SHARE OF GHG EMISSIONS FROM TRANSPORTATION SECTOR:

38.7%

2021 → 2022

MOST OF THE DECREASE IN TRANSPORTATION EMISSIONS CAME FROM THE HEAVY-DUTY VEHICLES SUB-SECTOR:

13.1%

2021 → 2022

EMISSIONS FROM PASSENGER VEHICLES DECREASED BY:

2.4%



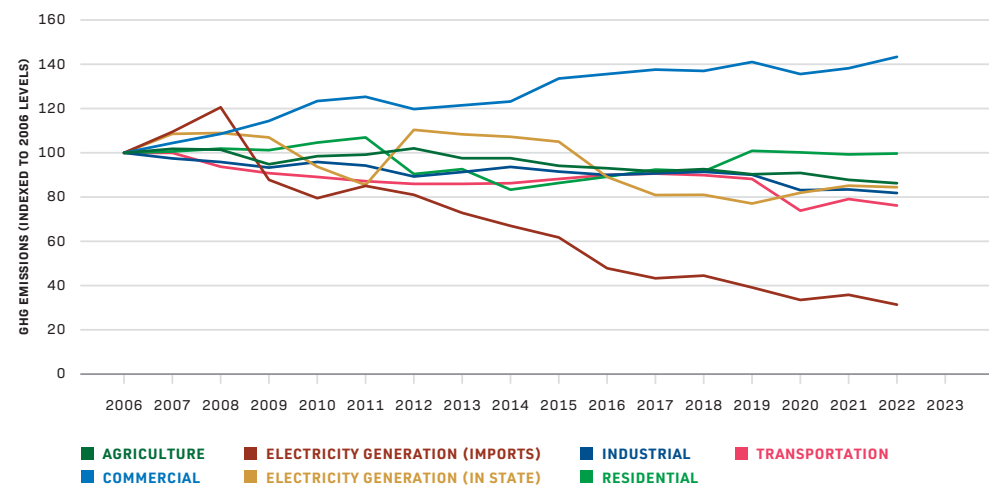


KEY FINDING 3

Emissions from in-state generation of electricity have increased in recent years.

The electric power sector has traditionally been a key source of emissions reductions in California. Compared to 2000, emissions from imports have decreased by 61.9% while emissions from in-state generation have fallen by 28.6%. However, in recent years, emissions from in-state generation have been increasing. While there was a modest decrease in these emissions of 0.8% from 2021 to 2022, emissions remained 9.5% higher in 2022 compared to the pre-pandemic level in 2019. Overall electric power sector emissions fell modestly from 2019 to 2022, but this was driven by a large decrease in emissions from imports.

Figure 3. GHG by Sector (Indexed to 2006 Levels) BY SECTOR, CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: National Transit Database, Department of Transportation; Motor Fuel & Highway Trust Fund, Office of Highway Policy Information, U.S. Department of Transportation. NEXT 10 / SF - CA - USA

As the grid becomes cleaner, further emissions cuts in the electric sector may become more difficult, making the work to reduce other sectors even more critical. The increase in emissions from in-state generation of electricity in 2022 follows recent trends, emissions from this source also increased by 10.3% from 2019 to 2021.

2019 → 2022
 OVERALL ELECTRIC POWER SECTOR EMISSIONS ARE **DOWN**
0.8%
 IN 2022 COMPARED TO 2019

EMISSIONS FROM IMPORTS WERE **9.2%** LOWER IN 2022 COMPARED TO 2019

2021 → 2022
 EMISSIONS FROM ELECTRIC POWER DECREASED BY **4.3%** FROM 2021 TO 2022

EMISSIONS FROM IMPORTS DECREASED BY **11.9%** FROM 2021 TO 2022

KEY FINDING 4

California's average residential electricity bills are now higher than the U.S. average.

Despite having the most expensive kilowatt-hour electricity rates, California's residential electricity bills had been below the U.S. average for years. However, California's once-held advantage of having a lower average residential electricity bill compared to the rest of the U.S. has vanished in the wake of the pandemic. In 2012, the margin stood at 20.4% below the national average, but as of 2022, it has shifted to a 2.2% higher than the U.S. average. On the other hand, California has consistently maintained its price advantage in the industrial sector with California electricity bills being 32.1% lower than the U.S. average – even though the cost per kilowatt-hour (\$0.17/kWh) was more than double the national average of \$0.08/kWh.

Table 1. Electricity Prices and Bills (Inflation Adjusted) by Sector CALIFORNIA AND THE REST OF THE U.S.

| SECTOR | REGION | PRICE PER KWH 2022 | AVERAGE MONTHLY BILL | | 10YR % CHANGE |
|---------------|--------------|--------------------|----------------------|-------------|---------------|
| | | | 2012 | 2022 | |
| RESIDENTIAL | CALIFORNIA | \$0.26 | \$108.10 | \$138.29 | 28% |
| | FLORIDA | \$0.14 | \$159.43 | \$154.50 | -3% |
| | ILLINOIS | \$0.16 | \$112.80 | \$112.74 | 0% |
| | NEW YORK | \$0.22 | \$139.28 | \$130.81 | -6% |
| | OHIO | \$0.14 | \$136.12 | \$121.07 | -11% |
| | PENNSYLVANIA | \$0.16 | \$134.36 | \$136.17 | 1% |
| | TEXAS | \$0.14 | \$161.13 | \$162.17 | 1% |
| UNITED STATES | \$0.15 | \$135.82 | \$135.25 | 0% | |
| INDUSTRIAL | CALIFORNIA | \$0.17 | \$6,809.42 | \$4,572.40 | -33% |
| | FLORIDA | \$0.09 | \$8,157.26 | \$5,684.43 | -30% |
| | ILLINOIS | \$0.09 | \$46,706.12 | \$54,449.93 | 17% |
| | NEW YORK | \$0.08 | \$11,930.92 | \$13,880.99 | 16% |
| | OHIO | \$0.07 | \$18,303.71 | \$16,034.55 | -12% |
| | PENNSYLVANIA | \$0.08 | \$14,578.073 | \$22,682.38 | 56% |
| | TEXAS | \$0.06 | \$5,858.18 | \$2,654.15 | -55% |
| UNITED STATES | \$0.08 | \$9,436.32 | \$6,737.77 | -29% | |
| COMMERCIAL | CALIFORNIA | \$0.22 | \$910.54 | \$1,173.66 | 29% |
| | FLORIDA | \$0.10 | \$824.83 | \$704.69 | -15% |
| | ILLINOIS | \$0.11 | \$739.98 | \$698.65 | -6% |
| | NEW YORK | \$0.16 | \$1,205.45 | \$937.82 | -22% |
| | OHIO | \$0.10 | \$777.60 | \$631.89 | -19% |
| | PENNSYLVANIA | \$0.11 | \$617.57 | \$455.78 | -26% |
| | TEXAS | \$0.09 | \$838.62 | \$769.25 | -8% |
| UNITED STATES | \$0.12 | \$796.19 | \$746.89 | -6% | |

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Climate Investments. NEXT 10 / SF - CA - USA

Additionally, California's average monthly commercial electricity bill has become considerably more expensive relative to the U.S. average during the last decade, from 14.4% higher in 2012 to 57.1% higher in 2021. This rise can be attributed to a disparity between the growth in the number of customers and the surge in prices during the same period. The state of California can no longer depend solely on mild weather and energy efficiency measures to mitigate the impact of high utility bills. Rising rates have been driven by wildfire-related expenses, insurance, and solar adoption that reduces revenue.

2012 → 2022

RESIDENTIAL ELECTRICITY RATES IN CALIFORNIA HAVE INCREASED BY:

20.5%

TOTAL U.S. RESIDENTIAL RATES ALSO INCREASED BY

6.8%

OVER THE SAME TIME PERIOD

2021 → 2022

RESIDENTIAL RATES HAD THE HIGHEST ONE-YEAR GROWTH RATE IN BOTH CALIFORNIA AND THE U.S. – BY

13%

AND

7.1%

RESPECTIVELY

2022 → 2023

NEW LIGHT-DUTY ELECTRIC VEHICLE SALES IN ALL CLASSES ROSE BY

46%

FROM 2022 TO 2023

2023

ZEV PICKUPS MADE UP

43%

OF LIGHT-DUTY ZEV REGISTRATIONS COMPARED TO

34%

IN 2022 AND

26%

IN 2021

2023

THE PERCENTAGE OF REGISTERED VEHICLES ON-ROAD THAT ARE ZEVS REACHED

5.2%

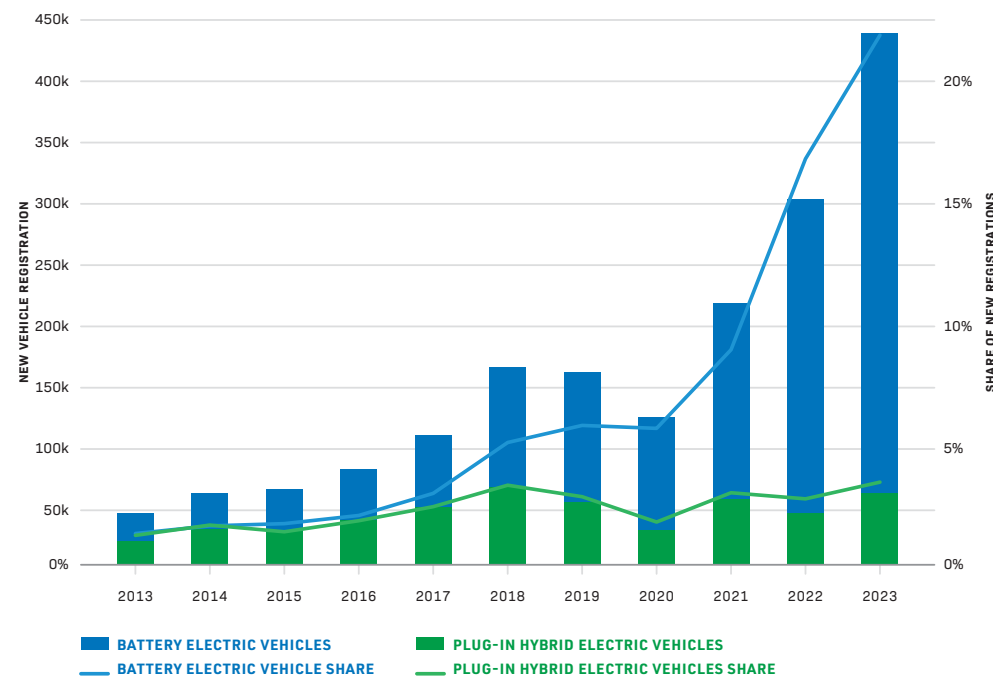
IN 2023



California continues to hit ZEV adoption milestones.

California met the 2025 goal of 1.5 million zero-emission vehicles (ZEVs) on road two years early in April 2023. In 2023, new battery electric vehicles (BEVs) registered accounted for 21.5% of total new vehicles registered in California – the first year it was greater than 20%. Together, new BEV and plug-in hybrid (PHEV) registrations totaled a quarter (24.7%) of new vehicle registrations in 2023, more than double share of 11.6% in 2021. The number of electric light-duty pickups, SUVs and vans registered in 2023 hit an all-time high of 654,405, up 71.3% compared to 2022. This represents an important milestone as California continues to make progress toward electrifying its largest GHG emitting sector.

Figure 4. Electric Vehicle Registration and as Percent of Total New Light Vehicle Registration CALIFORNIA, 2013-2023



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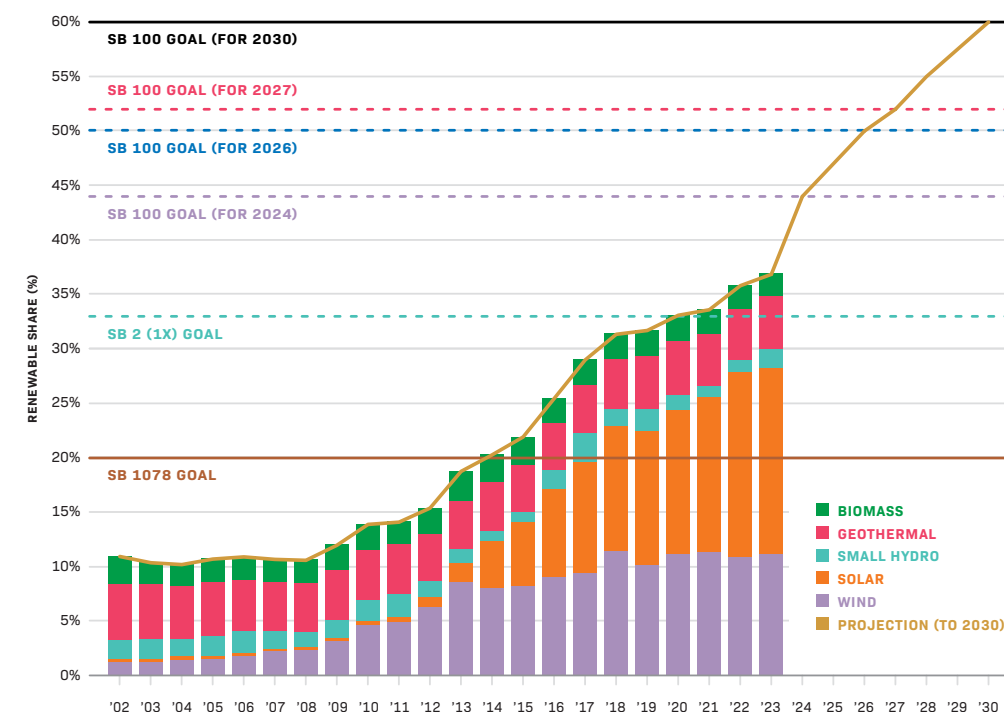
Meeting the 2025 goal early put California in a better position to meet the 2030 goal of 5 million ZEVs on-road. To reach that goal, ZEV registrations in California need to increase by an annual average of 18.6% from 2025 to 2030, revised downwards from the 24% required last year. At the current trajectory, California is anticipated to achieve the milestone of 5 million ZEVs on the road by 2030.

California is behind on meeting its upcoming renewable energy targets.

In 2023, the share of renewable sources² in California's power mix (including imports) increased to 36%, a rise of 1.1% compared to 2022. California has maintained a significant lead in renewables, with an average yearly growth rate of 1.7% from 2008 to 2023, compared to the rest of U.S. growth rate of 0.8%. To meet the upcoming 2026 goal of 50% of generation from RPS-eligible renewable sources, California's share of electricity generation from renewables would need to increase by 4.4% each year from 2023 to 2026, revised upward from 3.5% previously.

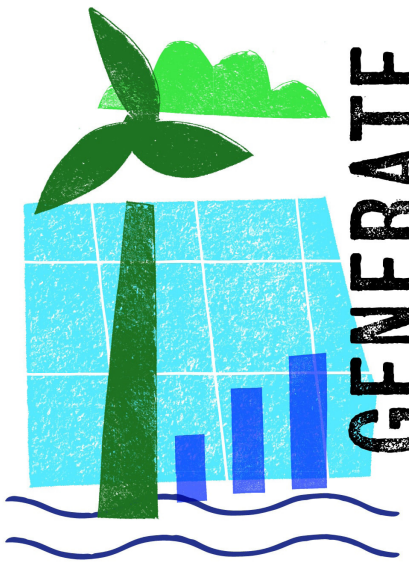
Figure 5. California's Path to 60% RPS Goal by 2030

ASSUMING LINEAR GROWTH



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Energy Commission. NEXT 10 / SF - CA - USA

If California's power mix remained the same as in 2023, California would need to increase RPS-eligible renewables by 19.4% in 2024 – an unlikely scenario. To reach the 2027 goal of 52%, the share of electricity generation from renewables would need to increase by 3.8% each year from 2023 to 2027. To meet the 2030 goal of 60%, the share of electricity generation from renewables would need to increase by 3.3% annually from 2023 to 2030. Although the growth rate of renewables in the power mix has increased from 2022 to 2023 – at 1.1%, it is still slower than the rate needed to reach 2026 goal.



SOLAR & WIND

ARE THE LARGEST RENEWABLE SOURCES, MAKING UP

17%

AND

11.2%

RESPECTIVELY, OF THE STATE'S TOTAL POWER MIX

2022 → 2023

GENERATION FROM SOLAR (IN-STATE GENERATION AND IMPORTS) FELL BY:

2.3%

THE FIRST TIME WHEN YEAR-OVER-YEAR SOLAR GENERATION HAS FALLEN

IN THE U.S., RENEWABLES ONLY MAKE UP

15.3%

OF ELECTRICITY GENERATION



KEY FINDING 7

Energy storage capacity in California continues to skyrocket.

More utility-scale storage, such as lithium-ion battery and long-duration, is needed to make the grid better at incorporating renewables and reduce curtailments that have been trending upwards in recent years. California's legislators have been modernizing the state's energy storage infrastructure, reducing its heavy reliance on large hydro-electric projects. In 2023, utility-scale lithium-ion battery storage projects expanded into 25 counties across the state, up from only 11 last year. This underscores the extensive reach and impact of energy storage endeavors, signifying a widespread commitment to harnessing the potential of emerging technologies for a more sustainable and resilient energy landscape.

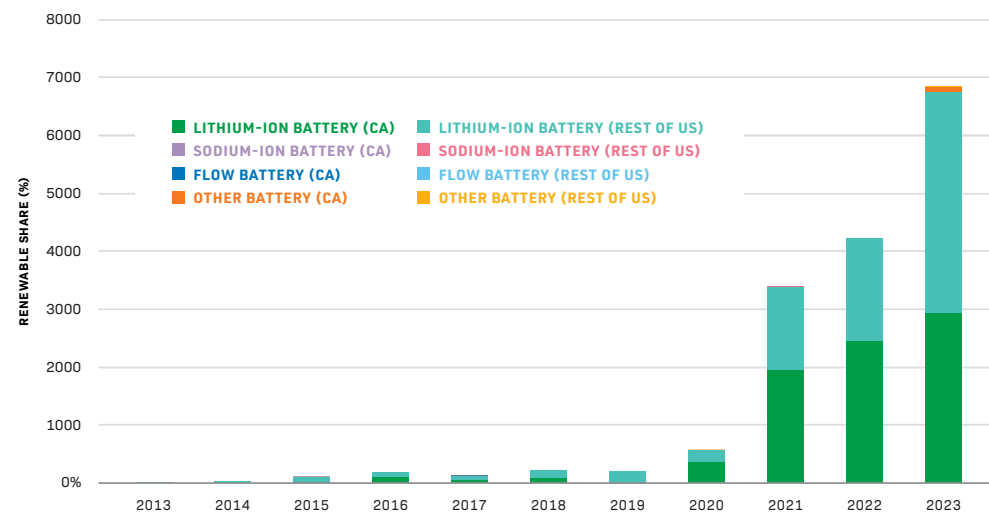
2023

CALIFORNIA ADDED **3,011 MW** OF ENERGY STORAGE WHILE THE REST OF THE U.S. ADDED 3,835 MW

2021 → 2023

NEW ENERGY STORAGE CAPACITY GREW BY **23%** IN CALIFORNIA AND **117%** IN THE REST OF THE U.S.

Figure 6. Energy Storage Capacity Additions
CALIFORNIA VS. U.S., 2013-2023



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The California battery storage industry proliferated starting in 2021 and the landscape of energy storage projects in California is rapidly evolving. Due to the increased popularity of pairing solar PV projects with battery storage, by secondary generation technology, battery storage (1,312 MW) alone accounted for all capacity in interconnection queue, up 125% from 2022. By primary generation technology, the interconnection queue totaled 2,170 MW. That includes 1,628 MW from solar and 542 MW from battery storage. While these increases are impressive, storage resources must grow considerably to meet the 15 GW of energy storage target by 2032.

2023

CALIFORNIA ACCOUNTED FOR **44%** OF NEW ENERGY STORAGE ADDED NATIONWIDE

About Next 10's California Green Innovation Index

Next 10's *California Green Innovation Index* tracks the state's progress in reducing greenhouse gas emissions, spurring technological and business innovation, and growing businesses and jobs that enable the transition to a more resource-efficient economy. The 2024 *Index* is the 16th edition published by Next 10.

Next 10 is an independent, nonpartisan organization that educates, engages and empowers Californians to improve the state's future. Next 10 was founded in 2003 by businessman and philanthropist F. Noel Perry. Next 10 is focused on innovation and the intersection between the economy, the environment, and quality of life issues for all Californians.

Advisors to the California Green Innovation Index

Next 10 thanks the following expert advisors for their generous time and guidance on this project over the last twelve editions:

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Endnotes

- "California Climate Policy Fact Sheet: Emissions Reduction Policy," Center for Law, Energy & Environment, UC Berkeley Law. Available at: <https://www.law.berkeley.edu/wp-content/uploads/2019/12/Fact-Sheet-Emission-Reduction-Policy.pdf>
- RFS-eligible resources include biomass, small hydro, geothermal, solar, and wind.

To learn more, visit
greeninnovationindex.org



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