A New Era of Manufacturing for Public Good

The Case for the California Grid Manufacturing Initiative

Climate & Community Institute

UAW

BlueGreen Alliance Foundation

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The Climate and Community Institute (CCI) is a progressive climate and economy think tank. Our growing staff and network of over 60 academic and expert fellows create and mobilize cutting-edge research at the nexus of inequality and the climate crisis. We fight for a transformational agenda that will rapidly and equitably decarbonize the economy by focusing on material benefits for working people.

United Auto Workers Region 6 is the region of over 120,000 active & retired UAW members in Alaska, Arizona, California, Hawai'i, Idaho, Nevada, Oregon, Utah, and Washington, organizing for a just and sustainable future for all.

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Contents

Acronyms

CGMI: California Grid Manufacturing Initiative
GO Biz: Governor's Office of Business and Economic Development
IBank: California Infrastructure and Economic Development Bank
CAISO: California Independent System Operator
CPUC: California Public Utilities Commission
CEC: California Energy Commission
PG&E: Pacific Gas and Electric Company
SCE: Southern California Edison
SDG&E: San Diego Gas and Electric
IOU: investor-owned utility

> We created the Community Benefits Plan approach at DOE because we knew that project developers that engage early and meaningfully with communities and workers see clear benefits, from shorter permitting and siting timelines to lower litigation risk to better-performing systems. As we transition our entire economy to more sustainable and resilient infrastructure and projects, it's critically important to do so in collaboration with people and places. Even if the CBP approach isn't used at the federal level in the coming years, developers are continuing to do the work because they see the benefits on the ground.
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> **Kate Gordon, CEO of California Forward**
> [Title]

Executive summary

California's intertwined crises of rising cost of living and accelerating climate change are driving the demand for more renewable energy sources to bring down costs. These resources can also, fortunately, undergird high-road, union workforces. However, to effectively bring more renewables online, the state desperately needs to upgrade and modernize its grid to accommodate an electrified, resilient economy. The simultaneous barriers to fixing the grid and addressing these crises include supply chain bottlenecks and long lead times for critical electricity grid components. At the same time, there is growing demand for components, limited domestic production capacity, and the need for customized products. The effects of these constraints are compounded by growing demand for energy interconnection, electrification, aging infrastructure replacement, and wildfire and extreme weather investments by utilities.

The combination of these conditions is driving up costs, causing dangerous local and atmospheric pollution from fossil fuels, and worsening the impacts of wildfires. The crisis is also interfering with the state's climate leadership and delaying the development of a green growth coalition essential to California's future. This report examines the California Grid Manufacturing Initiative (CGMI), introduced in February 2026 by Assemblymember Petrie-Norris as AB 2516, a pro-worker green industrial policy proposal to address these problems, while reducing Californians' energy bills and creating good, green jobs.[1]

The CGMI would have a dual purpose: to intervene on both the demand and supply side of grid component supply chain market failures. The CGMI would aggregate demand for critical electricity grid components and coordinate procurement to achieve economies of scale and reduce costs for utilities. On the supply side, the CGMI would enter into joint venture (JV) agreements with manufacturers to expand or establish new manufacturing capacity in the state—creating high-road jobs and easing supply chain shortages with affordable components.

Our modeling shows that by reducing capital costs of transmission equipment, the CGMI would save California ratepayers billions of dollars in utility bills—including up to $1,000 per year per household by 2050.

Target date	Status quo: annual investor-owned utility capital costs	CGMI policy proposal: annual investor-owned utility capital costs	Annual savings for all residential ratepayers	Annual savings per residential household	Annual savings for all industrial ratepayers	Cumulative savings for all California ratepayers by target date
2040	$10.2–$13.8 billion	$6.3–$6.5 billion	$1.5–$2.9 billion	$150–$300	$700 million–$1.3 billion	$20–$37 billion
2050	$20.8–$34.6 billion	$8.4–$8.5 billion	$4.9–$10.5 billion	$500–$1,000	$2.2–$4.7 billion	$100–$200 billion

The CGMI represents a commonsense market intervention for California. Other countries have taken similar approaches to stabilizing demand for electrical equipment, particularly for transformers, and California has had success with leveraged procurement processes in zero-emission buses and pharmaceutical drugs.

We found that grid component delays are creating ripple effects throughout the California economy:

[1] California State Legislature, *Assembly Bill No. 2516 California Grid Manufacturing Initiative*, AB-2516, Sacramento, CA: California Legislative Information, introduced February 20, 2026, published March 24, 2026, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202520260AB2516.

- **Grid equipment bottlenecks and long lead times**: Demand for critical grid equipment like transformers has risen as much as 274 percent since 2019 while supply has not risen enough in response. In 2025, available supply met only half of demand for certain components. Meanwhile, unit costs have risen as much as 95 percent across transformer types.

- **Price spikes and costs to ratepayers**: Due to the long-term nature of how grid investments are passed onto ratepayers, even short-term price disruptions can have long-term consequences. The effect of recent grid equipment price spikes on 2024 spending alone will be responsible for about $4 billion in increased ratepayer costs spread over the next 40 years among customers of California's three large investor-owned utilities.

- **Delayed renewables and energy storage deployment**: 13.2 GW of renewable energy and battery storage projects—enough to power nearly 10 million homes[2]—are delayed or at risk of delay due to their reliance on delayed transmission projects. Nearly half (6.5 GW) of these are due specifically to long lead times or delayed components in the transmission buildout. In Southern California Edison (SCE) territory, which covers 15 million people, 76 percent of transmission projects developed since 2020 have been delayed, and almost one in five (18 percent) of those delays were due to long lead times on necessary grid equipment, resulting in a median delay of two years.

A proactive approach to grid equipment procurement and manufacturing would yield the following benefits:

- **Ratepayer savings**: Modeling shows that resolving increasing grid equipment costs in this sector could save California ratepayers $100–$200 billion cumulatively over the next 25 years. This would amount to $150–$300 in annual savings on utility bills for residential households by 2040 and $500–$1,000 per household by 2050.

[2] Based on the common statistic that 1 GW of energy can power 750,000 homes. See AJ Dellinger, "Gigawatt: The Solar Energy Term You Should Know About," *CNET*, updated March 22, 2024, full. 2024. "Gigawatt: The Solar Energy Term You Should Know About." CNET. 2024. https://www.cnet.com/home/solar/gigawatt-the-solar-energy-term-you-should-know-about/.

- **California industry and economy**: Lower-cost electricity increases investment and economic growth. It especially benefits high-tech manufacturing and other energy-hungry sectors. Modeling on the potential impact on industrial customers shows the potential for $700 million–$1.3 billion in annual savings by 2040 and $2.2–$4.7 billion by 2050 for industrial ratepayers in California.

- **High-road jobs**: Expanding in-state production would create permanent, family-sustaining manufacturing jobs in the process, with up to **12,000 sustained, full-time jobs**—including up to 4,600 direct jobs in grid equipment manufacturing as the program is implemented. These estimates are based on in-state manufacturing supplying a portion of in-state demand for grid equipment; if manufacturing supported by this policy grows to export outside of California, the number of jobs should be expected to grow further.

The California Public Utilities Commission (CPUC) has already recommended that utilities conduct proactive procurement of certain grid equipment in response to significant transmission and renewable energy delays. They also recommend that utilities forecast demand on longer time horizons and adjust their procurement volumes accordingly.[3] By supporting strategic state-level coordination and intervening through the creation of joint ventures to manufacture components for the grid, the CGMI tackles these challenges directly while increasing affordability and efficiency to ratepayers in the capital procurement system. The policy would also build out a green, skilled, high-road workforce in-state and accelerate progress to meet the state's climate goals.

To develop this vision for a more coordinated and cost-effective approach, this report (1) describes the problems facing the California grid; (2) outlines the structure of the proposed California Grid Manufacturing Initiative; and (3) examines the economic, social, and climate benefits of this intervention.

[3] California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*, Sacramento, CA: California Public Utilities Commission, November 2025 https://www.cpuc.ca.gov/-/media/cpuc-website/industries-and-topics/documents/energy/rps/2025/2025-california-renewables-portfolio-standard-rps-annual-report.pdf.

Introduction

California's residents are paying the second-highest electricity rates in the country—making the need for relief even more urgent. Since 2019, California has experienced the largest increase in electric rates in the country, with residential electricity prices rising 39 percent in just six years.[4] The burden of these increases is felt most painfully by working people and low-income communities of color; in California, low-income households spend nearly three times more of their annual income (4.4 percent) on electricity bills than other households (1.5 percent) in the state.[5] Market-based solutions are not moving with the necessary speed or intention to meet the needs of the electricity and affordability crises.

At the same time, California has set decarbonization goals that require 100 percent of the state's retail electricity to be supplied by renewables and zero-carbon resources by 2045. The state also faces a deadly and devastating acceleration of wildfires, made worse by its aging, smoke- and heat-susceptible transmission. This combination produces multifold risks for Californians and the environment—from blackouts to profound social, economic, and environmental repercussions. Electrification and deployment of renewable energy resources requires more grid infrastructure to handle electricity flows. Wildfire mitigation and resilience improvements drive additional need for widespread upgrades to grid infrastructure. Grid upgrades, particularly related to wildfire resilience and insurance costs, are driving increased rates for Californians. To rise to this challenge, the state must take a more active role in addressing market failures that have stymied necessary grid buildout and modernization.

The material demands of the grid buildout are straining the grid component supply chain. Key electrical equipment is facing drastic increases in demand resulting in serious shortages, longer lead times, and cost increases. Critical transmission projects are delayed as a result of this market failure; for example, 18 percent of all Southern

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[4] This was a 46 percent increase in residential electricity rates over six years, if adjusting for inflation. Severin Borenstein, "Locating the Electricity Affordability Crisis," *Energy Institute Blog*, January 26, 2026, https://energyathaas.wordpress.com/2026/01/26/locating-the-electricity-affordability-crisis/.

[5] Low-income households here refers to households with annual income less than 200 percent the federal poverty level. Tess Thorman, Patricia Malagon, and Paulette Cha, "Low-Income Households Struggle with the Cost of Electricity Bills," *Public Policy Institute of California* (blog), August 12, 2025, https://www.ppic.org/blog/low-income-households-struggle-with-the-cost-of-electricity-bills/.

California Edison (SCE) transmission project delays are due to long-lead-time components including transformers.[6] Delays have downstream effects on renewable energy and battery storage project interconnection, causing significant delays to important decarbonization and grid reliability projects. California's decarbonization goals are too important to rely on market-based solutions alone.

California is uniquely situated to lead the country by leveraging its size and economic power to advance pro-worker green industrial policy to benefit working class residents.[7] The California Green Manufacturing Initiative (CGMI) presents a timely and creative solution that would centralize procurement of critical electricity grid components to lower cost, while incentivizing new in-state manufacturing where the existing supply chain is falling short.

This report demonstrates how the CGMI can intervene on both supply-side and demand-side barriers to enable a more rapid, cost-efficient grid buildout, deliver affordability for ratepayers, and create high-road, in-state manufacturing jobs for California's workforce.[8] On the demand side, the CGMI would increase efficiency and decrease costs by coordinating the procurement of grid equipment. On the supply side, the CGMI would promote increased production of critical electricity grid components by offering financial incentives or establishing public-private joint ventures with manufacturers to expand or establish new in-state production. The CGMI's remit will span equipment and components needed for the state's transmission and distribution grid.

The coordination of grid equipment procurement paired with an increase in in-state production of components would help lower the cost of grid equipment and electricity bills. Ratepayers stand to see $200 billion in savings over the next 25 years if the cost of electrical equipment stabilizes and declines, rather than continuing to rise at its current pace.[9] The expansion of manufacturing capabilities in the

[6] California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*, https://www.cpuc.ca.gov/-/media/cpuc-website/industries-and-topics/documents/energy/rps/2025/2025-california-renewables-portfolio-standard-rps-annual-report.pdf.

[7] UAW Region 6, with contributions from Isabel Estevez, PhD, "Organize, Industrialize, Decarbonize! A Pro-Worker, Green Industrial Policy for California," UAW Region 6, August 2025, https://www.uawregion6.org/organize-industrialize-decarbonize.

[8] "High-road employment" means employment that is consistent with the job-quality standards and employment practices set forth in subdivision (s) of Section 14005 of the California Unemployment Insurance Code.

[9] See details on modeling in the Appendix.

state for particularly bottlenecked components would not only address shortfalls and speed up the energy transition, but could enable the creation of up to 12,000 full-time jobs in California.

California's grid and energy affordability crisis

California's grid is facing supply chain market failures characterized by critical shortages in grid equipment, sharp increases in cost, and long lead times. The primary driver of this has been a rapid rise in demand for grid infrastructure caused by forecasted electricity demand growth amid escalating climate and wildfire crises that require investment to mitigate risk for communities and critical infrastructure alike. These factors have in turn further delayed decarbonization and wildfire resilience progress while driving up energy costs for ratepayers.

Grid supply chain market failures delay progress and drive up electricity costs

The demand for grid components is straining the supply chain across the electricity grid, leading to major delays and cost increases. Bottlenecks have significantly worsened since the inflection point for supply chains exposed by COVID-19 and have been exacerbated by tariffs and trade restrictions. Tariffs and other trade measures will only further increase competition for grid components needed in California and the raw materials required to build them.

The persistent shortage of electrical and grid components is indicative of market failure in this sector that results from the combination of high fixed costs, uncertain procurement timelines, and degree of customization. A recent investigation by Bloomberg highlights how this interplay of factors has limited transformer availability.[10] Potential manufacturers are uncertain how much unmet demand is belied by current shortages, or how persistent that demand would be if they ramped up production. Given the costs of increasing

[10] Akshat Rathi, Naureen Malik, and Tiffany Tsoi, "The Device Throttling the World's Electrified Future," *Bloomberg*, March 25, 2025, https://www.bloomberg.com/features/2025-bottlenecks-transformers/.

output, they are hesitant to do so. The combination of high fixed costs and uncertainty means the shortage persists.[11]

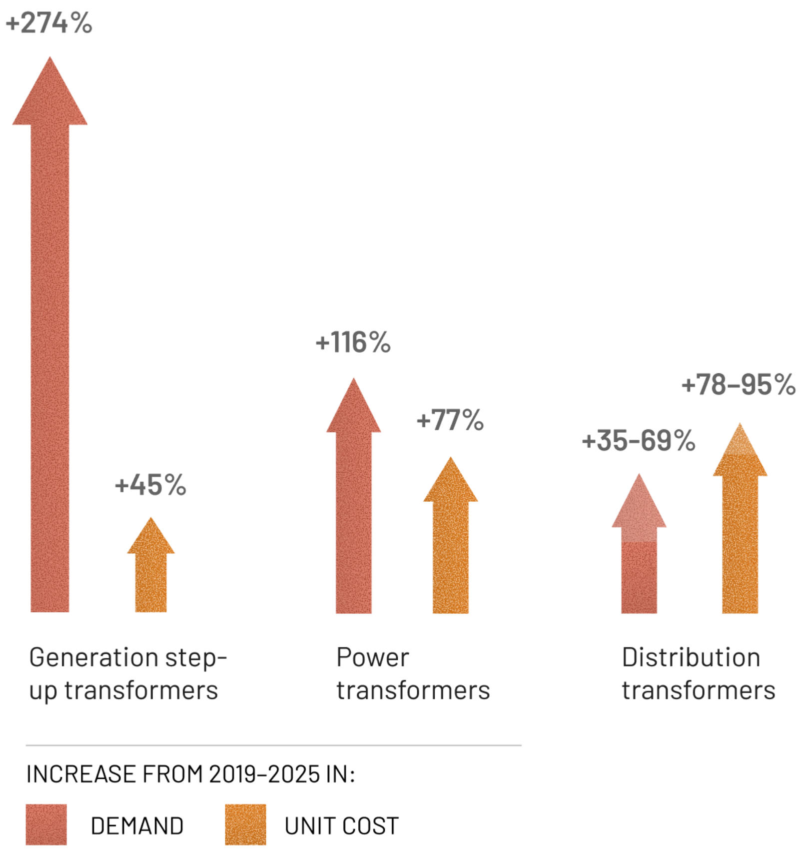
Supply chain bottlenecks are sector-wide but are particularly pronounced for transformers, which have seen the most dramatic increase in demand, cost, lead times, and market deficit as a result. Demand for all transformers—generation step-up, large power, and distribution transformers—has increased drastically since 2019. Global supply has not kept pace with this sharp increase in demand, and the cost of this equipment has skyrocketed. These shortages and cost increases drive up utility spending which gets passed onto ratepayers. The situation is also extending the lead time for the equipment: some transformers now have lead times of nearly three years.[12] And the crisis is not expected to resolve itself anytime soon: demand for transformers is expected to remain high with continued adoption of renewable energy and electrification efforts. For example, the shortage of some distribution transformers is expected to worsen over the next five years due to electrical demand and industrial growth.[13]

[11] Akshat Rathi, Naureen Malik, and Tiffany Tsoi, "The Device Throttling the World's Electrified Future."

[12] Wood Mackenzie, "Making the Connection: Meeting the Electric T&D Supply Chain Challenge Executive Summary in Partnership with American Clean Power," *POWER Magazine*, September 2025, https://www.powermag.com/wp-content/uploads/2026/01/making-the-connection-executive-summary-september-2025.pdf.

[13] Wood Mackenzie, "Making the Connection: Meeting the Electric T&D Supply Chain Challenge Executive Summary in Partnership with American Clean Power."

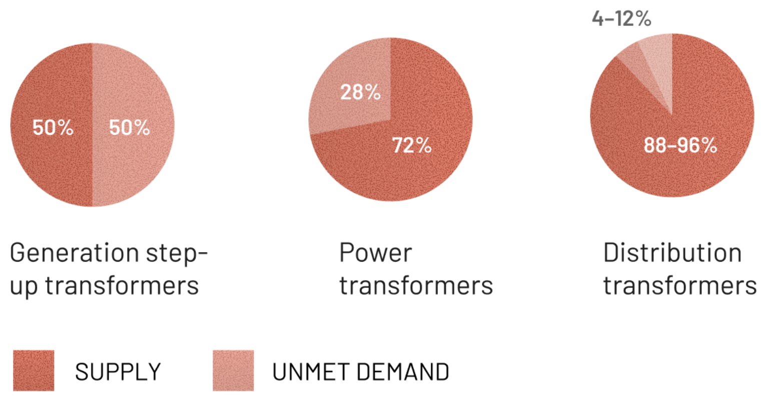
Demand and unit costs for different types of transformers have greatly increased since 2019.



Source: Climate and Community Institute, using data from Wood Mackenzie (2025).[14]

[14] Wood Mackenzie, "Making the Connection: Meeting the Electric T&D Supply Chain Challenge Executive Summary in Partnership with American Clean Power" and Devin Thomas, Benjamin Boucher, and Michael Mendrek-Laske, "Transformer Troubles: Manufacturing and Policy Constraints Hit US Transformer Supply," *Wood Mackenzie*, August 13, 2025, https://www.woodmac.com/news/opinion/transformer-troubles-manufacturing-and-policy-constraints-hit-us-transformer-supply/. Note: distribution transformers include pole mounts, padmount 1 phs transformers, and padmount 3 phs transformers, which is why a range is displayed.

As of 2025, supply is insufficient to meet demand.



Source: Climate and Community Institute, using data from Wood Mackenzie (2025).[15]

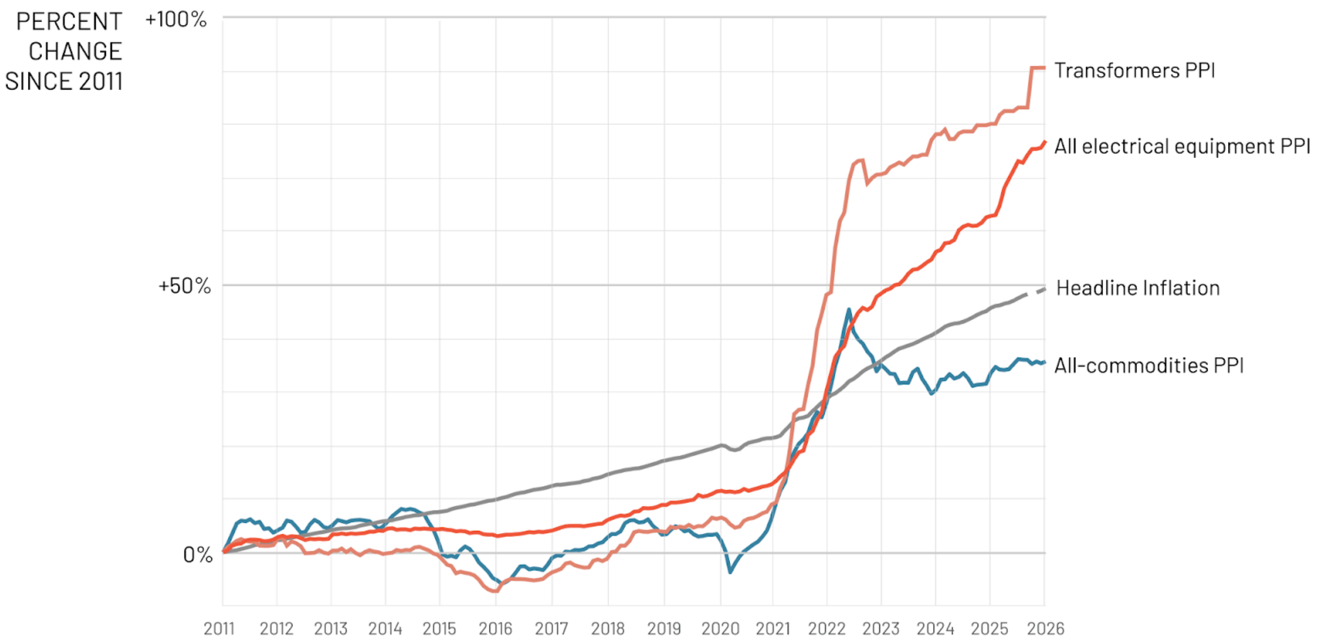
Electrical equipment and transformer costs have risen more rapidly than other commodities and remained persistently high. A comparison of Producer Price Indices (PPIs), which measure the prices received by suppliers in a given sector—and therefore the cost to purchasers— , shows the dramatic rise in electrical equipment and transformer costs following 2020 as compared to the cost of all commodities and overall headline inflation. Between June 2022 and January 2026, the average annual change in the electrical equipment PPI[16] was almost 7 percent, while inflation rose 3.7 percent and the all-commodities PPI fell nearly 2 percent on average annually during the same time period. The electrical equipment PPI and all-commodities PPI moved together until June 2022, at which point the all-commodities PPI decreased and stabilized, while the electrical equipment PPI and transformers PPI continued to rise. The all-commodities PPI, the electrical equipment PPI, and headline inflation all increased at approximately the same rate of 30 percent between January 2011 and January 2022. In the subsequent four years, through January 2026, the all electrical equipment PPI rose by an additional 40 percent while the all-commodities PPI increased by only 6 percent, and inflation only 20 percent, showing the divergence

[15] Wood Mackenzie, "Making the Connection: Meeting the Electric T&D Supply Chain Challenge Executive Summary in Partnership with American Clean Power" and Devin Thomas, Benjamin Boucher, and Michael Mendrek-Laske, "Transformer Troubles: Manufacturing and Policy Constraints Hit US Transformer Supply," *Wood Mackenzie*, August 13, 2025, https://www.woodmac.com/news/opinion/transformer-troubles-manufacturing-and-policy-constraints-hit-us-transformer-supply/. Note: distribution transformers include pole mounts, padmount 1 phs transformers, and padmount 3 phs transformers, which is why a range is displayed.

[16] NAICS sector 3353; this specifically measures the prices received by producers of grid and related equipment, such as transformers, switchgear, generators, and industrial controls. US Bureau of Labor Statistics, "QCEW Industry Codes and Titles (For NAICS Coded Data)," *Quarterly Census of Employment and Wages*, Washington, D.C.: US Bureau of Labor Statistics, last updated May 5, 2022, accessed March 29, 2026, https://www.bls.gov/cew/classifications/industry/industry-titles.htm.

between grid equipment prices and the rest of the market. The rise in price of transformers began sooner and was even more dramatic than within grid equipment more broadly.

Transformer and electrical equipment prices have increased dramatically in recent years, compared to all commodities and overall inflation.



Source: Federal Reserve Bank of St. Louis (FRED) API. **Note**: The Producer Price Index measures the prices received by suppliers in a given sector. Inflation is the headline Consumer Price Index (CPI).

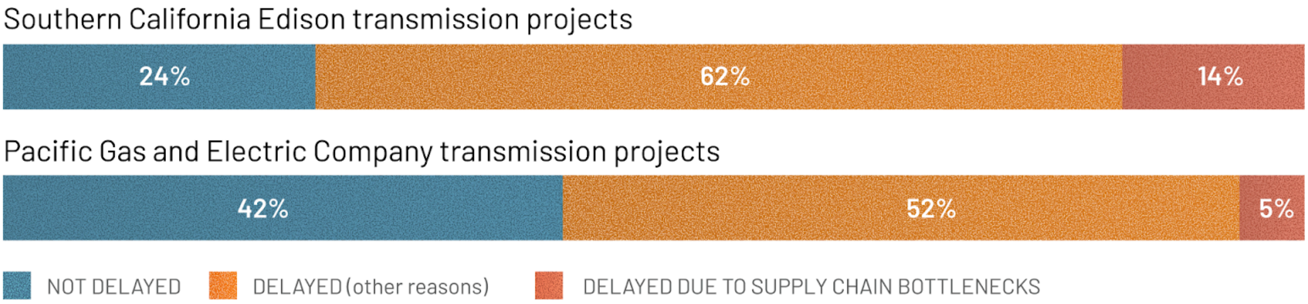
Evidence that shortages in critical grid equipment are already slowing the energy transition is acknowledged by California utilities who report growing lead times for grid equipment have delayed transmission projects, which in turn delay the connection of renewable generation and storage projects. A significant portion of transmission project delays are caused by long equipment lead times or other supply chain shortages.[17]

In SCE and Pacific Gas and Electric Company (PG&E) territory, the majority of transmission projects currently in development or completed in the last five years have been delayed. A substantial portion of these delays have been caused by long lead times or

[17] California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*.

delayed components and have led to median delay times of up to two years. These transmission project delays have directly impacted California's energy transition by holding back renewable energy and battery storage project timelines. Between SCE and PG&E, 13.2 GW of in-development renewable energy and battery storage capacity is delayed or at risk of delay due to a delayed transmission project,[18] representing enough energy to power nearly 10 million homes but which will come online late due to transmission project delays. Nearly half of these delays—6.5 GW of renewable energy or storage projects—are delayed or at risk of delay specifically due to long-lead-time components. A continuation of these transmission project delays will threaten even more renewable/storage projects that are needed to decarbonize California.

A substantial portion of transmission projects are delayed due to supply chain bottlenecks, preventing up to 6.5 gigawatts of renewable power from coming online.



As a result of supply chain bottlenecks in transmission projects, **4.5 GW** of renewable energy and storage projects are delayed, with an additional **2 GW** at risk of delays.

Source: Climate and Community Institute, using data from California Public Utilities Commission (2025).[19] **Note**: The figures above include transmission projects currently in development or completed in the last five years. Supply chain bottlenecks include long lead times and delayed components.

[18] California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*.

[19] California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*.

Drivers of supply chain pressures

Climate goals and growing demand

California's grid needs to expand to meet climate goals and growing demand for electricity, including forecasted demand growth due to data centers.[20] Existing legislation commits California to 100 percent clean energy by 2045[21] which will require a massive buildout in renewable energy (including distributed and utility-scale resources) and battery storage capacity. Corresponding electrification efforts such as adoption of EVs or heat pumps, on top of data center growth, additionally increase the demand for electricity. Even if demand growth is not a major factor for California, electrifying the economy and building renewable energy both require upgrading the electrical grid to handle more flows of electricity, including building out or upgrading electricity lines, substations, and transformers within both the transmission and distribution systems. To meet the needs of the energy transition, the California Independent System Operator (CAISO) estimates that by 2045, over 165 GW of new energy resources will need to come online, including solar, geothermal, wind, and battery storage resources.

Meeting climate goals also requires electrification of buildings, vehicles, and industries. Enabling this transition off fossil fuels and onto electricity requires utilities upgrade distribution grid components responsible for delivering electricity to homes, factories, and other end users.[22] However, cost increases associated with distribution system upgrades are now one of the leading drivers of rate increases for California ratepayers.[23] Ensuring affordable access to grid infrastructure will prevent more cost increases for ratepayers while enabling more rapid decarbonization and resilience efforts needed to protect all Californians.

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[20] California Independent System Operator, "Large Loads," *California ISO*, 2025, https://www.caiso.com/generation-transmission/load/large-load.

[21] 100 percent of the state's retail electricity must be supplied with a mix of Renewables Portfolio Standard (RPS)-eligible and zero-carbon resources by December 31, 2045 and 100 percent of electricity procured to serve all state agencies by December 31, 2035, for a total of 100 percent clean energy. Interim targets are 90 percent by December 31, 2035, and 95 percent by December 31, 2040. See California State Legislature, *California Public Utilities Code § 454.53*, Sacramento, CA: California State Legislature, 2025, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PUC&sectionNum=454.53..

[22] Sydney Forrester, Andrew Satchwell, Galen Barbose, Evan Cappers, Cesca Miller, and Andrew Alberg. n.d. "Retail Electricity Price and Cost Trends MARKET Market and Retail-Rate Knowhow for the Energy Transition," December 2024, https://eta-publications.lbl.gov/sites/default/files/2025-01/retail_price_and_cost_trends_2024_update_final_v3.pdf.

[23] Forrester et al., "Retail Electricity Price and Cost Trends."

Resilience upgrades to address wildfire risk

Surging electricity costs and increased demand for grid components are driven in part by upgrades needed to address aging infrastructure and wildfire resilience needs.[24] Much of the US grid is aging and requires equipment upgrades and replacements to ensure grid resilience and reliability: more than 85 percent of transformers installed across the country are more than 25 years old,[25] with 15 percent more than 40 years old—longer than their expected lifetime. This nation-wide problem is putting pressure on supply chains everywhere, but the effects are acutely felt in California, with the highest electricity costs of the continental 48 states.

California's wildfires, emblematic of the climate crisis, require significant action on multiple fronts to mitigate the worst of their economic, ecological, and social effects—from air quality impacts to devastating instability in the housing sector.[26] "Mega-fires," or fires more than 100,000 acres, have become so frequent that the National Interagency Fire Center no longer tracks them as exceptional events.[27] Exposed and aging transmission infrastructure contributes to increased risk and severity of wildfires, leaving California ratepayers uniquely exposed to risks that increase retail electricity prices. Over the last five years, wildfire-related costs have been the leading driver of electricity rate increases for residents.[28] Costs related to liability insurance and rebuilding damaged infrastructure or undergrounding power lines make up 10–24 percent of utility costs that get passed onto ratepayers, and between the three major California investor-owned utilities, these costs increased, on average, nearly 70 percent in under two years.[29]

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[24] Matt Baker, "Why We Support the Levels of Undergrounding Approved in PG&E's General Rate Case," *Public Advocates Office*, November 17, 2023, https://www.publicadvocates.cpuc.ca.gov/press-room/commentary/231117-undergrounding-pge-grc.

[25] US Department of Energy, "Flexible Transformers Transform the Grid of the Future," *Office of Electricity* (blog), October 29, 2021, https://www.energy.gov/oe/articles/flexible-transformers-transform-grid-future.

[26] Sara Nelson, Patrick Bigger, Micah Elias, and Andrew Schuldt, "High Roads to Resilience," Climate and Community Institute, August 2022, https://climateandcommunity.org/research/high-roads-to-resilience/.

[27] US Department of Agriculture, Forest Service, *Confronting the Wildfire Crisis: A Strategy for Protecting Communities and Improving Resilience in America's Forests*, FS-1187a, Washington, DC: US Department of Agriculture, January 2022, 9, https://www.fs.usda.gov/sites/default/files/Confronting-Wildfire-Crisis.pdf.

[28] Ryan Wiser, Eric O'Shaughnessy, Galen Barbose, Peter Cappers, and Will Gorman, "Factors Influencing Recent Trends in Retail Electricity Prices in the United States," *The Electricity Journal* 38, no. 4: 107516, https://doi.org/10.1016/j.tej.2025.107516.

[29] The Public Advocates Office, "2023–2024 Wildfire-Related Cost Increases of California's Three Major Investor-Owned Electric Utilities," *CA.gov*, June 14, 2024, https://www.publicadvocates.cpuc.ca.gov/-/media/cal-advocates-website/files/press-room/reports-and-analyses/240613-public-advocates-office-electric-ious-wildfire-cost-increases.pdf.

Proposed solution: California Grid Manufacturing Initiative

As envisioned in AB 2516, the CGMI would be implemented by the Energy Unit of the Governor's Office of Business and Economic Development (GO-Biz). The CGMI would empower the Energy Unit to coordinate grid equipment procurement for California utilities and transmission owners. The CGMI would also advance in-state manufacturing capacity for critical electrical grid components. CGMI's purpose would be to increase the availability, affordability, and timeliness of grid equipment by supporting supply chain development to enable California to meet clean power targets and greenhouse gas reduction goals, accommodate new load growth, mitigate grid congestion, and improve grid reliability and resilience. The initiative should be supported with the required staffing and expertise to carry out the functions of the program successfully, including the appropriate staffing to ensure proper coordination with partner agencies.

The CGMI represents a standard industrial policy intervention for California in the face of market failure—and an intervention that would put the state at the forefront of innovations in pro-worker US green industrial policy. Other countries taking similarly bold action are reaping the benefits. In Canada, the government is directly investing millions into expanding transformer manufacturing facilities, and, in one case, creating 500 full-time equivalent (FTE) jobs in the process.[30] The Canadian government is going even further to support manufacturing expansion by backstopping utilities that purchase transformers.[31] The German government is supporting both grid equipment and renewable energy component manufacturers via guarantees and bonds,[32] including guarantees for power converters

[30] Jake MacAndrew, "Canada Invests CAD $40M to Expand Transformer Facility." *DataCenterNews Canada*, September 30, 2025, https://datacenternews.ca/story/canada-invests-cad-40m-to-expand-transformer-facility; Federal Economic Development Agency for Southern Ontario, "Government of Canada Supports Northern Transformer's Innisfil Expansion," *Canada.ca*, September 18, 2025, https://www.canada.ca/en/economic-development-southern-ontario/news/2025/09/government-of-canada-supports-northern-transformers-innisfil-expansion.html.

[31] Akshat Rathi, Naureen Malik, and Tiffany Tsoi, "The Device Throttling the World's Electrified Future."

[32] European Investment Bank, "Germany: EIB and Deutsche Bank to Boost Europe's Wind Energy Manufacturers," *European Investment Bank*, July 31, 2024, https://www.eib.org/en/press/all/2024-308-eib-and-deutsche-bank-to-boost-europe-s-wind-manufacturers.

and substations.[33] In California, the state has accomplished similar goals through strategic procurement for zero-emission buses and bottlenecked drugs through the CalRx program.[34] In the US, the New York City Housing Authority (NYCHA) provides the precedent: the scale of NYCHA's holdings and the standardized building types across its portfolio allow the authority to create large influxes of standardized demand that spur manufacturing investment and bring products to market.[35]

In response to transmission and renewable energy delays, the California Public Utilities Commission (CPUC) has recommended that utilities conduct proactive procurement of certain grid equipment like transformers. They also recommend utilities develop methods to forecast demand on longer time horizons and adjust their procurement volumes accordingly.[36] The CGMI would intervene to mandate utilities to accomplish both of these recommendations.

Process

The CGMI would authorize the Energy Unit to intervene in two important ways: 1) on the demand side by coordinating and aggregating grid equipment procurement; and 2) on the supply side by incentivizing additional in-state manufacturing.

Demand-side intervention: Demand assessment and procurement

The CGMI will undertake procurement of grid equipment on behalf of California utilities, public utilities, regulatory agencies, and

[33] Germany Trade & Invest, "Germany Offers Guarantees for Power Converters," *Gtai.de*, July 9, 2024, https://www.gtai.de/en/invest/industries/energy/germany-offers-guarantees-for-power-converters-179897; German Offshore Wind Energy Association, "Expansion of Offshore Wind Energy: Strengthen Supply Chains and Ports Now!," July 15, 2024, *Bwo-Offshorewind.de*, https://bwo-offshorewind.de/en/ausbau-der-offshore-windenergie-jetzt-lieferketten-und-haefen-staerken/.

[34] Department of General Services (DGS), "2025 DGS ZEV Action Plan," California Governor's Office of Business and Economic Development, December 2025, https://business.ca.gov/wp-content/uploads/DGSActionPlan.pdf; "CalRx - Making Prescription Drugs More Affordable for Californians," *CalRx.ca.gov*, n.d., accessed March 29, 2026, https://calrx.ca.gov/.

[35] Kira McDonald, Daniel Aldana Cohen, and Ruthy Gourevitch, "The Case for a Green New Deal for Public Housing," Climate and Community Institute, March 2024, https://climateandcommunity.org/research/gnd-for-public-housing-2024/.

[36] California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*.

transmission owners.[37] CGMI would take instruction from the CPUC, the California Energy Commission (CEC), CAISO, and other transmission owners on the type and volume of equipment for which it is to send out procurements. CPUC would oversee a planning process by utilities to determine how much and what equipment can be procured ahead of time, ensuring that they incorporate long-term demand forecasting into procurement.[38] CEC would oversee an analogous process for public utilities and CAISO would do so for transmission owners. The planning processes are designed to have key stakeholders (utilities, transmission owners, and regulatory agencies) identify future grid equipment needs and to approve a subset of those amounts and technologies for procurement via the state. The CPUC in particular will also approve an amount to ratebase for the purposes of the centralized procurement process with the public utilities. Once plans are finalized by the respective agencies and a specific amount of procurement is identified, CGMI will be informed and will run a centralized procurement process for the identified equipment. Once a procurement signal is set, participants are mandated to pay for and take delivery of the equipment that is procured. Larger procurement orders can lower or stabilize prices for utilities—and in turn, consumers—by combining the purchasing power of all utilities across California. Avoided delays will provide price stability to buyers and suppliers alike. Procurement would be open to manufacturers from around the globe.

Supply-side intervention: Expanded manufacturing

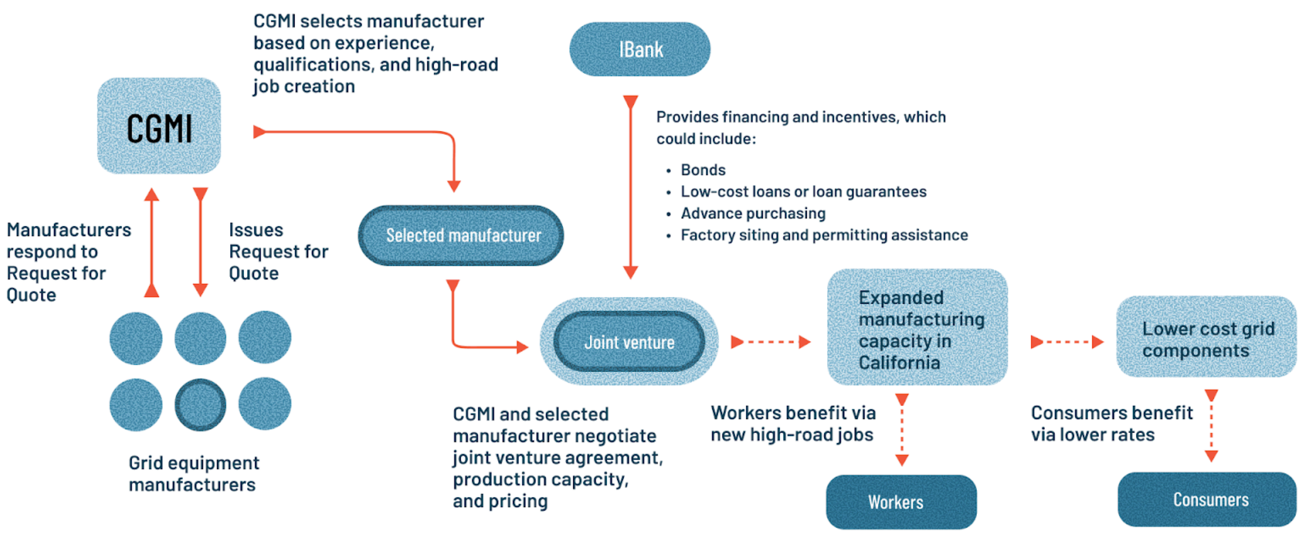
Manufacturer responses to the procurement would inform how much demand can be met and identify barriers to production. If manufacturer responses to procurement indicate that the market cannot meet demand in a timely and cost-effective way, manufacturing capacity can be boosted via state financing which can create new high-road labor standards and relieve supply chain bottlenecks that are slowing the energy transition. The CGMI may

[37] The bill would apply the activities of the CGMI to all “electrical corporations,” defined in Public Utilities Code Section 218 as “every corporation or person owning, controlling, operating, or managing any electric plant for compensation within this state, except where electricity is generated on or distributed by the producer through private property solely for its own use or the use of its tenants and not for sale or transmission to others.” California State Legislature, *California Public Utilities Code § 218*, Sacramento, CA: California State Legislature, effective January 1, 2009, accessed March 29, 2026, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=218.&lawCode=PUC.
[38] California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*.

offer targeted financial incentives and/or enter into joint venture agreements with manufacturers in order to grow in-state manufacturing of grid equipment. Manufacturers meeting competency, experience, and high-road labor standards would be afforded preference, and may be issued revenue bonds via the California Infrastructure and Economic Development Bank (IBank) to expand or establish in-state facilities. Manufacturers may also be selected for partnership via a joint venture with the CGMI; joint ventures would be established to expand in-state manufacturing and create high-road jobs while adding affordable supply of grid equipment in the state. Financial incentives for all manufacturers would be conditioned on measurable public benefits including in-state production, high-road job creation, workforce development, community benefits, and affordability.

California Grid Manufacturing Initiative (CGMI)

If the CGMI identifies a shortage in supply for critical electrical grid equipment, it can incentivize new or expanded manufacturing facilities via joint venture (JV) agreements and other assistance.



Administration and financing structure

The CGMI will be housed within the Energy Unit of GO-Biz. In this role, the Energy Unit will function as the central entity for coordinating the procurement of electricity grid components as well as offering incentives to in-state manufacturers of said grid components. This work will be undertaken in coordination with the CPUC, CEC, CAISO, and IBank and proceed on a rolling basis, which offers several advantages. First, a process is created whereby longer-term demand can be identified by key stakeholders in California and communicated to suppliers. Second, it allows for developers of goods such as transformers to secure long-term commitments so that they can commit to additional production. Third, it allows for modification of procurement needs as bottlenecks, technologies, or the needs themselves change.

The Energy Unit would be authorized to undertake the supply-side activities of the CGMI program: the Energy Unit may issue requests for proposals and other competitive solicitations as well as requests for qualifications to suppliers, manufacturers, and consortia. The Energy Unit, through IBank, may issue revenue bonds to manufacturers that expand or establish in-state production; for joint venture partners, bond financing is also available in addition to low-cost loans or loan guarantees, advance purchase commitments or mandatory offtake agreements, site access, leasing of public land, or permitting assistance. The Energy Unit would submit an annual report to the legislature describing its activities, procurements, manufacturing initiatives, and ratepayer impacts.

The California IBank, on behalf of CGMI, may issue taxable or tax-exempt revenue bonds to finance both procurement and manufacturing of requisite grid equipment.[39] The bonds are not deemed to constitute a debt or liability of the state and are only to be repaid from the revolving fund. In particular, bonds for manufacturing are repaid when sales of grid equipment allow manufacturers to recoup the cash necessary to pay off their initial financing. Bonds for

[39] The bill would create the CGMI Revolving Fund in the State Treasury, within which would exist the Manufacturing Incentive Account and the Procurement Account. Proceeds from the sale of bonds to support manufacturing would go into the Manufacturing Incentive account, while money from the sale of bonds for procurement would be deposited into the Procurement Account.

procurement are repaid when the equipment bought through CGMI is passed onto its final customer, particularly the utilities.

The CPUC will approve the recovery of costs incurred by electric ratepayers through utility equipment purchases. For both sets of bonds issued, the CPUC's ratebasing of equipment purchases and the requirement to take delivery once a procurement commitment is made[40] strongly increases the credit worthiness of the bonds issued through IBank to finance both manufacturing and procurement. New manufacturing initiatives are given certainty that someone will pay for the equipment they will produce and the CGMI will be assured that its expenditures on procurement can be recouped. In the absence of this backstop from ratepayers,[41] the credit rating and resulting yield of the bonds may be highly volatile due to the risks taken on by: (1) CGMI in holding equipment purchased from manufacturers before recouping it, and (2) manufacturers in producing large quantities of equipment without anticipated revenue.

In order to effectively aggregate purchases and harness California's buying power, either the state or ratepayers—or both—must stand behind the aggregated purchases.

Potential strategic focus areas and technology choice

In both demand-side and supply-side interventions, the CGMI would have the freedom to strategically select technologies that it deems critical and suitable for intervention based on the needs expressed by utilities and transmission owners and through strategic priorities. In doing so, the CGMI can bring manufacturing facilities that are of particular importance to the energy transition into California, which will enable the state to meet climate goals and speed decarbonization.

The CGMI would select technologies to procure based on demand signals provided by utilities in the needs assessment. This freedom would enable the CGMI to target components contributing to

[40] The ratebasing of equipment purchases need not mean utilities are not subject to disallowances if, after delivery, the purchases are deemed to be insufficient by the CPUC.

[41] In the current bill language, the backstop is currently provided by ratepayers. It can alternatively be provided by the state as well (either alone or in a shared arrangement with ratepayers).

transmission and renewable/storage project delays in California. If centralized procurement reveals that there is a need for additional supply, the CGMI can incentivize manufacturers to expand or establish new facilities in California. Adding this supply will ultimately reduce the market deficit in grid equipment, enabling utilities to access the technology it needs faster. Additional manufacturing supply in California can also be exported to other states' utilities and transmission owners, ultimately advancing the energy transition for the whole country. By unlocking supply chain shortages, CGMI interventions can release the potential of California-based manufacturing and position the state as a national leader on tackling affordability and decarbonization together. The process for needs assessment and procurement may happen on regularly occurring timelines depending on the technologies selected and the information gathered from utilities and transmission owners. The CGMI would have the power to reevaluate technology needs through this recurring process, adapting the choice of technologies to the needs of the grid.

While transformers mark one of the most dramatic shortages in the grid equipment supply chain at the moment, CGMI's remit would span all critical electrical grid equipment including transformers, cables and wires, power electronics, circuit breakers, reconductors, switchgear, protection and control equipment, communications, and energy storage technology. For example, utilities may indicate sizable demand for advanced grid technologies that could be acquired at lower costs through centralized, bulk procurement.

Specific focus areas might include highly specialized and bottlenecked supply chains that have few players in the United States and none in California. For example, global obstructions of certain technologies like large power transformers are causing cost increases and project delays in the state, yet there is very low-volume production in California and little domestic production overall. In the case of large power transformers, there is a concentrated set of producers who are producing at just-in-time capacity and benefit from price increases, which may disincentivize expansion. There are also high technical demands in expanding production, long lead times, and workforce shortages. Industry practice also leads to delimited opportunities for standardization and cost-cutting. These considerations will influence how fast production can be ramped up to meet current shortages.

Other areas of focus may include those areas where California has some existing manufacturing but still faces bottlenecks and cost increases. Distribution transformer production exists in the state but needs to be ramped up—there may be a case for less-acute cost mitigation per unit in some instances, but expansion for a large component need might potentially also be accomplished more quickly and cheaply than other alternatives. Here, opportunities for mature technologies with more standardization possibilities may be advantageous.

The CGMI may also prioritize technologies that advance California's grid resilience and decarbonization needs. For example, certain advanced transmission technologies (ATTs) such as high-capacity advanced conductors that enhance transmission line capacity and grid reliability are already manufactured in California to some extent. Expansion and cost lowering of such technologies could accelerate an affordable grid buildout for the state. Similarly, advanced meters for behind-the-meter assets may be a strategic technology choice for lowering the cost of meters that enable the use of bidirectional electric vehicles or solar-plus-storage systems, a critical element of decarbonization.

Modeling the benefits of CGMI interventions

The CGMI is intended to bring major benefits to California: it would 1) help lower costs of necessary grid equipment, saving billions for California ratepayers; and 2) bring manufacturing facilities to the state, enabling the growth of thousands of high-road in-state jobs.

Drive down costs

The CGMI will use centralized procurement of grid equipment and expansion of in-state manufacturing to lower the cost of critical grid components for utilities, with savings passed on to ratepayers as required by state law. Centralized procurement would play some role in driving down costs by enabling larger, earlier orders. However, capacity expansion is likely to play a stronger role by using public financing to add supply of affordable components in the state.

The need for cost savings in grid equipment procurement is made clear by the drastically rising costs and shortages found in the supply chain today. The PPI of electrical equipment has risen much faster than the rate of inflation or the PPI of all commodities. Analysis confirms that prices in this sector are a significant driver of utility costs,[42] and recent price spikes have had a critical impact on ratepayer costs as a result.

The goal of the CGMI would be to bring down the cost of critical electric grid equipment. Modeling was conducted to evaluate the impact of potential price declines in electrical equipment which makes up a significant portion of capital spending that utilities pass onto ratepayers. This report evaluates how costs to ratepayers differ under two potential scenarios.[43] The first scenario assumes electrical equipment costs continue to rise at the current rate of about 7 percent per year.[44] The second imagines that electrical equipment for utilities begins to decline at 2 percent annually, as the all-commodities PPI did following June 2022. Modeling included the three large investor-owned utilities (IOUs) in California: Pacific Gas and Electric Company, San Diego Gas & Electric (SDG&E), and Southern California Edison, which represent about three quarters of California electricity customers.

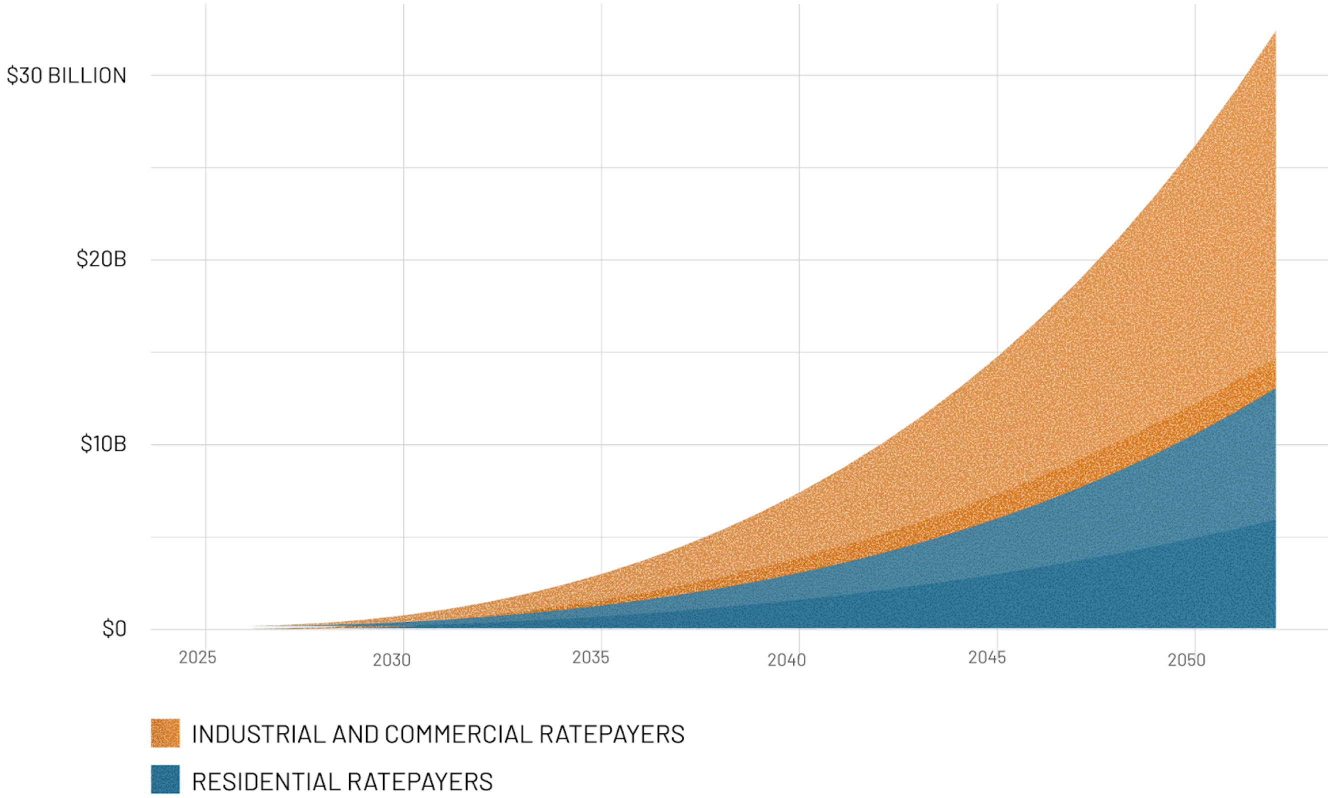
Modeling shows that ratepayers stand to save billions in electricity bills if the cost of electrical equipment goes down. Compared to a scenario in which costs continue to rise at their current rate, the declining cost scenario would lead to $20–$37 billion in cumulative savings by 2040 and $100–$200 billion by 2050, with annual savings growing from $583 million in 2030 to over $26 billion in 2050 at the high end. Savings from even a time-limited price shock are substantial: the effect of recent grid equipment price spikes on 2024 spending alone will be responsible for an estimated $3.2–$4.6 billion in increased ratepayer costs spread over the next 40 years, among customers of California's three large IOUs.

[42] Statistical analysis of the relationship between electrical equipment PPI and utility costs, with price components driven by wildfire resilience removed, confirms that prices in this sector are a significant driver of utility costs that are passed onto ratepayers.

[43] See Appendix for additional information on modeling and methodology.

[44] Calculated from June 2022 to January 2026.

Stabilizing and decreasing the cost of electrical equipment would lead to up to $26 billion in annual savings for California ratepayers by 2050.



Note: The above chart shows a low- and high-range estimate based on two variations of our model. See Appendix for details.

Lower prices for utilities mean lower costs for both residential and industrial ratepayers. For residential ratepayers, cost savings are approximately $150–$300 per household a year on average by 2040 and $500–$1,000 annually by 2050.[45] In addition to these household-level savings, public, industrial, and commercial ratepayers would see savings in the billions across the modeled scenarios, with annual average potential savings for industrial customers in California of $700 million–$1.3 billion by 2040 and $2.2–$4.7 billion by 2050. As the CGMI aims to bring more manufacturing to California, lower electricity rates will only aid in

[45] "2022 Average Monthly Bill-Residential (Data from Forms EIA-861-Schedules 4A-D, EIA-861S and EIA-861U)." n.d. https://www.eia.gov/electricity/sales_revenue_price/pdf/table_5A.pdf.

doing so as the high cost of electricity in the state has historically hindered industrial growth.

Ending bottlenecks for critical grid equipment and lowering prices would benefit Californians in direct and indirect ways, some of which are included in our modeling and others which should be expected but have not yet been modeled. Lower-cost and more reliable electricity drives economic growth and investment broadly while grid stress measurably impedes it.[46] Places with less expensive electricity can have more success in attracting investment in general, but particularly in high-energy sectors like manufacturing and industry—including high-value-added industries like green manufacturing that are currently clustered in the South and Southeast. Lowering energy costs would put California on the high road to accelerating the development of industries required to meet its own needs for the energy transition.[47] Addressing bottlenecks in grid equipment would allow the grid to modernize more cheaply but also more quickly. A modernized grid is less susceptible to sparking and resulting wildfires, and would therefore incur lower insurance costs and subject Californians to less wildfire risk. Direct rate savings from reduced costs are included in our model, but these indirect impacts on investment, high-value-add manufacturing, and wildfire timelines are currently omitted.

The modeling of these cost savings is a multistep process that is described in full in the Appendix to this report. The model is constructed from relationships between grid equipment prices and capital expenditures by utilities and between capital expenditures and revenue requirement, which is how much utilities can collect from ratepayers. The nature of the relationships means that differences in cost for grid equipment are only gradually realized as costs for ratepayers—but these differences accumulate and compound over time. In short, every dollar utilities spend on capital investments in a given year leads to $2.50–$3.00 in ratepayer costs over a period of decades;[48] conversely, every dollar utilities save on capital investments in any year leads to $2.50–$3.00 in ratepayer savings. Long time horizons are necessary to consider the impacts of price

[46] Akshat Rathi and Marilen Martin, "Electricity Is Now Holding Back Growth Across the Global Economy," *Bloomberg*, December 15, 2025, https://www.bloomberg.com/news/features/2025-12-15/electricity-is-holding-back-growth-across-the-global-economy.

[47] Jorge Tamames, "Growing Pains," *Phenomenal World*, August 27, 2025, https://www.phenomenalworld.org/analysis/growing-pains/.

[48] The exact timeframe varies by several factors; CPUC often uses 40 years as a simplifying approximation. California Public Utilities Commission, *2025 California Renewables Portfolio Standard: Annual Report*.

differences for grid equipment on ratepayers. In our modeled scenario, grid equipment prices are continually diverging over time while the impacts of all past differences accumulate; these compounding effects lead to non-linear, increasing growth in ratepayer prices over time. However, even if we used a scenario in which prices do not continue to diverge, costs from prior years would still accumulate over time due to the long time horizon over which they are paid.

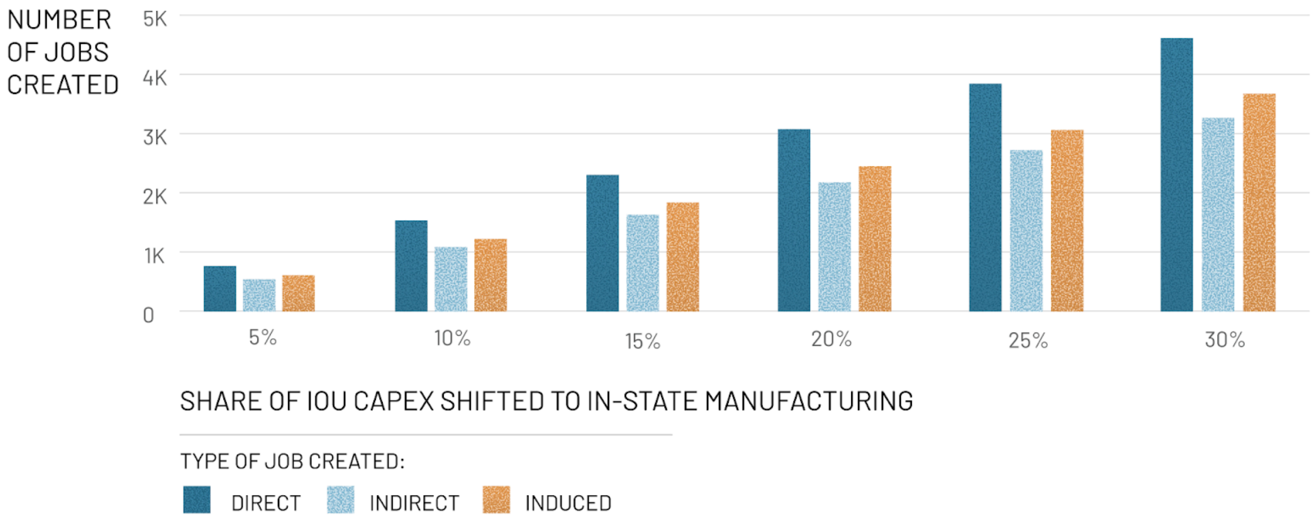
Create high-road jobs in California

The CGMI would promote the creation of high-road jobs in California through its interventions in manufacturing supply chains. Modeling shows that a growth in in-state manufacturing could create as many as 12,000 jobs, including 4,600 directly created in grid equipment manufacturing.[49] These direct jobs would add substantially to the 8,800 jobs in the grid equipment manufacturing sector in CA currently, with an average annual pay of $110,000.[50] The figure below shows the range of job type and job creation potential of scenarios in which in-state production reaches a range of utility equipment spending for the three large California IOUs. Even shifting 5 percent of electrical equipment spending by these utilities to in-state manufacturers could create 2,000 sustained jobs. If in-state manufacturing initiated through this proposal grows to supply electrical equipment to export markets outside the state, the number of jobs generated could grow substantially.

[49] Based on a scenario in which in-state manufacturing supply grows to reach 30 percent of IOU spending on electrical equipment, using IMPLAN projections of CA statewide impact of additional final demand in NAICS sector 3353. More details on methodology are found in the Appendix.

[50] US Bureau of Labor Statistics, "QCEW Data File Documentation Guide," *Quarterly Census of Employment and Wages*, Washington, D.C.: US Bureau of Labor Statistics, last updated September 22, 2020, accessed March 29, 2026, https://www.bls.gov/cew/about-data/documentation-guide.htm.

Growing in-state manufacturing to supply 5 to 30 percent of IOUs' annual capital expenditures would create thousands of new high-road jobs.



Note: See Appendix for details.

Because the CGMI positions the state as a market participant, it provides an opportunity for the state to ensure that the buildout of these critical industries delivers benefits to California workers and communities. As a procurer of equipment, the state would be well positioned to incentivize in-state production and provision of high-road jobs, as it has done in numerous other instances.[51] As a condition of entering a joint venture, the state would be empowered to leverage its power to prioritize manufacturers that ensure high-road job provisions—including workers' voice on the job, industry-standard wages, employer-paid healthcare and retirement, and workforce training or apprenticeship programs. The CGMI may offer targeted financial incentives to manufacturers for new or expanded facilities in the state on the condition of high-road jobs creation and workforce training programs.

Workforce training and development programs are a critical aspect of establishing high-road green manufacturing jobs in California.[52]

[51] Sam Appel and Jessie H.F. Hammerling, "California's Climate Investments and High Road Workforce Standards: Gaps and Opportunities for Advancing Workforce Equity," UC Berkeley Labor Center, September 2023, https://laborcenter.berkeley.edu/wp-content/uploads/2023/09/Californias-Climate-Investments-and-High-Road-Workforce-Standards.pdf.

[52] California Workforce Development Board, "High Road Training Partnerships," *Cwdb.Ca.gov*, accessed March 29, 2026, https://cwdb.ca.gov/cwdb-home/our-programs/high-road-programs/high-road-training-partnerships/.

Advanced manufacturing to drive the green industrial sectors forward requires advanced skillsets and apprenticeships and high-road workforce training ensures access for disadvantaged and dislocated workers to high-quality jobs in industry. Currently, lack of training is a constraining factor for domestic manufacturing of critical electricity grid components, leading to shortages of qualified workers to fill potential jobs. Apprenticeship programs pairing labor and management representatives can and should be empowered to support developing industries to equitably speed the transition to a decarbonized economy. By investing in worker training, California can build a high-road workforce that has the skills and knowledge to lead the country in domestic green manufacturing.

Direct jobs would be created in the grid equipment manufacturing sector by increased demand in the sector. Indirect jobs would link to grid equipment manufacturing by supplying inputs to that sector, such as intermediate components and materials, legal services, warehousing and shipping, or otherwise. Induced jobs would be dispersed throughout California's economy as workers holding direct and indirect jobs spend into local and statewide economies.

Conclusion

The California Grid Manufacturing Initiative offers a triple bottomline. It would intervene with the goals of: 1) reducing costs by streamlining grid component procurement, 2) reducing supply chain shortages by empowering the state to establish additional manufacturing capacity in California, and 3) getting California on track to meet decarbonization and electrification goals while addressing wildfire risk through timely resilience upgrades.

California needs this level of bold, innovative policy action to address the dual crises of climate change and affordability. The state has ambitious climate and decarbonization goals, but supply chain shortages and rising costs of critical grid equipment are slowing progress and increasing ratepayer bills. The state needs to take on the shortages and delays that are plaguing the transmission and distribution grid buildout and affecting renewable energy and battery storage projects downstream. By tackling these challenges head-on, the state can build the infrastructure it needs to deliver in other emerging sectors critical to a just transition, including building a robust and cost-effective offshore wind industry, and develop resilient and localized supply chains that would speed deployment of renewable energy, lower costs to consumers, and empower a high-road union manufacturing workforce within the state.

These interventions would cut costs for ratepayers and create high-road green manufacturing jobs. Modeling shows that if CGMI works to reduce transformer costs and stop the sharp increase currently underway, ratepayers could save $217 billion over the next 25 years. If manufacturing is expanded in California, thousands of jobs could be created: if just 5 percent of utility equipment spending comes from in-state facilities, 2,000 jobs would be created. If in-state production reaches 30 percent of utility equipment spending, the job potential would reach nearly 12,000 sustained jobs. The number could be even higher if in-state manufacturing becomes an exporting sector that supplies utilities outside the state. Enhancing in-state manufacturing and reducing delays in the electrical grid buildout will pave the way for California to bring more renewables online and to achieve necessary wildfire resilience upgrades faster and more affordably.

Appendix

Methodological summary

To model potential cost savings and estimate the effect of electrical equipment prices on revenue requirement, we assembled data from sources described below and then estimated a linear regression model to relate electrical equipment prices, as measured by the Producer Price Index in this sector, to specific subsets of capital expenditures by IOUs. The regression showed a close relationship, which allowed us to model the impacts of counterfactuals of lower electrical equipment prices or different rates of change in PPIs on revenue requirements.

For job estimates, IOU capital expenditures on electrical equipment were used to estimate effective demand that could potentially be created in that sector through a CGMI. This was fed into a statewide IMPLAN number to obtain direct, indirect, and induced jobs.

Cost savings

Data universe

To estimate ratepayer savings, we constructed a model from PPIs for electrical equipment (NAICS 3353), utility data scraped from FERC (Federal Energy Regulatory Commission) Form 1 financial reports, and EIA (Energy Information Agency) datasets on utility customers and sales.

Producer Price Indices measure relative changes in "average selling prices received by domestic producers for their output."[53] PPIs are measured by the Bureau of Labor Statistics (BLS) and are broken down by industry, as defined by their North American Industrial Classification System (NAICS) codes. We focus on the relationship between PPIs and IOU capital expenditures in order to isolate the effect of increasing prices in this sector on expenditures—and therefore also on revenue requirements. PPIs were retrieved from the Federal Reserve Bank of St. Louis (FRED).[54] The electrical equipment

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[53] US Bureau of Labor Statistics, "Producer Price Indexes," *Bls.gov*, July 19, 2008, https://www.bls.gov/PPI/.

[54] Federal Reserve Bank of St. Louis, "Federal Reserve Economic Data," *Stlouisfed.org*, accessed March 29, 2026, https://fred.stlouisfed.org/. Series PCU3353133531, PCU335311335311, CPILFESL, and PPIACO. Other subsectors within NAICS 3353 also included in the PPI plot.

PPI used in this analysis is specifically pertinent to grid equipment used for generating, transforming, and distributing electricity; other categories exist for appliances, computing equipment, etc.[55]

We extracted annual capital spending by the three largest CA IOUs (SCE, PG&E, and SDG&E) for 2011–2024 from FERC Form 1 data,[56] using a script to parse these documents and extract capital expenditures (capex) totals and subcategories. FERC Form 1 data is recognized for its irregularities,[57] but the data was checked for completeness and did contain records for the key fields for all years and IOUs after cleaning.

We extracted this disaggregated capital spending data to isolate spending most sensitive to electrical equipment costs. This data comes from the FERC Form 1 table Electric Plant In Service (accounts 101, 102, 103, and 106). We allocated spending line items in this table to three categories: one for primarily wildfire-driven costs; one for costs insensitive to electrical equipment prices; and a third, which formed the basis for our model, that we hypothesized would be sensitive to electrical equipment prices.

The following table shows how FERC spending categories were allocated to isolate electrical equipment capex. The first column lists line items we identified as primarily driven by wildfire resilience efforts and the second column shows items likely insensitive to electrical equipment prices. The third column is the remainder after subtracting the first two groups from the total, which appears in the FERC data as "Electric Plant in Service." This category of spending was used to estimate the relationship between electrical equipment utility capital expenditures ($capex_e$) and the PPI for electric equipment for our model. We consulted the Code of Federal Regulations electronic archive (eCFR) to understand and categorize these line items.[58]

[55] US Census Bureau, *2022 North American Industry Classifications System (NAICS) Manual, Washington, D.C.: Executive Office of the President, Office of Management and Budget, 2022*, https://www.census.gov/naics/reference_files_tools/2022_NAICS_Manual.pdf.

[56] Federal Energy Regulatory Commission, "FERC EForms Submission History," *Ferc.gov*, 2026, https://ecollection.ferc.gov/submissionHistory. Accessed Form 1 for PG&E, SCE, and SDG&E, 2011-2024. XML and XBRL files.

[57] Federal Energy Regulatory Commission, "FERC Form 1 – Annual Report of Major Electric Utilities," PUDL 2026.3.1.dev33 Documentation, *The Public Utility Data Liberation Project*, 2026, https://catalystcoop-pudl.readthedocs.io/en/latest/data_sources/ferc1.html.

[58] Federal Energy Regulatory Commission, *Title 18 Part 101—Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act*, Washington, D.C.: Electronic Code of Federal Regulations, last amended March 24, 2026, https://www.ecfr.gov/current/title-18/chapter-I/subchapter-C/part-101.

Classification of FERC spending categories used to isolate electrical equipment capex

Wildfire-driven

- Towers and fixtures
- Poles and fixtures
- Overhead conductors and devices
- Underground conduit
- Underground conductors and devices

Not driven by electrical equipment price changes

- Intangible Plant
- Land and land rights
- Structures and improvements
- Distribution services
- Installations and leased property on customers' premises
- Energy storage equipment

All other electrical equipment (used to estimate relationships used in modeling)

The remainder after categories in the other two columns are subtracted from the total, which includes:

- Production equipment
- Miscellaneous and accessory plant equipment
- Line transformers
- Station equipment
- Meters
- All other

The figures below show how both wildfire-driven and other electrical equipment spending categories have both clearly increased very substantially. Figure A2 shows how our aggregated spending categories have increased over time. Figure A3 is a more detailed version of Figure A2 that breaks out many subcategories of spending within these large groupings. Together, these figures show that rising capital expenditures are not being driven solely by wildfire resilience and related efforts, although those are of course major drivers.

Figure A1: Simplified IOU capital expenditures over time

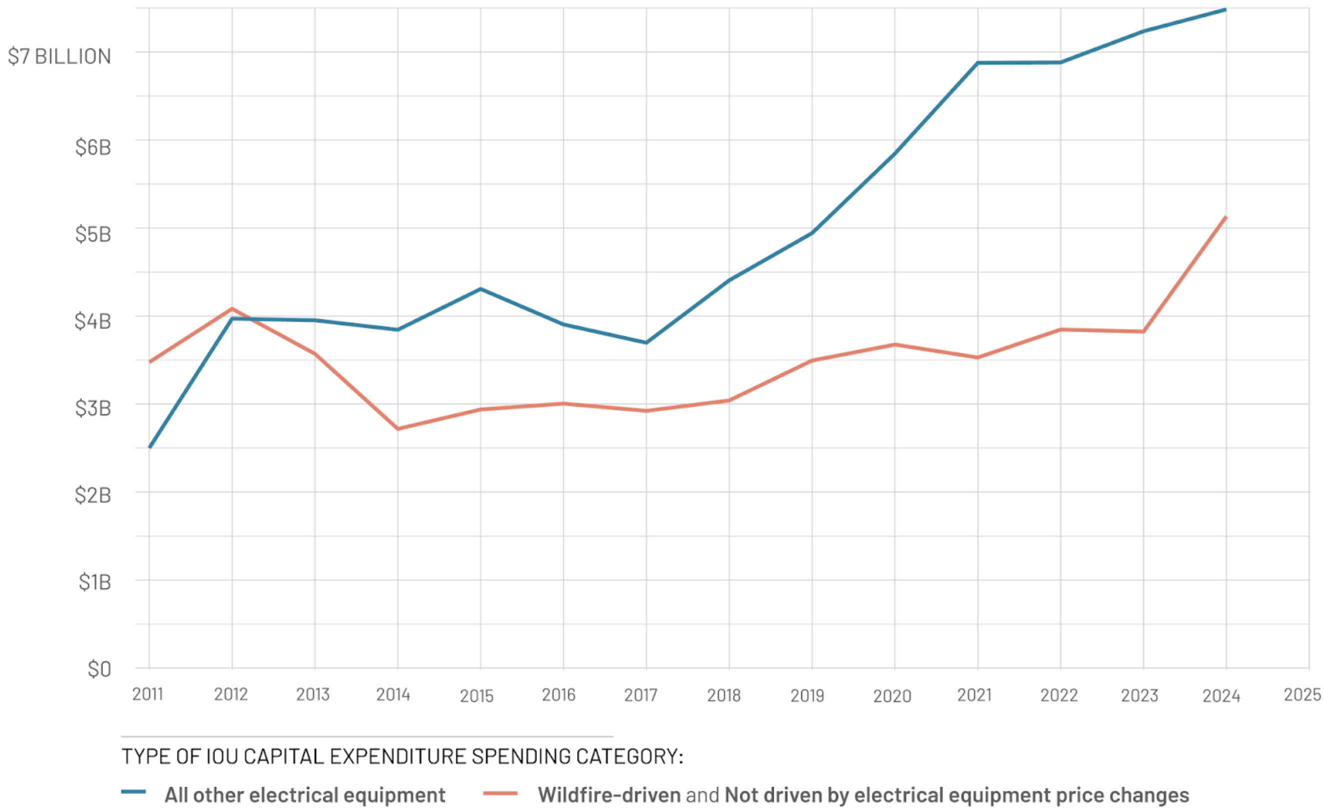


Figure A2: Detailed IOU capital expenditures over time

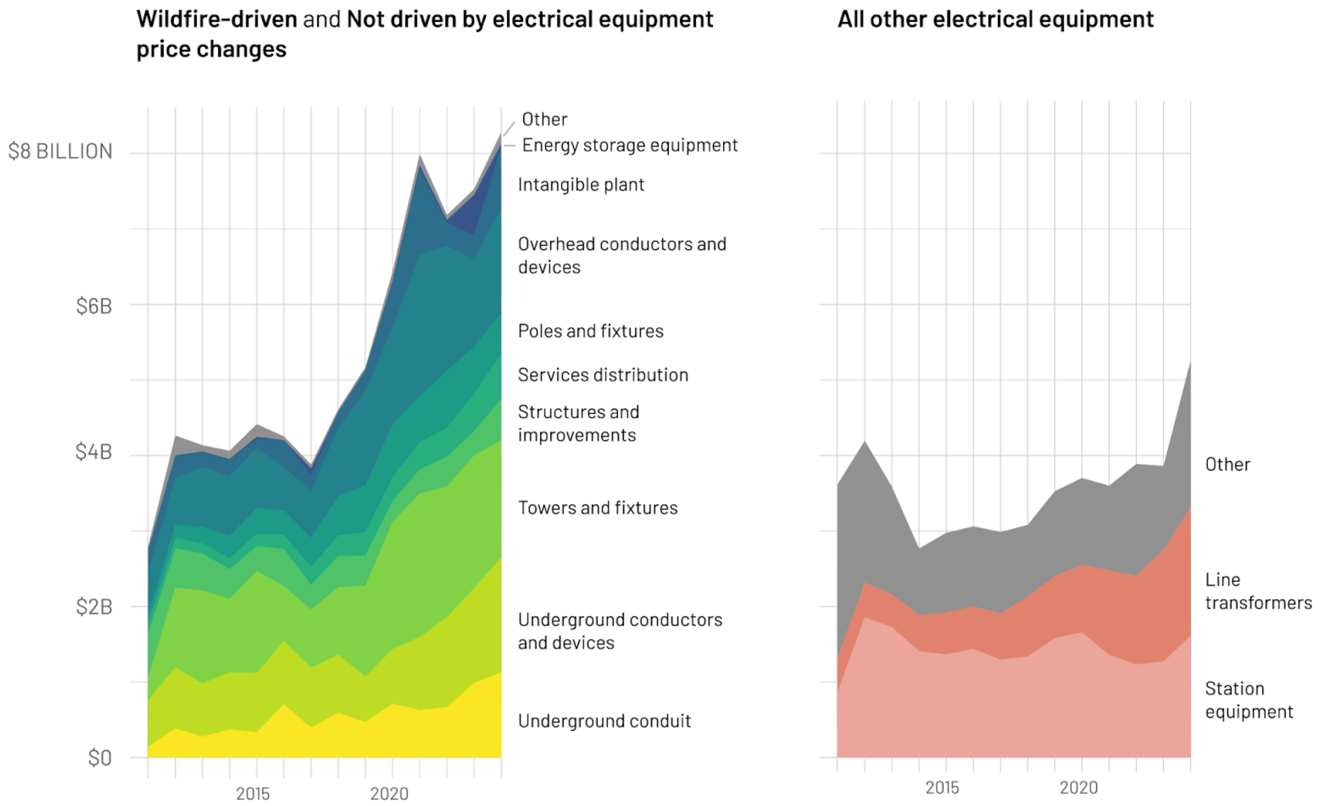
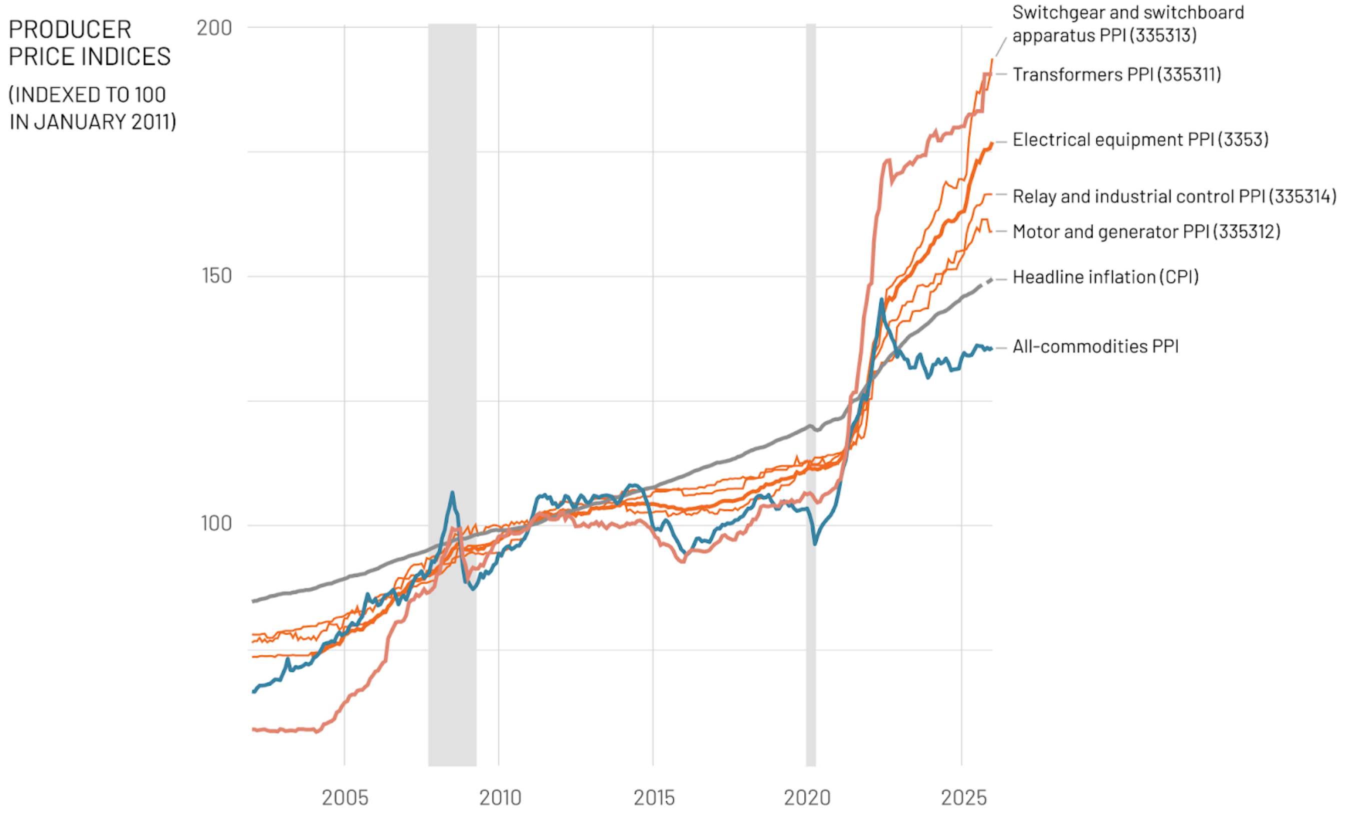


Figure A3 shows how PPIs for relevant categories have changed over time. After 2020, while the PPI for all commodities fell from its peak and then leveled out, the electrical equipment PPI and its subcategories (transformer, motors and generator, switchgear and switchboard apparatus, and relay and industrial control PPIs) rose higher and have continued to rise. Notably, while the electrical equipment PPI closely tracked the all-commodities PPI until June 2022, the all-commodities PPI fell substantially before stagnating, while the electrical equipment PPI continued to rise. This divergence helped construct the logic of our modeled scenarios.

We include headline inflation (Consumer Price Index) and the all-commodities PPI in the plot to provide context, showing how the electrical equipment PPI has continued to rise in recent years while broader measures of prices have fallen or decelerated. These broader measures are also used as robustness checks in our modeling, described below.

Figure A3: Detailed Producer Price Indices over time



Note: Gray vertical bars represent recessions.

Verifying the relationship between PPI and capex

A regression was set up to estimate the impact of electrical equipment prices ($PPI_{electrical}$) on electrical equipment capex ($capex_e$, described above). The functional form selected was:

$$log(capex_e) = B_0 + B_1 * log(PPI_{electrical, lagged}) + B_2 * IOU + B_3 *$$

where $capex_e$ and $PPI_{electrical}$ are as described above, IOU is a categorical variable that varies by utility, and $customers$ is the number of customers served by each IOU in each year, including both bundled and delivery-only. Customer data is from EIA data, Form 861, and retrieved through the Catalyst Cooperative.[59]

[59] US Energy Information Administration, "EIA Form 861 – Annual Electric Power Industry Report," PUDL 2026.2.1.dev33 Documentation, *The Public Utility Data Liberation Project*, 2026, https://catalystcoop-pudl.readthedocs.io/en/latest/data_sources/eia861.html.

Model 1 (low-end estimates)

Model 1, which produced our low-end estimates of projected electrical equipment PPI and subsequent savings to California ratepayers, omitted IOUs from control variables. Model 1 produced a log-lagged $PPI_{electrical}$ coefficient of 0.75. The output for the regression, with heteroscedasticity-robust standard errors, is:

Term	Estimate	Std. error	Statistic	p-value
(Intercept)	-2.591	1.504	-1.723	0.093
$\log(PPI_{electrical,lagged})$	0.754	0.251	2.999	0.005
log(customers)	1.306	0.065	20.196	0.000

R-squared	Adj. R-squared	Sigma	p-value	AIC	BIC	Observations
0.9138	0.9090	362.2008	0.0000	-11.892	-5.238	39

Model 2 (high-end estimates)

Model 2, which produced our high-end estimates of projected electrical equipment PPI and subsequent savings to California ratepayers, omitted IOUs from control variables. Model 2 produced a log-lagged $PPI_{electrical}$ coefficient of 1.16. The output for the regression, again with heteroscedasticity-robust standard errors, is:

Term	Estimate	Std. error	Statistic	p-value
(Intercept)	35.98	37.772	0.953	0.348
$\log(PPI_{electrical,lagged})$	1.16	0.424	2.724	0.010
IOU: San Diego Gas & Electric Company	-3.47	3.370	-1.030	0.310
IOU: Southern California Edison Company	-0.20	0.178	-1.125	0.269
log(customers)	-1.30	2.538	-0.512	0.612

R-squared	Adj. R-squared	Residual std. error	p-value	AIC	BIC	Observations
0.9171	0.9073	365.4623	0.0000	-9.4224	0.5590	39

A number of variations were considered, including variations using $PPI_{all\ commodities}$ instead of $PPI_{electrical}$ or omitting PPI entirely. These were substantially worse at predicting spending, in line with expectations. Omitting the lag on PPI also worsened the model diagnostics. The two models described above were selected based on model diagnostics (especially AIC and BIC) compared to reasonable alternatives. Model 1, which omits IOU from its controls, has a coefficient of 0.75 for log-lagged $PPI_{electrical}$, and provides the lower end of our estimates. Model 2 includes IOU with its controls, has a coefficient of 1.16, and provides the higher end of our estimates. The coefficients for log-lagged $PPI_{electrical}$ from the two models imply that a 1 percent increase in PPI would yield a 0.75 or 1.16 percent increase respectively in $capex_e$.

As described above, we subtract spending categories closely associated with wildfire hardening efforts from the independent variable of this regression. Although electrical equipment costs very likely increase the costs of wildfire-hardening capex as well, the timing of the major price spikes closely aligns with increased wildfire resilience, so leaving these categories in our regression would have introduced multicollinearity that would have biased model estimation.

Counterfactuals: From lower prices to lower rates

Confirming this relationship and assembling the above data allowed us to model the impact of hypothetical or counterfactual conditions of prices, including:

1) What if 2024 capital spending had not been subject to the massive relative price increases in electrical equipment beginning in 2022?

2) How would costs to ratepayers differ in a future in which $PPI_{electrical}$ keeps rising at its current rate versus one in which it declines at the rate of all-commodities PPI from June 2022 to January 2026? (Figure A4)

For each of these counterfactuals, we can convert differences in PPI to differences in IOU capex. This, in turn, can be converted to revenue requirements over time—the costs that utilities are authorized to collect from ratepayers—through a formula described by CPUC in the 2025 SB695 report.[60]

In short, capital expenditures will add depreciation expenses and a return on undepreciated investment to the revenue requirement every year, until the asset is fully depreciated. We follow CPUC's example in this document and use a 40-year depreciation period for the modeling. However, while the CPUC uses a return on investment in their example that shows each dollar spent on capex adding a little over $3 added to the revenue requirement over a period of decades, we use a lower debt-weighted rate of return of just over 7.5 percent.[61] Note that the 40-year depreciation period means that high costs of capital are paid for over a very long period of time.

Our model focuses on California's three big IOUs and omits small IOUs and publicly owned utilities. The inclusion of small IOUs and publicly owned utilities would increase the magnitude of potential savings. The three IOUs we included in our model serve roughly 75 percent of CA ratepayers.[62] Per-household costs are scaled to the portion of households served by these utilities (including both bundled and delivery-only).

In both of these counterfactuals, estimates are derived from relationships between the PPI and the non-wildfire and non-electrical spending categories, as described above. This is another factor that adds some conservatism to our estimates: the spike in $PPI_{electrical}$ coincided very closely with increasing spending on wildfire resilience, and this multicollinearity would compromise efforts to estimate the relationship between PPI and spending in wildfire categories. However, conduit, cables, and other equipment in these removed categories are also subject to supply chain challenges and shortages that could also be addressed by this proposal.[63] These excluded

[60] California Public Utilities Commission, *2025 Senate Bill (SB) 695 Report*, California: September, 2025. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2025/2025-sb-695-report_093025.pdf. See Figure 1: "Comparison of Timing of Cost Recovery of $1 Billion." Contribution to revenue requirement was equal to $RoR * (C - AD) + D_j$, where *RoR* is the rate of return, *C* is the initial cost or capital expenditure; *AD* is accumulated depreciation; and D_j is depreciation in year *j*.

[61] California Public Utilities Commission, *CPUC Cost of Capital Decision*, A.25-03-010, Sacramento, CA: California Public Utilities Commission, December 18, 2025, https://www.cpuc.ca.gov/-/media/cpuc-website/industries-and-topics/documents/energy/electric-energy/electric-costs/cost-of-capital-fact-sheet.pdf.

[62] Gabriel Petek, "Assessing California's Climate Policies—Residential Electricity Rates in California," Legislative Analyst's Office, January 7, 2025, https://lao.ca.gov/Publications/Report/4950.

[63] International Energy Agency, "Building the Future Transmission Grid," International Energy Agency, February 25, 2025, https://www.iea.org/reports/building-the-future-transmission-grid.

buckets of spending—which will continue to grow as wildfire risk and climate change continue to increase—would constitute additional savings if they were included.

The first counterfactual is a simple exercise imagining if the capex by the three big IOUs in 2024 had been at 2019 prices instead of 2024 prices. How much would ratepayers save, from just this one year of capital expenditures, if the post-2020 price increases never happened? Because capex is added to the revenue requirement over time, these savings would be realized over time, but they are large. From just the one year of spending, ratepayers would save $4.6 billion over the following 40 years. A total of $1.8 billion of this would be for residential ratepayers, based on the approximately 40 percent of IOU revenue typically drawn from residential ratepayers.[64] This would amount to roughly $60 of savings per California household for one year of spending at different prices, as well as billions in savings for public, commercial, and industrial customers.

The second counterfactual, which models longer-term future conditions, necessitates additional complexity, but likely gives a fuller idea of impacts that could be reasonably expected if electrical equipment prices are brought under control. Due to the long time horizons of paying for capital expenditures, the effects of different price levels accumulate over time.

Scenario 1: $PPI_{electrical}$ continues to rise at the rate it did from June 2022 to January 2026: 6.94 percent per year.

Scenario 2: $PPI_{electrical}$ declines at the rate that $PPI_{all\ commodities}$ did from June 2022 to January 2026: –1.86 percent per year.

First, two parallel scenarios for future PPIs are constructed. These scenarios extrapolate recent trends into the future. Specifically, Scenario 1 extrapolates the average annual percent change in electrical equipment PPI from June 2022 to January 2026 into the future (6.94 percent), while Scenario 2 extrapolates the trend over the same time period for the all-commodities PPI into the future (–1.86 percent). This allows a comparison between the continuation of the most recent trend and a hypothetical: what if electrical equipment PPI started following the all-commodities PPI trend? Figure A4 shows

[64] EIA data (also Form 861). See US Energy Information Administration, "EIA Form 861 – Annual Electric Power Industry Report." See also Gabriel Petek, "Assessing California's Climate Policies—Residential Electricity Rates in California."

how the electrical equipment PPI grows or decreases in these scenarios, while Figure A5 helps illustrate the logic of how these scenarios were constructed: electrical equipment and all-commodities PPI moved together until June 2022, at which point all-commodities PPI decreased and stabilized, while electrical equipment PPI continued to rise. Scenario 1 notably uses a conservative assumption that improvement will only happen at a rate already seen by the all-commodities PPI from June 2022 to January 2026, even though the proposal is designed to address supply chain and market power issues that would still be reflected in that all-commodities PPI. It should be noted that our projections are annualized, while historical PPI data is monthly. Projecting PPI into the future allows us to use the relationship between price and expenditure to estimate future spending levels by IOUs across price scenarios.

Figure A4: Modeled electrical equipment PPI projection scenarios

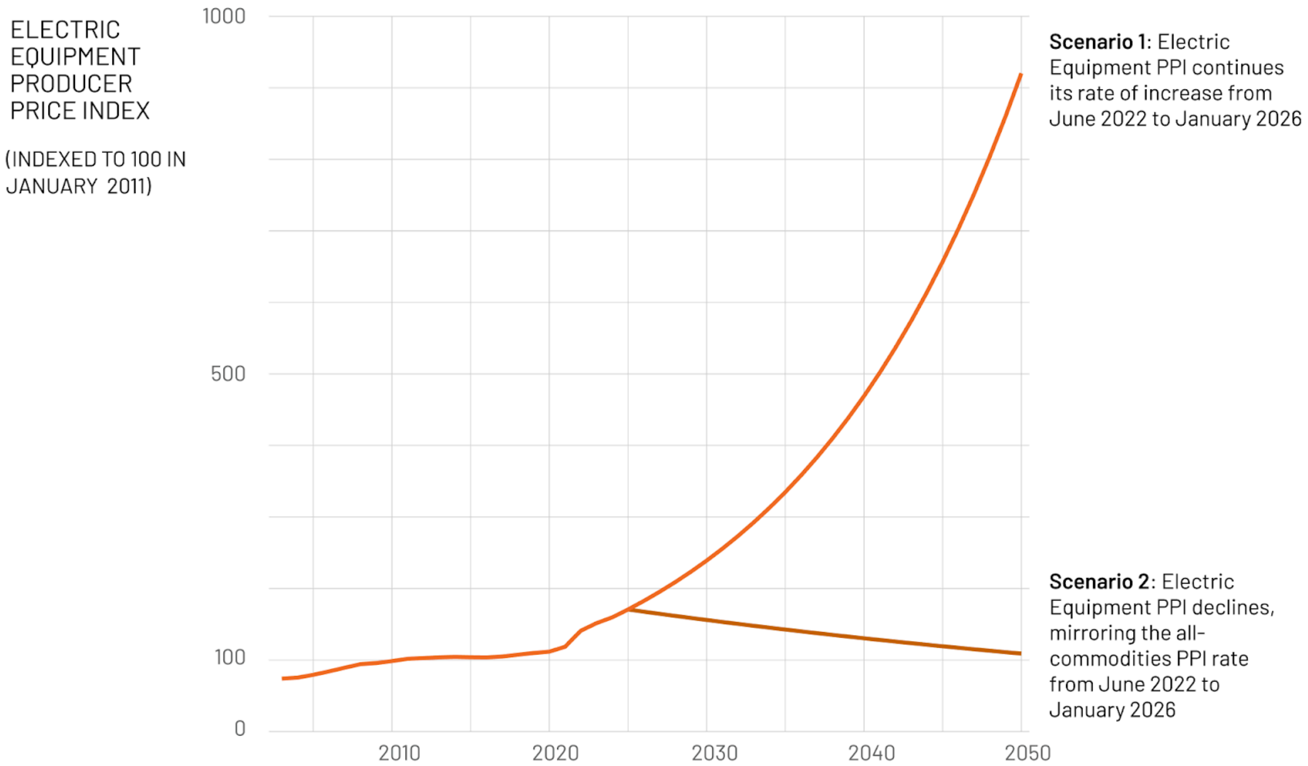
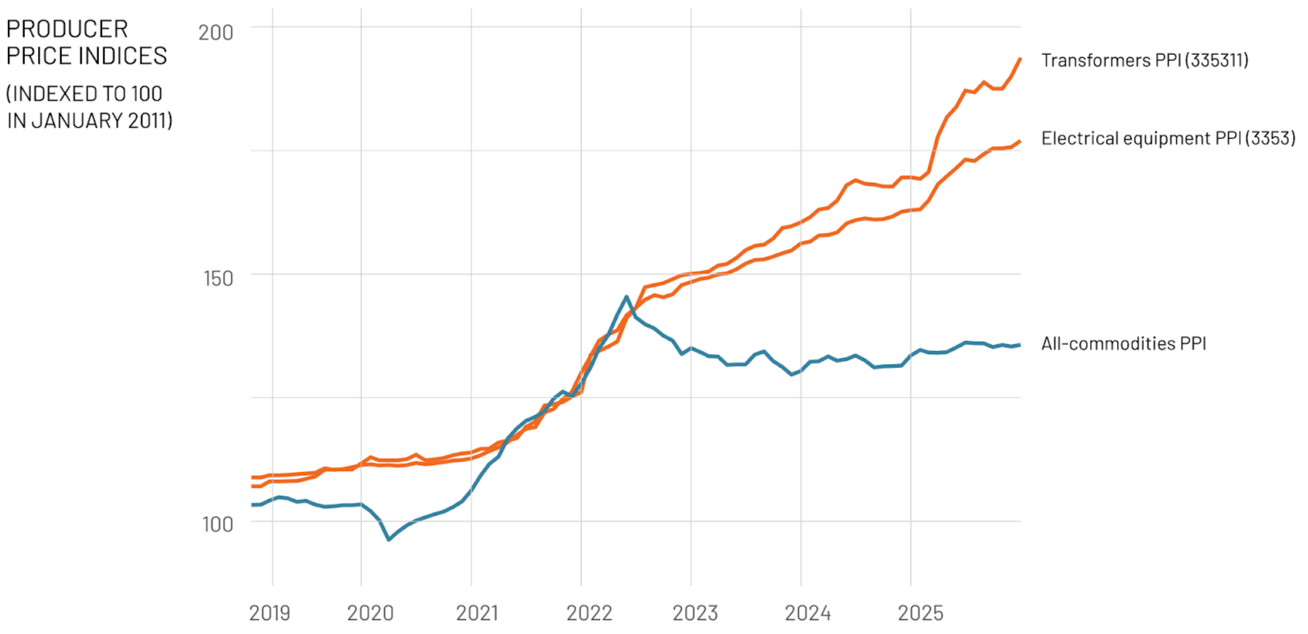


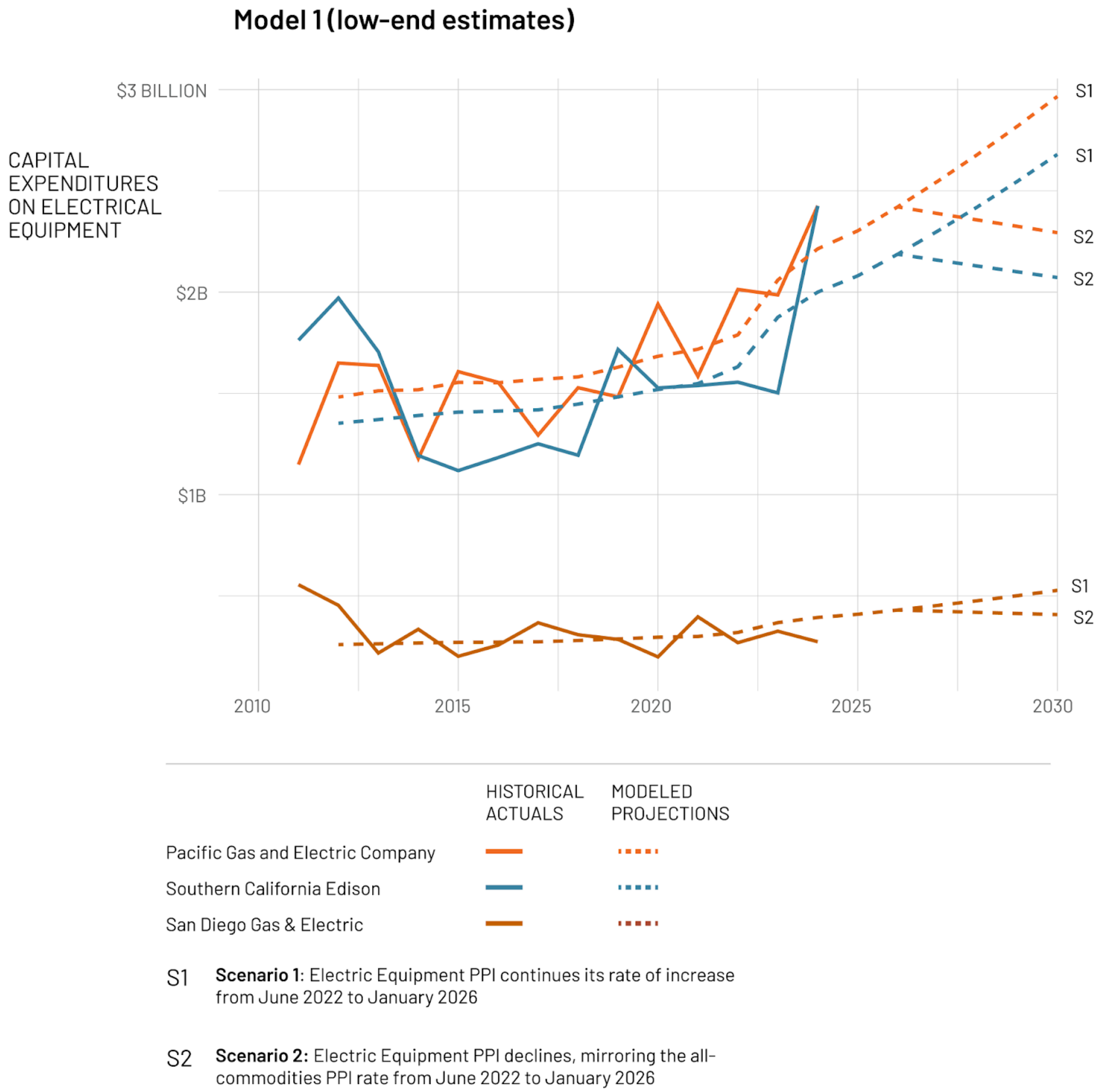
Figure A5: Recent PPIs for major categories

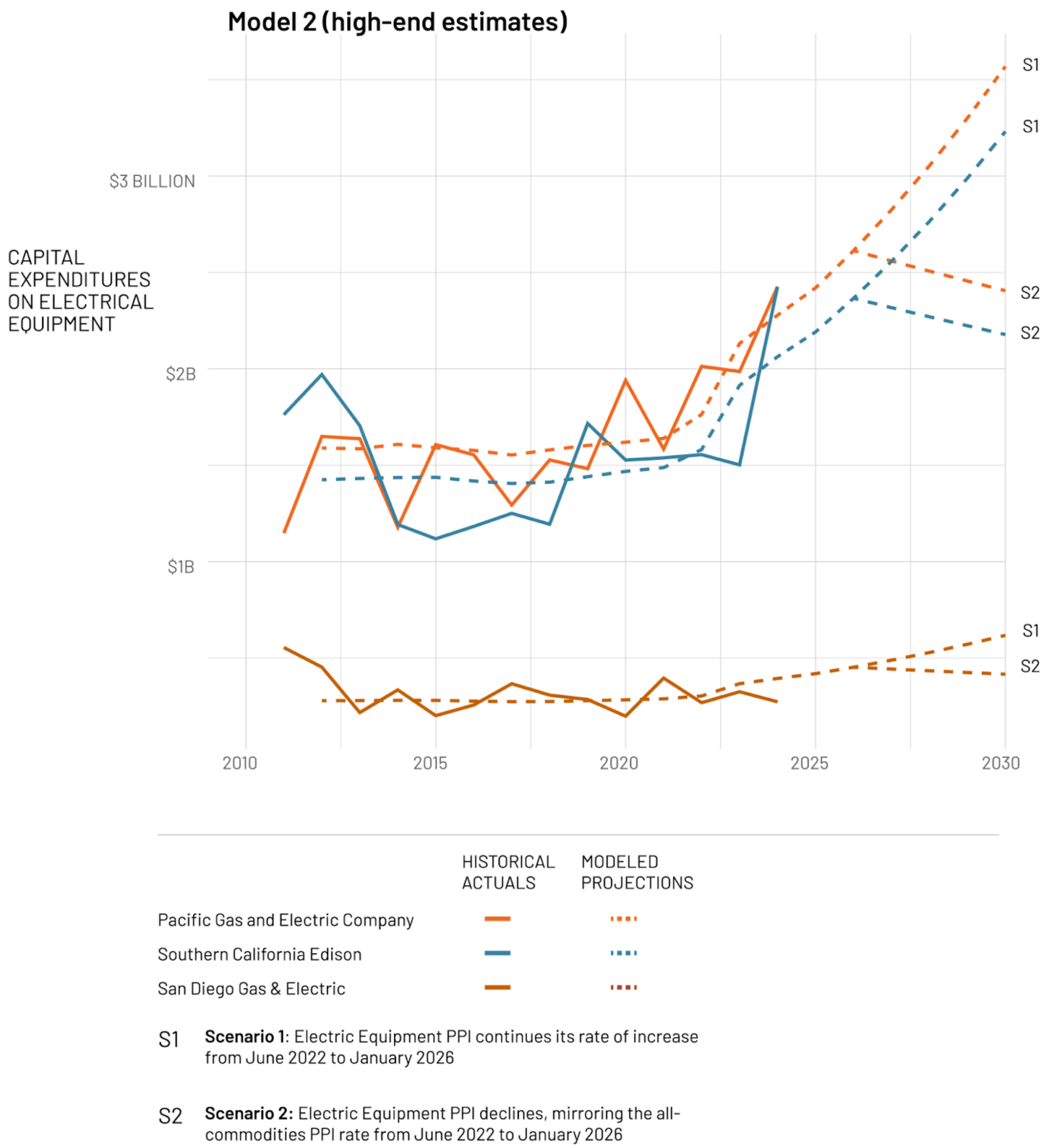


Modeling future scenarios also required projections for future customers by IOU, because $log(customers)$ was a control variable in our cost regression. To keep our model as simple as possible and focus estimated impacts on the counterfactual being considered, we simply extend existing customers into the future.

Figure A6 shows how model-predicted electrical equipment capex (dashed lines) differ from actuals (solid lines) from 2011–2024 for each of the three major IOUs, and how predictions begin to diverge as the cost model is applied across the different price scenarios. Figure A6 includes projections for both regression models. Due to the use of lagged PPI in the regression, the forecasted scenarios do not begin diverging until 2027.

Figure A6: Historical actual electrical equipment capex versus modeled projections for each scenario and major IOU

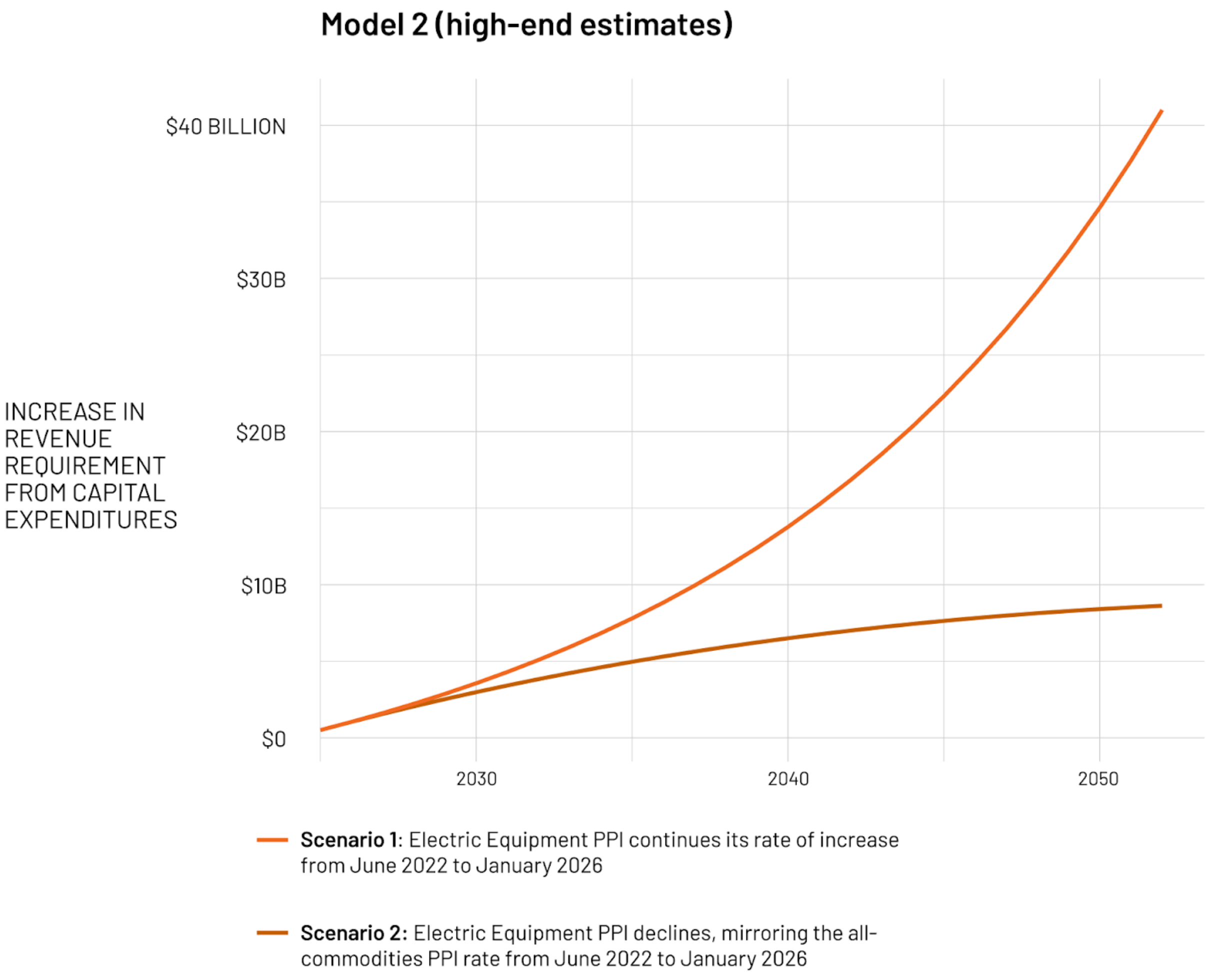




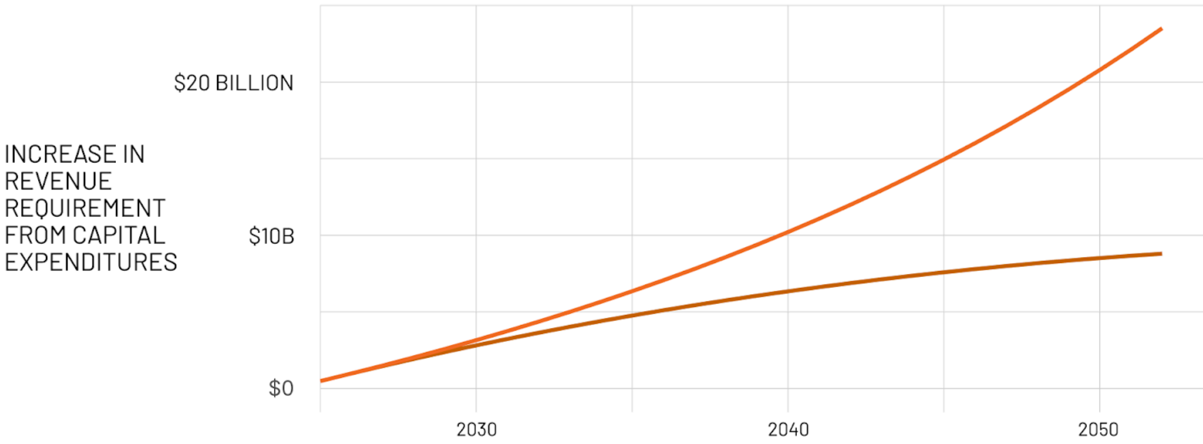
With capex modeled across these different scenarios, one with electrical equipment prices continuing to rise and the other with them beginning to fall, we can show the magnitude of the impact of electrical equipment price increases on CA ratepayers. The impact of capex on revenue requirement was described above; we use the same formula and 40-year depreciation period, and the same 40 percent of revenue from residential ratepayers as we did in the first modeled counterfactual. Notably, this means that none of the costs that accumulated throughout the 25-year modeling period we used (from 2026–2052) will be fully paid off by the end of the modeled period: Spending from even the very beginning of this modeling period would still be getting passed onto ratepayers after 2050. As the scenarios are extended farther into the future, the differences between them become increasingly stark, as PPIs continue to diverge and as the capital investments that still need to be paid off continue to accumulate.

Figure A7 shows how the total revenue requirement from capex diverges in each scenario. In Model 1 (low-end estimate), the difference reaches $13 billion by 2050. In Model 2 (high-end estimate), it reaches $26 billion by 2050.

Figure A7: Total revenue requirement from electrical equipment capital expenditures over time, by scenario



Model 1 (low-end estimates)



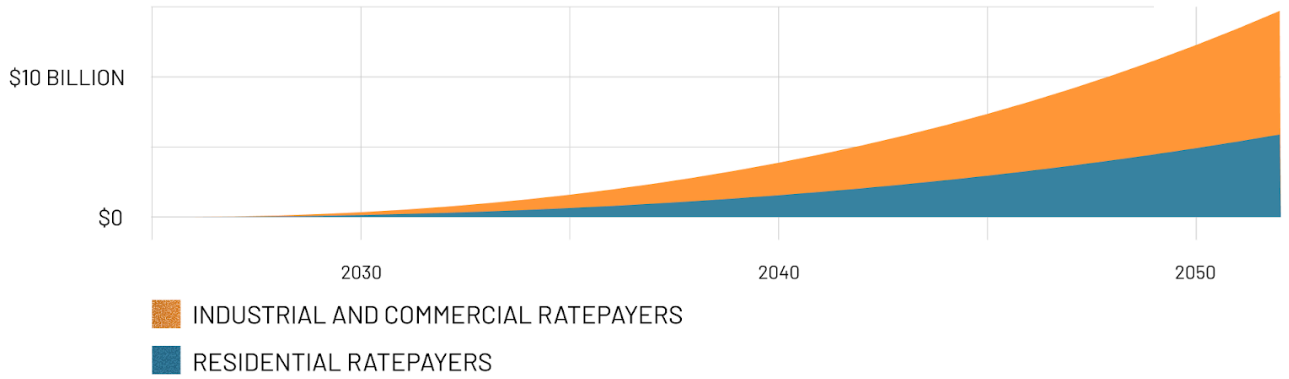
Scenario 1: Electric Equipment PPI continues its rate of increase from June 2022 to January 2026

Scenario 2: Electric Equipment PPI declines, mirroring the all-commodities PPI rate from June 2022 to January 2026

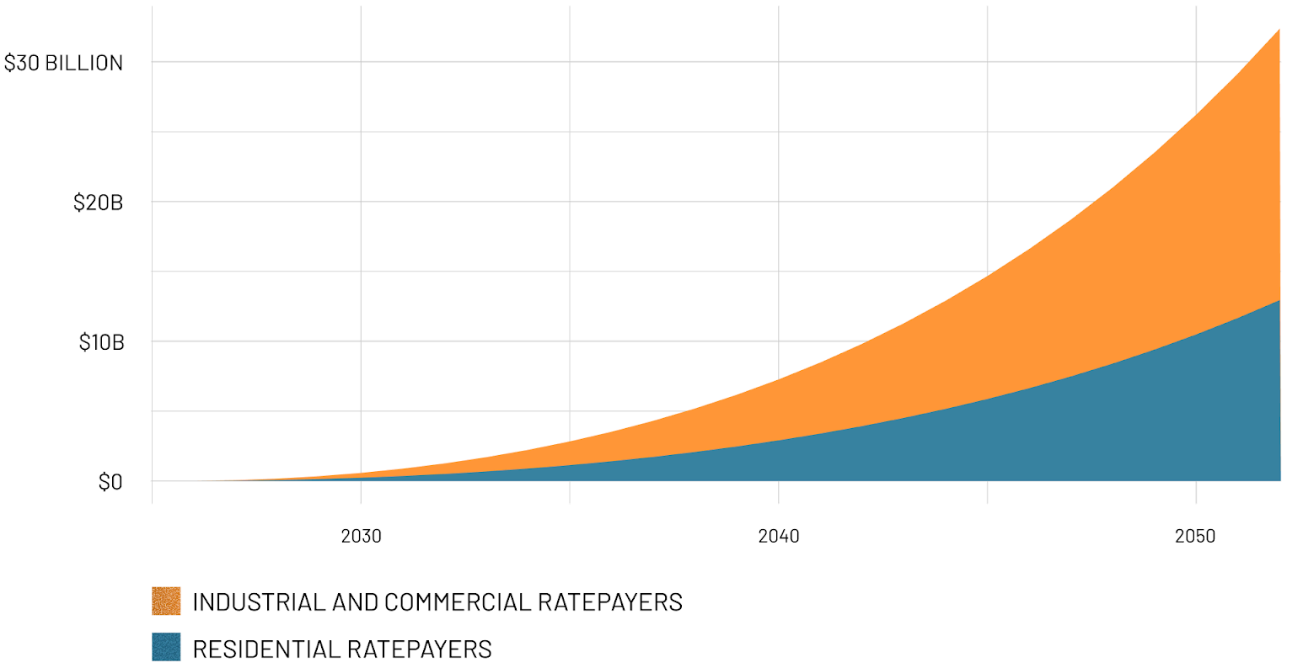
Figure A8 shows the annual potential savings to CA ratepayers, or the difference in revenue requirements from capex, across the two scenarios over time. This difference grows in a compounding fashion, but becomes significant quickly: total ratepayer savings reach $342 million (in Model 1) to $583 million (in Model 2) by 2030 and $3.9 billion (Model 1) to $7.3 billion (Model 2) by 2040. Cumulative, rather than annual, savings reach $20 billion (Model 1) to $37 billion (Model 2) by 2040, or $100 billion (Model 1) to $200 billion (Model 2) by 2050.

Figure A8: Modeled annual savings to ratepayers

Model 1 (low-end estimates)



Model 2 (high-end estimates)



Jobs estimates

As noted, IOU capital expenditures on electrical equipment were used to estimate effective demand that could potentially be created in that sector through a CGMI, and we used this as an input in a statewide IMPLAN number to obtain direct, indirect, and induced jobs. We included some FERC Form 1 spending categories that had been placed in the "wildfire-driven" cost category, as described above, which have experienced shortages and could be eligible to be addressed by CGMI interventions. These included both overhead and underground conductors, conduit, and devices. These categories were added to $capex_e$, described above. Average spending from 2020–2024 was used as the total effective demand to IMPLAN sectors selected to re-create the same NAICS sector 3353 used above.[65] Because the CGMI is flexible in how much in-state manufacturing it would anticipate or incentivize, we modeled jobs using this input-output methodology if anywhere between 5 and 30 percent of the large IOUs' capital expenditures were met through new, in-state manufacturing.

This modeling approach bases potential jobs on the needs of in-state utilities; therefore, if in-state grid manufacturing became an export sector that supplied utilities outside the state with equipment as well, the potential number of new jobs could expand substantially. This is a reasonably likely possibility but was not included in the modeling.

Share of IOU capital expenditures met through new in-state manufacturing	Direct jobs	Indirect jobs	Induced jobs	Total jobs
5%	770	545	614	1,929
10%	1,540	1,091	1,227	3,858
15%	2,310	1,636	1,841	5,788
20%	3,081	2,182	2,454	7,717
25%	3,851	2,727	3,068	9,646
30%	4,621	3,273	3,682	11,575

[65] IMPLAN industrial sectors mapped to six-digit NAICS codes, so we took an average of the four subsectors included in NAICS 3353. These included IMPLAN 314, 315, 316, and 317.