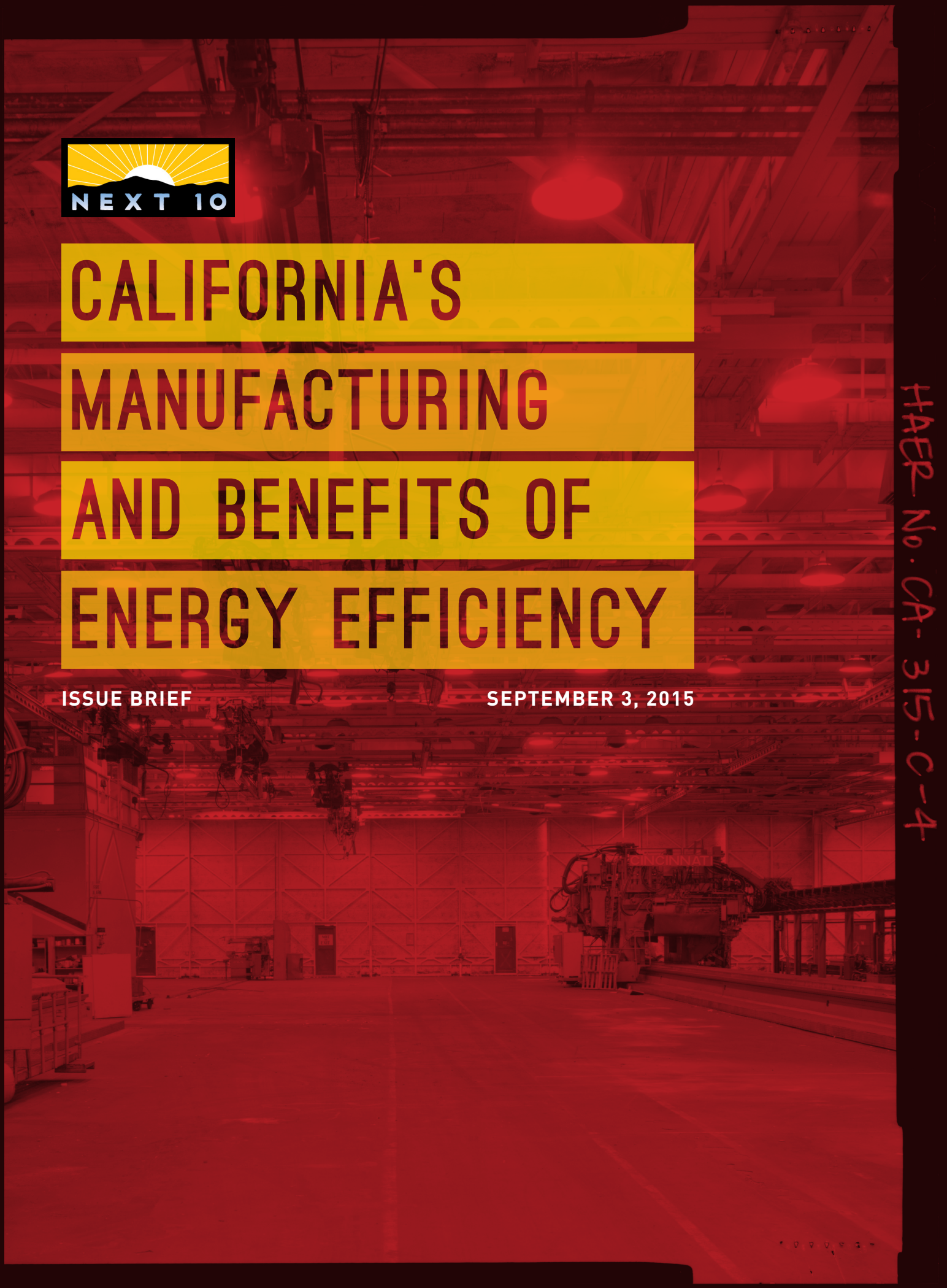
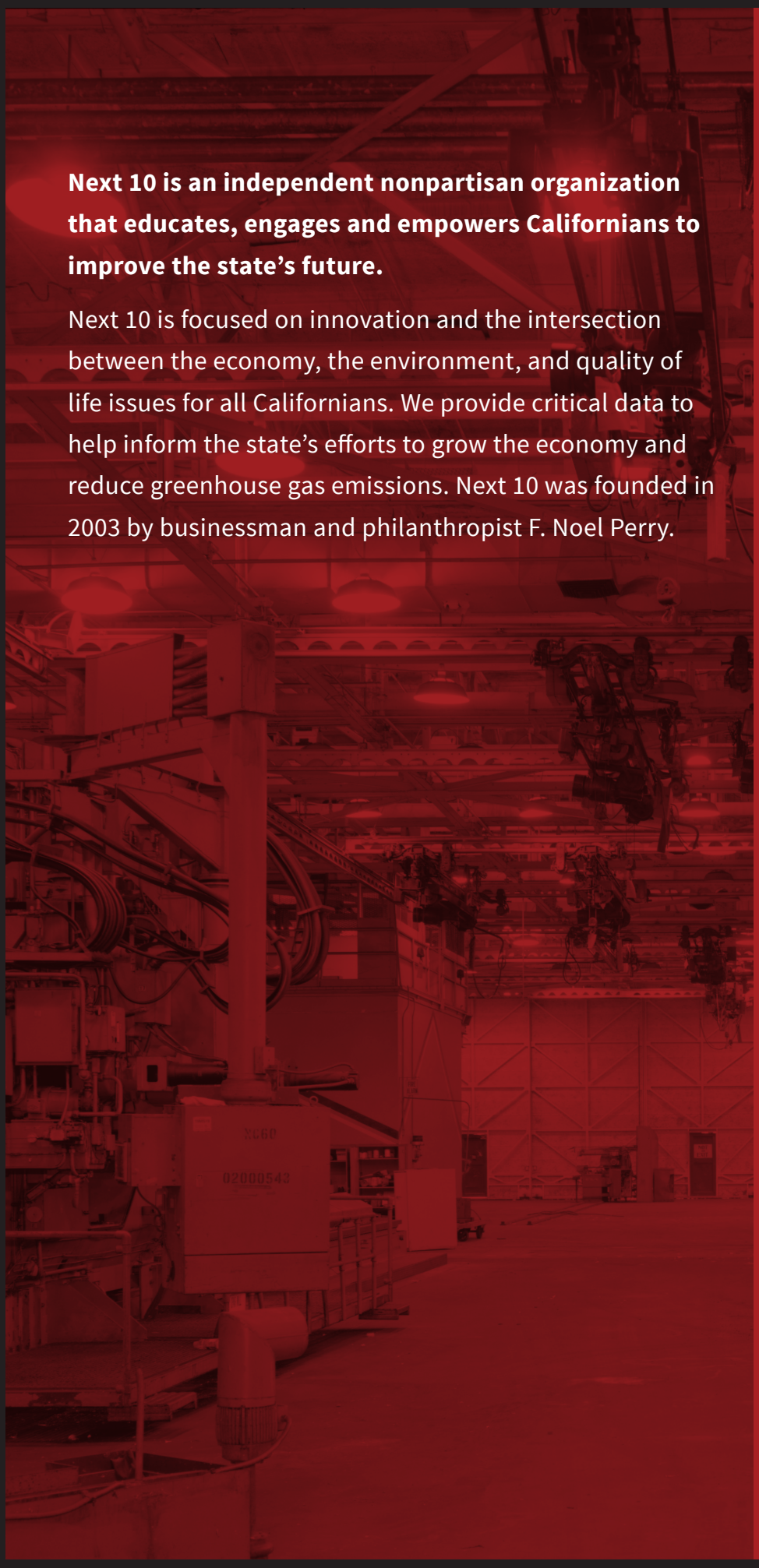


CALIFORNIA'S MANUFACTURING AND BENEFITS OF ENERGY EFFICIENCY

ISSUE BRIEF

SEPTEMBER 3, 2015



Next 10 is an independent nonpartisan organization that educates, engages and empowers Californians to improve the state's future.

Next 10 is focused on innovation and the intersection between the economy, the environment, and quality of life issues for all Californians. We provide critical data to help inform the state's efforts to grow the economy and reduce greenhouse gas emissions. Next 10 was founded in 2003 by businessman and philanthropist F. Noel Perry.

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REVIEWING THE FACTS: INTRODUCTION

The impact of California's energy and climate policies on business is the subject of much debate and analysis. Data compiled and analyzed in Next 10's 2015 "California Green Innovation Index", as well as previous years editions, demonstrate that California has achieved economic growth while becoming more efficient, and ranks among the least carbon intensive economies in the world. This report takes a closer look at changes in energy costs for businesses, particularly in manufacturing.

A variety of objective factors contribute to a state's business climate, including availability of a skilled workforce, quality of life, access to capital, taxes and regulations, government incentives, and real estate costs, as well as energy costs. We examine electricity costs relative to aggregate business costs, as well as relative to output, to better understand energy and electricity costs in this context.

Discourse about climate policies frequently call out the manufacturing sector's sensitivity to energy and electricity costs. Because of the importance of this sector to California's economy, we examine the relationship of electricity expenditures to this industry in additional detail. Manufacturing accounted for 11.1 percent of California's Gross Domestic Product (GDP) in 2014, and 1,260,000 jobs. These manufacturing jobs are high quality, with workers earning an average of $90,500, versus $54,500 for all non-farm businesses in the state.[1]

This issue brief updates Next 10's 2010 study "The Changing Business Climate" with new data released this year from the 2012 U.S. Economic Census. The analysis shows that California businesses continue to benefit from the state's energy efficiency measures. In particular, the analysis highlights four key facts:

Fact 1: California electricity and energy productivity in manufacturing is outpacing the rest of the nation.

Fact 2: Electricity bills are lower in California

Fact 3: California manufacturers spend a smaller share of total operating costs on electricity

Fact 4: California is still the top state for manufacturing

Reviewing the Facts

FACT 1: CALIFORNIA ELECTRICITY AND ENERGY PRODUCTIVITY IN MANUFACTURING IS OUTPACING THE REST OF THE NATION

California's manufacturers benefit from higher efficiencies in their use of energy than manufacturers in the rest of the nation. California manufacturers are the second most productive in terms of output relative to total electricity costs, behind only Connecticut (Table 1). Energy productivity measures manufacturing GDP relative to energy costs. By improving efficiencies in the consumption of energy, companies can spend less on energy, increase resilience to external shocks (such as volatile fuel costs), and redirect cost savings into other areas to boost the company's competitive edge.

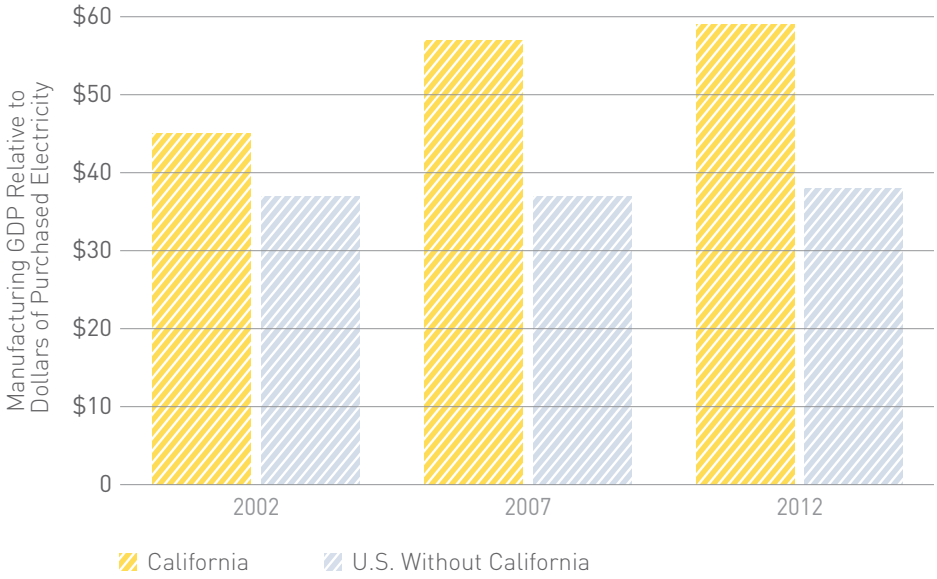
In 2012, California's manufacturers generated nearly $59 of GDP for every dollar spent on electricity - $21 more than the rest of the United States (in 2012 dollars) (Figure 1). Between 2002 and 2012, manufacturers in California improved electricity productivity by 30 percent, and rose in the rankings from 12th in 2002 to second in 2012.

In energy productivity, which includes purchased electricity as well as purchased fuels consumed for heat or power, California manufacturers continue to outperform the rest of the nation. California ranked sixth in energy productivity in 2012, rising three spots from 2002, and above other large manufacturers such as Texas (24th) and Illinois (13th) (Table 1). In 2012, California manufacturers generated nearly $38 of GDP for every dollar spent on energy, compared to $22 generated in the rest of the United States (in 2012 dollars) (Figure 2). Since 2002, California manufacturers increased energy productivity by 19 percent compared to a 12 percent increase in the rest of the nation.

California is still the top state for manufacturing, and output in the sector has grown faster than the rest of the nation.

Figure 1: Manufacturing Electricity Productivity

Manufacturing Output Relative to Dollars of Purchased Electricity
California and U.S. without California



Data Source: Bureau of Economic Analysis, US Census Bureau Economic Census
Analysis: Collaborative Economics

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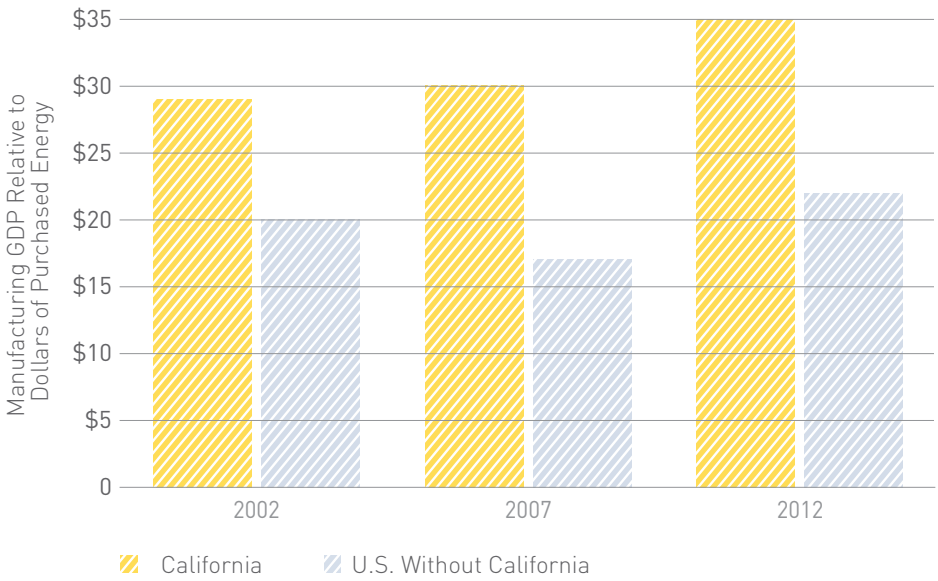
Figure 2: Manufacturing Energy Productivity

Manufacturing Output Relative to Dollars of Purchased Energy
California and U.S. without California



Data Source: Bureau of Economic Analysis, US Census Bureau Economic Census
Analysis: Collaborative Economics

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Table 1: Manufacturing Output Relative to Dollars of Purchased Electricity and Energy

All States and United States Overall, 2012

	Rank	Manufacturing GDP Relative to $ Electricity Purchases	Rank	Manufacturing GDP Relative to $ Energy* Purchases
Connecticut	1	$64	3	$42
California	2	$59	6	$35
Arizona	3	$58	2	$43
Massachusets	4	$57	4	$39
Oregon	5	$57	1	$43
Maryland	6	$55	8	$33
North Carolina	7	$54	5	$37
Texas	8	$53	24	$24
Colorado	9	$52	7	$34
Illinois	10	$51	13	$38
New Jersey	11	$50	9	$32
New York	12	$50	10	$31
Utah	13	$46	12	$28
Rhode Island	14	$42	11	$29
Virginia	15	$42	16	$27
Louisiana	16	$42	37	$15
Washington	17	$41	18	$26
Minnesota	18	$41	19	$26
Nevada	19	$41	20	$25
Florida	20	$40	21	$24
New Hampshire	21	$40	14	$28
New Mexico	22	$40	15	$27
United States		$39		$23
Kansas	23	$37	23	$24
Oklahoma	24	$37	29	$20
Michigan	25	$37	17	$26
Indiana	26	$36	25	$24
Missouri	27	$35	22	$24
Pennsylvania	28	$35	27	$21
North Dakota	29	$34	36	$16
Iowa	30	$34	35	$16
Wisconsin	31	$33	26	$22
Hawaii	32	$33	48	$9
Ohio	33	$32	28	$21
Nebraska	34	$32	32	$17
South Dakota	35	$33	39	$14
Tennessee	36	$34	30	$20
Georgia	37	$35	31	$19
Idaho	38	$36	34	$17
Delaware	39	$28	38	$14
Vermont	40	$26	33	$17
Montana	41	$25	41	$13
Mississippi	42	$22	47	$9
Alaska	43	$22	49	$8
Maine	44	$21	46	$9
Alabama	45	$20	42	$12
South Carolina	46	$19	40	$14
Arkansas	47	$18	43	$12
West Virginia	48	$17	45	$11
Wyoming	49	$16	50	$8
Kentucky	50	$16	44	$11

*Energy includes purchased fuels consumed for heat, power, or the generation of electricity.

Data Source: U.S. Census Bureau, Economic Census, Bureau of Economic Analysis

Analysis: Collaborative Economics.

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FACT 2: ELECTRICITY BILLS ARE LOWER IN CALIFORNIA

While average electricity rates in the state are higher than the national average, Californians spend less on electricity bills than the rest of the nation as a whole due the state's strong track record in energy efficiency. These energy cost savings leave more money to be invested in other goods and services or capital upgrades and job creation, supporting growth in the state's economy.

In 2013, California had the third lowest electricity bill in the nation as a percent of the total state economy. California's statewide electricity bill as a share of its GDP equated to 1.7 percent, lower than the U.S. without California and states with comparable economies and populations (Figure 3). Only Washington and Illinois outperformed California, though by less than 0.1 percent (Table 3a).

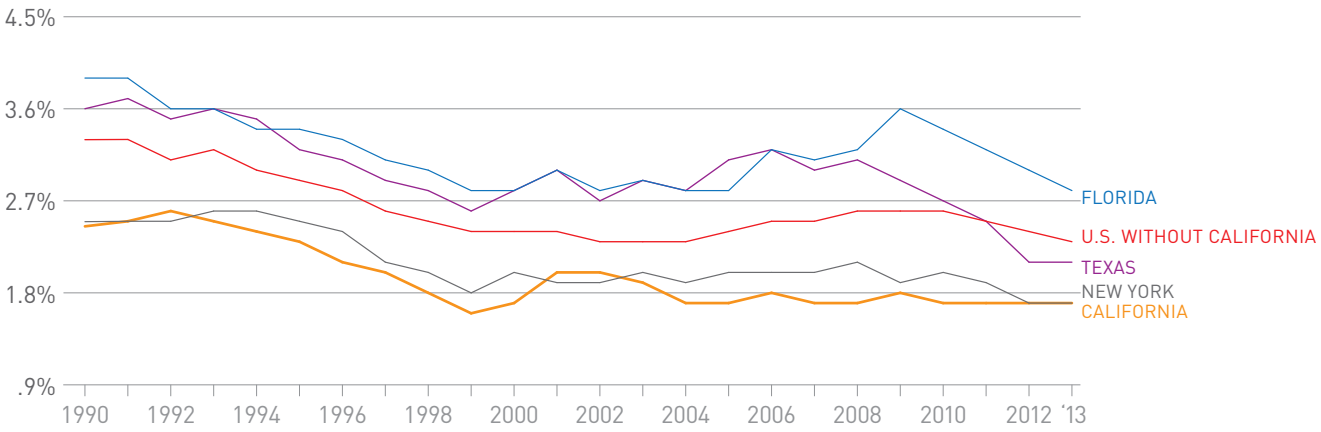
California's average monthly bill for the residential and industrial sectors were both 26 percent lower compared to the U.S. without California in 2013 (Table 2). In fact, California ranked seventh in the nation for the lowest average residential electricity bill, and adjusting for cost of living makes California's average bill even lower. California also performed better than the national average in industrial sector (which includes manufacturing) average monthly bills, ranking 22nd in 2013 (Table 3c).

California's residential, industrial, and commercial average monthly bills stayed relatively constant between 2003 and 2013. In comparison, some other states had large jumps in average monthly bills over the same time period, such as New York and Florida in the industrial sector (+78% and +35%, respectively) and Texas in the commercial sector (+25%) (Table 2). While variations in climate affect average monthly bills and rankings due to the need for cooling in the summer, California's average climate is similar to many states since it incorporates hot inland regions along with more mild coastal climates.

In the commercial sector, California's average electricity bills were 23 percent higher than the U.S. without California in 2013 and ranked 45th (Table 3d). This relatively high bill may be due to inefficiencies in buildings coupled with higher electricity rates. Companies offering commercial sector solutions, such as behind the meter storage, energy management, and on-site renewable systems, and the pending California SB 350 legislation to increase energy efficiency in existing buildings, may help improve commercial sector electricity bills in the future.

Figure 3: Electricity Bill Share of GDP

California, U.S. Without California, Florida, New York and Texas



Data Source: U.S. Department of Energy, Energy Information Administration, Bureau of Economic Analysis
Analysis: Collaborative Economics

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Table 2: Electricity Prices and Bills (Inflation Adjusted) by Sector

California, New York, Florida, Texas and the U.S. without California

		Price per kWh	Average Monthly Bill			
		2013	2003	2013	% Change 2003-2013	Rank 2013
Residential	California	$0.16	$ 90	$92	2%	7
	U.S. without California	$0.13	$103	$115	12%	
	New York	$0.19	$105	$115	9%	32
	Florida	$0.11	$134	$124	-8%	36
	Texas	$0.12	$140	$ 135	-3%	47
Industrial	California	$0.11	$6,215	$6,149	-1%	22
	U.S. without California	$0.07	$7,983	$7,777	-3%	
	New York	$0.07	$7,045	$12,550	78%	34
	Florida	$0.08	$4,386	$5,910	35%	21
	Texas	$0.06	$4,959	$5,229	5%	16
Commercial	California	$0.14	$827	$833	1%	45
	U.S. without California	$0.11	$599	$641	7%	
	New York	$0.16	$1,028	$954	-7%	47
	Florida	$0.10	$638	$623	-2%	31
	Texas	$0.08	$541	$678	25%	37

Data Source: U.S. Department of Energy, Energy Information Administration; Inflation Adjusted with Bureau of Labor Statistics
Analysis: Collaborative Economics

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Table 3a: Electricity Bill as a Share of GDP

All States and United States Overall, 2013

	Rank	Electricity Bill Share of GDP
Washington	1	1.6%
Illinois	2	1.6%
California	3	1.7%
New York	4	1.7%
Alaska	5	1.8%
Massachusets	6	1.8%
Colorado	7	1.8%
Utah	8	1.8%
Connecticut	9	1.9%
New Jersey	10	1.9%
Oregon	11	2.0%
Rhode Island	12	2.0%
Delaware	13	2.0%
Minnesota	14	2.1%
Texas	15	2.1%
Maryland	16	2.1%
Virginia	17	2.2%
Iowa	18	2.3%
United States		2.3%
New Hampshire	19	2.3%
New Mexico	20	2.3%
South Dakota	21	2.4%
Pennsylvania	22	2.4%
Ohio	23	2.5%
Nevada	24	2.5%
Wisconsin	25	2.6%
North Carolina	26	2.6%
Maine	27	2.6%
North Dakota	28	2.6%
Michigan	29	2.7%
Oklahoma	30	2.7%
Kansas	31	2.7%
Nebraska	32	2.7%
Georgia	33	2.8%
Arizona	34	2.8%
Louisiana	35	2.8%
Montana	36	2.8%
Missouri	37	2.8%
Vermont	38	2.8%
Florida	39	2.8%
Indiana	40	3.0%
Idaho	41	3.0%
Tennessee	42	3.1%
Wyoming	43	3.1%
Arkansas	44	3.1%
West Virginia	45	3.5%
Kentucky	46	3.5%
South Carolina	47	4.0%
Alabama	48	4.1%
Hawaii	49	4.2%
Mississippi	50	4.3%

Data Source: U.S. Department of Energy, Energy Information Administration, Bureau of Economic Analysis
Analysis: Collaborative Economics

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Table 3b: Average Monthly Electricity Bill, Residential

All States and United States Overall, 2013

	Rank	Average Monthly Bill
New Mexico	1	$78
Maine	2	$80
Illinois	3	$82
Utah	4	$84
Colorado	5	$86
Montana	6	$90
California	7	$92
Washington	8	$92
Wyoming	9	$92
Rhode Island	10	$93
Wisconsin	11	$97
Minnesota	12	$98
Oregon	13	$98
Michigan	14	$99
Vermont	15	$99
Idaho	16	$100
Iowa	17	$102
Massachusets	18	$103
New Hampshire	19	$104
West Virginia	20	$108
Ohio	21	$109
Kansas	22	$110
New Jersey	23	$110
South Dakota	24	$110
Arkansas	25	$110
North Dakota	26	$112
Nevada	27	$112
Indiana	28	$112
Oklahoma	29	$112
United States		$113
Kentucky	30	$115
New York	31	$115
Alaska	32	$116
Louisiana	33	$122
North Carolina	34	$122
Florida	35	$124
Missouri	36	$124
Delaware	37	$124
Arizona	38	$125
Tennessee	39	$126
Pennsylvania	40	$126
Georgia	41	$127
Virginia	42	$127
Nebraska	43	$128
Mississippi	44	$134
Connecticut	45	$134
Texas	46	$135
South Carolina	47	$137
Alabama	48	$139
Maryland	49	$139
Hawaii	50	$193

Data Source: U.S. Department of Energy, Energy Information Administration
Analysis: Collaborative Economics

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Table 3c: Average Monthly Electricity Bill, Industrial

All States and United States Overall, 2013

	Rank	Average Monthly Bill
Nebraska	1	$1,258
Idaho	2	$1,793
Montana	3	$2,236
Arkansas	4	$2,440
Oregon	5	$2,563
Kansas	6	$2,611
Maryland	7	$3,179
Washington	8	$3,509
Oklahoma	9	$4,251
New Mexico	10	$4,515
South Dakota	11	$4,546
North Dakota	12	$4,794
Rhode Island	13	$4,830
West Virginia	14	$5,126
Utah	15	$5,168
Texas	16	$5,229
Wyoming	17	$5,449
New Jersey	18	$5,593
New Hampshire	19	$5,648
Colorado	20	$5,671
Florida	21	$5,910
California	22	$6,149
Maine	23	$7,577
United States		$7,620
Louisiana	24	$8,128
Connecticut	25	$8,157
Georgia	26	$8,800
Missouri	27	$9,106
Arizona	28	$9,264
Massachusets	29	$11,070
Iowa	30	$11,115
Pennsylvania	31	$11,525
Minnesota	32	$11,809
Mississippi	33	$12,086
New York	34	$12,550
Alaska	35	$13,673
Ohio	36	$13,982
North Carolina	37	$14,281
Indiana	38	$14,928
Michigan	39	$15,251
Nevada	40	$20,068
Delaware	41	$22,067
Alabama	42	$24,270
Kentucky	43	$24,685
Virginia	44	$26,840
Wisconsin	45	$31,000
South Carolina	46	$32,575
Illinois	47	$34,722
Vermont	48	$59,528
Tennessee	49	$100,469
Hawaii	50	$132,054

Data Source: U.S. Department of Energy, Energy Information Administration
Analysis: Collaborative Economics

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Table 3d: Average Monthly Electricity Bill, Commercial

All States and United States Overall, 2013

	Rank	Average Monthly Bill
Idaho	1	$377
West Virginia	2	$386
Montana	3	$390
Iowa	4	$400
Arkansas	5	$443
Maine	6	$447
Nevada	7	$448
Colorado	8	$468
Oklahoma	9	$480
South Dakota	10	$484
Vermont	11	$484
New Hampshire	12	$490
Oregon	13	$503
Wyoming	14	$509
South Carolina	15	$511
Kentucky	16	$512
Pennsylvania	17	$524
Nebraska	18	$524
North Carolina	19	$528
Mississippi	20	$531
New Mexico	21	$534
Washington	22	$541
Massachusets	23	$545
Kansas	24	$557
Alabama	25	$561
Indiana	26	$568
Illinois	27	$585
Ohio	28	$602
North Dakota	29	$605
Tennessee	30	$606
Florida	31	$623
Missouri	32	$625
Wisconsin	33	$630
Louisiana	34	$653
Minnesota	35	$654
United States		$660
Utah	36	$667
Texas	37	$678
Michigan	38	$679
Rhode Island	39	$688
Georgia	40	$692
Delaware	41	$695
Alaska	42	$758
Virginia	43	$765
Arizona	44	$811
California	45	$833
New Jersey	46	$858
New York	47	$954
Connecticut	48	$1,072
Maryland	49	$1,097
Hawaii	50	$1,560

Data Source: U.S. Department of Energy, Energy Information Administration
Analysis: Collaborative Economics

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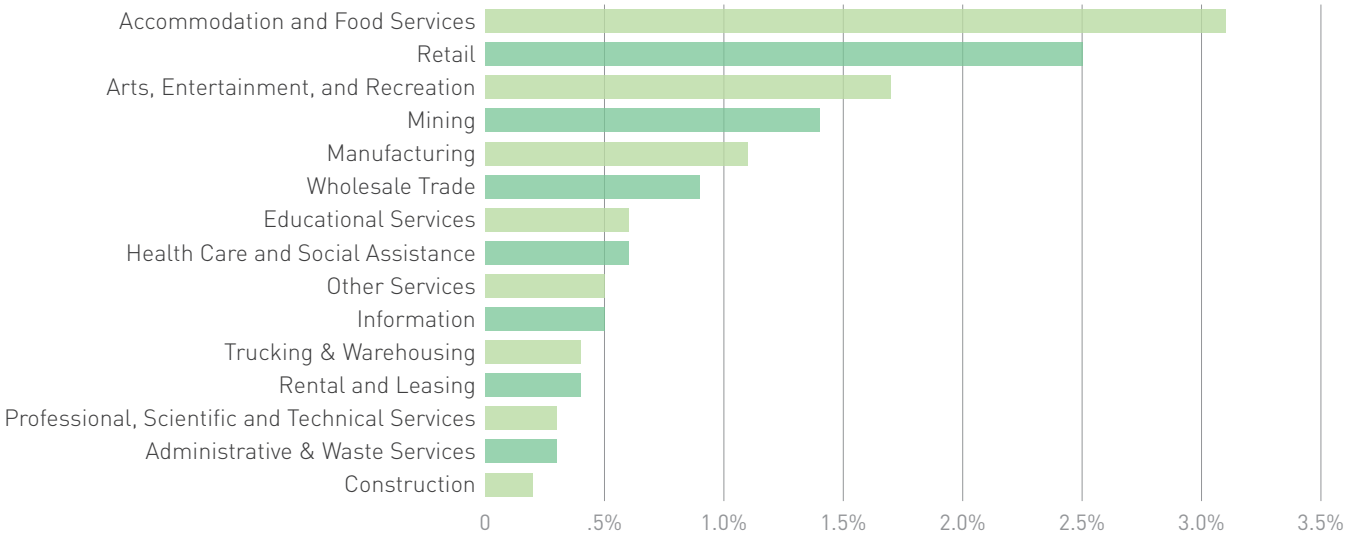
FACT 3: CALIFORNIA MANUFACTURERS SPEND A SMALLER SHARE OF TOTAL OPERATING COSTS ON ELECTRICITY

California manufacturers spent less on electricity as a share of total costs than most other states. In 2012, California manufacturers spent 0.9 percent of operating costs on electricity, compared to the U.S. average of 1.1 percent.

While electricity costs are often considered a major portion of business operation expenses, median electricity expenditures were only 0.6 percent of total operating costs in the U.S. across all sectors in 2012. Electricity costs as a portion of total operating expenditures vary by industry, and industries including Accommodation and Food Services; Retail; Mining; and Arts, Entertainment and Recreation all spent a higher share of total operating costs on electricity than Manufacturing (Figure 4).

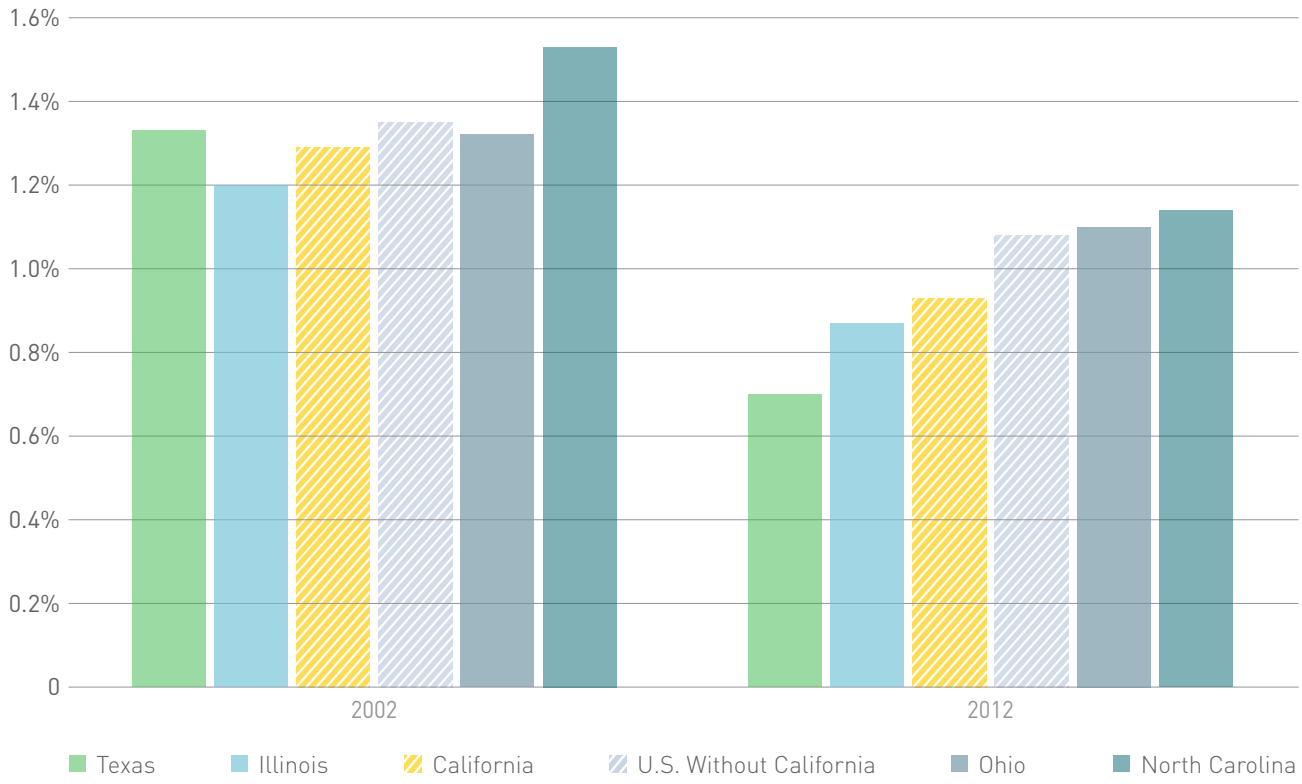
California manufacturers ranked 15th in the U.S. for the lowest electricity purchases as a share of operating costs in 2012, an improvement from 22nd in 2002. Factoring in purchased fuels for on-site power, California ranks even better at 13th (Table 4). Over the same period, California's average manufacturing electricity purchases fell from 1.3 percent to 0.9 percent as a share of total operating costs (Figure 5). This was a larger improvement than the U.S. without California, and all of the next four largest manufacturing states with the exception of Texas.

Figure 4: Purchased Electricity as a Percent of Total Operating Expenses by Industry United States, 2012



Data Source: US Census Bureau Economic Census, Annual Wholesale Trade Report, Annual Retail Trade Report, Service Annual Survey
Analysis: Collaborative Economics

Figure 5: Electricity Purchases as a Percent of Total Operating Expenses in Manufacturing
Top 5 States for Manufacturing, and U.S. Without California



Data Source: US Census Bureau, Economic Census
Analysis: Collaborative Economics

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A key driver of the decrease in electricity's share of total operating costs in California is energy efficiency upgrades, not a decrease in the share of companies in high electricity-usage industries. California's portion of manufacturing establishments in industries with higher-than-median electricity expenditures as a share of operating costs has been stable between 2002 and 2012.[2]

Shifts in the source of electricity are another factor in electricity's share of total costs. Electricity purchases exclude power generated on-site, though energy purchases factor in fuels consumed for on-site power and heat. Manufacturers in states like Texas and Louisiana with a strong petroleum and natural gas presence tend to produce more power on-site and purchase less electricity compared to California. This on-site energy production is one cause of the high rankings of some states in electricity purchases, but lower rankings in total energy purchases (Table 4).

Table 4: Electricity and Energy Purchases as a Percent of Total Operating Expenses in Manufacturing

All States and United States Overall, 2012

	Electricity Purchases		Energy* Purchases	
	Rank	Percent	Rank	Percent
Hawaii	1	0.6%	37	2.1%
Louisiana	2	0.6%	20	1.7%
Alaska	3	0.6%	26	1.8%
Delaware	4	0.7%	1	1.3%
Texas	5	0.7%	12	1.6%
Oklahoma	6	0.8%	8	1.4%
North Dakota	7	0.8%	17	1.6%
Illinois	8	0.9%	15	1.6%
Utah	9	0.9%	7	1.4%
Kansas	10	0.9%	3	1.4%
South Dakota	11	0.9%	33	1.9%
Nebraska	12	0.9%	18	1.6%
Connecticut	13	0.9%	5	1.4%
Iowa	14	0.9%	32	1.9%
California	15	0.9%	13	1.6%
Rhode Island	16	0.9%	4	1.4%
Colorado	17	0.9%	9	1.5%
New Jersey	18	1.0%	10	1.5%
New Mexico	19	1.0%	6	1.4%
Minnesota	20	1.0%	14	1.6%
Arizona	21	1.0%	2	1.4%
Michigan	22	1.0%	11	1.5%
United States		1.1%		1.8%
New York	23	1.1%	25	1.8%
Ohio	24	1.1%	22	1.7%
New Hampshire	25	1.1%	16	1.6%
Pennsylvania	26	1.1%	28	1.8%
Maryland	27	1.1%	29	1.9%
Wisconsin	28	1.1%	23	1.7%
Missouri	29	1.1%	19	1.6%
Florida	30	1.1%	31	1.9%
North Carolina	31	1.1%	21	1.7%
Nevada	32	1.2%	30	1.9%
Montana	33	1.2%	38	2.2%
Massachusets	34	1.2%	24	1.7%
Indiana	35	1.2%	27	1.8%
Washington	36	1.2%	34	2.0%
Georgia	37	1.3%	36	2.0%
Mississippi	38	1.3%	48	3.2%
Tennessee	39	1.3%	35	2.0%
Virginia	40	1.5%	39	2.3%
Idaho	41	1.5%	43	2.5%
Wyoming	42	1.5%	47	3.2%
Alabama	43	1.6%	44	2.6%
Arkansas	44	1.6%	41	2.4%
Vermont	45	1.6%	40	2.4%
Maine	46	1.8%	50	4.2%
South Carolina	47	1.8%	42	2.5%
Kentucky	48	1.9%	45	2.7%
West Virginia	49	2.1%	49	3.4%
Oregon	50	2.2%	46	2.9%

*Energy includes purchased fuels consumed for heat, power, or the generation of electricity.

Data Source: US Census Bureau, Economic Census

Analysis: Collaborative Economics.

FACT 4: CALIFORNIA IS STILL THE TOP STATE FOR MANUFACTURING IN THE US

California continues to generate the most manufacturing output (GDP), jobs, and exports of any state in the U.S., despite concerns about energy and climate policies stifling manufacturing in the state. In fact, over the past decade, California's growth in manufacturing GDP has outpaced the rest of the U.S. (+15% versus +5%, respectively, between 2004 and 2014), led by industries such as chemicals and computer and electronics products (Table 5).

Though hit hard by the 2007-2008 recession, manufacturing output rebounded in the U.S. nationwide since 2009 and in California since 2011. In recent years, the pace of California's recovery has been more rapid than the rest of the U.S. (Figure 6). Despite initial concerns about impacts of climate policies on manufacturing, this period of manufacturing recovery in California occurred while climate policies, such as the Global Warming Solutions Act of 2006 (AB 32), were in place.

Manufacturers are recognizing competitive advantages to increasing their operations in the U.S., including access to high quality talent (for increasingly competitive wages), high labor productivity, low energy costs, and favorable exchange rates.[3] Building on these U.S. strengths, California's mix of specialized talent, research & development assets, large end markets, and geographic location present additional competitive advantages to manufacturers. Between 2010 and 2014, California had the highest number of newly-reshored businesses than any other state. These newly-reshored operations tended to have smaller average workforces than businesses returning to states in the Southeast, such as South Carolina and Texas.[4] Texas in particular has experienced strong growth in manufacturing output over the last decade, led by the expansion of petroleum and coal products and chemical products. Despite these gains, in 2012 California was home to twice as many manufacturing companies as Texas (36,300 and 17,700, respectively).[5]

California's climate policies have served as a competitive strength for manufacturers, encouraging clean technology manufacturers to develop and locate within the region. A key example is Proterra, a manufacturer of zero emission battery-electric busses. In Spring 2015, South Carolina-based Proterra announced an expansion of its manufacturing operations into California, driven largely by strong market demand due to California's zero emission vehicle policies.

Table 5: Manufacturing GDP

	Manufacturing GDP (Billions)		Share of State GDP from Manufacturing	Manufacturing GDP Percent Growth 2004-2014
	Rank 2014	2014		
California	1	$255.53	11.1%	+15%
Texas	2	$238.38	14.5%	+38%
Illinois	3	$99.67	13.4%	+5%
Ohio	4	$98.69	16.9%	-9%
North Carolina	5	$95.75	19.8%	+15%
Indiana	6	$ 93.61	29.5%	+9%
Michigan	7	$ 90.65	20.1%	-8%
Pennsylvania	8	$79.62	12.0%	-9%
New York	9	$69.12	4.9%	-11%
Washington	10	$57.77	13.5%	+51%

Data Source: Bureau of Economic Analysis
Analysis: Collaborative Economics

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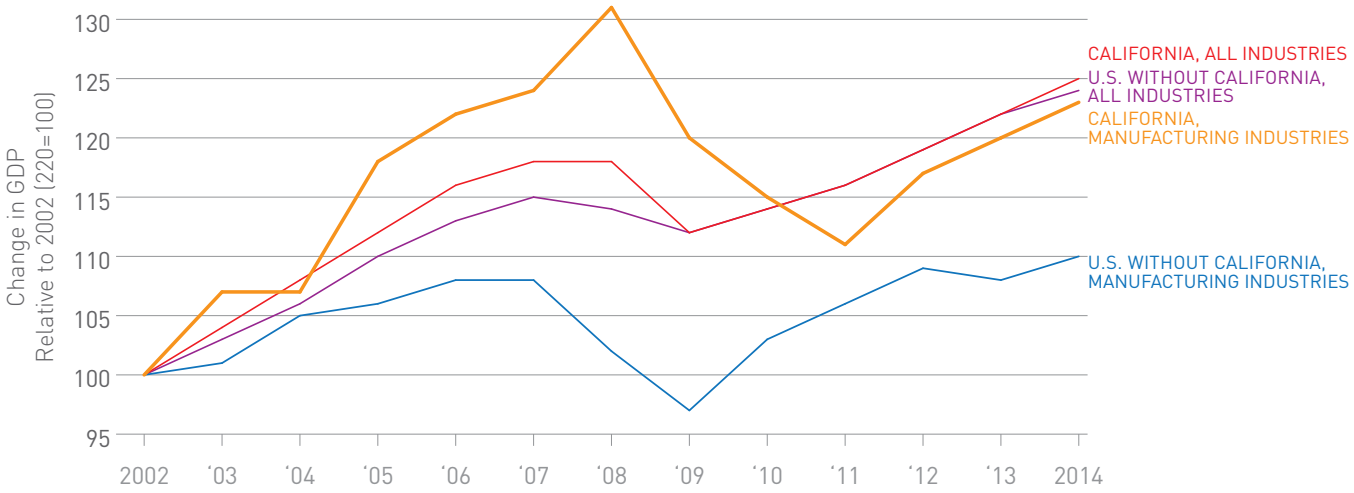
Figure 6: GDP Trends In All Industries and Manufacturing

California and U.S. without California Industries
Change in GDP Relative to 2002



Data Source: Bureau of Economic Analysis.
Analysis: Collaborative Economics

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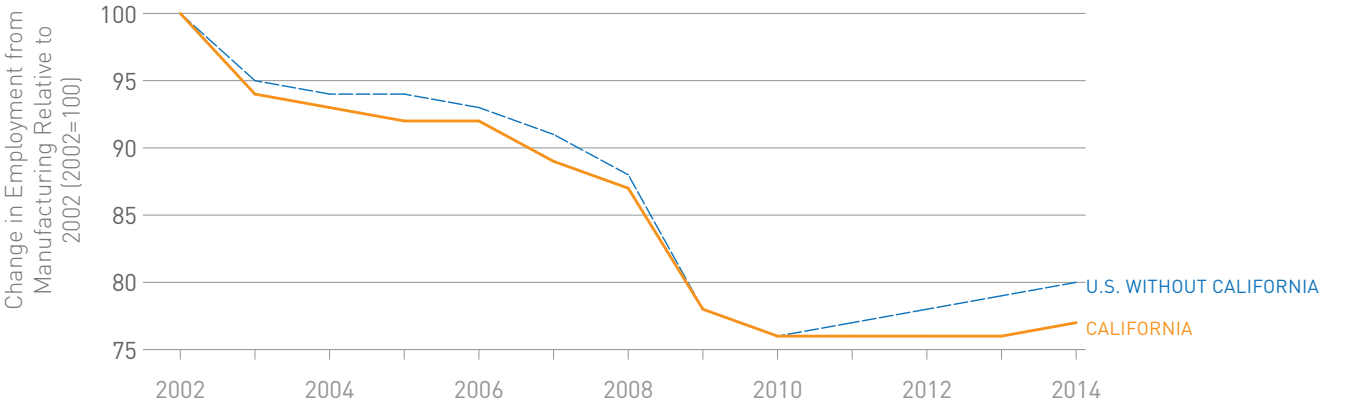
Figure 7: Trends in Manufacturing Employment
California & U.S. Without California
Change in Employment Relative to 2002



Data Source: Bureau of Labor Statistics
Analysis: Collaborative Economics

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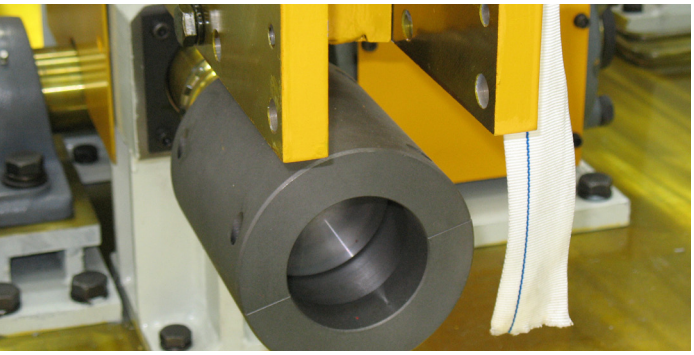
While manufacturing output has rebounded in the U.S. and California from the recession, employment growth in manufacturing has remained limited, in part due to technology, process and productivity changes occurring in manufacturing globally. Manufacturing employment trends in California over the last decade mirrored those of the rest of the U.S. Between 2002 and 2014, jobs in manufacturing industries declined nearly 20 percent in the U.S. without California, and about 23 percent in California (Figure 7). More recently, employment grew in both the U.S. without California and in California since 2010, rising 6.1 percent and 2.4 percent, respectively.

Manufacturing is undergoing profound changes globally, as companies increasingly incorporate automation and robotics to improve products and processes.[6, 7] The result is a shift towards more technology-intensive operations, which require fewer workers. These trends are also driving demand for manufacturing research, design and engineering roles, for which California's highly skilled workforce is well positioned.[8]

California's continued growth and leadership in manufacturing, along with similar employment trends with the rest of the U.S., affirm that global economy, technology and workforce trends are more significant drivers of manufacturing operations decisions than climate policies.



CONCLUSION

California's energy and climate policies have helped promote efficiency and reduce average energy bills for businesses and residents, as well as encourage manufacturers to be among the most energy productive in the U.S.

The facts discussed in this issue brief show that for every dollar spent on electricity and energy in California, manufacturers produce significantly more value than the U.S. average. California's manufacturers also spend less on energy and electricity costs relative to total operating expenses than in many other places, and this share is falling. In addition, California's average electricity bills for residential and industrial users are far below average.

Improvements in energy efficiency and productivity have supported growth in manufacturing and the economy overall. While global manufacturing trends are shifting towards increased automation and fewer jobs, California is still the top state for manufacturing, and output in the sector has grown faster than the rest of the nation. Businesses' falling electricity expenses enable investments in other areas to boost their competitive edge. Similarly, households are able to invest or spend their energy savings on other goods, supporting growth in the rest of the economy.

APPENDIX

Gross Domestic Product

Nominal gross domestic product (GDP) data for California are sourced from the Bureau of Economic Analysis, U.S. Department of Commerce. Real GDP figures are nominal GDP data converted into 2014 dollars using the U.S. personal consumption expenditures (PCE) deflator. Manufacturing GDP reflects nominal gross domestic product for NAICS codes 31-33 by state, adjusted for inflation with the U.S. PCE deflator.

Inflation Adjustment

Inflation-adjusted figures (excluding GDP) are converted into 2014 dollars using the U.S. city average Consumer Price Index (CPI) of all urban consumers, published by the Bureau of Labor Statistics.

Population

California population data used to calculate per capita figures are from the California Department of Finance's "E-4 Population Estimates for Cities, Counties and the State, with 2000 and 2010 Census Counts." National, state and "U.S. without California" population data are from the U.S. Census Bureau, Population Estimates Branch.

Employment

Manufacturing and overall employment data reflect annual average employment from the Bureau of Labor Statistics' (BLS) Quarterly Census of Employment and Wages. Manufacturing employment is for NAICS codes 31-33. Based on data availability, 2014 data are preliminary estimates from BLS.

Statewide Electricity Bill as a Percent of GDP and Electricity Bill by Sector

Electricity pricing data are from the U.S. Department of Energy, EIA, Current and Historical Monthly Retail Sales, Revenues and Average Retail Price per Kilowatt-hour by State and by Sector (Form EIA-826), and includes the amount of electricity sold to end users (excludes self-generation). Electricity Bill Percent of GDP multiplies monthly retail sales and prices (by sector), aggregates by year and then divides by GDP. Data to calculate electricity bills by sector are from 1990 – 2013 use Retail Sales of Electricity by State by Sector Provider (EIA-861) and 1990 - 2013 Average Price by State by Provider (EIA-861), published by the U.S. Department of Energy, EIA. Electricity bill figures are inflation-adjusted.

Electricity Purchases as a Percentage of Total Operating Expenses by Industry, Electricity and Energy Productivity in Manufacturing

Electricity and Energy Purchases and Total Operating Expenses data for the manufacturing sector, utility and construction sectors are from the U.S. Census Bureau, Economic Census 2002, 2007 and 2012. Economic Census 2012 for manufacturing was released in Spring 2015 for the U.S. and all states. Electricity Purchases for other sectors are sourced from the U.S. Census Bureau's 2012 Annual Services Survey, 2012 Annual Wholesale Trade Survey and 2012 Annual Retail Trade Survey. Total Operating Expenses combine total compensation (including fringe), total cost of materials, annual depreciation, total rental payments and all other costs. Total Operating Costs exclude capital expenditures. Energy Purchases include Electricity Purchases, and additional fuels purchased for on-site power generation and heat.

Electricity and Energy Productivity in manufacturing divides Manufacturing GDP by Electricity and Energy Purchases. GDP data is from the U.S. Commerce Department, Bureau of Economic Analysis.

END NOTES

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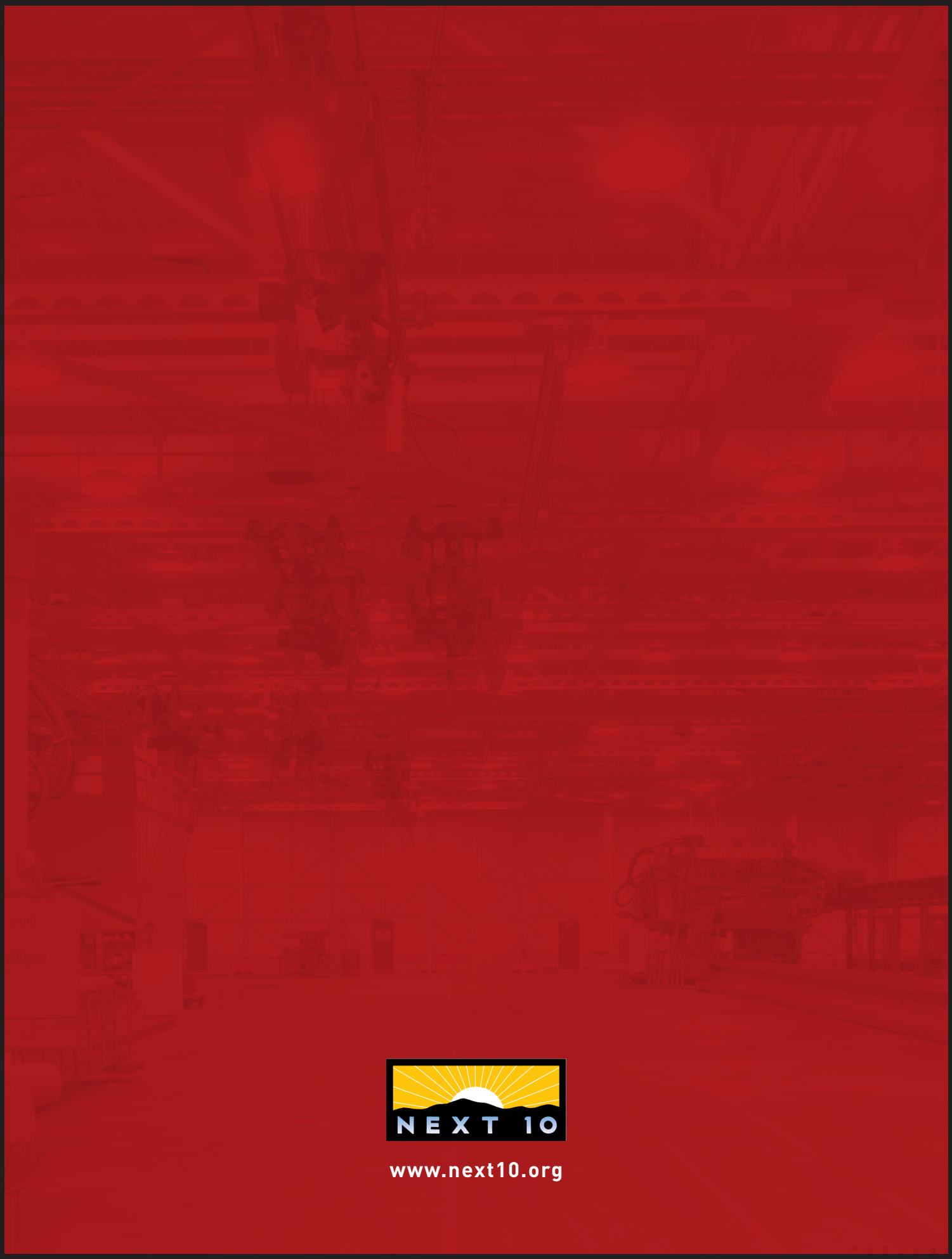

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