



# San Diego: Energy, the Economy, and the Call for Pause

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## KEY FINDINGS AND EXECUTIVE SUMMARY

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1. Absent strategic coordination, California's policies could increase energy costs in San Diego, hurting key industries and burdening residents struggling to balance household budgets.
2. San Diegans already pay some of the highest electricity costs in the nation.
3. Between 2000 and 2012 residential costs averaged 12% more per kilowatt hour (kWh) for San Diego Gas & Electric (SDG&E) customers than for customers of California's other two investor-owned utilities.
4. As of February 17, 2015, the statewide average price of a gallon of regular unleaded gasoline in California is 19.2% higher than the national average. San Diego's gas prices have traditionally run slightly higher than the state average. California's high fuel taxes, along with cost increases resulting from the cap-and-trade program, could result in high fuel costs for residential and business consumers.
5. The best evidence from national databases suggests that San Diegans also pay significantly more for electricity than do residents and businesses in regions with which San Diego competes for investment and economic development.
6. This gap could worsen as California implements renewable portfolio standards. Many large-scale renewable resources are located far to the east, require substantial investments in transmission infrastructure, and remain more expensive than carbon-based alternatives.
7. A renewable resource San Diego has in abundance—rooftop solar power—involves technology that demands policy coordination between California's energy regulators and policy makers. An unresolved issue is how to incentivize more customers to adopt solar technology while ensuring an adequate revenue stream to SDG&E to maintain the grid, to develop generating capacity for times when solar resources are not operating at peak efficiency, and wind down the massive subsidies from non-solar customers.
8. The opportunity for middle class advancement in the region is under stress. Household incomes, after adjusting for inflation, have declined 8.0% since 2008. Employment in construction and manufacturing have declined by a combined 28,000 jobs over the same time.
9. A number of the new mandates by California regulators fall disproportionately on some groups of ratepayers and industries.
10. Recent growth patterns suggest a future where an increasing percentage of San Diegans live in parts of the county that require more energy to cool their homes. Since 1990, more than 200,000 San Diegans have moved into areas where high temperatures reach or exceed 80 degrees more than 180 days per year.

## INTRODUCTION

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San Diego's economy is at a critical inflection point. As the region emerges from the Great Recession, it continues to undergo a profound transformation. No longer is San Diego dominated by tourism, military-base operations, and defense procurement. Instead, San Diego is home to a diversified innovation economy whose fortunes are dictating the region's economic performance. At the same time, like many regions, San Diego faces increasing gaps between upper- and lower-income households. Income gaps are even more of a challenge in San Diego than elsewhere because San Diego has a smaller "opportunity economy" than other California cities (Shires 2014). There are fewer rungs for San Diegans to grab onto when trying to move themselves and their families up the socioeconomic ladder compared to places with larger manufacturing bases, bigger logistical hubs, or which have had a more robust construction recovery. The region has many economic strengths, but economic mobility has become one of its biggest challenges.

The recession also seems to have done little to fundamentally alter the problem of high housing prices. While the collapse of home values in 2007 and 2008 caused great harm in San Diego, prices have rapidly rebounded, and the region remains one of the most unaffordable in the nation.

Finally, the military faces more budget pressures at the federal level than it has in at least two decades. While San Diego is positioned to benefit economically from a national security strategy that shifts to the Pacific, budget cutters in Washington and the long-term fiscal realities that will demand reduced defense spending counterbalance such positive effects.

Long-term upward pressure on regional energy prices impacts these trends. San Diegans already pay among the highest electricity costs in the nation. On the one hand, these high per kilowatt-hour costs and the push to incentivize renewable sources of energy has helped San Diego. The region has seen significant development with respect to rooftop solar installations, and there is a vibrant clean tech industry in the region. With 7,800 San Diegans employed in the sector, the San Diego Regional Economic Development Corporation calculates that employment density in clean tech is 2.5 times that of the United States (San Diego Regional EDC 2015). Higher prices, however, come at a cost, adding pressure to manufacturing and construction jobs when the region needs more jobs in these opportunity sectors.

In addition, California policy makers have made regulatory changes in a nonstrategic way. The Little Hoover Commission, an independent state-oversight agency, noted, "Californians still lack the measuring tools to evaluate the full costs of implementing the renewable portfolio standard simultaneously with other major energy policy goals. Given the positive record of California relating to affordable electricity through energy efficiency, we are disappointed that the cost side of the equation has received inadequate or incomplete attention" (Little Hoover Commission 2014). The cost side of the equation is particularly important in San Diego. The region lacks the kind of low cost generating resources (principally, access to major hydroelectric-

power-generating facilities) that other areas of California enjoy. What the region does have is abundant solar resources that produce significant amounts of energy during the middle of the day but whose availability lags during the evening peak and at night. Thus, San Diego, perhaps more than other parts of the state, has a major stake in how regulators continue to promote local rooftop solar while financing continued improvements in the distribution grid and the peaking generation required to back-stop solar during evening peak load periods (Bloomberg News 2012).

A recent bright spot for the economy has been increased consumer confidence and spending that have resulted from lower gasoline prices. University of San Diego economics professor Alan Gin has estimated that a ten-cent change in the price of gasoline equates to a \$10 million monthly impact on the San Diego economy (KPBS 2014). The current world-wide glut of oil and cheaper gas prices have helped San Diego household budgets. Poorly thought-out policies that increase the cost of gasoline will act like a tax on San Diego households. For example, San Diego suffered during the 1990s because of infrastructure bottlenecks in the supply of transportation fuels to the region and because of uncompetitive market structures (Soleymani 2001) and the region regularly experiences a spike in gasoline during the spring as refiners have to change over to meet California's unique regulations regarding summer season gasolines.

For these reasons, along with others explored in the following pages, San Diego would benefit from a pause in ratcheting up California's already aggressive efforts to transform the state's energy industry. Policy makers must understand how various policies and initiatives affect the costs consumers and businesses bear and whether the mandates they impose are fostering a more sustainable, cost-effective energy system.

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This paper compares San Diego's energy prices with those of competing regions and identifies how further price increases will harm the region's economic competitiveness. Section 1 briefly recaps San Diego's recovery from the region's worst economic downturn in the last 70 years. In many ways, the causes of the downturn in San Diego were similar to those of other Sunbelt cities. An unprecedented rise in housing prices to unsustainable levels preceded their inevitable collapse. The resulting spike in household debt and reductions in consumer spending hurt the region's construction, real estate, and retail sectors. The key difference is that in San Diego, critical pillars of the economy—the U.S. military and the innovation sector—did not crumble, which partially mitigated the recession's impact. So while San Diego had just as severe a housing collapse as the Inland Empire, Phoenix, and South Florida, its overall unemployment rate was lower and the region did not experience such a profound shock to its economy. San Diego felt the sting of the Great Recession, but not the near-Depression level dislocation that many other Sunbelt communities experienced.

That experience gave policy makers false comfort about policies enacted over the past decade that have made energy more expensive. Growth in the local economy's innovation and defense sectors masked the

impact of rising costs at the regional macroeconomic level. Whereas rising energy costs have darkened an already bleak economic situation in places like the Inland Empire (Husing 2014), in San Diego, policy makers could put off hard choices and the development of an overall strategic vision without feeling that they were dramatically hurting the local economy.

Section 2 shows how San Diego's energy costs compare with those of other regions. Two sources illustrate the high costs per kWh that San Diego business and residential customers face. The gap between San Diegans' energy costs and those of energy users in other regions is growing. We show that San Diego has some of the highest per kWh costs in the nation and rates that far exceed those charged in competing regions. What partially mitigates high per kWh costs for some San Diegans is lower overall energy consumption. However, because of internal migration patterns to hotter areas, per capita consumption has risen since 2000. Section 2 also looks at gasoline costs in San Diego. For at least two decades, California's gas prices have run higher than those of the rest of the nation. At least one analysis has suggested that California's cleaner-burning fuel mandates that other states have not adopted account for much of this difference. The result has been the decoupling of the California market from others and greater market power for upstream refiners. Additional mandates, such as the push for low-carbon fuels, could have a similar effect, further increasing the costs California consumers bear.

Section 3 looks at income inequality in the region and what Michael Shires, associate professor of public policy at Pepperdine University, has termed the "opportunity economy" – sectors which pay middle wage incomes but which do not necessarily require four year college degrees. Like many regions, San Diego has seen the gap widen between those in the upper-income tier and those in the lower-income tier. At the same time, both manufacturing and construction, industries that have long provided upward socioeconomic mobility, are under significant stress. These industries pay wages high enough to sustain a middle-class standard of living but do not necessarily require four-year college degrees for entry-level positions. Higher electricity and fuel costs can limit employment growth in these industries. Section 3 uses data from the U.S. Energy Information Administration to identify segments of the manufacturing sector, employing more than 11,000 San Diegans, which are particularly energy intensive and hence vulnerable to price spikes and disruptions.

Section 4 turns to a perennial problem in San Diego: high housing costs. San Diego has long been infamous for its high cost of housing and for the gap between the housing demand generated by the population and the supply brought to the market. The result has been housing prices that strain household budgets and depress the region's standard of living. This section presents data showing how big that affordability gap is and how dramatic the temperature gap is between temperate coastal neighborhoods and hotter inland communities. With the region expected to add 1 million residents by 2040, these differences are likely to increase regional energy demands over time.

Section 5 summarizes our key findings and suggests how to balance the important goals of energy sustainability and San Diego's economic competitiveness.

# 1.

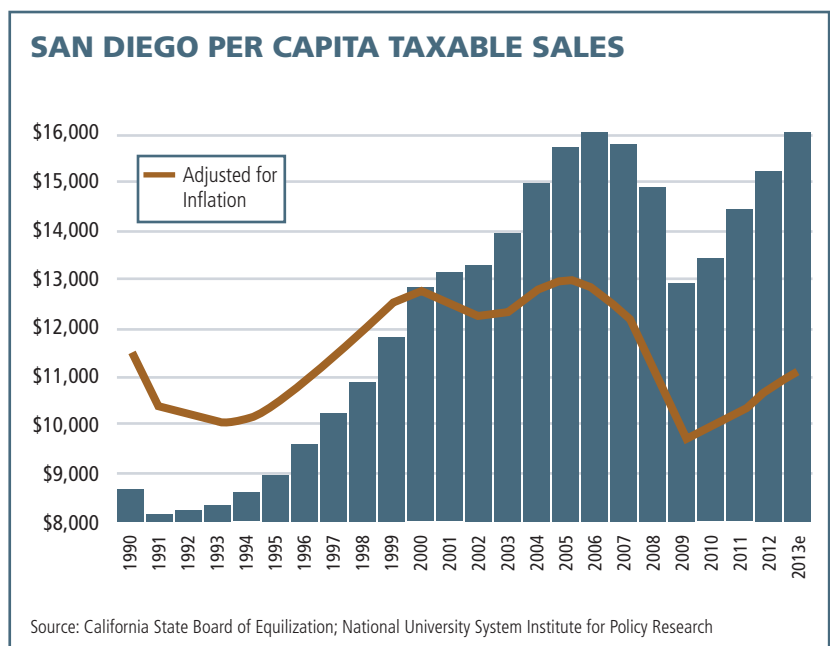
## A SLOW SLOG BACK FROM THE RECESSION: SAN DIEGO'S RECENT ECONOMIC HISTORY

San Diego's experience during the Great Recession was unique in ways that matter when analyzing how energy costs and energy reliability will shape the region's future economic performance.

Like many Sunbelt cities, San Diego saw its real estate prices rise to unsustainable levels then collapse, creating a debt overhang that has profoundly impacted area households. While San Diego has always had high housing prices, the run-up during the early 2000s was unprecedented. The median home price jumped from \$290,000 in 2002 to \$500,000 by the fourth quarter of 2004. By mid-decade, developers were buying up apartment complexes, investing a modest sum in upgraded interior fixtures, and then converting the properties into condominiums and fending off buyers camping out to get their shot at entry-level housing (Nevin 2010).

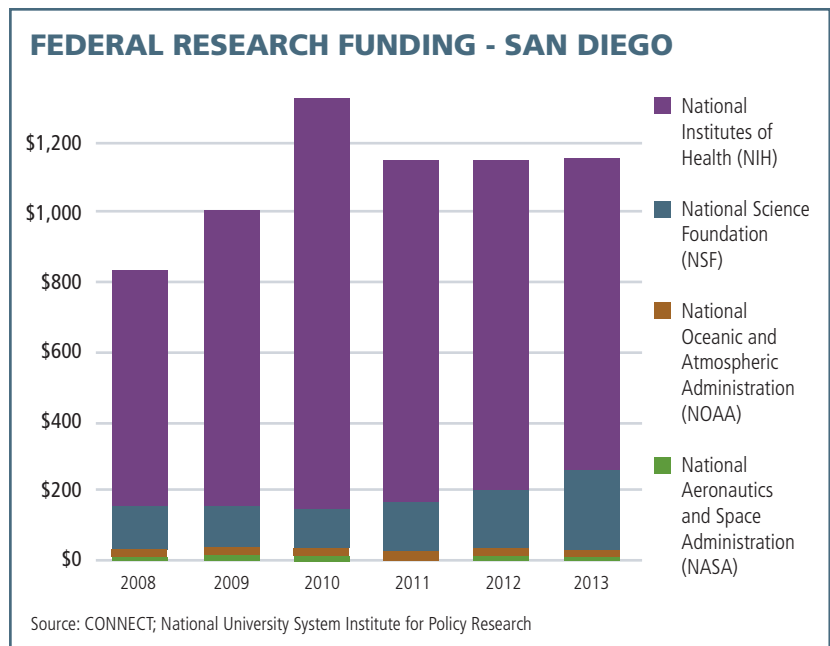
This run-up proved unsustainable, as prices far exceeded the regional median income. At the peak, San Diego's median home cost nearly eight times the regional median household income. Unsurprisingly, the bubble burst, causing severe dislocations. By the start of 2009, the county's median home price was \$270,000, a 46% decline from the peak (National Association of Home Builders n.d.).

Collapsing prices affected San Diego just as they affected other cities. Immediately, employment cratered in the sectors most closely associated with residential real estate development. Employment in construction in the county fell from a peak of 93,700 jobs in August 2005 to a low of 53,600 jobs in January 2011. In the finance, insurance, and real estate sector, employment peaked at 84,400 jobs in March 2006. Five years later, employment in the sector stood at just 66,800 jobs.



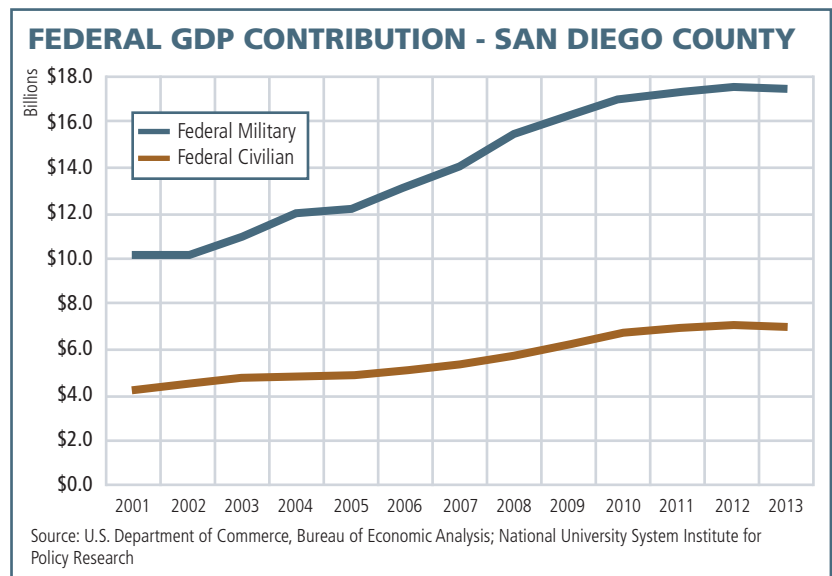
High levels of household debt incurred during the bubble dragged down retail spending. While there are no regional statistics on personal indebtedness, there is no reason to believe that many San Diego households did not experience the debt hangover that has plagued the national economy since 2007 (Federal Reserve 2014). This debt hangover was most apparent in consumer spending and retail employment.

In those ways, San Diego’s economic circumstances were similar to those of other hard-hit Sunbelt areas like Las Vegas, southern Florida, Arizona, and California’s Inland Empire. All saw remarkable growth in construction and residential real estate during the early part of the decade and just as rapidly saw that growth die off, leaving consumers in these regions with significant debt. Unemployment spiked, particularly in the areas most tied to residential housing construction and retail sales.



What was different in San Diego was how the simultaneous expansion of federal spending, especially on the military, cushioned the blow. From 2006 through 2013, the number of federal workers in San Diego grew from 40,400 to 46,500, with the majority of that growth occurring among civilian workers for the Department of Defense. Aerospace manufacturing jobs increased during the recession by 1,000. While the number of uniformed personnel in San Diego has dipped since peaking at 112,000 in 2009, some of this decrease is likely the result of deployments. When deployed personnel have dependents who continue to reside in San Diego, such dips barely affect the regional economy. Federal funding for research—important to the region’s universities, research institutions, and innovation economy—also increased during the recession, growing from \$800 million in 2008 to just under \$1.4 billion in 2010. One can see the effect of this spending by looking at the contribution of federal spending to San Diego’s gross domestic product (GDP). From 2001, when it stood at \$14 billion, federal expenditures rose to top \$22 billion in 2013.

San Diego’s innovation economy also held up remarkably well during the recession, reflecting both local structural strengths and fortuitous global trends. As detailed in section 3, a strong innovation economy contributed to a long-term trend of growing income inequality in San Diego that we do not see abating. While the innovation economy is unlikely to be significantly impacted by increased energy costs, this part of the economy has traditionally



required very high levels of education, and thus its growth has a minimal effect on strengthening the opportunity economy. Furthermore, as of 2014 these jobs only comprise about 13% of all private sector employment in the region (CONNECT, 2014).

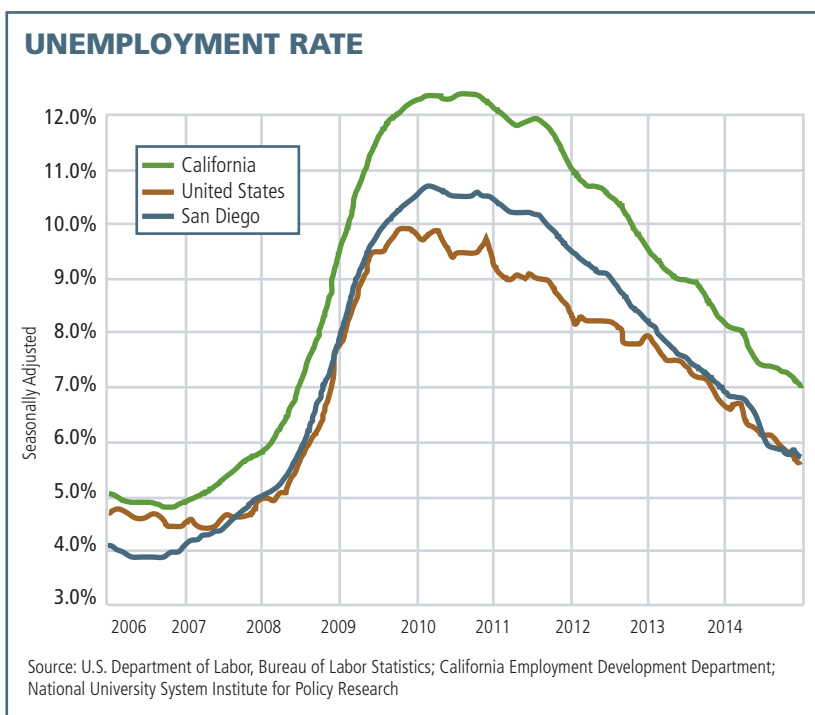
The Great Recession officially ended in San Diego in 2010. Like nearly everywhere else, the recovery has been sluggish. Indeed, it has been the slowest economic recovery the region has experienced since World War II. San Diego's economy took four years

to fully recover from the 2007–09 recession, which was much deeper than the previous major recession of 1990–93.

Recently released and revised estimates of metropolitan GDP by the U.S. Bureau of Economic Analysis (BEA) indicate that San Diego's GDP reached \$197.9 billion in 2013. San Diego's 1.7% GDP increase in 2013 was squarely in the middle for economic growth among the nation's 381 metropolitan areas, which also saw GDP growth of 1.7% in 2013.

While economic output has been sluggish, San Diego's employment growth has been even slower. Only last year, four years after the recession ended, did the number of jobs in San Diego return to 2007 levels.

The slow expansion of jobs while the labor force continued to increase has resulted in the unemployment rate remaining just under 6%, well in excess of the 4% unemployment rate pre-recession. In some neighborhoods and smaller cities unemployment is still above 10%. Under these conditions, wages have been stuck. Even though inflation has remained low, household incomes have not kept pace. From 2005 through 2012, median household income (in nominal dollars) has decreased from \$63,727 in 2008 to \$62,962 in 2013. After adjusting for inflation, that represents an 8% decrease in real household income. Without policy coordination, higher energy costs will take an even bigger bite out of stagnant household budgets.





## 2.

## ENERGY COSTS

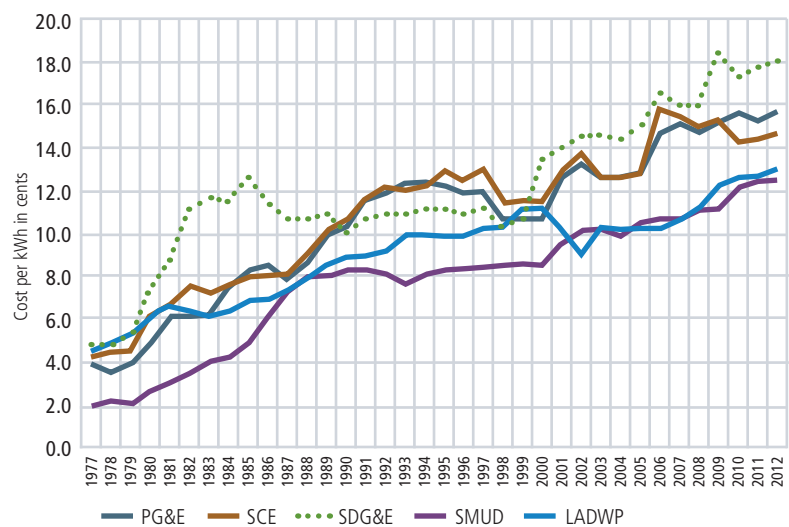
San Diegans have traditionally paid higher prices for electricity and gasoline than consumers in the rest of the state. There are likely many reasons for this difference, including limited competition, infrastructure constraints, high land costs which affects the cost of building energy infrastructure, and the perception of a difficult local regulatory environment (Halverstadt 2015; Bauder 2014). Data from the California Energy Commission (CEC) show that the average per kWh cost of energy for residential and commercial customers of San Diego Gas & Electric (SDG&E) is currently higher than that for either of the state's other two investor-owned utilities (CEC 2014). Except for a brief period during the early 1990s, this has been the case since at least 1977 (ibid).

The biggest difference between SDG&E and the other large California utilities is residential costs. For example, from 2000 through 2012, the costs to residential rate payers in San Diego were, on average, 1.9 cents higher per kWh than the costs to residential customers served by Pacific Gas & Electric (PG&E) and Southern California Edison (SCE). In recent years, there has also emerged a difference in the costs to commercial customers of SDG&E and the costs to commercial customers of other major utilities in the state.

Since 2009, SDG&E's average cost to commercial customers has been 2.25 cents per kWh higher than that of PG&E and SCE, or 16% to 18% higher depending on the year examined.

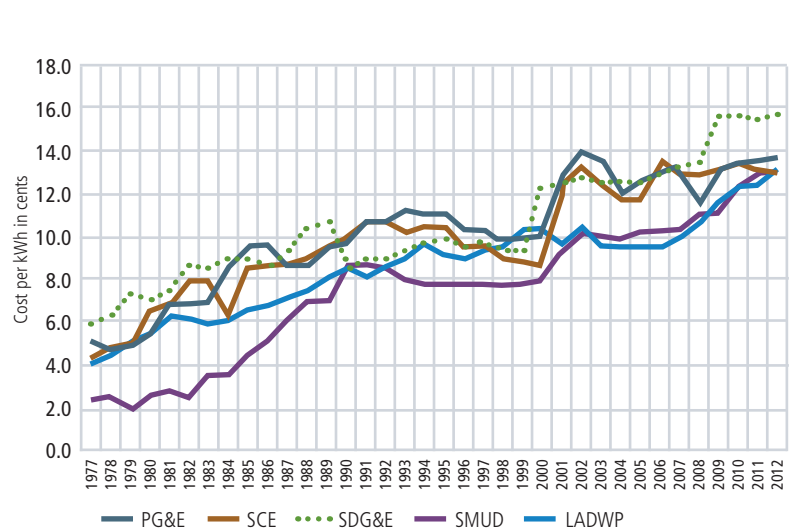
A challenge for the San Diego region is that mandates requiring fixed costs, such as energy-efficiency education campaigns or the smart grid program, fall on a much smaller customer base

**UTILITY-WIDE AVERAGE RESIDENTIAL COST**



Source: California Energy Commission

**UTILITY-WIDE AVERAGE COMMERCIAL COST**



Source: California Energy Commission

that, on average, uses less energy to spread the fixed costs over. According to the U.S. Energy Information Administration (EIA), in 2012, SDG&E had 1,242,395 residential customers compared to 4,599,000 residential customers in PG&E's territory and 4,356,000 in SCE's. Statewide policies that do not take into account SDG&E's much smaller service area risk disproportionately burdening customers who already bear higher costs than others in the state.

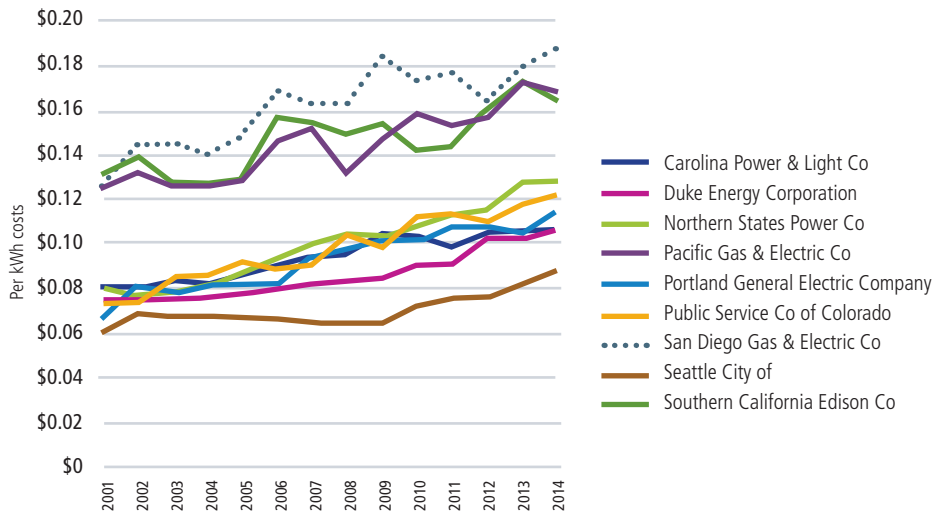
While the CEC does not provide similar data on utilities outside of California, the U.S. Energy Information Agency collects revenue, usage, and operational data from most energy providers in the United States using EIA form 816.<sup>1</sup> It is possible to derive an average cost per kWh by taking the figure for annual total sales for each customer class (residential, commercial, and industrial) and dividing that figure by the reported total energy delivered. Similarly, the data allow one to derive average annual total cost per customer and trends in total energy consumed per customer. In this report, we only consider revenues from bundled customers who receive both energy and delivery from the utility; we exclude figures from customers who only receive either energy or delivery.

The following three figures show utility costs for San Diego and for 10 other utilities serving regions most often cited as San Diego's chief competitors for investment and economic development (San Diego Association of Governments 2002, 2008b). The data illustrate just how much more expensive electricity is in San Diego on a per kWh basis. San Diego's residential costs are 5.1 cents per kWh higher than the average costs in these other regions. Commercial customers in San Diego also pay more per kWh than commercial customers in other regions. From 2001 through 2014, commercial costs in San Diego were 5.6 cents higher per kWh than the average in the competitor regions. These differences are somewhat less pronounced for industrial users. However, since 2007, San Diego's industrial users have paid the highest prices for electricity among these metropolitan areas.

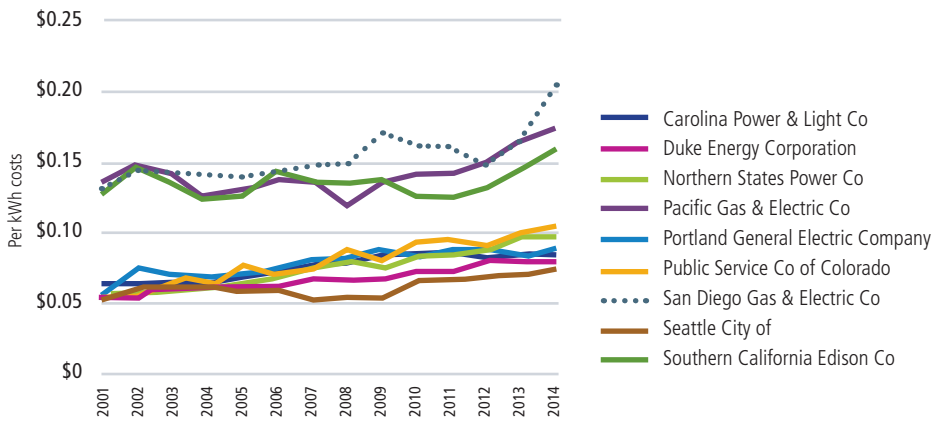
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1. Data can be found at U.S. Energy Information Administration, Electricity Data, <http://www.eia.gov/electricity/data.cfm>. Due to methodological differences, the numbers in the CEC study and secondary measures of costs vary slightly. For example, the CEC reports that average residential costs for SDG&E users in 2012 were 18.1 cents per kWh, while calculations derived from EIA form 816 indicate costs of 16.4 cents per kWh. We do not believe these differences detract from the key finding: that overall, San Diego's electricity costs measured on a per kWh basis are among the highest in the nation.

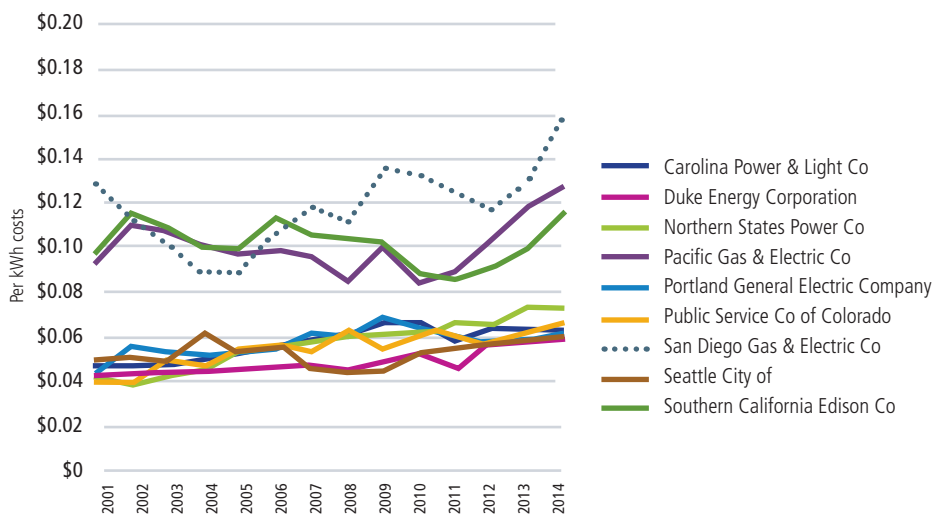
### AVERAGE RESIDENTIAL COST PER KWH, 2001-2014



### AVERAGE COMMERCIAL COST PER KWH, 2001-2014



### AVERAGE INDUSTRIAL COST PER KWH, 2001-2014



Source: Energy Information Agency; National University System Institute for Policy Research

San Diego’s higher per kWh costs have an important counterbalancing factor: on average, San Diego customers use less energy than consumers in many other parts of the country. Aggressive Energy Efficiency policies enacted in California over the past decade coupled with San Diego’s temperate climate helps reduce the need for air conditioning during much of the summer, and the lack of heavy industry in the region also contributes to relatively low per capita energy use. Using finalized EIA data, the following three tables provide the average per customer usage for 2012.

<b>AVERAGE ENERGY USAGE PER RESIDENTIAL CUSTOMER, 2012</b>	
<b>Utility Name</b>	<b>Annual kW Usage per Customer</b>
Carolina Power & Light Co	13,420
Duke Energy Carolinas, LLC	12,640
Portland General Electric Co	10,370
City of Seattle	8,680
Northern States Power Co	8,110
Public Service Co of Colorado	7,850
Southern California Edison Co	7,080
Pacific Gas & Electric Co	6,690
<b>San Diego Gas &amp; Electric Co</b>	<b>6,110</b>

Source: U.S. Energy Agency and NUSIPR calculations

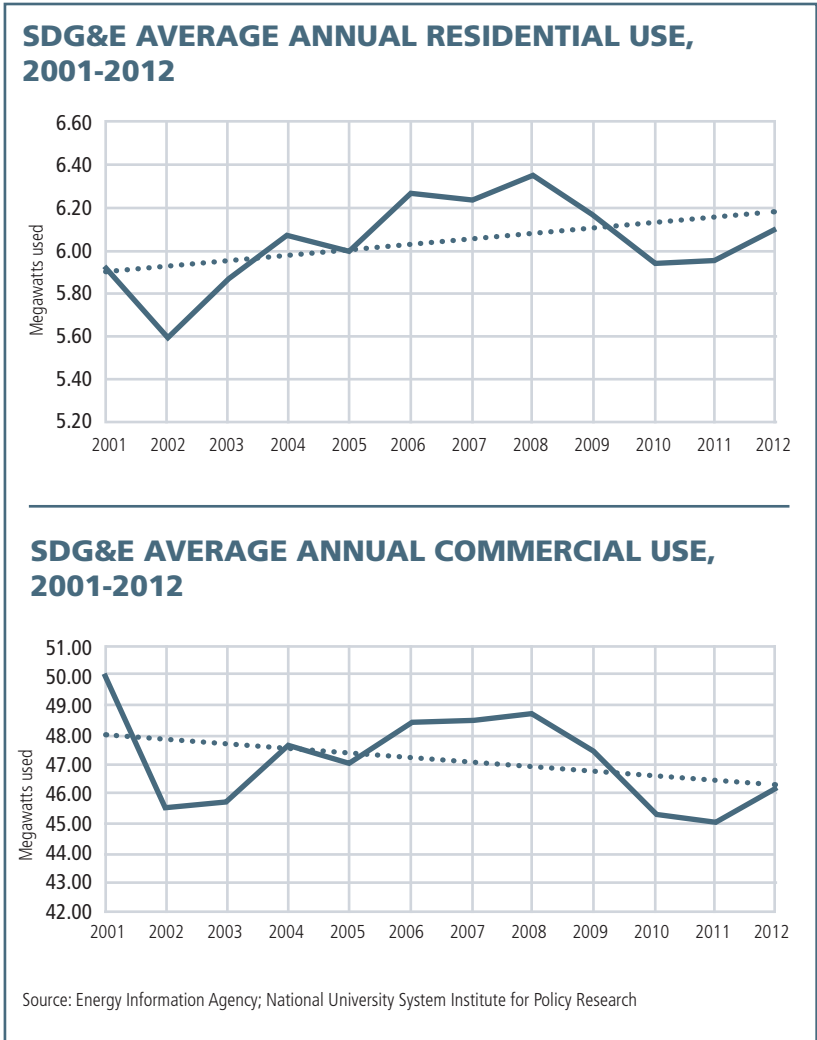
<b>AVERAGE ENERGY USAGE PER COMMERCIAL CUSTOMER, 2012</b>	
<b>Utility Name</b>	<b>Annual kW Usage per Customer</b>
City of Seattle	131,377
Northern States Power Co	101,457
Duke Energy Carolinas, LLC	84,238
Carolina Power & Light Co	71,034
Portland General Electric Co	68,703
Southern California Edison Co	64,866
Public Service Co of Colorado	61,718
Pacific Gas & Electric Co	55,503
<b>San Diego Gas &amp; Electric Co</b>	<b>46,151</b>

Source: U.S. Energy Agency and NUSIPR calculations

AVERAGE ENERGY USAGE PER INDUSTRIAL CUSTOMER, 2012	
Utility Name	Annual kWh Usage per Customer
Public Service Co of Colorado	20,270,186
Northern States Power Co	18,687,258
Pacific Gas & Electric Co	10,151,826
City of Seattle	5,054,056
<b>San Diego Gas &amp; Electric Co</b>	<b>4,392,047</b>
Duke Energy Carolinas, LLC	2,449,475
Carolina Power & Light Co	2,230,505
Portland General Electric Co	1,062,502
Southern California Edison Co	242,044

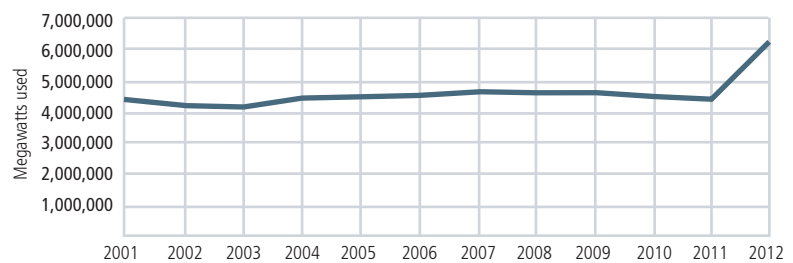
Source: U.S. Energy Agency and NUSIPR calculations

These overall energy usage differences may begin to diminish. San Diego has seen most of its population growth in the past several years in areas that have many more high-temperature days than the cooler coastal areas where most growth had previously occurred. If this trend continues, the energy San Diego households use for summer cooling will likely increase. This population shift may also explain why energy use per residential customer has been trending up over the past decade. Possibly reflecting the continued concentration of employment in coastal areas (as well as the more aggressive adoption of energy conservation building standards and designs), consumption by commercial customers was trending in the opposite direction—though it is now trending upward as the region comes out of the recession.



There are reasons to believe that San Diego's energy costs will continue to rise. SDG&E currently has a request before the California Public Utilities Commission (CPUC) to raise rates by an average of 7.5%, reflecting increased insurance costs and general inflationary pressures. The proposed rate increase does not include additional costs

### SDG&E AVERAGE ANNUAL INDUSTRIAL USE, 2001-2012



Source: Energy Information Agency; National University System Institute for Policy Research

created by the premature shuttering of the San Onofre nuclear power plant, commodity costs, transmission lines, or other major capital projects which will be folded into future rate increases (Lee 2014).

Longer term, the outlook is uncertain. California has aggressively adopted renewable portfolio standards (RPS) that have created a fierce divide among policy analysts. Some observers believe that the transition to a less carbon-intensive energy portfolio is essentially costless as the state leverages abundant solar resources, moves toward more distributed generation models, and offsets increases in per kWh costs with increased conservation and efficiency programs. Even if there are modest cost increases, some argue, the economic consequences will be more than offset by how this transition to a less carbon-intensive economy spurs innovation and new firm formation to meet the demand for cleaner and more efficient energy.

Other analysts suggest that the renewable energy standards are likely to cost money. California is already among the most efficient users of energy in the country. The California Air Resources Board's own researcher predicted a rise in energy costs and used that prediction to forecast decreased consumption and shifts in consumer spending patterns (and thus the predicted economic "gains" from the more stringent energy portfolio requirements).

It is impossible to know which of these views will be borne out by future events. Much if not all of the outcome hinges on the private sector's capacity to break through current engineering challenges and produce renewable energy at a price which is competitive with that of carbon-based energy sources. To the extent that this happens, requirements that 33% or even 50% of the state's energy come from renewable sources may be met without a dramatic price increase. Impacts will be further minimized to the extent that residential and commercial customers find ways to conserve additional energy. Per kWh costs may increase, but the overall bite taken out of household budgets may remain the same or even decrease.

However, as critics are right to point out, this outcome is not assured. Rooftop solar installations continue to require subsidies to be cost-effective options for most California consumers. Regulators and policy makers struggle with how to structure California's energy system to encourage efficient distributed generating capacity while maintaining a large, reliable transmission grid.

Instructive in this debate is a 2014 analysis by the Little Hoover Commission. As it noted, there have been numerous projections about energy costs and about the state's efforts to increase the share of renewables

in its energy portfolio (Little Hoover Commission 2014). Forecasts vary significantly, and many questions look at only a few of the moving parts of a complex system. For example, several reports that the Hoover Commission examined focus on average generation costs of large-scale renewable projects. However, in San Diego, an alternative pathway is emerging with the widespread adoption of rooftop solar, a development that alters the distribution of short- and long-term costs among utilities, solar adopters, and consumers who are unable or unwilling to install their own systems. Especially in San Diego, analysts are largely shooting blind in understanding the long-term effects on customer classes as rooftop generation becomes increasingly cost-competitive with retail rates, while at the same time SDG&E is mandated to provide a reliable grid able to meet all peak-demand requirements, including the demand created by both solar adopters and the rest of the customer base. A time-out from further increasing the RPS would enable the state to modify rates from the regime imposed by Assembly Bill 1X so as to allow a fuller understanding of who will pay to provide a reliable grid, while at the same time many customers are generating a portion of their total energy consumption on their rooftops.<sup>2</sup>

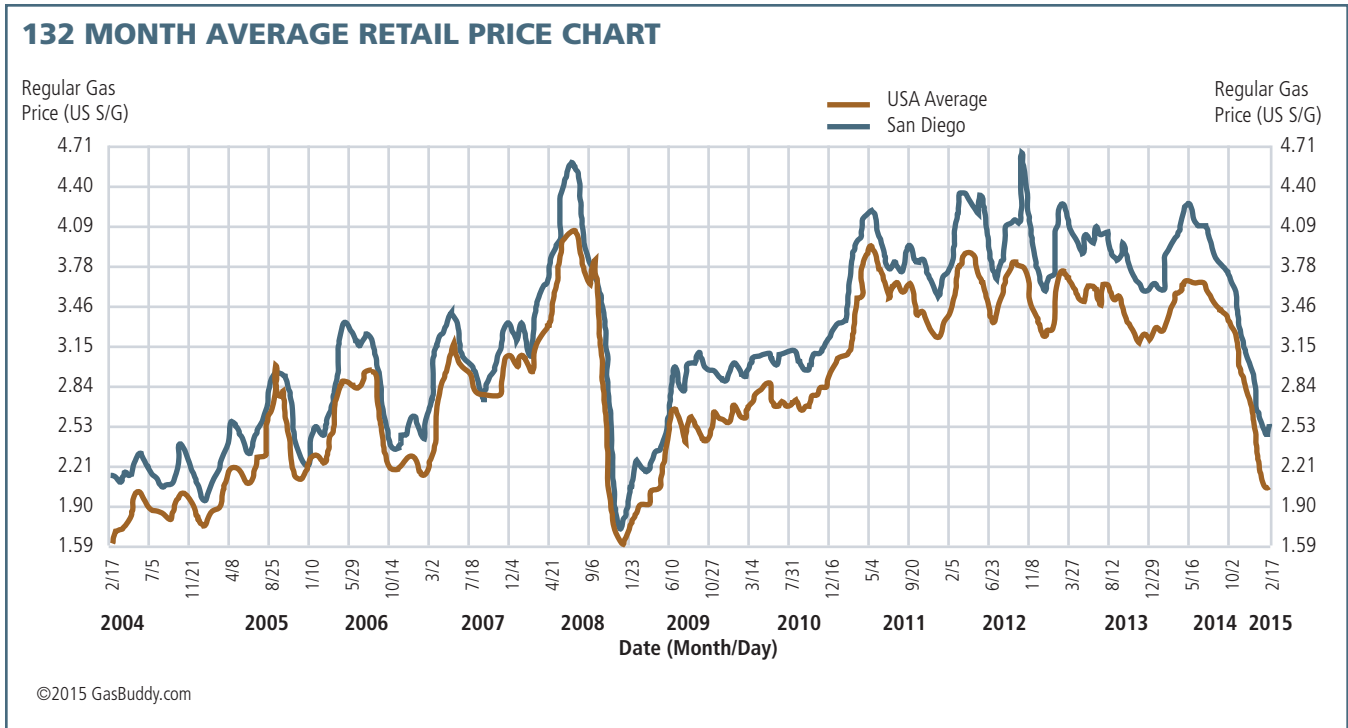
Costs are also likely to increase in San Diego County given the permitting challenges of large-scale infrastructure projects. SDG&E spent nearly a decade seeking permits for the Sunrise Powerlink transmission line between renewable resources in Imperial County and the utility's main customer base in San Diego. It has proved extremely difficult to obtain regulatory approvals for peaker power plants, infrastructure that some have argued is vital in meeting generation requirements in the valley between when solar systems begin drop off in the late afternoon as the sun begins to set while, at the same time, residential and commercial demands continue to increase and peak in the evening hours (Lee 2012). Regulatory approval and forecasting are still divided in complex and poorly coordinated ways between the CPUC and the CEC. Assembly Bill 32, the California Global Warming Solutions Act, has greatly increased the Air Resources Board's role in policy areas that will profoundly impact the state's energy future and the cost of energy to consumers. As former California governors George Deukmejian, Gray Davis, and Pete Wilson wrote in a 2014 opinion piece, the absence of a coordinated plan is creating opportunity costs for the state and likely leading to inefficiencies:

Such a plan is needed to provide the coordination, guidance and strategy to achieve our state's environmental and economic goals. A comprehensive plan will offer a pathway to accomplish these goals while capturing emerging energy opportunities, both conventional and renewable, for the benefit of California consumers. A good energy plan will also recognize that strong economic competition from other states and nations absolutely requires that California's energy costs remain competitive for business. (Deukmejian, Davis, & Wilson 2014)

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2. See, for example, <http://epicenergyblog.com/2013/06/26/residential-rates-revisited-part-3-legislative-fixes/>

With respect to gasoline, San Diego's prices have usually trended closely to prices in other major California markets which, in turn, have some of the highest gas prices in the nation. The figure below compares the average retail price for a gallon of regular unleaded gasoline for San Diego and for the rest of the nation since 2004.



As with electricity, policy makers should be concerned about how various mandates will interact and impact fuel prices. Some of the policies having the greatest impact are enacted at the state level. For example, there is concern that the move toward including motor fuels under the cap-and-trade system, as well as requiring motor fuels to meet California's unique low-carbon standards, could increase the cost of gasoline in the state, though there is significant debate over the magnitude of this impact (Adams 2014).

In other ways, San Diego has unique circumstances. For example, the region does not have a major oil refinery, so it must import all of its retail gasoline from refiners outside of the region. To the extent that new policies, such as the switch to gasoline types unique to the state, make supply chains and inventory management more cumbersome, San Diegans could disproportionately bear these costs (Soleymani 2001, p. 1398).



# 3.

## INCOME INEQUALITY AND SAN DIEGO'S OPPORTUNITY ECONOMY

The recovery from the recession has accentuated an important trend in San Diego: the continued transformation of the region's economy toward one that is more diversified and largely driven by firms in the innovation sector (Walshok & Shragge 2014). Yet, the parts of the economy which provides the greatest chances for upward mobility – sectors such as manufacturing and construction – have been stuck in neutral. Energy policies that increase prices will make it more difficult to decrease inequality and to increase opportunities for upward mobility.

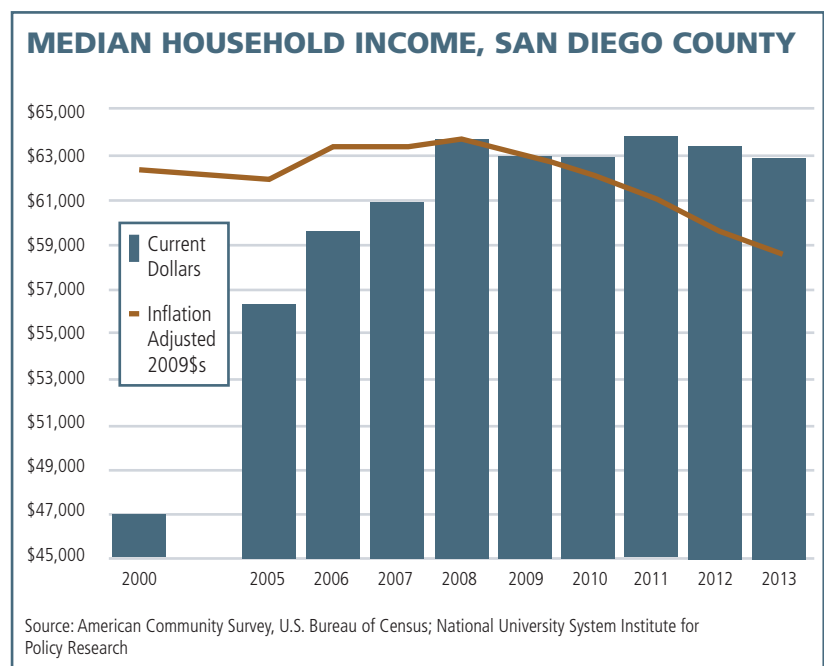
\* \* \*

Like many regions, a significant problem in San Diego is income inequality and the challenge of increasing upward mobility. After adjusting for inflation, median household income in the county has fallen from a peak of \$63,727 in 2008 to \$58,607 in 2013 (adjusted for inflation to 2008 dollars).

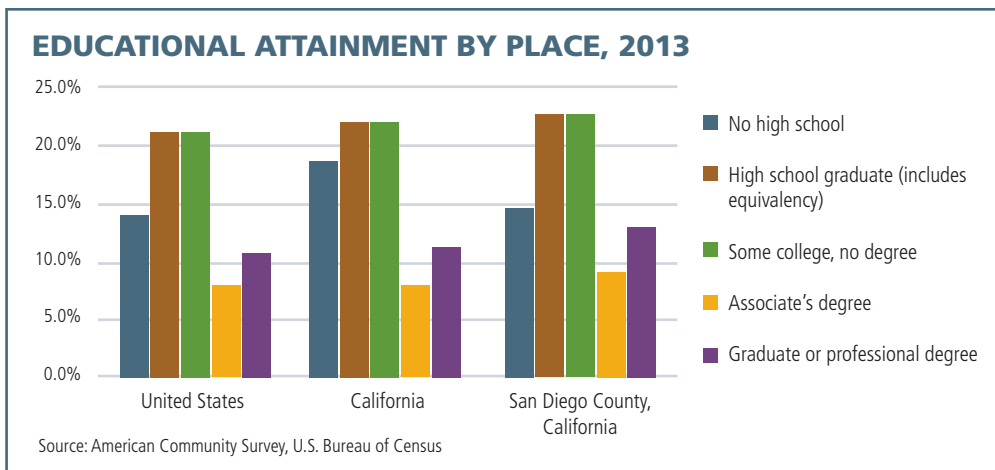
For residents without a college degree, the numbers are much worse. In 2005, the median annual earnings for San Diegans with a high school degree or equivalent was \$28,318 (not inflation adjusted). In 2012, the median annual

earnings for a resident with a high school degree had barely moved and stood at \$29,582. Adjusted for inflation, this segment of the population has seen median average earnings decrease by more than 15%. In contrast, San Diegans holding a bachelor's degree saw earnings, after adjusting for inflation just slightly decrease, from hold steady from \$47,492 in 2005 to an inflation adjusted \$46,620 in 2012 (a 1.8% decline).<sup>3</sup>

Educational attainment is barbell shaped in the region. Compared with the nation and the rest of the state, more San Diegans have at least a bachelor's degree. At the same time, more San Diegans do not have even a high school degree, a key issue when looking at the importance of growing the opportunity economy.

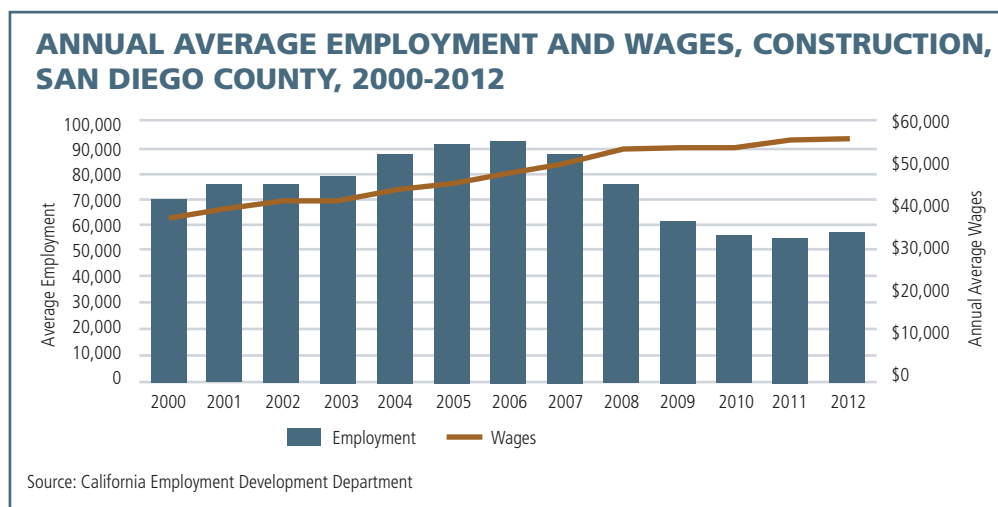


3. U.S. Census, American Community Survey five-year estimate.



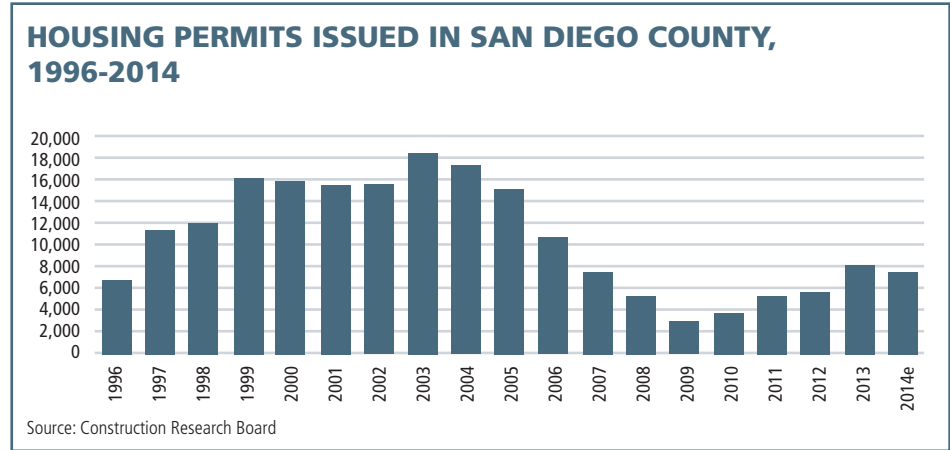
The increasingly two-tiered nature of San Diego’s economy a main reason why it is important to get energy policy right. While energy costs have generally tracked with income, recent rate-increase requests and the impact of policies like the RPS could push prices higher faster than median incomes rise. This possibility is especially likely for lower-income San Diegans, who have seen a decline in their real incomes over the past ten years. A similar situation exists with respect to policies such as low-carbon fuel mandates and cap-and-trade policies directed at the transportation sector. Indeed, as discussed in section 4, one response to high housing costs has been for lower- and medium-income households to move to far-flung exurban communities. Policies that raise the cost of fuel act like a regressive tax on households that already suffer long commutes.

A second major concern is that rising energy prices will hurt San Diego’s already stressed opportunity economy. There are two key sectors for jobs that help San Diegans move up the economic ladder: construction and manufacturing. In construction, from 2006 through 2010, the region lost nearly 37,000 jobs, dropping from a peak of 92,000 to a low of 55,517. While there has been some recovery, these are key jobs lost in the region’s opportunity economy.



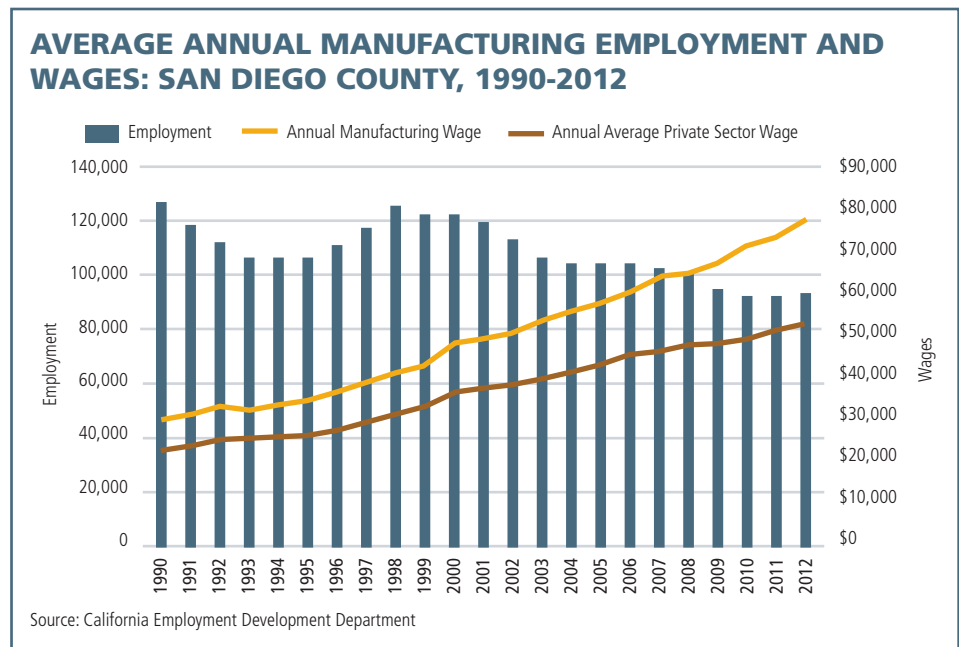
In 2013, construction jobs had a median wage of \$55,197, which was 2.6% above the median private-sector wage of \$53,776.<sup>4</sup> Construction jobs do not necessarily require a post-secondary degree, instead focusing on apprenticeship and on-the-job training. While that sector has experienced modest recovery, with 61,568 construction jobs as of March 2014, the region is still well off the previous peak.

Moreover, it is unclear whether construction employment will return to 2006 levels. Since 2009, the region has given out an average of only 5,490 housing permits per year, well off its traditional average of 10,000 to 12,000. The San Diego



Association of Governments projects that the majority of housing built in the region will not be in major master-planned communities that typically hire thousands of workers during build-out. Instead, new housing construction will focus on infill projects that will be much smaller (and much more difficult to gain approval for, if current neighborhood battles are any indication). Segments of the construction industry can be particularly energy intensive, including aggregate mining, site preparation, and material manufacturing. Dr. Michael Shires argued that especially as California's cap-and-trade policies increase fuel and transportation costs, some projects that might otherwise have proceeded will find that they no longer make financial sense and will be delayed or cancelled (Shires 2014).

Also under significant stress are the region's remaining manufacturers. Manufacturing employment in San Diego totaled 129,000 jobs during 2001. Since then, it has been in a long decline despite increases in manufacturing production. San Diego manufacturing largely comprises computers and electronics, transportation equipment (primarily for



4 . U.S. Bureau of Labor Statistics; Quarterly Census of Employment and Wages

aerospace and shipbuilding), miscellaneous (mostly recreational goods, like golf equipment), and chemical products.

Jobs in this sector also pay well. In 2013, the annual average wage in manufacturing stood at \$75,917, or more than \$20,000 above the regional annual median wage for the rest of the private sector.

As in Los Angeles and the Inland Empire, energy costs are likely to affect certain segments of the manufacturing industry (Shires 2014; Husing 2014). San Diego’s computer and electronics and recreational goods industries have been under long-term stress and face increasing competition from lower-cost regions.

The U.S. Energy Information Administration has compiled data on energy uses in different manufacturing segments (U.S. Energy Information Administration 2010). The following table shows the energy consumption per employee and value added per BTU used in various manufacturing sub-sectors. The far-right column shows the number of San Diegans employed in 2012 in each sub-sector.

<b>ENERGY CONSUMPTION PER EMPLOYEE AND VALUE ADDED PER BTU USED: 2010</b>					
<b>NAICS Code</b>	<b>Subsector and Industry</b>	<b>Energy Consumption per Employee (million Btu)</b>	<b>Consumption per Dollar of Value Added (thousand Btu)</b>	<b>Consumption per Dollar of Value of Shipments (thousand Btu)</b>	<b>Average Annual Employment San Diego Count 2012</b>
324	Petroleum and Coal Products	37,173.20	35.5	6	79
322	Paper	5,040.30	23.9	10.8	784
331	Primary Metals	2555.50	6.7	3.6	838
327	Nonmetallic Products	1699.80	13	6.7	1,504
325	Chemicals (other than Pharm and Medicine)	1,268.20	2.7	1.7	1,618
321	Wood Products	1,196.60	12.3	5.1	354
311	Food	878.9	4.7	1.9	4,517
312	Beverage and Tobacco Products	435	1.3	0.6	1,475
313	Textile Mills	383.5	3.9	1.6	315
326	Plastics and Rubber Products	246	2	1.2	3,387
334	Computer and Electronic Products	183.9	0.6	0.4	24,548
3254	Pharmaceuticals and Medicines	149.6	0.2	0.2	5,706
332	Fabricated Metal Products	143.9	1	0.6	7,140
336	Transportation Equipment	137.4	0.5	0.3	13,783
333	Machinery	80.4	0.4	0.2	8,423
339	Miscellaneous	79.4	0.3	0.2	4,125
337	Furniture and Related Products	73.8	0.7	0.4	1,636
314	Textile Product Mills	68.8	0.5	0.4	544
335	Electrical Equip., Appliances, and Components	56.8	0.6	0.3	2,231
315	Apparel	29.8	0.6	0.2	1,237
316	Leather and Allied Products	25.6	0.4	0.2	267

Source: U.S. Energy Information Agency, Manufacturing Energy Consumption Survey, 2010

Probably the most notable issue is the relatively high energy usage by the food industry. Food preparation has been an industry targeted for growth and attraction by San Diego economic developers, and higher energy prices could create real and significant barriers to growing this industry (San Diego Association of Governments 2008a). In 2012, there were 11,169 San Diegans working in manufacturing jobs that used above the median energy consumption per employee of 397 million BTUs. By that measure, these jobs are the most at risk if energy prices rise disproportionately in San Diego County.

## 4.

## HOUSING COST

San Diego remains among the nation's least affordable housing markets. The latest comparison of the nation's 200-plus major metropolitan area housing markets by the National Association of Home Builders shows San Diego was the nation's ninth least affordable, with only 23.4% of area households able to afford to purchase the median-priced home.

Unaffordable housing in San Diego is not a new phenomenon. The area's median home prices have long been significantly higher than national averages. The figure to the right shows the median price of homes sold in San Diego compared to national prices.

San Diego's relative housing unaffordability is borne out by other measures.

The figure to the right shows the ratio of the median home price to income. During the 1990s, San Diego home prices were equal to 3.5 times to just over 4.0 times the average household income in the region, while the national ratio was 3.0. During the housing bubble, this ratio first spiked to 8.0 and then collapsed to 3.6. The ratio has crept back up, reaching 6.0 in 2014.

## HOUSING OPPORTUNITY INDEX, 4th Quarter 2014

Least Affordable Rank	Metropolitan Area	Housing Opportunity Index +	Median Home Sales Price	Median Family Income	Ratio of Home Price to Income
1	San Francisco-San Mateo-Redwood City, CA*	11.1	\$920,000	\$100,400	9.16
2	Napa, CA	12.0	507,000	70,300	7.21
3	Santa Cruz-Watsonville, CA	15.0	593,000	77,900	7.61
4	Los Angeles-Long Beach-Glendale, CA*	16.2	460,000	61,400	7.49
5	Salinas, CA	16.9	420,000	59,100	7.11
6	Santa Ana-Anaheim-Irvine, CA*	17.1	585,000	83,400	7.01
7	San Jose-Sunnyvale-Santa Clara, CA	21.8	681,000	101,900	6.68
8	New York-White Plains-Wayne, NY-NJ*	24.7	450,000	65,500	6.87
9	Santa Rosa-Petaluma, CA	25.0	440,000	76,900	5.72
10	SAN DIEGO-CARLSBAD-SAN MARCOS, CA	25.3	430,000	72,700	5.91
11	San Luis Obispo-Paso Robles, CA	26.6	435,000	77,000	5.65
12	Oakland-Fremont-Hayward, CA	31.4	499,000	88,500	5.64
13	Santa Barbara-Santa Maria-Goleta, CA	33.3	450,000	72,800	6.18
14	Oxnard-Thousand Oaks-Ventura, CA	34.8	463,000	88,700	5.22
15	Honolulu, HI	35.3	509,000	82,600	6.16
16	Ocean City, NJ	41.3	365,000	73,500	4.97
17	Stockton, CA	45.4	250,000	58,200	4.30
18	Riverside-San Bernardino-Ontario, CA	45.5	269,000	60,700	4.43
19	Miami-Miami Beach-Kendall, FL	46.3	205,000	48,600	4.22
20	Laredo, TX	46.4	144,000	39,000	3.69
21	Barnstable Town, MA	47.7	330,000	74,900	4.41
22	Sacramento-Arden Arcade-Roseville, CA	48.5	292,000	68,000	4.29
23	Provo-Orem, UT	49.3	292,000	64,200	4.55
24	Fresno, CA	49.9	205,000	48,700	4.21
25	El Centro, CA	50.5	175,000	43,000	4.07
	National	62.8	215,000	63,900	3.36

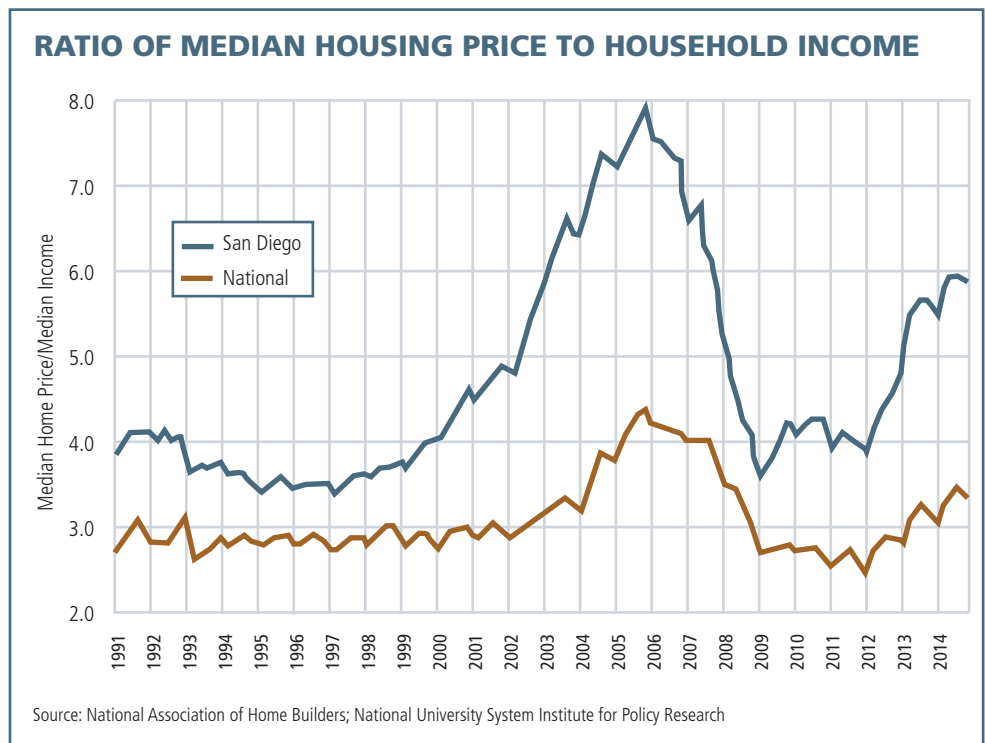
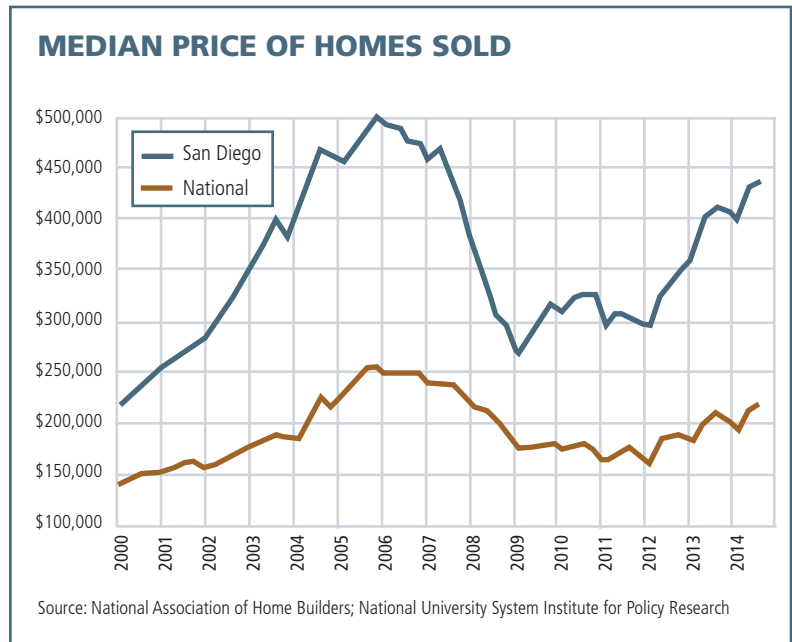
\*Indicates metropolitan divisions, all others are metropolitan statistical areas.  
 +Share of homes sold during the quarter affordable to median income.  
 Source: National Association of Home Builders; National University System Institute for Policy Research.

One way San Diegans have responded to these prices is by moving farther and farther east, where land prices (and thus housing costs) have traditionally been lower. Successive waves of suburbanization have led to growth in the El Cajon Valley, the inland corridor along Interstate 15, and far eastern Chula Vista and southern Riverside County.

The following map shows the number of days with high temperatures of at least 80 degrees. The most temperate areas are along the coast, with higher temperatures in the inland valleys. To conduct this climate analysis, NUSIPR obtained geocoded population data from the 1990, 2000, and 2010 censuses and matched it to a zip-code data layer using GIS mapping software.

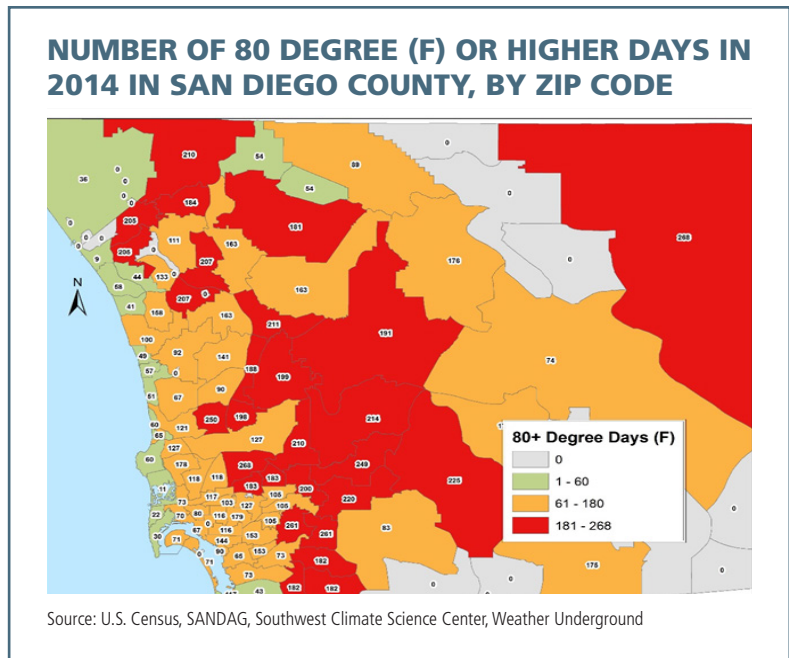
Additional daily climate data for 2014 was gathered online from the Southwest Climate Science Center and the Weather Underground website, then sorted, formatted, and joined with the other datasets.

We then examined census data to see where population growth had occurred during the past decade. As the table to the right shows, while temperate areas with fewer than 60 days of 80-plus degree temperatures have added 63,998 residents since 1990, areas that have at least 180 days above 80 degrees have added almost four times as many residents. The region's population distribution has shifted noticeably. Today, one out of three residents live in areas that weathered six months or more of high temperatures in 2014.



As noted in section 3, this population shift could have profound effects on energy usage in the San Diego region. Offsetting the region's extremely high per kWh costs was the fact that overall energy usage tended to be lower. A reason for this lower overall usage, especially for residential customers but also for commercial users, is that the region's temperate climate limits the number of days when people run air conditioners. However, as the population has grown and shifted to areas where the climate is more severe, energy usage has ticked up. Given both the trend line in the chart below and migration patterns, it is likely that the region will see per capita energy use increase, especially in areas farther from the coast.

This increased demand for energy will challenge energy policy makers. San Diego has proved largely unable to overcome resistance to infill development from existing residents, and most major housing projects result in organized opposition that is difficult to counter. There is every reason to believe that San Diego will continue to see most future development outside of its central business district, in the areas to the east, and that per capita energy demand will increase. Optimistically, these are the same areas where local solar



### 80 DEGREE DAYS AND POPULATION GROWTH, BY ZIP CODE

80+ Degree (F) Days in 2014	1990-2010 Net Population Growth
0-60	63,998
61-120	169,310
121-180	99,493
181-240	226,371
241+	40,360

Source: U.S. Census, SANDAG, Southwest Climate Center, Weather Underground

### 80 DEGREE COOLING DAYS AND POPULATION SHIFT, BY ZIP CODE

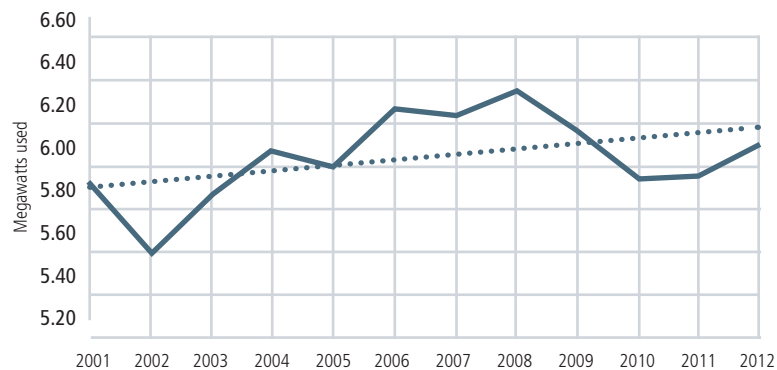
80+ Degree (F) Days in 2014	1990 Population	2000 Population	2010 Population
0-60	14.50%	14.40%	13.70%
61-120	32.30%	32.20%	31.50%
121-180	22.70%	21.40%	21.50%
181-240	23.60%	24.90%	26.50%
241+	7.00%	7.20%	6.90%

Source: U.S. Census, SANDAG, Southwest Climate Center, Weather Underground



resources are abundant and present the opportunity for developing additional renewable resources. However, as mentioned earlier, encouraging additional solar power while maintaining a robust and reliable energy grid has created significant policy challenges. The current state of flux suggests a reason to call a time-out until policy makers determine a smart and strategic way to meet renewable energy goals and fund grid reliability that is equitably distributed among all energy users in the region.

### SDG&E AVERAGE ANNUAL RESIDENTIAL USE, 2001-2012



Source: Energy Information Agency; National University System Institute for Policy Research

# 5.

## CONCLUSIONS AND RECOMMENDATIONS

San Diegans have traditionally paid some of the country's highest per kWh costs for energy. This is true whether we measure the costs against the nation as a whole, against those of other California utilities, or against the metropolitan areas most often pointed to as the region's competitors (Halverstadt 2015). Further, along with other Californians, San Diegans pay among the highest costs for gasoline in the continental 48 states. For these reasons alone, San Diego has a particular interest in seeing policy makers develop a more coordinated and strategic approach to the state's energy future. Moreover, in addition to high costs, the region is among the leaders in adopting rooftop solar and has an interest in how California restructures the rate framework put in place by AB1X and in how it addresses the need to import most of its renewable energy from sources distant from population centers.

Yet, policies continue to be made without much strategic consideration. At the time of writing this report, SDG&E has an application before the PUC to restructure residential rates away from the four-tier system adopted in the wake of the California energy crisis and toward one which reduces the subsidies that tier one and two customers currently enjoy. There are good reasons to believe that such a shift would be equitable and more sustainable. It is also undeniable that the current structure has created powerful economic incentives for some customers, usually the most affluent and largest residential users, to invest in rooftop solar. The myriad policymaking bodies charged with charting a course for the state's energy future seem absent from these discussions, which are taking place within the context of a filing before the PUC. Policies toward transportation fuels are also at a critical crossroads and need greater coordination. The state is trying to figure out how to reduce greenhouse emissions from the transportation sector at the same time it is struggling with how to equitably pay for transportation infrastructure (Burke et al. 2015).

At this opportune moment, San Diegans need a policy leader to call a time-out. San Diego, along with the rest of California, has a strong interest in developing a more sustainable and economically efficient energy system. Taking the time, during this period of unprecedented change, to get policy right would seem only prudent and would yield significant benefits to the region's citizens.

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