LEGISLATING ENERGY PROSPERITY

Wayne Winegarden, Ph.D.

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By Wayne Winegarden, Ph.D.
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Pacific Research Institute
101 Montgomery Street, Suite 1300
San Francisco, CA 94104
Tel: 415-989-0833
Fax: 415-989-2411
www.pacificresearch.org

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Foreword

By Daniel Turner, Founder and Executive Director of Power the Future and Wayne Winegarden, Senior Fellow at PRI

The Pacific Research Institute and Power The Future have partnered on a study to investigate the impact that California's green policies are having on the state's economy.

California, though it is the fifth largest economy in the world, has some notable economic challenges that include the highest poverty rate (18.1 percent) of any state in the nation and the country's worse homelessness crisis.

The question posed to the researchers was: can we connect California's energy policies to these economic challenges?

In total, California implements 218 different energy efficiency regulations, incentives, and tax programs. These include policies to reduce greenhouse gas emissions and energy taxes on families. Despite their intention, these policies fail to achieve their intended goals. For instance, since 2007, total CO_2 emissions have fallen over 14 percent nationally while emissions declined 9 percent in California over the same time period.

While its policies are not leading to a larger decline in emissions, Californians are still paying the price. Residential electricity prices are 46 percent higher and business electricity prices are 69 percent higher in California than the national average. Before issues with global oil producers and the COVID-19 pandemic affected both production and demand, the average price of a gallon of gas was 37 percent more expensive in California compared to the nationwide average. Since the COVID-19 disruptions, California's percentage price gap widened to 55 percent.

Policies meant to better California have neither achieved the tangible, intended goal of reducing emissions nor have they improved the quality of life for the people of California. Instead the policies have increased the electric bills for households and businesses, and raised gas prices at the pump. Policies which do not achieve their intended outcomes and which hurt families and businesses need to be revisited, revised, or preferably repealed.

These higher costs that the state's energy policies impose on California's families are even less justifiable today due to the recession caused by the coronavirus pandemic. As the recession has decreased the financial security of millions of California families, reducing the unnecessary economic burdens California's energy policies cause is more imperative than ever. By eliminating these costs, the state can thrive while also promoting its natural beauty and environment. California has the potential to be a better, more economically friendly state, and this study identifies the policies that are preventing these important goals from becoming a reality.

Executive Summary

California can continue to lower its greenhouse gas (GHG) emissions, help families recover from the coronavirus-induced recession, and still benefit from a more affordable, and more reliable, energy sector. Realizing these benefits require state government leaders to take a different policy approach, however. If this opportunity is seized, energy reforms that reverse the myriad of costly regulations and tax programs could generate between $14.8 billion and $26.8 billion in annual energy savings, or between $1,147 and $2,077 per household. While it would take time for these savings to be fully realized, this represents an opportunity to deliver the equivalent of a major tax cut to hard working California households and businesses, many of whom are struggling financially due to the economic downturn triggered by COVID-19.

Currently, California implements 218 different energy efficiency regulations, incentives, and tax programs that reduce job and income growth across the state but are felt more severely in the Central Valley and Inland Empire regions, areas which are much poorer than coastal communities. These lost opportunities are often justified based on the need to reduce overall GHG emissions. However, there are other policy approaches that are capable of lowering GHG emissions without imposing the economic consequences of California's approach. After all, since CO_2 emissions peaked in 2007, they have fallen over 14 percent nationally but only by 9 percent in California. Changing California's approach can unlock potential economic opportunities that include more affordable gasoline, more affordable electricity, badly-needed new job opportunities, and higher family incomes—while still achieving the same goal of lowering GHG emissions.

Starting with the potential savings on gasoline, between 2001 and 2014, prior to when California's energy policies began impacting gasoline prices, the average price-premium relative to the U.S. was 11.3 percent. As of 2019, California's price-premium widened significantly to 37 percent higher than the national average. Even with the collapse in gas prices through April 2020, gas prices are more than 55 percent more expensive in California compared to the national average. Repealing the California-only policies that are responsible for these relative price spikes would help return the state's excessive gas prices back to the pre-2015 average. While such a transition would take time, based on California driving trends and the average gas prices in 2019, state consumers could save between $9.5 billion and $9.6 billion annually, depending upon the assumptions regarding how many of the total miles driven in 2019 were due to electric vehicles. Based on the gas prices as of April 24, 2020, California consumers could save between $10.9 billion and $11.0 billion annually.

A similar pattern applies to California's electricity prices. As of 2018, state residential electricity prices are 46 percent higher than the U.S. average, and business electricity prices are 69 percent higher than the U.S. average. Except for the price spikes in 2000 – 2002 that resulted from the state's infamous electricity crisis, California's electricity price premium has never been wider. And, just like with the gasoline market, these excessive costs are a direct result of California's global warming policies. Since it is the state's policies that are driving the rising prices, reversing these policies will remove the pressures that are inflating California's energy costs while enabling electricity generation infrastructure to become more cost-efficient. The result will be lower electricity prices for both residential and business customers.

> "However, there are other policy approaches that are capable of lowering GHG emissions without imposing the economic consequences of California's approach.

While there is no reason why California's electricity prices must be higher than the rest of the country, there are many other inefficiencies that still plague California's electricity market and work against energy affordability in the state. To account for these inefficiencies, the analysis runs two scenarios. A Low Impact Scenario assumes that California's electricity prices would only decline to the average premium that persisted between 1990 and 2014, excluding the years of the electricity crisis during the early 2000s. Based on this assumption, electricity prices would be 32.2 percent higher for residential consumers and 45.0 percent higher for business consumers today as opposed to the current premium of 46 percent and 69 percent, respectively. A High Impact Scenario assumes that California's electricity prices would decline to the U.S. average. Across residential and business consumers, based on the current number of customers and the current consumption per customer, eliminating the policy inefficiencies can generate annual potential savings between $5.3 billion and $15.7 billion.

Treating the total potential gasoline and electricity cost reductions (between $14.8 billion and $26.8 billion) as the equivalent of a major tax cut, eliminating these excessive costs would increase average annual real state GDP growth between 3.1 percent and 3.3 percent. Over 10 years, such an increase in the annual economic growth rate would increase the size of California's economy, adjusted for inflation, by between $122.5 billion and $223.4 billion. Due to this accelerated economic growth, Californians would benefit from faster job growth and an acceleration in the growth of family incomes – and state government would also benefit with billions in new tax revenue to fund important priorities. This would be a welcome economic boost at a time of a significant statewide recession.

Even with the collapse in gas prices through April 2020, gas prices are more than 55 percent more expensive in California compared to the national average. It is clear that the state's energy policies burden families with large economic costs and denies potential economic opportunities to too many of the state's residents. Making these costs worse, lower- and middle-income families bear a disproportionate share of the current burden. Because of this, lower- and middle-income families stand to gain the most from an alternative policy approach. Importantly, this alternative policy approach does not mean that overall GHG emissions will increase. As evidenced by the faster decline in GHG emissions in other states, an alternative approach to energy will enable California to reduce its emissions footprint without imposing the large, and regressive, economic costs associated with its current policies.

Achieving both of these goals requires the state to repeal the costly mandates, taxes, and regulations that artificially drive up the costs of traditional energy sources, and in their stead, implement policies that increase the use of natural gas, and promote zero-emission nuclear power.

Introduction

California enjoys many advantages relative to all other states. It has an ideal climate, beautiful beaches, and plentiful natural resources. California is also home to a top-notch university system, the largest high-tech cluster in the U.S., the largest agricultural economy, and one of the largest financial centers in the U.S. With all of these benefits, it is not surprising that California is the fifth largest economy in the world.[1]

Despite these advantages, California has imposed many barriers to prosperity that reduce economic opportunity in the Golden State. When adjusted for the cost of living and noncash government benefits, California has the highest poverty rate (18.1 percent) of any state in the nation.[2] The state also faces the country's worse homelessness crisis, exceptionally high energy costs, and looming fiscal crises (e.g. California's unfunded pension liabilities). On top of these challenges, like the rest of the country, the cornavirus has hit the state's economy hard, costing families jobs, income, and wealth, and impacting state and local budgets.

While the economic carnage caused by the coronavirus may have been unavoidable, many other lost opportunities are not random, nor due to bad luck. They are the expected consequences from California's policy choices. Since the consequences are self-inflicted, California can capture these opportunities by changing its policies. Toward this goal, changing the state's approach toward energy production and energy use is one of the most important policy changes that California can make.

The Pacific Research Institute's November 2018 publication, *Legislating Energy Poverty* documented California's array of energy policies, and their adverse consequences.[3] These policies include:

- Cap-and-trade regulations, effective since 2013, that cover approximately 85 percent of total greenhouse gas (GHG) emissions in California;
- Renewable portfolio mandates that require California to generate 100 percent of its electricity from zero-emission energy sources by 2045;
- Net Metering regulations that require utilities to purchase excess energy generated from the rooftop solar panels installed on residential and commercial structures at over-valued rates (the rates are over-valued because the utilities are forced to pay retail prices for wholesale energy);
- Efficiency standards and programs that mandate buildings, equipment, and appliances meet or exceed government mandated energy efficiency thresholds;

- The mandate effective in 2020 that all construction of new homes in California must have a solar photovoltaic system as an electricity source;
- The growing push for bans of natural gas hook-ups in new buildings (following the implementation of the ban in Berkeley);
- Motor vehicle fuel standards that require automakers to reduce GHG emissions from cars by 34 percent by 2025;
- Low carbon fuel standards that require a 10 percent decline in the carbon intensity of all transportation fuels by 2020; and
- Electric vehicle subsidies that include the $5,000 state rebate to purchasers of electric cars.

In total, California implements 218 different energy efficiency regulations, incentives, and tax programs according to the *Database of State Incentives for Renewables & Efficiency* (DSIRE), a renewable energy and energy efficiency resource operated by the N.C. Clean Energy Technology Center at N.C. State University.[4] These policies hinder job and income growth opportunities and impose particularly large burdens in the Central Valley and Inland Empire regions – regions that are less economically prosperous than the coast.

> "These policies hinder job and income growth opportunities and impose particularly large burdens in the Central Valley and Inland Empire regions.

For example, according to the California Business Roundtable, as of March 2020, the unemployment rate was 3.5 percent in the Bay Area but 10.8 percent in the Central Valley.[5] According to the state Employment Development Department, 3.2 million people statewide filed unemployment claims over the six week period ending April 18[6], while the state unemployment rate surged to 5.3 percent.

In addition, these policies dramatically increase the cost of living on families, contribute to the state's poverty and homelessness crises, and discourage businesses and manufacturers from expanding their operations in California.

The lost opportunities are problematic because, as documented in *Legislating Energy Poverty*, it is not necessary to impose California's array of government regulations, taxes, and mandates in order to meaningfully reduce overall GHG emissions. For the nation overall, total CO_2 emissions peaked in 2007 and have fallen over 14 percent since; CO_2 emissions in California declined 9 percent (or the 13th smallest state decline in emissions) over the same time period.

In light of these trends, California's energy policies should not be evaluated as if these regulatory burdens are a necessary condition for reducing overall GHG emissions. Other approaches that embrace the fracking revolution, increase the use of natural gas, and promote zero-emission nuclear power are capable of lowering GHG emissions but also promoting economic growth.

Since energy use touches nearly every aspect of our lives, Californians are facing large costs from these policies. While currently lost, these opportunities can be realized. The goal of this paper is to document these substantial economic benefits that could be gained if the state's energy policies were altered. As documented below, these economic benefits include:

- A substantial reduction in the annual energy costs of families living in California that would have the effect of a large income tax cut on all Californians, but whose benefits would be skewed toward lower income families;
- A substantial reduction in the annual energy costs of businesses located in California that is effectively a large income tax cut on businesses of all sizes and;
- A needed financial boost to millions of families across California who are struggling economically.

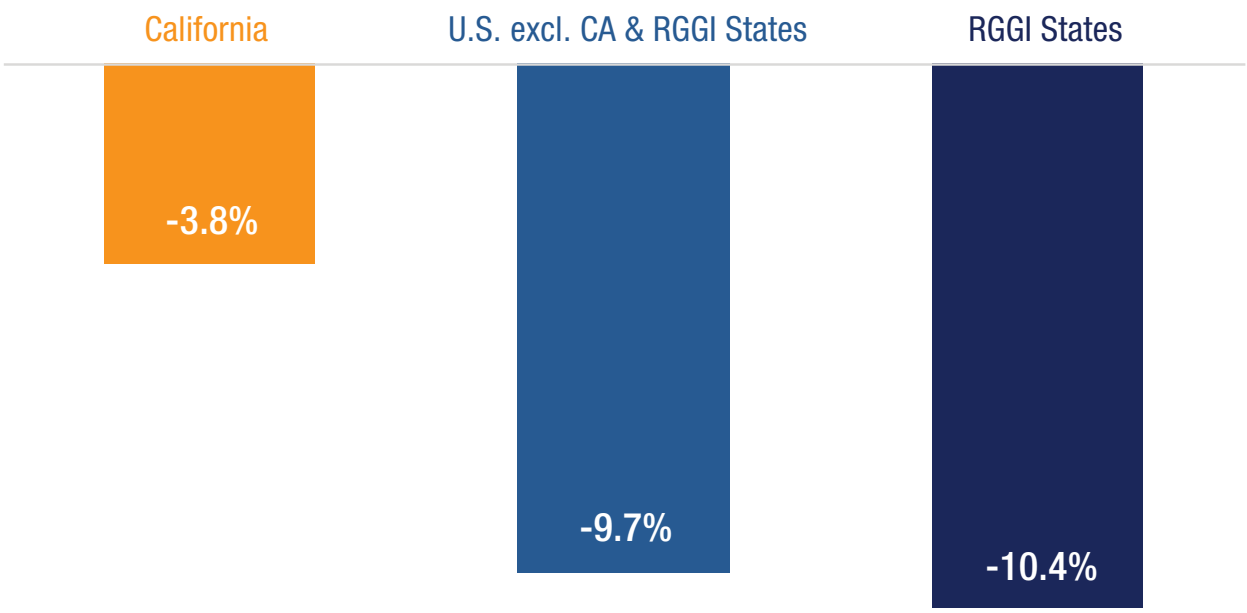
Alternative Pathways Toward Greenhouse Gas Emission Reductions

Before assessing the possible economic opportunities, it is important to discuss the impact of California's policies on the problem of global climate change (the "California approach"). After all, the policy goal from California's array of mandates, regulations, taxes, and credits is to reduce GHG emissions. Many supporters might claim that any lost economic opportunities are "worth it" if the policies reduce GHG emissions. However, the emissions and power generation data collected by the U.S. Energy Information Administration (EIA) raise serious doubts that the costs are worth it. The experience of California compared to the remaining states demonstrates that the state can implement alternative policy approaches that would lower GHG emissions and allow Californians to benefit economically.

To illustrate that there are other options for reducing GHG emissions, Figure 1 compares the carbon emission intensity of California between 2007 and 2016, measured as the kilograms of energy-related carbon dioxide emissions per million Btu, to two benchmarks. The year 2007 is used as the reference baseline because overall emissions in the U.S. and California both peaked in 2007. Therefore, this peak year is used as the emissions reference point throughout the analysis.

"The experience of California compared to the remaining states demonstrates that California can implement alternative policy approaches that would lower GHG emissions and allow Californians to benefit economically.

FIGURE 1 PERCENTAGE DECLINE IN CARBON INTENSITY: CALIFORNIA COMPARED TO ALL OTHER STATES, 2016 COMPARED TO 2007
(MEASURED AS KILOGRAMS OF ENERGY-RELATED CARBON DIOXIDE EMISSIONS PER MILLION BTU)



Source: Author calculations based on EIA data

The first benchmark California is compared to is the average carbon intensity of the other states excluding California and excluding the states that participate in the Regional Greenhouse Gas Initiative (RGGI), such as Massachusetts and New York. RGGI is an inter-state cap and trade agreement that encompasses states that, to some extent, have committed to policies that are similar to California's. The second benchmark compares California to the RGGI states.

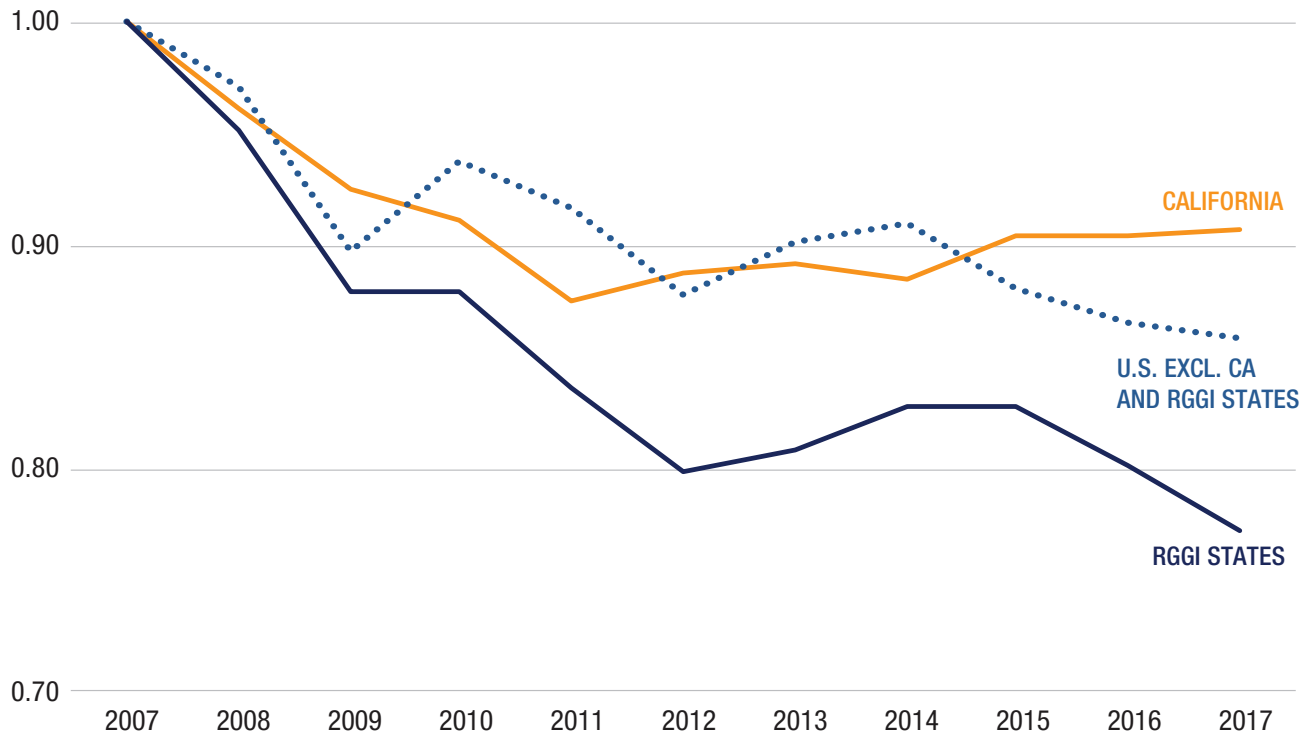
When comparing the decline in carbon intensity it is important to note that, traditionally, California's energy sector has been less carbon intensive than the average state. Much of this difference arises because California has a temperate climate and its economy is skewed toward the less energy-intensive service industry than the average U.S. state.

Since 2007, as California has been implementing its array of global climate change policies, the state's carbon intensity has declined 3.8 percent from 53.4 in 2007 to 51.4 in 2016 (the latest data available), see Figure 1. In comparison, the states that participate in RGGI, which are also less carbon intensive economies due, in part, to their heavier reliance on the services sector, have seen their carbon intensity decline 10.4 percent from 53.1 on average to 47.8. Outside of California and the RGGI states, total carbon intensity declined 9.7 percent from 61.2 on average to 55.3. As a result of the slower decline in California's carbon intensity compared to the rest of the country, California's carbon intensity is now slipping closer to the national average. One clear lesson that emerges from Figure 1 is that California's policies are not leading to larger increases in emission efficiencies relative to the rest of the country – including the states that are not implementing policies that are consistent with the California approach.

The inability of the California approach to create superior results with respect to reducing GHG emissions is further supported by two additional considerations. First, California's policies simultaneously encourage and discourage low-emission technologies, ultimately causing total emissions to stagnate while emissions continue to decline in the rest of the country. Second, once the global lifetime emission impacts are considered, the beneficial impact on global emissions from the California approach look even less favorable.

To see why California's policies have been contradictory, it is helpful to examine the pattern of emission declines that have been occurring in California compared to the previous two benchmarks. Figure 2 presents this information by documenting the total carbon dioxide emissions of California compared to the previous two benchmarks. For comparability reasons, these values are scaled to 1.0 as of 2007.

FIGURE 2 CARBON DIOXIDE EMISSIONS: CALIFORNIA COMPARED TO ALL OTHER STATES 2007 THROUGH 2017
(EMISSIONS SCALED 2007 = 1.0; MEASURED AS MILLION METRIC TONS OF CARBON DIOXIDE)

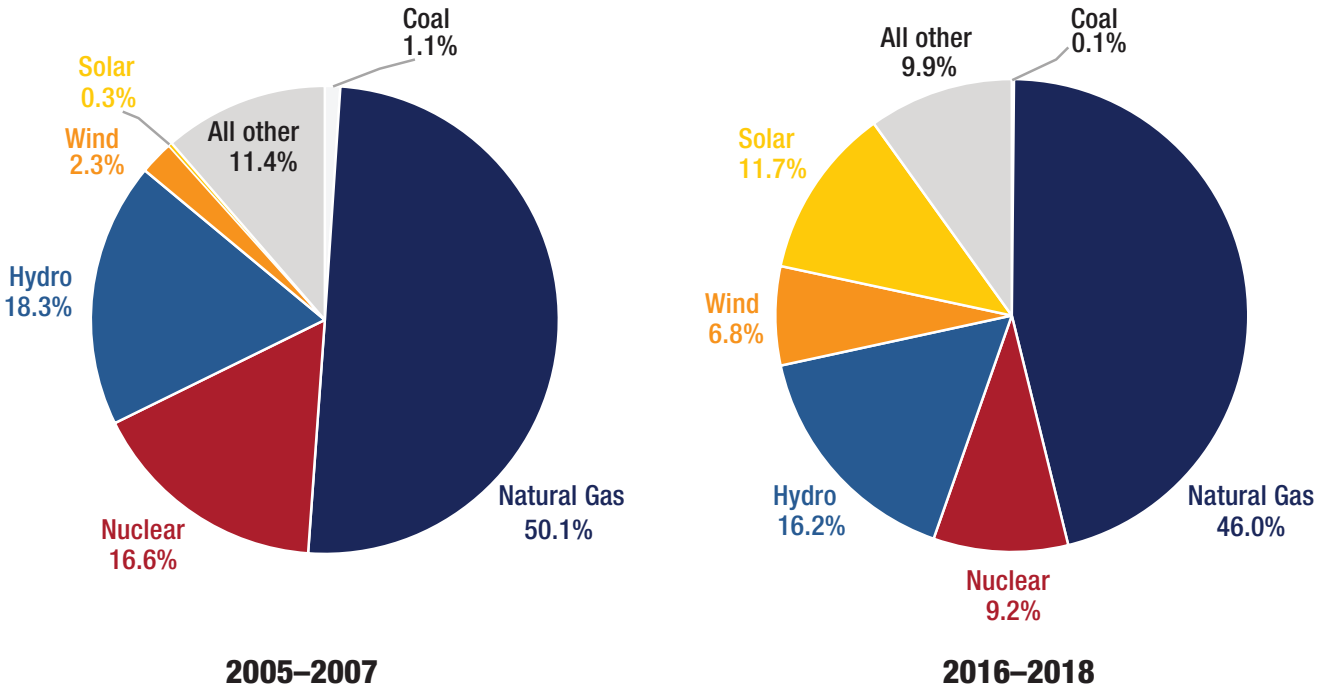


Source: Author calculations based on EIA data

With respect to the broader goal of reducing overall GHG emissions, the good news is that emissions have declined significantly in California, in the RGGI states, and in all of the other states. Figure 2 also illustrates an important inflection point in California emissions that began after 2011. This inflection point is not noticeable in the rest of the country where emissions increased slightly for a few years, but then continued the downward trend reaching all-time emission lows for CO_2.

California's inflection point in 2011 coincides with the closure of the San Onofre nuclear power plant in January 2012.[7] In a continuation of this policy, the Diablo Canyon nuclear facility will begin shutting down starting in 2024 ultimately leading to the elimination of nuclear power generation in California.[8] From an emissions perspective, these policies work against the goal of reducing GHG emissions. Specifically, due to the reduction in nuclear facilities, California's expensive renewable mandates are simply substituting one low-emissions source of energy (e.g. wind and solar) for the disfavored source of low-emissions energy (e.g. nuclear). This impact can be visualized in Figure 3.

FIGURE 3 CALIFORNIA'S GENERATION POWER SOURCE MIX (BASED ON OUTPUT IN MEGAWATT HOURS)



Source: Author calculations based on EIA data

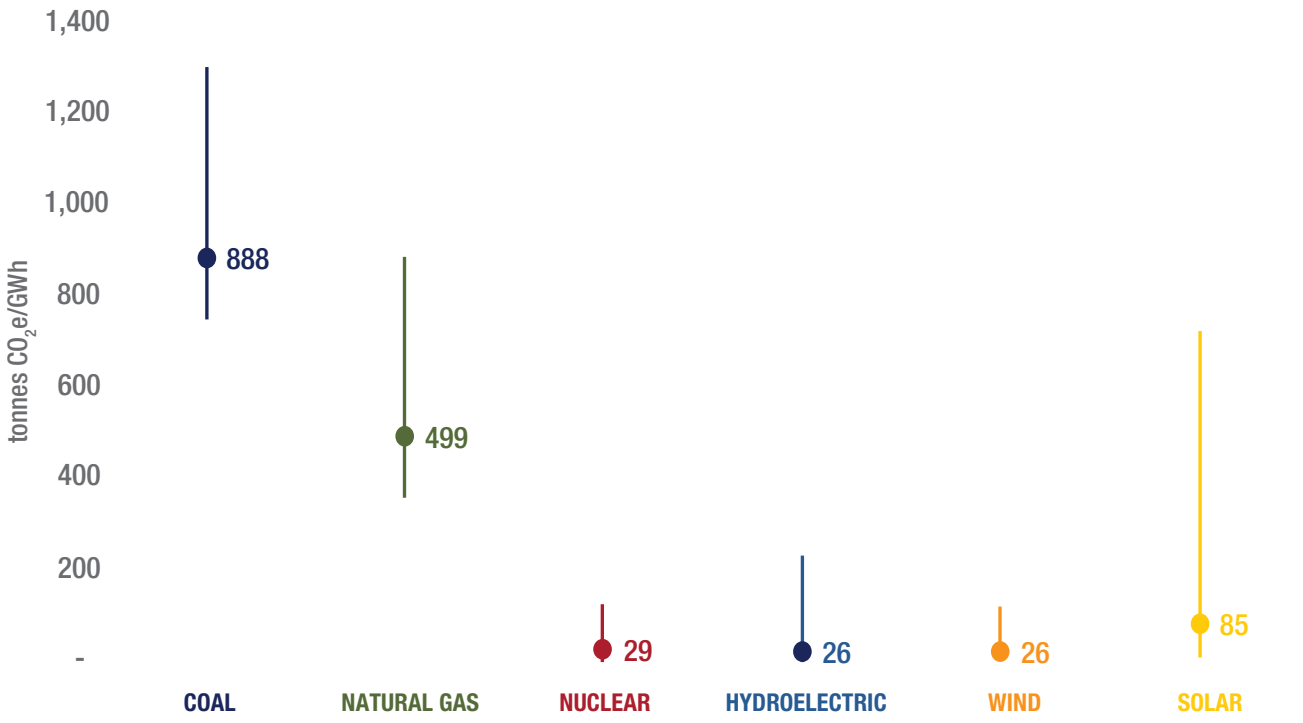
The left-hand pie chart in Figure 3 presents the average percentage composition of California's power generation by source between 2005 and 2007. The right-hand pie chart presents the average between 2016 and 2018. Three-year averages are used in order to smooth out the volatility that is evident in the annual figures that could distort the comparisons.

A few trends in Figure 3 stand out. First, in response to California's numerous mandates and subsidies, the share of wind and solar power have increased from around 2.6 percent between 2005 and 2007 to 18.5 percent between 2016 and 2018. Second, offsetting this increase was a substantial decline in the percentage provided by nuclear, and to a lesser extent hydro power. Not surprisingly, the decline in nuclear power's share of generation occurred in 2012. Initially, natural gas generation filled in the gap, with eventually the additional wind and solar generation capacity added since 2012 substituting for nuclear. From an emissions perspective, this tradeoff is a wash, which helps explain the flat to rising emissions profile for California since 2012 in contrast to the rest of the country.

Looking forward, the plan to close down California's final nuclear power plant beginning in 2024 promises more of the same going forward. The result will likely be that the decline in GHG emissions in California will continue to lag the emission declines that will be realized in the rest of the country, despite the economic opportunities that California is losing due to its global warming policies.

These problems are enhanced once the life-cycle emissions of alternative power generating technologies are considered. Life-cycle emissions account for the emissions generated in every stage of the power generation facility's lifecycle that incorporates the emissions from acquiring the resources necessary to build the facility/technology, building the facility, acquiring the materials necessary to generate the power, and any disposal related issues. Estimating the life-cycle emissions is difficult, but based on a review of the studies that have estimated the life-cycle emissions of alternative power sources completed by the World Nuclear Association, there are reasons to wonder whether California's developing power generation infrastructure is leading to a net decrease in the state's life-cycle emissions.[9] Based on this review of the study, Figure 4 presents the life-cycle emissions of the typical electricity generation power sources.

FIGURE 4 AVERAGE, LOW, AND HIGH ESTIMATES FOR LIFE-CYCLE EMISSIONS BY POWER SOURCE (EMISSIONS MEASURED AS TONNES CO_2E/GWH)



Source: World Nuclear Association

The dots in Figure 4 represent the average (mean) life-cycle emissions estimate of the studies reviewed while the line represents the range of estimates (from low to high). Nuclear, wind, and hydroelectric have the lowest life-cycle emission estimates, and the smallest ranges, among the power sources evaluated. The estimated life-cycle emissions for solar power not only exceeds these low-emission sources, its range of estimates crosses with natural gas. Due to this overlap, there is uncertainty regarding whether the life-cycle emissions of solar power are actually lower than the life-cycle emissions from natural gas. It is just as important to note that the range of solar emissions also overlaps with nuclear, wind, and hydroelectric power. This also means that, potentially, the life cycle emissions of solar power are comparable to these technologies. However, the large range of possibilities raises questions regarding the value of solar relative to the other low-emission sources.

These findings are important for California because both nuclear and hydroelectric power have been declining as a share of California's generated power and, although wind has been increasing, the majority of the increase in alternative energy generation is due to solar power. Thus, from a global basis, it is unclear whether all of the changes California has been implementing is actually reducing total lifecycle GHG emissions.

The data reviewed above illustrate that it is possible to realize the benefits from traditional, market-priced, energy sources and still reduce overall GHG emissions. Further, because natural gas is an important resource that is lowering emissions in other parts of the country, development of natural gas resources can accelerate the reduction in total U.S. GHG emissions.

Taking all of these results together undermines the argument that any economic opportunities lost are worth the cost. Instead, the economic costs imposed by the California approach are unnecessary assuming that the goal of these policies is to reduce global GHG emissions over the long-term.

Documenting the Energy Opportunity in California

As documented in *Legislating Energy Poverty,*[10] California's approach comes with large economic costs that families and businesses must pay. Reducing these costs would make it easier for families in California to cover their expenses, and perhaps, even have a little left over to save for the future. These benefits are particularly valuable for low-income families who are struggling to get by in high-cost California. Similarly, businesses in California, particularly small businesses, struggle under high energy costs that make it more expensive to operate in the state. These higher costs reduce the vibrancy of California's business environment to the detriment of broad-based income growth. Removing these additional government-created costs would be an effective tax cut for families and businesses in California, a well-timed tax cut given the economic costs created by the coronavirus pandemic. As documented below, the potential tax cut opportunity is substantial given the size of the government-created energy costs.

The benefits from reducing the energy taxes on families and businesses will take time to reach its full potential. However, as documented below, the potential benefits to California families, particularly those in the Central Valley and Inland Empire regions, are significant.

Estimating the Economic Benefits from Reducing California's Effective Energy Tax on Families and Businesses

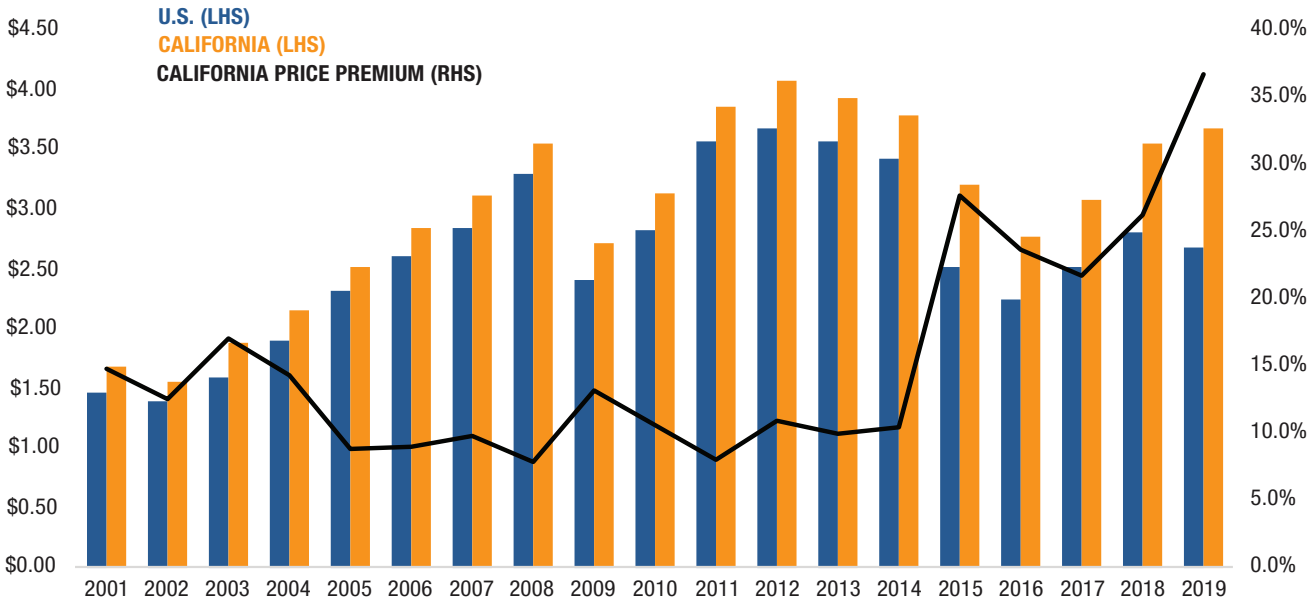
While the state does not reap the financial benefits, effectively, California's approach to energy imposes an additional tax burden on the California economy. Eliminating this tax burden that neither raises money for the state, nor effectively achieves its stated purpose, is an important economic opportunity that can meaningfully improve the financial vibrancy of families and businesses. When all of these costs are considered, there are billions of dollars in potential savings for California's households and businesses.[11]

Starting with the gasoline market, California's cost of gasoline has always been higher than the national average. However, these excessive costs have risen even further as the state has implemented the California approach to energy policies, see Figure 5. The blue and orange bars in Figure 5 present the average price of a gallon of gasoline in the U.S. and California, respectively. The black line illustrates how much higher California's prices are (on a percentage basis) compared to the rest of the U.S. Figure 5 illustrates that even

as gas prices were declining in 2015, the excessive costs in California were widening relative to the rest of the country. Further as gas prices rebounded in 2017, the growth in California prices continued to widen. Beginning in 2020, oil and gasoline prices have experienced an unprecedented decline. Similar to 2015, prices in California remain significantly higher than the national average.

The fact that the relative cost of gasoline in California continued to widen, regardless of whether gas prices were rising or declining, is an indication that the expansion is not related to market factors. Instead, the rising premium is due to California's policies. In fact, the widening of California's excessive gas prices coincided with the expansion of its energy policies with the explicit goal of raising the cost of gasoline. And, from a cost of gas perspective, the policy has worked. In 2019, the average price of a gallon of gas (all grades, all formulations) in California was $3.68, or 37 percent higher than the U.S. average of $2.69. As of April 24, 2020, the average price of a gallon of gas (all grades, all formulations) in California was $2.77, or more than 55 percent higher than the U.S. average of $1.79.

FIGURE 5 AVERAGE ANNUAL PRICES FOR GASOLINE: ALL GRADES, ALL FORMULATIONS
CALIFORNIA COMPARED TO U.S. AVERAGE | 2001 – 2019 (DOLLARS PER GALLON)



Source: Author calculations based on Energy Information Administration data

Between 2001 and 2014, prior to when California's energy policies began impacting gasoline prices, the average price-premium relative to the U.S. was 11.3 percent. If the energy policies were repealed, then it follows that the state's excessive gas prices would fall from its current price premium and return to this pre-2015 average. Due to the recent volatility in oil prices, four scenarios are run. These are high- and low-impact scenarios based on two scenarios for the amount of driving attributable to electric vehicles, and two alternative prices for gasoline—the average U.S. and California gasoline prices for 2019, and the prices as of April 24, 2020. While such a transition would take time, ultimately, consumers could save between $9.5 billion and $11.0 billion annually, see Table 1, which walks through the data and calculations behind these savings estimates. Note that typical estimates of miles driven are used for April 2020, as the dramatic drop off in driving due to stay-at-home orders are not representative of normal times.

TABLE 1 ESTIMATED AGGREGATE GASOLINE EXPENDITURE SAVINGS IN CALIFORNIA SAVINGS BASED ON 2019 PRICE AND CONSUMPTION DATA

	2019 Prices		April 24, 2020 Prices	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Vehicle Miles Traveled by Gas-Powerd Vehicles	348.8 Billion	344.9 Billion	348.8 Billion	344.9 Billion
Average mpg	24.9	24.9	24.9	24.9
Total Gallons	14.0 Billion	13.9 Billion	14.0 Billion	13.9 Billion
Average Gasoline Cost per Gallon in California	$3.68	$3.68	$2.77	$2.77
Total Gasoline Expenditures at Current Price Premiums	$51.5 Billion	$51.0 Billion	$38.9 Billion	$38.4 Billion
Potential Gasoline Cost per Gallon in California	$2.99	$2.99	$1.99	$1.99
Potential Total Gasoline Expenditures	$41.9 Billion	$41.5 Billion	$28.0 Billion	$27.5 Billion
Potential Savings	**$9.6 Billion**	**$9.5 Billion**	**$11.0 Billion**	**$10.9 Billion**

Source: Author calculations based on data from the Federal Highway Administration, Environmental Protection Agency, and Energy Information Administration

To estimate the potential gas savings, it is necessary to document how much Californians drive in a year. According to the Federal Highway Administration (FHA), Californians drove 348.8 billion vehicle miles in 2018.[12] Most of these miles were driven by conventional motor vehicles, although some of these miles were driven by electric vehicles. Since the FHA does not break out this difference, two different scenarios are run. The High Impact Scenario attributes none of the miles driven to electric vehicles (EV), establishing an upper end estimate for the aggregate amount of gasoline expenditures. The Low Impact Scenario subtracts out an estimate for the number of miles driven by EVs from the total vehicle miles driven, thereby attributing fewer miles to gasoline powered vehicles.

To account for the impact of EVs, it was assumed that the average EV owner drives his/her EV the same distance as the average vehicle in California. The average distance driven in California is estimated based on the total vehicle miles driven per registered vehicle in California, which is estimated to be 11,326 miles per year according to the data from the Federal Highway Administration.[13] The number of EVs in California is based on the number of plug-in electric vehicles registered in California (8.64/1,000 people) as reported by *Inside EVs*.[14] Based on these data, the estimated total miles driven by EVs in California in 2018 is 3.9 billion miles, indicating that the total number of miles driven by gasoline powered vehicles was 344.9 billion miles, see Table 1, Row 1.

According to the Environmental Protection Agency (EPA), the average fuel economy in the 2017 model year was 24.9 mpg, see Table 1, Row 2. For conservative purposes, the 2017 model year's mpg is used to convert the total miles driven into total gallons of gasoline required, see Table 1, Row 3.[15] Based on the average cost of a gallon of gasoline in 2019 (columns 3 and 4), and the price as of April 24, 2020 (columns 5 and 6), the total gas expenditures based on 2019 prices is estimated to be $51.5 billion in Scenario 1, and $51.0 billion in Scenario 2. The total expenditures on gas based on the prices as of April 24, 2020 are estimated to be between $38.4 billion and $38.9 billion, see Table 1, Row 5.

If the average pre-2015 price premium persisted, then the 2019 average annual price would have been $2.99 per gallon instead of the 2019 average annual price of $3.68 per gallon, see Table 1, Row 6. Based on the average price as of April 24, 2020, the price would have been $1.99 per gallon instead of $2.77 per gallon. The total expenditures under these scenarios would have been between $41.5 billion and $41.9 billion, based on the average 2019 prices, see Table 1, Row 7, and between $27.5 billion and $27.8 billion based on the prices as of April 24, 2020. This implies a potential savings of between $9.5 billion and $9.6 billion if the additional costs imposed on gasoline sales were lessened based on 2019 prices, and between $10.9 billion and $11.0 billion based on the prices as of April 24, 2020.

Before examining the potential savings from electricity, it is insightful to view the potential gas savings on a household basis. While the relative cost per gallon is around all-time highs in California, the total vehicle miles driven per registered vehicle in California (11,326) tends to be slightly less than the total vehicle miles driven per registered vehicle in the U.S. (11,892) based on data from the Federal Highway Administration, see Table 2, Row 1.[16] Therefore, from a household perspective, these fewer miles driven slightly offsets the higher costs per gallon. Based on the average fuel economy and the average gasoline prices in the U.S. versus California, the average annual gasoline costs can be estimated, see Table 2, Rows 2 through 5. Even after accounting for the slightly fewer miles traveled, the higher gasoline prices require the average driver in California to spend nearly $400 a year more than the average driver in the U.S.

If, instead of the current gasoline prices, the pre-2015 California premium persisted (California's current energy policies were not implemented), then the average California driver could save between $313 and $358 annually, or cut their gasoline costs between 19 percent and 28 percent, see Table 2, Rows 8 through 9.

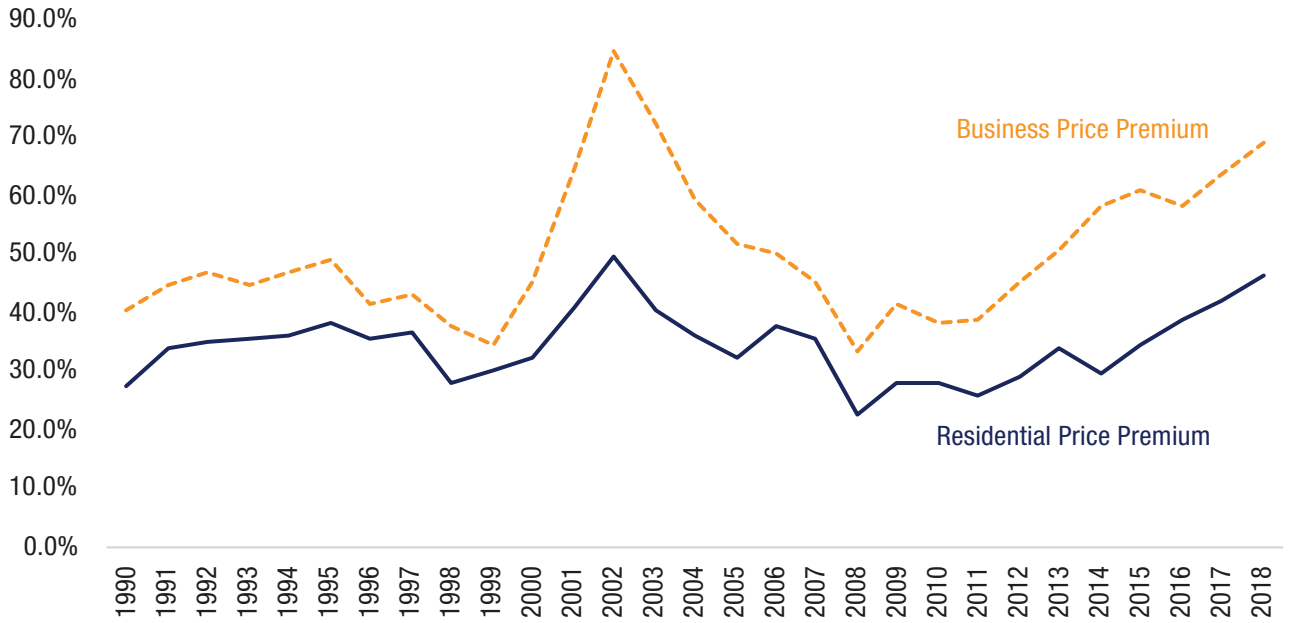
TABLE 2 POTENTIAL SAVINGS FOR CALIFORNIANS FROM ELIMINATING THE EXPANDED GAS PRICE PREMIUM

		2019		APRIL 24, 2020	
		U.S.	California	US	California
1	Vehicle Miles Traveled per registered vehicle (2018)	11,892	11,326	11,892	11,326
2	Average mpg	24.9	24.9	24.9	24.9
3	Average gallons sold [(1) / (2)]	477.59	454.87	477.59	454.87
4	Average gasoline price	$2.69	$3.68	$1.79	$2.77
5	Average annual gasoline costs [(3) * (4)]	$1,284.45	$1,673.93	$852.97	$1,261.82
6	Pre-2015 average California price premium		11.3%		11.3%
7	California Gasoline pre-2015 average premium [(4) * (6)]		$2.99		$1.99
8	Gasoline Costs at Historical Avg. [(7) * (3)]		$1,361.31		$904.01
9	Savings				
10	Dollars [(8) – (5)]		$312.62		$357.81
11	Percentage [{(8) / (5)} - 1]		18.7%		28.4%

Source: Author calculations based on data from: Department of Transportation, Environmental Protection Agency, Energy Information Administration, and U.S. Census

In addition to savings on gasoline expenditures, California's energy policies are also driving up the costs of electricity in California compared to the rest of the country. When evaluating the potential savings to residential and business electricity consumers it is necessary to recognize the historical price volatility in California's electricity pricing. This volatility is evident in Figure 6. Figure 6 presents California's excess electricity prices for residential and business customers relative to the U.S. average. The price spikes starting in 2000, and peaking in 2002, and the elevating prices since 2008, which are reaching the 2002 levels, stand out in the chart. As of 2018, residential electricity prices were 46 percent higher in California than the U.S. average and business electricity prices are 69 percent higher than the U.S. average.

FIGURE 6 AVERAGE ANNUAL ELECTRICITY PRICES FOR RESIDENTIAL AND BUSINESS CUSTOMERS CALIFORNIA COMPARED TO U.S. AVERAGE
1990 - 2018



Source: Author calculations based on Energy Information Administration data

The price spike in 2000–2002 was due to the state's infamous electricity crisis. Today, as Nelson and Shellenberger (2018) explain, the rise is driven by California's global warming policies:

> Between 2011 and 2017, California's electricity prices rose five times faster than they did nationally. Today, Californians pay 60 percent more, on average, than the rest of the nation, for residential, commercial and industrial electricity.
>
> California's high penetration of intermittent renewables such as solar and wind are likely a key factor in higher prices. Economists agree that "the dominant policy driver in the electricity sector [in California] has unquestionably been a focus on developing renewable sources of electricity generation."[17]

Since it is California's policies that are driving the rising prices, reversing these policies will remove the pressures that are inflating California's energy costs and enable California's electricity generation infrastructure to become cost-efficient. The result will be lower electricity prices for both residential and business customers.

There are other inefficiencies that plague California's electricity market; therefore, it is possible (perhaps likely) that electricity prices will not decline to the average U.S. price without additional structural reforms. There is no innate reason why prices in California should be higher, however. Consequently, the Low Impact Scenario assumes that California's electricity prices only decline to the average premium that persisted between 1990 and 2014, excluding the years of the electricity crisis during the early 2000s, which equals a price premium for the low impact scenario of 32.2 percent for residential consumers and 45.0 percent for business consumers. The High Impact Scenario assumes that California's electricity prices will decline to the U.S. average.

TABLE 3 ESTIMATED AGGREGATE ELECTRICITY EXPENDITURE SAVINGS IN CALIFORNIA SAVINGS BASED ON 2018 PRICE AND CONSUMPTION DATA

	RESIDENTIAL		BUSINESS	
	Low Impact Scenario	High Impact Scenario	Low Impact Scenario	High Impact Scenario
Current revenues/kwh	$0.19		$0.15	
Current consumption per customer (in kwh)	6,556		89,207	
Annual cost per customer	$1,235		$13,710	
# of customers (in millions)	13.6		1.9	
Total current expenditures (in billions)	$16.8		$25.6	
Potential revenues / kwh	$0.17	$0.13	$0.13	$0.09
Current consumption per customer (in kwh)	6,556	6,556	89,207	89,207
Annual potential cost per customer	$1,115	$844	$11,761	$8,113
# of customers (in millions)	13.6	13.6	1.9	1.9
Total potential expenditures (in billions)	$15.2	$11.5	$21.9	$15.1
Potential savings by consumer (in billions)	$1.6	$5.3	$3.6	$10.4
TOTAL POTENTIAL SAVINGS (in billions)	**$5.3**	**$15.7**		

Table 3 presents the calculations behind the potential savings. Table 3, Rows 1 through 5 present the calculations that equal the current total expenditures on electricity by residential and business consumers. Table 3, Rows 6 through 10 then illustrate how the total expenditures would change if the policy-induced costs were removed under the Low-Impact and High-Impact scenarios. In total, across residential and business consumers, based on the current number of customers and the current consumption per customer, eliminating the policy inefficiencies can (over time) generate annual potential savings between $5.3 billion and $15.7 billion.

Combining these potential savings, reforming California's energy policies could generate between $14.8 billion and $26.8 billion in annual savings, see Table 4. Per household, the potential savings are between $1,147 and $2,077. While it would take time for these savings to be fully realized, this represents an opportunity to deliver the equivalent of a major tax cut to hard working California households and businesses. Relative to California's FY2019-20 state budget revenues, these savings are the equivalent of a tax cut that is between 7.1 percent and 12.8 percent of total revenues.[18]

TABLE 4 ESTIMATED POTENTIAL AGGREGATE ELECTRICITY AND GASOLINE EXPENDITURE SAVINGS IN CALIFORNIA

	CA TOTAL DIRECT SAVINGS (IN BILLIONS)			
	Based on 2019 Gas Prices		Based on 4/24/2020 Gas Prices	
	Low Impact Scenario	High Impact Scenario	Low Impact Scenario	High Impact Scenario
Gasoline	$9.520	$9.627	$10.896	$11.019
Residential Electricity	$1.625	$5.317	$1.625	$5.317
Business Electricity	$3.633	$10.430	$3.633	$10.430
Total	$14.778	$25.374	$16.154	$26.766
Savings per household	**$1,147**	**$1,969**	**$1,253**	**$2,077**

The connection between higher energy costs and slower economic growth, even after accounting for the economy's improving energy efficiency, is well established although the estimated magnitude of these impacts varies. Examples of studies that support this conclusion include Kilian (2008), Berk and Yetkiner (2013), Stern (2004), and the Congressional Budget Office (2006).[19]

To provide a sense of the economic opportunity that California could gain, and because California's additional energy costs are not driven by market fundamentals but are decreed by the state government, these government-created cost burdens are evaluated as a reduction in California's tax burden using the results of Yakovlev (2014).[20] Yakovlev (2014) identifies the empirical relationship between the average tax rate (tax burden) and state GDP growth, controlling for the other impacts on economic growth. Based on his results, the average tax rate has a negative and significant impact on state GDP growth – a 1 percent increase in the tax rate decreases state GDP growth by 1.9 percent.[21]

Based on Yakovlev's (2014) results, compared to the longer-run inflation-adjusted economic growth rate in California of 2.7 percent (between 1999 and 2018) average annual real state GDP growth would be expected to increase to between 3.1 percent and 3.3 percent. Over 10 years, such an increase in the annual economic growth rate would increase the size of California's economy, adjusted for inflation, by between $122.5 billion and $223.4 billion. Along with this accelerated economic growth, Californians will benefit from faster job growth and an acceleration in the growth of family incomes.

In closing this section, it is important to emphasize, once again, that California can embrace these beneficial economic opportunities while also decreasing the total amount of GHG emissions. This would require reversing policies such as phasing out California's nuclear generation facilities, leveraging hydropower opportunities, and emphasizing natural gas resources that likely have a lower life-cycle emissions profile than current solar technologies. Such a combined policy would increase energy affordability for the millions of families in California struggling with energy poverty while still helping to reduce global GHG emissions.

Conclusion

Affordable energy is indispensable for our quality of life. Without inexpensive and reliable energy, economic growth stagnates, and our quality of life plummets. California's energy policies create excessive costs that make energy more expensive and less reliable. As a result, opportunities to improve the standard of living for millions of Californians are being lost.

Ostensibly, the purpose of forgoing the potential economic and quality of life benefits from cheap and reliable energy is to reduce California's emission of greenhouse gasses (GHGs). But, as illustrated above, even after implementing the California approach toward GHG emissions, the emission declines in California are not exceeding the average declines in the rest of the country. Consequently, it is clearly unnecessary to implement California's policies in order to reduce the state's overall GHG emissions. In fact, had California simply maintained its nuclear power plant infrastructure, the state could have maintained a similar GHG emission profile without encouraging the large economic costs that have been associated with its current policy approach. And, these large economic costs have been felt throughout California.

Due to these costs, families are now burdened with unnecessarily higher energy costs and businesses costs of doing business are significantly higher. The burden from these costs are even more troubling due to the heavy costs Californians are now bearing due to the coronavirus-induced recession. The above analysis demonstrated that adjusting California's policies can generate between $14.8 and $26.8 billion in annual energy savings for businesses and consumers, depending upon the specific price assumptions. A savings potential that equates to $1,147 and $2,077 per household.

Reclaiming these lost economic opportunities should become a top priority for the state.

Endnotes

1 Evans P (2019) "16 mind-blowing facts about California's economy" *Market Insider*, April 26; https://markets.businessinsider.com/news/stocks/california-economy-16-mind-blowing-facts-2019-4-1028142608.

2 Fox L (2019) "The Supplemental Poverty Measure: 2018" *U.S. Census Current Population Reports*, October; https://www.census.gov/content/dam/Census/library/publications/2019/demo/p60-268.pdf. Washington D.C. has the highest poverty rate of 18.2 percent.

3 Winegarden W (2018) "Legislating Energy Poverty: A case study of how California's and New York's climate change policies are increasing energy costs and hurting the economy" Pacific Research Institute, November.

4 "DSIRE Summary Map" N.C. Clean Energy Technology Center at N.C. State University; https://programs.dsireusa.org/system/program/maps (accessed November 22, 2019).

5 "More than $3 billion paid in unemployment benefits to workers impacted by COVID-19," California Employment Development Department news release April 23, 2020; https://edd.ca.gov/About_EDD/pdf/news-20-12.pdf (accessed April 27, 2020)

6 "California unemployment rate rose to 5.3 percent in March," California Employment Development Department news release April 17, 2020; https://edd.ca.gov/newsroom/unemployment-april-2020.htm (accessed April 27, 2020).

7 Nikolewski R (2018) "Nuclear power receives its death sentence in California: Regulators vote to shut down Diablo Canyon" *San Diego Union Tribune* January 11; https://www.sandiegouniontribune.com/business/energy-green/sd-fi-diablocanyon-shutdownvote-20180111-story.html.

8 Ibid.

9 (2011) "Comparison of Lifecycle Greenhouse Gas Emissions of Various Electricity Generation Sources" World Nuclear Association; http://www.world-nuclear.org/uploadedFiles/org/WNA/Publications/Working_Group_Reports/comparison_of_lifecycle.pdf.

10 Winegarden W (2018) "Legislating Energy Poverty: A case study of how California's and New York's climate change policies are increasing energy costs and hurting the economy" Pacific Research Institute, November.

11 It is important to note that the potential savings are static estimates that do not address whether Californians will change their use of energy – the actual demand is taken as a given in the analyses that follow. It is possible that the lower electricity and gasoline prices will encourage greater electricity and gasoline use. Given global warming concerns, it is also possible that Californians will spend the potential savings on other goods and services, or even increase their savings. The analysis does not attempt to incorporate such considerations.

12 The data on vehicle miles driven is from: "Highway Statistics 2018" Federal Highway Administration; https://www.fhwa.dot.gov/policyinformation/statistics/2018/.

13 The data on vehicle miles driven is from: "Highway Statistics 2018" Federal Highway Administration; https://www.fhwa.dot.gov/policyinformation/statistics/2018/. Total motor vehicle registrations are from "Highway Statistics 2017"; https://www.fhwa.dot.gov/policyinformation/statistics/2017/mv1.cfm. The estimated vehicle miles driven per vehicle are the division of total vehicle miles driven divided by the number of registered vehicles. As documented in a UC Davis study, between the first week of March and the second week of April, driving distances in California declined 75 percent due to the "stay at home" orders issued to contain the coronavirus pandemic; see, Shilling F (2020) "Special Report 3: Impact of COVID19 Mitigation on Traffic, Fuel Use and Climate Change" UC Davis Road Ecology Center April 30; https://roadecology.ucdavis.edu/files/content/projects/COVID_CHIPs_Impacts_updated_430.pdf. The estimated savings on gasoline expenditures will be lower should these new driving patterns reflect a new normal. This analysis assumes that the impact from the pandemic will be transitory and the typical driving patterns will return. Should the 75 percent decline reflect the new normal, then the estimated gas savings in the paper should be discounted by 75 percent.

14 Kane M (2018) "State-By-State Look At Plug-In Electric Cars Per 1,000 Residents" *Inside EVs*, December 12; https://insideevs.com/news/341522/state-by-state-look-at-plug-in-electric-cars-per-1000-residents/.

15 Accounting for older, less fuel-efficient cars, would imply total gasoline expenditures would be higher and, consequently, the potential savings larger.

16 The data on vehicle miles driven is from: "Highway Statistics 2018" Federal Highway Administration; https://www.fhwa.dot.gov/policyinformation/statistics/2018/. Total motor vehicle registrations are from "Highway Statistics 2017"; https://www.fhwa.dot.gov/policyinformation/statistics/2017/mv1.cfm. The estimated vehicle miles driven per vehicle are the division of total vehicle miles driven divided by the number of registered vehicles.

17 Nelson M and Shellenberger M (2018) "Electricity prices in California rose three times more in 2017 than they did in the rest of the United States" *Environmental Progress* February 12; http://environmentalprogress.org/big-news/2018/2/12/electricity-prices-rose-three-times-more-in-california-than-in-rest-of-us-in-2017.

18 Petek G (2019) "The 2019-20 Budget: California Spending Plan" Legislative Analyst's Office, October; https://lao.ca.gov/reports/2019/4083/spending-plan-2019.pdf.

19 Examples of these studies include Kilian L (2008) "The Economic Effects of Energy Price Shocks." *Journal of Economic Literature*, 46(4):871-909. Berk I and Yetkiner H (2013) "Energy Prices and Economic Growth: Theory and Evidence in the Long Run" *Working Paper in Economics #13/03* April. Stern DI (2004) "Economic Growth and Energy" *Encyclopedia of Energy* Volume 2. Yetkiner H and Berk I *The Long-term Impacts of Energy Prices on Economic Growth*. (2006) "The economic Effects of Recent Increases in Energy Prices" Congressional Budget Office July. (2006) "Energy Prices and the Economy" Joint Economic Committee January.

20 Yakovlev PA (2014) "State Economic Prosperity and Taxation" *Mercatus Working Paper* No. 14-19, July; https://www.mercatus.org/system/files/Yakovlev-State-Economic-Prosperity.pdf.

21 For conservative purposes, the lower-end range of impacts is used for this analysis.

About the Author

Wayne Winegarden, Ph.D.

Wayne H. Winegarden, Ph.D. is a Senior Fellow in Business and Economics at the Pacific Research Institute and director of PRI's Center for Medical Economics and Innovation. He is also the Principal of Capitol Economic Advisors.

Dr. Winegarden has 25 years of business, economic, and policy experience with an expertise in applying quantitative and macroeconomic analyses to create greater insights on corporate strategy, public policy, and strategic planning. He advises clients on the economic, business, and investment implications from changes in broader macroeconomic trends and government policies. Clients have included Fortune 500 companies, financial organizations, small businesses, state legislative leaders, political candidates and trade associations.

Dr. Winegarden's columns have been published in the *Wall Street Journal, Chicago Tribune, Investor's Business Daily,* Forbes.com, and Townhall.com. He was previously economics faculty at Marymount University, has testified before the U.S. Congress, and is asked to present his research findings at policy conferences and meetings. Previously, Dr. Winegarden worked as a business economist in Hong Kong and New York City; and a policy economist for policy and trade associations in Washington D.C. Dr. Winegarden received his Ph.D. in Economics from George Mason University.

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- America is blessed with abundant and reliable energy sources that have been the lifeblood of our national advancement and prosperity.

- We must be generous stewards of our environment for this and future generations.

- Sharing facts (about energy policies, organizations and activists) creates a better-informed population.

- We can have the highest quality of life and the cleanest, most cared for environment.

Power The Future carries out these beliefs by disseminating research, sharing facts and truths, engaging at the local level and interacting with the media. With so many loud voices in the energy conversation, ours will highlight truth, unmask agendas, expose hypocrisy and reduce hyperbole.

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