

LIGHTS

ON

California Energy
Policy Survey

THOMAS TANTON

Second Edition



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An Energy Policy Survey for California

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Energy is the master resource of modern society...With abundant, reliable, affordable energy, much is possible. Without it, hope, opportunity and progress are hobbled...Artificially high prices will cause countless families in our country...to choose between food on the table and fuel.

–Roy Innis, Chairman, Congress for Racial Equality

Executive Summary

California stands at a crossroad. Down one path lie higher energy prices and less security. Down the other path lies prosperity. Will California and its policy makers choose the right path?

California needs a responsible and rational energy policy to achieve the broadest set of energy options possible so that consumers can choose what is right for their individual circumstances. Compelling opportunities exist to correct the current situation and allow new energy supplies to drive down costs and improve reliability. Such improvement will require putting all issues into balance and avoiding the pre-eminence currently given to climate-change policies.

This report provides important facts about California's energy system, and discusses three current policies of critical importance to California's future. What effect will California's landmark law on greenhouse gases have on energy price and reliability? Has the public-policy tide shifted on offshore oil exploration and development? Will the moratorium on expanded nuclear power survive in the face of a slow-speed energy crunch?

California is blessed with entrepreneurs, inventors, and vast natural and energy resources. Yet California tilts to government intervention in energy markets, a trend harmful to consumers and the economy, and often with little benefit to the environment.

After 30 years of increasingly heavy-handed government regulation, and with little to show for it, the time has come for California to consider seriously the approach of free-market environmentalism and protection of property rights. California should strive to increase energy-supply options, rather than limiting them to fads favored by regulators and interest groups.

Nuclear power and offshore drilling would go a long way toward easing our energy shortfalls and financial instability. The state could also ensure more consistent supply by authorizing construction of new refineries for the first time in more than three decades. Supply will meet demand, if legislators allow it to do so.

When it comes to energy, California should focus on actual performance criteria, not specific technologies. Legislators should eliminate overlapping energy agencies and normalize tax preferences and subsidies across technologies.

These key reforms will help restore stability to the energy market, keep businesses and consumers in the state, and keep the lights on. Energy is vital to the future of California and the nation. State leaders should seize the opportunity to make California a leader in this field.

Introduction: California's Perpetual and Expanding Energy Crisis

California and the nation are in the midst of economic and financial turmoil. Headlines shout daily about the plummeting dollar and home values, disappearing jobs, soaring fuel and food costs, a growing massive state-budget deficit, and huge government bailouts.

Apparently oblivious to the strain on California households, some state regulators push implementation of a new and untested program, which adds a massive burden on every household and business in the state, with no immediate benefit. These regulators seem bent on upholding the “just say no” approach to energy policy.

Before the energy debacle of 2000, many states planned to follow California's restructuring of electricity markets. When California's infant electricity market experienced a meltdown, characterized by extremely high prices, bankruptcies, and blackouts, most states abandoned their moves to follow in California's footsteps.

Today, the pursuit continues through efforts to reduce greenhouse gases and hoard resources, such as those off our coast.

This report provides important facts about California's energy system, and discusses three current policies of critical importance to California's future. What effect will California's landmark law on greenhouse gases have on energy price and reliability? Has the public-policy tide shifted on offshore oil exploration and development? Will the moratorium on expanded nuclear power survive in the face of a slow-speed energy crunch?

The *California Energy Policy Survey* will shed light on these questions and provide California voters and policy makers with sound courses of action for meeting the state's pressing energy needs. Equally important, the *Survey* will inform national debates centered on calls to emulate what California is doing.

California Statistics and Trends

California is home to more than 37 million people¹ and boasts the world’s eighth-largest economy, down from the sixth largest in 1990. The population has grown from fewer than 24 million in 1980, an increase of almost 60 percent. Much of the growth in absolute numbers has occurred in large cities such as Los Angeles, but in percentage terms, less densely populated areas have grown much more rapidly. During this 28-year period, Los Angeles County grew by 50 percent, while Placer County, east of Sacramento, more than doubled with a rise of 173 percent. Other less populated counties are also growing rapidly.²

In Census 2000, 15.7 million California residents aged five years and over reported changing their place of residence between 1995 and 2000. Depending on their previous place of residence, the movers can be divided into four major groups: those who moved within the same county (62 percent), to a different county within California (20 percent), from a different state (9 percent), and from a different country (9 percent). Approximately 2.2 million Californians migrated to other states, compared with 1.4 million who moved to California from other states and 1.4 million who moved to California from other countries.³ California’s gross domestic product was \$1.6 trillion in 2006 (2000 dollars), reflecting an approximate annual growth of 4 percent from 2003. California’s economy represents 14.6 percent of the United States as a whole.⁴

Electricity Demand

While overall electricity consumption has grown along with population and economic growth, the sales per customer increased only 1 percent from 1990 to 2005.⁵ Meanwhile other states experienced higher growth in their economy and energy demand. California remains in first place with the highest prices per kilowatt-hour of our neighbors in the West, and 30 percent higher than the national average, as shown in table 1.⁶

California’s use of electricity is affected by many factors not available to other states. California’s climate, for example, reduces consumption for heating and cooling of homes and businesses. Also, California’s economy has undergone a structural change, moving away from energy-intensive manufacturing toward services more

reliant on electricity quality than quantity. While the California economy has grown during the past 25 years, it has also become more volatile and taken on a new face. Demographic changes are also underway, with more people living in the same household and residential property prices increasing. California’s

Comparative Electricity Prices, Western States, National Price (cents/kWh 2008)			
	Residential	Industrial	All Sectors
California	14.12	10.05	12.41
Oregon	8.48	5.17	7.18
Washington	7.14	4.48	6.27
Arizona	11.02	6.5	9.42
Colorado	10.36	6.7	8.71
Idaho	6.83	4.17	5.28
Montana	9.34	6.56	8.1
Nevada	12.36	7.7	9.76
New Mexico	10	6.16	8.1
Utah	8.37	4.48	6.47
Wyoming	8.47	4.78	5.82
U.S. Average	11.43	6.77	9.49

Table 1

California remains in first place with the highest prices per kilowatt-hour of our neighbors in the West, and 30 percent higher than the national average.

California Electricity Generation Mix Percent of Kilowatt Hours ⁷			
Resource Type	2002	2005	2007
Coal	20.0%	20.1%	16.6%
Large Hydro	17.7	17.0	11.7
Natural Gas	36.5	37.7	45.2
Nuclear	14.9	14.5	14.8
Renewables	11.0	10.7	11.8

Table 2

prices for electricity are higher than the rest of the nation, with few exceptions. Many California policies exacerbate the high prices, and current policies will make that situation even worse.

Electricity Sources

In 2007, California produced 69.5 percent of the electricity it uses, more than two-thirds of the total. The rest is imported from the Pacific Northwest (8 percent), primarily hydroelectric, and the U.S. desert southwest (22 percent), primarily coal fired. Natural gas is the main source for electricity at 45 percent of the total system power. In 2007, Californians spent \$33 billion for their electricity. The electrical energy generated from each major fuel type is shown in table 2. Variations in hydroelectric output due to weather (rainfall) are balanced with natural gas and to a lesser extent coal. No significant change has occurred in renewables since 2002, despite major policy initiatives. While each resource type contributes to energy, they are not all equal in their ability to provide power and keep the lights on during peak periods. Many of the resource types specifically favored by California policy, such as wind, add little to no capacity, and ironically are the most expensive.

Transportation Energy Demand

Californians consume nearly 44 million gallons of gasoline and 10 million gallons of diesel every day.⁸ Demand has moderated some in the past year due to record-high gasoline and diesel prices. California

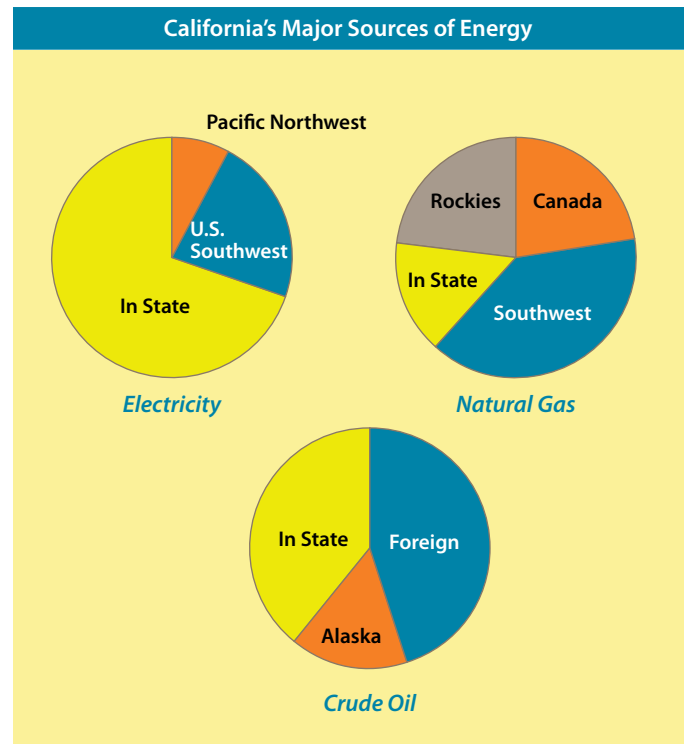


Figure 1

refineries produce these fuels and other products from crude oil and blending components, coupled with significant imports from other states. Transportation fuel production in California depends on the availability and quality of the crude oils used by refineries in the state.

Petroleum and Natural Gas Supply

Natural gas is an important fuel for California. It is the primary source for space heating, electricity generation, and many industrial processes, and it provides the key feedstock for some chemical processes. Figure 1 shows the main sources of energy for California, including natural gas, which arrives in the state through four large pipelines.

California ranks fourth in the nation among oil producing states, behind Louisiana, Texas, and Alaska, respectively. Crude oil production in California averaged 731,150 barrels per day in 2004, a decline of 4.7 percent

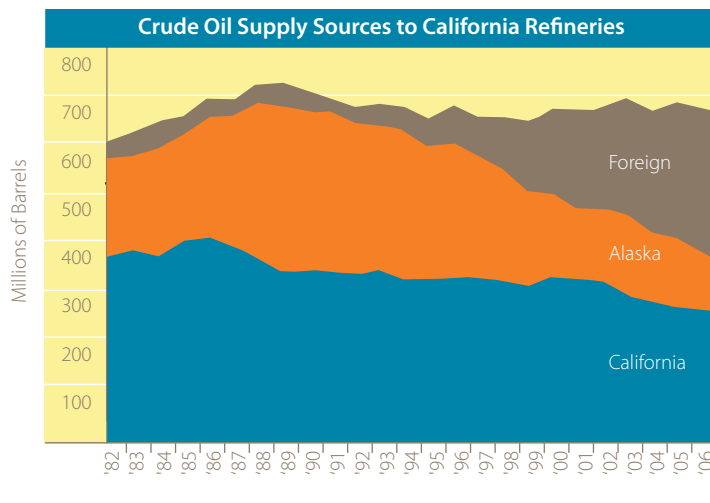


Figure 2

from 2003. In 2005, the total receipts to refineries of roughly 674 million barrels came from in-state oil production (39.4 percent), oil from Alaska (20.1 percent), and oil from foreign sources (40.4 percent).

Figure 2 shows the average annual refinery receipts of crude oil from 1986 through 2006. The supply of crude oil to California refineries has changed substantially in the last 10 years. Most notably, receipts of foreign crude oil have increased as production sources from California and Alaska have continued to decline. This may change if offshore drilling and development are reinstated. According to the latest data from the U.S. Energy Information Administration, the country sending us the largest amount of petroleum is not Venezuela, Iran, or indeed any Middle Eastern country, but rather our friends to the north: Canada. Canadian imports account for more than 18 percent of our total imports. Another 10 percent is provided by Mexico.

Almost 30 percent of our energy imports come from our two nearest neighbors and strongest trade partners

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in North America. Indeed, the United States imports more oil from non-OPEC countries, 54 percent, than from the cartel, 46 percent.

California domestic production is down from 1982 to 2006 because old producing fields have not been reworked and significant new fields have been placed off limits since 1982. The U.S. Mineral Management Service estimates that approximately 86 billion barrels could be economically recovered off the coast, including California’s coast, in the area know as the Outer Continental Shelf.⁹ Similarly, Alaskan crude imports to California may rebound with additional development of fields in that state.¹⁰

California is a major refining center for West Coast petroleum markets, with combined crude oil distillation capacity totaling more than 1.9 million barrels per day, ranking the state third-highest in the nation. California ranks first in the U.S. in gasoline and diesel consumption and second in consumption of jet fuel.

A large network of crude-oil pipelines connects producing areas with refineries in the San Francisco Bay Area, Los Angeles, and the Central Valley. Major ports in northern and southern California receive Alaska North Slope and foreign crude oil for processing in many of the state’s 21 refineries. Despite a population of 37 million that is heavily dependent on the automobile, California, like the rest of the nation, has not authorized construction of a new refinery for more than 30 years.

Greenhouse Gases and Air Quality Associated with Energy

Approximately one-half the emissions of carbon dioxide (CO₂), the most common of the greenhouse gases, comes from the transportation sector. About 80 percent of that, or about 40 percent of the total, is associated with petroleum fuel used in vehicles. Other air pollution issues associated with petroleum fuel (ozone and smog, for example) are likewise associated with the use of the fuel, and not the production. Since the 1960s and 70s, advancements in fuel and vehicle technology have dramatically improved the efficiency of vehicles and their emissions.

Government Regulatory Overview

California has one of the most complex energy policy and regulatory systems in the nation. Numerous agencies have responsibility for setting and enforcing regulations and policies that affect every person and company in California. In addition to a public utilities commission (CPUC), which every state has, and a forecasting and policy integration function (California Energy Commission, the CEC), like only a few others have, the state has created numerous other agencies with conflicting or overlapping functions.

With the passage of AB 32, California's greenhouse gas reduction act, the state granted unprecedented powers to the California Air Resources Board (CARB). Working with other agencies, CARB now controls vast reaches of life and business in California, from baking bread (yeast emits CO₂ during the leavening process) and making wine (more CO₂ from fermentation) to making and using cement. It similarly influences travel and where people live (a reference to "smart growth" for greenhouse gas [GHG] emission purposes).

California's attorney general Jerry Brown, a former state governor, has embarked on several lawsuits against local and regional governments to account for GHG emissions from development projects; he fought a water bottler on the same grounds.¹¹ In today's California policy arena, GHG emissions and their control trump many other considerations—from forging a balanced budget to improving the lives of citizens.

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Perspective on Three Current California Policies

Unintended Consequences of California Energy Policy

High energy prices have driven some types of business out of California, especially those energy intensive by nature, such as manufacturing. The change in economic structure and the resulting increased volatility of economic growth, with a shift to services, software, and entertainment activity, is more subject to boom/bust cycles because it is dependent on customers' discretionary dollars.¹² As noted, it has also caused a shift from electricity to natural gas where fuel switching is feasible. The structural change in the economy, coupled with demographic shifts, also affects state tax revenues.

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If one burrows into the state's storehouse of statistical data, a disturbing pattern emerges on financing government services. A generation ago, the state's two major revenue sources, personal income taxes and sales taxes, were producing almost exactly the same amount of money, around \$10 billion each per year. While state sales taxes have climbed to about \$30

billion a year since then, income taxes have exploded to \$56 billion, nearly twice as much.

Two factors are widening the gap between the two tax types. A very "progressive" income-tax system with narrow brackets puts the biggest burden on high-income residents, boosting revenues faster than overall income rises. Also involved is a flattening of consumer spending on taxable retail goods such as cars, clothing, and appliances. As a portion of personal income, taxable sales have been declining steadily, from more than 50 percent a generation ago to about 40 percent today.

Put another way, since 1981 retail spending subject to taxation has declined from 48 percent of sales to 38 percent. There have been few detailed studies, but the aging of the economically dominant population is a major factor. As people age, they spend less of their incomes on

hard goods and more on non-taxed services and investments. Internet commerce is another, lesser factor.

The relative handful of high-income Californians who pay the vast majority of personal income taxes are, in turn, increasingly dependent on capital gains and other non-salary income. Even the slightest uptick or downturn in the stock market, real estate, or other speculative activities can generate a rapid increase or decrease in tax revenues, as the past decade has shown on several occasions.

Thin and Absent Supply Reserves

California has relied on measures such as demand-side management (DSM), a form of political conservation that encourages cross subsidies and free ridership, and must be paid for through a coercive levy.¹³ California also deploys the renewable portfolio standard, which requires utilities to include a certain—and growing—percentage of renewable sources in their electricity mix.¹⁴ The Golden State prohibits new nuclear and coal plants, resists new gas-fired facilities, and ensures that the lead time for new transmission lines is extremely long. As a result, the supply of electricity for California is not keeping pace with the growth in demand.

For many years, a central feature of power plant-siting proceedings was the determination of need, often impeded by claims of DSM and energy efficiency. California's reserve margin is necessary to protect

against grid imbalances caused by a temporary spike in demand, such as a heat wave or a power-plant breakdown. Today it has decreased to only about 10 percent from an average level of about 18 percent in the early 1980s. On many days, especially in summer, operational reserves drop to less than 5 percent, leading to curtailments and potential rolling blackouts. Closely associated with thin supply is increased price volatility.

More Price Volatility

While most retail consumers are isolated from the time-dependent cost of capacity, this price volatility does harm utilities directly and consumers indirectly. Because of demand patterns, which peak during hot afternoons, and greater reliance on inefficient generation, costs during peak hours can be 5–10 times those of normal hours. The marginal unit to be dispatched determines the cost for peak hours. With a larger reserve margin, the marginal need can be made up by increasing loads on more efficient units, reducing the costs and volatility.

Nuclear

Gov. Arnold Schwarzenegger has stated he believes that nuclear power has “a great future” and that it is time to “relook at that issue again rather than just looking the other way and living in denial.” The governor made these comments on March 14, 2008, in Santa Barbara, at a conference sponsored by the *Wall Street Journal*. His views made waves in environmental and energy circles. Gov. Schwarzenegger told the *Wall Street Journal* that it is time for the Golden State to reconsider nuclear power if it ever wants to meet energy demands for the future. He decried “environmental scare tactics

Gov. Schwarzenegger told the *Wall Street Journal* that it is time for the Golden State to reconsider nuclear power if it ever wants to meet energy demands for the future.

that frighten everyone that we’re going to have another blowup and all of those things.” He did not seem to notice that his favorite legislation, AB 32, the California Global Warming Solutions Act of 2006, is predicated on exactly those types of scare tactics. Nevertheless, it is refreshing that he remains open minded about nuclear power—and he is not alone.

Assemblyman Chuck DeVore (R-Irvine) tried last summer to qualify a ballot initiative and more recently to push bills that would again allow nuclear power in the state. California has two active nuclear power plants: the Diablo Canyon Nuclear Power Plant on Avila Beach in San Luis Obispo County, and the San Onofre Nuclear Generating Station next to San Onofre State Beach in northern San Diego County. Together, they supply about 12 percent of California’s electricity. They were built before the state placed a ban on new nuclear plants in 1976, pending release of the political hostage of spent fuel disposal. Rather than dispose of spent fuel, however, we could follow the energy example of the French. Using technology we developed, they recycle the fuel for even more energy. California, after all, is a national leader in recycling.

Nuclear power can be slightly more expensive than coal-fired power—which has become subject of an effective ban in California—but the current energy options allowed in California are far more expensive than either coal or nuclear. Nuclear technology may be even more cost-competitive than other technologies, as costs are fixed year to year, like a mortgage with a fixed rate, which is likely to provide stability in uncertain financial times. As new demands may be placed on coal to control CO₂ emissions, the cost of coal power may begin to exceed nuclear power. Natural gas is also expensive, with potentially continuing price increases and volatility. The wind is fickle and seldom available on hot summer days when air conditioning, comfort, and health all demand power.

Nuclear power, on the other hand, has known costs not subject to future fuel volatility, and is available rain

or shine. Consider also the great irony in this debate. Had we continued to build nuclear power plants over the past 30 years instead of depending increasingly on fossil plants and fickle renewables, we would most likely be meeting our goals contained in AB 32. Last year, the Nuclear Regulatory Commission (NRC) received seven applications for new power plants in other states and is expecting a dozen more this year. It is time for California to follow the lead and recognize the promise of nuclear power for environmental and economic reasons.

Offshore Drilling

The push for offshore drilling has opened a rift among California environmentalists. Many are calling for increased oil recovery to reduce the amount of natural oil seepage, while others continue to fear the risk of major spills.

In Santa Barbara, a new environmentalist group, Stop Oil Seeps (SOS California), has formed to call for renewed dialogue on the issue, in an effort to reduce oil pollution of the sea and nearby shorelines and provide revenue for alternative energy incentives.

Santa Barbara is home to the largest natural oil and gas seepages in the Western Hemisphere and the second largest and most active in the world. According to the California State Lands Commission, there are more than 2,000 active underwater seeps along the California coast, with more than 1,200 in the Santa Barbara channel alone.

The Santa Barbara Channel was the scene of a major offshore oil drilling accident in 1969, when a blowout on the ocean floor caused widespread damage to marine

life and the nearby coast. The blowout and resulting damage led to calls for bans on offshore oil recovery, ultimately leading to congressional moratoria that persist to this day, but remain the subject of heated political and partisan wrangling.¹⁵ The accident also sparked the establishment of Earth Day, an annual environmental event.

On May 31, 2008, Bruce Allen, head of SOS California, told a town hall forum in Santa Barbara that the amount of oil that has seeped naturally into the ocean since 1970 is 31 times the amount spilled in the 1969 accident, which has been estimated at three million gallons. University of California at Santa Barbara (UCSB) professor Bruce Luyendyk told the same town hall forum that reductions in natural seepage have been achieved by offshore production, such as at Platform Holly, which reduces reservoir pressure. Luyendyk said that seeps—not spills—are responsible for most of the oil mucking up the beaches along the Santa Barbara Channel. For example, seeps off Coal Oil Point near UCSB put an average of 4,200 gallons (1,000 barrels) of oil into the ocean every day.

Oil is not the only thing seeping from the seabed. Natural gas bubbles up from the same fissures—approximately 100,000 cubic meters per day. “That translates into about three million cubic feet a day,” Luyendyk has said. “Your typical household uses 250 cubic feet of gas a day.”

Allen noted research suggesting offshore oil spills are responsible for less contamination than natural oil seepage, and he encouraged people to be more open-minded about the environmental pros and cons of oil recovery.

“People who say we can’t drill our way out of this problem simply haven’t bothered to do the math, at least here in California,” Allen told the May 31 forum. “With the increased royalty revenue from \$140 oil, California offshore drilling could fund much... There’s a potential synergy we can take advantage of. We can reduce dependence on foreign oil, reduce tanker traffic, expand on alternative energy and clean up the environ-

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ment.” Expanding oil production through offshore drilling, he said, would generate \$1.6 billion a year for California through existing royalty statutes, and \$330 million a year for Santa Barbara County alone.

“And two billion of the estimated 13 billion barrels offshore in California is already discovered but off-limits because of the moratorium,” Allen added, “which we could start producing safely in a few years and lower America’s dependence on foreign oil. You only find energy solutions when you look for them.”

According to a recent Bureau of Land Management (BLM) report, vast untapped oil and natural gas resources exist on public lands in the United States. These public lands are estimated to contain 31 billion barrels of oil and 231 trillion cubic feet of natural gas, but are presently closed to energy production.

The report, known as EPCA III, estimates that energy supplies put off-limits by Congress equal 117 billion barrels of oil and 651 trillion cubic feet of natural gas. This is enough oil to replace our OPEC imports for more than 50 years, and enough natural gas to supply all U.S. needs for 30 years. The inventory found that 60 percent of the onshore federal and state lands with potentially significant domestic amounts of natural gas and crude are presently closed to leasing. This translates to inaccessible status for 62 percent of the oil and 41 percent of the natural gas. An additional 30 percent of onshore federal oil and 49 percent of onshore federal gas may only be developed subject to restrictions over and above standard environmental lease terms, including seasonal timing limitations. The study found that in the inventory areas just 8 percent of onshore federal oil and 10 percent of onshore federal gas are accessible under standard lease terms.

America has abundant energy resources. However, for a variety of reasons, many of these resources are not available for development. At a time when energy prices have reached record levels and Americans are feeling the impact every single day, we must find ways

to develop those key energy resources that are available to us right here at home, on our public lands.

Offshore oil and gas is not the only place to reduce loss of hoarded resources through seepage. The only natural gas well in the Yuba Goldfields area of Yuba County, named the “YUBA 1 Well,” was discovered in 1967 based on gas seeps and seismic data in old gold-dredge ponds about three miles east of Marysville, California. Seven seeps were found in old gold-dredge ponds in the area of the YUBA 1 Well. In 2004, natural gas production began. The natural gas seeps diminished as production of the gas in the subsurface formation proceeded. Since starting to produce this gas, the gas “boil” (that released uncontrolled into the atmosphere from under water) has diminished to almost zero. Wellhead pressures have dropped from about 400 psi to around 100 psi.

Greenhouse Gases and AB 32

Assembly Bill 32, the California Global Warming Solutions Act of 2006, aims to establish the world’s first comprehensive regulatory program to achieve quantifiable, cost-effective reductions of greenhouse gases. The legislation requires CARB to establish a statewide GHG emissions cap for 2020, based on 1990 emissions. Also, CARB must adopt mandatory reporting rules for significant sources of greenhouse gases and adopt a plan by January 1, 2009, that indicates how emission reductions will be achieved. By January 1, 2011, the state is to adopt regulations to achieve the maximum technologically feasible and cost-effective reductions. The state will also convene an Environmental Justice Advisory Committee and an Economic and Technology Advancement Advisory Committee to advise CARB. The legislation requires consideration of the effect of any mandates on California’s economy, especially low-income communities. Under AB 32, the governor is authorized to invoke a safety valve in the event of extraordinary circumstances, including the threat of significant economic harm, for up to 12 months at a time.¹⁶

As the lead agency responsible for implementing AB 32, CARB has recently released an “economic analysis” of their control strategies, stating:

The analysis we have conducted indicates that if California implements the comprehensive greenhouse gas strategy, as recommended in the draft Scoping Plan, not only will the economy grow by a similar amount as we move toward 2020, but it will grow at a slightly higher rate. Increased economic growth is anticipated primarily because the investments motivated by several measures, such as the expansion and strengthening of existing energy efficiency programs and implementation of new and existing policies to reduce emissions from the transportation sector, result in substantial energy savings that more than pay back the cost of the investments at expected future energy prices.

These results support the conclusion that the decision made in 2006 to reduce its greenhouse gas emissions was not just a good environmental choice, it also will help sustain growth and enable the state to reap the full range of economic benefits that come with a transition to a more sustainable future.¹⁷

This conclusion is in doubt; there is evidence that the economic harm provision is being ignored and that AB 32 will cripple an already struggling economy and push energy costs out of reach for consumers and small businesses. Contrary to its rhetoric, AB 32 would place the highest burden on those families who can least afford it—all for a program that may or may not even reduce emissions, and certainly will not affect the climate.

Independent studies of the costs of implementing AB 32 show it would cost California at least 1 percent of its state economic output—equivalent to the loss of an entire year’s economic growth. The reductions called for by AB 32 represent less than 1 percent of

If California achieves its emission reduction goals it will have at best a minimal impact on future climate.

global anthropogenic emissions, which represent about 5 percent of all greenhouse gases. AB 32 will reduce global emissions less than two-tenths of 1 percent.¹⁸ If California achieves its emission reduction goals it will have at best a minimal impact on future climate.

The same independent studies show electricity prices growing as much as 50 percent (and for less reliability), and gasoline prices soaring 72 percent to 151 percent. With California’s average price for a gallon of regular gasoline at \$4.00, these increases would put gasoline at \$7.15 to \$11.57 a gallon. The average household in 2020 would lose \$1,100 to \$4,000 to increasing energy prices, spending up to 4 percent more of their total annual income on energy than they do today. The extra expense doesn’t include the rising price of food and other commodities, which will climb as energy prices drive transportation and production costs. These new costs would disproportionately target disadvantaged and working-class households, who would pay as much as 14 percent to 16 percent of their income to energy costs, according to an analysis by Science Application International Corporation (SAIC).¹⁹

The same dynamic is at work on the federal level. In September, Rep. Charles Rangel (D-NY) introduced a bill to extend yet again a number of clean-energy tax breaks. The “Renewable Energy and Energy Conservation Tax Act of 2008” is modeled on the credit extensions originally in last year’s omnibus energy bill. The new bill, HR 5351, includes a three-year extension of the production tax credit for wind and other renewable energy sources brought on-line through the end of 2011. The measures would cost \$7.19 billion over the next 10 years, according to a bill summary published by the House Ways and Means Committee.

The bill failed during deliberations between House and Senate, but the extensions became part of the large “bail-out” bill passed on October 2, 2008. But the renewable-energy lobby is trying to focus attention on the extension’s economic benefits instead of dwelling on the controversial issues of global warming and of siphoning off the profit incentives of traditional sources. But other than short term and temporary jobs, just what economic benefit would result?

Estimates of how many jobs are created by “going green” vary widely, but not all economists believe that there will be any kind of green-job boom. More important is the question of whether these supposedly new jobs simply displace existing jobs or are make-work schemes to transfer wealth. Will they help improve our productivity and prosperity?

Unfortunately, the likely answer is no. The more complete story is that some jobs may be created, but only at the expense of others. Further, the result would be less overall economic growth on net and most likely the loss of existing capital. Less wealth and prosperity is the ultimate result. Reducing productivity also makes us less competitive internationally, in an increasingly competitive global economy. Though some jobs may be created in the short term, a long-term downward spiral is also created.

Such actions are not sustainable. Congress should keep long-term implications of their “job creation” arguments for increased mandates in mind as they move forward. Ideally, they will recognize the fallacy of creating jobs at the expense of productivity and thereby destroying wealth. Green-energy mandates should not be implemented if the cost is less productivity, less wealth, and less prosperity for all Americans.

Cap and Trade Auction under AB 32

The California Public Utilities Commission and California Energy Commission (“The Commissions”) have released their “Final Opinion on Greenhouse

Gas Regulatory Strategies” in electricity.²⁰ The report will go to CARB, which has oversight of all GHG policy. In addition to some direct efficiency measures, the Opinion recommends that in 2012 CARB start the program by giving away 80 percent of annual allowances to retailers and auctioning the other 20 percent. In each succeeding year, the fraction of allowances auctioned will grow to include another 20 percent of the total.

The Commissions’ main analytical tool is a GHG calculator spreadsheet from consulting firm E3. It allows users to choose their assumptions and see what happens to power costs and emissions. Numerous parties have run it to support their positions, but the opinion centers on a consensus scenario for a California-only program. As generally acknowledged, reshuffling contracts will ensure that the overall carbon intensity of western states’ generation is little changed. Power demand will be almost unaffected and dispatch patterns will only change to yield more than the mandated abatement if allowances go over \$100/ton or gas prices double.

Maybe there wasn’t time to think about the subject, but the CPUC and CEC also acknowledge that they don’t know anything about the economically efficient levels of electricity-related emissions. They consider it challenging at this point because they have very little sense of the abatement opportunity and costs in other sectors, which are to be managed by other state agencies. Other missing material is noteworthy. No one asked E3 to estimate the impacts on different types of customers (“inter-sectoral cost and equity issues”) because rate designs were complex and differed among classes. In light of the model’s overall complexity it is hard to justify an attempt to approximate such a politically important set of figures. Of course if these impacts were calculated

Green-energy mandates should not be implemented if the cost is less productivity, less wealth, and less prosperity for all Americans.

readers could more easily make interstate comparisons and estimate lost industrial and commercial loads.

Economic Impacts of AB 32

There's more to this than just cap-and-trade, which will be accompanied by many mandatory efficiency measures. But the Commissions also don't know whether the latter will work. "One of the biggest uncertainties," says the opinion, "is the anticipated cost of achieving extremely high levels of energy efficiency. Such scenarios will require activities and technologies that have not been accomplished (sic) with existing approaches; therefore, there is little empirical evidence to verify cost assumptions."

The current renewable portfolio standard is 20 percent by 2010, which has failed to the extent that the state now gets a smaller percentage of power from renewables today than in 2002. Boldness requires legislation that will set a 33-percent standard for 2020. We're talking bold, because the E3 model says that additional GHG reductions from the higher standard may come in at an average incremental cost of \$133 per ton.

The implementation of AB 32 is perhaps the most far-reaching and complex policy ever instituted by a state government. It is without precedent in the state or the nation. In addition to its reach, AB 32 elevates CARB to a level of authority that dwarfs its previous roles in air quality.

California's regulators have long used complex computer-based models to examine proposed policies. During the 1980s, they were integral components of integrated resource planning (IRP) for electric utilities under the Public Utilities and Energy Commissions. The hope was that models that captured the complexity of power supply and conservation choices could shed light on how to provide reliable electric services at the lowest possible cost. Often guided by such models, IRP unfortunately produced choices that made electricity more costly than necessary and ultimately gave rise to the state's costly experiment in power deregulation.

To achieve AB 32's goals at a reasonable cost, elected officials and other policy makers must understand that a reflexive trust in similar models could have the same consequences for carbon-related policy. Relative to electricity restructuring, failure of climate policy would be even more catastrophic. AB 32's requirements and CARB's initiatives affect far more of California's economy and will have greater financial impacts.

Relative to electricity restructuring, failure of climate policy would be even more catastrophic. AB 32's requirements and CARB's initiatives affect far more of California's economy and will have greater financial impacts.

The first model-based study of AB 32 was done by CRAI for the Electric Power Research Institute (EPRI), a nonprofit research center largely funded by utilities and the CEC.²¹ SAIC performed the other for the American Council on Capital Formation (ACCF) and the National Association of Manufacturers (NAM).²² CRAI deals exclusively with California, while SAIC considers the national effects of the draft Lieberman-Warner Climate Change Act, whose findings can be broken down to state levels. Because that bill's provisions resemble AB 32's, the California findings of SAIC may be comparable to those of CRAI.

Those models, as well as those used by CARB, utilize literally thousands of pieces of data as input and posit hundreds of interrelationships for the computer to process in generating its forecasts. Their codes differ because so much about the detailed structure of the economy is still unknown and continues to change. Each model gives the user one of many possible ways to explore that structure. Unsurprisingly, they produce differing outcomes. Anyone who encounters their findings needs to understand their possibilities and limitations.

CRAI estimates that AB 32 will reduce gross state product (GSP, similar to gross domestic product) by \$32 billion in 2020, or 1.35 percent of its forecasted value for that year, while SAIC finds a 2020 loss of \$24 billion (1.0 percent). Accepting these estimates for the moment, they tell us that AB 32 will result in the loss of a year of overall economic growth. Its cumulative impact will be hundreds of billions in losses (some scenarios estimate more than \$510 billion), because they will not be made up over the models' horizons.

Models are often run under different “scenarios” that represent different policies (e.g., cap and trade versus a fuel tax) or background assumptions (e.g., how quickly sequestration technology might develop). Different scenarios can mean different ranges of lower-level estimates, as when SAIC forecasts inflation-adjusted residential power prices in 2030 to be 38 percent to 49 percent higher than today, and gasoline prices 72 percent to 151 percent higher. Models can capture impacts further downstream, for example by showing how consumers' real purchasing power for other goods falls when higher energy prices affect their production costs.

Definitional differences can explain some differing conclusions. In SAIC's two scenarios, the average household will lose either \$1,244 or \$4,032 of its 2020 disposable income (i.e., after taxes and inclusive of transfers received). CRAI's base scenario shows a seemingly smaller \$1,170 drop in household consumption. That difference may simply acknowledge that consumption accounts for only a part of disposable income. Models also allow us to see dispersed geographic and demographic effects. CRAI's results show that the decline in California economic activity is partially countered by

increases in other western states. Changes to California's productivity resulting from carbon policy will affect our competitiveness with other states and nations.

The models can also show how AB 32 will induce changes in the composition of economic activity that affect standards of living. A state's GSP is made up of consumer goods and capital goods that businesses purchase for future production. AB 32 takes labor and other inputs away from consumer and capital goods and puts them into the implementation of AB 32. The total dollar value of GSP may change little, but more compliance-related goods and services means fewer goods will be produced to meet the needs of consumers and growing businesses, or to remain internationally competitive. Some models neglect important costs of adjustment to policy change.

SAIC, for example, sees a 2.5-percent loss in the nation's “industrial output” (largely manufacturing) in 2020, but this figure does not include costs of redeploying workers (unemployment and retraining) and redirecting investment away from disfavored industries. Models can also help us understand how policies will affect the well-being of different demographic groups. SAIC, for example, predicts that in 2020 California's low-income families will spend 14 percent to 16 percent of their incomes on energy instead of today's 12 percent, quite possibly an understatement because higher energy costs also raise the prices of other goods (like food) they buy.

The numbers above are unlikely to even come close to those that will show up in 2020. As far as quantitative accuracy, the models are best treated as very hazy crystal balls, and no one should bet their money (or the taxpayers' money) on coming close to the forecast. It is almost certain that other plausible assumptions could produce far more optimistic or pessimistic results.

Rather than having a duel between competing models for an answer, there is a better application of the divergent results. Models are worth using for a very different reason. They force us to organize our thoughts, and

Changes to California's productivity resulting from carbon policy will affect our competitiveness with other states and nations.

their results are starting points for further analysis. Most important, they allow us to see the significance of assumptions in both data inputs and structure that may have seemed insignificant before we saw the results. For an example, look at a conflict between CRAI and SAIC on estimates of lost GSP.

CRAI sees losses of \$32 billion in 2020 and \$37 billion in 2030. The loss increases, but over 10 years GSP grows by enough that the relative loss falls from 1.35 percent to 1.07 percent per year. Losses estimated in SAIC's model reveal a very different pattern. They rise from \$24 billion in 2020 (1.0 percent of GSP) to \$81 billion in 2030 (2.6 percent). CRAI sees some adaptation to AB 32, while SAIC sees its effects becoming more onerous.

Looking inside the models, we find an assumption that might drive the differing conclusions. Specifically, CRAI assumes that a low-cost technology to produce low-carbon auto fuels will become commercially viable between 2020 and 2030, which would greatly ease our adaptation to AB 32. SAIC makes no such assumption and instead sees that removing a ton of emissions will be more costly after the easy ones have been addressed. Either assumption is valid, but not certain.

The point of modeling is not to get an answer. It is to highlight the questions that matter for further analysis, and to figure out important contingencies.²³ These conflicting outcomes suggest that we investigate more closely the current state of research on low-carbon fuels to better judge how soon and how cheaply new technologies might be commercialized. Policy investigations might also be worthwhile. Should \$10 million be taken from other researchers and given to those working on low-carbon fuels? If so, what other research areas appear to be the least promising? Models can tell us where to look for ways to lower the cost of implementing AB 32, not whether a predetermined set of rules are cost effective. Taking that look requires research that goes beyond the models, but the models give us better ideas about which topics to investigate.

The implementation schedule for AB 32 is short and the complexity of carbon policy is breathtaking. A large number of agencies are making poorly coordinated efforts to formulate policies whose costs are uncertain and whose effectiveness is often unknown. Because AB 32 will impact every part of the economy it is time to suspend the law's interim deadlines so that all parties can better understand the state of the project, learn what is known and what is unknown, and plan accordingly. Both government and the public must learn what models can and cannot do. Absent this understanding, many people may unquestioningly accept forecasts that are almost surely in error. They could also reject tools without warrant that, if properly used, can provide policy guidance unobtainable by other methods.

Policies that combine market-oriented abatement incentives with increased technological innovation are the most cost-effective. For an emission-control policy based on market-oriented policies, marginal abatement costs increase with the stringency of the emission reduction targets. Costs increase more rapidly over time than do annual emission reductions. Key aspects of the policies California intends to implement to meet these goals remain unclear, and these can significantly affect the overall costs.

Regulating emissions associated with electricity imports entails a trade-off between leakage of emissions and higher abatement costs. "Leakage" refers to California climate policies that reduce in-state GHG emissions while increasing out-of-state emissions, and may apply for other commodities such as cement. The policy being developed assumes that California utilities could shift long-term contracts for electricity supply from outside California, but such shifts could potentially result in significant leakage.

Under such contract "shuffling," coal plants in other states could continue to operate at full capacity by selling in other markets, while hydro and other renewable resources are contracted to sell power to California. Because of contract shuffling, for every ton of emis-

sion reduction from the electric sector in California, there could be an increase of 0.85 tons of electric-sector emissions from the rest of the western states. Regulatory efforts to prevent such contract shuffling could significantly increase costs to California ratepayers.

Uncertainties about the future course of California's climate policy will affect consumer behavior, business R&D spending, and investments in capital assets. Failure to resolve these issues leaves firms and households uncertain about even relatively near-term investment decisions. Investors faced with this situation may defer investment decisions until future regulatory policy becomes clear, and this may result in inadequate investment in future California electricity supply in particular. Thus, these policies could lead to future electricity shortages in California.

The average cost of this policy would be about \$31,900 to every California household. Median California household income is about \$50,000. Therefore, the long-term cost would be the equivalent of nearly two-thirds of one year's median income to every household in California. The costs to Blacks and Hispanics in California would be even more severe.

The energy and energy-induced price increases resulting from these policies would be regressive in that poorer households would bear a larger burden relative to their income than wealthier households. In fact, as confirmed in a recent U.S. Congressional Budget Office study, the economic effects of the type of policy that California is implementing are almost perfectly regressive. At every level of income the percentage increase in households' costs are higher for less wealthy households, and the relative impact on the lowest income quintile is twice as great as on the highest. This understates the economic impact, since wealthier individuals have more discretionary income. A \$50 increase in monthly energy bills is more harmful to a family with an annual income of \$30,000 than is a \$100 increase to a family with an annual income of \$150,000.

Government intervention is especially troublesome when the free market is making significant progress on an issue like GHG emissions. The main greenhouse gas is carbon dioxide (CO₂) and its major source is the combustion of fossil fuels to supply energy. Emissions can be reduced by a variety of measures, such as improving energy efficiency and developing alternative energy sources, like wind and solar power. However, a rapid move away from fossil fuels is unlikely because energy supply infrastructure has a long lifetime, and such a move could significantly harm economies. Another way to reduce emissions is to capture the CO₂ released from fossil fuel-fired power plants and store it underground. Carbon capture and sequestration (CCS) is the focus of significant attention, as power generation accounts for about one-third of CO₂ emissions from fossil-fuel use. On other fronts, companies are reducing natural gas flaring (a very potent greenhouse gas) to cut emissions, while also adding to energy supplies. Overall, the California and U.S. economies are de-carbonizing.

Most of the investments have benefits beyond reducing GHG emissions. They typically increase energy supplies, improve efficiency, or diversify energy supplies. From 2000 through 2006, U.S. oil and gas companies invested \$38 billion in energy technologies in the North American market²⁴ that have lower GHG emissions. This expenditure is 42 percent of the estimated total \$91-billion spent by U.S. companies and the federal government. Of the industry investments, \$34 billion (94 percent of the \$38 billion total) were directed toward efficiency, fuel diversification, and reduced methane flaring.

In addition to U.S. oil and gas interests, the motor-vehicle, agricultural, electric utility, and renewable-fuel industries made significant technology investments. These are estimated to have invested \$37 billion (or 41 percent of the \$91 billion total) from 2000 to 2006. Of the \$37 billion, \$20 billion (54 percent) is associated with end-use technologies and \$12 billion (32 percent) with non-hydrocarbons. Likewise, the federal government is estimated to have invested \$15 billion

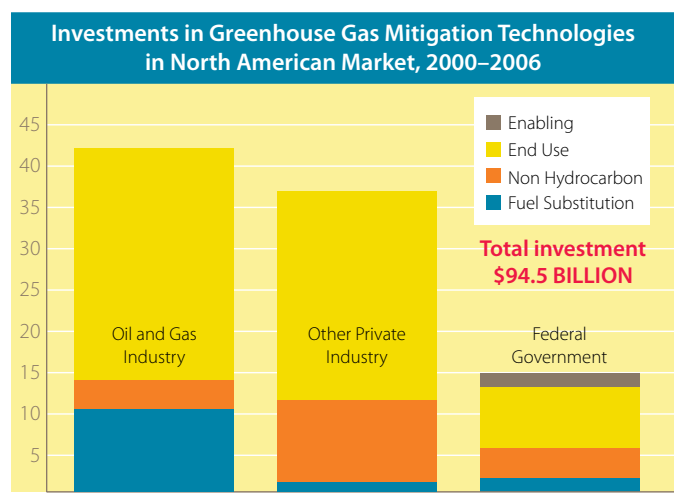


Figure 3

(16 percent of the \$91 billion total) from 2000 to 2006 through the Climate Change Technology Program. While the level of investment is low relative to the private sector, seed-money investments, particularly at the basic research stage, can leverage billions of dollars of later private investment. Figure 3 shows the investments by investor type and by technology category.

The analysis did not include federal tax transfers in the form of credits and similar techniques, nor international assistance. The preponderance of investments in improved efficiency comprising 41 percent of the \$91 billion total reflects a continuing primary role for oil, gas, and coal in the energy mix over the next decades. All major forecasts of U.S. and global energy supply, including outlooks developed for the United States by the Energy Information Administration (U.S. Department of Energy) and for the world by the International Energy Agency (Organization for Economic Co-Operation and Development), continue to place carbon-based fuels in the forefront for supplying the world’s energy needs. However, even given this preponderance, there is substantial activity in fuel substitution and non-hydrocarbon technologies.

These applications will play a growing and important role in the future, forming an energy cornucopia that

promises a new chapter in the history of the energy industry. Similarly, today’s investments in enabling technologies promise expanded flexibilities in meeting the future’s need to supply humanity with cost effective and clean power and energy. It is simply disingenuous to claim that the United States is not doing anything to reduce emissions.

California legislators and policy makers seem bent on following Europe, but that parade seems headed for a different destination than originally thought.

California legislators and policy makers seem bent on following Europe, but that parade seems headed for a different destination than originally thought. Britain, for one, is trying to change European proposals to make governments and companies cut their carbon emissions by 2020 to tackle global warming. Documents show Britain wants Brussels to offset more domestic carbon savings through investment in clean projects in the developing world. The government’s own calculations show the proposed change would allow Europe to emit an extra billion tonnes of CO₂ from 2013 to 2020.²⁵

The move would let firms and countries import more carbon credits to count against their pollution targets. It would allow Europe to make less effort to cut its pollution, while keeping it on course to meet an ambitious target of reducing carbon emissions by 20 percent by 2020.

The change is described in a discussion paper prepared by the UK on possible amendments to the European Union (EU) climate and energy package. Dated August 8, 2008, the paper states: “There are many good reasons why we should support increased access to project credits,” and says the contribution of credits from schemes such as the UN’s clean development mechanism (CDM) should be “limited to 50 percent

of absolute effort.”²⁶ In other words, it wants to allow half of the targeted carbon savings to be achieved through imported credits. The original EC proposal set the limit at about a quarter.

In 2006, the U.S. continued a two-decade trend toward emissions stabilization, now at a rate of less than one-half percent. While the U.S. is often criticized for being the world’s largest emitter of carbon dioxide, it is also the largest contributor to the world’s wealth, producing about 28 percent of the world’s goods and services. Our carbon intensity continues to improve.

The EU has attempted to reduce GHG emissions through a complex web of mandates, subsidies, regulations, and cap-and-trade programs imposed on member countries and residents. Growth in emissions in EU countries has increased faster and farther than the U.S., as reported by the Environmental Impact Assessment. The growth in EU emissions would likely have been much greater had trading of emissions from coal-dominated Poland and East Germany not occurred, which ironically did not reduce emissions.

In both the U.S. and EU, emissions are up compared with 1990, but the U. S. is performing much better. The EU is increasing emissions three times more rapidly than the U.S. California would do best for its citizens by putting aside the heavy hand of government and following the more results-oriented lead of the United States.

In the meantime, in a question raised at the outset, what effect will California’s landmark law on greenhouse gases have on energy price and reliability?

Toward a High-Energy Future for the Golden State

At the time of this writing, California has agreed to a budget that virtually assures future financial crises. This is not the most opportune moment to impose incredibly complex, expensive, and unproven new programs such as AB 32 on businesses and households already struggling to survive.

Businesses, already fighting to make ends meet and provide critical jobs, will see new fees as one more reason to move across state borders, or across the ocean, taking opportunities and investments with them. That will translate to less economic output, a smaller corporate tax, fewer jobs for Californians, and worsened state-budget woes.

California needs time to research the costs of GHG policy, as well as time for the economy to prepare for change or for better solutions to emerge. If California is to remain a competitive giant, AB 32's implementation should not punish consumers without a better understanding of the fundamentals of economic vitality.

Cuts in greenhouse gases may be necessary, but it is innovation, more likely, not regulation, which will bring the breakthroughs of our energy future. Our economic and environmental outlook requires incentives for new technologies and tax credits for research and development, not devastating burdens that drive companies out and take money from promising projects.

California must promote technological developments and entrepreneurial innovation to reduce emissions, while ensuring its economy continues to grow apace with population. Regulations intended to reduce greenhouse gases must be paired with a commitment to protect consumers and jobs in California. Now is the time for prudence, study, and a better solution that does not put our economic welfare at such risk.

Negative consequences are looming from the GHG emission restrictions, the low carbon fuel standard, and the renewable portfolio standard. These unintended consequences involve billions of dollars and threaten reliable and affordable energy in the Golden State.

On another front, has the public-policy tide shifted on offshore oil exploration and development? At this writing Congress has authorized new drilling, and many Californians are rethinking the issue. This fresh approach is welcome, but has yet to translate into new supplies from California's abundant offshore resources.

Will the moratorium on expanded nuclear power survive in the face of a slow-speed energy crunch? That also remains to be seen. If policy makers share the governor's optimism about nuclear power, it has yet to translate into new power plants and new energy supplies for California. Even in difficult economic times, demand continues to outpace supply.

California is blessed with entrepreneurs, inventors, and vast natural and energy resources. Yet California tilts to government intervention in energy markets, a trend harmful to consumers and the economy, and often with little benefit to the environment.

After 30 years of increasingly heavy-handed government regulation, with little to show for it, the time has come for California to consider seriously the approach of free-market environmentalism and protection of property rights.²⁷ California should strive to increase energy supply options, rather than limiting them to fads favored by regulators and interest groups. Nuclear power and offshore drilling would go a long way toward easing our energy shortfalls and financial instability. The state could also ensure more consistent supply by authorizing construction of new refineries for the first

It is innovation, not regulation, which will bring the breakthroughs of our energy future.

Supply will meet demand, if legislators allow it to do so.

time in more than three decades. Supply will meet demand, if legislators allow it to do so. As Bruce Allen of SOS California noted, you only find energy solutions when you look for them.

When it comes to energy, California should focus on actual performance criteria, not specific technologies. Legislators should eliminate overlapping energy agencies and normalize tax preferences and subsidies across technologies.

These key reforms will help restore stability to the energy market, keep businesses and consumers in the state, and keep the lights on. Energy is vital to the future of California and the nation. State leaders should seize the opportunity to make California a leader in this field.

Endnotes

- ¹ California Department of Finance, Demographic Research Unit; <http://www.dof.ca.gov>
- ² Derived from California Department of Finance, Demographic Research Unit; <http://www.dof.ca.gov>
- ³ State of California, Department of Finance, *They Moved and Went Where: California's Migration Flow, 1995–2000*, (Sacramento, California, June 2007). It would be interesting to correlate the level of economic and political freedom in the countries where emigrants to California originated relative to freedom in California and other states.
- ⁴ U.S. Bureau of Economic Analysis.
- ⁵ U.S. Department of Energy, Residential Energy Consumption Survey, 2005.
- ⁶ http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html, September 16, 2008.
- ⁷ http://www.energyalmanac.ca.gov/electricity/total_system_power.html
- ⁸ California State Board of Equalization data for 2004. Taxable gasoline figures amounted to an average of 43.5 million gallons per day, while taxable diesel fuel sales figures have been adjusted upward to reflect an estimated 22 percent distribution of exempt and refund diesel sales that are excluded from their taxable gallons.
- ⁹ <http://www.mms.gov/offshore/Resources.htm>
- ¹⁰ Environmental concerns have been at the center of debates limiting offshore exploration and development, even though according to the Mineral Management Service less than 1 percent of oil found in the ocean is a result of exploration and development.
- ¹¹ Tom Tanton, “Brown Blocks Bottled Water Over Global Warming,” *Sacramento Union*, August 14, 2008.
- ¹² Construction Industry Research Board, (Security Pacific through 1986), seasonally adjusted by the CA Dept. of Finance; updated: May 31, 2007.
- ¹³ See Thomas Tanton, *Lights On: An Energy Policy Survey for California* (San Francisco CA: Pacific Research Institute, November 2007), p. 7.
- ¹⁴ *Ibid.*, p. 13.
- ¹⁵ In July, President Bush lifted an executive ban on offshore drilling but that action put the onus on Congress and the states. <http://www.cbsnews.com/stories/2008/07/14/national/main4257757.shtml>
- ¹⁶ AB 32 Fact Sheet—Global Warming Solutions Act of 2006. <http://www.pewclimate.org/docUploads/CA-AB32factsheet.pdf>
- ¹⁷ California Air Resources Board, *Climate Change Draft Scoping Plan: Economic Analysis Supplement Pursuant to AB 32, The California Global Warming Solutions Act of 2006*, September 17, 2008.
- ¹⁸ California emits 6.71 percent of U.S. emissions. http://www.eia.doe.gov/oiaf/1605/ggrpt/excel/tbl_statesector.xls.
- ¹⁹ The U.S. emits about 22 percent of the world total. See www.eia.doe.gov/oiaf/1605/ggrpt/ p. 6. AB 32 requires an approximate 10-percent reduction from today's levels.
- ²⁰ Science Applications International Corp. for NAM, Analysis of the *Lieberman-Warner Climate Security Act* (S.2191) The Opinion is at <http://docs.cpuc.ca.gov/efile/PD/89317.pdf> and the GHG calculator at <http://www.ethree.com/GHG/GHG%20Calculator%20v2b.zip>
- ²¹ *Program on Technology Innovation: Economic Analysis of California Climate Initiatives: An Integrated Approach, Volume 1: Summary for Policymakers*. (Palo Alto, CA: EPRI, 2007).
- ²² Science Applications International Corp. for the National Association of Manufacturers, Analysis of the *Lieberman-Warner Climate Security Act* (S.2191).
- ²³ For example, the high prices that plagued California's power markets in 2001 resulted in large part from their bidding rules, which had been based on some models' forecasts of continuing surplus generation capacity. Had there been contingency arrangements to change those rules in the event of a supply shortage, the dislocations would not have been so severe.
- ²⁴ “North American market” is used herein to include Canada and the U.S. Source: Institute for Energy Research and University of Texas; *Greenhouse Gas Emission Reduction Investments by Energy Firms, Other Industry and Federal Government*, forthcoming.
- ²⁵ David Adam, “Leaked papers show Britain trying to weaken plan for EU carbon cuts,” *The Guardian*, September, 18, 2008. <http://www.guardian.co.uk/environment/2008/sep/18/carbonemissions.climatechange>
- ²⁶ *Ibid.*
- ²⁷ In 1991, Terry Anderson and Donald Leal released *Free Market Environmentalism*. Their thesis, that free markets could protect the environment as well as or better than government if property rights institutions were in place, challenged conventional thinking. In the past, environmental policy had always been viewed as an example of market failure. Anderson and Leal claimed that this was not the case and offered alternatives to prove it. *Free Market Environmentalism* has been used in curricula at Stanford, Harvard, and other universities.

About the Author

Thomas Tanton, a PRI Fellow in Environmental Studies, also serves as an adjunct scholar at the Institute for Energy Research and President of T2 & Associates, an energy technology consulting firm. Mr. Tanton has more than 35 years experience in the energy, economy, and environmental fields. Until 2000, Mr. Tanton was Principal Policy Advisor with the California Energy Commission (CEC) where he began his career in 1976. He developed and implemented policies and legislation on energy issues of importance to California, and the U.S., including electric restructuring, gasoline and natural gas supply and pricing, energy facility siting and permitting, environmental issues, technology development, and transportation. He also served as lead advisor on energy and infrastructure to California's task force on 21st Century development. He has testified before several state legislatures and Congress, and provided expert witness testimony.

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