California's energy and climate policy: A full plate, but perhaps not a model policy

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Abstract

California is a leader among states in its efforts to cut greenhouse gas emissions. Under the California Global Warming Solutions Act of 2006 (Assembly Bill 32), the state has set itself on a course to reduce its greenhouse gas emissions to 1990 levels by the year 2020. In addition to its cap-and-trade program, California aims to accomplish this objective via a large assortment of complementary and overlapping policies. To a significant degree, cap-and-trade is a market-based "dessert" that follows a multicourse menu of other regulatory initiatives aimed at cutting emissions. The reduced cost-effectiveness, political costs, and regulatory costs associated with this approach make it unlikely to form a suitable model for states in which political commitment to climate action is more limited or regulatory capacity is not as great as in California.

Keywords

California, cap-and-trade, climate policy, energy efficiency, greenhouse gas emissions, Low Carbon Fuel Standard, Renewable Portfolio Standard, tailpipe standards

Reading news accounts of California's efforts to cut emissions of greenhouse gases, it would be easy to think that the state's efforts are working because of its cap-and-trade program. Now that the US Environmental Protection Agency (EPA) is set to require similar efforts from at least the electric power sectors of all 50 states,[1] regulators and environmentalists argue that California has laid out a model for other states to follow (Hsia-Kiung et al., 2014; Whetzel, 2014) and that the evidence suggests that this model is not only working (Newell et al., 2014) but also cheap—prices in the California cap-and-trade market earlier this year were between $11 and $12 per ton of carbon dioxide (Point Carbon, 2014). Given the design of the cap-and-trade program, this price amounts to a bet by the market that compliance with a 15 percent reduction in California's emissions (CARB, 2014a) can be accomplished in eight years at a marginal abatement cost of just $12 per ton. If this were true, the argument for using California as a model would be quite compelling.

But this assessment raises an important question: What characteristics

should a model program for cutting state-level emissions possess? First and foremost, it should be effective. That is, it should actually reduce emissions below the level they would have been in the absence of the program. Second, because support for environmental programs is limited, it should be as cost-effective as possible.[2] In other words, a model program should accomplish the maximum reductions possible given the resources a state is willing to commit. Third, a model program should be simple enough that a state with limited political support for climate change can implement it with relatively few politically costly decisions for legislators and regulators. Even if politicians are willing to expend limited political capital at one point in time to set the ball rolling, climate policies that require repeated and frequent actions by legislators will be hard to sustain.[3] Fourth, a model policy should not require regulatory capacity beyond the means of most states. California's environmental and energy regulators are some of the most advanced and well-resourced in the world. Because of California's long-standing problems with air pollution, the California Air Resources Board (CARB), California's lead air-pollution regulator, is unusual in its ability to design and implement multiple, complex, and interacting policies simultaneously. A model policy needs to stay within the capacities of regulators with more limited staff and funding levels.

These four dimensions—effectiveness, cost-effectiveness, modest political demands, and modest regulatory demands—map out the key contours of a policy framework likely to be feasible in most states, as opposed to just those in which elected officials view environmental issues (and climate change in particular) as central to their broader governance agenda. This list of four factors for a model climate policy is by no means intended to be complete, but rather to serve as a rough yardstick against which to measure the California experience. The California model is a complex one in which the carbon market is merely the highest-visibility program; four other energy and climate programs actually do most of the work of cutting emissions.

Cap-and-trade: California climate policy "dessert"

California's experience is much more complicated than just cap-and-trade. Since passage of the California Global Warming Solutions Act of 2006 (also known as Assembly Bill 32, or AB 32), California has undertaken an unprecedented number of steps to reduce greenhouse gas emissions from all sectors of its economy. This substantial, multifaceted effort has received bipartisan support in a state that is deeply committed to environmental quality and has been sustained through the largest economic downturn since the Great Depression. The effort is also motivated by, and builds on, California's long-standing struggle to achieve goals for traditional air pollutants set by the EPA under the Clean Air Act. California's efforts have been the result of at least 14 new pieces of legislation, as well as at least 32 separate rulemaking processes since the passage of AB 32 in 2006 (CARB, 2014a).

All of this activity beyond the cap-and-trade program has had important impacts on the emissions trading program itself. In many respects, California has decided not to trust carbon pricing incentives to reduce its emissions.

Rather, it has planned and implemented a complex regime of command-and-control and performance-based regulations aimed at achieving the emissions target set by AB 32 and then created cap-and-trade as a sort of emissions insurance policy—to make sure that "no ton is left behind," in the words of longtime CARB Chairperson Mary Nichols. A perhaps more useful metaphor is that the numerous new rules and regulations are the main courses of the California climate policy model, while cap-and-trade is a complex dessert, aimed at impressing and generating favorable reviews from out-of-town visitors. There is more than one course—after all, this is California, the land of the nine-course tasting menu.

The main courses of California climate policy turn out to be policies such as greenhouse gas tailpipe standards, the Low Carbon Fuel Standard, energy efficiency standards for buildings, and renewable energy mandates for utilities. To be fair, as will be discussed below, many of these so-called "complementary policies" are, to a greater or lesser extent, market-oriented in their approach—but this is leading to a fragmentation of price signals within the California climate change program. And because so many emissions reductions are mandated by the complementary policies, cap-and-trade actually has far less work to do in implementing the climate policy agenda in California than might be understood from the media attention it has generated (Whetzel, 2014).

CARB's official estimate is that emissions trading will provide 29 percent of the reductions needed to comply with AB 32 while complementary measures will provide the remaining 71 percent (CARB, 2014a). But this estimate assumes perfect operation of the many rules and regulations that will be phased in by 2020—an outcome that is difficult if not impossible to verify. And any work that cap-and-trade may have left to do is likely to be undermined by "leakage" of emissions to neighboring states as California utilities shed their ownership in dirty out-of-state power plants.[4]

If cap-and-trade is the dessert, what are the main courses? Here is a menu that is by no means comprehensive but does give a taste of California's all-in approach to climate change.

The four main courses of California climate policy

Of the many laws and regulations that have been implemented over the past decade by California legislators and regulators, four will most likely deliver the lion's share of reductions under California's climate policy. Each program is highly ambitious in its objectives, innovative in many respects, and the product of prodigious legislative and regulatory effort.

Tailpipe emissions standards for cars and trucks

The first efforts aimed at cutting California greenhouse gas emissions focused on light-duty vehicles—passenger cars and light trucks. Fran Pavley, the legislative leader in California's efforts to reduce its emissions, authored and shepherded Assembly Bill 1493 through the California Legislature in 2002. This bill directed CARB to set tailpipe standards for light-duty vehicles sold in California beginning in the 2009 model year. CARB approved implementing regulations in 2004 that generated protracted litigation,

ultimately resolved by a settlement with the EPA and the National Highway Traffic Safety Administration (NHTSA) after the Obama administration took office in 2009. California regulations became the national standard and were incorporated into the updates to the Corporate Average Fuel Economy standards by the EPA and NHTSA in 2010.

Subsequent agreement between CARB, the EPA, and NHTSA prescribed even deeper reductions for the 2017 to 2025 model years. These were in turn wrapped into a new state regulation—called the Advanced Clean Cars program—that aims to reduce emissions of smog-forming pollutants and greenhouse gases while at the same time facilitating deployment of low- and zero-emission vehicles. CARB estimates that the improvements in fuel economy brought about by AB 1493 cut emissions by 22 percent in 2012, and will reduce them by 30 percent in 2016 relative to 2009, and 34 percent in 2025 relative to 2012. Because the first round of tailpipe standards was mandated by law prior to passage of AB 32, CARB does not count them toward the mandated reductions, instead including them in its baseline emissions forecast. In its most current forecast, CARB estimates that the second round of standards will reduce emissions by 4 million metric tons of carbon dioxide equivalent in 2020 (CARB, 2010a), which is equivalent to taking more than 840,000 cars off the road (EPA, 2014a). However one handles the in-state accounting for the two rounds of tailpipe standards, it's important to recognize that because these have become national standards, they have had and will probably have a larger impact on US greenhouse gas emissions than anything else California has accomplished.

Low Carbon Fuel Standard for gasoline

The next-largest slice of reductions needed to achieve the AB 32 objective of returning California emissions to 1990 levels are to come from the Low Carbon Fuel Standard. This regulation aims to reduce the life-cycle carbon intensity—the amount of greenhouse gases released to the atmosphere from the production and consumption—of refined gasoline sold in California by 10 percent by 2020. The program, as implemented, allows refineries to trade renewable fuel credits to increase its cost-effectiveness.

As part of the implementing regulations, CARB specified default carbon intensities for a variety of gasoline feedstocks. These default values are specific to fuel type (for example, corn ethanol) and location (say, the Midwest), because the energy intensity of production varies substantially. Midwestern corn-ethanol producers challenged this approach as an unconstitutional regulation of interstate commerce. After delays that created significant regulatory uncertainty for biofuel producers, CARB ultimately prevailed in the litigation and has implemented the program. Thus far, because of a lack of availability of advanced biofuels, significant compliance with the Low Carbon Fuel Standard has come from imports of Brazilian sugarcane-based ethanol—which, even accounting for shipping emissions, has a lower carbon intensity than corn-based ethanol from the US Midwest.

In its planning documents, CARB has estimated that the fuel standard will reduce emissions by 15 million metric tons of carbon dioxide equivalent compared with a 2020 business-as-usual scenario, or 19 percent of the reductions

the agency needs to comply with its AB 32 target. So far, credit trading in the fuel standard indicates that the recent marginal abatement costs of this program are somewhere between $30 and $50 per metric ton of carbon dioxide equivalent—or three to four times the carbon price in the cap-and-trade market (CARB, 2014b).

Energy efficiency standards for new buildings

Next on the menu of major initiatives to reduce greenhouse gas emissions in California is the green buildings program, which aims to cut energy use by buildings through periodic revisions to the Title 24 building energy efficiency program. This long-standing California program focuses on improving the energy efficiency of new residential and commercial buildings. The program undergoes periodic upgrades in stringency at three-year intervals. The California Energy Commission, with an eye on greenhouse gas emissions reductions, has set ambitious objectives toward which it plans to move the new building energy standards via these periodic updates. Specifically, new residential construction will be "net-zero energy" by 2020, meaning that new construction, including on-site distributed energy generation, will not consume energy from the grid on an annual basis. New commercial construction is to be net-zero energy by 2030 (California Energy Commission, 2007).

The California Energy Commission recently implemented the 2013 update to the building standards and is in the early planning stages of the 2016 update, which will take effect in July 2017 (California Energy Commission, 2014). CARB has estimated that these building standards will contribute 12 million metric tons of carbon dioxide equivalent toward achievement of the AB 32 target for 2020, or 15 percent of the total reduction below business-as-usual emissions levels (CARB, 2010a). This is equivalent to the emissions from more than one million homes (EPA, 2014a). CARB's estimate is that these reductions will occur at a negative cost —they will actually save money for building owners, occupants, and society as a whole (CARB, 2008b). These policies are best understood as an intensification, and reorientation toward climate change, of long-standing policy on building energy efficiency in California.

Renewable Portfolio Standard for electricity utilities

Last on the list of significant regulatory actions aimed at achieving emissions reductions is an aggressive expansion of the Renewable Portfolio Standard from 20 percent to 33 percent. The standard places an obligation on utilities that sell electricity to retail customers to procure 33 percent of their power from eligible renewable resources by 2020. Nuclear energy and existing hydropower are not included as eligible resources under this program. The standard was initially implemented via executive order, and ultimately by new legislation that expanded the reach of the program beyond investor-owned utilities to the large municipally-owned utilities in the state. This broadening and deepening of the Renewable Portfolio Standard, combined with federal tax incentives, has led to a dramatic increase in renewable energy project development in California. In 2013, all major investor-

owned utilities buying electricity on the retail market achieved the 20 percent renewable energy target (California Public Utilities Commission, 2014).

As of July 2014, the interconnection queue contained sufficient capacity to meet and even exceed the 33 percent target in 2020 (California Independent System Operator, 2014). Achieving this outcome has taken prodigious efforts aimed at facilitating planning, permitting, and integration of variable energy resources into the California electricity system. Key issues of concern have been the cost to ratepayers and grid reliability, particularly given the retirement of the San Onofre Nuclear Generating Station and a number of older natural gas-fired power plants. CARB has estimated the impacts of the Renewable Portfolio Standard on California greenhouse gas emissions at 11 million metric tons of carbon dioxide equivalent, 14 percent of the reductions needed to comply with AB 32.[5] This is equivalent to retiring three major coal-fired power plants (EPA, 2014a). Marginal abatement costs of the standard are difficult to estimate, due to a variety of factors, including changes in the capital cost of renewable energy facilities, uncertainties regarding the true costs of integrating this amount of variable energy into an electricity system, and other concurrent changes in the California grid that may affect electricity costs—such as plant retirements and transmission investments. CARB's own early estimate of the marginal abatement cost of the Renewable Portfolio Standard was $133 per metric ton of carbon dioxide equivalent, or more than 10 times the current price of carbon in the cap-and-trade market (CARB, 2008b).

Achievement of AB 32's goal, a 15 percent reduction of California's emissions by 2020, will be accomplished by a large number of regulatory activities. The four largest, other than cap-and-trade, are forecast to account for about 42 million metric tons of the reductions, or 54 percent of the total. Other mandatory reductions are forecast to reduce emissions by approximately an additional 13 million metric tons. That leaves a balance of 23 million metric tons, or 29 percent of the total, that must be achieved using California's cap-and-trade program. It's important to emphasize that because these other regulatory programs—the other 71 percent of reductions—are mandated under California law and regulation, they will be supplied to the carbon market at zero cost. This, along with leakage, is the key explanation for why current prices are low in the market.

California climate policy: Effective but not a model program

Taken as a whole, these programs present a picture of vigorous, multilayered legislative and regulatory action, often with close coordination between different state agencies. This overlapping and redundant character of the California program—for example, emissions from the electricity sector will be reduced by efficiency programs, by the Renewable Portfolio Standard, and by the cap-and-trade program—is likely to produce an effective outcome, with emissions falling below baseline values. Effectiveness is an important, but not sufficient, condition for serving as a model for state action on climate change; cost-effectiveness, modest political demands, and modest regulatory demands also matter.

California's suite of climate policies is likely to be less than optimally cost-effective. Evidence for this exists in the

wide range of estimated marginal abatement costs for various policies. In particular, some policies, such as the Low Carbon Fuel Standard, have observable carbon prices that are higher ($30 to $50 per ton) than the market price for carbon ($11 to $12 per ton), while others, such as the Renewable Portfolio Standard, have assumed prices ($133 per ton) that are far above the market price. Higher prices than those observed in the cap-and-trade program are strong evidence for a lack of cost-effectiveness because they suggest that lower-cost sources of reduction are available in the market for cap-and-trade allowances. Thus for states with more-limited appetites than California for climate policies, an approach more focused on cost-effectiveness may yield greater reductions at a similar cost.

Because of the politics of climate change—citizens appear to want action, but legislators fail to enact many policies to reduce emissions (Krosnick and MacInnis, 2013)—models that require frequent and politically costly intervention by legislators may be difficult to implement. Here as well, California's policy may not serve as a useful model. In addition to AB 32, at least 14 other pieces of legislation have been enacted in support of emissions reductions within California. Other states, which exhibit behavior more similar to that of the US Congress, which has attempted but failed to enact climate legislation on a number of occasions, will struggle to emulate such a legislative record.

Finally, California's enormous administrative capacity to craft detailed implementing regulations for the various bills enacted by the legislature is likely unavailable in most other states. CARB, the California Energy Commission, and the California Public Utilities Commission have together undertaken at least 32 separate rulemaking proceedings in furtherance of the AB 32 objectives. CARB has also been forced to expend significant resources defending its policies in court. CARB and other state agencies have been able to do this partly because of the sustained commitment of legislators to fund the effort.[6] Whether air regulatory agencies in other states can successfully undertake such efforts is an unanswered question. So far, the federal government has proposed just $24 million in assistance to states for developing implementation plans for the recently proposed EPA power-sector emissions regulations (Chemnick, 2014).

Overall, California's climate change program, while effective, is one that is unlikely to be replicable elsewhere, because it relies on a political reality—very strong support for climate change policy—and large and well-funded air and energy regulators that do not exist in most states. Given these constraints, states seeking to cut emissions should look to policies that are effective in reducing emissions, as are California's, but also cost-effective, politically feasible, and simpler to implement.

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Notes

1. On June 2, 2014, the EPA published a draft of its Clean Power Plan which would require that states achieve greenhouse gas performance standards for fossil-fuel-fired electric power plants (EPA, 2014b).

2. Polling suggests widespread public support for climate policies but limits on willingness to pay (Krosnick and MacInnis, 2013).
3. The fact that a stable majority of Americans support action on climate change and yet legislators have been unwilling to enact it suggests that political actors opposed to the policy are important limiting factors (Krosnick and MacInnis, 2013).
4. See the article by Danny Cullenward in this issue (Cullenward, 2014), as well as Bailey et al. (2013).
5. This estimate includes only the additional reductions produced by an increase in renewable energy from 20 percent to 33 percent of supply. Of course, the first 20 percent also contributes to lowering California emissions. If these were included, the reduction from renewable mandates would be greater. Compare CARB (2008a) with the agency's 2020 forecast (CARB, 2010b).
6. CARB hired approximately 130 full-time employees to assist in implementing AB 32 at a time when other state agencies were shrinking due to the California budget deficit. CARB was allowed to borrow in order to do so. Eventually, a fee was levied to recover these costs. Historically, AB 32 implementation by CARB has cost approximately $35 million per year (CARB, 2014c).

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