California's Bold New Climate Policy

LAWRENCE H. GOULDER

With Governor Arnold Schwarzenegger's signing last fall of Assembly Bill 32, California became the first state to commit to an economy-wide greenhouse gas regulatory program. The state must now lower emissions to 1990 levels by the year 2020—a 25–30 percent reduction from "business as usual" emissions in 2020.

California's initiative is a test case. Success could hasten the arrival of a broader, federal program. Failure could set back further United States policy efforts indefinitely.

Lawrence H. Goulder is the Shuzo Nishihara Professor of Environmental and Resource Economics at Stanford University. He recently served as vice-chair of the California Market Advisory Committee, which was charged with developing recommendations for the design of a cap-and-trade system to contribute to the state's climate-change policy effort. E-mail: goulder@stanford.edu.

The new law gives the California Air Resources Board (CARB) until January 2009 to develop a draft plan to achieve these reductions. CARB's finalized regulations are supposed to take effect in 2011.

CARB has broad flexibility in deciding how to achieve the AB32 targets. What approaches should CARB take? In this essay I argue that California should adopt a "cap-and-trade" program as part of its effort. I also point out some major challenges that a California cap-and-trade system would need to overcome—challenges that emerge because this effort is being undertaken at the state level rather than at a national or international level.

FIRST: IS A STATE-LEVEL EFFORT MISGUIDED?

Before focusing on implementation, consider the fundamental question of whether it makes sense to undertake climate policy at the state level. Critics point out that California would enjoy relatively little environmental benefit from its own emissions-reduction efforts. Carbon dioxide and other greenhouse gases tend to become dispersed nearly uniformly throughout the globe. Hence the beneficial impacts (avoided climate-change-related damages) from California's reductions likewise would be spread worldwide, with only a small fraction occurring within the Golden State.

So is California leading with its chin? I don't think so. California's efforts should not be viewed in isolation. Its climate policy can be regarded as a demonstration project that (if successful) will speed up the arrival of a broader, national program. Thus a California program could be partly responsible for the additional benefits to the state, the nation, and the globe that would

come from an earlier move to a national policy. From this perspective, a state-level approach has some merit.

WHAT POLICIES SHOULD BE INVOKED TO BRING ABOUT CALIFORNIA'S EMISSIONS REDUCTIONS?

The California Air Resources Board (CARB) has full authority to decide how to meet the statewide emissions-reduction target. In recent decades CARB has established an impressive record of reductions in air pollution, water pollution, and various toxins. Most of the reductions have been achieved through direct regulation that includes efficiency standards on buildings and appliances, and required technology improvements on light-duty vehicles.

CARB is now contemplating including another tool—cap-and-trade—within its arsenal of policies to achieve the statewide emissions-reduction target. Cap-and-trade should be given a key role.

The Main Rationale for Cap-and-Trade

The principal argument for cap-and-trade is that, relative to a system with fixed caps on emissions, it lowers the costs of achieving a given emissions-reduction target. Facilities with relatively high abatement costs will prefer to purchase additional emissions allowances, thus avoiding some costs of abatement. Facilities with relatively low abatement costs will prefer to sell some of their emissions allowances, thereby obtaining revenues that more than compensate for the costs of the additional reductions they must now undertake. The system thus rewards both sellers and buyers, while harnessing market forces to bring about emissions reductions where the reductions can be accomplished most cheaply.

If regulators knew exactly how much it would cost each facility to reduce emissions by various amounts, they could set emissions limits for each facility at just the level that would result from cap-and-trade. In reality, however, regulators do not have this information. A cap-and-trade program introduces a market to overcome this information problem.

Cap-and-trade systems are not simply an idea. They are already in place in the Los Angeles region to address local nitrogen oxide and sulfur dioxide emissions, in the Midwest and Northeast to deal with sulfur dioxide emissions from coal-fired power plants, and in the European Union to reduce greenhouse gas emissions from the power sector and some manufacturing industries. In 2008, industrialized nations adopting the Kyoto Protocol will participate in a broad international greenhouse gas cap-and-trade program, and in 2009, ten states in the northeastern U.S. will implement a cap-and-trade program to address greenhouse gases from electric power plants.

The theoretical case for cap-and-trade is buttressed by empirical studies. For example, two major studies of the Midwest-Northeast sulfur dioxide emissions cap-and-trade program—one by Curtis Carlson and collaborators and another by Denny Ellerman—estimate cost-savings of 43–55 percent relative to a system with uniform standards on emissions.

Cap-and-Trade vs. Direct Regulation

Some adherents to direct regulation view cap-and-trade as a threat. In part, this stems from the belief that cap-and-trade must displace existing direct regulation.

In fact, direct regulation and cap-and-trade can work side-by-side, even within a given industry. To see this, suppose emissions from a group of facilities are controlled through direct regulation. Suppose also that an emissions trading system is now introduced, one that spans the sectors in which these facilities are

located. The system's limited supply of emissions allowances indicates the permissible total emissions from these and other facilities within the covered sectors. Correspondingly, it necessitates a certain overall emissions reduction. To the extent that the direct regulations continue to restrict or reduce emissions, they help meet the aggregate cap. If the direct regulations' restrictions are not sufficient to bring total emissions down to the aggregate cap, the emissions allowance market will do the rest of the work: the price of allowances will settle at a level that brings the demand for allowances (total emissions) in line with the fixed supply. Thus, a combination of price-incentives (attributable to the allowance price) and direct regulation will bring emissions within the aggregate cap. Direct regulation is not at odds with cap-and-trade. To the contrary, it contributes to meeting the cap.

Of course, the absence of conflict between direct regulation and cap-and-trade is not a reason to use direct regulation. As suggested above, cap-and-trade has some potential advantages over direct regulation in terms of cost-effectiveness. Why not dispense with direct regulation?

There are at least two reasons why direct regulation still deserves a spot in the policy landscape. One is that some types of emissions—for example fugitive emissions of methane from natural gas pipelines—are very difficult to monitor directly, and direct regulation (such as requiring pipelines to meet certain quality requirements) may be the best way to control the emissions involved. A second is the possibility of additional market failures. By putting a price on greenhouse gas emissions, cap-and-trade addresses one market failure—namely, the inability of the market to capture the externality related to damages from climate change. However, some sectors or activities involve other market failures and may require additional instruments to deal with those failures. Building insulation requirements, for example, can address the market failure that results when apartment renters do not pay for marginal heating costs. No single instrument can address all of the market failures involved, and more than one policy tool may be justified.

Cap-and-Trade vs. Technology-Push Policies

Many analysts point out that "solving" the climate change problem will require the development of radically different, clean technologies for supplying energy or using energy for various services (e.g., transportation). Some claim that cap-and-trade is a poor policy for promoting such technologies. They argue that direct technology-promoting policies—such as subsidies to research and development of alternative energy supply technologies (e.g., improved wind turbines)—are a better approach to the climate problem.

In fact, direct technology-promoting policies have a place in dealing with the climate problem—but not to the exclusion of policies like cap-and-trade that address the market failure stemming from the climate externality from greenhouse gas emissions. Other market failures related to the innovation market—such as the inability of inventors to reap all of the rewards from new knowledge generated by their research efforts—justify direct technology promotion. Once again, multiple market failures call for multiple instruments.

Cap-and-Trade vs. a Carbon Tax

Many devotees of market-based approaches to environmental protection nevertheless are lukewarm about cap-and-trade: they regard a carbon tax as superior.

To many business groups, the carbon tax is better because it avoids uncertainty about the

marginal price of emissions: the emissions price (carbon tax) is established by the regulator, leaving the quantity of emissions to be determined by the market. In contrast, many environmental groups prefer cap-and-trade because it avoids uncertainty about the quantity of emissions: the quantity of allowable emissions is set by the regulator, while the price of emissions (the allowance price) emerges endogenously from trades.

Some analysts favor a carbon tax on the grounds that it might involve lower administrative costs than cap-and-trade, particularly if allowances in a cap-and-trade program were initially allocated free rather than through an auction. Negotiating and carrying out the rules for free allocation could involve significant administrative costs. On the other hand, others argue that under cap-and-trade it might be easier to bring statewide emissions close to the limit called for by Assembly Bill 32, since the cap-and-trade program reduces uncertainty about the quantity of emissions that will result after the policy is in place.[1]

In my view, neither approach clearly dominates the other. Why did the state embrace cap-and-trade over a carbon tax? The answer may reflect distributional impacts. Many business groups recognize that cap-and-trade has the potential to impose a smaller burden on polluters than a simple carbon tax. To the extent that some emissions allowances are allocated to emitters free (rather than auctioned), it puts a smaller share of the regulatory burden on emitters relative to a simple carbon tax—under which emitters would effectively pay for every unit of emissions.[2] This may help explain the greater political acceptability of cap-and-trade.

SOME DESIGN CHALLENGES

If CARB adopts a cap-and-trade system, it will need to face substantial challenges in the design of such a system. For starters, it will need to determine the size of the total cap, the sectors to be included under the program, and the method of allocating allowances. Some of the most difficult design issues stem from the fact that the effort is at the state level rather than at a broader jurisdictional level.

Leakage

In particular, it will be very important to confront the problem of emissions leakage: increases in out-of-state emissions that offset the California reductions. Emissions leakage can occur two ways. First, some firms experiencing cost increases as a result of California's regulations might move out of state. To the extent this happens, the regulations would simply cause the location of emissions to switch from California to other states or countries, rather than cause total emissions to decline. Second, the regulations could shift consumer demands in a way that undoes the intended impact on emissions. For example, if emissions by electric power generators are capped, this could lead to higher prices of California-generated electricity, which in turn might induce retailers to substitute imported electricity for the electricity generated within the state. While emissions from power generation within California would decline, the overall emissions associated with Californians' use of electricity wouldn't fall—thus defying the emission-reduction goals of recent legislation. California's legislation makes clear that it will not do to simply push its emissions intensive industries out of state, nor to simply shift to the consumption of out-of-state emissions intensive products.

There is no easy solution to the leakage problem. (And note that direct regulation can lead to

leakage as well.) But leakage can be subdued. The leakage problem related to imported electricity, in particular, can be addressed by requiring California's electricity retailers to be accountable for all of the emissions associated with the electricity they sell—whether or not it is generated by power plants within the state. This would reduce the ability to avoid the emissions cap through increased imports. Still, it is not possible to account perfectly for the emissions associated with imported electricity. Imported electricity comes from a variety of sources (hydropower, natural gas fired, coal fired) with very different emissions implications per megawatt-hour. There is no way to gauge precisely what source meets California's demands at the margin—that is, what source would not be utilized if California did not import the electricity. However, rough estimates of emissions associated with imported electricity probably would be sufficient to prevent serious electricity-sector leakage.

Linkage

A second crucial issue is linkage. It will be important to decide whether it would be useful to link a California cap-and-trade system with emissions-trading systems elsewhere. The European Union now has an active greenhouse gas emissions market. Should California's market be linked to that one? On the one hand, this could promote greater global cost-savings. On the other, it could lead to California emitters' purchasing a significant number of allowances from European emitters in order to avoid cutting back emissions within the state. Many would find this objectionable.

Convertibility

A final issue is raised by the prospect of passage of a national cap-and-trade program within the next few years. If this should occur, should a California program remain alongside a national program, or should it allow the national program to replace it? I recommend the latter. Maintaining the California program in parallel could lead to unnecessary administrative costs. If allowances from the two systems are not exchangeable across systems, California emission sources would face dual compliance obligations, which would complicate firms' emissions abatement decisions. On the other hand, if allowances can be traded across programs, the California program becomes redundant: its only significance is to enlarge the total number of allowances in circulation. These considerations suggest that California's cap-and-trade system should be designed to allow for easy conversion into a federal program.

FINAL WORDS

In committing itself to significant reductions in greenhouse gas emissions, California has continued its tradition of being a first-mover among U.S. states on environmental policies. Despite the difficulties of pursuing climate policy at the state level, California's initiative still has considerable merit. The major task ahead is to determine the specific policy instruments to be employed to achieve the statewide emissions targets. Here too the state has the opportunity to show leadership—by including a cap-and-trade system as part of the emissions-reduction effort. Such a system needs to be carefully designed to deal with leakage and linkage issues, and it should allow for the smooth conversion to a national system.

Letters commenting on this piece or others may be submitted at http://www.bepress.com/cgi/submit.cgi?context=ev.

NOTES

1. It may be noted that a Weitzman-type analysis, which can indicate whether a price or quantity instrument is likely to lead to smaller policy errors ex post, does not indicate the relative appeal of a carbon tax or cap-and-trade in the present context. The reason is that the total allowable quantity is already given by AB32. The relevant issue is achieving that quantity with maximal cost-effectiveness, not introducing the policy that has the smallest expected value of efficiency losses due to deviations from the optimal quantity.
2. Note, however, that a cap-and-trade system in which all allowances are auctioned has distributional impacts similar to a carbon tax in that emitters must pay for every unit of emissions. Moreover, a carbon tax in which some inframarginal emissions are exempted can have distributional impacts similar to a cap-and-trade system with free allocation of some allowances.

REFERENCES AND FURTHER READING

Carlson, Curtis, Dallas Burtraw, Maureen Cropper, & Karen L. Palmer (2000) "Sulfur Dioxide Control by Electric Utilities: What are the Gains from Trade?" The Journal of Political Economy, 108(6), 1292–1326.

Ellerman, A. Denny (2003) "Ex Post Evaluation of Tradable Permits: The U.S. SO_2 Cap-and-Trade Program," Working Paper 03-003. Cambridge, MA: Massachusetts Institute of Technology Center for Energy and Environmental Policy Research.

Keohane, Nathaniel O., Richard L. Revesz, and Robert N. Stavins (1998) "The Choice of Regulatory Instruments in Environmental Policy," Harvard Environmental Law Review, 22(2):313–67. Available at: http://ksghome.harvard.edu/~rstavins/Papers/The_choice_of_regulatory.pdf

Market Advisory Committee to the California Air Resources Board (2007) "Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California," Report to the California Air Resources Board, June 30, 2007. Available at: http://www.climatechange.ca.gov/documents/2007-06-29_MAC_FINAL_REPORT.PDF.

Weitzman, Martin L. (1974) "Prices vs. Quantities," The Review of Economic Studies, 41(4):477–91.