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Air Quality Improvement: An Alternative Strategy

Elizabeth G. Hill
Legislative Analyst

Air Quality Improvement: An Alternative Strategy

Is the Current Regulatory Approach the Most Effective Way to Meet the State's Air Quality Goals?

Summary

California has serious air quality problems as there are many parts of the state which do not meet federal or state air quality standards. The state's reliance on "command and control" regulatory policies has resulted in significant improvements in air quality. However, policy makers are increasingly expressing concern about the ability of the current policies to provide cost-effective future gains in air quality.

Because the major sources of pollution are more difficult to regulate using command and control policies, more and more proposals are beginning to stress economic incentives. Incentives-based regulatory policies can offer a more cost-effective method for achieving air quality goals because they encourage cost-avoiding behavior, and innovative and flexible approaches to controlling pollution. In order to encourage the implementation of incentives-based policies, we recommend that the Legislature: (1) amend the California Clean Air Act to explicitly authorize the use of incentives-based regulatory policies, (2) authorize the Air Resources Board and local air pollution control districts to use fees, and (3) establish and evaluate a tradeable discharge permit pilot program in a major air basin.

California suffers from some of the country's worst air quality problems. In order to improve air quality, the state and local air quality districts have implemented some of the toughest air quality controls in the country. The state's primary approach to improving air quality has been to use "command and control" regulation of pollution sources, which relies on administrative processes to establish rules that mandate or prohibit actions, and

to appeal to voluntary cutbacks in activities that create pollution. This approach has achieved significant success in reducing outputs of certain pollutants. Yet virtually every urban and many rural areas of the state remain out of compliance with existing state and federal standards.

Last year we discussed amendments to the California Clean Air Act (please see *1989-90 Budget: Perspectives and Issues,* page 111) that are designed to strengthen the authority of regulatory agencies and improve coordination between air districts. Policy makers at the federal, state and local levels, however, are increasingly expressing concerns about the current strategies for improving air quality. More and more proposals are beginning to surface that look beyond the state's current regulatory policies to ones that stress incentives and flexibility in order to improve the prospects for achieving the state's air quality goals at lower cost to society. These policies are known as incentives-based regulatory policies.

In this analysis we review command and control regulatory policies (CCR), examine the deficiencies of CCR policies, present an overview of incentives-based regulation (IBR) and discuss specific IBR policies.

BACKGROUND

California residents experience more days of poor air quality than do residents of any other state in the nation. Air pollution can cause health problems (severe ones for some people), kill trees, damage agricultural crops, and damage buildings, infrastructure and other exposed materials. One recent study by the South Coast Air Quality Management District (SCAQMD) estimates that air pollution in that region alone could cost individuals and businesses as much as $9.6 billion annually. While that study has received some criticism, most experts would agree that air pollution is very costly. Last year (please see *1989-90 Budget: Perspectives and Issues,* page 115), we identified 25 counties in California that continue to violate federal standards for at least one pollutant (such as sulfur and nitrogen oxides, particulates, hydrocarbons, and carbon monoxide).

One reason why air pollution is more serious in California than elsewhere is because of the state's weather and topography. Rapid population growth and life-style choices, which include the widespread use of automobiles, intensify the state's air quality problems. Past federal and state regulatory activity has identified and implemented most of the relatively inexpensive, known pollution control technologies on large, easily identifiable pollution sources (such as manufacturing and power plants). Future

efforts to comply with state and federal air quality standards increasingly will have to deal with individually smaller and more diffused sources of pollution (such as automobiles and consumer products). This will (1) increase the costs of control efforts in order to obtain relatively modest improvements in air quality and (2) limit the ability of government to improve air quality merely by mandating specific technologies. Significant future gains in air quality are likely to require major changes both in the way we produce products and in individual life-styles.

CURRENT REGULATORY SYSTEM

In this section we review the command and control regulatory process and examine its advantages and deficiencies.

The Components of CCR

California currently relies heavily on command and control regulation (CCR) to meet air quality goals. In part, this has developed due to the role of the federal Environmental Protection Agency in implementing the federal 1970 Clean Air Act (including the 1977 amendments). The CCR approach consists of the following major processes:

- ***Planning.*** Once goals (such as pollutant standards) have been established, a planning process (which typically follows a regulatory proceeding format) is undertaken to develop particular strategies for achieving the standards. An example of such a plan is the SCAQMD plan, (released in 1988 and known as the South Coast plan) which anticipates compliance with all federal standards (except ozone) by the year 2007.
- ***Approving Control Technologies.*** Generally compliance strategies rely heavily on tailend control technologies (that is controls on the exhaust from factories and automobiles), and regulatory proceedings are used to identify those technologies. For example, the regulatory agency may determine that a particular kind of smokestack attachment (a "scrubber") is needed in order to remove additional sulfur dioxide from electric power plant exhaust.
- ***Permitting New Pollution Sources.*** A permitting process (also using an administrative proceeding format) is designed in order to site new facilities that might be sources of pollutants.
- ***Monitoring and Enforcement.*** In order to assure compliance with the foregoing decisions, regulatory agencies engage in enforcement and monitoring activities.

The unifying feature of these CCR elements is that they rely on administrative procedures which typically include: hearings with written and oral testimony, workshops where participants discuss options, analysis and evaluation of proposals by staff, decisions rendered by a governing board and challenges to the decisions pursued in the courts.

Command and Control in California

The components discussed above can be seen in the regulatory systems used in California. It is a complex system to describe for several reasons:

- Both federal and state statutes apply;
- There are regulatory agencies at the federal, state and local levels; and
- There are different types of pollution sources: stationary (such as factories and power plants), mobile (such as cars and trucks) and so-called "area" (such as paint, deodorants, pesticides, solvents, and lubricants) sources.

The mix of agency regulatory and enforcement responsibilities is somewhat different for each source. Additionally, agencies develop regulations that can require either existing technologies or not-yet-developed technologies (so-called technology-forcing). Therefore, in describing CCR in the state, we focus on its general features rather than on specific regulatory institutions (except where examples help illustrate our analysis).

The federal Environmental Protection Agency (EPA) sets ambient air quality standards for certain specified pollutants and requires states to develop state implementation plans (SIPs) for achieving compliance with those standards. Additionally, because of its more severe problems, California has set standards for certain pollutants that are more stringent than the federal standards. Under California's SIP, air pollution control districts (APCDs) prepare the local implementation plans and manage the stationary source regulatory programs and the state Air Resources Board (ARB) has primary responsibility for the mobile source regulatory program and for reviewing district regulatory programs for conformance with clean air goals.

The ARB and APCDs inventory and monitor sources of pollution, which make it possible to establish and enforce maximum allowable concentrations of emissions *at each source.* This approach is limited, however, since in many areas the relationship between the amount and pattern of emissions and the measured ambient air quality is complex and poorly understood. As a

result, it is sometimes difficult to ascertain exactly what improvement in air quality would result from requirements (for example, a particular control technology) placed on a specific source. Nonetheless, the plan must make a convincing case that it would achieve compliance or the EPA is authorized to impose sanctions (such as prohibiting construction or withholding certain federal funds). A state plan can be approved, however, if it shows "reasonable effort" to achieve compliance, including the requirement that emissions sources adopt the *best available control technology* (BACT).

Since the BACT depends on specific technical features of particular facilities (such as manufacturing plants, oil refineries, automobiles and power plants), the agencies identify a BACT *for each polluter.* These decisions are based on evidence submitted during a formal public hearing process. Further, the agency bears the burden of showing that the technology is feasible and will make progress toward reducing emissions. The federal BACT standard also has an economic reasonableness component. Because of the severity of California's air pollution problem, however, the state's regulatory program places less emphasis on whether the required technology is economically feasible.

WHAT ARE THE ADVANTAGES OF COMMAND AND CONTROL REGULATION?

The regulatory process outlined in the previous section is complex, yet it has perceived advantages that make it a popular means of achieving compliance with the state's air quality standards. These include:

- ***"Fairness" And Targeted Relief.*** CCR encourages public input, requires equal compliance from all polluters, yet allows for specific implementation delays or variances from general rules. Because CCR focuses on individual concerns and because CCR results mainly in indirect costs to individuals (such as control costs that are buried in product prices, general taxes and regulatory fees), it gives the appearance of fairness.
- ***Ease of Enforcement.*** CCR typically results in requirements for particular technologies that are easily monitored because in many cases the inspector need only visit the plant to take readings from the mandated device and make inspections to determine that it is operating within defined specifications.
- ***Familiarity.*** CCR has been developed over a long period; therefore, the rules and procedures are understood by the parties that have an interest in the process.

Further, a practitioner "industry" of consultants, lawyers, analysts and others have created a knowledge-base about the workings of CCR processes.

The advantages of CCR are most pronounced when (1) the regulatory goals are well-defined; (2) the problems are not susceptible to other, less intrusive, regulatory mechanisms; (3) there are relatively few, noncomplex pollution sources and (4) the administrative process can be operated in a cost-effective and timely manner. Too often, however, the world in which CCR operates is not so clear cut.

WHAT ARE THE PROBLEMS WITH THE CURRENT REGULATORY SYSTEM?

Command and control regulation has been able to achieve success in the past because the technological and behavioral changes mandated by regulatory agencies could be accommodated by most segments of the population without significant disruptions to their existing life-styles. However, the cost of additional controls is increasing dramatically and intruding more and more on current life-style choices. As a result, the regulatory process is becoming less effective in achieving further improvements in air quality. There are several reasons why direct regulation is likely to be less effective in the future than it has been in the past.

Social Costs Not Reflected in Prices

Everyone suffers substantial economic costs from dirty air. However, none of us pay the full costs of the damage that our pollution creates. Moreover, where we *indirectly* pay the cost for pollution (such as in higher car prices because of catalytic converters), we seldom think of these costs as related to pollution. Consequently, we have little economic incentive to modify our behavior. Because CCR generally imposes a technological solution, it can increase the "up front" cost of a product or facility (such as a car or a power plant), but is unlikely to affect decisions about use of the services provided by the product or facility (such as the amount of driving or electricity use). For example, once you purchase the car (with its pollution control equipment) there is little incentive to stop driving to the grocery store everyday in favor of fewer, better planned trips.

Reduced Incentives to Innovate or to Minimize Control Costs

The current regulatory model provides little incentive for *polluters* to develop alternative pollution control technologies that would reduce pollution *beyond* the levels required by regulations. Regulatory agencies also do not often encourage changes in

production processes (such as the use of recirculation systems that capture polluting gases for reuse or the use of different, less harmful chemical processes for cleaning parts in factories) that could be more cost effective. Instead, the regulations typically require specific control technologies (some of which have not yet been developed) that industries must use in order to reduce specified pollutants (generally at the tailend).

If an industry develops an alternative method for controlling emissions (whether it is a change in the production process or an alternative tailend control technology), it must show, through an administrative process, that the alternative reduces emissions by as much as the control measure specified in the regulations. This can be costly and there is no guarantee that the regulatory authority will approve the measure. As a result, industries have relatively little incentive to budget significant research monies for the development of alternative technologies or processes beyond those expenditures necessary to develop the mandated technology.

Regulatory Agency Bears Burden of Proof

The burden of proving that a particular control should be imposed lies with the regulatory agency (such as an APCD or the ARB) rather than with those who pollute. While basic pollution standards exist which businesses and individuals are expected to meet, the regulatory agency must generally decide how this will be done. Thus, the regulatory agency is placed in the position of having to defend its decisions about control strategies or technologies. Polluters are not required to defend their continued violation of the standards or mandated reductions during the regulatory process that determines the control strategy. With the burden of proof on state and local agencies, polluters have incentives to postpone, or weaken regulations because they need not comply until all appeals to the proposed regulations are exhausted.

The burden placed on direct regulation can be seen in the efforts of the Air Resources Board to regulate underarm aerosol deodorants. This product group was chosen as the prototype consumer product group by the ARB since economic alternatives were already in the market (roll-on's and other non-aerosols). Thus, it was thought to be the easiest product group to regulate. Nonetheless, the proceeding took about two years from beginning to end. To repeat this process for each of the over 100 product categories identified by the ARB could last into the next century. The process would probably be more difficult for the remaining product groups because many of them do not have readily identifiable alternatives that would be considered less environmentally harmful.

Emphasis on Planning Not Achievement

The federal Clean Air Act requires regulatory authorities to place an emphasis on the development of plans that show how each political entity will meet standards. As we discussed last year (please see *The 1989-90 Budget: Perspectives and Issues,* page 116) if a district *knowingly* submits a plan that would fail to meet federal standards, the EPA is required to impose sanctions. The districts have great latitude regarding actual implementation or attainment of their plans so long as the districts can show that they reasonably thought their plans would meet the standards by the target date. Adopting a plan, however, does not guarantee either (1) that the plan will be implemented as adopted, or (2) that implementation will necessarily lead to the attainment of air quality standards.

For example, San Diego was *not* sanctioned for failing to meet federal standards for ozone and carbon monoxide by 1988 because its plan, when originally adopted, was determined to have sufficient measures to achieve the standards. On the other hand, the EPA was forced by court order to impose construction sanctions in the South Coast and Sacramento County districts because the EPA found that these district plans, when originally submitted, did not include sufficient measures to ensure a reasonable expectation of meeting the standards.

A more specific example of how focusing on technological solutions developed through regulation can divert energy from achieving mandated standards is the effort of the SCAQMD to develop rules needed to meet the 1988 federal deadlines. In 1986, we examined the stationary source control measures proposed by the SCAQMD as part of its 1982 south coast air quality plan. We found that, of the 24 rules and regulations included in the plan, 13 rules were either relaxed or deferred entirely pending further research. The deferrals came about because the technologies required by the rules were either not yet developed or were too expensive. This is not a criticism of the district, rather it shows how difficult it can be to find ways to solve an extremely difficult air quality problem within the framework of CCR.

The emphasis on planning and on developing technology also can draw resources away from enforcement. For example, in three of the largest air pollution control districts, only 14 percent of the staff actually enforce regulations. Most of the staff are employed developing plans and regulations, collecting data, and developing new technologies.

Emissions Clean-Up Cost Is Increasing Rapidly

Current control technologies, required for both stationary and mobile sources, have considerably reduced individual source

emissions. But the costs of tailend control technologies offering the ability to achieve significant *additional* emissions reductions are escalating rapidly. For example, in Los Angeles, recent estimates of costs to control nitrogen oxide emissions from stationary sources are about $20,000 per ton reduced. These control costs are likely to be much higher in the future as the district is required to make additional reductions in order to attain compliance.

Further, past federal and state requirements for mobile source pollution reduction added relatively moderate costs to the base price of automobiles and resulted in engines that are about 90 percent cleaner than prior to controls. Most observers believe, however, that the cost for cleaning up the remaining 10 percent is likely to be much more expensive. In general, the notion of escalating costs makes sense because it is reasonable to expect air quality districts to impose the least costly technologies before requiring more expensive, exotic technologies.

Summary Regarding CCR

Growth is outstripping the states's ability to regulate and enforce clean air requirements using the traditional policies. Additionally, the main pollution sources in the future are increasingly becoming small, numerous, and difficult to identify mobile and area sources rather than large, easily identified stationary sources. Given tough new planning and regulatory requirements enacted by the Legislature in 1988, it appears that significant improvements in air quality will be costly and difficult to achieve. This is because future air quality improvements are going to require much greater behavioral change and more reliance on innovative technologies. CCR does little to alter the incentives individuals and firms face when making decisions that result in air pollution. In the next section, we examine an alternative regulatory strategy that offers advantages over the CCR strategies currently used.

INCENTIVES-BASED REGULATION: A COST-EFFECTIVE APPROACH

What Is Incentives-Based Regulation?

Incentives-based regulation (IBR) relies on several basic principles that complement the way individuals and businesses respond to each other during the course of their everyday activities. The basic principles of IBR include:

- ***Recognizing Full Costs of Actions.*** The most fundamental principle of IBR is that individuals and businesses must recognize the ***full costs to society*** (includ-

ing damage to the environment) of the goods and services they purchase. Currently, prices of goods and services do not include a component that fully reflects damage to air quality; thus, individuals have reduced incentives to engage in more environmentally sound activities.

- ***Recognizing "Ownership" of the Environment.*** Second, IBR explicitly recognizes society's "ownership" of the environment by placing the burden of proof for damage to the environment on the polluter. Hence, the polluter must justify why it is violating society's right to clean air. By analogy, an individual has the right to seek damages from someone who disposes of garbage on his or her property.
- ***Creating Private Incentives to Comply.*** Third, IBR creates private incentives both to avoid polluting and to develop innovative solutions to the pollution problem. Individuals and businesses tend to engage in activities that are cost-avoiding. IBR would act to modify prices in a way that causes goods and services to reflect the full costs to society associated with their use. Thus environmentally harmful products or activities would become more expensive compared to less harmful products or activities; and individuals would tend to shift their purchases to relatively lower-cost "clean" products or activities.
- ***Changes the Focus of Regulatory Activity.*** Finally, IBR changes the nature of regulatory activity from its current emphasis on administrative process to an emphasis on enforcement of standards and permits, identifying problems, and crafting rules that improve private incentives.

How Would IBR Produce Cleaner Air?

Ideally, polluters should pay all of the costs of the pollution they cause, thereby imposing no costs on society. When someone drives a car, or manufactures a product, that individual faces costs associated directly with that activity (these costs usually are referred to as private costs). A motorist pays for the car, for the gasoline, and for insurance. A manufacturer faces costs for capital and labor. In the process of driving or manufacturing, these individuals also usually produce pollutants.

Under the current system of regulation, polluters do not pay *directly* for the damage to the environment caused by their activity (these costs usually are referred to as social costs). Instead,

most of these social costs are borne by individuals *indirectly* either through (1) impaired life-style due to damage to the environment (such as visual impacts, damaged buildings, and poorer health), (2) higher cost for products resulting either from the use of mandated emissions control technology or from damage to products caused by pollution, and (3) tax support for regulatory agencies. But, paying for pollution indirectly through degraded life-styles, hidden costs and taxes *does not send clear signals to individuals about the air quality consequences of their choices.*

An incentives-based regulatory strategy attempts to assign the cost of pollution *directly* to those that cause it, primarily by the use of fees that are added to the prices of goods and services. These fees would be set so that they are related to the amount of damage resulting from the polluting activities. Under this approach, motorists, for example, would pay for environmental damage, just as motorists currently pay for gasoline and the wear and tear on their vehicles. They would then have clear incentives to seek less costly alternatives. Correspondingly, the manufacturer would be faced directly with the costs of pollution when making production decisions and would have greater flexibility regarding how to avoid the costs.

By confronting individuals and firms with the full social cost of their choices, they would have incentives to avoid activities, modes of transportation and production processes that cause pollution. Presumably, rational individuals will alter their behavior to reflect more environmentally sound options: car pooling, driving at non-peak hours, taking public transit, and moving closer to their work. Similarly, manufacturers and other businesses would strive to avoid costs by seeking innovations on the production floor, changing the hours of operation, or perhaps by offsetting their pollution by purchasing discharge permits from other manufacturers who can reduce their pollution at lower cost (see below). Prices that reflect the environmental costs of particular activities are *constant reminders* that individuals and businesses can reduce costs by seeking ways to reduce pollution.

There are numerous examples of how price changes can affect behavior. For example, after the oil embargo in the early 1970s, the price of gasoline increased dramatically. As a result, drivers significantly reduced their overall consumption of gasoline by changing driving habits and by purchasing increased numbers of more fuel-efficient cars. When gasoline prices dropped in the 1980s, consumption increased again. Another example concerns the rapidly increasing cost of disposing of toxic substances (both landfill costs and liability costs). The result is that manufacturers are investing in less toxic manufacturing proc-

esses and recycling toxic chemicals for reuse within their facilities in order to avoid costs.

Advantages of An IBR Policy

Our analysis indicates that society would experience a number of benefits from an IBR strategy for reducing air pollution.

Lower-Cost Approach to Achieving Compliance. An incentives-based regulatory policy offers individuals and businesses many more opportunities for reducing the costs required to meet air quality standards. The basis for this is that IBR establishes a system that, in effect, forces individuals and businesses to confront the social costs of their activities *and* offers them direct incentives to engage in activities that allow them to avoid those costs. Since these incentives are driven by individual behavior, they are more likely to be an *effective* approach to achieve compliance than is CCR. Additionally, since IBR allows for flexibility in decisions about how to achieve compliance, IBR is more likely to be an *efficient* means of achieving compliance than is CCR.

An example of how flexibility can reduce costs and achieve compliance is offered by an experiment undertaken by the EPA at the request of Du Pont. Rather than requiring a specific emissions-reducing technology, as was the traditional practice, Du Pont proposed that the EPA establish a "bubble" over one of its plants and establish the maximum allowable emissions level from the entire plant (this level was set equal to the total emissions that would have occurred using EPA mandated equipment on each source of emissions). Du Pont estimated that the more flexible approach would allow it to save about $81 million compared to the costs of using the traditional technology and still reduce emissions to the same level that would have occurred under the old system.

3M Corporation also has been actively working with the EPA and local air quality districts to allow changes in production process that would allow it to meet its required emissions reductions more cheaply than would tailend controls. 3M estimates that it has achieved cumulative savings of about $400 million since 1975 compared to its anticipated costs if it just installed required control technology.

Another example of how IBR can reduce costs by increasing flexibility is found in a recent study undertaken for the EPA. This study estimates the savings that could result from using transferable discharge permits (discussed below) to reduce the emissions of sulfur oxides at electrical generating plants in the Midwest. It found that the use of transferable permits to reduce emission of

sulfur oxides by 10 million tons annually could result in cumulative capital cost savings of almost $26 billion by the year 2010 (leading to reduced consumer utility bills of about $5 billion annually by 2010). These estimates could prove to be too high. Nonetheless, they suggest that considerable savings could result from the use of more flexible approaches to emissions reduction.

Incentives for Innovation. In addition to changing behavior, a crucial part of achieving current and future standards is to find and implement new control technologies and less polluting production processes and products. Under the current system, there is little incentive for corporations to make those research and development investments. By focusing on cost avoidance, IBR would reward manufacturers and others that make investments in emissions reducing technology research. Further, by creating a market in these technologies, IBR would encourage entrepreneurs to engage in research and development of new technologies. While it is true that some research and development activity occurs now, there is general agreement that much more could be done.

What Is the Role of the Regulatory Agency Under IBR?

Incentives-based regulation does not eliminate the need for regulatory agencies or for command and control regulation. However, since IBR relies more heavily on individual responses that avoid costs than on administrative processes, the regulatory agency would have a different role than is the case currently. These agencies would be more heavily focused on developing strategies to enhance the workings of IBR and on solving implementation problems. Additionally, they would be more oriented toward monitoring and enforcing the incentives schemes used to achieve compliance with the standards.

Finally, an important function of the regulatory agency under IBR would be to evaluate problems as they arise in order to determine the appropriate mix of regulatory strategies to pursue for any given source of pollution. These evaluations would be based on an impartial analysis of the benefits and costs of each approach. Incentives-based regulation could, in some instances, prove to be a less effective means of achieving agency goals than CCR. For example, in emergency situations (like extreme atmospheric inversion layers), the direct, prohibition or restriction of certain activities may be necessary. Consequently, there would be a continued need for some CCR, but these instances would be both more limited and better focused than is the case now.

APPLICATIONS OF INCENTIVES-BASED REGULATION

California's air quality problems come from three major sources; stationary (such as power plants and manufacturing plants), mobile (such as cars and trucks), and area (such as consumer products). Each of these major sources possesses unique characteristics. Therefore, we describe a number of possible incentives-based strategies to use in achieving air quality improvements.

Stationary Sources

Stationary sources have received considerable attention by regulators. As we discussed earlier, the command and control regulation of these sources is beginning to require large investments for relatively modest additional reductions in emissions. One alternative approach to regulating stationary sources is the IBR option of transferable discharge permits.

Transferable Discharge Permits. Transferable discharge permits (TDPs) are permits to release specified amounts of certain pollutants into the air. The holder of the TDP, which would be issued by a regulatory agency, could either use, sell, or "bank" the permits. The regulatory agency would establish the maximum level of permissible emissions for each geographic area. Then, TDPs equal in total to the permissible discharge level would be created and distributed in some manner. The Congress currently is debating proposed amendments to the 1970 Clean Air Act, and at least one version of these amendments includes a provision for TDPs for sulfur oxides (a major component of acid rain).

Once the permits are allocated, any party (including environmentalists or government agencies) could buy, sell, trade or bank the TDPs for future use. The regulatory agency's main function after the initial distribution of the permits would be to act as the recorder of all transactions and to monitor emissions from all sources to determine compliance with permit holdings (the agency would no longer be involved in approving the technologies chosen by permit holders). If properly designed, TDPs also could be used to "ratchet-down" the total allowed emissions year by year in order to meet established standards. This would be done by reducing, at regular intervals, the amount of pollution allowed by each permit.

Noncompliance Penalties. Clearly, there would be incentives for a company to violate the terms of its TDPs unless penalties were imposed and strictly enforced to ensure that companies and individuals comply with the permits they hold. It is important that these penalties be set at a level higher than the

price of TDPs. If they are not, it would be cheaper for a company to pay the penalty and continue to pollute in excess of its TDP allowance.

Mobile Sources

Tradeable discharge permits also could be designed for mobile sources. Markets for these permits, however, would likely be expensive to organize and operate. Therefore, we focus on various fee systems for mobile sources. Designing a fee system that recognizes the full social cost of air quality degradation caused by mobile sources requires several strategies. Among the issues that would need to be dealt with are: (1) intensity of use of the vehicle (miles driven), (2) fuel efficiency and ability to operate without polluting, and (3) where and when the vehicle is used (particularly in congested areas).

Emission Fees. One IBR strategy is to increase the price of gasoline by adding an environmental fee. The price of gasoline currently does not reflect the full costs of the damage its use causes to the environment. Thus, an environmental fee would be established that would reflect the damage it causes. Since the social costs could be expected to change over time, the environmental fee could be adjusted periodically as estimates of environmental costs change.

Differential Registration Fees. Another IBR strategy that could be used to create incentives to purchase less polluting cars is a differential registration fee (DRF). DRFs are designed to encourage motorists to purchase less polluting cars by imposing surcharges at the time of purchase for vehicles having higher-than-average expected emissions levels. Individuals purchasing vehicles having lower emissions than the average would receive a subsidy (paid from the surcharges imposed on high-emissions vehicles), which would in effect lower the price of low-emissions vehicles. The surcharges and subsidies could be designed so that they would offset each other (except for administrative costs). The subsidies and surcharges should provide incentives both to individuals to purchase cars that pollute less and to manufacturers to produce more of the less-polluting vehicles. The DRFs could be combined with emissions fees in order to (1) reinforce the incentive for both purchasers and manufacturers to change the fleet composition and (2) to capture both up front and continuing costs of pollution.

Congestion Fees. A third IBR strategy that also could be used to encourage changes in driving behavior is the congestion fee. Delays on highways caused by congestion can significantly increase the level of pollutants compared to travel at normal

speed. Congestion fees could help to "internalize" the environmental damage caused by the overuse of highways during peak times. The fee would be assessed during peak times to discourage travel then and encourage use of highways during off peak times. Crude congestion fee experiments (for example, in Singapore and Hong Kong) have been underway for a number of years and have met with some success. Presently, Caltrans is experimenting with a toll fee system on the Coronado Bridge in San Diego that allows commuters to pass the toll booth at highway speed, electronically registers the fee, and bills the commuter monthly in much the same way as one pays the telephone or electric bill. Systems like this one could also be used to reduce congestion on freeways and other roads by assessing fees based on the level of congestion at a given time and place.

Area Sources

Area sources are primarily consumer products such as deodorants, charcoal lighter fluid, felt tip pens, aerosol sprays and house paint. Collectively, these products represent a relatively small part (approximately 10 percent of total volatile organic compound, or VOC, emissions) of our current air quality problem. However, in the south coast air basin, emissions from these products are estimated to be up to half of the total allowable VOC emissions (measured in tons per year) allowed by current standards. As emissions from stationary and mobile sources are reduced and as population grows, these products are becoming a much more important focus of the state's effort to improve air quality. There are several IBR strategies that could be used for these products.

One possibility is to establish fees, collected at retail sales outlets that would be imposed on those products that cause environmental damage. This approach, however, could prove costly to operate and monitor in many cases. Another possibility, which the ARB is investigating, is the use of fees or TDPs that would be applied at the manufacturing level in order to reduce monitoring and enforcement costs. The higher retail cost of products should induce consumers to switch to less-polluting products. An example of how this could work is found in the recently imposed federal excise tax on chlorinated fluorocarbons (CFCs). This tax was set at a level that would make the cost of CFCs to purchasers equal to more environmentally sound alternatives.

WHAT ARE THE OBJECTIONS TO AN IBR POLICY?

Over the years several objections to an IBR approach to improving air quality have been raised.

Equity Considerations. Fees can place a burden on low income individuals. This is a reasonable concern. What is not often recognized, however, is that the current regulatory policies also impose costs. Under CCR, these costs often are hidden in the price of products sold by companies that are subject to the regulatory process. In any case, the equity concerns raised by an IBR approach could be addressed by the use of other policy tools such as redistributing fees back to low-income groups or by using fees to improve public transit facilities.

"Right" to Pollute. This alleged problem is heard less frequently now than was the case several years ago. The expressed concern is that polluters, by paying a fee or purchasing a TDP, are buying a right to pollute. It is true that this system explicitly recognizes that individuals and firms will continue to pollute, however, it forces them to pay the full costs of their actions. Conceptually, this is no different than paying for the use of a landfill where the landfill operator sets fees based on the type of waste. Command and control regulation also creates a "right" to pollute by issuing permits to individuals and businesses. Additionally, for mobile sources, once a car is purchased (including the cost of on-board control technologies) there is no additional fee for the pollutants discharged. In essence, individuals receive a "right" to pollute for *free* under CCR.

Difficulties in Setting Fees and Penalties. Setting the correct fees and penalties is central to the operation of a successful IBR policy. Fees and penalties that are too "low" would lead to insufficient reductions to meet air quality goals while fees and penalties that are too "high" would lead to greater costs than are necessary to meet the goals. The regulatory agency would have to be careful to adjust them regularly and in ways that did not disrupt the overall goals for which they were adopted. While setting fees and penalties could present a challenge, the basic fee levels could be determined using both data collected by regulators and criteria developed by researchers. Experience with effluent charges (fees used to control water pollution) both in the U.S. and in Europe suggest that the fee setting process can work well. Changes to fees and penalties could be done by the agencies at regular intervals.

"Hot Spots" and "Pollution Events." Geographic features or local increases in pollution sources can lead to a build up in pollutants called hot spots. Hot spots can cause health-threatening levels of pollution locally even though the air basin as a whole is not suffering from air quality problems. Weather conditions or seasonal factors also can lead to concentrations of pollution (these are known as pollution events). TDPs and fees might prove to be inefficient ways to counter these isolated or short-duration prob-

lems because it could be too costly to develop permits and fees that are sufficiently specific and enforceable to be practicable. The nature of these events could require the use of administratively imposed controls to supplement emissions and congestion fees in emergencies. This use of emergency regulations is an excellent example of the *focused use of CCR, especially in combination with IBR policies.*

SUMMARY AND RECOMMENDATIONS

We recommend the Legislature (1) amend current law to authorize the use of economic incentives (including the ability to assess fees) and (2) establish a tradeable discharge permit pilot program.

Air pollution is enormously costly to Californians. The current command and control regulatory policies that state and local agencies use to improve air quality have achieved substantial improvements but may not be effective in solving the state's remaining air quality problems. As a result, it may prove difficult to reach the state's air quality goals in a cost-effective way. If the state hopes to achieve these goals, an alternative set of regulatory policies should be considered.

Incentives-based regulatory policies offer a more cost-effective method for achieving air quality standards because they encourage cost-avoiding behavior, innovative solutions, and flexibility in achieving the state's goals. Given the advantages of incentives-based regulatory policies, we believe the Legislature should begin to implement such policies in addressing the state's air pollution problems. As some key first steps toward that end, we recommend that the Legislature take the following actions:

- ***California Clean Air Act.*** Amend the California Clean Air Act to explicitly authorize the use of economic incentives, particularly for mobile sources and consumer products.
- ***Fee Authority.*** Provide the ARB and the local districts with the authority to impose fees such as emissions fees, congestion fees, and variable registration fees in order to further the objective of developing effective economic incentives programs.
- ***Pilot Program.*** Establish and evaluate a tradeable discharge permit pilot program for stationary sources in a large air basin.

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