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Efficient Methods to Achieve Clean Air

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As Texas approaches the new millennium, a type of air pollution called ground-level ozone threatens future growth. Texas cities that do not meet U.S. Environmental Protection Agency (EPA) standards for this type of pollution could face sharp restrictions on new businesses and could bear significant new environmental costs.

Many Texas cities are either in nonattainment with EPA guidelines for ozone or close to it. Although high ozone concentrations are generally found in the larger cities, recent research has shown that ozone-causing pollutants can spread across wide areas and that regional strategies to reduce ozone are more effective than focusing on only the areas with high concentrations. Thus, in the future, the costs of reducing ground-level ozone probably will be paid by firms and individuals in rural as well as metropolitan areas.

Texas Air Quality and EPA Standards

Brian Foster, with the Texas Natural Resources Conservation Commission (TNRCC), described ozone as "good up high, bad nearby." In other words, the ozone layer in the upper atmosphere is good because it filters ultraviolet radiation from the sun, but high accumulations of ozone

near the earth's surface can be harmful. Ground-level ozone, which is the main component of smog, can cause a variety of respiratory problems in individuals and can also be harmful to plants and animals. Sources of the pollutants that lead to ozone include motor vehicles, power plants, refineries, chemical plants, dry cleaners and paint shops.

Houston-Galveston-Brazoria, Dallas-Fort Worth, Beaumont-Port Arthur and El Paso do not meet EPA standards for ground-level ozone, and Longview-Marshall, San Antonio, Tyler, Austin, Corpus Christi, Victoria and Brownsville-Harlingen are near nonattainment.

In July 1997, the EPA

VISTA, a publication of the San Antonio Branch of the Federal Reserve Bank of Dallas, studies economic issues and trends in South Texas. This issue reports on market-based approaches to improving air quality, as discussed at the conference "Air Quality and Economic Growth" sponsored by the San Antonio Branch of the Dallas Fed in August 1998.

Environmental experts and economists from across the United States addressed the particular problems facing Texas, the benefits of market-based solutions, lessons from other regions, auto emission reductions and Texas-Mexico border issues.

announced new standards for ground-level ozone that will go into effect in the year 2000 based on levels measured in 1997 through 1999. These new standards may make it even more difficult to meet EPA guidelines. Foster noted that San Antonio has been in compliance, but if the new standard were applied to the years 1995 through 1997, San Antonio would be noncompliant.

Foster highlighted a new regional strategy by the TNRCC to lower ozone levels. The regional strategy includes defining three regions—two regions for reductions in the two main sources of ground-level ozone, volatile organic compounds (VOC) and nitrogen oxides (NO_x), and one region for cleaner burning gasoline. All three regions cover much of the eastern half of the state. While the nonattainment areas within these regions will be subject to the stiffest restrictions, the entire region will face restrictions on large emitters and will be required to use cleaner burning gasoline.

Barry McBee, chairman of the TNRCC, discussed regional trends such as the strong population and employment growth in Texas, growth of the high-tech manufacturing sector and the surging growth in rural unincorporated areas. These trends increase the potential emission sources and require the region to be innovative in finding ways to reduce ozone-forming pollutants.

McBee highlighted five key areas that should help the state reach EPA attainment: (1) new and tougher controls on larger business and industrial sources of ozone-forming pollutants, (2) use of cleaner burning gasoline, (3) lower emissions from gasoline stations, (4) cleaner burning cars and trucks and (5) voluntary reduction of emissions from

older, grandfathered industrial plants.

Arthur Bedrosian, an environmental expert from Austin, said that much of the cost of compliance will hit businesses and individuals in the form of higher taxes as cities struggle to pay for public information campaigns, lower-emission public-sector vehicles and larger investments in public transportation. For example, to purchase cleaner running diesel buses, Austin had to invest \$100 million. For the first 15-mile stretch of light rail planned for the city, costs are estimated to be \$660 million.

Compliance costs will increase in the future. Power plants could face costs that reach into the millions of dollars. Pollution controls at gasoline stations can run from \$10,000 to \$20,000 per station. Dry cleaners could have to pay between \$20,000 and \$30,000 per facility, and auto paint shops could be hit with capital costs ranging from \$50,000 to \$100,000. Any business that emits ozone-forming pollutants could be affected. This includes virtually all businesses. Consumers will feel the impact through higher utility bills and higher prices for goods and services.

Market-Based Solutions

In his opening remarks to kick off the conference, Bob McTeer, president of the Dallas Fed, said that what is most important to ozone reduction is not the specific solutions but the process by which solutions are formed. One can choose a command-and-control approach or a market-based approach. Command and control would dictate large volumes of rules that cover every possible pollutant and every possible polluter and tell everyone precisely what they can and cannot do. This method

would be costly and inefficient.

The market-based approach would be to set clear goals and then devise a structure in which creative genius and entrepreneurship can thrive. We must create a system where incentives stimulate new solutions, McTeer said. "As Philip Howard states in *The Death of Common Sense*, 'Law should articulate goals, award subsidies, allocate presumptions, and provide mechanisms for resolving disagreements, but law should almost never provide the final answer.'"

Dallas Burtraw, an environmental economist, agreed with McTeer and pointed to the success of a market-based program that has reduced acid rain. The 1990 Clean Air Act amendments set up a cap and trade program in which a national cap was set on total sulfur dioxide (SO₂) emissions and sources (primarily power plants) were allowed to trade emission credits. Under this program, SO₂ (the primary cause of acid rain) was reduced faster than stipulated in EPA goals and at a much lower cost than projected.

Burtraw estimates that 30 percent to 40 percent of the cost savings was a direct result of the market trading—allowing plants that can reduce emissions cheaply to sell credits to those that have higher costs of reduction. Other cost savings came from some related dynamics. For example, the price of scrubbers, which are used to reduce SO₂ emissions, was cut by more than half. Prior to trading, power plants had five scrubbers—four in use and one spare. Under the trading program, plants discovered they could use the trading market when an extra scrubber was needed, so they eliminated the fifth scrubber, immediately realizing a 20 percent savings in environmental capital.

Air Quality and Economic Growth

Conference Speakers

- R. Richard Bastian**, Executive Vice President and Director, Clean Air Action Corp., Racine, Wisconsin
- Arthur V. Bedrosian**, Vice President, Zephyr Environmental Corp., Austin
- Allen Blackman**, Fellow, Quality of the Environment Division, Resources for the Future, Washington, D.C.
- Dallas Burtraw**, Fellow, Quality of the Environment Division, Resources for the Future, Washington, D.C.
- Lynda R. Clemmons**, Director, Enron Capital & Trade Resources Corp., Houston
- Brian E. Foster**, Policy Coordinator, Texas Natural Resources Conservation Commission, Austin
- Raymond S. Hartman**, Director, Cambridge Economics Inc., Boston
- Terrence S. Higgins**, Technical Director and Assistant Treasurer, National Petrochemical and Refiners Association, Washington, D.C.
- Thomas Klier**, Senior Economist, Federal Reserve Bank of Chicago
- Bharat Mathur**, Chief, Bureau of Air, Illinois Environmental Protection Agency, Springfield
- Barry R. McBee**, Chairman, Texas Natural Resources Conservation Commission, Austin
- Robert D. McTeer, Jr.**, President and Chief Executive Officer, Federal Reserve Bank of Dallas
- John D. Merrifield**, Associate Professor of Economics, University of Texas at San Antonio

The old command-and-control methods certainly can and have worked to reduce pollution, Burtraw said, noting that over the past decade we have dramatically reduced the level of most pollutants in cities across the United States. In San Antonio, for example, air quality has improved by 50 percent with respect to carbon monoxide, by 75 percent with respect to lead and by 25 percent with respect to PM₁₀ particulate matter. The point of permit trading is to continue these reductions but at a significantly lower cost.

Lynda Clemmons, an active permit trader for Enron, said that although SO₂ trading was slow at first, it has grown rapidly over the past several years. The number of allowances traded (each representing the right to emit one ton of SO₂) increased from approximately 1 million in 1994 to approximately 8 million in 1997. Participation in the program has increased as industry has become more confident that the program will exist in the future.

The success of SO₂ permit trading has led to state-level trading programs to reduce ground-level ozone, Clemmons said. SO₂ has been a training ground for pollution markets to come, particularly for NO_x, a component of ground-level ozone, and carbon dioxide (CO₂), which is a source of global warming. The NO_x market looks even more robust than the market for SO₂ emissions, Clemmons said, and the success of both markets depends on confidence that the rules of the game will not change.

Lessons From Other Regions

Thomas Klier, an environmental economist, has studied an important environmental market program in Southern California that hopes to reduce some of the highest concentra-

tions of ozone in the nation. In 1994 the South Coast Air Quality Management District (SCAQMD) introduced the Regional Clean Air Incentives Market (RECLAIM) in the Los Angeles basin. RECLAIM is a regional market designed to improve air quality through the reduction of two pollutants, NO_x and oxides of sulfur (SO_x).

SCAQMD decided to use environmental markets to reduce the economic dislocation and regulatory burden that would result from increasingly stringent emission standards, Klier said. The RECLAIM program targeted stationary facilities emitting four tons or more of NO_x per year. This criterion encompassed 390 facilities, representing roughly 65 percent of the permitted stationary NO_x emissions in the Los Angeles basin.

RECLAIM sets an area-wide emissions budget that declines over time and specifies an emissions reduction schedule for each facility in the program to

the year 2003. The average NO_x reduction required by the original 390 facilities was on the order of 75 percent of starting emission levels. Klier found RECLAIM to be a well-designed environmental market: transaction costs were low and trades were easy to execute. Klier also found a good level of market participation. In addition, the prices paid for future emissions were below SCAQMD's earlier projections, suggesting that the additional flexibility in compliance provided by RECLAIM reduced the cost of controlling for NO_x.

Based on his study of RECLAIM, Klier concluded both theory and practice have demonstrated that market-based environmental programs can be significantly more cost effective than traditional command-and-control regulations. While the regional emissions trading market in California is still in its early stages, the evidence thus far suggests it will be successful in reducing the cost of meeting

environmental goals.

Bharat Mathur, chief of the Bureau of Air at the Illinois Environmental Protection Agency, said it is important to realize that, in the Midwest, concentrations of ozone-causing pollutants often are transported from other regions. Ozone levels in the Chicago area can be as much as 83 percent of EPA standards without any emissions from within Chicago. Without a regional strategy to reduce ozone precursors, Chicago would essentially have to close all major industries and eliminate most of its automobile traffic to meet EPA guidelines.

Illinois was instrumental in the formation of the Ozone Transport Assessment Group (OTAG), a partnership between the EPA and industry and environmental groups that was created to address ozone transport over the eastern United States. OTAG developed a broad regional plan that focused on the sources of ozone precursors, not just the areas they concentrated in.

To reduce the causes of ozone in the Chicago area, the Illinois Environmental Protection Agency created the Emissions Reduction Market System (ERMS). Unlike RECLAIM, ERMS was designed as a seasonal program, because the high ozone concentrations in Chicago occur only in the summer months. The first trading under the program will occur in early 1999 for the following summer's emissions. Mathur said the main goal of the program is to minimize the costs of further reductions in the area's key ozone precursor—volatile organic material (VOM)—by providing flexibility and allowing sources to determine the best way to reduce emissions.

Reducing Auto Emissions

According to John Merrifield, a professor at UTSA, the

1990 Clean Air Act amendments were successful in significantly reducing emissions from new cars. Because new cars have very low emissions, most of the reductions in emissions must come from older cars. Emission reductions from autos must focus on a mix of retrofits, improved maintenance, faster fleet turnover, better driving habits and reduced congestion.

Merrifield said an auto emissions fee that increases with the level of emissions (rather than a pass/fail system) would encourage better maintenance and accelerated vehicle retirement. Remote sensing devices placed on heavily traveled roadways are also an effective and efficient way to reduce emissions.

Merrifield acknowledged that often poorer individuals who can least afford to make significant repairs or to purchase a new vehicle own the older, high-emitting vehicles. "Inhaling their exhaust, however, is a terribly inefficient way to subsidize the poor." Instead, Merrifield said, communities can try to cushion the compliance costs by using auto emission fees to fund assistance with repairs and vehicle replacement.

Another cost-effective method to reduce auto emissions is a highway congestion toll assessed electronically. The toll's costs are often entirely justified by the benefits of saving motorists' time, conserving fuel and reducing road capacity requirements. Air quality gains are a side benefit.

As pollution levels increase, it may become cost effective to create pollution allowance markets for motor vehicles. After using a base amount allowable, motorists wanting to emit more would buy extra permits on the market. Vehicle travel would be monitored by sensor so that driving at off-peak hours and when the sun is down, which results in less ozone formation, would use

fewer credits. Emissions would be determined by vehicle specifications, so individuals would have an incentive to purchase low-emitting vehicles.

Terry Higgins, with the National Petrochemical and Refiners Association, said new fuel and vehicle technologies have come a long way. The automobile industry is preparing for emission reductions that will be needed in 2004–2006. An example of advanced automobile technology is Toyota's recently announced hybrid electric/gasoline engine, which gets 56 miles per gallon.

Progress is also being made in the refining industry. Reducing the sulfur content in gasoline must be part of the solution, Higgins said. The petroleum-refining industry has introduced a plan to reduce sulfur in high-ozone areas of the country to an average of 150 parts per million (PPM) and never greater than 300 PPM. In other parts of the country, gasoline would have an average of 300 PPM, not to exceed 450 PPM. Benefits of such a proposal include a focus on areas where needs are greatest, consistency with the existing distribution system, assurance of stable imports, cost-effectiveness and minimum impact on refining capability and viability. This program is estimated to have the effect of removing more than 16 million cars from the road in the OTAG region.

In summary, Higgins said vehicle technology is available to meet ever stringent EPA requirements. To assure the benefits of this technology, however, vehicle testing and certification should be done using fuels sold in the market (rather than ultra-low sulfur fuels as is currently done). Also, standards must be tightened for light-duty trucks and sport utility vehicles, and vehicle inspection and maintenance programs

are essential. Finally, lowering sulfur levels in gasoline will add significantly to achieving lower levels of ozone. While a goal of 150 PPM is achievable at a reasonable cost in the near future, research continues that should allow us to reduce levels even further.

Texas–Mexico Border Issues

The border between countries represents a unique situation in air quality management. How do you control pollution that arrives from another country, which is not subject to U.S. rules and regulations? R. Richard Bastian, with Clean Air Action Corp., said agreements between companies in the United States and Canada show that international trading of pollution credits can be successful. Because the trades must overlap at least two different sets of regulations and are usually pathbreaking, the general rule is “do it first, then ask for agreement, rather than ask for permission and wait...and wait...and wait.”

Increased industrialization and urbanization along the Texas–Mexico border have created a number of pollution problems. In seeking solutions, we must realize that Mexico has a relatively new and immature regulatory system. In the last few years, however, Mexico has become sensitive to environmental issues, and its regulatory infrastructure is beginning to develop.

Four principal sources of air pollution affect the El Paso–Juarez area: vehicle emissions, dust from unpaved roads, industrial emissions, and open-air fires and combustion. Each of these suggests an opportunity for credit trading. And because much of the source is in Mexico, \$1 spent on pollution abatement in Juarez is likely to have a greater effect on the air in El Paso than if that \$1 were spent

on El Paso’s pollution sources.

If rights to pollute were issued along both sides of the border, Mexican cities and/or gasoline station owners could profit from switching to lower emitting fuels and then selling their emission credits in the market. Particulate matter credits could be earned by paving roads or sending a water truck twice a day to spray water on dusty roads. Juarez has an older vehicle fleet and could benefit from a vehicle retirement program such as the one being explored by the TNRCC for Texas urban areas.

Given the relative prosperity of the two countries and the types of emissions that both face, the formula for making emissions trading work along the border is a somewhat simple one. The most cost-effective method of achieving compliance in Texas is to seek emission reductions on the Mexico side. Governments, regulators and environmentalists on both sides must be willing to make it happen, by endorsing either a pilot program or a series of pilot transactions.

Allen Blackman, from Resources for the Future, agreed with Bastian that to reduce air pollution along the border, programs must target sources on both sides of the border. Efforts have been ongoing to generate institutional cooperation and pollution control on the U.S.–Mexico border, and, more recently, ways have been developed to give U.S. firms credit for paying for pollution control in Mexico.

One such mechanism is through international supplemental environmental projects in which firms that are in violation of EPA restrictions can avoid paying fines by instead paying for pollution projects in Mexican facilities. In a recent example, a U.S. firm in El Paso

was found in violation of hazardous-waste shipping regulations. Instead of imposing the fine, the EPA allowed the company to implement air and water pollution controls on its plant in Juarez. The EPA also allows firms to fund similar projects on plants they do not own.

Blackman said he spent three years on a nongovernmental, jointly funded international project in Juarez that focused on trying to get the 250 to 350 brickmakers to switch to burning propane. This industry, which usually burns waste products such as wood, tires and used motor oil, is a significant source of air pollution in the region. The task was formidable because the industry was a very low-profit, highly competitive industry that had little regulation enforcement, and burning propane was more costly than burning debris. While the project was able to switch up to 50 percent of the producers to propane, subsequent price increases in propane reversed the gains. Blackman said the next step is to consider natural gas, because, once the pipelines are installed, the cost is comparable to burning trash. A key lesson from the



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project was that a second-best method to reduce pollution might be preferable if it represents a lower cost for the producer.

Summary

San Antonio and other regions throughout the state face stiff economic restrictions if they do not meet EPA guidelines for ozone-forming pollutants. How the regions respond to this challenge will determine their growth for years to come. In his luncheon speech, Dallas Burtraw related the following anecdote: Sam Walton, the founder of Wal-Mart, was asked in an interview, "What explains your success?" He answered, "Good decisions." "How do you come to make good decisions?" "Experience." "Mr. Walton, how do you get experience?" "Bad decisions!"

In finding the right envi-

ronmental policies, Burtraw said, we are bound to make mistakes, but these mistakes will lead to better policies in the future. In formulating policies, however, we should strive to create incentives that stimulate innovative methods to reduce harmful emissions.

One policy that has been successful is a market-trading program to reduce acid rain. Applying the lessons learned from this program, states have adopted similar programs to reduce other air pollutants, such as those causing low-level ozone. Several of the speakers highlighted the early signs of success in these programs. Market programs may be difficult to implement for auto and border country emissions. Even with these types of pollution, however, incentives can be used to efficiently reduce emissions.

While the United States has made significant progress in reducing pollutants in the environment, many estimate that future gains will come at significantly higher costs. To balance economic growth with the costs of a clean environment, market-based programs have the potential to encourage innovative and cost-efficient methods of pollution reduction.

—Rachel Peña
Keith Phillips

For information on how to purchase an audiotape of the conference by individual speaker, call Rachel Peña at (210) 978-1663 or e-mail rachel.pena@dal.frb.org.

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