US - Canada Air Quality Agreement 1996 Progress Report

Executive Summary

This report builds on the 1992 and 1994 United States/Canada Air Quality Agreement Progress Reports. The report reviews the acid rain control programs, emissions forecasts, and scientific research in both countries; it discusses new areas of concern, such as ground-level ozone (smog) and air toxics; and it includes the first five-year review of the Air Quality Agreement.

ANNEX 1 COMMITMENTS

Sulfur Dioxide

Acid rain, the principal bilateral air quality issue for many years, is the primary focus of cooperation under the Air Quality Agreement; however, ground-level ozone and air toxics are becoming increasingly important areas of concern. Canada fully implemented its Acid Rain Control Program in 1994, and the United States has made substantial progress implementing its program, which will largely be completed by 2000.

Canada's sulfur dioxide (SO_2) reduction program has been successful. Canada has achieved a 54-percent decrease in SO_2 emissions in the 7 eastern provinces from 1980 levels. Emissions decreased from 3.8 million tonnes in 1980 to 1.7 million tonnes in 1995, significantly surpassing the emissions goal for eastern Canada. All major sources targeted by the program have completed technological improvements or programs to reduce SO_2 emissions and to ensure that the 2.3-million tonne cap will be respected until 2000.

Canada is also committed to permanently capping its national SO_2 emissions at 3.2 million tonnes, beginning in 2000. Canada is currently 16 percent under this cap, with national emissions for 1994 reported at 2.7 million tonnes. Current projections beyond 2000 indicate that this cap will be met for some time. A national multi-stakeholder group, however, is developing a National Srategy on Acidifying Emissions to evaluate the need for further emission reductions.

The United States began its first compliance year in 1995 for Phase I of the Acid Rain program. SO_2 emissions declined sharply in 1995 at the original Phase I 263 utility units. Emissions at these large, mostly coal-burning facilities were nearly 5 million tons below 1980 levels, representing a decline in emissions at these units of more than 50 percent since 1980. Emissions reductions at these Phase I units are 95 percent of total 1995 emissions reductions. Additional 1995 reductions of 300,000 tons were achieved by 182 substitution and compensating units-Phase II units that chose to comply with Phase I requirements early. Actual SO_2 emissions levels for all utility units in Phase I decreased to 5.3 milion tons from 1980 levels of 10.9 million tons. This represents a reduction of 3.4 million tons more than allowable levels of 8.7 million tons for the first compliance year. In addition, the first annual reconciliation of SO_2 allowances and emissions for Phase I units reported that all Phase I units met their compliance obligations-SO_2 allowances matched SO_2 emissions generated in 1995. No excess emissions were reported for any Phase I utility units.

Nitrogen Oxides

Canada and the United States committed to reductions of nitrogen oxides (NO_x) in Annex 1 of the Agreement. The reduction goals amount to about 10 percent of national NO_xemissions for both countries by 2000: 100,000 tonnes in Canada and 2 million tons in the United States. Both countries are concerned about the role of nitrogen compounds, not only in the formation of ground-level ozone but also in acidification processes.

In Canada, measures are in place to reduce NO_x emissions from stationary sources by 125,000 tonnes by 2000, fulfilling Canada's commitments. The measures include, among others, national emission limits for new fossil-fueled power plants; retrofits at several existing power plants; new source standards for boilers, process heaters, and cement kilns; and a complete reconstruction of the INCO metals smelter at Sudbury, Ontario.

Canada's "Next Steps" Smog Management Plan, to be developed by 1997, will call for additional measures to reduce NO_x emissions.

The United States is undertaking a combination of measures for stationary and mobile sources to reduce NO_x emissions as mandated under the 1990 Clean Air Act Amendments (CAAA). NO_x emissions are expected to be reduced by more than 2 million tons by 2000. A major part of these reductions in NO_x emissions is expected to be achieved through Acid Rain Program reductions of emissions from coal-fired electric power plants.

Compliance Monitoring

Almost all major Canadian sources now have implemented either continuous emissions monitoring (CEM) or methods of comparable effectiveness. Thus, Canada is in substantial compliance with its obligations in Annex 1.

In the United States, all operating Phase I and Phase II sources have installed CEMs or other acceptable alternatives. There is an unprecedented level of accuracy in the CEMs installed by utilities and nearly full compliance with emissions reporting requirements. Some 98 percent of installed monitors at Phase I units passed the required 10-percent relative accuracy standard; 93 percent achieved relative accuracy standards of less than 7.5 percent. In addition, monitors used at Phase 1 units were in operation more than 95 percent of the time.

Prevention of Significant Deterioration and Visibility Protection

The U.S. Prevention of Significant Deterioriation (PSD)/visibility program was designed to keep areas with clean air clean. Since the 1994 Progress Report, the United States has continued to model and monitor the effects of long-range transport of air pollution on visibility in national parks and wilderness areas, the main areas to be protected in the PSD program.

To fulfill its PSD obligations, Canada believes that its Canadian Environmental Assessment Act (proclaimed 1995), together with provincial permitting and assessment regulations and maximum desirable air quality objectives (the benchmark for assessment of new sources), provides protection comparable to the U.S. PSD program. Discussions are under way between the two governments on the compatibility of the Canadian approach with the U.S. program.

ANNEX 2 COMMITMENTS

Monitoring Networks

Canada and the United States are continuing to integrate data from acidic deposition monitoring networks to ensure that data collected under both countries' programs are comparable and credible. The networks monitor wet deposition and measure air concentrations used to estimate dry deposition. The major networks, the Canadian Air and Precipitation Monitoring Network, the U.S. National Dry Deposition Network, and the U.S. National Atmospheric Deposition Program/National Trends Network, are providing comprehensive data collection in North America.

Each country has its own approach for monitoring ground-level ozone concentrations. The two governments have been cooperating in analyzing significant ozone episodes that occurred in the summer of 1995 and are exploring other opportunities for cooperation.

Emissions Inventories

Both countries continue to work together to ensure emission inventory data consistency and coordination in emission trends analysis. Canada and the United States have been updating and improving their estimates for the 1990 emissions inventory using the latest information obtained from states and provinces, source measurements, and special study findings. The expanded use of CEMs in both countries is expected to improve the accuracy and timeliness of emission data. Numerous tools have also been developed to analyze trends and forecasts. The countries are continuing to meet semiannually to explore opportunities for enhanced cooperation.

Scientific and Technical Cooperation

Since the last progress report, the two governments have continued to cooperate in atmospheric modeling, deposition monitoring, emissions inventories, effects research and monitoring, control technologies, and market-based initiatives.

Key atmospheric modeling and deposition monitoring findings and developments include the following:

- Wet sulfate deposition (a measure of acidification from SO_2) continues to decrease, correlated with SO_2 emissions reductions. Wet nitrate deposition (a measure of acificiation from NO_x), shows no consistent change. Models support the deposition changes based on sulfur reduction and also support the important role of nitrogen in the deposition of nitrogen and in ozone formation and control.

- Precipitation acidity has showed no consistent change. This is believed to be the result of a widespread decline in calcium and magnesium concentrations in precipitation.

- A U.S. report using the Regional Acid Deposition Model predicts that most of the northeastern United States and lower eastern Canada will experience a 30-percent or greater reduction in total sulfur deposition by 2010.

Significant findings on aquatic ecosystems trends include the following:

- Decreases in sulfur deposition have been accompanied by decreases in sulfate concentrations of surface waters in eastern Canada and the northeastern United States. Decreases in surface-water sulfate led to limited improvements in water quality (e.g., a few waters show increases in pH or decreased acidity (increased acid neutralizing capacity (ANC)). The declining sulfate concentrations are often accompanied by declining concentrations of base cations, including calcium, magnesium, and potassium.

- Results from a field experiment and modeling studies indicate that continued nitrogen deposition at current levels could result, in the long term, in an erosion of the benefits of sulfur emissions controls in both countries. Experimental addition of nitrogen to a forested watershed in Maine shows quick reponses to watershed nitrogen saturation and associated decreases in pH and acid neutralizing capacity. A watershed model projects that, depending on time to watershed nitrogen saturation, atmospheric nitrogen deposition to some eastern U.S. lakes and streams may play an important role in future lake and stream acidification.

- Continued lake monitoring in the Adirondacks has shown a recent decrease in lake nitrate conentrations. This is a significant change from prior data during the 1980s, which had indicated increasing nitrate concentrations. These data indicate the value of continuous monitoring of changes in surface-water chemistry.

Canadian and U.S. forest health monitoring continues to find no evidence of widespread, forest decline associated with acidic deposition. The eastern North American hardwood forest is generally in good health. There is evidence that acidic deposition can cause discernible effects in forests suffering from other forms of stress, including drought or high-elevation temperature extremes. For example, there is birch decline near Canada's Bay of Fundy due to acid fog and red spruce decline at high elevations. In addition, symptoms of ozone damage were found in 1995 on ozone-sensitive plant species on more that 50 percent of 105 forested ozone monitoring sites throughout the northeastern United States.

In the area of visibility, Canada and the United States are continuing to merge visibility data sets and to cooperate in using models to predict future changes in visiblity.

Regarding effects on materials, research into the effects of acid rain on marble and limestone will continue to improve predictive capability.

Health effects research indicates a growing consensus that acidic aerosols and other types of particulate matter have an adverse health effect on large segments of the population. Since the last progress report, epidemiologic studies of the links between health effects and ambient levels of particulate matter have been further validated. Controlled human exposure studies of ozone and acidic aerosols indicate acute effects on lung function; these studies support epidemiological findings. Chronic exposure to acid aerosols has been associated with decline in lung function in children, but it is not known if the decline is permanent. Ozone exposure associated with acid summer haze is associated with increased respiratory hospital admissions and increased hospital emergency-room visits for respiratory causes.

Regarding quality assurance, bilateral field and laboratory intercomparisons continue to confirm the compatibility of Canadian and U.S. air quality data and to demonstrate steady improvement in laboratory performance.

In technical activities, the two governments are continuing to study, develop, and exchange information on new clean air technologies. In particular, the United States will fund more than $7 billion in projects under the Clean Coal Technology Program over the course of the decade.

The United States continues to use market-bzse mechanisms to achieve air pollution reduction at a lower societal cost. A report issued by the General Accounting Office in December 1994 estimated that with full interutility trading under the Acid Rain Program's allowance trading system, the annualized cost of SO_2reductions should be less than $2 billion, compared to an annualized cost of compliance without trading of $4.9 billion. In addition, numerous innovative market incentive programs are being explored and developed by individual states and regional groupings of states, including California's South Coast Air Quality Management District, the Los Angeles Clean Air Initiatives Market, the Ozone Transport Commission (OTC), and the Ozone Transport Assessment Group (OTAG).

Economic Research

Canada and the United States continue to exchange information on the costs and benefits of clean air controls. A 1995 study on the health benefits of reducing vehicle emissions in Canada found that the benefits ranged from Can$1l billion to Can$30billion over a 24-year period. In addition, a 1995 study conducted by the U.S. Environmental Protection Agency (EPA) estimated that the U.S. Acid Rain Program will lead to health benefits in the order of $12-40 billion per year by 2010 as a result of reducing levels of sulfate particles in the air.

Article V Notification

Since the fall of 1994, the two countries have been notifying each other of proposed actions, activities, or projects that could likely cause significant transboundary air pollution. Canada has sent eight formal notifications to the United States, while the United States has sent two to Canada. The United States has also notified Canada of other actions under the Clean Air Act that addressed air pollution.

ADDITIONAL AREAS OF COOPERATION

Ground-Level Ozone

Ground-level ozone is the main component of smog. It is formed from NO_x and volatile organic compounds (VOCs) in the presence of sunlight. Ground-level ozone is both a regional and transboundary problem.

Canada and the United States are moving forward on two fronts to address this pollutant. Domestically, Canada is completing Phase I of its NO_x/VOC Management Plan and developing its "Next Steps" Smog Management Plan. The goal is to attain the air quality objective of 82 parts per billion (ppb) ozone in Canada. The United States established OTC in the Northeast and OTAG for the entire eastern United States to study and recommend regional control strategies to mitigate interstate pollution and achieve the 120 ppb air quality standard for ozone. The United States continues to make substantial progress in improving air quality levels in ozone nonattainment areas. Of the original 98 classified ozone nonattainment areas, 28 have been redesignated to attainment. Fourteen of these were redesignated in 1995.

Both countries are also reviewing their respective air quality objectives/standards for ground-level ozone because recent studies indicate that human health effects can occur at even lower concentrations. Cooperatively, the two countries are also engaged in a transboundary ozone management pilot project, known as the Regional Ozone Study Area (ROSA) project. This project will investigate the effectiveness of regional controls on NO_x and VOC emissions in addressing the transboundary flow of ground-level ozone.

Air Toxics

Air toxics are trace contaminants emitted to the atmosphere that are hazardous to human health or plant and animal life. They tend to persist in the environment for a long time and can also accumulate over time in animals that consume contaminated food and water. Hundreds of different air toxics have been identified, including heavy metals (e.g., mercury) and organic compounds (e.g., benzene and dioxins). Air toxics can be transported thousands of miles from where they were emitted, making them a transboundary problem as well as a global one.

Canada and the United States both launched domestic programs about 20 years ago to control these pollutants. This report, however, only describes the bilateral and international efforts in which the two countries are engaged to control air toxics. These efforts include the Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin and new protocols to the Convention on Long-Range Transboundary Air Pollution, and UN global work on presistent organic pollutants.

Although none of these agreements is formally linked to the Air Quality Agreement, the Air Quality Committee has decided to report on them to provide a more complete picture of how the two countries control transboundary air pollution.

ARTICLE X: REVIEW AND ASSESSMENT

During 1995 and 1996, Canada and the United States (the Parties) carried out the first five-year review of the Agreement. The review concluded that, overall, the two countries have been mostly successful in fulfilling their obligations as set forth in the Air Quality Agreement, particularly regarding implementation of the acid rain control programs in each country. The Parties agreed, however, that control of transboundary air pollution has not occurred to the extent necessary to fully protect the environment.

Furthermore, the Agreement does not currently focus on other serious transboundary air pollutants, such as ground-level ozone, air toxics, and inhalable particles. The Parties have begun studying regional ozone management, however, and are evaluating what role they might play regarding air toxics.

While the Parties agreed on most aspects of the review, they disagreed about two main obligations: the prevention of air quality deterioration/visibility protection under Article IV and assessment and mitigation under Article V.

The two Parties also invited public input to the review via public hearings held by the International Joint Commission. Sixteen presenters participated in the hearings, with 48 citizens groups, industry associations, provinces, and individuals submitting written comments. The majority of the presenters were from Canada. In summary, comments indicated a consensus that the Agreement provides a good framework for addressing all transboundary air pollution issues. The public, however, expressed the need to give higher priority to air quality and health issues and recommended that the Agreement be expanded to include new annexes on ground-level ozone, air toxics, and inhalable particulates.

Note: The text of the 1996 Progress Report uses American spelling throughout (e.g., sulfur instead of sulphur). Future progress reports will alternate the use of Canadian and American spelling. Dollars are US$ unless otherwise indicated.