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Transport Impacts. Publication No. EPA–454/R–98–019. (NTIS No. PB 99–121089).

Escoffier-Czaja, C. and J.S. Scire, 2002. The Effects of Ammonia Limitation on Nitrate Aerosol Formation and Visibility Impacts in Class I Areas. Twelfth AMS/AWMA Conference on the Application of Air Pollution Meteorology, 20–24 May 2002; Norfolk, VA.

Gifford, F.A., Jr. 1976. Turbulent Diffusion Typing Schemes—A Review. *Nuclear Safety*, 17: 68–86.

Horst, T.W., 1983. A Correction to the Gaussian Source-depletion Model. In *Precipitation Scavenging, Dry Deposition and Resuspension*. H. R. Pruppacher, R.G. Semonin and W.G.N. Slinn, eds., Elsevier, NY.

Hsu, S.A., 1981. Models for Estimating Offshore Winds from Onshore Meteorological Measurements. *Boundary Layer Meteorology*, 20: 341–352.

Huber, A.H. and W.H. Snyder, 1976. Building Wake Effects on Short Stack Effluents. Third Symposium on Atmospheric Turbulence, Diffusion and Air Quality, American Meteorological Society, Boston, MA.

Irwin, J.S., 1979. A Theoretical Variation of the Wind Profile Power-Law Exponent as a Function of Surface Roughness and Stability. *Atmospheric Environment*, 13: 191–194.

Liu, M.K. *et al.*, 1976. The Chemistry, Dispersion, and Transport of Air Pollutants Emitted from Fossil Fuel Power Plants in California: Data Analysis and Emission Impact Model. Systems Applications, Inc., San Rafael, CA.

Pasquill, F., 1976. Atmospheric Dispersion Parameters in Gaussian Plume Modeling Part II. Possible Requirements for Change in the Turner Workbook Values. Publication No. EPA–600/4–76–030b. Office of Air Quality Planning & Standards, Research Triangle Park, NC 27711.

Petersen, W.B., 1980. User's Guide for HIWAY–2 A Highway Air Pollution Model. Publication No. EPA–600/8–80–018. Office of Research & Development, Research Triangle Park, NC 27711. (NTIS PB 80–227556)

Rao, T.R. and M.T. Keenan, 1980. Suggestions for Improvement of the EPA–HIWAY Model. *Journal of the Air Pollution Control Association*, 30: 247–256 (and reprinted as Appendix C in Petersen, 1980).

Robe, F.R., Z–X. Wu and J.S. Scire, 2002: Real-time SO_2 Forecasting System with Combined ETA Analysis and CALPUFF Modeling. Proceedings of the 8th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, 14–17 October 2002; Sofia, Bulgaria.

Schulman, L.L. and J.S. Scire, 1980: Buoyant Line and Point Source (BLP) dispersion model user's guide. The Aluminum Association; Washington, DC. (*See* A.2 in this appendix.)

Schulman, L.L. and S.R. Hanna, 1986. Evaluation of Downwash Modification to the Industrial Source Complex Model. *Journal of the Air Pollution Control Association*, 36: 258–264.

Segal, H.M., 1983. Microcomputer Graphics in Atmospheric Dispersion Modeling. *Journal of the Air Pollution Control Association*, 23: 598–600.

Snyder, W.H., R.S. Thompson, R.E. Eskridge, R.E. Lawson, I.P. Castro, J.T. Lee, J.C.R. Hunt, and Y. Ogawa, 1985. The structure of the strongly stratified flow over hills: Dividing streamline concept. *Journal of Fluid Mechanics*, 152: 249–288.

Turner, D.B., 1969. Workbook of Atmospheric Dispersion Estimates. PHS Publication No. 999–26. U.S. Environmental Protection Agency, Research Triangle, Park, NC 27711.

Weil, J.C. and R.P. Brower, 1984. An Updated Gaussian Plume Model for Tall Stacks. *Journal of the Air Pollution Control Association*, 34: 818–827.

Weil, J.C., 1996. A new dispersion algorithm for stack sources in building wakes, Paper 6.6. Ninth Joint Conference on Applications of Air Pollution Meteorology with A&WMA, January 28–February 2, 1996. Atlanta, GA.

Weil, J.C., L.A. Corio, and R.P. Brower, 1997. A PDF dispersion model for buoyant plumes in the convective boundary layer. *Journal of Applied Meteorology*, 36: 982–1003.

Zhang, X., 1993. A computational analysis of the rise, dispersion, and deposition of buoyant plumes. Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA.

Zhang, X. and A.F. Ghoniem, 1993. A computational model for the rise and dispersion of wind-blown, buoyancy-driven plumes—I. Neutrally stratified atmosphere. *Atmospheric Environment*, 15: 2295–2311.

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APPENDIX X TO PART 51—EXAMPLES OF ECONOMIC INCENTIVE PROGRAMS

I. INTRODUCTION AND PURPOSE

This appendix contains examples of EIP's which are covered by the EIP rules. Program descriptions identify key provisions which distinguish the different model program types. The examples provide additional information and guidance on various types of regulatory programs collectively referred to as EIP's. The examples include programs involving stationary, area, and mobile sources. The definition section at 40 CFR 51.491 defines an EIP as a program which may include State established emission fees or a system of marketable permits, or a system of State fees on sale or manufacture of products the use of which contributes to O_3 formation, or any combination of the foregoing or other similar measures, as well as incentives and requirements to reduce vehicle emissions and vehicle miles traveled in the area, including any of the transportation control

measures identified in section 108(f). Such programs span a wide spectrum of program designs.

The EIP's are comprised of several elements that, in combination with each other, must insure that the fundamental principles of any regulatory program (including accountability, enforceability and noninterference with other requirements of the Act) are met. There are many possible combinations of program elements that would be acceptable. Also, it is important to emphasize that the effectiveness of an EIP is dependent upon the particular area in which it is implemented. No two areas face the same air quality circumstances and, therefore, effective strategies and programs will differ among areas.

Because of these considerations, the EPA is not specifying one particular design or type of strategy as acceptable for any given EIP. Such specific guidance would potentially discourage States (or other entities with delegated authority to administer parts of an implementation plan) from utilizing other equally viable program designs that may be more appropriate for their situation. Thus, the examples given in this Appendix are general in nature so as to avoid limiting innovation on the part of the States in developing programs tailored to individual State needs.

Another important consideration in designing effective EIP's is the extent to which different strategies, or programs targeted at different types of sources, can complement one another when implemented together as an EIP ''package.'' The EPA encourages States to consider packaging different measures together when such a strategy is likely to increase the overall benefits from the program as a whole. Furthermore, some activities, such as information distribution or public awareness programs, while not EIP's in and of themselves, are often critical to the success of other measures and, therefore, would be appropriate complementary components of a program package. All SIP emissions reductions credits should reflect a consideration of the effectiveness of the entire package.

II. Examples of Stationary and Mobile Source Economic Incentive Strategies

There is a wide variety of programs that fall under the general heading of EIP's. Further, within each general type of program are several different basic program designs. This section describes common types of EIP's that have been implemented, designed, or discussed in the literature for stationary and mobile sources. The program types discussed below do not include all of the possible types of EIP's. Innovative approaches incorporating new ideas in existing programs, different combinations of existing program elements, or wholly new incentive systems provide additional opportunities for States to find ways to meet environmental goals at lower total cost.

A. Emissions Trading Markets

One prominent class of EIP's is based upon the creation of a market in which trading of source-specific emissions requirements may occur. Such programs may include traditional rate-based emissions limits (generally referred to as emissions averaging) or overall limits on a source's total mass emissions per unit of time (generally referred to as an emissions cap). The emissions limits, which may be placed on individual emitting units or on facilities as a whole, may decline over time. The common feature of such programs is that sources have an ongoing incentive to reduce pollution and increased flexibility in meeting their regulatory requirements. A source may meet its own requirements either by directly preventing or controlling emissions or by trading or averaging with another source. Trading or averaging may occur within the same facility, within the same firm, or between different firms. Sources with lower cost abatement alternatives may provide the necessary emissions reductions to sources facing more expensive alternatives. These programs can lower the overall cost of meeting a given total level of abatement. All sources eligible to trade in an emissions market are faced with continuing incentives to find better ways of reducing emissions at the lowest possible cost, even if they are already meeting their own emissions requirements.

Stationary, area, and mobile sources could be allowed to participate in a common emissions trading market. Programs involving emissions trading markets are particularly effective at reducing overall costs when individual affected sources face significantly different emissions control costs. A wider range in control costs among affected sources creates greater opportunities for cost-reducing trades. Thus, for example, areas which face relatively high stationary source control costs relative to mobile source control costs benefit most by including both stationary and mobile sources in a single emissions trading market.

Programs involving emissions trading markets have generally been designated as either emission allowance or emission reduction credit (ERC) trading programs. The Federal Acid Rain Program is an example of an emission allowance trading program, while ''bubbles'' and ''generic bubbles'' created under the EPA's 1986 Emission Trading Policy Statement are examples of ERC trading. Allowance trading programs can establish emission allocations to be effective at the start of a program, at some specific time in the future, or at varying levels over time. An ERC trading program requires ERC's to be

measured against a pre-established emission baseline. Allowance allocations or emission baselines can be established either directly by the EIP rules or by reference to traditional regulations (e.g., RACT requirements). In either type of program, sources can either meet their EIP requirements by maintaining their own emissions within the limits established by the program, or by buying surplus allowances or ERC's from other sources. In any case, the State will need to establish adequate enforceable procedures for certifying and tracking trades, and for monitoring and enforcing compliance with the EIP.

The definition of the commodity to be traded and the design of the administrative procedures the buyer and seller must follow to complete a trade are obvious elements that must be carefully selected to help ensure a successful trading market that achieves the desired environmental goal at the lowest cost. An emissions market is defined as efficient if it achieves the environmental goal at the lowest possible total cost. Any feature of a program that unnecessarily increases the total cost without helping achieve the environmental goals causes market inefficiency. Thus, the design of an emission trading program should be evaluated not only in terms of the likelihood that the program design will ensure that the environmental goals of the program will be met, but also in terms of the costs that the design imposes upon market transactions and the impact of those costs on market efficiency.

Transaction costs are the investment in time and resources to acquire information about the price and availability of allowances or ERC's, to negotiate a trade, and to assure the trade is properly recorded and legally enforceable. All trading markets impose some level of transaction costs. The level of transaction costs in an emissions trading market are affected by various aspects of the design of the market, such as the nature of the procedures for reviewing, approving, and recording trades, the timing of such procedures (*i.e.*, before or after the trade is made), uncertainties in the value of the allowance or credit being traded, the legitimacy of the allowance or credit being offered for sale, and the long-term integrity of the market itself. Emissions trading programs in which every transaction is different, such as programs requiring significant consideration of the differences in the chemical properties or geographic location of the emissions, can result in higher transaction costs than programs with a standardized trading commodity and well-defined rules for acceptable trades. Transaction costs are also affected by the relative ease with which information can be obtained about the availability and price of allowances or credits.

While the market considerations discussed above are clearly important in designing an efficient market to minimize the transaction costs of such a program, other considerations, such as regulatory certainty, enforcement issues, and public acceptance, also clearly need to be factored into the design of any emissions trading program.

B. Fee Programs

A fee on each unit of emissions is a strategy that can provide a direct incentive for sources to reduce emissions. Ideally, fees should be set so as to result in emissions being reduced to the socially optimal level considering the costs of control and the benefits of the emissions reductions. In order to motivate a change in emissions, the fees must be high enough that sources will actively seek to reduce emissions. It is important to note that not all emission fee programs are designed to motivate sources to lower emissions. Fee programs using small fees are designed primarily to generate revenue, often to cover some of the administrative costs of a regulatory program.

There can be significant variations in emission fee programs. For example, potential emissions could be targeted by placing a fee on an input (e.g., a fee on the quantity and BTU content of fuel used in an industrial boiler) rather than on actual emissions. Sources paying a fee on potential emissions could be eligible for a fee waiver or rebate by demonstrating that potential emissions are not actually emitted, such as through a carbon absorber system on a coating operation.

Some fee program variations are designed to mitigate the potentially large amount of revenue that a fee program could generate. Although more complex than a simple fee program, programs that reduce or eliminate the total revenues may be more readily adopted in a SIP than a simple emission fee. Some programs lower the amount of total revenues generated by waiving the fee on some emissions. These programs reduce the total amount of revenue generated, while providing an incentive to decrease emissions. Alternatively, a program may impose higher per-unit fees on a portion of the emissions stream, providing a more powerful but targeted incentive at the same revenue levels. For example, fees could be collected on all emissions in excess of some fixed level. The level could be set as a percentage of a baseline (e.g., fees on emissions above some percentage of historical emissions), or as the lowest emissions possible (e.g., fees on emissions in excess of the lowest demonstrated emissions from the source category).

Other fee programs are ''revenue neutral,'' meaning that the pollution control agency does not receive any net revenues. One way to design a revenue-neutral program is to have both a fee provision and a rebate provision. Rebates must be carefully designed to

avoid lessening the incentive provided by the emission fee. For example, a rebate based on comparing a source's actual emissions and the average emissions for the source category can be designed to be revenue neutral and not diminish the incentive.

Other types of fee programs collect a fee in relation to particular activities or types of products to encourage the use of alternatives. While these fees are not necessarily directly linked to the total amount of emissions from the activity or product, the relative simplicity of a usage fee may make such programs an effective way to lower emissions. An area source example is a construction permit fee for wood stoves. Such a permit fee is directly related to the potential to emit inherent in a wood stove, and not to the actual emissions from each wood stove in use. Fees on raw materials to a manufacturing process can encourage product reformulation (e.g., fees on solvent sold to makers of architectural coatings) or changes in work practices (e.g., fees on specialty solvents and degreasing compounds used in manufacturing).

Road pricing mechanisms are fee programs that are available to curtail low occupancy vehicle use, fund transportation system improvements and control measures, spatially and temporally shift driving patterns, and attempt to effect land usage changes. Primary examples include increased peak period roadway, bridge, or tunnel tolls (this could also be accomplished with automated vehicle identification systems as well), and toll discounts for pooling arrangements and zero-emitting/low-emitting vehicles.

C. Tax Code and Zoning Provisions

Modifications to existing State or local tax codes, zoning provisions, and land use planning can provide effective economic incentives. Possible modifications to encourage emissions reductions cover a broad span of programs, such as accelerated depreciation of capital equipment used for emissions reductions, corporate income tax deductions or credits for emission abatement costs, property tax waivers based on decreasing emissions, exempting low-emitting products from sales tax, and limitations on parking spaces for office facilities. Mobile source strategies include waiving or lowering any of the following for zero- or low-emitting vehicles: vehicle registration fees, vehicle property tax, sales tax, taxicab license fees, and parking taxes.

D. Subsidies

A State may create incentives for reducing emissions by offering direct subsidies, grants or low-interest loans to encourage the purchase of lower-emitting capital equipment, or a switch to less polluting operating practices. Examples of such programs include clean vehicle conversions, starting shuttle bus or van pool programs, and mass transit fare subsidies. Subsidy programs often suffer from a variety of ''free rider'' problems. For instance, subsidies for people or firms who were going to switch to the cleaner alternative anyway lower the effectiveness of the subsidy program, or drive up the cost of achieving a targeted level of emissions reductions.

E. Transportation Control Measures

The following measures are the TCM's listed in section 108(f):

(i) Programs for improved public transit;

(ii) Restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high occupancy vehicles;

(iii) Employer-based transportation management plans, including incentives;

(iv) Trip-reduction ordinances;

(v) Traffic flow improvement programs that achieve emission reductions;

(vi) Fringe and transportation corridor parking facilities serving multiple-occupancy vehicle programs or transit service;

(vii) Programs to limit or restrict vehicle use in downtown areas or other areas of emission concentration particularly during periods of peak use;

(viii) Programs for the provision of all forms of high-occupancy, shared-ride services;

(ix) Programs to limit portions of road surfaces or certain sections of the metropolitan area to the use of non-motorized vehicles or pedestrian use, both as to time and place;

(x) Programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas;

(xi) Programs to control extended idling of vehicles;

(xii) Programs to reduce motor vehicle emissions, consistent with title II, which are caused by extreme cold start conditions;

(xiii) Employer-sponsored programs to permit flexible work schedules;

(xiv) Programs and ordinances to facilitate non-automobile travel, provision and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity;

(xv) Programs for new construction and major reconstruction of paths, tracks or areas solely for the use by pedestrian or other non-motorized means of transportation when economically feasible and in the public interest. For purposes of this clause, the Administrator shall also consult with the Secretary of the Interior; and

(xvi) Programs to encourage the voluntary removal from use and the marketplace of pre-1980 model year light-duty vehicles and pre-1980 model light-duty trucks.

[59 FR 16715, Apr. 7, 1994]

APPENDIX Y TO PART 51—GUIDELINES FOR BART DETERMINATIONS UNDER THE REGIONAL HAZE RULE

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I. INTRODUCTION AND OVERVIEW

A. What is the purpose of the guidelines?

The Clean Air Act (CAA), in sections 169A and 169B, contains requirements for the protection of visibility in 156 scenic areas across the United States. To meet the CAA's requirements, we published regulations to protect against a particular type of visibility impairment known as ''regional haze.'' The regional haze rule is found in this part at 40 CFR 51.300 through 51.309. These regulations require, in 40 CFR 51.308(e), that certain types of existing stationary sources of air pollutants install best available retrofit technology (BART). The guidelines are designed to help States and others (1) identify those sources that must comply with the BART requirement, and (2) determine the level of control technology that represents BART for each source.

B. What does the CAA require generally for improving visibility?

Section 169A of the CAA, added to the CAA by the 1977 amendments, requires States to protect and improve visibility in certain scenic areas of national importance. The scenic areas protected by section 169A are ''the mandatory Class I Federal Areas * * * where visibility is an important value.'' In these guidelines, we refer to these as ''Class I areas.'' There are 156 Class I areas, including 47 national parks (under the jurisdiction of the Department of Interior—National Park