RULE EFFECTIVENESS GUIDANCE: INTEGRATION OF INVENTORY, COMPLIANCE, AND ASSESSMENT APPLICATIONS

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SECTION 1
INTRODUCTION

Rule effectiveness (RE) is a generic term for identifying and estimating the uncertainties in emission estimates caused by failures and uncertainties in emission control programs. It is a measure of the extent to which a rule actually achieves its desired emission reductions. Because it applies where emission control programs are in place, RE is usually identified with State implementation plans (SIP's) for areas which are not in attainment with the national ambient air quality standards (NAAQS). The RE applications include base year and projected emission estimates for SIP components, appraisals of proposed SIP emission reductions, periodic assessments of the progress of emission reductions and individual and category-specific source compliance determination and planning.

Rule effectiveness accounts for identifiable emission underestimates due to factors including noncompliance with existing rules, control equipment downtime, operating and maintenance problems and process upsets. It may also indicate errors in the projection of emission estimates as well as the actual estimates themselves. For many applications, an RE assessment includes the adjustment of emissions for sources or source-categories to correct for these failures and uncertainties. As such, RE provides a more reliable estimate for SIP control, planning, and modeling activities.

There are no succinct mathematical formulae that adequately account for the many different variables influencing RE, although it can be thought of as a complex function of the following types of factors: the nature of the regulation, the nature of techniques used to comply with the regulation, the performance of each source in complying with the regulation, and the performance of the implementing agency in enforcing the regulation. Table 1-1 lists specific examples of each type of factor. The list is not exhaustive; however, it demonstrates the large number and wide variety of factors that affect RE.

1.1 RE APPLICATIONS

The term "rule effectiveness" derives from the Environmental Protection Agency's (EPA's), rule effectiveness protocol published by the Stationary Source Compliance Division (SSCD) in March 1988, and the post-87 ozone and carbon monoxide (CO) SIP policy. Readers may refer to the SSCD protocol for the use of RE for compliance purposes (Rasnic, John B., Director SSCD, to Regional Air Directors, revised RE national protocol, December 21, 1992) and the *Procedures for Estimating and Applying Rule Effectiveness in Post-1987 Base Year Emission Inventories for Ozone and Carbon Monoxide State Implementation Plans* (Office of Air Quality Planning and Standards, Research Triangle Park, NC, June 1989) for

TABLE 1-1. FACTORS INFLUENCING GENERIC RULE EFFECTIVENESS

Nature of the Regulation or Control

- possible ambiguity or deficiencies in wording
- level of detail of recordkeeping required
- level of complexity of compliance determination
- inadequate test methods

Nature of Control Techniques Used to Comply With Regulation

- level of confidence in long-term capabilities of control technique (*i.e.*, whether the emissions control is prone to failure or degradation even with adequate attention)
- complexity of control technique (*i.e.*, likelihood that operator error or variability in operator technique could affect compliance)
- potential for fugitive emissions not ducted to control device (*i.e.*, adequacy of emissions capture system)

Performance of Source in Complying With Regulation

- training for those complying with environmental regulations
- schedule for maintenance and inspection of control equipment
- adequacy of recordkeeping practices (*i.e.*, can compliance be determined from available records?)
- assurance of compliance over time, considering the previous record of process upsets or control equipment malfunction
- timeliness of response to notices of violation

Performance of Implementing Agency in Enforcing Regulation

- attention and resources directed at this source or source category
- communications effort with respect to compliance requirements
- completeness of data maintained on file
- thoroughness in training inspection personnel
- timeliness and thoroughness of inspections
- adequacy of follow-up on noncomplying sources

Ability to Adequately Project Future Emissions

- adequacy of baseline estimate
- adequacy and accuracy of economic projections
- technological changes and their penetration into the markets
- effect of economically-based, innovative emission control programs

a statement of the original policy for emissions inventories. Use of the term "rule effectiveness" has expanded to include other, related, applications and has resulted in confusion over the appropriate terms, procedures and applications.

The appropriate method for determining and using RE depends upon the purpose of the determination: SIP inventories, SIP improvement creditability, SIP progress, and control program compliance. Many specific RE applications may be generically referred to as rule effectiveness. The following common uses fall under the generic umbrella rule effectiveness:

- Improving the accuracy or representativeness of emission estimates across a nonattainment area is called *inventory rule effectiveness*. When employed in a base year SIP (the usual application), it is also called base year inventory RE. When used during base year projections to develop rate-of-progress plans and demonstrate attainment, it is called projection year inventory RE. Both are referred to as inventory RE.

- *Rule effectiveness improvements* are measures taken to improve rule compliance and effect emission reductions as part of a rate-of-progress emission reduction program.

- Measuring, defining, and refining the control strategy progress to achieve the required emission reductions designated in the Clean Air Act (Act) is more accurately called *SIP effectiveness*.

- Identifying and addressing weaknesses in control strategies and regulations related to compliance and enforcement activities is called *compliance effectiveness*. These applications fall under the purview of EPA's SSCD.

Each user needs to determine the effectiveness of rules and controls in reducing emissions to the desired level as it relates to the specific purpose. For example, inventory personnel need to know the expected exceedance of emissions from the base estimate and the effect on emission projections. Both inventory and planning personnel may work with rule improvements as part of current and projected emission control programs. The SIP planners are concerned with the ability of the SIP strategy to meet specific ambient pollutant targets. Compliance personnel are interested in the relationship between actual and permissible emissions for a particular source or source category.

1.2 POLLUTANTS

Because RE originated with ozone/CO SIP guidance, it is primarily associated with volatile organic compounds (VOC) emissions and controls. Most current SIP emission controls continue to be VOC based. The EPA requires that RE be applied to base year SIP inventories for ozone precursors and CO. The RE currently applies to the ozone precursors, CO, oxides of nitrogen (NO_x), and VOC, although applications have been limited or, in the case of NO_x, absent due to the lack of control programs. As additional guidance and regulations are applied to other pollutants, such as sulfur dioxide (SO_2) and particulates less than 10 microns in diameter (PM-10), RE will be applied to these emission estimates.

1.3 SOURCE TYPES

Point, area and mobile sources are all subject to RE. The RE for point and area sources is typically an explicit component of the emission estimate to more accurately represent actual emissions. For mobile sources, models developed by the Office of Mobile Sources (OMS) factor RE effects internally and not as a single, explicit component. Readers undertaking the various applications which are subject to RE or a similar adjustment, should identify how and where RE is used.

1.4 PURPOSE

The purpose of this document is twofold: (1) to summarize and integrate the various RE concepts, and (2) introduce the procedures necessary to quantify SIP RE improvements for emission reduction credits. Similarities and distinctions are drawn between RE concepts and guidelines are presented for interpreting results using different RE applications. Various EPA publications which describe RE or refer to RE applications are identified.

SECTION 2
APPLICABLE GUIDANCE

Various EPA publications describe RE or applications using RE concepts. This section provides a listing of these publications and identifies the context of the reference (Table 2-1). Many of these publications originated with the EPA Office of Air Quality Planning and Standards (OAQPS), including the Air Quality Management Division (AQMD), Ozone and CO Programs Branch (OCMPB); the Technical Support Division (TSD), Emission Inventory Branch; and the SSCD, Technical Support Branch. Rule effectiveness is also mentioned in OMS guidance and in Regional Office studies. Readers interested in various RE guidance and applications should refer to the appropriate guidance document. The primary RE publications which provide guidance on determining and calculating RE are listed below:

Procedures for Estimating and Applying Rule Effectiveness in Post-1987 Base Year Emission Inventories for Ozone and Carbon Monoxide State Implementation Plans, Office of Air Quality Planning and Standards, Research Triangle Park, NC, June 1989.

This is the first document on RE for inventory applications and presents the post-87 SIP policy on RE. This policy is defined in 52 FR 45059. It has been replaced by the following document for SIP's developed under the Act.

General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990. 57 FR 13498, April 16, 1992.

The General Preamble, the road map for Title I implementation, sets out the RE policy in the context of the 15 percent rate-of-progress plans required for moderate and above nonattainment areas. Under this policy, EPA recognizes that improving the implementation of existing rules is a valid control measure towards meeting the mandated 15 percent emission reduction. These "rule effectiveness improvements" are creditable within the same constraints as other reduction measures. These improvements must result in real emission reductions; simply altering the method of calculating RE is not creditable.

Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories. EPA-454/R-92-010. Office of Air Quality Planning and Standards, Research Triangle Park, NC. November 1992.

This publication replaces the post-87 SIP policy and is consistent with other 1990 base year SIP inventory guidance. It provides a background discussion, procedures for estimating inventory RE, procedures for adjusting base year emissions and numerous examples for applying RE. The document defines exemptions to RE, such as direct determination, with examples. It

addresses how to conduct an RE survey and interpret the results, including approved point and area source questionnaires.

Rasnic, John B., Director SSCD, to Regional Air Directors, *Revised Rule Effectiveness National Protocol*, December 21, 1992.

This memorandum describes the SSCD RE "protocol study" approach and updates the original policy presented in March 1988. It identifies the procedures for States to use in conducting an RE study. The memorandum contains an overview of the purpose and goals of the SSCD protocol, the correct method(s) for choosing a sample of sources, the process of field inspections and office investigations, as well as other steps in conducting an RE study. The attachments in the document have checklists for State inspectors to use during a study. An example of a final RE study report is provided.

TABLE 2-1. RELATED EPA PUBLICATIONS

Source/ Reference	Publication/ Context
OAQPS/AQMD	***Guidance on the Adjusted Base Year Emission Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans*, EPA-452/R-92-005, October 1992**
p. 26	1996 and attainment projections. The Act-mandated controls and their associated control efficiencies and RE factors for both the 15-percent rate-of-progress plan and the attainment demonstration are required in both written and electronic formats (see Table 1 of the guidance). Related information for additional controls is encouraged.
p. 35	RE improvements. States with pre-existing nonattainment areas have concerns about what additional measures are needed to achieve the 15 percent reduction requirements where RACT rules have already been adopted. The RE improvements are creditable reductions (and subject to the same constraints as other creditable reductions) where the reductions are real and not merely higher RE calculations. The RE improvements must be documented using a post-implementation SSCD protocol study.
OAQPS/AQMD	***Procedures for Preparing Emissions Projections*, EPA-450/4-91-019, July 1991**
p. 11	For the purpose of ... projection year emissions inventories under the Act, EPA will allow the use of the 80 percent default value for RE, but will also give States the option to derive local, category-specific RE factors. In both baseline and control strategy projections, the RE determined for the source category should be applied to all sources in the category .... (This guidance has been amended herein and conforms to the subsequent base year RE options for assigning RE to individual sources and source categories.)
OAQPS/AQMD	***Guidance for Growth Factors, Projections and Control Strategies for the 15 Percent Rate-of-Progress Plans*, EPA-450/R-93-002, March 1993**
p. 17	Projections. Rule penetration and RE measure the number of sources subject to a regulatory requirement that are attempting compliance and the degree to which those sources are complying. Assumptions concerning these two elements of a regulatory program can have major impacts on the nature and scope of the program.

(continued)

TABLE 2-1. RELATED EPA PUBLICATIONS (continued)

Source/ Reference	Publication/ Context
p. 45	RE improvements. One method of achieving creditable emissions reductions from stationary sources is to improve the implementation of existing regulations. These improvements (i.e., emission reductions) are subject to the same creditability constraints as are the other emission reductions. The RE improvements must reflect real emissions reductions resulting from specific implementation of program improvements (i.e., RE improvement measures). Actual emissions reductions must result from improving RE; simply calculating a higher RE using a different methodology is not creditable. The RE improvements must be documented as a minimum by conducting a post-implementation source-specific emission study. Base year RE (pre-implementation) may have been determined using any of the four approved methods.
OAQPS/AQMD	***Guidance on Preparing Enforceable Regulations and Compliance Programs for the 15 Percent Rate-of-Progress Plans*, EPA-452/R-93-005, June 1993**
p. 21-24	Brief overview of different applications of RE.
OAQPS/TSD	***Emission Inventory Requirements for CO State Implementation Plans*, EPA-450/4-91-011, March 1991**
p. 23	Base year inventory RE (CO). The RE shall be applied for stationary sources that are affected by a regulation and for which emissions are determined by means of emission factors and control efficiency estimates, and for fuel programs.
OAQPS/TSD	***Emission Inventory Requirements for Ozone State Implementation Plans*, EPA-450/4-91-010, March 1991**
p. 25	Base year inventory RE (ozone). The RE determined for the source category shall be applied to all sources in the category (both point and area sources).
OAQPS/TSD	***Procedures for the Preparation of Emission Inventories for CO and Precursors of Ozone, Volume I: General Guidance for Stationary Sources*, EPA-450/4-91-016, May 1991**
p. 2-10	Base year inventory RE. An adjustment applicable to base year stationary point and area emissions is RE. The RE is a factor applied from an individual source's or a source category's average emissions control efficiency to adjust the estimated emissions to a more realistic level.

(continued)

TABLE 2-1. RELATED EPA PUBLICATIONS (continued)

Source/ Reference	Publication/ Context
OAQPS/TSD OMS	*Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA-450/4-81-026d, 1992
p. 43-61	Mobile sources. Factoring compliance rates into emission control programs is discussed, including reference to default values, MOBILE model inputs and references to additional, detailed guidance for model inputs.

SECTION 3
RULE EFFECTIVENESS APPLICATIONS

This section presents the current applications of RE. These applications include the following uses:

- Inventory (base year) SIP
- Inventory (projection year) SIP
- Compliance effectiveness
- SIP RE improvements
- SIP effectiveness

The first two, base year and projection year RE, employ inventory RE and differ only in the application of inventory RE, not the determination of RE.

Each application is presented with relevant equations and guidance on appropriate use. Where applicable, examples are included to illustrate the calculation procedure. Inventory RE and compliance effectiveness, which are discussed in detail in other guidance documents, are only summarized here. The SIP RE improvement is a new concept and a complete description and quantification procedure are presented here. The SIP effectiveness has been referenced in other documents, but a more complete and integrated exposition is provided here.

3.1 INVENTORY (BASE YEAR) RULE EFFECTIVENESS

3.1.1 Definition and Purpose

The inventory RE is an adjustment to estimated emission data to account for emission underestimates due to compliance failures and the inability of most inventory techniques to include these failures in an emission estimate. The RE adjustment, applied to the base year SIP inventories, accounts for known or suspected underestimates due to noncompliance with existing rules, control equipment downtime or operating problems and process upsets. The result is a best estimate of actual base year emissions, leading to more reliable estimates of expected emission reductions and control measure effectiveness in future years. The EPA requires that base year SIP inventories for ozone and CO nonattainment areas apply and report RE. As post-Act guidance for other nonattainment area inventories (*e.g.*, SO_2 or PM-10) is released, these inventories may also require the RE adjustment.

The RE adjustment is a category-specific emission adjustment applied to both point and area sources operating under emission control rules [*e.g.*, sources in a control techniques guidelines (CTG) category]. Rule effectiveness is applied to point and area source emissions by category; for point sources the calculation procedure requires that emissions be calculated process by

process. Area sources also include a rule penetration factor which adjusts the inventory according to the percent of sources in a category which is actually covered by the regulation. The results of an RE evaluation should be interpreted as an aggregate for the category as control strategies are developed and not solely applied to the individual sources that were evaluated.

Base year inventory RE considers that emission changes brought on by growth, production changes, etc. are artifacts that should be excluded when determining RE. Inventory RE simply adjusts the estimated emissions for the effects of noncompliance. By definition, all source categories for which a regulation exists should have an RE value between zero and 100 percent (*i.e.*, source categories for which no regulation exists would have no RE factor associated with them). To say that a particular regulation was 100 percent effective would mean that the regulatory agency could ensure complete and continual compliance at all sources covered by the regulation, with no incidence of control equipment failure or process upset at any source and no sources evading control requirements. To say that a regulation was zero percent effective would mean that no sources in the category had made any effort to comply with the applicable regulation. *The RE cannot be less than zero or greater than 100 by definition.*[1]

3.1.2 Relation to Other RE Applications

State or local agencies must assume that there will be less than 100 percent compliance of rules in the absence of substantiation. Otherwise, rules will not actually achieve the intended reductions mandated in Section 182(b)(1) and 182(c)(2)(B) of the Act: 15 percent over 6 years, and 3 percent per year thereafter until attainment is reached.

Because inventory RE relates directly to the *compliance* procedures and history of sources in the inventory, measures of compliance effectiveness can be used as the basis for an RE determination. Results from an appropriate SSCD Protocol study, discussed later in this section, may be used as the basis for an inventory RE calculation.

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[1] Greater than 100 percent RE would imply that rules or controls are more effective than designed. Certain circumstances such as economic downturns and process changes may cause a real reduction in emissions, but these decreases are not attributable to RE. Some States have suggested that overcompliance to avoid potential violation ramifications does indeed produce greater than anticipated reductions. The EPA encourages States to document and quantify overcompliance within the context of the emission estimate, but will not recognize RE in excess of 100 percent.

Although not typically identified by the term rule effectiveness, mobile source inventories account for noncompliance within the EPA-sponsored software designed to generate emission factors for mobile sources (the MOBILE5 model). Mobile sources are addressed separately at the close of this discussion.

3.1.3 Estimating and Applying Base Year RE

The information presented in this section has been taken from *Guidelines for Estimating and Applying RE for Ozone/CO SIP Base Year Inventories* (EPA-454/R-92-010, Office of Air Quality Planning and Standards, Research Triangle Park, NC, November 1992). Consult that document for detailed procedures, explanations and documentation of RE before applying RE to a base year inventory. Table 3-1 summarizes the steps involved.

3.1.3.1 *Identifying relevant categories and sources*

Every source category subject to an emission control regulation during the inventory period should be considered for application of RE. For many nonattainment areas, the list of CTG categories provides a starting point to identify regulated sources. It is important to include all regulated sources, regardless of whether the regulation had received official EPA approval prior to the inventory period. In some cases, sources are exempt from emission regulations if an emission cap (*e.g.*, 25 tons VOC per year) is not exceeded as defined by the emission control rule. These sources are not necessarily subject to RE, although a State or local agency may choose to include these sources if compliance with the emission cap after the application of the appropriate RE factor is a known problem. Once the affected emission categories and sources have been identified, each source within a category is reviewed to determine the appropriate RE application.

The following sources are exempt from the RE adjustment:

- sources where no controls are required (*i.e.*, the source is unregulated)
- sources for which control is achieved by means of an irreversible process change that eliminates the use of VOC or the potential for CO emissions
- sources for which emissions are calculated by means of a direct determination

For sources that are affected by a rule but are completely uncontrolled, an RE of zero percent should be recorded in the inventory. Sources using an irreversible process change to control emissions should be assumed to be achieving 100 percent

TABLE 3-1. APPLYING RE IN BASE YEAR SIP INVENTORIES

Step	Considerations
Determine relevant emission categories	Source categories which are subject to emission controls (*i.e.*, there is a rule in place) during the *year of inventory* should be considered.
Identify *exempt* sources	Emissions from sources with uncontrolled, directly determined or permanently eliminated emissions are *exempt* from adjustment for RE.
Calculate an RE value (%) for each relevant category	Agencies calculate RE values derived from an SSCD study, RE questionnaires or the default value. Questionnaires require a survey of sources in the categories identified in the first step. Alternate methods for highly controlled sources may be developed with the approval of EPA.
Calculate control efficiency for each affected source	A reasonable estimate of the emission control efficiency for each source (point) or category (area) is essential to the RE calculation. This efficiency may be measured or estimated based on the control device or estimated based on the rule in place.
Calculate base year emissions (adjusted for RE)	Emissions are adjusted for RE as described in the *Guidelines for Estimating and Applying RE* guidance using uncontrolled emissions, control efficiency and the RE value; these emissions are the SIP base year emissions.
Document RE calculations	When submitting the SIP inventory, agencies should document the procedures and calculations made to show that RE has been appropriately addressed, including criteria used to exempt sources.

RE. When emissions can be calculated by means of a direct determination, RE falls out of the calculation and, thus, is not applicable (*i.e.*, the emission estimate is not contingent on the effectiveness of controls).

3.1.3.2 *Determining RE*

In determining an RE value for adjusting the base year VOC emission inventory, State and local agencies may elect to (1) use an across-the-board RE presumption of 80 percent for all sources; (2) use the questionnaire approach specified in the *Guidelines for Estimating and Applying RE* to determine a category-specific RE value for both point sources and area sources; (3) use or design a study specific to a category in accordance with the procedure developed by SSCD; or (4) develop an alternate approach specific to the Region, State or locality as approved by EPA.[2] Special consideration and options for highly-controlled sources have been proposed by EPA.

3.1.3.3 *Applying RE*

Applying RE requires three inventory data elements: (1) the RE value (percent); (2) overall control efficiency; and (3) estimated uncontrolled emissions. Once a source has been determined to be subject to RE and an RE percentage has been determined for each source category, the emissions from that point or area source can be adjusted. If the questionnaire approach was used, each category will be composed of surveyed and non-surveyed sources. Apply the individual questionnaire RE result for sources surveyed by the questionnaire; apply the calculated category RE value to the sources in the category which were not surveyed. The calculation is done source by source at the emission calculation step [typically the *segment* or *process* level in the Aerometric Information Retrieval System (AIRS) for point sources and category by category for area sources].

The following equation is used to calculate rule-affected emissions:

$$\textit{RE Emissions} = \textit{Uncontrolled Emissions} \times \left(1 - \left(\textit{Control } \frac{\textit{Efficiency}}{100} \times \frac{\textit{RE}}{100}\right)\right) \quad (1)$$

where RE and control efficiency are expressed as percent. The equation clearly demonstrates that RE accounts for the effectiveness of the control and should be applied to both

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[2] Seitz, John S.; Memorandum on Calculation of Rule Effectiveness for Emissions Inventories; May 26, 1993. This memorandum is reproduced as Appendix A.

regulatory and physical controls. Figure 3-1 displays the RE adjustment effect based on 80 and 90 percent inventory RE across a range of control efficiencies.

Regulatory controls are emission limits implemented through either regulatory or physical means. A solely regulatory control is typically an emission rate limitation unrelated to a control device. For example, an industrial coating operation may be limited to using a coating of no more than 2.0 lbs VOC per gallon coating. In these cases, the control efficiency derived for equation (1) is based on the difference between total solvent consumption pre- and post-regulation or the expected emission reduction percent calculated for the regulation(s) affecting the source.

A physical control is a control device such as an incinerator or carbon adsorber used to reduce emissions from a process. Control efficiency may be reported on the basis of the manufacturer's specifications or emission testing. To be reliable, capture efficiency, actual operating conditions, and process and/or device upsets must be included when estimating emissions. These variables may be factored into a single average control efficiency or emissions may be estimated for each different operational mode (refer to the appropriate emission inventory guidance).

Rule effectiveness must be documented in the SIP inventory submittal, consistent with the OAQPS *Emissions Inventory Requirements*, the *Quality Review Guidelines*, and the individual inventory preparation plans. These requirements include a discussion of how RE was incorporated into the inventory. States should clearly annotate emission summary tables as either adjusted or unadjusted for RE. Emission estimates will be reviewed to ensure appropriate application of RE in the base year inventories. Any deviations from OAQPS guidance on RE should be discussed in the submittal.

3.1.3.4 *Highly-controlled sources*

The EPA recognizes that emissions from sources with control efficiencies in excess of 95 percent may appear to be artificially inflated and can negatively impact air quality modeling analyses. EPA guidance permits three options to evaluate highly-controlled sources (*i.e.*, sources with control efficiencies in excess of 95 percent). Prior to implementing these options, the State should attempt to verify both capture and control efficiencies for these highly-controlled sources. The following options are summarized from *Guidelines for Estimating and Applying RE*:

- Option I: apply the questionnaire to determine the actual RE source by source. If the questionnaires cannot be completed by the

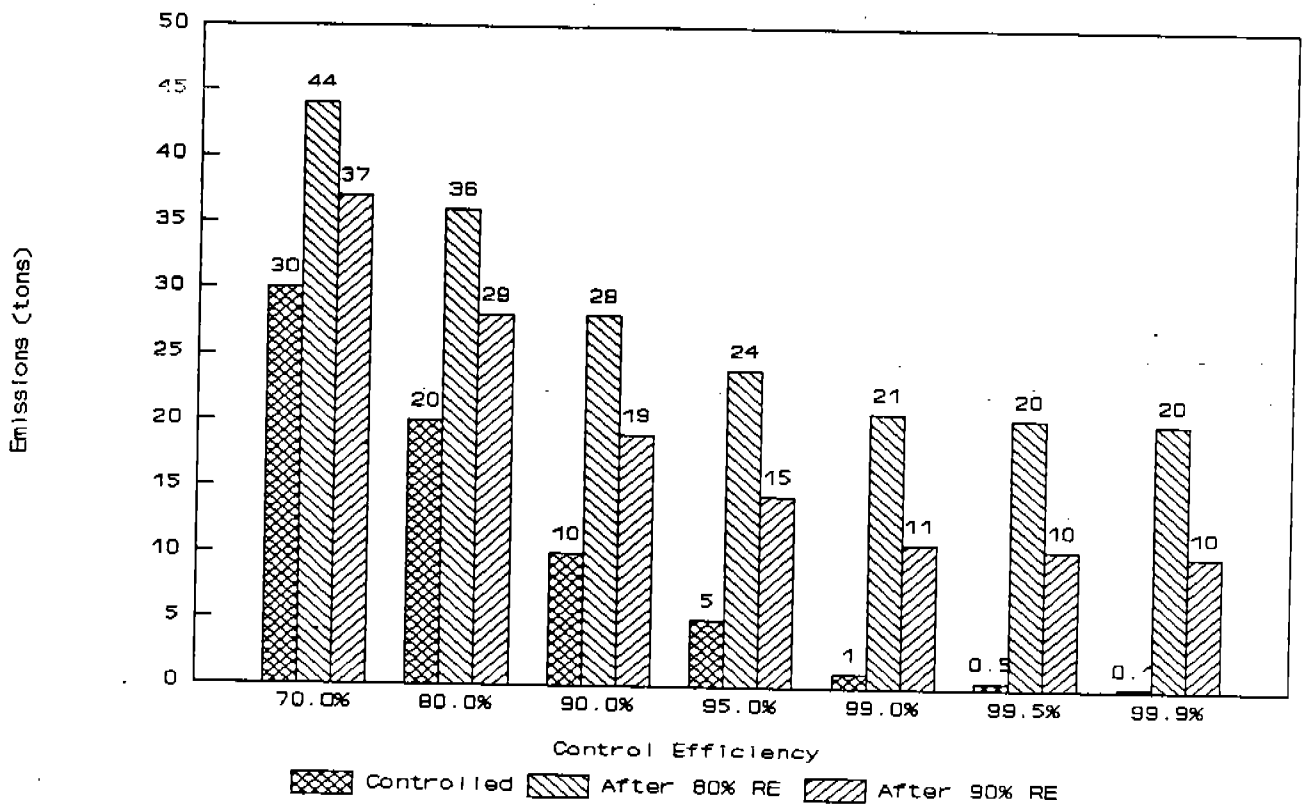

Figure 3-1. Controlled emissions before and after application of RE (based on uncontrolled emissions = 100 tons).

base year SIP inventory deadline, an adjustment can be made afterwards. In these areas, Option II must be used for the base year inventory submittal.

- Option II: apply the 80 percent default value for RE to the sources with control efficiencies greater than 95 percent in the base year inventory.

- Option III: use Option I or II for the 1990 base year inventory. After submitting the 1990 base year inventory, develop an alternative questionnaire to determine RE for these highly-controlled sources and obtain EPA approval for the RE questionnaire. (An SSCD protocol study could also be used, although it may be impractical to design and implement a

study between the base year inventory and control strategy development phases of a SIP.) Adjust the base year emissions inventory after the new RE values have been calculated for these sources.

As of the publication of this document, two State agencies successfully implemented Option I in addition to application of the 80 percent default (Option II).

Example

The following example illustrates how to assess and calculate RE in a base year emission calculation. The EPA *Guideline* referenced previously contains many examples for both point and area source applications, including examples using regulatory controls and requiring calculation of solids equivalency for coatings.

An assembly plant that coats automobile parts uses 150 gallons per day of coatings containing 5.5 pounds VOC per gallon. An additional 10 gallons of solvent, with a density of 7.1 pounds VOC per gallon, is used for cleanup each day. Emissions are controlled by an incinerator that demonstrated a 90 percent capture and control efficiency during a recent test. The plant keeps substantial records of coating and solvent usage, but no data on control device operation and/or maintenance. The RE for this source category has been determined to be 75 percent based on questionnaire responses. *What emissions should be reported in the inventory?*

It may appear that emissions can be calculated by means of a direct determination due to the good coating and solvent records at the source. However, the presence of a control device precludes direct determination of emissions. Therefore, RE needs to be included in the emission calculation.

$$\begin{aligned} \textit{Uncontrolled Emissions} &= (150\ \textit{gal Coating/day} \times 5.5\ \textit{lbs VOC/gal Coating}) \\ &\quad + (10\ \textit{gal Solvent/day} \times 7.1\ \textit{lbs VOC/gal Solvent}) \\ &= 825\ \textit{lbs VOC/day} + 71\ \textit{lbs VOC/day} \\ &= 896\ \textit{lbs VOC/day} \end{aligned} \tag{1}$$

(Had the RE value been 85 percent rather than 75 percent, the adjusted emissions would have been 211 lbs/day rather than 291 lbs/day. The 10 percent RE increase would have translated into a 27 percent decrease in estimated emissions.)

$$Emissions = Uncontrolled\ Emissions \times [1 - (Control\ Efficiency \times RE)]$$

$$= 896\ lbs\ VOC/day \times [1 - (0.90)(0.75)]$$

$$= 291\ lbs\ VOC/day \qquad (2)$$

3.1.4 Other Interpretations of Inventory RE

Other Agencies have or may adopt different approaches to incorporating RE into their base year inventories based on their experience. Any alternate approaches applied to SIP inventories must be approved by EPA prior to submittal of the inventory.

3.1.5 Mobile Sources

The term rule effectiveness is infrequently applied to mobile sources. The effects of noncompliance have been integrated into the inputs of the MOBILE models developed by OMS, including the latest MOBILE5. Because RE has historically not been treated explicitly, mobile source guidance does not identify any single term or group of terms as RE. However, some of the various components of base year RE, as applied to mobile sources, are identifiable.

Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources (EPA-450/4-81-026d; 1992) identifies several mobile source control measures which could be affected by noncompliance. Although this list is not exhaustive, it introduces the major control program types and RE components integrated into a base year inventory:

- Inspection and Maintenance (I/M)
- Anti-tampering programs (ATP's)
- Fuel volatility specifications for Reid vapor pressure (RVP)
- Refueling controls

The following discussion highlights how mobile source emission estimation methods, specifically the MOBILE model, factor uncertainty and noncompliance with control programs. Where the mobile emission factors are based on the performance of vehicles independent of State and local control programs, individual program design and implementation differences impact the effectiveness of the programs and the resulting emission reductions. These "program parameters" need to be assessed correctly to produce reliable emission estimates. The OMS publishes detailed guidance which specifically addresses the MOBILE model, model inputs and other aspects of mobile source data collection, emission estimation and controls. However, control source measures and noncompliance have not been discussed in the

terminology of RE. For a more complete discussion of these concepts and their specific relationships to the MOBILE model, refer to pages 43-61 of *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources.*

The four major control programs listed previously are general emission reduction classifications. Other programs, notably economically-based approaches such as the mobile emission reduction credit program, do exist and should be adjusted for noncompliance as well.

3.1.5.1 *I/M*

The I/M programs are inspections of vehicles using a measurement of tailpipe emissions. Vehicles exceeding program cutpoints are repaired to pass a retest (or the owner is required to spend up to a maximum dollar amount to meet the standards). The I/M effectiveness depends on numerous factors, including the compliance rate. The annual compliance rate is simply the percentage of subject vehicles which complete the inspection and certification process. The I/M compliance can be determined through sticker surveys, license plate surveys or a gross comparison of the final tests completed to the total number of subject vehicles. The EPA assumes that a 98 percent compliance rate is possible in areas with: (1) a registration system using automatically-generated compliance documents to uniquely and serially identify complying vehicles with, (2) centralized government processing under management oversight. Areas with less stringent requirements or enforcement will have lower compliance rates.

3.1.5.2 *ATP's*

The ATP's encompass periodic inspections of vehicles to detect damage to, disabling of, or removal of emission controls. Many mobile emission control programs combine I/M and ATP into a single inspection; the MOBILE model uses a single compliance rate to reduce both the I/M and ATP portions of the program. The ATP's may include inspection of several vehicle components:

- Air pump
- Catalyst
- Fuel inlet restrictor
- Tailpipe lead (misfueling indicator)
- Exhaust gas recirculation system
- Evaporative control system
- Positive crankcase ventilation system
- Gas cap

The MOBILE models calculate tampering rates based on these eight components. The OMS developed and recommends tampering rates from their analysis of multi-city tampering surveys.

3.1.5.3 *Fuel specifications*

Evaporative and exhaust emissions vary with fuel volatility. EPA describes specific procedures to determine fuel volatility (RVP) in the *User's Guide to MOBILE5* (10/93) available from OMS, Emission Planning and Strategies Division. The RVP data may be available from several sources and should be used in the following order of preference:

- *Local survey data* which, because these are actual measured values, show noncompliance or overcompliance. These data are available for many cities as published by the Motor Vehicle Manufacturer's Association or the National Institute for Petroleum and Energy Research, or may be gathered in a local, quality-assured survey.

- *Nearby area survey* data available from the sources listed above.

- *Federal or State RVP limits* which are adjusted up or down based on available information on over- or under-compliance.

3.1.5.4 *Refueling*

Refueling emissions for gasoline-fueled vehicles result from the displacement of vapor from the fuel tank to the atmosphere. Controls include "at the pump" (Stage II) and "onboard" vehicle refueling systems. Spillage and the inherent efficiency of these systems impact the overall control effectiveness. Exemptions, equipment age, maintenance, and frequency and stringency of inspections by service station operators and personnel influence the efficiency of the systems.

The EPA recommends that MOBILE5 be used to model refueling emissions. The *User's Guide to MOBILE5* (10/93) shows how to input this information and allows user input for control efficiency and phase-in parameters. The EPA has estimated the typical effectiveness of Stage II programs in *Technical Guidance - Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities*, EPA-450/3-91-022A, November 1991. Based on Act exemptions for stations selling fewer than 10,000 gallons of gasoline per month (50,000 gallons per month for small, independent marketers), EPA has supplied these overall control estimates for combined emissions from spillage and displacement:

- 83 percent for semi-annual agency inspection programs

- 77 percent for annual agency inspection programs
- 56 percent for minimal agency inspections

Local studies of Stage II controls are preferred. The MOBILE model supports locally-derived control estimates or these default values as inputs.

3.2 COMPLIANCE EFFECTIVENESS (SSCD PROTOCOL STUDY)

3.2.1 Purpose

The rule effectiveness national protocol provides guidance to the States and local agencies for conducting rule effectiveness studies that conform to standards set by the SSCD. The SSCD protocol studies, as they are called, were initiated in 1988 as a compliance tool. Recent revisions, including the 1992 revision, have extended their scope to include the emissions inventory and SIP planning processes.

There are two primary purposes for the SSCD studies. First, they "determine the effectiveness of rules for a specific source category in a specific nonattainment area."[3] Second, the studies "identify specific implementation problems which need to be addressed by the State and EPA compliance and enforcement staff."[3] The two purposes are complementary because States determining the effectiveness of a rule usually identify problems that the regulatory agency has had in implementing and enforcing it. Once the problems have been identified, recommendations can be made to correct them.

The SSCD recognizes the following three applications of the results of a protocol study:

- Compliance effectiveness; the original and primary reason to study source category compliance histories, implementation procedures, and regulatory applicability and effects on emissions

- Rule effectiveness; derived from compliance effectiveness, to assess the "excess" emissions which should be attributed to a source category

- The SIP effectiveness; derived from compliance effectiveness, to identify emission surpluses and shortfalls during SIP implementation

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[3] Rasnic, John B.; Memorandum on Revised Rule Effectiveness National Protocol; December 21, 1992.

In addition to these applications, the RE improvement credits discussed in detail in section 3.2.3 rely on protocol study results to demonstrate planned reductions.

3.2.2 Application

The SSCD protocol prescribes inspections, emissions tests and agency audits to compare actual measured emissions to "allowable" emissions under the existing rule(s). The difference represents the degree of compliance with the rules (*i.e.*, the RE in achieving emissions reductions). The protocol requires that the source sample size from a single source category be determined statistically, with considerations given to the allocation of personnel for inspections.[3] (Sampling requirements are outlined in the national protocol.)

The protocol describes the criteria and procedures that the States should use in conducting the two phases of the SSCD studies. The State or local agency should recommend the appropriate order for conducting these phases in their particular area. One phase is a field inspection in which the State agency visits a representative number of facilities and determines their compliance with the rule. A second phase is an office investigation in which the State agency evaluates the implementation of the regulatory program. The SSCD protocol ensures that studies are completed so that the integrity of the RE factors developed for a specific source category in a specific region is maintained. As the studies are source category-specific for a particular nonattainment area, the RE factors cannot be generalized to a whole population. Similarities in implementation problems, compliance and rule applicability may be identified when reviewing studies from different regions for the same source category. One State has requested and received approval to use the results of their protocol study in their 1990 base year inventory for that source category.

An SSCD study identifies problems which can be corrected, processes corrective action options, and comments on advantages and disadvantages of each option. Within one year following a study, a follow-up audit is conducted to determine whether corrective actions were implemented. Finally, an SSCD study includes an inventory demonstration for the selected source category which includes the following elements: (1) field investigation follow-ups if inventory discrepancies evolve; and (2) a search for potentially omitted sources, including a survey of source exemption applicability and a ground survey to locate unregistered sources.

3.2.3 RE Improvement Credits

The SSCD studies are important to States seeking to quantify the reductions in actual VOC and/or NO_x emissions in nonattainment areas. For example, section 182(b)(1)(A) of the Act requires States with ozone nonattainment areas classified as moderate and above to submit revisions to their SIP's by November 15, 1993. These SIP revisions must include rate-of-progress plans that demonstrate a 15 percent reduction in actual VOC emissions by November 15, 1996. States are allowed to use RE improvements in rate-of-progress plans and attainment demonstrations. Refer to section 4 for a more detailed discussion of RE improvements.

To receive credits for an RE improvement, a State must document the emission reductions associated with the improvement. The *General Preamble for Title I* identifies SSCD studies as the primary tool States should use for the documentation. The Preamble suggests that the studies be completed before and after an RE improvement has been implemented. The difference in actual emissions before and after the improvement should be documented in the SSCD study. The requirement of the 1996 SSCD study ensures that only real reductions will be counted. Once the documentation has occurred, the State can calculate the emission reduction credits to be earned from the RE improvement.

For those States that have been using the 80 percent RE level in their emission inventories, the SSCD study would have to demonstrate an RE above that level after the RE improvement for the State to receive emission reduction credits for an RE improvement. For example, assume that an SSCD study revealed that a rule has been 75 percent effective in reducing emissions from a source category. The State has been applying 80 percent RE to its emission inventories for that source category. If a second SSCD study revealed that the RE would be 85 percent after an improvement to the rule, then the State would receive the emission reduction credits associated with a 5 percent (85 percent - 80 percent) RE improvement, not 10 percent (85 percent - 75 percent). If the State had applied the 75 percent RE factor to their base year inventory, the entire 10 percent difference would be creditable.

3.2.4 Effectiveness of Rules

The SSCD national protocol defines three methods corresponding to the three applications mentioned in Section 3.2.1: compliance effectiveness, rule effectiveness, and SIP effectiveness. Each method relies on data generated through the SSCD study, but each represents a different evaluation of the overall effectiveness of an emissions control program.

The SSCD study approach may be applied *only* to a single source category for which a given study is designed. The result of each study is a category-specific RE estimate for a particular geographic area and category. States and local agencies may need to determine if previously existing SSCD study results remain valid or if the study is outdated due to industry or regulatory changes. Only studies deemed valid for the inventory period may be used. To apply the result for SIP purposes, the calculation must reflect this context.

In meeting the objective of determining the effectiveness of a rule, an SSCD study should generate an effectiveness ratings. These ratings attempt to quantify how well sources are complying with the rule and how well the regulatory agency is enforcing it. There are three methods for assessing the effectiveness of a rule: the compliance effectiveness (CE) method, the rule effectiveness method, and the SIP effectiveness method. The first two methods focus on the severity of noncompliance with a rule, as measured in excess emissions.

The equation for the CE method is the following:

$$CE = \frac{[Allowable - (Actual - Allowable)]}{Allowable} \times 100 \qquad (4)$$

The CE method quantifies excess emissions in relation to allowable emissions. The method provides an accurate gauge of the excess emissions generated by a particular source category and the degree to which those emissions exceed the standard. For example, assume an auto body finishing shop has a VOC coating standard of 3.8 lbs. VOC/gallon of solids. If an auto body finishing facility is using a coating that exceeds the standard by 1.0 lbs./gallon of solids, the percentage effectiveness according to the CE method would be the following:

$$CE = \frac{[3.8 - (4.8 - 3.8)]}{3.8} \times 100 = 73.7\% \qquad (5)$$

There are inherent limitations with the CE method. None of the variables in the equation takes into account the emission reductions required or achieved under a rule. Therefore, one cannot directly compare the excess emissions with the reductions required by a given rule. The method also has an inherent mathematical problem. If actual emissions are greater than twice the allowable emissions for a source category, the equation generates a negative percentage effectiveness. A negative

percentage effectiveness indicates that a rule would actually increase emissions from a source category, which is highly unlikely. In such a case, the regulations agency should closely examine both source compliance and the rule itself to determine how the rule is increasing emissions.

The equation for the RE method is the following:

$$RE = \frac{(Baseline - Actual)}{(Baseline - Allowable)} \times 100 \qquad (6a)$$

or

$$RE = \frac{\dfrac{Allowable}{(1 - Control\ Efficiency)} - Actual}{\dfrac{Allowable}{(1 - Control\ Efficiency)} - Allowable} \times 100 \qquad (6b)$$

where:	baseline	=	uncontrolled base year emissions
	actual	=	actual emissions from the source or source category
	allowable	=	allowable emissions determined from the SIP
	control efficiency	=	control efficiency defined in the CTG

Like the CE method, the RE method measures the magnitude of excess emissions. However, it differs for the other two in that it ties excess emissions to the reductions achieved and required by the rule. In the framework of the previous example for the CE method, consider the auto body finishing category. Assume that the shops purchase reformulated coatings to meet a new standard, 2.2 lbs. of VOC/gallon of solids. The CTG considers this to equate to a 60 percent reduction in emission rate. However, the auto body finishers operate above the standard, at 2.6 lbs. VOC/gallon solids. Therefore, the percentage effectiveness would be:

$$RE = \frac{\dfrac{2.2}{(1 - 0.6)} - 2.6}{\dfrac{2.2}{(1 - 0.6)} - 2.2} \times 100 = 87 \qquad (7)$$

The RE method also has some limitations associated with it. If baseline data are not available, the method allows the use of the categorical reduction assumptions in the control technique guidelines. The assumptions are often inaccurate, which can lead

to an inaccurate RE rating for a source category. Another limitation with the method occurs when few, if any, emission reductions are required for a facility. If the facility generates small excess emissions, the RE method gives it a very poor percentage effectiveness.

The SIP effectiveness method provides information on the current progress toward the planned emission reductions:

$$SE = \frac{(Baseline\ Emmissions - Current\ Emissions)}{(Baseline\ Emissions - Projected\ Emissions)} \qquad (8)$$

The SIP effectiveness is discussed separately in detail in section 3.4.

3.2.5 CE Evaluation

A percentage effectiveness rating is not enough to describe the compliance effectiveness of a rule for a source category. An SSCD study should attempt to link the rating to a regulatory agency's overall effort. The study should address the factors that affect the percentage effectiveness rating such as the compliance rate of the sources in a category, inspection frequency and thoroughness, the language of the rule (*i.e.*, whether or not it has loopholes), and the reporting and recordkeeping by the regulatory agency. Evaluating these factors will provide a more complete evaluation of the effectiveness of a rule.

3.3 PROJECTION YEAR RULE EFFECTIVENESS

The RE must also be factored into the projected inventories that support the SIP rate-of-progress plans. New control measures cannot be assumed to be 100 percent effective; the emission estimates based on the emission control strategies must account for the same effects of noncompliance as did the base year inventory. The EPA recently published guidance on the preparation of emission projections to support the 15 percent rate-of-progress plans required for the Act (*Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans, EPA-450/R-93-002, March 1993*). Emission projections are used in conjunction with ambient air quality modeling analyses to determine whether NAAQS attainment will be reached. The EPA requires rate-of-progress plans submitted by November 1993 to demonstrate reductions planned by 1996. Subsequent EPA guidance will address the 3 percent-per-year reductions required after 1996 for areas requiring further reductions to reach attainment. Areas which meet the required reductions in terms of real, permanent, enforceable reductions are making reasonable further progress (RFP).

3.3.1 Data Elements

Emission projections are used to predict future inventory (and, in part, ambient) conditions and test the ability of regulatory control strategies to show RFP and demonstrate attainment. The following data are required to calculate projection year emissions:

- Base year data
  - Operating rate
  - Emissions
  - Emission factor
  - Control efficiency
  - *Rule effectiveness*

- Projection year data
  - Growth factor
  - Allowable limits (emission factor, control efficiency, emission rate)
  - *Rule effectiveness*

Later in this section, the equations necessary to calculate projected emissions will be presented. The terms Current Control Projection Emissions and Control Strategy Projection Emissions will be used. The former refers to emissions which have been projected from current emissions or operating conditions and growth factors on the basis of current controls and RE only. The latter refers to emissions projected based on future control strategies and RE values for those strategies.

3.3.2 Determination of RE

The function of RE in projecting emissions is the same as the base year role: to account for the effects of rule noncompliance on the emission estimate. RE assumptions may have a major impact on the control programs and planned reductions. An underestimate of actual RE may result in more extensive or stringent control measures than necessary to reach attainment. An overestimate of RE may mean that planned control measures are insufficient to reach attainment (as measured by monitoring stations) despite supposed reasonable further progress in the SIP. Inventory RE for projections may be assessed in two ways for sources adjusted for RE in the base year inventory:

- The base year RE value may be applied to projection years when no RE improvements are planned as part of the emission reduction strategy. The base year value may be the 80 percent default value or it may be derived from an SSCD protocol study, RE questionnaires, or another approved RE evaluation method.

- The projected emissions may incorporate planned, creditable RE improvements to the base year value. Calculation of these improvements is treated separately in a later section, but credit for such improvements are subject to the same restrictions as other reductions. *The State or local agency must plan for a future SSCD protocol study to demonstrate the improvements (e.g., an SSCD study must be conducted by 1996 to meet the requirements of the 15 percent rate-of-progress plans).*

For sources not in the base year inventory or which were unadjusted for RE because they were uncontrolled or because emissions were directly determined, an RE value should be applied consistent with the application of inventory RE:

- Sources with directly determined emission estimates should not have RE applied in a projected inventory. Since direct determination represents actual emissions, no RE is applied in the base year. If a source is exceeding allowable emissions, the level of noncompliance is already included in the base year emissions. The best assumption for emission projections is that this level of noncompliance will remain constant in the absence of new regulatory programs. Note that this assumption precludes any calculation of potential RE improvements where direct determination has been used. (Sources which were deemed to be controlled by an irreversible process change are not subject to any inventory RE adjustment in the base or projection years.)

- Uncontrolled sources (both base and projection years) are not subject to an RE adjustment.

- Currently uncontrolled sources which will be controlled under the emission reduction strategy should use (1) the category RE value for categories already subject to RE or (2) the default RE value for the projection years for currently uncontrolled categories unless another approved method is available. The first case covers sources which were previously uncontrolled because they made no attempt at compliance or are below established cut-offs in the base year. The second case

covers sources in categories which are not subject to current control regulations.

Any differences between base year and projection year RE should be identified and supported in the documentation for the 15 percent rate-of-progress plan.

3.3.3 Point Source Projection Methods

The role of RE in emission projections is described in *Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans*, EPA-452/R-93-002, March 1993 beginning on page 51. The reader is directed to this reference for a complete discussion of projections for the rate-of-progress projection plans with sample emission projections calculations and scenarios. The correction errata for the 15 percent rate-of-progress guidance is included as Appendix B.

Several of the methods [referenced as (2) and (4) in the document] use the RE value differently from traditional base year applications which depend upon applying RE to the control efficiency. In these alternate cases, no control efficiency is explicitly available and a different adjustment to the emission factor (including controls) is made. These methods are highlighted below. The reader should refer to the 15 percent rate-of-progress guidance.

Method 2: Projection calculated from base year operating rate, allowable (post-control) emission factor, RE, and growth factor

This method should be applied when the base year emissions are calculated by the emission factor method and the emission factor accounts for the control level for the projection year.

The equation for projecting emissions in this case is:

$$EMIS_{PY} = ORATE_{BY,O} \times EMF_{PY} \times \left[\frac{(200 - RE_{PY})}{100}\right] \times GF \qquad (9)$$

where:

$EMIS_{PY}$	=	Projection year emissions - ozone season typical weekday (mass of pollutant/day)
$ORATE_{BY,O}$	=	Base year operating rate (activity level) - ozone season daily rate (production units/day)
EMF_{PY}	=	Projection year (post-control) emission factor (mass of pollutant/production unit)
RE_{PY}	=	Projection year RE (percent)
GF	=	Growth factor (dimensionless)

Current control projection emissions in this case are calculated if the projection year emissions factor and base year RE values represent current regulatory or permit conditions and/or actual conditions where appropriate. Control strategy projection emissions in this case are calculated if the projection year emission factor and RE values represent future control strategies or regulations developed to meet rate-of-progress targets. Projection year RE values can only improve from base year RE on the basis of an RE improvements analysis.

Method (2) will be used for emission factor-based control measures such as solvent content limits on surface coating. These projections must also account for RE. The factor [(200 - RE_{PY})/100] adjusts emissions for RE. With a RE of 80 percent, emissions will be adjusted by a factor of 1.2. You will note that this mathematical treatment of RE is different from base year RE. The impact of applying RE in combination with a control efficiency is explained in the base year discussion. In this equation (9), control efficiency is not explicit; rather, it is integral to the post-control emission factor. To apply RE, the term [(200 - RE)/100] has been introduced. It is equivalent to the impact (on emissions) of applying RE to a 50 percent control efficiency.

Figure 3-2 shows the increasing difference between the effect of the traditional RE application and this new RE term when the RE Factor, defined as the ration of RE-adjusted emissions to controlled emissions) is examined. If, for instance, the allowable (post-control) emission factor is converted to a percentage reduction from the pre-control emission factor and used as the projection year control efficiency in method (1), different results may be produced depending on how much the resulting percentage reduction varies from 50 percent. The difference is very large for high control efficiencies.

Method 4: Projection calculated from base year actual emissions, emission factor-based control levels, RE, and growth factor

This method will be used for processes where the base year emissions are calculated by material balance, stack test, or any method other than emission factors. Method (4) must be used for emission factor-based control measures such as solvent content limits on surface coating if the operating rate is unavailable.

The equation for projecting emissions in this case is:

$$EMIS_{PY} = EMIS_{BY,O} \times \left[\frac{\left[\frac{(200 - RE_{PY})}{100}\right]}{\left[\frac{(200 - RE_{BY})}{100}\right]}\right] \times \left[\frac{EMF_{PY}}{EMF_{BY}}\right] \times GF \qquad (10)$$

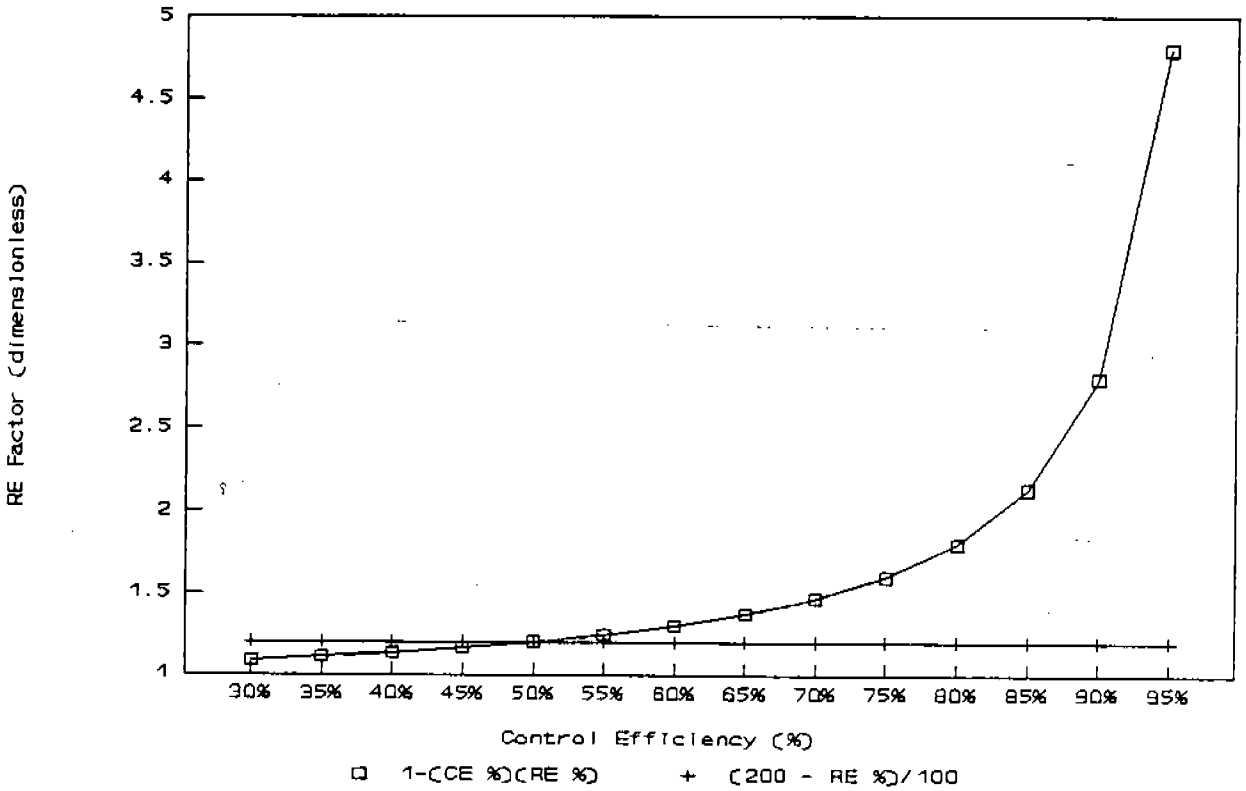

Figure 3-2. RE Factor as a function of control efficiency for two RE adjustments (uncontrolled emissions = 100 tons).

where:

$EMIS_{PY}$	=	Projection year emissions - ozone season typical weekday (mass of pollutant/day)
$EMIS_{BY,O}$	=	Base year ozone season actual emissions (mass of pollutant/day)
RE_{PY}	=	Base year RE (percent)
RE_{BY}	=	Projection year RE (percent)
EMF_{PY}	=	Projection year emission factor (mass of pollutant/production unit)
EMF_{BY}	=	Base year actual emission factor (mass of pollutant/production unit)
GF	=	Growth factor (dimensionless)

Emissions for the current control projection in this case are calculated when the projection year emission factor and RE values represent existing regulatory or permit conditions. Under the current control projection, the projection year emission factor may be equivalent to the base year emission factor if the actual

conditions are equivalent to (*i.e.*, not more stringent than) the regulatory or permit conditions.

Control strategy projection emissions in this case are calculated by using the future control strategy emission factor and RE values in method (4). Projection year RE values can only improve from base year RE on the basis of an RE improvements analysis.

These projections must also account for RE. The factor [(200 - RE)/100] adjusts emissions for RE as discussed previously under Method (2).

3.4 SIP EFFECTIVENESS

3.4.1 Definition and Purpose

The SIP Effectiveness (SE) is defined as the ability of the attainment plan(s) to achieve the planned emission reductions. The SE is estimated by comparing actual emission reductions to the projected emission reductions. By contrast, RE estimates the degree to which an existing rule is working. The SE may be influenced by both the suitability of the rule and the ability to make accurate projections. Low SE may be caused by an inadequate rule; poor compliance, emission violations, variances and enforcement problems; and unrealistic baseline emissions or underestimated growth. High SE may be due to overcompliance, unrelated source process changes or overestimated growth.

The purpose of SE is to provide a SIP planner with information on progress through emission reductions towards attainment and to refine the planning process. The technique is currently used in Region IX to gauge progress towards attainment and is referenced in Appendix F of the SSCD protocol study guidance. Significant variations from 100 percent indicate a problem in one or more of the areas previously noted. If there is evidence that attainment may not be reached, the cause and extent of the emission surplus requires investigation.

3.4.2 Calculation Procedure

The EPA equation to calculate SE is applied on a *source category* basis, not individual source by source analysis. The equation expresses a relationship between the baseline (base year) emissions, current emissions, and projected emissions. Baseline emissions are annual emissions for the year the control strategy was adopted. For this example, 1990 is the base year. Current year refers to the *actual emission* inventory corresponding to the SE determination; the SE for 1992 requires the 1992 inventory be used as the current year. Future year SE cannot be calculated. Projected emissions refer to the emissions projected from the

baseline (1990) to the current year (1992). This procedure works as well for seasonal daily emissions as for annual, but the dimensional emission units must be consistent throughout the procedure. (If emissions must be converted for some data, use 250 work-days as equivalent to one year.) This equation calculates the progress towards attainment (SE) from baseline, current, and projected emissions:

$$SE = \frac{(Baseline\ Emissions) - (Current\ Emissions)}{(Baseline\ Emissions) - (Projected\ Emissions)}, \text{ or}$$

$$SE = \frac{Base - Current}{Base - Projected} \qquad (15)$$

3.4.2.1 *Projected emissions*

The baseline and current year emissions should be available from the respective emissions inventories. Projected emissions must be calculated and should be consistent with *Procedures for Preparing Emissions Projections* (EPA-450/4-91-019, July 1991). This guidance defines projected emissions in the following manner:

$$Projected = Base \times GF \times \frac{(100 - Eff_{projected\ year})}{(100 - Eff_{baseline})} \qquad (16)$$

where,

$E_{projected\ year}$	=	Emissions in the projected year
$E_{baseline}$	=	Emissions in the baseline year
Growth Factor	=	Growth factor used to prepare projection
$Eff_{projected\ year}$	=	Control strategy efficiency as percent in the projected year
$Eff_{baseline}$	=	Control strategy efficiency as percent in the baseline year

Region IX's experience indicates that control factors (the estimated control impact of a regulation on a category) rather than control efficiencies are used in preparing projections. Equations (15) and (16) may be adjusted where control factors (CF), rather than control efficiencies, are used:

$$Projected = Base \times GF \times \frac{(CF_{projected\ year})}{(CF_{baseline})} \qquad (17)$$

The difference between baseline and projected emissions is a combination of two elements: growth among sources that are

controlled and growth among uncontrolled sources. An equivalent form of equation (17) factors these two components:

$$Projected = Base + (Controlled\ Growth) + (Uncontrolled\ Growth) \quad (18)$$

$$Projected = Base + [(Base + Base \times (GF - 1)) \times (CF - 1)] + Base \times (GF - 1)] \quad (19)$$

where,

Base:	Baseline emissions
(Base + Base x (GF-1)) x (GF-1):	Effects of growth and increased controls in the projected year
Base x (GF-1)	Effect of growth due to uncontrolled sources

Where CF is higher in the projected year than the base, the term (CF -1) will be negative and serves to discount base year emissions. Negative growth will be represented by GF<1, which will also discount the current emission baseline.

3.4.2.2 *Absolute shortfall or surplus*

Once the projected emissions have been determined, the SE can be calculated. (SE is calculated throughout the duration of a SIP as an indicator of reasonable further progress.) The SE does not quantify the success or failure of the SIP. The absolute magnitude of the emissions shortfall or surplus in a given year is a better indicator of success or failure. The emission reduction claimed in a SIP for a category is calculated as follows:

$$Emission\ Reduction = -[Base + Base \times (GF - 1)] \times (CF - 1) \quad (20)$$

Equation (20) is the middle term in equation (19); it is the projected emission reduction based on growth and control. Shortfall or surplus is simply the difference between current and projected emissions and the corresponding emissions that were projected based on growth and control:

$$\begin{array}{l} Shortfall \\ \quad or \\ Surplus \end{array} = Current\ Emissions - Projected\ Emissions \quad (21)$$

Current emissions will only equal the baseline in the base year.

3.4.3 Interpreting SE

As mentioned, the absolute shortfall or surplus is key to determining the severity of any problem, or the magnitude of success of the SIP. The value of the SEs (Table 3-2) will provide a quick indicator and direct further investigations as to whether growth or control projections were in error.

TABLE 3-2. THE SIP EFFECTIVENESS INDICATOR

SE Value	Emissions Interpretation
>100%	Planned reductions are being exceeded
100%	Planned reductions are being met
<100%	Shortfall in planned reductions
<0%	Absolute emissions have increased

Examples

Two examples for calculating and using SIP Effectiveness are presented. The examples have been provided courtesy of EPA Region IX and the California Air Resources Board. The data necessary to complete the SE calculation are baseline emissions, current emissions, projection and baseline year control efficiencies (or control factors), and category growth factors.

Example 1

An agency has determined baseline emissions for metal coil coating to be 500 tons per year. The control factor is 1.0 for the baseline and 0.64 for the projection year (*i.e.*, emissions from the source category are planned to be reduced by 64 percent). The projected growth factor for the category is 1.10. The current emissions are 150 tons per year.

Substituting into equation (19), the projected emissions for this year can be computed:

These projected emissions of 352 tons per year are divided between controlled (500 - 198 = 302 tons per year) and uncontrolled (50 tons per year). Compared to current emissions (150 tons), there are 202 tons in surplus reduction this year. Using equation (15), these figures can be substituted to determine SE:

$$\begin{aligned} Projected &= [Base] + [(Base + Base \times (GF - 1)) \times (CF - 1)] + [Base \times (GF - 1)] \\ &= [500] + [(500 + 500 \times (1.1 - 1)) \times (0.64 - 1)] + [500 \times (1.1 - 1)] \\ &= [500] - [198] + [50] \\ &= 352 \end{aligned} \tag{22}$$

These projected emissions of 352 per year are divided between controlled (500 - 198 + 302 tons per year) and uncontrolled (50

tons per year). Compared to current emissions (150 tons), there are 202 tons in surplus reduction this year. Using equation (15), these figures can be substituted to determine SE:

$$SE = \frac{(Base) - (Current)}{(Base) - (Projected)} * 100$$

$$SE = \frac{500 - 150}{500 - 352} * 100 \qquad (23)$$

$$= 236.5\%$$

Example 2

An agency reports baseline emissions of 1 ton per day for miscellaneous metal coating. The projected control efficiency is 42 percent while the baseline control efficiency is 0 percent (no control). Currently, the category emits 0.8 tons per day and emissions were projected based on a growth factor of 1.05.

The projected control factor must first be calculated from the projected control efficiency: 1 - 0.42 = 0.58.

$$\begin{aligned} Projected &= [Base] + [Base + Base \times (GF - 1) \times (CF - 1)] + [Base \times (GF - 1)] \\ &= [1] + [(1 + 1 \times (1.05 - 1)) \times (0.58 - 1)] + [1 \times (1.05 - 1)] \\ &= [1] - [0.441] + [0.05] \\ &= 0.609 \end{aligned} \qquad (24)$$

Compared to projected emissions of 0.609 tons per day, current emissions of 0.8 tons per day represent a shortfall of 0.191 tons per day in meeting the planned emissions reduction. Finally, SE can be calculated:

$$SE = \frac{(Base) - (Current)}{(Base) - (Projected)}$$

$$SE = \frac{1 - 0.8}{1 - 0.609} \qquad (25)$$

$$= 51.2\%$$

These emissions could be converted to an annual basis assuming 250 operating days per year or using a more accurate estimate based on actual source operations in the category.

An SE below 100 percent indicates that there is an emission reduction shortfall in the miscellaneous metal coating category. The air pollution control agency should investigate to determine the source of the deficiency.

SECTION 4
SIP RE IMPROVEMENT CREDITS

4.1 DEFINITION AND PURPOSE

A rule effectiveness improvement is a reduction in emissions due to an improvement in the implementation of a rule for a regulatory program. It refers to a comparison of the implementation of the rule before the improvement to the implementation of the rule after the improvement. The RE improvement measures are the discrete actions taken to improve compliance, enforcement, and the rule itself. The RE improvements are a major source of emission reductions for nonattainment areas previously subject to SIP requirements prior to the Clean Air Act as amended (Amended Act) because these areas have already adopted reasonably available control technologies (RACT) for many, if not most, of their larger sources.

The RE improvement measures can take several forms, ranging from more frequent and in-depth training of inspectors to larger fines for sources that do not comply with a given rule. An RE improvement or improvement measures should not be confused with RE. The RE is an evaluation of the effectiveness of a rule for an existing or future regulatory program. There is no comparison between different forms of rule implementation; rather RE provides EPA with a snapshot at a given point in time of how well point and area sources are achieving the emission reductions the rule was designed to provide.

The purpose of RE improvements is to provide States with additional strategies to achieve actual emission reductions for their SIP's. Section 182(b)(1)(A) of the Act requires States with ozone nonattainment areas classified as moderate and above to submit SIP revisions by November 15, 1993. A portion of the revisions, known as rate-of-progress plans, focuses on how the nonattainment areas will meet the NAAQS for ozone by November 15, 1996. The rate-of-progress plans must demonstrate that the nonattainment areas will achieve a 15 percent reduction in actual VOC emissions by the 1996 date. Some States have already implemented rules for RACT, particularly if they had ozone nonattainment areas prior to the Amended Act. These States need additional means to obtain actual reductions in VOC and/or NO_x emissions. The General Preamble for Title I identifies RE improvements as one of the means States can use to meet the 15 percent reduction requirement by November 15, 1996.

The primary purpose of this section is to help the reader determine the effect of RE improvement measures so that States can use them for emission reduction credits in their rate of progress plans. The remainder of the section focuses on determining

creditable RE improvements and illustrating the process through a sample calculation.[4]

4.1.1 Determination of Improvements and Improvement Measures

To estimate the creditable emission reductions from RE improvement measures, State and local agencies need to be able to quantify the predicted increase in RE.[5] The methodology, therefore, must measure the impact of specific improvement measures available to a State or local agency.

No existing compliance and emission data were available to quantitatively assess the reduction in emissions from any single or set of measures. Consequently, a panel of experts representing State, Regional, and Headquarters personnel from AQMD, SSCD, and TSD used the Delphi method to develop quantitative values for specific RE improvement measures.[6] These values are presented in the RE matrix in Appendix C.

The matrix is based upon a questionnaire that EPA uses to estimate base RE for source categories (see *Guidelines for Estimating and Applying RE for Ozone/CO State Implementation Plan Base Year Inventories*). It contains various levels of activities and conditions (*e.g.*, frequency of inspections, level of recordkeeping, procedures for operation and maintenance of control equipment) that influence RE. As a result of the panel's work, the questionnaire was modified to reflect RE improvements. The Ozone/CO Programs Branch then incorporated input from personnel at State and local agencies, EPA Headquarters, and Regional offices. Several principles helped to guide the development of the matrix:

- All States should be guaranteed at least 80 percent base RE unless an SSCD protocol reveals a lower RE.
- States will not receive credit for RE improvements which do not increase RE above 80 percent.

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[4] Emissions from sources or source categories which have been directly determined are not eligible for creditable RE improvements because the base year RE is not an explicit component of the calculation. For directly determined emissions, emissions due to noncompliance are already accounted in the emission estimate.

[5] RE improvement creditability is subject to the same creditability constraints as other reductions (57 FR 13509, Section III.3.a.4 of the General Preamble).

[6] Helmer, Olaf; Analysis of the Future: the Delphi Method (DDC-649 640); March 1967.

Expected Rule Effectiveness Improvements From Various Measures For Point Source And Area Source Categories

Category/Measure	Weights (X)	Current Percent of Emissions (Y)	X * Y	Future Percent of Emissions (Z)	X * Z
A. TRAINING OF PLANT OPERATORS	G(A)= 20				
Percent of emissions[a] from sources covered by a regulation or permit that:					
1. Require formal operator introductory training course of:	$G(A_1)$= 9				
a. More than 80 hours	10				
b. 41-80 hours	8				
c. 25-40 hours	5				
d. 24 hours or less	2				
e. On job training only	☜ 1				
Total					
2. Require operators to take refresher training annually of:	$G(A_2)$= 7				
a. More than 80 hours	10				
b. 41-80 hours	8				
c. 25-40 hours	5				
d. 24 hours or less	☜ 1				
e. On job training only	1				
Total					

[a] Emissions are actual emissions from sources without control devices and uncontrolled emissions from sources with control devices.

☜ Indicates the measure presumed to be indicative of a program achieving 80 percent RE.

Figure 4-1. RE improvements matrix.

- States improving from a level over 80 percent should receive full credit for any additional improvement.

- RE improvement measures should be documented in a permit or in a SIP revision.

- One hundred percent RE is rarely achieved, except in cases of direct determination of emissions or elimination of VOCs or other pollutants altogether through an irreversible process change; one hundred percent RE is normally approached "asymptotically."[7]

The matrix is divided into 13 categories designated by the capital letters A through M. The categories represent a range of activities and conditions that influence RE. Within six of the categories are subcategories that more specifically define their respective categories. Subcategories are designated by numbers ranging from 1 to 3. Measures are the most specific item on the matrix. They represent the levels of activities and conditions and are arranged in a descending order with the first measure having the most significant impact on RE and the last measure having the least significant impact. Measures are designated by small letters ranging from a to f.

Once the matrix was developed, the Delphi Method was used to assign weights to the various categories, subcategories, and measures. The Delphi Method relies on a panel of experts to narrow choices on a topic with varying degrees of interpretation. The OCMPB invited seven experts from State regulatory agencies and the EPA to serve on the panel. The experts reviewed the matrix four times, assessing the relative values of each category, subcategory, and measure. This was an iterative process where panelists had the opportunity to anonymously review other panelists' ratings and comments, explain their own rationales, and revise their ratings to narrow the range of values.

After narrowing the choice of values, the panel assigned a weight to each category on a scale of 1 to 30 and distributed the weight among the subcategories (where applicable). The experts also assigned weights to each measure on a scale of 1 to 10.

The first (most stringent) measure in each category and subcategory automatically received a 10 to ensure consistency among the most effective measures. The measures at and below the 80 percent level automatically received a 1. This ensures that

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[7] Arguments have been made that sources may overcomply with rules to avoid or decrease the potential for rule or emission limit violations. While these situations may occur, there would be no effect on base year inventories and improvement programs should not anticipate such overcompliance.

States do not receive emission reduction credits for RE improvements below the 80 percent level.

The first category in the matrix in "Training of plant operators," which is designated by "A." The Delphi Panel assigned it a weight of 20, G(A)=20. The weight was distributed among subcategories 1, 2, and 3 in the following manner: $G(A_1)=9$, $G(A_2)=7$, and $G(A_3)=4$. The panel also assigned weights from 1 to 10 to each measure within the subcategories. For example, the 5 measures of subcategory $G(A_1)$, which gauges RE for operator training courses, have the weights of 10, 8, 5, 2, and 1 respectively.

In addition to assigning weights, the Delphi Panel selected the measure that best represents the 80 percent default for each category and subcategory. The 80 percent default is the level of activity or condition that a State regulatory program or a source must perform at to achieve 80 percent RE for a given rule. The checked boxes in the matrix signify the 80 percent default levels. In subcategory $G(A_1)$, the 80 percent default is measure e, "on the job training only." Because States cannot receive emission reduction credits for RE improvements below the 80 percent default using the matrix, it represents the measure with the least impact on RE for each category and subcategory.

The reviewer must use the weights in the matrix to calculate a Rule Effectiveness Raw Score (RERS) for a given source category. The RERS is then used to determine the effect of the RE improvement measures and the final RE after the improvement measures have been implemented. The final RE is a percentage that the reviewer multiplies by the emission inventory for a given source category in a nonattainment area. The product of RE and emissions is the actual emissions from the source category after the RE improvement has been implemented. It is compared to the actual emissions from the source category before the RE improvement measures were implemented, and the difference is the actual emission reductions for which the State can receive credit in its rate-of-progress plan.

Equations 1 through 4 below illustrate how a State regulatory agency would calculate the RERS and use it to determine the effect of the RE improvement measures, the final RE, and the emission reduction credits. (An example calculation is provided after the presentation of the methodology.)

$$RERS = \sum_{G=1}^{n} \{G(x_s) \sum_{F=1}^{m} [F(t,G(x_s),f) \times z(t,f)] - [F(t,G(x_s),o) \times y(t,o)]\} \quad (1)$$

$G(x_s)$	=	weight assigned to subcategory s of category x (for some categories, s is equal to 1)
$F(t,G(x_s))$	=	weight assigned to measure t of subcategory s
$F(t,G(x_s),o)$	=	value of measure t of subcategory s before REimprovement is implemented
$F(t,G(x_s),f)$	=	value of measure t of subcategory s after RE improvement is implemented
$y(t,o)$	=	emissions corresponding to facilities implementing measure t as a % of total emissions from the source category *before* improvement is implemented, where applicable, or 1
$z(t,f)$	=	emissions corresponding to facilities implementing measure t as a % of total emissions from the source category *after* improvement is implemented, where applicable, or 1

$$RERS(i) = [100 - RE(o)] \times RERS/RERS(\max) \quad (2)$$

$$RE(f) = RE(o) + RE(i) \quad (3)$$

$$ERC = [RE(f) \times I] - [RE(o) \times I] \quad (4)$$

RERS(max)	=	maximum RERS = 1818 (from sum of differences between minimum and maximum values of the measures in each category and subcategory)
RE(o)	=	original RE (base RE) before RE improvement
RE(i)	=	RE improvement over base RE
RE(f)	=	final RE after RE improvement
I	=	current emission inventory for the stationary source category
ERC	=	total emission reduction credits from RE improvements

The matrix was assembled assuming that the baseline 80 percent RE value was used. No credit is given in the matrix for improvements up to 80 percent. (The result of the matrix is a

delta RE percent to be added to the baseline.) If 80 percent was used for the baseline, but real RE in the base year is greater (*e.g.*, 90 percent), it will be difficult to show much improvement in the matrix, although a subsequent SSCD study may show that a higher RE can be applied in the 1996 inventory. In this case, the State may add RE improvement measures and project a small RE increase (*e.g.*, 5 percent), but could receive credit for a larger one (*e.g.*, 15 percent) if the SSCD study shows 95 percent RE. In some ways, this could be seen as an unjustified credit owing to the original overinflation of the baseline inventory. It would, however, be a real reduction in the emission inventories and creditable.

4.2 CREDITABILITY

Creditability of emission reductions towards SIP requirements (e.g., reasonable further progress, and attainment demonstrations) is the key issue in RE improvements. The RE credits will range from zero (no improvements) to 20 percent (future complete source compliance from an 80 percent base year) *where the 80 percent default value was used*. If base year RE was determined from an SSCD protocol study and was lower than 80 percent, the RE improvement credit may exceed 20 percent. Creditable emissions must meet three tests to be creditable in a SIP and ultimately to show reasonable further progress.

- No credit will be given for improvements that bring a program up to the 80 percent RE (default) level unless the base year RE was determined using an SSCD protocol study.
- Credit must be computed and documented *by source category* using the RE improvements matrix explained in this document.
- An SSCD protocol study must be performed after implementation of the improvement to show the actual emission reductions achieved by the RE improvement measures implemented as a result of the rate-of-progress plans.

The RE improvements must reflect actual emission reductions resulting from specific implementation program improvement measures. To receive emission reduction credits for RE improvement measures, a State agency must document the improvements (*i.e.*, emission reductions). An SSCD protocol study that meets EPA's protocol requirements must be performed to confirm that emission reductions have been achieved after the implementation of the improvement program.

Emission reduction credits due to RE improvement measures are based on the difference between RE in 1996 and RE in the base

year. States that have been assuming 80 percent RE for a given rule before an RE improvement goes into effect can only receive credits for the portion of emission reductions over the 80 percent level. (If the State or local agency has used a prior SSCD study, the RE questionnaire or an approved RE study, all improvements up to and in excess of the 80 percent level are creditable.) For example, a State might have a rule that requires the vapor recovery systems of gasoline tank trucks to be tested for leaks every year by certified vapor tightness contractors. The State may have assumed in the base year emission inventory that testing the vapor recovery systems on gasoline tank trucks every year achieved an 80 percent RE. Based on the RE improvements matrix, the State projects that doubling the frequency of testing will achieve a 10 percent improvement. If the follow-up SSCD study shows that increasing the frequency of testing from every year to every 6 months improves the RE to 90 percent, the State would receive the emission reduction credits associated with a 10 percent RE improvement (90 percent - 80 percent).

Sources with directly determined base year emission estimates are not eligible for creditable RE improvements. Since direct determination represents actual emissions, no RE is applied in the base year. If a source is exceeding allowable emissions, the level of noncompliance is already included in the base year emissions. The RE improvements cannot be calculated where base year RE has not been explicitly estimated and applied. For these sources, the level of noncompliance is assumed to remain constant in the absence of new regulatory programs.

4.3 STANDARDS FOR COMMITMENT TO RE IMPROVEMENT MEASURES

The RE improvement measures must result in actual emission reductions and not mere "paper reductions." An SSCD study is therefore required to document actual emission reductions after improvement measures are in place. To obtain credit for future RE improvements in 15% rate-of-progress plans, there must be a binding commitment by the State to implement proposed RE improvement measures. The following types of improvement measures should be part of the regulations or permits submitted with the SIP revision as part of the overall SIP emission reduction strategy:

- training of plant operators;
- procedures for operation and maintenance of control and/or process equipment;
- clarity of testing procedures and schedules;
- monitoring;
- administrative authority--prison, fines, citations.

Implementation of RE improvement measures will be subject to the enforcement and sanction provisions of the Act.

In addition, EPA is studying whether RE improvement commitments can be written into existing Memoranda of Understanding (MOU) or Agreement (MOA) between the States and EPA's Regional Offices. The following types of improvement measures could be listed in an MOA:

- inspector training (commitment for travel and training);
- educational opportunities for source (commitment to develop education materials and conduct workshops);
- RE evaluation program (commitment for rule monitoring and evaluation and/or audit plan);
- different types of inspections (commitment for the level of inspection for the affected sources);
- media publicity of enforcement action (commitment to publish notice of violations);
- follow-up inspections (section 105 grant condition for funds to ensure sufficient inspectors to perform follow-up inspections).

If permitted by the Office of the General Council (OGC), MOA may be a useful addition to ensure long-term adoption of the improvements, although MOU's and MOA's will not be sufficient in and of themselves. States, local agencies, and Regional Offices may use or develop other strategies for ensuring commitments as approved by headquarters and the OGC, where necessary.

4.4 PERMISSIBLE MODIFICATIONS TO THE RE IMPROVEMENTS METHOD AND MATRIX

To ensure a consistent national standard for measuring RE improvements, the RE improvements matrix must be used by all States in calculating emission reduction credits for reasonable further progress. No other methods may be used to quantify these improvements for the SIP. Although every effort was made to include the relevant RE improvement categories and measures, EPA recognizes that the matrix does not contain all the current or potential strategies or measures that a State or local agency may find appropriate. Some modifications of the matrix are permissible to accommodate effective strategies, although any changes or additions are strictly circumscribed.

Matrix modifications are currently limited to two types:

- Addition or change to measures within a category or subcategory.

- Addition or change to subcategories already in one of the category groupings (as represented by the capital letters A through M in the matrix).

For example, some agencies achieve a higher rate of compliance by conducting whole facility inspections. The matrix,

however, is limited to the traditional Level 0 through Level 4 inspection criteria. In this case, the agency would be permitted to increase the measure value assigned to the relevant inspection level if the whole facility approach is taken. In no case can any measure exceed a value of 10.

In a second example, agencies may use pollution prevention-biased compliance rather than or in addition to traditional enforcement methods to bring about the mandated emission reductions. Because the pollution prevention options may bring about a permanent reduction through reformulation, modernization, recycling or reuse, an agency may have experience that such nontraditional enforcement is more effective than imposition of large fines. In this case, pollution prevention compliance measure(s) should be integrated into the enforcement measures in the matrix.

In both cases, measure weights will need to be assigned to the new measures. Insofar as possible, the existing weights assigned by the Delphi panel should be used as guides to placement of other measures in the 1 to 10 scale. In the above example, a weight would need to be assigned to the RE improvement measure, whole facility inspection. Assume this was the highest level of inspection, Level 5, and therefore would receive a weight of 10. The weights for levels 0-4 could then be redistributed as follows: Level 4, 5-points; Level 3, 3-points; Levels 2, 1, and 0, 1-point each. Any modifications to the matrix should be documented and justified as part of the SIP documentation supplied to the Regional Offices and headquarters.

The addition of any subcategories will require the redistribution of weights between the subcategories in a category. The overall category weight assigned by the Delphi panel must be retained.

4.5 EXAMPLE

A large city named Opa City is located in an ozone nonattainment area. Opa City has several rules that attempt to reduce VOC emissions from one of the area's stationary source categories, gasoline marketing sources. In the late 1980's, the EPA Regional office conducted several SSCD studies of the gasoline marketing sources in the area and determined that the RE for the rules governing the source category was 82 percent. When the Amended Act was enacted, Opa City was classified as a serious ozone nonattainment area. In accordance with section 182(b)(1)(A), the local air regulatory agency, Countywide Air Management Programs (CAMP), began to develop its rate of progress plan to demonstrate that the Opa City area would be able to achieve the 15 percent reduction in VOC emissions by November 15, 1996. Having implemented RACT rules for most of the area's larger

sources, CAMP looked for additional means to achieve the reductions.

The Agency implemented several changes to the regulatory program for the gasoline marketing source category. One of the changes was to initiate a training program of 25 hours for gasoline tank truck drivers and workers at gasoline bulk terminals to increase their awareness of the air regulations. In another regulatory change, CAMP increased the fine from $1,000 per month to $12,000 per day for gasoline tank trucks that do not use the Stage I vapor recovery systems while they deliver gasoline to service stations. The CAMP does not have to take court action to impose the fine.

For its rate of progress plan to receive emission reduction credits from the rule changes, CAMP has to calculate the RERS for the source category by filling out the matrix. After answering each question on the matrix, CAMP determined the difference between implementation of the rules before and after the rule changes for each category or subcategory on the matrix. For example, in subcategory A_1, CAMP determined that, before the rule changes, measure e, "on the job training," applied to 100 percent of the emissions from gasoline marketing sources. After the rule changes were implemented, CAMP determined that measure c, "requiring 25-40 hours of introductory training," applied to gasoline marketers representing 75 percent of the emissions from gasoline marketing because tank truck operators and bulk terminal workers had to complete the new 25 hour training course. Measure e continued to apply to the remaining 25 percent of emissions after the rule changes. The CAMP calculated the difference between subcategory A_1 before and after the rule changes in the following manner:

$G(A_1)$ = 9 (weight assigned by Delphi Panel)
$F(e(A_1))$ = 1 (weight assigned by Delphi Panel)
$F(c(A_1))$ = 5 (weight assigned by Delphi Panel)
$F(e(A_1),o)$ = $F(e(A_1)) * 100\% = 1$
$F(e,c(A_1),f)$ = $[F(c(A_1)) * 75\%] + [F(e(A_1)) * 25\%) = 5 * 75\% + 1 * 25\% = 4.75$

$$F(e,c,(A_1),f) - F(e(A_1),o) = 4.75 - 1 = 3.75 \qquad (5)$$

The CAMP has to repeat the process for all of the other categories and subcategories in the matrix. For example, there is a significant difference in the score for subcategory J_1 because of the increased fines for gasoline tank truck drivers that do not use the Stage I vapor recovery equipment. The difference in subcategory J_1 before and after the rule changes is the following

(note that subcategory J_1 requires no weighting factor for emissions):

$G(J_1)$	=	8
$F(e(J_1))$	=	1
$F(b(J_1))$	=	7
$F(e(J_1),o)$	=	1 x 1 = 1
$F(b(J_1),f)$	=	1 x 7 = 7

$$B(b(J_1),f) - F(e(J_1),o) = 7 - 1 = 6 \qquad (6)$$

After all of the differences are determined from the matrix, they are summed for the RERS:

$$RERS = \sum_{G=1}^{n} \{G(x_s) \sum_{F=1}^{m} [F(t,G(x_s),f) \times z(t,f)] - [F(t,G(x_s),o) \times y(t,o)]\} \qquad (7)$$
$$= 946$$

In the next two steps of the process, CAMP would use equations (2) and (3) to calculate the RE improvement and the final RE after the rule changes had been implemented.

RE(o)	=	82% (based on the SSCD study)
RERS	=	946
RERS(max)	=	1,818

$$RE(i) = (100\% - 82\%) \times \frac{946}{1818} = 8.43\% \qquad (8)$$

$$RE(f) = 82\% + 8.43\% = 90.43\% = 90\% \qquad (9)$$

The final step CAMP takes is determine the actual emission reductions from the RE improvement measures. To do this, equation (4) must be used.

RE(o)	=	82%
RE(f)	=	90%
I	=	current emission inventory for gasoline marketing source category = 500 tons
ERC	=	emission reduction credits

$$ERC = [90\% \times 500 \text{ tons}] - [82\% \times 500 \text{ tons}] = 450 - 410 = 40 \text{ tons} \quad (10)$$

The CAMP can receive 40 tons in emission reduction credits for its RE improvement measures.

SECTION 5
AN INTEGRATED VIEW OF RULE EFFECTIVENESS

Various types of RE and RE applications have been discussed in the preceding chapters. The purpose of this document has been to present an overview of the different types of RE in a single document that integrates the guidance materials. While it is important to understand these individual applications and methodologies, their common purpose is evaluating the real effect of emission control programs on emission estimates. All RE types evaluate single sources or source categories and are applicable to a single geographic (usually nonattainment) area. This common purpose led to the more or less common terminology of "rule effectiveness" which this document has attempted to separate into four major RE types:

- Compliance effectiveness
- Inventory rule effectiveness
- (Inventory) rule effectiveness improvements
- SIP effectiveness

As explained in the previous chapters, each RE type fulfills a different purpose within the SIP process. With the exception of compliance effectiveness, as represented by the SSCD protocol approach, and inventory RE, there are no provisions for converting from one type to another. Table 5-1 presents a summary of RE types and typical SIP applications, and shows which applications require the interaction of several RE types. Figure 5-1 shows an example of how RE fits into the SIP process through 1997. The salient aspects of each RE value are summarized below and in Table 5-2.

5.1 RULE EFFECTIVENESS TYPES

5.1.1 Compliance Effectiveness

Compliance effectiveness is represented by the SSCD protocol study approach. The determination is made to evaluate the extent to which a rule actually achieves (or has the capability of achieving) desired emission reductions, both in terms of the reductions projected for that rule and the reductions that would be ordinarily achieved if the rule was properly implemented. The study is specific to a particular category in a single geographic area. The calculation of compliance effectiveness (CE) is strictly the relationship between actual and allowable emissions at the time of the evaluation:

$$CE\ (\%) = \frac{\text{Allowable} - (\text{Actual} - \text{Allowable})}{\text{Allowable}} \times 100 \qquad (1)$$

TABLE 5-1. RE TYPE AND APPLICATION MATRIX

Application	RE Type			
	Compliance[a]	Inventory	RE Improvements	SIP Effectiveness
Category-specific stationary source compliance	✓			
Base year SIP inventory	✓	✓		
Emission control and reduction strategies	✓		✓	
Periodic inventories	✓	✓		
Interim progress of SIP measures				✓
Rate-of-Progress (6-year) inventory	✓	✓		✓
RE Improvement Credits	✓	✓	✓	

[a] SSCD protocol study must be used to demonstrate RE improvements in 1996.

At 100 percent, the source category is in compliance and produces neither excess emissions nor excess reductions. Results above 100 percent indicate that actual emissions are below allowable (overcompliance); CE between 0 and 100 shows that actual emissions exceed allowable emissions. (Where actual emissions are twice allowable emissions, CE reaches 0 and becomes negative as the ratio of actual to allowable increases beyond 2.) Figure 5-2 displays the relationship between CE and actual emissions for a given allowable emission level.

The results of an SSCD protocol study may be used to determine inventory RE, although the calculation method is different. Likewise, information gathered within the SSCD study provides data applicable to a SIP effectiveness estimate, although the two types of rule effectiveness are calculated and evaluated differently.

SIP MILESTONE →	1990 Base Year Inventory	Attainment Plan / 15% Rate of Progress	'93 Periodic Inventory		Milestone Compliance Demonstration	'96 Periodic Inventory
MILESTONE DATE →	1992	1993	1994	1995	1996	1997
RE TYPE ↓						
Compliance (SSCD Protocol Study)[a]	Apply Protocol RE[b]		Apply Protocol RE[b]		Confirm RE Improvements[c]	Apply Protocol RE[c]
Inventory RE[a]	Apply Default or Questionnaire		Apply Default or Questionnaire		Apply Default or Questionnaire	Apply Default or Questionnaire
RE Improvements		Apply Matrix			Use SSCD study to confirm improvements and receive credit	
SIP Effectiveness			Progress Tracking	Progress Tracking	Progress Tracking	Progress Tracking

[a] RE for the base and periodic year inventories can be determined from either an SSCD Protocol study, the RE questionnaire or the 80 percent default or the approved alternative method.

[b] Apply the Protocol results applicable to the base year.

[c] Apply the results of the follow-up SSCD study for the 1996 milestone compliance demonstration.

Figure 5-1. SIP milestone and rule effectiveness schedule.

TABLE 5-2. INTERPRETATION OF RE VALUES

RE Type	Value Range (%)	Emissions Interpretation of RE Value				
		>100%	100%	0-100%	0%	<0%
Compliance effectiveness (CE)	Unlimited	actual < allowable sources in compliance	actual = allowable sources in compliance	allowable exceeded; sources not in compliance	actual = twice allowable	actual exceeds 2 x allowable
Inventory rule effectiveness (RE)	0 - 100 (defined)	N/A*	all sources in full compliance (maximum)	degree of compliance	no sources attempting compliance	N/A
RE Improvements	0 - 20			(0 - 20); improvement over 80% that may be creditable towards reductions	no improvement	
SIP effectiveness (SE)	Unlimited	planned reductions exceeded (surplus)	planned reductions met	planned reductions not met (shortfall)	current = baseline	current exceeds baseline

* N/A = not allowable

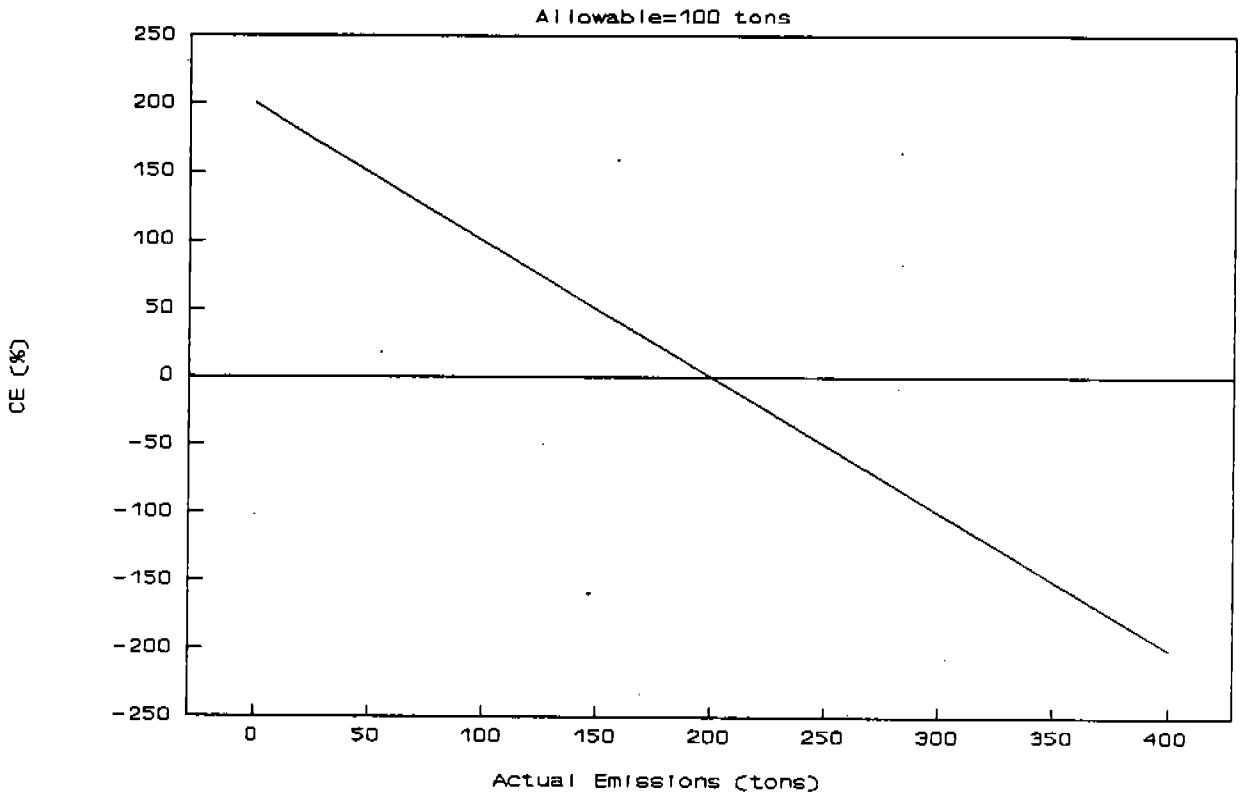

Figure 5-2. Relation of compliance effectiveness to actual emissions (allowable emissions held constant at 100 tons).

5.1.2 Inventory RE

Inventory RE is determined from the RE questionnaire, an SSCD protocol study, or an approved alternative method for a particular source category in a particular geographic area. Inventory RE applies to all sources operating under an emission control rule in a nonattainment area. The EPA has suggested that an 80 percent default be applied when no other information is available. In the questionnaire case, the RE calculation is made by completing and weighting the questionnaire results.[8] When applying SSCD protocol study results, either of two equations is applicable:

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[8] *Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories.* EPA-454/R-92-010. Office of Air Quality Planning and Standards, Research Triangle Park, NC. November 1992.

$$\% \text{ RE} = \frac{\text{Baseline} - \text{Actual}}{\text{Baseline} - \text{Allowable}} \times 100 \qquad (2)$$

Where the baseline cannot be determined, the following equation, which calculates the baseline from allowable emissions and the control efficiency, is used:

$$\% \text{ RE} = \frac{\left(\frac{\text{Allowable}}{1 - \text{Control Efficiency}} - \text{Actual}\right)}{\left(\frac{\text{Allowable}}{1 - \text{Control Efficiency}} - \text{Allowable}\right)} \times 100 \qquad (3)$$

By definition, inventory RE ranges only between 0 and 100. One hundred implies that all sources in a category are in compliance all the time; zero indicates that no sources are making an effort to comply. Using the SSCD RE equations, RE values in excess of 100 are mathematically possible when allowable emissions exceed actual emissions. Results exceeding the defined upper bound of 100 are not recognized for inventory RE applications as discussed in previous chapters. Base year inventory RE may also be used as the baseline for RE improvements where the base year RE is at least 80 percent.

Note that the specific RE calculation can be a function of control efficiency if the second SSCD option is used. This control efficiency is the control associated with the rule (*e.g.*, the CTG). As a mathematical artifact, sources with lower control efficiencies will have intrinsically lower RE in the 0 to 100 range for a given set of allowable and actual emissions (*i.e.*, the only difference between the sources is the control efficiency). Figure 5-3 displays the relationship between RE calculated from equation (3) and actual emissions for a given allowable emission level and two control efficiencies.

5.1.3 RE Improvements

Emission reduction strategies based on increasing RE are termed RE improvements. Estimated improvements from the base year (as percent RE) are calculated by defining the RE improvement measures to be taken and applying the RE improvements matrix:

$$\text{RE Improvement} = (100 - \text{RE}_{\text{base year}}) \times \frac{\text{RE Matrix Total}}{\text{RE Matrix Maximum}} \qquad (4)$$

The RE improvement creditability is the key issue in RE improvements. The RE credits will range from zero (no improvements) to 20 percent (future complete source compliance from an 80 percent base year) where the 80 percent default value was used. If base year RE was determined from an SSCD protocol

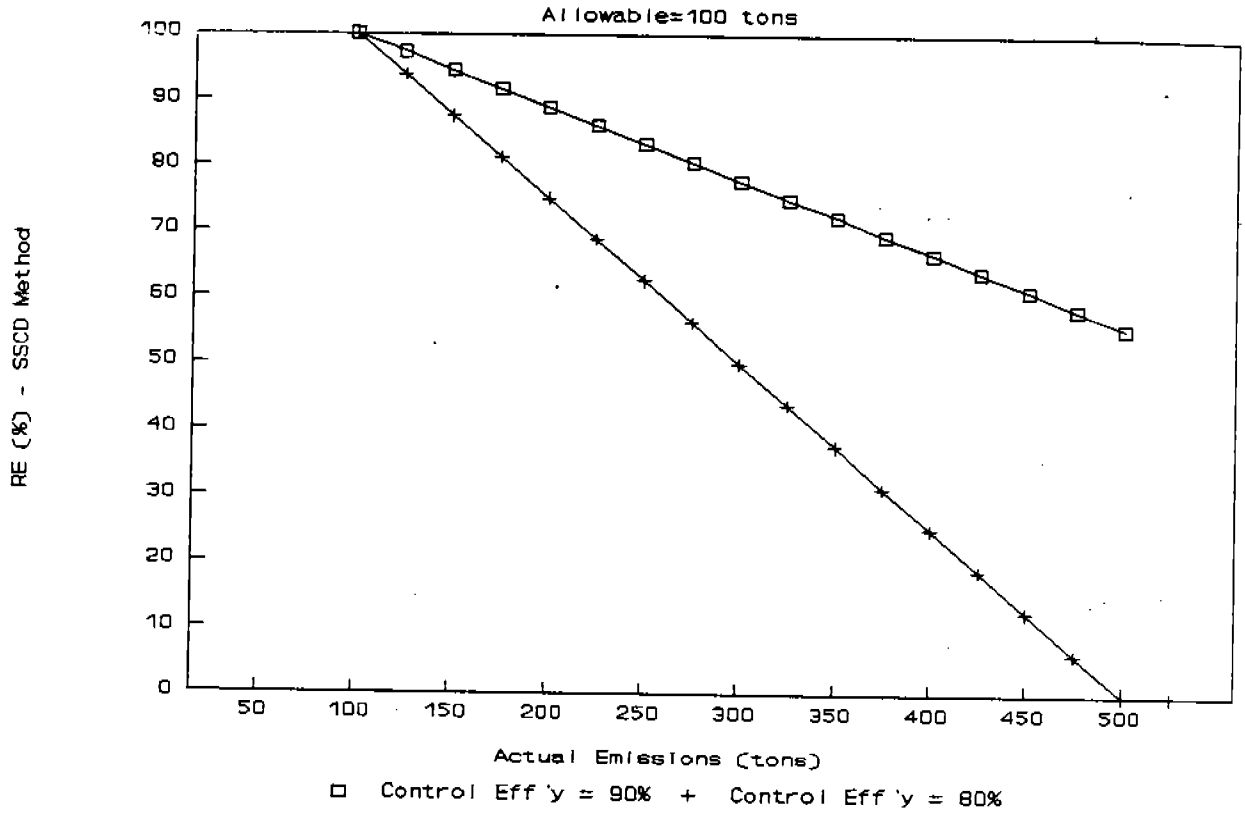

Figure 5-3. Relation of rule effectiveness calculated by the SSCD method to actual emissions (allowable emissions held constant at 100 tons).

study, RE credit may exceed 20 percent. Creditable emissions must meet three tests to be creditable in a SIP and ultimately to show reasonable further progress.

- No credit will be given for improvements that bring a program up to the 80 percent RE (default) level unless the base year RE was determined using an SSCD protocol study

- Credit must be computed and documented *by source category* using the RE improvements matrix explained in this document

- An SSCD protocol study must be performed to show the actual RE improvements that were achieved (*e.g.*, a 1996 RE study is required to demonstrate the actual achievement of.

improvements that were planned as part of the mandated 15 percent reductions by 1996)

States and local agencies are free to devise their own RE improvement programs in concert with their Regions. Due to the nature of the RE calculation, highly-controlled source emissions will benefit most from improved RE. Selection of source categories and improvements should be based on the characteristics of an area's sources and regulatory program.

The EPA SSCD is currently exploring options for a streamlined RE Protocol applicable only to RE improvement studies. The goal of this streamlining would be a less time- and resource-intensive study designed specifically to allow RE improvements to be verified within the time frame of the 1996 RFP demonstration.

5.1.4 SIP Effectiveness

The SE is defined as the ability of the attainment plan(s) to achieve the planned emission reductions. SIP Effectiveness is estimated by comparing actual emission reductions to the projected emission reductions.

$$SE = \frac{(Baseline\ Emissions) - (Current\ Emissions)}{(Baseline\ Emissions) - (Projected\ Emissions)} \qquad (5)$$

The SE can be calculated using information gathered as part of an SSCD protocol study or from current, base year and projected emission inventory data. The SE is calculated by source category by nonattainment area.

The SE values of 100 indicate that planned SIP reductions are being met in the current year. Values above 100 signify surplus reductions in proportion to the expected reduction; values below 100 denote a shortfall. Negative values connote an absolute increase of emissions over the base year. The SE values are indicators of SIP progress; the underlying causes must be investigated separately. Figure 5-4 displays the relationship between SE and current emissions for a given baseline emission level (100 tons) and projected emission level (90 tons).

5.2 ECONOMIC INCENTIVES PROGRAMS

A full discussion of RE includes related, but different, concepts that will be applied in EPA's economic incentives programs (EIP's). *The specific types of RE discussed in this document do not apply directly to the EIP's.* These programs are mandates under the Act [see Section 182(g)(4)(B)] and EPA has proposed rules for implementing EIP's in the Federal Register (FR 11110, Vol. 58, Number 4; February 23, 1993). In general, EIP's pursue CO or ozone precursor emission reductions through

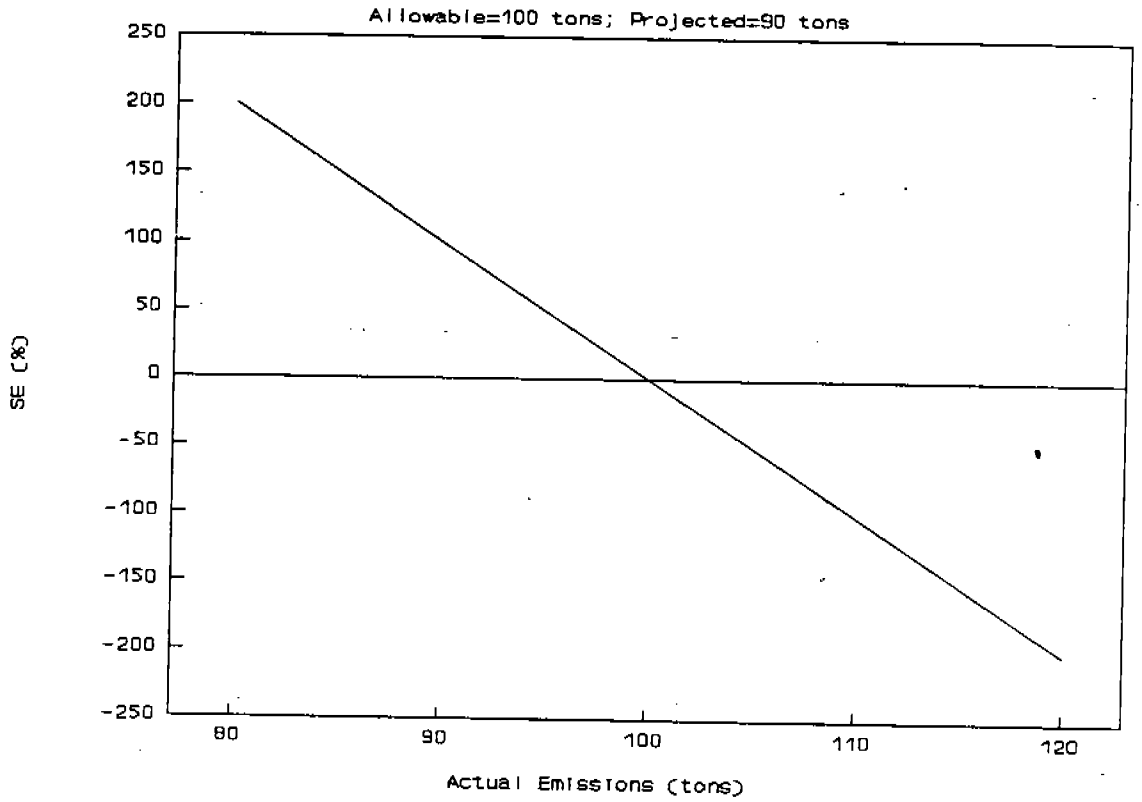

Figure 5-4. Relation of SIP effectiveness to actual emissions (baseline emissions and projected emissions held constant).

incentive-based, innovative strategies. These programs may be classified into three broad regulatory categories:

- *Emission limiting* strategies such as a marketable emission allowance program.
- *Market response* strategies that create economic incentives such as fees to reduce emissions.
- *Directionally sound* strategies such as public awareness campaigns that are conducive to emission reductions.

The first two classes may be creditable within certain restrictions toward the required 1996 and subsequent reductions; the third is not creditable. The relation to RE rests on creditability. The EIP emission reductions, like more traditional

performance standards and technological emission controls, require both an emission baseline and reduction quantifiability to be creditable. Traditional stationary source reduction strategies must account for the potential failure to meet the anticipated reductions due to noncompliance and other factors through the use of the RE factor.

5.2.1 Compliance and Programmatic Uncertainty Factors

The EIP's may also be subject to uncertainties in the actual emission reductions due to noncompliance as well as inherent quantification problems. While the first type of uncertainty, noncompliance, is typical of the traditional inventory RE concept, the second type is not. Inherent quantification difficulties have been identified as "programmatic uncertainties" and originate from the very design of certain EIP types as well as the strategies employed.

The EPA has defined two classes of programmatic uncertainty. Where market incentives are employed, it will be impossible to specify the resulting emission reduction with certainty regardless of compliance. Under this scenario, all sources could be in complete compliance with an emission fee program, for example, with no certain reduction in emissions. (*Likely* emission reductions must be in some way estimable, even with uncertainty, to be creditable.) The second type of uncertainty stems from "soft" quantification methods necessary to define compliance in some circumstances. Examples include emission caps on fugitive sources, inherently difficult to quantify, and some mobile source strategies.

The EPA has suggested that the rule compliance factor may be based on historical compliance with traditional programs as measured by inventory RE. Programmatic uncertainties may require one or more "presumptive norms" to address: 1) inexperience and uncertain techniques for strategies relying on market response, and 2) accuracy and precision in emission quantification for emission limiting strategies.

The EPA has not issued rules or guidance assessing the rule compliance factor or the two classes of programmatic uncertainty. According to EPA's proposed rules, however, State and local agencies will be required to justify whatever factors are used in the context of the design of an EIP.

5.2.2 Relation to Inventory RE

It is not EPA's intention that uncertainty associated with EIP's be added to inventory RE. Rather, the emission baseline and projection components of an EIP should be subject to the relevant EIP uncertainty factors. States and local agencies should take care to distinguish between the base year inventory for the rate-

of-progress plans and the EIP baseline. The EPA will be developing policy and guidance in this area.

5.2.3 Mobile Emission Reduction Credit Programs

Mobile emission reduction credit (MERC) program rules have also been proposed by EPA (FR 11134, Vol. 58, Number 4; February 23, 1993). The MERC programs are quite similar to the EIP concepts just discussed but apply to mobile sources. In light of the inherent uncertainty of reductions from a large, decentralized, heterogenous source population, MERC programs will be required to reflect uncertainties in compliance with and design of the program. These factors can again be labelled the rule compliance and program uncertainty factors, including 1) anti-tampering methods, 2) procedures to determine actual, remaining useful life, 3) techniques to provide unbiased measures of use among mobile sources, and 4) auditing and enforcement procedures.

APPENDIX A

CALCULATION OF RULE EFFECTIVENESS FOR EMISSIONS INVENTORIES

MEMORANDUM

SUBJECT: Calculation of Rule Effectiveness for Emissions Inventories

FROM: John S. Seitz, Director
Office of Air Quality Planning and Standards (MD-10)

TO: Director, Air, Pesticides and Toxics Management Division, Regions I and IV
Director, Air and Waste Management Division, Region II
Director, Air, Radiation and Toxics Division, Region III
Director, Air and Radiation Division, Region V
Director, Air, Pesticides and Toxics Division, Region VI
Director, Air and Toxics Division, Regions VII, VIII, and X

There has been some confusion about acceptable methods for determining rule effectiveness (RE) for 1990 base year emissions inventories and the necessary requirements for receiving emission reduction credits in 1996 for RE improvements. This memorandum clarifies the criteria that should be applied by the Regions when reviewing a State's method for assessing RE. In addition, it explains the requirement for taking credit for RE improvements in State 15 percent plans.

Review of Alternative RE Methods

In November 1992, the Environmental Protection Agency (EPA) published "Guidelines For Estimating and Applying Rule Effectiveness For Ozone/CO State Implementation Plan Base Year Inventories" (EPA-452/R-92-010). In this document, three methods for estimating RE were identified as acceptable strategies:

1. 80 Percent Default - uses an across-the-board RE presumption of 80 percent for all sources.

2. Questionnaire Approach - uses an EPA questionnaire to determine a category-specific RE value for both point sources and area sources.

3. Stationary Source Compliance Division (SSCD) Protocol Study - uses a study specific to a category in accordance with the procedure developed by SSCD.

In addition to these three methods, a fourth option was also made available in the addendum to the November 1992 guidance. This additional option gave States greater flexibility in designing an alternate method for estimating RE. The addendum outlined the following information that States should consider in alternative RE methods:

1. The overall capture and control efficiency generally available from the kind of capture and control equipment being assessed.

2. Any stack test/performance evaluation that was performed on the capture and control equipment.

3. The rated capture and control efficiency (from manufacturer's specifications or literature).

4. The kinds of activities that affect the determination of day-to-day performance of the capture and control equipment that are listed in the questionnaires contained in the guideline document (e.g., ease of determining compliance, type of control equipment, frequency and quality of inspections, and level of training of inspectors).

If a State develops an alternative RE method, it must not only account for the above information, but should also follow the basic requirements outlined in the guidelines. These include:

1. Following the sampling strategy outlined in section 2.4.2.3 of the guidelines and determining the appropriate sample size according to the method described in Appendix D. This means, for example, that if a State plans to use a modified version of the questionnaire, the following conditions should be met. At least 80 percent of the total pollutant-specific emissions (e.g., volatile organic compounds) from point sources should be covered by questionnaires and all categories representing 5 percent or greater of the pollutant-specific emissions from point sources should use the questionnaire. Both conditions (80 percent coverage of total point source pollutant emissions and every category representing 5 percent or more of the total point source pollutant emissions) should be met for the questionnaire approach. At least 10 point sources within a category should be sampled; all point sources should be sampled if there are 10 or fewer

sources in a category (see pages 20-21 and Appendix D of the guidelines for a more detailed explanation).

2. Providing the rationale for the alternate RE method (e.g., changes to the questionnaire, including why items were added or deleted and justification of changes to the weighting scheme for individual items).

When reviewing a State's alternate method for estimating RE, EPA Regions should be assured that every attempt has been made to meet the above criteria. However, there may be circumstances, such as unavailability of resources or information, that prevent a State from meeting these sampling guidelines. Any deviations from these guidelines must be approved by the Region with concurrence from Headquarters. In determining whether to approve these deviations, the Region should recognize the intent of the above sampling criteria, namely to obtain a statistically valid sample that will result in an emission estimate that is as accurate as possible.

If, based on the documentation provided by the State, a Region is unable to assess whether the alternative methodology follows the appropriate procedures, it should require the State agency to provide additional documentation. After the Regional Office has completed its review, the Region must consult with the Office of Air Quality Planning and Standards (OAQPS). Both Region and Headquarters concurrences are needed on any alternative RE method.

An alternative RE method that has already been approved by the Regional Office is exempt from any additional requirements of this memorandum.

Credit for RE Improvements

Rule effectiveness improvements must reflect actual emissions reductions resulting from specific implementation program improvements. To receive emission reduction credits for RE improvements, a State agency must document the improvements. An SSCD protocol study that meets EPA's protocol requirements must be performed to confirm that reductions have been made after the implementation of the improvement program. A State that plans to take credit for RE improvements in its 15 percent rate-of-progress plan to be submitted by November 15, 1993 must therefore commit in that plan to perform this study after implementation of the RE improvement program. Note that States that have been assuming 80 percent RE for a given rule before an RE improvement goes into effect can only receive credit for the portion of emissions reductions over the 80 percent level.

The OAQPS is currently developing guidance on how to quantify RE improvements in rate-of-progress plans. Questions on these issues may be directed to Gerri Pomerantz of the Air Quality Management Division (919-541-2317).

cc: Air Branch Chiefs, Regions I-X
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Tom Helms
Linda Lay
Marcia Mia
David Mobley
Rich Ossias
Gerri Pomerantz
Bill Repsher
John Silvasi
Henry Thomas

APPENDIX B

CORRECTION ERRATA TO THE 15 PERCENT RATE-OF-PROGRESS PLAN GUIDANCE SERIES

MEMORANDUM

SUBJECT: Correction Errata to the 15 Percent Rate-of-Progress Plan Guidance Series

FROM: G.T. Helms, Chief
Ozone and Carbon Monoxide Programs Branch (MD-15)

TO: Air Branch Chief, Regions I-X

This memorandum corrects several errors in the 15 percent rate-of-progress plan guidance series.

1. There is an error in the Table entitled, "Major Source Thresholds and Minimum Emissions Offset Ratio Requirements for Ozone Nonattainment Area Classifications," in the following 15 percent guidance documents:

- "Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate of Progress Plans" (EPA-452/R-92-005), p. A-3.
- "Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans" (EPA-452/R-93-002), p. A-3.
- "Guidance on the Relationship Between the 15 Percent Rate-of-Progress Plans and Other Provisions of the Clean Air Act" (EPA-452/R-93-007), p. 12.
- "Guidance on Preparing Enforceable Regulations and Compliance Programs for the 15 Percent Rate-of-Progress Plans" (EPA-452/R-93-005), p. A-4.

The error is in the item, "All Other Nonattainment Areas, in an Ozone Transport Region." The volatile organic compounds tons per year (tpy) should be 50 tpy rather than 100 tpy.

2. The document entitled "Guidance on the Relationship Between the 15 Percent Rate-of-Progress Plans and Other Provisions of the Clean Air Act" (EPA-452/R-93-007), has an error concerning the creditability of certain

transportation control measures. Section 5.8 of this document states the following on page 39:

> Emissions reductions resulting from TCM's are creditable if the TCM is not already federally mandated (e.g., the employee trip reduction program required under section 182(d)(1)(B) for severe and extreme ozone nonattainment areas), or is not part of an already existing SIP. As with all other emissions reductions, emissions reductions associated with TCM's are only creditable to the 15 percent rate-of-progress plan if they are quantifiable, real, enforceable, replicable, accountable, and occur by November 15, 1996.

The correction revises the first sentence of the preceding paragraph:

> Emissions reductions resulting from TCM's are creditable if the TCM was not a pre-1990 control measure in an already existing SIP. As with all other emissions reductions, emissions reductions associated with TCM's are only creditable to the 15 percent rate-of-progress plan if they are quantifiable, real, enforceable, replicable, accountable, and occur by November 15, 1996.

3. In the document, "Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans" (EPA-452/R-93-002, March 1993), there are several errors in Chapter 6.

a. On page 55, the text under the table, last sentence, "The [(200-RE_{PY})/100] factor is not valid for low RE values" is incorrect and should be deleted.

b. On page 57, the sentence before the heading, "Equation 5 - Projection calculated from permitted emissions rates," ("The [(200 - RE)/100] factor is not valid for low RE values") is incorrect and should be deleted.

c. On page 57, the second and third paragraphs under the heading, "Equation 5 - Projection calculated from permitted emissions rates," should read as follows:

The equation for projecting emissions in this case is:

$$EMIS_{PY} = ER_{PY} * \left[\frac{\left[\frac{(200 - RE_{PY})}{100}\right]}{\left[\frac{(200 - RE_{BY})}{100}\right]} \right] * \left[\frac{EMIS_{BY,O}}{EMIS_{BY,Annual}} \right] \quad (5)$$

where:

$EMIS_{PY}$	=	Projection year emissions ozone season typical weekday (mass of pollutant/day)
ER_{PY}	=	Projection year annual emissions cap (mass of pollutant/year)
RE_{BY}	=	Base year RE (percent)
RE_{PY}	=	Projection year RE (percent)
$EMIS_{BY,O}$	=	Base year ozone season typical weekday emissions (mass of pollutant/day)
$EMIS_{BY,Annual}$	=	Base year annual emissions (mass of pollutant/year)

The factor $EMIS_{BY,O}/EMIS_{BY,Annual}$ converts the long-term annual emissions cap to an ozone season typical weekday emissions cap using the ratio of base year ozone season typical weekday to annual emissions. Note that the mass units (i.e., tons, pounds) must be equivalent in both terms. These projections must also account for RE. The factor, "[(200 - RE)/100]," adjusts emissions for RE. See the explanation under equation (2) for additional information about this factor.

d. On page 65 under: "6. Mass Emissions Limit-Based Permits," the second and third paragraphs should be replaced with the following:

The long-term annual limits will be used for emissions projections since these are more representative of expected rather than maximum activity. These limits must be converted to reflect ozone season typical weekday conditions. Annual limits are converted using the ratio of base year ozone season emissions to base year annual emissions.

Base Year Operating Conditions

Ozone season emissions	= 150 lb/day = 0.075 tons/day
Annual emissions	= 23 tpy
RE	= 80%

Projection Year Conditions

Current permit	= 30 tpy
RE	= 80%

Equation (5) is used to calculate projection year emissions as follows:

$$EMIS_{PY} = ER_{PY} * \left[\frac{\left[\frac{(200 - RE_{PY})}{100}\right]}{\left[\frac{(200 - RE_{BY})}{100}\right]} \right] * \left[\frac{EMIS_{BY,O}}{EMIS_{BY,Annual}} \right] \qquad (5)$$

$$EMIS_{PY} = 30 * \left[\frac{\left[\frac{(200 - 80)}{100}\right]}{\left[\frac{(200 - 80)}{100}\right]} \right] * \left[\frac{0.075}{23}\right] = 0.098 \ tons/day = 196 \ lb/day$$

Please share this information with your State and local air pollution control agencies. Any questions about these corrections may be addressed to Kimber Scavo at (919) 541-3354 or Laurel Schultz at (919) 541-5511.

cc: William Becker, STAPPA/ALAPCO
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APPENDIX C

RE IMPROVEMENTS MATRIX

Expected Rule Effectiveness Improvements From Various Measures For Point Source And Area Source Categories

Category/Measure	Weights (X)	Current Percent of Emissions (Y)	X * Y	Future Percent of Emissions (Z)	X * Z
A. TRAINING OF PLANT OPERATORS[1]	G(A)= 20				
Percent of emissions* from sources covered by a regulation or permit that:					
1. Require formal operator introductory training course of:	$G(A_1)$= 9				
a. More than 80 hours	10				
b. 41-80 hours	8				
c. 25-40 hours	5				
d. 24 hours or less	2				
e. On job training only	1				
Total					
2. Require operators to take refresher training annually of:	$G(A_2)$= 7				
a. More than 80 hours	10				
b. 41-80 hours	8				
c. 25-40 hours	5				
d. 24 hours or less	1				
e. On job training only	1				
Total					
3. Require appraisal and update of training program:	$G(A_3)$= 4				
a. Annually	10				
b. Every 1-3 years	7				
c. Every 4 or more years	2				
d. Never or don't know	1				
Total					

* Emissions are actual emissions from sources without control devices and uncontrolled emissions from sources with control devices.

[1] Plant Operator is the person with direct control over the emission source or process.

(CONTINUED)

Category/Measure	Weights (X)	Current Percent (Y)	X * Y	Future Percent (Z)	X * Z
B. INSPECTOR TRAINING	G(B) = 20				
Percent of inspectors who receive:					
1. Formal inspector introductory courses (EPA sponsored or similar) of:	$G(B_1)$ = 9				
a. More than 80 hours	10				
b. 41-80 hours	1				
c. 25-40 hours	1				
d. 24 hours or less	1				
e. On job training only	1				
Total					
2. Receive source-specific, inspector-refresher course with annual hours averaging:	$G(B_2)$ = 6				
a. More than 80 hours	10				
b. 41-80 hours	8				
c. 25-40 hours	6				
d. 24 hours or less	1				
e. No refresher training	1				
Total					
3. Frequency with which appraisal and update training program is held for inspectors	$G(B_3)$ = 5				
a. Less than every six months	10				
b. Every six months to a year	7				
c. Every year to two years	1				
d. Every two to three years	1				
e. Every three to five years	1				
f. No annual refresher training	1				
Total					

Category/Measure	Weights (X)	Current Situation*	Current Value X * 1	Future Situation*	Future Value X * 1
C. EDUCATIONAL OPPORTUNITIES FOR SOURCE	G(C)= 12				
1. Frequency in years of workshops held by regulatory authority for industry on regulatory requirements	$G(C_1)$= 6				
a. Every six months or more frequently	10				
b. Every six months to a year	8				
c. Every year to two years	6				
d. Every two to three years	4				
e. Every three to five years	☐ 1				
f. More than every five years	1				
Total					
2. Frequency in years with which information packages on regulatory requirements are sent by the regulatory authority to sources	$G(C_2)$= 6				
a. Every six months or more frequently	10				
b. Every six months to a year	8				
c. Every year to two years	4				
d. Every two to three years	☐ 1				
e. Every three to five years	1				
f. More than every five years	1				
Total					

* Percent is not applicable. Please check the box that applies.

Category/Measure	Weights (X)	Current Percent of Emissions (Y)	X * Y	Future Percent of Emissions (Z)	X * Z
D. PROCEDURES FOR OPERATION AND MAINTENANCE (O&M) OF CONTROL AND/OR PROCESS EQUIPMENT	G(D) = 20				
Percent of emissions* from sources covered by a regulation or permit that:					
a. Have equipment operators follow and sign daily O&M instructions	10				
b. Have equipment operators follow daily written instructions for O&M	8				
c. Have equipment operators follow daily or weekly established O&M routine	4				
d. Maintain and operate control or process equipment but on no specific schedule	1				
e. No mention of O&M control or process equipment in the permit or regulation	1				
Total					
E. CLARITY OF TESTING PROCEDURES AND SCHEDULES	G(E) = 17				
Percent of emissions* from sources that have in place under permit or regulation:					
a. Specific guidelines on testing and test method requirements and schedule of required testing frequency	10				
b. Specific guidelines on testing and test method requirements but no schedule of required testing frequency	1				
c. General guidance on testing and/or testing frequency	1				
d. No guidance on testing and/or testing frequency	1				
Total					

* Emissions are actual emissions from sources without control devices and uncontrolled emissions from sources with control devices.

Category/Measure	Weights (X)	Current Situation*	Current Value X * 1	Future Situation*	Future Value X * 1
F. RULE EFFECTIVENESS EVALUATION PROGRAM	G(F)= 8				
1. Highest level of category-specific rule monitoring and evaluation:	$G(F_1)$= 4				
a. SSCD protocol study	10				
b. Other rule evaluation	1				
c. No rule evaluations after rule is implemented	1				
Total					
2. Highest level of follow-up from rule monitoring and evaluation:	$G(F_2)$= 4				
a. Rule corrections made based on SSCD protocol study result	10				
b. Rule corrections made based on other rule evaluations	1				
c. No follow-up	1				
Total					

* Percent is not applicable. Please check the box that applies.

Category/Measure	Weights (X)	Current Percent of Emissions (Y)	X * Y	Future Percent of Emissions (Z)	X * Z
G. MONITORING	G(G)= 25				
1. Percent of emissions* from sources covered by a regulation or permit that:	$G(G_1)$= 15				
a. Require source specific enhanced monitoring procedures with a detailed self-evaluation schedule and use these data for compliance purposes	10				
b. Require source specific monitoring procedures with a detailed self-evaluation schedule and use these data as an indicator of compliance only	5				
c. Give general guidance on source specific enhanced monitoring	1				
d. Do not contain source specific guidance on enhanced monitoring	1				
Total					
2. Percent of emissions* from sources covered by a regulation or permit which file enhanced monitoring records with regulatory authority	$G(G_2)$= 10				
a. Every 4 months or more frequently	10				
b. Every 4-6 months	9				
c. Annually or less frequently	4				
d. Monitoring is required by the rule but reports are not submitted to the regulatory authority	1				
e. Monitoring is not performed	1				
Total					

* Emissions are actual emissions from sources without control devices and uncontrolled emissions from sources with control devices.

Category/Measure	Weights (X)	Current Percent of Emissions (Y)	X * Y	Future Percent of Emissions (Z)	X * Z
H. TYPE OF INSPECTION	G(H)= 21				
Percent of emissions* from sources covered by a regulation or permit in the category receiving Level 0 through Level 4 inspections (as referenced in the Act Compliance/Enforcement Guidance Manual 1986 (attached))					
a. Level 4: stack testing	10				
b. Level 3: detailed engineering analysis of process parameters, internal inspection of control and/or process devices	8				
c. Level 2: review of records	1				
d. Level 1: visual inspection, opacity check	1				
e. Level 0: "drive by"	1				
Total					

* Emissions are actual emissions from sources without control devices and uncontrolled emissions from sources with control devices.

Category/Measure	Weights (X)	Current Situation*	Current Value X * 1	Future Situation*	Future Value X * 1
I. Administrative Authority - Prison	G(I)= 8				
Highest level of punishment the regulatory authority may impose for noncompliance and/or blatant violation of environmental laws.					
Prison sentence of:					
a. Greater than 10 years	10				
b. 5 - 10 years	9				
c. 2 - 5 years	8				
d. 6 months to 2 years	5				
e. Up to 6 months	3				
f. No authority	1				
Total					

* Percent is not applicable. Please check the box that applies.

Category/Measure	Weights (X)	Current Situation*	Current Value X * 1	Future Situation*	Future Value X * 1
J. Administrative Authority - Fines	G(J)= 14				
Highest level of fines the regulatory authority may impose for noncompliance and/or blatant violation of environmental laws.					
1. No court action required	$G(J_1)$= 8				
a. > $25,000 per day per violation	10				
b. $10,000 - $25,000 per day per violation	7				
c. $1,000 - $10,000 per day per violation	5				
d. $1,000 per month to $1,000 per day	1				
e. Up to $1,000 per month	1				
f. No authority to pursue fines	1				
Total					
2. Court action required	$G(J_2)$= 6				
a. > $25,000 per day per violation	10				
b. $10,000 - $25,000 per day per violation	7				
c. $1,000 - $10,000 per day per violation	4				
d. $1,000 per month, up to $1,000 per day	1				
e. Up to $1,000 per month	1				
f. No authority to pursue fines	1				
Total					

* Percent is not applicable. Please check the box that applies.

Category/Measure	Weights (X)	Current Situation*	Current Value X * 1	Future Situation*	Future Value X * 1
K. ADMINISTRATIVE AUTHORITY - CITATIONS	G(K)= 11				
Highest level of citation the regulatory authority may impose for noncompliance and/or blatant violation of environmental laws.					
a. $1,000 - $5,000 per day	10				
b. $500 - $1,000 per day	1				
c. Up to $500 per day	1				
d. No field citation authority	1				
Total					

* Percent is not applicable. Please check the box that applies.

Category/Measure	Weights (X)	Current Percent of Emissions (Y)	X * Y	Future Percent of Emissions (Z)	X * Z
L. MEDIA PUBLICITY OF ENFORCEMENT ACTION	G(L) = 9				
Percent of notices of violation receiving publicity in local newspaper or TV news within 2 months of issuance					
Total					
M. FOLLOW-UP INSPECTIONS	G(M) = 17				
Percent of non-complying sources that received follow-up inspections					
a. Within 30 days of NOV	10				
b. Within 30 - 60 days of NOV	1				
c. Within 60 or more days of NOV	1				
d. No follow-up inspection or don't know	1				
Total					

APPENDIX D

GLOSSARY

GLOSSARY

This glossary provides the specific definitions of EPA terms as they are used in this guidance. Different EPA programs sometimes use different definitions of the same term. Where possible these conflicts are noted. These definitions are presented for the purposes of this guidance document only; the reader is advised to refer to specific regulations, policies, and sections of the Act to obtain complete definitions for the program or title of interest.

Actual Emissions: The product of an actual emission rate for a current year (based on known physical characteristics), the actual operating rate ("throughput") and the actual operating schedule for the process. Actual emissions are frequently referred to as estimated emissions.

Adjusted Base Year Inventory: Section 182 (b)(1)(B) and (D) describes the inventory (hereafter referred to as the adjusted base year inventory) from which moderate and above ozone nonattainment areas must achieve a 15 percent reduction in VOC emissions by 1996. This inventory is equal to "the total amount of actual VOC or NO_x emissions from all anthropogenic (man-made) sources in the area during the calendar year of enactment," excluding the emissions that would be eliminated by Federal Motor Vehicle Control Program (FMVCP) regulations promulgated by January 1, 1990 and Reid vapor pressure (RVP) regulations (55 FR 23666, June 11, 1990), which require specific maximum RVP levels for gasoline in particular nonattainment areas during the peak ozone season. The 1990 rate-of-progress base year inventory (defined below) removes biogenic emissions and emissions from sources listed in the base year inventory that are located outside of the nonattainment area. The adjusted base year inventory removes the emissions reductions from the FMVCP and RVP program from the 1990 rate-of-progress base year inventory. The adjusted base year inventory, which was due by November 15, 1992, is used to calculate the required 15 percent reductions.

Adjusted Base Year Emissions Inventory = Base Year Emissions Inventory, minus the following:

- Biogenic source emissions
- Emissions from sources outside of the nonattainment area boundary
- Emissions reductions from the FMVCP
- Emissions reductions from the RVP rules

Aerometric Information Retrieval System (AIRS): A computer-based repository of information about airborne pollution in the United States. The system is administered by EPA's National Air Data

Branch (NADB) in the Office of Air Quality Planning and Standards (OAQPS). Point source emissions data will be stored on the AIRS Facility Subsystem (AFS). Area and mobile source emissions data will be stored on the AIRS Area and Mobile Sources Subsystem (AMS).

Allowable Emissions: The product of an enforceable emissions rate, the anticipated operating rate or activity level and the anticipated operating schedule. Allowable emissions are not based on the maximum worst case condition of operations at full load (8760 hours/year), but are calculated using the anticipated operating rate and the maximum allowable emission rate.

Anti-Tampering Programs: Mobile source emission control programs providing periodic inspections of vehicles to detect damage to, disabling of or removal of emission controls.

Area Source: Any stationary or non-road source that is too small and/or too numerous to be included in the stationary point-source emissions inventories.

Base Year Inventory: The base year inventory is an inventory of actual annual and weekday peak ozone season emissions that States use in calculating their adjusted and projected inventories, and in developing their control strategy. The base year inventory comprises emissions for the area during the peak ozone season, which is generally the summer months. It includes anthropogenic sources of NO_x and CO emissions, and both anthropogenic and biogenic sources of VOC emissions. Also included in the inventory are emissions from all stationary point sources and area sources as well as highway and nonhighway mobile sources located within the nonattainment area, and stationary sources with emissions of 100 tpy or greater of VOC, NO_x, and CO emissions within a 25-mile wide buffer zone of the designated nonattainment area. The base year inventory contains off-shore sources located within the nonattainment area boundaries and off-shore stationary sources with emissions of 100 tpy or greater of VOC, NO_x, or CO emissions within the 25-mile wide buffer area. For nonattainment areas that will perform photochemical grid modeling (e.g., serious and above areas and multi-State moderate areas), emissions for the entire modeling domain, which is usually larger than the nonattainment area because ozone is an area-wide problem, are required in the modeling inventory. This modeling inventory could be submitted with the base year inventory, or the modeling inventory submittal could be in a separate package. It is important to note that the 1990 base year inventory serves as the starting point for all other inventories.

Glossary (continued)

Clean Air Act as Amended in 1990 (Act): The Act was passed by Congress in October 1990 and signed into law by President Bush on November 15, 1990. November 15, 1990 is considered the date of enactment of the Act. Title I of the Act addresses the topic of NAAQS nonattainment, including standards for ozone and CO.

Compliance Effectiveness (CE): A determination made to evaluate the compliance (or noncompliance) of a particular source category in a single geographic area using the SSCD Protocol Study approach. The calculation of CE is strictly the relationship between actual and allowable emissions at the time of the evaluation.

Creditable Emission Reductions: In developing the 15 percent reduction control strategy required to be submitted as a SIP revision, States must keep in mind that the 1990 Act explicitly disallowed certain reductions from counting toward fulfilling the 15 percent reduction in emissions requirement. All emission reductions from State or Federal programs are creditable toward the 15 percent progress requirement except the following:

1. The FMVCP tailpipe or evaporative standards promulgated prior to 1990.
2. Federal regulations on RVP promulgated by November 15, 1990, or required under section 211 (h).
3. State regulations required under section 182 (a)(2)(A) submitted to correct deficiencies in existing VOC RACT regulations or previously required RACT rules.
4. State regulations required under section 182 (a)(2)(B) submitted to correct deficiencies in existing I/M programs or previously required I/M programs.

Current Year Emission Inventory: The most current year emissions, typically referenced to determine progress towards emission reductions. Base year refers to the original baseline inventory, typically 1990.

Economic Incentives Programs (EIP's): Programs mandated under the Act [see Section 182(g)(4)(B)]. EPA has also proposed rules for implementing EIP's in the Federal Register (FR 11110, Vol. 58, Number 4; February 23, 1993) to pursue CO or ozone precursor emission reductions through incentive-based, innovative strategies. These programs may be classified into three broad regulatory categories: emission limiting strategies, market response strategies, and directionally sound strategies.

Emission Inventory: A compilation of information relating to sources of pollutant emissions, including location, quantity of emissions, number and type of control devices, stack dimensions and gas flow rates, and additional pertinent details.

Glossary (continued)

Highly Controlled Source: Sources with control efficiencies in excess of 95 percent. Emissions may appear to be artificially inflated by RE and can negatively impact air quality modeling analyses.

Inspection and Maintenance (I/M): Programs requiring the inspection of vehicles including, but not limited to, measurement of tailpipe emissions, and mandating that vehicles with tailpipe emissions higher than the program cutpoints be repaired to pass a tailpipe emissions retest. Basic I/M programs must be at least as stringent as the requirements set out in Act Section 182(a)(2)(B).

Inventory RE: For stationary sources, a measure of the extent to which a regulatory program achieves emissions reductions. An RE of 100 percent reflects a regulatory program achieving all the emissions reductions that could be achieved by full compliance with the applicable regulations at all sources at all times. However, regulations typically are not 100 percent effective due to limitations of control techniques or shortcomings in the implementation and enforcement process. The EPA allows the use of four different methods for determining RE: an 80 percent default value; results from EPA questionnaires; results from a Stationary Source Compliance Division (SSCD) study; and results from an EPA-approved alternate RE method. Inventory RE applies to all base year and projected emission inventories.

Mobile Source: Any moving source of air pollutants, such as automobiles, vessels, locomotives, aircraft, etc.

1996 Target Level of Emissions: The 1996 target level of emissions is the maximum amount of ozone season VOC emissions that can be emitted by an ozone nonattainment area in 1996 for that nonattainment area to be in compliance with the 15 percent rate-of-progress requirements. It is calculated by adding 15 percent of the adjusted base year inventory emissions to the expected emissions reductions due to the FMVCP and RVP program, and from corrections to any deficient RACT rules and I/M programs. The summation of the 15 percent, the expected reductions from deficient I/M and RACT programs, and reductions from the FMVCP and RVP program is then subtracted from the 1990 rate-of-progress base year inventory to arrive at the 1996 target level of emissions. This target is used by States to design their 15 percent VOC emissions reduction control strategies. The projected control strategy inventory used in the rate-of-progress plan must be at or below the 1996 target level of emissions to demonstrate that the 15 percent VOC emissions reduction will be accomplished.

Glossary (continued)

1996 Target Level of Emissions = Rate-of-Progress Base Year Inventory, minus the following

- 15 percent of the adjusted base year inventory emissions
- Emissions reductions from corrections to any deficient RACT rules
- Emissions reductions from corrections to deficient I/M programs
- Emissions reductions from the pre-1990 FMVCP
- Emissions reductions from RVP rules

Peak Ozone Season: The contiguous 3-month period of the year during which the highest ozone exceedance days have occurred over the 3 to 4 years prior to the 1990 base year. Most ozone nonattainment areas have a peak ozone season lasting from June through August.

Physical Control: An emissions control device such as an incinerator or carbon adsorber used to reduce emissions from a process.

Point Source: Any stationary source that has the potential to emit more than some specified threshold level of a pollutant or is identified as an individual source in a State's emissions inventory. For base year SIP inventory purposes, point sources are defined as sources emitting 10 tpy or more of VOC emissions or 100 tpy or more of NO_x or CO emissions.

Rate of Progress Base Year Inventory: An accounting of all anthropogenic VOC, CO, and NO_x emissions in the nonattainment area. This emissions inventory is calculated by removing biogenic emissions and the emissions from sources that are located outside of the nonattainment area from the base year inventory. This inventory is used in developing the adjusted base year inventory. It is also used as the basis from which to calculate the 1996 target level of emissions.

Rate-of-Progress Plan: The portion of the SIP revision due by November 15, 1993, that describes how moderate and above ozone nonattainment areas plan to achieve the 15 percent VOC emissions reduction. All moderate intrastate areas that choose to utilize the Empirical Kinetic Modeling Application (EKMA) in their attainment demonstration are also required to include their attainment demonstration in this SIP revision.

Reasonably Available Control Technology (RACT): Reasonably available control technology is defined as the lowest emissions limit that a particular source is capable of meeting by the

application of control technology that is reasonably available considering technical and economic feasibility.

Regulatory Emission Limit: Emission limits implemented through regulatory means, such as a limit on the pounds VOC per gallon coating.

Rule Effectiveness (RE): A generic term for identifying and estimating the uncertainties in emission estimates caused by failures and uncertainties in emission control programs. Literally, it is the extent to which a rule achieves the desired emission reductions. Inventory RE applies to specific applications in SIP inventories.

Rule Effectiveness Improvement: An improvement in the implementation of a rule for a regulatory program. It refers to a quantitative reduction in emissions due to the implementation of improvement measures. RE improvements may be creditable towards the 15 percent emission reduction target.

Rule Effectiveness Improvement Measure: Any specific change to rule implementation, compliance, enforcement or the rule itself designed to improve the effectiveness of one or more emission control rules and to result in overall emission reductions.

Rule Effectiveness Questionnaire: A questionnaire approach to quantifying base year RE for both point and area sources. The questionnaires were developed by the OAQPS Air Quality Management Division to provide an alternative procedure to an SSCD protocol study to determine inventory RE.

Rule Penetration: The extent to which a regulation covers a complete source category (i.e., less than 100 percent rule penetration indicates that some sources within a category are not covered by the rule).

SSCD Protocol Study: National protocol of criteria and procedures for conducting rule effectiveness studies as defined by the Stationary Source Compliance Division at OAQPS. Primarily it is a compliance tool to evaluate the extent to which rules actually achieve desired emission reductions. Results may be used for inventory RE and SIP effectiveness calculations as well.

Source Category: Any group of similar sources. For instance, all residential dwelling units would constitute a source category.

State Implementation Plan (SIP) Effectiveness (SE): The ability of the attainment plan(s) to achieve the planned emission reductions. SIP Effectiveness is estimated by comparing actual emission reductions to the projected emission reductions.

Glossary (continued)

State Implementation Plan (SIP) Inventories: Emissions inventories required as part of the overall State implementation plan for achieving the National Ambient Air Quality Standards. States are required under the Clean Air Act to submit these plans to the U.S. Environmental Protection Agency.

Volatile Organic Compound: Any compound of carbon, excluding CO, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. This includes any organic compound other than those EPA has determined to have negligible photochemical reactivity. (Federal Register 3945, February 3, 1992.)