BOARD MEETING DATE: October 20, 2000 AGENDA NO. 40

REPORT: Public Hearing to Ratify Findings Required by Health and Safety Code Section 39616(e) Pertaining to the RECLAIM Program

SYNOPSIS: Health and Safety Code Section 39616(e) requires the Board to again ratify findings that, relative to the subsumed rules and control measures, RECLAIM (1) achieves equivalent or greater emission reductions at equivalent or less cost, (2) has comparable enforcement and monitoring, (3) does not delay attainment with California ambient air quality standards, (4) allows the use of emissions reduction from other sources such as mobile and area sources, and (5) promotes privatization of compliance and electronic availability of data. Staff has prepared a technical report addressing program implementation over the past six years to assist the Governing Board in its assessment of the program. The report includes data regarding emission reductions, ambient air quality status, program costs, and monitoring and enforcement.

COMMITTEE: Stationary Source, August 25, 2000, Reviewed.

RECOMMENDED ACTION:

1. Receive and approve the attached report; and

2. Adopt the attached resolution ratifying the identified findings in Health and Safety Code Sections 39616(c)(1), (2), (5), and (6), and 40440.1.

Barry R. Wallerstein, D. Env.
Executive Officer

CC:CM:DL:MH:scs

Background

The AQMD Governing Board adopted the Regional Clean Air Incentives Market (RECLAIM) program on October 15, 1993 with the goal of providing facilities with

added flexibility in meeting emission reductions requirements while lowering the cost of compliance. RECLAIM was designed to meet all state and federal requirements for clean air programs and a variety of performance criteria to ensure protection of public health, air quality improvement, effective enforcement, implementation costs, and minimal job impacts.

RECLAIM regulates emissions on a mass basis rather than limiting emission rates. The goal of RECLAIM is to provide facilities with added flexibility in meeting emission reduction requirements while lowering the cost of compliance. This is accomplished by establishing annual facility-specific emission reduction targets (i.e., allocations) without being prescriptive regarding the method of attaining compliance with the targets. Total allocations are reduced each year from 1994 through 2003 to achieve equivalent emissions reductions as would have been achieved through implementation of the rules and 1991 AQMP control measures subsumed by RECLAIM (allocations remain constant after 2003). Each facility may determine for itself the most cost-effective approach to reducing emissions, including purchasing emission credits from facilities which reduce emissions below their target levels. Facilities which are able to reduce their annual emissions below their allocation levels have the option to sell the excess portion of their allocations to facilities which have a need for additional allocations. Rigorous emissions monitoring and recordkeeping is essential to ensure compliance with RECLAIM's emissions requirements. Highly accurate emissions monitoring equipment (e.g., continuous emissions monitoring systems or CEMS) is required for determining emissions from the sources accounting for approximately eighty percent of RECLAIM emissions. In addition, sources are required to maintain daily, monthly, and quarterly emissions records and to reconcile their emissions with their allocations on a quarterly basis.

RECLAIM represents a significant departure from traditional command-and-control regulations. Therefore, pursuant to Health and Safety Code §39616, the Governing Board made a variety of findings regarding the program's projected performance during the Public Hearing at which RECLAIM was adopted. Health and Safety Code §39616(e) directs the Governing Board to ratify certain of these findings within seven years of adoption. These findings pertain to achieving equivalent or greater emissions reductions at equivalent or less cost, providing a level of enforcement and monitoring to ensure compliance with emission reduction requirements, promoting privatization of compliance and the availability of data in computer format, achieving emission reductions across a spectrum of sources including mobile, area, and stationary sources, and achieving timely compliance with state ambient air quality standards.

Staff previously prepared an audit report covering the first three years of program implementation (Three-Year Report) in collaboration with a variety of interested parties, as well as individual reports for each of the first five years of RECLAIM. The attached report builds on the work done in preparing the Three-Year Report and incorporates data

collected since the Three-Year Report was prepared. In addition to addressing the findings requiring ratification pursuant to Health & Safety Code §39616(e), the attached report includes a chapter addressing various issues such as the cost of RECLAIM Trading Credits and RECLAIM facilities with emissions below four tons per year.

The Governing Board commenced public hearings regarding ratification of these findings at its May 1998 meeting as part of the hearing regarding the Three-Year Report. Staff has subsequently held three public consultation meetings to distribute information to RECLAIM participants and interested parties and to seek comment and input.

Report Findings

The attached report addresses each of the above-identified findings which the Governing Board is directed to ratify by California Health & Safety Code §39616(e). The report findings are summarized below:

- The 1991 Air Quality Management Plan (AQMP) was designed to achieve its targeted emissions reductions by 2010. RECLAIM was designed to reduce collective emissions from the sources subject to the program to the same endpoint mass emissions they would have achieved through implementation of the control measures in the 1991 AQMP by 2003. RECLAIM emissions have been below the emissions allocations each year since the beginning of the program. Thus, RECLAIM is on track to achieve equivalent emissions reductions as would have resulted from continued implementation of the subsumed rules and control measures. [§39616(c)(1)]

- Adequate control technology and opportunities for further emissions reductions have been shown to exist for RECLAIM participants to collectively achieve their emissions goals for 2003. [§39616(c)(1)]

- The main costs of complying with RECLAIM are monitoring, reporting, and recordkeeping (MRR) costs; equipment and installation costs; and administrative costs. These cost factors under RECLAIM have continued to stay below those costs projected at the time of adoption. Current projections of the cost to install the necessary controls to achieve compliance with 2003 allocations are below the projections made at the time RECLAIM was adopted. [§39616(c)(1)]

- Continuous emissions monitoring systems (CEMS) are the most accurate and reliable equipment for real time monitoring of emissions. RECLAIM requires the use of mass CEMS on all major sources, which represent the vast majority of RECLAIM emissions. The subsumed rules and control measures required the use of far fewer CEMS, and most of those measured emissions concentration rather than mass. RECLAIM also includes detailed monitoring requirements for non-major sources and requires electronic reporting of emissions on a daily, monthly, or quarterly basis depending on

the emission potential of the source. The inspection and enforcement program under RECLAIM is more structured and regular than under the subsumed rules and control measures. Overall, RECLAIM's MRR and enforcement requirements are more rigorous and provide more accurate and complete data than the corresponding requirements of the subsumed rules and control measures. [§39616(c)(2)]

- RECLAIM has successfully promoted, and even required, privatization of compliance and the availability of electronic data. For example, periodic third-party source tests are required for large NOx sources, relative accuracy source tests are required for CEMS, and RECLAIM includes daily, monthly, and quarterly electronic emissions reporting. Furthermore, AQMD is committed to amending RECLAIM's MRR requirements to allow the use of electronic alternatives to strip chart recorders. The proposed rule amendment is currently targeted for March 2001. [§39616(c)(5)]

- RECLAIM provides for trading of emissions reductions from a variety of non-RECLAIM sources, including Emission Reduction Credits (ERC), and emission credits generated pursuant to Regulation XVI - Mobile Source Offset Programs or pursuant to Rule 2506 - Area Source Credits for NOx and SOx. Additionally, it may become possible to generate emission credits for use in RECLAIM through the Air Quality Investment Program (Rule 2501) and/or the Intercredit Trading Program (currently under development). [§40440.1]

- Per capita exposure to ozone in the South Coast Air Basin met the target reductions specified for year 2000 in Health and Safety Code §40920(c) several years ahead of schedule. Additionally, RECLAIM is still on target to achieve the same emissions reductions as was projected to result from implementation of the subsumed rules and control measures. RECLAIM's reductions are also more certain than the projected reductions from the subsumed rules and control measures. Thus, RECLAIM is not delaying attainment with state ambient air quality standards. [§39616(c)(6)]

AQMD staff will continue to monitor and assess the performance of the RECLAIM program and work closely with RECLAIM participants to ensure continued program success.

Attachment
Review of RECLAIM Findings

ATTACHMENT A

RESOLUTION NO. 2000-

A Resolution of the South Coast Air Quality Management District (AQMD) Governing Board ratifying the findings required pursuant to Health and Safety Code §39616(c)(1), (2), (5), and (6) and §40440.1

WHEREAS, the AQMD Governing Board finds that RECLAIM allocations were designed to achieve the emissions levels projected to result from implementation of the rules and control measures subsumed by RECLAIM. Aggregate actual RECLAIM emissions have consistently remained below total RECLAIM allocations, demonstrating that RECLAIM remains on track to achieve mass emissions levels equivalent compared to continued implementation of the rules and control measures subsumed by RECLAIM [§39616(c)(1)]; and

WHEREAS, the AQMD Governing Board finds that the average annual cost of implementing the rules and control measures subsumed by RECLAIM was projected to be significantly higher than the average annual cost for implementing RECLAIM when RECLAIM was adopted in 1993. Actual implementation costs for RECLAIM have been markedly lower than projected. RECLAIM program costs have been lower than projected aggregate program costs for the rules and control measures subsumed by RECLAIM [§39616(c)(1)]; and

WHEREAS, the AQMD Governing Board finds that RECLAIM requires more frequent and more accurate monitoring than would have been required by the rules and control measures subsumed by RECLAIM. This includes the majority of

RECLAIM emissions being continuously monitored on a mass basis by continuous emissions monitoring systems. RECLAIM also requires more frequent and more complete emissions reports, with the majority of emissions reported electronically on a daily basis and the remainder reported electronically on a monthly or quarterly basis. RECLAIM facilities are also required to maintain on-site records of their emissions reports as well as the underlying data used to quantify the emissions for three years. RECLAIM's monitoring, reporting, and recordkeeping requirements are more stringent than those of the rules and control measures subsumed by RECLAIM. Therefore, RECLAIM provides a level of monitoring comparable to or better than command and control measures [§39616(c)(2)]; and

WHEREAS, the AQMD Governing Board finds that each RECLAIM facility's reported emissions are audited after each compliance year, helping the facilities identify and correct compliance problems. Additionally, each RECLAIM facility has been inspected at least once per year since RECLAIM commenced, with inspections even more frequent during the early years of the program. This inspection regimen has helped RECLAIM facilities maintain a high level of compliance overall. The auditing and inspection procedures under RECLAIM are much more structured, uniform, and complete than under the rules and control measures subsumed by RECLAIM. Additionally, RECLAIM's inspection and enforcement program has been adequate to ensure a high level of compliance with the program's requirements. Therefore, RECLAIM provides a level of enforcement comparable or better than would have resulted under command and control measures [§39616(c)(2)]; and

WHEREAS, the AQMD Governing Board finds that RECLAIM promotes privatization of compliance through a variety of mechanisms. For example, privatization has occurred in the areas of CEMS installation and certification, source testing, and emissions reporting [§39616(c)(5)]; and

WHEREAS, the AQMD Governing Board finds that the provisions of RECLAIM require electronic reporting of emissions data and CEMS status on a daily, monthly, and quarterly basis. To a large extent, emissions determination, reporting, and recordkeeping are all being performed automatically by computers such that RECLAIM promotes the availability of data in computer format [§39616(c)(5)]; and

WHEREAS, the AQMD Governing Board finds that the Board has adopted rules providing for trading of emissions reductions from a wide variety of sources, including mobile sources (Regulation XVI - Mobile Source Offset Programs) and area sources (Rule 2506 - Area Source Credits for NOx and SOx) for use in RECLAIM and that the AQMD therefore complies with Health and Safety Code Section 40440.1; and

WHEREAS, the AQMD Governing Board finds that Health & Safety Code Section 40920(c) requires emissions reductions "sufficient to reduce overall population exposure to ambient pollutant levels in excess of the standard by at least 25 percent by December 31, 1994, 40 percent by December 31, 1997, and 50 percent by December 31, 2000" relative to a 1986-1988 baseline. The South Coast Air Basin has been successful at achieving these reductions in population exposure well ahead of schedule: the South Coast Air Basin overall and Los Angeles and Orange Counties had achieved compliance with the 2000 target by 1994, San Bernardino County achieved compliance with the 2000 target in 1995, and Riverside County achieved compliance with the 2000 target in 1996 [§39616(c)(6)]; and

WHEREAS, the AQMD Governing Board finds that the rules and control measures subsumed by RECLAIM were designed to achieve their collective mass emissions levels by 2010 while RECLAIM calls for the corresponding mass emissions levels by 2003. The mass emissions levels called for by RECLAIM are also more certain than those called for the rules and control measures it subsumed because RECLAIM specifies reductions on a mass basis rather than in terms of concentration or

mass per unit of production or fuel use. RECLAIM is helping bring the South Coast Air Basin into attainment with state ambient air quality standards and is not in any manner causing any delay in achieving such attainment or compliance with the California Clean Air Act [§39616(c)(6)]; and

WHEREAS, the AQMD Governing Board has held a public hearing in accordance with all applicable provisions of law.

NOW THEREFORE, BE IT RESOLVED, that the AQMD Governing Board hereby approves the attached report; and

BE IT FURTHER RESOLVED that the AQMD Governing Board hereby ratifies RECLAIM's compliance with Health and Safety Code Sections 39616(c)(1), (2), (5), and (6) and 40440.1; and

BE IT FURTHER RESOLVED that the AQMD Governing Board hereby requests the California Air Resources Board to concur in these findings pursuant to Health & Safety Code Section 39616(e).

Attachment

DATE: _____ _____

CLERK OF THE BOARDS

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Review of RECLAIM Findings

October 20, 2000

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

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Acknowledgments

The following staff assisted with the preparation of this report and their assistance is greatly appreciated:

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EXECUTIVE SUMMARY

Introduction

Regulation XX – Regional Clean Air Incentives Market (RECLAIM) was adopted in a public hearing October 15, 1993. The RECLAIM program represents a significant departure from traditional command-and-control regulations. RECLAIM regulates emissions on a mass basis rather than limiting emission rates. The goal of RECLAIM is to provide facilities with added flexibility in meeting emission reduction requirements while lowering the cost of compliance. This is accomplished by establishing annual facility-specific emission reduction targets (i.e., allocations) without being prescriptive regarding the method of attaining compliance with the targets. Total allocations are reduced each year from 1994 through 2003 to achieve equivalent emissions reductions as would have been achieved through implementation of the rules and 1991 AQMP control measures subsumed by RECLAIM (allocations remain constant after 2003).

Each facility may determine for itself the most cost-effective approach to reducing emissions, including purchasing emission credits from facilities which reduce emissions below their target levels. Facilities which are able to reduce their annual emissions below their allocation levels have the option to sell the excess portion of their allocations to facilities which have a need for additional allocations.

Rigorous emissions monitoring and recordkeeping is essential to ensure compliance with RECLAIM's emissions requirements. Highly accurate emissions monitoring equipment (e.g., continuous emissions monitoring systems or CEMS) is required for determining emissions from the sources accounting for approximately eighty percent of RECLAIM emissions. In addition, sources are required to maintain daily, monthly, and quarterly emissions records and to reconcile their emissions with their allocations on a quarterly basis.

The Governing Board made a number of findings regarding RECLAIM's projected performance at the October 1993 public hearing pursuant to Health and Safety Code §39616(c). The Governing Board subsequently commenced public hearings to reassess RECLAIM at its May 1998 meeting pursuant to Health and Safety Code §39616(e). Health and Safety Code §39616(e) further requires that the Governing Board ratify certain findings regarding RECLAIM's performance within seven years of the program's adoption. This report was prepared by AQMD staff in consultation with representatives of facilities subject to RECLAIM and other interested parties to assist the Governing Board in ratifying these findings. Health and Safety Code §39616(e) requires that the AQMD Board to ratify the following findings:

1. RECLAIM achieves equivalent or greater emissions reductions at equivalent or less cost as would have resulted from continued implementation of the subsumed rules and control measures [§39616(c)(1)];
2. RECLAIM requires enforcement and monitoring equivalent to those under command-and-control programs [§39616(c)(2)];

3. RECLAIM promotes privatization of compliance and the availability of electronic data [§39616(c)(5)];
4. RECLAIM does not postpone, delay or hinder compliance with the California Clean Air Act [§39616(c)(6)]; and
5. RECLAIM provides for trading of emissions reductions from a variety of non-RECLAIM sources, including mobile, area, and stationary sources [§40440.1].

The report consists of six chapters. Each of the first five chapters addresses one of the findings identified in Health and Safety Code §39616(e). Chapter six discusses other issues of interest pertaining to RECLAIM which are not encompassed by any of the five findings. Each of the chapters is briefly summarized below.

Chapter 1: Emission Reductions and Cost of Compliance

This chapter compares RECLAIM emissions reductions with the projected emissions reductions for implementation of the rules and control measures subsumed by RECLAIM and compares RECLAIM's program costs with the program costs of the subsumed rules and control measures. To make these comparisons, emissions levels that would have occurred as a result of implementing the rules and control measures subsumed by RECLAIM must be projected. In order to accomplish this, staff has utilized the aggregate RECLAIM allocations determined based on the emission reduction rates targeted by subsumed rules and control measures. Staff believes that this approach provides the appropriate basis for comparison because it most accurately reflects emissions from existing RECLAIM facilities under a normal economic situation. Based on staff's analysis, the comparisons between actual RECLAIM emissions and projected command-and-control emissions indicate that RECLAIM is on track to achieve emissions reductions equivalent to those which would have been achieved through implementation of the subsumed rules and control measures. This is consistent with RECLAIM's design criterion of achieving the same "endpoint" mass emissions as would have been achieved by implementing the rules and control measures subsumed by the program.

RECLAIM's program costs are compared with the program costs for implementation of the subsumed rules and control measures. These costs are broken down into costs of control; costs for monitoring, reporting, and recordkeeping; and administrative costs. An additional analysis is performed to determine the technologies required to achieve compliance with RECLAIM's allocations for 2003 and beyond and to evaluate the total cost of implementing these technologies. These analyses indicate that the annual costs of RECLAIM will remain below the corresponding costs of the subsumed rules and control measures and below the costs originally projected for RECLAIM. Furthermore, the emission goals set for 2003 are shown to be achievable with currently available technologies at a reasonable cost.

Chapter 2: Monitoring and Enforcement

RECLAIM requires use of continuous emissions monitoring systems (CEMS) to continuously monitor mass emissions from major sources. The rules and control

measures subsumed by RECLAIM required the use of far fewer CEMS and these CEMS were only used to monitor emissions on a concentration basis. The operational states of CEMS are tracked via electronic status transmittals. RECLAIM also includes detailed monitoring and reporting requirements for emissions from non-major sources, including expanded fuel use monitoring requirements. RECLAIM's recordkeeping and electronic reporting requirements are equally as rigorous. In general, RECLAIM's monitoring, reporting, and recordkeeping requirements are more rigorous than the corresponding requirements of the rules subsumed by RECLAIM. RECLAIM also has a much more structured inspection and enforcement program than the subsumed rules and measures. Each facility has been inspected at least once each year of the program, and often more frequently.

Chapter 3: Privatization of Compliance and Availability of Electronic Data

RECLAIM includes a number of elements which promote, and even require, privatization of compliance. For example third party source testing to verify the emission rates of large NOx sources and to determine the relative accuracy of CEMS is required on a periodic basis. Other program elements which also promote privatization include Quarterly Certification of Emissions, Annual Permit Emissions Program, and installation and certification of CEMS. Additionally, many facility operators have performed self audits to help identify ways the facility's operations can be optimized to minimize emissions without requiring the installation of additional controls.

RECLAIM's MRR requirements rely heavily upon electronic data. For example, the requirements for self (or third party) daily, monthly, and quarterly electronic reporting and recordkeeping are all based upon electronic data which is transmitted to AQMD electronically via data acquisition and handling systems and remote terminal units. Staff is also working on amendments to RECLAIM's monitoring, reporting, and recordkeeping requirements to allow use of electronic alternatives to strip chart recorders to continuously record data collected by CEMS.

Chapter 4: Trading Emissions Reductions from Non-RECLAIM Sources

Each RECLAIM facility was issued RECLAIM Trading Credits (RTC) in an amount based upon its operational history upon inclusion into the program. Additionally, each such facility which held Emission Reduction Credits (ERC) at the time of inclusion had their ERCs automatically converted to RTCs. Similarly, non-RECLAIM facilities had the opportunity to have any ERCs they held converted to RTCs by request. Emission credits generated pursuant to Regulation XVI - Mobile Source Offset Programs or pursuant to Rule 2506 - Area Source Credits for NOx and SOx can also be converted to RTCs. It may become possible to generate emission credits for use in RECLAIM through the Air Quality Investment Program (Rule 2501) and/or the Intercredit Trading Program (currently under development).

Chapter 5: State Ambient Air Quality Standards

Per capita exposure to ozone in the South Coast Air Basin met the target reductions specified for year 2000 in Health and Safety Code §40920(c) several years ahead of schedule. Additionally, RECLAIM is achieving the same emissions reductions as would have resulted from continued implementation of the subsumed rules and control measures. RECLAIM's reductions are also more certain than the projected reductions from the subsumed rules and control measures.

Chapter 6: Other Issues

Aside from the five findings requiring ratification, there are several other current issues associated with RECLAIM that are of importance at this time and are presented here for informational purposes.

The convergence of several factors resulted in a higher demand for NOx RECLAIM Trading Credits (RTC) for the 1999 compliance year. These factors include decrease of annual allocations to the point where allocations and emissions are roughly equal, restructuring of the electric utility industry resulting in change of ownership of ten local power plants, creation of an open market for sale of electricity, and electricity shortages during summer 2000 resulting in the need to generate more electricity than anticipated. This was particularly true for Cycle 2 (RTC expiration June 2000). The fixed supply of NOx RTCs and the high demand resulted in quickly rising prices for NOx RTCs. Some of the electric utilities have committed to several emissions control projects that will significantly reduce their emissions and, as a result, potentially enhance the availability of NOx RTCs in the future. Several additional RECLAIM facilities have also proposed to install low NOx burners and other control technologies to further reduce emissions at their facilities.

Some RECLAIM facilities have relatively low emissions levels. Installation of control equipment has a relatively high cost effectiveness (dollars per pound of emissions reduced) for these facilities. Therefore, they generally tend to be more reliant on the availability of lower-cost RTCs to maintain compliance with RECLAIM. As a result, these facilities experienced a more significant impact from the recent high prices for NOx RTCs. Facilities that have expanded their production and thereby increased their emissions since RECLAIM commenced were also impacted by the recent high prices.

It is also expected that the recent high prices for NOx RTCs will encourage other facilities to implement NOx control technologies so they can avoid or reduce their future needs to purchase NOx RTCs. Thus, it is anticipated that the above factors may potentially dampen the escalating NOx RTC prices that were experienced in the summer of 2000. Staff will expeditiously prepare a more detailed assessment of these factors and evaluate the appropriateness of implementing any backstop measures, if necessary.

Rule 2008 – Mobile Source Credits provides for conversion of mobile source emission reduction credits (MSERC) to RTCs for use in RECLAIM. However, United States Environmental Protection Agency (EPA) has not approved use of MSERC in RECLAIM. Therefore, any facility that elects to use RTCs generated from MSERC conversion is potentially subject to enforcement action by EPA or

through citizens' law suits even though such use is permissible under AQMD rules.

CHAPTER 1
EMISSION REDUCTIONS AND COST OF COMPLIANCE

Required Finding

Health and Safety Code §39616(c)(1) specifies that any market incentives program adopted by any air district's board "will result in an equivalent or greater reduction in emissions at equivalent or less cost compared with current command and control regulations and future air quality measures that would otherwise have been adopted as part of the district's plan for attainment."

Summary

This chapter compares RECLAIM emissions reductions with the projected emissions reductions for implementation of the rules and control measures subsumed by RECLAIM and compares RECLAIM's program costs with the program costs of the subsumed rules and control measures. To make these comparisons, emissions levels that would have occurred as a result of implementing the rules and control measures subsumed by RECLAIM must be projected. In order to accomplish this, staff has utilized the aggregate RECLAIM allocations determined based on the emission reduction rates targeted by subsumed rules and control measures. Staff believes that this approach provides the appropriate basis for comparison because it most accurately reflects emissions from existing RECLAIM facilities under a normal economic situation. Based on staff's analysis, the comparisons between actual RECLAIM emissions and projected command-and-control emissions indicate that RECLAIM is on track to achieve emissions reductions equivalent to those which would have been achieved through implementation of the subsumed rules and control measures. This is consistent with RECLAIM's design criterion of achieving the same "endpoint" mass emissions as would have been achieved by implementing the rules and control measures subsumed by the program.

RECLAIM's program costs are compared with the program costs for implementation of the subsumed rules and control measures. These costs are broken down into costs of control; costs for monitoring, reporting, and recordkeeping; and administrative costs. An additional analysis is performed to determine the technologies required to achieve compliance with RECLAIM's allocations for 2003 and beyond and to evaluate the total cost of implementing these technologies. These analyses indicate that the annual costs of RECLAIM will remain below the corresponding costs of the subsumed rules and control measures and below the costs originally projected for RECLAIM. Furthermore, the emission goals set for 2003 are shown to be achievable with currently available technologies at a reasonable cost.

Recommendation

Staff recommends that the Governing Board make the following findings:

- RECLAIM is achieving equivalent emissions reductions and at less cost than would have resulted from implementation of the rules and control measures subsumed by RECLAIM; and
- RECLAIM is in compliance with Health & Safety Code §39616(c)(1).

Background

The Governing Board made the following findings at the October 1993 Public Hearing to adopt RECLAIM:

- RECLAIM will result in emissions reductions equivalent in aggregate to the reductions which would be achieved through application of Best available Retrofit Control Technology to each source in the program.
- RECLAIM provides more certain emissions reductions than implementation of the rules and control measures subsumed by RECLAIM.
- RECLAIM "will have superior environmental benefits, and…provides emission reductions that are equal to command-and-control."
- RECLAIM will result in an equivalent reduction in emissions at less cost compared with current command-and-control regulations and future air quality measures that would otherwise have been adopted as part of the [AQMD's] plan for attainment.
- An extensive socioeconomic impact assessment of RECLAIM demonstrates that the costs of RECLAIM "are approximately substantially less than the cost of the command-and-control system."
- RECLAIM "will result in an equivalent reduction in emissions at less cost compared with current command-and-control regulations and future air quality measures that would otherwise have been adopted as a part of the [AQMD's] plan for attainment."

Emissions Reductions Comparison between RECLAIM and Command-and-Control Programs

There is a fundamental difference between the way in which emissions are regulated under RECLAIM and the way they were regulated by the subsumed rules (Table 1-1) and control measures (Table 1-2). Specifically, RECLAIM limits the total quantity (or mass) of NOx and SOx emitted to the atmosphere while the subsumed rules and measures (with the exception of Rule 1135) limit the concentration of NOx and SOx in the exhaust vented to the atmosphere or the mass of NOx or SOx emitted per unit of fuel consumed or per unit of production. Therefore, RECLAIM establishes definite upper limits on total mass emissions independent of future production activities. Future emissions under the subsumed rules and control measures, on the other hand, may vary based on factors such as future economic conditions, production levels, and how that production will be distributed between various sources.

Table 1-1
Subsumed Rules with Post-1993 Effective Dates

Rule	Description	Pollutant	Compliance Dates
1109	Emissions of NOx from Boilers & Process Heaters in Petroleum Refineries	NOx	12/31/95
1110.1	Emissions from Stationary ICE	NOx	12/31/94
1110.2	Emissions from Gaseous and Liquid-Fueled ICEs	NOx	12/31/99
1134	Emissions of NOx from Stationary Gas Turbines	NOx	12/31/95
1135	Emissions of NOx from Electric Power Generating Systems	NOx	12/31/89 through 12/31/2009
1146.1	Emissions of NOx from Small Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters	NOx	7/1/94
431.1	Sulfur Content of Gaseous Fuels	SOx	5/4/94, 5/4/96

Actual RECLAIM emissions are quantified with a high level of confidence for recent years due to the implementation of the program's rigorous monitoring, reporting, and recordkeeping (MRR) requirements. RECLAIM emissions for the initial years of the program may be somewhat overestimated due to the use of emission factors prior to the installation and certification of continuous emissions monitoring systems (CEMS) and the use of RECLAIM's worst-case "missing data" provisions during the transition to CEMS (e.g., whenever CEMS data are unavailable or emissions reports are not properly transmitted). Additionally, future aggregate emissions from RECLAIM facilities are bounded by the size of the aggregate pool of RECLAIM Trading Credits (RTC) for each future year of the program (see Figures 1-1 and 1-2 in the next section). Consequently, there is a clear set of annual RECLAIM emissions levels readily available for evaluating compliance with §39616(c)(1). On the other hand, as explained above, it is not possible to determine with absolute certainty the upper limit of emissions which would have resulted from implementation of the rules and control measures subsumed by RECLAIM (hereafter referred to as "projected command-and-control emissions"). Therefore, it is necessary to project a best estimate what emissions would have occurred under implementation of the rules and control measures subsumed by RECLAIM. This projection was conducted during the development of RECLAIM in 1993. RECLAIM allocations were then developed to match this projection in aggregate. In particular, RECLAIM allocations were designed to reach the same endpoint emission level in 2003 as implementation of the subsumed rules and control measures was projected to achieve in 2010.

Table 1-2
Subsumed Control Measures

Measure	Title	NOx Control Factor	SOx Control Factor	Effective Date
90P-B-1	Control of Emissions from Petroleum Refinery Fluid Catalytic Cracking Units [SOx]		90 %	1998
90P-B-2	Control of Emissions from Petroleum Refinery Fluid Catalytic Cracking Units [NOx]	70 %		1998
90P-C-2	Control of Emissions from Afterburners [NOx]	61 %		1998
90P-C-4	Control of Emissions from Small Boilers and Process Heaters [NOx]	75 %		1998
90P-C-5	Control of Emissions from Metal Melting Furnaces	50 %		1998
90P-C-6	Control of Emissions from Curing and Drying Ovens [NOx]	75 %		1998
90P-C-7	Control of Emissions from Glass Melting Furnaces [NOx] (container glass only)	94 %		1998
90P-C-8	Control of Emissions from Cement Kilns [NOx]	85 %		1998
90P-F-1	Phase-Out Stationary Source Fuel Oil and Solid Fossil Fuel Use [NOx, PM10, SOx]	60 %	100 %	2000
90A-C-5	Control of Emissions from Miscellaneous Combustion Sources [NOx]	50 %		1999
90A-F-1	Installation of Best Available Retrofit Control Technology on Miscellaneous Sources [All Pollutants]	20 %	20 %	1998

RECLAIM emissions data are presented in Tables 1-3 and 1-4. Even though Tables 1-3 and 1-4 present the aggregate reported emissions alongside the aggregate allocations for the same years, aggregate compliance for any one year cannot be easily concluded simply by comparing the two sets of data because RECLAIM facilities are divided into two compliance cycles. Cycle 1 facilities have compliance years from January through December and Cycle 2 facilities have compliance years from July through June of the following calendar year. RTCs issued to each facility have valid periods corresponding the facility's compliance year. However, a Cycle 1 facility may purchase and use Cycle 2 RTCs to reconcile its emissions as long as the emissions occurred during the RTCs' valid period, and vice versa. For example, a Cycle 2 facility could have used Cycle 1 1999 RTCs (valid January through December 1999), Cycle 2 1999 (valid July 1999 through June 2000), and Cycle 1 2000 (valid January through December 2000) for emissions occurring during its 1999 compliance year (July 1999 through June 2000). Therefore, emissions from Cycle 1 and Cycle 2 facilities need to be combined based on compliance year so that programmatic comparisons of aggregate annual emissions and aggregate allocations can be made. As a result, the data presented in Tables 1-3 and 1-4 are combined by compliance year rather than by calendar year. For example, the data reported for the 1994 compliance year was developed by adding the Cycle 1 1994 data

(January through December 1994) and the Cycle 2 1994 data (July 1994 through June 1995).

Table 1-3
RECLAIM NOx Emissions and RTC Supply by Compliance Year (tons/year)

Compliance Year	Actual Emissions	RTC Supply
1994	25,314	41,428
1995	25,764	37,296
1996	24,796	33,215
1997	21,789	29,052
1998	20,982	24,989
1999[1]	20,545	21,015

[1] 1999 emissions preliminary data.

Table 1-4
RECLAIM SOx Emissions and RTC Supply by Compliance Year (tons/year)

Compliance Year	Actual Emissions	RTC Supply
1994	7,232	10,491
1995	8,064	9,738
1996	6,484	9,020
1997	6,464	8,295
1998	6,793	7,577
1999[1]	6,525	6,911

[1] 1999 emissions preliminary data.

Since the reconciliation period for Cycle 2 facilities in the 1999 compliance year did not conclude until the end of August 2000, staff has not been able to fully complete the quality assurance and quality control review of the 1999 data. Staff is still in the process of completing the review and updating the data due to late reports, cross-cycle trading, and AQMD audits. Therefore, the 1999 data should be considered as preliminary data.

The RTC supply identified in Tables 1-3 and 1-4 include RTCs generated by the conversion of emission reduction credits (ERC), as allowed under the RECLAIM rules and as described in Chapter 4. When comparing RECLAIM emissions with projected command-and-control emissions, it is important to bear in mind that, although they are not included in the projected command-and-control emissions, the ERCs would have been available to offset emissions increases had AQMD continued to implement the subsumed rules and control measures. RTCs (instead of ERCs) are used to offset emissions increases under RECLAIM. Therefore, the converted ERCs need to be included in the total allocations and in the projected AQMP emissions in the following analyses.

Analysis of Equivalent Emissions Reductions

Evaluation

In order to have a meaningful comparison between emissions under RECLAIM and those under the subsumed rules and control measures, these emissions

must first be projected. RECLAIM allocations provide the mass emissions projections for RECLAIM. The subsumed rules and control measures, on the other hand, limit emissions concentration or mass of emissions per unit of fuel consumption or per unit of production. Therefore, in order to project the emissions inventories for the subsumed rules and control measures on a mass basis, both the starting emissions inventory and the rate of reductions are required. Changing either of these two factors will directly change the results of the comparison.

The methodology developed for allocating RTCs to RECLAIM facilities was designed to bring aggregate RECLAIM mass emissions to the same "endpoint" level as would have resulted from implementation of the subsumed rules and control measures starting from the 1987 emission inventory for the South Coast Air Basin. The 1991 AQMP called for reaching this endpoint by 2010, but RECLAIM is designed to reach it by 2003. That is, RECLAIM's endpoint allocations were intentionally established such that the RECLAIM endpoint would represent the same overall NOx and SOx emissions levels as the 1991 AQMP endpoint for the same facilities but reaches the endpoint earlier. Therefore, an obvious and straightforward methodology to determine if RECLAIM is achieving equivalent emissions reductions is simply to verify that RECLAIM emissions remain below RECLAIM allocations. Figures 1-1 and 1-2 illustrate that this analysis indicates that RECLAIM is on track to achieve equivalent emission reductions as would have been realized through implementation of the subsumed rules and control measures.

Figure 1-1
RECLAIM NOx Emissions and RTC Supply (tons/year)

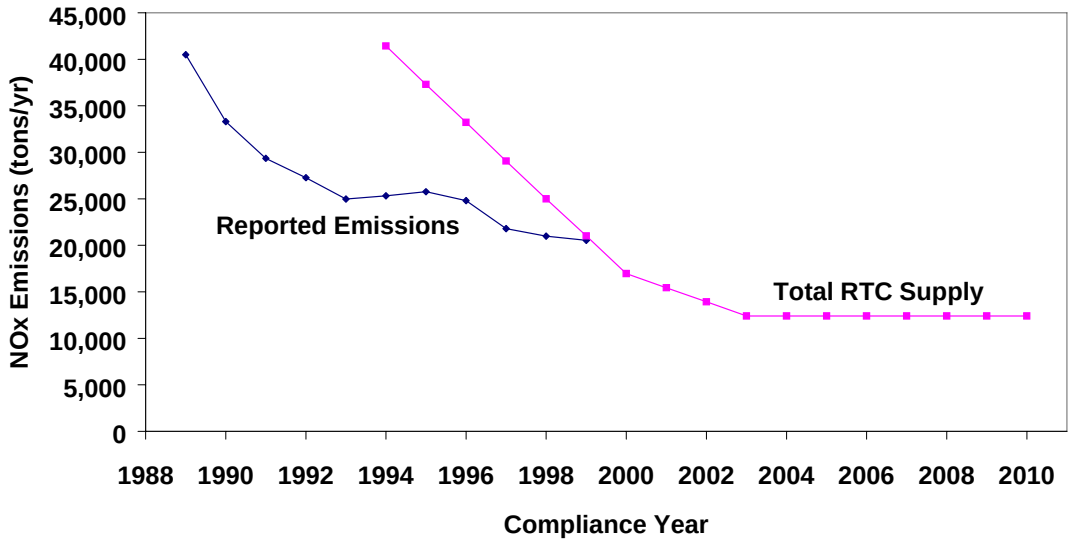
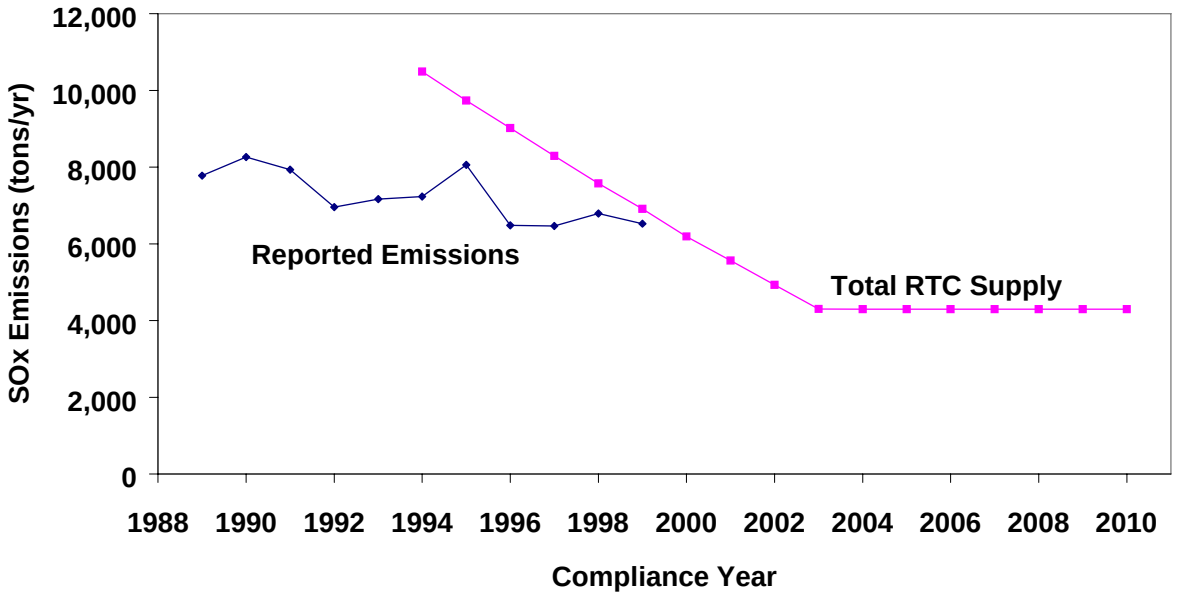


Figure 1-2
RECLAIM SOx Emissions and RTC Supply (tons/year)



This evaluation meets the criteria of comparing the two sets of emissions on a common basis. This approach compares actual RECLAIM emissions to the emissions projected to occur under continued implementation of the subsumed rules and control measures. Thus, RECLAIM allocations represent the best estimate of the future emissions that would have occurred under the 1991 AQMP.

AQMD has used this approach to demonstrate equivalent emissions reductions in the past ("RECLAIM Program Three-Year Audit and Progress Report"). Representatives from the Natural Resources Defense Council (NRDC) and the Coalition for Clean Air (CCA) have expressed concern that this approach "uses RECLAIM to prove RECLAIM." Nevertheless, staff continues to believe that this analysis provides strong support for the finding that RECLAIM will achieve equivalent or greater emissions reductions than would have been realized through continued implementation of the subsumed rules and control measures.

Discussion of Comments Regarding Emissions Reductions Analysis

NRDC and CCA representatives suggested comparing RECLAIM emissions to projected command-and-control emissions using the 1993 emission inventory as a starting point and applying the same rate of reduction called for from these sources in the 1991 AQMP. Staff does not concur with this approach for the reasons outlined below. However, for informational purposes only, staff projected the 1993 emission inventory into subsequent years by applying growth factors used in the 1997 AQMP and as originally provided by Southern California Association of Governments and control factors representing the percent emission reductions which would have occurred through implementation of subsumed control measures and rules. The growth factors were developed and applied by industry for each year. The control factors were developed and

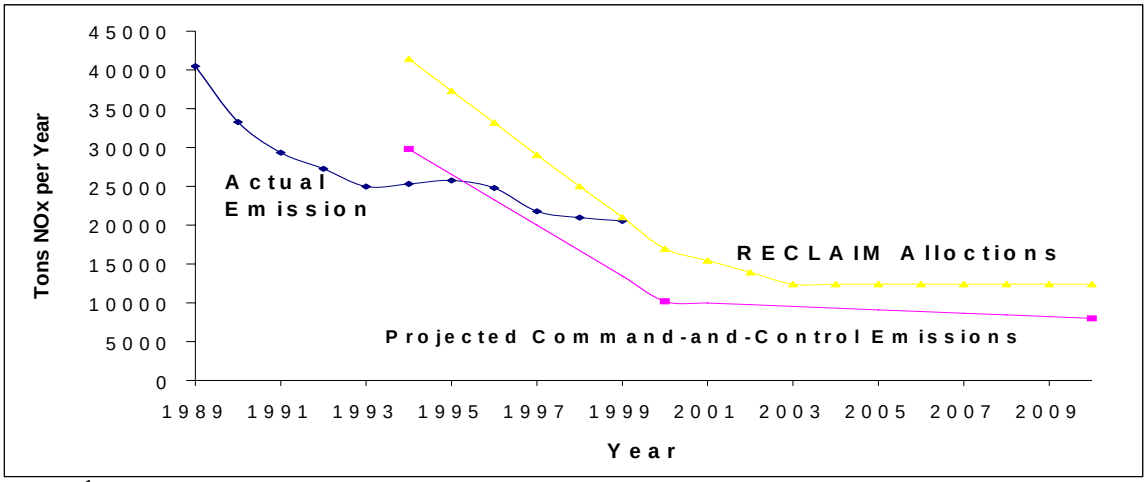
applied by industry and equipment type and by implementation year. These are the same control factors as were used to project the emissions inventories in the 1991 AQMP.

The emissions projected by this approach are tabulated in Table 1-5 and are compared to RECLAIM emissions and the RTC supply in Figures 1-3 and 1-4. Projected command-and-control emissions as estimated by this approach are significantly below RECLAIM emissions and the RTC supply. These results are not surprising when one realizes that this analysis amounts to shifting the allocation line by the difference between the projected and the actual emissions inventory while maintaining the emission reduction rate called for by the 1991 AQMP. This essentially locks in recessionary production levels from the early 1990s as reflected in the 1993 emission inventory.

Table 1-5
Emissions Estimates Projected by Applying 1991 AQMP Rate of Reduction Applied to 1993 Emissions Inventories (tons per day)

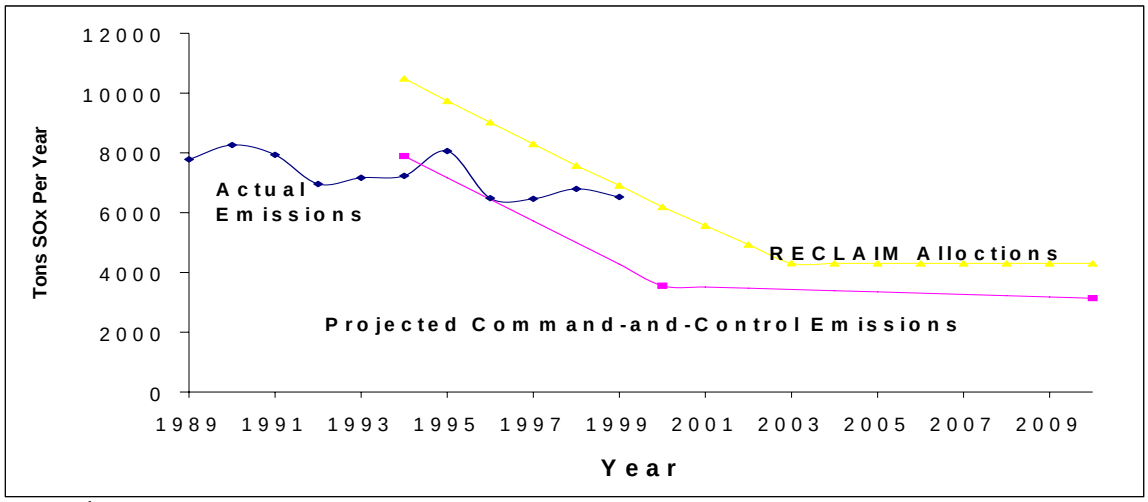
Year	NOx	SOx
1993	82	22
2000	28	10
2010	22	9

Figure 1-3
RECLAIM NOx Emissions, RTC Supply, and Projected Command-and-Control Emissions[1] by Year



[1] The "Projected Command-and-Control Emissions" line is interpolated as a straight line from the data in Table1-5, and does not include a year-by-year estimation between the 1993 and 2000 emission levels.

Figure 1-4
RECLAIM SOx Emissions, RTC Supply, and Projected Command-and-Control Emissions[1] by Year



[1] The "Projected Command-and-Control Emissions" line is interpolated as a straight line from the data in Table1-5, and does not include a year-by-year estimation between the 1993 and 2000 emission levels.

This approach not only locks RECLAIM facilities into the recessionary production levels of the early 1990s without providing for significant economic recovery, but also includes the implicit assumption that there will be no economic growth in any sector beyond that projected in the 1997 AQMP. Therefore, this approach does not provide an appropriate basis of comparison between projected command-and-control emissions and RECLAIM emissions. However, staff proceeded to conduct the analysis and present the results herein for information purposes only.

Conclusion from Emissions Comparisons

Staff believes the emission reduction comparison intended by the Legislature is accomplished by comparing aggregate RECLAIM emissions with aggregate allocations, as described above. This analysis compares on the same consistent basis the two sets of emissions called for under Health and Safety Code. In addition, it is equivalent with the 1997 AQMP, which is the most recent SIP-approved AQMP. The 1997 AQMP supercedes all previous AQMPs and therefore provides the appropriate benchmark for determining equivalence[1].

This analysis indicates that RECLAIM has resulted in emissions reductions equivalent to the reductions which would have been realized under continued implementation of the subsumed rules and control measures. It is anticipated that, in aggregate, RECLAIM facilities will continue to achieve equivalent emissions reductions. Figures 1-1 and 1-2 show that maintaining continued

[1] AQMPs are periodically superceded by updated AQMPs. Each time a new AQMP is prepared, pollutant-specific emission inventories are prepared based upon actual emissions and projected growth. Modeling is also conducted to determine the emissions levels of various pollutants which the air basin can accept while achieving attainment with ambient air quality standards. Control measures are then developed to reduce emissions to the levels determined through modeling to be consistent with ambient air quality standards. AQMPs are prepared on a three-year cycle (e.g., the most recent AQMPs were adopted in 1991, 1994, and 1997). Each AQMP supercedes its predecessor upon approval into the State Implementation Plan (SIP) by the United States Environmental Protection Agency.

equivalence (and continued compliance with allocations) will require installation of control technologies in the near term.

Analysis of Equivalent or Less Cost

This section addresses the control technologies that have been implemented as of December 1999, and the most cost-effective technologies available to achieve the emissions reductions required to be achieved through 2003. As with RECLAIM emissions, reasonably accurate cost data is available for RECLAIM. These costs include the costs of control; monitoring, reporting, and recordkeeping (MRR); and implementation and personnel (administrative costs). Costs associated with implementation of the 1991 AQMP are estimated for the costs of control, MRR, and implementation and personnel. Some facilities elect to purchase RTCs rather than install control equipment or otherwise reduce emissions. Such purchases represent a cost to the individual facilities, but they do not represent an overall cost of the program. Rather, they reflect a redistribution of the above-identified costs. For example, one facility can install control equipment and reduce its emissions, thereby reducing its need for RTCs. This facility can then sell its excess RTCs to another facility, allowing the second facility to delay installation of control. In this example, the cost of control at the first facility is a cost of the program, but the cost of RTCs sold to the second facility transfers funds from one RECLAIM facility to another. This transfer contributes to the cost of compliance of the second facility but decreases the cost of compliance for the facility that installed the control equipment. In essence, the second facility is sharing in both the cost and the benefit of the control equipment installed at the first facility. This is actually an example of the flexibility RECLAIM provides for facilities to share in the emissions reduction efforts. Some facilities can experience costs associated with non-compliance. However, these are avoidable costs and are not considered costs of the program. In addition, non-compliance with the subsumed regulations would have resulted in comparable costs. AQMD's analyses of program costs assume that facilities will operate in compliance with the program's requirements.

A socioeconomic impact assessment was performed during the development of RECLAIM in 1993 to assess impacts from implementation of the program. The annualized costs of RECLAIM for equipment installation and for recordkeeping and monitoring as projected in this socioeconomic assessment are summarized in Table 1-6. This assessment projected that the overall cost of RECLAIM would be less than was projected to be incurred if the rules and control measures it subsumed were implemented. To compare actual costs of the program to the original projections, staff reported in the RECLAIM Program Three-Year Audit and Progress Report cost data for the three main cost elements of the program: recordkeeping and monitoring costs, equipment installation costs, and administrative costs. These elements are again reviewed below.

Table 1-6
Projected Annualized Cost of RECLAIM (in millions of 1995 dollars)

Year	Equipment Installation	Recordkeeping & Monitoring
1994	0.0	13.0
1995	0.6	16.8
1996	79.4	16.8
1997	102.2	16.8
1998	140.9	16.8
1999	192.0	16.8
Average Annual (94-99)	102.0	16.2

Source: Volume III of RECLAIM Staff Report: Socioeconomic and Environmental Assessments (October 1993).

MRR Costs

RECLAIM Program Three-Year Audit and Progress Report summarized major source monitoring costs through December 1997. Additionally, two alternative continuous emissions monitoring systems (ACEMS) were installed during that period for a total of $625,000 installed cost.

Since January 1, 1998, there have been three applications for ACEMS, 12 new applications for CEMS, and four applications for modification of CEMS existing as of December 1997. Based on the reported costs in the application forms, two out of the four modified CEMS incurred an additional one-time cost of $211,000. It cannot be determined whether the two remaining modified CEMS incurred any additional one-time cost. The 15 new applications for CEMS and ACEMS had a combined installed cost of $2.6 million. Therefore, the total installed cost of monitoring equipment (new and modified) since January 1, 1998 is approximately $3 million (or an equivalent annualized cost of $369,000).

The cost of implementing ACEMS rather than CEMS bears further discussion. The five ACEMS are all for very similar or identical internal combustion engines, which are all used in the same application. Thus, the five ACEMS are all based on the same predictive model. This significantly reduced the costs associated with developing and proving the model relative to the cost of developing separate ACEMS with different models for dissimilar applications. The first two ACEMS cost $625,000, including demonstration and testing in parallel with CEMS. The subsequent three cost $207,000 for hardware only. It is expected that the cost of demonstration and parallel testing for these three units will be less than that of the first two. However, some major sources are more complex, which would make development of an ACEMS at a reasonable cost more difficult. Thus, ACEMS can be useful tools, but are not appropriate for all major sources.

Table 1-7 describes the one-time major source monitoring costs (capital expenditure) by industry since the start of RECLAIM, based on engineer contacts and information in the application forms for monitoring equipment. In cases where monitoring costs are available from both sources, the data from engineer contacts normally show lower costs than those from the application forms.

Using the projected installed cost ($17 million) from the Three-year Audit and Progress Report for the CEMS that were short of cost data from either source, the cost of monitoring equipment units from engineer contacts ($87 million), the

cost of the two ACEMS prior to December 1997 ($625,000), and the cost of monitoring equipment units since January 1998 ($3 million), the total installed cost of all monitoring equipment units is approximately $107.8 million at an annualized capital cost of $13.3 million, compared to a projected average annual cost of $16.2 million.

All other RECLAIM MRR costs are insignificant relative to the monitoring costs for major sources. Therefore, the costs summarized in Table 7-4 can be assumed to be representative of RECLAIM's total monitoring costs through August 2000.

Administrative Costs

Administrative costs include the costs of staff time to comply with RECLAIM's requirements and job impacts. Unfortunately, it is not feasible for AQMD to assign dollar values to these costs, but they can be discussed in general terms and the numbers of jobs gained and lost can be quantified. Some facilities are able to comply with RECLAIM with minimal impacts on staff time while other, larger facilities find it necessary to devote significant staff time to ensuring compliance. Consultants also help some facilities maintain compliance with RECLAIM.

RECLAIM facilities attributed 70 job losses and 2 job gains to RECLAIM during its first compliance year (January 1, 1994 to June 30, 1995). The job losses decreased to 49 while the job gains increased to 10 for the 1995 compliance year. RECLAIM contributed to minimal job impacts for the 1996 compliance year with one job gain and 2 job losses. Two facilities each reported one job gained attributable to RECLAIM during the 1997 compliance year. Two facilities reported that their compliance year 1997 job losses were due to a number of factors, of which RECLAIM was one. One of these facilities lost eight jobs due to decreased profitability but could not estimate to what extent RECLAIM contributed to the decreased profitability. The other of these facilities was a military installation being shut down by the federal government’s base closure plan. This facility reported that, while not a major factor, RECLAIM did contribute to the government's decision to select this base for closure. Three facilities attributed one job gain each to RECLAIM during the 1998 compliance year. Four facilities reported job losses due at least in part to RECLAIM during the same compliance year. Two of these facilities attributed its job losses to a number of factors, of which RECLAIM was one. The first of these facilities lost four jobs because they could not meet NOx Best Available Control Technology (BACT) requirements by incrementally retrofitting their ovens and boilers and therefore contends that the RECLAIM program prevented them from expanding. However, BACT requirements would have applied even if the facility was not in the RECLAIM program. In fact, the facility would have been faced with the

Table 1-7
Installed Costs of CEMS and ACEMS

SIC	Industry	# of Units Installed	Engineer Contacts				Application Forms			
			# of Units w/ Cost	Unit Cost		Total Cost	# of Units w/ Costs	Unit Cost		Total Cost
				Minimum	Maximum			Minimum	Maximum	
13	Oil & Gas Extraction	8	3	150000	270000	570000	4	116000	150000	532000
20	Food & Kindred Products	15	13	165000	675000	7285000	0	N/A	N/A	N/A
22	Textile Mill Products	2	2	128500	128500	257000	0	N/A	N/A	N/A
23	Apparel & Other Textile Products	1	1	350000	350000	350000	0	N/A	N/A	N/A
26	Paper & Allied Products	7	6	130000	310000	1100000	1	173000	173000	173000
28	Chemicals & Allied Products	18	11	126667	260000	1812500	3	133500	175000	442000
29	Petroleum & Coal Products	223	192	105185	473295	58119000	88	150000	626000	45994000
32	Stone, Clay & Glass Products	25	9	102500	190000	1166000	9	98000	330000	1434000
33	Primary Metal Industries	14	11	92500	332000	1913000	3	100000	320000	560000
34	Fabricated Metal Products	2	2	150000	150000	300000	0	N/A	N/A	N/A
37	Transportation Equipment	1	1	280000	280000	280000	0	N/A	N/A	N/A
45	Transportation by Air	2	2	171000	171000	342000	2	378000	378000	756000
49	Electric, Gas & Sanitary Services	98	75	37143	475000	13457000	14	69000	250000	1840000
50	Wholesale Trade--Durable Goods	2	2	125000	125000	250000	0	N/A	N/A	N/A
91-97	Government	1	0	N/A	N/A	N/A	1	112000	112000	112000
	TOTAL	419	330	37143	675000	87201500	125	69000	626000	51843000

additional requirement of providing offsets under the traditional new source review rules (Regulation XIII - New Source Review). The second facility claimed that the cost of RECLAIM compliance reduces profitability and limits competitiveness in the marketplace for the company and its local customers, thereby reducing near-term viability. However, AQMD staff learned that the company was faced with international competition that can sell products at a price lower than the cost of the RECLAIM facility's raw materials. The other two facilities which claimed to have job loss attributable to RECLAIM failed to provide the actual number of jobs. These two facilities never provided employment data to the AQMD. Therefore, job loss at these two facilities could not be estimated. Most every job gained identified above was related to implementing and maintaining monitoring equipment and records required under RECLAIM. However, as presented in the Three-Year Report, these jobs gained and lost do not have a significant impact on the overall employment figures of the region.

It should also be noted that administrative costs would also be incurred in complying with the subsumed rules and control measures. These costs would be analogous to those incurred under RECLAIM, but may not be as significant because, as discussed in Chapter 2, RECLAIM includes more comprehensive monitoring, reporting, and recordkeeping requirements. Again, it is not feasible to address these costs on a quantitative basis.

Equipment Installation Costs

There are three approaches available to RECLAIM facilities for complying with their annual allocations: increasing allocations by purchasing RTCs, decreasing emissions through process optimization and economization, and reducing emissions by installation of control technology. Allocation compliance has been achieved to a significant extent through the purchase of RTCs. This is because low-cost RTCs have been readily available as a result of a number of equipment and facility shutdowns. That is, RTCs originally allocated based upon historical activity of equipment which is no longer in operation have been used for emissions from other sources. Approximately 624 tons of year 2000 NOx RTCs, 457 tons of year 2003 NOx RTCs, 247 tons of year 2000 SOx RTCs, and 186 tons of year 2003 SOx RTCs have been made available from RECLAIM facilities which are no longer in operation. The availability of RTCs at relatively low cost in the initial years of the program has allowed companies to temporarily avoid installation of air pollution control equipment that would have otherwise been implemented to achieve emission reduction goals.

It is also qualitatively evident that quite a few facilities have made operational changes resulting in reduced emissions without making physical modifications to their equipment, although data is not available to quantify the extent of the contribution to overall allocation compliance made by this approach. For example, a facility with several units which perform the same function could shift their load to the units with the lowest emissions and reserve the higher-emitting units for periods of peak demand and for backup use. This is illustrated by Figures 1-5 and 1-6, which show that aggregate emissions from RECLAIM facilities have not increased even though California's economy has been growing since the start of the program. Figure 1-5 compares Reported NOx emissions for 1989 through 1998 with the local economy's gross regional product (GRP) for the same time period. GRP is used because the facilities in RECLAIM's NOx market represent nearly all sectors of the local economy. RECLAIM's SOx market, on

the other hand, includes facilities from relatively few sectors of the economy. Therefore, Figure 1-6 compares reported SOx emissions for 1989 through 1998 with the local economy's output from the impacted sectors (mining; food; paper; chemicals; petroleum products; stone, clay, etc.; primary metals; fabricated metals; public utilities; and wholesale).

Figure 1-5
RECLAIM NOx Emissions and Economic Growth

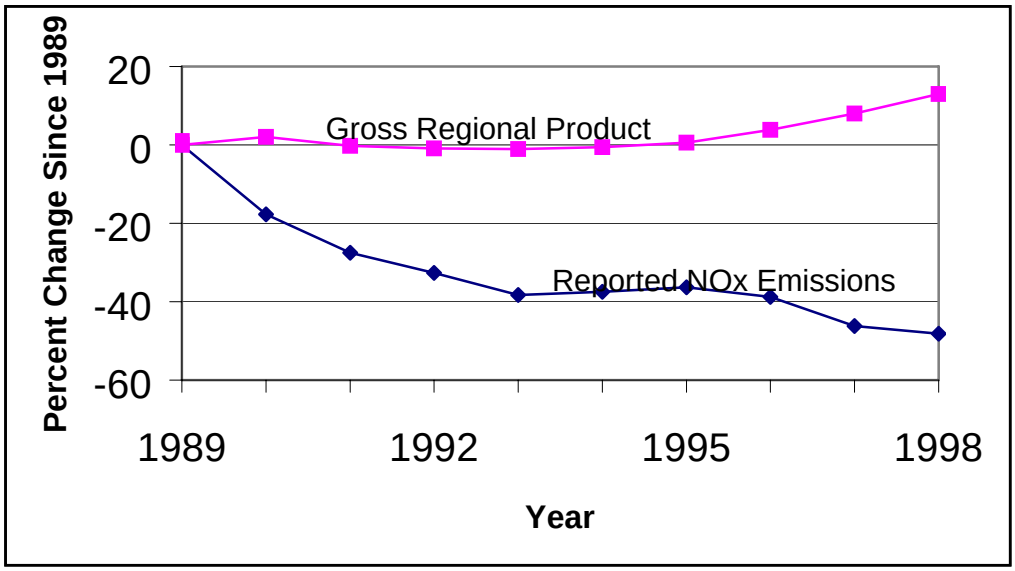


Figure 1-6
RECLAIM SOx Emissions and Economic Growth

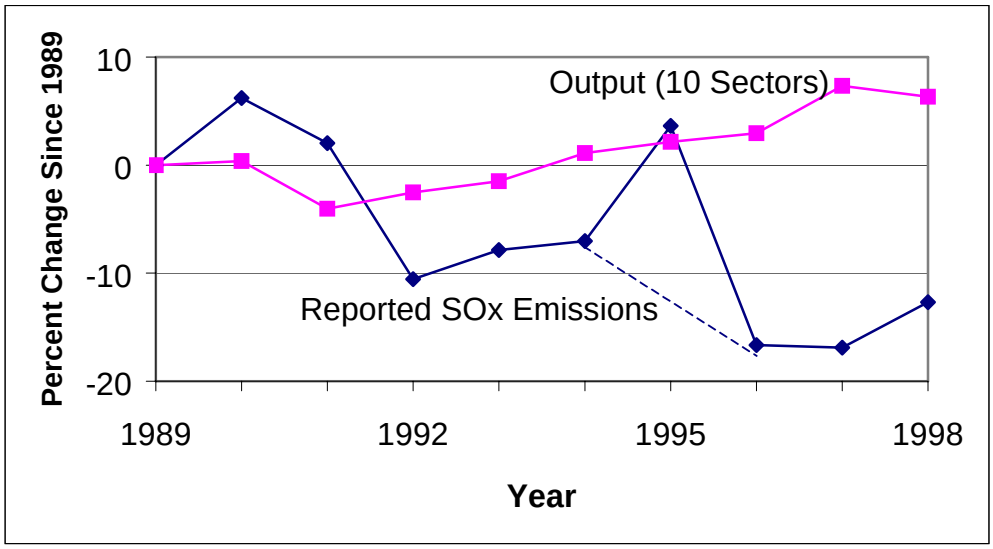


Figure 1-5 clearly shows that NOx emissions did not increase with economic growth. That is, NOx RECLAIM facilities were able to increase their production levels without increasing their emissions. In fact, these facilities combined economic growth with NOx emissions reductions between 1995 and 1998. In

general, SOx emissions are directly tied to fuel consumption. Thus, SOx emissions reductions are not as readily achieved through economization and optimization as are NOx emissions reductions. This is reflected in Figure 1-6, which shows that SOx emissions have been much more erratic than NOx emissions, although there has been an overall trend toward decreased SOx emissions. Note that 1995 reported SOx emissions greatly overestimated actual SOx emissions due to extensive use of "missing data procedures" to quantify SOx emissions based upon worst-case assumptions. Thus, the 1995 reported emissions data point in Figure 1-6 should be disregarded. Nevertheless, emissions continued to be lower than the allocations even at this exaggerated emissions level.

AQMD's permitting records indicate that some RECLAIM facilities have reduced their emissions by installing control technologies, but this has been a relatively less significant approach to allocation compliance. The results of this analysis are consistent with RECLAIM's design criterion of incentivizing use of the least expensive means of achieving required emission reductions.

Table 8-4 of the Final Environmental Assessment prepared for the October 1993 adoption of RECLAIM (reproduced here as Table 1-8) presents a comparison of the technologies which would have been required to be utilized under implementation of the subsumed rules and control measures with the control technologies projected to be implemented to comply with RECLAIM aggregate allocations. This data is presented year-by-year through 2000 (post-2000 reductions were presumed to require unidentified Tier II control technologies). Table 7-3 of the RECLAIM Program Three-Year Audit and Progress Report (reproduced here as Table 1-9) listed technologies that were implemented through the end of 1997. Table 1-10 summarizes technologies implemented under RECLAIM through 1999. Comparison of Tables 1-8,1-9 and 1-10 reveals that control technologies have not been implemented to the extent anticipated prior to adoption of RECLAIM because many facilities found it more economically attractive to delay capital investments in control equipment by purchasing low-cost RTCs. The recent increases in RTC prices are expected to result in facilities changing from this strategy to installation of control equipment in the near term. For example, AQMD has recently received applications for installation of selective catalytic reduction and low NOx/ultra-low NOx burners. Table 1-11 identifies the costs projected for the technologies to be implemented under RECLAIM as identified in Table 1-8.

Table 1-8
A Comparison of Projected NOx and SOx Control Technologies For the 1991 AQMP and the Proposed RECLAIM Through the Year 2000
[Table 8-4 of RECLAIM Final EA, October 1993]

Year	NOx CONTROLS		SOx CONTROLS	
	RECLAIM	AQMP	RECLAIM	AQMP
1994	No New Technology Identified	Low NOx Burners, Flue Gas Recirc., & SCR	No New Technology Identified	Dry FGD, Hydrodesulf., Wet Scrubber, & Low Sulfur Fuel (LSF)
1995	No New Technology Identified	SCR & Low NOx Burners	Hydrodesulf.	Dry FGD, Hydrodesulf., Wet Scrubber, LSF
1996	SCR, SNCR, Low NOx Burner, Urea Injec.	SCR, Alt. Fuels, Low NOx Burners	Hydrodesulf. & Some FGD	LSF & Hydrodesulf.
1997	SCR, Urea Inject., Low NOx Burner, Some Wet Scrubbers	SCR	Hydrogenation & Some Hydro-desulfurization	LSF
1998	SCR & Low NOx Burners	SCR & Some Electrification	No new Technology Identified	No new Technology Identified
1999	Low NOx Burner & SCR	No new Technology Identified	No new Technology Identified	No new Technology Identified
2000	SCR & Some Low NOx Burners	No new Technology Identified	No new Technology Identified	No new Technology Identified

Table 1-9
Control Technologies Implemented under RECLAIM through 1997
[Table 7-3 of the RECLAIM Program Three-Year Audit and Progress Report]

Technology	Pollutant	Installation Year	Cost-Effectiveness ($/ton)
Scrubber with ESP	SOx	1994-95	$1,400 - $2,200
Low-NOx Burner	NOx	1994-95	$1,000 - $3,000
Oxygen Enrichment	NOx	1996	$800
Oxy-Fuel Burner	NOx	1996	$500
SCR	NOx	1994	$300 - $600
SCONOx	NOx	1994	$300
Natural Gas Heater	NOx	1994, 1997	$100
Secondary Combustion of Fuel	NOx	1997	-$1,700 (cost savings)

Table 1-10
Control Technologies Implemented under RECLAIM 1997 through 1999

Technology	Pollutant	Installation Year	Cost Effectiveness (dollars per ton)
Flue Gas Recirculation	NOx	1997	$300
Low NOx Burner	NOx	1997-2000	$200 to $38,600
Low NOx Burner with Flue Gas Recirculation	NOx	1999	$2,900
Oxy-Fuel	NOx	1997	$8,000
Ultra Low NOx Burner	NOx	1999-2000	$3,900 to $10,600
Selective Catalytic Reduction	NOx	2000-2001	$1,000 to $12,500
Selective Catalytic Reduction for FCCU	NOx	2000	$500

Table 1-11
Projected Technology for RECLAIM Facilities

Technology	Pollutant	Installation Year	Cost-Effectiveness (1995 $/ton)
Wet Scrubber	NOx	1997	5,600
Low-NOx Burner	NOx	1996-99	6,500 – 47,000
Urea Injection	NOx	1996-97	1,500 – 12,000
SCR	NOx	1996-99	1,300 – 29,100
NSCR	NOx	1996	4,200
Hydrodesulfurization	SOx	1995-97	2,000 – 8,400
Hydrogenation	SOx	1997	4,200 – 9,300

Sources: 1991 AQMP and Table 8-4 in Volume III of RECLAIM Staff Report: Socioeconomic and Environmental Assessments (October 1993).

As discussed above, the majority of emissions reductions were achieved through process and emissions management and facilities ceasing operations. This approach was remarkably successful during the initial years of the program when considerable economic growth occurred, yet emissions remained level. The study staff conducted during the development of the Three-Year Report indicated that the actual cost of air pollution control equipment installed to comply with requirements under the RECLAIM program did not exceed those in the original projections [RECLAIM Program Three-Year Audit and Progress Report, Chapter 7]. Control technologies were implemented for relatively few of the total population of sources in RECLAIM from the time of the Three-Year Report through the end of 1999.

There has been a scarcity of NOx RTCs in recent months and, therefore, significant increases in the price of NOx RTCs over the same time period, as discussed in Chapter 6. It is anticipated that these market forces will spur installation of control technology in the near term. For example, several electricity generation facilities have committed to install NOx controls before summer 2001. Refer to Chapter 6 for a more complete discussion of RTC prices and the factors contributing to recent high prices.

Control Technology Evaluation

Figures 1-1 and 1-2 clearly show that additional sources of emission reductions need to be identified and implemented by RECLAIM facility operators to ensure continuous compliance through the coming years. Table 1-12 lists the current RTC supplies in Compliance Years 2000 and 2003 and also the targeted emissions reduction goals. However, as mentioned above, RECLAIM facilities have not made extensive use of installation of control technologies to reduce emissions. Therefore, staff has investigated the feasibility of meeting the RECLAIM NOx goals and opportunities for further NOx reductions from boilers, heaters, internal combustion engines, and gas turbines. These sources were selected because they are widely used in RECLAIM facilities and together they represent the majority of emissions in the program.

Table 1-12
Emission Reduction Goals

Emittant	Compliance Year 2000 Allocation (tons/day)	Compliance Year 2003 Allocation (tons/day)	Emission Reduction Goals (tons/day)
NOx	46.5	34.0	12.5
SOx	17.0	11.8	5.2

Staff evaluated possible emissions reductions by applying currently known, proven control technologies to those sources that are in the above-identified categories and have the potential to reduce their emissions with these control technologies. Table 1-13 lists the technologies applied, the types of sources, the achievable emission levels, and the corresponding possible emissions reductions. The possible reductions were developed based on the 1999 emissions levels and the estimated controlled emissions assuming the same level of operations as in 1999. The results of this very preliminary investigation indicate that full implementation of these identified technologies at RECLAIM facilities could result in approximately 26 tons per day of NOx reductions. Table 1-12 reveals the required NOx reductions only amounts to 12.5 tons per day. Furthermore, there are certainly more sophisticated emissions control equipment that can achieve higher degrees of reductions (see Table 1-14) and also additional categories of emissions sources (e.g. furnaces, ovens, fluidized catalytic cracking unit, etc.) besides those included in this investigation.

Table 1-13
Possible Reductions in Emissions
(Preliminary Estimate Using Known Technologies)

Source Type	Achievable Technology	Achievable Level	Achievable Reductions (tons/day)
Utility Boilers	Selective catalytic reduction	0.01 lb/mmBtu	10.17
Boilers > 40 mmBtu (refineries)	Ultra Low NOx burners	9 ppm	2.19
Boilers >= 20 mmBtu (except refinery heaters > 40 mmBtu)	Ultra Low NOx burners	9 ppm	0.48
Boilers < 20 mmBtu	Ultra Low NOx burners	12 ppm	0.26
Process heaters > 40 mmBtu (refineries)	Low NOx burners	0.03 lb/mmBtu	5.68
Process heaters > 2 mmBtu (except refinery heaters > 40 mmBtu)	Low NOx burners	0.03 lb/mmBtu	0.28
Gas turbines	Selective catalytic reduction	9 ppm	3.77
Diesel ICEs	Selective catalytic reduction	44 ppm	1.41
Natural gas ICEs	3-Way Catalyst	24-27 ppm	1.53

Note: Cost effectiveness data is not presented in this table because it may vary depending on the specific unit being controlled and the amount of emissions reduced as indicated in Table 1-10. Refer to discussion under the "Possible Cost Projection" section.

Table 1-14
Further Control Opportunities[1]

Source Type	Control Technology	Control Emission Level
Utility Boiler	SCR	5 ppmv at 3% O_2
Boilers > 20 mmBtu	SCR	7 ppmv at 3% O_2
Boilers < 20 mmBtu	ULNB	9 ppmv at 3% O_2
Boilers	SCONOX[2]	2+ ppmv at 3% O_2
Boilers	LTO[2]	5-7 ppmv at 3% O_2
Process Heaters > 40 mmBtu (refineries)	SCR	5 ppmv at 3% O_2
Process Heaters > 40 mmBtu (refineries)	LNB	18 ppmv at 3% O_2
Gas Turbines	SCONOX	1 ppmv at 15% O_2
Gas Turbines	XONON	2.5 ppmv at 15% O_2
Gas Turbines	SCR	3 ppmv at 15% O_2
ICE, Diesel	NOx TEC	33 ppmv at 15% O_2
ICE, Natural Gas	NSCR	11 ppmv at 15% O_2
Dryer	ULNB	10 ppmv at 3% O_2
Dryer	LNB	30 ppmv at 3% O_2
Oven	LNB	30 ppmv at 3% O_2
Furnace	LNB	40 ppmv at 3% O_2
Furnace, metal melting	Oxy-fuel	9 ppmv at 3% O_2
Afterburner	LNB	30 ppmv at 3% O_2

[1] Cost effectiveness data is not presented in this table because it may vary depending on the specific unit being controlled and the amount of emissions reduced as indicated in Table 1-10. Refer to discussion under the "Possible Cost Projection" section.

[2] SCONOX and LTO technologies are in use for boilers but not for a full six-month period.

As in the case of NOx emissions control, the majority of SOx emissions reductions during RECLAIM's first six years were achieved through process and emissions management and facilities ceasing operations. There has been very little implementation of SOx emission control equipment since the start of RECLAIM. However, refineries have installed or increased capacity of existing hydrodesulfurization units as part of their projects to produce California Reformulated Gasoline.

Over 80% of RECLAIM SOx emissions are from refineries. Of the SOx emissions from refineries, a significant portion is the result of combustion of fuel (i.e. refinery gas) containing sulfur. Refinery gas is a mixture of waste gas streams from the refining process. Some of these waste gases are treated before they are directed to the fuel mix drums which are the main supply of fuel to the various heaters within a refinery. The most efficient way to reduce SOx emissions from heaters is to remove the sulfur compounds in refinery gas prior to it being combusted. Sulfur removal units operate on the principle of using a medium (e.g. amine solution) to adsorb sulfur compounds from the waste gas stream and to regenerate the medium by subsequently desorbing the sulfur into a more concentrated stream. Each of the refineries in the Basin currently operates a variety of process units to remove sulfur compounds from process off gases from refining equipment, such as crude units, fluidized catalytic cracking units, alkylation units, and cokers. The sulfur is then released from the scrubbing medium by regenerating units. Marketable commodities (e.g. elemental sulfur, sulfuric acid, and fertilizers) are then produced by further processing of the concentrated stream. The design, installation, and removal efficiency of such sulfur removal units are highly specific to the origin of the waste gas stream, its sulfur content, the type of sulfur compounds, and the refining process involved. Therefore, reduction in emissions and cost for these units are also highly dependent on the process and are hard to estimate. However, the hydrogen sulfide removal efficiency for these units can be much higher than 90%. In addition, essentially all hydrogen sulfide can be removed from the off gases (< 10 ppm). One way to remove other sulfur compounds is to have treating units to convert sulfur compounds into hydrogen sulfide and then direct the treated stream to a hydrogen sulfide removal unit before sending the off gas to the fuel gas system.

Glass melting furnaces are another group of RECLAIM equipment that emits a significant level of SOx emissions. These SOx emissions are mainly from the process and not from fuel combustion. Scrubbers are used to reduce SOx emissions in the exhaust gas from these furnaces. The scrubbing media can be liquid or solid type. If dry scrubbing is involved, an additional particulate capture device, such as a baghouse or an electrostatic precipitator, is required. Control efficiencies of these scrubbers can reach 80% and above. Limited cost data is available due to the limited implementation of these technologies. The annualized cost of one such installation was reported to be $125,000.

Table 1-12 shows that SOx emissions need to be reduced by 4.2 tons/day or approximately by 25% by year 2003. Figure 1-2 shows that SOx emissions are approaching the level of allocations this year, as discussed above for NOx emissions. Therefore, actual reductions of SOx emissions are required to achieve the emission reduction goals set for 2003. However, staff does not have adequate data to determine if individual refineries can achieve the required reduction simply by re-directing process flow or if actual modifications and

expansions are required. In addition, due to the difficulty in determining the extent of reductions feasible within refineries based on the limited process data available to AQMD, a quantitative analysis of possible SOx reductions and the associated cost estimation is not feasible. Cost estimation is further complicated in that refinery SOx control technologies can yield marketable commodities. Although it is not feasible to project the cost, technologies do exist to achieve the required SOx emissions reductions.

Possible Cost Projection

The fundamental design of the RECLAIM program is to realize the greatest emission reductions at the lowest possible cost to industry. Even though the cost may be the same for a given type of equipment, the actual emissions reductions realized, and therefore the cost effectiveness of implementing the technology, may actually differ significantly depending on the mode and level of operation, and the emission level prior to implementation of the control technology. This variation is illustrated by the wide range of cost effectiveness data presented in Tables 1-9 and 1-10.

Under a perfect market condition, the most cost effective control technologies would be implemented first. However, cost can take on different forms. There are certainly other factors (e.g. risk perception, financial situation, and experience) besides monetary that determine for a particular facility the choice between installing control and purchasing credits. For example, a facility that has already achieved its 2003 emissions goals may not be willing to take on additional risk in installing additional controls even though the project may have financial benefit. On the other hand, the same facility may be willing to implement such a project if it has had prior success with the type of control technology. As discussed above, the cost effectiveness of the control is also highly dependent on the level of operations at a facility. Therefore, it is very difficult, if not impossible, to accurately anticipate where certain types of technology may be implemented.

The following case study is set up to project possible ranges of cost to realize the NOx emission reduction goals under RECLAIM. Cost data used in this study came from three sources: application data, direct contact with facility operators who implemented the control technology, and manufacturers of control equipment. The lesser of the cost to retrofit or the cost of a new equipment with the control installed will be the cost for that technology. Where there is a range of cost, the median cost is used. The following assumptions are further made:

- The required emissions reductions are realized among boilers, heaters, internal combustion engines, and gas turbines which together make up the majority of the emissions;
- The required emissions reductions are shared among each group of equipment in proportion to their share of achievable reductions as shown in Table 1-14;
- The identified control technology will be implemented on an individual piece of equipment based on the greatest actual emission reductions that can be realized through implementation of the identified technologies. Actual emission reductions are determined using the reduction from the present

emission level to the controlled emission level and the actual production rate reported during 1999;

- Each application will incur full cost of the technology at the appropriate equipment rating regardless of amount of reduction; and
- Control technologies are to be implemented within a short time frame as the emissions reductions are required within the next three years.

Each of the above assumptions adds to the uncertainty of the results. However, these assumptions are necessary to facilitate cost projection. In addition, adjustments to these assumptions will yield different cost projections. The results of this study indicate that 120 sources need to have control equipment implemented at an annualized cost of approximately $14.9 million dollars over the next ten years. Being that the required reductions total 12.5 tons/day (4,563 tons/year), this study yields an overall cost effectiveness of $3,300/ton of NOx reduced. This estimated cost is substantially lower than the back stop measures criteria of $15,000/ton of NOx RTC. Further details of this study are presented in Appendix A.

Cost Comparison Conclusion

Based on the above technology investigation, the RECLAIM emissions reduction goals are certainly attainable given the current state of technology. There is no need for further advancements in technology. The control cost study further shows that such reductions can be realized at a very reasonable and bearable cost. Table 1-6 indicates that the 1993 projected average annual cost for complying with RECLAIM was $102 million for equipment installation (1994 through 1999). However, the above analysis shows that compliance with allocations for years 2003 and beyond can be achieved at an annual cost of approximately $14.9 million. The annual cost projected by this model is low due to the nature of the model. That is, the model calls for implementation of the most cost-effective (lowest cost per ton of NOx reduced/prevented) technologies to be implemented within each category of sources. The predicted cost could be even lower if the model called for implementation of the most cost effective technologies overall regardless of source category (i.e., no apportioning of reductions by source category). On the other hand, the projected cost could be much higher if a less efficient market is assumed (i.e., controls implemented by facilities that need the reductions). In summary, the three main cost factors under RECLAIM continue to be lower than the projections made in 1993 for the program.

CHAPTER 2
MONITORING AND ENFORCEMENT

Required Finding

Health & Safety Code §39616(c)(2) specifies that market incentive programs must "provide a level of enforcement and monitoring, to ensure compliance with emission reduction requirements, comparable with command and control air quality measures that would otherwise have been adopted by the district for inclusion in the district's plan for attainment."

Summary

RECLAIM requires use of continuous emissions monitoring systems (CEMS) to continuously monitor mass emissions from major sources. The rules and control measures subsumed by RECLAIM required the use of far fewer CEMS and these CEMS were only used to monitor emissions on a concentration basis. The operational states of CEMS are tracked via electronic status transmittals. RECLAIM also includes detailed monitoring and reporting requirements for emissions from non-major sources, including expanded fuel use monitoring requirements. RECLAIM's recordkeeping and electronic reporting requirements are equally as rigorous. In general, RECLAIM's monitoring, reporting, and recordkeeping requirements are more rigorous than the corresponding requirements of the rules subsumed by RECLAIM. RECLAIM also has a much more structured inspection and enforcement program than the subsumed rules and measures. Each facility has been inspected at least once each year of the program, and often more frequently.

Recommendation

Staff recommends that the Governing Board make the following findings:

- RECLAIM provides monitoring and enforcement at least as stringent as would have been provided by the rules and 1991 AQMP control measures subsumed by RECLAIM; and
- RECLAIM is in compliance with Health & Safety Code §39616(c)(2).

Background

RECLAIM was designed with a basic principle that all emission reductions must be real, quantifiable, surplus, and enforceable. Thus, RECLAIM includes specific monitoring, reporting, and recordkeeping (MRR) requirements which guarantee reliable emissions quantification and even provide for substitute emissions data in instances where direct monitoring fails. AQMD has also implemented a strong enforcement program under RECLAIM.

At the October 1993 Public Hearing during which RECLAIM was adopted, the Governing Board found:

- "RECLAIM will provide a level of monitoring comparable to, or improved over, command-and-control air quality measures."
- RECLAIM requires more continuous emission monitoring systems than do the subsumed rules and control measures and requires the use of emission rates or concentration limits specifically validated for each of the remaining sources or categories for except for the smallest sources.
- RECLAIM requires source testing for the majority of emissions and requires more frequent and accurate reporting and recordkeeping than do the subsumed rules and control measures.
- RECLAIM "will provide a level of enforcement and monitoring, to ensure compliance with emission reduction requirements, comparable with command-and-control air quality measures that would otherwise have been adopted by [AQMD] for inclusion in [AQMD's] plan for attainment."
- "RECLAIM will provide an equivalent level of deterrence against non-compliance as compared to command-and-control programs."

These findings are further addressed in Chapter 5 of *RECLAIM Development Report* (October 1993). *RECLAIM Development Report* explains that RECLAIM CEMS are used to monitor emissions on a mass basis, as opposed to CEMS under the subsumed rules and measures which monitor emissions on a concentration basis and, further, that installation of CEMS is required sooner under RECLAIM than under the subsumed rules and measures. RECLAIM also expands the monitoring of fuel usage and source testing requirements. RECLAIM also enhances monitoring by requiring the use of electronically submitted status codes to track breakdowns and CEMS outages, rather than via telephonic reporting. This chapter will address these findings.

Analysis

The consistent availability of accurate, reliable emissions data is a key element of an "emission budget" program such as RECLAIM. Therefore, RECLAIM's Rule 2011 and Rule 2012 include detailed monitoring, reporting, and recordkeeping (MRR) requirements for SOx sources and NOx sources, respectively. These MRR requirements were designed to ensure the accuracy of each facility's reported emissions, as well as to provide the foundation for the program's enforceability. These MRR requirements are tiered by source type and size, as summarized in Table 2-1:

Table 2-1
Monitoring Requirements for RECLAIM Sources

Source Category	Major Sources (NOx and SOx)	Large Sources (NOx only)	Process Units and Rule 219 Equipment (NOx and SOx)
Monitoring Method	Continuous Emission Monitoring System (CEMS)	Fuel Meter or Continuous Process Monitoring System (CPMS)	Fuel Meter and/or Timer
Reporting Frequency	Daily	Monthly	Quarterly

The largest emission points under RECLAIM are termed major sources. These sources are relatively few in number yet account for approximately 90 percent of RECLAIM NOx emissions and approximately 98 percent of RECLAIM SOx emissions based upon emissions data for calendar year 1999. Therefore, by investing in the most accurate monitoring technologies available for these sources, it is possible to have a very accurate assessment of the majority of RECLAIM emissions without having to invest in such technologies to monitor emissions from the less significant but numerically much more abundant small- and medium-size sources. In other words, confining the use of the most accurate but most expensive monitoring technologies to RECLAIM's major sources allows facilities to maximize the benefits of these technologies while minimizing the costs.

Stringency of Monitoring Requirements

RECLAIM requires the use of a certified continuous emissions monitoring system (CEMS) to monitor emissions from each major NOx source and each major SOx source[1]. As of January 1, 2000, there were 425 major sources in RECLAIM[2]. These major sources were concentrated at 86 RECLAIM facilities. Prior to the implementation of RECLAIM, the use of CEMS was very limited. Furthermore, pre-RECLAIM CEMS were primarily used to monitor pollutant concentrations in an exhaust stream. RECLAIM CEMS are used to monitor mass emissions.

RECLAIM also requires periodic (annual or semi-annual) Relative Accuracy Test Audits (RATA) of each CEMS. RATAs are used to ensure that RECLAIM-certified CEMS continue to operate accurately. RATAs also help verify that CEMS receive proper ongoing maintenance and upkeep.

Although the monitoring requirements for large NOx sources, NOx process units, and SOx process units are less stringent than for major NOx sources and major SOx sources, they are at least as stringent as the monitoring requirements for the same equipment in the rules subsumed by RECLAIM. Table 2-2 provides a

[1] Operators of facilities with major sources do have one monitoring option which they may elect other than CEMS: alternative continuous emissions monitoring systems (ACEMS). ACEMS must provide equivalent accuracy, reliability, reproducibility, and timeliness as CEMS. Two ACEMS have been approved for major NOx sources and no ACEMS have been approved for major SOx sources. Four additional proposed NOx ACEMS are currently under development.

[2] In some cases a single piece of equipment is both a major NOx source and a major SOx source.

Table 2-2
Comparison of Monitoring Requirements

Subsumed RULE	Subsumed Rule Monitoring Equipment	Applicable Sources	RECLAIM Monitoring Equipment
474	None	Fuel burning equipment	For process unit • Fuel meter For large source • Fuel meter • Source test once every three years For major source • Fuel meter • CEMS (mass)
476	None	Steam generating equipment	For large source (40 to 500 mmbtu/hr with annual heat input of < 90 billion btu/yr): • Fuel meter • Source test once every three years For major source (>40 mmbtu/hr) • Fuel meter • CEMS (mass)
1109	CEMS (concentration)	Boilers and process heaters at refineries with greater than 40 million BTU per hour heat input	CEMS (mass)
1110.2	For all: • Engine timer • Source test every 3 years • Operating log For 1000 HP plus: • CEMS (concentration)	Internal combustion engines over 50 HP	For all: • Fuel meter • For large source • Source test every 3 years • For 1000 HP plus (major source): • CEMS (mass)
1112	• Fuel meter • CEMS (concentration)	Gray cement kilns	• Fuel meter • CEMS (mass)

Subsumed RULE	Subsumed Rule Monitoring Equipment	Applicable Sources	RECLAIM Monitoring Equipment
1117	Source test once or CEMS if complying by means of an AECP	Glass melting furnaces	For large source (<40 mmbtu/hr) • Fuel meter • Source test every 3 years For major source (>40 mmbtu/hr) • Fuel meter • CEMS
1134	For < 2.9 MW: • Source test once a year if NOx emissions are > 25 tons/yr or once every 8400 hours if less For > 2.9 MW • Fuel meter • Operation timer • CEMS (concentration)	Gas Turbine	For process unit (< 0.2 MW) Fuel meter For large source (0.2 to 2.9 MW): • Fuel meter • Source test once every three years For major source (> 2.9 MW) • Fuel meter • CEMS (mass)
1135	For all equipment • Fuel meter • CEMS (mass)	Utility boilers	For major source • Fuel meter • CEMS (mass)
1146	For 5 to 40 mmbtu/hr with < 90,000 therms annual fuel use: • Fuel meter For 5 to 40 mmbtu/hr or > 40 with 25% annual capacity factor: • Fuel meter • Source test once For >40 mmbtu/hr • Fuel meter • CEMS (mass)	Boilers and process heaters	For process unit (2 to 10 mmbtu/hr or 10 to 40 mmbtu/hr with annual heat input of < 23 billion btu/yr) Fuel meter For large source (10 to 40 mmbtu/hr hr or 40 to 500 mmbtu/hr with annual heat input of < 90 billion btu/yr): • Fuel meter • Source test once every three years For major source (>40 mmbtu/hr) • Fuel meter • CEMS (mass)
1146.1	For 2 to 5 mmbtu/hr: Fuel meter	Boilers and process heaters	For process unit (2 to 5 mmbtu/hr) Fuel meter

Subsumed RULE	Subsumed Rule Monitoring Equipment	Applicable Sources	RECLAIM Monitoring Equipment
1159	None	Nitric acid units	For process unit (<4 ton/yr NOx emissions from unit) Fuel meter For large source (4 to 10 ton/yr NOx emissions from unit): • Fuel meter • Source test once every three years For major source (> 10 ton/yr NOx emissions from unit) • Fuel meter • CEMS (mass)
53	None	All SOx emitting equipment	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)
53A	None	All SOx emitting equipment	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)
407	None	All SOx emitting equipment, except as exempted	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)
431.1	• Fuel meter • Continuous fuel gas monitoring system (CFGMS) or • CEMS	Equipment burning gaseous fuel other than exclusively natural gas	• Fuel meter • CEMS (mass)

Subsumed RULE	Subsumed Rule Monitoring Equipment	Applicable Sources	RECLAIM Monitoring Equipment
431.2	Test for sulfur content of fuel: • Once a month for refineries and utilities • Once a year for all others	Equipment burning diesel fuel	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)
431.3	None	equipment burning solid fuel	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)
468	None	Sulfur Recovery Units	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)
469	None	Sulfuric Acid Units	For major source • Fuel meter • CEMS (mass)
1101	None	Furnaces used to recover lead from automotive batteries	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)
1105	All variable parameters necessary to calculate mass emissions of sulfur oxides	Fluid catalytic cracking unit	For major source • Fuel meter • CEMS (mass)
1119	Source test once	Petroleum coke calcining equipment	For process unit • Fuel meter For major source • Fuel meter • CEMS (mass)

comparison of the monitoring requirements contained in the subsumed rules and the RECLAIM monitoring requirements for the same equipment.

RECLAIM requires periodic source test verification of emission factors used to quantify emissions for large sources. These source tests ensure that accurate factors are used, as well as continued maintenance and upkeep of equipment. The rules and control measures subsumed by RECLAIM did not have any corresponding periodic testing requirements or any other method to verify ongoing compliance with emission limits.

Recordkeeping and Reporting Requirements

In addition to its rigorous monitoring requirements, RECLAIM also includes substantial recordkeeping and reporting requirements. Again, these requirements are most rigorous for major sources, which are required to provide electronic emission reports on a daily basis. Furthermore, the raw monitoring data collected by each CEMS throughout the day (fifteen minute average data) upon which the daily report is based is required to be kept on site for three years after the end of the compliance year. Monthly electronic emissions reports are required for large NOx sources and quarterly electronic emissions reports are required for process units. The supporting records for these emission reports must also be kept on site for three years after the end of the compliance year.

Facility Compliance Audit

Each RECLAIM facility is required to certify the accuracy of its reported emissions both quarterly and annually. They also have the opportunity to correct their reported emissions during the certification process provided that they can document that the emissions originally reported were in error. This process further enhances the accuracy of emissions reporting under RECLAIM. A reconciliation period is provided prior to the due date of the annual emissions certification in order to provide facilities the opportunity to review and audit their emissions reports. Finally, AQMD staff performs audits of the annually certified emissions each year. Such audits have been performed for each facility for each completed compliance year of the program. These audits help facilities identify and correct compliance problems.

RECLAIM's MRR requirements collectively ensure that reported emissions are real, quantifiable, and enforceable. In general, these requirements are more rigorous than the corresponding requirements of the rules subsumed by RECLAIM. The subsumed rules and control measures used a concentration-based approach to limiting emissions. Therefore, the monitoring requirements were much less rigorous than they are for RECLAIM, which is a mass-based program. For the most part, mass emissions reporting was limited to the annual "emission fee billing" reports submitted by each facility. Emissions were generally reported on an aggregate basis in these reports and were frequently based upon default emission factors. The one exception to this general approach was Rule 1135, which required the use of CEMS and electronic emissions reporting for electric power generating systems operated by electric utilities.

Under the subsumed rules and control measures, facilities were inspected as a part of AQMD's ongoing compliance program. The inspection frequency was dependent on emissions potential. Under RECLAIM, however, the inspection process has been much more structured. Each RECLAIM facility has been

inspected a minimum of once per year during each year of the program to date. Inspections were even more frequent during the early years of the program. These early inspections helped facilities identify and correct any problems early on, thus enhancing overall compliance.

Conclusions

RECLAIM requires more stringent and more frequent monitoring than the subsumed rules and control measures. As a result, better emissions data is generated and collected under RECLAIM. Furthermore, RECLAIM's extensive audit program helps ensure a high rate of compliance. RECLAIM's monitoring requirements and enforcement procedures surpass the corresponding elements of the subsumed rules and control measures. Thus, it is clear that RECLAIM complies with H&S §39616(c)(2).

CHAPTER 3
PRIVATIZATION OF COMPLIANCE AND AVAILABILITY OF ELECTRONIC DATA

Required Finding

Health & Safety Code §39616(c)(5) requires that market incentive programs "promote the privatization of compliance and the availability of data in computer format. The district shall endeavor to provide sources with the option to keep records by way of electronic or computer data storage systems, rather than mechanical devices such as strip chart recorders."

Summary

RECLAIM includes a number of elements which promote, and even require, privatization of compliance. For example third party source testing to verify the emission rates of large NOx sources and to determine the relative accuracy of CEMS is required on a periodic basis. Other program elements which also promote privatization include Quarterly Certification of Emissions, Annual Permit Emissions Program, and installation and certification of CEMS. Additionally, many facility operators have performed self audits to help identify ways the facility's operations can be optimized to minimize emissions without requiring the installation of additional controls.

RECLAIM's MRR requirements rely heavily upon electronic data. For example, the requirements for self (or third party) daily, monthly, and quarterly electronic reporting and recordkeeping are all based upon electronic data which is transmitted to AQMD electronically via data acquisition and handling systems and remote terminal units. Staff is also working on amendments to RECLAIM's monitoring, reporting, and recordkeeping requirements to allow use of electronic alternatives to strip chart recorders to continuously record data collected by CEMS.

Recommendation

Staff recommends that the Governing Board make the following findings:

- RECLAIM is promoting privatization of compliance and the availability of electronic data; and
- RECLAIM is in compliance with Health & Safety Code §39616(c)(5).

Background

It also requires the implementing district to strive to incorporate options to comply with recordkeeping requirements electronically. Section 39616(c)(5) was not in the Health & Safety Code at the time of RECLAIM's October 1993 adoption. Therefore, the Governing Board did not make a finding in this regard. However, this chapter will address RECLAIM's compliance with this requirement.

Analysis

RECLAIM provides a variety of opportunities and requirements for the privatization of compliance and actively requires the availability and submittal of data electronically. The relevant self- (or third party-) compliance requirements are summarized below:

- Quarterly Certification of Emissions (QCE)
  Every RECLAIM facility is required to submitted a certified quarterly summary of emissions every three months. These certifications are prepared by the facility operator or by a third party, at the facility operator's discretion.
- Annual Permit Emissions Program (APEP)
  After the end of each compliance year, in conjunction with the fourth quarter QCE, each RECLAIM facility is required to submit a certified summary of RECLAIM emissions for the year. In some cases facility staff prepares these summaries. Other facilities elect to hire a third party to perform this function. In either case, a designated official of the facility must sign the certification.
- Relative Accuracy Test Audit (RATA) and Source Test Requirements
  Testing to determine the relative accuracy of CEMS and to verify the emission rates of large NOx sources is required periodically. These tests must be conducted by third parties.
- Installation & Certification of CEMS
  CEMS are complex systems of equipment. The assistance of a qualified third party is generally necessary to install a new CEMS and ensure it is operating properly. Additionally, testing by a third party is required for the certification of each CEMS.
- Emissions Trading
  Each facility operator is responsible for tracking the facility's emissions and ensuring that sufficient RECLAIM Trading Credits are in the facility's allocation account to offset the emissions. Thus, the facility operators have both the freedom and the responsibility to manage emissions and to buy and sell RTCs as appropriate to ensure continuous compliance.

In addition to the requirements identified above, many facility operators have found it useful to perform self audits. Such audits help identify ways in which the facility's operations can be optimized to minimize emissions without requiring the installation of additional controls. The facility operator would receive credit for these reductions under RECLAIM, but not under the subsumed rules and control measures. Thus, RECLAIM rewards creative problem solving on the part of facility operators and their consultants.

RECLAIM's MRR requirements rely heavily upon electronic (i.e. computer format) data. In fact, the requirements for self (or third party) daily, monthly, and quarterly electronic reporting and recordkeeping are all based upon electronic data. This data is transmitted to AQMD electronically via data acquisition and handling systems and remote terminal units. Although some facilities initially experienced data transmittal problems, the use of electronic data is generally of benefit to both the facilities and to AQMD. Electronic data is much easier to compile, manipulate, search, analyze, and store than hardcopy records.

RECLAIM currently requires the use of strip chart recorders to continuously record data collected by CEMS. This requirement results in paper records to support the electronic data collected, archived, and transmitted electronically. AQMD cosponsored a study with Western States Petroleum Association to identify appropriate electronic alternatives to strip chart recorders. The goal of the study was to identify technologies which provide viable electronic methods that can be implemented as alternatives to strip chart recorders. The recommendations from this study were released in a final draft report which was released March 1999. Subsequently, the AQMD Governing Board established the Monitoring, Recordkeeping, and Reporting (MRR) Task Force in April 1999. This Task Force presented recommendations for streamlining AQMD's MRR requirements to the Governing Board at its April 2000 meeting. As a result of this work, the Governing Board has directed staff to develop amendments to RECLAIM's MRR requirements contained in Rule 2011, Appendix A of Rule 2011, Rule 2012, and Appendix A of Rule 2012. These proposed amendments are intended to provide the option of using an alternative electronic recording system to strip chart recorders and are currently targeted for March 2001.

Conclusions

RECLAIM includes a variety of elements requiring facility operators and/or third parties to engaging in compliance activities on the facilities behalf. These activities include monitoring, reporting, recordkeeping, emissions testing, CEMS certification, emissions management, and emissions credit trading. RECLAIM places far more responsibility for compliance activities with the facility operators. Many of these compliance activities involve the collection, manipulation, transmittal, and storing of electronic data. In fact, the vast majority of RECLAIM compliance data is collected and handled electronically. RECLAIM enhances privatization of compliance and availability of electronic data and complies with H&S §39616(c)(5).

CHAPTER 4
TRADING EMISSIONS REDUCTIONS FROM NON-RECLAIM SOURCES

Required Finding

Health and Safety Code §40440.1 requires that a market incentive program implemented by SCAQMD "shall achieve emission reductions across a spectrum of sources by allowing for trading of emissions trading units for quantifiable reductions in emissions from a significant number of different sources, including mobile, area, and stationary…."

Summary

Each RECLAIM facility was issued RECLAIM Trading Credits (RTC) in an amount based upon its operational history upon inclusion into the program. Additionally, each such facility which held Emission Reduction Credits (ERC) at the time of inclusion had their ERCs automatically converted to RTCs. Similarly, non-RECLAIM facilities had the opportunity to have any ERCs they held converted to RTCs by request. Emission credits generated pursuant to Regulation XVI - Mobile Source Offset Programs or pursuant to Rule 2506 - Area Source Credits for NOx and SOx can also be converted to RTCs. It may become possible to generate emission credits for use in RECLAIM through the Air Quality Investment Program (Rule 2501) and/or the Intercredit Trading Program (currently under development).

Recommendation

Staff recommends that the Governing Board make the following findings:

- RECLAIM allows the use of emissions reductions generated by a variety of sources, including mobile, area, and stationary sources;
- Development of additional credit generation opportunities is underway; and
- RECLAIM is in compliance with Health & Safety Code §40440.1.

Background

The statute further clarifies that the program may initially be adopted in a form only providing for use of reductions from limited sources but then shall be subsequently amended to allow use of reductions from a broader spectrum of sources "as soon as practical after adoption."

RECLAIM was initially adopted with provisions for use of certain reductions from sources other than RECLAIM facilities. Provisions for use of additional sources of emissions reductions have subsequently been added. Additionally, SCAQMD is working to further expand the range of sources eligible to generate emissions reductions tradable under RECLAIM.

The Governing Board found "that the RECLAIM program will achieve…emission reductions across a spectrum of sources by allowing for trading of emission units for quantifiable reductions in emissions from a significant number of different sources from mobile and stationary sources which are within the [AQMD's] jurisdiction" at the October 1993 Public Hearing to adopt RECLAIM (Resolution No. 93-28). This chapter will address this finding.

Analysis

Each existing facility received an allocation of RTCs upon entry into RECLAIM. Each facility's allocation was based upon its historical operation levels and the types of equipment it operated pursuant to Rule 2002 - Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx). These allocations were issued for the years 1994 through 2010 and beyond and are the primary source of the RTC supply. Additionally, Rule 2002(c)(3) requires automatic conversion to RTCs of valid Emission Reduction Credits (ERC) held by RECLAIM facilities at the time of inclusion into RECLAIM (Tables 4-1 and 4-2). ERCs are denominated in units of pounds per day and RTCs are denominated in units of pounds in year. Therefore, ERC conversions are calculated based upon the holding facility's documented number of days of operation per year. Emissions reductions from several other types of sources such as non-RECLAIM stationary sources, mobile sources, and area sources are also available for use in the RECLAIM program, as discussed below.

Table 4-1
NOx RTCs from Converted ERCs at Non-RECLAIM facilities (tons/day)

YEAR	RTCs from Converted ERCs (RECLAIM Facilities)	RTCs from Converted ERCs (non-RECLAIM Facilities)	Total RTCs from Converted ERCs
1994	3.2	3.5	6.7
1995	3.2	3.5	6.7
1996	3.2	3.5	6.7
1997	3.2	3.5	6.7
1998	3.2	3.5	6.7
1999	3.2	3.5	6.7
2000	3.2	3.5	6.7
2001	2.9	3.2	6.1
2002	2.6	2.9	5.5
2003	2.3	2.5	4.9

Table 4-2
SOx RTCs from Converted ERCs at Non-RECLAIM facilities (tons/day)

YEAR	RTCs from Converted ERCs (RECLAIM Facilities)	RTCs from Converted ERCs (non-RECLAIM Facilities)	Total RTCs from Converted ERCs
1994	2.3	0.6	2.9
1995	2.3	0.6	2.9
1996	2.3	0.6	2.9
1997	2.3	0.6	2.9
1998	2.3	0.6	2.9
1999	2.3	0.6	2.9
2000	2.3	0.6	2.9
2001	2.0	0.5	2.5
2002	1.7	0.5	2.2
2003	1.5	0.4	1.9

Stationary Sources—Non-RECLAIM Facilities

Rule 2002(c)(4) provided non-RECLAIM facilities an opportunity to have any ERCs they held converted to RTCs for use in RECLAIM. The total ERCs from non-RECLAIM facilities converted to RTCs are summarized in Tables 4-1 and 4-2. The deadline for non-RECLAIM facilities to request conversion of ERCs to RTCs pursuant to Rule 2002 was June 20, 1994.

Mobile Sources

Regulation XVI - Mobile Source Offset Programs provides for the generation of emissions credits (Mobile Source Emission Reduction Credits, MSERC) from various types of emissions reductions from mobile sources, as identified in Table 4-3. RECLAIM's Rule 2008 - Mobile Source Credits establishes criteria and requirements for conversion of MSERCs to RTCs. MSERCS are converted to RTCs on a one-to-one basis for a finite set of years. Total RTCs converted from MSERCs are summarized in Table 4-4. Although EPA has approved Rule 2008 into the State Implementation Plan (SIP), it has not approved the rules in Regulation XVI. Therefore, sources electing to use RTCs generated by conversion of MSERCs may be subject to enforcement action by EPA or by lawsuits filed by citizens until Regulation XVI rules are approved into the SIP. The affected RTCs contain a notice to this effect.

Table 4-3
Mobile Source Credit Rules

Rule	Title
1605	Credits for the Voluntary Repair Of On-Road Motor Vehicles Identified Through Remote Sensing Devices
1610	Old-Vehicle Scrapping
1612	Credits for Clean On-Road Vehicles
1613	Credits for Truck Stop Electrification
1620	Credits for Clean Off-Road Mobile Equipment
1623	Credits for Clean Lawn and Garden Equipment

Table 4-4
NOx RTCs Converted from MSERCs by Rule of Origin (tons)

Year	Amount	Rule
1994	33	1610
1995	36	1610
1996	36	1610
1997	4	1610
1999	50	1612
2000	150	1612
2001	10	1612

Area Sources

Rule 2506 - Area Source Credits for NOx and SOx was adopted April 1997 to incentivize emissions reductions and technology development for unpermitted, non-mobile sources. These sources include residential appliances, a variety of combustion sources rated below 50 hp or 2,000,000 Btu per hour, and agricultural equipment. In some cases, applications for Area Source Credits (ASC) are subject to review by AQMD, California Air Resources Board, and United States Environmental Protection Agency (EPA). Rule 2506 specifies that ASCs can be converted to RTCs at a rate of nine pounds of RTCs per ten pounds of ASCs. Thus, adoption of this rule expanded the arena of available emissions reductions that can be traded under RECLAIM. AQMD has received two applications for ASCs—one was denied by AQMD due to insufficient data and AQMD completed its review of the second and forwarded it to EPA for review. EPA recently (September 2000) completed its review of this application and does not object to issuance of the ASCs. Therefore, AQMD anticipates final approval and issuance of the ASCs in the near future. Specifically, 75.56 tons per year of NOx ASCs will be issued for July 2000 through 2001, June 2001 through June 2002, and July 2002 through June 2003. This could potentially result in the addition of 68 tons of NOx RTCs to the market in each of these three years.

Air Quality Investment Program

There are two additional credit programs of interest, although they are not currently able to generate credits for use in RECLAIM. These programs are briefly described below:

- Air Quality Investment Program
  Rule 2501 - Air Quality Investment Program (AQIP) provides alternative compliance options for sources subject to AQMD's source-specific rules and regulations. Credits generated under the AQIP program are currently ineligible for RECLAIM use.

- Intercredit Trading Program
  AQMD is currently working to develop and "Intercredit Trading Program" intended to establish links between the various existing credit programs. The Intercredit Trading Program is envisioned as providing mechanisms to enable the movement of emissions credits between these programs, thereby enhancing the versatility and compliance options of these programs. For example, Intercredit Trading may enable the use of AQIP credits in RECLAIM.

Conclusions

RECLAIM facilities may use emission reductions from stationary point (permitted) sources, area (small, unpermitted) sources, and mobile sources in any combination to offset their RECLAIM emissions. Additional sources of emissions reductions may be approved for use in RECLAIM in the future. Therefore, RECLAIM complies with the Health and Safety Code §40440.1 requirement to allow use of emission reductions from a variety of emissions sources including point, area, and mobile sources.

CHAPTER 5
STATE AMBIENT AIR QUALITY STANDARDS

Required Finding

Health and Safety Code §39616(c)(6) specifies that any market incentives program adopted by any air district's board "will not in any manner delay, postpone, or otherwise hinder district compliance with Chapter 10 (commencing with Section 40910) of Part 3 [the California Clean Air Act]."

Summary

Per capita exposure to ozone in the South Coast Air Basin met the target reductions specified for year 2000 in Health and Safety Code §40920(c) several years ahead of schedule. Additionally, RECLAIM is achieving the same emissions reductions as would have resulted from continued implementation of the subsumed rules and control measures. RECLAIM's reductions are also more certain than the projected reductions from the subsumed rules and control measures.

Recommendation

Staff recommends that the Governing Board make the following findings:

- RECLAIM is not in any manner delaying compliance with the Chapter 10 of Part 3 of the Health & Safety Code; and
- RECLAIM is in compliance with Health & Safety Code §39616(c)(6).

Background

As discussed in Chapter 1, Health and Safety Code §39616(c)(1) specifies that market incentive programs achieve equivalent emissions reductions as would have resulted from implementing the rules and control measures they subsume. This legislation does not, however, require the equivalent emissions reductions to be achieved at the same rate as projected for continued implementation of the subsumed rules and control measures. In fact, the legislature specifically deleted language which would have required that market incentive programs achieve equivalent or greater emissions reductions "within an equivalent time frame." Rather, in Health and Safety Code §39616(c)(6), the legislature established the requirement that a market incentives program "will not in any manner delay, postpone, or otherwise hinder district compliance with Chapter 10 (commencing with Section 40910) of Part 3." Chapter 10 specifies the requirements regarding district plans to achieve attainment with California ambient air quality standards. That is, RECLAIM shall not result in a delay in reaching attainment with California ambient air quality standards.

Prior to adopting RECLAIM, the Governing Board found:

- AQMD “has developed an emission reduction strategy for the RECLAIM program that will require the applicable sources to reduce their emissions, in aggregate, by the equivalent level, as compared to continuing to implement the AQMP, taking into account the potential increase in emissions that could result without the imposition of mass caps.”
- Aggregate RECLAIM allocations are appropriate for each year of the program.
- RECLAIM will help achieve and maintain attainment with state ambient air quality standards by the earliest practicable date.
- RECLAIM “will not in any manner delay, postpone, or otherwise hinder [AQMD] compliance with Chapter 10 (commencing with Section 40910) of Part 3 of the California Health and Safety Code.”

Analysis

Section 40914(a) of Chapter 10 specifies that district plans must achieve at least a five percent annual reduction in district-wide emissions, "averaged every consecutive three-year period." However, §40914(b) provides that a

> district may use alternative emission reduction strategy which achieves less than an average of 5 percent per year reduction in districtwide emissions if the district demonstrates to the state board, and the [California Air Resources Board] concurs…that despite the inclusion of every feasible measure in the plan, and an expeditious adoption schedule, the district is unable to achieve at least a 5 percent annual reduction in districtwide emissions.

The California Air Resources Board found that AQMD's 1991 Air Quality Management Plan (AQMP) satisfied the requirement of §40914(b). Although Chapter 10 does not specify a minimum annual reduction where every feasible measure is implemented, it does provide broad guidance regarding the levels of reductions to be achieved. For example §40913(a) states that "each district plan shall be designed to achieve and maintain the state [air quality] standards by the earliest practicable date" and §40920(c) specifies that the measures in the AQMP be "sufficient to reduce overall population exposure to ambient pollutant levels in excess of the standard by at least 25 percent by December 31, 1994, 40 percent by December 31, 1997, and 50 percent by December 31, 2000" relative to a 1986-1988 baseline. Table 5-1 presents the baseline, 1997 target, 2000 target, and actual emissions (actual exposure) for the South Coast Air Basin and by county. Table 5-1 shows that the South Coast Air Basin overall and Los Angeles and Orange Counties had achieved compliance with the 2000 target by 1994, San Bernardino County achieved compliance with the 2000 target in 1995, and Riverside County achieved compliance with the 2000 target in 1996.

Table 5-1
Per Capita Exposure to Ozone above the State Standard of 0.09 ppm (hours)

Location	1986-88 baseline[1]	1994 actual	1995 actual	1996 actual	1997 actual	1998 actual	1997 target[2]	2000 target[3]
Basin	80.5	37.6	27.	20.	5.9	12.	48.3	40.2
Los Angeles	75.8	26.5	20.	13.	3.0	7.9	45.5	39.9
Orange	27.2	9.0	5.7	4.0	0.6	3.1	16.3	13.6
Riverside	94.1	71.1	48.	42.	13.	25.	56.5	47.0
San Bernardino	192.6	124.	91.	70.	24.	40.	115.	96.3

1. Average over three years, 1986 through 1988
2. 60% of the 1986-88 baseline exposures
3. 50% of the 1986-88 baseline exposures

RECLAIM regulates emissions of SOx and NOx. SOx is a precursor to PM10 and NOx is a precursor to ozone and PM10. The South Coast District is in attainment with the ambient air quality standards for SOx established by the California Clean Air Act and Chapter 10 does not apply to PM10. Therefore, §39616(c)(6) is not applicable for SOx. It is, however, applicable for NOx and ozone.

The 1991 AQMP calls for implementation of its Tier I and Tier II control measures for NOx by 2010. RECLAIM was designed to achieve the same emission reductions as would have been achieved by implementing the subsumed rules and control measures for the same sources by 2003 (refer to Chapter 1). Furthermore, the emissions reductions called for by RECLAIM are more certain than those required by the subsumed rules and control measures because they are specified on a total mass emitted basis rather than on a basis of concentration or mass per unit of production or fuel consumption.

Conclusions

Per capita exposure to ozone in the South Coast Air Basin met the target reductions specified for year 2000 in Health and Safety Code §40920(c) well ahead of schedule. Further, RECLAIM was designed to achieve the same emissions reductions as would have been achieved through implementation of the subsumed rules and control measures. RECLAIM emission reductions are more certain than the projected reductions from the subsumed rules and control measures because they are specified on a mass basis. Therefore, RECLAIM is not delaying attainment with California's ambient air quality standards and is in compliance with Health and Safety Code §39616(c)(6).

CHAPTER 6
OTHER ISSUES

Summary

Aside from the five findings requiring ratification, there are several other current issues associated with RECLAIM that are of importance at this time and are presented here for informational purposes.

The convergence of several factors resulted in a higher demand for NOx RECLAIM Trading Credits (RTC) for the 1999 compliance year. These factors include decrease of annual allocations to the point where allocations and emissions are roughly equal, restructuring of the electric utility industry resulting in change of ownership of ten local power plants, creation of an open market for sale of electricity, and electricity shortages during summer 2000 resulting in the need to generate more electricity than anticipated. This was particularly true for Cycle 2 (RTC expiration June 2000). The fixed supply of NOx RTCs and the high demand resulted in quickly rising prices for NOx RTCs. Some of the electric utilities have committed to several emissions control projects that will significantly reduce their emissions and, as a result, potentially enhance the availability of NOx RTCs in the future. Several additional RECLAIM facilities have also proposed to install low NOx burners and other control technologies to further reduce emissions at their facilities.

Some RECLAIM facilities have relatively low emissions levels. Installation of control equipment has a relatively high cost effectiveness (dollars per pound of emissions reduced) for these facilities. Therefore, they generally tend to be more reliant on the availability of lower-cost RTCs to maintain compliance with RECLAIM. As a result, these facilities experienced a more significant impact from the recent high prices for NOx RTCs. Facilities that have expanded their production and thereby increased their emissions since RECLAIM commenced were also impacted by the recent high prices.

It is also expected that the recent high prices for NOx RTCs will encourage other facilities to implement NOx control technologies so they can avoid or reduce their future needs to purchase NOx RTCs. Thus, it is anticipated that the above factors may potentially dampen the escalating NOx RTC prices that were experienced in the summer of 2000. Staff will expeditiously prepare a more detailed assessment of these factors and evaluate the appropriateness of implementing any backstop measures, if necessary.

Rule 2008 – Mobile Source Credits provides for conversion of mobile source emission reduction credits (MSERC) to RTCs for use in RECLAIM. However, United States Environmental Protection Agency (EPA) has not approved use of MSERC in RECLAIM. Therefore, any facility that elects to use RTCs generated from MSERC conversion is potentially subject to enforcement action by EPA or through citizens' law suits even though such use is permissible under AQMD rules.

Background

There are other issues regarding the RECLAIM program which do not directly pertain to the findings requiring ratification but which are important to the overall program, are of high interest, and are worth discussing. Therefore, this chapter will address issues such as the cost of credits, facilities that are most affected by credit price hikes, and the use of mobile source credits.

Cost of NOx Credits

In the AQMD's Annual RECLAIM Audit Report for the 1998 Compliance Year (published March 2000) staff made the following finding:

> *In 1999, RTC prices continued in the similar trend as previous years, with lower prices for the current year credits and higher prices for the future years. When compared to prior years, the average prices for NOx RTCs increased significantly in 1999, while average prices for SOx RTCs are below the average prices for RTCs traded in 1996, 1997, and 1998. Average prices for NOx RTCs traded in 1999 ranged from $1,827 per ton for current-year RTCs to $4,553 per ton for year 2001 RTCs. Average prices for SOx RTCs traded ranged from $784 per ton for current-year credits to $1,649 per tons for year 2005 RTCs. Figures 2-6 and 2-7 show the changes in average prices for NOx and SOx RTCs respectively.*
>
> *Since the start of the RECLAIM program in 1994, prices have generally been lower as the expiration date of the RTCs approaches. Prices are even lower during the 60-day reconciliation period after the expiration date of the RTCs. However, in 1999, the price trend for current-year RTCs has been reversed, and prices for these expiring RTCs have been increasing as the expiration date approaches.*

Figure 2-6
Yearly Average Prices for NOx RTCs

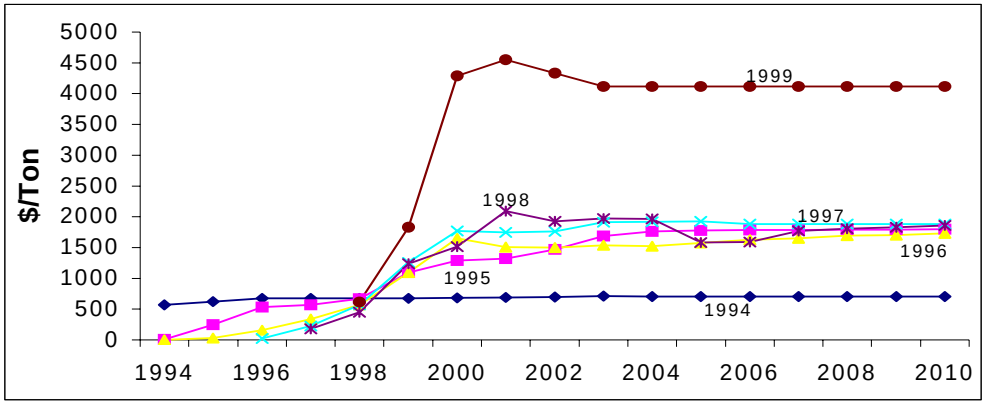
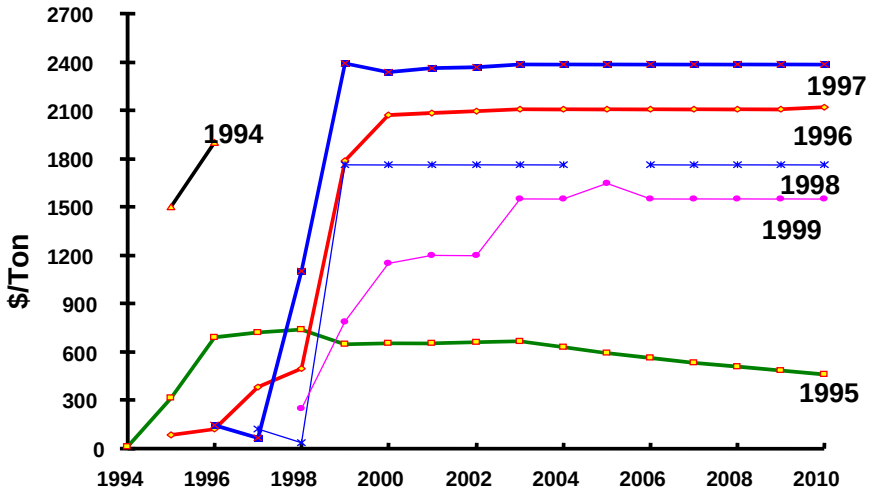


Figure 2-7
Yearly Average Prices for SOx RTCs



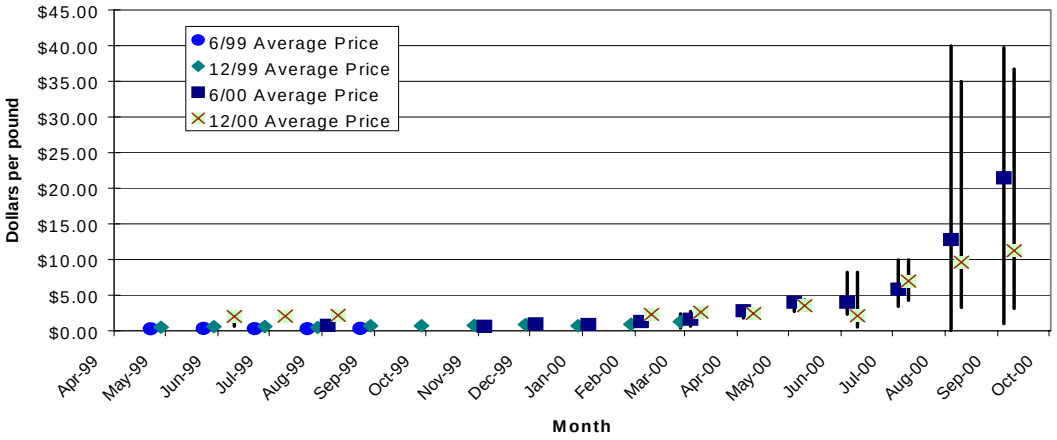
As in previous years, post-2010 RTCs are traded as if they were collectively tied to the 2011 RTCs; all trades involving post-2010 RTCs have been executed in blocks extending infinitely forward in time with a single aggregate price.

Trading prices for NOx and SOx RTCs in all years have been lower than the backstop price of $15,000 per ton as stated in Rule 2015 which would trigger an evaluation and review of the compliance and enforcement aspects of the RECLAIM program.

As noted in Annual RECLAIM Audit Report for the 1998 Compliance Year, RTC prices have historically decreased as the end of their period of validity approached, then decreased further during the reconciliation period, but this was not true for the 1999 compliance year. In fact, Cycle 1 NOx RTC prices for the 1999 compliance year (credit expiration date of December 31, 1999) continued to increase through the end of the Cycle 1 1999 reconciliation period (beyond which they could not be used or traded). The average price of Cycle 1 RTCs for the 1999 compliance year was $0.60 per pound in July 1999, $0.70 per pound in October 1999, $0.71 per pound in January 2000, $0.92 per pound in February 2000, and $1.28 per pound in March 2000. This price trend appeared to indicate that there is a higher demand for RTCs.

The price increase during the end of the compliance year and during the reconciliation period for Cycle 2 1999 compliance year (credit expiration date of June 30, 2000) was more pronounced: the average price for Cycle 2 1999 NOx RTCs was $0.89 per pound in January 2000, $2.83 per pound in April 2000, $5.84 per pound in July 2000, and $12.80 per pound in August 2000. The maximum prices recorded for 1999 RTCs were $2.40 per pound for Cycle 1 and $40.00 per pound for Cycle 2. Average NOx RTC prices (dollars per pound) traded during 2000 as of October 5, 2000 were $11.30 for Compliance Year 1999 Cycle 2 (expiring 6/30/2000), $6.85 for Compliance Year 2000 Cycle 1 (expiring 12/31/2000), $11.28 for Compliance Year 2000 Cycle 2 (expiring 6/30/2001), and $8.38 for Compliance Year 2001 Cycle 1 (expiring 12/31/2001). Figure 6-1 shows the NOx RTC monthly average price trends and price ranges within a month for calendar years 1999 and 2000 as the expiration dates approached.

Figure 6-1
NOx RTC Monthly Average Price Trends



Rule 2015(b) - Program Audits requires AQMD to conduct annual program audits. The annual average price of each type of RTC is reported as part of these audits. Rule 2015(b)(6) further specifies that the Executive Officer shall "review ... compliance and enforcement aspects of RECLAIM program" if the annual average price of RTCs identified in an audit exceeds $15,000 per ton. Annually, AQMD has been reporting the annual average prices of RTC for each compliance year in the Annual Reports for RECLAIM. Annual averages are arrived at by taking the weighted average of the prices reported under all trades received within a calendar year for RTCs of the same compliance year, regardless of Cycle. Trades reported with zero price are excluded from this evaluation. Trades of Compliance Year 1999 RTCs were allowed until August 29, 2000 (end of reconciliation period for Cycle 2 1999 facilities). The annual average price for trades that occurred in calendar year 2000 for Compliance Year 1999 RTCs is $15,369 per ton for NOx and $1,336 per ton for SOx. Therefore, the annual average price for Compliance Year 1999 NOx RTCs exceeded the $15,000 threshold. The annual average prices for RTCs for compliance years after 1999 cannot be determined at this time as trading activities are still on-going. Pursuant to Rule 2015(b), staff will initiate assessment of the compliance and enforcement aspects of the RECLAIM program and the need, if any, of implementing any backstop measure as delineated under Rule 2015(d) - Program Specific Backstops. The backstop measures to be considered include restricting trading, requiring pre-approval of trades, enhanced monitoring, increasing rates of reduction, implementing technology-specific emission reductions and, increased penalties. Staff is in the process of evaluating these and other options, including the possibility of bifurcating the market to differentiate between specific industries or larger compared to smaller facilities. Results of the assessment, including any recommended backstop measures, will be submitted to the Governing Board expeditiously for consideration.

Several factors contributed to the sharp price increase for Compliance Year 1999 Cycle 2 RTCs:

- RECLAIM's RTC supply decreases annually. The program has reached the point where the supply equals the demand, as has been predicted in recent

annual reports and in RECLAIM Program Three-Year Audit and Progress Report.

- Southern California Edison, which held ten RECLAIM facilities, divested its power plants as a result of restructuring of the electric utility industry in California. These power plants are now operated by several generating companies that are new to the area. The operators of these power plants have also indicated that they did not anticipate the high level of electricity demand.
- California State passed legislation to deregulate the electric utility industry. As a result, it created a new market place where electricity could be bought and sold at market rates. This allowed in-basin electric utility power producers to generate power to be sold and used outside the South Coast areas in order to supply the needed electricity for the state.
- Southern California electricity demand reached high levels in the summer of 2000. In addition, there was a shortage of imported electrical power that the Basin depended on during times of peak demand. Therefore, Southern California Edison's successors and the other electric utilities (e.g., Los Angeles Department of Water and Power, City of Pasadena, City of Burbank) needed to generate more electricity.
- The power producing facilities purchased a substantial portion of the available NOx RTCs to account for the increased emissions from these facilities. Therefore, the NOx RTC supply remaining for purchase by other facilities was very limited.

The convergence of the above-described situations resulted in quickly rising RTC prices and a scarcity of RTCs. However, four power generation facilities have submitted eight applications to install selective catalytic reduction (SCR). The NOx control efficiencies of these SCR systems is expected to be in the 80 to 95 % range. Thus, these projects are expected to result in reductions of approximately 1,800 tons of NOx emissions based upon the subject sources' 1999 production levels. Additional applications for NOx emissions control projects, such as installation of flue gas recirculation, low NOx burners and ultra-low NOx burners, have been submitted by refineries and other industries (refer to Table 1-10). These NOx emissions reductions projects are expected to result in a decrease in demand for NOx RTCs. Furthermore, it is anticipated that various other RECLAIM facilities will be motivated by the recent escalation of RTC prices to implement NOx control technologies in the near term. These in turn may result in a reduced demand for NOx RTCs from these facilities which in turn may cause a price stabilization. As discussed in Chapter 4, there is the potential to add 68 tons (136,000 pounds) of NOx per year through June 2003 to the RECLAIM program through the conversion of Area Source Credits. The potential addition of these credits into the market coupled with the start-up of additional control may cause price reductions to occur in 2001.

RECLAIM Facilities Most Affected by Credit Price Hikes

Facilities that depended on purchasing credits to achieve emission goals are especially sensitive to rapid changes in credit prices. Facilities that had voiced concerns over the recent high prices of credit can be grouped in two general

categories—facilities with low annual emissions and facilities with increased production.

Regulation XX requires that a facility be included in RECLAIM if its annual NOx or SOx emissions exceed four tons in any year since 1990. Due to the reductions in allocations, annual emission levels for some RECLAIM facilities in a variety of industries have been reduced to below the four-ton level. Some of these facilities have been relying on the supply of low cost credits to meet emissions goals. Therefore, these facilities are more vulnerable to sharp price increases. When the cost of credits increased sharply, these facilities expressed concern that the price of credits is having real impact on their financial status. They have suggested that there should be clauses within the RECLAIM rules to allow exit from RECLAIM (current rule language bars any facility from exiting RECLAIM once it enters the program).

These facilities generally do not have multiple sources of emissions or sources of emissions with substantial emission levels and therefore have less opportunities to affect efficient emission reductions. However, these facilities have emission sources that can be further controlled even though the cost for reducing emissions (cost effectiveness) may be relatively high compared to facilities with more emissions sources or higher emissions levels. Some of these facilities may also be able to report lower emissions if source tests are conducted on emissions sources to better document actual emissions profiles rather than relying on default emission factors. This can be achieved without the installation of actual control equipment.

However, removing these facilities from RECLAIM will reduce both the supply of credits and opportunities for RECLAIM facilities to reduce emissions. Additionally, further rule development would be needed to cause emissions reductions required under the AQMP for these sources.

A variety of RECLAIM facilities have experienced production growth. In response, these facilities installed new equipment to support the increased production. The new equipment is generally more efficient and less polluting. Under the Command and Control regulatory system, these sources would have been required to provide emission credits prior to installation. Under RECLAIM, the sources are allowed to provide the RTCs year-by-year. Thus, these facilities have been purchasing credits to offset the emissions increases. In general, these facilities still operate older sources that can be further controlled economically. However, during the recent period of rapid credit price increases, these facilities were unable to respond in time to install emission control equipment to quickly lower their emissions and demand for RTCs. Some such facilities suggested that the AQMD institute regulations to cap credit prices and also develop additional sources of credits to ease the price hike. Staff is conducting a more detailed assessment to determine if implementation of any backstop measures is needed and anticipates completing this assessment expeditiously.

Use of RTC Converted from Mobile Source and Area Source Credits

Rule 2008 – Mobile Source Credits allows the conversion of mobile source credits to RTCs subject to certain limitations. Even though Rule 2008 is approved by EPA in the State Implementation Plan (SIP), the rules (e.g., 1610 and 1612) under which mobile source credits are issued are not approved as part of the SIP. Therefore, the use of RTCs converted from mobile sources may not be acceptable to EPA. As a result, facilities that purchased these credits have been advised of the risk of using such credits under the RECLAIM program. Staff has been working with EPA and ARB to obtain EPA's approval. However, such effort has not yielded any positive results. In addition, representatives from environmental groups also expressed their opposition in the use of such credits under the RECLAIM program.

Similarly, Rule 2506 – Area Source Credits for NOx and SOx has not yet been approved by EPA into the SIP. Therefore, use of RTCs generated by conversion of ASCs potentially may result in similar risk as use of RTCs generated by conversion of mobile source credits. However, in the case of the ASCs currently pending approval (refer to Chapter 4), EPA has already reviewed the ASC application and did not object to the issuance of ASCs.

The availability of affordable credits that are real, quantifiable, and enforceable is the key to success of a market incentive program such as RECLAIM. As such, in addition to helping RECLAIM facilities to implement the needed control technologies, staff will continue to work with RECLAIM facilities, EPA, and California Air Resources Board to investigate and develop programs to provide alternative ways to generate emission credits that can be used in the RECLAIM Program.

APPENDIX A
SUPPORTING DATA FOR CONTROL COST CASE STUDY

Data for this case study were obtained from the following sources:

- Direct request for emissions and process data from RECLAIM facilities;
- Annual Emission Reports submitted by facilities;
- Facility Permits; and
- Electronic Data Reports submitted to USEPA.

The current emission level for each source was determined using the reported emissions and apportioned, if necessary, based on fuel consumption and equipment rating. In order to determine controlled emissions based upon an achievable control technology, the controlled emissions level readily achievable by the control technology was used. The control technologies and the respective achievable emission levels are presented in Table A-1. The achievable reductions are the difference between the baseline emissions and the controlled emissions. Emission reductions are excluded from this study for equipment where necessary data is not available, there are uncertainty in the calculated emissions, or the reduction is less than zero. The sources to be controlled within each category of equipment are selected based on the amount of emission reduction available. The "needed reductions" presented in Table A-1 are calculated for each equipment type by multiplying the achievable emissions reductions for the equipment category by the ratio of needed emissions reductions (12.5 tons/day) to total achievable emissions reductions (25.77 tons/day). For example, achievable emissions reductions for utility boilers is 10.17 tons per day, so the needed emissions reductions is

(10.17 tons/day) * (12.49 tons/day) / (25.77 tons/day) = 4.93 tons/day

Table A-2 shows the cost data derived from current permit applications submitted to AQMD and Table A-3 presents cost data provided by manufacturers. These cost data are then used to estimate the total annual cost for the required control equipment.

Table A-1
Achievable NOx Emissions Reductions and Annualized Cost Equipment Type

Source Type	Achievable Reductions (tons/day)	Needed Reductions (tons/day)	Units Required	Total Annualized Cost
Utility Boilers	10.17	4.93	7	$8,100,000
Boilers > 40 mmBtu/hr (refineries)	2.19	1.06	5	$400,000
Boilers >= 20 mmBtu/hr (except refinery heaters > 40 mmBtu/hr)	0.48	0.23	23	$1,400,000
Boilers < 20 mmBtu/hr	0.26	0.13	48	$1,100,000
Process heaters > 40 mmBtu/hr (refineries)	5.68	2.76	12	$900,000
Process heaters > 2 mmBtu/hr (except refinery heaters > 40 mmBtu/hr)	0.28	0.13	6	$100,000
Gas turbines	3.77	1.83	5	$2,400,000
Diesel ICEs	1.41	0.68	3	$300,000
Natural gas ICEs	1.53	0.74	11	$200,000
Total	25.77	12.49	120	$14,900,000

Table A-2
Cost of Control Equipment From Permit Applications

Equipment Type	Rating	Control Type	Emission Level	Median Annual Cost	High Annual Cost	Low Annual Cost	Count
Boiler	< 25 mmbtu/hr	UNLB	12 ppmv	$35,800	$35,800	$35,800	2
Boiler	< 25 mmbtu/hr	LNB	30 ppmv	$3,100	$4,400	$1,200	6
Boiler	>= 25 mmbtu/hr	ULNB	9 ppmv	$58,300	$84,700	$31,800	2
Utility Boiler	> 2000 mmbtu/hr	SCR	5 ppmv	$1,149,900	$1,149,900	$1,149,900	2
Heater	< 40 mmbtu/hr	LNB	0.03 lb/mmbtu	$3,300	$5,500	$2,600	7
Heater	40 - 100 mmbtu/hr	LNB	0.03 lb/mmbtu	$14,800	$18,500	$7,400	8
Heater	> 100 mmbtu/hr	LNB	0.03 lb/mmbtu	$69,200	$69,200	$27,100	5
Heater	>75 mmbtu/hr	SCR	5 ppmv	$230,700	$243,800	$217,600	2
FCCU	all	SCR	5 ppmv	$2,107,000	$2,107,000	$2,107,000	1
Oven	< 25 mmbtu/hr	LNB	30 ppmv	$500	$7,100	$500	3
Oven	< 25 mmbtu/hr	LNB	40 ppmv	$6,500	$11,500	$1,600	2
Oven	> 25 mmbtu/hr	LNB	30 ppmv	$24,900	$24,900	$24,900	1
Furnace	< 25 mmbtu/hr	LNB w/ FGR	40 ppmv	$22,300	$22,300	$22,300	1
Furnace	< 25 mmbtu/hr	LNB	50-60 ppmv	$10,400	$40,900	$6,800	7
Furnace	< 25 mmbtu/hr	Oxy-fuel	9 ppmv	$15,900	$15,900	$15,900	1
Dryer	> 25 mmbtu/hr	LNB	30-36 ppmv	$40,800	$71,500	$40,800	3
Dryer	< 25 mmbtu/hr	ULNB	10 ppmv	$11,100	$11,100	$11,100	1
Afterburner	< 25 mmbtu/hr	LNB	30 ppmv	$9,700	$9,700	$9,700	1

FGR = flue gas recirculation
LNB = low NOx burner
SCR = selective catalytic reduction
ULNB = ultra low NOx burner

Table A-3
Cost of Control Equipment Obtained from Manufacturers

Equipment Type	Equipment Rating	Control Type	Control Emission Level (ppmv)	Annual Cost
Boiler	20	ULNB	9	$22,800
Boiler	21	ULNB	9	$29,500
Boiler	21	ULNB	9	$54,100
Boiler	21	ULNB	9	$34,300
Boiler	25.2	ULNB	9	$34,500
Boiler	25.2	ULNB	9	$54,600
Boiler	25.2	ULNB	9	$36,600
Boiler	29.4	ULNB	9	$38,800
Boiler	29.4	ULNB	9	$62,000
Boiler	29.4	ULNB	9	$42,700
Boiler	33.6	ULNB	9	$42,900
Boiler	33.6	ULNB	9	$76,500
Boiler	33.6	ULNB	9	$43,300
Boiler	37.8	ULNB	9	$66,100
Boiler	40	ULNB	9	$54,600
Boiler	42	ULNB	9	$46,000
Boiler	42	ULNB	9	$109,900
Boiler	42	ULNB	9	$69,700
Boiler	60	ULNB	9	$62,500
Boiler	70	ULNB	9	$66,900
Boiler	2.1	ULNB	12	$11,800
Boiler	2.1	ULNB	12	$6,900
Boiler	4.2	ULNB	12	$16,300
Boiler	4.2	ULNB	12	$17,400
Boiler	4.2	ULNB	12	$9,500
Boiler	6.3	ULNB	12	$14,400
Boiler	8.4	ULNB	12	$26,500
Boiler	8.4	ULNB	12	$24,800
Boiler	12.6	ULNB	12	$34,900
Boiler	12.6	ULNB	12	$32,600
Boiler	16.8	ULNB	12	$51,800
Boiler	16.8	ULNB	12	$47,000
Boiler	21	ULNB	12	$56,900
Boiler	21	ULNB	12	$51,800
Boiler	2.1	LNB	20	$6,800
Boiler	2.1	LNB	20	$4,900
Boiler	4.2	LNB	20	$9,000
Boiler	4.2	LNB	20	$15,000
Boiler	4.2	LNB	20	$7,000
Boiler	6.3	LNB	20	$10,000
Boiler	8.4	LNB	20	$13,000
Boiler	8.4	LNB	20	$19,900
Boiler	12.6	LNB	20	$23,300

Equipment Type	Equipment Rating	Control Type	Control Emission Level (ppmv)	Annual Cost
Boiler	12.6	LNB	20	$25,200
Boiler	16.8	LNB	20	$27,900
Boiler	16.8	LNB	20	$31,500
Boiler	20	LNB	20	$8,200
Boiler	21	LNB	20	$30,300
Boiler	21	LNB	20	$33,200
Boiler	21	LNB	20	$22,600
Boiler	21	LNB	20	$26,700
Boiler	21	LNB	20	$26,700
Boiler	25.2	LNB	20	$27,500
Boiler	25.2	LNB	20	$28,600
Boiler	25.2	LNB	20	$28,600
Boiler	29.4	LNB	20	$30,700
Boiler	29.4	LNB	20	$31,300
Boiler	29.4	LNB	20	$31,300
Boiler	33.6	LNB	20	$34,900
Boiler	40	LNB	20	$14,000
Boiler	42	LNB	20	$37,500
Boiler	60	LNB	20	$18,700
Boiler	70	LNB	20	$21,000
Boiler	33.6	LNB	30	$31,700
Boiler	33.6	LNB	30	$31,700
Boiler	37.8	LNB	30	$48,300
Boiler	42	LNB	30	$55,000
Boiler	42	LNB	30	$55,000
ICE Diesel	50 hp	SCR	44	$24,600
ICE Diesel	150 hp	SCR	44	$29,100
ICE Diesel	300 hp	SCR	44	$35,300
ICE Diesel	500 hp	SCR	44	$46,400
ICE Diesel	1100 hp	SCR	44	$80,700
ICE Diesel	2500 hp	SCR	44	$151,100
ICE Diesel	4000 hp	SCR	44	$225,700
ICE Nat Gas	50 hp	3 way catalyst	24	$9,200
ICE Nat Gas	150 hp	3 way catalyst	24	$9,600
ICE Nat Gas	300 hp	3 way catalyst	24	$10,600
ICE Nat Gas	500 hp	3 way catalyst	24	$11,800
ICE Nat Gas	1100 hp	3 way catalyst	24	$14,800
ICE Nat Gas	2500 hp	3 way catalyst	24	$20,800
ICE Nat Gas	4500 hp	3 way catalyst	27	$27,500

Equipment Type	Equipment Rating	Control Type	Control Emission Level (ppmv)	Annual Cost
Turbine	<= 10 MW	SCR	9	$216,400
Turbine	> 10 to <= 100 MW	SCR	9	$535,400
Turbine	> 100 MW	SCR	9	$2,014,500

LNB = low NOx burner
SCR = selective catalytic reduction
ULNB = ultra low NOx burner