# SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

## Draft Staff Report

## Proposed Amendments to Regulation XX – Regional Clean Air Incentives Market (RECLAIM)

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## EXECUTIVE SUMMARY

The AQMD Governing Board adopted the Regional Clean Air Incentives Market (RECLAIM) program in 1993. The purpose of RECLAIM is to reduce NOx and SOx emissions through a market-based program. It is designed to provide facilities with flexibility to seek the most cost-effective solution to reduce their emissions. The program replaced a series of existing command-and-control rules and control measures specified in the 1991 Air Quality Management Plan (AQMP).

AQMD staff is proposing amendments to Regulation XX – RECLAIM to achieve additional NOx reductions pursuant to the 2003 AQMP Control Measure #2003CMB-10. The proposed amendments also address requirements for Best Available Retrofit Control Technology (BARCT) in accordance with California Health and Safety (H&S) Code §40440, which is applicable to market-based incentive programs and compliance with H&S Code § 39616. Reductions in NOx will help the Basin attain ozone and PM2.5 standards. Other proposed rule amendments include language clarifications and changes to the protocols.

This Draft Staff Report includes technical information related to BARCT and cost-effectiveness, describes some of the key policy issues, describes different viewpoints, and contains staff recommendations.

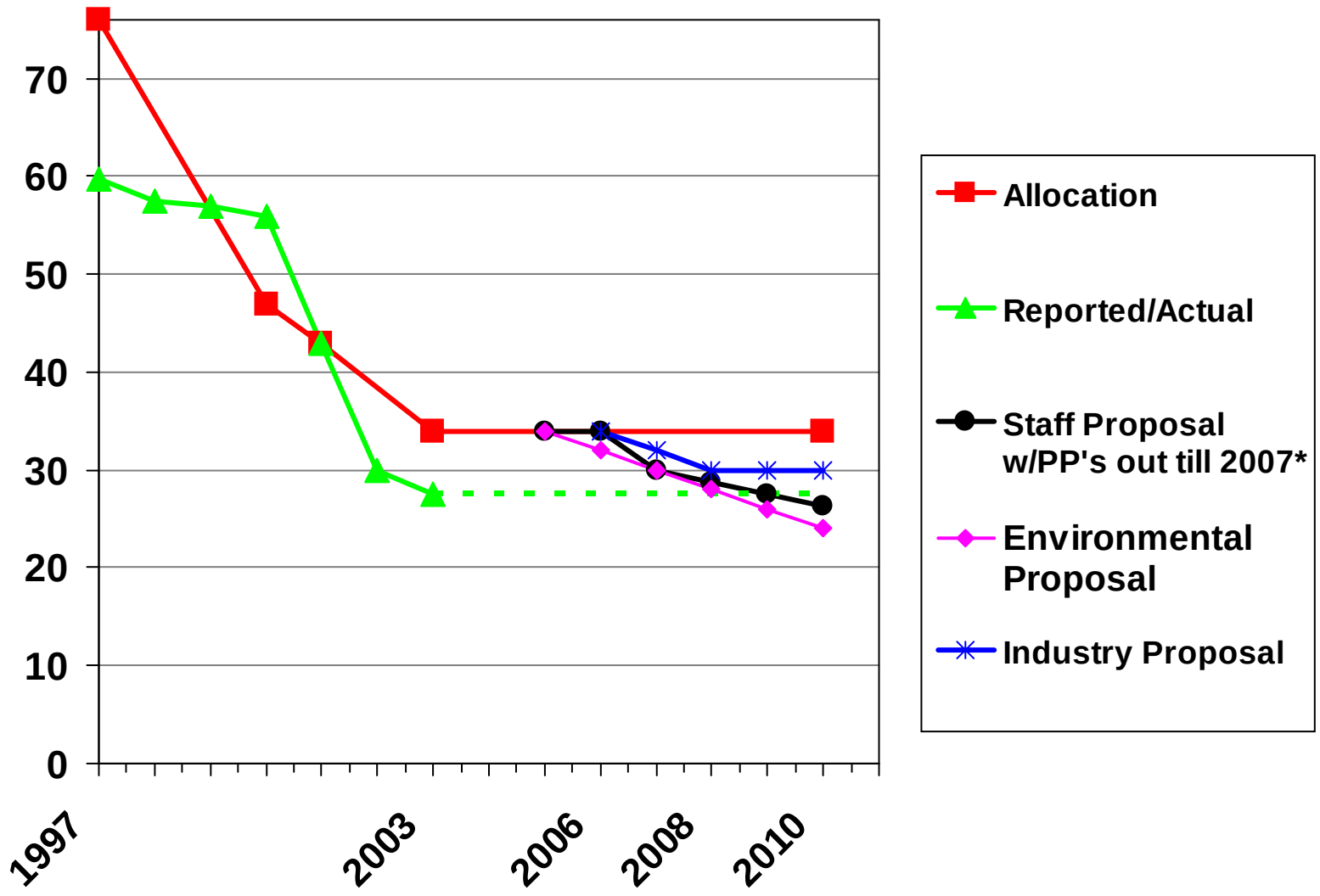
The staff proposal results in NOx reductions of 7.7 tons per day. In addition to staff's proposal, industry and the environmental community provided proposals. Figure ES-1 shows the reductions resulting from the staff proposal, other proposals, current allocations, and the projected actual emissions based on the most recent (compliance year 2003) reported emissions. The staff proposal calls for the reduction of 7.7 tons per day in two phases. Four tons per day would be reduced in 2007 and the remainder would be reduced in equal increments from 2008 to 2010. Under the staff proposal, the power producers would be allowed to buy RTCs for any compliance year and sell RTCs beginning in compliance year 2007 upon adoption of the proposed amendments. Power producers would only be able to sell RTC for compliance years 2005 and 2006 to new power generating facilities brought on-line on and after January 1, 2004 or later. Beginning January 1, 2007, all remaining trading restrictions would be lifted and power producers may buy, sell, or transfer NOx RTCs for compliance year 2007 and any future compliance year to or from any party. It should be noted that, currently, power producers can sell RTCs purchased above their initial allocations. Industry proposes NOx reductions of 4 tons total, with 2 tons being reduced in 2007 and 2 tons in 2008. No reductions would be sought for the 2009 compliance year and further reductions would be subject to evaluation in future AQMP revisions and separate rulemaking. In addition, industry proposes lifting of RTC trading restrictions for any power producer that chooses to opt for an early reduction on RTC holdings (e.g., starting with the 2005 compliance year instead of 2007 as proposed by staff). The environmental community proposal would result in NOx reductions of 10.2 tons total based on a straight-line rate of decline from 2006 to 2010, inclusive. While the environmental community proposal would leave power plants out of the program altogether, if they are allowed back into the full trading market, the proposal would not allow full market access to power plants until such time as they are subject to the same reductions as the rest of the market.

Currently, based on the 2003 emission reports submitted by RECLAIM facilities, actual NOx emissions were 6.6 tons per day less than total NOx RTC held in the market. Power plants have substantially reduced their emissions as a result of Rule 2009 and currently hold approximately 4 tons per day of RTCs above their actual emissions. In addition, there are technologically feasible and cost-effective reductions from many types of equipment in RECLAIM. The California Air Resources Board (CARB) endorses AQMD's technical evaluations.

Key issues discussed in this report include:

- BARCT determinations;
- Cost-effectiveness;
- Method of determining reductions;
- Amount of NOx RTC reductions;
- Timing of reductions;
- Method of applying reductions (program wide vs. industry specific); and
- Exemption from reductions or providing access to credits.

**Figure ES-1**
**NOx RTC Reductions**
**(Tons per Day)**



**Summary of Proposed Amendments**

The proposed amendments to the RECLAIM rules also contain the following key elements:

- Amend Rule 2001 to propose an exemption specific to agricultural sources, in order to maintain consistency with the original intent of the RECLAIM program. Until recently, these sources were exempt under state law. However, state law has been changed to require permitting and regulation of these sources. Agricultural sources would be regulated under traditional source-specific rules, rather than by the RECLAIM program.
- Amend Rule 2002 to achieve reductions in NOx emissions by the year 2010 in accordance with the BARCT requirements under state law.
- To address concerns about potential market impacts, establish an RTC price threshold by which reductions for compliance years 2008 through 2010 would become non-tradable;
- Amend Rule 2002 to establish the allocation methodology for facilities joining RECLAIM after the rule amendments;
- Amend Rule 2002 to provide a limited exemption for facilities already achieving BARCT when compliance costs under RECLAIM exceed the costs that would otherwise have occurred to meet the BARCT limits under command and control rules;
- Amend Rule 2002 to specify the process whereby foregone reductions from exempt facilities will be redistributed among the remaining RTC holders;
- Amend Rule 2002 and 2012 by adding a new emission factor for micro-turbines and by clarifying that the ending emission factors in Table 1 are specifically for Tier 1, compliance year 2000, and add further emission reductions beyond 2003 allocations;
- Amend Rule 2002 by allowing emissions from the qualifying internal combustion engines (ICEs) to be determined using an emission factor that is equivalent to the permitted BACT limits the ICEs achieve. Also, the descriptions for boilers, heaters, and steam generators are modified to match the description of the ICEs relative to equipment installed or modified after the maximum throughput year and that were meeting the BACT limits in effect at the time of installation or modification. No changes to the Tier I emission factors for the boilers are proposed.
- Amend Rule 2007 to modify trading restrictions for compliance years 2005 and 2006, and designate January 1, 2007 (i.e., compliance year 2007) as the date by which trading restrictions on power plants subject to Rule 2009 would be lifted, thereby allowing these facilities back into the full RECLAIM market;
- Amend Rule 2009 by removing the requirement for power producers to apply and keep detailed records of environmental dispatch procedures;
- Amend Rule 2010 by clarifying the procedures for reducing annual emissions allocations when facilities violate the requirements of Rule 2004 (d);
- Amend Rules 2011 and 2012, and their respective protocols, to allow a delay in the due date for Relative Accuracy Test Audits (RATA) for equipment that is operated intermittently, and by adding alternative methods of compliance testing

for natural gas combustion sources with high oxygen contents in the exhaust stream;

- Amend Rules 2011 and 2012, including the protocols, to allow reporting of emissions through the SCAQMD's internet website;
- Amend Rules 2011 and 2012, including the protocols, to specify that emission reports from sources that are not listed on the Facility Permit, such as contractor equipment, various location equipment, and equipment covered under applications are due every quarter which is the same as reporting for process units;
- Amend Rules 2011 and 2012, and their respective protocols, to correct typographical errors, and clarify the rule language;
- Amend Rule 2012 to reflect current requirements for large sources and process units equipped with stack flow monitors to measure exhaust flow rate and clarify the operating parameters are required for large sources and process units and corresponding emission rates that are required to be measured and reported;
- Amend Rule 2012, missing data procedures, to establish missing data provisions on an hourly basis versus the current daily requirement; and
- Amend Rule 2012 protocols to allow alternative test to demonstrate compliance with RECLAIM NOx concentration limits.

**Document Organization**

This staff report is organized as follows:

- Section I provides background on the regulatory history of RECLAIM;
- Section II summarizes the proposed rule amendments and alternative proposals;
- Section III contains staff's technical analysis of BARCT and cost-effectiveness, and provides a summary of viewpoints and recommendations by environmental and industry representatives, as well as staff's recommendations;
- Section IV discusses the impacts relative to the proposal, including a summary of findings by two economists regarding potential impacts on RECLAIM as a result of the proposed amendments; and
- The Appendices provide supporting documentation and data for the staff proposal, as well as response to comments.

# I. INTRODUCTION

On October 15, 1993, the SCAQMD Governing Board adopted Regulation XX, referred to herein as the RECLAIM program, which is a market-based program to reduce NOx and SOx emissions and subsequently help meet air quality standards while providing facilities with the flexibility to seek the most cost-effective solution for achieving the required reductions. RECLAIM was established as an alternative to the traditional command-and-control regulatory approach of setting specific emission limits on individual equipment and process that contribute to air pollution. Under RECLAIM, each facility has a NOx and/or SOx annual emissions cap (allocation) which decreases over time. Consequently, facility operators can decide what equipment, processes and materials they will use to reduce emissions to a level at or below their annual emission limits. In lieu of reducing emissions, facility owners or operators may elect to use the trading market to purchase RTCs from other facilities that have reduced emissions below their annual target. The RECLAIM program was designed to achieve the same level of emission reductions by the year 2003 as would have otherwise been achieved in aggregate by implementing existing command-and-control rules and 1991 AQMP measures.

To assure a more liquid market, as well as protect RECLAIM participants from price fluctuations that may be caused if all the RTCs expire at the same time, two trading cycles were established. Further, to balance emissions among the participating facilities in the RECLAIM program, the affected facilities were randomly divided into the two cycles. The Cycle 1 compliance year is from January 1 to December 31 and the Cycle 2 compliance year is from July 1 to June 30.

RECLAIM applies to facilities emitting four tons or more per year of NOx and/or SOx in the year 1990 or any subsequent year, excluding certain essential public services, such as landfills, public transit, and fire fighting facilities, that remain under command-and-control. As of the 2002 compliance year, the most recent year fully audited, there are approximately 330 facilities in the RECLAIM NOx program.

## Background

Since the implementation of RECLAIM in 1994, there has been a 50 percent decrease in reported emissions, some technology advancement, better monitoring and reporting, and high level of compliance rate in achieving the facility emissions cap. However, the program was initially over allocated, which led to an under-utilization of available, cost-effective technologies. Even in the last compliance year, there were 6.6 tons per day of unused RTCs, resulting in low credit prices and leaving little incentive for further controls.

The 2003 AQMP examined the RECLAIM program and found that additional reduction opportunities exist in the program due to advancement of control technology. Thus, the control measure, #2003CMB-10, was developed for NOx RECLAIM sources. AQMD staff is proposing amendments to Regulation XX – RECLAIM to achieve additional NOx reductions pursuant to the 2003 AQMP control measure #2003CMB-10. The proposed amendments address requirements for Best Available Retrofit Control Technology (BARCT) in accordance with California Health and Safety (H&S) Code §40440, which is applicable to market-based incentive programs, and comply with the requirements of H&S Code § 39616. Reductions in NOx are necessary to enable the Basin to attain ozone and PM2.5 standards. Other proposed rule amendments include language clarifications and changes to the protocols.

**State Law Requirements**

There are several requirements of state law with which the AQMD must comply with that effect the AQMD staff proposal to obtain additional emission reductions from the RECLAIM program, including achieving BARCT, maintaining equivalency to command-and-control, implementing all feasible measures, and achieving reductions at the earliest date practical. Following is a summary of the pertinent sections of the California Health and Safety Code.

§39616 – Market Based Incentive Programs
*"The program will…result in an equivalent or greater reduction in emissions at equivalent or less cost compared with current command-and-control regulations…provide a level of enforcement comparable to command-and-control…not result in a greater loss of jobs or more significant shifts from higher to lower skilled jobs, on an overall district-wide basis, than that which would exist under command-and-control…not in any manner delay, postpone, or otherwise hinder district compliance with Chapter 10…not result in disproportionate impacts, measured on an aggregate basis, on those stationary sources included in the program compared to other permitted stationary sources in the district's plan for attainment…"*

§40918 – Plan of District
*"Each district …shall…include the following measures in its attainment plan: the use of all reasonably available control technology…"*

§ 40920.5 – Districts with Extreme Air Pollution
*"Each District with extreme air pollution shall…include…any other feasible controls."*

§40440- Adoption of Rules and Regulations
*"The south coast district board shall adopt rules and regulations that carry out the plan and…shall…require the use of …best available retrofit control technology for existing sources"*

§ 40406. - Best Available Retrofit Control Technology
*"…"BARCT" means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, & economic impacts by each class or category of source."*

§ 40462 Deadlines for compliance
*"The plan and subsequent revisions shall contain deadlines for compliance with" the federal and state AAQS… "by the earliest date achievable by the application of all reasonably available control measures and technologies…"*

§40913 Contents of Plan
*"Each district plan shall be designed to achieve and maintain the state standards by the earliest practicable date…"*

The following sections describe the three primary requirements that the AQMD must meet in adopting this rule amendment: the AQMP, state California H&S Code requirements §40440 regarding all feasible measures and BARCT, and California H&S Code §39616, which is applicable to market incentive programs.

**Air Quality Management Plan (AQMP)**

The 2003 AQMP was adopted by the Governing Board in August 2003. The plan was designed to demonstrate attainment with national ambient air quality standards for ozone and PM10 and make progress toward attaining the state air quality standards. Subsequently, the AQMP was approved by CARB and submitted to EPA as a revision to the State Implementation Plan (SIP). The 2003 AQMP contains a control measure calling for additional NOx emission reductions from RECLAIM sources. The control measure identified an approximate three (3) tons per day reduction of NOx from the program by the end of the 2010 compliance year. Beginning with the 2003 AQMP, BARCT will be evaluated every three years with future AQMP updates.

**All Feasible Measures and BARCT**

The California Clean Air Act (CCAA) requires districts to achieve and maintain state standards by the earliest practicable date and for extreme non-attainment areas, to include all feasible measures Health and Safety (H&S) Code (H&S §§40913, 40914, and 40920.5). The term "feasible" is defined in the 14 California Code of Regulations, § 15364, as a measure "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors." The required use of BARCT for existing stationary sources is one of the specified feasible measures. H&S Code §§40440 (a)&(b)(1) and 40918 require AQMD to adopt rules requiring best available retrofit control technology for existing sources. H&S Code §40406 specifically defines BARCT as "…best available retrofit technology means an emission limitation that is based on the maximum degree of reduction achievable taking into account environmental, energy, and economic impacts by each class or category of source."

In RECLAIM, these emission limits were converted into mass emission limitations utilizing activity levels. Staff has examined the emission limits of other air pollution control district rules and other requirements for equipment categories in the RECLAIM program in an effort to determine the appropriate mass emission reductions to reflect BARCT, and, thus, all feasible measures for the sources. New BARCT limits would then be reflected as a reduction in the allowable mass emissions. Staff also examined what retrofit technologies had been achieved in practice. Staff also reviewed the technology and emission limits applied to all categories of equipment in the RECLAIM program. (For a list of RECLAIM equipment, the reader is referred to the tables at the conclusion of Rule 2002). As a result, staff has identified new BARCT levels for specific categories of equipment. The proposed BARCT for each category takes into account the range of types and size of equipment in each category. A more detailed discussion on BARCT as applicable to the proposed rule amendments is presented in Section I.

### H&S Code 39616

California H&S Code §39616 establishes the requirements under which a district may adopt a market-based incentive program. One of the requirements of §39616, which is applicable to market-based incentive programs, is that RECLAIM must result in an equivalent or greater level of emission reductions at an equivalent or lower cost as would have been achieved under a command-and-control regulatory structure. This equivalency demonstration was made when the RECLAIM program was adopted in October 1993 and again seven years after rule adoption (October 2000).

H&S Code § 39616(c) - Market-Based Incentive Programs, requires the AQMD Governing Board to make findings that the program, as compared to command and control regulations, to which these sources would be subject: (1) achieves equivalent or greater emission reductions at equivalent or less cost; (2) has comparable enforcement and monitoring; (3) will establish a baseline methodology that provides appropriate credit for equitable treatment of sources that reduced emissions prior to the start of the program; (4) will not result in greater job loss or shift to lower skilled jobs; (5) promotes privatization of compliance and electronic availability of data; (6) does not delay compliance with the California Clean Air Act Amendments regarding the California ambient air quality standards; and (7) will not result in disproportionate impacts on sources in the program, in the aggregate.

These findings were made for the original program adoption, reaffirmed in October 2000 (as required in §39616 upon the program's 7$^{th}$ year), and discussed for all subsequent rule amendments. The Health and Safety Code also requires that these findings be ratified no later than seven years after program adoption. This ratification occurred in October 2000. Findings will be made relative to the proposed amendments.

### Rule 2007 and Power Producers Trading Restrictions

In May 2001, Regulation XX was amended to address an RTC price spike due to delayed installation of control equipment at many facilities and California's energy crisis. During that time, RTC prices increased to more than $60 per pound. Power plants were required to install BARCT, temporary mitigation programs were established to offset excess emissions from power plants, and trading restrictions were placed on power producing facilities. The goal of the May 2001 amendments was to implement realistic, effective solutions to reduce and stabilize the prices of NOx RTCs. Power producing facilities could fully rejoin the trading market in the 2004 compliance year, provided that the Governing Board determined prior to July 2003 that their re-entry would not result in any negative effect on the remainder of the RECLAIM facilities or on California's energy security needs. These findings were made at the June 2003 public hearing.

The Governing Board adopted proposed changes to Rule 2007 at the December 5, 2003 public hearing, which would have removed most of the trading restrictions. However, CARB expressed concerns regarding reentry of power plants into the full market before the BARCT analysis and allocation adjustments were implemented. Consequently, as part of the amendments, the Governing Board approved a provision to allow power producers to trade among themselves and set a future effective date of September 1, 2004 when power producers would have unrestricted trading of RTCs. At that time, it was anticipated that rule amendments to implement BARCT and adjust allocations would be completed prior to September 2004.

Rule 2007 was amended at the September 3, 2004 Governing Board meeting to extend current trading restrictions. To address CARB concerns regarding reintroducing power plants to the trading market before the program is adjusted for BARCT, Rule 2007 was amended to continue the existing use restrictions until other RECLAIM rule amendments occur that will decrease allocations to reflect BARCT as required under state law. Currently, Rule 2007 power plant trading restrictions will continue until RECLAIM rules are amended and the specific date to remove trading restrictions specified. Power producing facilities will continue to be able to:

- sell NOx RTCs to the AQMD; and
- sell RTCs above the facility's original allocation for each compliance year.

**Staff Proposal for NOx Reductions**

The staff proposal was developed using a method to determine applicable BARCT and subsequently, demonstrate equivalency to command and control. BARCT was evaluated for all equipment categories covered by RECLAIM. Based on the 2003 AQMP base year inventory (i.e., 1997), application of new BARCT and growth projections, this method results in a projection of future actual emissions reflecting the most recent benchmark for command and control equivalency determination based on the new BARCT determined. Control factors representing new BARCT levels were then applied to derive the remaining emissions, thereby quantifying the reductions feasible from current RTC holdings. Since the remaining emissions reflect projected actual emissions after application of BARCT, the proposal includes adding a 10% adjustment (increase) to remaining emissions to account for inaccessible RTCs due to imperfect market conditions and RTCs held by facilities to ensure compliance with annual audits.

Under the staff proposal, total RTC reductions would be 7.7 tons per day and implemented across-the-board based on equal percent reductions to all RTC holdings. The reductions would be implemented in phases: 4 tons per day of reductions in compliance year 2007 and the remaining 3.7 tons per day of reductions would be implemented in equal increments beginning in compliance year 2008 and continuing through compliance year 2010, on a straight-line rate of reduction. Power producers would be allowed to purchase RTCs for any compliance year, and sell compliance year 2007 or later RTCs as of adoption of the amendments. However, with the exception of being able to sell RTCs for compliance years 2005 and 2006 to new power generating facilities brought on-line on or after January 1, 2004, current restrictions on the sell of RTCs would remain in effect until the 2007 compliance year. The reason for the restriction in 2005 and 2006 is to retire excess emissions from power plant RTC holdings rather than have them enter the trading market, thereby delaying controls from other facilities.

The proposal states that the RTC reductions during the phase two reductions (compliance years 2008, 2009, and 2010) will not occur if the average price exceeds $15,000 per ton. However, the rule also contains provisions by which reductions will be reinstated if the price drops back below $15,000 per ton.

Staff also proposes criteria by which a facility would qualify for an exemption from RTC holding reductions. During the rule development process, there were comments raised that the across-the-board reduction penalizes facilities that have already made changes to bring all of

their equipment to BARCT levels or facilities that do not have equipment that has been identified for new BARCT. A further reduction could result in continual purchase of RTCs. An exemption from further reductions was requested. The staff proposal includes a limited exemption, provided certain criteria are met. The criteria reflect these situations and the exemption applies if costs are greater than what would have occurred in the absence of RECLAIM. An application is required to demonstrate that the criteria are met. The exemption is only applicable to original RTC allocations, not additional holdings (i.e., resulting from purchases or otherwise transferred). To qualify the exemption, the following criteria must be met:

- the facility existed prior to the start of RECLAIM and entered either at the start of the program or later pursuant to Rule 2001 because facility emissions exceeded 4 tons per year;
- the facility does not have any equipment identified in Table 3 of Rule 2002 (i.e., 2010 emission factors for equipment with new BARCT) and the achieved emission rates for each equipment at the facility are less than or equal to the 2000 (Tier I) Ending Emission Factor listed in Table 1 of Rule 2002 for the corresponding equipment type;
- RTCs have never been sold for 2007 or later compliance years; and
- the facility demonstrates that the cumulative NOx compliance costs incurred for meeting the RECLAIM allocation exceeds the costs that otherwise would have occurred under a command-and-control regulatory approach to meet and maintain the emission limits specified in Table 1 of Rule 2002; or
- alternatively, in lieu of the aforementioned criteria, the proposed reductions would not apply to any facility whose starting and year 2000 Allocations were calculated using the same emission factors that are equal to or lower than the 2000 (Tier 1) emission factors listed in Table 1, emission rate achieved for each source at the facility is less than or equal to the emission factors listed in Table 3 for the corresponding equipment type, and the facility has not sold RTCs for 2007 or later compliance years.

It is unknown at this time exactly how many facilities would qualify for the exemption since the total compliance costs, especially the retrofit control costs, at the facility level are not available to the staff. However, based on Rule 2009.1 Compliance Plans, there are approximately 10 facilities that may potentially qualify for the exemption. These facilities have gone through the Rule 2009.1 process to demonstrate that all equipment at the facility meets current BARCT requirements. In addition, under the alternative exemption criteria (Rule 2002, paragraph (i)(2)), it is estimated that as many as 3 facilities, based on allocation data, would qualify for the exemption, resulting in about 0.02 tons per day of reductions foregone. Potential applicants for the exemption have two time periods to file: 1) within 6 months of rule adoption or 2) between January 1 and March 31, 2006. Any forgone reductions by facilities meeting the exemption criteria would be distributed evenly among the remainder of the RTC holders and implemented two years from the compliance year the exemption applies to. Public notification of the distributed reductions would occur at least one year prior to implementation.

Staff proposes that the first phase of emission reductions (4.0 tpd) be submitted to the SIP for compliance year 2007. The additional 3.7 tpd reductions for compliance years 2008 through 2010, however, would not be submitted to the SIP until implemented; this is due to the potential for some or all of the 3.7 tpd to be used in the event RTC prices rise beyond $15,000 per ton and the program is subject to review pursuant to Rule 2015. The compliance year 2008 and 2009 reductions will be submitted into the SIP immediately following the completion of

implementation (i.e., reductions achieved). The 2010 reductions will not be submitted until 12 months after full implementation.

Staff held numerous briefing sessions with CARB staff in the last several months regarding staff approaches/methodologies, and technology and policy issues. CARB is supportive of the technical analysis.

CEQA and socioeconomic analyses for the project have been prepared. The Draft CEQA document was available for a 45-day public comment period ending December 7, 2004 and the socioeconomic report was released on December 8, 2004.

**Public Process**

The working group process has been used extensively throughout this rule development process. The RECLAIM Working Group was first established at the time of original program development in the early 1990s and has been consulted numerous times over the years regarding amendments to the program. The RECLAIM Working Group includes members representing small and large businesses, the environmental community, as well as CARB and U.S. EPA. A Working Group meeting was first held on March 19, 2004 to receive input on the staff's initial proposal, which included discussions of the methodology to reduce RTC holdings, preliminary impact analysis, and proposed amended rule language. Additional Working Group meetings were held April 1 and 15, May 11, June 23, and July 14, August 12, September 10, and November 18, 2004 to review staff's assessment of BARCT and cost-effectiveness; method, timing, and amount of RTC holding reductions; and to provide feedback on the rule proposals. Subcommittee meetings were also held to address specific issues of the petroleum refining and power producing industries.

A Public Consultation meeting was held on November 19, 2003 to discuss the December 2003 amendments and to introduce the concepts for the proposal. A Public Workshop was held April 7, 2004 regarding staff's initial proposal. A subsequent Public Consultation meeting was held on August 12, 2004 to summarize the proposed amendments and to provide a forum for additional public input. A final Public Workshop was held October 28, 2004 to summarize staff's updated proposal and provide additional time for comment.

A White Paper was developed in preparation for an October 1, 2004 Informational Hearing before the Governing Board. It contained technical information related to BARCT and cost-effectiveness, described some of the key policy issues, describes different viewpoints, and made preliminary staff recommendations. At the Board meeting, staff summarized the pros and cons of RECLAIM after more than a decade of implementation and outlined the legal requirements for further reductions. In addition, staff described a preliminary proposal and summarized proposals from industry and the environmental community. Staff also addressed concerns regarding the other proposals, as well as the main technical and policy issues. At the meeting, stakeholders were afforded the opportunity to address the Board directly with their comments, concerns, and suggestions. At the end of the meeting, the staff received input from the Board as to the type of information they would like to have when considering the proposed amendments.

In addition, significant technical data has been shared with interested parties. Several technical meetings were held with representatives from the petroleum refining, oil and gas extraction, and

power producing, as well as several meetings with representatives from several trade organizations. Data shared by the AQMD can be found on the AQMD website at, http://www.aqmd.gov/reclaim/reclaim_meetings.htm, provides meeting materials.

## II. PROPOSED AMENDMENTS TO REGULATION XX - RECLAIM

AQMD staff is proposing amendments to the RECLAIM program to achieve NOx reductions to implement a control measure in the 2003 AQMP and to meet state law requirements for Best Available Retrofit Control Technology (BARCT). Other rule changes include adding an alternative method of compliance demonstration for equipment with high oxygen content in the exhaust, adjustments to the testing schedule for equipment that is operated sporadically, provisions for reporting CEMs data through the AQMD web site, and clarifying rule language.

### Regulation XX

AQMD initially adopted Regulation XX - RECLAIM in October 1993. At that time, the Regulation consisted of 12 rules, as follows:

- Rule 2000 – General, contains the program objective, purpose, and definitions;
- Rule 2001 – Applicability, sets criteria for inclusion in RECLAIM;
- Rule 2002 – Allocations for NOx and SOx, establishes the mechanism for deriving facility allocations;
- Rule 2004 – Requirements, contains requirements for demonstrating requirements;
- Rule 2005 – New Source Review for RECLAIM; delineates requirements for new, modified, and relocated equipment, as well as trading zones;
- Rule 2006 – Permits, establishes requirements for issuing and amending facility permits;
- Rule 2007 – Trading Requirements, sets the terms and conditions for trading of RTCs;
- Rule 2008 – Mobile Source Credits, contains requirements for use of emission reduction credits generated by mobile sources;
- Rule 2010 – Administrative Remedies and Sanctions, establishes the penalty structure for violation of RECLAIM requirements, such as emissions in excess of allocations;
- Rule 2011 – Requirements for Monitoring, Reporting, and Recordkeeping for SOx, contains the operational requirements for SOx emitting equipment at RECLAIM facilities;
- Rule 2012 – Requirements for Monitoring, Reporting, and Recordkeeping for NOx, contains the operational requirements for NOx emitting equipment at RECLAIM facilities; and
- Rule 2015 – Backstop Provisions, contains requirements for annual and three-year audits, and steps to be taken in the event certain program parameters are exceeded, such as the price of RTCs.

As part of the May 2001 rule amendments, three additional rules were added to Regulation XX to 15. These rules are:

- Rule 2009 – Compliance Plans for Power Producing Facilities, establishes requirements for installation of control equipment at power plants with an electrical generating capacity greater than fifty (50) megawatts;
- Rule 2009.1 – Compliance Plans and Forecast Reports for Non-Power Producing Facilities, establishes requirements for non power producing facilities emitting 25 tons or more of NOx to submit a plan outlining their compliance strategy; and

- Rule 2020 – RECLAIM Reserve, created a reserve of NOx emission reductions that can be used for the RECLAIM Air Quality Investment Program (RECLAIM AQIP), Mitigation Fee Program, or natural gas turbine power plant peaking sources.

The RECLAIM rules have been amended several times over the last ten years. Most notable were the May 2001 amendments to address the electrical generation crisis followed by the June 2004 amendments to Rule 2015 to address EPA's concerns relative to mitigation of breakdown emissions that was raised during the SIP approval process for the May 2001 amendments. In addition, Rule 2007 was amended in September 2004 to extend the existing trading restrictions until other RECLAIM rule amendments decrease allocations to implement the 2003 AQMP and to reflect BARCT in accordance with state law.

**Proposed Amendments**

The proposed amendments to the RECLAIM rules contain several key elements, as follows:

- Amend Rule 2001 to propose an exemption specific to agricultural sources, in order to maintain consistency with the original intent of the RECLAIM program. Until recently, these sources were exempt under state law. However, state law has been changed to require permitting and regulation of these sources. Agricultural sources would be regulated under traditional source-specific rules, rather than by the RECLAIM program.
- Amend Rule 2002 to achieve reductions in NOx emissions by the year 2010 in accordance with the BARCT requirements under state law and establish an RTC price threshold by which reductions for compliance years 2008 through 2010 would become tradable;
- Amend Rule 2002 to establish the allocation methodology for facilities joining RECLAIM after the rule amendments;
- Amend Rule 2002 to provide a limited exemption for facilities already achieving BARCT when compliance costs under RECLAIM exceed the costs that would otherwise have occurred to meet the BARCT limits under command and control rules;
- Amend Rule 2002 to specify the process whereby foregone reductions from exempt facilities will be redistributed among the remaining RTC holders;
- Amend Rule 2002 and 2012 by adding a new emission factor for micro-turbines and by clarifying that the ending emission factors in Table 1 are specifically for Tier 1, compliance year 2000, and add further emission reductions beyond 2003 allocations;
- Amend Rule 2002 by allowing emissions from the qualifying internal combustion engines (ICEs) to be determined using an emission factor that is equivalent to the permitted BACT limits the ICEs achieve. Also, the descriptions for boilers, heaters, and steam generators are modified to match the description of the ICEs relative to equipment installed or modified after the maximum throughput year and that were meeting the BACT limits in effect at the time of installation or modification. No changes to the Tier I emission factors for the boilers are proposed.
- Amend Rule 2007 to modify trading restrictions for compliance years 2005 and 2006, and designate January 1, 2007 (i.e., compliance year 2007) as the date by which trading restrictions on power plants subject to Rule 2009 would be lifted, thereby allowing these facilities back into the full RECLAIM market;

- Amend Rule 2009 by removing the requirement for power producers to apply and keep detailed records of environmental dispatch procedures;
- Amend Rule 2010 by clarifying the procedures for reducing annual emissions allocations when facilities violate the requirements of Rule 2004 (d);
- Amend Rules 2011 and 2012, and their respective protocols, to allow a delay in the due date for Relative Accuracy Test Audits (RATA) for equipment that is operated intermittently, and by adding alternative methods of compliance testing for natural gas combustion sources with high oxygen contents in the exhaust stream;
- Amend Rules 2011 and 2012 to allow reporting of emissions through the SCAQMD's internet website;
- Amend Rules 2011 and 2012 to specify that emission reports from sources that are not listed on the Facility Permit, such as contractor equipment, various location equipment, and equipment covered under applications are due every quarter same as process units;
- Amend Rules 2011 and 2012, and their respective protocols, to correct typographical errors, clarify the rule language, and update the protocols;
- Amend Rule 2012 to reflect current requirements for large sources and process units equipped with stack flow monitors to measure exhaust flow rate and clarify the operating parameters are required for large sources and process units and corresponding emission rates that are required to be measured and reported;
- Amend Rule 2012, missing data procedures, to establish missing data provisions on an hourly basis versus the current daily requirement; and
- Amend Rule 2012 protocols to allow alternative test to demonstrate compliance with RECLAIM NOx concentration limits.

The following is a more detailed summary of each proposed rule amendment.

### Proposed Amended Rule 2001 - Applicability

On September 22, 2003, SB 700 was signed into state law and became effective on January 1, 2004. SB 700 was promulgated in order to alleviate EPA's concerns regarding the ability of all state permitting authorities to fully implement Title V of the 1990 Amendments to the Federal Clean Air Act by developing permitting programs that meet certain federal criteria, including a requirement to permit all major stationary sources of air pollution. Previous to SB 700, HSC §42310(e) contained an exemption from permit requirements that was applicable to agricultural sources engaged in the growing of crops, or raising of fowl or other animals at large agricultural facilities as defined in HSC §39011.5. To remedy the inconsistency with the Title V program, SB 700 eliminated the exemption applicable to agricultural sources.

Because these agricultural sources were previously exempt from permit requirements on a state-wide basis, there was no need to include an exemption in Rule 2001 to specifically exempt these sources from RECLAIM requirements. However, with SB 700 now in effect, some of these facilities may be required to enter the NOx RECLAIM program, unless this rule is amended. To maintain consistency with the original intent of the RECLAIM program, amendments are proposed to PAR 2001 to include a specific exemption for agricultural sources. Agricultural sources will be regulated under source-specific rules.

### Proposed Amended Rule 2002 – Allocations for Oxides of Nitrogen ($NO_X$) and Oxides of Sulfur ($SO_X$)

Adjustment to NOx RTC Holdings

The 2003 AQMP control measure (2003 CMB-10) estimated an additional reduction in NOx RECLAIM emissions of three tons per day by 2010. This preliminary estimate was to be refined during rule development. Subsequent technical analysis of available BARCT controls indicates that a larger reduction is feasible and staff recommends 7.7 tons per day of emission reductions from all NOx RTC holders, occurring in two phases. The first phase is scheduled to begin in compliance year 2007 by reducing emissions by 4.0 tons per day. For subsequent years, 2008 through 2010, the remaining 3.7 tons per day will be evenly distributed in a straight-line rate of reduction at approximately 1.2 tons per day per year. The RTC holdings for each compliance year after 2010 will be the same as the holdings in 2010. The proposal states that the RTC reductions during the second phase of reductions (compliance years 2008, 2009, and 2010) will not occur if the price exceeds $15,000 per ton. For example, if the price of $15,000 per ton of NOx RTC is exceeded in 2010, then the RTC holdings for that year would be adjusted to the previous year RTC level, the holdings for the 2009 compliance year. These incremental reductions, if restored, could be tradable for use by any RECLAIM facility. In the event the average RTC price falls back below $15,000 per ton for a period of 6 months, proposed amended Rule 2002 contains provisions to reinstate the RTC holding reductions in future years. This price trigger is designed to address potential uncertainty in growth forecasts.

The $15,000 per ton trigger for program evaluation would be retained as a program backstop measure in Rule 2015. Of the total 7.7 tons per day of proposed NOx reductions, only the first phase reductions attributed to compliance year 2007 (i.e., 4.0 tons per day) would be submitted to the SIP prospectively. The remaining NOx reductions attributed to compliance years 2008 through 2010 (i.e., 3.7 tons per day) would not be submitted to the SIP when the rule is adopted to allow for some or all of these reductions to be used in the event RTC prices rise above $15,000 per ton. The 2008 and 2009 reductions will be submitted into the SIP when reductions are achieved; however, the 2010 reductions will be submitted after being achieved for a 12-month period.

The proposal was developed based on a method utilizing the AQMP to determine applicable BARCT and equivalency to command-and-control and then the amount reflects a 10 percent adjustment (an increase) to the remaining emissions after applying the AQMP method (The reader is referred to Section III regarding method, amount and timing of RTC reductions). The purpose of this adjustment is to allow a buffer of RTCs (excess or unused RTCs) to account for an imperfect market and to recognize that facilities hold extra RTCs for a compliance margin.

New facilities initially totally permitted, on and after October 15, 1993, but prior to adoption of and entering the RECLAIM program after adoption of the amendments would not have a rate of reduction until 2001. Reductions from 2001 to 2003, inclusive, would be implemented pursuant to the rule. New facilities initially totally permitted on and after the adoption of the amendments, would have no rate of reduction, provided that RTCs obtained have been adjusted according to the rule, as applicable. The Facility Permit for such facilities will require the Facility Permit holder to, at the commencement of each compliance year, hold RTCs equal to the amount of RTCs provided as offsets pursuant to Rule 2005.

The proposal also contains criteria by which a facility may apply for an exemption from RTC holding reductions. During the rule development process, there were comments raised that the across-the-board reduction penalizes facilities that have already made changes to bring all of their equipment to BARCT levels or facilities that do not have equipment that has been identified for new BARCT. A further reduction could result in continual purchase of RTCs. An exemption from further reductions was requested. The staff proposal includes a limited exemption, provided certain criteria are met. The criteria reflect these situations and assess costs that the exemption applies if costs are greater than what would have occurred in the absence of RECALIM. An application is required to demonstrate that the criteria are met. The exemption is only applicable to original RTC allocations, not additional holdings (i.e., resulting from purchases or otherwise transferred). Two types of facility can qualify for the exemption. The first type of facility has to meet all of the following criteria:

- the facility existed prior to the start of RECLAIM and entered either at the start of the program or later pursuant to Rule 2001 because facility emissions exceeded 4 tons per year;
- the facility does not have any equipment identified in Table 3 of Rule 2002 (i.e., 2010 emission factors for equipment with new BARCT) and the achieved emission rates for each equipment at the facility are less than or equal to the 2000 (Tier I) Ending Emission Factor listed in Table 1 of Rule 2002 for the corresponding equipment type;
- RTCs have never been sold for 2007 or later compliance years; and
- the facility demonstrates that the cumulative NOx compliance costs incurred for meeting the RECLAIM allocation exceeds the costs that otherwise would have occurred under a command-and-control regulatory approach to meet and maintain the emission limits specified in Table 1 of Rule 2002.

The proposed rule language also includes criteria for comparing costs of RECLAIM to costs that otherwise would have occurred under a command-and-control regulatory approach. The following costs need to be considered:

- the costs of controlling emissions under both programs will have to be determined separately using similar parameters. The costs of RECLAIM are those incurred to stay under the RECLAIM allocations while the facility is subject to RECLAIM. However, the costs that would have occurred under command-and-control will need to be estimated. The proposed rule sets the command-and-control emission limit to equal to the 2000 (Tier I) Ending Emission Factors listed in Table 1 of Rule 2002. The rule language further specifies that the costs for controls to achieve the specified level will be estimated using the parameters and procedures for determining total direct and indirect capital investment and total annual costs as specified in the most recent edition of the Control Cost Manual published by the U.S. EPA Office of Air Quality and Planning Standards;
- the realized and anticipated revenues and expenditures from buying and selling RTCs. When registering RTCs trades, RTCs prices are reported to the District. Revenues from RTC sales through brokers will be included and attributed to the facilities. The reported prices can include commissions charged as percentage of the trade value but do not include costs associated with legal proceedings, feasibility studies, or market activity analysis not directly related to RTC transactions. Revenues from selling RTCs will be

treated as cost savings under RECLAIM. Whereas, expenditures from buying RTCs will be treated as costs under RECLAIM;

- none of the costs associated with compliance with the New Source Review provisions of Rule 2005, Rule 2012(c), or otherwise applicable state or federal requirements. These costs would have incurred under either of the two regulatory approaches and would have cancelled out in the comparison;
- none of the costs that did not directly reduce NOx emissions, nor costs that result only in improving process efficiency or product quality, nor cost of projects that were initiated before the date the facility was subject to RECLAIM requirements, nor costs of litigation. These costs would have occurred under either of the two regulatory approaches and would have cancelled out in the comparison; and
- any cost savings that resulted in implementing any NOx emissions strategy, such as fuel savings, increased production or sale.

Alternatively, in lieu of the aforementioned criteria, the proposed reductions would not apply to any facility whose starting and year 2000 Allocations were calculated using the same emission factors that are equal to or lower than the 2000 (Tier 1) emission factors listed in Table 1. Secondly, emission rate achieved for each source at the facility is less than or equal to the emission factors listed in Table 3 for the corresponding equipment type. Thirdly, the facility has never transferred or sold RTCs for 2007 or later compliance years. These facilities have already achieved Tier I emission levels at the time the facility entered RECLAIM and the facilities continued to achieve early reductions when compared to the new BARCT emission levels.

To obtain an exemption, the facility must file an application to demonstrate that it meets the above the criteria. The facility would have to, at a minimum, include the following criteria (although more information may be required):

- a detailed description of each project and itemized listing of how it relates to meeting the RECLAIM reduction requirements, including date(s) of start and completion of each project listed;
- detailed calculations of the amount of emission reduction/increase resulted from each project, proof of emission levels achieved and the time period during which the emission levels are maintained. The emission levels achieved shall be based on actual CEMS data or source tests results;
- itemized revenue and expenditures for each RTC trading activity incurred since participation in the RECLAIM program;
- itemized costs for each project and corresponding receipts for such expenditures; and
- cost savings resulted from each projects (e.g. fuel savings, improved productivity, increased sale, etc.) and proof of the values of such savings.

The above data are required to determine if part of the cost should be included in the comparison and, if so, whether a cost belongs to RECLAIM or command-and-control. The data will also demonstrate if every source at the facility is achieving the current BARCT emission levels. Failure to provide all necessary information to allow proper evaluation of the exemption will result in the denial of the exemption request.

If approved, the exemption would only apply to the initial RTC allocations issued by AQMD, which would be designated as non-tradable, begin the next compliance year following the exemption application, and not apply to reductions resulting from future periodic BARCT review. If denied, a facility has the right to appeal the denial of the exemption to the Hearing Board. Potential applicants for the exemption have two time period to file: 1) within 6 months of rule adoption or 2) between January 1 and March 31, 2006. Any forgone reductions by facilities meeting the exemption criteria would be distributed evenly among the remainder of the RTC holders and implemented two years from the compliance year of the applicable exemption. For example, if the exemption for a RECLAIM facility was approved in 2006, then the exemption would apply to the compliance year 2007 reductions, which would then be distributed among the remaining RTC holders in the 2009 compliance year. A public notification of the distributed reductions would occur at least one year prior to implementation.

Emission Factors

The current version of Rule 2002 does not have an emission factor specifically for micro-turbines. As a default, micro-turbines currently use the same emission factor for natural gas-fired turbines which is 413 pounds of NOx per million standard cubic feet (lbs NOx/mmcf) of fuel. A new emission factor specific to micro-turbines of 54.4 lbs NOx/mmcf of fuel is proposed to be added to Table 1 in Rule 2002. In addition, Table 1 will be clarified to reflect that the ending emission factors are for compliance year 2000.

A new entry is added to Table 1 of Rule 2002 for internal combustion engines (ICEs) that were installed or modified after the maximum throughput year and that were meeting the BACT limits in effect at the time of installation or modification. The maximum throughput year is the year selected for purpose of determining starting allocation at the time the facility entered the RECLAIM program. The proposal will allow emissions from the qualifying ICEs to be determined using an emission factor that is equivalent to the permitted BACT limits the ICEs have to achieve. In addition, similar to these ICEs, there are categories of emission factors in Table 1 for boilers, heaters, and steam generators that were "new or modified, and subject to BACT, after the start year as determined pursuant to Rule 2002 (c)(1)". To be consistent, the descriptions for these boilers are modified to match the description of the ICEs. No changes to the Tier I emission factors for the boilers are made.

### Proposed Amended Rule 2007 – Trading Requirements

The current version of Rule 2007, last amended on September 3, 2004, restricts power producers from reconciling emissions using NOx RTCs that were purchased on or after January 12, 2001 until other RECLAIM rule amendments occur that will decrease allocations to reflect BARCT as required under state law, unless certain criteria are met. To address BARCT under RECLAIM, PAR 2007 proposes to completely lift the trading restrictions effective on January 1, 2007, which is the first compliance year when programmatic reductions are scheduled to occur across-the-board for all facilities. The September 3rd amendments delayed the removal of trading restrictions until adoption of the rule amendments implementing the 2003 AQMP control measure and BARCT equivalency.

Power producers would be allowed to purchase RTCs for any compliance year as well as sell compliance year 2007 or later RTCs as of adoption of the amendments. However, with the exception of being able to sell RTCs for compliance years 2005 and 2006 to new power

generating facilities brought on-line on and after January 1, 2004, current restrictions on the sell of RTCs would remain in effect until the 2007 compliance year.

**Proposed Amended Rule 2009 – Compliance Plans for Power Producing Facilities**

The current version of Rule 2009 requires each power producing facility with a generating capacity of 50 MW or greater to prepare a compliance plan that ensures timely installation of BARCT at all electric generation units. In addition, for electric generating equipment located in the South Coast Air Basin and exceeding 250 MW generating capacity in aggregate, each compliance plan is required to contain 'environmental dispatch procedures' to establish a hierarchy or criteria for operating the lowest NOx-emitting units to the maximum extent feasible during the installation process. Even though the environmental dispatch procedures are set to expire at the completion of the 2005 compliance year, all affected facilities are currently operating in compliance with the BARCT emission levels such that these requirements are no longer necessary. Thus, for clarity and consistency with the current compliance status and to relieve the affected facilities of recordkeeping requirements that are no longer necessary, amendments to Rule 2009 are proposed to change the sunset date of the environmental dispatch procedures effective upon the date of adoption.

**Proposed Amended Rule 2010 – Administrative Remedies and Sanctions**

This clarification is being added to subdivision (b) to reflect AQMD practices regarding how and when deductions are made. The intent of this amendment to the deduction provision is to clarify how a deduction is made once the Executive Officer makes a determination, through an audit or other means, that a facility has violated Rule 2004(d)(1). This deduction occurs in addition to the company receiving a Notice of Violation and associated penalties. For each quarter that a facility has violated Rule 2004 (d)(1), the Executive Officer will determine the amount by which the allocation was exceeded for that quarter alone. Unreconciled exceedances for one quarter do not get carried into the next quarter. Then the Executive Officer will add together the quarterly exceedances to calculate the total annual exceedance. This amount is then deducted from the compliance year after which the EO makes the determination that a facility violated Rule 2004 (d)(1).

For example, if a facility exceeded its total annual allocation in the first quarter by 10 pounds and did not purchase sufficient RTCs to cover the exceedance by the end of the reconciliation period for the first quarter, it will have a quarterly exceedance of 10 pounds. If the company continues to operate without purchasing RTCs and emits 40 pounds in the second quarter, then the facility has a second quarter exceedance of 40 pounds. These 40 pounds would be added to the first quarter exceedance of 10 pounds, for a total exceedance of 50 pounds for the year thus far. If the company still continues to operate without purchasing RTCs, then the subsequent quarterly emissions would also constitute exceedances and would be added to the total until the facility purchased sufficient RTCs to cover the total exceedance. However, if purchases are made in the third quarter that covers the total exceedances for the year, and assuming the facility has no exceedance in the fourth quarter, then the total deduction for the compliance year would be 50 pounds.

**Proposed Amended Rule 2011 - Proposed Amended Rule 2011 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Sulfur (SOx) Emissions**

**(Protocol) and Proposed Amended Rule 2012 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NOx) Emissions (Protocol)**

The substantive proposed changes to both rules and protocols are as follows:

- Rule 2011 (f)(2) and Rule 2012 (h)(2) would change to the current submittal due date for monthly interim reports (currently, by the tenth day of month) to be consistent with the due date for other types of monthly reports (i.e., by the 15th day of the month).
- An emission factor is being added to Table 1 of Rule 2002 and the protocol for Rule 2012 specifically for micro-turbines which constitutes a new source category.
- The protocol for Rule 2012 would allow demonstrations of compliance with RECLAIM concentration limits to be based on total mass NOx emissions when testing the exhaust from large sources and process units provided that all of the following conditions exist:
    - the exhaust gases have an oxygen content greater than 19 percent;
    - there is no other fuel or combustible material present in the process;
    - the affected sources combust a single fuel which has been specifically included; and,
    - all exhaust points can be tested.
- Both protocols for Rules 2011 and Rule 2012 would allow delaying the due date for verifying the accuracy of CEMS devices for sources that operate intermittently. The proposed amendments also include requirements for affected facilities to comply with the following:
    - demonstrate that the normal operating schedule for the source is intermittent and cyclical in nature;
    - obtain prior one-time approval for using the alternative procedures;
    - demonstrate that the source is operated intermittently during the quarter when postponement of the Relative Accuracy Test Audit (RATA) is needed; and,
    - the CEMS passes the alternative RATA performance standards.
- Both protocols for Rule 2011 and Rule 2012 would allow the transmission of CEMS monitoring data through the SCAQMD's website.
- Both protocols for Rules 2011 and 2012 would require quarterly reporting of emissions from sources that are not listed on the Facility Permit, such as contractor equipment, various location equipment, and equipment covered under applications. Currently, emissions from these sources are required to be reported except that the due dates for the reports are not explicitly specified.
- Update Rule 2012 protocol Table 3-A and Table 4-A to reflect current requirements for large sources and process units equipped with stack flow monitors to measure and report exhaust flow rate. In addition, to clarify that the measuring and reporting of production rates, process rate, and shaft output or throttle setting, as well as operating time and production/processing/ feed rate are required for process units permitted with emission rates corresponding to the measured variable.
- Current rule requires stack flow monitors be used in certain cases where other monitoring options are not applicable. In these cases monthly or quarterly exhaust flow volumes are required to determine emissions from large source or process units, respectively. With the advent of digital recording systems, some systems have the capability of recording hourly flow data. The proposed rule language clarifies the

emission calculation based on these hourly data. In addition, it allows substitution of data using existing missing data procedures whenever valid data are not obtained.

It should be noted that the proposed Rule 2012 alternative method for demonstrating compliance with concentration limits is a new test method. Facilities that cannot use the existing method due to high oxygen content and low carbon dioxide content in the exhaust stream may apply to use this method by filing a permit application and paying the appropriate fee.

The current versions of Rules 2011 and 2012, including their protocols, contain some typographical errors and administrative inconsistencies. For simplicity, administrative corrections are proposed to both rules and they will primarily focus on Chapters 2 and 4, plus Attachment E of Rule 2011 and Chapters 2, 3, and 4, plus Attachment F of Rule 2012.

**Alternative Proposals**

Alternative proposals regarding RTC holding reductions have been submitted by representatives of industry and the environmental community that would affect amendments to Rule 2002 only. Industry's proposal would reduce NOx emissions by 4 tons total across-the-board for all facilities, with 2 tons being reduced in 2007 and 2 tons in 2008. No reductions would be sought for the 2009 compliance year and further reductions would be subject to evaluations of BARCT, based on the resolution of key policy issues (e.g., cost-effectiveness), or a market-based approach that examines economic activity, including RTC prices in future AQMP revisions. In addition, industry proposes lifting of RTC trading restrictions for any power producer that chooses to opt for an early reduction on RTC holdings (e.g., starting with the 2005 compliance year instead of 2007 as proposed by staff). It should be noted that not all industry representatives agree with the across-the-board reduction element. There has been a request to allow an industry-specific reduction or otherwise exempt facilities already at BARCT with no additional BARCT proposed.

The environmental community proposal would reduce NOx emissions by 10.2 tons total based on a straight-line rate of decline from 2006 to 2010, inclusive. The level of reduction is on the same basis as the staff proposal, except that it does not include the 10 percent adjustment. While the environmental proposal would prefer to leave power plants out of the program altogether, if they are allowed back into the full trading market, the proposal would not allow full market access until such time they are subject to the same reductions as the rest of the market.

# III. BARCT ANALYSIS

## A. Overview

As described in Section I, BARCT is defined in state law as "an emission limitation that is based on the maximum degree of reduction available taking into account environmental, energy, and economic impacts by each class or category of sources" (§ 40406). Thus, there are a number of factors to consider when evaluating BARCT for the RECLAIM program, such as technical feasibility, cost-effectiveness, and how a BARCT concentration limit is translated to mass emission limits under RECLAIM. The following information provides background, highlights different viewpoints, and provides technical information relative to each equipment category and staff recommendations.

### BARCT

When RECLAIM was adopted the applicable command and control rules and control measures that represent BARCT were converted into mass emission limits for facilities, expressed in allocations (pounds of RTCs per year). The ending factors in Tier I Ending Emission Factors in Rule 2002 represented, for each category of equipment, the level of emission control required by the applicable rule and/or near-term control measures. Additional reductions in facility emission allocations from 2000 to 2003 incorporated control measures from the 1991 AQMP. In some cases, these were technology forcing.

RECLAIM allows flexibility in how a facility meets programmatic reductions; therefore, facilities generally are not required to add BARCT to any equipment. An exception to this generality came during the California energy crisis. At that time the power producers were required to reduce NOx emissions by adding controls. Programmatic reductions may be met by a variety of options, including control beyond BARCT, changes to other equipment, efficiency improvements, or equipment replacements.

BARCT is established when technology is identified that can reduce emissions from existing equipment. Among the criteria considered when evaluating BARCT were:

- Does another air pollution control district or agency have BARCT that we have not identified or have a more stringent BARCT level than the SCAQMD?
- Is the proposed BARCT level achieved in practice as retrofits?
- Is technology available and feasible for retrofits?
- Do manufacturers offer guarantees for achieving proposed emission levels?
- Is retrofit technology cost-effective?
- Based on the above criteria, could a command and control BARCT rule have been proposed in the absence of the RECLAIM program?

To determine new BARCT for RECLAIM, several steps were employed. First, adopted AQMD BARCT rules for non-RECLAIM facilities were compared to current Rule 2002 Tier 1 factors for the various types of RECLAIM equipment. The Tier I factors were developed based on the subsumed rules and control measures at the time RECLAIM began. Many of the rules have not changed, but some, like Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters have been

amended since the original RECLAIM program was adopted to make emission limits more stringent for non-RECLAIM sources. Second, other districts' rules were reviewed to determine if any exist that AQMD does not have or are more stringent than those of the AQMD. In most cases, other districts' rules are either less stringent or equivalent to those implemented by the AQMD. Some district rules had more stringent limits and these were considered when evaluating new BARCT. AQMD staff also conducted a literature search for other regulations nationwide. Based on this survey, California was found to have more stringent limits. Third, technology for NOx control was considered. For example, the control efficiency of low NOx burner technology has improved since the beginning of RECLAIM. As part of the technology review, manufacturers of controls were consulted on technological feasibility and, if applicable, to determine emission levels guaranteed for various types of equipment. Recent permits were also evaluated to determine achieved-in-practice emission limits for retrofit controls. Fourth, a cost analysis was performed to determine if the proposed controls were cost-effective.

This analysis included the extent of emission reductions beyond the Tier I emissions limits and the incremental cost-effectiveness for various levels of controls, with two exceptions. For Rule 2009, the level of controls spanned pre-Rule 2009 emissions to proposed BARCT and for FCCUs, actual emissions from four facilities were compared to proposed BARCT. A final consideration was the reasonableness to write a command-and-control BARCT rule in the absence of the RECLAIM program. That is, the availability of sufficient data and information to either amend an existing rule or develop a new rule meeting all the requirements of a standard rule development process would be conducted in order to implement all feasible measures to demonstrate expeditious progress toward attainment. The new BARCT levels represent an average for the equipment. It is likely that for some categories the specific emission limits could vary based on equipment size or rating.

## Cost-Effectiveness

### Introduction

Cost-effectiveness is defined as dollars per ton of pollutant reduced. Criteria pollutants and their precursors subject to the cost-effectiveness assessment include volatile organic compounds (VOC), oxides of nitrogen (NOx), oxides of sulfur (SOx), particulate matter (PM), and oxides of carbon (CO). The major parameters in cost-effectiveness include capital and installation costs, operating and maintenance costs, interest rates, and project life.

Cost-effectiveness calculations have been performed for control measures in the Air Quality Management Plan (AQMP) and proposed rules. The cost-effectiveness assessment is often used in a relative sense, i.e., to compare the effectiveness of control measures, rules, and their alternatives.

### RECLAIM Cost-Effectiveness Calculations

Cost-effectiveness for BARCT was completed using the equipment inventory in the AQMD database, and the emission reductions that were determined by the difference between the Tier I emission factor and the proposed new BARCT and the peak activity level used in deriving the year 2000 allocation. Rule 2009 and FCCU cost-effectiveness were calculated differently, as previously noted. Peak year activity was the same as what each facility used in determining

original allocations. Each facility chose a single year from 1987 to 1992. The same throughput data at source category levels (e.g., boilers, heaters) was used for this analysis. Device level data (i.e., by individual units) is unavailable under the current RECLAIM reporting scheme.

It should be noted that emission reductions used for the cost-effectiveness evaluation of the various equipment categories with new BARCT are not the same as those reductions calculated under the AQMP method to derive programmatic RTC holding reductions. This was done because the AQMP method incorporates projected emission growth that varies from year to year. The allocation method, on the other hand, relies on an inventory that was used to establish initial year 2000 allocations by equipment type. Therefore, the emissions reduced in the cost-effectiveness calculations are consistent with the initial RTCs allocated to the facilities.

Equation for determining emission reductions for cost-effectiveness:

(Peak year activity x Tier I end factor) – (Peak year activity x proposed new BARCT)

The AQMD routinely conducts cost-effective analyses regarding proposed rules and regulations that result in the reduction of criteria pollutants (NOx, SOx, VOC, PM, and CO). The analysis is used as a measure of relative effectiveness of a proposal. It is generally used to compare and rank rules, control measures, or alternative means of emissions control relating to the cost of purchasing, installing, and operating control equipment in order to achieve the projected emission reductions. Cost-effectiveness is a key element to the BARCT criteria for economic feasibility. The AQMD has historically used the Discounted Cash Flow (DCF) method for evaluating cost-effectiveness. The following equation illustrates the DCF approach:

$$\text{DCF} = \frac{\text{One-time Cost} + (\text{Recurring Cost x Present Value Factor})}{\text{Emission Reductions over Project Life}}$$

The total capital investment, and operation and maintenance costs are based on the total number of equipment with Tier I ending emission factor greater than the proposed new BARCT.

Several issues were raised by stakeholders regarding the cost-effectiveness analysis, including equipment life, cost threshold, and which method should be used. These are discussed below.

## Equipment Life

### Issue

Cost-effectiveness is determined by dividing the cost of controls by the amount of emission reductions expected over a given period of time. Typically this is based on an equipment life of 10 years since most industrial equipment lasts about 10 years prior to replacement. While this is appropriate for many types of equipment, certain types of equipment and controls under consideration for new BARCT in the RECLAIM program have a much longer life expectancy. Using a longer life expectancy lowers the cost-effectiveness. Industry representatives have asked to standardize equipment life as 10 years for all equipment. The issue is the appropriateness of using a longer equipment life when calculating cost-effectiveness.

### Background

Historically, since 1989, a 10-year equipment life is most typical for cost-effectiveness because 10 years is a representative length of life expectancy for many types of equipment. In a recently adopted SCAQMD rule for controlling particulate matter from fluid catalytic cracking units (i.e., Rule 1105.1), a 25 year equipment life was used to derive the cost-effectiveness. Also, a 20-year life was used for some of the control options in Rule 1178 when calculating cost-effectiveness. A 10 year equipment life was used for non-refinery boilers and process heaters, metal melting and heat treating, and miscellaneous combustion sources. A 25-year life was used on for fluid catalytic cracking units and refinery boilers and process heaters.

### Discussion

Due to advancements in emission control technologies, a 10-year equipment life is no longer appropriate under all circumstances. For example, SCR equipment manufacturers design the reactor for a 25 year life, with a minimum maintenance schedule of 5 years for catalyst replacement. Refinery representatives have commented that in evaluating costs for large boilers and heaters that a 20-year life is considered.

### Industry Comments

- Equipment life greater than 10 years (e.g., 25 years) should not be used to derive the cost-effectiveness of emission reductions because the equipment can only be financed for 10 years. If greater than 10 years is appropriate, then no further reductions from the equipment should be sought for the same period where facilities have installed the controls to comply with the RECLAIM RTC reductions.

### Environmental Organization Comments

- Equipment life should be based on the actual life expectancy of the control equipment.

### Staff Recommendations

Based on information gathered from industry and control equipment manufacturers, staff recommends varying equipment life depending on the type of equipment. If a piece of equipment is financed over ten years, that does not mean its useful life is limited to 10 years. If a 10-year life was used as the norm since the beginning of the RECLAIM program, beginning in 2005, all RECLAIM equipment would be replaced with new equipment. Many types of equipment, such as large boilers and refinery FCCUs typically last 20 to 40 years. In addition, any further control would need to be proven cost-effective for the next increment of emission reductions. Furthermore, if a piece of control equipment is replaced while having additional useful life due to AQMD rulemaking, a sunk cost (assuming no salvage value) can be added to the next increment of cost-effective analysis. Staff believes using a longer equipment life for some equipment categories is more realistic than 10 years.

## Incremental Cost-Effectiveness of BARCT

California Health and Safety Code §40920.6 requires an analysis of cost-effectiveness and incremental cost-effectiveness prior to adopting rules or regulations that are proposed to meet BARCT. Incremental cost-effectiveness is used to measure the dollars per ton difference between two or more control options. It is calculated by dividing the difference in the dollar costs by the difference in the emission reduction potentials between the two control technologies. Incremental cost-effectiveness does not reflect potential emission reductions and is not comparable to other methods of determining cost-effectiveness. Incremental cost-effectiveness analysis for each source category is presented in Section II of this report. The equation used for this calculation follows.

Incremental cost-effectiveness equation:

$$(PV_1 - PV_2) \div (ER_1 - ER_2) = \$/\text{ton}$$

Where:
$PV_1$ = Present Value of control technology 1
$PV_2$ = Present Value of control technology 2
$ER_1$ = Emission Reductions from control technology 1
$ER_2$ = Emission Reductions from control technology 2

Taking all the factors into consideration, the analysis resulted in recommendations for new BARCT for some categories and none for others, as described below.

## New BARCT

New BARCT was recommended for some types of equipment, including:

- Rule 1146 and 1146.1 boilers and heaters;
- Rule 1109 refinery boilers and heaters;
- Fluid catalytic cracking units;
- Metal melting and heating processes; and
- Miscellaneous combustion equipment including ovens, kilns, calciners, dryers, and furnaces.

### Implementation Schedule

Unlike command and control rules, RECLAIM allows facilities flexibility to comply with their allocations, such as: 1) operate within the existing NOx allocations and retain excess RTCs; 2) operate within the existing NOx allocations and trade excess RTCs; 3) purchase RTCs to make up for any emissions exceeding NOx allocations; and 4) retrofit existing combustion equipment not currently operating at BARCT levels with NOx control equipment to further reduce NOx emissions below the annual allocation. Aside from being required to operate within RTC holdings for any given year, operators of RECLAIM facilities are not bound by a particular implementation schedule. However, the proposed amendments to the RECLAIM program may further induce facility operators to install control equipment as facility allocations get reduced over the years.

In general, installation of low NOx burners requires less planning, designing, and construction time than SCR. Therefore, equipment that can be controlled with low NOx burners could be retrofit sooner than equipment that can be controlled with SCR. It is possible that a number of Rule 1146/1146.1 boilers/heaters, metal melting, heat treating, and miscellaneous combustion equipment could be retrofit with low-NOx burners within a year or two of adoption of the proposed reductions. On this basis, the RTC reductions from this type of retrofit would occur by the 2007 compliance year. SCR retrofits require significantly more lead time and resources. Due to turnaround schedules at refineries, construction for SCR retrofits on refinery boilers and heaters could begin in 2 to 3 years and construction/installation staggered over a period of 3 or 4 years. Turnaround schedules for FCCUs are generally every 4 to 5 years. Therefore, SCR retrofits for FCCUs could occur as early as 2007, continuing on through 2010.

If the proposed amendments are adopted in the next several months, the estimated implementation schedule, with reasonable lead time for engineering design, procurement, and permitting, would be as shown in Table 1, should facilities elect to install controls.

**Table 1**
**Estimated Command-and-Control Regulatory Development Schedule**

| Rule/Strategy | Implementation |
|---|---|
| Heat Treating | 2006 - 2007 |
| Metal Melting | 2006 - 2007 |
| Rules 1146/1146.1 Boilers and Heaters | 2006 - 2007 |
| Miscellaneous Combustion Sources | 2006-2009 |
| FCCU | 2007-2010 |
| Rule 1109 Boilers and Heaters (>110 mmbtu/hr) | 2007-2010 |

**No New BARCT**

No new BARCT was recommended for the following categories of equipment:

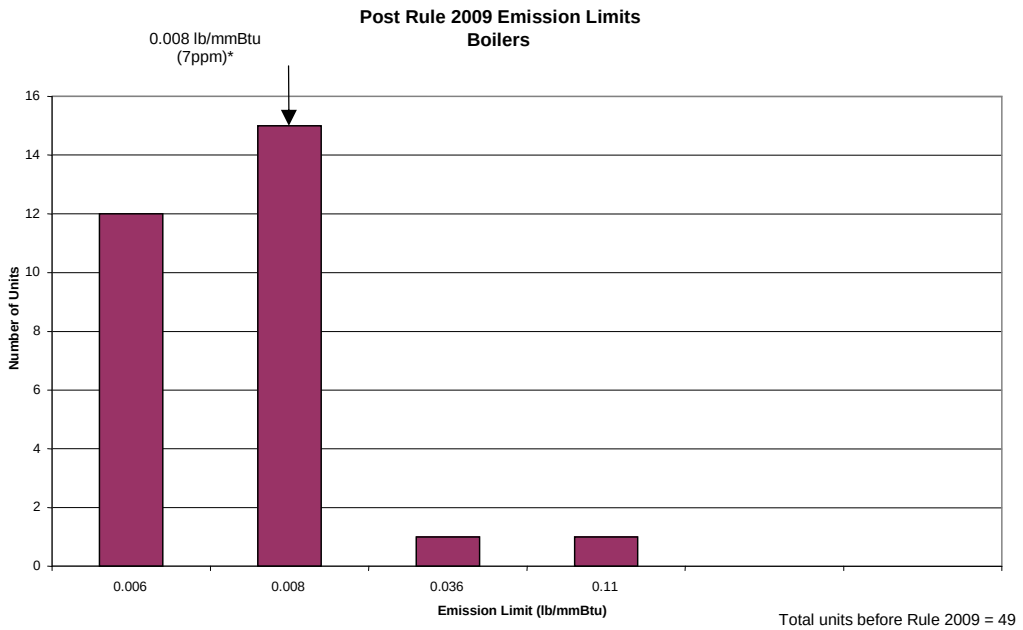
- Gas turbines;
- Cement kilns;
- Internal combustion engines;
- Glass melting furnaces; and
- Curing and drying ovens.

**Rule 2009 BARCT Completed Already**

BARCT for equipment at power producing facilities subject to Rule 2009 was considered separately as part of the year 2001 RECLAIM amendments and subsequent rule implementation. Consequently, much of the analysis was done at the time these facilities filed applications for modifications of their equipment. Under Rule 2009, a case-by-case technical and cost-effectiveness evaluation was performed for each boiler or turbine unit to determine BARCT.

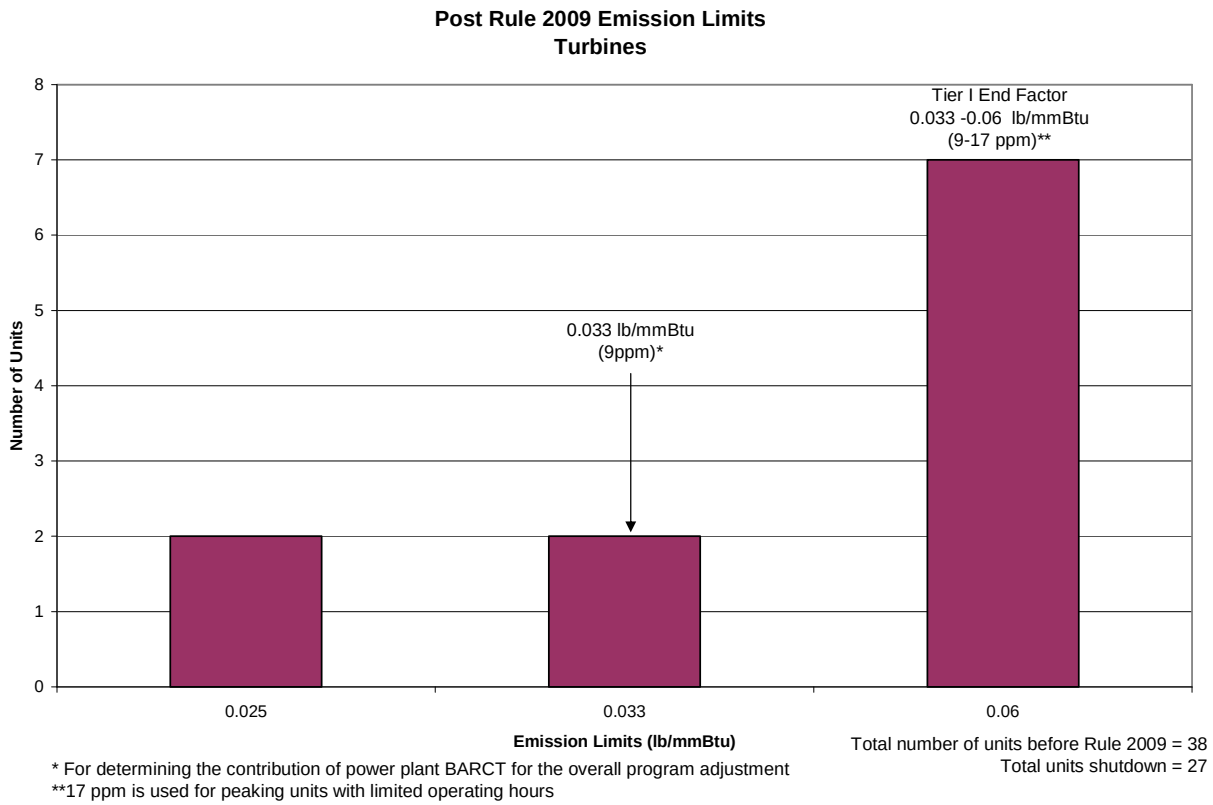
Permit information shows that BARCT for the majority of equipment under Rule 2009 ranges from 5 to 9 ppm. The weighted average for all utility boilers, including those higher than 9 ppm, after the Rule 2009 retrofits is 7 ppm. Some units were not able to attain this concentration due to space constraints for SCR installations. To comply with Rule 2009, some units were (1) taken out of service, (2) replaced by more efficient equipment, or (3) retrofit with controls. For the purpose of current BARCT determinations, the average concentration limit for all utility boilers was used and is an achieved in practice, technologically feasible, and cost effective limit. Under RECLAIM Rule 2009, the units which could not cost effectively attain a 7 ppm concentration were given permit limits at a higher concentration. If a command and control rule were written for utility boilers, it is most likely that the current Rule 1135 approach would be followed to allow compliance flexibility, such as system-wide emission limit averaging and facility-wide annual emissions cap. On this basis, 7 ppm is selected to represent the average emission rate for the entire source category in calculating RECLAIM annual emissions. Figures 1 and 2 illustrate the current emission limits for power plant boilers and turbines.

**Figure 1**




* For determining the contribution of power plant BARCT for the overall program adjustment
**Note:** The Tier I End Factor is unique for each utility ranging from 0.010 - 0.018 lb/mmBtu.

**Figure 2**




Section III contains a detailed description of the BARCT technology evaluation for each source category. Table 2 summarizes the BARCT analysis including, rule analysis, control technology, cost-effectiveness and recommendation for new BARCT.

**Table 2**
**Proposed BARCT and Cost-Effectiveness**

| Subsumed Rule/CM | Rule-CM Description | Tier 1 Emission Factor | Tier 1 Control Technology | Basis for BARCT | New Proposed BARCT (lb/mmBtu) | New Control Technology | Cost-Effectiveness ($/ton)* | Other District Rule More Stringent? |
|---|---|---|---|---|---|---|---|---|
| 90A-C-5 | Misc. Combustion (Ovens, Kilns, Calciners, Dryers, Furnaces) | 0.062 lb/mmBtu | Lo NOx Burner, Combust. Modifi. | Manufacturer Information, Permit Data for Retrofit (70 units currently at or below 30 ppm) | 0.036 (30 ppm) | Ultra Lo NOx Burner | $11,000 (10 yr) | No |
| 90P-B-2 | Petroleum Refinery FCC Units | 70% reduction | SCR | Permit Data for Retrofit | 85% reduction | SCR | $21,000 (10 yr)<br>$16,500 (15 yr)<br>**$12,200 (25 yr)**[1] | No |
| 90P-C-5 | Metal Melting Furnaces | 0.062 to 0.162 lb/mmBtu | Lo NOx Burner | Manufacturer Information, Permit Data (60 units currently at or below 45 ppm) | 0.055 (45 ppm) | Ultra Lo NOx Burner | $8,500 (10 yr) | No |
| | Heat Treating Furnaces | | | | | | $4,000 (10 yr) | No |
| R1109 | Refinery Boilers and Heaters > 110 mmBtu/hr | 0.030 lb/mmBtu | Lo NOx Burner, FGR | Manufacturer Information, SJVUAPCD, Permit Data for Retrofit | 0.006 (5 ppm) | SCR | $20,300 - $31,000 (10 yr)<br>$15,600 - $24,000 (15 yr)<br>**$11,200 - $17,000 (25 yr)**[1] | No |
| R1146 | Boilers and Heaters ≥ 5 MM Btu/hr | 0.045 lb/mmBtu | Lo NOx Burner, FGR | Manufacturer Information, SJVUAPCD, Permit Data for Retrofit | > 20 mmBtu/hr 0.010 (9 ppm)<br>2 – 20 mmBtu/hr 0.015 (12 ppm) | Ultra Lo NOx Burner | $9,000 -$10,000 (10 yr)[2] | San Joaquin Valley Unified APCD |
| R1146-1 | Boilers and Heaters 2-5 MM Btu/hr | 0.038 lb/mmBtu | | | | | | |
| R2009[3] | Utility Boilers | Differs by facility | Facility Cap, repower, Combust. Modif., FGR, SNCR, SCR | Permit Data for Retrofit | 0.008 (7 ppm)[7] | SCR | $3,000 (10 yr)<br>$2,200 (15 yr)<br>$1,500 (25 yr) | No |

| Subsumed Rule/CM | Rule-CM Description | Tier 1 Emission Factor | Tier 1 Control Technology | Basis for BARCT | New Proposed BARCT (lb/mmBtu) | New Control Technology | Cost-Effectiveness ($/ton)* | Other District Rule More Stringent? |
|---|---|---|---|---|---|---|---|---|
| 1134 | Gas Turbines | 0.06 lb/mmBtu | Various, SCR, Water or Steam Injection | | None | SCR | No | San Joaquin Valley Unified APCD |
| 1112 | Cement Kilns | Various | Lo NOx Burner, Comb. Modif. | | None[4&6] | | | No |
| 1110.2 | Internal Combustion Engines | Various | Various depending on engine use: electrification, SCR, turbo-charger, after-cooler, comb. modif. | | None[6] | | | No |
| 1117 | Glass Melting Furnaces | 4 lb/tons product | Lo NOx burner, Combustion modif. | | None[5] | | | No |
| 90P-C-6 | Curing & Drying Ovens | 0.03 lb/mmBtu | Lo NOx burner, Combustion modif. | | None[5] | | | No |

*The overall weighted average cost-effectiveness is $8,300-$13,000 per ton.

[1]This value reflects the staff recommended equipment life and corresponding cost-effectiveness.
[2]Control costs were obtained from 3 manufacturers. Cost-effectiveness calculations for two of the manufacturers yielded numbers in the range of $9,000 to $10,000 per ton while the third was much higher. The third manufacturer gave costs only for burners rated at ≥ 20 mmBtu/hr.
[3]Rule 2009 utility boiler cost-effectiveness is based on pre-Rule 2009 emissions.
[4]Controls not achieved in practice
[5]Further reductions not technically feasible
[6]Further reductions not economically feasible
[7]For determining the power plant BARCT contribution to the overall program adjustment

## B. BARCT Evaluation by Source Category

### Introduction

Following is a discussion of each RECLAIM equipment category evaluated for new BARCT levels. Each section highlights key comments, technical evaluation, equipment life, and cost-effectiveness.

Table 5A contains a summary of the BARCT determinations for each of the equipment categories that were found to have technically and economically feasible emission reductions.

### Fluid Catalytic Cracking Units

#### Technology Evaluation

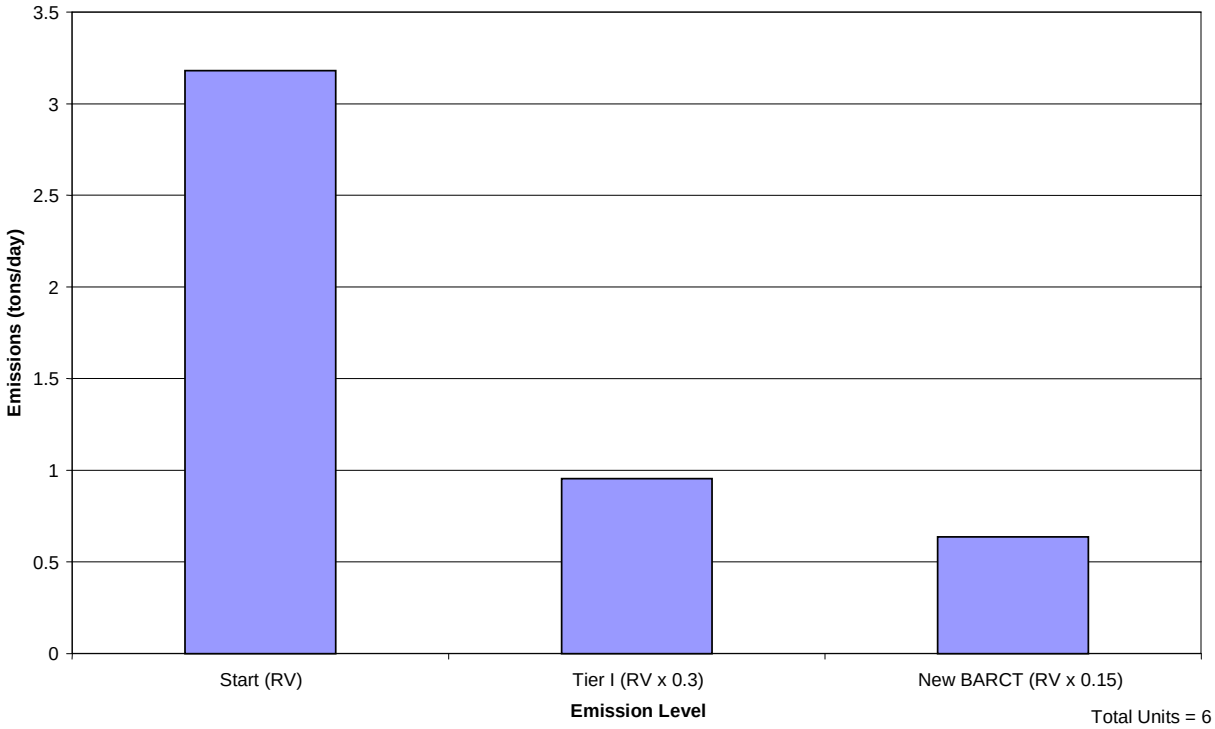
There was a control measure for fluid catalytic cracking units (FCCUs) that was subsumed under RECLAIM when the program was initiated. The control measure would have reduced emissions through installation of SCR. SCR technology has improved in the last decade. There are no other district rules for this type of equipment, and none were found nationwide.

There are six FCCUs in the SCAQMD. Two units have been retrofit with SCR and achieved greater than 90 percent NOx reduction upon initial operation, demonstrating that this technology is achieved in practice. However, in order to allow for control equipment maintenance (e.g., plugged catalyst) down time when the FCCU continues to operate, the new BARCT limit for this equipment category was set at a control efficiency of 85 percent. The technology has been achieved in practice and has manufacturer guarantees. 1991 AQMP Control Measure 90P-B-2 specified 70% reduction based on SCR. SCR technology has improved in recent years. Worldwide 15 FCCUs have been retrofit with SCRs and most are achieving at least 85% control efficiency. The technology is considered achieved in practice. Given the feasibility of controls and the amount of reduction achievable it is likely that, in the absence of RECLAIM, a command and control rule would have been written for this category. Therefore, SCR at 85% control efficiency has been determined to be the proposed BARCT.

Figure 3 is a graph of the emissions based on uncontrolled, Tier 1, and new BARCT levels. Due to the small number of units and to protect the confidentiality of the facilities, the bar chart for the FCCUs shows total emissions for the 6 units based on actual emission data. Charts for most other categories, where there are large numbers of equipment, are histograms. Two units in the South Coast basin have already achieved the new BARCT emission level. The other 4 units have not yet achieved Tier I levels.

**Figure 3**

**Fluid Catalytic Cracking Units**




Note: No established BACT limit
RV = reported value
Cost-effectiveness (25 year life) = $12,200 per ton

### Equipment Life

In a recently adopted SCAQMD rule for controlling particulate matter from fluid catalytic cracking units (i.e., Rule 1105.1), an equipment life of 25 years was used to derive the cost-effectiveness. Due to advancements in emission control technologies, a 10-year equipment life is not appropriate for this equipment. SCR equipment manufacturers design the reactor for a 25 year life, with a minimum maintenance schedule for catalyst replacement. Refinery stakeholders have commented that in evaluating costs for large boilers and heaters that a 20-year life is considered. However, based on manufacturer data and efforts under Rule 1105.1 rule development, an equipment life of 25 years is recommended. Also, a 20-year life for some of the control options was used in Rule 1178 when calculating cost-effectiveness.

### Cost-Effectiveness

The cost-effectiveness of installing SCR, based on the range of costs associated with installation of BARCT on this equipment and an equipment life of 25 years, is expected to be approximately $12,200 per ton NOx reduced. If based on a life of 15 years, cost-effectiveness would be $16,500 per ton. For a 10 year life, the cost-effectiveness would be $21,000. Incremental cost-

effectiveness is based on varying control efficiency from 70% to 85% and is $8,320 per ton for a 10 year life, $6,500 per ton for a 15 year life, and $4,800 per ton for a 25 year life.

Staff's analysis included typical costs for the purchase, installation, and operation of SCR control equipment. Facility data was used to the extent feasible. However, some facilities may experience other site-specific costs that can increase control costs. Actual facility-/unit-specific cost data was submitted by some representatives of the petroleum refining industry relative to the purchase and installation of the SCR controls. For comparison purposes, staff conducted a cost-effectiveness analysis utilizing the data and similar assumptions as that of staff's analyses. The reader is referred to Appendix B for a summary of that data and relative cost-effectiveness.

#### Industry Comments

- SCR as BARCT is incorrect, it is BACT/LAER. SCR is not easily transferable to all FCCUs, as they are unique. De NOx catalyst technology for BARCT should be considered for this category of equipment.

- The AQMD's assessment shows that there are only two FCC units that are uncontrolled. Due to the few number of units, a facility-specific analysis should be conducted for this equipment category. An independent analysis conducted on the equipment shows BARCT not to be cost-effective, based on a 10-year equipment life.

#### Environmental Organization Comments

- Actual life of the control equipment should be used in determining cost-effectiveness.

### Refinery Boilers and Process Heaters

#### Technology Evaluation

Rule 1109 – Emissions of Oxides of Nitrogen from Boilers and Process Heaters in Petroleum Refineries, applies to boilers and heaters at refineries with a heat input rating of greater than 40 mmBtu/hr and was subsumed into RECLAIM when the program was initiated. Rule 1109 limits these units to 25 ppm or approximately 0.030 pound of NOx per mmBtu. The 2000 (Tier I) Ending Emission factor for refinery boilers was based on the 25 ppm limit, so reduction to this level has already been accounted for in the allocations for the year 2000.

San Joaquin Valley Unified APCD (SJVUAPCD) has a more stringent limit than AQMD rules for a subcategory of refinery boilers/heaters. The SJVUAPCD Rule 4306 limits emissions from units with greater than 110 mmBtu/hr input rating to 5 ppm. The SJVUAPCD requirements for refinery boilers/heaters rated at < 110 mmBtu/hr are less stringent than SCAQMD Rule 1109. SJVUAPCD has not yet implemented their rule, so no units have been retrofit there.

Staff consulted with burner manufacturers and refineries in studying the technology available to reduce NOx from refinery boilers and heaters. Ultra low NOx burners are only capable of reducing NOx levels in refinery boilers/heaters to approximately 25 ppm due to the size and design of the equipment and the combustion characteristics of refinery gas. Selective catalytic

reduction is capable of reaching 5 ppm NOx limits and, based on current installations at in-Basin refineries, is an achieved-in-practice retrofit technology. This technology has improved in recent years, as seen with the SCR retrofits for utility boilers which achieved limits as low as 5 ppm. SCR was determined to be cost-effective for refinery boilers/heaters rated at greater than 110 mmBtu/hr, but not for the 40 to 110 mmBtu/hr units. In view of SJVUAPCD's more stringent emission limits and improvements in SCR, it is likely that Rule 1109 would have been amended from the Tier I 25 ppm level to include more stringent limits for large refinery boilers/heaters in the absence of RECLAIM.

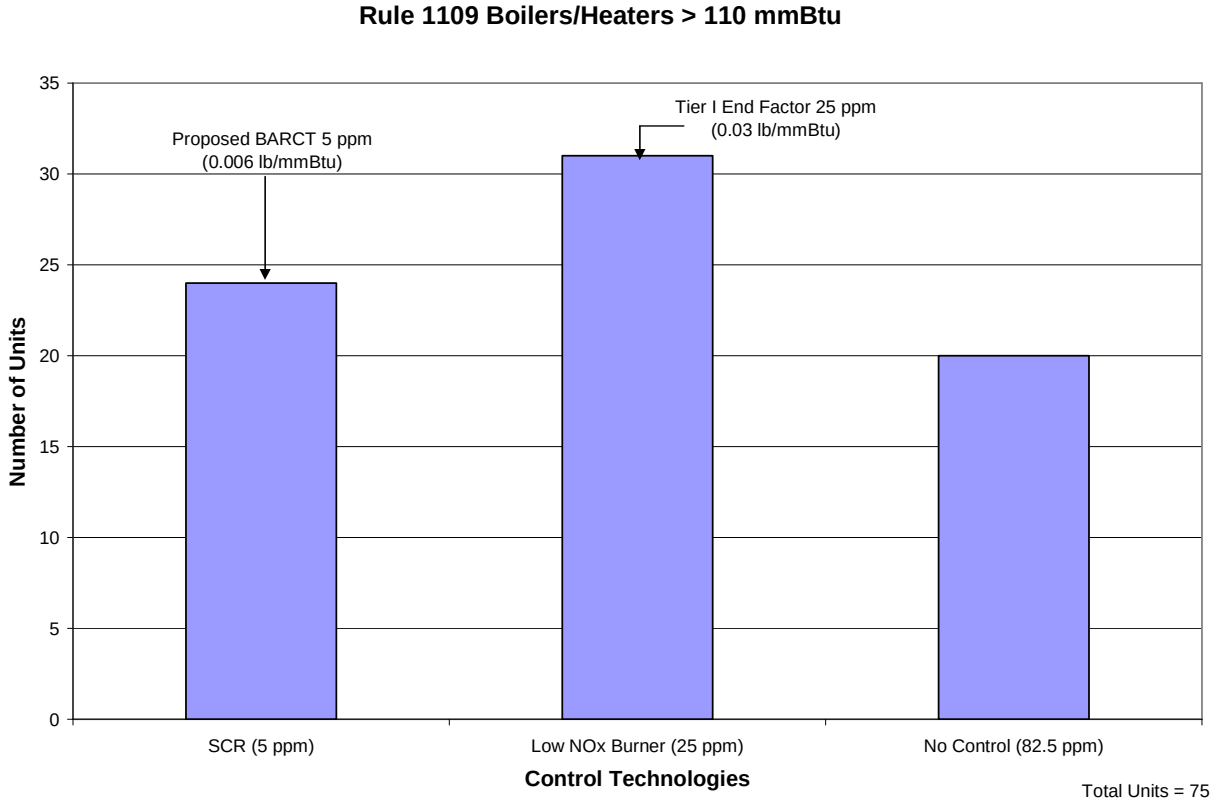
The RECLAIM inventory for refinery boilers and heaters includes approximately 140 boilers and heaters. Of those, 75 are rated at greater than 110 mmBtu/hr. Approximately a third of those 75 are already equipped with SCR. No new BARCT was set for units between 40 and 110 mmBtu/hr since SCR is not cost-effective based on 25 ppm, the level achievable with ultra low NOx burners. A new BARCT level of 5 ppm was determined for refinery boilers/heaters rated at greater than 110 mmBtu/hr based on the SJVUAPCD rule and the cost-effectiveness and feasibility of control with SCR.

Figures 4 and 5 represent the population of Rule 1109 boilers and heaters in the RECLAIM universe and their current type of control equipment. For the purposes of these charts, boilers and heaters that are uncontrolled were assumed to be at the starting emission factor of 82.5 ppm. Those equipped with low NOx burners were assumed to be at Tier 1 ending emission factor of 25 ppm and those with SCR were assumed to meet the new BARCT level of 5 ppm. The charts are not histograms like those for the remaining categories because most of these units do not have NOx permit limits.

**Figure 4**

Note: BACT is 5 ppm

**Figure 5**




Note: BACT is 5 ppm
Cost-effectiveness (25 year life) = $11,200 - $17,000 per ton

### Equipment Life

For this equipment, a life of 25 years was used to derive the cost-effectiveness. Due to advancements in emission control technologies, a 10-year equipment life is not appropriate for this application. As a rule of thumb, SCR equipment manufacturers design the reactor for a 25 year life, with a minimum maintenance schedule for catalyst replacement (i.e., every five years). Refinery stakeholders have commented that in evaluating costs for large boilers and heaters that a 20-year life is considered. However, based on manufacturer data, an equipment life of 25 years is recommended.

### Cost-Effectiveness

The cost-effectiveness of SCR, based on the range of costs associated with installation of BARCT to reduce emissions from 25 ppm to 5 ppm on this equipment and an equipment life of 25 years, is expected to approximately be $11,200 to $17,000 per ton NOx reduced. If based on a life of 15 years, installation of SCR is anticipated to cost about $15,600 to $24,000 per ton and 10 years about $20,300 to $31,000. The range of cost effectiveness is due to the starting emissions used in the calculations. The lower end of the range uses a starting emission factor of 34.5 ppm based on actual refinery data. The upper end of the range uses a starting factor of 25 ppm which represents the Rule 1109 emission limit. It should also be noted that for about 20

units that have not implemented the original Rule 1109 requirement of 25 ppm, the cost-effectiveness to reach 5 ppm would be approximately $4,300 per ton for a 260 mmBtu boiler operating at 75% capacity and based on a control equipment life of 25 years.

Incremental cost-effectiveness was not calculated for this category. Industry had raised a concern that some units have already been retrofit with low NOx burners. The cost-effectiveness for the large Rule 1109 boilers/heaters was calculated using emission reductions from the Tier I limits in Rule 2002 which are based on low NOx burner technology. The cost-effectiveness for this category is based on the incremental reduction from that Tier I level based on low-NOx burners, as it is already subsumed by RECLAIM and accounted for in the facilities' initial allocations. The most feasible candidate for control to that next incremental level to meet 5 ppm NOx concentration is SCR. Therefore, the incremental cost-effectiveness is the same as the cost-effectiveness for the proposed new BARCT (i.e., from low-NOx burners to SCR).

Staff's analysis included typical costs for the purchase, installation, and operation of SCR control equipment. Facility data was used to the extent feasible. However, some facilities may experience other site-specific costs that can increase control costs. As with FCCUs, actual facility-/unit-specific cost data was submitted by some representatives of the petroleum refining industry relative to the purchase and installation of the SCR controls. For comparison purposes, staff conducted a cost-effectiveness analysis utilizing the data and similar assumptions as that of staff's analyses. The reader is referred to Appendix B for a summary of that data and relative cost-effectiveness.

#### Industry Comments

- BARCT is proposed for all refinery heaters and boilers greater than 110 mmbtu/hr. The AQMD's cost-effectiveness for refinery heaters and boilers ranges from $17,400 per ton for a 25-year life to $31,500 per ton for 10-year life. AQMD staff has deemed this category to be cost-effective in total. However, there is a spectrum of costs depending on the circumstances surrounding a particular unit. Staff's analysis of BARCT should acknowledge that many refinery boilers and heaters over 110 mmbtu/hr already have some level of control. The threshold for BARCT controls should be raised to 250 mmbtu/hr, which should be the basis for additional NOx reductions from this equipment category. This will reduce the overall cost-effectiveness below $15,000 based on a 10 year equipment life.

#### Environmental Organization Comments

- Actual life of the control equipment should be used in determining cost-effectiveness.

### Industrial Boilers and Process Heaters (non-Refinery)

#### Technology Evaluation

Several factors went into determining the BARCT level for RECLAIM boilers and heaters. Current BARCT for non-RECLAIM facilities for this equipment is governed by SCAQMD Rules 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial

Boilers, Steam Generators, and Process Heaters and 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters. Rules 1146 and 1146.1 basically apply to all other boilers and heaters greater than 2 mmbtu/hr heat input rating, with the exception of those used to generate electricity and refinery boilers and heaters rated at greater than 40 mmbtu/hr which are covered by other rules and described in the next section.

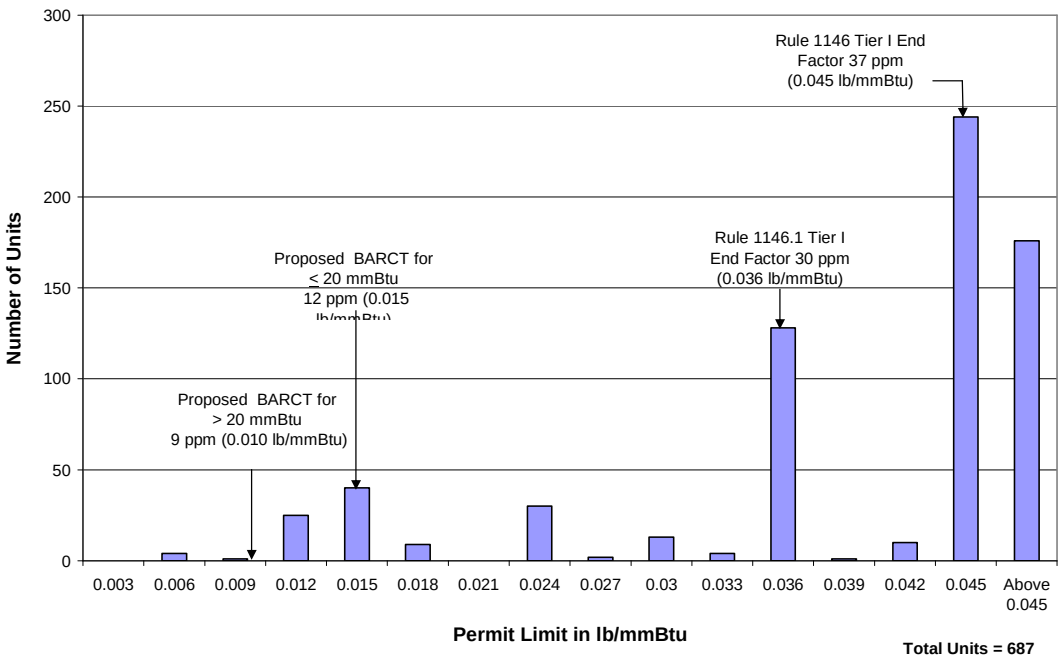
San Joaquin Valley Unified Air Pollution Control District's (SJVUAPCD) Rule 4306 – Boilers, Steam Generators, Heaters, and Process Heaters, is more stringent than the AQMD's rules for some classifications of boilers/heaters. Gaseous fueled units rated at less than or equal to 20 mmbtu/hr are limited to 12 ppm and those rated at greater than 20 mmbtu/hr are limited to 9 ppm. In addition to these two categories, the rule specifies other categories and limits. For gaseous-fueled oilfield and load following boilers/heaters, the limit is 15 ppm. For all liquid fueled units, regardless of size or usage, the limit is 40 ppm. SJVUAPCD Rule 4306 also allows a weighted average based on annual fuel usage for units that operate on both gaseous and liquid fuels. SJVUAPCD has not yet implemented their rule, so it is unknown how many units have achieved the new limits in that district.

Other considerations in the BARCT analysis were the existing technologies for NOx control. Selective catalytic reduction, while able to reach low NOx limits and achieved in practice, was determined not to be technologically feasible for this source category, particularly the smaller units. Unlike low-NOx burners, SCR installations require additional space for the controls and ammonia tanks. Due to space constraints and the toxicity issues of ammonia, SCR is typically not feasible for smaller units. Low NOx burners and ultra low NOx burners are capable of achieving NOx emission limits of 12 ppm for natural gas units rated at less than or equal to 20 mmbtu/hr and 9 ppm for units rated at greater than 20 mmbtu/hr. In view of SJVUAPCD's more stringent emission limits and improvements in burner technology, it is likely that Rules 1146 and 1146.1 would have been amended to include more stringent limits for non-refinery boilers/heaters in the absence of RECLAIM.

The RECLAIM inventory includes approximately 700 boilers and heaters in the Rule 1146/1146.1 category. The category encompasses units from many different industries used for various processes, including approximately 100 refinery units (non-Rule 1109). Most of the boilers/heaters are fired on natural gas only, however there are some units permitted for use with other fuels, including liquid fuels, process gas, and refinery gas. A histogram of the boiler inventory was prepared based on permitted emission limits (see Figure 6). Some of the units with the lowest permit limits may be units installed at BACT. New BARCT levels of 12 ppm for units less than or equal to 20 mmbtu/hr and 9 ppm for units greater than 20 mmbtu/hr were determined for the Rule 1146 and 1146.1 boilers/heaters based on the evaluation of other district's rules, analysis of retrofit technology, and consideration of the mix of equipment types and fuels in the RECLAIM inventory. The new BARCT level is the same as the level SJVUAPCD has set for natural gas units in their Rule 4306.

**Figure 6**

**Rule 1146 & 1146.1 Boilers/Heaters**




Notes: BACT for ≤ 20 mmbtu/hr is 12 ppm
BACT for > 20 mmbtu/hr is 9 ppm
Cost-effectiveness (10 year life) = $9,000 - $10,000 per ton

### Equipment Life

For this equipment, a life of 10 years is appropriate based on useful life of low-NOx burner technology and was used to derive the cost-effectiveness.

### Cost-Effectiveness

The cost-effectiveness, based on the range of costs associated with installation of BARCT on this equipment and an equipment life of 10 years, is expected to range from $9,000 to $10,000 per ton NOx reduced from the Tier I control levels. An incremental cost-effectiveness analysis was performed for this equipment category. The incremental cost-effectiveness was determined to be approximately $55,000 - $74,000/ton. This was based on Low-NOx burners and SCR control technologies.

## Metal Melting and Metal Heat Treating

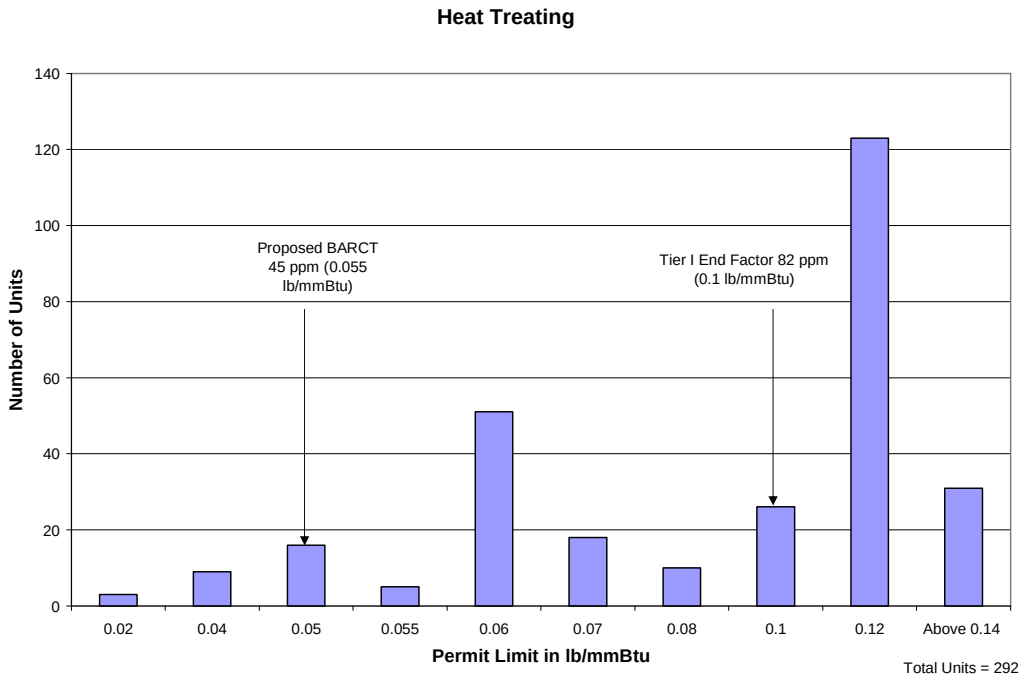
### Technology Evaluation

Current BARCT in RECLAIM for heat treating and metal melting furnaces was based on a subsumed 1991 AQMP control measure (90P-C-5). These types of equipment are subject to an end factor in Rule 2002 of approximately 50 ppm or 0.062 pounds of NOx per mmbtu of heat input.

A review of South Coast and other districts' rules showed no specific rules for these two types of equipment other than rules regarding toxic emissions. Based on discussions with and information provided by equipment vendors, burner and combustion technology has improved since RECLAIM was initiated (1993/1994). Low NOx burners and ultra low NOx burners have been used to achieve NOx limits at or below 45 ppm for this type of equipment in retrofit applications. Due to the wide variety of equipment designs, the attainable NOx emission level varies on a case-by-case basis.

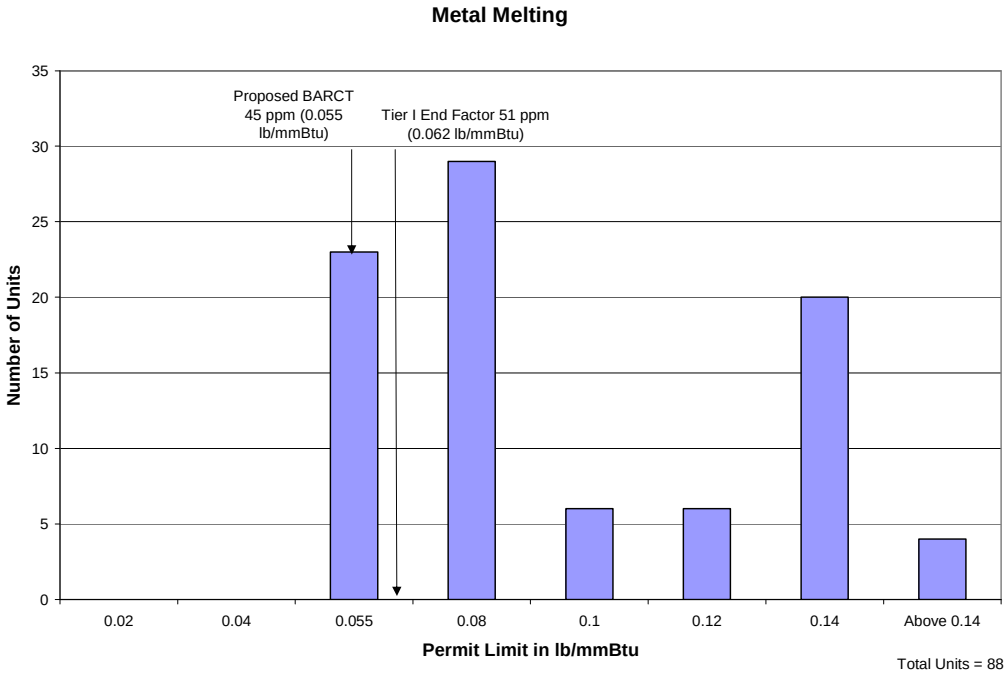
The RECLAIM inventory includes approximately 300 heat treating furnaces. Based on permit limits for NOx, more than 30 of the units are at or below 45 ppm. A histogram of the heat treating equipment is shown in Figure 7 based on the permitted NOx limits for the units. Some of the units with the lowest permit limits may be units installed at BACT. There are approximately 90 metal melting furnaces in the RECLAIM inventory with over one-fourth of the units currently at or below 45 ppm based on permit limits (see Figure 8). Many of the heat treating and metal melting furnaces are uncontrolled, however a review of units with burner retrofits showed that NOx levels at or below 45 ppm are achievable. Based on improvements in burner and combustion technology, discussions with burner manufacturers, and a review of existing retrofits, a new average BARCT level of 45 ppm or 0.055 pounds of NOx per mmbtu of heat input was determined to be feasible for this equipment. 1991 AQMP Control Measure 90P-C-5 specified 50% reduction based on low NOx burners. Burner technology has improved in recent years. It is likely that, in the absence of RECLAIM, a command and control rule would have been written for this category, considering the number of sources and emissions inventory. That is, the availability of sufficient data and information to either amend an existing rule or develop a new rule meeting all the requirements of a standard rule development process would be conducted in order to implement all feasible measures to demonstrate expeditious progress toward attainment.

## Figure 7




Note: BACT is natural gas with low NOx burner
Cost-effectiveness (10 year life) = $4,000 per ton

**Figure 8**




Note: BACT is natural gas with low NOx burner
Cost-effectiveness (10 year life) = $8,500 per ton

### Equipment Life

For this equipment, a life of 10 years based on useful life of low-NOx burner technology is appropriate and was used to derive the cost-effectiveness.

### Cost-Effectiveness

The cost-effectiveness, based on the range of costs associated with installation of BARCT on this equipment and an equipment life of 10 years, is expected to be approximately $8,500 per ton for metal melting furnaces and $4,000 per ton NOx reduced for heat treating furnaces. An incremental cost-effectiveness analysis was performed for metal melting and heat treating. The incremental cost-effectiveness was determined to be approximately $46,000 and $60,000 per ton, respectively. This was based on the difference between Low NOx burners and SCR control technologies.

## Miscellaneous Combustion Equipment

### Technology Evaluation

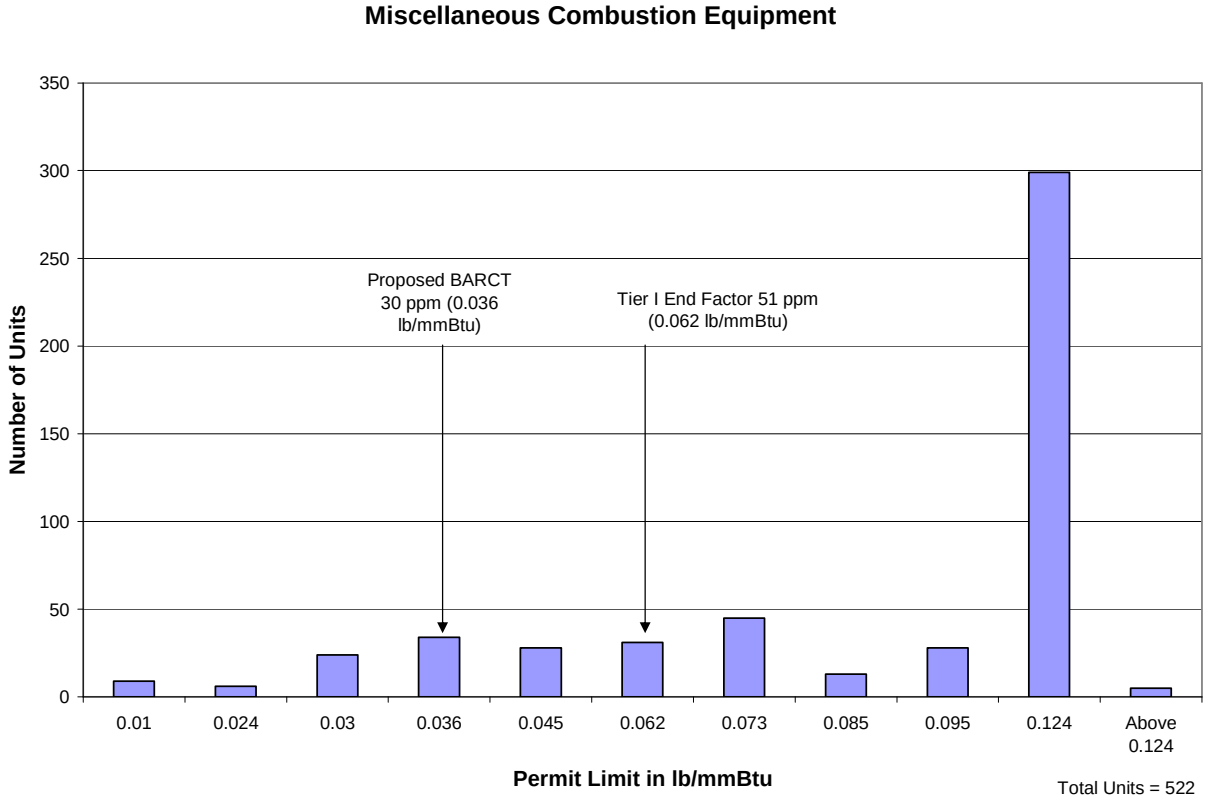
The miscellaneous equipment category includes ovens, kilns, calciners, dryers, and furnaces. It does not, however, include ceramic, clay, cement, or brick kilns or metal melting, heat treating, or glass melting furnaces. Current BARCT in RECLAIM for miscellaneous combustion equipment was based on a subsumed 1991 AQMP control measure (90A-C-5). These types of

equipment are subject to an end factor in Rule 2002 of approximately 50 ppm or 0.062 pounds of NOx per mmbtu of heat input.

A review of South Coast and other districts' rules showed no specific rules for this type of equipment. However, burner and combustion technology has improved and ultra low NOx burners have been used to achieve NOx limits at or below 30 ppm for all these types of equipment in retrofit applications. There is a wide variety of equipment designs so NOx emission levels are typically determined on a case-by-case basis.

The RECLAIM inventory includes approximately 500 miscellaneous combustion sources in this category. Figure 9 is a histogram showing the distribution of the miscellaneous combustion units based on permit limits. Some of the units with the lowest permit limits may be units installed at BACT. More than 70 units are currently permitted for NOx levels at or below 30 ppm. A review of units with burner retrofits showed that NOx levels at or below 30 ppm are achievable. Based on improvements in burner and combustion technology, discussions with burner manufacturers, and a review of existing retrofits, a new average BARCT level of 30 ppm or 0.036 pounds of NOx per mmbtu of heat input was determined to be feasible for this equipment. 1991 AQMP Control Measure 90A-C-5 specified 50% reduction based on low NOx burners. Burner technology has improved in recent years. It is likely that, in the absence of RECLAIM, a command and control rule would have been written for this category, considering the number of sources and emissions inventory. That is, the availability of sufficient data and information to either amend an existing rule or develop a new rule meeting all the requirements of a standard rule development process would be conducted in order to implement all feasible measures to demonstrate expeditious progress toward attainment.

**Figure 9**




Note: BACT is natural gas with low NOx burner
Cost-effectiveness (10 year life) = $11,000 per ton

### Equipment Life

For this equipment, a life of 10 years based on useful life of low-NOx burner technology is appropriate and was used to derive the cost-effectiveness.

### Cost-Effectiveness

The cost-effectiveness, based on the range of costs associated with installation of BARCT on this equipment and an equipment life of 10 years, is expected to be approximately $11,000 per ton NOx reduced from the Tier I level. An incremental cost-effectiveness analysis was not done for miscellaneous combustion equipment at this time. Currently Lo-NOx burner technology is the most practical, available option to meet the BARCT limit. While it is technically feasible to use SCR to control NOx emissions from this type of equipment, it would require additional equipment to raise the exhaust temperature since this equipment operates at too low of temperatures for the SCR to operate efficiently. Raising the temperature will likely add NOx emissions from the heaters needed to heat the exhaust stream to a temperature that would enable the use of an SCR.

**Equipment Categories with No Proposed BARCT**

Other categories of equipment in RECLAIM were evaluated to determine if new BARCT is feasible. Among the criteria considered when evaluating whether there was a need for new BARCT or not were:

- Does another air pollution control district or agency have a more stringent BARCT level than the SCAQMD?
- Is the proposed BARCT level achieved in practice with retrofits?
- Is technology available and feasible for retrofits?
- Do manufacturers offer guarantees for achieving proposed emission levels?
- Is retrofit technology cost-effective?
- Based on the above criteria, could a command and control BARCT rule have been proposed in the absence of the RECLAIM program?

Other categories of equipment evaluated for new BARCT included afterburners, curing and drying ovens, glass melting furnaces, cement kilns, gas turbines, non-emergency internal combustion engines, and refinery boilers and heaters rated between 40 and 110 mmbtu per hour. We have not identified new, more stringent, BARCT for this equipment to date. New BARCT was not established for these categories for various reasons. In some cases, current BARCT NOx emission levels are already the most stringent. In other cases, the available retrofit technology was not cost-effective. Appendix A contains a detailed listing of the BARCT findings for each of these categories. RECLAIM facilities have the option of choosing to retrofit some of these sources in lieu of the sources where new BARCT is proposed. Although retrofits were deemed not cost-effective for a category, retrofits on individual pieces of equipment may be cost-effective. This allows RECLAIM participants other possibilities for flexibility to decide the best way to meet their reduced NOx RTC allocations and/or to generate additional reductions for the rest of the market.

Of the aforementioned categories evaluated for BARCT, only gas turbines were found to have a control level more stringent than that previously subsumed under the RECLAIM program. However, upon review of the cost associated with the use of SCR, the controls were not found to be cost-effective based on the activity levels used for estimating the year 2000 allocations.

**Staff Recommendation**

The following categories of equipment have been identified as capable of further emission reductions beyond the Tier I emission factors (i.e., Rule 2002 Table 2 factors) based on retrofit technologies that are achieved in practice and cost-effective: industrial and refinery boilers and heaters; metal melting furnaces; metal heat treating; fluid catalytic cracking units (FCCU); and miscellaneous combustion sources (i.e., ovens, kilns, calciners, dryers, and furnaces). Utility boilers can also achieve further reductions beyond Tier I controls; however, since they have previously installed BARCT pursuant to Rule 2009, these reductions have already been achieved and need to be reflected in program allocations.

## C. METHOD, AMOUNT, AND TIMING OF RTC REDUCTIONS

### Issues

Key issues regarding implementation of the 2003 AQMP control measure and state BARCT requirements are the:

- Method for determining reductions of RTC holdings;
- Facilities seeking exemption from the programmatic RTC reductions; and
- Rate at which RTC holdings are reduced, and how reductions are applied.

### Background

At the time the RECLAIM program was created, the universe of facilities was based, in general and with some exclusions, on facility-wide emissions of 4 tons per year or greater. Each facility received a starting allocation (1994 compliance year), an ending or Tier I allocation (compliance year 2000), and a 2003 compliance year allocation meant to represent technology forcing BARCT (i.e., Tier II emission reductions called for in the 1991 AQMP) as well as the 1991 plan's growth and control scenario that was used as the basis for determining equivalency with command and control.

Allocations for 1994 were based on each facility's peak activity year from 1989 to 1992 multiplied by emission factors listed in Rule 2002, whereas the year 2000 ending allocations were based on peak year activity from 1987 to 1992 multiplied by Tier I ending emission factors, also listed in Rule 2002. The final ending allocation for 2000 and 2003 levels were based on an across-the-board reduction for all facilities equivalent to the 1991 AQMP growth and control scenario including Tier II emission reductions for the universe of sources, in aggregate.

## Method for Determining Reductions of RTC Holdings

### Methodologies

In assessing the RTC reductions necessary to meet the state law requirements, staff examined several methodologies that would best reflect the implementation of the current BARCT in a timely manner achieving equivalent emission reductions to command and control. Two primary methods used in the initial RECLAIM program design were evaluated. One approach, called "AQMP method", was used for establishing the 2003 ending allocations by calculating the growth and control scenario anticipated under the 1991 AQMP, including Tier II technology forcing reductions. The other method, termed "allocation method", was used for the 1994 and the 2000 allocations by using the peak year activity selected by the facility for its equipment under the RECLAIM program multiplied by the emissions factors established by staff to reflect various levels of BARCT controls for the respective milestone years. A third method was suggested by the RECLAIM Working Group. This method, termed the "market-driven method," uses RTC price levels as a surrogate to indicate if BARCT is achieved. Essentially, under this method a pre-determined amount of RTCs (e.g., 2 or 3 tons per day) would be reduced by the RECLAIM facilities. Prior to the next AQMP, the RECLAIM program would be subject to an RTC price evaluation. The RTC price would indicate if an additional ton per day should be reduced by the RECLAIM facilities over the subsequent 3 years. After careful evaluation of the three methods, staff is proposing to rely on the AQMP method to derive the amount of RTC reductions needed for the following reasons:

- The 2003 AQMP baseline inventory and growth projection provide the most recent benchmark for command and control equivalency determination.
- The 1997 baseline inventory reported by the facilities provides a more recent equipment profile in the RECLAIM universe and captures the NSR activities since 1994. This is similar to the original RECLAIM program that used 1991 AQMP which used 1987 as the base year.
- If a more recent base year were to be used, a new set of growth factors needs to be developed to maintain data integrity. Similarly, control factors need to be revised to reflect controls already installed. This approach would create a different emission currency from the one used in the 2003 AQMP.
- The growth projections developed for the 2003 AQMP provide a more balanced view of the regional economy as compared to the allocation method that used the peak year activities selected by individual facilities that tend to overestimate the growth assumptions, since it is unlikely that all facilities would operate at their high throughput year at any given time.
- CARB requires that the RECLAIM program be evaluated periodically as part of AQMP revisions. The AQMP method would allow consistency in its approach for future program evaluation and be more amenable to future revisions to emissions inventory and growth forecast.

<u>AQMP Method</u>

The AQMP method was based on the use of 1997 reported emissions for all RECLAIM facilities. The 1997 emissions inventory was created using RECLAIM facilities reported CO emissions as a surrogate to disaggregate total NOx emissions. Compared to other non-

RECLAIM pollutants, such as VOC and PM, CO emissions are used for apportioning the RECLAIM NOx and SOx emission since CO is a better surrogate for combustion (i.e., direct product of combustion) and is reported on all combustion forms. In addition, since the reporting of CO emissions is primarily based on default emission factors and the corresponding fuel usage reported on various combustion forms, this approach will ensure that the total RECLAIM emissions for each facility are distributed proportionally among various combustion equipment within each facility. Although reported NOx emissions are facility totals, RECLAIM facilities report their CO, PM, and VOC emissions from combustion processes based on type of equipment/combustion process (e.g., ICEs, boilers, heaters, etc.). The facility total $NO_X$ emissions are apportioned to the combustion categories using the reported CO emissions.[1] Total facility $NO_X$ emissions reported are thus allocated to corresponding combustion types. Each is then assigned a unique equipment description based on SIC, fuel type, and fuel usage provided in the emission reports.

The data on the combustion equipment can be associated with multiple devices.[2] The emission inventory process used for the 2003 AQMP disaggregates the emissions to the device level by using:

- facility device IDs and the corresponding Source Category Codes (SCCs) from AQMD's Facility Permit System for RECLAIM and Title V facilities and
- reported device-level emissions on AQMD's Facility Reporting System for RECLAIM facilities.

This information is then used to disaggregate the reported emissions to specific devices for any matched SCCs. The emissions were then grown based on SCAG growth factors from the 2003 AQMP and reduced by control factors based on the new BARCT determinations, as follows:

Projected Emissions = 1997 Baseline x SCAG Growth Factors x New BARCT Control Factors

The AQMP method results in a projection of future actual emissions based on baseline emissions, and growth and control levels. This methodology yielded projected emissions in the year 2010 of 24.1 tons per day.

Control Factors

In addition to growth factors, the AQMP method applies control factors to the 1997 NOx emissions levels. The application of these factors demonstrates the effect of traditional command-and-control rules in conjunction with new BARCT levels. These control factors are based on the rules or control measures for each equipment category subsumed by the RECLAIM program with adjustments for equipment at or below BARCT or exempt from the rule. The equipment at or below BARCT is determined by reviewing permit limits from RECLAIM

[1] First calculate total CO emissions from all combustion types. Then, apportion the $NO_X$ emissions using the ratio of the CO emissions in each row of the combustion form by the total CO emissions from all combustion types.

[2] Annual Emission Reporting allows the aggregation of emissions from like equipment (e.g. boilers) burning the same fuel.

facility permit data. In the case of power producers and refinery boilers/heaters, industry provided additional data.

Typically, the control factor for an equipment category begins with a start factor which is from the 1994 starting emission factors. The starting factor is then divided by the new BARCT levels summarized in Table 2 and discussed in Section II. Dividing the starting factor by the new BARCT results in a control factor for the category. The control factor is the percent of emissions that would remain after the implementation of the proposed new BARCT. For example, if a new BARCT was determined to reduce emissions by 75%, after control the remaining emissions would be 25%, and the control factor would be 0.25. That factor would then be multiplied by the projected 2010 emissions grown from the 1997 emissions for the equipment category to show the remaining emissions by 2010. For example, if the projected 2010 emissions were 800 tons per year and the control factor was 0.25, the remaining emissions would be 0.25 x 800 = 200 tons per year. That factor may then be weighted for exempt equipment and equipment already at or below BARCT in 1997 to give a more realistic estimate of remaining emissions. The control factors applied to each equipment category are described below.

***Equipment with no subsumed rules or control strategies with no new BARCT***
Equipment was categorized based on equipment types. There were no subsumed rules or control measures for some of the equipment types and no new BARCT under the analysis. For example, tail gas units at refineries had no associated rule or control measure. For this type of equipment category a control factor of 1.0 was applied (i.e., no reductions).

***Miscellaneous Combustion Equipment***
The starting emission factor for this category was represented by the AQMP Control Measure 90A-C-5, a strategy for control of NOx emissions from miscellaneous combustion equipment. The initial control factor for this category is derived by dividing the new BARCT level by the starting emission factor. This value is then weighted to account for equipment at or below BARCT as of 1997. The determination of the equipment at or below BARCT is based on permit limits from RECLAIM facility permit data.

| | | |
|---|---|---|
| Starting Factor | = | 0.124 lb/mmbtu |
| New BARCT | = | 0.036 lb/mmbtu |
| Initial Control Factor | = | New BARCT ÷ Starting Factor |
| | = | 0.036 ÷ 0.124 |
| | = | 0.29 |

Weighting control factor for equipment at or below BARCT:

| | | |
|---|---|---|
| % of equipment at or below BARCT | = | 2.9% |
| Control Factor | = | % of equipment at or below BARCT x 1.00 + % of equipment above BARCT x Initial Control Factor |
| | = | 2.9% x 1.00 + 97.1% x 0.29 |
| | = | 0.311 |

***Fluid Catalytic Cracking Units***

The starting emission factor for this category is the reported value at individual refineries. The control factor for fluid catalytic cracking units at refineries is based on an achieved-in-practice use of SCR at an 85 percent efficiency rate meaning 85 percent of the reported emissions are removed, leaving 15 percent or the emissions remaining by 2010. Therefore, the control factor is 15 percent or 0.15.

***Metal Melting and Heat Treating Equipment***

The starting emission factor for this category was represented by the AQMP Control Measure 90P-C-5, strategy for control of NOx emissions from metal melting and heat treating equipment. The control factor for this category is calculated by dividing the new BARCT level by the starting emission factor.

| | | |
|---|---|---|
| Starting Factor | = | 0.124 lb/mmbtu |
| New BARCT | = | 0.055 lb/mmbtu |
| | | |
| Control Factor | = | New BARCT ÷ Starting Factor |
| | = | 0.055 ÷ 0.124 |
| | = | 0.444 |

***Control Factor for Refinery Boilers/Heaters***

The starting emission factor for refinery boilers and heaters is from Rule 1109 – Emissions of Oxides of Nitrogen from Boilers and Process Heaters in Petroleum Refineries which applies to refinery boilers and heaters with input ratings greater than 40 mmbtu/hr. The starting emission factor for this category is based on reported uncontrolled emissions for refinery boilers (i.e., Rule 2002 starting emission factor). The uncontrolled emission factor used for Rule 1109 development and for RECLAIM starting allocations was 82.5 ppm or 0.100 lb/mmbtu for all refinery boilers/heaters with an input rating greater than 40 mmbtu/hr.

New BARCT for this category depends on the input rating of the boiler or heater. No new BARCT is proposed for units rated at 40 to 110 mmbtu/hr, so their current BARCT factor is 25 ppm or 0.030 lb/mmbtu based on the original NOx limit specified in Rule 1109. For units rated at greater than 110 mmbtu/hr, the new BARCT is more stringent based on achieved-in-practice SCR limits of 5 ppm or 0.006 lb/mmbtu.

The initial control factor for refinery boilers and heaters in the 40 to 110 mmbtu/hr range is calculated by dividing the current BARCT (25 ppm) by the start factor (82.5 ppm). The control factor for the larger units is a weighted average derived from actual emissions reported in 1999 by refineries at a device level for 1997 for most of the refineries and for 1999 for two refineries where 1997 data was unavailable. Using the 1997 and 1999 data gives the refineries credit for any emission reductions achieved by controls placed on the units at that time. The weighted control factor for the larger units is calculated by taking the percent of emissions at a given ppm concentration multiplied by the control factor which is 5 ppm divided by the reported start emission factor for that ppm level and then summing the results. The derivation of the weighted control factor for the boilers/heaters rated at greater than 110 mmbtu/hr is shown below. The resulting control factor for >110 mmbtu/hr refinery boilers/heaters is 0.049.

**Table 3**
**Summary of Refinery 1997 Emission for Boilers/Heaters > 110 mmbtu/hr**

| Percent Emissions at ppm Level | Start Factor (ppm) | End Factor (ppm) | Control factor (end ÷ start) | Emission weighted control factor (cf x %) |
|---|---|---|---|---|
| 0.4016% | 7 | 5 | 0.691 | 0.0028 |
| 0.1277% | 9 | 5 | 0.570 | 0.0007 |
| 0.2475% | 11 | 5 | 0.456 | 0.0011 |
| 0.2265% | 12 | 5 | 0.411 | 0.0009 |
| 0.2156% | 13 | 5 | 0.397 | 0.0009 |
| 0.1006% | 14 | 5 | 0.346 | 0.0003 |
| 0.5497% | 15 | 5 | 0.343 | 0.0019 |
| 0.6551% | 16 | 5 | 0.318 | 0.0021 |
| 0.4382% | 17 | 5 | 0.296 | 0.0013 |
| 0.6535% | 18 | 5 | 0.283 | 0.0019 |
| 0.4922% | 22 | 5 | 0.225 | 0.0011 |
| 0.2190% | 26 | 5 | 0.194 | 0.0004 |
| 0.2271% | 27 | 5 | 0.185 | 0.0004 |
| 0.5559% | 37 | 5 | 0.134 | 0.0007 |
| 0.5501% | 38 | 5 | 0.132 | 0.0007 |
| 1.8086% | 39 | 5 | 0.128 | 0.0023 |
| 0.4470% | 41 | 5 | 0.121 | 0.0005 |
| 0.4633% | 45 | 5 | 0.112 | 0.0005 |
| 0.9562% | 49 | 5 | 0.102 | 0.0010 |
| 0.7046% | 53 | 5 | 0.094 | 0.0007 |
| 0.3744% | 58 | 5 | 0.087 | 0.0003 |
| 0.5153% | 59 | 5 | 0.085 | 0.0004 |
| 0.6460% | 66 | 5 | 0.075 | 0.0005 |
| 0.4583% | 76 | 5 | 0.066 | 0.0003 |
| 0.4430% | 77 | 5 | 0.065 | 0.0003 |
| 1.0030% | 94 | 5 | 0.053 | 0.0005 |
| 0.3256% | 95 | 5 | 0.052 | 0.0002 |
| 0.6731% | 103 | 5 | 0.048 | 0.0003 |
| 5.3883% | 105 | 5 | 0.048 | 0.0026 |
| 1.2659% | 107 | 5 | 0.047 | 0.0006 |
| 1.6177% | 111 | 5 | 0.045 | 0.0007 |
| 1.4749% | 113 | 5 | 0.044 | 0.0007 |
| 1.5377% | 116 | 5 | 0.043 | 0.0007 |
| 1.7369% | 120 | 5 | 0.042 | 0.0007 |
| 0.8013% | 121 | 5 | 0.041 | 0.0003 |
| 1.7800% | 122 | 5 | 0.041 | 0.0007 |
| 2.9780% | 126 | 5 | 0.040 | 0.0012 |
| 1.9073% | 127 | 5 | 0.039 | 0.0007 |
| 5.1119% | 130 | 5 | 0.038 | 0.0020 |
| 1.9102% | 134 | 5 | 0.037 | 0.0007 |
| 2.0755% | 140 | 5 | 0.036 | 0.0007 |

| Percent Emissions at ppm Level | Start Factor (ppm) | End Factor (ppm) | Control factor (end ÷ start) | Emission weighted control factor (cf x %) |
|---|---|---|---|---|
| 0.0084% | 150 | 5 | 0.033 | 0.0000 |
| 3.0734% | 153 | 5 | 0.033 | 0.0010 |
| 1.7752% | 154 | 5 | 0.032 | 0.0006 |
| 3.1185% | 173 | 5 | 0.029 | 0.0009 |
| 2.4443% | 175 | 5 | 0.029 | 0.0007 |
| 2.3607% | 192 | 5 | 0.026 | 0.0006 |
| 2.2718% | 205 | 5 | 0.024 | 0.0006 |
| 1.4715% | 211 | 5 | 0.024 | 0.0003 |
| 1.4919% | 214 | 5 | 0.023 | 0.0003 |
| 2.2984% | 218 | 5 | 0.023 | 0.0005 |
| 1.9401% | 226 | 5 | 0.022 | 0.0004 |
| 2.3405% | 231 | 5 | 0.022 | 0.0005 |
| 1.7605% | 236 | 5 | 0.021 | 0.0004 |
| 2.0967% | 238 | 5 | 0.021 | 0.0004 |
| 1.9427% | 241 | 5 | 0.021 | 0.0004 |
| 3.9421% | 249 | 5 | 0.020 | 0.0008 |
| 2.9571% | 265 | 5 | 0.019 | 0.0006 |
| 3.5319% | 306 | 5 | 0.016 | 0.0006 |
| 3.0402% | 362 | 5 | 0.014 | 0.0004 |
| 10.1659% | 440 | 5 | 0.011 | 0.0012 |
| 1.0307% | 450 | 5 | 0.011 | 0.0001 |
| 0.8729% | 587 | 5 | 0.009 | 0.0001 |
| **100%** | | | **Control Factor** | **0.0490** |

The two control factors for 40 to 110 mmbtu/hr and greater than 110 mmbtu/hr boilers/heaters are then weighted based on the ratio of emissions generated by the equipment in each size range resulting in a composite control factor for the equipment category. Based on the ratio of the sum of the input ratings for each size range to the sum of all input ratings, approximately 80% of the emissions are from the larger units and 20% are from the smaller ones.

Start Factor = 0.100 lb/mmbtu
Current BARCT for 40 – 110 mmbtu/hr units = 0.030 lb/mmbtu

Initial Control Factor for 40 – 110 mmbtu/hr units = Current BARCT ÷ Start Factor
= 0.030 ÷ 0.100
= 0.300

Weighted Control Factor for > 110 mmbtu/hr units = 0.049

Weighting control factor for the two different equipment sizes:

% of emissions from 40–110 mmbtu units = 20%
% of emissions from >110 mmbtu units = 80%

| | | |
|---|---|---|
| Control Factor | = | % of emissions from 40–110 mmbtu/hr units x Initial Control Factor for 40–110 mmbtu/hr units + % of emissions from >110 mmbtu/hr units x Initial Control Factor for >110 mmbtu/hr units |
| | = | 20% x 0.30 + 80% x 0.049 |
| | = | 0.099 |

***Internal Combustion Engines***

There is no new BARCT proposed for this category so the control factors are based solely on applicable rules. The start factor for internal combustion engines subject to Rule 1110.2 – Emissions from Gaseous- and Liquid-fueled Engines is 0.235 based on the staff report and SIP submittal for the original rule. Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines applies to some engines which are exempt from Rule 1110.2. The control factor for engines subject to Rule 1470 is 0.92 based on the expected NOx reductions from the rule. The control factor for engines which are at or below BARCT and those which are exempt from Rule 1110.2 and not subject to Rule 1470 is 1.00 since no further reductions are required under command and control rules. The three control factors are then weighted to account for the percent of emissions from each category.

| | | |
|---|---|---|
| Control factor for engines subject to R1110.2 | = | 0.235 |
| Control factor for R1110.2 exempt diesel engines subject to R1470 | = | 0.920 |
| Control factor for engines not subject to either rule | = | 1.000 |

Weighting control factor for the % of engines in the three different groups:

| | | |
|---|---|---|
| % of engines subject to Rule 1110.2 | = | 74% |
| % of R1110.2 exempt diesel engines subject to R1470 | = | 18% |
| % of engines not subject to either rule | = | 8% |

| | | |
|---|---|---|
| Control Factor | = | % of engines subject to R1110.2 x control factor for engines subject to R1110.2 + % of R1110.2 exempt diesel engines subject to R1470 x control factor for R1110.2 exempt diesel engines subject to R1470 + % of engines not subject to either rule x control factor for engines not subject to either rule |
| | = | 74% x 0.235 + 18% x 0.92 + 8% x 1.00 |
| | = | 0.42 |

***Cement Kilns***

The control factors for cement kilns are facility-specific and ranged from 0.242 to 0.445 depending upon the equipment types. The factors were based on Rule 2002 starting and ending factors since no new BARCT was proposed for this equipment category, Rule 1112 – Emissions of Oxides of Nitrogen from Cement Kilns. The control factor of 0.445 was based on a settlement agreement regarding the ending factor with one facility.

***Gas Turbines***

No new BARCT is proposed for gas turbines. Therefore, the control factor is based on the Rule 2002 starting factor and ending (Tier I) factor. Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines applies to stationary gas turbines rated at 0.3 megawatt (MW) and larger and is the basis for the start factor for this category. The initial control factor is determined by dividing the Rule 2002 Tier I by the start factor. The initial control factor is then adjusted because 4 percent of the emissions were from peaking turbines which are exempt from Rule 1134. After adjusting the factor for exempt equipment, it is then weighted to account for equipment at or below the Tier I emission limits in Rule 2002. It was determined from the equipment inventory that approximately 37% of the emissions in 1997 came from units at or below the Tier I level based on permit limit data from RECLAIM facility permits.

| | | |
|---|---|---|
| Start Factor | = | 0.184 lb/mmbtu |
| Rule 2002 Tier I factor | = | 0. 060 lb/mmbtu |
| | | |
| Initial Control Factor | = | Tier 1 factor ÷ Starting Factor |
| | = | 0.060 ÷ 0.184 |
| | = | 0.326 |
| | | |
| Adjusting control factor for exempt equipment: | | |
| Control factor for exempt equipment | = | 1.000 |
| % of emissions from exempt equipment | = | 4% |
| | | |
| Adjusted Control Factor | = | % of exempt equipment x 1.000 + % of equipment subject to R1134 x initial control factor |
| | = | 4% x 1.000 + 96% x 0.326 |
| | = | 0.353 |

Weighting control factor for equipment at or below Rule 1134 emission level:

| | | |
|---|---|---|
| Control factor for equipment at or below Tier I | = | 1.00 |
| | | |
| % emissions from equipment at or below the Tier I level | = | 37% |
| % of emissions above Tier 1 level | = | 63% |
| | | |
| Control Factor | = | % of emissions from equipment at or below the Tier I level x control factor for equipment at or below the Tier I |

level + % of emissions from equipment above Tier I level x adjusted control factor
= 37% x 1.00 + 63% x 0.353
= 0.592

***Utility Boilers***

The control factor for utility boilers was based on actual 1997 emissions or fuel throughputs and the emission concentrations for the utility boilers subject to Rules 1135 and 2009. The power producing industry provided most of the data and other data was taken from the Rule 2009 compliance plan applications. The methodology used for determining the control factor was similar to that used for refinery boilers and heaters. First, it was determined what percent of total 1997 utility boiler emissions were at each emission concentration (ppm) or start factor. This percent was multiplied by each control factor (7 ppm ÷ start factor). The results were then summed to give a weighted control factor of 0.143. The calculation for the weighted control factor is shown below.

**Table 4**
**Summary of Power Plant 1997 Emission for Utility Boilers**

| Percent Emissions at ppm Level | Start Factor (ppm) | End Factor (ppm) | Control Factor (end ÷ start) | Emission Weighted Control Factor (cf x %) |
|---|---|---|---|---|
| 4.0% | ≤7 | 7 | 1.000 | 0.040 |
| 1.4% | 9 | 7 | 0.778 | 0.011 |
| 2.5% | 10 | 7 | 0.700 | 0.017 |
| 0.4% | 30 | 7 | 0.233 | 0.001 |
| 0.5% | 47 | 7 | 0.149 | 0.001 |
| 0.2% | 57 | 7 | 0.123 | 0.000 |
| 0.5% | 65 | 7 | 0.108 | 0.001 |
| 0.2% | 68.3 | 7 | 0.102 | 0.000 |
| 0.2% | 68.6 | 7 | 0.102 | 0.000 |
| 0.8% | 80 | 7 | 0.088 | 0.001 |
| 82.1% | 85 | 7 | 0.082 | 0.068 |
| 0.9% | 89 | 7 | 0.079 | 0.001 |
| 0.5% | 90 | 7 | 0.078 | 0.000 |
| 0.6% | 97 | 7 | 0.072 | 0.000 |
| 1.8% | 100 | 7 | 0.070 | 0.001 |
| 3.5% | 189 | 7 | 0.037 | 0.001 |
| 100% | | | | |
| | | | **Control Factor** | **0.143** |

***Other Boilers/Heaters***

Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters and Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and

Process Heaters apply to all boilers greater than 2 mmbtu/hr with the exception of those used to generate electricity, Rule 1109 units, and sulfur plant reaction boilers.

The starting factors for this category are based on Rules 1146 for boilers/heaters rated at greater than 5 mmbtu/hr and 1146.1 for those rated at 2 to 5 mmbtu/hr. The control factors are calculated by dividing the start factor by the new BARCT level. However, there are two new BARCT levels for this category, 12 ppm or 0.015 lb/mmbtu for units rated less than or equal to 20 mmbtu/hr and 9 ppm or 0.010 lb/mmbtu for units greater than 20 mmbtu/hr. Because the BARCT size ranges do not match the rule size ranges, a composite BARCT number is used based on a weighted average of the two new BARCT factors. The composite new BARCT level is 10.5 ppm or 0.012 lb/mmbtu.

The two resulting control factors are then weighted based on approximately 85% of the emissions from Rule 1146 units and 15% from Rule 1146.1 units. The weighted control factor was then adjusted slightly based on 5 percent of the emissions in 1997 being at or below BARCT. The amount of emissions at or below BARCT was determined based on RECLAIM facility permit data.

| | | |
|---|---|---|
| Starting Factor for 1146 (>5 mmbtu/hr) | = | 0.045 lb/mmbtu |
| Starting Factor for 1146.1 (2-5 mmbtu/hr) | = | 0.124 lb/mmbtu |
| New BARCT factor for units >20 mmbtu/hr | = | 0.010 lb/mmbtu |
| New BARCT factor for units 2-20 mmbtu/hr | = | 0.015 lb/mmbtu |
| Composite BARCT factor for Rule 1146/1146.1 | = | 0.012 lb/mmbtu |
| Control factor for 1146 (>5 mmbtu/hr) | = | Composite BARCT factor ÷ Starting Factor for 1146 (>5 mmbtu/hr) |
| | = | 0.012 ÷ 0.045 |
| | = | 0.2667 |
| Control factor for 1146.1 (2-5 mmbtu/hr) | = | Composite BARCT factor ÷ Starting Factor for 1146.1 (2-5 mmbtu/hr) |
| | = | 0.012 ÷ 0.124 |
| | = | 0.0967 |

Weighting the control factors for the percent of emissions subject to each Rule:

| | | |
|---|---|---|
| % emissions from 1146 boilers | = | 85% |
| % emissions from 1146.1 boilers | = | 15% |
| Weighted Control Factor | = | % emissions from 1146 boilers x Control factor for 1146 (>5 mmbtu/hr) + % emissions from 1146.1 boilers x Control factor for 1146.1 (2-5 mmbtu/hr) |
| | = | 85% x 0.2667 + 15% x 0.0967 |
| | = | 0.2412 |

Adjusting for equipment at or below BARCT:

| | | |
|---|---|---|
| Control factor for equipment at or below BARCT | | |
| % emissions from equipment at or below BARCT | = | 5% |
| % of emissions above BARCT | = | 95% |
| Control Factor | = | % emissions from equipment at or below BARCT x control factor for equipment at or below BARCT + % of emissions above BARCT x weighted control factor |
| | = | 5% x 1.00 + 95% x 0.2412 |
| | = | 0.2791 |

10 Percent Adjustment

The AQMP projections are based on actual emissions in 1997 and assumptions for growth. Staff believes that a certain level of compliance margin needs to be explicitly considered in a market based program, because not all excess/unused RTCs are for sale in the market to meet the buyers' needs. The reasoning is two-fold based on observations of the market activities in the last decade of program implementation. First, there are some companies that made corporate decisions not to sell unused RTCs; therefore, excess/unused credits were retired to benefit the environment, and were not available in the market. Staff performed an analysis to identify companies that have never sold any RTCs for the past 10 years and the amount of RTCs retired in each compliance year. The analysis indicated that there are about 67 RECLAIM facilities (many of them joined the program after 1994) that have never sold their RTCs and have retired, on average, 1% of total RTCs in the market annually.

Second, facilities typically retain extra RTCs in a given compliance year, should the audit results show more emissions than reported. This would prevent facilities from being subjected to non-compliance findings, penalties, and potential reductions for future year RTC deductions. In order to estimate the amount of compliance margin, staff selected compliance year (CY) 2002 to be representative of a typical compliance year. CY 2002 was chosen because the program has passed its initial stage for a long enough period of time that one would not expect a significant amount of unused RTCs due to recessionary impacts in the early 1990's or uncertainty in missing data provisions. Meanwhile, there were ongoing applications for control equipment, resulting in RTCs available for compliance. In addition, compliance year 2002 is the first year after the energy crisis, representing market behavior that demonstrates how facilities would maximize RTC use. For example, due to the shortage of RTCs during compliance years 2000 and 2001, where, of necessity, some 2002 cycle 1 RTCs were used for year 2001 cycle 2 compliance. On the other hand, since the market did not experience unusually high demand in 2002, portions of CY 2002 cycle 2 RTCs were transferred for use in CY 2003 by cycle 1 facilities. This cross-cycle trading illustrates how facilities can maximize use of their RTCs unless there is a need to retain such RTCs for their own compliance purposes or where no suitable buyers can be found in the market. Although it is impossible to quantify the latter, based

on reasons stated earlier regarding the selection of CY 2002 for this analysis, it is believed that the contribution by the latter to the overall unused/excess RTCs in 2002 would be small. Therefore, the remaining RTCs unused in CY 2002 would closely resemble what the facilities would hold back as compliance margin. Staff analysis indicates that there were about 9 % of total 2002 RTCs unused by the end of compliance year 2002 potentially held back by facilities as compliance margin or because suitable buyers could not be identified in the market. This finding is based on the analysis of cross-cycle trading recorded by the AQMD that extended the credit use to the next compliance year or advanced to the previous compliance year. Cross-cycle trading allows RTC holders to maximize the credit use potential and not let them expire unless they have to.

Furthermore, the AQMP method relies on an overall control efficiency for a source category, which may generate some technical uncertainty in emission quantification. Finally, setting the emission target based on the AQMP methodology is, in essence, setting allowable emissions based on projected actual emissions. It also justifies some adjustment to the market to reflect compliance margins facilities typically strive to achieve.

Based on the discussions above, staff recommends adding 10% to the RTC demand calculation in deriving the 2010 emission reduction target for the RECLAIM program to account for compliance margin as well as imperfect market interactions between buyers and sellers.

Results

The AQMP methodology results in a 7.7 ton per day reduction, derived as follows:

RTC Reductions = Current RTC Holdings - [AQMP Remaining Emissions x 10% Adjustment Factor]
= 34.2 tpd - [24.1 x 1.10]
= 7.7 tpd

The following table (Table 5A) summarizes for each major equipment category, the 1997 baseline emissions, the baseline in 2010 assuming growth as in the 2003 AQMP, the control factor for each subsumed rule or control measure, and the calculated remaining emissions in 2010. To calculate total reductions for the programmatic BARCT adjustment, the total remaining emissions (24.1 tpd) is adjusted upward by 10 percent, and subtracted from the total RTC holdings (34.2 tpd). Subsequently, Table 5B summarizes the RTC holding reductions for the entire RECLAIM Program.

**Table 5A**
**RECLAIM BARCT NOx Emissions and Control Factors**

| Control Measure | 1997 Baseline (tpd) | 2010 Baseline (tpd) | Tier I Control Factor | Tier I Reductions (tpd) | Tier I Remaining (tpd) | New BARCT Control Factor | New BARCT Reductions (tpd) | New BARCT Remaining (tpd) | Incremental Reduction Beyond Tier I | % Contribution to Incremental Reduction |
|---|---|---|---|---|---|---|---|---|---|---|
| **Non-Power Plants** | | | | | | | | | | |
| Miscellaneous Combustion 90A-C-5 | 5.9 | 8.2 | 0.515 | 3.99 | 4.21 | 0.311 | 5.67 | 2.53 | 1.68 | 20% |
| FCCU 90P-B-2 | 6.3 | 6.6 | 0.300 | 4.59 | 2.01 | 0.150 | 5.57 | 1.03 | 0.98 | 11% |
| Metal Melting & Heat Treating 90P-C-5 | 0.9 | 1.7 | 0.500 | 0.87 | 0.83 | 0.444 | 0.96 | 0.74 | 0.09 | 1% |
| Refinery Boilers/Heaters Rule 1109 | 10.9 | 11.4 | 0.300 | 7.95 | 3.45 | 0.099 | 10.23 | 1.17 | 2.28 | 27% |
| Cement Kiln Rule 1112 | 5.2 | 6.4 | 0.242-0.800 | 3.65 | 2.75 | 0.242-0.800 | 3.65 | 2.75 | 0 | 0% |
| Gas Turbines Rule 1134 | 6.9 | 8.2 | 0.592 | 3.36 | 4.84 | 0.592 | 3.36 | 4.84 | 0 | 0% |
| Boilers/Heaters Rules 1146/1146.1 | 4.2 | 5.0 | 0.737 | 1.32 | 3.68 | 0.279 | 3.62 | 1.38 | 2.30 | 27% |
| Internal Combustion Engines Rule 1110.2 | 10.7 | 12.1 | 0.420 | 7.04 | 5.06 | 0.420 | 7.04 | 5.06 | 0 | 0% |
| Others | 1.4 | 2.2 | --- | 0.0 | 2.14 | --- | 0 | 2.14 | 0 | 0% |
| **TOTAL** | **52.4** | **61.8** | | **32.77** | **28.97** | | **40.10** | **21.64** | **7.33** | **86%** |
| **Rule 2009 Power Plants** | | | | | | | | | | |
| Utility Boilers Rule 1135 | 8.6 | 11.4 | 0.250 | 8.56 | 2.86 | 0.143 | 9.79 | 1.63 | 1.23 | 14% |
| Internal Combustion Engines Rule 1110.2 | 0.5 | 0.6 | 0.420 | 0.35 | 0.26 | 0.420 | 0.35 | 0.26 | 0 | 0% |
| Gas Turbines Rule 1134 | 0.6 | 0.8 | 0.592 | 0.34 | 0.49 | 0.592 | 0.34 | 0.49 | 0 | 0% |
| **TOTAL** | **9.7** | **12.8** | | **9.25** | **3.61** | | **10.48** | **2.38** | **1.23** | **14%** |
| **GRAND TOTAL** | | | | | | | | | | |
| | **62.1** | **74.6** | | **42.02** | **32.58** | | **50.58** | **24.02** | **8.56** | **100%** |

Note: The AQMP method reflects control factors for more equipment than just those with new BARCT in order to account for rules or control measures for each equipment category subsumed by RECLAIM.

**Table 5B**
**RTC Holding Reduction Summary**

| | Current Compliance Year 2004 and Later (tpd) | Compliance Year 2007 (tpd) | Compliance Year 2008 (tpd) | Compliance Year 2009 (tpd) | Compliance Year 2010 (tpd) | Total RTC Reductions |
|---|---|---|---|---|---|---|
| RTC Holdings | 34.2 | 30.2 | 29.0 | 27.7 | 26.5 | 7.7 |
| Reductions | | 4.0 | 1.2 | 1.2 | 1.2 | |
| Cumulative Reductions | | 4.0 | 5.2 | 6.5 | 7.7 | |

Note: figures are rounded to the nearest tenth of a ton.

**Table 6**
**SIC Code Growth Factors by County for the Year 2010**

| SIC Sector | SIC Code | Los Angeles | Orange | Riverside | San Bernardino |
|---|---|---|---|---|---|
| Agriculture | 1-9 | 0.868 | 0.986 | 1.019 | 0.703 |
| Mining | 10-12,14 | 0.910 | 0.680 | 1.200 | 0.260 |
| Oil & Gas Extr. | 13 | 1.000 | 1.000 | 1.000 | 1.000 |
| Construction | 15-17 | 1.354 | 1.436 | 2.575 | 1.602 |
| Food/Tobacco | 20 | 1.090 | 1.290 | 1.470 | 1.500 |
| Textile Mill | 22 | 1.430 | 1.380 | 1.670 | 1.660 |
| Apparel/Other Text. | 23 | 1.390 | 1.650 | 1.510 | 1.450 |
| Lumber/Wood | 24 | 0.890 | 1.210 | 1.360 | 1.500 |
| Furniture/Fixtures | 25 | 0.950 | 1.150 | 1.520 | 1.780 |
| Paper | 26 | 1.270 | 1.640 | 1.940 | 1.510 |
| Printing | 27 | 1.030 | 1.630 | 1.710 | 2.750 |
| Chemicals | 28 | 1.280 | 1.480 | 1.630 | 1.880 |
| Petroleum Products | 29 | 1.000 | 1.000 | 1.000 | 1.000 |
| Rubber & Plastic | 30 | 1.390 | 2.130 | 1.900 | 2.310 |
| Leather | 31 | 0.630 | 0.640 | 0.860 | 0.660 |
| Stone,Clay & Glass | 32 | 1.200 | 1.110 | 1.490 | 1.210 |
| Primary Metals | 33 | 1.730 | 1.390 | 1.760 | 1.830 |
| Fabricated Metals | 34 | 1.030 | 1.420 | 1.960 | 1.900 |
| Machinery | 35 | 2.910 | 3.840 | 5.230 | 7.110 |
| Electronic Equip. | 36 | 2.430 | 2.510 | 4.660 | 4.120 |
| Trans. Equip. | 37 | 1.090 | 1.270 | 1.850 | 1.470 |
| Instruments | 38 | 1.440 | 2.050 | 3.620 | 2.600 |
| Misc. Mfg. | 39 | 0.902 | 1.130 | 1.434 | 1.477 |
| Railroads | 40 | 1.530 | 1.970 | 1.320 | 1.550 |
| Local Transits | 41 | 1.049 | 1.441 | 1.167 | 1.182 |
| Trucking | 42 | 1.436 | 1.536 | 1.970 | 1.815 |
| Water Transport | 44 | 1.083 | 1.111 | 0.000 | 0.000 |
| Air Transport | 45 | 1.100 | 1.797 | 2.000 | 1.243 |
| Pipelines Trans. | 46 | 1.140 | 1.360 | 0.000 | 1.350 |
| Travel Services | 47 | 1.754 | 1.925 | 0.857 | 1.000 |
| Communications | 48 | 1.070 | 1.830 | 1.850 | 2.400 |
| Utilities | 49 | 1.293 | 1.579 | 4.200 | 2.083 |
| Wholesales | 50-51 | 1.034 | 1.413 | 1.669 | 1.648 |
| Retails | 52-59 | 1.023 | 1.404 | 1.863 | 1.531 |
| Finance | 60-62,67 | 0.923 | 1.569 | 1.780 | 1.557 |
| Insurance | 63-64 | 1.030 | 1.656 | 1.636 | 1.417 |
| Real Estate | 65,67 | 1.263 | 1.529 | 1.543 | 1.441 |
| Hotels | 70 | 1.163 | 1.350 | 1.182 | 1.387 |
| Personal Services | 72 | 1.282 | 1.667 | 1.920 | 1.590 |
| Business Services | 73 | 1.549 | 1.477 | 2.559 | 2.093 |
| Auto Repairs | 75-76 | 1.025 | 1.758 | 2.289 | 1.843 |
| Motion Pictures | 78 | 1.164 | 1.500 | 1.636 | 1.133 |
| Amusements | 79 | 1.112 | 1.554 | 1.631 | 1.286 |
| Health Services | 80 | 1.091 | 1.151 | 2.183 | 1.791 |
| Legal Services | 81 | 1.245 | 1.807 | 1.923 | 1.476 |
| Educational Services | 82 | 1.146 | 1.321 | 2.300 | 1.600 |
| Non-Profit Org. | 83,84,86 | 1.304 | 1.829 | 2.188 | 1.745 |
| Professional Services | 87,89 | 1.250 | 1.443 | 1.923 | 1.722 |
| Government | 91-97 | 1.138 | 1.205 | 1.563 | 1.390 |

**Note: SCAG projections relative to 1997 base year.**

Source: Table 2-6 of Appendix III of the 2003 AQMP
For SIC = 4911, CEC forecast was used in the 2003 AQMP to be about 2.5% per year.

Allocation Method

Although not recommended by staff, calculations were performed to estimate the emissions and what emission reductions would have been if the allocation method is used. Under this approach, the equipment profile and the peak year activity (1987 - 1992) was used to establish the 2000 allocations. For the same source categories, instead of the year 2000 ending emission factors, the proposed new BARCT emission factors were used unless no new BARCT was proposed. The year 2000 ending emission factors are the lower of the Rule 2002, Table 1 emission factors or reported emission factors at the start of the RECLAIM program (i.e., 1993). The total resulting emissions based on the method are 28.3 tons per day, about 18 percent higher than the AQMP method without the 10% adjustment, or about 7 percent higher than the AQMP method with the 10% adjustment. This outcome is expected, because using the individual peak year activity as a growth surrogate is likely to over-predict emissions growth, resulting in less emission reductions.

Industry Proposal

Some industry representatives have suggested using a market-driven method using RTC price levels as a surrogate to determine when BARCT has been met. The method suggests small, incremental reductions in allocations allowing adequate time for the market to react. The industry proposal is to remove 2 tons per day of NOx RTCs from the program in each of compliance years 2007 and 2008 on an across-the-board basis. This proposal is intended to address the concern about market impacts if too large a reduction is taken too quickly.

Commencing mid-2009 (i.e., after both RECLAIM cycles have implemented the second-phase reduction), the AQMD shall determine whether the current program end of cycle RTC credit prices over the preceding 18 months remained significantly below $15,000 per ton (or such other cost benchmark as the Board may establish). Upon such determination, subject to the considerations of the full range of factors relevant to the overall performance of the RECLAIM program, including, but not limited to, RTC price trends, trading volume, anticipated growth or decline in levels of economic activity among sources subject to RECLAIM and technology development and implementation, staff may propose further reductions. No further reductions would be proposed if the RTC price had reached or was projected soon to reach the established benchmark. This evaluation would occur no later than the AQMP cycle following the implementation of the second-phase reduction (i.e., 2010) and could occur as early as mid-2009. Thereafter, the AQMD would evaluate the RECLAIM program for additional adjustment in either direction every AQMP cycle.

In addition, the industry proposal would have the AQMD continue to develop rules and protocols authorizing the generation of RTCs from the reduction in emissions from mobile and area sources, by extending the sunset dates in existing rules and adopting appropriate additional rules.

It would be difficult to demonstrate BARCT and equivalency with command and control using a market-driven method and BARCT equivalency because this method does not factor in a date by which controls may be achieved. With each AQMP, an evaluation would occur. By allowing the market to settle each time an adjustment is made, the program would always be attempting to catch up to BARCT. Appendix C contains a summary, based on key proposal elements, of industry's proposal as it compares to that of the environmental community's and staff's.

Environmental Community Proposal

The environmental community has proposed that RTCs be reduced according to the AQMP method without the 10% adjustment (10.2 tons per day), implemented across-the-board, with reductions occurring over a five year period starting in 2006 and ending 2010. Reductions from 2006 to 2009, inclusive would be equivalent to 2 tons per day and the remaining 2.2 tons per day in 2010. In addition, there would not be a last year RTC price backstop, therefore, all reductions would be credited to the SIP, and there would be no exemptions. The environmental community prefers that the power plants remain separate from the remainder of the RECLAIM universe due to the amount of excess RTCs that would be brought back into the market. However, if they are to be included, then they would recommend that the power plant trading restrictions remain in place until reductions occur and that the facilities RTC holdings be reduced with all other facilities' RTC holdings.

BARCT changes with time as new technology develops. Since AQMD is legally required to achieve equivalent reductions to command & control through the RECLAIM program, it should continue to evaluate BARCT as part of future AQMPs. Appendix C contains a summary, based on key proposal elements, of the environmental community's proposal as it compares to that of industry's and staff's.

**Industry Comments**

- Determination of RTC holding reductions should consider growth and job impacts.
- Representatives of the power producing industry have raised concerns that use of 1997 actual emissions as the basis for RTC holding reductions will result in an under-prediction of power plant emissions, as 1997 was the last year of operating under a regulated electricity generation market. This concern on the impact of future holdings was also shared by other industrial sectors.
- In order to retain program integrity and reduce the possibility for unintended impacts, the RTC holding reduction methodology should be based on the peak-year/new-BARCT methodology. Use of the AQMP, which depends on control and growth factors, can be inaccurate and emissions based on an average year would be inappropriate. It also uses "base year" and forecasted growth rates that appear to underestimate regional production and industrial competitiveness needs. The peak-year method provides high production year compliance flexibility. However, if the AQMP method is used, consideration should be given to all facilities to carryover surpluses to the next year.
- A general concern has been raised that reductions beyond three tons per day could be damaging to the market and could result in a shortage of RTCs.
- A facility that is at BARCT pursuant to its Rule 2009.1 compliance plan should not be subject to further reductions. Any future reductions should be based on a determination of new BARCT at the facility.
- Municipal power producing utilities should be exempt from the proposed RTC holding reductions, provided the facility:
    - operates all NOx emitting equipment (excluding Rule 219 exempt equipment) at BACT or BARCT; and

  - has not sold RTCs in the private market.
- AQMD should monitor the RTC price for two years and introduce the next round of reductions gradually over a period of 3 years to ensure market stability. The technology-based BARCT determination is not necessary and inappropriate for a market program. A $10,000 per ton or $15,000 per ton RTC price can be used as a surrogate to indicate if BARCT is achieved.
- Can a more recent year than 1997 be used as a base year for the AQMP method?

**Environmental Organization Comments**

- The reductions should begin earlier.
- Reductions should occur over a shorter period of time.
- The 10% adjustment gives too much of a cushion and may keep RTC prices too low to spur the implementation of controls.
- The environmental community has stated that RTC holding reductions are supported and that AQMD should seek the greatest reductions possible, that is, 10.2 tons per day.

AQMD staff responses to the industry and environmental community comments are presented in Appendix E.

**Staff Recommendations**

Staff recommends the AQMP approach with the 10% adjustment for determining the total reductions for the RECLAIM program. While both methods have precedence for use in setting allocations, the allocation approach has some disadvantages. Using a peak year from 1987 – 1992 as a surrogate for growth relies on data that is 12- 17 years old, whereas the AQMP approach uses 1997 actual emissions and more recently developed growth projections. 1997 actual emissions were used for the baseline for the 2003 AQMP. Choosing a different year would require development of new growth factors from SCAG and revised control factors to reflect controls implemented by the base year chosen. Emissions in later years would most likely be lower than emissions in 1997 to reflect more controls added by RECLAIM facilities and turnover of equipment which would be at BACT levels. Using the 1997 base year for the 2003 AQMP is consistent with the original 1994 program design, which used 1987 as the baseline for the 1991 AQMP.

The allocation method approach uses old peak year activity applied to the facility's year 1993 equipment list, which may not be representative over time. Using peak year activity results in an overestimation of the remaining emissions since it is unlikely all facilities will be operating at their peak level at the same time. As such, the allocation method cannot be a stand alone methodology and it needs another reference point to demonstrate equivalency to the command-and-control program. In the initial design of the RECLAIM program, both 2000 and 2003 ending allocations were reduced to match the 1991 AQMP controls. Calculations for each type of equipment at each facility 10 years after the program implementation would be extremely difficult, if not impossible. For example, there would be new or replaced equipment that do not have a historical peak year activity prior to 1994. After 1994, major sources report their

emissions through CEMs that usage data for individual equipment is not readily available. Furthermore, this approach does not address RTC holdings versus calculated emissions and are less repeatable than the AQMP method. Staff does not recommend use of this method for calculating remaining emissions.

As previously mentioned, the market-driven method would rely upon an incremental removal of RTCs from the program in three year intervals. Under this method it is assumed that a RECLAIM program evaluation of RTC prices in conjunction with future AQMPs would provide adequate information for any additional reduction in RTCs. This method would have merit if BARCT was the only variable that impacted the price of RTCs. In fact there are multiple factors that influence RTC price. For example, during the energy crisis in 2000-2001, the RTC prices went up to $40 to $60 per pound, which was more a result of delay in installing controls and increased power plant demand, rather than the true reflection of control costs. On this basis, the market-driven approach is not recommended due to the difficulty of demonstrating equivalency to command and control and BARCT.

**Facilities at BARCT or BACT**

Throughout the public process to amend RECLAIM, including numerous Working Group and stakeholder meetings, concerns were raised regarding whether further reductions of facility's RTCs would be equitable for facilities already at BARCT or BACT. Several options have been discussed regarding whether it is appropriate to exempt certain facilities from further reductions under RECLAIM. The exemption(s) could either be in the form of: 1) exemption from RTC reductions only or 2) exclusion from the program altogether. The general framework for these scenarios are listed below:

1) Exemption from RTC Reductions

Exempt facilities:

- that are in the RECLAIM program since 1994 and have 1994 allocations equivalent to 2000 allocations;
- where all equipment, except those exempt under Rule 219, is at or below the proposed new BARCT; or
- that have never sold their RTCs post 2004;

For facilities that are exempt:

- holdings would become non-tradable; but
- holdings above initial allocations would not be exempt from further reductions and are tradable.

2) Exclusion from the RECLAIM Program

Exclusive facilities:

- where all equipment, except at exempt under Rule 219, is at or below BARCT;
- that are willing to accept an annual emissions cap that is based on the amount of RTCs retired from the program and is subject to equipment concentration limits at current BARCT or BACT limits, and command-and-control requirements, for all future permitting actions; and

For excluded facilities:

- holdings above initial allocations are not exempt from further reductions.

**Discussion**

In a market program, there are many compliance options, including installation of control equipment or delay of controls by purchasing credits. Since 1994, facilities have made various business decisions at different times with the goal of complying with program requirements at lower costs. In many cases the cost of compliance is less than traditional command-and-control regulations, due to the flexibility inherent in the program, as facilities are not required to control a particular piece of equipment on a specific schedule to a particular emissions level. As long as the program meets its mass emissions cap, it is meeting the programmatic BARCT requirement, regardless of whether a facility has actually installed BARCT or not. These facts would suggest that an across-the-board approach to further reduce the emissions, while allowing facilities to continue to select of the most advantageous compliance option(s), is the appropriate approach. However, staff recognizes that some facilities have implemented all feasible controls on-site. Without reducing its production rate or otherwise shutting down, especially for those who have already been reduced between 2001 and 2003, the only compliance option for such a facility is to purchase RTCs. Staff also recognizes that that the results of the current BARCT evaluation do not affect all equipment categories under the program.

There are a number of competing considerations. Many facilities have already benefited from the flexibility of the RECLAIM program, including by using facility averaging to meet the mass emissions cap requirement, financing of control costs through RTC sales, and making RTC purchases to delay costs. The challenge is to make the policy determine at what point additional compliance cost under RECLAIM is no longer beneficial as compared to command-and-control. The concept of RECLAIM is built upon the objective of having compliance costs at or below command-and-control costs, while continuing to provide flexibility to facilities. Furthermore, a market has to have an adequate number of participants to be a market. Therefore, if an exemption is broadly crafted, a facility can be in and out of the market at will. As such, RECLAIM cannot effectively function as a market. At the same time, a goal of RECLAIM is to treat facilities equitably within the goals of the program.

**Industry Comments**

- For facilities that have already controlled to BARCT levels or better, it is more equitable to have no reductions or allow them out of the program.
- Some companies may need protection if they cannot afford to purchase credits and have already spent money to control facility NOx emissions.
- If reductions are required from these facilities, there should be an AQIP program.
- Some of these companies have benefited from previous sales of credits; no special consideration shall be given.
- In a market system there would be less demand (less sellers) if such facilities were allowed out of the program or exempted from the across-the-board reductions.
- Fewer buyers in the market would mean less need for other reductions or innovation.
- The “out-of-program” concept changes the fundamental design of the RECLAIM program.

**Environmental Organization Comments**

- There should be no exemptions from the program; each facility should be subject to reductions.

AQMD staff responses to the industry and environmental community comments are presented in Appendix D.

**Staff Recommendation**

Taking into account all of the issues raised regarding equity between facilities and market needs, staff is recommending a limited exemption from further RTC reductions, if a facility is qualified and applies for such an exemption. Staff is proposing a set of criteria to exempt certain facilities' original RTCs issued by AQMD from further RTC reductions resulting from this round of BARCT evaluation. A summary of these criteria are as follows:

1) The potential exemption would be limited to facilities in existence since 1994, whether joining RECLAIM at the start of the program or later due to their actual emissions exceeding 4 tpy. Newly constructed facilities after 1993 are excluded because they already benefit from the many design features in RECLAIM on NSR. For example, new facilities under RECLAIM would only need to purchase offsets at a 1 to 1 ratio instead of 1.2 to 1 under the command-and-control program. Also, under RECLAIM RTCs obtained for new facilities only need to be in one year increments at a time, not a stream of credits based on potential to emit as required under command-and-control. Unused RTCs at the end of a compliance year can be sold in the market; however, under command-and-control, offsets, once those RTCs are submitted for permitting purposes, they cannot be recovered if the actual emissions do not reach the potential to emit. Furthermore, in order to generate ERCs under command-and-control, credits are discounted to the BACT level as if the source were operated at a controlled level. This requirement is not applicable to RECLAIM facilities. On this basis, new facilities after 1993 would be subject to the further RTC reductions.

2) An exemption would apply to facilities that do not have any equipment subject to the proposed new BARCT listed in Table 3 of Rule 2002, and the current emission factors achieved for each equipment onsite are at or below the 2000 Tier I ending emission factors provided in Table 1 of Rule 2002. The purpose of this criterion is to ensure that the qualifying facilities do not have any further reduction opportunities onsite and do not contribute to any of the new BARCT reductions from their original RTCs issued by the AQMD.

3) The facilities have not sold their original allocations for 2007 or later compliance years. This limitation is to ensure that, if an exemption were not granted, the facilities would otherwise be buyers only because of the further RTC reductions, not their previous RTC sales.

4) The qualifying facilities must demonstrate that their cumulative compliance costs under RECLAIM as of the date of their application for exemption exceeded the costs that the

facilities would otherwise have incurred under the command-and-control. Costs under command-and-control category would include control equipment or any retrofit technology necessary to meet and maintain the emission factors specified as the year 2000 Tier I ending emission factors for the applicable equipment categories in Table 1 of Rule 2002. This cost data was determined using the cost parameters and procedures identified in the most recent edition of the Control Cost Manual published by the U.S. EPA Office of Air Quality and Planning Standards. Costs for the RECLAIM program would include control costs to attain the emission factors for the equipment at the facilities and all revenues and/or costs associated with RTC transactions (including broker commissions) as reported to the District. However, costs associated with legal proceedings, feasibility studies, or market activity analysis not directly related to RTC transactions are excluded from the cost consideration. In addition, costs associated with the installation of BACT under Rule 2005 or monitoring, recordkeeping, and reporting (e.g., CEMS) under Rule 2012 (C) are excluded because these provisions are mandatory in RECLAIM and are required under command-and-control as well. Similarly, costs that resulted in NOx emission reductions in excess of meeting the RECLAIM requirement for that equipment type are excluded. RECLAIM facilities are allowed to choose compliance strategies under RECLAIM including installing better controls. The excess emission reductions can then be used to offset emissions increases from other sources at the same site. The costs of over-control should not be included to exaggerate the RECLAIM costs in that under command-and-control these emission increases would have to be offset under New Source Review requirements. Furthermore, excluded from consideration are costs that did not directly reduce NOx emissions, costs that result only in improving process efficiency or product quality, cost of projects that were initiated before the date the facility was subject to RECLAIM requirements, and costs of litigation. These costs would have occurred under either of the two regulatory approaches and would have cancelled out in the comparison. In addition, cost savings that resulted in implementing any NOx emissions strategy, such as fuel savings, increased production or sale are to be included as benefits as a result of implementing control under RECLAIM.

5) Alternatively to the above four criteria, facilities that have implemented all feasible controls on site at the start of the program as evidenced by the fact that their initial 1994 and 2000 allocations were calculated based on the same emission rates (i.e., zero rate of reductions between 1994 and 2000) can potentially qualify for the exemption. They can qualify if they have not sold their 2007 or later RTCs and their current emission rates achieved on site continue to be equal to or less than the emission factors provided in Table 3 or Table 1, whichever is lower. Although having implemented all feasible measures, these facilities were subject to the same 28% reductions as the rest of the RECLAIM facilities between 2001 and 2003. Accordingly, additional reductions would put them further in the RTC deficit category. Therefore, staff is proposing to exempt these facilities from this further shave.

The exemption would only apply to the original RTCs issued by the District. RTCs acquired after the start of the program would be subject to the same reductions as the rest of the market. Facilities have two windows of opportunity to apply for the exemption 1) within six months after the rule adoption or, 2) between January 1 and March 31, 2006. These timeframes would

provide adequate time to complete the staff review and approval process prior to the start of 2007 reductions. Because the exempted reductions from these facilities will be redistributed to other facilities/RTC holders in the program, the staff proposal does not recommend the exemption application process be ongoing. The rest of the market needs to have certainty for their reduction targets. Furthermore, the exemption is only applicable to the current BARCT evaluation. The exempt facilities are not insulated from future reductions if future onsite control options are identified as part of periodic BARCT evaluations. The exempt facilities need to continue to meet the Rule 2004 requirements and are subject to Rule 2005 requirements, if applicable. Once facilities receive an approval from the District, all of their original RTCs for compliance years 2007 and after are designated as non-tradable. Since the primary reason for the exemption is that the facilities' only compliance option is the purchase of RTCs and the facilities have implemented all feasible controls, it would not be fair to the rest of the market to allow the facilities to participate in the market when they can benefit from the market, but to exit the market when further reductions are required for the market. Shifting the reduction burden from the exempt facilities to the rest of the market would make the RECLAIM compliance costs distributed to facilities more like a command-and-control system, because there would be fewer buyers in the market. Reserving the selling privilege to the non-exempt facilities can potentially mitigate their compliance costs and may incentivize advanced controls beyond proposed BARCT. The process is initiated by facility submitting a request for exemption in the form of a compliance plan application. The facility would submit all relevant data to demonstrate its eligibility for the exemption. The application will be denied if it lacks all required information. If facilities requesting an exemption disagree with the staff's evaluation, an appeal process through the Hearing Board is proposed to resolve the dispute.

Staff's proposal seeks to balance the need to maintain a viable RECLAIM market while addressing the serious concerns raised by facilities that do not have further reduction opportunities on site. The exemption criteria includes an element of cost comparison, which is based on the H&S Code requirement that the RECLAIM program shall be at a cost equal or less than that of the command and control program. Although the cost threshold has been used on a programmatic basis, the same concept was adapted here for individual facilities. This approach along with other requirements, such as non-tradable designation for 2007 and later RTCs, ensures that facilities have contributed their fair share to the market before exiting the reduction pool. It also ensure that they cannot further benefit from the market by selling excess RTCs due to production fluctuations. In addition, the foregone reductions from the exempt facilities would be redistributed among the remaining facilities to achieve the same reduction goal 2 years later. Staff believes these delayed reductions would meet the state requirement of achieving BARCT in a timely manner. The current reduction schedule is based on a typical implementation schedule for the source category as a whole, not for individual facilities. Under the source-specific rules, it is not unusual that extended compliance dates would be granted to individual facilities where control options are not currently available (i.e., facilities requesting exemptions) or that a reasonable lead time is given to facilities that need to achieve additional reductions (i.e., greater reductions for the remaining facilities in the market).

Staff has evaluated and rejected the approach to reduce overall RTCs suggested by industry- or facility-specific reductions. If an industry-specific approach were selected, an equal reduction would be applied to all facilities within the same industry. This approach would present several problems: 1) it would not address the issue of facilities already at or below BARCT; 2) not all

facilities in the same industry category have identical equipment profiles; and 3) a fair percent of reduction would be difficult to derive because proposed new BARCT is equipment-based, not industry-based. If a facility-specific approach were selected, it would require the re-calculation of appropriate RTCs for every facility based on certain production levels. This approach, however, cannot address the problem regarding the potential difference between current holdings and projected emissions at BARCT by RECLAIM facilities, or holdings by non-RECLAIM facilities. Excess holdings at a facility may represent purchases for future expansion, not necessarily emission reduction potential. Similarly, facilities may currently hold less calculated BARCT emissions due to prior trading activities. In the end, it would be difficult to determine how many RTCs to take, if any. Furthermore, either method would still likely require an across-the-board adjustment to match the command-and-control equivalency similar to the initial RECLAIM program for its 2000 and 2003 allocation determination.

## Rate of NOx RTC Reductions and How Reductions are Applied

### Introduction

A key requirement is that BARCT be implemented and reductions achieved on a timely basis reflecting the availability of BARCT controls. There are several policy options for how reductions are obtained from RECLAIM, including the slope of the reduction line, the time allowed for reductions to occur and whether reductions are applied equally to all RTC holders or by differential rates of reduction by industry or by facility.

Just as the 1991 AQMP reductions from compliance year 2000 to 2003 were applied programmatically across all facilities, regardless of equipment type and size, staff proposes to utilize the same approach for achieving additional emission reductions under the program. Factors for analyzing the appropriate reduction schedule include the time necessary for planning, design, financing, engineering, and construction.

### Discussion

#### Rate of NOx RTC Reductions

Under the current RECLAIM regulation, RTCs have remained at the same level since 2003. Total actual emissions from all RECLAIM facilities for the year 2002 were 30 tons per day, approximately 8.5 tons per day less than the available RTCs in the market. Reported actual emissions for the compliance year 2003 are 27.6 tons per day, 6.6 tons per day lower than available RTCs in the program. Annual audits for RECLAIM show that, except for the energy crisis in 2000 and 2001, there are generally 15 to 20 percent unused RTCs at the end of the compliance year. While not all unused RTCs are available in the market, the current very low prices during the reconciliation period (less than $1.00 per pound, and as low as $0.40 per pound), indicate that the market as a whole has excess RTCs and can be further reduced in a reasonable time frame. Specifically, Rule 2009 power plants have implemented BARCT (and beyond BARCT for the purpose of this proposal) since 2003. The most recent compliance year 2003 power plant reports indicate that power plants had 4.4 tons per day excess RTCs in 2003. This indicates that near-term reductions are feasible based on reductions already achieved.

In addition to examining when reductions can begin, it is also necessary to determine when all BARCT measures can be fully implemented. Some equipment categories (i.e., FCCUs) may need until 2010 to achieve these reductions due to factors such as planning, engineering, permitting and equipment turn-around time. Concerns were raised that although the market as a whole clearly has sufficient RTCs, adequate time (i.e., 2 to 3 years) should be given to individual facilities should they choose to install controls instead of purchasing credits from the market.

#### RTC Reduction Options

Regardless of the years in which RTC holding reductions occur, there are two options for the application of those reductions: an “across-the-board” reduction; and equipment-/industry-specific reduction. Each approach has advantages and disadvantages.

Across-the-Board

Under this approach, each facility or RTC holder would have an equal percentage reduction from their current RTC holdings for each individual year. For example, if the reductions were 20 percent by 2010, all RTC holdings will be reduced by the same percentage. This approach, from a market aspect, is believed to be the most appropriate as it achieves reductions on a programmatic basis and allows the market forces of supply and demand to dictate where the most cost-effective reductions will come from. Furthermore, this approach would have minimal interruption to the ongoing trading activities, because regardless who holds the credits, the rate of reductions would be the same.

Equipment-/Industry-Specific

This approach would apply reductions to only those facilities that have equipment where a new BARCT level has been determined. The reductions to RTC holdings would be facility-specific based on the level of control achieved at the facility. The reduction would be derived based on the allocation method discussed earlier. This approach, from an equity standpoint, does not appear to disbenefit (in the form of RTC holding reductions) those facilities that have already made efforts to achieve BARCT at their facility or are already at BACT. However, it does not address several issues. These include: selection of appropriate activity levels for the facilities in question; how to demonstrate programmatic equivalency to command and control; based on a snapshot of holdings, certain amount of RTCs would always be held by brokers who do not own or operate any equipment; facilities may hold emissions for future expansion not representing current emissions; and facilities could transfer RTCs to another facility or third party if that would result in a lower rate of reduction. This approach also fails to recognize the trading activities that have taken place since the inception of the program.

Exemption from Reductions

In this approach, a facility would be exempted from RTC reductions in recognition of each equipment at the facility meeting or exceeding current BARCT requirements. Facilities at BARCT would be "side-tracked" within the RECLAIM program and not subject to further allocation reductions until such time there is a determination that further BARCT controls can be applied. As a condition of gaining this status, a BARCT facility could not be a net seller of RTCs. In other words, it would be allowed to buy RTCs, and it would be allowed to trade between cycles as long as the net effect of its trading was to increase the number of RTCs held over the cycle to cycle trading period (i.e., 18 months). This exemption from the shave would apply only to the District's allocation of RTCs to the facilities, not to any RTCs acquired from third parties and held by facilities in their accounts. By requiring a shave of RTCs acquired from third parties, concerns about "RTC laundering" by third parties to avoid the shave are prevented.

Price Trigger for Temporary Relief

Industry expressed concerns regarding the potential for increased RTC prices and the amount of time it takes to conduct a Rule 2015 evaluation in the event prices exceed $15,000 per ton. One possible solution is to track RTC market price to provide a temporary relief mechanism. An advantage of this approach is the assurance of a quick response to stabilize the market. However, the industry stakeholders claimed that they cannot effectively rely on this strategy, because they need to plan their compliance options several years ahead. Environmental representatives have commented that this relief removes the incentive to install control equipment and raises the potential for market manipulation. Staff's response, however, is that

the relief is not designed to delay controls, but to serve as a temporary solution when there is a significant mismatch between and demand and supply while giving staff time to perform a program evaluation.

**Industry Comments**

- Some industry representatives have stated that RTC holding reductions for the RECLAIM program should be implemented evenly across all RECLAIM sources. Other industry representatives advocate equipment- or industry-specific reductions, stating that across-the-board reductions are not fair to facilities that have installed control equipment and accomplished their commensurate command-and-control reductions.
- Industry representatives have recommended that programmatic reductions begin in 2007 instead of 2006 to allow time for installing air pollution controls, to allow adequate time for planning, design, permitting, construction, and implementation of control equipment.
- Access to restricted RTCs in the event prices exceed $15,000 per ton should be based on a one-month or three-month period, not a 12-month rolling average.
- Restricted RTCs should be transferable to facilities under common ownership in the event the average RTC prices threshold of $15,000 is exceeded.

**Environmental Organization Comments**

- The reductions should begin earlier.
- Reductions should occur over a shorter period of time.

AQMD staff responses to the industry and environmental community comments are presented in Appendix E.

**Staff Recommendation**

Staff proposes that a decrease in RTC holdings would be implemented across-the-board with limited exemption on a two-phase programmatic basis between compliance years 2007 and 2010 reflecting the total reduction of 7.7 tons per day (or 22.5 percent) for the current program. The first phase is 4 tons per day in 2007 and 3.7 tons between 2008 and 2010 in equal increments. As a companion piece to this recommendation, power plants would be able to buy RTCs for any compliance year upon adoption, however, they would still be restricted to selling RTC for only the 2007 compliance year or later. Reductions in 2007, 4.0 tons per day, would be credited toward the California SIP. Reductions for the 2008 through 2010 compliance years would be retained by facilities as non-tradable credits for use or sale only if the average RTC price, based on a 12-month rolling average, exceeds $15,000 per ton during 2008 or later years. In the event this occurs, the incremental reductions would no longer be restricted and the holders of the credits could use or sell the RTCs for compliance purposes pursuant to Rule 2004. When prices exceed $15,000 per ton, a program evaluation is also required under Rule 2015 and upon completion of the evaluation, staff will recommend appropriate adjustments and/or other necessary corrections to the program. In the event the average RTC price falls back below

$15,000 per ton, then the reductions will be reinstated for future years. Staff, therefore, believes the relief would be a temporary delay in achieving the targeted reductions.

Staff is proposing a 12-month rolling average in determining if the average RTC price exceeds $15,000 per ton. This time-frame is chosen to avoid potential price manipulation. Staff has observed that most of the trading activities occur during the cycle-end reconciliation. A 12-month period provides an average price of 2 trading cycles, which would eliminate isolated abnormalities. $15,000 per ton is selected because it is slightly higher than the overall cost-effectiveness for BARCT under the staff proposal. Furthermore, it is consistent with the threshold in Rule 2015 for program evaluation. This price threshold ensures that the program continues to meet the state law requirements for BARCT equivalency.

A two-phase reduction approach is designed to address two seemingly conflicting objectives. First, industry stakeholders requested sufficient lead time be given to facilities who want to install controls in lieu of purchasing RTCs. A two-year lead time (2005-2006) for equipment design, budgeting cycle (i.e., 2005-2006), permitting, and installation of low-NOx burners is adequate. Second, since power plants have already implemented BARCT, immediate reductions from the program can be taken to reflect BARCT. Delaying the start of reductions until 2007 and restricting power plant trading would in essence retain the environmental benefit from power plant reductions in the interim while allowing other facilities to install controls if electing to do so. The price trigger provides a safety valve for the market without compromising long-term environmental objectives.

Due to the large size and complexity of many facilities, such as refineries, reductions were assumed to occur over several years due to various equipment turn-arounds scheduled. In addition, for such large facilities, it was necessary to take into consideration turn-around times for equipment turnover and maintenance. For example, the schedule for refinery FCCU turn-arounds would not be completed by all refineries until after 2008. Therefore, staff is proposing reductions to be spread out from 2007 to 2010. This would provide the additional reductions necessary to achieve the command-and-control equivalent emission reductions and allow for the necessary lead time to implement the reductions at the facilities.

The staff proposal is based on cost-effective control technologies implemented under a schedule if command and control rules were implemented. However, in a market program, the decision to purchase RTCs or install controls and the implementation schedule is decided by the individual facility operators. In a relatively small market like RECLAIM, there is a potential to have a mismatch between demand and supply. Therefore, staff recommends a price trigger to monitor the market by providing temporary relief. The reason why the reductions for compliance years 2008 through 2010 are subject to price trigger is explained as follows. The first phase of reductions (4 tons per day) can be achieved with greater certainty based on the reductions already achieved as of 2003-2004 and has consensus from all stakeholders. The second phase of reductions has been subject to debate regarding control costs, cost-effectiveness, and growth projections in the 2003 AQMP, particularly for electric generation. As can be seen in Table 7, demographic projections do vary slightly between planning cycles for the same year 2010. Thus, the price trigger mechanism provides an emergency relief valve should unexpected events occur to provide a temporary relief. It should be noted that currently Rule 2015 requires a program evaluation when credit price exceeds $15,000 per ton. This temporary relief allows staff to

perform a more detailed program evaluation to determine the causes and, depending on the findings, staff may recommend other actions for the Governing Board's consideration to correct the problems. However, when RTC prices return to normal (i.e., below 15,000 per ton) for a period of 6 months, scheduled reductions will resume beginning in the next compliance year.

**Table 7**

**Baseline Socioeconomic Forecasts for the South Coast Air Basin for 2010**

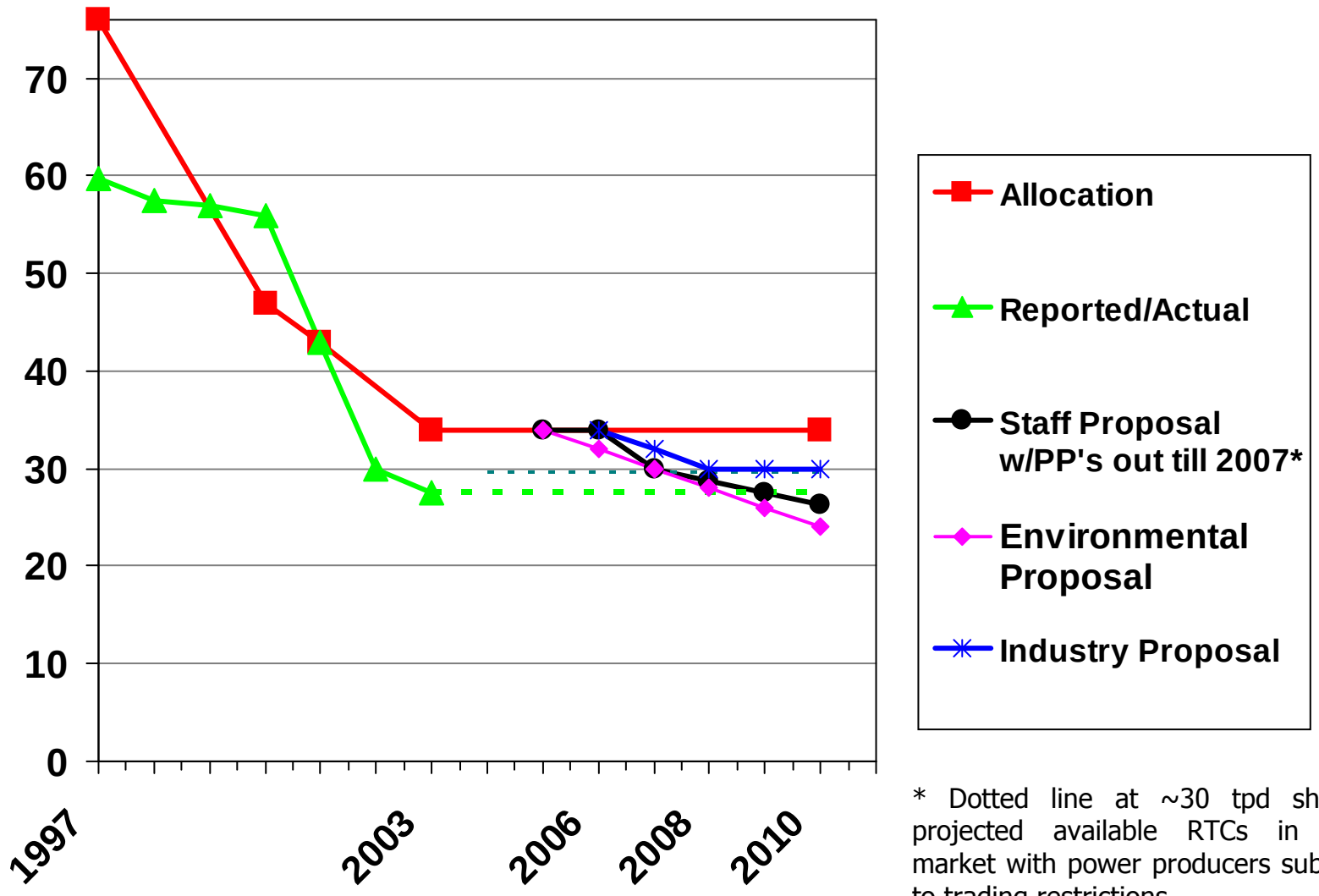
| Socioeconomic Category | 1991 AQMP | 1994 AQMP | 1997 AQMP | 2003 AQMP |
|---|---|---|---|---|
| Population (millions) | 15.7 | 17.3 | 16.7 | 18.2 |
| Housing Units (millions) | 6.1 | 6.0 | 5.7 | 5.9 |
| Total Employment (millions) | 8.2 | 8.6 | 8.0 | 8.5 |
| Daily VMT (millions) | 387.6 | 413.9 | 377.9 | 454.7 |

Source: Chap. 3 of 1991, 1994, 1997 & 2003 AQMPs

The $15,000 per ton trigger for program evaluation would be retained as a program backstop measure in Rule 2015. Of the total 7.7 tons per day of proposed NOx reductions, only the phase one reductions attributed to compliance year 2007 (i.e., 4.0 tons per day) would be submitted to the SIP. The remaining NOx reductions attributed to compliance years 2008 through 2010 (i.e., 3.7 tons per day) would not be submitted to the SIP to allow for some or all of these reductions to be used in the event RTC prices rise beyond $15,000 per ton.

Figure 10 illustrates the staff and alternative proposals relative to the current RTCs and reported actual emissions. The dotted line for the staff proposal represents the projected available RTCs in the market with power plants continue to be subject to trading restrictions. The emission reduction under staff's proposal would result in 2010 emissions approximately 1.2 tons per day below the reported 2003 emissions, while the industry proposal would be 2.5 tons above the 2003 levels.

**Figure 10**
**NOx RTC Reductions**
**(Tons per Day)**




* Dotted line at ~30 tpd shows projected available RTCs in the market with power producers subject to trading restrictions.

## D. GENERAL DISCUSSION TOPICS

Throughout the rule development process, other issues that have not been discussed previously in this Draft Staff Report have been raised. These issues are described below, with discussion and staff recommendations, where appropriate.

### Cost Threshold

#### Issue

This issue involves: (1) the appropriateness of a threshold, and (2) if appropriate, the value of the threshold.

#### Background

The Governing Board has not set an upper limit for cost-effectiveness. Cost-effectiveness for command and control rules for NOx BARCT is looked at on a rule-by-rule basis rather than having a single dollar per ton number. When a rule is brought to the Governing Board, the Board determines the cost, affordability to the industry, etc. and determines the cost-effectiveness number for the controls. The RECLAIM program combines many types of industries. Therefore a mixture of more and less cost-effective controls is appropriate.

Cost-effectiveness is used as a criteria for analyzing controls for new equipment for non-major sources. Under the Best Available Control Technology (BACT) guidelines, the current maximum cost-effectiveness is $19,100 per ton for NOx controls and the incremental cost-effectiveness maximum is $57,200 per ton.

Under the RECLAIM rules, a program evaluation is required if the average cost of RTCs over a one-year period reaches $15,000 per ton. This evaluation level was never intended to be used as a cap and has never been adjusted to present value, which if it had would be about $17,500 per ton. It should be noted that control cost is only one factor affecting RTC prices. Other significant factors include supply and demand of credits available in the market.

#### Discussion

Neither BARCT nor the RECLAIM program requires that only the least cost control alternatives are considered. Theoretically, the most cost-effective controls are put on first by RECLAIM facilities, followed by more costly controls. RECLAIM is designed to encourage the development of more cost-effective controls.

An analysis of previous NOx rules and control measures was done to help quantify cost-effectiveness. The following weighted cost-effectiveness includes stationary source AQMD rules and 2003 AQMP control measures. This analysis shows that $15,000 per ton level represents the upper 75 percent of the weighted cost-effectiveness in relation to the statistically significant parameters of these rules and control measures. All results are in 2003 dollars.

**Table 8**
**Cost-Effectiveness of AQMD Rules and 2003 AQMP Measures**

| Cost-Effectiveness | |
|---|---|
| $9,900 | Average |
| $6,600 | Standard Deviation |
| $12,900 | 60 Percentile |
| $14,300 | 75 Percentile |
| $17,800 | 90 Percentile |
| $20,200 | 95 Percentile |

As shown above, the PAR 2002 $15,000 per ton can be tied to the 75th percentile or even lower. Theoretically speaking, RTCs should reflect both control costs and transaction costs. A market price of $15,000 per ton would mean the control cost is actually less. Statistically, an upper percentile would be appropriate in establishing an upper limit.

In the past, the AQMD Board has adopted new or amended rules with a cost-effectiveness that is within the range of the costs associated with the proposed amendments. Table 9 provides a summary of some past Board actions.

**Table 9**
**Cost-Effectiveness of Past Board Actions**

| | | | Cost-Effectiveness | |
|---|---|---|---|---|
| **Rule No.** | **Source(s)** | **Date of Adoption or Amendment** | **Date of Adoption/ Amendment** | **2003 Dollars** |
| 1109 | Refinery Boilers/Heaters | August 1988 | $12,700 | $16,700 |
| 1146.1 | Small Boilers/Heaters | October 1990 | $12,500 | $15,300 |
| 1135 | Utility Boilers | July 1991 | $28,150 | $34,000 |
| 2003 AQMP | Various | August 2003 | --- | $22,000 |

H&S Code §39616(f) requires the AQMD to set a market price for RTCs above which a reassessment of the program is triggered. It should be noted that if the $15,000 program evaluation trigger level of Rule 2015, which was adopted as part of the original program design, were converted to current dollars, the program evaluation level would be approximately $17,400. Affordability and overall costs are critical factors in rule development. Setting one universal cost-effectiveness threshold may take away the flexibility in industry-by-industry consideration. Cost-effectiveness and affordability are critical to small business. Also, one should not underestimate the technology advancement potential that tends to lower control costs over time.

For example, when Rule 1135 was first adopted the SCR cost then was $9,700 and now is $3,100.

Relative to a BARCT cost threshold, some industry participants have argued that a limit, suggested in a July 1997 presidential policy memo regarding implementation of revised air quality standards for ozone and PM, should be used. The intent of the memo was to demonstrate that there was a "strong desire to drive the development of new technologies with the potential of greater emission reduction at less cost." Specifically, the memo states, "$10,000 per ton of emission reduction is the high end of the range of reasonable cost to impose on sources." The memo did not provide the basis for this cost threshold figure, but was intended to be used not only for strategies to attain the PM and ozone standards, but for market-based strategies as well to reduce compliance costs. This included concepts such as a Clean Air Investment Fund, which would allow sources facing control costs higher than $10,000 a ton for any of these pollutants to pay a set annual amount per ton to fund cost-effective emissions reductions from non-traditional and small sources. However, the final EIP (January 2001) stated that the $10,000 per ton threshold be used "as a guide," but that state and local agencies may set "required per ton threshold for payment into a fund higher or lower than $10,000, based on local and regional circumstances and the purposes designated for the fund..." Circumstances in this region are such that significant additional reductions are needed to attain national ambient air quality standards, such that a low threshold of $10,000 is inappropriate because it would not result in enough reductions. In addition, this level was not set as a regulatory requirement, rather it was a policy objective of the administration in 1997.

In the evaluation of BARCT, not all equipment categories have a new BARCT level proposed. However, incremental cost-effectiveness was a consideration when a new BARCT level was identified for certain categories. For example, for boilers subject to Rule 1146, SCR was not accepted as BARCT due to the incremental cost of control (i.e., from 30 ppm to 5 ppm). Based on the incremental cost-effectiveness, the level of control for this category was then identified as ultra-low NOx burners. This is not to say that if a boiler is currently uncontrolled, SCR would not be considered cost-effective. For refinery heaters and boilers a 5 ppm emission concentration from SCR control led to a bifurcation by equipment size. That is, SCR was not found cost-effective for units between 40 and 110 mmbtu/hr. For the larger than 110 mmbtu/hr units, SCR was identified to be cost-effective and therefore proposed as BARCT. In another example, a new BARCT level was determined for gas turbines. Adding SCR to obtain further reductions was found not to be cost-effective and the reductions were therefore not included in the programmatic reductions.

**Table 10**
**Cost-Effectiveness Ranking**

| Equipment | $/ton | BARCT Concentration | Control Technology |
|---|---|---|---|
| Utility Boilers[1] | 1,500 – 3,000 | 7 ppm | SCR |
| Heat Treating | 4,000 | 45 ppm | LoNOx |
| Metal Melting | 8,500 | 45 ppm | LoNOx |
| R1146, R1146.1 Boilers/Heaters | 9,000 – 10,000 | 9 and 12 ppm | LoNOx |
| Misc. | 11,000 | 30 ppm | LoNOx |
| FCCU[2] | 12,200 | 85% reduction | SCR |
| R1109 Boilers/Heaters > 110 mmBtu[2] | 11,200 – 17,000 | 5 ppm | SCR |

[1] Rule 2009 Utility boiler cost-effectiveness is based on pre-Rule 2009 emissions.
[2] Cost-effectiveness based on 25 year life, others based on 10 year life.

Based on this ranking, if the more costly controls were removed from the staff proposal, the costs, as well as potential reductions would be significantly less. Table 11 provides an example for various scenarios if certain refinery equipment were not included in the BARCT adjustments.

**Table 11**
**Potential Scenarios Based On Cost-Effectiveness Ranking**

| Scenario | Reductions[1], tpd | Reductions w/10% Market Adjustment | Weighted Average C/E |
|---|---|---|---|
| All BARCT Proposed | 10.2 | 7.7 | $8,300 – $13,000 |
| All BARCT w/o R1109 Units >110 mmbtu/hr | 7.9 | 5.3 | $9,300 – $10,000 |
| All BARCT w/o R1109 Units 110-250 mmbtu/hr | 8.8 | 6.4 | $10,700 – $12,800 |
| All BARCT w/o R1109 Units >110 mmbtu/hr & FCCU | 6.9 | 4.2 | $8,600 – $9,400 |

1. Emission reductions include Rule 2009 Utility Boilers, cost-effectiveness does not.

### Industry Comments

- Allowable cost-effectiveness should not exceed $15,000 per ton of reduction, based on a 10-year equipment life. Any control equipment with a higher cost-effectiveness should not be considered when determining the level of RTC reductions sought as a result of this process.
- A BARCT cost-effectiveness threshold needs to be established.
- BARCT cost-effectiveness should be based on $10,000 per ton NOx threshold given by EPA as ceiling for BARCT. If not, then BARCT cost-effectiveness should be set at $15,000 per ton, consistent with the program evaluation criteria of Rule 2015.
- Cost-effectiveness should not exceed that noted in the 2003 AQMP control measure for further RECLAIM reductions.

### Environmental Organization Comments

- A cost threshold prevents the market from performing as a free market.
- If a cost threshold is set to prevent credit prices from rising too high, then a low end threshold should be set to prevent prices from going too low. When credit prices drop there is a disincentive for facilities to add controls.

AQMD staff responses to the industry and environmental community comments are presented in Appendix E.

### Staff Recommendation

Adopting one cost-effectiveness threshold for BARCT rules for all industries does not take into consideration differences in size and available resources. For example if an industry is made up primarily of small businesses affordability may become an issue, whereas large industry may have no problem with that same threshold. Staff recommends considering cost-effectiveness on equipment category basis.

## LCF and DCF Cost-Effectiveness Methods

### Issue

The AQMD routinely conducts cost-effective analyses regarding proposed rules and regulations that result in the reduction of criteria pollutants (NOx, SOx, VOC, PM, and CO). The analysis is used as a measure of relative effectiveness of a proposal. It is generally used to compare and rank rules, control measures, or alternative means of emissions control relating to the cost of purchasing, installing, and operating control equipment in order to achieve the projected emission reductions. Cost-effectiveness is a key element to the BARCT criteria for economic feasibility. There are two primary methods for evaluating cost-effectiveness: Discounted Cash Flow (DCF); and Levelized Cash Flow (LCF). DCF is the AQMD's chosen method of analyzing costs. However, comments have been received suggesting that the LCF method of cost-effectiveness should be used in support of AQMD rulemaking. This issue has been a long-standing debate. The Board approved the use of DCF in 1989. Likewise, it has been used for BACT determinations since 1995 and rule development since 1996. However, the purpose of any method is to provide a relative comparison to past and future actions. In general, LCF reflects a cost-effectiveness that is approximately 30 percent higher than DCF.

### Background

The major parameters in cost-effectiveness include capital and installation costs, operating and maintenance costs, interest rates, and project life. DCF is based on a conversion of future expenditures (including annual costs) to a present value basis using a present value factor. LCF is different in that fixed capital expenditures are converted into an equivalent annual amount using a capital recovery factor. Under the same interest rate and project life, the present value factor is a reciprocal of the capital recovery factor. LCF generally yields numbers that are 20 to 30% higher that DCF. Appendix B provides a more detailed discussion of each method and includes examples of each.

**Discussion**

DCF is more versatile than LCF in that DCF can easily deal with non-constant annual operating and maintenance costs and those costs occurring longer than the standard one-year interval (e.g., catalyst replacement every five years). Second, DCF allows non-uniform emission reductions over the project life. Finally, DCF is neutral on how a project is financed by individual businesses, which is very much tied to the well-being of these businesses.

In addition, the most important criteria in applying a cost-effectiveness methodology is to maintain consistency. That is, if past rulemaking projects are based on DCF, then it would be prudent to continue using DCF for future projects. Using the LCF method for this analysis would result in the inability to compare cost-effectiveness for new BARCT with past rules.

**Industry Comments**

- LCF is more appropriate than DCF for cost-effectiveness.
- In comparing control technologies relied upon by other air districts, consistent cost-effectiveness methodologies should be used to make the appropriate comparison.

The stakeholder comments have been addressed in the discussion above.

**General Industry Comments**

- The proposed RECLAIM amendments and the agreement with CARB alters the fundamental principals in the design of the program by redefining BARCT equivalency every three years.

Discussion: The requirements of the Health and Safety Code are not intended to be a one-time demonstration at the start of the program. Rule 2002 also states the potential for further emission reductions needed for attainment demonstration. Therefore, it is not against the fundamental design of the program to perform periodic review of new BARCT. AQMD staff worked closely with CARB staff regarding the appropriate interval for the BARCT review required by H&S Code § 40440. The agreement was to review BARCT every three years in conjunction with AQMP revisions. This allows a systematic review over a reasonable period of time, rather than utilizing the most conservative approach of requiring a BARCT every time any of the RECLAIM rules are amended. The program design concept of meeting equivalent reductions from the sources in the program as what would have occurred under command and control remains unchanged. Staff recommends that a BARCT analysis be conducted every three years, in conjunction with AQMP revisions.

- The proposal does not adequately factor the need for credits as a result of NSR. An example is the potential need for increased electric power generation over the next ten years. The proposal fails to recognize the significance of this industry's expected growth.

Discussion: The method used to calculate emission reductions possible for the BARCT relied on the new control factors for select categories of equipment and the growth factors from the 2003 AQMP. New source growth is accounted for in the category and county projections of growth. For power plants, the CEC forecast of 2.5 percent per year was used to estimate growth for this sector.

- RTC reductions should be recognized as a "take-away" of credits that have real, significant financial cost to companies. This represents a financial loss since many companies bought such credits to ensure compliance. This is a write-off that publicly-traded companies will have to show in their financial statements. The replacement or opportunity cost of the RTC reduction is larger than the anticipated financial loss. The RTC reductions will significantly increase the cost of future compliance, as these credits were not surplus to operational needs.

Discussion: At the onset of RECLAIM, RTCs were allocated to RECLAIM facilities free of additional charge, yet have value to the facilities as a commodity that can be bought and sold. While RTCs have value, they are not a property right.

The proposed amendments to RECLAIM will reduce the number of current RTCs. Since there was no cost associated with allocated RTCs for a facility, there should be no financial loss to the facility as the AQMD retires them. Any additional purchase of RTCs executed by a facility is made in lieu of emission control. The choice between the RTC purchase and emission control is solely a business decision. The associated expenditure is the compliance cost of RECLAIM, which is no different from the compliance cost of any command-and-control rule. Yet, RECLAIM facilities have choices that are not afforded to those under the command-and-control rules.

- The proposal does not address the unique situation associated with the power industry. For example, increased in-Basin generation may be necessary in the event a problem occurs with one of the transmission lines bringing in power. Such a disruption could trigger an order by Cal-ISO for a significant and unexpected ramp-up of electricity production. Such an event could be disruptive to the RECLAIM market and put a strong and unanticipated upward pressure on the price of RTCs.

Discussion: Current power plant holdings are approximately 30 percent above recent actual emissions (compliance year 2002). Power plants, due to Rule 2009, have installed BARCT and BACT on all generation equipment. Even if the generation demands of the 2000/2001 energy crisis were repeated, emissions from power plants are expected to be significantly below current RTC holdings. In June 2003, staff presented its findings to the Board that current RTCs held by the facilities are sufficient to cover the emissions resulting from an electrical generation demand at the level seen in the 2000-2001 timeframe.

## E. Conclusions

The BARCT analysis indicates which equipment category additional NOx emission reductions are feasible from beyond the rules and control measures subsumed by RECLAIM. In addition to the BARCT reductions that are cost-effective and feasible for several categories of RECLAIM

equipment, there are other potential reductions in the program. For example, even though as a category, no reductions are proposed programmatically for internal combustion engines, but there are many pieces of equipment that are not yet controlled to Tier I levels and may be able to reduce emissions very cost-effectively. Some oil and gas facilities have electrified their engines. In addition, RECLAIM facilities have the ability to utilize combustion optimization technology or changes in throughput to generate credits when they are not at production levels that need all of their annual allocations. Another consideration is the supply of credits resulting from new source review. When equipment in RECLAIM is replaced, BACT is required. This normal progression of equipment replacement upon the end of its useful life results in additional credits that are no longer needed by the facility to retire against the higher emissions from the equipment that was replaced. These three factors have not been quantified or accounted for in the overall program reductions, and will help provide room for growth of all sources, including supply for new power plants.

The current RECLAIM market has a surplus of 6.6 tons per day when comparing total RTC holdings to 2003 reported emissions. This has resulted in low credit prices (e.g., $2,600/pound). Cost-effective controls are available and there is little incentive to install such controls. However, there is a need to meet state law requirements and ensure a stable market. Staff's proposal to amendment RECLAIM meets both of those objectives.

# IV. IMPACT ASSESSMENT

## Introduction

This section assesses the impacts associated with the proposed amendments to Regulation XX - RECLAIM.

## Impact Analysis

The determination of the amount of emission reductions that could be technically and economically achieved, and how to apply those reductions under the program were conducted under series of key steps, as follows:

- Determine the advancement of NOx emissions control technology (i.e., BARCT) as it applies to the equipment under the program and whether such equipment is technically advanced in those applications beyond that was subsumed under the program at the time of adoption in October 1993;
- Derive the amount the emission reductions feasible under each application based on the advancement of technology;
- Analyze the cost-effectiveness of applying the technologically feasible controls;
- Derive the amount of technically and economically feasible reductions; and
- Take into consideration the timeframe necessary to implement the control technologies at facilities.

### Cost-Effectiveness

The AQMD routinely conducts cost-effective analyses regarding proposed rules and regulations that result in the reduction of criteria pollutants (NOx, SOx, VOC, PM, and CO). The analysis is used as a measure of relative effectiveness of a proposal. It is generally used to compare and rank rules, control measures, or alternative means of emissions control relating to the cost of purchasing, installing, and operating control equipment in order to achieve the projected emission reductions. The major parameters in cost-effectiveness include capital and installation costs, operating and maintenance costs, interest rates, and project life.

As discussed in Section III, relative to the BARCT discussion, cost-effectiveness is included in the discussion as to the feasibility of the control technology to provide additional emission reductions under the program. Staff recommends continued use of the DCF method of calculating cost-effectiveness. In addition, staff also recommends that, as appropriate, an equipment life suitable for the type of retrofit control equipment be used. As shown in Table 10, cost-effectiveness varies by equipment category can be ranked to demonstrate which control technologies are most cost-effective. As can be seen, BARCT involving low-NOx burner technologies are the most cost-effective.

### BARCT

As discussed in Section III and shown in Table 2, new BARCT has been determined for some types of equipment in five general categories of equipment, as follows:

- Rule 1146 and 1146.1 boilers and heaters;
- Rule 1109 refinery boilers and heaters;
- Fluid catalytic cracking units;
- Metal melting and heating processes; and
- Miscellaneous combustion equipment including ovens, kilns, calciners, dryers, and furnaces.

Likewise, there were several equipment categories where no new BARCT was determined:

- Gas turbines;
- Cement kilns;
- Internal combustion engines;
- Glass melting furnaces; and
- Curing and drying ovens.

Of the aforementioned categories evaluated for BARCT, only gas turbines were found to have a control level more stringent than that previously subsumed under the RECLAIM program. However, upon review of the cost associated with the use of SCR, the controls were not found to be cost-effective.

RECLAIM facilities have the option of choosing to retrofit some of these sources in lieu of the sources where new BARCT is proposed. Although retrofits were deemed not cost-effective for a category, retrofits on an individual piece of equipment may be cost-effective. This allows RECLAIM participants other possibilities for flexibility to decide the best way to meet their reduced NOx RTC allocations.

### NOx Reductions and RTC Holding Reduction Schedule

There are two types of control technologies for new BARCT levels, i.e., ultra low-NOx burners and selective catalytic reduction. Applying these technologies to the equipment categories under RECLAIM have resulted in the feasibility of additional emission reductions under the program, beyond that was subsumed under the original program design more than a decade ago. The AQMP method, as discussed in Section III, demonstrates that reductions of 7.7 tons per day are feasible under the program, which will comply with the requirements of state law.

The potential reductions identified by the various equipment categories are those that make any proposed NOx reductions achievable on a programmatic basis. The proposed amendments to the RECLAIM program would further induce such projects to occur. Either installation/modifications of NOx emission control equipment or RTC purchases may happen as a result of the amendments, as would occur under an active credit trading program.

As previously discussed, there are key equipment categories where advancements in control technology were found to be technically feasible and cost-effective to achieve a net NOx emission reduction of 7.7 tons per day. However, it was necessary for staff to analyze how these reductions should be applied under the program. Just as AQMP Tier II reductions from compliance year 2000 to 2003 were applied programmatically across all facilities, regardless of equipment type and size, staff proposes to utilize the same approach for achieving additional emission reductions under the program. Factors for analyzing the appropriate reduction schedule include the time necessary for planning, design, financing, engineering, and construction.

Due to the large size and complexity of many facilities, such as refineries, reductions were assumed to occur over several years. In addition, for such large facilities, it was necessary to take into consideration turn-around times for equipment turnover and maintenance. For example, the schedule for refinery FCCU turn-arounds would not be completed by all refineries until after 2008. Therefore, staff is proposing a two phase programmatic NOx reduction schedule taking these factors into consideration. This schedule calls for the BARCT-equivalent reductions, based on the aforementioned allocation approach (4.0 tons per day), to be achieved by the 2007 compliance year. The remainder of the reductions (3.7 tons per day), due to the need to allow more time for larger units such as FCC units, would begin in compliance year 2008 and achieved by the 2010 compliance year. This would provide the additional reductions necessary to achieve the command-and-control equivalent emission reductions and allow for the necessary lead time to implement the reductions at the facilities.

The staff proposal was developed using a selected method to calculate BARCT and subsequently, demonstrate equivalency to command and control. BARCT was evaluated for all equipment categories covered by RECLAIM. Based on the 2003 AQMP base year inventory (i.e., 1997) and associated growth projections, this method results in a projection of future actual emissions. Results from the application of this methodology reflect the most recent benchmark for command and control equivalency determination. Control factors representing new BARCT levels were then applied to derive the remaining emissions, thereby quantifying the reductions feasible from current RTC holdings. Since the remaining emissions reflect projected actual emissions after application of BARCT, the proposal includes adding a 10% adjustment (increase) to remaining emissions to account for inaccessible RTCs due to imperfect market conditions and RTCs held by facilities to ensure compliance with annual audits.

Under the proposal, total RTC reductions would be 7.7 tons per day and implemented across-the-board based on equal percent reductions to all RTC holdings. The reductions would be implemented in phases: 4 tons per day of reductions in compliance year 2007 and the remaining 3.7 tons per day of reductions would be implemented in equal increments beginning in compliance year 2008 and continuing through compliance year 2010, on a straight-line rate of reduction. Current trading restrictions on power producers would remain in effect until the 2007 compliance year to retire excess emissions from power plant RTC holdings rather than have them enter the trading market and potentially allow emission increases, thereby delaying controls from other facilities.

The proposal states that the RTC reductions during the last three compliance years (compliance years 2008 through 2010) will not occur if the price exceeds $15,000 per ton. It should be noted that in Rule 2015 – Backstop Provisions, exceeding an RTC price of $15,000 would result in a

RECLAM program evaluation. Staff also proposes criteria by which a facility would qualify for an exemption from RTC holding reductions. The exemption is only applicable to original RTC allocations, not additional holdings (i.e., resulting from purchases or otherwise transferred). To qualify the exemption, the following criteria must be met:

- the facility existed prior to the start of RECLAIM and entered either at the start of the program or later pursuant to Rule 2001 because facility emissions exceeded 4 tons per year;
- the facility does not have any equipment identified in Table 3 of Rule 2002 (i.e., 2010 emission factors for equipment with new BART) and the achieved emission rates for each equipment at the facility are less than or equal to the 2000 (Tier I) Ending Emission Factor listed in Table 1 of Rule 2002 for the corresponding equipment type;
- RTCs have never been sold for 2007 or later compliance years; and
- the facility demonstrates that the cumulative NOx compliance control costs incurred for meeting the RECLAIM allocation exceeds the costs that otherwise would have occurred under a command-and-control regulatory approach to meet and maintain the emission limits specified in Table 1 of Rule 2002; or
- alternatively, in lieu of the aforementioned criteria, the proposed reductions would not apply to any facility whose starting and year 2000 Allocations were calculated using the same emission factors that are equal to or lower than the 2000 (Tier 1) emission factors listed in Table 1, emission rate achieved for each source at the facility is less than or equal to the emission factors listed in Table 3 for the corresponding equipment type, and the facility has not sold RTCs for 2007 or later compliance years.

It is unknown at this time how many facilities would qualify for the exemption since the total compliance costs, especially the retrofit control costs, at the facility level are not available to the staff. However, there are approximately 10 facilities that may potentially qualify for the exemption. These facilities have gone through the Rule 2009.1 process to demonstrate that all equipment at the facility meet current BARCT requirements. In addition, under the alternative exemption criteria (Rule 2002, paragraph (i)(2)), it is estimated that as many as 3 facilities, based on the allocation data, would qualify for the exemption, resulting in about 0.02 tons per day of reductions foregone. Potential applicants for the exemption have two time periods to file: 1) within 6 months of rule adoption or 2) between January 1 and March 31, 2006. Any forgone reductions by facilities meeting the exemption criteria would be distributed evenly among the remainder of the RTC holders and implemented two years from the compliance year the exemption applies to. Public notification of the distributed reductions would occur at least one year prior to implementation.

Staff proposes that the first phase of RTC reductions (4.0 tpd) be submitted to the SIP for compliance year 2007. The additional 3.7 tpd reductions for compliance years 2008 through 2010, however, would not be submitted to the SIP until implemented; this is due to the potential for some or all of the 1.2 tpd to be used in the event RTC prices rise beyond $15,000 per ton and the program is subject to review pursuant to Rule 2015.

Staff held numerous briefing sessions with CARB staff in the last several months regarding staff approaches/methodologies, and technology and policy issues. CARB staff supports AQMD staff's technical analysis.

### Impacts of Other Proposed Amendments

A set of proposed administrative and other minor changes, including correction of typographical errors, rule clarifications, and protocol updates are also proposed as part of these amendments. None of these proposed changes would pose any socioeconomic or environmental impacts.

## California Environmental Quality Act (CEQA) Analysis

Pursuant to the California Environmental Quality Act (CEQA) and SCAQMD Rule 110, a Notice of Preparation of a Draft Environmental Assessment and Initial Study (NOP/IS) that identified potential adverse impacts to air quality, energy, and hazards and hazardous materials was circulated for a 30-day public review period beginning March 11, 2004.

The AQMD is preparing a draft Environmental Assessment (EA) for Proposed Amended Regulation XX – Regional Clean Air Incentives Market (RECLAIM). The draft EA was released for a 45-day public review period ending December 7, 2004 and comments received during this review period will be responded to and included in the Final EA. Copies of the draft EA can be obtained by calling the AQMD's Public Information Center at (909) 396-2039, upon its release.

## MARKET ANALYSIS

In summer 2004, the AQMD contracted with two economists to examine the market implications of reducing NOx RECLAIM trading credits (RTCs) by three to 10 tons daily by the year 2010 or 2013, analyze market impacts of power plants' re-entry to the RECLAIM market, and provide possible means to ensure market stability resulting from negative market impacts. Their detailed analyses are in Appendix D—Economist Reports on potential Impacts of the RECLAIM Amendments—of the RECLAIM Rule Staff Report and are summarized below.

### Professor Anil Puri

Professor Puri is Dean of the College of Business & Economics at California State University, Fullerton. In his report to the AQMD, Professor Puri noted that the annual NOx RTC reduction was at 12.1 percent between 1994 and 1999, which was accompanied by the steady declining emissions despite strong job growth during this period. He expected that NOx emissions would rise after the 2001-03 economic slowdown, which could result in an upward pressure on NOx RTC prices. He also predicted that the rate of decline in emissions would be smaller than that in RTCs in the future. The potential upward pressure on RTC prices would be tempered because the last three years' emission reductions will become eligible for trading if the 12-month rolling averages of NOx RTCs exceed $15,000 per ton. Thus, the $15,000 a ton trigger acts as a price stabilizing force.

Re-entry of power plants to the RECLAIM market would increase the market size and efficiency. However, the opt-out-of-RECLAIM option in exchange for additional emission reductions would do the opposite. If power plants can provide cheaper emission reduction technologies, then smaller increases in RTC prices would be expected. Additionally, the AQMD may seek low cost reductions first to keep prices of RTCs low.

**Professor Karen Polenske**

Professor Polenske, Head of the International Development and Regional Planning group at the Massachusetts Institute of Technology, collaborated with Dr. Ali Shirvani-Mahdavi on the assessment of the proposed amendments to RECLAIM. Specifically, they examined the demand for and supply of NOx RTCs based on the worst (at the 2000 – 01 level during the California energy crisis) and average cases for power plant generation capacity throughout 2013 and the proposed new BARCT levels.[3]

They concluded that historically the majority of the RECLAIM facilities looked for internal means to meet the emission needs with RTC transactions as an auxiliary solution. They suggested that demand and supply conditions in the RECLAIM market be considered in establishing RTC reductions and re-entry of power plants. Re-entry of power plants would increase RTC supply more than RTC demand. Based on their analysis of the most stringent scenarios (a combination of the worst and average cases for power generation capacity and steeper rate of NOx reductions in the early years than the proposed amendments), re-entry of power plants on an incremental basis may be considered, if necessary. The incremental re-entry could be based on a percentage of power plants (a plant is either in or out) or a percentage of their emission levels (only a proportion of emissions from every plant is in). The former scheme would be easier to implement.

The opt-out-of-RECLAIM option and periodic review of the BARCT level were viewed as additional strategies to mitigate adverse conditions on the market demand or supply, thereby relieving the pressure on RTC prices. Furthermore, the across-the-board emission reduction was viewed as more efficient and cost effective than the facility-specific reduction.

**Socioeconomic Assessment**

A socioeconomic analysis of the RECLAIM amendments has been performed. The socioeconomic report was released December 8, 2004.

[3] The average is referred to as the baseline-normal scenario by the California Energy Commission. It represents a medium (normal) level of hydroelectric generation availability in the Pacific Northwest region and a normal demand forecast under the baseline generation scenario. The baseline generation scenario assumes the retirement of approximately 3,200 megawatts (MWs) of existing steam and combustion type turbines, addition of approximately 6,600 MWs of newer more efficient generation by 2013, and availability of 900 MWs of new renewables throughout Southern California through 2013.

## Draft Findings under California Health and Safety Code

California Health and Safety Code § 40727 requires that prior to adopting, amending or repealing a rule or regulation, the AQMD Governing Board shall make findings of necessity, authority, clarity, consistency, non-duplication, and reference based on relevant information presented at the public hearing and in the staff report.

Necessity

A need exists to amend Rules 2001 – Applicability, 2002 – Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx), 2007 – Trading Requirements, 2010 – Administrative Remedies and Sanctions, 2015 – Backstop Provisions, 2011 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Sulfur (SOx) Emissions (Protocol), and 2012 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NOx) Emissions (Protocol) to seek additional emission reductions from RECLAIM relative to the 2003 AQMP (Control Measure #2003CMB-10), to demonstrate BARCT equivalence pursuant to California Health and Safety Code §40440, to demonstrate equivalency to command-and-control regulations pursuant to California Health and Safety Code §39616(c)(1), and to make changes necessary for the ongoing administration of the program.

Authority

The AQMD Governing Board has authority to amend existing Rules 2001 – Applicability, 2002 – Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx), 2007 – Trading Requirements, 2010 – Administrative Remedies and Sanctions, 2015 – Backstop Provisions, 2011 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Sulfur (SOx) Emissions (Protocol), and 2012 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NOx) Emissions (Protocol), pursuant to California Health and Safety Code §§ 39002, 39616, 40000, 40001, 40440, 40440.1, and 40702.

Clarity

The proposed amended rules are written or displayed so that its meaning can be easily understood by the persons directly affected by them.

Consistency

The proposed amended rules are in harmony with and not in conflict with or contradictory to, existing statutes, court decisions or state or federal regulations.

Non-Duplication

The proposed amended rules will not impose the same requirements as any existing state or federal regulations. The amendments are necessary and proper to execute the powers and duties granted to, and imposed upon, AQMD.

Reference

By adopting the proposed amended rules, the AQMD Governing Board will be implementing, interpreting and making specific the provisions of the California Health and Safety Code §§ 39002, 39616, 40001, 40440 (a), 40440.1, 40702, and 40725 through 40728.5; and Title 42 U. S. C. Sections 7410 and 7511a.

**Comparative Analysis**

H&S Code §§ 40727 and 40727.2 require a written analysis comparing the proposed amended rule with existing regulations. The §40727.2 analysis is traditionally applied to source-specific rules requirements affecting equipment subject to a command-and-control regulatory approach. RECLAIM varies from this regulatory approach in that it is based on a mass cap approach with a declining balance. This regulatory program decreases emission credit holdings, which caps emissions at a facility, as opposed to application of equipment-specific requirements. Therefore, this comparative analysis differs from the traditional comparative analysis. A comparative analysis was not applicable in prior amendments to the RECLAIM rules because those amendments did not reduce RTC holdings, which would have the impact of reducing each facility's emissions cap. Rule 2009, adopted in May 2001, resulted in BARCT requirements and trading restrictions being placed on power producing facilities that had a generating capacity greater than 50 mega-watts, but did not reduce the facilities' RTC holdings.

A comparative analysis, as required by H&S Code §40727.2, compares individual pieces of equipment to any applicable standard. The key to this analysis is to demonstrate non-duplication of new or amended regulatory requirements on an affected source. There are no significant changes proposed to the other program elements, such as enforceable procedures, operating parameters or work practice requirements. In addition, amendments to the monitoring, recordkeeping, and reporting requirements are administrative in nature, as they do not affect or otherwise change an emissions limitation or add a significant requirement. On this basis, this comparative analysis focuses only on the determination of a new BARCT standard for the equipment under RECLAIM.

Relative to the derivation of new BARCT standards, all of the equipment categories listed in Table 1 of Rule 2002 were examined by staff and presented to stakeholders for comments and feedback. However, as shown in Table 2 of Section III of this staff report, new BARCT was only determined for miscellaneous combustion equipment, metal heat treating and melting, petroleum FCCUs, refinery boilers and heaters, and non-refinery boilers and heaters. As discussed in Section III of this report, BARCT reductions from utility boilers have already been achieved, but their commensurate reductions are being accounted for in this proposal. In making the BARCT determinations, also discussed in Section III, a systematic approach of analysis was undertaken to derive any new control standards. This analysis, included review of potentially applicable requirements from other air pollution control districts or agencies, applicable AQMD rules, as well as emission controls achieved in practice or otherwise technologically and economically feasible that would have otherwise been required under a command-and-control regulatory approach in the absence of RECLAIM. The results of the analysis are summarized by equipment category in Appendix A.

The proposed programmatic reductions are based on the determination of new BARCT for certain emission sources. The resulting equipment-level reductions that would have occurred if applied with the same percentage under a command-and-control regulatory program are subsumed and spread among all RECLAIM facilities. The RTCs are proposed to be evenly reduced as RECLAIM is a market-based program with facility-level mass emissions caps. Therefore, there are no specific air pollution control requirements (i.e., equipment specific emission limits) for these sources that must be met. Facilities are allowed the flexibility to meet

their reduction requirements by what ever means they choose, such as equipment modifications, installation of control equipment, or purchasing RTCs.

Notwithstanding the aforementioned discussion, RECLAIM facilities are subject to the requirements of other AQMD regulations not subsumed by the program, including requirements under Regulation II – Permits, and Regulation IV – Prohibitions, such as Rule 401 – Visible Emissions, Rule 402 – Nuisances, and Rule 403 – Fugitive Dust. It should be noted that there are federally mandated programs, such as New Source Review (BACT/LAER), Prevention of Significant Deterioration, and Standards of Performance for New Stationary Sources, which are also applicable to the RECLAIM program and incorporated within the program. RECLAIM also complies with federal policy regarding start-up, shutdown, and malfunctions. In addition, there is not a comparable state or federal program for a cap and declining balance of NOx emissions. However, RECLAIM, as it currently exists, is in the SIP and complies with federal requirements applicable to market-type air pollution control programs, such as the Economic Incentive Program (EIP) guidelines.

Consequently, RECLAIM stands on-its-own and does not contain any duplicative or conflicting regulatory requirements.

**Incremental Cost-Effectiveness**

Health and Safety Code §40920.6 requires an incremental cost-effectiveness analysis for Best Available Retrofit Control Technology (BARCT) rules or emission reduction strategies when there is more than one control option which would achieve the emission reduction objective of the proposed amendments, relative to ozone, CO, SOx, NOx, and their precursors. The proposal to amend Rules 2001, 2002, 2007, 2009, 2010, 2011, and 2012 does not require specific emission controls or emission reduction strategies. The programmatic adjustments are based on BARCT levels, which considered cost-effectiveness.

In the evaluation of BARCT, not all equipment categories have a new BARCT level proposed. However, incremental cost-effectiveness was a consideration when a new BARCT level was identified for certain categories (the reader is referred to the Section III, BARCT Analysis, cost-effectiveness discussion for each equipment category with a new BARCT determination). For example, for boilers subject to Rule 1146, SCR was not accepted as BARCT due to both the cost-effectiveness and incremental cost of control. Based on cost-effectiveness, the level of control for this category was then identified as ultra-low NOx burners. An incremental cost analysis confirmed the rejection of SCR as a viable alternative. For refinery heaters and boilers a 5 ppm emission concentration from SCR control led to a bifurcation by equipment size. That is, SCR was not found cost-effective for units between 40 and 110 mmbtu/hr. For the larger than 110 mmbtu/hr units, SCR was identified to be cost-effective and therefore proposed as BARCT. In another example, a new BARCT level was determined for gas turbines. However, the reductions by SCR were found not to be cost-effective and the reductions were therefore not included in the programmatic reductions.

Table 12 contains a summary of the incremental cost-effectiveness of controls for the equipment categories identified as having new BARCT. As stated in Section III-B - BARCT Evaluation By Source Category, incremental cost effectiveness was not calculated for Rule 1109 refinery

boilers and heaters or for miscellaneous equipment. The cost-effectiveness for refinery boilers and heaters already accounts for reductions achieved by low NOx burners. The only candidate for control is SCR, therefore, there is no incremental cost-effectiveness. For miscellaneous equipment, Low-NOx burner technology is currently the most practical, available option to meet the BARCT limit. While it is technically feasible to use SCR to control NOx emissions from this type of equipment, it would require additional equipment to raise the exhaust temperature since this equipment operates at too low of temperatures for the SCR to operate efficiently. In addition, De-NOx was not considered a viable control technology for FCCUs because it increases other emissions (e.g., carbon monoxide and particulate matter) while reducing NOx and the refineries in the Basin that have used or are using it have or will be removing it.

Facilities are not required to install the new BARCT control equipment. Reductions are proposed to be implemented across-the-board and facilities have the flexibility to attain those reductions by choosing a lesser cost approach, such as purchasing RTCs, equipment modifications, controlling other equipment at the facility, or by some other means.

**Table 12**
**Incremental Cost Effectiveness of Control Options**

| Equipment Category | Control Technology | Present Value of Control Technology | Emission Reduction | Incremental Cost Effectiveness ($/ton) |
|---|---|---|---|---|
| FCCU | SCR 70% NOx Reduction | $96,600,000 | 14,000 tons/25yr | $4,800/ton |
| | SCR 85% NOx Reduction | $111,100,000 | 17,000 tons/25yr | |
| R1146 & 1146.1 Boilers/Heaters | Low NOx Burner | $121,000 - $160,000 | 20 tons/10yr | $55,000 - $74,000/ton |
| | SCR | $270,000 | 22 tons/10yr | |
| Metal Melting | Low NOx Burner | $41,000 | 6 tons/10yr | $46,000/ton |
| | SCR | $270,000 | 11 tons/10yr | |
| Heat Treating | Low NOx Burner | $30,000 | 3 tons/10yr | $60,000/ton |
| | SCR | $270,000 | 7 tons/10yr | |
| Rule 1135 Utility Boilers | SCR to 9 ppm | $5,900,000 | 820 tons/25yr | $5,200/ton |
| | SCR to 7 ppm | $6,600,000 | 960 tons/25yr | |

Equation:

(Present Value of Control Technology 1 - Present Value of control Technology 2) ÷ (Emission Reductions Control Technology 1- Emission Reductions Control Technology 2) = Incremental Cost Effectiveness

Note: Present Value of Control Technology is calculated using the same method as cost effectiveness. See Appendix B for more detail.

***FCCU Incremental Cost Effectiveness***

Incremental cost-effectiveness for fluid catalytic cracking units is based on varying control efficiency from 70% to 85% and is $8,320 per ton for a 10 year life, $6,500 per ton for a 15 year life, and $4,800 per ton for a 25 year life. The Tier I level for control efficiency was 70%. SCR technology has improved since the beginning of RECLAIM and is now capable of 85% or greater control efficiency.

***Rule 1146 & 1146.1 Boilers/Heaters Incremental Cost Effectiveness***

The incremental cost-effectiveness for Rule 1146 and 1146.1 boilers and heaters was determined to be approximately $55,000 - $74,000/ton. This was based on Low-NOx burners and SCR control technologies. Low-NOx and ultra low-NOx burners can be used to achieve the new BARCT levels. SCR can also be used, but is much more expensive.

***Metal Melting and Heat Treating Incremental Cost Effectiveness***

An incremental cost-effectiveness analysis was performed for metal melting and heat treating. The incremental cost-effectiveness was determined to be approximately $46,000 and $60,000 per ton, respectively. This, as with Rule 1146 and 1146.1 boilers and heaters, was based on the difference between Low NOx burners and SCR control technologies.

***Rule 1135 Utility Boiler Incremental Cost Effectiveness***

An incremental cost effectiveness analysis was done for utility boilers based on different levels of SCR control efficiency. The analysis was performed to show the incremental cost between the Rule 2009 limit of 9 ppm and the achieved-in-practice BARCT level 7 ppm. The incremental cost was $10,400 per ton for 10 years, $ 7,600 per ton for 15 years, and $5,200 per ton.

***Rule 1109 Refinery Boilers and Heaters Incremental Cost Effectiveness***

The cost effectiveness calculation for refinery boilers and heaters is, in essence, an incremental cost effectiveness. It is based on the difference between the Rule 1109 limit of 25 ppm which can be attained by low NOx burners to the new BARCT level of 5 ppm attainable with SCR.

**Requirement to Make Findings Pursuant to California Health & Safety Code § 39616**

H&S Code § 39616(c) - Market-Based Incentive Programs, requires the AQMD Governing Board to make findings that, relative to the subsumed rules and control measures, the program: (1) achieves equivalent or greater emission reductions at equivalent or less cost; (2) has comparable enforcement and monitoring; (3) baseline methodology that treats all facilities equitably; (4) will not result in greater job loss or shift to lower skilled jobs; (5) promotes privatization of compliance and electronic availability of data; (6) does not delay compliance with the California Clean Air Act Amendments regarding the California ambient air quality standards; and (7) will not result in disproportionate impacts, in the aggregate, on sources in the program.

These findings were made for the original program adoption, reaffirmed in October 2000 (as required in §39616 upon the program's 7$^{th}$ year), and subsequently reaffirmed for all the later rule amendments. The Health and Safety Code also requires that these findings be ratified no

later than seven years after program adoption. This ratification occurred in October 2000. Findings will be made relative to the proposed amendments.

Staff has evaluated the effect of these proposed changes to RECLAIM relative to these criteria. RECLAIM was originally designed to meet projected emissions, in aggregate, from all RECLAIM facilities by 2010. The proposed emission reductions will programmatically achieve BARCT for all RECLAIM sources. The reductions in programmatic RTC holdings reflect BARCT, in aggregate, for several categories of equipment in RECLAIM.

Health and Safety Code § 39616(c)(1)

This section requires that a market-based incentive program 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 AQMD's plan for attainment. Reductions under RECLAIM, at the time of adoption, were based on the 1991 Air Quality Management Plan (AQMP), which was designed to achieve its targeted emission reductions by 2010. RECLAIM was originally 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.

Staff has identified six cost-effective BARCT measures that are beyond the 2000 ending emission factors adopted in 1993. If RECLAIM facilities all choose to install these controls, the costs would be equivalent to command-and-control. However, under RECLAIM, facilities have other options for compliance that would implicitly be more cost-effective than command-and-control. Otherwise, they would not be selected. See the socioeconomic report for a more detailed comparison of compliance costs between RECLAIM and command-and-control.

Health and Safety Code § 39616(c)(2)

This section requires a level of enforcement and monitoring to ensure compliance comparable to command-and-control type regulations that would have otherwise been adopted. 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 command-and-control regulatory program. 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.

The proposed amendments to the protocols, although administrative in nature, provide necessary flexibility to facilities (i.e., RATA testing and alternative testing for compliance demonstration) while ensuring the accuracy of emissions reporting by allowing web-based transfer of data and requiring quarterly emission reports from sources not listed on the facility permit.

Health and Safety Code § 39616(c)(3)
The findings regarding a baseline methodology that treats all facilities equitably are not affected by the proposed amendments. This element pertained to the program upon adoption relative to a baseline methodology that provided facilities appropriate credit so that sources which were modified prior to implementation of the program to reduce emissions are treated equitably.

Health and Safety Code § 39616(c)(4)
This section requires that a market-based incentive program will not result in greater job losses or more significant shifts from high- to low-skilled jobs compared to command-and-control measures. This finding was made in 1993 when RECLAIM was adopted and subsequent annual review has shown that there have been few job losses attributed to RECLAIM. As described previously, the flexibility of the program is expected to result in lower costs, which would also be expected to translate to less job losses. Similarly, a shift from high- to low-skilled jobs is not expected to occur due to these amendments. *The socioeconomic analysis for this effort will analyze job impacts relating to the proposed amendments, in particular the impacts relating to the reduction of RTC holdings and the installation of controls.*

Health and Safety Code § 39616(c)(5)
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. The proposed rule amendments include provisions to allow facilities to report emissions through the AQMD web site.

Health and Safety Code § 39616(c)(6)
This section requires that a market-based incentive program will not in any manner delay, postpone, or otherwise hinder AQMD progress in attaining state ambient air quality standards. The proposed amendments will contribute towards attainment of the standards through implementation of BARCT on a program basis. RECLAIM was designed to meet projected emission reductions from the facilities, in aggregate, by 2010. Key years for Reasonable Further Progress demonstrations include 2006 and 2010. 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 achieved the same emissions reductions as was projected to result from implementation of the subsumed rules and control measures by 2003. Further RECLAIM reductions are also more certain than the projected reductions from the subsumed rules and control measures due to currently available and cost-effective technologies. Thus, RECLAIM is not delaying attainment with state ambient air quality standards. As shown in the 2003 AQMP, the program will be equivalent for those years. In addition, Population Exposure goals are still met.

Health and Safety Code § 39616(c)(7)
This section requires that a market-based incentive program will not result in disproportionate impacts, measured on an aggregate basis, on those stationary sources included in the program compared to other permitted stationary sources in the AQMD's plan for attainment. The general program design features of RECLAIM have been retained and the key elements of the program are intact. The proposed amendments address additional emission reductions under the program

that are technically feasible and cost-effective, and which meet requirements under state law relative to all feasible measures, including BARCT, and represent what staff would propose as source-specific rules if RECLAIM did not exist. New BARCT incorporated into RECLAIM becomes all feasible measures for similar equipment at non-RECLAIM facilities. For example, AQMD plans to amend Rules 1146 and 1146.1 to reflect the technical evaluation done for RECLAIM. There is a process in place to eliminate potential discrepancies between RECLAIM and non-RECLAIM, such as the periodic review of RECLAIM (i.e., annual audits) and periodic SIP revisions to review all feasible measures. Therefore, the proposed amendments are not expected to result in any disproportionate impacts.

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