

심포지엄 2) 남가주지역에서의 대기질 관리

Air Quality Management in the South Coast Air Basin

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1. Introduction

There has been remarkable historical improvement in the air quality of the South Coast Air Basin for the past decades. Such improvement was possible because of continuous development and implementation of stringent air quality control measures throughout the Basin area. Yet, the air is far from meeting all federal and state air quality standards and is among the worst in the nation. To ensure continued progress toward clean air and comply with state and federal requirements, the South Coast Air Quality Management District(SCAQMD or the District) in conjunction with the California Air Resources Board(AQMD), the United States Environmental Protection Agency(US EPA), and Southern California Association of Governments(SCAG), has prepared the Final 2007 updates to its AQMP(2007 AQMP or 2007 Plan). The Final 2007 AQMP employs the most up-to-date science and analytical tools and incorporates a comprehensive strategy aimed at controlling pollution from all sources, including stationary sources, on-road and off-road mobile sources and area sources.

This paper presents the challenging task that the District is facing toward meeting the federal and state ambient air quality standards for $PM_{2.5}$ and 8-hour ozone by 2015 and 2024, respectively, and presents regulatory efforts the District is endeavoring to be in compliance with the standards by the deadlines through implementation of the Final 2007 AQMP.

2. Air Quality

Over the years, the air quality in the Basin has improved significantly through the comprehensive control strategies implemented to reduce pollution from mobile and stationary sources. For instance, the total number of days on which the Basin exceeds the federal 8-hour ozone standard has decreased dramatically over the last two decades from about 150 days to less than 90 while Basin-station-days decreased by approximately 80 percent. However, the Basin still exceeds the federal 8-hour standard more frequently than any other locations in the U.S. Under federal law, the Basin is designated as a "severe-17" nonattainment area for the 8-hour ozone standard.

In 2005, the annual $PM_{2.5}$ standard was exceeded at several locations throughout the Basin. However, the 24-hour $PM_{2.5}$ standard(98th percentile less than $65\mu g/m^3$) was not exceeded during the year. In 2005, the Basin did not exceed the standards for carbon monoxide, nitrogen dioxide, sulfates or lead.

The Basin has met the PM_{10} standards at all stations except for western Riverside where the annual PM_{10} standard has not been met as of 2006. Additional efforts, through localized programs, are under way to ensure compliance with this standard.

3. Emission Inventory

An emission inventory of air pollutants and their sources is essential to identify the major contributors of air contaminants and the measures required to reduce air pollution. 2002 is the base

year used to project future year(2014/2023) emissions for the Final 2007 AQMP. The 2002 base year emissions inventory reflects adopted AQMD air regulations that are implemented as of June 30,2006 and most CARB rules adopted by June 2005. Future baseline emissions inventories incorporate adopted rules with post-June 30, 2006 compliance dates and demographic and economic growth projections provided by the SCAG. Table 1 presents the four major classifications of the inventory and estimation methods.

Table 1. Classification of Emission Inventory and Its Estimation.

Classification	Method of Estimation
The Base Year(2002) Baseline Emissions	
· Point source	- Reported data from permitted facilities.
· Area source	- Jointly developed by the CARB and District.
· Off-road emissions	- Jointly developed by the CARB and District using OFFROAD model and adjustments.
· On-road emissions	- Calculated from the CARB EMFAC2007 V2.3 emission factors and SCAG's transportation activity data.
The Future(2014/2023) Baseline Emissions	- Estimated using demographic and economic growth factors.

Over the years, significant improvements have been made to quantify emission sources upon which control measures are developed. Increased use of continuous monitoring and source tests, as well as technical assistance to facilities and auditing of reported emissions by the District, has contributed to the improvements in point source inventories. Notwithstanding these improvements, there are still areas that may not have been adequately addressed. For instance, area source inventories that rely on average emission factors and regional activities have inherent uncertainty. Industry-specific surveys or source-specific studies during rule development have provided much needed refinement to the emission estimates. Mobile source inventories remain the greatest challenge due to the high number and types of equipment and engines involved, in-use performance vehicles, and complex emission characteristics. Relative to future growth, there are many challenges with making accurate projections.

4. Control Strategy

The overall control strategy for this Final Plan is designed to meet applicable federal and state requirements, including attainment of ambient air quality standards. The focus of the Plan is to demonstrate attainment of the federal PM_{2.5} ambient air quality standard by 2015 and the federal 8-hour ozone standard by 2024, while making expeditious progress toward attainment of state standards.

Ammonium nitrates and ammonium sulfates represent a dominant fraction of PM_{2.5} components and are formed in the atmosphere through secondary reactions of precursor emissions of NO_x, SO_x, and ammonia. Based on the District's modeling sensitivity analysis, SO_x reductions, followed by directly-emitted PM_{2.5} and NO_x reduction, provide the greatest benefits in terms of reducing the ambient PM_{2.5} concentrations. VOC reductions can contribute to improvements in ambient PM_{2.5} air quality but are of lesser effectiveness yet are critical for making progress toward the 8-hour ozone

attainment.

Based on the District's modeling analysis, the estimated reduction targets for PM_{2.5} attainment are approximately 192 tons per day (t/d) of NO_x, 24t/d of SO_x, 15t/d of PM_{2.5}, and 59t/d of VOC from the average annual day emission inventories in 2014, while the reduction targets for the 8-hour ozone attainment are estimated at 116t/d of VOC and 383t/d of NO_x from the projected summer planning emission inventories in 2023. The PM_{2.5} attainment strategy is based on the implementation of short-term and mid-term control measures by the District as well as the CARB's revised draft proposed state strategy. In addition to the above-mentioned control measures, long-term measures are also required for the 8-hour ozone strategy, referring to measures which are based on further development and improvement of known low- and zero-emission control technologies in addition to new technological advancement. Tables 2 and 3 present emission reductions which are required to attain 2014 PM_{2.5} standard and 2023 ozone standard, respectively.

Table 2. Emission reduction targets for 2014 based on average annual day emissions inventory(tons per day).

Sources	VOC	NO _x	CO	SO _x	PM _{2.5}
Year 2014 baseline	528	654	2,577	43	102
Emission reductions:					
District's control measures	10	7	17	3	3
CARB's revised draft proposed state strategy	43	122	--	20	9
District staff's proposed additional mobile source control measures	6	63	12	1	3
Total reductions (all measures)	59	192	29	24	15
2014 remaining emissions ¹	469	454	2,548	19	87

¹Reflects baseline inventory adjustments.

Table 3. Emission reduction targets for 2023 based on summer planning emissions inventory(tons per day).

Sources	VOC	NO _x
Year 2023 baseline	536	506
Emission reductions:		
District's control measures	19	9
CARB's revised draft proposed state strategy	54	141
District staff's proposed additional mobile source control measures	16	43
Long-term measures	27	190
Total reductions (all measures)	116	383
2023 remaining emissions ¹	420	114

¹Reflects baseline inventory adjustments.

5. Conclusion

The overall control strategy in the AQMP provides a path to achieving emission reductions and air quality goals. Although great strides have been made in air pollution control technologies and

emission reduction programs, air quality goals cannot be achieved without significant further emission reductions. Implementation of the Final 2007 AQMP will be based on a series of control measures and strategies that vary by source type as well as the pollutant that is being targeted.

Without an aggressive control strategy and close collaboration of efforts among the federal, state, and regional governments, local agencies, business, and the public, the PM_{2.5} and 8-hour ozone standards will not be likely achieved.

References

SCAQMD (2007) Final 2007 Air Quality Management Plan, South Coast AQMD, June 2007.