

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Socioeconomic Impact Assessment for

Proposed Amended Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters
Proposed Amended Rule 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters;
Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters; and
Proposed Rule 1100 - Implementation Schedule for NO_x Facilities

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EXECUTIVE SUMMARY

A socioeconomic analysis was conducted to assess the potential impacts of Proposed Amended Rules (PAR) 1146, 1146.1, and 1146.2 (collectively referred to herein as the PAR 1146 Series), and Proposed Rule (PR) 1100 on the four-county region of Los Angeles, Orange, Riverside and San Bernardino. A summary of the analysis and findings is presented below.

<p>Elements of Proposed amendments</p>	<p>SCAQMD staff has begun the process of transitioning equipment at NOx Regional Clean Air Incentives Market (RECLAIM) facilities from a facility permit structure to an equipment-based command-and-control regulatory structure per SCAQMD Regulation XI – Source Specific Standards. PAR 1146 Series will be the first set of rules to be amended to initiate the transition of equipment from the NOx RECLAIM program to a command-and-control regulatory structure while achieving Best Available Retrofit Control Technology (BARCT). PAR 1146 Series would include proposed amendments to Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; and Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters. In addition, SCAQMD staff has developed PR 1100, an administrative rule which establishes the compliance schedule for facilities exiting the RECLAIM program.</p>
<p>Affected Facilities and Industries</p>	<p>The PAR 1146 Series would affect 105 facilities with at least one boiler or heater (a total of 302 units) within SCAQMD’s jurisdiction. Of these 105 affected facilities, 68 are located in Los Angeles County, 22 in Orange County, five in Riverside, and the remaining 10 facilities are in San Bernardino County. The PAR 1146 Series would affect a wide variety of operations in many sectors of economy such as manufacturing and non-manufacturing sectors.</p> <p>Among the 105 affected facilities, the sectors affected the most are transportation equipment (North American Industrial Classification Code (NAICS) 336) with approximately ten percent, food manufacturing (NAICS 311) with approximately nine percent, textile mills manufacturing (NAICS 313) with approximately nine percent, and pipeline transportation (NAICS 486), paper manufacturing (NAICS 322), and petroleum and coal product manufacturing each with approximately eight percent of the total affected facilities, respectively. The remaining 48 percent of the affected facilities are spread among a large number of sectors in the economy.</p>
<p>Assumptions of Analysis</p>	<p>The Final Socioeconomic Report for the 2005 RECLAIM fully analyzed the socioeconomic impacts of installing selective catalytic reduction (SCR) units and ultra-low NOx burners (ULNB) (the same type of technologies) that are currently proposed under the PAR 1146 Series. However, few of the RECLAIM facilities actually installed the control equipment, achieving required BARCT emission reductions in other ways. Thus, for many of these RECLAIM facilities, they will actually undertake these costs of installation for the first time. Costs of installation and the current socioeconomic conditions have changed since 2005. As a result, staff</p>

	<p>conservatively analyzed these socioeconomic impacts using, to the extent data is available, current costs under the current socioeconomic conditions.</p> <p>PAR 1146 and 1146.1 would require 72 out of 105 facilities to meet emission limits by the compliance date of 2023. Ten out of these 105 facilities would be eligible for the deferred compliance option, and the remaining 23 facilities would be subject to change in Monitoring and Reporting and Recording (MRR) requirements after they exit from the RECLAIM program.</p> <p>Under PAR 1146 (Group I), it was assumed that three facilities would need to meet the NOx limits by SCR retrofits for six units. The average capital cost of a SCR unit is estimated at \$500,000 (including installation). Each SCR unit is assumed to last for 25 years. Each SCR unit is due for a catalyst replacement every five years. The cost of catalyst replacement is assumed to be about one third of the equipment cost of an SCR unit (\$100,000).</p> <p>Under PAR 1146 (Group II and III), it is assumed that 71 facilities would need to meet the NOx limits by ULNBs to achieve the existing limits for Group II and III natural gas units. The average capital and installation costs of retrofitting boilers with ULNBs are estimated at \$117,000 and \$78,000 (including installation) per unit for Group II and Group III, respectively. Each burner is assumed to last for 15 years. The incremental cost of monitoring is assumed to be minimal.</p> <p>PAR 1146 would require the affected owners of Group I, Group II, and Group III units to apply for permit modifications and pay a one-time permit application fee of \$7,823, \$7,314, and \$4,930, respectively. Additional annual operating and maintenance costs of PAR 1146 would include operating and maintenance, catalyst replacement (every five years), electricity, and ammonia usage for the applicable SCR and ULNB units.</p> <p>The additional annual maintenance cost for each SCR for Group I and a ULNB for Group II and Group III unit is estimated at \$6,000 and \$500, respectively. The cost of electricity is assumed to be \$0.15 per Kw/hr. The cost of catalyst replacement is assumed to be about one third of the equipment cost of an SCR unit (\$100,000). Based on a 50 percent annual capacity and 8,760 hours of annual operation, additional costs of ammonia usage for Group I units is estimated at \$4,800.</p> <p>Under PAR 1146.1, it was assumed that ten affected facilities will need to meet the NOx limits by ULNBs to achieve the existing rule limits. The average capital and installation costs of retrofitting boilers with ULNBs is estimated at \$51,000 (including installation) per unit. Each burner is assumed to last for 15 years.</p> <p>PAR 1146.1 would require the owners of the affected units to apply for permit modifications and pay a one-time permit application fee of \$3,117. Additional annual operating and maintenance costs of PAR 1146.1 would include general maintenance and electricity for applicable ULNB units. The additional annual maintenance cost for</p>
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	<p>each ULNB is estimated at \$500. The annual cost of electricity for each unit is assumed to be \$590 (\$0.15 per Kw/hr).</p> <p>Under PAR 1146.2, it was assumed that four facilities will need to need to meet the NOx limits by ULNBs. Due to the lack of information available on the universe of affected sources under PAR 1146.2, and to account for the potential cost impacts of those affected facilities with non-permitted units, staff has included additional ULNB costs for a total of 850 units (estimated based on the equipment data provided from facility responses of initial determination notifications as of April 2018) to account for the non-permitted units that could be impacted by PAR 1146.2.</p> <p>The average capital and installation cost of retrofitting a boiler with a ULNBs is estimated at \$20,500 (including installation). Each burner is assumed to last for 15 years. Additional annual operating and maintenance costs of PAR 1146.2 would include the incremental electricity cost for applicable ULNB units. The annual cost of electricity for each unit is assumed to be \$590 (\$0.15 per Kw/hr).</p> <p>PR 1100 is an administrative rule and does not impose additional costs to affected facilities, as such, no additional costs or socioeconomic impacts were assumed here.</p>
<p>Compliance Costs</p>	<p>The main requirements of the PAR 1146 Series that have cost impacts for affected facilities would include one-time costs and annual recurring costs. The one-time costs would include capital and installation of SCRs, ULNBs, and one-time permit modifications. Annual recurring cost estimates include additional operating and maintenance costs of SCRs and ULNBs, catalysts replacement, additional electricity, and additional ammonia usage.</p> <p>The average annual cost of the PAR 1146 Series is estimated at \$3.7 to \$4.3 million between 2020 and 2045. Annual costs of installing SCRs and ULNBs would result in about \$2.40 million (65%) to \$3.02 million (69%) of overall annual compliance costs. The majority of the cost (\$2.4 to \$2.67 million or 64% to 61%) is expected to be incurred due to PAR 1146 (Group I, II, and III). The average annual costs of PAR 1146.1 is estimated to be \$0.09 to \$0.1 million and that of PAR 1146.2 is estimated to be \$1.26 to \$1.76 million, respectively.</p> <p>The majority of the overall annual compliance costs is expected to be incurred by the food and beverage sector (17%), utility sector (14 %), air craft and transportation manufacturing (9%), textile product mills (9%), paper manufacturing (8%), and pipeline transportation by (8%). The cost-effectiveness of the PAR 1146 Series is estimated at \$9,000 to \$30,000 based on the Discount Cash Flow (DCF) method and \$12,000 to \$45,000 based on the Levelized Cash Flow method.</p>

	<table border="1"> <thead> <tr> <th data-bbox="488 195 928 233">Proposed Amendments</th> <th data-bbox="932 195 1133 233">DCF (\$/ton)</th> <th data-bbox="1133 195 1479 233">LCF (\$/ton)</th> </tr> </thead> <tbody> <tr> <td data-bbox="488 233 928 273">Rule 1146-Group I</td> <td data-bbox="932 233 1133 273">\$30,000</td> <td data-bbox="1133 233 1479 273">\$45,000</td> </tr> <tr> <td data-bbox="488 273 928 312">Rule 1146-Group II</td> <td data-bbox="932 273 1133 312">\$25,000</td> <td data-bbox="1133 273 1479 312">\$44,000</td> </tr> <tr> <td data-bbox="488 312 928 352">Rule 1146-Group III</td> <td data-bbox="932 312 1133 352">\$20,000</td> <td data-bbox="1133 312 1479 352">\$40,000</td> </tr> <tr> <td data-bbox="488 352 928 392">Rule 1146.1</td> <td data-bbox="932 352 1133 392">\$36,000</td> <td data-bbox="1133 352 1479 392">\$73,000</td> </tr> <tr> <td data-bbox="488 392 928 432">Rule 1146.2</td> <td data-bbox="932 392 1133 432">\$9,000</td> <td data-bbox="1133 392 1479 432">\$12,000</td> </tr> </tbody> </table>	Proposed Amendments	DCF (\$/ton)	LCF (\$/ton)	Rule 1146-Group I	\$30,000	\$45,000	Rule 1146-Group II	\$25,000	\$44,000	Rule 1146-Group III	\$20,000	\$40,000	Rule 1146.1	\$36,000	\$73,000	Rule 1146.2	\$9,000	\$12,000	
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<p>Jobs and Other Socioeconomic Impacts</p>	<p>The cost-effectiveness of the overall PAR 1146 Series is estimated at \$12,000, and \$26,000 for DCF and LCF, respectively.</p> <p>Based on the above assumptions, the compliance cost of the PAR 1146 Series, and the application of the Regional Economic Models, Inc. (REMI) model, it is projected that an average of 50 to 60 jobs will be forgone annually, on average, between 2020 and 2045. The projected jobs loss impacts represent about 0.005 percent of the total employment in the four-county region.</p> <p>The sectors of pipeline transportation (NAICS 486), textile mills and products (NAICS 313), transportation equipment (NAICS 336), and food services (NAICS 311) are projected to incur a portion of compliance costs and thus experience some jobs forgone. The reduction in disposable income would dampen the demand for goods and services in the local economy, thus resulting in a small number of jobs forgone projected in sectors such as construction (NAICS 23), retail trade (NAICS 44-45), wholesale (NAICS 42), and accommodation and food services (NAICS 72). The remainder of the projected reduction in employment would be across all major sectors of the economy from secondary and induced impacts of the PAR 1146 Series.</p>																			
<p>Competitiveness</p>	<p>It is projected that the manufacturing sector, where most of the affected facilities belong, would experience a rise in its relative cost of services and its delivered price by 0.001 percent in 2035. While these changes are relatively small, it should be noted that the delivered price change is a change in the index of all prices in the manufacturing sector. Delivered prices that a facility may charge for specific goods or services may increase at a greater rate than this, allowing incurred cost to be passed through to downstream industries and end-users. The rest of the sectors would experience minor increases in the relative cost of production and relative delivered price with respect to their counterparts in the rest of the U.S.</p>																			
<p>Impacts of CEQA Alternatives</p>	<p>There are five CEQA alternatives associated with the PAR 1146 and 1146.1. Alternative A, the no project alternative, means that the current version of Rules 1146, 1146.1, and 1146.2 would remain in effect. Under Alternative B (less stringent), the compliance deadline for meeting the NOx emissions limits would be extended by one year. Under Alternative C (more stringent), the NOx emission limits would remain the same as the proposed project, but facilities would need to meet 100 percent compliance by January 1, 2021. Under Alternative D, the Group I units would need to meet nine ppm or (0.011 lb per MMBtu) instead of five ppm (0.0062 lb per MMBtu) and as a result they are expected to meet the NOx limits by ULNBs instead of SCRs. With Alternative E, the NOx emission limit would be more stringent for units with a rated heat input of greater than or equal to 40 MMBtu per hour and less than 75 MMBtu per hour. This alternative would include a subset of Group II units that would</p>																			

	<p>be subject to the same NOx emissions limits as Group I units of five ppm and assumed to meet the requirements through SCR retrofits.</p> <p>Average annual compliance costs for the CEQA alternatives range from \$4.1 to \$5 (high-end 4 %) million between 2020 and 2045. The cost-effectiveness of the PAR 1146 and 1146.1 and CEQA Alternatives range from \$11,000 to \$13,000 per ton of NOx reductions. Average annual jobs forgone for the CEQA alternatives range from 56 to 63 between 2020 and 2045.</p>
<p>Potential NOx RTC Market Impacts</p>	<p>Currently, there are 36 facilities in operation which have received an initial determination notification. If PAR 1146, 1146.1, and 1146.2 are adopted, 26 additional facilities (62 total) are expected to receive an initial determination notification because, according to staff’s evaluation, all of their permitted RECLAIM NOx source equipment will be subject to these rules once the proposed amendments are adopted.</p> <p>These 62 affected facilities currently account for only about one percent of annual NOx emissions and two percent of NOx RECLAIM Trading Credits (RTCs) holdings in the NOx RECLAIM universe. As such, staff concludes that these facilities’ compliance with Rule 2002(f)(9) would have a very small impact, if any, on the demand and supply of NOx RTC market. Specifically, while the transition of the 62 facilities out of the NOx RECLAIM program could potentially assert upward pressure on the discrete-year NOx RTC prices, it is unlikely to result in large price fluctuations in the NOx RTC market, nor is the transition expected to significantly affect the remaining NOx RECLAIM facilities that are not yet ready to exit the market-based program.</p>

INTRODUCTION

As a result of control measure CMB-05 from the SCAQMD's 2016 Air Quality Management Plan (AQMP) and Assembly Bills (AB) 617 and 398, SCAQMD staff has been directed by the Governing Board to begin the process of transitioning equipment at NOx RECLAIM facilities from a facility permit structure to an equipment-based command-and-control regulatory structure per SCAQMD Regulation XI – Source Specific Standards.

The PAR 1146 Series in combination with PR 1100 will transition affected units at NOx RECLAIM facilities to a command-and-control regulatory structure. The PAR 1146 Series would: 1) expand the applicability to include units that were not previously required to comply with Rules 1146/1146.1 because they were in the NOx RECLAIM program; 2) require RECLAIM facilities to submit a permit application for each unit that does not currently meet the NOx concentration limits in Rules 1146/1146.1; 3) require the affected equipment to meet the applicable NOx concentration limit for all Rule 1146/1146.1 units for a minimum of 75 percent of the total heat input by January 1, 2021 and 100 percent of the total heat input by January 1, 2022; 4) require RECLAIM facilities replacing Rule 1146/1146.1 units to notify the Executive Officer which unit(s) will be replaced; and 5) require RECLAIM facilities with Rule 1146.2 units to meet the rule's NOx emission limits by December 31, 2023 if a more stringent BARCT limit as determined by a technology assessment is not applicable.

In addition, SCAQMD staff has developed Proposed Rule (PR 1100), an administrative rule which establishes the compliance schedule for the PAR 1146 Series facilities exiting the RECLAIM program. The compliance schedule for PAR 1146 and 1146.1 will be a two-year period depending on the equipment size and number of affected units at each facility. Implementation of the proposed project is estimated to reduce NOx emissions by 0.16 ton per day by January 1, 2023.

LEGISLATIVE MANDATES

The Socioeconomic impact assessments at SCAQMD have evolved over time to reflect the benefits and costs of regulations. The legal mandates directly related to the assessment of the proposed rule include the SCAQMD Governing Board resolutions and various sections of the California Health & Safety Code (H&SC).

SCAQMD Governing Board Resolutions

On March 17, 1989 the SCAQMD Governing Board adopted a resolution that calls for an economic analysis of regulatory impacts that includes the following elements:

- Affected industries
- Range of probable costs
- Cost effectiveness of control alternatives
- Public health benefits

Health & Safety Code Requirements

The state legislature adopted legislation that reinforces and expands the Governing Board resolutions for socioeconomic impact assessments. H&SC Sections 40440.8(a) and (b), which became effective on January 1, 1991, require that a socioeconomic analysis be prepared for any proposed rule or rule amendment that "will significantly affect air quality or emissions limitations." Specifically, the scope of the analysis should include:

- Type of affected industries
- Impact on employment and the regional economy
- Range of probable costs, including those to industry
- Availability and cost effectiveness of alternatives to the rule
- Emission reduction potential
- Necessity of adopting, amending or repealing the rule in order to attain state and federal ambient air quality standards

H&SC Section 40728.5, which became effective on January 1, 1992, requires the SCAQMD Governing Board to actively consider the socioeconomic impacts of regulations and make a good faith effort to minimize adverse socioeconomic impacts. It also expands Socioeconomic Impacts Assessments to include small business impacts, specifically:

- Type of industries or business affected, including small businesses
- Range of probable costs, including costs to industry or business, including small business

Finally, H&SC Section 40920.6, which became effective on January 1, 1996, requires that incremental cost effectiveness be performed for a proposed rule or amendment that imposes Best Available Retrofit Control Technology or "all feasible measures" requirements relating to ozone, carbon monoxide (CO), oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and their precursors. Incremental cost effectiveness is defined as the difference in costs divided by the difference in emission reductions between a control alternative and the next more stringent control alternative.

The necessity analysis and the analysis of control alternatives and their incremental cost-effectiveness are presented in the Staff Report prepared for the proposed amendments.

REGULATORY HISTORY

Rule 1146, which was originally adopted in September 1988, established a 40 ppm NO_x emission limit for units with an annual heat input greater than 90,000 therms. Since the original adoption, the rule has been amended four times. The January 1989 amendments lowered the NO_x emission limit to 30 ppm for units with rated heat input greater or equal to 40 million Btu/hr. The costs associated with this amendment included the retrofitting cost of boilers and heaters with Selective Catalytic Reduction (SCR) and Fuel Gas Recirculation (FGR). The total annualized cost of this amendment was estimated at \$44,500 to \$445,400. The January 1989 amendment were estimated

to reduce 0.5 ton of NO_x per day with an average cost-effectiveness of \$19,377 per ton of NO_x reduced.

The May 1994 amendments added a tune-up procedure for natural-draft combustion units. The procedure had no cost or emission reductions associated with it because it had already been commonly used by operators of natural-draft units. In June 2000, Rule 1146 was amended to exempt one facility that exceeded the 90,000 therm fuel usage threshold from the NO_x emission limit provided certain conditions were met. The amendment provided relief to the subject facility.

The rule amendments in November 2000 lowered the NO_x limit from 40 to 30 ppm for units with rated heat input less than 40 million Btu/hr and burning gaseous fuel only, added annual testing requirement, and required fuel flow meters for all units. The total annualized cost of the proposed amendments was estimated at \$790,900. The amendments resulted in a reduction of 91 tons of NO_x emissions per year with a cost-effectiveness of \$7,000 per ton of NO_x reduced.

The September 2008 amendments lowered NO_x emission limits from boilers, steam generators, and process heaters. Specifically, the amendments lowered NO_x limits from 30 to 25 ppm for any units fired on landfill gas and 15 ppm for any units fired on digester gas. For units burning gaseous fuel other than digester and landfill gases, the amendments required NO_x limits of 5 ppm for Group I (75 million Btu/hr or greater) units and 9 ppm for the Group II (at least 20 but less than 75 million Btu/hr) and Group III (from 5 to less than 20 million Btu/hr except atmospheric units) units, respectively. Atmospheric units were required to meet a 12 ppm NO_x limit. It was expected that the amendments to reduce 1.2 tons per day of NO_x emissions by 2015 will be achieved with an overall cost-effectiveness of \$21,750 per ton of NO_x reduced.

The PAR 1146 Series will be the first set of rules to be amended to initiate the transition of equipment from the NO_x RECLAIM program to a command-and-control regulatory structure while achieving BARCT. The Final Socioeconomic Report for the 2005 RECLAIM fully analyzed the socioeconomic impacts of installing SCRs and ULNBs; the same type of technologies which will be used to comply with the amendments currently proposed for the PAR 1146 Series. However, few of the RECLAIM facilities actually installed the control equipment, achieving required BARCT emission reductions in other ways. Thus, for many of these RECLAIM facilities, they will actually undertake these costs of installation for the first time. Costs of installation and the current socioeconomic conditions have changed since 2005. As a result, staff will now analyze these socioeconomic impacts using, to the extent data is available, current costs under the current socioeconomic conditions.

The Final Socioeconomic Report for the 2016 AQMP fully analyzed the socioeconomic impacts for the 2016 AQMP, including the entire RECLAIM Transition project. CMB-05- Further NO_x Reductions from RECLAIM Assessment-was presented in the Final Socioeconomic Report where the potential cost of reducing five tons per day NO_x emissions were estimated and the associated regional economic impacts projected. Specifically, the costs presented were scaled from a thorough BARCT assessment conducted as part of the 2015 NO_x RECLAIM Amendments, and the analysis conservatively assumed that the estimated cost per ton of NO_x emission reduction would be 50 percent higher (\$17,000 to \$28,000) than the cost-per-ton estimate of installing all

BARCT control equipment identified in the 2015 NO_x RECLAIM Amendments. That analysis is consistent with applicable Governing Board resolutions and statutory requirements.

Proposed Amendments to Rule 1146, 1146.1, 1146.2, and Proposed Rule 1100

The proposed amendments will affect Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; and Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters.

Rule 1146 applies to boilers, steam generators, and process heaters of equal to or greater than 5 million BTUs per hour of rated heat input capacity used in all industrial, institutional, and commercial operations with the exception of boilers used by electric utilities to generate electricity (or electricity generating facilities, EGFs), boilers and process heaters with a rated heat input capacity greater than 40 million BTUs per hour that are used in petroleum refineries, sulfur reaction plant boilers, and units operated at RECLAIM facilities pertaining to NO_x emissions only.

Rule 1146.1 applies to boilers, steam generators, and process heaters that are greater than 2 million BTUs per hour and less than 5 million BTUs per hour of rated heat input capacity used in any industrial, institutional or commercial operation with the exception of boilers operated at RECLAIM facilities pertaining to NO_x emissions only. Rule 1146.2 applies to large water heaters and small boilers and process heaters with a rated heat input capacity up to and including 2,000,000 BTUs per hour. There are both manufacturer and end-user requirements contained in the rule.

PR 1100 would establish the implementation schedule for Regulation XX NO_x RECLAIM facilities that are transitioning to a command-and-control regulatory structure. PR 1100 would apply to units that would be subject to the emission requirements of PARs 1146 and 1146.1. Definitions for a Rule 1146 unit and a Rule 1146.1 unit are included in PR 1100 that make reference to the definition of boiler and process heater contained in both Rule 1146 and Rule 1146.1. In addition, a definition for Industry-Specific Category has been specified that would list the types of RECLAIM facilities that would not be subject to the requirements of PR 1100.

AFFECTED INDUSTRIES

Among the 266 facilities currently in the NO_x RECLAIM program, approximately 105 RECLAIM facilities with at least one boiler or heater (a total of 302 permitted units) will be affected by PAR 1146 Series and PR 1100. Of these 105 affected facilities, 68 are located in Los Angeles County, 22 in Orange County, five in Riverside, and the remaining 10 facilities are in San Bernardino County.

PAR 1146 and 1146.1 would require 72 out of 105 facilities to meet the emission limits for 164 pieces equipment by the compliance date of 2023. Ten out of these 105 facilities would be eligible for the deferred compliance option, and the remaining 23 facilities would be subject to Monitoring, Reporting, and Recording (MRR) requirements of the PAR 1146 Series which imposes no

additional costs. Table 1 identifies the industry sectors, as classified by the NAICS, and the number of respective units subject to PAR 1146 Series and PR 1100.

Figure 1 and Table 1 present the industry classification and number of affected facilities by industry types. Among the 105 affected facilities, the sectors affected the most are transportation equipment (NAICS 336) with approximately ten percent, food manufacturing (NAICS 311) with approximately nine percent, textile mills manufacturing (NAICS 313) with approximately nine percent, and pipeline transportation (NAICS 486), paper manufacturing (NAICS 322), and petroleum and coal product manufacturing with each approximately eight percent of the total affected facilities, respectively. The remaining 48 percent of the affected facilities are spread among a large number of sectors in the economy.

Figure 1
Distribution of Affected Facilities by Industries

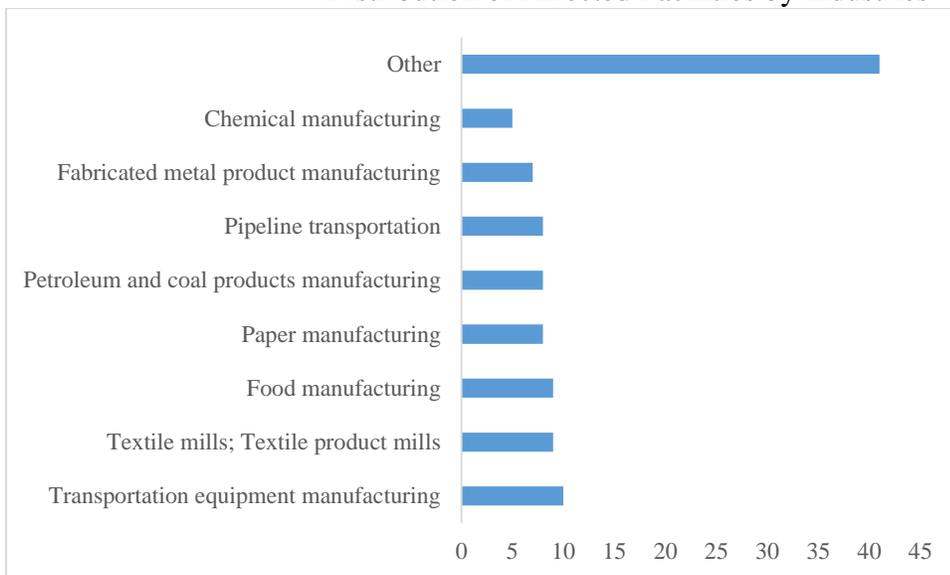


Table 1
Potentially Affected facilities by Industry

Industry	NAICS	Number of Facilities
Oil and gas extraction	211	4
Mining (except oil and gas)	212	1
Utilities	22	6
Nonmetallic mineral product manufacturing	327	2
Primary metal manufacturing	331	4
Fabricated metal product manufacturing	332	7
Computer and electronic product manufacturing	334	3
Other transportation equipment manufacturing	3364-3369	10
Miscellaneous manufacturing	339	1
Food manufacturing	311	9
Beverage and tobacco product manufacturing	312	2
Textile mills; Textile product mills	313-314	9
Paper manufacturing	322	8
Petroleum and coal products manufacturing	324	8
Chemical manufacturing	325	5
Plastics and rubber product manufacturing	326	3
Wholesale trade	42	2
Retail trade	44-45	2
Pipeline transportation	486	8
Scenic and sightseeing transportation and support activities for transportation	487-488	1
Monetary authorities - central bank; Credit intermediation and related activities; Funds, trusts, & other financial vehicles	521-522, 525	1
Real estate	531	1
Administrative and support services	561	3
Amusement, gambling, and recreation	713	1
Accommodation	721	1
Food services and drinking places	722	1
Personal and laundry services	812	1
State and Local Government	92	1
Total		105

Small Businesses

The SCAQMD defines a "small business" in Rule 102, for purposes of fees, as one which employs 10 or fewer persons and which earns less than \$500,000 in gross annual receipts. The SCAQMD also defines "small business" for the purpose of qualifying for access to services from SCAQMD's Small Business Assistance Office (SBAO) as a business with an annual receipt of \$5 million or less, or with 100 or fewer employees. In addition to SCAQMD's definition of a small business, the federal Clean Air Act Amendments (CAAA) of 1990 and the federal Small Business Administration (SBA) also provide definitions of a small business.

The CAAA classifies a business as a "small business stationary source" if it: (1) employs 100 or fewer employees, (2) does not emit more than 10 tons per year of either VOC or NOx, and (3) is a small business as defined by SBA. The SBA definitions of small businesses vary by the six-digit NAICS codes. In general terms, a small business must have no more than 500 to 1,000 employees for most manufacturing industries, and no more than \$7 million in average annual receipts for most nonmanufacturing industries.¹ For example, a business in the industry of paper manufacturing, (NAICS 322120) with fewer than 750 employee, chemical manufacturing (325110) with fewer than 1,000 employees, and textile and Fabric Finishing manufacturing with fewer than 1,000 employees are considered small businesses by SBA.

Out of the 105 affected facilities within the SCAQMD's jurisdiction, information on sales and employees for 54 facilities were available, based on 2018 Dun and Bradstreet data. Under the SCAQMD definition of small business, there are eight small businesses affected by PAR 1469. Using the SBA definition of small business for the manufacturing sector, 54 of the facilities are considered small businesses. Under the CAAA definition of small business, 46 facilities are considered small businesses since eight out of these 54 facilities have the annual emissions in excess of 10 tons of VOC or NOx.

COMPLIANCE COST

The main requirements of the PAR 1146 Series that have cost impacts for affected facilities would include one-time costs and annual recurring costs. The one-time costs would include capital and installation of SCRs, ULNBs, and one-time permit modifications. Annual recurring cost estimates include annual operating and maintenance costs of SCRs and ULNBs, catalysts replacement, additional electricity, and additional ammonia usage.

The average annual cost of the PAR 1146 Series is estimated at \$3.7 to \$4.3 million between 2020 and 2045. The majority of the cost (\$2.4 to \$2.67 million or 64% to 61%) is expected to be incurred by due to PAR 1146 (Group I, II, and III). The average annual costs of PAR 1146.1 is estimated at 0.09 to \$0.1 million and that of PAR 1146.2 is estimated at \$1.26 to \$1.76, respectively.

The majority of the overall annual compliance costs is expected to be incurred by the food and beverage sector (17%), utility sector (14 %), air craft and transportation manufacturing (nine percent), textile product mills (nine percent), paper manufacturing (eight percent), and pipeline transportation by (eight percent).

Staff has used the following sources to estimate costs of capital, installation, operating and maintenance of SCRs and ULNBs:

- 1) Final Staff Report for Proposed Amended Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters, September 5, 2008,

¹ See the SBA website (<http://www.sba.gov/community/blogs/community-blogs/small-business-matters/what-small-business-what-you-need-know-and-wh>). The latest SBA definition of small businesses by industry can be found at <http://www.sba.gov/content/table-small-business-size-standards>.

- 2) Final Staff Report for Proposed Amended Rule 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters, September 5, 2008
- 3) Final Socioeconomic Report for Proposed Amended Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters, September 5, 2008,
- 4) Final Staff Report to Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters May 5, 2006.
- 5) Vendors cost estimates²

PAR 1146

Under PAR 1146, it was assumed that an additional three facilities would meet the NOx limits by SCR retrofits for six units.* The average capital cost of a SCR unit is estimated at \$500,000 (including installation). Each SCR unit is assumed to last for 25 years. Each SCR unit is due for a catalyst replacement every five years. The cost of catalyst replacement is assumed to be about one third of the equipment cost of an SCR unit (\$100,000).

Under PAR 1146, it was also assumed that 71 facilities would meet the NOx limits by ULNBs for Group II and III natural gas units. According to a recent vendors' cost estimate, the average capital and installation costs of retrofitting boilers with ULNBs are estimated at \$117,000 and \$78,000 (including installation) per unit for Group II and Group III, respectively. Each burner is assumed to last for 15 years. PAR 1146 would also require the affected owners of Group I, Group II, and Group III units to apply for permit modifications and pay a one-time permit application fee of \$7,823, \$7,314, and \$4,930, respectively.

Additional annual operating and maintenance costs of PAR 1146 would include incremental operating and maintenance, catalyst replacement (every five years), incremental electricity, and ammonia usage for the applicable SCR and ULNB units. Based on vendor's estimates, the additional annual maintenance cost for each SCR unit, and ULNBs for Group II and Group III unit is estimated at \$6,000, and \$500, respectively. The retrofit units under Group II and Group III are expected to increase electricity usage due to efficiency loss. The cost of electricity is assumed to be \$0.15 per Kw/hr. Based on 50 percent annual capacity and 8,760 hours of annual operation, additional annual costs of ammonia usage (for chemical reaction) for Group I units, is estimated at \$4,800. The total average annual cost of PAR 1146 is estimated at \$2.4 to \$2.67 million.

PAR 1146.1

Under PAR 1146.1, it was assumed that ten affected facilities would meet the NOx limits by ULNBs. According to a recent vendors' cost estimate, the average capital and installation costs

² April 2018, Parker Boiler and California Boiler.

*For the cost and job impacts analysis herein, staff used the initial conservative assumption of eight SCR units by five facilities.

of retrofitting boilers with ULNBs is estimated at \$51,000 (including installation) per unit. Each burner is assumed to last for 15 years. In addition, PAR 1146.1 would require the owners of the affected units to apply for permit modifications and pay a one-time permit application fee of \$3,117.

Additional annual operating and maintenance costs of PAR 1146.1 would include general maintenance and electricity for applicable ULNB units. Based on vendor estimates, the additional annual maintenance cost for each ULNB is estimated at \$500. The incremental cost of electricity for each unit is assumed to be \$590 (\$0.15 per Kw/hr). The total average annual cost of PAR 1146.1 is estimated at \$89,000 to \$104,000.

PAR 1146.2

Rule 1146.2 applies to large water heaters and small boilers and process heaters with a rated heat input capacity up to and including 2,000,000 BTUs per hour. There are both manufacturer and end-user requirements contained in the rule.

Rule 1146.2 units are exempt from SCAQMD permitting requirements per Rule 219 (Equipment Not Requiring a Written Permit Pursuant to Regulation II). Only a small portion of the Rule 1146.2 units are permitted due to unique circumstances, such as operators obtaining a lower emission factor for calculating the unit's potential to emit (PTE). Based on SCAQMD permit database, four of the permitted Rule 1146.2 RECLAIM units would be required to meet the NOx limits.

Due to the lack of information available on the universe of affected sources under PAR 1146.2, and to account for the potential cost impacts of those affected facilities with non-permitted units, staff has included additional ULNB costs for a total of 850 units (estimated based on the equipment data provided from facility responses of initial determination notifications as of April 2018) to account for the non-permitted units that could be impacted by the PAR 1146.2. The average capital and installation cost of retrofitting a boiler with a ULNBs is estimated at \$20,500 (including installation). Each burner is assumed to last for 15 years. No additional annual operating and maintenance costs were assumed. The total average annual cost of PAR 1146.2 is estimated at \$1.26 to \$1.57 million, respectively.

As presented in Table 2, PAR 1146 and PAR 1146.2 contribute to about \$2.67 million (61 %) and \$1.57 million (36%) of the total annual costs, respectively.

PAR 1100

PR 1100 is an administrative rule and does not impose additional costs to affected facilities, as such, no additional costs or socioeconomic impacts were assumed here.

Table 2
Total and Average Annual Cost of the PAR 1146 Series
by Types of Amendments

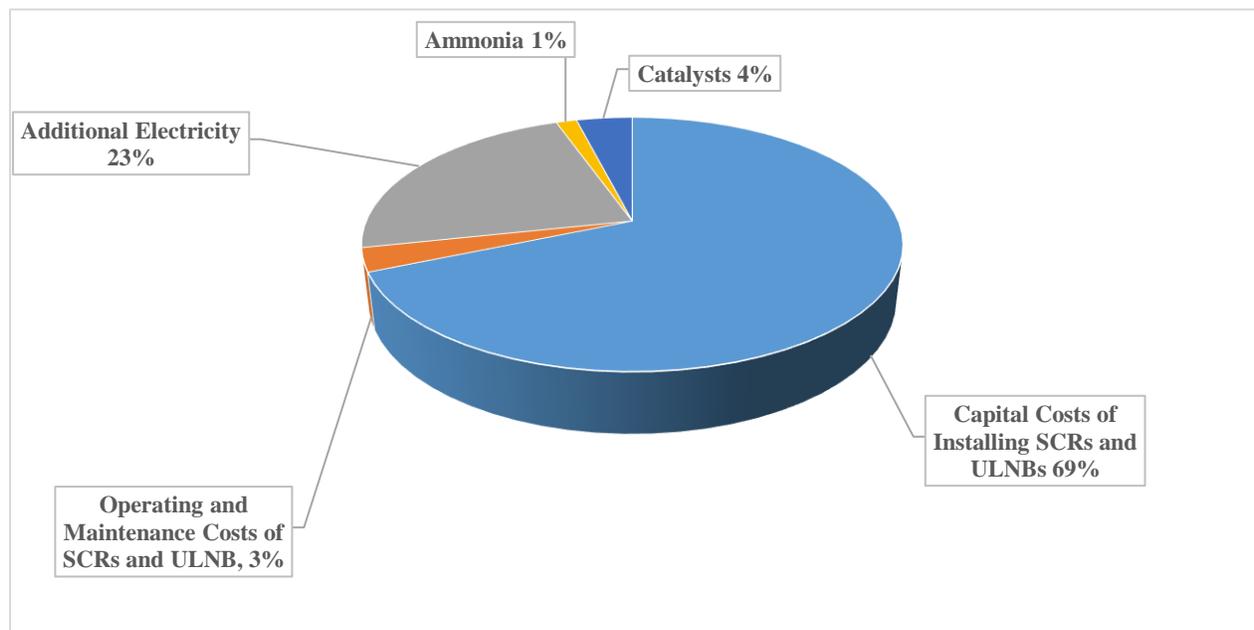
Proposed Amendments	Present Worth Value (2020)		Annual Average (2020-2045)	
	1% Discount Rate	4% Discount Rate	1% Real Interest Rate	4% Real Interest Rate
Rule 1146-Group I	\$13,423,000	\$10,611,000	\$581,000	\$653,000
Rule 1146-Group II	\$23,604,000	\$18,343,000	\$1,192,000	\$1,289,000
Rule 1146-Group III	\$10,861,000	\$9,318,000	\$635,000	\$728,000
Total PAR 1146	\$47,888,000	\$38,272,000	\$2,408,000	\$2,670,000
Rule 1146.1	\$1,469,000	\$1,297,000	\$89,000	\$104,000
Rule 1146.2	\$17,558,000	\$17,539,000	\$1,265,000	\$1,576,000
Total	\$66,915,000	\$57,108,000	\$3,761,000	\$4,351,000

Table 3 and Figure 2 represent the distribution of the overall costs by selected cost categories. The majority of costs of the PAR 1146 Series (\$3.02 million or 69 %) stem from the installation of SCRs and ULNBs. The additional costs of electricity and catalyst replacement are estimated at about \$0.99 Million and \$0.17 million, respectively.

Table 3
Total and Average Annual Cost of the PAR 1146 Series
by Cost Categories

Cost Categories	Present Worth Value (2020)		Annual Average (2020-2045)	
	1% Discount Rate	4% Discount Rate	1% Real Interest Rate	4% Real Interest Rate
One-Time Cost				
SCR (including Installation and Permits)	\$4,512,000	\$4,344,000	\$195,000	\$267,000
ULNB (including Installation and Permits)	\$31,702,000	\$31,172,000	\$2,238,000	\$2,755,000
Recurring Costs				
Electricity	\$22,951,000	\$16,142,000	\$993,000	\$993,000
Operating and Maintenance	\$2,865,000	\$2,015,000	\$124,000	\$124,000
Ammonia	\$936,000	\$659,000	\$41,000	\$41,000
Catalyst	\$3,948,000	\$2,777,000	\$171,000	\$171,000
Total	\$66,915,000	\$57,108,000	\$3,761,000	\$4,351,000

Figure 2
Annual Estimated Costs of the PAR 1146 Series by Cost Categories



Cost-Effectiveness

As presented in Table 4, the cost-effectiveness of the PAR 1146 Series is estimated at \$9,000 to \$30,000 based on the Discount Cash Flow (DCF) method and \$12,000 to \$45,000 based on the Levelized Cash Flow method, respectively³. The cost-effectiveness of the overall PAR 1146 Series is estimated at \$12,000, and \$26,000 for DCF and LCF, respectively.

Table 4. Cost-Effectiveness

Proposed Amendments	DCF (\$/ton)	LCF (\$/ton)
Rule 1146-Group I	\$30,000	\$45,000
Rule 1146-Group II	\$25,000	\$44,000
Rule 1146-Group III	\$20,000	\$40,000
Rule 1146.1	\$36,000	\$73,000
Rule 1146.2	\$9,000	\$12,000

³ The main difference between the DCF and LCF methods lies in how the costs are expressed. DCF utilizes the present value, or a stream of all present and future costs discounted to and summed up in the same initial year. In comparison, LCF amortizes all costs, incurred at present or in the future, into a yearly expenditure of equal amount over the project life. As the same amount of money is usually considered to be more valuable now than in the future (i.e., the financial concept “time value of money”), the same amount of cost is therefore lower when discounted to its present value than when amortized to the present and each future period of the project life. This is why a cost-effectiveness value as calculated using DCF is always lower than that calculated using LCF. In other words, the methodological choice is to some degree analogous to the choice of measurement units: the same length can be expressed as one inch or 2.54 centimeters, and the smaller (or greater) number should not be taken to indicate a shorter (or longer) length. Similarly, a cost-effectiveness value calculated using the DCF method should not be compared with another cost-effectiveness value calculated using the LCF method. In the interest of transparency and comparability and based on Abt’s recommendation, staff had begun providing both values since the rulemaking process that led to the 2015 NOx RECLAIM amendments.

Table 5 presents the total and average annual compliance costs of the PAR 1146 Series by industry types. The majority of the overall annual compliance costs is expected to be incurred by the food and beverage sector (17%), utility sector (14 %), air craft and transportation manufacturing (nine percent), textile product mills (nine percent), paper manufacturing (eight percent), and pipeline transportation by (eight percent).

**Table 5:
Projected Total and Average Annual Compliance Costs by Industry for Affected Facilities
(2017 Dollars)**

Industry that Typically Uses the Equipment	NAICS Codes	Present Worth Value (2020)		Average Annual Costs(2020-2045)	
		1% Discount Rate	4% Discount Rate	1% Discount Rate	4% Discount Rate
Oil and gas extraction	211	\$4,957,000	\$4,196,000	\$271,000	\$313,000
Utilities	22	\$9,682,000	\$8,132,000	\$510,000	\$589,000
Nonmetallic mineral product manufacturing	327	\$195,000	\$176,000	\$12,000	\$14,000
Primary metal manufacturing	331	\$438,000	\$394,000	\$27,000	\$32,000
Fabricated metal product manufacturing	332	\$3,577,000	\$3,031,000	\$205,000	\$235,000
Computer and electronic product manufacturing	334	\$2,509,000	\$2,143,000	\$146,000	\$168,000
Air Craft and transportation equipment manufacturing	3364-3369	\$5,196,000	\$4,621,000	\$319,000	\$375,000
Miscellaneous manufacturing	339	\$390,000	\$351,000	\$24,000	\$29,000
Food manufacturing	311	\$5,628,000	\$4,754,000	\$296,000	\$343,000
Beverage and tobacco product manufacturing	312	\$6,770,000	\$5,667,000	\$356,000	\$410,000
Textile mills; Textile product mills	313-314	\$6,169,000	\$5,247,000	\$356,000	\$408,000
Paper manufacturing	322	\$5,606,000	\$4,737,000	\$307,000	\$354,000
Petroleum and coal products manufacturing	324	\$772,000	\$702,000	\$49,000	\$58,000
Chemical manufacturing	325	\$2,889,000	\$2,448,000	\$166,000	\$190,000
Plastics and rubber product manufacturing	326	\$1,728,000	\$1,441,000	\$97,000	\$110,000
Retail trade	44-45	\$781,000	\$703,000	\$49,000	\$58,000
Pipeline transportation	486	\$5,509,000	\$4,694,000	\$318,000	\$366,000
Monetary authorities and related activities	521-522, 525	\$112,000	\$103,000	\$7,000	\$9,000
Professional, scientific, and technical services	54	\$390,000	\$351,000	\$24,000	\$29,000
Administrative and support services	561	\$586,000	\$527,000	\$37,000	\$43,000
Amusement, gambling, and recreation	713	\$1,171,000	\$1,054,000	\$73,000	\$86,000
Accommodation	721	\$390,000	\$351,000	\$24,000	\$29,000
Personal and laundry services	812	\$1,468,000	\$1,285,000	\$88,000	\$103,000
Total		\$66,915,000	\$57,108,000	\$3,761,000	\$4,351,000

JOBS AND OTHER SOCIOECONOMIC IMPACTS

The REMI model (PI+ v2.1) was used to assess the total socioeconomic impacts of a policy change (i.e., the proposed rule). The model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino, and for each county, it is comprised of five interrelated blocks: (1) output and demand, (2) labor and capital, (3) population and labor force, (4) wages, prices and costs, and (5) market shares.⁴

The assessment herein is performed relative to a baseline (“business as usual”) where the proposed amendments would not be implemented. The proposed amendments would create a policy scenario under which the affected facilities would incur an average annual compliance costs totaling \$3.76 to \$4.35 million to comply with other requirements of the PAR 1146 Series. Direct effects of the proposed amendments have to be estimated and used as inputs to the REMI model in order for the model to assess secondary and induced impacts for all the actors in the four-county economy on an annual basis and across a user-defined horizon (2020 to 2045). Direct effects of the proposed amendments include additional costs to the affected entities and additional sales, by local vendors, of equipment, devices, or services that would meet the proposed requirements.

While compliance expenditures may increase the cost of doing business for affected facilities, the purchase of additional SCRs and ULNBs combined with spending on operating and maintenance, may increase sales in other sectors. Table 6 lists the industry sectors modeled in REMI that would either incur cost or benefit from the compliance expenditures.⁵

⁴ Within each county, producers are made up of 66 private non-farm industries, three government sectors, and a farm sector. Trade flows are captured between sectors as well as across the four counties and the rest of U.S. Market shares of industries are dependent upon their product prices, access to production inputs, and local infrastructure. The demographic/migration component has 160 ages/gender/race/ethnicity cohorts and captures population changes in births, deaths, and migration. (For details, please refer to REMI online documentation at <http://www.remi.com/products/pi>.)

⁵ It is worth mentioning that improved public health due to reduced air pollution emissions may also result in a positive effect on worker productivity and other economic factors; however, public health benefit assessment requires the modeling of air quality improvements. Therefore, it is conducted for AQMPs and not for individual rules or rule amendments.

Table 6
Industries Incurring vs. Benefitting from Compliance Costs/Spending

Source of Compliance Costs	REMI Industries Incurring Compliance Costs (3-digit NAICS)	REMI Industries Benefitting from Compliance Spending (NAICS)
SCR and Ultra NOx Burners	Fabricated Metal Manufacturing (332) Other Manufacturing (333-337) Wholesale and Retail Trade (423, 444) Professional, Scientific, and other Technical Services (541, 651) Repair and Maintenance (811)	<i>One-time-Capital:</i> Machinery Manufacturing (333414)
Catalyst		Machinery Manufacturing
SCR and Ultra NOx Burners (Maintenance)		<i>Recurring Cost:</i> Professional, Scientific, and Technical Services (541)
Permit Modifications		<i>One-time-Capital:</i> Public Administration (92) ⁶
Monitoring		<i>Recurring Cost:</i> Professional, Scientific, and Technical Services (541)
Utilities (Electricity)		<i>Recurring Cost:</i> Utilities (221)
Ammonia		<i>Recurring Cost:</i> Chemical Manufacturing (325)

As discussed earlier, the total average (2020-2045) annual compliance costs for affected facilities by the PAR 1146 Series was estimated to range from \$3.76 million to \$4.35 million per year, depending on the real interest rate assumed (1%-4%).

PAR 1146 Series is expected to result in approximately 50 to 60 jobs forgone annually, on average between 2020 and 2045, depending on the real interest rate assumed (1%-4%). The projected jobs loss impacts represent about 0.005 percent of the total employment in the four-county region.

As presented in Table 7, in 2021, 160 additional jobs could be created in the overall economy. This is mainly due to additional purchase and spending on installation of SCRs and ULNBs provided by the industries of machinery industry, and construction, and professional and technical services sectors. As the cost of doing business kicks in and is maintained, and the positive impact of spending gradually subsides, jobs forgone are expected to begin.

⁶ Instead of using the default “local government spending” policy variable in REMI, staff elected to use a “custom local government spending” policy variable that it considers to more accurately reflect the SCAQMD spending portfolio. This custom policy variable has a lower proportion of local government spending going into the construction industry and proportionately allocates the difference to local government and professional services sectors. The simulation using this custom policy variable results in a prediction of a lower net job gain than would have been found with the default policy variable. This follows the approach taken in the Socioeconomic Impact Assessment of the PAR Regulation III Fees from June 2017.

Although the manufacturing sector (NAICS 31-33) would bear the majority of the estimated total compliance costs of the PAR 1146 Series, the industry job impact is projected to be relatively small (annual average of 10 jobs foregone between 2020 and 2045). This is because other businesses in the manufacturing sector, specifically in the machinery manufacturing and fabricated metals industry, are expected to benefit from the increased sale of various types of control equipment (SCRs and ULNBs), thus offsetting the direct effect of compliance costs incurred by other manufacturing facilities. In earlier years, the sector of machinery, construction and professional and technical services (NAICS 541) are projected to gain jobs on an annual average from additional demand for equipment installation and maintenance made by the affected facilities.

The remainder of the projected reduction in employment would be across all major sectors of the economy from secondary and induced impacts of the proposed amendments. In earlier years positive job impacts from the expenditures made by the affected facilities would more than offset the jobs foregone from the additional cost of doing business. Jobs foregone in the later years are due to additional costs of doing business by affected facilities.

The sectors of pipeline transportation (486), textile mills and products (NAICS 313), transportation equipment (NAICS 336), food services (NAICS 311), are projected to incur portion of compliance costs and thus experience a minor share of jobs foregone. As the cost of doing business kicks in and is maintained, and positive impact of spending gradually subsides, jobs foregone are expected to begin. The reduction in disposable income would dampen the demand for goods and services in the local economy, thus resulting in a small number of jobs foregone projected in sectors such as construction (NAICS 23), retail trade (NAICS 44-45), wholesale (NAICS 42), and accommodation and food services (NAICS 72).

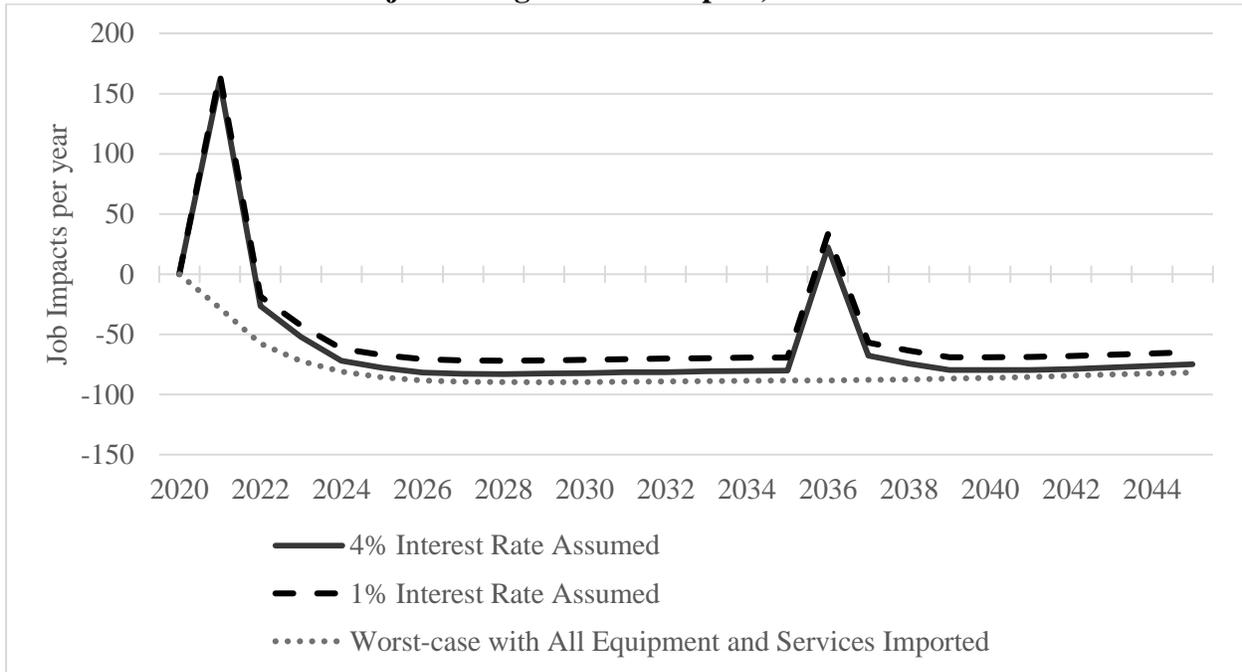
**Table 6:
Job Impacts of PAR 1146 Series**

Industries (NAICS)	2020*	2021	2025	2035	2045	Average Annual Jobs (2020-2045)	Average Annual Baseline Jobs (2020-2045)	% Change from Baseline Jobs
Oil and Gas Extraction (211)	0	0	-1	-2	-2	-2	17869	-0.0112%
Construction (23)	0	59	-13	-6	-5	-2	583602	-0.0003%
Fabricated Metal (332)	0	3	-1	-2	-1	-1	94,540	-0.0011%
Machinery (333)	0	17	0	0	0	1	27,089	0.0037%
Computer and Electronic Products (334)	0	0	-2	-2	-1	-1	102,719	-0.0010%
Transportation Equipment (336)	0	0	-1	-1	-1	-1	56,833	-0.0018%
Food Manufacturing (311)	0	0	-1	-1	-1	-1	50,489	-0.0020%
Textile Mills and Products (313)	0	-1	-3	-4	-3	-3	9,502	-0.0316%
Rest of Manufacturing (31-33)	0	3	-6	-6	-5	-5	263,393	-0.0038%
Total Manufacturing (31-33)	0	22	-12	-13	-11	-10	604,565	-0.0008%
Wholesale trade (42)	0	5	-3	-3	-3	-3	567,454	-0.0005%
Retail trade (44-45)	0	9	-9	-10	-9	-8	1,083,861	-0.0007%
Professional and Technical Services (54)	0	9	-4	-5	-6	-4	978,063	-0.0004%
Pipeline Transportation (486)	0	0	-1	-1	-1	-1	1,136	-0.0880%
Administrative and support services (561)	0	7	-5	-5	-5	-4	879,802	-0.0005%
Food services and drinking places (722)	0	5	-4	-5	-5	-4	711,232	-0.0006%
Repair and Maintenance (811)	0	1	-1	-1	-1	-1	133,421	-0.0007%
Government (92)	0	10	-4	-7	-6	-4	969,497	-0.0004%
Other Industries	0	-11	7	6	9	6	4,498,971	-0.0001%
Total	0	160	-78	-80	-75	-60	11,634,038	-0.0005%

*There are no job impacts in 2020 since the PAR 1146 Series implementation dates start from 2021. However, one of the CEQA Alternatives (Alternative C) assumed that affected facilities would install SCRs and ULNBs in 2020. For the purpose of consistency in comparing the CEQA Alternatives with the proposed amendments, average annual costs and associated job impacts were presented from 2020 to 2045.

Figure 3 presents a trend of job gain and losses over the 2020 to 2045 time frame. The upticks in positive jobs in 2021 and 2036 are due to additional spending on installation of ULNBs replacements. In addition, staff has analyzed an alternative scenario (worst case) where the affected facilities would not purchase any control or service from providers within the Basin. This scenario would result in an average of 80 jobs forgone annually.

**Figure 3:
Projected Regional Job Impact, 2020-2045**



Competitiveness

The additional cost brought on by the PAR 1146 Series would increase the cost of services rendered by the affected industries in the region. The magnitude of the impact depends on the size and diversification of, and infrastructure in a local economy as well as interactions among industries. A large, diversified, and resourceful economy would absorb the impact described above with relative ease.

Changes in production/service costs would affect prices of goods produced locally. The relative delivered price of a good is based on its production cost and the transportation cost of delivering the good to where it is consumed or used. The average price of a good at the place of use reflects prices of the good produced locally and imported elsewhere.

It is projected that the manufacturing sector, where most of the affected facilities belong, would experience a rise in its relative cost of services and its delivered price by 0.001 percent in 2035, respectively. While these changes are relatively small, it should be noted that the delivered price change is a change in the index of all prices in the manufacturing sector. Delivered prices that a facility may charge for specific goods or services may increase at a greater rate than this, allowing incurred cost to be passed through to downstream industries and end-users.

CEQA ALTERNATIVES

There are five CEQA alternatives associated with the proposed amendments to the PAR 1146 Series. Alternative A, the no project alternative, means that the current version of Rules 1146, 1146.1, and 1146.2 would remain in effect. Under Alternative B (less stringent, starting at 2022), the compliance deadline for meeting the NO_x emissions limits would be extended by one year. Under Alternative C (more stringent), the NO_x emission limits would remain the same as the proposed project, but facilities would need to meet 100 percent compliance by January 1, 2021.

Under Alternative D, the Group I units would need to meet nine ppm or (0.011 lb per MMBtu) instead of five ppm (0.0062 lb per MMBtu) and as a result they are expected to meet the limits by ULNBs versus SCRs. With Alternative E, the NO_x emission limit would be more stringent for units with a rated heat input of greater than or equal to 40 MMBtu per hour and less than 75 MMBtu per hour. This alternative would include a subset of Group II units that would be subject to the same NO_x emissions limits as Group I units of five ppm and assumed to meet the limits by SCR retrofits.

Average annual compliance costs for the CEQA alternatives range from \$4.1 to \$5 million between 2020 and 2045, as shown in Table 8. The cost-effectiveness of the PAR 1146 Series and CEQA Alternatives range from \$11,000 to \$13,000 per ton of NO_x reductions. Jobs forgone for the CEQA alternatives range from 56 to 63 between 2020 and 2045.

Alternative B and Alternative C have the same cost-effectiveness and both would achieve the same emission reductions. Even though Alternative C has later compliance dates the cost-effectiveness evaluation is time neutral. Alternative D has the lower average annual cost and jobs forgone than the proposed amendments because under this Alternative no SCRs are required. Alternative E has the highest average annual cost and jobs forgone among all the CEQA alternatives, because under this Alternative more SCRs are required.

Table 8
Cost and Job Impacts of CEQA Alternatives (in millions of dollars)

Alternatives	Average Annual (2020-2045)		
	Cost	Cost-Effectiveness \$/ton (NO _x)	Jobs
Proposed Amendments	\$4,351,000	\$12,000	-60
Alternative A—No Project	0.0	N/A	N/A
Alternative B—(Less Stringent) (Implementation in 2022)	\$4,118,000	\$12,000	-56
Alternative C—(More Stringent) (100% implementation in 2021)	\$4,466,000	\$12,000	-63
Alternative D—No SCR (Less Stringent)	\$4,183,000	\$11,000	-58
Alternative E—Lower Limits (More Stringent)	\$4,995,000	\$13,000	-63

UPDATED COST IMPACTS ASSESSMENT FOR COMPLIANCE WITH RULE 2002

Potential Impacts for NO_x RECLAIM Facilities Ready to Exit

Rule 2002(f)(9) prohibits a RECLAIM facility from selling any future compliance year RECLAIM Trading Credits (RTCs) upon receipt of a final determination notification that it is ready to exit the NO_x RECLAIM program. Currently, there are 36 facilities in operation which have received an initial determination notification.⁷ If PAR 1146, 1146.1, and 1146.2 are adopted, 26 additional facilities are expected to receive an initial determination notification because, according to staff's evaluation, all of their permitted RECLAIM NO_x source equipment will be subject to these rules once the proposed amendments/proposed rules are adopted. It is anticipated that these 62 facilities will receive final determination notifications in 2018 and will not be able to sell their NO_x RTCs for compliance year 2019 onwards.

Among the 62 facilities, 61 were allocated NO_x RTCs free of charge at the outset of the NO_x RECLAIM program. (The remaining one facility joined the NO_x RECLAIM program after its inception in 1994 and was not issued allocations.) The initial allocations for the 61 facilities amounted to approximately 7.3 TPD. Due to past adjustments including credit shaves, and more importantly, the sale of these initial allocations as infinity-year block (IYB) RTCs to other NO_x RECLAIM facilities and brokers/investors, the total NO_x RTCs currently held by these 62 facilities have dwindled to 0.4 TPD for compliance years 2019 and later.⁸ At the same time, total NO_x emissions from these same facilities have also declined to approximately 0.3 TPD in recent years.

For the purpose of this analysis, it is assumed that none of the 62 facilities would acquire additional NO_x RTCs or sell their current NO_x RTC holdings of 0.4 TPD before receiving a final determination notification. However, it is foreseeable that at least some of these NO_x RTC holdings may be sold or transferred before they are frozen due to receipt of final determination notifications.

Since there were no costs associated with the initially allocated NO_x RTCs for a RECLAIM facility, the facilities would not incur financial losses as a result of complying with Rule 2002(f)(9) if their frozen future compliance year NO_x RTC holdings are at or below their respective adjusted initial allocations. However, it was estimated that, out of the total 0.4 TPD of future compliance year NO_x RTCs currently held by the 62 facilities, at least 0.06 TPD were acquired by some of the affected facilities in addition to their initial allocations, either through purchases with positive prices or transfers at no cost. If these facilities continue to stay in the NO_x RECLAIM program and their NO_x emissions remain between five percent below and above their 2016 levels, then 0.01-0.02 TPD of these additionally acquired RTCs were estimated to be used for compliance

⁷ Previous socioeconomic analysis included in the January 2018 Final Staff Report for Proposed Amended Rules 2001 and 2002 analyzed a total of 38 facilities that were identified as ready to transition out of the NO_x RECLAIM program. However, two of the 38 facilities were shutdown facilities that should not have been included in the analysis.

⁸ According to the NO_x RTC holdings data as of April 6, 2018 and excluding any transactions that may have occurred after this date.

purposes, with the remaining being potential surplus RTCs available for sale or transfer. Applying the most recent 12-month rolling average NOx RTC price of \$4,182 per ton,⁹ the value of these potential surplus RTCs would be approximately \$70,000-\$87,000 per compliance year. However, as they pertain to SCAQMD, RTCs are not property rights. It is known to all market participants that purchasing RTCs beyond the current compliance year is accompanied by known investment risks that are embedded within the RECLAIM programs. The risk factors include, but may not be limited to, programmatic allocation shaves, potential RTC trade freezes, and the eventual sunset of either RECLAIM programs.

Meantime, 19 to 24 out of the 62 facilities are estimated to have insufficient NOx RTC holdings if they were to continue to stay in the NOx RECLAIM program and their NOx emissions remain between five percent below and above their 2016 levels. By exiting the NOx RECLAIM program, these facilities would avoid the need to acquire about 0.05-0.06 TPD of NOx RTCs which, if also valued at \$4,182 per ton, would imply potential cost-savings approximately worth \$75,000-\$90,000 per compliance year.

Potential NOx RTC Market Impacts

Since the SCAQMD Governing Board's March 2017 adoption of the 2016 AQMP, which includes the sunset of NOx RECLAIM, the number of NOx IYB trades has quickly plummeted. In 2017, there were only two IYB trades totaling 0.01 TPD.¹⁰ The IYB price has also declined rapidly, from a 12-month rolling average of \$380,057 per ton in January 2017 to \$39,673 per ton in January 2018, which largely reflects the remaining years of the NOx RECLAIM program life that is expected by the market participants. However, the short-term price impact of facility exit on the discrete-year RTC market may not go hand-in-hand with the overall impact of sunseting the NOx RECLAIM program on the IYB market, as evidenced by the surge in discrete-year NOx RTC prices in 2017.

The analysis below will focus on the potential impacts to the discrete-year NOx RTC market due to compliance with Rule 2002. The potential exit of the 62 facilities from the NOx RECLAIM program could possibly affect the demand and supply in the NOx RTC market for compliance year 2019 and beyond, as well as the future prevailing NOx RTC prices. Therefore, the remaining NOx RECLAIM facilities may be indirectly impacted as a result.

Table 9 reports the potentially foregone market demand and supply for three different NOx emission scenarios. The first scenario assumes future NOx emissions of the 62 facilities would be five percent below their respective 2016 levels; the second scenario assumes the same emission levels as in 2016; and the third scenario assumes their future NOx emissions would be five percent above their respective 2016 levels. These scenarios are consistent with the variations of overall NOx emissions from the RECLAIM universe, which had a maximum year-over-year difference of approximately five percent during the period of 2011-2016.

⁹ 12-month rolling average of Compliance Year 2017 NOx RTCs, as calculated from January 2017 to December 2017. See Table I of "Twelve-Month and Three-Month Rolling Average Price of Compliance Years 2017 and 2018 NOx and SOx RTCs," available at: http://www.aqmd.gov/docs/default-source/reclaim/nox-rolling-average-reports/rtes_price---jan-2018.pdf.

¹⁰ Excluding credit swaps and credit transfers with no price.

Table 9
Potential Impacts on NOx RTC Market Demand and Supply

		NOx Emission Scenarios for Future Compliance Years		
		<i>5% Below 2016 NOx Emissions</i>	<i>Same as 2016 NOx Emissions</i>	<i>5% Above 2016 NOx Emissions</i>
A	Foregone Market Demand	0.05	0.05	0.06
B	Foregone Market Supply – From All Facilities with Surplus RTC Holdings	0.20	0.19	0.18
C	Net Foregone Market Supply (= B - A)	0.15	0.13	0.12
	Percent Difference: <i>(Supply – Demand)/Demand (= C/A)</i>	301%	250%	206%
D	Foregone Market Supply – From Facilities with Surplus RTC Holdings & Historical Record of RTC Sales/Transfers	0.15	0.15	0.14
E	Net Foregone Market Supply (= D - A)	0.10	0.09	0.08
	Percent Difference: <i>(Supply – Demand)/Demand (= E/A)</i>	211%	171%	137%

Note: The supply and demand of NOx RTCs are expressed in TPD and rounded to the nearest hundredth. Percent differences are rounded to the nearest integer.

The foregone market demand, as estimated by the shortage of a facility’s future compliance year NOx RTC holdings for NOx emissions reconciliation, would be about 0.05-0.06 TPD. At the same time, the potential foregone market supply from *all* facilities with potential surplus RTC holdings is estimated at 0.18-0.20 TPD, or about 200-300 percent higher than the estimated foregone market demand. However, it is observed that some of these facilities with potential surplus NOx RTCs have never sold or transferred NOx RTCs to another NOx RECLAIM facility since the NOx RECLAIM program began in 1994. Therefore, it is reasonable to assume that they will not participate in the market even if they continue to stay in the NOx RECLAIM program. When estimated by the potential surplus NOx RTC holdings from only the facilities with a historical record of NOx RTC sales and/or transfers, the foregone market supply is estimated to be lower at 0.14-0.15 TPD, or about 130-210 percent higher than the estimated foregone market demand. Therefore, the transition of the 62 facilities out of the NOx RECLAIM program could potentially assert upward pressure on the discrete-year NOx RTC prices. However, when compared to the 7.0 TPD of discrete-year NOx RTCs traded in calendar year 2017, the estimated net foregone market supply of 0.08-0.15 TPD represents just one- to two percent of that total traded volume.¹¹

Given the analysis above and the fact that the 62 facilities—which are potentially ready to transition out of the NOx RECLAIM program into command-and-control—currently account for

¹¹ In calendar year 2017, a total of 2,556 tons of discrete year NOx RTCs were traded (2556 tons/365 days = 7.0 TPD). See page ES-2 of “Annual RECLAIM Audit Report for 2016 Compliance Year,” available at <http://www.aqmd.gov/docs/default-source/reclaim/reclaim-annual-report/2016-reclaim-report.pdf>. Notice, however, that some of the RTCs might have been traded more than once in the same year.

only about one percent of annual NO_x emissions and two percent of NO_x RTC holdings in the NO_x RECLAIM universe, staff concludes that these facilities' compliance with Rule 2002(f)(9) would have a very small impact, if any, on the demand and supply of NO_x RTC market. Specifically, while the transition of the 62 facilities out of the NO_x RECLAIM program could potentially assert upward pressure on the discrete-year NO_x RTC prices, it is unlikely to result in large price fluctuations in the NO_x RTC market, nor is the transition expected to significantly affect the remaining NO_x RECLAIM facilities that are not yet ready to exit the market-based program.

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