

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Socioeconomic Impact Assessment For Proposed Amended Rule 1153.1– Emissions of Oxides of Nitrogen from Commercial Food Ovens

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EXECUTIVE SUMMARY

A socioeconomic analysis has been conducted to assess the impacts of Proposed Amended Rule 1153.1. A summary of the analysis and findings is presented below.

<p>Key Elements of the Proposed Amendments</p>	<p>Proposed Amended Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (PAR 1153.1), seeks further emission reduction of oxides of nitrogen (NOx) in the South Coast Air Basin. PAR 1153.1 would require facilities to lower NOx emissions during two Phases. Phase I Emission Limits are combustion-based, which require all equipment categories, with the exception of tortilla ovens fired solely by infrared (IR) burners, to meet a 30 ppmv NOx emission limit. Tortilla ovens in this case must meet a more stringent NOx emission limit of 15 ppmv. Currently, burners meeting these limits are commercially available, cost-effective, and already in-use.</p> <p>Phase II Emission Limits require that after the effective date of January 7 2027, all smokehouses bakery ovens, and cooking ovens that are rated less than or equal to 3 million British thermal units per hour (MMBtu/hr) should transition to a zero-emission technology to meet a 0 ppmv NOx emission limit, once the unit turns 22 years old and the burner turns 7 years old. Upon full implementation by 2043, PAR 1153.1 is estimated to reduce NOx emissions by 0.11 tons per day. This reduction will have positive effects on public health and ambient air quality.</p>
<p>Affected Facilities and Industries</p>	<p>PAR 1153.1 affects manufacturers and operators of commercial food ovens, roasters, and smokehouses that produce food and beverage products for human consumption. These facilities mainly belong to food and beverage manufacturing, as classified in the North American Industrial Classification System (NAICS 311 and 312). Staff identified 97 facilities with a total of 218 commercial food ovens that are currently regulated by Rule 1153.1. Six out of 97 facilities are currently in the RECLAIM program.</p> <p>Fifty out of the 97 facilities are small facilities with units that have a rated heat input capacity less than 325,000 Btu per hour and emit less than one pound of NOx per day, which would be exempt from PAR 1153.1 requirements. PAR 1153.1 only affects the remaining 47 facilities that have units with a rated heat input capacity greater than 325,000 Btu per hour. Of these 47 affected facilities, 29 are in Los Angeles County, 9 are in Orange County, 3 are in Riverside County, and the remaining 6 are in San Bernardino County.</p>
<p>Assumptions for the Analysis</p>	<p>PAR 1153.1 establishes a compliance schedule in two phases. The main requirements under Phase I are combustion-based limits and will require affected facilities to install low NOx burners (LNB) which are needed to achieve the proposed emission limits. For Phase I limits, three different types of LNBs were considered and evaluated. The three types of burners</p>

<p>Assumptions for the Analysis</p>	<p>evaluated are ribbon burners, infrared (IR) burners, and air heater cone type burners, which can achieve the emission limits proposed in Phase I of PAR 1153.1.</p> <p>Staff assumed that 40 units located at the affected facilities would need to install air heater cone type low NOx burners. Total installed cost is estimated to range from \$12,000 to \$255,000 for each unit. Staff also assumed that 39 units at the affected facilities would install ribbon and/or IR type burners. The total per-unit installed estimated cost range from \$55,000 to \$236,000. In addition, the burner installation costs were assumed to be 50 percent of the capital cost for air heater cone type burners and three times the capital cost for ribbon/IR type burners. Each new burner is assumed to last 10 years and installed in 2024. No additional operation and maintenance (O&M) costs were taken into account as the annual maintenance for the new burners would be equivalent to that of the existing burners being replaced.</p> <p>Meeting the Phase II zero-emission limits of PAR 1153.1 will likely necessitate a complete replacement of the unit at a facility. Retrofitting a gas-fired oven to operate on electricity can be considerably more expensive than purchasing a new electric oven. PAR 1153.1 mandates the adoption of zero-emission technology for smokehouse ovens, indirect-fired bakery ovens, bakery ovens, and cooking ovens rated less than or equal to 3 MMBtu/hr. From January 1, 2027, these four equipment categories must transition to zero-emission technologies when their existing units reach 25 years of age and their burners are used for 10 years or more.</p> <p>For capital cost of zero-emission electric ovens, staff considered the cost difference between a new electric oven and a new gas-fired oven. In addition, the total installed costs accounted for related expenses such as installation, facility electrical upgrades, and utility-side electrical upgrades. Staff assumed that the installation costs would amount to 25 percent of the estimated capital cost, while facility electrical upgrades would constitute 10 percent of the capital cost, and new units rated at or below 3 MMBtu/hr would require an additional \$2,000 for utility-side electrical upgrades, while new units exceeding 3 MMBtu/hr would require an additional \$50,000 for utility-side electrical upgrades.</p> <p>Based on these assumptions, staff estimated that the affected facilities install 14 electric tunnel ovens, with each unit having a total estimated cost ranging from \$1,300,000 to \$2,000,000. Additionally, staff assumed that the affected facilities would install 38 units of electric batch ovens, each having a total estimated cost between \$375,000 and \$503,000.</p> <p>Most of the compliance costs under the Phase II requirements are</p>
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<p>Assumptions for the Analysis (Cont.)</p>	<p>associated with additional fuel switching costs, which is the difference between the annual electricity costs of the new electric oven and the annual natural gas costs of the gas-fired oven. In estimating the fuel switching costs, staff assumed that electric oven units would be more efficient than its gas-fired counterpart and thus they need 20 percent less of thermal input. This estimate was based on vendor feedback and discussions with a utility provider. Recognizing the substantial uncertainty in forecasting electricity and natural gas rates, staff based fuel switching costs on multiple sources. These sources combine recent rates that capture current volatility in natural gas prices with forecasted rates from the California Energy Commission (CEC). Based on recent electricity rates of the Energy Information Administration (EIA), staff used an average industrial electricity rate of 14.82 cents/kWh for the State of California, while for recent natural gas rates, staff assumed a cost of 62 cents/therm. This latter price is calculated based on the 24-month average natural gas price from May 2021 to May 2023, sourced from the Southern California Gas Company (SoCal Gas).</p> <p>Forecasted electricity rates are based on the California Energy Commission (CEC) 2022 Energy Demand Update for industrial consumers in the Los Angeles Department of Water and Power (LADWP) and Southern California Edison (SCE) planning areas. The average of the two planning areas’ forecasted rates over the 2024-2035 period is the assumed future electricity rate, which is 16.82 cents per kWh. The forecasted natural gas price is based on the CEC forecast for SoCal Gas from the 2021 Integrated Energy Policy Report (IEPR). Staff averaged the SoCal Gas forecast over the 2024-2035 period to calculate the assumed future natural gas rate at 54 cents per therm.</p> <p>Forecasting energy prices involves uncertainty, and actual rates will differ from forecasted rates in any given year. Staff acknowledges this uncertainty and notes that the methodology used in this analysis is not precedential. Staff will continue to update its forecasts and cost assumption methodologies in future rulemakings, based on best practices and the latest energy prices forecasts including but may not be limited to the California IEPR.</p>
<p>Compliance Costs</p>	<p>The average annual compliance costs of PAR 1153.1 are estimated to range from \$12.82 million to \$13.50 million, depending on the real interest rate assumed (1% to 4%). All the estimated annual costs are expected to be incurred by the food manufacturing sector (NAICS 311) where the bakery ovens belong.</p> <p>The table below presents the summary of the average annual cost of PAR 1153.1 by requirement categories. About 83 percent of the total annual compliance cost is attributed to the bakery ovens alone. The recurring costs of Bakery Ovens (which is mainly the fuel switching costs) are</p>

<p>Compliance Costs (Cont.)</p>	<p>estimated to account for 65 percent of the total annual cost of PAR 1153.1, followed by the bakery ovens one-time capital costs which would be about 18 percent of the total annual cost.</p> <table border="1" data-bbox="597 338 1255 1100"> <thead> <tr> <th colspan="3">Average Annual Compliance Costs (2024-2051)</th> </tr> <tr> <th>Cost Categories</th> <th>1% Real Interest Rate</th> <th>4% Real Interest Rate</th> </tr> </thead> <tbody> <tr> <td colspan="3">One-Time Cost</td> </tr> <tr> <td>Bakery Oven</td> <td>\$1,906,742</td> <td>\$2,455,914</td> </tr> <tr> <td>Cooking Oven</td> <td>\$268,046</td> <td>\$337,081</td> </tr> <tr> <td>Tortilla Oven</td> <td>\$283,625</td> <td>\$321,642</td> </tr> <tr> <td>Drying Oven</td> <td>\$24,582</td> <td>\$27,877</td> </tr> <tr> <td>Roaster</td> <td>\$6,270</td> <td>\$7,338</td> </tr> <tr> <td>Smokehouse</td> <td>\$31,405</td> <td>\$42,996</td> </tr> <tr> <td>Dryer</td> <td>\$4,051</td> <td>\$4,594</td> </tr> <tr> <td colspan="3">Recurring Costs</td> </tr> <tr> <td>Bakery Oven</td> <td>\$8,709,123</td> <td>\$8,709,123</td> </tr> <tr> <td>Cooking Oven</td> <td>\$1,183,496</td> <td>\$1,183,496</td> </tr> <tr> <td>Smokehouse</td> <td>\$406,183</td> <td>\$406,183</td> </tr> <tr> <td>Total</td> <td>\$12,823,523</td> <td>\$13,496,244</td> </tr> </tbody> </table>	Average Annual Compliance Costs (2024-2051)			Cost Categories	1% Real Interest Rate	4% Real Interest Rate	One-Time Cost			Bakery Oven	\$1,906,742	\$2,455,914	Cooking Oven	\$268,046	\$337,081	Tortilla Oven	\$283,625	\$321,642	Drying Oven	\$24,582	\$27,877	Roaster	\$6,270	\$7,338	Smokehouse	\$31,405	\$42,996	Dryer	\$4,051	\$4,594	Recurring Costs			Bakery Oven	\$8,709,123	\$8,709,123	Cooking Oven	\$1,183,496	\$1,183,496	Smokehouse	\$406,183	\$406,183	Total	\$12,823,523	\$13,496,244
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<p>Job Impacts</p>	<p>Direct effects of the proposed project are used as inputs to the REMI model in order for the model to assess secondary/induced impacts for all the industries in the four-county economy on an annual basis and across a user-defined horizon.</p> <p>When the compliance cost is annualized using a 4% real interest rate, it is projected that an annual average of 116 net jobs will be foregone from 2024 to 2051. The 116 annual jobs forgone represents less than 0.001% of total annual jobs in the four-county area.</p> <p>In 2024, when most of the capital spending for the new burners are anticipated, approximately 64 additional jobs are projected to be created in the regional economy. This positive job impact would have a trickle-down effect on sectors such as construction, miscellaneous professional services, retail, and wholesale trade. Furthermore, the operating and maintenance expenditures associated with the implementation of the project would benefit industries involved in electricity generation, transmission, and distribution (NAICS 2211).</p> <p>However, as affected facilities continue to bear the amortized capital</p>																																													

	<p>expenditures of burners then of electric ovens and as the annual fuel switching costs associated with electric ovens begin to occur from 2027, a gradual reduction in the positive job impacts from earlier years is expected to occur. Consequently, this reduction would lead to jobs forgone in the subsequent years following the initial implementation.</p> <p>Food manufacturing sector (NAICS 311) would incur the largest share of the average annual jobs foregone (52) as all the assumed compliance costs will be borne by this industry.</p>
<p>Competitiveness</p>	<p>The overall impacts of the PAR 1153.1 on the production costs and delivered prices in the region is not expected to be significant. According to the REMI Model, PAR 1153.1 is projected to increase the cost of production of the food manufacturing in the South Coast region by 0.069 percent and increase the relative delivered price of goods provided by 0.0448 percent in 2027 when both Phases I and II requirements are effective.</p>

INTRODUCTION

Proposed Amended Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (PAR 1153.1), seeks further emission reduction of oxides of nitrogen (NO_x) in the South Coast air district and is part of a suite of “landing” rules for facilities regulated under the REgional Clean Air Incentives Market (RECLAIM) or under another existing source specific rule.

PAR 1153.1 would require facilities to lower NO_x emissions during two Phases. Phase I Emission Limits are combustion-based and require all equipment categories, with the exception of tortilla ovens, to meet a 30 part-per-million-by-volume (ppmv) NO_x emission limit. Those tortilla ovens, fired solely by infrared (IR) burners, would need to meet a 15 ppmv NO_x emission limit. Burners meeting these limits are currently commercially available, cost-effective, and in-use.

Phase II Emission Limits require all smokehouses, bakery and cooking ovens that are rated less than or equal to 3 Million Metric British Thermal Unit per hour (MMBtu/hr) to transition to a zero-emission technology and to submit a permit application to meet a 0 ppmv NO_x emission limit once the unit turns 22 years old and the burner turns 7 years old after the future effective date of January 7, 2027. Upon full implementation by 2043, PAR 1153.1 is estimated to reduce NO_x emissions by 0.11 ton per day, which will benefit public health and ambient air quality.

PAR 1153.1 also includes an Alternative Compliance Schedule Plan to address additional time that might be needed if a facility’s utility provider is not able to supply the necessary energy to the facility to power the electric oven(s) and result in a delay in meeting the rule deadlines. An alternative compliance schedule will only be considered for upgrades that are outside the control of the facility.

LEGISLATIVE MANDATES

The legal mandates directly related to the assessment of the proposed rule include South Coast AQMD Governing Board resolutions and various sections of the California Health & Safety Code.

South Coast AQMD Governing Board Resolutions

On March 17, 1989, the South Coast AQMD 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 and Safety Code Requirements

The state legislature adopted legislation which reinforces and expands the Governing Board resolutions for socioeconomic impact assessments. California Health and Safety Code Section 40440.8, which became effective on January 1, 1991, requires a socioeconomic impact assessment be performed for any proposed rule, rule amendment, or rule repeal which "will significantly affect air quality or emissions limitations."

Specifically, the scope of the socioeconomic impact assessment should include the following:

- 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; and
- Necessity of adopting, amending, or repealing the rule in order to attain state and federal ambient air quality standards.

Health and Safety Code Section 40728.5, which became effective on January 1, 1992, requires the South Coast AQMD 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 impact assessments to include small business impacts, specifically it includes the following:

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

Finally, Health and Safety Code 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 (BARCT) or "all feasible measures" requirements relating to ozone, carbon monoxide (CO), oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and their precursors.

AFFECTED FACILITIES

PAR 1153.1 affects manufacturers and operators of commercial food ovens, roasters, and smokehouses produce food and beverage products. These facilities mainly belong to food and beverage manufacturing, as classified in the North American Industrial Classification System (NAICS 311 and 312). Staff identified 97 facilities with a total of 218 commercial food ovens that are currently regulated by Rule 1153.1. Six out of 97 facilities are currently in the RECLAIM program.

Out of the 97 facilities, 50 of them are classified as small facilities with units with a rated heated

input capacity below 325,000 Btu per hour and emissions of less than one pound of NO_x per day. These small facilities are exempt from the emission limits imposed by PAR 1153.1. Consequently, the regulation applies to the remaining 47 facilities, which have units with a rated heat input capacity exceeding 325,000 Btu per hour. Among these 47 affected facilities, 29 are located in Los Angeles County, 9 in Orange County, 3 in Riverside County, and the remaining 6 in San Bernardino County.

Small Business

South Coast AQMD 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. South Coast AQMD also defines "small business" for the purpose of qualifying for access to services from the South Coast AQMD'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 the South Coast AQMD's definitions of a small business, the federal Small Business Administration (SBA) and the federal 1990 Clean Air Act Amendments (1990 CAAA) also provide definitions of a small business.

The 1990 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 NO_x, and (3) is a small business as defined by SBA. In general terms, a small business must have no more than 500 employees for most manufacturing and mining industries.¹ The SBA definitions of small businesses vary by six-digit NAICS codes. More specifically, other snack manufacturing (NAICS 311919) has 750 employees and commercial bakeries (NAICS 311812) has 1,000 employees as the thresholds below which a business is considered as small.

Dun and Bradstreet data on the number of employees and revenues are available for 43 out of 47 affected facilities. Based on this data, there are only two facilities that meet the South Coast AQMD's Rule 102 definition of a small business; however, this number increases to 20 according to the SBAO definition. Based on SBA's definition of a small business, 38 out of the 43 facilities would be classified as small businesses. Under the 1990 CAAA definition, there are 38 facilities meeting the criteria to be considered as small businesses.²

COMPLIANCE COSTS

PAR 1153.1 aims to reduce NO_x emissions from commercial food ovens that are used to prepare food or products for making beverages for consumption. PAR 1153.1 would affect 47 facilities that operate commercial food ovens including tortilla ovens, drying ovens, bakery ovens, cooking ovens, roasters, dryers, and smokehouses. PAR 1153.1 establishes a compliance schedule in two Phases.

¹ https://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf

² Based on facility-level data on NO_x and VOC emissions for calendar year 2022.

Phase I Requirements

For Phase I, emission limits are effective upon rule adoption and are applicable to all equipment categories that do not currently meet the 30 ppmv NO_x limit or 15 ppmv NO_x limit for tortilla ovens solely firing IR burners. All commercial food oven categories/subcategories are subject to Phase I emission limits and would need to take compliance actions upon rule adoption if they are currently not meeting the limits.

The main requirements of the proposed amendments under Phase I that have cost impacts for affected facilities would include the installation of new burners to achieve the proposed emission limits. For Phase I limits, three different types of burners were considered and evaluated, including ribbon burners, IR burners, and air heater cone type low NO_x burners, which are guaranteed to comply with the emission limits proposed by PAR 1153.1.

Based on quotations and cost estimates provided by vendors, ribbon burners and IR burners tend to have higher prices per oven than air heating cone type low NO_x burners. This price difference is primarily due to the fact that bakery and tortilla ovens can utilize a larger number of burners per oven, potentially reaching up to 181 burners. The higher number of burners significantly drives up the cost, compared to other food ovens that use the air heating cone type burners which typically have one or two burners. Therefore, the cost of the burners depends on the size, type, and quantity of burners in an oven.

Additionally, staff identified several units that have recently retrofitted their units with new burners to comply with the existing 40 ppmv or 60 ppmv NO_x limits. These facilities may face a challenge with stranded assets. To address this issue, staff proposed a compliance schedule that would require facilities to meet the Phase I emission limits either upon burner replacement or within a maximum burner life of 10 years, based on the age of the burner. This approach aims to address the concerns of stranded assets and provide a reasonable transition period for affected facilities.

Burners One-time Capital Costs

To determine the cost of implementing the BARCT-based NO_x emission limits, staff obtained cost information or estimates of control equipment from various vendors. Ten equipment manufacturers were contacted; meetings were held with several vendors multiple times to gather technical input and cost estimates, which were then used in the BARCT assessment and cost-effectiveness analysis.

To estimate the costs of new burners, staff reached out to several burner manufacturers, including Flynn Burners, Honeywell/Maxon, and Micron Fiber-Tech. Then, each vendor provided cost estimates either during meeting or through email correspondence with staff. All costs mentioned in this section are in 2022 dollars. Thus, in the projection of future compliance costs, these costs are assumed to remain constant in the foreseeable future, with any increases attributed to inflation.

It is important to note that the estimated costs in this analysis are highly dependent on site-specific factors and business decisions made by the facilities subject to PAR 1153.1. Additionally, staff made every effort in the cost analysis to represent the costs realistically, taking into account various factors that may influence the price a business will pay to implement a control. For each cost item, the estimated cost was based on either an industry average or a reasonable range, taking into account all the available information and data. The procedure and assumptions used for each cost estimate are discussed below.

It was estimated that 40 applicable units at the affected facilities would need to install air heater cone type low NO_x burners. The total installed cost of burners for each oven is estimated to range from \$12,000 to \$255,000. Additionally, it was assumed that 39 applicable units at the affected facilities would need to install ribbon and/or IR type burners. Based on vendors' price quotes and staff's cost curve analysis included in the Draft Staff Report, the total installed cost for each applicable unit requiring ribbon and/or IR type burners is estimated to range from \$55,000 to \$236,000. As the proposed rule would require replacement of existing burners in an applicable unit based on the age of the oldest burner, staff uses the total cost of the new compliant burners, instead of the cost difference between a new compliant burner and a new but to-be-noncompliant burner, to conservatively approximate the potential compliance costs related to the burner emissions limits.

It was assumed that the burner installation costs would be 50 percent of the capital cost for air heater cone type burners and three times the capital cost for ribbon/IR type burners. Ribbon and IR burner install costs are based on quotes from two manufacturers and recent install costs from two facilities with recent installations of these burners. The higher install cost of these burners is driven by additional support structures required for mounting these burners. Traditional air heater cone burners do not require additional structures according to quotes obtained by staff and have lower install costs as a result. Each new burner is assumed to have a lifespan of 10 years based on vendors' feedback, and the implementation of the burners would occur upon the adoption of PAR 1153.1.

Burners Operating and Maintenance (O&M) Costs

Based on vendor feedback, the annual maintenance associated with the new burner is assumed to be the same as the existing burners that the facility will be replacing; thus, no additional O&M costs were considered.

Phase II Requirements

Effective on January 1, 2027, PAR 1153.1 will require zero-emission technology for smokehouses, indirect-fired bakery ovens, bakery ovens less than or equal to 3 MMBtu/hr, and cooking ovens less than or equal to 3 MMBtu/hr. These four categories are required to transition to zero-emission technologies once their existing units reach 25 years old and their burners reach 10 years old after the future effective date of January 7, 2027.

Electric Oven One-time Capital Costs

To estimate the capital costs associated with the implementation of zero-emission electric commercial food ovens to meet the Phase II limits, staff identified two main types of ovens: Tunnel Ovens, which are primarily used as bakery and tortilla ovens, and Batch Ovens, which are mainly used as cooking, drying, and smokehouse ovens. In order to estimate the incremental cost of replacing gas-fired units by electric units, staff reached out to vendors such as AMF Den Boer, BABBCO, Maurer-Atmos, Reading Bakery Systems, and WP Bakery Group to gather equipment cost quotes for both electric and gas-fired units.

The cost of zero-emission electric ovens depends on the type and size, typically measured by their maximal instantaneous power demand in kilowatts (kW). The useful life for both types of ovens was assumed to be 25 years based on vendor feedback. By obtaining quotes from vendors and considering the size and type of ovens, staff were able to estimate the capital costs associated with acquiring these zero-emission electric ovens.

The cost estimation for implementing zero-emission electric ovens took into account the incremental cost difference between purchasing a new electric oven and a new gas-fired oven. In addition to the capital cost, various related expenses were also considered, including installation, facility electrical upgrades, and utility-side electrical upgrades.

Staff assumed that the installation cost would amount to 25 percent of the estimated capital cost, while facility electrical upgrades (behind-the-meter) were estimated at 10 percent of the capital cost. Staff also included the cost of utility-side (front-of-meter) upgrades that the facility may incur. According to Southern California Edison (SCE), this cost will vary depending on the facilities location and only part of the cost will be passed on to the facility, with the remainder borne by rate payers. Based on examples provided by SCE, staff assumed the partial cost passed on to the facility to be \$2,000 for units rated less than or equal to 3 MMBtu/hr and \$50,000 for units greater than 3 MMBtu/hr. Therefore, the total installation costs encompass the capital cost, installation cost, facility electrical upgrades, and utility-side electrical upgrades.

It was assumed that the affected facilities would install a total of 14 electric Tunnel Ovens, with each unit estimated to cost between \$1,300,000 and \$2,000,000, based on cost curve analysis conducted by staff. Similarly, it was assumed that the affected facilities would install 38 units of electric Batch Ovens, with each unit estimated to cost between \$375,000 and \$503,000. Please see staff report for further detail regarding the cost estimations per oven.

Electric Oven Operating and Maintenance (O&M) Costs

Operating and maintenance (O&M) cost, is a recurring expenditure that is incurred annually and would include items such as materials, labor, and maintenance costs associated with operations of the new equipment. In the case of electric oven units, the fuel switching costs were the only additional O&M cost that was considered. This is mainly because the electric ovens are conservatively assumed to have the same O&M costs as their gas-fired counterpart units. Based

on vendor feedback, electric ovens do not rely on combustion as the heat source; therefore, combustion system maintenance will not be required, and O&M costs, aside from fuel switching costs, may be significantly reduced as a result.

Incremental Cost of Fuel Switching

The fuel switching cost represents the difference in cost between the annual electricity costs of the new electric oven and the annual cost of the gas-fired oven. Since electricity is generally more expensive than natural gas, the fuel switching cost reflects the increase in utility costs that facilities would incur by transitioning to electric ovens.

Based on conversations with electric oven manufacturers, staff assumed that electric oven units would be more efficient and consume 20 percent less energy compared to their gas-fired counterparts. While electric units will typically require a higher energy demand during start up, electricity use will steadily decline as the oven reaches operating temperature. Furthermore, since there is no combustion taking place, flue gas extraction is significantly reduced resulting in less heat energy loss. However, due to the higher cost of electricity, this efficiency gain may not fully offset the increased energy expenses.

Given the uncertainty in forecasting electricity and natural gas rates, staff incorporated multiple sources of information. These sources include recent rates that capture current volatility in natural gas prices, as well as forecasted rates from the California Energy Commission (CEC). The analysis averages the forecasted rates and recent rates reflective of different scenarios. For more detailed assumptions and analyses regarding fuel switching costs, please refer to the specific section of the staff report (Page 24 to 25 in chapter 2).

Recent Electricity and Natural Gas Rates

Staff used an industrial electricity rate of 14.82 cents/kWh. This rate is based on the average industrial retail electricity price in California during 2021 collected by the Energy Information Administration (EIA)³. The EIA is an agency within the U.S. Department of Energy charged with the collection, analysis, and dissemination of energy-related data. For recent natural gas rates, staff assumed a cost of 62 cents/therm. This price is calculated based on the 24-month average natural gas price from May 2021 to May 2023 sourced from the Southern California Gas Company (SoCal Gas)⁴. Staff used SoCal Gas rates because SCG is the primary gas utility for the affected facilities, while electricity is supplied by a range of different municipal providers which motivated the use of EIA averages for electricity rates.

³ https://www.eia.gov/electricity/sales_revenue_price/pdf/table4.pdf

⁴ <https://www.socalgas.com/for-your-business/energy-market-services/gas-prices>

Forecasted Rates

Forecasted electricity rates are based on the CEC 2022 Energy Demand Update⁵ for industrial consumers in the Los Angeles Department of Water and Power (LADWP) and Southern California Edison (SCE) planning areas. The average of the two planning areas' forecasted rates over the 2024 - 2035 period is the assumed electricity rate of 16.82 cents per kWh. The forecasted natural gas price is based on the CEC forecast for SoCal Gas from the 2021 Integrated Energy Policy Report (IEPR)⁶. Staff averaged the SoCal Gas forecast over the 2024–2035 period to calculate the assumed rate of 54 cents per therm.

Fuel Switching Cost Assumptions and Methodology

Staff first calculated the total annual energy demand for each unit. This is calculated by multiplying the unit's hourly power demand by the number of hours it operates. Staff assumed that facilities run at 50% operating capacity, or 4,380 hours per year. Additionally, electric ovens are assumed to require 20% less energy input than the existing gas-fired ovens, so the total energy demand for electric units is lower than the total demand for corresponding gas-fired units. Energy demand is then multiplied by the forecasted price per kWh in each year to calculate total annual energy cost for each unit and fuel type. The incremental fuel switching cost is the difference between the estimated annual fuel cost of an electric unit relative to its gas-fired equivalent.

Forecasting energy prices involves uncertainty, and actual rates will differ from forecasted rates in any given year. Staff acknowledges this uncertainty and notes that the methodology used in this analysis is not precedential. Staff will continue to update its forecasts and cost assumption methodologies in future rulemakings, based on best practices and the latest energy prices forecasts including but may not be limited to the California IEPR.

Total Compliance Cost of PAR 1153.1

The total cost would include overall cost over 28 years. As presented in Table 3, the total present worth of compliance cost of the PAR 1153.1 is estimated at \$323.74 and \$211.79 million, respectively, depending on the real interest rate assumed (1% to 4%).⁷ The average annual

⁵ <https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2022-integrated-energy-policy-report-update-2>

⁶ <https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report>

⁷ In 1987, South Coast AQMD staff began to calculate cost-effectiveness of control measures and rules using the Discounted Cash Flow method with a discount rate of 4 percent. Although not formally documented, the discount rate is based on the 1987 real interest rate on 10-year Treasury Notes and Bonds, which was 3.8 percent. The maturity of 10 years was chosen because a typical control equipment life is 10 years; however, a longer equipment life would not have corresponded to a much higher rate-- the 1987 real interest rate on 30-year Treasury Notes and Bonds was 4.4 percent. Since 1987, the 4 percent discount rate has been used by South Coast AQMD staff for all cost-effectiveness calculations, including BACT analysis, for the purpose of consistency. The incremental cost reported in this assessment was thus annualized using a real interest rate of four percent as the discount rate. As a sensitivity test, a real interest rate of one percent will also be used, which is closer to the prevailing real interest rate.

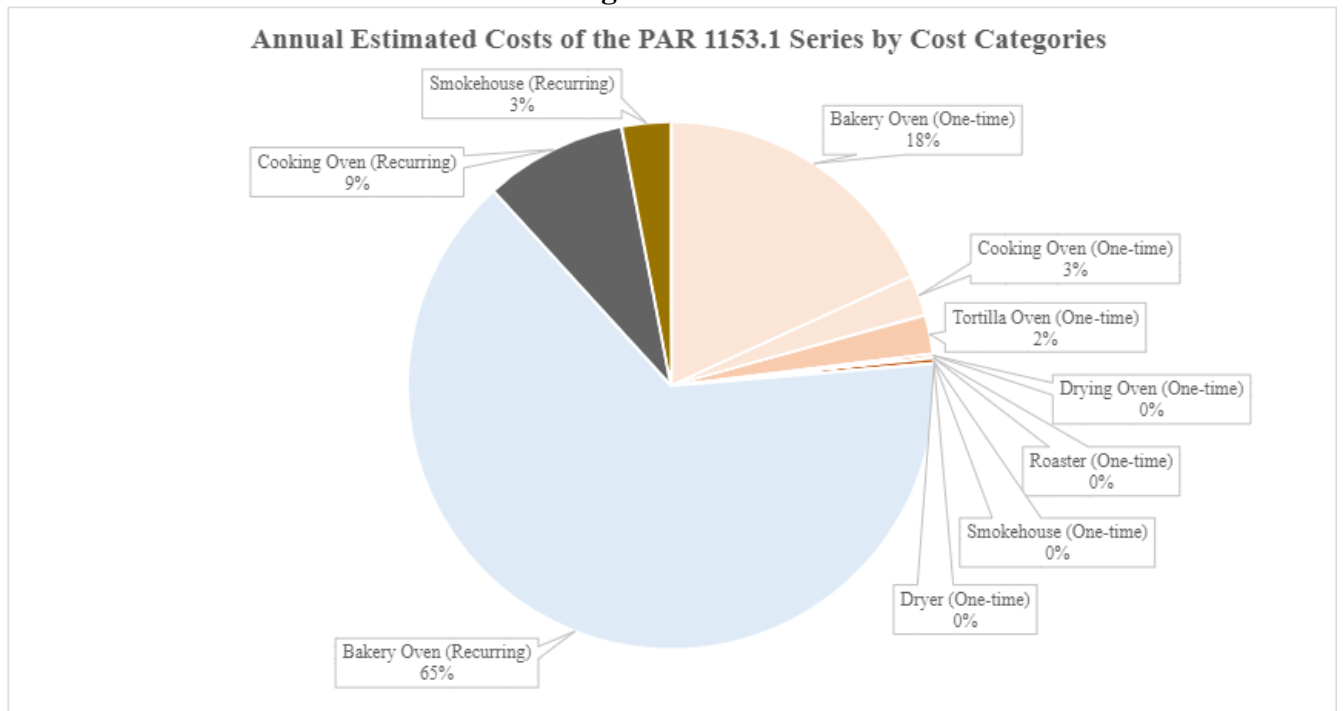
compliance costs of PAR 1153.1 are estimated to range from \$12.82 million to \$13.50 million, depending on the real interest rate assumed (1% to 4%). About 83 percent of the total annual compliance cost is attributed to the bakery ovens alone. All the estimated annual costs are expected to be incurred by the food manufacturing sector (NAICS 311) where most of the bakery ovens belong. Table 1 presents total and average annual compliance cost of the PAR 1153.1 by requirement categories.

Table 1
Total Present Worth and Average Annual Estimated Costs of PAR 1153.1

Present Worth Value (2024)			Annual Average (2024-2051)	
Cost Categories	1% Discount Rate	4% Discount Rate	1% Real Interest Rate	4% Real Interest Rate
One-Time Cost				
Bakery Oven	\$59,072,823	\$39,017,347	\$1,906,742	\$2,455,914
Cooking Oven	\$8,124,118	\$5,403,033	\$268,046	\$337,081
Tortilla Oven	\$7,821,190	\$5,359,541	\$283,625	\$321,642
Drying Oven	\$677,870	\$464,517	\$24,582	\$27,877
Roaster	\$177,932	\$120,803	\$6,270	\$7,338
Smokehouse	\$1,029,356	\$668,789	\$31,405	\$42,996
Dryer	\$111,700	\$76,543	\$4,051	\$4,594
Recurring Costs				
Bakery Oven	\$208,635,138	\$135,862,223	\$8,709,123	\$8,709,123
Cooking Oven	\$28,364,829	\$18,501,103	\$1,183,496	\$1,183,496
Smokehouse	\$9,724,241	\$6,317,993	\$406,183	\$406,183
Total	\$323,739,197	\$211,791,892	\$12,823,523	\$13,496,244

Figure 1 presents the estimated annual compliance costs of the PAR 1153.1 by the cost categories. The bakery ovens recurring costs, which primarily include the fuel switching costs associated with transitioning from gas-fired to electric ovens, account for approximately 65 percent (\$8,709,123) of the total annual cost. This indicates that the ongoing fuel switching expenses are the most significant component of the compliance costs for bakery ovens. Following that, the bakery ovens one-time capital costs contribute around 18 percent of the total annual cost. These capital costs represent the initial investment required for purchasing and installing the new equipment, such as electric ovens or control devices. The remaining percentage of the total annual cost is attributed to the capital costs associated with other equipment affected by PAR 1153.1. This includes the installation of control equipment for different types of food ovens and any other relevant equipment required for compliance.

Figure 1



MACROECONOMIC IMPACTS ON THE REGIONAL ECONOMY

The Regional Economic Model (REMI, PI+ v3) was used to assess the total socioeconomic impacts of the anticipated policy change (i.e., the proposed rule).^{8,9} 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.¹⁰

It should be noted that the REMI model is not designed to assess impacts on individual operations. The model was used to assess the impacts of the proposed project on various industries that make up the local economy. Cost impacts on individual operations were assessed outside of the REMI model and used as inputs into the REMI model.

Impact of Proposed Amendments

The assessment herein is performed relative to a baseline (“business as usual”) where the proposed amendments would not be implemented. It is assumed that the 47 affected facilities would finance the capital and installation costs of control equipment, or more specifically, these one-time costs are assumed to be amortized and incurred over the equipment life. The proposed project is assumed to be the implementation of PAR 1153.1 by the affected facilities, which would create a policy scenario under which the affected facilities would incur an average annual compliance cost of approximately \$13.50 million when costs are annualized using a 4% real interest rate, or \$12.82 million when evaluated using a 1% real interest rate from year 2024 onwards when all controls are assumed to have been installed.

Direct effects of the proposed project are used as inputs to the REMI model in order for the model to assess secondary and induced impacts for all the industries in the four-county economy on an annual basis and across a user-defined horizon: 2024 (first year when the affected facilities are assumed to incur compliance costs due to PAR 1153.1 implementation) to 2051 (last year that costs associated with operation and maintenance are incurred). Direct effects of the proposed amendments include (1) additional costs that the facilities would incur by installing control equipment, (2) additional fuel switching costs that affected facilities would incur by switching from gas-fired ovens to the electric ovens, (3) additional spending by local contractors and vendors

⁸ Regional Economic Modeling Inc. (REMI). Policy Insight® for the South Coast Area (70-sector model). Version 3. 2023.

⁹ REMI v3 has been updated based on The U.S. Economic Outlook for 2021-2023 from the University of Michigan's Research Seminar in Quantitative Economics (RSQE) release on May 21, 2021, The Long-Term Economic Projections from CBO (supplementing CBO's March 2021 report, The 2021 Long-Term Budget Outlook), and updated BEA data for 2020 (revised on May 27, 2021).

¹⁰ Within each county, producers are made up of 156 private non-farm industries and sectors, 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>.)

for installation of the new ovens, and (4) additional local utilities services which are needed to meet the proposed requirements.

Whereas all the compliance expenditures and additional operating costs of the new ovens that are incurred by the affected facilities would increase their cost of doing business, the installation of the new ovens and additional spending in the utility sector would increase the spending and sales of businesses in various sectors, most of which are in the South Coast AQMD region. It was assumed that all the new ovens, including the electric ones are produced outside of the region and as such no additional benefits were assumed from production and sales of these new ovens. Table 2 lists the industry sectors modeled in REMI that would either incur cost or benefit from the compliance expenditures. Construction sector where most of the contractors and new oven installers belong as well as the local utilities are expected to benefit from implementation of the PAR 1153.1.

**Table 2
Industries Incurring vs. Benefitting from Compliance Costs/Spending**

Type of Food Ovens	REMI Industries Incurring Compliance Costs	REMI Industries Benefitting from Compliance Spending
Bakery Oven	Food Manufacturing (NAICS 311)	<i>One-time Capital:</i> Construction (NAICS 23) <i>Recurring:</i> Utilities (NAICS 22)
Cooking Oven	Food Manufacturing (NAICS 311)	<i>One-time Capital:</i> Construction (NAICS 23) <i>Recurring:</i> Utilities (NAICS 22)
Tortilla Oven	Food Manufacturing (NAICS 311)	<i>One-time Capital:</i> Construction (NAICS 23)
Drying Oven	Food Manufacturing (NAICS 311)	<i>One-time Capital:</i> Construction (NAICS 23)
Roaster	Food Manufacturing (NAICS 311)	<i>One-time Capital:</i> Construction (NAICS 23)
Smokehouse	Food Manufacturing (NAICS 311)	<i>One-time Capital:</i> Construction (NAICS 23) <i>Recurring:</i> Utilities (NAICS 22)
Dryer	Food Manufacturing (NAICS 311)	<i>One-time Capital:</i> Construction (NAICS 23)

Regional Job Impacts

When the compliance cost is annualized using a 4% real interest rate, it is projected that an annual average of 116 net jobs foregone will occur from 2024 to 2051. The 116 annual jobs foregone represents less than 0.001% of total annual jobs in the four-county area.

The implementation of PAR 1153.1 is expected to have both positive and negative job impacts on the regional economy over time. In 2024, when most of the capital spending for the new burners is anticipated, it is projected that about 64 additional jobs will be added to the economy due to the compliance expenditures and additional spending associated with the installation of new burners. These jobs are expected to benefit sectors such as construction, miscellaneous professional services, retail, and wholesale trade.

However, as affected facilities continue to bear the costs of capital expenditures, including the subsequent installation of electric ovens and the associated higher fuel switching expenses starting in 2027, the accelerated job growth due to the initial effects of burner installation is projected to slow down, eventually leading to jobs foregone. The food manufacturing sector (NAICS 311) is anticipated to bear the largest share of average annual jobs foregone, with an estimated 52 jobs. This sector is expected to incur the majority of the compliance costs associated with PAR 1153.1.

The reduction in disposable income resulting from the overall jobs foregone is expected to dampen the demand for goods and services in the local economy. This, in turn, would contribute to jobs foregone in sectors such as food services and drinking places, retail trade, and wholesale trade. While the negative job impacts are projected to be relatively minor, several major sectors of the regional economy could experience these effects from the secondary and induced consequences of PAR 1153.1 implementation.

It's important to note that these job impact projections are based on assumptions and analysis using the REMI model. The actual job impacts may vary depending on various factors and uncertainties in the economy and industry dynamics. As presented in Table 2, many major sectors of the regional economy would experience negative, albeit minor, job impacts in later years from the secondary and induced effects of PAR 1153.1 implementation.

Table 3: Projected Job Impacts of PAR 1153.1 for Select Industries by Year

Industry	2024	2030	2035	2040	2045	2051	Average Annual (2024-2051)	Baseline Average Annual (2024-2051)	% Change from Baseline
Food manufacturing (311)	-2	-52	-68	-66	-60	-51	-52	60,738	-0.0856%
State and Local Government (92)	2	-9	-11	-12	-11	-10	-9	957,052	-0.0009%
Food services and drinking places (722)	1	-10	-12	-11	-10	-8	-9	697,522	-0.0013%
Retail trade (44-45)	2	-12	-10	-9	-8	-7	-8	811,778	-0.0010%
Social assistance (624)	1	-6	-7	-6	-6	-5	-5	537,523	-0.0010%
Real estate (531)	2	-6	-6	-6	-6	-5	-5	567,128	-0.0009%
Administrative and support services (561)	2	-5	-5	-5	-5	-4	-4	833,379	-0.0004%
Wholesale trade (42)	1	-5	-5	-4	-4	-3	-4	417,208	-0.0009%
Truck transportation (484)	0	-4	-4	-4	-3	-3	-3	108,515	-0.0029%
Apparel manufacturing; Leather and allied product manufacturing (315-316)	0	-3	-4	-4	-3	-2	-3	60,433	-0.0047%
Professional, scientific, and technical services (54)	3	-4	-2	-2	-2	-2	-2	987,523	-0.0002%
Nursing and residential care facilities (623)	0	-2	-2	-2	-2	-2	-2	176,251	-0.0009%
Educational services; private (61)	1	-2	-2	-2	-2	-2	-1	292,737	-0.0005%
Hospitals; private (622)	0	-2	-2	-2	-2	-1	-1	184,244	-0.0008%
Machinery manufacturing (333)	0	0	0	0	0	0	0	24,976	0.0005%
Construction (23)	37	-14	-4	-2	-2	-2	0	525,058	0.0001%
Computer and electronic product manufacturing (334)	0	0	1	1	0	0	0	122,989	0.0004%
Utilities (22)	0	8	7	5	5	4	5	19,242	0.0277%
Remaining Industries	12	-20	-21	-18	-20	-18	-15	4,146,003	-0.0004%
All Industries	64	-145	-157	-147	-139	-120	-116	11,596,925	-0.0010%

Figure 2 presents a projected time series of job impacts over the 2024 - 2051 period. Based on Abt Associate’s 2014 recommendation to enhance socioeconomic analysis by conducting scenario analysis on major assumptions, staff has analyzed an alternative scenario (worst case) where the affected facilities would not purchase any control equipment or services from providers within the South Coast Air Basin. This is a hypothetical scenario in order to test the sensitivity of the previously discussed scenarios where the analyses rely on REMI’s embedded assumptions about how the capital and O&M spending would be distributed inside and outside the region. In reality, utilities expenditures are paid to local utilities producers. Moreover, increased construction jobs related to control installation are likely to be offered by the local construction companies.

This worst-case scenario would result in an annual average of approximately 184 jobs forgone. The 184 jobs forgone represents less than 0.0016% of total jobs in the region.

Figure 2: Projected Regional Job Impact, 2024-2051



Competitiveness

The additional cost brought on by PAR 1153.1 would increase the cost of services rendered by the affected industries in the region. The magnitude of the impact depends on the size, diversification, 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.

The overall impacts of the PAR 1153.1 on the production costs and delivered prices in the region is not expected to be significant. According to the REMI Model, PAR 1153.1 is projected to increase the cost of production of the food manufacturing in the South Coast region by 0.069 percent and increase the relative delivered price of goods provided by 0.0448 percent in 2027 when both Phases I and II requirements are effective.

REFERENCES

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