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Socio-Economic Impact Study of Proposed Amendments to Regulation 6, Rule 3, Wood Burning Devices

Submitted to: Bay Area Air Quality Management District

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EXECUTIVE SUMMARY

Description of Proposed Rule

The Bay Area Air Quality Management District ("Air District" or "BAAQMD") proposes to amend Regulation 6, Rule 3 (Rule 6-3) to further reduce emissions of fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) and visible emissions from wood-burning devices used as a source of primary or supplemental heat, or ambiance.

During the winter months, wood burning is a major contributing source of $PM_{2.5}$ concentration in the Bay Area and wood smoke contributes approximately 30 to 40 percent of $PM_{2.5}$ concentrations. Because of the topography and wintertime weather patterns in the Bay Area, and the large number of households burning wood in the region, $PM_{2.5}$ concentration can build and result in unhealthy air quality.

Rule 6-3 was originally adopted in 2008, and BAAQMD has implemented multiple strategies to reduce emissions from household wood burning, including a robust enforcement program along with public education and outreach regarding the harmful effects of wood smoke. Rule 6-3 has successfully contributed to a reduction in wood burning by area residents, but $PM_{2.5}$ emissions still exceed federal health standards, and wood smoke continues to negatively impact local air quality. As a result, BAAQMD is proposing to amend the Rule in order to further reduce harmful emissions from wood smoke.

The proposed rule amendments would:

- clarify and strengthen the requirements for claiming exemptions;
- adopt new wood heater standards set forth by EPA;
- strengthen the visible emissions limitation;
- require real estate and rental disclosures to communicate the health hazards of $PM_{2.5}$; and
- transition new building construction and rental properties to cleaner heating options.

Following is a brief synopsis of the key changes to Rule 6-3.

Sole Source of Heat Exemption

The proposed amendment would require that only residences with an EPA-certified wood-burning device which is the only permanently installed source of heat qualify for this exemption. Additionally, a claimant would be required to register that EPA-certified device with the Air District to receive this exemption. The purpose of this proposal is to ensure that devices used as sole sources of heat are cleaner and more efficient than those previously exempt from the rule. The replacement of older, more polluting, uncertified wood burning devices that are used as primary heating in areas without natural gas is vital to improving air quality.

Exemption for Non-functional, Permanently Installed Heaters

The Air District proposes a 30-day exemption to allow temporary use of a wood-burning device during a *Winter Spare the Air Alert* while a repair is being made to the regularly used non-wood heater. This exemption will only apply if a household has no alternate form of heat available, such as gas or electric heating.

Exemption for Loss of Natural Gas and/or Electric Power

The current Rule 6-3 has two separate exemptions for temporary gas or electric service outages. These exemptions allow use of a wood-burning device during a *Winter Spare the Air Alert* if there is a loss of natural gas and/or electric power due to natural disasters, such as, but not limited to, earthquakes, fires, floods, storms, or if an outage is due to utility service disruptions. The Air District is proposing to combine these two exemptions sections into one.

Clarify, Amend, or Add Definitions to Rule

The proposed changes to definitions in Section 200 of the rule would include a number of new or amended definitions to support amended rule requirements.

U.S. EPA Requirement for Residential Wood Heaters

Since adoption of Rule 6-3 in 2008, the Air District has enforced EPA requirements for residential wood heaters such that all wood heaters sold in the Air District must be “EPA Phase II Certified.” On February 3, 2015, EPA updated emission standards for new residential wood heaters and the Air District is proposing to require wood burning devices to meet these new certification requirements. EPA’s new emission standards and five-year compliance schedule for new heaters establishes health-protective measures that ensure manufacturers continue to move toward cleaner technologies and consumers transition to cleaner heater options. Wood heaters currently in use and in homes are not affected by these new emission standards and the standards do not require a replacement or upgrade of existing devices.

Requirement for Sale, Resale, Transfer or Installation of Wood-Burning Devices

The current rule prevents the sale, resale, supply, transfer, or installation of non-EPA certified wood-burning devices within the Bay Area. The proposed amendment provision is intended to remove loopholes that allow non-compliant stoves to stay on the market and be sold by the general public. This requirement applies to both used and new devices; however, the requirement does not apply to a wood-burning device that is an existing installed fixture included in the sale or transfer or real property.

Visible Emissions Limitation

The Air District proposes to amend and strengthen the visible emissions standard to be consistent with Regulation 6, Rule 1, General Requirements, for sources of particulate matter. The proposed amendment would shorten the duration of excessive visible emissions to three minutes in any hour. Following a 20-minute start-up allowance for new fires, visible emissions of greater than 20 percent opacity that aggregate to three minutes in any hour would be prohibited. The proposed amendment would make it easier for Air District staff to determine which wood-burning devices are not operating properly and creating excessive smoke.

Real Estate and Rental Disclosure Requirement

The Air District is proposing a measure that would require disclosure when selling, leasing, or renting properties with wood-burning equipment, describing the negative health impacts of $PM_{2.5}$.

Requirement for Rental Properties

The Air District is proposing a new requirement that all rental properties in areas with natural gas availability include a permanently installed form of heat that does not burn wood or solid fuel. This proposed requirement ensures all landlords provide tenants with a cleaner heating option than burning wood in areas that have natural gas by disallowing all rental properties in areas with natural gas service from claiming the Sole Source of Heat exemption.

Requirement for New Building Construction

Rule 6-3 currently allows any new construction of a building or structure to install a wood-burning device that meets EPA certification requirements. The Air District proposes to amend and strengthen this requirement by ensuring new construction in the Bay Area transition to only the cleanest, most efficient heating options, such as, but not limited to, gas-fueled or electric heaters. Under this proposed amendment, new buildings could no longer install a wood-burning fireplace or EPA-certified wood heater.

Requirement for Fireplace or Chimney Remodels

The Air District proposes to amend and clarify the requirements regarding remodeling a chimney or fireplace so that only remodels with costs greater than $15,000 (excluding cost of local building permit) and that require a building permit would trigger the installation of an EPA-certified, gas-fueled, or electric device.

Registration Requirement
The Air District proposes to establish a new registration program that would require all claimants of Sole Source of Heat exemption to register their EPA certified wood-burning devices. The Air District is proposing a free and voluntary registration program with a requirement to renew the registration every five years.

This proposed registration requirement would provide an inventory of EPA-certified wood-burning devices in geographical areas without natural gas service and allow the Air District to strategically allocate resources to households that are not using EPA-certified devices in areas without natural gas service. This proposed requirement also would allow Air District staff to better address wood smoke concerns in certain communities that do have natural gas service and are using wood-burning devices during WSTA alerts.

Mandatory Burn Ban
Rule 6-3 prohibits wood-burning in the Bay Area when forecasts indicate $PM_{2.5}$ concentrations will reach prescribed unhealthy levels. The Air District does not plan to amend the standard of this requirement; however, the Air District is proposing to amend the name by changing it from "Solid-fuel Burning Curtailment" to "Mandatory Burn Ban." A name change would effectively communicate to the general public that when a Winter Spare the Air Alert alert is declared, a "Mandatory Burn Ban" is in effect and wood burning is illegal in the Bay Area.

Socio-Economic Impacts

Affected Industries
The Sole Source of Heat exemption's requirement for heating system upgrades will lead to additional expenses for households rather than directly for any industry. Changes in household expenditures could result in impacts across all sectors of the economy as households divert income toward meeting this requirement. However, the cost of heating unit replacement could be offset in part by reduced expenditures for fuel due to increased efficiency in fuel use.

The lower fuel consumption would in turn lead to potentially reduced purchases from firewood dealers and reduced revenues at those businesses.

The requirement for replacement of wood-fueled heating devices in rental units where natural gas is available will require landlords to expend funds to upgrade heating systems in certain rental properties, thus leading to a potential economic impact for these residential property owners.

Impacts on Affected Industries.

Impacts Related to Household Expenditures

The most substantial impacts are on the households that will be required to update their current wood-burning heat source to an EPA-approved wood heater. The resulting economic impacts will be due to changes in household spending patterns, as the reductions in expenditures circulate through the economy.

To meet the new requirements for the Sole Source of Heat exemption, households with older wood-burning heat systems will be required to upgrade to an-EPA-certified wood-burning device or to switch to a different heating fuel source. Air District staff estimate the purchase and installation cost of a new EPA-certified heater at between $2,500 and $6,000, with a basic heater cost of $5,000. This cost could be amortized over a number of years, through the use of a home improvement loan. BAE has assumed the use of a five-year loan at eight percent annual interest, based on the cost and typical terms. For the loan for a $5,000 heater, the annual costs for the term of the loan would be $1,217.

The heater replacement costs would be offset to some extent by reduced fuel costs due to the use of a more efficient heating system, especially for households using a fireplace; Air District staff has estimated the annual fuel cost savings for those replacing a wood stove at $100, and $300 for replacing a fireplace. The net annual costs would be $917 for replacing an older wood stove, and $1,117 for replacing a fireplace.

Air District staff estimates that there are approximately 19,000 households in the Air District that use wood as their primary heating fuel, and staff estimates that half of these households will need to upgrade their heating system as a result of the new requirements of the sole source exemption, and further estimates that of these 9,500 households, one third use a fireplace and two-thirds use an uncertified wood stove. Taking the number of households in each category, and multiplying by the annual net cost estimate per household, total annual compliance costs are estimated at $10.0 million.

The IMPLAN input output model has been used to generate estimates of regional induced impacts resulting from changes in household income affecting revenues across the entire economy, and for the major industry sectors. These impacts are then be compared to total economic activity and activity by sector to assess the impacts of the return lost due to the implementation of the proposed amendments to Rule 6-3 on overall net income.

The analysis here conservatively assumes that the $10 million in expenditures by household is entirely lost to the Bay Area, even though this is not likely to be the case; for instance, the construction sector would likely benefit as contractors are hired to install new heating systems. Even as a complete reduction, however, the impacts are a “drop in the bucket” relative to the overall size of the Bay Area economy. The estimated impacts of the assumed reduction in available household income as a share of total profits by major industry sector is insignificant across all sectors, with no sector showing a reduction in annual profits of even one-tenth of one percent. This loss of profit is far below the 10 percent ARB threshold. It should also be noted that this is a one-time non-recurring impact.

Impacts on Firewood Dealers

Firewood dealers may see direct impacts on sales due to the replacement of older wood-burning heating systems (including fireplaces and non-EPA-certified wood stoves) with more efficient EPA-certified wood heating systems. The amendments to Rule 6-3 would require a number of households to upgrade their current wood-burning device to a newer unit, and thus there would be costs and economic impacts to the households affected. However, using the newer more efficient devices would lead to energy cost savings since they would require lower fuel consumption. As a result, firewood dealers may face lower sales and reduced revenues.

Firewood dealers are part of the category defined in the North American Industry Classification System (NAICS) as “Fuel Dealers,” an industry comprising “establishments primarily engaged in retailing heating oil, liquefied petroleum (LP) gas, and other fuels via direct selling,” in NAICS category 454310. There are very few establishments in the Other Fuel Dealers category. According to the 2012 Economic Census, there were only 22 establishments in this category in all of California, and only eight in the San Jose-San Francisco-Oakland Combined Statistical Area (CSA), which encompasses the Air District’s region. Based on the data available, the dealers in the state employed only 79 workers, and the CSA’s dealers employed a total of between 20 and 79 employees.

BAAQMD also queried Dun & Bradstreet data and obtained the following list of firewood dealers in the Bay Area. This query shows 17 dealers, with 71 employees and annual revenues estimated at approximately $7.9 million. While this information varies somewhat from the Economic Census, it confirms that there are a limited number of firewood dealers in the Bay Area, and that they have limited employment.

Firewood dealers have very limited costs related to compliance with the amended Rule; the only costs might relate to labelling wood as seasoned/non-seasoned, but these costs should be minimal and are not considered here. The significant losses are related to decreased business, not compliance costs. The savings in fuel costs for households is in turn a loss of revenue for firewood dealers. Based on the same assumptions as used in the analysis of impacts on households, the annual loss in revenue for firewood dealers in the Bay Area is estimate at approximately $1.6 million.

Assuming that firewood dealer expenses are directly proportional to revenues, net income and profits would decline by the same percentage. The assumption of direct proportionality is conservative in estimating impacts; while some costs (obtaining the firewood at wholesale or otherwise, and staffing levels to some degree) will decrease with lower sales, other costs, such as rent or property taxes, are fixed such that operating expenses would actually not decline proportionally, and net income would decrease more than gross revenues on a proportional basis. Thus an assumed decline of 20 percent in net income is a conservative estimate, and this conservative estimate of loss is greater than the ARB 10 percent threshold used by BAAQMD as a proxy for burden, so a 20 percent or greater loss indicates that the proposed costs related to compliance have the potential for significant adverse economic impacts.

IMPLAN has been used to assess any indirect and induced impacts from these lost revenues. Given the likely small size of this lost revenue relative to the overall economy, these impacts are not substantial. The overall economic loss amounts to less than six jobs, and less than $1 million in annual output. Over half of the impacts are direct impacts for the firewood dealers.

Impacts on Rental Property Owners
As a result of the amendments to Rule 6-3, rental property owners with housing units heated using wood as a fuel will be required to switch to natural gas or another non-solid fuel heat source in areas where natural gas is available. The number of affected properties is assumed to be extremely low, since most rental properties in areas with natural gas service already do not use wood as a heat source. The Air District estimates that approximately 250 properties would be affected by the rule change mandating a conversion away from wood heaters in rental units located in areas with natural gas availability.

The business of renting these properties falls in NAICS 53110, Lessors of Residential Buildings and Dwellings. This sector has a high proportion of nonemployer businesses, likely due to a large number of small landlord sole proprietors and partnerships that own a limited number of buildings and handle the business themselves, or through independent contractors (e.g., a separate property management firm). Overall as of 2012, the ABAG nine-county region has a total of 22,478 establishments engaged in this line of business, of which 20,284 have no employees. Even if each of the estimated 250 impacted units in the Air District is operated by a separate entity, this still only constitutes approximately 1.3 percent of the establishments.

Among the establishments with employees, there are a total of approximately 10,000 workers who are directly employed. The nonemployers tend to have much lower revenues per establishment, another indicator that they tend to control fewer rental units than the employers. Overall, the establishments in the ABAG Region reported gross revenues of approximately $7.8 billion in 2012.

To meet the new requirements that rental properties heating with wood in areas with natural gas availability switch over to a non-solid fuel source (most likely gas), landlords will be required to install gas furnaces or other new heating systems that do not rely on wood for fuel. Air District staff estimate the purchase and installation cost of a new gas heater at between $2,500 and $6,000, with a basic heater cost of $5,000. This cost is assumed to be amortized over the lifetime of the heating system. For a $5,000 heater, the annual amortization is assumed to be $539.

The heater replacement costs would be offset by reduced fuel costs due to the use of a more efficient heating system, but the analysis here conservatively assumes that tenants are responsible for fuel costs, so those savings would accrue to the tenants. For the 250 units assumed to be affected, the estimated total annual compliance costs are approximately $135,000.

The analysis indicates that a typical property owner would see a reduction of approximately 9.2 percent in net income, below the ARB 10 percent threshold deemed significant. It should be noted that many of the assumptions regarding rents and tenant responsibility for fuel costs, are conservative; for example if utility savings go to the tenant, the property owners may be able to increase contract rents to pass through the costs of installing the new heating system, or if the property owner is responsible for heating fuel costs, the savings through switching from wood to gas would go to the landlord, reducing the compliance costs.

Based on an IMPLAN analysis the indirect and induced impacts from these compliance costs are trivial, amount to less than one job and only $43,500 annually in indirect and induced output in the entire Bay Area economy.

Impacts on Small Businesses
According to California Government Code 14835, a small business is any business that meets the following requirements:

- Must be independently owned and operated;
- Cannot be dominant in its field of operation;
- Must have its principal office located in California;
- Must have its owners (or officers in the case of a corporation) domiciled in California; and
- Together with its affiliates, be either:
    - A business with 100 or fewer employees, and an average annual gross receipts of $10 million or less over the previous three tax years, or
    - A manufacturer with 100 or fewer employees.

Household Impacts
The direct impacts here are on households, not businesses. The induced impacts from an assumed reduction in household expenditures are spread across the entire economy and are very small, and impacts at small businesses are assumed at the same level.

Firewood Dealers
Assuming these establishments are independently owned, they would all meet the criteria of California Government Code 14835 for categorization as small businesses, based on having 100 or fewer employees and annual revenues of less than $10 million, because even as a group they have fewer employees and less revenue than these thresholds. As discussed above, based on impacts on profits, there is the potential for significant impacts for any of these businesses meeting the definition of a small business. However, overall it should be noted that this is a very limited number of businesses with few employees and limited revenues.

Residential Rental Property Owners
While no information was gathered on how many of the affected properties were owned by small businesses, the data indicate that many property owners have no employees at all, and small residential properties are often owned by individuals or small investor partnerships. In some cases, residences are rented by former owner-occupants who continue to hold the property. In the most extreme scenario, all 250 of the affected properties would be owned by small businesses as defined above according to California Government Code 14835.

However, the analysis indicates that the impacts of the proposed rule amendment requiring the replacement of wood heating sources would not see a drop in profits that would reach significant levels for a typical landlord, in an analysis that is conservative and also does not account for potential long-term capital gains.

DESCRIPTION OF PROPOSED RULE AMENDMENT

The Bay Area Air Quality Management District ("Air District" or "BAAQMD") proposes to amend Regulation 6, Rule 3 (Rule 6-3) to further reduce emissions of fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) and visible emissions from wood-burning devices used as a source of primary or supplemental heat, or ambiance.

During the winter months, wood burning is a major contributing source of $PM_{2.5}$ concentration in the Bay Area and wood smoke contributes approximately 30 to 40 percent of $PM_{2.5}$ concentrations. Because of the topography and wintertime weather patterns in the Bay Area, and the large number of households burning wood in the region, $PM_{2.5}$ concentration can build and result in unhealthy air quality.

Rule 6-3 was originally adopted in 2008, and BAAQMD has implemented multiple strategies to reduce emissions from household wood burning, including a robust enforcement program along with public education and outreach regarding the harmful effects of wood smoke. Rule 6-3 has successfully contributed to a reduction in wood burning by area residents, but $PM_{2.5}$ emissions still exceed federal health standards, and wood smoke continues to negatively impact local air quality. As a result, BAAQMD is proposing to amend the Rule in order to further reduce harmful emissions from wood smoke.

The proposed rule amendments would:

- clarify and strengthen the requirements for claiming exemptions;
- adopt new wood heater standards set forth by EPA;
- strengthen the visible emissions limitation;
- require real estate and rental disclosures to communicate the health hazards of $PM_{2.5}$; and
- transition new building construction and rental properties to cleaner heating options.

This section describes the proposed amendments in more detail, largely repeating information found in the Staff Report describing the proposed amendments.[1]

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[1] From BAAQMD Staff Report, "Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood Burning Devices - Proposed Amendments," henceforth referred to as the "Staff Report," August 10, 2015.

A. Sole Source of Heat Exemption

In Rule 6-3, a wood-burning device may be used during a *Winter Spare the Air (WSTA) Alert* if that wood-burning device is the only source of permanently installed heat. BAAQMD proposes to amend the Sole Source of Heat exemption to strengthen and clarify the conditions for qualification. The proposed amendment would require that only residences with an EPA-certified wood-burning device which is the only permanently installed source of heat qualify for this exemption. Additionally, a claimant would be required to register that EPA-certified device with the Air District to receive this exemption. (See below for a discussion of BAAQMD's proposed new registration program.)

The purpose of this proposal is to ensure that devices used as sole sources of heat are cleaner and more efficient than those previously exempt from the rule. Wood stoves tend to last a long time and are replaced less frequently than other major appliances; so many older, uncertified wood-burning devices are still used regularly for heating. For this reason, the replacement of older, more polluting, uncertified wood burning devices that are used as primary heating in areas without natural gas is vital to improving air quality.

B. Exemption for Non-functional, Permanently Installed Heaters

Rule 6-3 currently does not provide an exemption for non-functional heaters and does not address concerns where a wood-burning device may be the only source of heat available until the primary heater is repaired. The Air District proposes a 30-day exemption to allow temporary use of a wood-burning device during a *Winter Spare the Air Alert* while a repair is being made to the regularly used non-wood heater. This exemption will only apply if a household has no alternate form of heat available, such as gas or electric heating. The proposal would require claimants to submit repair documentation for verification upon request by the Air District within ten days.

C. Exemption for Loss of Natural Gas and/or Electric Power

The current Rule 6-3 has two separate exemptions for temporary gas or electric service outages. These exemptions allow use of a wood-burning device during a *Winter Spare the Air Alert* if there is a loss of natural gas and/or electric power due to natural disasters, such as, but not limited to, earthquakes, fires, floods, storms, or if an outage is due to utility service disruptions. The Air District is proposing to combine these two exemptions sections into one and require that service outages must be verifiable by the local utility service provider.

D. Clarify, Amend, or Add Definitions to Rule

The proposed changes to definitions in Section 200 of the rule would include a number of new or amended definitions to support amended rule requirements.

E. U.S. EPA Requirement for Residential Wood Heaters

Since adoption of Rule 6-3 in 2008, the Air District has enforced EPA requirements for residential wood heaters such that all wood heaters sold in the Air District must be "EPA Phase II Certified." On February 3, 2015, EPA updated emission standards for new residential wood heaters and the Air District is proposing to require wood burning devices to meet these new certification requirements. EPA's new emission standards and five-year compliance schedule for new heaters establishes health-protective measures that ensure manufacturers continue to move toward cleaner technologies and consumers transition to cleaner heater options. Wood heaters currently in use and in homes are not affected by these new emission standards and the standards do not require a replacement or upgrade of existing devices.

F. Requirement for Sale, Resale, Transfer or Installation of Wood-Burning Devices

The current rule prevents the sale, resale, supply, transfer, or installation of non-EPA certified wood-burning devices within the Bay Area. The purpose of this requirement is to ensure that no member of the general public sells or purchases wood-burning devices that are not EPA certified. The proposed amendment provision is intended to remove loopholes that allow non-compliant stoves to stay on the market and be sold by the general public. This requirement applies to both used and new devices; however, the requirement does not apply to a wood-burning device that is an existing installed fixture included in the sale or transfer or real property.

G. Visible Emissions Limitation

Visible emissions that exceed 20 percent opacity from chimneys, stovepipes, or flues based on visual observation for at least six consecutive minutes in any one-hour period are not allowed under the current Rule 6-3. This requirement does not apply to the startup of a new fire for 20 minutes in any four-hour period.

The Air District proposes to amend and strengthen the standard to be consistent with Regulation 6, Rule 1, General Requirements, for sources of particulate matter. The proposed amendment would shorten the duration of excessive visible emissions to three minutes in any hour. Following a 20-minute start-up allowance for new fires, visible emissions of greater than 20 percent opacity that aggregate to three minutes in any hour would be prohibited. This requirement does not apply to the startup of a new fire for 20 minutes in any four-hour period. The proposed amendment would make it easier for Air District staff to determine which wood-burning devices are not operating properly and creating excessive smoke.

H. Real Estate and Rental Disclosure Requirement

The purpose of Rule 6-3 is to limit emissions of particulate matter and visible emissions from wood-burning devices to protect air quality and public health. The Air District is proposing a measure that would require disclosure when selling, leasing, or renting properties with wood-burning equipment, describing the negative health impacts of $PM_{2.5}$.

I. Requirement for Rental Properties

The Air District is proposing a new requirement that all rental properties in areas with natural gas availability include a permanently installed form of heat that does not burn wood or solid fuel. This proposed requirement ensures all landlords provide tenants with a cleaner heating option than burning wood in areas that have natural gas by disallowing all rental properties in areas with natural gas service from claiming the Sole Source of Heat exemption.

J. Requirement for New Building Construction

Rule 6-3 currently allows any new construction of a building or structure to install a wood-burning device that meets EPA certification requirements. The Air District proposes to amend and strengthen this requirement by ensuring new construction in the Bay Area transition to only the cleanest, most efficient heating options, such as, but not limited to, gas-fueled or electric heaters. Under this proposed amendment, new buildings could no longer install a wood-burning fireplace or EPA-certified wood heater.

K. Requirement for Fireplace or Chimney Remodels

Rule 6-3 currently requires the installation of a gas-fueled, electric, or EPA-certified wood-burning device as part of a remodel of a fireplace or chimney, when that remodel construction requires a local building permit. The current requirement of the rule is vague and may unreasonably require any fireplace or chimney remodel, regardless of the scale or scope of the remodel job, to install an EPA-certified device.

The Air District proposes to amend and clarify this requirement so that only remodels with costs greater than $15,000 (excluding cost of local building permit) and that require a building permit would trigger the installation of an EPA-certified, gas-fueled, or electric device. Enforcement of this provision would be by the local city or county where the building permit is received.

L. Registration Requirement

The Air District proposes to establish a new registration program that would require all claimants of Sole Source of Heat exemption to register their EPA certified wood-burning devices. The Air District is proposing a free and voluntary registration program with a requirement to renew the registration every five years. Registrants would be required to maintain all documents that verify Sole Source of Heat exemption status and would be required to be able to demonstrate that registered devices are operated according to manufacturer's specifications.

This proposed registration requirement would provide an inventory of EPA-certified wood-burning devices in geographical areas without natural gas service and allow the Air District to strategically allocate resources to households that are not using EPA-certified devices in areas without natural gas service. This proposed requirement also would allow Air District staff to better address wood smoke concerns in certain communities that do have natural gas service and are using wood-burning devices during WSTA alerts.

M. Mandatory Burn Ban

Rule 6-3 prohibits wood-burning in the Bay Area when forecasts indicate $PM_{2.5}$ concentrations will reach prescribed unhealthy levels. This requirement is currently named in the rule as "Solid-fuel Burning Curtailment."

The Air District does not plan to amend the standard of this requirement; however, the Air District is proposing to amend the name by changing it from "Solid-fuel Burning Curtailment" to "Mandatory Burn Ban." A name change would effectively communicate to the general public that when a WSTA alert is declared, a "Mandatory Burn Ban" is in effect and wood burning is illegal in the Bay Area.

REGIONAL TRENDS

This section provides background information on the demographic and economic trends for the nine-county San Francisco Bay Area, which represents the Air District's jurisdiction.[2] Regional trends are compared to statewide demographic and economic patterns since 2000, in order to show the region's unique characteristics relative to the State.

Regional Demographic Trends

Table 1 shows the population and household trends for the nine county Bay Area and California between 2000 and 2015. During this time, the Bay Area's population increased by 10.7 percent, compared to 14.3 percent for California as a whole. Similarly, the number of Bay Area households grew by 8.5 percent, compared to 11.5 percent growth statewide, as average household size increased in both geographies.

Table 1: Population and Household Trends, 2000-2015

Bay Area (a)	**2000**	**2015**	**Total Change 2000-2015**	**% Change 2000-2015**
Population	6,784,348	7,510,942	726,594	10.7%
Households	2,466,020	2,675,537	209,517	8.5%
Average Household Size	2.69	2.75		
California				
Population	33,873,086	38,714,725	4,841,639	14.3%
Households	11,502,871	12,830,035	1,327,164	11.5%
Average Household Size	2.87	2.95		

Notes:
(a) Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.

Sources: California State Department of Finance, 2015; US Census, 2000; BAE 2015.

The Bay Area's slower growth is tied to its relatively built-out environment, compared to the state overall. While Central Valley locations, such as the Sacramento region, experienced large increases in the number of housing units, the Bay Area only experienced moderate increases in housing units.

[2] The Air District's jurisdiction consists of nine counties, including all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties, as well as the western portion of Solano County and the southern portion of Sonoma County. See http://www.arb.ca.gov/app/dislookup/dislookup.php

Regional Economic Trends

Table 2 shows jobs by sector in 2009 and 2014 for the Bay Area and California. In the five-year period between 2009 and 2014, the Bay Area's employment base grew by 12.7 percent, increasing from 3.10 million jobs to 349 million jobs, as the economy has recovered from the depths of the Great Recession. The state saw somewhat smaller job growth, increasing by 8.9 percent from 14.75 million jobs in 2009 to 16.06 million jobs in 2014.

The largest non-government sectors in the Bay Area economy are Health Care and Social Assistance; Professional, Scientific, & Technical Services; Retail Trade; Accommodation and Food Services; and Manufacturing. The first two sectors each constituted 10 percent or more of the region's total jobs in 2014, with the latter three falling just below that threshold. Overall, the Bay Area's economic base largely reflects the state's base, sharing a similar distribution of employment across sectors. One noteworthy variation is the high employment in the Professional, Scientific, & Technical Services, which makes up 11.2 percent of employment in the Bay Area compared to only 7.4 percent statewide.

Most industry sectors showed an increase in employment in the Bay Area between 2009 and 2014, with increases of greater than 20 percent in Information; Professional, Scientific, & Technical Services; Management of Companies and Enterprises; Administrative and Waste Services; Educational Services; and Accommodation and Food Services. Most of these sectors are associated with the technology economy. Statewide, only one sector, Administrative and Waste Services, grew more than 20 percent over the five-year period. It is noteworthy that over the same period, government employment declined slightly in both the Bay Area and California.

In large part, the impacts of the proposed amendments to Rule 6-3 will fall on households burning wood either as a heat source or for ambiance, rather than on particular industries. Two small subsectors that might be affected are Direct Selling Firewood Dealers (a subset of NAICS 454310, Fuel Dealers) who could see sales decline due to the replacement of wood stoves and fireplaces with either more efficient wood-burning appliances or heaters using other non-solid fuel sources such as natural gas and electricity. Additionally, rental property owners required to replace wood-burning heat sources with cleaner fuels could also be affected.

Table 2: Jobs by Sector, 2009-2014 (a)

	Bay Area					California				
	2009 (b)		2014 (c)		% Change	2009 (b)		2014 (c)		% Change
Industry Sector	**Jobs**	**% Total**	**Jobs**	**% Total**	**2009-2014**	**Jobs**	**% Total**	**Jobs**	**% Total**	**2009-2014**
Agriculture	21,300	0.7%	21,600	0.6%	1.4%	371,800	2.5%	417,200	2.6%	12.2%
Mining and Logging	2,000	0.1%	1,800	0.1%	-10.0%	26,100	0.2%	31,300	0.2%	19.9%
Construction	135,000	4.4%	152,700	4.4%	13.1%	623,100	4.2%	675,400	4.2%	8.4%
Manufacturing	312,500	10.1%	320,100	9.2%	2.4%	1,283,600	8.7%	1,269,600	7.9%	-1.1%
Wholesale Trade	114,000	3.7%	122,300	3.5%	7.3%	645,300	4.4%	715,100	4.5%	10.8%
Retail Trade	299,200	9.7%	324,000	9.3%	8.3%	1,522,500	10.3%	1,633,800	10.2%	7.3%
Transportation, Warehousing, and Utilities	92,200	3.0%	100,600	2.9%	9.1%	474,500	3.2%	522,200	3.3%	10.1%
Information	111,300	3.6%	146,000	4.2%	31.2%	441,300	3.0%	457,900	2.9%	3.8%
Finance and Insurance	112,000	3.6%	114,400	3.3%	2.1%	528,100	3.6%	518,400	3.2%	-1.8%
Real Estate and Rental and Leasing	45,700	1.5%	50,000	1.4%	9.4%	254,900	1.7%	265,900	1.7%	4.3%
Professional, Scientific, and Technical Services	304,300	9.8%	390,400	11.2%	28.3%	1,013,600	6.9%	1,187,000	7.4%	17.1%
Management of Companies and Enterprises	58,300	1.9%	70,500	2.0%	20.9%	199,900	1.4%	225,200	1.4%	12.7%
Administrative and Waste Services	159,700	5.2%	196,700	5.6%	23.2%	850,200	5.8%	1,021,200	6.4%	20.1%
Educational Services	76,400	2.5%	93,900	2.7%	22.9%	304,300	2.1%	355,300	2.2%	16.8%
Health Care and Social Assistance	357,100	11.5%	422,000	12.1%	18.2%	1,739,600	11.8%	2,059,000	12.8%	18.4%
Arts, Entertainment, and Recreation	31,200	1.0%	35,900	1.0%	15.1%	244,900	1.7%	277,000	1.7%	13.1%
Accommodation and Food Services	262,800	8.5%	320,200	9.2%	21.8%	1,258,100	8.5%	1,480,100	9.2%	17.6%
Other Services, except Public Administration	104,200	3.4%	116,700	3.3%	12.0%	486,100	3.3%	539,800	3.4%	11.0%
Government (d)	455,700	14.7%	445,800	12.8%	-2.2%	2,479,600	16.8%	2,411,000	15.0%	-2.8%
Subtotal (e)	**3,055,000**	**98.7%**	**3,445,500**	**98.7%**	**12.8%**	**14,747,600**	**100.0%**	**16,062,300**	**100.0%**	**8.9%**
Additional Suppressed Employment (f)	40,800	1.3%	44,300	1.3%	8.6%	n/a	n/a	n/a	n/a	
Total, All Employment (e)	**3,095,800**	**100.0%**	**3,489,800**	**100.0%**	**12.7%**	**14,747,600**	**100.0%**	**16,062,300**	**100.0%**	**8.9%**

Notes:
(a) Includes all wage and salary employment.
(b) Represents annual average employment for calendar year 2009.
(c) Represents annual average employment for calendar year 2014.
(d) Government employment includes workers in all local, state and Federal workers, not just those in public administration. For example, all public school staff are in the Government category.
(e) Totals may not sum from parts due to independent rounding.
(f) County employment for some industries in some counties was suppressed by EDD due to the small number of firms reporting in the industry for a given county. Additionally, Santa Clara data is for MSA, which includes San Benito County. As of 2014, San Benito had approximately 16,100 wage and salary jobs, an insignificant number relative to the Bay Area total.

Sources: California Employment Development Department, 2015; BAE, 2015.

AFFECTED INDUSTRIES

As discussed previously, there are several amendments being proposed to Rule 6-3. The following discussion considers each of the topic areas, and assesses which industries might be adversely impacted.

A. Sole Source of Heat Exemption

The proposed amendment would require that, in order to obtain the sole source of heat exemption, households would be required to use an EPA-certified wood-burning device. Additionally, these households would be required to register that device with the Air District. Thus, the greatest impacts for this rule change would be on households rather than directly on any industry. Changes in household expenditures could result in impacts across all sectors of the economy as households increase or decrease their spending on heating their residences. The analysis in the next section will consider these impacts by major sector across the regional economy.

The lower fuel consumption would in turn lead to potentially reduced purchases from firewood dealers, so the analysis here will consider potential impacts on those dealers. The makeup of this industry is described in more detail in the impacts section below.

B. Exemption for Non-functional, Permanently Installed Heaters

This proposed exemption permits the temporary operation of wood-burning devices in an emergency situation where no other heat source is available. Since there is no cost to consumers associated with this rule change, there should be no resulting economic impacts.

C. Exemption for Loss of Natural Gas and/or Electric Power

The change proposed here is largely a combination of two current exemptions to wood-burning restrictions, and adds only a verification component. There should be no economic impact resulting from these modifications to Rule 6-3.

D. Clarify, Amend, or Add Definitions to Rule

These changes are being made to support other amended rule requirements, so no economic impacts would be associated with these actions.

E. U.S. EPA Requirement for Residential Wood Heaters

This rule requires that new/replacement wood heaters are required to meet certain EPA standards as the standards are tightened, but there is no requirement that older stoves be replaced by a certain date. There should be no significant economic impacts relating to this rule amendment.

F. Requirement for Sale, Resale, Transfer or Installation of Wood-Burning Devices

This proposed amendment further restricts the types of stoves that the general public can sell, transfer, or install in the Bay Area, removing some non-compliant stoves from the market. There should be no significant economic impacts relating to this rule amendment, given that the current rules are already fairly restrictive, and other requirements of Rule 6-3 mandate that these types of wood burning devices already cannot be installed as replacements for existing units, and furthermore, the rule does not require the replacement of a unit when it is a fixed part of the sale of a home.

G. Visible Emissions Limitation

This new stricter limitation allows the Air District staff to more easily detect wood-burning devices that are not operating properly. For household burning properly seasoned wood, especially in a properly operating EPA-approved unit, this restriction should not generate additional costs. As a result, only households without a sole source exemption may be impacted. These households would have the option to stop using a fireplace or stove that was not properly operating, or to use only properly seasoned wood, and thus are not facing mandatory costs related to the amendment.

H. Real Estate and Rental Disclosure Requirement

This is an administrative requirement that should have no economic impacts associated with it.

I. Requirement for Rental Properties

This amendment would mandate the use of heat sources that do not burn wood or other solid fuel in rental properties in locations where natural gas is available. Rental properties in these locations would no longer be able to claim the Sole Source of Heat exemption.

This new requirement will require landlords to expend funds to upgrade heating systems in certain rental properties, thus leading to a potential economic impact for these residential property owners. It will also impact any businesses currently selling firewood or other fuel for use at these properties. Additionally, renters at these residences who pay for their heat will see a change in their fuel costs; this change is likely to be beneficial, with reduced costs related to a change in fuel and a more efficient heating system.

The Air District estimates that only approximately 250 units would be affected by this rule, and have proposed that the requirement become effective on November 1, 2018, providing landlords ample time to switch to another source of heat.

J. Requirement for New Building Construction

This restriction on the installation of wood-burning fireplaces in new construction should have no direct adverse economic impact on households. There are no new costs, with potential construction savings resulting from the elimination of a home feature from new houses. It also ensures long-term savings on energy costs for the residents.

K. Requirement for Fireplace or Chimney Remodels

This amendment and clarification of an existing rule actually clarifies that the requirement is limited to a smaller set of households, and thus should have no adverse economic impact; in fact, households with fireplace or chimney repairs costing less than $15,000 are now clearly not required to spend money to modify their fireplace or other wood heat source.

L. Registration Requirement

This requirement in and of itself only requires households to register their EPA-certified wood-burning devices and requires minimal paperwork with no fee required, and in and of itself should have no economic impact. The impacts are related to the requirement that a Sole Source of Heat exemption will only be given for EPA-certified devices. The potential economic impacts of that rule amendment are discussed above.

M. Mandatory Burn Ban

This rule change is only a name change to a standard, and thus has no industry impacts.

SOCIO-ECONOMIC IMPACTS

This section describes the direct impacts on households, firewood dealers, and owners of residential rental property due to compliance costs and other costs associated with the proposed rule amendments. In order to estimate the economic impacts of amending Rule 6-3 on the relevant industries, this report assesses the impacts of the potential loss of household expenditures overall, the potential loss of sales at firewood dealers, and the relative cost to property owners related to the requirement to switch rental units to other fuels such as natural gas.

The implementation of the amendments to Rule 6-3 should result in lower household energy costs as more efficient heating systems are installed, whether EPA-approved wood-burning heaters, natural gas, or other types of newer systems, especially for households heating via fireplaces. These savings are considered in the analysis of direct impacts on households.

In addition to direct impacts, the changes in household expenditure patterns and any decline in revenues for the directly affected industries will result in a "ripple effect" through the regional economy. These effects are analyzed by utilizing the IMPLAN input-output model.

IMPLAN Input-Output Model

Economists use regional and national input-output models as a tool to understand the complex interactions among the various parts of an economy. The economic model used in this analysis, IMPLAN, is a software package that automates the process of developing input-output models for regions within the United States. The IMPLAN model is well-respected as an industry standard for estimating economic impacts resulting from current or hypothetical economic activities, often called "events."

At the heart of the IMPLAN model is a county-level trade flow called the Social Accounting Matrix (SAM) constructed from the production functions of 536 industries, using data from a variety of sources including the Bureau of Economic Analysis, Bureau of Labor Statistics, and US Census. The SAM uses each county's observed economic relationships between government, industry, and household sectors, allowing IMPLAN to model payments between industries, between households and industries, between government and industries, and between government and households. Thus, for a specified region, the input-output table accounts for all of the dollar flows between the different sectors within the economy.

Economic impacts as measured by IMPLAN are categorized as direct, indirect, and induced economic activity (defined in terms of jobs and total spending). Induced impacts are those resulting from household spending, and thus are the subject of the analysis proposed here.

- Direct Impacts. Direct impacts refer to the set of producer or consumer expenditures applied to the predictive model for impact analysis. IMPLAN then displays how the local economy will respond to these initial changes.

- **Indirect Impacts.** The indirect impacts refer to the impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to income and taxes. The analysis of household spending undertaken here does not analyze these impacts, since the impacts resulting from household expenditures are not in this category.

- **Induced Impacts.** The induced impacts refer to an economy's response to an initial change (direct impact) that occurs through re-spending of income according to household spending patterns. When households earn income, they spend part of that income on consumer goods and services. IMPLAN models households' income spending patterns and distributes them through the local economy. These impacts are analyzed here.

For this analysis, BAE is actually assessing the potential loss of spending power as households have to spend earnings on upgrading their heating systems, net of the fuel cost savings resulting from having a more efficient heating system. In addition, the indirect and induced impacts resulting from declining revenues for firewood dealers and compliance costs for residential rental property owners are estimated.

Impacts Related to Household Expenditures

The most substantial impacts are on the households that will be required to update their current wood-burning heat source to an EPA-approved wood heater. The resulting economic impacts will be due to changes in household spending patterns, as the reductions in expenditures circulate through the economy.

More specifically, the analysis here uses IMPLAN, as described above. IMPLAN software models the way income in one sector is spent and then re-spent in other sectors of the economy, generating waves of economic activity, known as "economic multiplier" effects. For this analysis, BAE will assess the difference between these multiplier effects due to the changes in household expenditures related to the costs and savings associated with the amendments to Rule 6-3.

This analysis conservatively assumes that for the additional household expenditures required to comply with the amended Rule, particularly with the requirement to use an EPA-compliant heater to get the sole source exemption, these expenditures will be lost to the Bay Area, even though it is likely that at least some if not most household will be purchasing new heating units in the Bay Area and using local contractors for the installation. Thus the impact estimate may slightly overestimate the impacts on businesses in the Air District. As will be shown below, these impacts are still extremely small.

Economic Profile

The IMPLAN model also generates estimates of overall economic activity and output/revenue for each of its 536 sectors and for the entire regional economy. This information will provide overall revenues for the Bay Area economy by sector to use in the analysis of rate of return.

Estimated Rate of Return

In its report on returns of active corporations, the Internal Revenue Service (IRS) provides annual data on total sales and net income for public companies across the broad spectrum of the private sector. For this analysis, 10-year averages were used such that the impacts of any particular year's performance due to economic fluctuations are lessened. Overall, the ratio of net income to total receipts across all active corporations is 6.0 percent on average for the 2003 to 2012 period.

Table 3: Returns on Total Receipts for All Industries, 2003-2012, for Active Corporations

All Industries	Total Receipts 2003-2012 (in $000)	Net Income 2003-2012 (in $000)	Net Income as % of Total Receipts
2003	$4,232,565,964	$213,681,780	5.0%
2004	$4,737,162,166	$275,398,651	5.8%
2005	$5,252,513,618	$361,042,566	6.9%
2006	$5,815,389,092	$386,202,310	6.6%
2007	$6,092,467,565	$400,730,264	6.6%
2008	$6,126,386,899	$317,090,536	5.2%
2009	$5,392,866,853	$272,466,326	5.1%
2010	$5,684,431,238	$334,093,927	5.9%
2011	$6,230,405,646	$375,437,189	6.0%
2012	$6,572,866,128	$475,998,050	7.2%
Average annual net income as % of total receipts (a)			6.0%

(a) Computed based on average net income percentage each year; sums of receipts and net income not used, in order to control for inflation over the time period.

Source: Internal Revenue Service, Returns of Active Corporations, Table 1; BAE, 2013.

Compliance Costs

To meet the new requirements for the Sole Source of Heat exemption, households with older wood-burning heat systems will be required to upgrade to an-EPA-certified wood-burning device or to switch to a different heating fuel source. Air District staff estimate the purchase and installation cost of a new EPA-certified heater at between $2,500 and $6,000, with a basic heater cost of $5,000.[3] This cost could be amortized over a number of years, through the use of a home improvement loan. While homeowners with sufficient equity would be able to use a home equity line of credit with a lower interest rate, BAE has assumed the use of a five-year loan at eight percent annual interest,

[3] From BAAQMD Staff Report, "Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood Burning Devices - Proposed Amendments," henceforth referred to as the "Staff Report," August 10, 2015.

based on the cost and typical terms. For the loan for a $5,000 heater, the annual costs for the term of the loan would be $1,217 (see Table 4).

The heater replacement costs would be offset to some extent by reduced fuel costs due to the use of a more efficient heating system, especially for households using a fireplace; Air District staff has estimated the annual fuel cost savings for those replacing a wood stove at $100, and $300 for replacing a fireplace. As also shown in Table 4, the net annual costs would be $917 for replacing an older wood stove, and $1,117 for replacing a fireplace.

Based on Census data, Air District staff estimates that there are approximately 19,000 households in the Air District that use wood as their primary heating fuel, and staff estimates that half of these households will need to upgrade their heating system as a result of the new requirements of the sole source exemption, and further estimates that of these 9,500 households, one third use a fireplace and two-thirds use an uncertified wood stove. Taking the number of households in each category, and multiplying by the annual net cost estimate per household, total annual compliance costs are estimated at $10.0 million.

Table 4: Compliance Costs Related to Rule Amendment for Sole Source Exemption

Furnace Installation Costs		
Cost of furnace	$5,000	(a)
Term for home improvement loan	5	(b)
Interest rate (annual)	8.00%	(c)
Monthly payment	$101	(d)
Annual cost of heater installation	$1,217	(d)
Fuel Cost Savings for Switch to EPA Qualified Device		
Switch from fireplace to EPA-certified device	$300	(e)
Switch from uncertified wood stove to EPA-certified device	$100	(e)
Net Annual Costs per Household		
Switch from fireplace to EPA-certified device	$917	(f)
Switch from uncertified wood stove to EPA-certified device	$1,117	(f)
Total Households Impacted		
Total number of households burning wood	19,000	(g)
Percent using an uncertified device	50%	(g)
Total required to upgrade for the Sole Source Exemption	9,500	(h)
Percent using a fireplace	33.3%	(i)
Percent using an uncertified stove	66.7%	(i)
Total w fireplace required to upgrade	3,167	(j)
Total w uncertified stove required to upgrade	6,333	(j)
Net Annual Compliance Costs for All Households		
Switch from fireplace to EPA-certified device	$2,900,000	(k)
Switch from uncertified wood stove to EPA-certified device	$7,100,000	(k)
Total Compliance Costs	**$10,000,000**	

(a) From BAAQMD Staff Report, "Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood Burning Devices - Proposed Amendments," henceforth referred to as the "Staff Report," August 10, 2015.
(b) Maximum term allowable for a loan of this size per https://www.lightstream.com/home-improvement-loan#rates or https://www.suntrust.com/PersonalBanking/Loans/UnsecuredHomeImprovementLoans.
(c) Best rate found for a home improvement loan at https://www.lightstream.com/home-improvement-loan#rates or https://www.suntrust.com/PersonalBanking/Loans/UnsecuredHomeImprovementLoans.
(d) Calculation based on terms above, assuming monthly payments.
(e) From the Staff Report.
(f) Cost of heat source upgrade less annual fuel savings costs.
(g) From the Staff Report.
(h) Total number of households times the percentage using an uncertified device.
(i) From the Staff Report, based on the assumed split by device type for renter households.
(j) Total number of household require to upgrade times percent currently using this device for heating.
(k) Costs per household times number of households.

Sources: BAAQMD; U.S. Census American Community Survey; other sources as noted; BAE, 2015.

IMPLAN is used to generate estimates of regional induced impacts resulting from changes in household income affecting revenues across the entire economy, and for the major industry sectors. These impacts are then be compared to total economic activity and activity by sector to assess the impacts of the return lost due to the implementation of the proposed amendments to Rule 6-3 on overall net income.

Economic Impacts Analysis for Affected Industries

In order to determine the impacts of these measures on business establishments covered by the proposed Rule amendments, the analysis that follows compares annualized compliance costs to annual profits. The analysis then calculates the compliance costs as a percentage of profits to determine the level of impact. BAAQMD uses the ARB's 10 percent threshold as a proxy for burden. Annualized compliance costs resulting in profit losses of 10 percent or more indicate that the proposed compliance measure has the potential for significant adverse economic impacts. For the analysis based on changes in household expenditures due to the Sole Source of Heat exemption requirement for heating system upgrades, there are far too many firms to reasonably assess impacts on a firm-by-firm basis.

Revenue and Profits by Major Industry Sector

Table 5 shows the estimated overall annual revenues and profits for the Bay Area by major industry group, based on IMPLAN estimates of overall revenues and IRS data on corporate profits. Overall, the Bay Area has a trillion-dollar economy, with the largest revenue generated by the manufacturing sector.

Sectoral Impact on Profits

As shown above in Table 4, the total estimated compliance costs for implementing the new Sole Source Exemption rule is $10 million. These costs will be borne by households, and thus will reduce the income available to spend on other items. The analysis here conservatively assumes that this income is entirely lost to the Bay Area, even though this is not likely to be the case; for instance, the construction sector would likely benefit as contractors are hired to install new heating systems. Even as a complete reduction, however, the impacts are a "drop in the bucket" relative to the overall size of the Bay Area economy. This is reflected in the extremely low impacts on profits, as shown in Table 5. The estimated impacts of the assumed reduction in available household income as a share of total profits by major industry sector is insignificant across all sectors, with no sector showing a reduction in annual profits of even one-tenth of one percent. This loss of profit is far below the 10 percent ARB threshold. It should also be noted that this is a one-time non-recurring impact.

Small Business Impacts

These impacts are spread across the entire economy, such that impacts at small businesses are assumed at the same level.

Table 5: Impacts of Reduced Household Income as Share of Profit by Major Industry Sector for the Bay Area

Major Sector	Baseline Revenue/ Output	Impacts of Income Change	Estimated $ Profit	Impacts as % of Profit
Agriculture, forestry, fishing, and hunting	$3,409,458,088	$16,438	$143,860,875	0.011%
Mining	$4,465,861,468	$11,458	$1,021,261,331	0.001%
Utilities	$9,308,693,956	$58,120	$630,362,600	0.009%
Construction	$45,377,021,811	$91,288	$2,074,732,097	0.004%
Manufacturing	$274,080,382,579	$521,304	$18,651,330,940	0.003%
Wholesale trade	$42,392,287,703	$332,302	$1,562,180,675	0.021%
Retail trade	$38,869,824,168	$554,102	$805,154,545	0.069%
Transportation and warehousing	$25,672,647,100	$204,254	$929,447,851	0.022%
Information	$120,072,055,460	$465,315	$11,410,514,294	0.004%
Finance and insurance	$57,036,661,420	$670,480	$13,385,839,475	0.005%
Real estate and rental and leasing	$57,595,668,232	$450,208	$9,816,803,050	0.005%
Professional, scientific, and technical services	$130,248,386,122	$269,905	$14,868,719,037	0.002%
Management of companies (holding companies)	$20,861,104,908	$94,209	$9,276,574,358	0.001%
Administrative & support & waste management & remediation services	$24,986,829,511	$159,726	$1,511,276,009	0.011%
Educational services	$9,447,342,898	$167,571	$1,087,261,971	0.015%
Health care and social assistance	$55,098,401,530	$880,984	$6,359,045,008	0.014%
Arts, entertainment, and recreation	$9,172,473,638	$135,017	$829,795,195	0.016%
Accommodation and food services	$26,308,712,576	$365,923	$959,293,641	0.038%
Other services	$19,769,096,186	$312,830	$985,920,432	0.032%
All Sectors	**$974,172,909,355**	**$5,761,432**	**$96,309,373,383**	**0.006%**

Sources: IMPLAN; Internal Revenue Service, Returns of Active Corporations, Table 1; BAAQMD; BAE, 2015.

Impacts on Firewood Dealers

As noted previously, firewood dealers may see direct impacts on sales due to the replacement of older wood-burning heating systems (including fireplaces and non-EPA-certified wood stoves) with more efficient EPA-certified wood heating systems. The amendments to Rule 6-3 would require a number of households to upgrade their current wood-burning device to a newer unit, and thus there would be costs and economic impacts to the households affected. However, using the newer more efficient devices would lead to energy cost savings since they would require lower fuel consumption. As a result, firewood dealers may face lower sales and reduced revenues.

Economic Profile of Affected Industry

Firewood dealers are part of the category defined in the North American Industry Classification System (NAICS) as "Fuel Dealers," an industry comprising "establishments primarily engaged in retailing heating oil, liquefied petroleum (LP) gas, and other fuels via direct selling," in NAICS category 454310. More specifically, the Economic Census provides some data specifically for "Other Fuel Dealers," which are "establishments primarily engaged in retailing fuels, such as coal, wood, or other fuels (except liquefied petroleum gas and heating oil) via direct selling."

There are a very small number of establishments in the Other Fuel Dealers category. According to the 2012 Economic Census, there were only 22 establishments in this category in all of California, and only eight in the San Jose-San Francisco-Oakland Combined Statistical Area (CSA), which encompasses the Air District's region.[4] Based on the data available, the dealers in the state employed only 79 workers, and the CSA's dealers employed a total of between 20 and 79 employees.

Table 6: Profile of Other Fuel Dealers Industry

Area	Number of Establishments	2012 Revenues	Number of Employees	Annual Payrolll
San Jose-San Francisco-Oakland, CA CSA (a)	8	(b)	(c)	(b)
California	22	$8,030,000	79	$1,516,000
United States	156	$108,702,000	495	$12,711,000

Note: "Other Fuel Dealers" includes establishments primarily engaged in retailing fuels, such as coal, wood, or other fuels (except liquefied petroleum gas and heating oil) via direct selling. Includes only establishments with payroll.
(a) This Combined Statistical Area (CSA) is the smallest area for which data were available that covered the entire BAAQMD region. CSA includes the nine-county ABAG region plus San Joaquin, Santa Cruz, and San Benito Counties.
(b) Data withheld to avoid disclosing data for individual companies.
(c) 20-99 employees; more detailed data withheld to avoid disclosing data for individual companies.

Source: 2012 Economic Census.

BAAQMD also queried Dun & Bradstreet data and obtained the following list of firewood dealers in the Bay Area (see Table 7). This query shows 17 dealers, with 71 employees and annual revenues estimated at approximately $7.9 million. While this information varies somewhat from the Economic Census for a variety of reasons related to the source,[5] it confirms that there are a limited number of firewood dealers in the Bay Area, and that they have limited employment.

[4] See footnote in table defining the Combined Statistical Area. This was the smallest area for which data were available.

[5] For example, the Duns data may include businesses with no paid employees, even though DUNS reports employees at each site. Also, the Economic Census data is from a different time frame, and the DUNS data cannot be confirmed via administrative records that the Census Bureau may have access to.

Table 7: Firewood Dealers in the Bay Area

Business Name	City	Number of Employees	Sales Volume
Fessenden Firewood	Berkeley	5	$550,000
Bahara's Firewood	Sunnyvale	5	$430,000
Xinar.com	Sebastopol	2	$600,000
The Coldest Winter	San Francisco	1	$66,000
Lost Coast Forest Products, Inc.	Santa Rosa	12	$1,900,000
Kosich Firewood	Danville	3	$160,000
Alaimo's Wood Farm	Pittsburg	1	$140,000
Hurst Firewood	Napa	1	$120,000
Valley Firewood	Novato	3	$230,000
Summit Tree & Firewood Company	Petaluma	2	$150,000
Oconnell Ranches-apple & Firewood Prdct	Sebastopol	4	$310,000
Nero's Designer Firewood	Novato	15	$1,000,000
All Seasons Firewood Llc	Santa Rosa	6	$510,000
Firewood Farms	Half Moon Bay	1	$50,000
Northwinds Firewood Tree Service	Belmont	2	$150,000
Fessenden Firewood	Richmond	5	$540,000
Hurst Firewood	Vallejo	3	$980,000
Total		**71**	**$7,886,000**

Sources: Dun & Bradstreet; MTC; BAAQMD, 2015.

While the other fuel dealers are not the only source for firewood, it is unlikely that decreased sales of firewood products at other retail outlets (e.g., supermarkets or hardware stores) would be substantial enough to impact business adversely. The 2012 Economic Census data indicate that they do not account for a substantial portion of sales for other types of retailers. As shown in the table below, firewood sales make up less than one percent of sales at gasoline stations that carry the product; for fuel dealers selling firewood, 22 percent of revenues come from sales of firewood.

Table 8: Major Sellers of Wood for Fuel, United States

Type of Retailer (a)	Number of Establishments	Revenues from **All Sales** (b)	Revenues from Sales of Firewood	As Percent of Total Sales
Gasoline Stations (c)	1,481	$7,134,752,000	$12,168,000	0.2%
Fuel Dealers (d)	136	$224,131,000	$49,373,000	22.0%

(a) Includes retailers where wood sales are listed as a separate product line. Does not include all retailers selling wood for fuel.
(b) Total sales of establishments reporting sales of wood for fuel.
(c) Includes gasoline stations with convenience stores.
(d) Includes all retail fuel dealers, not just Other Fuel Dealers.

Source: 2012 Economic Census, Preliminay Product Line Sales.

Estimated Rate of Return

Firewood dealers are part of the larger category of nonstore retailers (NAICS 454), which is the most specific category available in the IRS data on net income. For this analysis, 10-year averages were used as a benchmark such that the impacts of any particular year's performance due to economic fluctuations are lessened. As shown in Table 9, the 10-year average net income as a percent of total receipts for nonstore retailers is 5.9 percent.

Table 9: Returns on Total Receipts for Nonstore Retailers, 2003-2012, for Active Corporations

Nonstore Retailers (NAICS 454)	Total Receipts 2003-2012 (in $000)	Net Income 2003-2012 (in $000)	Net Income as % of Total Receipts
2003	$42,187,687	$2,010,771	4.8%
2004	$45,845,008	$1,588,577	3.5%
2005	$44,535,355	$3,459,395	7.8%
2006	$44,095,173	$3,177,093	7.2%
2007	$56,400,579	$3,281,813	5.8%
2008	$56,355,294	$2,628,645	4.7%
2009	$49,189,594	$2,227,209	4.5%
2010	$56,990,292	$4,135,871	7.3%
2011	$58,733,455	$3,161,725	5.4%
2012	$62,054,401	$5,149,527	8.3%
Average annual net income as % of total receipts (a)			**5.9%**

(a) Computed based on average net income percentage each year; sums of receipts and net income not used, in order to control for inflation over the time period.

Source: Internal Revenue Service, Returns of Active Corporations, Table 1; BAE, 2013.

Compliance Costs

Firewood dealers have very limited costs related to compliance with the amended Rule; the only costs might relate to labelling wood as seasoned/non-seasoned, but these costs should be minimal and are not considered here. The significant losses are related to decreased business, not compliance costs. Table 10 provides an estimate of the decline in revenues for firewood dealers. It is assumed that the losses will be sustained by these businesses; households heating with wood as their primary fuel are unlikely to be purchasing the kinds of small packages typically available at gasoline stations and other retailers such as supermarkets.

The savings in fuel costs for households is in turn a loss of revenue for firewood dealers. Based on the same assumptions as used in the analysis of impacts on households, the annual loss in revenue for firewood dealers in the Bay Area is estimate at approximately $1.6 million.

Table 10: Compliance Cost for Firewood Dealers

Annual Per HH Fuel Cost Savings for Switch to EPA Qualified Device		
Switch from fireplace to EPA-certified device	$300	(a)
Switch from uncertified wood stove to EPA-certified device	$100	(a)
Total Households Impacted		
Total number of households burning wood	19,000	(b)
Percent using an uncertified device	50%	(b)
Total required to upgrade for the Sole Source Exemption	9,500	(c)
Percent using a fireplace	33.3%	(d)
Percent using an uncertified stove	66.7%	(d)
Total w fireplace required to upgrade	3,167	(e)
Total w uncertified stove required to upgrade	6,333	(e)
Net Annual Savings for All Households		
Switch from fireplace to EPA-certified device	$950,000	(f)
Switch from uncertified wood stove to EPA-certified device	$630,000	(f)
Total Net Annual Savings	**$1,580,000**	
Change in Gross Revenue for Firewood Dealers	**($1,580,000)**	
Estimated Existing Revenues	**$7,886,000**	(g)
Change in Income for Firewood Dealers	**-20%**	

(a) From BAAQMD Staff Report, "Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood Burning Devices - Proposed Amendments," henceforth referred to as the "Staff Report," August 10, 2015.
(b) From the Staff Report. Assumes 100% of rental units require upgrade.
(c) Total number of households times the percentage using an uncertified device.
(d) From the Staff Report, based on the assumed split by device type for renter households.
(e) Total number of household require to upgrade times percent currently using this device for heating.
(f) Savings per household times number of households.
(g) From Dun & Bradstreet.

Sources: Dun & Bradstreet; MTC; BAAQMD; U.S. Census American Community Survey; other sources as noted; BAE, 2015.

Economic Impacts Analysis for Affected Industry

In order to determine the impacts of these measures on firewood dealers affected by the proposed Rule amendments, the analysis that follows considers lost revenues relative to estimated net income for these dealers.

As noted above in Table 10, the implementation of the Sole Source Exemption rule will lead to increased heating efficiency, which translates into decreased firewood costs for households, which in turn would lead to decreased revenues for firewood dealers. This decline is estimated at approximately $1.6 million annually, or 20 percent of revenues. Assuming that firewood dealer expenses are directly proportional to revenues, net income and profits would decline by the same percentage. The assumption of direct proportionality is conservative in estimating impacts; while some costs (obtaining the firewood at wholesale or otherwise, and staffing levels to some degree) will decrease with lower sales, other costs, such as rent or property taxes, are fixed such that operating expenses would actually not decline proportionally, and net income would decrease more than gross revenues on a proportional basis. Thus an assumed decline of 20 percent in net income is a conservative estimate, and this conservative estimate of loss is greater than the ARB 10 percent threshold used by BAAQMD as a proxy for burden, so a 20 percent or greater loss indicates that the proposed costs related to compliance have the potential for significant adverse economic impacts.

Once the lost revenues are estimated, IMPLAN has been used to assess any indirect and induced impacts from these lost revenues. Given the likely small size of this lost revenue relative to the overall economy, these impacts are not substantial. As shown in Table 11, the overall economic loss amounts to less than six jobs, and less than $1 million in output.[6] Over half of the impacts are direct impacts for the firewood dealers.

Table 11: Overall Impacts of Reduction in Firewood Sales on the Bay Area Economy

Impact Type	Employment	Output
Direct Effect	3.6	$597,240
Indirect Effect	0.9	$190,757
Induced Effect	1.2	$200,824
Total Effect	5.8	$988,821

Sources: IMPLAN; Dun & Bradstreet; MTC; BAAQMD; BAE, 2015.

Small Business Impacts

According to California Government Code 14835, a small business is any business that meets the following requirements:

- Must be independently owned and operated;
- Cannot be dominant in its field of operation;
- Must have its principal office located in California;
- Must have its owners (or officers in the case of a corporation) domiciled in California; and
- Together with its affiliates, be either:
    - A business with 100 or fewer employees, and an average annual gross receipts of $10 million or less over the previous three tax years, or
    - A manufacturer with 100 or fewer employees.

Assuming these establishments are independently owned, they would all meet the criteria of California Government Code 14835 for categorization as small businesses, based on having 100 or fewer employees and annual revenues of less than $10 million, because even as a group they have fewer employees and less revenue than these thresholds. As discussed above, based on impacts on profits, there is the potential for significant impacts for any of these businesses meeting the

[6] The losses shown here are less than the lost sales, as IMPLAN calculates impacts based on producer prices rather than retail prices.

definition of a small business. However, overall it should be noted that this is a very limited number of businesses with few employees and limited revenues.

Impacts on Rental Property Owners

As a result of the amendments to Rule 6-3, rental property owners with units heated using wood as a fuel will be required to switch to natural gas or another non-solid fuel heat source.

Economic Profile of Affected Industry

The number of affected properties is assumed to be extremely low, since most rental properties in areas with natural gas service already do not use wood as a heat source. The Air District estimates that approximately 250 properties would be affected by the rule change mandating a conversion away from wood heaters in rental units located in areas with natural gas availability.

The business of renting these properties falls in NAICS 53110, Lessors of Residential Buildings and Dwellings. This sector has a high proportion of nonemployer businesses, likely due to a large number of small landlord sole proprietors and partnerships that own a limited number of buildings and handle the business themselves, or through independent contractors (e.g., a separate property management firm). Overall as of 2012, the ABAG nine-county region has a total of 22,478 establishments engaged in this line of business, of which 20,284 have no employees (see Table 12). Even if each of the estimated 250 impacted units in the Air District is operated by a separate entity, this still only constitutes approximately 1.3 percent of the establishments.

Among the establishments with employees, there are a total of approximately 10,000 workers who are directly employed. The nonemployers tend to have much lower revenues per establishment, another indicator that they tend to control fewer rental units than the employers. Overall, the establishments in the ABAG Region reported gross revenues of approximately $7.8 billion in 2012.

Table 12: Profile of Lessors of Residential Buildings and Dwellings, 2012

Area	Establishments with Employees: Number of Establishments	2012 Revenues ($000)	Number of Employees	Annual Payrolll ($000)
ABAG Region	2,194	$3,400,343	9,976	$372,924
California	9,101	$14,302,841	41,843	$1,474,922
United States	65,108	$80,671,161	305,641	$9,716,605

	Nonemployer Establishments: Number of Establishments	2012 Revenues ($000)	Number of Employees	Annual Payrolll ($000)
ABAG Region	20,284	$4,367,014	n.a.	n.a.
California	98,856	$20,599,453	n.a.	n.a.
United States	1,057,754	$143,842,054	n.a.	n.a.

	All Establishments: Number of Establishments	2012 Revenues ($000)
ABAG Region	22,478	$7,767,357
California	107,957	$34,902,294
United States	1,122,862	$224,513,215

Note: All dollar amounts in thousands of dollars.

Source: 2012 Economic Census; 2012 Nonemployer Statistics for the US, States, Metropolitan Areas, and Counties.

Estimated Rate of Return

Lessors of residential properties are part of the larger Real Estate industry (NAICS 531), which is the most specific category available in the IRS data on net income. Once again, the analysis used 10-year averages as a benchmark for performance. As shown in Table 13, the 10-year average net income as a percent of total receipts for the real estate industry is 20.6 percent.

Table 13: Returns on Total Receipts for Real Estate, 2003-2012, for Active Corporations

Nonstore Retailers (NAICS 454)	Total Receipts 2003-2012 (in $000)	Net Income 2003-2012 (in $000)	Net Income as % of Total Receipts
2003	$69,885,998	$15,277,639	21.9%
2004	$82,641,953	$18,528,154	22.4%
2005	$104,148,261	$25,281,219	24.3%
2006	$101,261,630	$22,908,353	22.6%
2007	$86,593,476	$18,253,630	21.1%
2008	$68,519,534	$8,671,787	12.7%
2009	$63,735,255	$8,126,277	12.8%
2010	$62,402,424	$11,512,465	18.4%
2011	$64,228,970	$15,389,887	24.0%
2012	$74,143,139	$18,899,153	25.5%
Average annual net income as % of total receipts (a)			**20.6%**

(a) Computed based on average net income percentage each year; sums of receipts and net income not used, in order to control for inflation over the time period.

Source: Internal Revenue Service, Returns of Active Corporations, Table 1; BAE, 2013.

Compliance Costs

To meet the new requirements that rental properties heating with wood in areas with natural gas availability switch over to a non-solid fuel source (most likely gas), landlords will be required to install gas furnaces or other new heating systems that do not rely on wood for fuel. Air District staff estimate the purchase and installation cost of a new gas heater at between $2,500 and $6,000, with a basic heater cost of $5,000.[7] This cost is assumed to be amortized over the lifetime of the heating system. For a $5,000 heater, the annual amortization is assumed to be $539 (see Table 14).

The heater replacement costs would be offset by reduced fuel costs due to the use of a more efficient heating system, but the analysis here conservatively assumes that tenants are responsible for fuel costs, so those savings would accrue to the tenants.

Air District staff estimates that there are approximately 250 rental units in the Air District that use wood as their primary heating fuel but have natural gas available at the property, and staff assumes that all of these housing units will need to upgrade their heating system as a result of the new requirements. For these 250 units, the assumed annual compliance costs total approximately $135,000.

[7] From BAAQMD Staff Report, "Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood Burning Devices - Proposed Amendments," August 10, 2015.

Table 14: Compliance Costs Related to Rule Amendment for Renter-Occupied Units

Revenues and Operating Expenses		
Monthly Rental Rate	$2,500	(a)
Vacancy Rate	5%	(c)
Projected Annual Income		
Residential		
Gross Scheduled Rents	$30,000	
Less Vacancy	($1,500)	
Gross Annual Revenues	**$28,500**	
Net Income as Percent of Revenues (per IRS)	20.6%	(c)
Net Annual Income	**$5,859**	
Furnace Installation Costs		
Cost of Furnace	$5,000	(d)
Lifetime of Furnace (Years)	15	(e)
Interest Rate(Annual)	7.0%	(f)
Monthly Payment	$44.94	
Amortized Annual Cost of Heater Installation	**$539**	
Heater Cost as % of Annual NOI	**9.2%**	
Total Households Impacted		
Total number of households burning wood	250	(g)
Percent using an uncertified device	100.0%	
Total rental units required to upgrade	**250**	
Total Annual Compliance Cost for Landlords	**$135,000**	

(a) Estimate of typical rent by BAE; since many of these properties are likely to be single family houses, this estimate is deemed conservative. Assumes renters pay fuel cost so no fuel cost savings accrue to property owner.
(b) Industry standard assumed for stabilized vacancy rate.
(c) Internal Revenue Service, Returns of Active Corporations, Table 1.
(d) From BAAQMD Staff Report, "Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood Burning Devices - Proposed Amendments," henceforth referred to as the "Staff Report," August 10, 2015.
(e) Lower end of estimate for typical heating system lifetime, from BAE Internet research.
(f) Per BAAQMD amortization assumption.
(g) From Staff Report.

Sources: BAAQMD; IRS; BAE, 2015.

Economic Impacts Analysis for Affected Industry

Table 14 above also shows the assumed impacts on profits. Based on the assumptions here, a typical property owner would see a reduction of approximately 9.2 percent in net income, below the ARB 10 percent threshold deemed significant. It should be noted that many of the assumptions regarding rents and tenant responsibility for fuel costs, are conservative; for example if utility savings go to the tenant, the property owners may be able to increase contract rents to pass through the costs of installing the new heating system, or if the property owner is responsible for heating fuel costs, the savings through switching from wood to gas would go to the landlord, reducing the compliance costs.

Based on an IMPLAN analysis the indirect and induced impacts from these compliance costs are trivial, amount to less than one job and only $43,500 annually in indirect and induced output in the entire Bay Area economy.

Table 15: Overall Impacts of Compliance Costs on Residential Rental Property Owners in the Bay Area

Impact Type	Employment	Output
Direct Effect	0.7	$135,000
Indirect Effect	0.2	$24,976
Induced Effect	0.1	$18,517
Total Effect	0.9	$178,493

Sources: IMPLAN; BAAQMD; BAE, 2015.

Small Business Impacts

While no information was gathered on how many of the affected properties were owned by small businesses, the data presented above in Table 12 indicate that many property owners have no employees at all, and small residential properties are often owned by individuals or small investor partnerships. In some cases, residences are rented by former owner-occupants who continue to hold the property. In the most extreme scenario, all 250 of these properties would be owned by small businesses as defined above according to California Government Code 14835.

However, the analysis indicates that the impacts of the proposed rule amendment requiring the replacement of wood heating sources would not see a drop in profits that would reach significant levels for a typical landlord, in an analysis that is conservative and also does not account for potential long-term capital gains.