

**SACRAMENTO METROPOLITAN
AIR QUALITY MANAGEMENT DISTRICT**

For Agenda of **May 28, 2009**

To: Board of Directors
Sacramento Metropolitan Air Quality Management District

From: Larry Greene,
Executive Director/Air Pollution Control Officer

Subject: Report on Rule 421 – Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning Effectiveness

Recommendation

Receive a report and provide staff input as appropriate.

Executive Summary

This report discusses results from our second season implementing Rule 421 prohibiting burning of wood and other solid wastes on winter days forecast to have poor air quality. The report discusses the results from two studies of the air quality benefits and public awareness of Rule 421. Staff plans to ask the Board to consider changes to the rule to provide greater health protections. Staff is seeking early input from Board members on this information. Following today's meeting, staff will begin our normal public workshop process, consider the public input, and return for Board approval of rule change options in September 2009.

Sacramento does not meet state or federal health standards for fine particle air pollution (PM2.5). Sacramento will be formally designated nonattainment for the federal health standards later this year. Fine particulate matter is linked to serious adverse health effects, including aggravated asthma, heart attacks, and premature death in people with heart or lung disease. The largest single source of Sacramento's wintertime PM2.5 emissions is wood and other solid fuel burning in fireplaces, wood and pellet stoves.

Although we have known for many years that there are significant health consequences from PM2.5, recent health studies specifically attributed adverse health effects to wood smoke including aggravated lung and heart disease, reduced lung function, and reduction in the blood's ability to clot. The research found that wood smoke can cause a 10 percent increase in hospital admissions for respiratory problems among children. The studies also found that up to 70 percent of smoke from chimneys can re-enter a home or neighboring residences. In addition, the California Air Resources Board (ARB) recently updated their mortality studies and now estimates that in the Sacramento Metropolitan Area, 100 – 600 premature deaths would be avoided every year at an economic benefit of over \$0.9 billion per year if we met the state and federal annual PM2.5 standards.

The District has a three pronged plan to reduce emissions from wood burning 1) provide financial incentives to remove or replace fireplaces and dirty stoves with cleaner burning options, 2) prohibit installation of new fireplaces and dirty stoves, and 3) prohibit burning on days when weather conditions cause wood smoke to be trapped near the ground and build up to unhealthy levels.

This third element was enacted on October 25, 2007, when the Board adopted Rule 421, Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning. Rule 421 is in effect from November 1st through the end of February. When PM2.5 concentrations are forecast to exceed the federal health standard of 35 µg/m³ but will not exceed 40 µg/m³ burning is prohibited, except in EPA certified stoves or pellet stoves. This is called a Stage 1 no-burn day. When PM2.5 concentrations are forecast to exceed 40 µg/m³, all burning is prohibited. This is called a Stage 2 no-burn day. The rule does not apply to fireplaces and stoves that burn gaseous fuels (natural gas and propane), and exempts burning that is the sole source of heat, or in situations when not burning would be a financial hardship to a resident.

Staff commissioned two studies of the effectiveness of our wood burning control efforts, specifically Rule 421. The first study, conducted by Sonoma Technology, Inc. (STI) examined the air quality benefits on forecast no-burn days in the last two seasons. The second study, conducted by Aurora Research Group, examined the public awareness and response to the rule.

The STI study determined that Rule 421 improved PM2.5 air quality readings an average of 23% when all burning was prohibited, and 10% on days when exempt devices were allowed to burn. The Aurora study determined that 92% of the survey respondents (adults with wood burning devices) were aware of the requirements and 52% complied when all burning was prohibited. Compliance rates were lower, 42%, on days when some burning was allowed.

This public response and air quality improvements, while significant, are not sufficient to meet the health standards. Therefore, staff evaluated potential benefits from reducing the thresholds for prohibiting burning as noted below. The San Joaquin Valley air district recently amended their wood burning rule to reduce their threshold to 30, and automatically drop the threshold to 20 if they do not meet their federal air quality deadline (2015.) A similar provision could be added to our rule.

	Current rule	Option 1	Option 2	Option 3
Stage 1 threshold	35	31	25	Eliminated
Stage 2 threshold	40	35	30	30
Average no. of no-burn days	23	28	44	31
No. of avoided days over the federal health standard	13	16	18	17

Health Effects and Air Quality

Particulate matter (PM) is a mixture of very small liquid droplets and solid particles. Adverse health effects are linked to particles that are less than 10 microns in diameter (PM10), and fine particles that are less than 2.5 microns in diameter (PM2.5). According to the U.S. Environmental Protection Agency (EPA), health studies have linked exposure to particulate matter, especially fine particles, to several significant health problems, including:

- increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing;
- decreased lung function;
- aggravated asthma;
- development of chronic bronchitis;
- irregular heartbeat;
- nonfatal heart attacks; and
- premature death in people with heart or lung disease.

Exposure to particulate matter pollution can cause coughing, wheezing, and decreased lung function even in otherwise healthy children and adults. EPA estimates that thousands of elderly people die prematurely each year from exposure to fine particles. In addition, a recent study (Dominici et al., 2006) of the correlation between PM2.5 concentrations and hospital admission rates concluded that short-term exposure to PM2.5 increases the risk of hospitalization for cardiovascular and respiratory diseases.

ARB heard the results of several studies earlier this year that showed smoke from wood fires aggravates lung and heart disease and increases the number of hospital admissions. The research results indicate exposure to wood smoke may reduce lung function and reduce the blood's ability to clot properly. In addition, wood smoke exposure may also increase substances in the body that lead to cardiovascular and pulmonary inflammation. The research found that wood smoke can cause a 10 percent increase of hospital admissions for respiratory problems among children. The studies also found that up to 70 percent of smoke from chimneys can re-enter a home or neighboring residences.

In 2008, ARB updated their studies of mortality effects from elevated PM2.5 concentrations. They now estimate that in the Sacramento Metropolitan Area, 100 – 600 premature deaths would be avoided at an economic benefit of over \$0.9 billion per year if the region met the state and federal annual PM2.5 standards.

The District is currently designated as a nonattainment area for the state and federal¹ PM10 standards and for the state PM2.5 standard. In addition, the District will be nonattainment with the federal PM2.5 health standard when formal designations are published later this year.

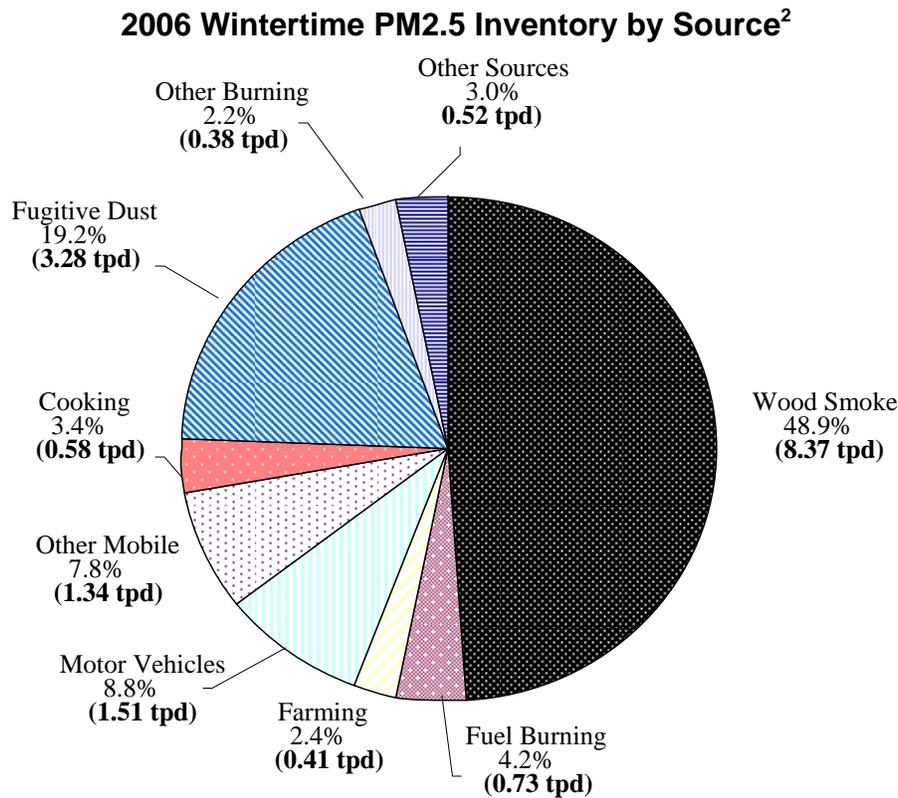
Wood smoke also contains VOCs which include toxic and/or cancer-causing substances, such as benzene, formaldehyde and benzo-a-pyrene, a polycyclic aromatic hydrocarbon (PAH).

¹ Based on 1998-2000 monitoring data, EPA made a finding (February 15, 2002 Federal Register, Volume 67, Number 32, Page 7082 et seq.) that Sacramento County attained the federal ambient PM10 standard by the applicable December 31, 2000 attainment deadline. Note that this EPA finding did not redesignate the Sacramento District to attainment.

Wood Burning Inventory and Emissions Background

Wood smoke is the single largest directly emitted PM_{2.5} emissions source, 49% as reported by the California Air Resources Board's 2006 wintertime PM_{2.5} emissions inventory for Sacramento County.

The California Air Resources Board (CARB) is responsible for preparing the wood burning emission inventory for Sacramento County. The current CARB inventory (2006) estimates PM_{2.5} emissions to be 8.37 tons on an average winter day from wood burning in Sacramento County.



The number of wood burning devices in Sacramento County³ are:

- 155,600 open hearth fireplaces
- 25,100 wood stoves
- 80,300 wood burning inserts
- 15,100 pellet stoves

² California Air Resources Board, Emission Inventory, Emission Data, Criteria Emissions, Forecasted Emissions by Summary Category 2007 Almanac (Base Year 2006), Winter, PM_{2.5}, 2006, Sacramento Metropolitan AQMD, www.arb.ca.gov/app/emsinv/fcemssumcat2007.php

³ State of California, Department of Finance; E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2008, with 2000 Benchmark; http://www.dof.ca.gov/research/demographic/reports/estimates/e-5_2001-06

Rule 421 – Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning

The District's strategy to improve particulate matter air quality includes a three pronged approach to reducing emissions from wood burning, financial incentives, regulating new wood burning installations, and reducing burning from existing fireplaces and wood stoves. The program to provide financial incentives to remove or replace existing fireplaces and dirty wood stoves was established in June 2006. To date, a total of almost 2100 fireplaces and dirty wood stoves have been removed or replaced with cleaner burning alternatives. On October 26, 2006 the Board of Directors approved a rule that prohibits installing new fireplaces and dirty wood burning devices. The last prong was adopted on October 25, 2007, as Rule 421, Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning. Residents and businesses that take advantage of the financial incentives to install gaseous fuel burning devices are exempt from our wood burning regulations.

Rule 421 prohibits wood or other solid fuel fires and use of fireplaces and wood or pellet stoves and inserts on days forecast to exceed the federal health standards. Gas fireplaces and inserts are allowed to burn. The rule has exemptions for wood burning that is the sole source of heat, used for cooking, in religious ceremonies, and when prohibiting wood burning is a financial hardship.

Rule 421 is in effect from November 1st through the end of February. A "Stage 1" no-burn day is called when the forecasted PM2.5 concentration exceeds 35 but does not exceed 40 $\mu\text{g}/\text{m}^3$. EPA certified wood devices and pellet stoves are allowed to burn on Stage 1 days provided they do not emit visible smoke. A "Stage 2" day is called when the forecasted concentration exceeds 40 $\mu\text{g}/\text{m}^3$. On a Stage 2 day all wood and other solid fuel burning is prohibited. Rule 421 also contains provisions for a voluntary no-burn request (called a "burning discouraged" day) to be issued when the PM2.5 forecast exceeds 25 $\mu\text{g}/\text{m}^3$ but will not exceed 35 $\mu\text{g}/\text{m}^3$.

Outreach Summary

Because several hundred thousand people are affected by this rule, public outreach is critical to the rule's success. The public can find out if it is a "no-burn" day several ways. Daily burn forecasts are printed in [The Sacramento Bee](#), and included in nearly all local radio and television weather broadcasts. The District also maintains a toll free phone message, sends emails to subscribers and posts the forecasts on our websites, www.AirQuality.org and www.SpareTheAir.com. The websites also have exemption request forms, frequently asked questions and many other educational publications.

To help get the word out, the District created 465 new partnerships with companies and organizations in addition to the 800 partners from the previous season. Through the Internet, the District sent e-mails to almost 9,000 Sacramento County Air Alert subscribers. A 9-week radio campaign and print ads in 18 community newspapers reminded the community to Check Before You Burn. The District distributed four articles to homeowners associations, neighborhood associations, Chamber of Commerce, Realtors and PTAs describing aspects of the Check Before You Burn program.

Check Before You Burn Day Summary

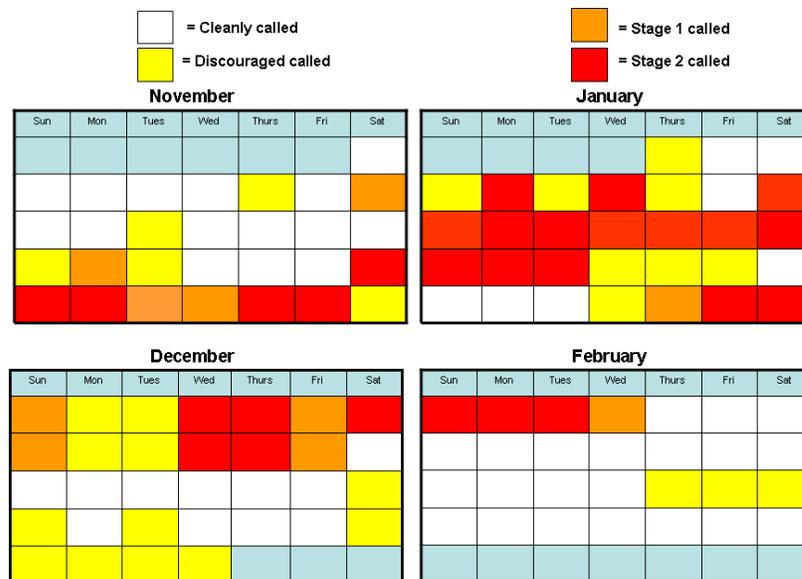
The figure below summarizes the days that were called during the 08/09 no-burn season. There were a total of 10 Stage 1 days, 28 Stage 2 days and 28 Burning Discouraged days.

Weather conditions were conducive to high PM 2.5 concentrations during the 2008/2009 season and two extended multi-day pollution episodes occurred when an upper-level ridge of high pressure persisted over the West Coast resulting in warm aloft temperatures, limiting the vertical mixing of pollutants. And at the surface, high pressure over Nevada and the Great Basin resulted in calm-to-light winds, limiting the dispersion of pollutants.

Although there were more Stage 2 days in 2008/2009 than the first season, the weather conditions and air quality levels were not without precedent. There was a 13-day episode in December 2005 that would have been Stage 2 for all but one day if the Check Before You Burn program had been in effect.

Figure 1

2008 – 2009 Mandatory No Burn Program Called Days



Past Season Enforcement Statistics Summary

Another key aspect of this program is enforcement. A violation occurs when wood smoke is visible on a no-burn day. Inspectors conduct surveillance on no-burn days and respond to complaints. Inspectors do not enter private property and the notice of violation is mailed to the resident. Photos are used, if possible, to assist in documenting the violation. Any residence found to be in violation is issued a citation, and is subject to monetary fines. The Board waived fines for the first season. This past season an administrative penalty of \$50 was assessed for first time violators, with the option to complete and pass a compliance class, either on-line or in

person, in lieu of paying the penalty. Subsequent violations have been handled under the standard mutual settlement process; to date, one second offense violator paid a fine of \$360.

The following tables show the enforcement statistics for the past two years.

Enforcement Statistics	07-08 Season	08-09 Season (through 5/14/09)
Sole Source Waivers	33	96
Medical Waivers	0	4
Financial Hardship Waivers	9	50
Denied Hardship Waivers	0	3
Violations observed	21	211
Smoke complaints received on no-burn days	27	228
Total smoke complaints received	114	285

Violation Resolution	08-09 Season (through 5/14/09)
Violations Issued	211
Violations Resolved:	192
Written Exam Received	115
Online Test Taken	23
Night Course Taken	1
Paid Fine	10
Violation was rescinded – sole source of heat, wrong address, no fireplace	38
No further action – occupied by squatters	5
Violations Issued Second Offense	1
Paid Fine (\$360)	1

Phone Survey Background and Results

Aurora Research Group conducted a telephone survey of Sacramento County residents in April 2009. This survey was similar to the telephone survey Aurora previously conducted in April 2007. The purpose of this study was to gauge public awareness of mandatory no-burn restrictions and to gauge the effectiveness and compliance rates of Rule 421 on burning discouraged, Stage 1 and Stage 2 days.

The 2009 Aurora phone survey received responses from 400 random digit dial telephone surveys from county residents, including a subset of 6% who would be classified as low-income residents based on federal guidelines. Only those who have the capability to burn wood or pellets were included in the 400 surveys. The most important findings are that 92% of all respondents are aware of the mandatory curtailment restrictions, 42% complied with all the Stage 1 restriction days and 52% complied with all the Stage 2 restriction days, and 32% complied with the voluntary no-burn requests. In addition, the percentage of people that own EPA certified stoves and pellet stoves that did not burn on Stage 1 days was nearly the same as those with fireplaces and dirty stoves. This indicates that those people are not taking advantage of the exemption Rule 421 provides.

Other key findings are:

- 50% of all respondents who had the capability to burn wood or pellets did not burn at all this last winter.
- 50% of all respondents burned sometime during the last winter season. 30% of all respondents burned wood less than once per week. 11% indicated burning more than once a week.
- No respondents indicated wood burning as their sole source of heat.
- Among the 45% of those who reduced their wood burning last winter, 35% of those who burned less did so because of air quality or health concerns, or because they heard a request not to burn.
- 72% of all respondents are specifically aware of the Check Before You Burn Program.
- 85% of those respondents aware of the mandatory curtailment restrictions see or hear about a mandatory curtailment episode on TV and radio.
- 56% of all respondents rated residential wood burning fireplaces as a serious or very serious part of wintertime air pollution. However, 82% rated traffic as a serious or very serious part of wintertime air pollution.

The final Aurora report is included in Attachment A.

Rule 421 Effectiveness Analysis and Results

The District contracted with STI to study the air quality benefits from Rule 421. They conducted three different analyses; a cluster analysis, Chemical Mass Balance (CMB) modeling, and numerical modeling.

- **Cluster Analysis**
Cluster analysis involves grouping days with similar meteorology. For each group, the analysis then compares the PM_{2.5} concentrations on days prior to the adoption of Rule 421 to days after Rule 421 was in effect. The difference in PM_{2.5} concentrations can be largely attributed to the benefits achieved by Rule 421.

A total of 11 day-pairs (22 days) with similar meteorological conditions was compared. Half of the 22 days occurred prior to adoption of Rule 421 and the other half of the days were either stage 1 or stage 2 burn ban days. The results of the cluster analysis showed an average reduction in 24-hour average PM_{2.5} concentration on a stage 1 day of 4 µg/m³ (10% reduction) and on a stage 2 day of 12 µg/m³ (23% reduction.) The greatest reduction of PM_{2.5} concentrations occurred during the evening hours.

- **Chemical Mass Balance (CMB) model**
A CMB model uses analysis of the chemical species contain in particulate matter collected on filters to determine which emissions sources contribute to the PM_{2.5} problem. Studies have established a "fingerprint" of chemical species that are associated with different emissions sources. The CMB model then uses this information to quantify contribution from each source type.

The results of the CMB modeling indicates the average wood smoke contribution on days when PM_{2.5} concentrations were high was at least 11 µg/m³ (27%) and was as high as 19 µg/m³ of the total PM_{2.5} concentration⁴. These results indicate that it is possible to achieve a PM_{2.5} reduction on the order of 10 to 20 µg/m³ on a Rule 421 no-burn day. This percentage is consistent with emissions inventory⁵.

- **Numerical Modeling**
STI runs a gridded air quality modeling system called BlueSky Gateway⁶. This model system provides hourly predictions of PM_{2.5} concentrations for the entire United States, including Sacramento using weather information, emissions data, and an air quality model to represent the chemical reactions that occur in the atmosphere. BlueSky Gateway's sub-components include the weather model, called MM5, an emissions model called, Sparse Matrix Operator Kernel Emissions (SMOKE), and the Community Multiscale Air Quality model (CMAQ). STI estimated PM_{2.5} concentrations assuming 100% curtailment. Because the model represents the entire United States, and consequently has a fairly coarse resolution, peak concentrations may be under-predicted by the model.

The results of the modeling analysis shows that the average PM_{2.5} reduction with complete curtailment was 7 µg/m³ or 21%.

⁴ Along with smoke, burning wood emits nitrogen oxides and organic compounds. Nitrogen oxides and organic compounds then react in the atmosphere to form PM_{2.5}. However, because there are many other sources of organic compounds and nitrogen oxides, it is not possible to specifically quantify the amount of this secondary PM_{2.5} that are from wood smoke emissions. Therefore, 11 µg/m³, is a conservative estimate of the wood smoke contribution to total PM_{2.5} concentrations.

⁵ If the secondary PM_{2.5} compounds were excluded, the percentage associated with wood smoke would be 58%, similar to the percentage estimated using emissions inventory methods.

⁶ The model grid resolution is 36 kilometers.

- Other data analysis
STI also determined how many days during the 2008/2009 season that benefits from Rule 421 avoided an exceedance of the federal health standard. A total of 20 days exceeding the NAAQS violations were observed, and had Rule 421 not been in effect there would have been about 13 additional days on which the NAAQS was exceeded.

Finally, STI evaluated the potential for under-predictions in the forecast air quality. No-burn forecasts are made based on the air quality and weather forecasts for each day. To provide greater certainty of avoiding federal health standard violations, the thresholds could be reduced to account for the potential under-prediction.

The STI report is included in Attachment B.

Federal Nonattainment Issues

On December 22, 2008, the EPA Administrator signed rules designating the Sacramento area as nonattainment for the federal 24-hour PM_{2.5} health standard of 35 µg/m³. The designations are under review by the new administration and are expected to be published in the coming months. Attainment plans will be due in 2012 and the attainment deadline will be 2014, but may be extended to 2019 if properly justified to EPA.

Attainment of the federal health standards is determined using the design value. When Rule 421 was adopted our design value³ was based on 2004-2006 data. Since that time, PM_{2.5} concentrations have increased, likely due to weather influences. Sacramento will likely need more reductions than previously estimated to attain. It is likely that the current Rule 421 alone will not be enough to attain before the plan is due. Strengthening Rule 421 by lowering the thresholds may help to further reduce PM_{2.5} concentrations during winter months, thereby potentially reducing the need for other, more costly regulatory measures.

PM_{2.5} Design Value⁷	
Monitoring Station	µg/m³
Del Paso Manor, Years 2004-2006	48.7
Del Paso Manor, Years 2006-2008	51.8 ⁸
Federal Health Standard	35

⁷ This data was acquired at Del Paso Manor station located in Sacramento County that has a federal reference method monitor. The average value is calculated according to procedures specified in Appendix N of Title 40, Code of Federal Regulations Part 50. The procedures require selection of the 98th percentile monitored concentration. For example, in 2006 the top seven readings were excluded from the calculation.

⁸ Days overwhelming impacted by the 2008 wildfires were excluded when calculating this design value. EPA's exceptional event rule allows exclusion of those data under specific circumstances. Staff has worked with the California Air Resources Board to justify these PM_{2.5} data as an exceptional event.

Other District's Mandatory No-Burn Rules

San Joaquin Valley Unified Air Pollution District (SJVUAPCD) adopted its rule prohibiting wood burning on forecast poor air quality days on July 17, 2003. The threshold for prohibiting burning was set to the federal PM_{2.5} health standard at the time, 65 µg/m³ or greater. On October 16, 2008 they lowered their threshold to 30 µg/m³, and will automatically lower that threshold to 20 µg/m³ if they fail to attain the federal health standard of 65, by April 2015. The 20 µg/m³ threshold would be implemented 60 days after the effective date of EPA's published finding of failure to attain for PM_{2.5}.

The Bay Area Air Quality Management District (BAAQMD) and South Coast Air Quality Management District (SCAQMD) also recently adopted similar mandatory no-burn rules. The BAAQMD threshold is 35 µg/m³ and became effective on November 1, 2008. The SCAQMD rule becomes effective November 1, 2011, with a threshold of 35 µg/m³. None of these three districts exempt EPA certified devices or pellet stoves from mandatory no-burn restrictions.

Potential Rule Changes

When Rule 421 was first adopted, forecasting error had not been quantified nor considered when setting the thresholds. With the additional STI forecasting information and actual Rule 421 air quality benefits, threshold levels can now be re-examined. Staff evaluated lowering the threshold to strengthen the rule for three reasons; 1) the studies indicate that although the public awareness and air quality benefits are very good, we are still not meeting state or federal health standards, 2) when the thresholds were established staff did not have information to consider the potential for under predicting air quality forecasts or actual air quality benefit information, and 3) recent health studies indicate that serious health consequences can be specifically attributed to wood smoke and that updated ARB health information estimates higher mortality rates in Sacramento from high PM_{2.5} concentrations

Three options were evaluated:

Option 1 - Reduce the Stage 1 threshold from 35 to 31 µg/m³ to account for the potential under prediction in air quality forecasts. Reduce the Stage 2 threshold from 40 to 35 µg/m³ to account for the actual benefits that occur on Stage 1 no-burn days

Option 2 - Reduce the Stage 1 threshold to 25 µg/m³ and the Stage 2 threshold to 30 µg/m³ to be consistent with the San Joaquin Valley no-burn threshold. Reduce the voluntary threshold to 20 µg/m³.

Option 3 - Eliminate the exemption for EPA certified and pellet stoves since the survey showed that most residents do not take advantage of this exemption. Set the no-burn threshold to 30 µg/m³ to be consistent with the SJVUAPCD rule. Either maintain the voluntary threshold at 25 µg/m³ or reduce the voluntary threshold to 20 µg/m³.

The rule change could also include a provision to automatically reduce the thresholds if Sacramento does not meet the federal health standards by the required deadlines, either 2014 or 2019.

Impacts and benefits from potential rule changes

Staff used PM2.5 concentration data collected over the last 5 seasons to estimate the number of no-burn days that might be called each winter if the new potential thresholds were established. In addition, staff estimated the number of additional exceedances of the federal health standard that might be avoided if the actual average Rule 421 benefit established by STI's study would have occurred if a no-burn day had been called at the lower thresholds.

Optional threshold changes ($\mu\text{g}/\text{m}^3$)							
	Current rule		Option 1		Option 2		Option 3
Voluntary threshold	25		25		20		20 or 25
Stage 1 threshold	35		31		25		Eliminated
Stage 2 threshold	40		35		30		30
Number of no-burn days called							
# of days in 2004/2005	7	9	9	16	17	29	29
# of days in 2005/2006	7	14	1	21	15	27	27
# of days in 2006/2007	5	24	4	29	10	37	37
# of days in 2007/2008 ⁹	7	8	4	15	14	20	20
# of days in 2008/2009 ⁹	7	26	6	33	10	43	43
Average # of no-burn days	7	16	5	23	13	31	31
Average total no. of mandatory no-burn days	23		28		44		31
Average # of voluntary no-burn days	22		17 ¹⁰		19		33 @ 20 $\mu\text{g}/\text{m}^3$ 13 @ 25 $\mu\text{g}/\text{m}^3$
Benefits							
No. of avoided days over the federal health standard	13		16		18		17

⁹ During 2004-Mid-2007, air quality forecasting was either not done, or done using unrefined methods. To use a consistent method throughout this analysis, rather than use the actual forecast concentrations during these Check Before You Burn seasons, the number of mandatory curtailment days per year were determined by adding the STI reported cluster analysis average benefits of 4 $\mu\text{g}/\text{m}^3$ for a stage 1 no-burn day and 12 $\mu\text{g}/\text{m}^3$ for a stage 2 no-burn day to the actual observed concentration for each day. If that summed value was above the threshold being evaluated in each cell, then it was counted as a mandatory no-burn day.

¹⁰ The number of days is lower than the current rule, even though the threshold has not changed, because some of the previous voluntary days become mandatory no-burn days.

Conclusion

The studies reported that public response and air quality improvements from Rule 421 are significant, but are not sufficient to meet health standards at this time. More recent health studies show adverse health effects can be specifically attributed to wood smoke. Other health studies indicate that Sacramento has a higher number of premature deaths from high PM2.5 concentrations than previously believed. Therefore, staff evaluated potential benefits from reducing the thresholds using the results from STI and Aurora Research Group's evaluation of Rule 421 effects. The San Joaquin Valley air district recently amended their wood burning rule to reduce their threshold to 30, and automatically drop the threshold to 20 if they do not meet their federal air quality deadline (2015.) A similar provision could be added to our rule. The following is a summary of the potential rule change options.

	Thresholds ($\mu\text{g}/\text{m}^3$)			
	Current rule	Option 1	Option 2	Option 3
Stage 1 threshold	35	31	25	Eliminated
Stage 2 threshold	40	35	30	30
Average no. of no-burn days	23	28	44	31
Estimated no. of avoided days over the federal health standard	13	16	18	17

Next Steps

Staff will continue outreach efforts to inform the public of air quality forecasts and wood burning curtailment. Staff is planning to present the threshold reduction options at public workshops in July. Workshops will be held in downtown Sacramento, Carmichael/Orangevale, Folsom, Galt and at the District office. Staff plans to return to the Board in September with proposed amendments to Rule 421 to reduce the thresholds. If adopted then, amendments can be implemented before the 2009/2010 Check Before You Burn season. This would allow potential additional benefits to be assessed over three burn seasons before the federal air quality plan is due in late 2012.

Respectfully Submitted

Approved as to form:

 Larry Greene
 Executive Director/Air Pollution Control Officer

 Kathrine Pittard
 District Counsel

Attachments

Attachment A
Final Aurora Survey Report

Attachment B
STI Final Report
Evaluation of SMAQMD's Check Before You Burn Program