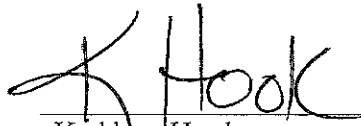


Fairbanks North Star Borough
Air Pollution Control Commission

Air Quality Comprehensive Plan
Framework for Healthy Air, People, and Economy

Prepared and Approved by the
Fairbanks North Star Borough Air Pollution Control Commission



Kathleen Hook
Chair

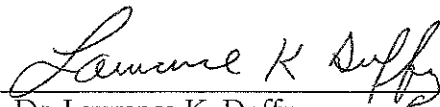
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Vice-Chair

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Dr. Lawrence K. Duffy

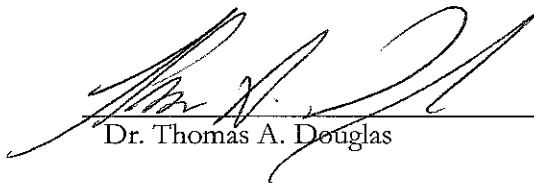
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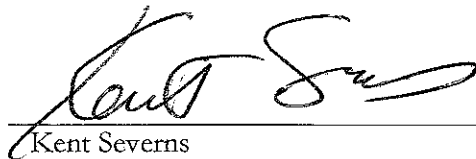
Date



Dr. Thomas A. Douglas

5/4/16

Date



Kent Severns

5/6/16

Date



Michael R. Pollen

5/6/16

Date

Table of Contents

List of Acronyms	4
Recommendations to the Mayor of the Fairbanks North Star Borough	5
Executive Summary	5
Introduction.....	6
Background.....	6
State of Alaska Mandate	7
FNSB Setting	8
Source of FNSB PM _{2.5} Emissions.....	9
FNSB PM _{2.5} Monitoring Data	11
Health Effects of PM _{2.5}	12
State of Alaska’s Response to the Problem	15
ADEC Response to the Problem.....	17
City of Fairbanks Response to the Problem.....	18
FNSB Response to the Problem.....	18
FNSB Incentives and Initiatives	21
Current Economic Impacts	23
Limiting Factors.....	24
Risks and Consequences of Failure	25
Desired Future Scenario.....	26
Recommended Goals, Objectives, and Actions.....	27
Goal 1 - Policy:	27
Goal 2 - Economic:	28
Goal 3 - Social:	28
Goal 4 - Technological:	29
Conclusion	29

List of Acronyms

ADEC	Alaska Department of Environmental Conservation
ADHSS	State of Alaska Department of Health and Social Services
ADOT	Alaska Department of Transportation
AIDEA	Alaska Industrial Development and Export Authority
APCC	Air Pollution Control Commission
AQTF	Air Quality Task Force
BACT	Best Available Control Technology
BMPs	Best Management Practices
CCHRC	Cold Climate Housing Research Center
CI	Confidence Interval
CMB	Chemical Mass Balance
COPD	Chronic Obstructive Pulmonary Disease
EPA	Environmental Protection Agency
FEDC	Fairbanks Economic Development Corporation
FNSB	Fairbanks North Star Borough
GVEA	Golden Valley Electric Association
IGU	Interior Gas Utility
LNG	Liquid Natural Gas
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
PEST	Political, Economic, Social, and Technological Analysis
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matter
PM _{2.5}	Particulate Matter less than 2.5 micrometers in diameter
SFBA	Solid Fuel Burning Appliances
SIP	State Implementation Plan
WSCO	Wood Stove Change Out

Recommendations to the Mayor of the Fairbanks North Star Borough

The purpose of this Air Quality Comprehensive Plan, Framework for Healthy Air, People, and Economy (AQ Framework) is to provide a list of actionable items to the Fairbanks North Star Borough (FNSB) Mayor, staff, and policy makers to achieve compliance with the Clean Air Act as expediently and economically as possible.

Executive Summary The combustion of solid and liquid fuels creates very fine particulate matter, known as PM_{2.5}. These particles are two and a half millionths of a meter and smaller and cannot be seen with the naked eye. High levels of PM_{2.5} in the air can lead to mild to severe human health problems and even premature death. Federal law provides for the protection of human health and safety, and PM_{2.5} levels in the air are regulated under the federal Clean Air Act.

Due to geography, climate, types of emission sources, and population density within the FNSB, the concentrations of PM_{2.5} often exceed the maximum levels set by the Clean Air Act. If PM_{2.5} levels exceed the maximum allowable levels on a regular basis, federal law mandates the development and implementation of a plan to reduce and maintain PM_{2.5} below the regulatory maximums. In the event that a plan is not developed that meets EPA approval and PM_{2.5} levels are not reduced, the federal government can and will impose economic sanctions, including withholding federal funds for highway construction, reducing or eliminating federal expenditures on military bases in the area, and creating additional challenges for the local power plants and refinery to install emission controls or obtain permits.

Balancing an individual's right to economic self-determination against others' life, liberty, and pursuit of happiness may create conflict. The AQ Framework was developed as a tool for the FNSB, recommending methods to reduce PM_{2.5} in the most effective way that protects both the individual's freedom of choice and economic rights and the community's right to a healthy environment. This AQ Framework presents 1) the health needs to reduce PM_{2.5}; 2) the policy, economic, social, and technological challenges faced in doing so; 3) consequences of failure in addressing the problem; 4) a desired future scenario; and 5) limiting factors which includes lack of awareness, affordable clean energy, high emitting equipment, and building energy efficiency. This AQ Framework does not provide a specific plan, and instead provides a suite of ideas, from abstract to specific, focused on moving our community toward solving these challenges. The recommendations include changes to policy, subsidies to reduce emissions, increased communications, and the use of technologies to protect people

from air pollution.¹ The Air Pollution Control Commission (APCC) intends to revisit and revise this AQ Framework every 3 years.

Introduction If we are to protect our health and our economy, it is vitally important that we reduce air pollution in our community. The APCC was established “to develop comprehensive plans for the prevention, abatement, and control of air pollution in the borough.”² Members of the APCC, Alaska Department of Environmental Conservation (ADEC), FNSB residents, and state and locally-elected officials supported the development of this AQ Framework.

Background According to the Environmental Protection Agency (EPA), Congress designed the Clean Air Act to protect public health and welfare from different types of air pollution caused by a diverse array of pollution sources. The Act contains key provisions to control common pollutants, with the intention to protect public health and welfare nationwide. The law requires the EPA to establish national ambient air quality standards (NAAQS) based on the latest science. The EPA also requires states to adopt enforceable plans to achieve these standards.³

The EPA must identify and issue “air quality criteria” for pollutants that “cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare” and “the presence of which in the ambient air results from numerous or diverse mobile or stationary sources.”⁴ After issuing air quality criteria for a pollutant the EPA must establish primary and secondary NAAQS for the pollutant.⁵ Primary NAAQS are standards “requisite to protect the public health” and secondary NAAQS are standards “requisite to protect the public welfare.”⁶

Under the Clean Air Act, states are divided into air quality control regions.⁷ If the EPA issues NAAQS for a pollutant then states must, within three years, adopt and submit

¹ The APCC would like to acknowledge the efforts of the Fairbanks economic Development Corporation, through the Interior Issues Council, who hosted during the months of May and June 2015 nine meetings of interested parties known as the Air Quality Task Force (AQTF). The initial draft of this document is a result of the efforts of these participants.

² Fairbanks North Star Borough Code Chapter 2.48.120

³ Information accessed on June 11, 2015 at http://www.epa.gov/air/caa/pdfs/CAA_Nutshell.pdf.

⁴ 42 U.S.C. § 7408(a)(1) (2012).

⁵ *Id.* § 7409(a)(1)(A).

⁶ *Id.* § 7409(b)(1)-(2).

⁷ *Id.* § 7407.

state implementation plans (SIPs), specifying the manner in which the state will achieve and maintain the NAAQS for each of the state's air quality control regions.⁸

If the air quality in a control region falls short of NAAQS for a criteria pollutant then the region is designated in nonattainment for that pollutant.⁹ States with nonattainment areas are required to devise and carry out additional SIP measures in order to improve air quality.¹⁰ Generally, SIPs must provide for attainment of the NAAQS within five years of a nonattainment designation.¹¹ But the EPA may, after taking into account the severity of the nonattainment and the availability of pollution control measures, conclude that additional time is warranted and extend the period for attainment up to an additional five years.¹²

The Clean Air Act includes provisions to ensure states and local communities submit and implement adequate SIPs. Sanctions are applied if the agency finds a state has failed to submit or carry out an adequate SIP, or if the EPA disapproves a submitted plan.¹³ If the state has not cured the deficiency within 18 months of the EPA's finding or disapproval then the EPA may restrict the state's use of federal highway funds in the nonattainment area or require offsetting emissions reductions, at a two-to-one ratio, for new or modified major stationary sources in the nonattainment area.¹⁴

If the deficiency is not remedied within two years of the EPA's finding or disapproval then the EPA must impose both sanctions.¹⁵ And if the EPA finds a state has not submitted an approvable SIP demonstrating attainment within two years, or if the EPA disapproves a SIP after two-years nonattainment, then the EPA is required to develop a federal implementation plan to ensure air quality improvement.¹⁶

State of Alaska Mandate Article 7, Section 4 of the Alaska Constitution states: "The legislature shall provide for the promotion and protection of public health." The legislature has declared that "[i]t is the policy of the state to conserve, improve, and protect its natural resources and environment and control water, land, and air pollution, in order to enhance the health, safety, and welfare of the people of the state and their overall economic and social well-being." Pursuant to this policy the legislature established the Alaska Department of Environmental Conservation

⁸ *Id.* § 7407, 7410.

⁹ *Id.* § 7407(d).

¹⁰ *Id.* § 7502.

¹¹ *Id.* § 7502(a)(2)(A).

¹² *Id.*

¹³ *Id.* § 7509.

¹⁴ *Id.* §§ 7503, 7509.

¹⁵ *Id.* § 7509(a)-(b).

¹⁶ *Id.* § 7410.

(ADEC). Within the ADEC is the Division of Air Quality, which “prevents, abates and controls air pollution in a cost-effective, accountable manner.” The Division oversees three programs:

- The Air Non-point and Mobile Sources Program is responsible for managing mobile and area air pollution sources. Its mission is to protect public health and the environment by working to achieve ambient clean air standards throughout Alaska.
- The Air Permit Program controls significant, stationary sources of air pollution to protect and enhance air quality, abate air pollution impacts, and ensure protection of public health and the environment.
- The Air Quality Monitoring Program undertakes air quality assessments to provide measurement of air quality conditions to support decision making related to improving or preserving clean air.

FNSB Setting The FNSB is a second-class, general law Borough. “The Borough has the following general powers, subject to other provisions of law . . . To establish and prescribe the functions of a borough department, office, or agency . . . To enforce an ordinance and to prescribe a penalty for violation of an ordinance.”¹⁷

The FNSB is located in the interior region of Alaska and covers 7,444 square miles. The population is approximately 100,000 people living predominantly in and around the cities of Fairbanks and North Pole. There are approximately 41,607 housing units,¹⁸ 153,333 total vehicles,¹⁹ and eight stationary sources which includes power plants or refineries.²⁰ The physiographic setting and climate are described as “sub-arctic interior river valley.” The FNSB is located at the edge of an area where air masses remain in place for long periods of time due to low wind speed and cold temperatures. This stagnating air, combined with wintertime radiative cooling leads to strong lower atmospheric inversions. This is exacerbated in and around the cities of Fairbanks and North Pole because they are surrounded by hills on three sides.

EPA adopted a NAAQS for particulate matter (PM) pollution 2.5 microns or less in diameter (PM_{2.5}). The following table provides the current PM_{2.5} NAAQS.

¹⁷ Information accessed on June 11, 2015 at <http://www.codepublishing.com/AK/FairbanksNorthStarBorough/?FairbanksNSB15/FairbanksNSB1504.html>.

¹⁸ Information accessed on June 9, 2015 at <http://quickfacts.census.gov/qfd/states/02/02090.html>.

¹⁹ Information accessed on June 9, 2015 at <http://doa.alaska.gov/dmv/research/curreg14.htm>.

²⁰ ADEC SIP Appendix III.D.5.6-6.

National Ambient Air Quality Standards Particulate Matter PM _{2.5}		
Averaging Time	Level	Form
24-hr	35 µg/m ³	Not to exceed more than once per year on average over 3 years
3 years	35 µg/m ³	98 percentile, average over 3 years
Annual	12 µg/m ³	Annual mean, averaged over 3 years

In 1997, the EPA established the first annual and 24-hour NAAQS for PM_{2.5}. In 2006, the EPA strengthened the 24-hour ambient PM_{2.5} standard from 65 micrograms per cubic meter (µg/m³) to 35 µg/m³. States were required to examine monitoring data collected within their communities and to make designation recommendations based on the new standard by December 2007. Compliance with ambient air quality standards is based on the calculation of a “design value” for individual monitors consistent with the calculation of the applicable standard. For the 24-hour ambient PM_{2.5} standard, the design value is calculated from the 3-year average of annual 98th percentile values.

In 2009, the EPA designated Fairbanks as nonattainment for the 24-hour PM_{2.5} standard using measurements collected at the State Office Building over the previous 3-year period, 2006 – 2008. The 98th percentile value for each of those years was 42.2 µg/m³, 33.1 µg/m³ and 46.7 µg/m³; collectively they produced a PM_{2.5} design value of 41 µg/m³ for the 3-year period ending in 2008. Design values are updated each year, based on the previous 3-years of data.²¹

Source of FNSB PM_{2.5} Emissions PM_{2.5} within the nonattainment area consists mainly of organic carbon, sulfate, nitrate, and ammonia. And in the summer, wildfires can contribute to PM_{2.5} exceedance days. To determine the exact local PM_{2.5} sources, the FNSB examined air pollution from three permanent air quality monitoring stations in downtown Fairbanks: a multi-pollutant station at the FNSB Administrative Center; a micro-scale station at the Old Post Office building; and a neighborhood-scale station at the State Office Building. In 2012 the North Pole Fire Station on Hurst Road (also known as North Star Fire Station), a micro-scale station, also began collecting air pollution measurements.

According to Ward et al²²

²¹ State of Alaska Fairbanks PM_{2.5} Moderate State Implementation Plan December 24, 2014

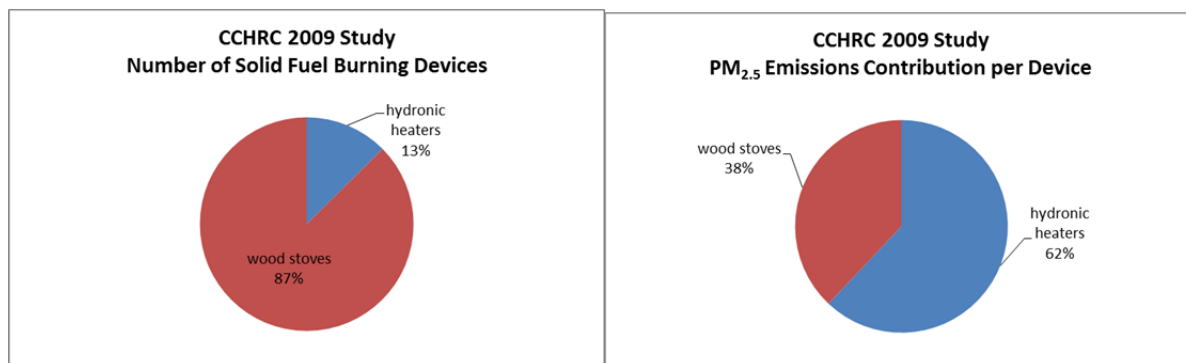
²² Source Apportionment of PM_{2.5} in a Subarctic Airshed - Fairbanks, Alaska, Aerosol and Air Quality Research, 12: 536–543, 2012 .

In an effort to understand the sources of PM_{2.5} in the Fairbanks airshed, source apportionment using Chemical Mass Balance (CMB) modeling was conducted at four locations in Fairbanks over a three-winter period (2008/2009, 2009/2010, and 2010/2011). At each of the four sites, PM_{2.5} concentrations averaged between 22.5 ± 12.0 µg/m³ and 26.5 ± 18.9 µg/m³, with frequent exceedances of the 24-hour NAAQS on the scheduled sample days. The results of the CMB modeling revealed that wood smoke (likely residential wood combustion) was the major source of PM_{2.5} throughout the winter months in Fairbanks, contributing between 60% and nearly 80% of the measured PM_{2.5} at the four sites. The other sources of PM_{2.5} identified by the CMB model were secondary sulfate (8–20%), ammonium nitrate (3–11%), diesel exhaust (not detected-10%), and automobiles (not detected-7%). Approximately 1% of the PM_{2.5} was unexplained by the CMB model. Additional research is needed to confirm the wood smoke results of the CMB model, as well as determine which sources (fuel oil residential heating, coal combustion, etc.) contribute to the measured secondary sulfate.

In 2009, the Cold Climate Housing Research Center (CCHRC) completed a study which calculated the contribution of PM_{2.5} emissions from various wood burning devices. CCHRC referenced a 2005/2006 Sierra Research survey²³ which inventoried FNSB wood burning devices and how they were used (such as all day, only night/weekends, not at all) and then used that data along with PM_{2.5} emission rates (grams/hour) from wood burning devices to calculate the resulting PM_{2.5} emissions. The survey estimated there were 10,420 wood stoves in the nonattainment area, and they emitted approximately 214 tons of PM_{2.5} per year. The study also indicated there were approximately 1,500 wood fired hydronic heaters in the nonattainment area and they emitted approximately 350 tons of PM_{2.5} per year, more than any other residential source. Thus solid fuel hydronic heaters representing 13% of the Solid Fuel Burning Appliances (SFBA) (1500/11,920) in the non-attainment area contributed approximately 62% of the total tons of PM_{2.5} per year resulting from SFBA's (350 tons/564 tons).²⁴

²³ Dulla, Bob, Frank Di Genova. March 18th, 2008. Subject: Fairbanks Home Heating Survey, Winter 2007-2008

²⁴ Cold Climate Housing Research Center, Reducing PM_{2.5} Emissions from Residential Heating Sources in the Fairbanks North Star Borough, February 23, 2009 (p. 14) as cited in ADEC's Final 2014 SIP.



FNSB PM_{2.5} Monitoring Data Because FNSB is one nonattainment area with potentially multiple airsheds, meeting the Clean Air Act standard is difficult but achievable. The city of Fairbanks three-year air quality average has recently decreased and is close to meeting the Clean Air Act 24-hour standard of 35 micrograms of PM_{2.5} per cubic meter known as an exceedance day. The number of exceedance days at the North Pole monitoring site is well above the Clean Air Act Standard.²⁵

According to the ADEC in its draft monitoring plan for 2014/2015, the Alaska Monitoring NAAQS Summary for PM_{2.5} for 2011, 2012, and 2013 at the NCore site located at 809 Pioneer Road (installed in December 2010) and at the North Pole Fire Station on Hurst Road (installed in March 2012) were as follows:

TARGET: NAAQS 35 µg/m³ (24-Hr, 98th percentile)

Site	2011	2012	2013	2014	2015
NCore Site	33.1	50.0	36.2	31.6	36.7*
North Pole Fire #3	NA	NA	NA	139	111.6*

* Preliminary data

24-Hr, 98th percentile, average over 6 month winter sampling season

Site	2011	2012	2013	2014
North Pole Fire #3	No Data	158.4	121.6	139

TARGET: NAAQS 12 µg/m³ (Annual mean)

²⁵ ADEC Annual Air Quality Monitoring Network Plan 2014-2015 (Public Notice Draft)

Site	2011	2012	2013	2014	2015
NCore Site	10.4	11.3	10.5	10.4	10.0*
North Pole Fire #3**	No Data	16.8	29.1	No Data	No Data

* Preliminary Data

**Not an actual annual mean, data collected over 6 month period during winter season

In summary, significant investment in monitoring and research has been expended to define the nature and magnitude of air quality issues in the Fairbanks area. This information has provided a basis upon which mitigation measures have been discussed and continue to be debated. What is clear is that action needs to be taken by all stakeholders in the FNSB to improve air quality, protect public health, and reduce the direct and indirect costs associated with poor air quality. Ultimately, these actions need to work toward achieving Clean Air Act standards.

Health Effects of PM_{2.5} Wood smoke is especially harmful to children, pregnant women, the elderly, and people with lung and heart disease.²⁶ Wood smoke is a mixture of solids, gases, and liquids. Much like cigarette smoke, wood smoke contains hundreds of air pollutants that can cause cancer and other health problems. The particles in smoke are tiny bits of solids and liquids produced by incomplete combustion. Breathing air with wood smoke in it causes inhalation of fine particles deeply into the lungs. The particles contain toxic substances that can remain in the lungs for months, causing changes that lead to diseases and structural damage. These 2.5 micron diameter particles are so small they get past the respiratory tract's defenses and reach the deepest areas of the lungs (the alveoli, tiny air sacs where oxygen enters the blood stream).

Many other harmful substances, such as toxic organic chemicals, can be carried into the lungs by fine particles. An organic chemical is any chemical containing carbon and hydrogen. Many organic chemicals in wood smoke contribute to health problems in the respiratory tract. Examples of harmful organic chemicals of concern in wood smoke include: benzene, formaldehyde, acetaldehyde, acrolein, and polycyclic aromatic hydrocarbons (PAHs).²⁷

²⁶ Affidavit of Dr. Ali Hamade in Case No. 4FA-13-01205CI, State of Alaska v. Straughn, January 22, 2013.

²⁷ Naecher, Luke P. et al. Woodsmoke Health Effects: A Review. *Inhalation Toxicology*, 19:67-106, 2007.

Breathing wood smoke can have short- and long-term effects. Some of the short-term effects include: irritated eyes, throat, sinuses, and lungs; headaches; reduced lung function, especially in children; lung inflammation or swelling; increased risk of lower respiratory diseases; more severe or frequent symptoms from existing lung diseases (such as asthma, emphysema, pneumonia, and bronchitis), and risk of heart attack and stroke. Other long-term effects include: chronic lung disease including chronic bronchitis and emphysema (COPD), chemical and structural changes in lungs, and cancer.²⁸

Adults with normal health generally have better resistance to most effects of wood smoke. However, they may feel shortness of breath and notice it is more difficult to exercise. They may also notice irritated eyes, sore throats, phlegm, chest tightness, headaches, and allergy symptoms. Although anyone can have health effects from wood smoke, those most likely to be affected even at low levels are: infants and children, the elderly, pregnant women, and adults with existing heart or lung conditions.²⁹

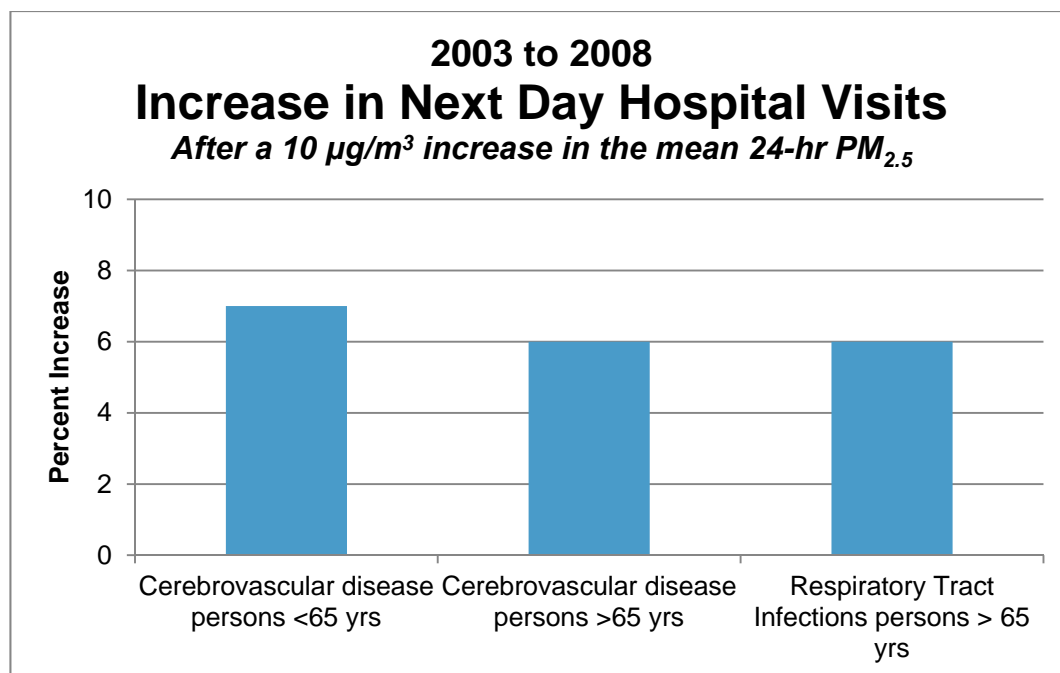
PM_{2.5} is a particle small enough to enter the bloodstream and cause immediate or consequential human health impacts. Sources that emit PM_{2.5} can also emit even smaller particles that can enter a human cell causing other health impacts.

For the period 2003-2008, the State of Alaska Department of Health and Social Services (ADHSS) reviewed Fairbanks Memorial Hospital data and FNSB PM_{2.5} air monitoring data to determine if increases in PM_{2.5} concentrations were associated with increases in hospital visits for selected cardiac and respiratory conditions.³⁰ A total of 5,718 hospital visits consisting of 1,596 emergency room visits and 4,122 hospitalizations were analyzed; the mean 24-hr PM_{2.5} level was 20.1 µg/m³. According to the report, hospitalizations for the following health conditions were statistically significantly associated with increased mean 24-hr PM_{2.5} levels:

²⁸ Affidavit of Dr. Ali Hamade in Case No. 4FA-13-01205CI, State of Alaska v. Straughn, January 22, 2013.

²⁹ Ibid.

³⁰ ADHSS Association between Air Quality and Hospital Visits — Fairbanks, 2003–2008, Bulletin 26, August 2010.



In summary, these results indicate that increased concentrations of ambient PM_{2.5} levels in FNSB were associated with increased risk of hospitalizations due to cerebrovascular disease in all persons and respiratory tract infections all persons aged >65 years during the study period.

According to the American Lung Association³¹, lung disease diagnoses amongst the FNSB population have increased between 2011 to 2014 at representative rates of pediatric asthma by 22.8% (n= 1,775 to 2,180), adult asthma by 9.3% (n=6482 to 7,074), and COPD by 7.2% (n=2900 to 3810). Cardiovascular disease diagnoses have been made for 5.8% of the population.

On January 29, 2015, a representative of the Fairbanks Memorial Hospital testified to the FNSB Assembly that, between 2009 and 2014, there was a positive correlation between elevated PM_{2.5} concentrations and hospital admittance for respiratory complaints such as wheezing, shortness of breath, and a cough.³²

While research links air pollution with increased illnesses in children, including documented increased rates of school absenteeism,³³ a similar correlation cannot be

³¹ American Lung Association, State of the Air Report 2012 and 2015, accessed on June 1, 2015 at <http://www.stateoftheair.org/2015/states/Alaska/>

³² Testimony of Shawn X. Zhan to FNSB Assembly, January 29, 2015.

³³ Noonan CW, Ward TJ, Navidi W, Sheppard L, Bergauff M, Palmer C. 2011. Assessing the Impact of a Wood Stove Replacement Program on Air Quality and Children’s Health. Research Report 162. Health Effects Institute, Boston, MA.

made with an FNSB school district reference because the FNSB school district does not report data in this manner.

State of Alaska's Response to the Problem Based upon historical measurements of FNSB PM_{2.5} levels, in 2006 the EPA notified the State of Alaska and the FNSB that average daily amounts of air-borne particulate matter in parts of the FNSB exceed the level deemed healthy by the Clean Air Act. The EPA designated FNSB as noncompliant on December 18, 2009. Noncompliance triggered a requirement to provide a SIP that demonstrated a path to attainment by December 2012. Due to lawsuits the EPA pushed that date back to December 31, 2014.

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as “nonattainment” those areas that violate the NAAQS and those areas that contribute to violations. The Clean Air Act prescribes the methodology to consider “pollutant emissions, air quality data, population density and degree of urbanization, traffic and commuting patterns, growth, meteorology, geography and topography, jurisdictional boundaries, and level of control of emissions sources.” In 2007, ADEC worked with the FNSB and the EPA to describe and designate the area not meeting the established standards.

Initial evaluation of possible control measures and model development with those various measures began and continued from 2011 through 2013. In September 2013 ADEC released proposed regulation changes for the non-attainment area pertaining to open burning, wood-fired heating device visible emission standards, solid fuel-fired heating device fuels, wood-fired heating device standards, and PM_{2.5} air episode and advisories. ADEC announced a plan to take comments through the Fall of 2013, incorporate comments into a draft Moderate SIP in early 2014, conduct a final 30-day public comment period, and submit the SIP to EPA by May 2014. However, after the closure of the public comment period the draft SIP was not released for public comment until November 17, 2014. The final SIP was submitted to the EPA on December 31, 2014 and the proposed regulations became effective on February 28, 2015.

Access to affordable and abundant natural gas is paramount to substantially reducing PM_{2.5} emissions in the FNSB. In a borough with over 100,000 residents, currently only about 1,100 commercial and residential properties have access to natural gas. To deliver natural gas to the most people possible and minimize air pollution as soon as possible, the State of Alaska, along with the FNSB community, has taken several steps in the past few years through the creation of the Interior Energy Project (IEP).

The IEP has three main goals:

- 1) Boost the economy of the Interior by lowering heating costs.

- 2) Improve public health concerns by significantly reducing air quality PM 2.5 levels.
- 3) Help avoid federal funding sanctions if the air quality does not improve.

Interior utilities, Interior Gas Utility (IGU) and Fairbanks Natural Gas (FNG) are both project entities within the IEP.

Funding for the IEP was provided in sponsored legislation – namely SB 23 in 2013 totaling over \$332.5 million for the delivery, transportation and distribution of LNG to Interior Alaska communities.

The IEP funding package includes a collaboration of legislation including SB 23 and others equaling \$150 million in bonding authority, \$125 million in low-interest loan availability, \$30 million in tax credits for construction of natural gas storage facilities and \$57.5 million in zero percent interest grants to assist the community in achieving its goals of providing \$15/mcf gas (roughly \$2.00/gal fuel oil) to as many FNSB residents as businesses possible, as quickly as possible.

To date, IGU has received about \$38 million and FNG has received about \$15 million through low cost, tax-free loans and grants from the State of Alaska, administered by the Alaska Industrial Development and Exploration Authority (AIDEA). Additionally, the FNSB has authorized a \$7.5 million line of credit for the IGU, as well as a \$3 million capital grant from the State administered by the FNSB. The IGU distribution system is estimated to cost about \$300 million. This price does not include storage or transportation costs.³⁴

In 2015, the Interior Gas Utility installed about 72 miles of pipe in the City of North Pole and the surrounding area south to Dyke Road and north to Hurst Road. The 2 inch to 8 inch high density polyethylene (HDPE) pipe runs in front of 2,200 homes available to hook up to the system, with project costs equaling \$20 million. Phase 1 included partnerships with over a dozen contracting, permitting and construction agencies, crossing the Alaska Railroad in five areas and the Trans-Alaska Pipeline (TAPS) for the first time in their history by a pipeline not owned or controlled by Alyeska Pipeline Service Company.

Fairbanks Natural Gas (FNG), the current supplier to 1,100 residents and businesses in the FNSB community, expanded their distribution system by an additional 60 miles from 2014 to 2015. The FNG system is currently capable of serving an additional 3,500 residents with a natural gas supply if there were additional LNG storage.

³⁴“FAQ” Interior Gas Utility. 2013. Web. Accessed April 14, 2016.

AIDEA purchased Fairbanks Natural Gas in 2015, with plans to combine the two utilities for better efficiency and lower costs in serving the community with an affordable natural gas option. Initially, this acquisition has reduced rates to current FNG customers while negotiations are underway for transitional ownership and the planned sale to IGU, expected in 2016.

Due to the various efforts and delays of the IEP since its inception in 2013 and a significant drop in oil prices, GVEA, who was considered a possible tenant anchor, secured a 12-year contract to buy a new naphtha fuel blend instead of waiting for a natural gas project to come to fruition.³⁵ GVEA, however, has expressed interest in taking 2.5 million gallons of LNG should the price be competitive. GVEA has committed to take 0.6 bcf of gas to help the project by taking gas in the summer when other users would not need gas for heating. Storage capacities for residents are mandated to have a 5-day reserve and LNG processing plants are anticipated to begin construction in fall of 2016.

In March 2016, AIDEA announced that Salix, a subsidiary of Avista Corporation, was chosen as a finalist to produce LNG from southcentral Alaska (Cook Inlet) for Interior use with an anticipated delivery date of 2018. Delivery to the burner tip is targeted at a price of \$14-17 per thousand cubic feet or the equivalent of \$2 per gallon of home heating oil.³⁶ The reduction in energy costs and air pollution are considered large motivators for conversions from heating oil to natural gas at these prices.

ADEC Response to the Problem In response to the failure to meet the Clean Air Act standards, ADEC has implemented a suite of control measures and made information available to the public. Enforcement of ADEC regulations can only be accomplished through cease and desist orders and ultimately court procedures. The most well-known instance in Fairbanks, Alaska v. Straughn, was focused on outdoor wood boiler emissions and led to multiple court events and dozens of dockets over a seven-month period.³⁷

³⁵ Buxton, Matt. "New GVEA Fuel Contract Worries Backers of Natural Gas for Fairbanks." Fairbanks News Miner. N.p., 15 Dec. 2015. Web. 14 Apr. 2016.

³⁶ IEP Natural Gas Conversion Analysis. 2014. Prepared for AIDEA by Cardno Entrix. Ch. 39 SLA 2015.

³⁷ Case number 4FA-13-01205CI, information accessed on July 8, 2015 at http://www.courtrecords.alaska.gov/eservices/?x=EH*tNFLDzxby5R7W1CJWSz6qgx5MITn6Cw74Z6ydUT31fTGNP0C4fZau5wzqCHdEYT*MtdZfePDi5h*3f19n8A.

ADEC submitted a Moderate SIP to EPA in December 2014 and EPA found the Moderate SIP officially “complete” on February 18, 2015. Now EPA has up to June 2016 to review the SIP and make a finding of adequacy. They can approve, partially approve, or disapprove all or parts of the SIP. If any part of the SIP is disapproved, ADEC will be required to address the deficiencies with a SIP amendment.

ADEC anticipates the EPA will designate Fairbanks as a Serious Area for non-attainment in June 2016 triggering a requirement to submit a Serious SIP by December 2017. Thus, ADEC began Serious SIP development in January 2015 in order to meet the December 2017 deadline for submission to EPA.

Anticipating mandatory Best Available Control Technology (BACT) for stationary sources upon Serious non-attainment designation by EPA in 2019, ADEC has requested that owners and operators of eight stationary sources voluntarily conduct and submit a preliminary BACT analysis by December 2015 and a final by March 2016. ADEC begins Serious SIP modeling in March 2016. ADEC anticipates having a draft Serious SIP for public review by December 2016, public notice and hearings in February 2017, and submission to EPA by December 2017.

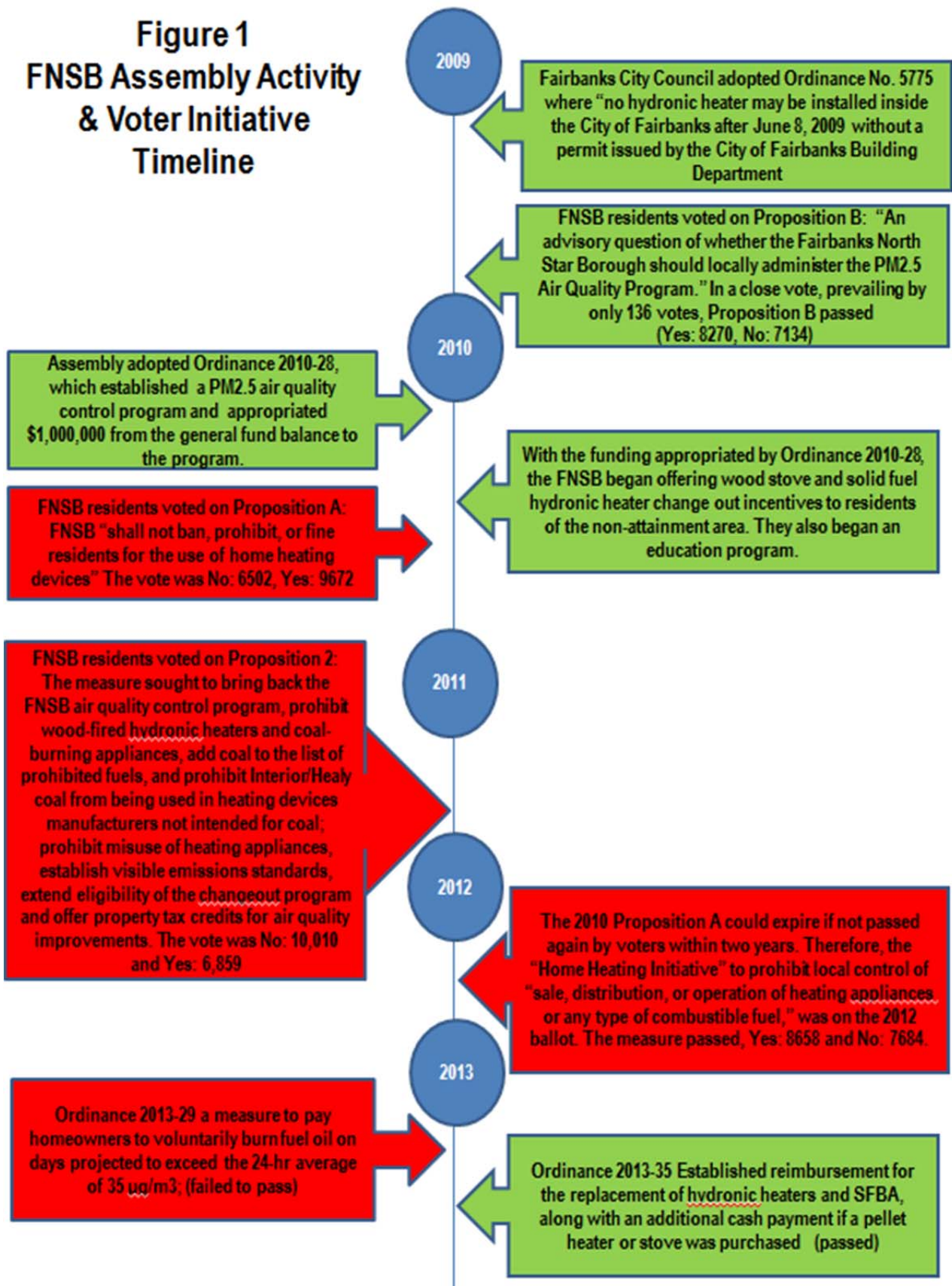
City of Fairbanks Response to the Problem Responding to the problem of non-attainment and pending federal sanctions, on May 18, 2009 the Fairbanks City Council adopted Ordinance No. 5775 whereby “no hydronic heater may be installed inside the City of Fairbanks after June 8, 2009 without a permit issued by the City of Fairbanks Building Department. No permit shall be issued until standards are adopted by the Fairbanks City Council.” On October 22, 2012 Ordinance No 5903 amended Fairbanks General Code Chapter 34, Article VI Section 34-201 to include the stipulation that permits for the upgrade or replacement of existing hydronic heaters may be issued if the upgraded or replacement heater is qualified by the EPA.

During the period from 2009 through 2014, Aurora Energy expanded the system distributing steam building heat in the Fairbanks city core. It is estimated that the equivalent displacement of heating oil is 326,400 gal/yr.³⁸

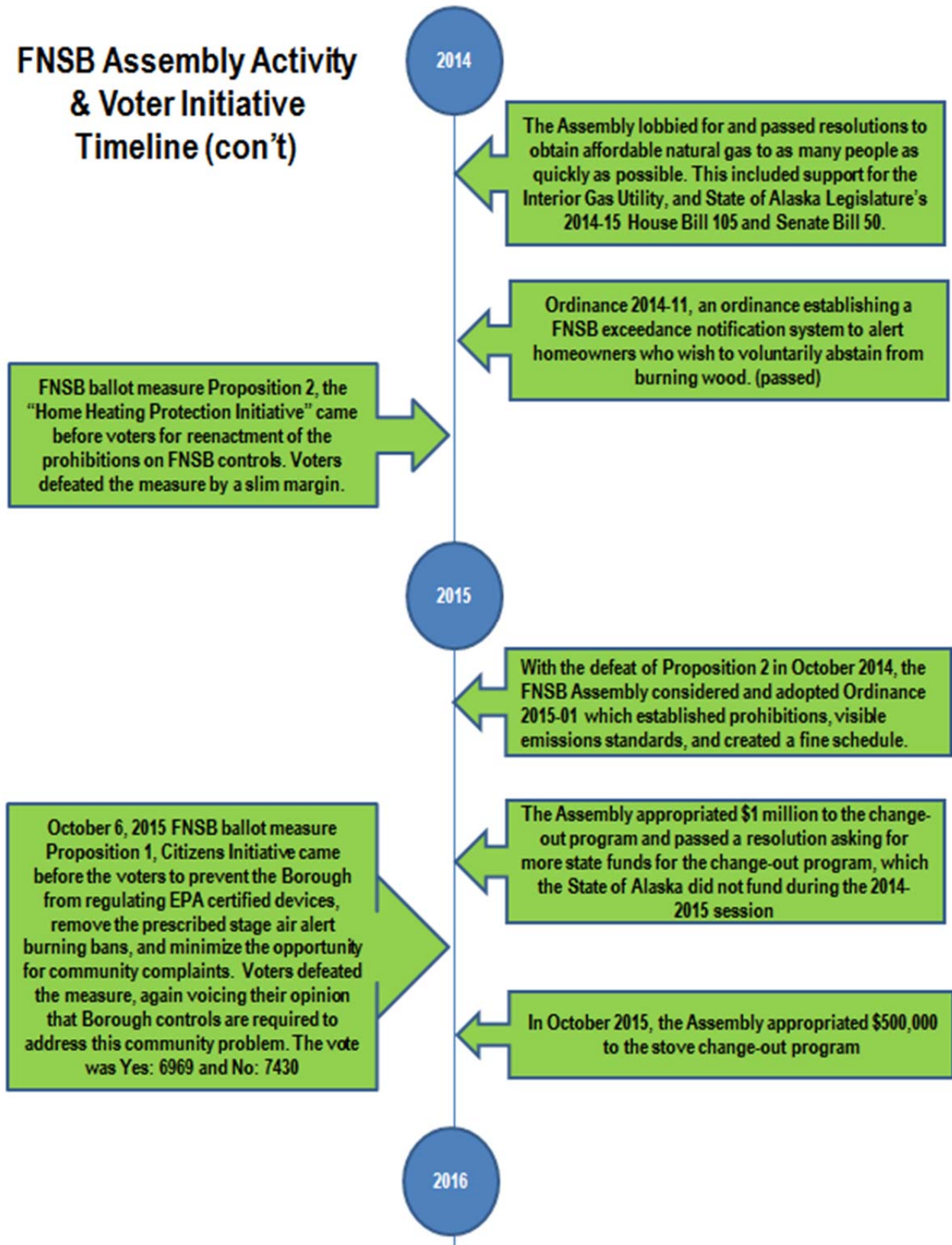
FNSB Response to the Problem Since 2009 there have been several Borough Assembly and Voter Initiatives to resolve the PM_{2.5} issue. Key actions are represented in Figure 1, FNSB Assembly Activity & Voter Initiative Timeline. Actions moving the Borough forward to resolve this problem is designated by green boxes. Actions creating barriers to resolve this problem is designated by red boxes.

³⁸ Per David Fish, Aurora Energy, August 16, 2015 email correspondence

**Figure 1
FNSB Assembly Activity
& Voter Initiative
Timeline**



FNSB Assembly Activity & Voter Initiative Timeline (con't)



FNSB Incentives and Initiatives Despite the uncertainty of local regulations, the FNSB has spent nearly \$7,000,000 to help homeowners reduce smoke from solid fuel burning appliances.³⁹ These dollars were spent because the ADEC SIP states that SFBA's create the most quantifiable contribution to PM_{2.5} pollution. The main education effort has been the promotion of a "Split, Stack, Store" campaign, which urges wood burners to take steps to burn clean, dry wood.

ADEC and FNSB have a suite of control measures, a voluntary burn cessation program, and other information available to the public. Overall, the FNSB has removed 288 SFBA's, exchanged 1,653 SFBA's, and repaired 59 SFBA's at a cost of \$6,750,000. An additional incentive program provides wood pellets. A breakdown on the change out program is as follows:

- replaced 1,517 wood stoves;
- removed (no replacement) 199 wood stoves;
- replaced 46 hydronic heaters; and
- removed (no replacement) 89 hydronic heaters.

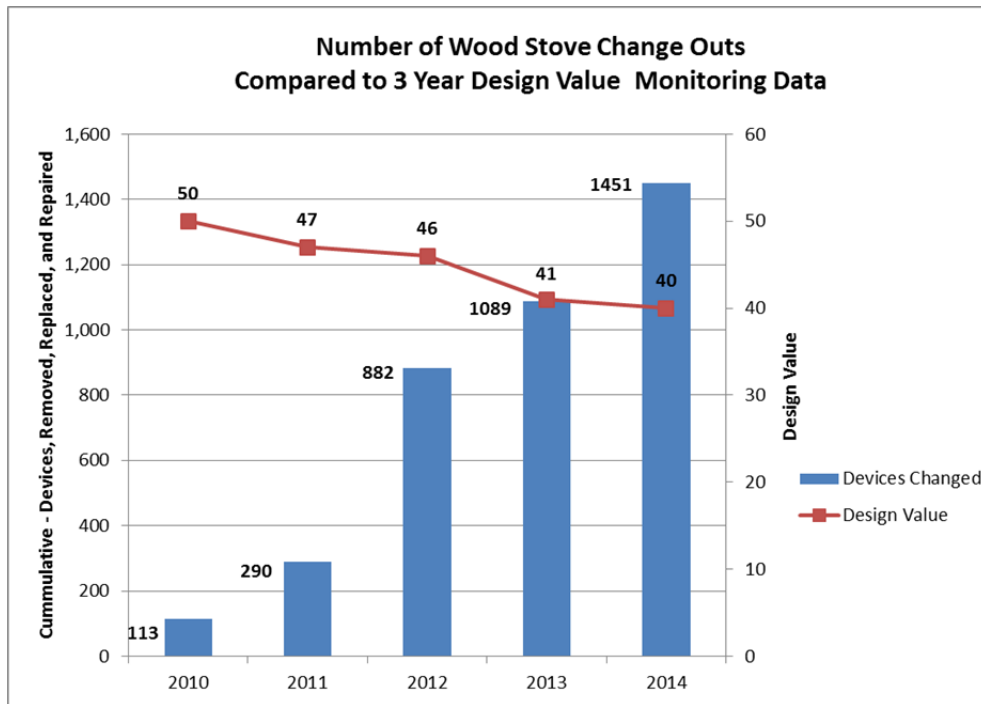
Additionally, in FY2016, the FNSB may spend \$1,152,730 in federal and state grants to conduct monitoring, stove change-outs, and outreach. An additional \$500,000 of FY2016 FNSB General Funds will support staffing and operations of the Air Quality Division. In the FY2015-16 FNSB budget the Air Quality Division was allocated two additional full-time positions to help with outreach to residents known to emit significant amounts of PM_{2.5}. In addition, ADEC has staff and operational funds to study, report, monitor, and enforce air quality regulations in the nonattainment area.⁴⁰

There are an estimated 41,607 residential units in the FNSB. Within the FNSB nonattainment area, it is estimated 1,500 SFBA's do not meet the current FNSB standard of emitting no more than 2.5 grams of PM_{2.5} per hour.

The following graph represents the number of wood stove change out (WSCO) devices compared to the Fairbanks monitoring data calculated for the 3 year design value. Attainment with PM_{2.5} 24-hr standards of 35 µg/m³ is determined by a design value, a rolling 3 year average of the highest 98th percentile concentration at each compliance monitor.

³⁹ Personal communication with Ron Lovell, FNSB Air Quality Division, on June 8, 2015.

⁴⁰ Personal communication with Ron Lovell, FNSB Air Quality Division on June 5, 2015.



Current outreach and education efforts by the FNSB range from print advertising, radio Public Service Announcements, e-mail and text voluntary burn cessation notifications, “Split, Stack and Store” brochures, web site and Facebook site information including current air quality levels, and “Sniffer” maps. ADEC has a robust statewide web site with audio-visual products, links to studies, brochures, etc.

In 2011, CCHRC completed a study to determine the length of time and storage methods needed to fully cure firewood in Fairbanks to a moisture content of 20% or less. The study confirmed that cutting, splitting, stacking, and covering wood for a single summer resulted in dry wood by winter-time. When split and stored over the summer, firewood took only 6 weeks to three months to cure. Properly cured firewood optimizes heat output and less dry wood is needed to meet the heating demand. Additionally, properly cured wood releases fewer emissions such as PM_{2.5}.⁴¹

Current Economic Impacts It is difficult to calculate the negative impacts of PM_{2.5} on our economy. We know they range from individual medical bills to lost wages. Switching from heating with self-collected firewood to heating oil increases a homeowner’s cost of living but saves them time and is more convenient. There are first-hand accounts of residents vacating the FNSB and unsuccessful worker recruitment due to air quality concerns. Reducing the amount of indoor air pollution

⁴¹ CCHRC publication Wood Storage Best Practices in Fairbanks, Alaska, June 27, 2011

led to increased costs for the Woodriver Elementary School. One legal action involving a violation in the Woodriver Elementary School neighborhood required registering complaints and litigating for over five years.⁴²

Efforts to address the problem have created positive economic effects too. Sales of certified wood stoves have likely been positive due to the change out program. Demand for clean-burning wood products led to the opening of Superior Pellet Fuels and construction of a large kiln by Wood Brothers. The State of Alaska has invested tens of millions of dollars, creating local jobs, in its efforts to bring affordable natural gas to as many homes as quickly as possible. According to an Interior Gas Utility press release, in the summer of 2014 “[s]ome 165 construction jobs are anticipated to be created,” “as well as 35 to 40 additional professional positions for other elements of the infrastructure project.”

Limiting Factors The following is a list of limiting factors intended to guide objectives and strategies. What is not listed but largely central to all is a lack of funding at the local, state, and federal level.

- **Lack of Awareness** Anecdotal evidence suggests residents fail to grasp the serious direct and indirect economic and health consequences of failure to properly burn wood. Absent this awareness, state and FNSB efforts to curb emissions are deemed by some to be an unwarranted intrusion on their rights.
- **Affordable Clean Energy** While it is debatable that bringing natural gas or propane to the nonattainment area will lead to attainment, it will certainly lower PM_{2.5} levels if the gas is affordable. A related concern is that investment in converting from fuel oil might be lost if the natural gas supply disappears prematurely.
- **High Emissions** Allowing the use of older, higher polluting SFBA is considered an impediment to attainment. Replacing all SFBA that emit more than 2.5 grams/hr of PM_{2.5} would make a measurable difference in PM_{2.5} levels. The burning of green, wet wood is also a limiting factor. Homeowners are seen harvesting green wood in winter for immediate use.
- **Energy Consumption** Homes that are well insulated require less fuel to maintain a comfortable indoor temperature. Yet, many homes in the non-attainment area are poorly insulated and could benefit from energy audit programs.

⁴² Affidavit of Kristen Brown in Case No. 4FA-13-01205CI, State of Alaska v. Straughn, January 24, 2013.

- **Compliance** A lack of understanding increases the likelihood that homeowners will not comply with ADEC and FNSB measures to curb PM_{2.5} emissions. Currently ADEC's only mechanism to compel compliance is through litigation.
- **Increasing Population and Development** The long-term trend in Fairbanks has been for growth in population. Any increase in population most likely will include homes with wood heat, and this will continue to add future sources contributing to the air quality pollutant load.

Risks and Consequences of Failure If FNSB is unable to reduce levels of PM_{2.5}, this would carry continued and worsening economic and health consequences for residents and visitors. If the ADEC and FNSB fail to demonstrate a path to achieve air quality standards, the EPA will play a larger role, partnering with ADEC and FNSB to develop a federal implementation plan identifying additional efforts required to improve FNSB air pollution. However, a federal plan may not be as flexible as a local or state-developed approach and individual home heating choices could be even more limited under federal than state or local control.

PM_{2.5} health impacts to humans are irrefutable. As stated earlier, a study at Fairbanks Memorial Hospital indicates that increased concentrations of ambient PM_{2.5} levels in FNSB were associated with increased risk of hospitalizations due to cardiovascular disease in all persons and respiratory tract infections in persons over 65 years of age. A correlation with increased risk of death is assumed but has not been documented due to the technical difficulty of doing so locally.

The negative economic impacts include medical expenses, lost wages and productivity, added expenses of switching to cleaner heating fuel, and federal sanctions associated with failure to meet the federal standard.

A study in California looking at the economic impacts associated with health effects found that:

families with children who have asthma are bearing a high cost. The total annual estimate between \$3,800 and \$4,000 represents 7 percent of median household income in our study in these two communities. This is troublesome because that is higher than the 5 percent considered to be a bearable or sustainable level of health care costs for a family

and

Traditional risk assessment methods for air pollution have underestimated both the overall burden of asthma and the cost of the disease associated with air pollution. Our findings suggest the cost has been substantially

underestimated and steps must be taken to reduce the burden of traffic-related pollution.⁴³

Another economic impact is that all stationary sources of PM_{2.5}, namely energy production facilities, first assess what Best Available Control Technology may be employed at the facility to reduce emissions. If the deadline for meeting Clean Air Act standards is not met, facilities will be required to implement the new control technology. It is possible these actions will cost the eight facilities in the Fairbanks area several million dollars, increase local energy costs, and contribute very little to solving the problem.

The second federal sanction is the loss of federal highway administration funding for most Alaska Department of Transportation (ADOT) projects, except those that seek to reduce air pollution like pedestrian trails. In the 2015-2020 spending plan the Northern Region of the ADOT is slated to spend over \$300,000,000 of federal highway funds, some of which are at risk of federal sanctions. The loss of these funds would likely result in economic impacts throughout the entire FNSB, not just the non-attainment area.

In non-attainment areas, like those in the Fairbanks North Star Borough, the Department of Defense must conduct additional environmental, air quality review in order to determine conformity beyond the typical environmental review required under the National Environmental Policy Act (NEPA). This air quality review is separate from the NEPA process, but often the public review process can be harmonized with it. Generally conformity analyses will add to the overall cost of the desired federal action. If conformity requirements are overlooked or conformity is not demonstrated, the action is vulnerable to legal action and may be subject to delays.

Desired Future Scenario The desired future scenario is healthy air, people, and a vibrant economy in the FNSB. Efforts to reduce PM_{2.5} will improve, not harm or stifle, the local economy. For many residents, changing out an old inefficient wood stove for a new more efficient one will mean significant savings in the cost of wood to heat their homes. In addition, by meeting federal clean air standards as quickly as possible, the harmful impacts of federal sanctions will be avoided.

In the future the cost to address PM_{2.5} should not just feature the cost of managing and complying with the air quality program but must also consider the cost of health

⁴³ Romley JA, Hackbarth A, and Goldman, DP, *The Impact of Air Quality on Hospital Spending*, Santa Monica, Calif.: RAND Corporation, TR-777-WFHF, 2010, accessed on June 10, 2015 at http://www.rand.org/pubs/technical_reports/TR777/.

care, loss of job productivity, loss of life, and impact of federal sanctions on stationary sources and federal highway funds.

To have healthy air, future homeowners, businesses, and local governments will need money to fund mandatory air quality monitoring; provide cleaner, affordable home heating; exchange older, higher polluting SFBA's for cleaner units; and continue to expand mass transit to reduce vehicle emissions.

In the future, spikes in hospital admission rates or visits to clinics or emergency rooms due to PM_{2.5} will decline to pre-nonattainment levels. Asthma and COPD cases in the FNSB will return to below the national average. In addition, people that want to use a SFBA (with the cleanest fuels) as a primary or alternate source of home heating will be able to do so without harming their own or their neighbors' health.

In the future, clean, affordable home heat will be available to every homeowner in the nonattainment area. Affordable is defined by less than 10% of annual household income.⁴⁴ Examples could include electric, hot water, natural gas, manufactured logs, propane, wood pellets, and firewood with less than 20% moisture content.

Recommended Goals, Objectives, and Actions Solutions for compliance are complex. The APCC acknowledges the leadership of the AQTF initially evaluating objectives per the Political, Economic, Social, and Technological Analysis (PEST). A PEST analysis is a tool, which evaluates external factors that commonly affect business activities for performance outcomes. This process identified key factors and constraints which would influence an outcome for a strong and vibrant community. Due to limited State and Borough resources, the APCC felt it was important to focus on the root cause of the problem, and evaluated each objective for the following criteria to focus on the most effective solutions: 1. Will it reduce PM_{2.5} emissions? 2. Will it move FNSB closer to the target of achieving compliance? and 3. Is it affordable? The APCC recognizes that some of the initial objectives may be good ideas but they do not meet the above criteria.

Goal 1 - Policy: *Solutions to the air quality challenges must address policy and laws related not only to air pollution, but also provide clean, sustainable, and economic energy sources.*

⁴⁴ Information accessed on June 10, 2015 at <http://fee.org/freeman/detail/the-poor-need-affordable-energy>.

Policy Objective 1: FNSB should develop a “Plain English Guide” to City, Borough, and State air quality regulations, including an education template to communicate to the public.

Policy Objective 2: FNSB should address the fact that wood fired hydronic heaters emit a disproportionate amount of the total tons of PM_{2.5} per year resulting from wood smoke. And improperly designed and operated hydronic heaters increase these emissions to an even greater amount.

Policy Objective 3: FNSB should prioritize SFBA change out within the air quality control zone to maximize cost returns on lowering emissions.

Policy Objective 4: FNSB should support Building Energy Efficiency programs by

- Developing public education and incentivizing energy efficiency programs
- Developing economic incentives in energy efficient construction
- Encouraging lending institutions and appraisers and real estate professionals to recognize the real value in energy efficient construction

Policy Objective 5: FNSB should petition the legislature to create citation authority to enforce air pollution regulations

Goal 2 - Economic: *Remove economic obstacles associated with the reduction of air pollution to levels necessary to protect human health.*

Economic Objective 1: FNSB should prioritize the Wood Stove Change out Program, including support of a financial sliding scale for cleaner fuel devices

Economic Objective 2: FNSB should provide a property tax credit for properly designed wood sheds in property tax assessments

Goal 3 - Social: *Solutions to the air quality challenge must address the quality of life, demographics, and safety of residents and visitors while promoting our community culture.*

Social Objective 1: The Assembly should continue to communicate with the public to acknowledge and address the impact of the air quality improvement plan in relation to citizens’ freedoms, rights, and responsibilities as members of a community.

Social Objective 2: APCC should identify challenges the community is having with issues or opportunities identified in this AQ Framework document , and will assist the Assembly to find solutions.

Social Objective 3: FNSB should work with Community organizations to explain the impacts of poor air quality on the health and welfare of residents.

Social Objective 4: FNSB should work with community organizations to create homeowner education guides, resources, and tools to reduce PM_{2.5} emissions.

Social Objective 5: FNSB, APCC, and community organizations should create an “AQ 101” presentation and talking points for groups and for one-on-one interactions.

Social Objective 6: FNSB should work with ADEC and community organizations to collect and post AQ-related data in a user-friendly format on a variety of platforms.

Goal 4 - Technological: *Solutions to the indoor and outdoor air quality challenge must address research and development of alternative sources of home heating, energy efficiencies, best management practices (BMPs), and efficient heating systems.*

Technological Objective 1: FNSB should work with community organizations to develop and provide homeowners with BMPs to maximize energy efficiency in all new and existing facilities.

Technological Objective 2: FNSB should work with community organizations to develop and provide homeowners with BMPs that encourage technological developments that reduces PM_{2.5} emissions from all new and existing facilities within the non-attainment area, including transportation projects.

Technological Objective 3: FNSB OR ADEC should expand the monitoring program with non-regulatory monitors to assist the FNSB citizenry’s understanding of air quality and air sheds.

Conclusion In 2009, EPA designated areas within the FNSB as nonattainment for the Clean Air Act’s 24-hour PM_{2.5} standard. This occurred because local air monitoring stations measured PM_{2.5} at concentrations which exceeded the maximum levels set by the Clean Air Act.

This AQ Framework document outlines four primary goals to reduce PM_{2.5} and achieve EPA compliance while protecting both the individual's freedom of choice and economic rights along with balancing the community's right to a healthy environment.

1. Establish policy that addresses solid fuel fired devices contributing to PM_{2.5} pollution, along with supporting building design energy efficiency programs that ultimately reduce the amount of space heating required.
2. During challenging economic times, it is often difficult to find the financial and community resources to address PM_{2.5} pollution. To be successful, the resulting health effects of poor air quality, in combination with the economic obstacles to reduce PM_{2.5} pollution, need to be identified and prioritized. A robust and flexible monitoring program is an essential component of that analysis. It is critical we identify maximum return on any investments made in PM_{2.5} mitigation efforts.
3. Achievement of PM_{2.5} attainment will require leadership from all members of the community from the FNSB Mayor to residents using solid fuel as a heat source and to their neighbors. Effective communication is essential so each FNSB resident understands what their role is in achieving compliance.
4. PM_{2.5} compliance will require a number of thoughtful and creative solutions that will involve not just FNSB staff but will require community organizations and volunteers to assist both businesses and homeowners on what options are available to reduce their contribution to PM_{2.5} emissions and impact to the community's health if not achieved.