ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Amendments to:

State Air Quality Control Plan

Vol. II: III.D.7.7

Control Strategies

Adopted

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Michael J. Dunleavy, Governor

Emma Pokon, Commissioner

Note: This document consists of the Fairbanks North Star Borough $PM_{2.5}$ Serious SIP (189(b)), the 2020 Amendments (189(d)), and the new 2024 Revised/Amendments. The new 2024 Amendments from page III.D.7.7-142 to III.D.7.7-192 provide the adopted language for inclusion in the section of the State Air Quality Control Plan to address the partial disapproval of the Serious SIP and the 2020 Amendments. The Serious SIP requirements from Section 7.7 to Section 7.7.11 and the 2020 Amendments from Section 7.7.12 to 7.7.13.11 are included to provide historical background information.

7.7. **Control Strategies**

CAA section 189(b)(1)(B) and 40 C.F.R. § 51.1010 describe the Serious area attainment plan requirements for best available control measures (BACM). Attainment plan submissions must include provisions to assure that the best available control measures for the control of particulate matter shall be implemented no later than 4 years after the date the area is reclassified as a Serious area. This section outlines the control strategies that were considered by DEC and the Borough and identifies the measures selected for implementation.

7.7.1 Best Available Control Technology (BACT) Requirements

Large stationary sources are a subgroup of emissions sources that are given special attention in the required BACM analysis. Per federal requirement, DEC evaluated all point sources with emissions greater than 70 TPY of $PM_{2.5}$ or for any individual $PM_{2.5}$ precursor (NOx, SO_2, NH_3, VOCs). These units are subject to site-specific review for BACT. A BACT limit is a numerical emission limit that is needed for each emission unit for each pollutant subject to review. The limit must be met on a continual basis; specify a control technology or work practice; include an averaging period, and be enforceable as a practical matter. BACT analyses are detailed in Section 7.7.8.

7.7.2 Best Available Control Measure (BACM) Requirements

Those emission sources that are not classified as large stationary sources and subject to BACT are subject to Best Available Control Measure requirements. These sources include smaller space heating sources, motor vehicles, other fuel burning equipment, and small industrial sources. The process for selecting BACM is defined in a series of steps detailed in the Final $PM_{2.5}$ Rule.[1] Those steps clarify and update PM_{10} control measure selection guidance presented in the Addendum to the General Preamble[2] for the selection of $PM_{2.5}$ controls for both Reasonably Available Control Measures (RACM), required for Moderate nonattainment areas and BACM for Serious nonattainment areas. Presented below is a summary of the 5-step BACM selection guidance presented in the Final $PM_{2.5}$ Rule:

- Step 1: Develop a comprehensive inventory of sources and source categories of directly emitted $PM_{2.5}$ and $PM_{2.5}$ precursors.
- Step 2: Identify potential control measures.
- Step 3: Determine whether an available control measure or technology is technologically feasible.
- Step 4: Determine whether an available control technology or measure is economically feasible.
- Step 5: Determine the earliest date by which a control measure or technology can be implemented in whole or in part.

1 https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf
2 https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19940816_59fr_41998-42017_addendum_general_preamble.pdf

The following source categories were evaluated for BACM. This list is based on emissions inventory information and other technical analyses that identify the most important sources for $PM_{2.5}$ in the nonattainment area.

- Solid Fuel Burning
  - Outdoor solid fuel-fired boilers (hydronic heater)
  - Solid fuel-fired heaters
  - Fireplaces
  - Burn barrels, residential open burning
  - Agricultural and forest burns
- Residential and Commercial Fuel Oil Combustion
- Transportation
  - Automobiles
  - Heavy-duty vehicles
- Commercial sources
  - Coffee roasters
  - Charbroilers
  - Incinerators
  - Used oil burners

The inventory supporting the BACM analysis was developed in a manner consistent with the emissions inventory requirements for Serious area plans specified in the Final $PM_{2.5}$ Rule. This included representation of source activity and emissions on a seasonal, rather than annual basis as provided for under the Final PM Rule. As discussed in Section III.D.7.6 Emission Inventory, use of seasonal estimates is appropriate for the 24-hour $PM_{2.5}$ standard in Fairbanks since violations of the standard are confined to winter months (October through March) and source activity that triggers these violations peaks during that time. The majority of wintertime activity and emission factor data supporting the inventory was developed based on local data and test measurements.

7.7.3 Evidence of Compliance with the Moderate SIP - Existing and Continuing Control Measures

The $PM_{2.5}$ Implementation Rule at 40 C.F.R. § 51.1005(b)(1)(ii) requires that the State show evidence that all controls submitted in the applicable plan have been implemented. DEC and the Borough are implementing all the measures identified in the approved Moderate Area SIP. Table 7.7-1 summarizes the Moderate SIP control measures and their implementation status.

Table 7.7-1
Moderate SIP Control Measures

Control Measure/Program	Voluntary Measure	Status	
		Implemented	On-going
Space Heating and Solid Fuel Heating Controls			
Solid Fuel-Fired Heating Device Upgrades	X	X	X
Solid Fuel-Fired Heating Device Emission Standards		X	X

Improving Solid-Fuel Device Operations	X	X	X
Reduced Use of Solid Fuel Heating During Air Pollution Episodes (Curtailment)		X	X
AHFC Energy Programs	X	X	X
Expanded Availability and Use of Natural Gas	X	X	X
Required Replacement of Non-Certified Wood Heating Devices When Properties are Sold (Contingency Measure)		X	X
Enhanced Dry Wood Compliance: Registration of Wood Sellers and Moisture Content Disclosure (Contingency Measure)		X	X
Transportation Control Strategies			
Expanded Availability of Plug-Ins	X	X	
Mass Transit System	X	X	X
DOT Anti-Idling and Diesel Emission Reductions	X	X	
DEC Diesel Emission Reduction Efforts	X	X	
Federal Diesel Emission Reduction Programs		X	X
Federal Motor Vehicle Control Program		X	X
Open Burning			
Winter Season Open Burning Ban		X	X
Point Source Controls			
Reasonably Achievable Control Technology		X	X
New Source Review Permit Program		X	X

Nearly all of the measures included in the Moderate SIP are on-going controls. There are a few of the identified measures that were projects that have been completed, including the DEC diesel emission reduction pilot project, DOT anti-idling and diesel emission reductions project, and the projects to add plug-ins for motor vehicles in specific parking lots. These completed projects will continue to provide on-going emission reduction benefits into the future.

Additional information and more detailed documentation on the implementation of the Moderate SIP control measures is included in Appendix III.D.7.7.

7.7.4 Control Strategy Origination

The $PM_{2.5}$ Final Rule requires states to identify controls for all sources and source categories in the latest base year emission inventory for the nonattainment area. The starting point for assembling a list of controls is the RACM analysis prepared for the Moderate SIP. However, it is worth noting that progress on control measures did not stop with the RACM analysis and the Moderate SIP. During the time period following the Moderate SIP submission FNSB had authority to regulate the home heating source sector. The most recent version of the FNSB air quality program with significant control measures began with adoption of FNSB Ordinance 2015-01 on February 27, 2015 which created the following control measures:

- Visible emission standards;
- $PM_{2.5}$ emissions crossing property lines;

- Setback for hydronic heaters;
- Prohibited fuels;
- Limitations on appliance sales;
- Nuisance provisions; and,
- Curtailment program.

FNSB Ordinance 2015-01 also established the air quality control zones within the nonattainment boundary and established a fine schedule for noncompliance.

FNSB Ordinance 2016-21, adopted May 4, 2016 added a control measure that required persons convicted of two or more violations involving visible emissions or $PM_{2.5}$ crossing property lines to remove certain hydronic heaters. FNSB Ordinance 2016-37, adopted July 28, 2016 modified the No Other Adequate Source of Heat (NOASH) exemption for the curtailment program requiring that qualifying structures were constructed on or before December 31, 2016 to ensure that no new construction would be eligible for a NOASH affidavit.

FNSB Ordinance 2017-18, adopted March 9, 2017 strengthened the curtailment program by:

- Removing the temperature threshold on the curtailment program which prevented curtailment from being called when the temperature was below -15 degrees Farenheit at the Fairbanks International Airport;
- Modified the curtailment program from a 3 stage program to a 2 stage program by removing the voluntary stage;
- Lowered the first stage threshold from 35 $\mu g/m^3$ to 25 $\mu g/m^3$; and,
- Lowered the second stage threshold from 55 $\mu g/m^3$ to 35 $\mu g/m^3$.

FNSB Ordinance 2017-18 also strengthened the wood stove change out program by requiring pellet stoves certified as a replacement option be EPA certified to 2.0 g/hr or less and added emergency power systems as a replacement option.

FNSB Ordinance 2017-44, adopted June 19, 2017 added a new control measure requiring permits for installation of SFBA in new construction. Ordinance 2017-44 strengthened the wood stove change out program by requiring professional installation, proper wood storage, and training. Ordinance 2017-44 strengthened the curtailment program by requiring a waiver to operate a SFBA during a Stage 1 curtailment, therby making a Stage 1 curtailment enforceable, and also required more stringent NOASH documentation.

FNSB Ordinance 2018-04, adopted February 8, 2018 modified the NOASH requirements from only Borough listed (under 2.5 g/hr) to Borough listed or EPA certified appliances manufactured after 1998. The change was made to ensure consistency with the Wood Stove Change Out Program.

FNSB Ordinance 2018-26, adopted September 13, 2018 added standards for Retrofit Control Devices (RCD) such as electrostatic precipitators (ESP). The standards included testing requirements, emission standards for RCDs, installation requirements, and a curtailment exemption if regulatory requirements were met.

FNSB Ordinance 2018-45, adopted November 8, 2018 repealed prohibited acts, the curtailment program, and the fine schedule from FNSB Code. The repeal was due to Proposition 4 which states that the FNSB, excluding the natural gas utility, shall not in any way regulate, prohibit, curtail, ban, nor issue fines or fees associated with the sale, distribution, installation or operation of solid fuel heating appliances or any type of combustible fuels. FNSB Ordinances prior to 2018 were all previously adopted by the State into the Moderate SIP and are being implemented by the State where the FNSB could no longer do so.

FNSB Ordinances 2015-01, 2016-21, 2016-37, 2017-18, 2017-44, 2018-04, 2018-26, and 2018-45 are included in Appendix III.D.7.7.

For the purposes of this Serious SIP, the starting point for assembling a list of controls is the RACM analysis prepared for the Moderate SIP. All controls considered, but not adopted must be identified. States are also required to examine a wide range of information sources on existing and potential control measures. Measures and technologies considered and implemented in attainment plans are a significant source of information. Other information sources include summaries of control measures assembled by regional planning organizations and local air quality consortiums. Additionally, the Stakeholder process allowed for public input into control measure selection. The following sections provide a summary of control measure selection.

7.7.4.1 Preliminary Draft BACM Report

DEC prepared a preliminary draft BACM report that was released March 22, 2018 for public review. The preliminary draft BACM document identified 72 control measures for consideration that included information from the RACM analysis from the Moderate SIP. A list of the control measures identified is provided in table 7.7-2.

Table 7.7-2. Control Measure from March 22, 2018 Preliminary Draft Document

Number	Description
1	Surcharge on Device Sales
2	Prohibit advertising used devices that do not meet emission criteria for new device sales
3	Require building or other permit
4	Require confirmation of proper installation by requiring professional installation or on-site inspection
5	Register/require industry certification of heating professionals
6	Prohibit installation of flue dampers unless device was certified using a flue damper
7	Require devices meet stricter emission criteria in high pollution zones.
8	Prohibit installation of Solid Fuel Heating Device (SFHD) in new construction
9	Limit the density of SFHD in new developments
10	Install EPA-certified device whenever a fireplace or chimney is remodeled
11	Prohibit use of rain caps on stacks
12	Require minimum stack height for outdoor wood boilers relative to rooflines of nearby unserved buildings
13	Submit sale and installation information to Air Program
14	Require installation of thermal mass to improve efficiency and prevent frequent cycling in selected new units
15	Disclosure of devices on property sale

Number	Description
16	Require notice and proof of destruction or surrender of removed, uncertified devices (date certain removal of uncertified devices)
17	Require Removal of Uncertified Solid Fuel Burning Devices Upon Sale of Property
18	No Visible Emissions during Curtailment Periods
19	Require registration of devices to qualify for exemption from curtailments
20	Require renewals with inspection requirements
21	Optional device registration for curtailment exemptions
22	Require registration of all devices
23	Require exempt households to display a decal visible from a point of public access
24	Require Permanent Installed Alternative Heating Method in Rental Units
25	Require detailed application or inspection to verify need for No Other Adequate Source of Heat (NOASH)
26	Require inspection of device and installation
27	Require annual renewal of waiver
28	Set income threshold [for Curtailment Exemption]
29	Allow only NOASH households to burn during curtailment periods
30	Distribution of Curtailment Information at Time of Sale of Wood-Burning Device
31	Require sale of only dry wood during late summer to end of winter
32	Require dry wood to be clearly labeled to prohibit marketing of non-dry wood as dry wood
33	Burn permits required
34	Prohibit burn barrels and other outdoor equipment
35	Restrict burning during air pollution events
36	Prohibit residential open burning
37	Periodic burn windows
38	Ambient $PM_{2.5}$ curtailment threshold (1-hr average)
39	Use of AQI as Basis for Curtailment Threshold
40	Single stage curtailment
41	Special needs permit
42	Burn down period
43	Exempt ceremonial or religious fires
44	Alternative heating appliance failure
45	Elevation exemption from wood burning curtailments
46	Lack of electrical or natural gas service availability
47	Inspection warrants
48	Date certain removal of “coal only heater”
49	Prohibit use of coal burning heaters
50	Require low sulfur content coal
51	Ultra-low Sulfur Heating Oil
52	Operation and sale of small “pot burners” prohibited
53	No Use, Sale or Exchange of Used Oil for Fuel, unless it Meets Constituent Property Limits
54	Adopt CARB vehicle standards
55	School bus retrofits
56	Road paving
57	Other Transportation Control Measures (TCMs)
58	Controls on road sanding and salting
59	I/M Program
R1	Regional kiln
R4	All wood stoves must be certified

Number	Description
R5	Ban new installations - Hydronic Heaters
R6	Remove hydronic heaters at time of home sale
R7	Ban use of Hydronic Heaters
R10	Replace uncertified units at time of sale
R11	Replace uncertified units at time of significant remodeling
R12	Replace uncertified stoves in rental units
R15	Ban new installations - Wood Stoves
R16	Disincentives to sell used stoves
R17	Ban use of Wood Stoves
R20	Transportation Control Measures
R29	Increase Coverage of District Heating Systems

7.7.4.2 Stakeholder Recommendations

With the preliminary control measures out for review the Air Quality Stakeholders Group was formed; details regarding the group formation can be found in Section III.D.7.2.14. The Stakeholder Group's objective was to identify, evaluate and recommend community based solutions to bring the area into compliance with federal air quality standards for $PM_{2.5}$. In reviewing the control measures from the preliminary draft documents, the group was asked to determine which would be appropriate "as is" or should be modified for the Fairbanks environment. Stakeholders were also encouraged to develop new control measures that could meet the SIP requirment of being enforceable, not voluntary, and leading to permanent emission reductions.

Individual control measures were first reviewed in smaller working groups where a majority vote was required to bring the control measure in front of the entire group. Once in front of the entire group a control measure required a two thirds majority to be included in the final package. The goal of the group was to reach consensus on a control measure package, which was defined as the total number of individual voting stakeholders in attendance minus one. In the event the Stakeholder Group could not reach consensus, a two thirds majority of stakeholders in attendance was required and a dissenting opinion would be noted and included as part of the final recommendations. Consensus on the final recommendation package was not reached. The final recommendations passed by 93 percent of those present and voting. A dissenting opinion was not received. The Stakeholders Group recommended control measures are shown in Table 7.7-3. Control measures rejected by the Stakeholders Group are shown in Table 7.7-4.

Table 7.7-3. Air Quality Stakeholders Group Control Package Recommendations

Number	Description
S 1a	Require registration of all residential and small commercial heating devices
S 1b	FNSB should include registration of all residential and small commercial heating devices with property tax notice, with tax credit for response
S 1c	Registration of heating devices should include renewal and inspection requirements
S 2	Alternative BACT Banking Fund established by State of Alaska to allow Point Sources to place offset dollars to be used to fund $PM_{2.5}$ control measures
S 3	Point Sources pay an annual assessment to the Alternative BACT Offset Fund in lieu of capital expenditures for BACT and MSM (Point Sources WG)

Number	Description
S 4	Offset funds used primarily to reduce impacts of wood smoke, and not on studies
S 5	Eligibility for Point Sources to pay offsets requires that offsets yield greater annual impacts in $PM_{2.5}$ reduction than DEC proposed BACT/MSM plant modifications
S 6	Speciation study funded by FNSB and Point Sources to determine the level of contribution of point sources to the SO_2 problem
S 7	DEC and each point source negotiate on choice of MSM or economic incentive program (offset)
S 8	Bring natural gas to Fairbanks to allow switch from SFBA or oil boiler to natural gas boiler
S 9	Build and operate a public-private kiln for wood drying
S 10	Establish a dry for wet wood exchange program
S 11	Require all homes with SFBAs to have appropriate wood storage
S 12	Mandate shift from #2 fuel oil to #1 fuel oil borough-wide; ULSD as contingency measure
S 13	Require sale of only dry wood when it is commercially available, with exemption for 8-foot rounds
S 14	Add surcharge to price of #2 fuel oil
S 15	State and/or Borough seek funding to implement a voluntary program to improve residential energy efficiency in the non-attainment area that prioritizes wood-burning homes in AQ hot spots
S 16	Require home energy audit at the time of home sale
S 17a	Request to Congress and State of Alaska to fund $40-million 2-year WSCOP
S 17b	Mandatory removal of uncertified devices over 3-year period
S 18	Require notice and proof of destruction or surrender of removed, uncertified devices
S 19	Offer higher incentives for replacing SFBAs in multi-family structures under WSCOP
S 20	Prohibit use and require removal of coal-only heaters from homes and small commercial sites
S 21	Create incentives for fuel oil boiler upgrades
S 22	Require permanent installed alternative heating method in rental units, with exemption for current NOASH permit holders
S 23	Require catalytic device change out per manufacturer's specifications, with mandatory chimney sweep and device check on annual or biennial basis
S 24	Require inspection for NOASH renewals
S 25	Allow only NOASH households to burn during curtailment periods
S 26	Require renewal of Stage 1 permits
S 27	Require inspection for Stage 1 eligibility
S 28	Require installation permit for all new SFBAs and restrict the types of devices allowed to borough (state) list of approved devices
S 29	Require installation of device that meets state emission standards whenever a fireplace or chimney is remodeled
S 30	Prohibit sales of SFBAs that don't meet state standards
S 31	Allow SFBA in new construction as secondary heat only; primary heating system must have sufficient capacity to heat the building
S 32	Require all aftermarket controls on SFBAs to be professionally installed, with exemption for existing devices
S 33	Require all SFBAs to be properly sized and professionally installed, with exemptions for existing devices
S 34	Adopt legislation giving DEC citation authority
S 35	Increase funding for curtailment enforcement
S 36	Use infrared cameras to observe heat signature for solid-fuel heating device operations

Number	Description
S 37	Increase penalties for burning wet wood
S 38	Rejected in final package
S 39	Rejected in final package
S 40	Develop a public relations strategy that promotes a positive and proactive approach to public outreach on Fairbanks air quality issues
S 41	Communicate the costs of $PM_{2.5}$ non-attainment, including increased medical costs, loss of federal highway funds and construction jobs, increased electric costs for residents and businesses, and other health and societal costs
S 42	Be clear that the goal is not to eliminate wood burning, but to preserve our ability to heat with wood by agreeing not to burn during inversions
S 43	Seek additional venues and audiences for Dr. Owen Hanley's talk on the health impacts of $PM_{2.5}$
S 44	Develop other high-impact presentations that make the science and consequences of $PM_{2.5}$ pollution clear
S 45	Learn from behavioral economics and social marketing how to identify and address barriers to changing behaviors
S 46	Partner with the Cooperative Extension to provide classes in responsible wood burning
S 47	Coordinate with local schools to incorporate air quality messages and alerts in daily announcements
S 48	Encourage teachers to include air quality science and health impacts in lesson plans
S 49	Engage the public through events that are creative and entertaining, such as a contest for building the best modular dry wood storage
S 50	Include continued funding for highway signs in next Targeted Airshed Grant proposal
S 51	Continue the "Plug it in at +20" campaign
S 52	Rejected in final package
S 53	Rejected in final package
S 54	Rejected in final package
S 55	Rejected in final package
S 56	FNSB and DEC should continue to evaluate retrofit control devices such as ESPs using currently appropriated funding

Table 7.7-4. Air Quality Stakeholders Group Control Package Rejections

Reason	Number	Description
Measures with majority support that did not reach the 2/3 threshold for inclusion in the report	A.a.	Offset funding amounts increase each year until attainment is reached or BACT and MSM requirements are triggered
	A.b.	State troopers used for compliance and enforcement during alerts
	A.c.	Ban hydronic heaters in new construction and when homes are sold
	A.d.	Implement GVEA emergency tariff to reduce cost of electric heat for NOASH during air quality alerts
	A.e.	Mandatory requirement under WSCOP that participants with noncompliant SFBA replace with heating device that does not burn solid fuel
Measures considered but not receiving majority vote	B.a.	Require a home energy audit to qualify for an exemption from a curtailment program
	B.b.	Require a home to improve their energy efficiency star rating to qualify for exemption from a curtailment program
	B.c.	In new installations, permit catalytic-equipped stoves only
	B.d.	Prohibit use, sale or exchange of used oil for fuel in the non-attainment area

Reason	Number	Description
	B.e.	Prohibit operation and sale of small used oil burners
	B.f.	Reduce FNSB-certified stove from 2.5 to 1.5 g/hr standard
	B.g.	To qualify for NOASH, provide proof of 5-star rating by 2025
	B.h.	Require sale of only dry wood from late summer to end of winter
	B.i.	Use aerial technology (small camera-equipped drone) to identify smoke plumes
	B.j.	Offset funds support development of proposal to NSF and other funders to study Fairbanks and North Pole Air Quality issues
	B.k.	Require electrostatic precipitators (ESP) for new installation or changeout
	B.l.	Require home to be brought up to minimum star rating at time of home sale
Items considered in work groups but not forwarded to or recorded vote by full group	C.a.	Reduce density of SFBAs
	C.b.	Limitation of wood fired heating device sales
	C.c.	Only allow NOASH burn exemptions during Stage 1 alerts
	C.d.	Increase access to wood cutting permit areas year-round
	C.e.	Increase disbursement of moisture meters
	C.f.	Recreational fire exemptions
	C.g.	Increase coverage of district heating system
	C.h.	Fuel oil boiler O&M programs
	C.i.	State use of royalty gas
	C.j.	Vehicle idling measures
	C.k.	Start ULSD production in Borough
	C.l.	Diesel awareness around monitors
	C.m.	Requirement to use ULSD for oil boilers (group picked #1 instead)
	C.n.	Expanded incentives for conversion to natural gas
	C.o.	Expanded incentives to offset ULSD transition
Items amended or rejected in final package	D.a.	CM #7: amended to DEC and point source negotiation
	D.b.	CM #17b: reference to outdoor hydronic heaters deleted
	D.c.	CM #25: amended to refer only to Stage 2 curtailment periods
	D.d.	CM #38: rejected: Point Sources sponsor curtailment enforcement teams to supplement staffing during Stage 1 and 2 alerts
	D.e.	CM #39: rejected: Authorize warrants for inspection of devices being operated during curtailment periods
	D.f.	CM #52: rejected: Explore potential of suspending operations of minor sources (small point sources, coffee roasters, charbroil grills, small commercial coal fired boilers) during air quality alerts
	D.g.	CM #53: rejected: Identify possible source-specific control measures to assist in further emissions reduction from small stationary sources
	D.h.	CM #54: rejected: Implement a heavy-duty diesel inspection and maintenance program to reduce emissions from mobile sources
	D.i.	CM #55: rejected: Investigate anti-idling technologies and incentives to reduce emissions from mobile sources associated with idling

7.7.4.3 Other Control Measures for Consideration

After the preliminary draft documents were released additional control measures were identified. These other control measures include: EPA comments, public comments, rejected stakeholder

measures, small commercial and industrial sources, and new control measures. Other control measures identified are shown in Table 7.7-5.

Table 7.7-5, Other Control Measures

Number	Description
60	Vehicle Idling
61	(EPA3a) Fuel Oil Boiler Upgrade - Burner Upgrade/Repair
62	(EPA3b) Fuel Oil Boiler Upgrades - Replacement
63	Require Electrostatic Precipitators
64	Weatherization and energy efficiency measures
65	Emissions crossing property lines
66	Lower curtailment threshold
67	Coffee Roasters - Commercial
68	Charbroilers - Commerical
69	Incinerators - Commercial
70	Used Oil Burners
71	Date certain removal for EPA certified devices over 2.0 g/hr or over 25 years old

7.7.4.4 Control Measure Selection

A number of control measures address the space heating source sector, in particular the solid fuel space heating source sector. Due to the multiple processes for identifying control measures, and overlap between the control measures, a crosswalk and summary was developed which is shown in Table 7.7-6. When comparing control measures identified in the preliminary draft to Stakeholder control measures specific details may differ, however in several cases a common intent is found in both sets of measures. The crosswalk identifies where the common intent is present.

In total 118 unique control measures were identified which are presented in the crosswalk and summary in Table 7.7-6. The BACM analysis in Appendix III.D.7.7 addresses 84 of the control measures. The 34 unique control measures identified but not addressed in the BACM analysis include 33 Stakeholder recommendations and one contingency measure. The contingency measure is addressed in Section III.D.7.11. Of the 33 Stakeholder measures not included in the BACM analysis 23 were determined to be non-regulatory in nature (e.g. education and outreach recommendations, or implementation strategies/enhancements for existing measures), 6 recommendations dealt with stationary point sources and are not addressed in BACM, 3 are proposed to be adopted into DEC regulations, and 1 resulted in a FNSB resolution. FNSB resolution number 2019-08 supports legislation granting DEC administrative penalty authority in areas classified as serious nonattainment areas and can be found in Appendix III.D.7.7.

Step 2 in the BACM analysis was to identify potential control measures. The process identified 84 control measures for analysis. The analysis showed that 6 of the control measures identified did not meet the definition for BACM and were dismissed.

Step 3 in the BACM analysis was to determine if the control measure was technically feasible. 22 control measures were determined to be technically infeasible and were dismissed. 8 control measures were found to be adopted in different form with no further analysis required. 48 measures were determined to be technologically feasible. 40 of those measures were adopted through new state regulations. The 8 remaining measures were forwarded for Step 4 analysis.

Step 4 in the BACM analysis was to determine if the control measure was economically feasible. 7 control measures were determined to be economically infeasible and were dismissed from BACM.

Step 5 in the BACM analysis was to determine if a control measure or technology could be implemented in whole or in part no later than 4 years after reclassification of the area to Serious, which would be June 2021. A total of 41 measures are addressed through state regulations.

Detailed information regarding the analysis of individual BACM is found in the BACM appendix.

Table 7.7-6. Control Measure Summary and Crosswalk

Identified Measures			**Measures Dismissed from BACM**				**Proposed BACM Measures**		
Number	**Stakeholder Measure**	**Rejected by Stakeholder**	**Adopted in Different Form**	**Technical Dismissal**	**Economic Dismissal**	**Does Not Meet BACM Definition**	**Proposed to Adopt as BACM**	**Proposed Contingency Measure/ MSM**	**Page in BACM Appendix**
1				Tech					25
2							18 AAC 50.077(k)		27
3	S28 S31						18 AAC 50.077(j)		28
4	S33						18 AAC 50.077(i)		29
5							18 AAC 50.077(i)		30
6				Tech					31
7							18 AAC 50.077(b),(c),(d),(e)		33
8					Econ				35
9		C.a.		Tech					36
10	S29			Tech					38
11				Tech					38
12				Tech					40

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	Proposed Contingency Measure/ MSM	Page in BACM Appendix
13							18 AAC 50.077(a),(b),(h),(l),(k),(i),(j)		42
14						Not BACM			43
15							18 AAC 50.077(a),(h),(l) & Episode Chapter		44
16	S17b S18						18 AAC 50.077(a),(l),(m),(h) & Episode Chapter		46
17							18 AAC 50.077(a),(l),(m) & Episode Chapter		48
18				Tech					50
19, 21	S1a, S1c						18 AAC 50.077(h)(3) & Episode Chapter		52 & 56
20							18 AAC 50.077(h) & Episode Chapter		54
22	S1a						18 AAC 50.077(h), (c), (d), & (n)		57
23				Tech					58
24	S22						18 AAC 50.077(j)		59
25	S24						Episode Chapter		61
26							18 AAC 50.077(i)		62
27	S26, S27						Episode Chapter		63
28							Episode Chapter & 18 AAC 50.077(a),(l)		64
29	S25	C.c.					Episode Chapter		65
30							18 AAC 50.077(k)		66
31	S13	B.h.					18 AAC 50.076(d),(e),(g),(j),(k),(l)		67

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	Proposed Contingency Measure/ MSM	Page in BACM Appendix
32							18 AAC 50.076(d),(e),(g),(j),(k),(l)		69
33			ADF						72
34			ADF						74
35						Not BACM			75
36			ADF						76
37			ADF						77
38						Not BACM			78
39						Not BACM			80
40	S25	C.c.					18 AAC 50.077(a),(l) & Episode Chapter		81
41			ADF						84
42							18 AAC 50.075(e)		85
43		C.f.	ADF						86
44			ADF						87
45						Not BACM			88
46						Not BACM			89
47	S39	D.e.	ADF						91
48	S20						18 AAC 50.079(f)		92
49	S20						18 AAC 50.079(f)		93
50				Tech					94
51	S12						18 AAC 50.078(b)		96
52		B.d., B.e.			Econ				98
53		B.d., B.e.			Econ				98

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	Proposed Contingency Measure/ MSM	Page in BACM Appendix
54				Tech					100
55				Tech					101
56				Tech					102
57				Tech					139
58				Tech					103
59				Tech					139
60		C.j., D.h., D.i.		Tech					104
61	S21	C.h.			Econ				106
62	S21	C.h.			Econ				107
63		B.k.		Tech					108
64	S15, S16	B.a., B.b.		Tech					109
65							18 AAC 50.075(f)(2)		110
66							Episode Chapter		111
67		D.f., D.g.					18 AAC 50.078(d)		112
68		D.f., D.g.					18 AAC 50.078(c)		116
69		D.f., D.g.					18 AAC 50.078(c)		118
70		D.f., D.g.					18 AAC 50.078(c)		122
71								18 AAC 50.077(n)	
R1	S9			Tech					123
R4		B.c., B.f.					18 AAC 50.077(a),(l)		124

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	Proposed Contingency Measure/ MSM	Page in BACM Appendix
R5		A.c.					18 AAC 50.077(a),(b),(l)		125
R6		A.c.					18 AAC 50.077(a),(b),(l)		126
R7		A.c.		Tech					128
R9							18 AAC 50.077(a),(l)		129
R10							18 AAC 50.077(a),(l)		131
R11	S29						18 AAC 50.077(a),(l)		132
R12							18 AAC 50.077(a),(l)		133
R15					Econ				135
R16							18 AAC 50.077(a),(i),(l)		136
R17				Tech					138
R20				Tech					139
R29		C.g.			Econ				143
	S1b			Non-reg					
	S8			Non-reg					
	S10			Non-reg					
	S11			Non-reg					
	S14			Non-reg					
	S17a			Non-reg					
	S19			Non-reg					
	S23						Episode Chapter		
	S30						18 AAC 50.077(a)		
	S32						18 AAC 50.077(i)		

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	Proposed Contingency Measure/ MSM	Page in BACM Appendix
	S34						FNSB Resolution		
	S35			Non-reg					
	S36			Non-reg					
	S37			Non-reg					
	S2						Refer to BACT Analysis for details		
	S3						Refer to BACT Analysis for details		
	S4						Refer to BACT Analysis for details		
	S5						Refer to BACT Analysis for details		
	S6						Refer to BACT Analysis for details		
	S7						Refer to BACT Analysis for details		
	S40			Non-reg					
	S41			Non-reg					
	S42			Non-reg					
	S43			Non-reg					
	S44			Non-reg					
	S45			Non-reg					
	S46			Non-reg					
	S47			Non-reg					
	S48			Non-reg					
	S49			Non-reg					
	S50			Non-reg					
	S51			Non-reg					
	S56			Non-reg					

7.7.5 Adopted Control Measures (Specific Regulations)

The following regulations reflect new or revised measures for the Serious SIP. Regulations and on-going measures adopted in the Moderate SIP remain in effect. The full adopted regulations reside in the Volume III Appendix to Volume II, Section II, however, a summary of the adopted regulations is also discussed in this section. The summary language in Table 7.7-7 does not reflect the detailed verbiage that is in the actual regulations. Please review the official, adopted regulatory language to ensure full understanding of the requirements.

Table 7.7-7, Control Measure Regulation Summary

Control Measure Identification	Proposed Regulation citation	Summary
Registration requirements		
Stakeholder #1a BACM 13, 19, 21, 22, 15	Repeal and replace 18 AAC 50.077 new subsection 18 AAC 50.077(h)	Requires wood fired heating devices to be registered with DEC • upon sale of new device by vendor or dealer, • prior to closing if real estate transaction includes a device, • when applying for a waiver • to participate in the Burn Right Program • to participate in any wood-stove change-out or conversion program • Prior to closeout of any compliance or enforcement action
Fuel Requirements		
Stakeholder #13 Modified BACM 31, 32	18 AAC 50.076 (d), (e), (g), (j), (k)	Requires commercial wood seller to register with the Department. Identifies requirements to register Effective October 1, 2021, commercial wood seller must ensure that wood being sold must have a moisture content less than 20%, unless otherwise exempted. Until October 1, 2021, registered commercial wood sellers will continue with the requirements governing the sale of wet wood. After October 1, 2021, • Wood sellers may only sale wet wood in round logs 8 feet or more in length AND meet all requirements for selling wet wood AND confirm in writing the buyer's ability to properly dry the wood for use in the next winter season or beyond. • May only sell dry wood that: o Properly seasoned, split and store covered for at least 9 months unless otherwise confirmed dry. o Mechanically dried, where the drying process has been inspected and approved by the department to ensure consistency and reliability or o Harvested from an inspected fire killed source that has been split, stacked, stored and confirmed dry prior to freezing. Includes affidavit to buyer that wood is dry on forms provided by department.
BACM 31, 32	18 AAC 50.076 (l)	Non-commercial wood sellers may not sell wet wood.

Control Measure Identification	Proposed Regulation citation	Summary
Stakeholder #12 BACM 51	18 AAC 50.078(b)	Requires only fuel oil containing no more than 1000 parts per million sulfur may be sold for use in home and commercial heating – starting September 1, 2022.
Device Requirements		
Wood-fired heating devices		
Repeal and replace existing 50.077 (Standards for wood-fired heating devices)		
		•
BACM 7, R16, modified BACM R5 modified Consistent with FNSB incorporated Ordinance	18 AAC 50.077(a)	Includes a general prohibition on the installation of wood fired heating devices within the area, with exceptions set out in the remainder of the section. No outdoor hydronic heaters may be sold or installed unless pellet fueled.
	18 AAC 50.077(b)	Identifies the EPA emission rate used as requirement of **pellet fueled wood fired hydronic heater**, that EPA certification is required, EPA test methods and measurement requirements. 0.10 lb/MMBtu Identifies that the certification from EPA will be reviewed by the department and the underlying certification test results accepted.
	18 AAC 50.077(c)	Identifies EPA emission rate used as requirement of **woodstoves** and **pellet fueled woodstoves**, that EPA certification is required, EPA test methods and measurement requirements. 2.0 g/hr Identifies that the certification from EPA will be reviewed by the department and the underlying certification test results accepted.
Existing regulations renumbered and edited as needed for consistency Consistent with FNSB incorporated Ordinance	18 AAC 50.077(d)	Identifies EPA emission rate used for wood-fired heating devices whose rated size is 350,000 Btu or greater per hour, that EPA certification is required, EPA test methods and measurement requirements. 2.0 g/hr
	18 AAC 50.077(e)	Allows department to review manufacturer test results and place a model on the department's list of devices, which identifies what devices are allowable under this section.
	18 AAC 50.077(f)	Allows sale of a device not meeting regulations to be sold outside of the nonattainment area when confirmed in writing by the buyer the device will not be installed within the nonattainment area.
	18 AAC 50.077(g)	Allows for a temporary waiver for conveyance of an existing noncompliant device after department considers financial hardship, technical feasibility, and potential impact to locations sensitive to exposure to $PM_{2.5}$.
Stakeholder #32, #33, BACM 4, 5, 13, 26, R16	18 AAC 50.077(i)	Wood-fired heating devices and wood fired retrofit control devices must be professionally sized and professionally installed with confirmation of proper installation and location. Installers must meet requirements.
Consistent with FNSB incorporated Ordinance Stakeholder #22, #28, #31 BACM 3, 24	18 AAC 50.077(j)	A person may not install: • a pellet fueled wood-fired hydronic heater within 300 feet from the closest property line or within 660 feet from a school, clinic, hospital or senior housing unit • a wood-fired heating device may not serve as the primary or only heat source in: o New construction except a 'dry cabin' on 2 + acre parcel o For rental units, unless the heater was in a rental before effective date of regulations and qualified for a NOASH.

Control Measure Identification	Proposed Regulation citation	Summary
		○ 18 AAC 50.077(o) defines "dry cabin" as a residential structure 1000 square feet or less that does not have a well or water provided by a direct public utility.
BACM 30 BACM 2	18 AAC 50.077(k)	• Vendor shall provide curtailment information to buyer at time of sale and review proper operating instructions with buyer • Vendor may not advertise devices prohibited for sale within nonattainment area
Stakeholder #17b, 18 BACM 15, 16, 17, 28, R4, R6, R9, R10, R11, R12 & R16	18 AAC 50.077(l)	Requires all EPA uncertified devices and all outdoor hydronic heaters, except outdoor pellet fueled hydronic heaters to be • Removed or replaced by December 31, 2024. • Removed or replaced before being sold, leased, or conveyed as part of an existing building; and All removed devices must be rendered inoperable.
BACM 16	18 AAC 50.077(m)	Devices that may not be reinstalled within the area shall be rendered inoperable.
Coal fired devices		
Stakeholder #20, BACM 48, 49	18 AAC 50.079(f) new	Existing coal-fired heating devices to be • removed or replaced by December 31, 2024 • remove or replace before being sold, leased, or conveyed as part of an existing building • removed devices shall be destroyed or rendered inoperable
Solid Fuel Device Operations/Curtailment		
BACM 42	18 AAC 50.075(e)(3) new	Fuel to non-exempt devices must be withheld, and combustion in these devices – as evidenced by visible smoke from a chimney – must cease within three hours after the effective time of a curtailment of operation under an emergency episode
Consistent with prior FNSB incorporated Ordinance	18 AAC 50.075(f)(2) new	Solid fuel fired heating device shall be operated so that visible emissions do not cross property lines.
Stakeholder #25, BACM 40, 66	Episode Chapter	Advisory and Alert Thresholds • Advisory – 15 ug/m^3 • Stage 1 – 20 ug/m^3 • Stage 2 – 30 ug/m^3
Stakeholder #23, #24,#26, #27 BACM 16, 19, 20, 25, 27, 28 & 29	Episode Chapter	NOASH and Exemptions requirements • Length of waivers based on age and emission rate of device • Annual renewals on oldest and highest emission rated devices • inspection of device to verify proper installation required • inspection of maintenance (chimney sweep) required • Device registration required • Documentation of dry wood supply
Small area sources		
BACM 68, 69, 70	18 AAC 50.078 (c)	One time submission of information requirement for small area sources: Charbroilers, Incinerators, Waste Oil Burners

Control Measure Identification	Proposed Regulation citation	Summary
North Pole coffee roaster already has technology installed (BACM 67 for other coffee roasters)	18 AAC 50.078 (d)	Requires that coffee roasters within area install a pollution control device on any unit that emits 24 pounds or more of particulate matter in a 12-month period and install control or demonstrate technically/economically infeasibility not later than one year from effective date of regulation.
Contingency Device Requirement		
Contingency Measure/ MSM	Serious SIP Contingency measure chapter New subsection 18 AAC 50.077(n)	Identifies measure that will be triggered on effective date of EPA issuing a finding under 40 C.F.R. 51.1014(a)(1) – (4) for failure to attain, failure to meet a quantitative mile stone, failure to submit a quantitative or failure to make reasonable further progress. • Remove/replace all EPA certified stoves that are 25 years or older AND have an emission rating greater than 2.0 g/hr • Remove or replace by December 31, 2024. • For devices newer than 25 years before the effective date of the EPA finding, removal or replacement is required before 25 years from the date of manufacture.

7.7.5.1 Area Source – Space Heating Controls

In order to reduce $PM_{2.5}$ emissions from space heating, the FNSB and DEC have developed a number of measures that work together to lower emissions from sources in a manner that accounts for an on-going need to use wood as an economical heating source. The following controls supplement or strengthen the existing control measures discussed in 7.7.3.

7.7.5.1.1 Registration

A clear understanding of the inventory of solid-fuel heating devices within the nonattainment area will further assist emission reductions. There are two avenues to collecting this data, regulatory requirements and voluntary.

18 AAC 50.0777(h) identifies all the areas where registration information is required to be collected and submitted to DEC. The focus of registration builds off existing efforts and occurs at the times where individuals interact with DEC solid-fuel related programs.

DEC is developing a voluntary program entitled, Burn Right, to provide acknowledgement and recognition to those who demonstrate they meet or exceed those qualities that ensure limited emissions from wood-burning. This program will allow individuals to voluntarily provide device registration information such as age, type, and location of device, have their wood source confirmed as dry, and show they have regular maintenance such as a chimney sweep. Those who participate and meet the device age and type requirements will also be eligible for a Stage 1 waiver.

The Burn Right program will also provide an avenue for more individualized response to unique situations, such as, masonry heaters, or custom homes.

7.7.5.1.2 Device Requirements – wood-fired & coal-fired standards

In order to continue using wood-fired heating devices into the future, it is critical that the cleanest burning devices are used and that old devices be removed. Therefore, the device requirements are being tightened in this plan. There is a date certain requirement for all non-certified solid fuel-fired devices to be removed by December 31, 2024. This includes the required removal of all uncertified outdoor hydronic heaters, and all outdoor hydronic heaters that carry an EPA white tag as they do not meet current emission standards. Only pellet-fueled hydronic heaters will be allowed to be installed moving forward. In addition, the contingency measure will require all EPA certified stoves to be removed that are older than 25 years and have a PM emission rate of more than 2.0 g/hr. Furthermore, once the contingency measure is triggered, it also establishes a rolling 25 year requirement, so that each year additional devices will be required to be removed as they become 25 years old.

As of 2019, the current device inventory estimates that approximately 13,418 wood burning appliances are in the nonattainment area with 2,553 of those appliances estimated to be uncertified. Estimates also show approximately 481 coal fired residential heaters in the nonattainment area for a total of 3,034 appliances that need to be removed. Current funding for the Borough's wood stove change out program show that, including the 2018 Targeted Air Shed grant award, the total projected change outs achievable from 2019 through 2024 are 1,290. The number of stoves requiring to be upgraded will also be affected by the triggering of the contingency measure. As mentioned when the contingency measure is triggered those devices manufactured between 1988 and approximately 1995 will be subject to the requirement to be removed or replaced by December 31, 2024. And each year additional model years will be added. The date of 2024 provides residents adequate time to participate in the solid-fuel burning appliance change out program in order to comply with the regulation and contingency measure without overwhelming the Borough program resources.

The standards for the allowable devices are being lowered to the EPA Step 2 standards. These standards are now at 2.0 g/hr for wood stoves and inserts and 0.10 lb/MMBtu for pellet hydronic heaters.

Furthermore, wood-fired devices will have additional requirements beyond the basic EPA certification. After September 1, 2020, woodstove device certification testing will need to include either an emissions profile from measurements using the tapered element oscillating microbalance (TEOM) as defined in the Standard Operating Procedures developed by the Northeast States for Coordinated Air Use Management (NESCAUM) to show its ability to meet a not to exceed criteria for a rolling 1-hour average gram per hour or DEC will use the valid 1-hour filter measurement of the device's EPA certification test.

The TEOM measurement monitors and records emissions through the entire certification tests, and demonstrates where there may be uncontrolled emissions. See Appendix III.D.7.7 for charts that show a comparison between catalytic and non-catalytic woodstove emission profiles measured using the same EPA certified testing procedure as well as charts showing comparisons using the same cord wood test. TEOM measurement in wood stove testing is new and has not be incorporated into the federal certification procedures. Therefore, as an alternative to using the

TEOM, DEC will allow use of the valid 1-hour filter measurement from the EPA certification tests. The maximum 1-hr filter measurement may not exceed 6 grams/hour. Under the 2015 NSPS, EPA required reporting of emission rates for the first hour of the test period. This data reflects the timing and emission rates typically associated with the 60-minute test requirements for PM testing at all other sources (EPA Method 5). Assessment of one-hour data allows agencies to gauge performance and determine which appliances are low emitting from the start of the certification test versus those that have been able to design for long charcoal tails to minimize the peak emissions.

Given the community's desire and need for supplemental heat options, it is important to ensure that the devices used are as clean burning as possible and that the device performance is consistent. The current test method that results in the certification value (grams/hr) averages emissions over four steady-state runs. The values from each of these runs is an average emission rate over the time it takes to burn 100% of the full load of wood used for each run. This approach translates into a certification value that is an average of an average. Averaging results multiple times minimizes emission rates, which results in certification values that may vastly under predict actual in-use emission rates and does not reflect the fuel loading events that in field use may occur multiple times per day.

Real-time PM measurements collected from EPA certification tests have shown that the maximum emission rate occurs within two hours of the test period, and typically, on average, appliances spend approximately 50% of the certification testing time in the period known as the charcoal tail, where virtually no emissions occur, and in some cases filters may experience particulate loss due to warm dry air blowing through the filter. Therefore, DEC will post a list of approved devices that have an EPA certification and meet either the rolling 1-hr average as shown through the use of a TEOM, or that their maximum 1-hr filter measurement from the certifying test is less than 6.0 grams per hour.

Device requirements for wood-fired stoves also include the requirement that all new devices must be professionally sized for the structure and professionally installed. Installers must be certified and the regulations specify the certification requirement. Removed devices are required to be rendered inoperable.

Existing residential and smaller commercial coal-fired devices are also required to be removed by December 2024, unless an in-use source test is conducted that demonstrates the device meets the standard of 18 grams per hour of total particulate matter. Also, new residential and commercial coal-fired devices will be prohibited from installation within the nonattainment area.

7.7.5.1.3 Device Requirements – operations/curtailment

Two new provisions have been added to the DEC regulations, one which was previously included and implemented in an FNSB ordinance. DEC is clarifying that visible emissions may not cross property lines and that within 3 hours of the effective time of a curtailment announcement there shall be no visible emissions from a chimney stack.

Curtailment thresholds for an Advisory or Alert and waiver requirements have all been strengthened, and are discussed in depth in Section III.D.7.12, Emergency Episode Plan.

7.7.5.1.4 Fuel Requirement – dry wood

To strengthen the existing requirements that only dry wood may be burned and all commercial wood sellers be registered, DEC is requiring, effective October 1, 2021 that all wood sold must be dry, except for round logs that are 8 feet in length or longer. Vendors selling 8-foot logs must still disclose moisture content and must confirm the buyer will not need the wood for the current winter as well as their ability to properly dry the wood for use in the next season or beyond. The requirements for selling dry wood include both commercial and non-commercial entities and provide that wet wood may not be marketed as dry.

In addition, DEC regulation 18 AAC 50.076(k) has set the minimum of 9 months drying time, unless otherwise confirmed, to ensure that the wood is dry given the variation in wood drying with different storage options. DEC commissioned a study to determine the length of drying time and the study found that wood cut in the fall dries much more slowly and essentially stops drying once the wood becomes frozen. At this time the community lacks adequate storage space to dry the wood required to fill the commercial market. The summer of 2020 could be used by the commercial wood sellers to secure the space and construct structures to air dry the wood. Cord wood harvested during the spring of 2021 could then be stored and dried by October 2021, which is the most expeditious schedule that the commercial wood industry can follow to meet the requirements of this rule. Alternatively, between the effectiveness of the rule and the summer of 2020, time could be used by wood sellers to research using a kiln to mechanically dry wood. If this approach is selected, time would also be needed to secure funding, procure and setup the necessary equipment, and set up a supply of wood. In order to treat all wood sellers equally, the October 1, 2021 is the soonest this measure could be reasonably implemented area wide.

7.7.5.1.5. Fuel Requirement – home heating oil

Ultra-Low Sulfur Diesel (ULSD) which has a sulfur content of 15 ppm is the fuel used in the Lower 48 nonattainment areas to meet BACM and BACT. An area wide fuel switch from Diesel #2 (2,566 ppm) to Diesel #1 (1000 ppm) by September 1, 2022 is the proposed BACM alternative as it is more economically feasible and still provides a large sulfur reduction. The change in fuel would impact home heating and some stationary engines; transportation diesel fuel is already ULSD. A UAF/DEC cost analysis estimates 7 cent/gallon increase or about $68.31 annual cost to average household. The same cost analysis estimates approximately 30 cent/gallon increase if ULSD is used. The full UAF/DEC cost analysis may be found in the appendix to the BACM Analysis documents.

September 1, 2022 was determined as the conversion year due to comments received during the public comment period. There is an inadequate supply of locally produced Diesel #1 (1000 ppm) and additional time was required to allow for the local refinery to modify its processes. Concerns were also raised that the increased cost in fuel oil could drive more residents to burning

less expensive and higher PM emitting solid fuels. The additional time also allows residents to budget and prepare for the increased cost. DEC received requests through the comment process to delay the conversion until 2024, but DEC felt that was too long a delay and that the approximate two years provided should be sufficient to allow the local refinery and residents to plan and prepare for the change in fuel oil.

7.7.5.1.6 Compliance and Enforcement

DEC is responsible for enforcing compliance with the state regulations. The department's compliance activities are conducted using the tools and authorities provided under the state statutes. The Division of Air Quality does not have statutory authority to issue administrative penalties for violations of Alaska environmental law. This means that DEC staff cannot simply write "tickets" to individuals that are found to be violating state regulations. All compliance and enforcement activities are case specific. However, DEC generally initiates compliance activities in response to field observations or complaints received that indicate the potential for violations of a state regulation. DEC staff investigate complaints to verify or corroborate a problem or violation of a state requirement. In most cases, the department finds that compliance can be achieved through assistance to businesses and individuals in understanding the regulatory requirements and how they can comply. In the event that compliance assistance is not successful in resolving a compliance issue, department staff use administrative enforcement tools such as written notices of violation, compliance agreements, nuisance abatement orders, and in rare cases, civil court actions.

7.7.5.1.7 Education

Education and outreach is extremely important to the successful implementation of the local control measures. DEC will focus on the outreach in support of the regulatory requirements and FNSB will focus on other education and outreach.

The Stakeholders group recommended that DEC should include in the next Targeted Air Shed Grant proposal continued funding for highway signs for use in notifications of Stage alerts and curtailments (Stakeholder recommendation S 50 in Table 7.7-3). DEC included funding for highway signs in the 2018 Targeted Air Shed Grant proposal. However, the application that contained the highway sign funding was not selected by EPA for award. DEC will continue efforts to seek funding for the desired highway signs.

DEC uses a variety of outreach methods as it implements regulations and voluntary control programs to improve air quality in the nonattainment area. DEC has a robust Internet site that contains information on requirements such as those related to solid-fuel heating, use of dry wood, open burning, emission standards for new wood and coal heaters, and upgrades of non-certified solid-fuel heaters. DEC staff maintain a list of certified devices and conduct outreach and meet with real estate professionals on requirements for removal or replacement of uncertified wood heaters. Staff also work directly with heating device vendors and commercial wood sellers to ensure that wood heater and moisture content requirements are being met. The Division provides air quality alerts via phone text, email, and internet to advise the public of Stage alerts and actions they need to take to reduce air pollution and protect themselves.

Compliance staff reach out to individuals observed burning during a curtailment period to ensure they know the regulatory requirements and to provide compliance assistance if they need a NOASH waiver, want to take advantage of the Borough wood heater change out program, or find sources for dry wood. The Division also has the "Burn Wise Alaska" web site that is focused on providing citizens information to prevent wood smoke impacts. This web site has links to brochures, posters, activity books, and advertisements that can be used to help educate others on wood burning topics. DEC coordinates its activities with the FNSB Air Quality Division to make the best use of outreach resources within the nonattainment area.

One of the FNSB Air Quality Division's core responsibilities is education and outreach. Since 2010 FNSB has been implementing various education and outreach efforts. Prior to the passage of Proposition 4, FNSB resources were used to inform community members on a number of regulations, including the curtailment program. However, after the passage of Proposition 4 FNSB resources can no longer be spent educating the community on matters that regulate home heating devices. Therefore, FNSB's education and outreach programs will focus on best practices, health effects, and other matters that are non-regulatory in nature.

FNSB's "Split, Stack, Store, & Save" campaign, which has been running since 2011, encourages residents to plan ahead by cutting and properly storing a winter season's worth of wood a full year before they plan to use it. Health related ads such as "The Air We Breathe", and "Who suffers from poor air quality?" are periodically aired. The "Go Out and Look" ad campaign encourages homeowners to observe their stacks and prompts corrective action if visible emissions are observed. Television, radio, and YouTube ads will continue to be developed and placed as funding allows.

FNSB operates a Wood Stove Change-Out Program (WSCOP) which incorporates several education components. If an applicant is receiving a solid fuel burning appliance through the program the applicant is required to show proof of proper wood storage (if applicable), review EPA's Burn Wise program material, pass a quiz administered by FNSB Air Quality Staff on the content of the Burn Wise program, have the new appliance installed by a borough-listed installer, and receive training from the installer on proper device operation. The FNSB Air Quality Division will continue educational components associated with the WSCOP as funding allows.

FNSB encourages residents to plug in their vehicles at temperatures up to 20 °F above zero. Engine block heaters are considered an essential component of winter driving in Fairbanks. It is estimated that a significant number of vehicles will not start at temperatures of 20 °F below zero. Since -20 °F or colder temperatures are a frequent occurrence in winter, it was assumed that by encouraging motor vehicle operators to plug in at warmer temperatures, carbon monoxide and $PM_{2.5}$ emissions would be reduced without creating an onerous burden on residents, as they already have engine block heaters. Based on its historical success in implementing the plug-in program, the Borough continues public awareness as part of the "plug it in" campaign. FNSB will continue the "plug it in" campaign as funding allows. FNSB also conducts public outreach and education to encourage the use of mass transit, and will continue to do so as funding allows.

In coordination with DEC, FNSB continues to maintain and operate a $PM_{2.5}$ forecasting model. FNSB relies on forecasted $PM_{2.5}$ levels to disseminate information regarding public health issues. During the winter months (October – March) daily forecasts are published on FNSB's Air

Quality website describing the air quality for the next three days along with any adverse health effects, while DEC issues air episodes or alerts as needed. During the summer months, periodic air quality advisories are issued for forest fires as required. DEC will continue to issue summer and winter air quality advisories/alerts and episodes.

FNSB operates a neighborhood monitoring program with the primary purpose of providing select elementary schools with local real time $PM_{2.5}$ data for decision making, and to display the data for public access. Eleven low cost pDR monitors have been placed throughout the community, and real-time data is displayed on DEC's and FNSB's website. The monitoring plan is provided in Appendix III.D.7.05. FNSB will continue to operate the neighborhood monitoring program as funding allows.

FNSB has hosted three Clear the Air conferences (2016-2018). All agencies (EPA, DEC, and FNSB) have been involved in the conferences, which are open to the general public. The conferences have been used as a platform to disseminate information to the community and engage the general public. FNSB may continue to host conferences as needed.

Over the years, FNSB has developed print based media such as the Air Quality Resource Booklet and the Air Quality Coloring Book. Print based media is distributed by: mailings, events, and is available at the FNSB Air Quality office. FNSB will continue to develop and distribute print based media as funding allows.

Historically FNSB has attended events (e.g. Tanana valley State Fair, Earth Day on Ft. Wainwright) and given presentations (e.g. Fairbanks Chamber of Commerce and Fairbanks Economic Development Corporation) in an effort to foster one on one communication. FNSB will continue these activities as funding and staffing allow.

The Stakeholders recommendations included ten education/outreach recommendations, numbers S 40 through S 49 in Table 7.7-3. FNSB will work to incorporate the Stakeholder recommendations as staffing and funding allow.

7.7.5.2 Area Sources – Small Sources (Incinerators, Char broilers, Used Oil, Coffee Roasters)

Small area sources and their impact on emissions within the nonattainment area are not well understood. Therefore, DEC will require all incinerators, charbroilers and used oil burners to provide a one-time submittal of information that will allow DEC to better understand these sources and determine if these sources and their emissions need to be addressed in the future. Coffee Roasters will require the addition of a control technology on any unit that emits 24 pounds or more of particulate matter in a 12-month period. DEC will waive the requirement if information is provided that documents that the control technology is economically or technologically infeasible. The requirement for installation of control equipment on coffee roasters will be 1 year from the effective date of regulation.

7.7.5.3 Non-Road

Non-road sources encompass all mobile sources that are not on-road vehicles. They include recreational and commercial off-road vehicles and equipment as well as aircraft, locomotives, recreational pleasure craft (boats) and marine vessels. (Neither commercial marine nor recreational vessel emissions are contained in the modeling inventory, as they do not operate in the arctic conditions experienced in the Fairbanks modeling domain during the winter.) The benefits of fleet turn over and more stringent emission standards, a federal responsibility, are quantified in the non-road emissions option within EPA's MOVES2014b emission factor model.

7.7.5.4 Mobile Sources

Engine preheaters are used extensively throughout Fairbanks when ambient temperatures drop below 0 °F to ensure that vehicles exposed to these temperatures can be easily started. Local testing programs have confirmed that preheating vehicles, a practice commonly referred to as "plugging-in," provides a substantial reduction in motor vehicle cold start emissions.

Recognizing the many benefits of plugging-in (e.g., reduced emissions, lower need for maintenance, fuel economy, startability, etc.), the Borough has a long-standing practice of expanding the number of parking spaces equipped with electrical outlets. This has been achieved by securing funds for retrofitting existing facilities (e.g., school renovations) and including outlets in new public facilities (e.g., the construction of new schools). It has also been achieved by encouraging the private sector to retrofit existing facilities (e.g., hospital expansions) and including outlets in new private facilities (e.g., Home Depot). This strategy was made more viable with Congress' passage of the Transportation Equity Act for the 21st Century that removed the restriction on the use of Congestion, Mitigation and Air Quality (CMAQ) funds for the Section 108(f) transportation control measure (xii) that reduces motor vehicle emissions under extreme cold start conditions.

7.7.5.5 Mass Transit – FNSB Transit Fleet Natural Gas Efforts

The Borough Transportation Department operates a transit program called the Metropolitan Area Commuter System (MACS). Details of the current MACS system may be found in Appendix III.D.7.7.

The Fairbanks North Star Borough (FNSB) intends on transitioning its entire transit revenue service fleet of 25 vehicles comprising of 15 full size transit buses and 10 para-transit vans to compressed natural gas (CNG) over the next 8 years. Once the transition is complete, the FNSB estimates diesel fuel usage will be reduced by about 105,500 gallons annually and gasoline use will decrease by about 23,840 gallons per year. This will result in direct emission reductions of $PM_{2.5}$, VOC, CO, NOx and CO_2 within the non-attainment area. Specific reduction information is included in the CNG Feasibility Study (see Appendix III.D.7.7). This SIP does not include emission reductions from the planned CNG transit conversion, but acknowledges this significant effort as a voluntary measure.

The following outlines the major essential elements necessary to switch to CNG from diesel and gasoline fuels within the FNSB transit fleet. All elements described within this summary are necessary for a transition. Because this transition requires a large scale commitment on behalf of the FNSB in long term planning and financial obligations, the decision process was elevated to the FNSB Assembly which adopted the overall transition plan on February 14, 2019 through Resolution 2019-03 (see Appendix III.D.7.7) and fully supports the transition to CNG fueled buses and vans.

Major Essential Elements towards CNG Conversion

1) CNG Feasibility Study

2) Transit Maintenance and Storage Facility Upgrades

3) Transit Fleet Replacement Schedule and Funding Sources

4) Acquisition and Installation of CNG Fueling Infrastructure

CNG Feasibility Study

Completed on September 6, 2018, the CNG Feasibility Study examined all aspects of converting the transit fleet to CNG fuel. The study provided critical information which was used to determine viability, benefits, costs and the necessary steps and timeframes to complete the transition.

Transit Maintenance and Storage Facility Upgrades

The existing facility is not compatible with maintenance or storage requirements of gaseous fueled vehicles and therefore major upgrades are necessary. The FNSB was awarded a grant through the Federal Transportation Administration (FTA) on May 18, 2017 for $12,800,000 which is being used for design and construction of a new maintenance/storage facility and will be fully compliant with CNG fuel requirements. The design process began in early 2018 with site preparation work during the summer of 2018 and initial completion targets in 2020.

Ground testing on the existing property identified inadequate stability which will require significant measures and funding to correct. Financial and logistical analysis suggests moving the project to an alternate location will benefit the entire project. An alternate site has been identified and the FNSB is currently in the early stages of acquiring this property. A number of processes will need to be completed before the project can continue including several environmental studies, ground stability determination and FTA approval. In the event an alternate site is not available the original plan of building on the current location will proceed. An updated design/construction schedule indicates target dates around the end of 2021 for completion are likely.

Transit Fleet Replacement Schedule and Funding Sources

The CNG feasibility study outlines a replacement schedule which transitions the entire bus fleet by 2027 and the paratransit van fleet by 2026 to maximize benefits. Replacements are primarily driven by the useful life of each vehicle as designated by the FTA.

The FNSB has already appropriated $1,839,948 on August 10, 2017 for the purchase of 4 transit buses and has included an additional $558,000 in the FY19/20 budget for the replacement of another bus for a total of five buses. Furthermore, the FNSB has appropriated $286,085 on June 14, 2018 for the purchase of four paratransit vans. This will result in the initial transition of 9 of the total fleet of 25 vehicles.

All transit revenue service vehicles have now been added to the borough's Vehicle Equipment Fleet Fund (VEFF) and has begun contributing funds into that program for the continued replacement of transit vehicles. Transit revenue service vehicles have not been previously included in the VEFF program nor have financial contributions been made towards their replacement. This significant change highlights the borough's commitment towards the CNG transition project.

The FNSB FY19/20 budget includes the combined use of FTA Section 5307 funding and local match funds to acquire buses. It is the FNSB's intent to continue to use similar funding combinations in the future to procure transit vehicles and continue the transition process.

Acquisition and Installation of CNG Fueling Infrastructure

The CNG feasibility study outlined the type and size of fueling infrastructure necessary to accommodate the FNSB transit fleet and operational needs coupled with growth opportunity. As the CNG fueling infrastructure needs to be located at the site of the new maintenance/storage facility, the current site acquisition process is an important step before the FNSB can begin the equipment procurement and installation process that will be closely matched to the completion of the construction project.

The CNG transition has many active components which are all important and timing is critical to assure the arrival of CNG vehicles are closely matched to a compatible building and fueling equipment which can support the new buses.

Besides the direct emission benefits associated with the transition from diesel and gasoline to CNG which is included in the CNG feasibility study, an indirect benefit will be derived by increasing the base load demand for CNG. Current natural gas demand for home heating is variable due to seasonal requirements. Current residential natural gas customers currently stand about 475 homes and average .32 MCF use per day during a typical year in Fairbanks.

The FNSB transit fleet is projected to use 77,728 cubic feet per day on average increasing the natural gas demand equivalent to an additional 234 homes. This additional base load demand should assist FNG with providing a more stable and cost effective offering of clean home heating options within the nonattainment area.

The CNG fueling infrastructure planned for installation will be the first of type in Fairbanks and could accommodate additional fleet vehicles. As a fast-fill type of CNG fueling infrastructure is important to fleet operators for efficiency and convenience, the FNSB is hopeful that other fleet operators may be encouraged to also transition their fleets to CNG enhancing overall emission benefits to the community and nonattainment area.

7.7.5.6 Federal Diesel Emission Reduction Program

The federal government has multiple regulations and initiatives that will help address emissions in the non-attainment area. EPA's National Clean Diesel Campaign works with manufacturers, fleet operators, air quality professionals, environmental and community organizations, and state and local officials to reduce diesel emissions. The National Clean Diesel Campaign offers Diesel Emission Reduction Act funding opportunities through the competitive National Clean Diesel Funding Assistance Program to fund retrofit projects using Smartway verified diesel emission reduction technologies and the non-competitive State Clean Diesel Grant Program that funds grant and loan projects for clean diesel projects. Smartway is a public-private initiative between EPA, large and small trucking companies, rail carriers, logistics companies, commercial manufacturers, retailers, and other federal and state agencies. Its purpose is to improve fuel efficiency and the environmental performance (reduction of both greenhouse gas emissions and air pollution) of the goods movement supply chains. Smartway evaluates emissions control technologies and determines the eligibility of individual technologies for funding under DERA grants. Federal emissions standards for exhaust and evaporative emissions exist for Light-Duty Vehicles, Trucks, and Motorcycles, Heavy-Duty Engines and Vehicles, and Non-road Engines and Vehicles. These emissions standards on manufacturers have incrementally reduced the amount of emissions permitted from each type of regulated engine, resulting in cleaner diesel engines. Phase 3 emissions standards started taking effect in 2017.

7.7.5.7 Federal Motor Vehicle Control Program

The Federal Motor Vehicle Control Program (FMVCP) is the federal certification program that requires all new cars sold in 49 states to meet certain emission standards. (California is excluded because it has its own state-mandated certification program). These standards vary according to vehicle age, with the newer vehicles required to be considerably cleaner than older models. The result of more stringent emission standards over time from newly manufactured vehicles results in a drop in overall emissions from the vehicle fleet in Fairbanks, as older, dirtier vehicles are replaced with newer, cleaner vehicles. Carbon monoxide cold temperature (down to +20° F) emission standards phased in between 1994 and 1996 for passenger cars and light duty trucks significantly enhanced control system performance for all pollutants at the temperatures associated with cold climate exceedances. California Air Resources Board vehicle emission standards were considered and analyzed as a potential BACM (Measure 54), but were found to be not cost effective for the nonattainment area.

Federal Tier 2 emission standards for passenger cars, light trucks and larger passenger vehicles are focused on reducing emissions most responsible for ozone and particulate matter (i.e., nitrogen oxide or NOx and hydrocarbon or HC emissions). Mandated reductions in the sulfur content of gasoline further enhanced the performance of motor vehicle emission control systems. Starting in 2017, Tier 3 standards further reduced both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles. Additional reductions in gasoline sulfur have made emission control systems more effective for both existing and new vehicles, and enabled more stringent vehicle emissions standards. EPA's MOVES2014b model has been used to assess the benefits of the FMCVP and Tier 2 and Tier 3 emission standards.

7.7.6 Most Stringent Measures (MSM)

EPA defines MSMs in 40 C.F.R. 51.1010 (b) as those measures that are identified as an MSM and included in the attainment plan for any state or are achieved in practice in any state. A measure could also be considered an MSM if the measure cannot be implemented within the four year window after an area is reclassified as Serious. Furthermore, an MSM could be a control measure that has not been implemented anywhere else.

For the Serious SIP, DEC has identified the required removal of EPA certified devices that are 25 years old and have a PM emission rating of greater than 2.0 g/hr. Initially these older EPA certified devices are required to be removed by December 2024 and this requirement will be triggered upon EPA's determination that the area failed to attain the standard. However, once the regulation is triggered, all older EPA certified devices must be removed or replaced upon sale of the property where they are located. Furthermore, the 25 years, is a rolling time period. Every year, a new set of older EPA certified devices will be eligible for removal or replacement. This on-going MSM will provide the foundation for transitioning the area's wood-fired heating devices more quickly to the 2.0 g/hr standard.

7.7.7 Calculating the Benefits of Control Measures

Calculation of emission benefits for key control measures through 2019, the statutorily-required Serious SIP attainment data are summarized within Section III.D.7.6. Within this sub-section, optimally-achievable benefits for additional controls slated for adoption by Alaska beyond 2019 are also presented. They are consistent with the emission benefits presented later in Section III.D.7.9.2 for the estimated expeditious alternative date attainment demonstration.

As discussed in detail earlier in Section III.D.7.6, control measure benefits are calculated to reflect reductions over and above those from measures adopted under the earlier Moderate SIP. In addition, reductions from on-going federal control programs such as the FMCVP, Diesel Emission Reduction Program and fuel standards are accounted for in projected baseline emission estimates. Thus, the control measure reductions presented here (and later in Section III.D.7.9) reflect incremental benefits over and above projected baseline and Moderate SIP control reductions.

Table 7.7-8 lists the non-point state and local control measures for which emission benefits were quantified.[3] The Borough's Wood Stove Change Out (WSCO) Program is highlighted in gray italics at the top of Table 7.7-8 to indicate that although it is not part of the State's post-2019 control measure package, it continues to provide benefits from change outs beyond 2019 based on currently available funding.

[3] As listed earlier in Table 7.7-7 the package of measures planned for adoption by Alaska include additional measures beyond those listed in Table 7.7-8 for which data were not fully available to quantify emission benefits.

Table 7.7-8
List of State/Local Non-Point Control Measures for Which Benefits were Quantified

Source Sector	Measure ID	Measure Summary	First Full Year
Area, Space Heat	*WSCO*	*Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding*[a]	*On-going, thru 2023*
	Curtailment	Solid Fuel Burning Application Episodic Curtailment Program, reflects enhanced compliance by future attainment date	On-going
	STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	2023
	STF-13, Modified BACM31	Required commercially sold wood to be dry before sale	2022
	STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	2024
	BACM R9, R15, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/MMBtu certified emission rates for new wood fuel fired devices	2020
	BACM 48, 49	Removal of coal heaters	2024
	STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	2020
	STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	2020

[a] Reflects WSCO program funding through 2017 EPA Targeted Air Shed (TAS) Grant.

Those measures in Table 7.7-8 below the WSCO Program highlighted in tan reflect State measures for which benefits were quantified and estimated to support the alternative attainment date analysis presented later in Section III.D.7.9. The implementation or starting year for each measure is also shown in Table 7.7-8.

Table 7.7-9 presents the projected fully-implemented $PM_{2.5}$ and SO_2 emission benefits associated with each of the measures/programs listed in Table 7.7-8 (No reductions were calculated for the other precursor pollutants). The benefits shown for each individual measure are discounted to account for the overlap of measures controlling the same sources within the combined control package. Combined measure benefits shown at the bottom of Table 7.7-9 also properly account for measure overlap within the combined control package (eliminating double-counting).

Table 7.7-9
Projected Fully-Implemented Emission Reductions for State/Local Non-Point Control Measures

Measure ID	Measure Summary	Emission Reductions[a] (tons/episodic day)	
		$PM_{2.5}$	**SO_2**
WSCO	*Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding*	*0.29*	*<0.01*
Curtailment	Solid Fuel Burning Application Episodic Curtailment Program, reflects enhanced compliance by future attainment date	S1[b]: 0.14 S2[b]: 0.22	S1[b]: -0.09 S2[b]: -0.13
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	<0.01	1.77
STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	0.10	0.01
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	0.82	0.01
BACM R9, R15, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new wood fuel fired heating devices	0.62	0.02
BACM 48, 49	Removal of coal heaters	0.04	0.07
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	0.39	-0.04
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01
n/a	IGU-projected natural gas expansion through 2029	0.24	0.59
Combined Total, Area Space Heating (accounting for measure overlap)		**S1[b]: 2.65 S2[b]: 2.73**	**S1[b]: 2.33 S2[b]: 2.29**
n/a	Point Source fuel-based sulfur controls by 2029	n/a	4.46
Combined Total, Point Sources		**n/a**	**4.46**

[a] Emission reductions shown for each individual measure account for effects of overlap within the combined control measure package.
[b] S1 and S2 refer to benefits under Curtailment program Stage 1 (20 µg/m^3) and Stage 2 (30 µg/m^3) alert conditions.
n/a – Not Applicable.

DEC and the Borough recognize that the long-term mix of $PM_{2.5}$ control strategies implemented in Fairbanks could warrant revision. This would be accomplished through a future attainment or maintenance plan revision and subject to approval by EPA. Given the analyses of $PM_{2.5}$ emissions and $PM_{2.5}$ air monitoring data in this attainment plan, the agencies acknowledge the need to do so as early as 2020 to determine whether the measures have phased in as indicated, or are still on or ahead of the schedule denoted in Table 7.7-9 toward timely reductions in emissions and improvement of air quality. This evaluation could result in measures being removed or added to the plan depending on the outcome of the analyses prepared at that time. All changes to the air quality plan must be approved by EPA.

7.7.8 Best Available Control Technologies (BACT)

Large stationary sources are a subgroup of emissions sources that are given special attention in the state's BACT analysis. The emissions units (EUs) at these major stationary sources are subject to site-specific review for BACT. The U.S. Environmental Protection Agency (EPA) has defined BACT as meaning:

> *"…an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each regulated [New Source Review] pollutant which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the reviewing authority determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."*

A BACT limit is a numerical emission limit that is needed for each emission unit for each pollutant subject to review. The limit must be met on a continuous basis; specify a control technology or work practice; include an averaging period, and be enforceable as a practical matter.

The designation of the Fairbanks North Star Borough (FNSB) nonattainment area as "Serious" with regard to nonattainment of the 2006 24-hour $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) was published in Federal Register Vol. 82, No. 89, May 10, 2017, pages 21703-21706.

Per EPA guidance and consistent with its Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule ($PM_{2.5}$ Implementation Rule), DEC evaluated all point sources with emissions greater than 70 tons per year (tpy) of $PM_{2.5}$ or any individual $PM_{2.5}$ precursor (NOx, SO_2, NH_3, VOCs). Appropriate control of precursors is important for attaining the $PM_{2.5}$ NAAQS because secondarily formed particles (such as ammonium nitrate, ammonium sulfate, and some portion of organic carbon) comprise a large fraction of ambient $PM_{2.5}$ concentrations in many nonattainment areas. All $PM_{2.5}$ precursors were addressed, but only NOx and SO_2 were addressed on an emission unit specific basis in DEC's BACT Determinations. The 70 tpy thresholds apply to major stationary sources under the nonattainment new source review program in 40 C.F.R. § 51.165(a). The General Preamble

for PM_{10} nonattainment areas established a general approach to determine BACT using EPA's top-down BACT process used for the PSD program to identify BACT for sources in Serious PM_{10} nonattainment areas, therefore the top-down approach was used for the FNSB stationary sources.

Identification of BACT under EPA's top-down approach is a 5-step process:

Step 1: Identify available pollution control options.

- Inherently lower-emitting processes/practices.
- Add-on controls (e.g., scrubbers, fabric filters, catalytic reduction, etc.).
- Combination of inherently lower-emitting processes/practices and add-on controls.

Step 2: Eliminate technically infeasible pollution control options.

- Must demonstrate technical infeasibly based on physical, chemical, and engineering principles.

Step 3: Rank remaining control technologies by control effectiveness.

- Rank from greatest or best emissions reduction to those achieving the least.

Step 4: Evaluate the most effective controls and document results.

- Evaluate controls considering energy, environmental, and economic impacts.
- Start with the top emissions control option. If the evaluation of this options leads to acceptance as BACT (with no significant collateral environmental impacts), subsequent analysis is not required. If the top emissions control option is rejected, the analysis must be repeated for the next best option and so on until an acceptable option is reached.
- Document results.

Step 5: Make the BACT selection.

- Select top emissions control option. If the best pollution control option is not selected because of economic, energy, or consequential environmental impacts, the reasons must be clearly documented.

To complete the BACT process, DEC must establish enforceable emissions limits for each subject emission unit at the source for each pollutant subject to review. If technological or economic limitations in the application of a measurement methodology to a particulate emissions unit would make an emissions limit infeasible, a design, equipment, work practice, operational standard, or combination thereof may be prescribed. Also the technology upon which the BACT emissions limit is based should be specified so that they are specific to the individual emissions unit subject to BACT review.

DEC based its NOx, SO_2, and $PM_{2.5}$ evaluation on BACT determinations found in EPA's RACT/BACT/LAER Clearinghouse (RBLC), internet research, and the BACT analyses submitted by Aurora Energy, LLC (Aurora) for the Chena Power Plant, Golden Valley Electric Association (GVEA) for the North Pole Power Plant and Zehnder Facility, the U.S. Army Corps of Engineers (US Army) and Doyon Utilities (DU) for Fort Wainwright, and the University of Alaska Fairbanks (UAF) for the University of Alaska Fairbanks Campus. See Appendix

III.D.7.7 for DEC's BACT Determinations. The evaluation considers technical feasibility, estimates of actual emissions reductions, and cost effectiveness for each technology or work practice identified.

7.7.8.1. Ammonia (NH_3) Controls – Point Sources

The processes that emit ammonia (biomass burning, mobile, home heating) differ in Fairbanks from those in the lower 48, where ammonia from agricultural activities, vehicles, and other industrial activities form ammonium nitrate. In the Fairbanks nonattainment area, there is only a limited about of particulate matter-nitrate found on the measurement filters. The reductions in ammonia will come from nitrate and sulfate in the form of ammonium nitrate and ammonium sulfate that were formed from precursor gases NOx and SO_2 (some ammonium is associated with primarily emitted sulfate that is not from precursor gases). No controls are proposed for NH_3 for BACT or BACM. There is a negligible amount of ammonia associated with coal-fired boilers, fuel oil-fired turbines or diesel engine emissions and this amount is not in the emissions inventory.

7.7.8.2 Chena Power Plant

The following summary table outlines the overarching decision points for the Chena Power Plant, taking into consideration the BACT determination prepared by the Department as well as the financial indicators allowed for under the $PM_{2.5}$ Implementation Rule. For example, it was found that Dry Sorbent Injection was cost effective for a BACT control in a serious non-attainment area, but Aurora provided financial indicators that demonstrated that it would have an unacceptable adverse effect for business purposes. The Appendix to Section III.D.7.7 contains the documentation supporting the department's BACT determinations.

Table 7.7-10
DEC BACT and SIP Findings Summary Table for Chena Power Plant

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
EUs 4 through 7 - Coal-Fired Boilers - 497 MMBtu/hr (combined)			
NOx	Precursor Demonstration*	No additional control	N/A
SO_2	0.25% sulfur by weight	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
	0.301 lb/MMBtu (3-hr avg.)	No Additional Controls (periodic source testing)	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021

* Assumes precursor demonstration approved by EPA

Background Information for Chena Power Plant

Chena Power Plant is an existing stationary source owned and operated by Aurora, which consists of four existing coal-fired boilers, three 76 million British Thermal Units (MMBtu)/hour overfeed traveling grate stoker type boilers and one 269 MMBtu/hr spreader-stoker type boiler that burn coal to produce steam for heating and power. The BACT analysis from Aurora, which includes emission units found in Operating Permit AQ0315TVP03 Revision 1, was submitted by email to DEC on March 20, 2017.

In letters dated November 16, 2017, and September 10, 2018, DEC requested additional information to assist it in making a legally and practicably enforceable BACT determination for the source. Both DEC and EPA comments were enclosed in the letters. Aurora responded to the information requests on December 22, 2017, and November 1, 2018. DEC reviewed these responses and incorporated the additional information into its BACT Determination as warranted.

On March 22, 2018, DEC released a draft of the possible concepts and potential approaches for development of the FNSB Nonattainment Area Serious State Implementation Plan that included DEC's Preliminary BACT Determinations. The BACT Determination for the Chena Power Plant evaluated potential controls to reduce NOx and SO_2 emissions from its four coal-fired boilers.

7.7.8.2.1 NOx Controls for Chena Power Plant

NOx Precursor Demonstration

The NOx controls proposed in this section are not planned to be implemented. The optional precursor demonstration (as allowed under 40 C.F.R. § 51.1006) for the precursor gas NOx for point sources illustrates that NOx controls are not needed. DEC has included with this Serious SIP, a final precursor demonstration as justification not to require NOx controls.

The $PM_{2.5}$ NAAQS Final SIP Requirements Rule states if the state determines through a precursor demonstration that controls for a precursor gas are not needed for attaining the standard, then the controls identified as BACT/BACM or Most Stringent Measure for the precursor gas are not required to be implemented. Final approval of the precursor demonstration is at the time of the Serious SIP approval.

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the industrial coal-fired boilers:

- Good Combustion Practices (Less than 40% Control)
- Low Excess Air (10% - 20% Control)

Aurora provided an economic analysis for the installation of SCR on all four boilers combined. Aurora also provided economic analyses for the installation of SNCR on the three 76 MMBtu/hr boilers, the 269 MMBtu/hr boiler, and all four boilers combined. Aurora contends that its economic analyses indicate the level of NOx reduction does not justify the use of SCR or SNCR for the coal-fired boilers based on the excessive cost per ton of NOx removed per year.

As indicated in Step 2 of EPA's top down BACT approach, the Department does not consider SCR or SNCR to be technically feasible control technologies for the Chena Power Plant because the flue gas temperature is historically much lower than the range need for these technologies. However, DEC revised the cost analyses provided by Aurora for the installation of SCR and SNCR using the cost estimating procedures identified in EPA's May 2016 Air Pollution Control Cost Estimation Spreadsheets for SCR and SNCR, using the unrestricted potential to emit of the four coal-fired boilers, a baseline emission rate of 0.402 lb NOx/MMBtu (average of the two most recent NOx source tests accepted by the Department, which occurred on November 19, 2011 and July 12, 2019) a retrofit factor of 1.5 for projects requiring a difficult retrofit, a NOx removal efficiency of 90% and 50% for SCR and SNCR respectively, an interest rate of 5.0% (current bank prime interest rate), and a 20 year equipment life. DEC concluded that NOx emissions for EUs 4 through 7 shall be controlled by maintaining good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

7.7.8.2.2 $PM_{2.5}$ Controls for Chena Power Plant

The Chena Power Plant has direct $PM_{2.5}$ emissions less than 70 tons per year (threshold for $PM_{2.5}$ Implementation Rule) and is already equipped with a single full stream baghouse for controlling particulate emissions from the four coal-fired boilers. Baghouses/fabric filters are the highest rated control available (99.9% control efficiency) for $PM_{2.5}$ emissions from coal-fired boilers. Therefore, a $PM_{2.5}$ BACT analysis was not submitted or reviewed for the Chena Power Plant.

7.7.8.2.3 SO_2 Controls for Chena Power Plant

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the industrial coal-fired boilers:

- Wet Scrubbers (99% Control)
- Spray Dry Absorbers (SDA) (90% Control)
- Dry Sorbent Injection (DSI) (50 – 80% Control)
- Low Sulfur Coal (30% Control)
- Good Combustion Practices (Less than 40% Control)

Aurora provided an economic analysis for the installation of wet scrubbers, SDA, and DSI controls on all four boilers combined and separately for the 269 MMBtu/hr boiler. Aurora contends that its economic analyses indicate the level of SO_2 reduction does not justify the use of SO_2 control technologies for the coal-fired boilers based on the excessive cost per ton of SO_2 removed per year.

DEC also calculated the cost effectiveness for the installation of wet scrubbers, SDA, and DSI controls on all four boilers combined, and separately for the 269 MMBtu/hr boiler. DEC's calculation used the cost development methodology prepared by Sargent & Lundy for EPA for flue gas desulfurization (wet scrubbers), semi-dry scrubbers (SDA), and dry scrubbers (DSI). DEC assumed an unrestricted potential to emit for all four boilers, a baseline emission rate of 0.301 lb SO_2/MMBtu (average from the two most recent SO_2 source tests accepted by the department, which occurred on November 19, 2011 and July 12, 2019), a retrofit factor of 1.5 for

a difficult retrofit, an SO_2 removal efficiency of 99%, 90%, and 80% for wet scrubbers, SDA, and DSI respectively, an interest rate of 5.0% (current bank prime interest rate), and a 15 year equipment life.

On November 1, 2018, Aurora responded to DEC's September 13, 2018, information request for site-specific vendor information (Item 5) and provided two documents from Stanley Consultants, Inc. titled: "*Aurora Energy Preliminary Opinion of Probable Cost for Addition of Dry Sorbent Injection.pdf*" and "*Aurora_DSI_Opinion_of_Probable_Cost_rev0.pdf"*. This Opinion of Probable Cost indicates that the total installed cost for the addition of DSI would be $20,604,000. DEC revised its cost effectiveness calculation to reflect this value for total capital investment. DEC concluded that, absent other economic considerations, the level of SO_2 reduction justifies the use of DSI as BACT for the coal-fired boilers at $9,686/ton.

"Dry Sorbent Injection" or "DSI" means an add-on air pollution control system in which sorbent (e.g., Trona, hydrated lime, sodium carbonate, etc.) is injected into the flue gas stream upstream of a particulate matter control device to react with and neutralize acid gases (such as SO_2 and hydrogen chloride) in the exhaust stream forming a dry powder material that may be removed in a primary or secondary particulate matter control device.

When choosing between two or more technologies, it is reasonable for the state to consider the sizeable capital cost difference between wet scrubbers, SDA, and DSI, and the relatively small reduction of SO_2 between the control technologies. DEC determined the control effectiveness of these control options by evaluating actual emissions data from other sources employing similar types of controls, EPA's pollution control fact sheets, and taking into consideration that BACT limits must be achieved at all times. DEC calculated the cost effectiveness for installing wet scrubbers and SDA on the coal fired boilers and found the cost effectiveness of these controls to have an adverse economic impact at $15,838/ton and $17,042/ton respectively, when considering the total capital investment costs of $55,886,469 and $50,846,544.

DEC determined the numerical SO_2 BACT emission limit for the four coal-fired boilers at Chena Power Plant to be 0.10 lb/MMBtu averaged over a 3-hour period. DEC selected this BACT limit after evaluating existing emission limits in the RBLC database for coal-fired boilers, taking into account previous source test data from the Chena Power Plant and actual emissions data from other sources employing similar types of controls, using site specific vendor quotes provided by Stanley Consultants, and in-line with EPA's pollution control fact sheets while keeping in mind that BACT limits must be achievable at all times.

DEC proposed a requirement to conduct an initial performance test on the boilers to determine if the 0.10 lb/MMBtu emission rate can be met. As indicated in EPA's "Air Pollution Control Technology Fact Sheet" states that "SO_2 removal efficiencies [of DSI] are significantly lower than wet systems, between 50% and 60% for calcium-based sorbents. Sodium-based dry sorbent injection into the duct can achieve up to 80% control efficiencies. Dry sorbent injection is viewed as an emerging SO_2 control technology for medium to small industrial boiler applications. Newer applications of dry sorbent injection on small coal-fired industrial boilers have achieved greater than 90% SO_2 control efficiencies." See: EPA-452/F-03-034 at Page 5.[4]

[4] https://www3.epa.gov/ttncatc1/dir1/ffdg.pdf

7.7.8.2.4 Additional Information

On November 19, 2018, Aurora proposed a BACT alternative, contending that the least expensive SO_2 control (DSI) should not be established because Aurora cannot afford the control technology demonstrated to be economically feasible, referencing Federal Register, Vol. 81, No.164, Wednesday August 24, 2016. pg. 58085. This Federal Register indicates that the source should make its claim known to the state and support the claim with information regarding the impact of imposing the identified control measure or technology on the following financial indicators to the extent applicable:

1. Fixed and variable production costs;
2. Product supply and demand elasticity;
3. Product prices (cost absorption vs. cost pass-through);
4. Expected costs incurred by competitors;
5. Company Profits;
6. Employment costs;
7. Other costs (e.g., for BACM implemented by public sector entities).

Aurora provided documentation of their claim to DEC, indicating that they only have one electric customer (GVEA) and approximately 200 district heating customers and that the additional cost of the proposed control technology would price Aurora out of the market for both heat and power. They contend that this would result in an increase in ground level $PM_{2.5}$ as customers switch from district heat to oil and/or gas fired furnaces and boilers or wood, which would be counterproductive to reaching attainment with the health based standard. Below, is a summary of the financial indicators provided by Aurora:

1. Fixed and variable production costs: District heating operating costs exceed income generated resulting in a net loss over the past 5 years, based on RCA annual filing from 2013-2017.

2. Product supply and demand elasticity: The cost of control technologies cannot be absorbed by Aurora under the current pricing to consumers for district heating and power. Aurora has no alternative but to pass those costs to its customers. Those customers, in turn, would have no choice but to go elsewhere for their heat and power.

3. Product prices (cost absorption vs. cost pass-through): District heating prices cannot absorb the pass through costs of control technology. Aurora's district heating customer base is approximately 200 including mostly commercial and some residential customers. District steam heating rates are set with oversight by the RCA and do not vary. Hot water district heating prices differ depending on consumers' annual heating needs. The hot water district heating rates are adjusted throughout the year to be competitive with other sources of heat. Absorbing full or partial costs for upgrades or control technologies is not feasible through district heating rate adjustments. The price adjustment necessary to compensate for the current average annual net loss from district

heating would be an increase of $3.71/MMBtu representing a 20% increase in heating costs. A 20% increase in district heat prices per unit energy (MMBtu) is not marketable. The potential is a loss of revenue from customers switching to alternative forms of heat which would make district heating even less sustainable and exacerbate air quality due to an increase in ground level emissions. Aurora's power pricing cannot absorb the pass through cost of control technologies without revising the current contract and becoming less marketable. Aurora sells its power at wholesale price to GVEA, its sole electric customer. Aurora has averaged 186,000 MWh in net sales annually. Pass through of any additional incurred cost would have to be negotiated with GVEA, and would cause an increase in power costs to all customers in GVEA's service area.

4. Expected costs incurred by competitors: The FNSB nonattainment area impacts stationary sources within the area. Aurora's main competitors are power producers outside of the nonattainment area. Aurora's competition will not be required to consider BACT or MSM as a new requirement of a nonattainment area. This puts Aurora at a serious economic disadvantage. It is the only private for-profit power producer in the state being subjected to the $PM_{2.5}$ nonattainment area BACT requirements. The price of power with controls is $0.11/kWh. When additional disposal requirements are considered as a result of the use of the control technology, the price of Aurora's wholesale power to GVEA is $0.12/kWh.

Aurora's competition for power sales is primarily natural gas generated power; including Anchorage Municipal Light and Power (AMLP), Matanuska Electric Association, Inc. (MEA), and Chugach Electric Association (CEA). Aurora is also in competition with GVEA's fleet including the coal facilities (Healy #1 and Healy #2). The expected increase in price of Aurora's power due to BACT will make its power less marketable. At $0.12/kWh, the price of Aurora's power to GVEA would exceed AMLP ($0.09/kWh), Healy #1 ($0.10/kWh), MEA ($0.10/kWh), and CEA ($0.11/kWh) based on GVEA's cost of power report in 2017. Aurora currently provides 14% of GVEA's power requirements. At current prices, Aurora's power is competitive. An increase in the price of power to $0.11/kWh or $0.12/kWh would likely change that perspective.

5. Company Profits: Net income (loss) for Aurora over the past five years are not sufficient to absorb annual control technology costs for any of the control technologies proposed. These include income generated from district heat and power sales minus the operating costs and include nonutility income, interest income, miscellaneous amortizations, and interest expenses. The annual cost to operate the preferred technology is $4,284,104; the average 5-year net income (loss) for Aurora is $371,510. Conclusively, Aurora is not able to absorb the cost of additional control technologies.

6. Employment costs: DEC's calculations for annual operation costs of the proposed technologies include labor cost increases. The increases vary depending on the type of control technology. As a part of DEC's analysis for SO_2 controls, annualized cost increases include the projection of additional labor for operation, maintenance, and administration.

7. Other costs (e.g., for BACM implemented by public sector entities). No additional costs were considered.

DEC finds that these financial indicators are sufficient evidence to demonstrate that imposing add-on DSI controls on the existing coal-fired boilers would cause an adverse economic impact to Aurora. For more information see Appendix III.D.7.7 for Aurora's November 1, 2018, response to DEC's information requests that included the following enclosures:

1. CDS v SDA Cost Comparison.pdf
2. chena-so2-economic-analyses-adec--With ERM Comments.xlsm
3. chena-large-boiler-so2-economic-analyses-adec--With ERM Comments.xlsm
4. Aurora Energy Preliminary Opinion of Probable Cost.pdf
5. Aurora_DSl_Opinion_of_Probable_Cost_revO.pdf
6. BACT Proposal No. 1899-Rl.pdf
7. Aurora_Chena_DSl_General Arrangement.pdf
8. Unified Facilities Criteria (UFC} DoD Facilities Pricing Guide (ufc_3_701_01_c1_2018.pdf)
9. ufc_3_701_01_data_tables_may_2018.xlsx
10. NSPS ICI S02 RE.docx
11. ICI Boilers 20081118 final_revised-Jan2009 .pdf
12. EPA Air Pollution Cost Control Manual, sixth edition, January 2002, accessible at https://www3.epa.gov/ttncatc1/dir1/c_allchs.pdf

Also see Appendix III.D.7.7 for Aurora's November 19, 2018 Proposed BACT Alternatives Letter that included the following enclosures:

1. Appendix A.pdf
2. Appendix B.pdf
3. Appendix C.pdf
4. Appendix D.pdf
5. chena-sncr-economic-analysis-adec - AE changes V2.xlsm
6. chena-so2-economic-analyses-adec - AE changes V1.xlsm
7. chena-so2-economic-analyses-adec - AE changes V2.xlsm
8. chena-scr-economic-analysis-adec- AE Changes V1.xlsm
9. chena-scr-economic-analysis-adec- AE Changes V2.xlsm
10. chena-sncr-economic-analysis-adec - AE changes V1.xlsm

Long-term, the useful life of the facility needs to be determined and ultimately Aurora and DEC could enter into a formal agreement of the end of useful life when the plant will be shut down, retrofitted, or have units replaced.

7.7.8.2.5 DEC BACT and SIP Findings for Aurora Energy Chena Power Plant

FINDING: DEC finds that it is economically infeasible for Aurora Energy to implement retrofit SO_2 controls on its emission units at the Chena Power Plant. BACT is the existing operation of good combustion practices and using a low sulfur coal as a fuel source. By June 9, 2021, Aurora

Energy shall limit the sulfur content of coal to 0.25% S by weight and limit SO_2 emissions from the coal-fired boilers to no more than 0.301 lb/MMBtu.

Future Considerations:
In working through this BACT review, DEC has identified several topics that warrant additional consideration in future planning efforts.

- Aurora Energy has expressed to DEC their concerns that the impact of additional sulfur controls on their emission units will not provide significant reductions in sulfate concentrations in the ambient air at ground level. Because of this, the return on the cost investment for adding control technologies may be low in the context of resolving the local air pollution problem. There are a number of factors that affect individual point source impacts on $PM_{2.5}$ levels in the ambient air near ground level. For example, the Chena Power Plant has a high stack height, which means that the emissions are occurring well above the breathing zone during winter inversion episodes. Other sources of $PM_{2.5}$ and sulfur dioxide are emitting nearer ground level, such as oil space heating.

  In seeking options for addressing the federal BACT requirements, Aurora Energy has encouraged the state to conduct a precursor demonstration for sulfur dioxide, similar to the demonstration DEC has made for nitrogen oxides. However, precursor determinations must follow 40 C.F.R. § 51.1006 and be approved by EPA. Under these requirements, a precursor demonstration must collectively address all of the point sources in the area. DEC has analyzed sulfur impacts with its existing modeling tools (see Section 7.8.13), but is unable at this time to make a technically sound precursor demonstration for sulfur dioxide. DEC does not believe the modeling results are strong enough to pursue a precursor determination for sulfate for point sources given the uncertainty in the sulfate model performance and the contributions identified in the analysis. In the future, DEC anticipates updating its modeling platform for the nonattainment area and additional local data (e.g. emission source tests, monitoring) and research on atmospheric sulfur chemistry may become available. This could provide opportunities to more accurately analyze the significance of the contribution of sulfur sources from the Chena Power Plant and other point sources to sulfate concentrations at the regulatory ambient air monitors.

- According to Aurora Energy's November 2018 information submittal to DEC, they indicate an approximate 15-year useful life for the facility. Given the age of the existing emission units, this useful life projection appears reasonable and DEC expects that the emission units will very likely be decommissioned around 2034. A fifteen year time frame is outside the 10 year planning horizon currently considered within this plan. However, as DEC develops future plans, including eventual maintenance plans that look forward 20 years, consideration will need to be given to forecasting the space heating sources for the area into the timeframe that corresponds to the end of useful life for these emission units. As Aurora Energy considers its long term plans and DEC develops these future plans to meet federal requirements, DEC will further engage with them to understand and address the end of useful life for the emission units, including the impacts of decommissioning or replacement of these units on space heating in the area as well as

the potential need and viability for additional pollution control.

- In their information submittals to DEC, Aurora Energy identified alternative proposals that while not BACT, had potential to reduce $PM_{2.5}$ emissions in the nonattainment area. These proposals could be considered by Aurora Energy for voluntary implementation and, if implemented, considered by the State in future SIP revisions.

7.7.8.3 Fort Wainwright

The following summary table outlines the overarching decision points for Fort Wainwright, including the BACT controls, numerical emission limits, and timelines for implementation into federally enforceable permit conditions. The Appendix to Section III.D.7.7 contains the documentation supporting the department's BACT determinations.

Table 7.7-11
DEC BACT and SIP Findings Summary Table for Fort Wainwright

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
EUs 1 through 6 - Coal Fired Boilers - 230 MMBtu/hr (each)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.045 lb/MMBtu (3-hr avg.)	Full Stream Baghouse	Existing
SO_2	0.25% sulfur by weight	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
	0.12 lb/MMBtu (3-hr avg.)	Dry Sorbent Injection	Title I Permit App. by June 9, 2020 Effective no later than October 1, 2023
Emergency Engines, Generators, and Fire Pumps			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.015 - 1.0 g/hp-hr (3-hr avg.)	Good Combustion Practices and Limited Operation	Existing
SO_2	15 ppmw sulfur in fuel	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
Fuel Oil Boilers			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.012 lb/MMBtu (3-hr avg.)	Good Combustion Practices and Limited Operation	Existing
SO_2	15 ppmw sulfur in fuel	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
Material Handling Sources (Coal Prep and Ash Handling)			
$PM_{2.5}$	0.0025 - 0.02 gr/dscf	Enclosed Emission Points and Good Operating Practices	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021

* Assumes precursor demonstration approved by EPA

Background Information for Fort Wainwright

Fort Wainwright is an existing U.S. Army installation. EUs located within the military installation include units such as boilers and generators that are owned and operated by the U.S. Army Garrison Alaska (FWA). The FWA Central Heating and Power Plant (CHPP), also located within the installation footprint, is owned and operated by a private utility company, Doyon Utilities, LLC (DU). The two entities, DU and FWA, comprise a single stationary source operating under two permits.

Fort Wainwright has six spreader-stoker type coal-fired boilers each rated at 230 MMBtu/hr, that burn coal to produce steam for stationary source-wide heating and power. It also contains small and large emergency engines, fire pumps, and generators, diesel-fired boilers, and material handling equipment subject to BACT.

In letters dated October 20, 2017, and September 10, 2018, DEC requested additional information to assist it in making a legally and practicably enforceable BACT determination for the source. Both DEC and EPA comments were enclosed in the letters.

On March 22, 2018, DEC released a draft of the possible concepts and potential approaches for development of the FNSB Nonattainment Area Serious State Implementation Plan that included DEC's preliminary BACT Determinations. On May 23, 2018, DU provided comments on the draft and DEC incorporated the additional information into its BACT Determinations as warranted. The BACT Determination for Fort Wainwright evaluated potential controls to reduce NOx, $PM_{2.5}$, and SO_2 emissions from emissions units at the stationary source.

7.7.8.3.1 NOx Controls for Fort Wainwright

NOx Precursor Demonstration

The NOx controls proposed in this section are not planned to be implemented. The optional precursor demonstration (as allowed under 40 C.F.R. § 51.1006) for the precursor gas NOx for point sources illustrates that NOx controls are not needed. DEC has included with this Serious SIP, a final precursor demonstration as justification not to require NOx controls.

The $PM_{2.5}$ NAAQS Final SIP Requirements Rule states if the state determines through a precursor demonstration that controls for a precursor gas are not needed for attaining the standard, then the controls identified as BACT/BACM or Most Stringent Measure for the precursor gas are not required to be implemented. Final approval of the precursor demonstration is at the time of the Serious SIP approval.

Coal-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the industrial coal-fired boilers:

- Selective Catalytic Reduction (SCR) (70% - 90% Control)
- Selective Non-Catalytic Reduction (SNCR) (30% - 50% Control)
- Good Combustion Practices (Less than 40% Control)
- Low Excess Air (10% - 20% Control)

FWA provided economic cost analyses for the installation of SCR and SNCR on each of the six coal-fired boilers. FWA contends that its economic analyses indicate the level of NOx reduction does not justify the use of SCR or SNCR for the coal-fired boilers based on the excessive cost per ton of NOx removed per year.

DEC revised the cost analyses provided by FWA for the installation of SCR and SNCR as a combined system (one SCR/SNCR system for all six coal-fired boilers) using the cost estimating procedures identified in EPA's May 2016 Air Pollution Control Cost Estimation Spreadsheets for SCR and SNCR, using the unrestricted potential to emit of the six coal-fired boilers, a baseline emission rate of 0.58 lb NOx/MMBtu (Emission factor from AP-42 Table 1.1-3 for spreader stoker sub-bituminous coal (8.8 lb NOx/ton) and converted to lb/MMBtu using heat value for Usibelli Coal of 7,560 Btu/lb, http://www.usibelli.com/coal/data-sheet), a retrofit factor of 1.5 for a difficult retrofit, a NOx removal efficiency of 90% and 50% for SCR and SNCR respectively, an interest rate of 5.0% (current bank prime interest rate), and a 20 year equipment life. DEC concluded that the level of NOx reduction justifies the use of SCR or SNCR as BACT for the coal-fired boilers at $7,214/ton and $4,325/ton respectively. Since SCR has a higher control efficiency, it is selected as BACT to control NOx emissions from the coal-fired boilers.

Diesel-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the diesel-fired boilers:

- Limited Operation (94% Control)
- Low-NOx Burner (60% – 80% Control)
- Good Combustion Practices (Less than 40% Control)

FWA proposes using limited operation and maintaining good combustion practices to control NOx emissions from the diesel-fired boilers. FWA EUs 8, 9, and 10 will continue to be limited to 600 hours combined per 12 consecutive month period.

DEC reviewed Fort Wainwright's proposal and finds that the 27 diesel-fired boilers have a combined potential to emit (PTE) of less than 12 tons per year (tpy) for NOx. At 12 tpy, the cost effectiveness in terms of dollars per ton for add-on pollution control for these units is economically infeasible.

DEC finds that the BACT for NOx emissions from the small diesel-fired boilers is as follows:

- Combined operating limit of 600 hours per year for FWA EUs 8, 9, and 10;

- NOx emissions from diesel-fired boilers shall not exceed 0.15 lb/MMBtu; and
- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures.

Large Diesel-Fired Engines, Fire Pumps, and Generators

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the large diesel-fired engines (≥ 500 hp):

- Limited Operation (94% Control)
- Selective Catalytic Reduction (90% Control)
- Good Combustion Practices (Less than 40% Control)
- Turbo Charger and Aftercooler (6% – 12% Control)
- Federal Emission Standards (Baseline)

FWA proposes using limited operation and ensuring EUs meet the applicable federal emission guidelines to control NOx emissions from the large diesel-fired engines. FWA EUs 11, 12, and 13 will continue to be limited to 600 hours combined per 12 consecutive month period.

DEC finds that the BACT for NOx emissions from the large diesel-fired engines is as follows:

- Limit combined operation of FWA EUs 11, 12, and 13 to 600 hours per year;
- Limit DU EU 8 to 500 hours of operation per year;
- NOx emissions from DU EU 8, FWA 50 and 51 shall not exceed 4.8 g/hp-hr;
- NOx emissions from FWA EU 53 shall not exceed 3.0 g/hp-hr;
- NOx emissions from FWA EU 54 shall not exceed 5.75 g/hp-hr;
- NOx emissions from FWA EUs 11 through 13 shall not exceed 10.9 g/hp-hr
- Limit non-emergency operation of FWA EUs 50, 51, 53, and 54 to no more than 100 hours each per year; and
- Maintain good combustion practices by following the manufacturer's maintenance procedures at all times of operation.
- For the engines subject to 40 C.F.R. 60 Subpart IIII, demonstrate compliance with the numerical BACT emission limits by complying with the applicable NOx emission standards in Subpart IIII.

Small Emergency Engines, Fire Pumps, and Generators

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the small internal combustion engines (< 500 hp):

- Limited Operation (94% Control)
- Selective Catalytic Reduction (90% Control)
- Turbo Charger and Aftercooler (6% – 12% Control)
- Good Combustion Practices (Less than 40% Control)
- Federal Emission Standards (Baseline)

FWA proposes using good combustion practices and ensuring EUs meet the applicable federal emission guidelines to control NOx emissions from the small diesel-fired engines.

DEC finds that the BACT for NOx emissions from the small diesel-fired engines is as follows:

- Limit non-emergency operation of DU EUs 9, 12, 14, 22, 23, 29a, 30, 31a, 32, 33, 34, 35, 36, FWA EUs 26 through 39, and 55 through 65 to no more than 100 hours each per year;
- For engines manufactured after the applicability dates of 40 C.F.R. 60 Subpart IIII, comply with the applicable NOx emission standards in 40 C.F.R Part 60 Subpart IIII;
- Maintain good combustion practices by following the manufacturer's operating procedures at all times of operation; and
- Demonstrate compliance with the numerical BACT emission limits listed in the following Table 7.7-12 by maintaining records of maintenance procedures conducted in accordance with 40 C.F.R. Subparts 60 and 63, and the EU operating manuals:

Table 7.7-12

Location	EU	Year	Description	Size		Status	BACT Limit		Proposed BACT
DU	9	1988	Generator Engine	353	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	12	2002	Generator Engine	82	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	14	2008	Generator Engine	320	hp	Certified Engine	4.0	g/kW-hr	
DU	22	1989	Generator Engine	35	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	23	2003	Generator Engine	155	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	30	1952	Lift Pump Engine	75	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	32	1955	Lift Pump Engine	75	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	33	1994	Lift Pump Engine	75	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	34	1995	Well Pump Engine	220	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	35	2009	Well Pump Engine	55	hp	Certified Engine	4.7	g/kW-hr	
DU	36	1995	Well Pump Engine	220	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
DU	29a	2014	Lift Pump Engine	74	hp	Certified Engine	4.7	g/kW-hr	
DU	31a	2014	Lift Pump Engine	74	hp	Certified Engine	4.7	g/kW-hr	
FWA	26	2012	QSB7-G3 NR3	295	hp	Certified Engine	4.0	g/kW-hr	
FWA	27	2009	4024HF285B	67	hp	Certified Engine	4.7	g/kW-hr	
FWA	28	2007	CAT C9 GENSET	398	hp	Certified Engine	4.0	g/kW-hr	
FWA	29	ND	TM30UCM	47	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	Limited Operation for Non-Emergency Use (100 hours per year each)
FWA	30	2007	JW64-UF30	275	hp	Certified Engine	4.0	g/kW-hr	
FWA	31	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	32	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	Good Combustion Practices
FWA	33	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	34	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	35	1977	N-855-F	240	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	36	1977	N-855-F	240	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	37	2005	JU4H-UF40	94	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	38	1996	PDFP-06YT	120	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	39	1996	PDFP-06YT	120	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	55	2005	Generator Engine	212	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	56	2007	Generator Engine	176	hp	Permit condition 23.1c	6.9	g/hp-hr	
FWA	57	2005	Generator Engine	212	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	58	2007	Generator Engine	71	hp	Certified Engine	7.5	g/kW-hr	
FWA	59	1976	Generator Engine	35	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	60	2001	Generator Engine	95	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	61	1993	Generator Engine	50	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	
FWA	62	2011	Generator Engine	18	hp	Certified Engine	7.5	g/kW-hr	
FWA	63	2003	Generator Engine	68	hp	AP-42, Table 3.3-1	0.031	lb/hp-hr	

Location	EU	Year	Description	Size		Status	BACT Limit		Proposed BACT
FWA	64	2010	Generator Engine	274	hp	Certified Engine	4.0	g/kW-hr	
FWA	65	2010	Generator Engine	274	hp	Certified Engine	4.0	g/kW-hr	

7.7.8.3.2 $PM_{2.5}$ Controls for Fort Wainwright

Coal-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the industrial coal-fired boilers:

- Fabric Filters (99.9% Control)
- Electrostatic Precipitator (99.6% Control)
- Wet Scrubber (50 – 99% Control)
- Cyclone (20 – 70% Control)
- Good Combustion Practices (Less than 40% Control)

FWA currently operates a full stream baghouse (fabric filters) on the coal-fired boilers, which is the most effective control for $PM_{2.5}$ emissions. Therefore, no additional analysis was required for determining BACT for $PM_{2.5}$ emissions.

DEC finds that the BACT for $PM_{2.5}$ emissions from the coal-fired boilers is as follows:

- Operate and maintain a full stream baghouse at all times the units are in operation;
- $PM_{2.5}$ emissions from DU EUs 1 through 6 shall not exceed 0.045 lb/MMBtu over a 3-hour averaging period ($PM_{2.5}$ emission rate from EPA AP-42 Tables 1.1-5 and 1.1-6 for spreader stoker boilers with a baghouse; converted to lb/MMBtu using the typical gross as received heat value of 7,560 Btu/lb and 7 percent ash content of Usibelli coal identified in the coal data sheet at: http://usibelli.com/coal/data-sheet); and
- Conduct an initial performance test to obtain an emission rate.

Diesel-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the diesel-fired boilers:

- Scrubber (50 – 99% Control)
- Limited Operation (94% Control)
- Good Combustion Practices (Less than 40% Control)

FWA proposes maintaining good combustion practices in all diesel-fired boilers as BACT for $PM_{2.5}$ emissions. DEC reviewed FWA's proposal and finds that the 27 diesel fired boilers have a combined PTE of less than one tpy of $PM_{2.5}$ emissions. At one tpy, the cost effectiveness in terms of dollars per ton for add-on pollution control for these units is economically infeasible.

DEC determined that BACT for $PM_{2.5}$ emissions from the diesel-fired boilers is as follows:

- $PM_{2.5}$ emissions from the diesel-fired boilers shall not exceed 0.012 lb/MMBtu averaged over a 3-hour period, with the exception of the waste fuel boilers which must comply with the State particulate matter emissions standard of 0.05 grains per dry standard cubic foot under 18 AAC 50.055(b)(1);
- Limit combined operation of FWA EUs 8, 9, and 10 to 600 hours per year; and
- Maintain good combustion practices by following the manufacturer's maintenance procedures at all times of operation.

Large Diesel-Fired Engines, Fire Pumps, and Generators

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the large diesel-fired engines (≥ 500 hp):

- Limited Operation (94% Control)
- Diesel Particulate Filter (85% Control)
- Good Combustion Practices (Less than 40% Control)
- Diesel Oxidation Catalyst (30% Control)
- Low Ash Diesel (25% Control)
- Positive Crankcase Ventilation (10% Control)
- Federal Emission Standards (Baseline)

FWA proposes using limited operation and firing ULSD to control $PM_{2.5}$ emissions from the large diesel-fired engines. FWA EUs 11, 12, and 13 will continue to be limited to 600 hours combined per 12 consecutive month period.

DEC finds that the BACT for $PM_{2.5}$ emissions from the large diesel-fired engines is as follows:

- Limit combined operation of FWA EUs 11, 12, and 13 to 600 hours per year;
- Limit operation of DU EU 8 to 500 hours per year;
- $PM_{2.5}$ emissions from DU EU 8, FWA EUs 50, 51, and 53 shall not exceed 0.15 g/hp-hr;
- $PM_{2.5}$ emissions from FWA EUs 11 through 13 and 54 shall not exceed 0.32 g/hp-hr;
- Limit non-emergency operation of FWA EUs 50, 51, 53, and 54 to no more than 100 hours each per year;
- Combust only ULSD; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Small Emergency Engines, Fire Pumps, and Generators

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the small internal combustion engines (< 500 hp):

- Limited Operation (94% Control)
- Diesel Particulate Filter (DPF) (60% – 90%% Control)
- Diesel Oxidation Catalyst (40% Control)
- Low Ash/Sulfur Diesel (25% Control)

- Good Combustion Practices (Less than 40% Control)
- Federal Emission Standards (Baseline)

FWA proposes combusting ULSD, using good combustion practices, and meeting federal standards to control $PM_{2.5}$ emissions from the small diesel-fired engines.

DEC finds that the BACT for $PM_{2.5}$ emissions from the small diesel-fired engines is as follows:

- Combust only ULSD;
- Limit non-emergency operation of DU EUs 9, 12, 14, 22, 23, 29a, 30, 31a, 32, 33, 34, 35, 36, FWA EUs 26 through 39, and 55 through 65 to no more than 100 hours each per year;
- For engines manufactured after the applicability dates of 40 C.F.R. 60 Subpart IIII, comply with the applicable particulate matter emission standards in 40 C.F.R 60 Subpart IIII;
- Maintain good combustion practices by following the manufacturer's operating procedures at all times of operation; and
- Demonstrate compliance with the numerical BACT emission limits listed in the following Table 7.7-13 by maintaining records of maintenance procedures conducted in accordance with 40 C.F.R. Subparts 60 and 63, and the EU operating manuals:

Table 7.7-13

Location	EU	Year	Description	Size		Status	BACT Limit		Proposed BACT
DU	9	1988	Generator Engine	353	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	Limited Operation for Non-Emergency Use (100 hours per year each) Good Combustion Practices Combust ULSD
DU	14	2008	Generator Engine	320	hp	Certified Engine	0.2	g/kW-hr	
DU	22	1989	Generator Engine	35	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
DU	23	2003	Generator Engine	155	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
DU	30	1952	Lift Pump Engine	75	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
DU	32	1955	Lift Pump Engine	75	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
DU	33	1994	Lift Pump Engine	75	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
DU	34	1995	Well Pump Engine	220	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
DU	35	2009	Well Pump Engine	55	hp	Certified Engine	0.3	g/hp-hr	
DU	36	1995	Well Pump Engine	220	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
DU	29a	2014	Lift Pump Engine	74	hp	Certified Engine	0.3	g/kW-hr	
DU	31a	2014	Lift Pump Engine	74	hp	Certified Engine	0.3	g/kW-hr	
FWA	26	2012	QSB7-G3 NR3	295	hp	Certified Engine	0.02	g/kW-hr	
FWA	27	2009	4024HF285B	67	hp	Certified Engine	0.3	g/kW-hr	
FWA	28	2007	CAT C9 GENSET	398	hp	Certified Engine	0.2	g/kW-hr	
FWA	29	ND	TM30UCM	47	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	30	2007	JW64-UF30	275	hp	Certified Engine	0.2	g/kW-hr	
FWA	31	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	32	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	33	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	34	1994	DDFP-04AT	235	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	35	1977	N-855-F	240	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	36	1977	N-855-F	240	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	37	2005	JU4H-UF40	94	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	38	1996	PDFP-06YT	120	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	

Location	EU	Year	Description	Size		Status	BACT Limit		Proposed BACT
FWA	39	1996	PDFP-06YT	120	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	52	2002	Generator Engine	82	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	55	2005	Generator Engine	212	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	56	2007	Generator Engine	176	hp	Permit condition 23.1c	0.40	g/hp-hr	
FWA	57	2005	Generator Engine	212	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	58	2007	Generator Engine	71	hp	Certified Engine	0.4	g/kW-hr	
FWA	59	1976	Generator Engine	35	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	60	2001	Generator Engine	95	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	61	1993	Generator Engine	50	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	62	2011	Generator Engine	18	hp	Certified Engine	0.4	g/kW-hr	
FWA	63	2003	Generator Engine	68	hp	AP-42, Table 3.3-1	2.20 E-3	lb/hp-hr	
FWA	64	2010	Generator Engine	274	hp	Certified Engine	0.2	g/kW-hr	
FWA	65	2010	Generator Engine	274	hp	Certified Engine	0.2	g/kW-hr	

Material Handling

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the material handling equipment:

- Fabric Filters (50 – 99% Control)
- Enclosures (50 – 99% Control)
- Wet Scrubbers (50 – 99% Control)
- Electrostatic Precipitator (>90% Control)
- Cyclone (20% – 70% Control)
- Suppressants (less than 90% Control)
- Vents (less than 90% Control)

FWA proposes limiting the North Coal Handling Dust Collector (EU 7c) to no more than 200 hours per year, operating the material handling EUs 7a – 7c, 51a, and 51b in an enclosed environment and the emergency coal storage pile EU 52 with chemical stabilizers, wind fencing, covered haul vehicles, watering, and wind awareness to control $PM_{2.5}$ emissions.

DEC finds that the BACT for $PM_{2.5}$ emissions from the material handling equipment is as follows:

- $PM_{2.5}$ emissions from the material handling equipment EUs 7a – 7c, 51a, and 51b shall be controlled by operating and maintaining fabric filters at all times the units are in operation;
- $PM_{2.5}$ emissions from DU EU 7a shall not exceed 0.0025 gr/dscf;
- $PM_{2.5}$ emissions from DU EUs 7b, 7c, 51a, and 51 b shall not exceed 0.02 gr/dscf;
- $PM_{2.5}$ emissions from DU EU 52 shall not exceed 1.42 tpy. Continuous compliance with the $PM_{2.5}$ emissions limit shall be demonstrated by complying with the fugitive dust control plan identified in the applicable operating permit issued to the source in accordance with 18 AAC 50 and AS 46.14; and
- Compliance with the $PM_{2.5}$ emission rates for the material handling units shall be demonstrated by following the fugitive dust control plan and the manufacturer's operating and maintenance procedures at all times of operation.

7.7.8.3.3 SO_2 Controls for Fort Wainwright

Coal-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the industrial coal-fired boilers:

- Wet Scrubbers (99% Control)
- Spray Dry Absorbers (SDA) (90% Control)
- Dry Sorbent Injection (DSI) (50 – 80% Control)
- Low Sulfur Coal (30% Control)
- Good Combustion Practices (Less than 40% Control)

FWA provided economic cost analyses for the installation of wet scrubbers, SDA, and DSI controls on all six boilers combined. FWA contends that its economic analyses indicate the level of SO_2 reduction does not justify the use of SO_2 control technologies for the coal-fired boilers based on the excessive cost per ton of SO_2 removed per year. FWA proposes using good combustion practices, limited operation (no more than 300,000 tons of coal per year), and burning low sulfur coal as BACT for the coal-fired boilers.

DEC also calculated the cost effectiveness for the installation of wet scrubbers, SDA, and DSI controls on all six boilers combined. DEC's calculation used the cost development methodology prepared by Sargent & Lundy for EPA for wet scrubbers, SDA, and DSI. DEC assumed a potential to emit of 1,476 tpy for the six coal-fired boilers combined or 246 tpy individually (calculated using the existing permit limit of 336,000 tons of coal per year combined), a baseline emission rate of 0.58 lb SO_2/MMBtu (AP-42 Table 1.1-3 for spreader stoker boilers and 0.25% sulfur content by weight), a retrofit factor of 1.5 for difficult retrofits, a SO_2 removal efficiency of 99%, 90%, and 83% for wet scrubbers, SDA, and DSI respectively, an interest rate of 5.0% (current bank prime interest rate), and a 15 year equipment life. The SO_2 removal cost for a wet scrubber, SDA, and DSI for the coal-fired boilers were calculated at $16,356/ton, $16,748/ton, and $11,383/ton respectively.

DEC concluded that the level of SO_2 reduction justifies the use of a DSI as BACT to control SO_2 emissions from the six coal-fired boilers, and emissions shall not exceed 0.12 lb/MMBtu averaged over a 3-hour period. DEC selected this BACT limit after evaluating existing emission limits in the RBLC database for coal-fired boilers, taking into account previous source test data from coal-fired boilers in Alaska and actual emissions data from other sources employing similar types of controls, using site specific vendor quotes provided by Amerair Industries LLC. and Black & Veatch Corporation, and in-line with EPA's pollution control fact sheets while keeping in mind that BACT limits must be achievable at all times. Additionally, the existing permit limit of 336,000 tons of coal per year for the six coal-fired boilers combined is carried forward as a BACT limit for SO_2 emissions.

Diesel-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the diesel-fired boilers:

- Ultra-Low Sulfur Diesel (ULSD) (99% Control)
- Limited Operation (94% Control)

- Good Combustion Practices (Less than 40% Control)

FWA proposes limiting FWA EUs 8, 9, and 10 to 600 hours combined per 12 consecutive month period, as well as firing ULSD and maintaining good combustion practices in all diesel-fired boilers to control SO_2 emissions.

DEC finds that the BACT for SO_2 emissions from the diesel-fired boilers is as follows:

- SO_2 emissions from the diesel-fired boilers shall be controlled by only combusting ULSD, with the exception of the waste fuel boilers;
- Combined operating limit of 600 hours per year for FWA EUs 8, 9, and 10; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Large Diesel-Fired Engines, Fire Pumps, and Generators

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the large diesel-fired engines (≥ 500 hp):

- Ultra-Low Sulfur Diesel (ULSD) (99% Control)
- Limited Operation (94% Control)
- Good Combustion Practices (Less than 40% Control)
- Federal Emission Standards (Baseline)

FWA proposes using limited operation and firing ULSD to control SO_2 emissions from the large diesel-fired engines. FWA EUs 11, 12, and 13 will continue to be limited to 600 hours combined per 12 consecutive month period.

DEC finds that the BACT for SO_2 emissions from the large diesel-fired engines is as follows:

- SO_2 emissions from DU EU 8, and FWA EUs 11, 12, 13, 50, 51, 53, and 54 shall be controlled by only combusting ULSD;
- Limit operation of DU EU 8 to 500 hours per year;
- Combined operating limit of 600 hours per year for FWA EUs 11, 12, and 13;
- Limit non-emergency operation of FWA EUs 50, 51, 53, and 54 to no more than 100 hours each per year; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Small Emergency Engines, Fire Pumps, and Generators

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the small internal combustion engines (< 500 hp):

- Limited Operation (94% Control)
- Selective Catalytic Reduction (90% Control)
- Good Combustion Practices (Less than 40% Control)
- Turbo Charger and Aftercooler (6% – 12% Control)
- Federal Emission Standards (Baseline)

FWA proposes firing ULSD and using good combustion practices to control SO_2 emissions from the small diesel-fired engines.

DEC finds that the BACT for SO_2 emissions from the small diesel-fired engines is as follows:

- Limit non-emergency operation of DU EUs 9, 12, 14, 22, 23, 29a, 30, 31a, 32, 33, 34, 35, 36, FWA EUs 26 through 39, and 55 through 65 to no more than 100 hours each per year;
- Combust only ULSD; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

7.7.8.3.4 DEC BACT and SIP Findings for Fort Wainwright

FINDING: On or before June 9, 2020, DU shall submit a Title I permit application to DEC that includes a BACT requirement to install and operate a DSI pollution control system on the coal-fired boilers at CHPP no later than October 1, 2023.

Continuing thereafter, DU shall continuously operate such DSI control system so that it achieves and maintains a 3-hour average SO_2 emission rate of no greater than 0.12 lb/MMBtu. The DSI control system shall be operated at all times the power plant is in operation, so as to minimize emissions to the greatest extent practicable, consistent with the technological limitations, manufacturers' specifications, and good engineering and maintenance practices for such equipment and the CHPP.

The Title I permit will establish emission reduction requirements, control device installation schedules, and emission limits for the coal-fired boilers. The permit will include the limitations and requirements permanently. A summary of the permit limits and conditions is as follows:

- On or before June 9, 2021, DU shall limit the gross as received sulfur content of coal to no greater than 0.25% S by weight.
- On or before June 9, 2021, DU shall submit a Title I permit application to DEC that requires them to install and operate a DSI pollution control system on the coal-fired boilers at CHPP effective no later than October 1, 2023.
- On or before June 9, 2021, DU and FWA shall limit the sulfur content of fuel oil combusted in engines, generators, fire pumps, and fuel oil boilers to no greater than 15 ppmw (ULSD).
- DEC intends to issue the minor permit and incorporate the Title I requirements into the operating permit within one year of receiving a complete application.
- On or before October 1, 2023, DU shall install and operate a DSI pollution control system on the coal-fired boilers at CHPP.
- The SO_2 BACT limit for EUs 1 through 6 shall not exceed 0.12 lb/MMBtu averaged over a 3-hour period.

Future Considerations: ADEC understands that the U.S. Army Garrison Alaska at Fort Wainwright is conducting an environmental impact review under the National Environmental Policy Act review for heat and electrical upgrades to the facility. If as an outcome of the EIS

process, the Army decides to move forward with an alternative that replaces the current CHPP units prior to installation of the DSI pollution control system there may be opportunity through SIP revisions for DEC to work with FWA and DU to reflect that future change and any decommissioning of existing emission units.

7.7.8.4 Zehnder Facility

The following summary table outlines the overarching decision points for the Zehnder Facility, including the owner requested limits (ORLs) that GVEA proposed to limit emissions from the source to less than 70 tons per year, eliminating it as a major source of SO_2 emissions in the $PM_{2.5}$ Serious nonattainment area. The table also includes timelines for implementation into federally enforceable permit conditions. The Appendix to Section III.D.7.7 contains the documentation supporting the department's BACT determinations.

Table 7.7-14
DEC BACT and SIP Findings Summary Table for Zehnder Facility

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
EUs 1 and 2 - Fuel Oil-Fired Simple Cycle Gas Turbines - 268 MMBtu/hr (each)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.012 lb/MMBtu (3-hr avg.)	Low Ash Fuel and Good Combustion Practices	Existing
SO_2	< 70 tpy Facility Wide ORL	N/A	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
	1,000 ppmw sulfur in fuel	BACM Measure: 18 AAC 50.078	September 1, 2022
EUs 3 and 4 - Diesel-Fired Emergency Generators 28 MMBtu/hr (each)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.32 g/hp-hr	Good Combustion Practices and Limited Operation	Existing
SO_2	< 70 tpy Facility Wide ORL	N/A	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
	1,000 ppmw sulfur in fuel	BACM Measure: 18 AAC 50.078	September 1, 2022
EUs 10 and 11 - Diesel-Fired Boilers 1.7 MMBtu/hr (each)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.012 lb/MMBtu	Good Combustion Practices and 40 C.F.R. 63 Subpart JJJJJJ	Existing
SO_2	< 70 tpy Facility Wide ORL	N/A	Title I Permit App. by June 9, 2020

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
			Effective no later than June 9, 2021
	1,000 ppmw sulfur in fuel	BACM Measure: 18 AAC 50.078	September 1, 2022

* Assumes precursor demonstration approved by EPA

Background Information for Zehnder Facility

The Zehnder Facility (Zehnder) is an electric generating facility that combusts distillate fuel in combustion turbines to provide power to the Golden Valley Electric Association (GVEA) grid. The power plant contains two fuel oil-fired simple cycle gas combustion turbines and two diesel-fired generators (electro-motive diesels) used for emergency power and to serve as black start engines for the GVEA generation system. The primary fuel is stored in two 50,000 gallon aboveground storage tanks. Turbine startup fuel and electro-motive diesels primary fuel is stored in a 12,000 gallon above ground storage tank.

In letters dated November 16, 2017, and September 10, 2018, DEC requested additional information to assist it in making a legally and practicably enforceable BACT determination for the source. Both DEC and EPA comments were enclosed in the letters. GVEA responded to the first and second information request on December 20, 2017, and November 28, 2018 respectively. DEC reviewed these responses and incorporated the additional information into its BACT Determinations as warranted.

On March 22, 2018, DEC released a draft of the possible concepts and potential approaches for development of the FNSB Nonattainment Area Serious State Implementation Plan that included DEC's preliminary BACT Determinations. The BACT Determination for the Zehnder Facility evaluated potential controls to reduce NOx, $PM_{2.5}$, and SO_2 emissions from its simple cycle gas turbines, large diesel-fired engines, and diesel-fired boilers.

7.7.8.4.1 NOx Control Analysis for Zehnder Facility

NOx Precursor Demonstration

The NOx controls proposed in this section are not planned to be implemented. The optional precursor demonstration (as allowed under 40 C.F.R. § 51.1006) for the precursor gas NOx for point sources illustrates that NOx controls are not needed. DEC has included with this Serious SIP, a final precursor demonstration as justification not to require NOx controls.

The $PM_{2.5}$ NAAQS Final SIP Requirements Rule states if the state determines through a precursor demonstration that controls for a precursor gas are not needed for attaining the standard, then the controls identified as BACT/BACM or Most Stringent Measure for the precursor gas are not required to be implemented. Final approval of the precursor demonstration is at the time of the Serious SIP approval.

Simple Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the simple cycle gas turbines:

- Selective Catalytic Reduction and Water Injection (95% Control)
- Selective Catalytic Reduction (90% Control)
- Water Injection (70% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis of the control technologies available for the fuel oil-fired simple cycle turbines to demonstrate that the use of water injection with SCR, SCR, or water injection in conjunction with limited operation is not economically feasible on these units.

DEC revised the cost analyses provided by GVEA for the installation of SCR and water injection using the unrestricted potential to emit from the fuel oil-fired simple cycle turbines, a baseline emission rate of 0.88 lb NOx/MMBtu, a NOx removal efficiency of 95% for SCR and water injection, an interest rate of 5.0% (current bank prime interest rate), and a 20 year equipment life. DEC concluded the level of NOx reduction justifies the installation of SCR and water injection as BACT for the fuel oil-fired simple cycle gas turbines at $3,830/ton.

DEC finds that the BACT for NOx emissions from the fuel oil-fired simple cycle gas turbines is as follows:

- NOx emissions from EUs 1 and 2 shall be controlled by operating and maintaining selective catalytic reduction in conjunction with water injection at all times the units are in operation;
- NOx emissions from EUs 1 & 2 shall not exceed 0.044 lb/MMBtu over a 3-hour averaging period;
- Initial compliance with the proposed NOx emission limit will be demonstrated by conducting a performance test to obtain an emission rate; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Large Diesel-Fired Engines

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the large diesel-fired engines:

- Limited Operation (94% Control)
- Selective Catalytic Reduction (90% Control)
- Good Combustion Practices (Less than 40% Control)
- Federal Emission Standards (Baseline)
- Turbocharger and Aftercooler* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA proposed the following as BACT for NOx emissions from the large diesel-fired engines: NOx emissions from the operation of the diesel-fired engines shall be controlled with turbocharger and aftercooler; NOx emissions from the operation of the diesel-fired engines shall not exceed 0.024 lb/hp-hr over a 4-hour averaging period; and limited operation.

DEC finds that the BACT for NOx emissions from the large diesel-fired engines is as follows:

- NOx emissions from the operation of the diesel-fired engines will be controlled with turbocharger and aftercooler;
- Limit non-emergency operation of EUs 3 and 4 to no more than 100 hours per year each;
- NOx emissions from 3 and 4 shall not exceed 10.9 g/hp-hr over a 3-hour averaging period;
- Demonstrate compliance with the numerical BACT emission limit by complying with 40 C.F.R 63 Subpart ZZZZ; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Diesel-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the diesel-fired boilers:

- Low NOx Burners (40% - 60% Control)
- Good Combustion Practices (Less than 40% Control)

GVEA provided an economic analysis for the installation of low NOx burners per diesel-fired boiler. GVEA contends that the economic analysis indicates the level of NOx reduction does not justify installing low NOx burners on the diesel-fired boilers based on the excessive cost per ton of NOx removal per year.

DEC reviewed GVEA's proposal and finds that the two diesel-fired boilers have a combined potential to emit (PTE) of less than three tons per year (tpy) for NOx based on continuous operation of 8,760 hours per year. At three tpy, the cost effectiveness in terms of dollars per ton for add-on pollution control for these units is economically infeasible.

DEC finds that the BACT for NOx emissions from the diesel-fired boilers is as follows:

- NOx emissions from the diesel-fired boilers shall not exceed 0.15 lb/MMBtu;
- Demonstrate compliance with the numerical BACT emission limit by complying with 40 C.F.R 63 Subpart JJJJJJ; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

7.7.8.4.2 $PM_{2.5}$ Control Analysis for Zehnder Facility

Simple Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the simple cycle gas turbines:

- Good Combustion Practices (Less than 40% Control)
- Low Ash Fuel* (0% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA proposed the following as BACT for $PM_{2.5}$ emissions from the fuel oil-fired simple cycle gas turbines: $PM_{2.5}$ emissions from EUs 1 and 2 shall not exceed 0.012 lb/MMBtu over a 4-hour averaging period; and maintaining good combustion practices.

DEC finds that the BACT for $PM_{2.5}$ emissions from the fuel oil-fired simple cycle gas turbines is as follows:

- Combust only low ash fuel;
- $PM_{2.5}$ emissions from EUs 1 & 2 shall not exceed 0.012 lb/MMBtu[5] over a 3-hour averaging period;
- Initial compliance with the proposed $PM_{2.5}$ emission limit will be demonstrated by conducting a performance test to obtain an emission rate; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Large Diesel-Fired Engines

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the large diesel-fired engines:

- Limited Operation (94% Control)
- Diesel Particulate Filters (85% Control)
- Good Combustion Practices (Less than 40% Control)
- Diesel Oxidation Catalyst (30% Control)
- Low Ash Diesel (25% Control)
- Positive Crankcase Ventilation (10% Control)
- Federal Emission Standards (Baseline)

GVEA proposes limited operation as BACT for the large diesel-fired engines to no more than 500 hours per year each for maintenance checks and readiness testing.

5 Table 3.1-2a of US EPA's AP-42 Emission Factors. https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf

DEC reviewed GVEA's proposal finds that $PM_{2.5}$ emissions from the large diesel-fired engines can also be controlled by good combustion practices.

DEC finds that the BACT for $PM_{2.5}$ emissions from the large diesel-fired engines is as follows:

- Limit non-emergency operation of the large diesel-fired engines to no more than 100 hours per year each;
- $PM_{2.5}$ emissions from EUs 3 and 4 shall not exceed 0.32 g/hp-hr over a 3-hour averaging period;
- Demonstrate compliance with the numerical BACT emission limit by complying with 40 C.F.R 63 Subpart ZZZZ; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Diesel-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the diesel-fired boilers:

- Wet Scrubbers (50% - 99% Control)
- Good Combustion Practices (Less than 40% Control)

GVEA proposes good combustion practices as BACT for the diesel-fired boilers. DEC finds that the two diesel-fired boilers have a combined potential to emit (PTE) of less than two tpy for $PM_{2.5}$ based on continuous operation of 8,760 hours per year. At two tpy, the cost effectiveness in terms of dollars per ton for add-on pollution control for these units is economically infeasible.

DEC finds that BACT for $PM_{2.5}$ emissions from the diesel-fired boilers is as follows:

- $PM_{2.5}$ emissions shall not exceed 0.012 lb/MMBtu[6] over a 3-hour averaging period;
- Demonstrate compliance with the numerical BACT emission limit by complying with 40 C.F.R 63 Subpart JJJJJJ; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

7.7.8.4.3 SO_2 Control Analysis for Zehnder

Source Wide SO_2 Limit to Avoid BACT Requirements

GVEA provided updated and supplemental information in an alternative BACT proposal submitted on November 28, 2018. GVEA proposed to limit emissions from the Zehnder Facility to less than 70 tons per year in place of BACT for SO_2, eliminating the Zehnder Facility as a major source of SO_2. The Department has accepted this approach and is requiring GVEA to

[6] Emission factor from AP-42 Table's 1.3-2 (total condensable particulate matter from No. 2 oil, 1.3 lb/1,000 gal) and 1.3-6 (PM-2.5 size-specific factor from distillate oil, 0.25 lb/1,000 gal) converted to lb/MMBtu.

submit a Title I permit application no later than June 9, 2020 limiting the potential to emit of the Zehnder Facility to less than 70 tons per year.

Once the Zehnder Facility's SO_2 limit goes into effect, the facility will not be considered a major stationary source for SO_2 emissions subject to BACT limits. Instead the Zehnder Facility will be subject to the BACM measures. This includes the requirement contained in 18 AAC 50.078(b), which states, "After September 1, 2022, only fuel oil, containing no more than 1,000 parts per million sulfur, may be sold or purchased for use in fuel oil-fired equipment, including space heating devices. This subsection does not apply to major stationary sources subject to Best Available Control Technology determination or to diesel-fired equipment or vehicles subject to more stringent federal diesel fuel sulfur requirements."

Simple Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the simple cycle gas turbines:

- Ultra-Low Sulfur Diesel (99.7% Control)
- Low Sulfur Fuel (93% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis of the control technologies available for the fuel oil-fired simple cycle turbines to demonstrate that switching the fuel combusted in the simple cycle gas turbines to ultra-low sulfur diesel is not economically feasible on these units.

DEC revised the cost analyses provided by GVEA for the use of ultra-low sulfur diesel using the existing 580 tons of sulfur per year limit for the facility, an interest rate of 5.0% (current bank prime interest rate), and a 20 year equipment life. Additionally, the Department reviewed the cost information provided by GVEA to appropriately evaluate the total capital investment of installing two new 1.5 million gallon ULSD storage tanks at GVEA's North Pole Facility. DEC concluded the level of SO_2 reduction justifies the use of ultra-low sulfur diesel as BACT for the fuel oil-fired simple cycle gas turbines at $8,753/ton.

DEC finds that the BACT for SO_2 emissions from the simple cycle gas turbines is as follows:

- SO_2 emissions from EUs 1 and 2 shall be controlled by limiting the sulfur content of fuel combusted in the turbines to no more than 0.0015 percent by weight;
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation; and
- Compliance with the proposed fuel sulfur content limit will be demonstrated with fuel shipment receipts and/or fuel test results for sulfur content.

Large Diesel-Fired Engines

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the large diesel-fired engines:

- Ultra-Low Sulfur Diesel (99% Control)
- Limited Operation (94% Control)
- Good Combustion Practices (Less than 40% Control)
- Federal Emission Standards (Baseline)

GVEA provided an economic analysis of the control technologies available for the large diesel-fired engine to demonstrate that the use of ULSD with limited operation is not economically feasible on these units.

GVEA contends that the economic analysis indicates the level of SO_2 reduction does not justify the use of ULSD for the large diesel-fired engines based on the excessive cost per ton of SO_2 removed per year.

GVEA proposed the following as BACT for SO_2 emissions from the diesel-fired engines: SO_2 emissions from the operation of the diesel fired engines will be controlled with good combustion practices; and limit the sulfur content of fuel combusted in EUs 3 and 4 to no more than 0.5 percent sulfur by weight.

DEC reviewed GVEA's proposal for EUs 3 and 4 and finds that ULSD is an economically feasible control technology for large diesel-fired engines at $7,768/ton. DEC does not agree with some of the assumptions provided in GVEA's cost analysis that cause an overestimation of the cost effectiveness. However, since this overestimation is still cost effective, DEC did not revise the cost analysis. DEC further finds that SO_2 emissions from the large diesel-fired engines can additionally be controlled by limiting the use of the units during non-emergency operation.

DEC finds that BACT for SO_2 emissions from the large diesel-fired engines is as follows:

- SO_2 emissions from EUs 3 and 4 shall be controlled by combusting ULSD at all time the units are in operation;
- Limit non-emergency operation of the large diesel-fired engines to no more than 100 hours per year each;
- Maintain good combustion practices by following the manufacturer's operating maintenance procedures at all times of operation; and
- Compliance with the proposed fuel sulfur content limit will be demonstrated with fuel shipment receipts and/or fuel test results for sulfur content.

Diesel-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the diesel-fired boilers:

- Ultra-Low Sulfur Diesel (99% Control)

- Good Combustion Practices (Less than 40% Control)

GVEA proposed that BACT to control SO_2 emissions for the diesel-fired boilers shall be to combust only ULSD in the diesel-fired boilers.

DEC reviewed GVEA's proposal and finds that SO_2 emissions from the diesel-fired boilers can additionally be controlled with good combustion practices.

DEC finds that BACT for SO_2 emissions from the diesel-fired boilers is as follows:

- SO_2 emissions from EUs 10 and 11 shall be controlled by only combusting ULSD; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation; and
- Compliance with the proposed fuel sulfur content limit will be demonstrated with fuel shipment receipts and/or fuel test results for sulfur content.

7.7.8.4.4 Additional Information

For more information see Appendix III.D.7.7 for GVEA's December 22, 2017 response to DEC's information requests that included the following enclosures:

1. Response to request for additional information for the Best Available Control Technology Technical Memorandum from Golden Valley Electric Association (GVEA) for the North Pole Power Plant and Zehnder Facility.
2. Submittal to accompany CONFIDENTIALITY OF RECORDS APPLICATION AND CERTIFICATION and response to request for additional Information for the Best Available Control Technology Technical Memorandum from Golden Valley Electric Association (GVEA) for the North Pole Power Plant and Zehnder Facility.
3. Associated Microsoft Excel Spreadsheets (10 files)

For more information see Appendix III.D.7.07 for GVEA's November 28, 2018 Proposed BACT Alternatives Letter that included the following enclosures:

1. Attachment 1 - North Pole BACT Section 1 Tables
2. Attachment 2 - Technical Memo from PDC Regarding Bulk Fuel Storage
3. Attachment 3 - Leidos Strategic Fuel Evaluation
4. Attachment 4 - January 2017 through October 2018 Fuel Prices
5. Attachment 5 - Updated Cost Effectiveness Tables North Pole and Zehnder
6. Attachment 6 - Tables 5-4a and 5-5a, North Pole EU ID 1 and 2 Cost Effectiveness with Selective use of No. 1 HSD
7. Attachment 7 - Zehnder FY2019 Assessable Emissions Summary
8. Attachment 8 - House Freeze Up Time Estimates.
9. DVD
10. Associated Microsoft Excel Spreadsheets (4 files)

7.7.8.4.5 DEC BACT and SIP Findings for GVEA's Zehnder Facility

FINDING: On or before June 9, 2020, GVEA shall submit a Title I permit application to DEC limiting the PTE for SO_2 emissions from the Zehnder Facility to less than 70 tons per year.

Once the Zehnder Facility's SO_2 limit goes into effect, the facility will not be considered a major stationary source for SO_2 emissions subject to BACT limits. Instead the Zehnder Facility will be subject to the BACM measures. This includes the requirement contained in 18 AAC 50.078(b), which states, "After September 1, 2022, only fuel oil, containing no more than 1,000 parts per million sulfur, may be sold or purchased for use in fuel oil-fired equipment, including space heating devices. This subsection does not apply to major stationary sources subject to Best Available Control Technology determination or to diesel-fired equipment or vehicles subject to more stringent federal diesel fuel sulfur requirements."

Future Considerations:
GVEA is also exploring options that may assist the Interior Gas Utility (IGU) in providing economical natural gas to the Fairbanks area. If feasible, GVEA may be able to implement a fuel switch to natural gas for some emission units, which could help stabilize demand, or help reach some economies of scale for gas supply. Regarding the commercial availability of natural gas in Fairbanks, the term 'available' is used in Step 2 of the top-down BACT approach to refer to whether the technology (including fuel type) can be obtained by through commercial channels or is otherwise available within the common sense meaning of the term. The question of availability for purposes of BACT is a practical, fact determination, using conventional notions of whether a technology can be put into use (i.e., GVEA should evaluate whether natural gas can be obtained and used in each EU at the Zehnder Facility).

7.7.8.5 North Pole Power Plant

The following summary table outlines the overarching decision points for the North Pole Power Plant, including the BACT controls, numerical emission limits, and timelines for implementation into federally enforceable permit conditions. The Appendix to Section III.D.7.7 contains the documentation supporting the department's BACT determinations.

Table 7.7-15
DEC BACT and SIP Findings Summary Table for North Pole Power Plant

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
EUs 1 and 2 - Fuel Oil-Fired Simple Cycle Gas Turbines - 672 MMBtu/hr (each)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.012 lb/MMBtu (3-hr avg.)	Low Ash Fuel, Limited Operation, and Good Combustion Practices	Existing
SO_2	1,000 ppmw sulfur deliveries fuel on curtailment days	Certified Statement or Approved Analysis of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than October 1, 2020

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
	15 ppmw sulfur in fuel October 1 – March 31 (natural gas optional)	Certified Statement or Approved Analysis of Sulfur Content	Title I Permit App. by June 9, 2022 Effective no later than October 1, 2023
EUs 5 and 6 - Combined Cycle Gas Turbines - 455 MMBtu/hr (each)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.012 lb/MMBtu (3-hr avg.)	Low Ash Fuel, Limited Operation, and Good Combustion Practices	Existing
SO_2	50 ppmw sulfur in fuel (except during startup) (natural gas optional)	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
EU 7 - Diesel-Fired Emergency Generator - 400 kW			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.32 g/hp-hr (3-hr avg.)	Good Combustion Practices, Positive Crankcase Ventilation, and Limited Operation	Existing
SO_2	0.05 weight percent sulfur in fuel	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
EUs 11 and 12 - Propane-Fired Boilers 5.0 MMBtu/hr (each)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.008 lb/MMBtu (3-hr avg.)	Good Combustion Practices and Propane as Fuel	Existing
SO_2	120 ppmv sulfur in fuel	Certified Statement of Sulfur Content	Existing

* Assumes precursor demonstration approved by EPA

Background Information for North Pole Power Plant

The North Pole Power Plant (North Pole) is an electric generating facility that combusts distillate fuel in combustion turbines to provide power to the Golden Valley Electric Association (GVEA) grid. The power plant contains two fuel oil-fired simple cycle gas combustion turbines, two fuel oil-fired combined cycle gas combustion turbines, one fuel oil-fired emergency generator, and two propane-fired boilers.

In letters dated November 16, 2017, and September 10, 2018, DEC requested additional information to assist it in making a legally and practicably enforceable BACT determination for the source. Both DEC and EPA comments were enclosed in the letters. GVEA responded to the first and second information request on December 20, 2017, and November 28, 2018, respectively. DEC reviewed these responses and incorporated the additional information into its BACT Determination as warranted.

On March 22, 2018, DEC released a draft of the possible concepts and potential approaches for development of the FNSB Nonattainment Area Serious State Implementation Plan that included

DEC's preliminary BACT Determinations. The BACT Determination for the North Pole Power Plant evaluated potential controls to reduce NOx, $PM_{2.5}$, and SO_2 emissions from its simple cycle gas turbines, combined cycle gas turbines, large diesel-fired engines, and propane-fired boilers.

7.7.8.5.1 NOx Controls for North Pole Power Plant

NOx Precursor Demonstration

The NOx controls proposed in this section are not planned to be implemented. The optional precursor demonstration (as allowed under 40 C.F.R. § 51.1006) for the precursor gas NOx for point sources illustrates that NOx controls are not needed. DEC has included with this Serious SIP, a final precursor demonstration as justification not to require NOx controls.

The $PM_{2.5}$ NAAQS Final SIP Requirements Rule states if the state determines through a precursor demonstration that controls for a precursor gas are not needed for attaining the standard, then the controls identified as BACT/BACM or Most Stringent Measure for the precursor gas are not required to be implemented. Final approval of the precursor demonstration is at the time of the Serious SIP approval.

Simple Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the simple cycle gas turbines:

- Selective Catalytic Reduction and Water Injection (95% Control)
- Selective Catalytic Reduction (90% Control)
- Water Injection (70% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis of the control technologies available for the fuel oil-fired simple cycle turbines to demonstrate that the use of water injection with SCR, SCR, or water injection in conjunction with limited operation is not economically feasible on these units.

DEC revised the cost analyses provided by GVEA for the installation of water injection with SCR, SCR, and water injection in conjunction with limited operation. Additionally, the Department revised the NOx removal efficiency to 95%, 90%, and 70% for SCR with water injection, SCR, and water injection respectively, the interest rate was revised to 5.0% (current bank prime interest rate), the equipment life was revised to 20 years. DEC concluded the level of NOx reduction justifies the installation of SCR combined with water injection for the fuel oil-fired simple cycle gas turbines at $4,792/ton and $3,139/ton for EUs 1 and 2 respectively.

DEC finds that the BACT for NOx emissions from the fuel oil-fired simple cycle gas turbines is as follows:

- NOx emissions from EUs 1 and 2 shall be controlled by operating and maintaining selective catalytic reduction and water injection at all times the units are in operation;
- NOx emissions from EU 1 shall not exceed 0.044 lb/MMBtu over a 3-hour averaging period;
- NOx emissions from EU 2 shall not exceed 0.070 lb/MMBtu over a 3-hour averaging period;
- Initial compliance with the proposed NOx emission limit will be demonstrated by conducting a performance test to obtain an emission rate; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Combined Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the combined cycle gas turbines:

- Selective Catalytic Reduction (90% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)
- Water Injection* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis of the installation of SCR on the combined cycle gas turbines to demonstrate that the use of SCR in conjunction with water injection and limited operation is not economically feasible on these units.

The Department revised the cost analysis provided by GVEA for the installation of SCR in conjunction with the existing water injection to reflect limited operation and water injection as the baseline for emissions reduction for the control devices. Additionally, the Department revised the NOx removal efficiency to 90% for SCR combined with the existing Water Injection, an interest rate of 5.0% (current bank prime interest rate), and the equipment life was revised to 20 years. DEC concluded the level of NOx reduction justifies the installation of SCR combined with the existing water injection for the fuel combined cycle gas turbines at $3,877/ton.

DEC finds that the BACT for NOx emissions from the combined cycle gas turbines is as follows:

- NOx emissions from EUs 5 and 6 shall not exceed 0.024 lb/MMBtu over a 3-hour averaging period; and
- NOx emissions from EUs 5 and 6 shall be controlled by operating and maintaining selective catalytic reduction in conjunction with water injection at all times the units are in operation.
- Compliance with the proposed emission limit will be demonstrated by conducting an initial stack test to obtain an emission rate.

Large Diesel-Fired Engine

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the large diesel-fired engines:

- Selective Catalytic Reduction (90% Control)
- Good Combustion Practices (Less than 40% Control)
- Turbocharger and Aftercooler* (0% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis for the installation of SCR on the large diesel-fired engine. GVEA contends that the economic analysis indicates the level of NOx reduction does not justify installing SCR on the large diesel-fired engine based on the excessive cost per ton of NOx removed per year.

DEC reviewed GVEA's proposal for the large diesel-fired engine and finds that SCR is an economically infeasible control technology. DEC does not agree with some of the assumptions provided in GVEA's cost analysis that cause an overestimation of the cost effectiveness. However, since the large diesel engine is limited to 52 hours per year, DEC finds it unnecessary to revise the cost analysis as a decrease in 0.45 tpy of NOx from the large diesel engine will not be cost effective for installing SCR.

DEC finds that BACT for NOx emissions from the large diesel-fired engine is as follows:

- NOx emissions from EU 7 shall be controlled by limiting its operation to no more than 52 hours per 12 month rolling period;
- NOx emissions from EU 7 shall be controlled by operating a turbocharger and aftercooler at all times the unit is operating;
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation; and
- NOx emissions from EU 7 shall not exceed 10.9 g/hp-hr[7] over a 3-hour averaging period.

Propane-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the propane-fired boilers:

- Low NOx Burners (70% Control)
- Flue Gas Recirculation (20% - 25% Control)
- Good Combustion Practices (Less than 40% Control)
- Fuel Type* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

[7] Table 3.4-1 of US EPA's AP-42 Emission Factors. https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf

GVEA provided an economic analysis for the installation of LNB on the propane-fired boilers. GVEA contends that the economic analysis indicates the level of NOx reduction does not justify installing LNBs on the propane-fired boilers based on the excessive cost per ton of NOx removal per year.

DEC revised the cost analysis provided by GVEA for the installation of LNBs on the propane-fired boilers using a 70% control efficiency. Additionally, the interest rate was revised to 5.0% (current bank prime interest rate), and the equipment life was revised to 20 years.

DEC finds that BACT for NOx emissions from the propane-fired boilers is as follows:

- NOx emissions from EUs 11 and 12 shall be controlled by installing low NOx burners in conjunction with using propane as fuel at all times the units are in operation;
- NOx emissions from EUs 11 and 12 shall not exceed 0.045 lb/MMBtu[8] averaged over a 3-hour period; and
- Compliance with the preliminary emission rate limit will be demonstrated with records of maintenance following original equipment manufacturer recommendations for operation and maintenance and periodic measurements of O_2 balance.

7.7.8.5.2 $PM_{2.5}$ Controls for North Pole Power Plant

Simple Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the simple cycle gas turbines:

- Good Combustion Practices (Less than 40% Control)
- Low Ash Fuel* (0% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA proposed the following as BACT for $PM_{2.5}$ emissions from the fuel oil-fired simple cycle gas turbines: $PM_{2.5}$ emissions from EUs 1 and 2 shall be controlled by combusting only low ash fuel; $PM_{2.5}$ emissions shall not exceed 0.012 lb/MMBtu over a 4-hour averaging period; and maintaining good combustion practices.

DEC finds that the BACT for $PM_{2.5}$ emissions from the fuel oil-fired simple cycle gas turbines is as follows:

- Combust only low ash fuel;

8 Emission factor derived from AP-42 Table 1.5-1 for propane-fired boilers (13 lb/1,000 gal) converted to lb/MMBtu, and then assumes 80% control efficiency by installing low NOx burners.

- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures;
- $PM_{2.5}$ emissions from EUs 1 & 2 shall not exceed 0.012 lb/MMBtu[9] over a 3-hour averaging period; and
- Initial compliance with the proposed $PM_{2.5}$ emission limit will be demonstrated by conducting a performance test to obtain an emission rate.

Combined Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the combined cycle gas turbines:

- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA proposed the following as BACT for $PM_{2.5}$ emissions from the combined cycle gas turbines: $PM_{2.5}$ emissions shall not exceed 0.012 lb/MMBtu over a 4-hour averaging period; and Maintaining good combustion practices.

DEC finds that the BACT for $PM_{2.5}$ emissions from the combined cycle gas turbines is as follows:

- $PM_{2.5}$ emissions from EUs 5 and 6 shall be limited by complying with the combined annual NOx limit listed in Operating Permit AQ0110TVP03 Conditions 13 and 12, respectively;
- $PM_{2.5}$ emissions from EUs 5 & 6 shall not exceed 0.012 lb/MMBtu[9] over a 3-hour averaging period;
- Initial compliance with the proposed $PM_{2.5}$ emission limit will be demonstrated by conducting a performance test to obtain an emission rate; and
.
- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures; and

Large Diesel-Fired Engine

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the large diesel-fired engine:

- Diesel Particulate Filters (85% Control)
- Good Combustion Practices (Less than 40% Control)
- Low Ash Diesel* (0% Control)
- Positive Crankcase Ventilation* (0% Control)

9 Table 3.1-2a of US EPA's AP-42 Emission Factors. https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf

- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis for the installation of a diesel particulate filter on the large diesel-fired engine. GVEA contends that the economic analysis indicates that the level of $PM_{2.5}$ reduction does not justify the use of a diesel particulate filter based on the excessive cost per ton of $PM_{2.5}$ removed per year.

GVEA proposes the following as BACT for PM-2.5 emissions from the large diesel-fired engine: $PM_{2.5}$ emissions from EU 7 shall be controlled by operating with positive crankcase ventilation; Maintaining good combustion practices; $PM_{2.5}$ emissions from EU 7 shall be controlled by limiting operation to no more than 52 hours per 12 month rolling period; and $PM_{2.5}$ emissions from EU 7 shall not exceed 0.0022 lb/hp-hr[10] over a 3-hour averaging period.

DEC reviewed GVEA's proposal for the large diesel-fired engine and finds that installing a diesel particulate filter is an economically infeasible control technology. DEC does not agree with some of the assumptions provided in GVEA's cost analysis that cause an overestimation of the cost effectiveness. However, since EU 7 is limited to 52 hours per year, DEC finds it unnecessary to revise the cost analysis as a decrease in 0.03 tpy of $PM_{2.5}$ from EU 7 will not be cost effective for installing a diesel particulate filter.

DEC finds that the BACT for $PM_{2.5}$ emissions from the large diesel-fired engine is as follows:

- $PM_{2.5}$ emissions from EU 7 shall be controlled by operating with positive crankcase ventilation;
- $PM_{2.5}$ emissions from EU 7 shall be controlled by limiting operation to no more than 52 hours per 12 month rolling period;
- $PM_{2.5}$ emissions from EU 7 shall not exceed 0.32 g/hp-hr[11] over a 3-hour averaging period; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Propane-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the propane-fired boilers:

- Good Combustion Practices (Less than 40% Control)
- Low Sulfur Fuel* (0% Control)

[10] Emissions Inventory Data: http://dec.alaska.gov/Applications/Air/airtoolsweb/PointSourceEmissionInventory/XmlInventory?reportingYear=2017&organizationKey=10&facilityKey=110&addEmissionUnits=0&addReleasePoints=0

[11] Table 3.4-1 of US EPA's AP-42 Emission Factors (PM). https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf.

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA proposed the following as BACT for the propane-fired boilers: Burn low sulfur fuel in EUs 11 and 12; $PM_{2.5}$ emissions from Eus 11 and 12 shall not exceed 0.7 lb/1000 gal over a 4-hour averaging period; and compliance with the emission limit will be demonstrated with records of maintenance following original equipment manufacturer recommendations for operation and maintenance and periodic measurements of O_2 balance.

DEC reviewed GVEA's proposal for the propane-fired boilers and finds that an emission rate achievable with good combustion practices is also BACT for the propane-fired boilers.

DEC finds that the BACT for $PM_{2.5}$ emissions from the propane-fired boilers is as follows:

- Burn only propane as fuel in Eus 11 and 12;
- $PM_{2.5}$ emissions from Eus 11 and 12 shall not exceed 0.008 lb/MMBtu[12] over a 3-hour averaging period; and
- Compliance with the emission limit will be demonstrated with records of maintenance following original equipment manufacturer recommendations for operation and maintenance and periodic measurements of O_2 balance.
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

7.7.8.5.3 SO_2 Controls for North Pole Power Plant

Simple Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the simple cycle gas turbines:

- Ultra-Low Sulfur Diesel (99.7% Control)
- Low Sulfur Fuel (93% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis for switching the fuel combusted in the simple cycle gas turbines to ultra-low sulfur diesel and low sulfur fuel.

GVEA contends that the economic analysis indicates the level of SO_2 reduction does not justify the fuel switch to ULSD or low sulfur fuel in the simple cycle turbines based on the excessive cost per ton of SO_2 removed per year.

[12] Emission factor derived from AP-42 Table 1.5-1 for propane-fired boilers (0.7 lb/1,000 gal) converted to lb/MMbtu.

GVEA proposes the following as BACT for SO_2 emissions from the simple cycle gas turbines: SO_2 emissions from the fuel oil-fired simple cycle gas turbines will be controlled by complying with Nox limits for Eus 1 and 2 listed in Operating Permit AQ0110TVP03 Conditions 13 and 12, respectively; SO_2 emissions from the fuel oil-fired simple cycle gas turbines will be limited by maintaining good combustion practices; and r estricting the sulfur content to 500 ppm in fuel.

DEC revised the cost analyses provided by GVEA for the fuel switch to ULSD in the simple cycle gas turbines with an interest rate of 5.0% (current bank prime interest rate), and assuming a 20 year equipment life, and the average fuel cost increase provided by GVEA for the North Pole Facility of $0.424/gallon. Additionally, DEC reviewed the cost information provided by GVEA to appropriately evaluate the total capital investment of installing two new 1.5 million gallon ultra-low sulfur diesel storage tanks at GVEA's North Pole Power Plant. DEC concluded that the economic analysis indicates the level of SO_2 reduction justifies the use of ultra-low sulfur diesel as BACT for EU 1 and EU 2 at $13,838/ton and $13,923/ton respectively.

DEC finds that the BACT for SO_2 emissions from the simple cycle gas turbines is as follows:

- SO_2 emissions from EUs 1 and 2 shall be controlled by limiting the sulfur content of the fuel combusted in the turbines to no more than 0.0015 percent by weight (ULSD);
- Compliance with the proposed fuel sulfur content limit will be demonstrated with fuel shipment receipts and/or fuel test results for sulfur content; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Combined Cycle Gas Turbines

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the combined cycle gas turbines:

- Ultra-Low Sulfur Diesel (50% Control)
- Good Combustion Practices (Less than 40% Control)
- Light Straight Run Turbine Fuel* (0% Control)
- Limited Operation* (0% Control)
- Low Sulfur Fuel** (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

** Low sulfur fuel is listed as 0% control as it has the same fuel sulfur content requirements as the light straight run turbine fuel that is currently combusted in the fuel oil-fired combined cycle gas turbines.

GVEA provided an economic analysis for switching the fuel combusted in the combined cycle gas turbines to ultra-low sulfur diesel.

GVEA contends that the economic analysis indicates the level of SO_2 reduction does not justify the use of ULSD or low sulfur fuel based on the excessive cost per ton of SO_2 removed per year.

GVEA proposes the following as BACT for SO_2 emissions from the combined cycle gas turbines: SO_2 emissions from EUs 5 and 6 shall combust Light Straight Run Turbine Fuel (50 ppm S in fuel)

DEC revised the cost analysis provided for the fuel switch to ULSD in the combined cycle gas turbines using a higher PTE that includes the existing limit of 1.5 million gallons of gas turbine fuel 1-GT (Jet A/LAGO) used for startup with a sulfur content of 0.3 percent by weight, an interest rate of 5.0% (current bank prime interest rate), a 20 year equipment life, and the average fuel cost increase provided by GVEA for the North Pole Power Plant of $1.117/gallon. Additionally, DEC reviewed the cost information provided by GVEA to appropriately evaluate the total capital investment of installing two new 1.5 million gallon ULSD storage tanks at GVEA's North Pole Power Plant. DEC concluded that the economic analysis indicates the level of SO_2 reduction does not justify the use of ULSD as BACT for EUs 5 and 6 at $1,040,822/ton. DEC finds that the BACT for SO_2 emissions from the fuel oil-fired combined cycle gas turbines is as follows:

- Except during startup, SO_2 emissions from EUs 5 and 6 shall be controlled by limiting the fuel combusted in the turbines to light straight run turbine fuel (50 ppm S in fuel);
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation; and
- Compliance with the proposed fuel sulfur content limit will be demonstrated with fuel shipment receipts and/or fuel test results for sulfur content.

Large Diesel-Fired Engine

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the large diesel-fired engine:

- Ultra-Low Sulfur Diesel (99% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA provided an economic analysis of the control technologies available for the large diesel-fired engine. GVEA contends that the economic analysis indicates the level of SO_2 reduction does not justify the use of ULSD based on the excessive cost per ton of SO_2 removed per year.

GVEA proposes the following as BACT for SO_2 emissions from the large diesel-fired engine: SO_2 emissions from the large diesel-fired engine shall not exceed 0.05 weight percent sulfur; and Maintaining good combustion practices.

DEC reviewed GVEA's proposal for the large diesel-fired engine and finds that ULSD is not an economically feasible control technology. DEC does not agree that the cost effectiveness be based upon the annual cost of USLD, but on the difference in cost between the current fuel and

ULSD. However, due to the annual operational limit on EU 7, and the reduction in SO_2 emissions by using ULSD only being 0.0099 tpy DEC did not revise the cost analysis.

DEC's finding is that the BACT for SO_2 emissions from the diesel-fired engine is as follows:

- SO_2 emissions from EU 7 shall be controlled by combusting fuel that does not exceed 0.05 weight percent sulfur at all time the unit is in operation;
- SO_2 emissions from EU 7 shall be controlled by limiting operation to no more than 52 hours per 12 month rolling period;
- Compliance with the SO_2 emission limit while firing diesel fuel will be demonstrated by fuel shipment receipts and/or fuel test results for sulfur content; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Propane-Fired Boilers

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the propane-fired boilers:

- Good Combustion Practices (Less than 40% Control)
- Low Sulfur Fuel* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

GVEA proposed the following as BACT for the propane-fired boilers: Burn low sulfur fuel in EUs 11 and 12; and SO_2 emissions from EUs 11 and 12 shall not exceed 0.0012 lb/kgal over a 4-hour averaging period.

DEC reviewed GVEA's proposal for the propane-fired boilers and finds that the SO_2 emission rate provided by GVEA was erroneously calculated. The Department used AP-42 Table 1.5-1 emission factor for propane combustion (0.10S lb/1,000 gal, where S = gr/100 scf) and using the existing sulfur limit in Condition 11 of the stationary source's Operating Permit AQ0110TVP03 (120 ppmv). The Department corrected this emission factor to 0.75 lb/1,000 gal, assuming 16 ppmv sulfur = 1 gr/100 scf.

DEC finds that the BACT for SO_2 emissions from the propane-fired boilers is as follows:

- SO_2 emissions from EUs 11 and 12 shall be controlled by only combusting gas fuel (propane) with a total sulfur content of no more than 120 ppmv, or direct emissions of 0.75 lb/1,000 gal;
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation; and
- Compliance with the preliminary emission rate limit will be demonstrated with fuel shipment receipts and/or fuel tests for sulfur content.

7.7.8.5.4 Additional Information

GVEA provided updated and supplemental information in an alternative BACT proposal submitted on November 28, 2018. GVEA proposed as BACT for SO_2 to combust No. 1 HSD in EUs 1 and 2 on Air Quality Stage 1 and 2 Curtailment Days.

For more information see Appendix III.D.7.7 for GVEA's December 22, 2017 response to DEC's information requests that included the following enclosures:

1. Response to request for additional information for the Best Available Control Technology Technical Memorandum from Golden Valley Electric Association (GVEA) for the North Pole Power Plant and Zehnder Facility.
2. Submittal to accompany CONFIDENTIALITY OF RECORDS APPLICATION AND CERTIFICATION and response to request for additional Information for the Best Available Control Technology Technical Memorandum from Golden Valley Electric Association (GVEA) for the North Pole Power Plant and Zehnder Facility.
3. Associated Microsoft Excel Spreadsheets (10 files)

For more information see Appendix III.D.7.7 for GVEA's November 28, 2018 Proposed BACT Alternatives Letter that included the following enclosures:

1. Attachment 1 - North Pole BACT Section 1 Tables
2. Attachment 2 - Technical Memo from PDC Regarding Bulk Fuel Storage
3. Attachment 3 - Leidos Strategic Fuel Evaluation
4. Attachment 4 - January 2017 through October 2018 Fuel Prices
5. Attachment 5 - Updated Cost Effectiveness Tables North Pole and Zehnder
6. Attachment 6 - Tables 5-4a and 5-5a, North Pole EU ID 1 and 2 Cost Effectiveness with Selective use of No. 1 HSD
7. Attachment 7 - Zehnder FY2019 Assessable Emissions Summary
8. Attachment 8 - House Freeze Up Time Estimates.
9. DVD
10. Associated Microsoft Excel Spreadsheets (4 files)

7.7.8.5.5 DEC BACT and SIP Findings for GVEA's North Pole Power Plant

FINDING: DEC finds that it is economically infeasible for GVEA to immediately switch to ULSD at the North Pole Power Plant. Therefore by October 1, 2020, BACT for EUs 1 and 2 is to begin taking delivery of fuel oil with a sulfur content no greater than 1,000 ppmw (S1000) immediately after the Air Quality Stage Alert 1 and 2 are announced and remain taking deliveries of exclusively S1000 for as long as the air episode exists.

On or before June 9, 2022, GVEA shall submit a Title I permit application to DEC that includes a BACT requirement to limit the sulfur content of fuel combusted in EUs 1 and 2 to no greater than 15 ppmw (ULSD) from October 1 through March 31 to be effective no later than October 1, 2023.

Future Considerations:
GVEA is also exploring options that may assist the Interior Gas Utility in providing economical natural gas to the Fairbanks area. If feasible, GVEA may be able to do a fuel switch to natural gas, which could help stabilize demand, or help reach some economies of scale for gas supply. Regarding the commercial availability of natural gas in Fairbanks, the term 'available' is used in Step 2 of the top-down BACT approach to refer to whether the technology (including fuel type) can be obtained by through commercial channels or is otherwise available within the common sense meaning of the term. The question of availability for purposes of BACT is a practical, fact determination, using conventional notions of whether a technology can be put into use (i.e., GVEA should evaluate whether natural gas can be obtained and used in each EU at the North Pole Power Plant).

7.7.8.6 University of Alaska Fairbanks Campus

The following summary table outlines the overarching decision points for UAF, including the BACT controls, numerical emission limits, and timelines for implementation into federally enforceable permit conditions. The Appendix to Section III.D.7.7 contains the documentation supporting the department's BACT determinations.

Table 7.7-16
DEC BACT and SIP Findings Summary Table for the University of Alaska Fairbanks Campus

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
EU 113 - Dual Fuel-Fired Boiler – 295.6 MMBtu/hr			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.012 lb/MMBtu	Fabric Filters	Existing
SO_2	0.25% sulfur by weight	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
	0.2 lb/MMBtu (3-hr avg.)	No additional control	Existing
Diesel-Fired Engines			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.015 - 1.0 g/hp-hr (3-hr avg.)	Positive Crankcase Ventilation, Good Combustion Practices, and Limited Operation	Existing
SO_2	15 ppmw sulfur in fuel	Certified Statement or Approved Analysis of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
EUs 3, 4, and 19 through 21 - Fuel Oil-Fired Boilers			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	0.012 lb/MMBtu (Diesel 3-hr avg.) 0.0075 lb/MMBtu (N.G. 3-hr avg.)	Good Combustion Practices and Limited Operation	Existing

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
SO_2	1,000 ppmw sulfur in fuel (Diesel) 0.60 lb/MMscf (Natural Gas) October 1 – March 31	Certified Statement or Approved Analysis of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than October 1, 2020
	15 ppmw sulfur in fuel (Diesel) 0.60 lb/MMscf (Natural Gas) October 1 – March 31	Certified Statement or Approved Analysis of Sulfur Content	Title I Permit App. by June 9, 2021 Effective no later than October 1, 2023
EU 9a - Pathogenic Waste Incinerator (83 lb/hr)			
NOx	Precursor Demonstration*	No additional control	N/A
$PM_{2.5}$	4.67 lb/ton	Limited Operation and Multiple Chamber Design	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
SO_2	15 ppmw sulfur in liquid fuel	Certified Statement of Sulfur Content	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
Material Handling Sources (Coal Prep and Ash Handling)			
$PM_{2.5}$	0.003 - 0.050 gr/dscf	Enclosed Emission Points, fabric filters, and vents	Title I Permit App. by June 9, 2020 Effective no later than June 9, 2021
	5.50E-05 lb/ton	Enclosure Emission Points	

* Assumes precursor demonstration approved by EPA

Background Information for the University of Alaska Fairbanks Campus

The University of Alaska Fairbanks Campus is an existing stationary source owned and operated by the University of Alaska, which consists of two coal-fired boilers installed in 1962 that are being replaced by a circulating fluidized bed (CFB) dual fuel-fired boiler (coal and biomass) rated at 295.6 MMBtu/hr. Other EUs at the stationary source include a 13,266 hp backup diesel generator, 13 diesel-fired boilers, one classroom engine, one diesel engine permitted but not yet installed, and a coal handling system for the new dual-fuel fired boiler.

In letters dated October 20, 2017, and September 13, 2018, DEC requested additional information to assist in making a legally and practicably enforceable BACT determination for the source. Both DEC and EPA comments were enclosed in the letters. UAF responded to the information requests on December 21, 2017, and November 1, 2018. DEC reviewed these responses and incorporated the additional information into its BACT Determinations as warranted.

On March 22, 2018, DEC released a draft of the possible concepts and potential approaches for development of the FNSB Nonattainment Area Serious State Implementation Plan that included DEC's preliminary BACT Determinations. On May 23, 2018, UAF provided comments on the draft and DEC incorporated the additional information into its BACT Determinations as

warranted. The BACT Determination for the University of Alaska Fairbanks Campus evaluated potential controls to reduce NOx, $PM_{2.5}$, and SO_2 emissions from emissions units at the stationary source.

7.7.8.6.1 NOx Controls for the University of Alaska Fairbanks Campus

NOx Precursor Demonstration

The NOx controls proposed in this section are not planned to be implemented. The optional precursor demonstration (as allowed under 40 C.F.R. § 51.1006) for the precursor gas NOx for point sources illustrates that NOx controls are not needed. DEC has included with this Serious SIP, a final precursor demonstration as justification not to require NOx controls.

The $PM_{2.5}$ NAAQS Final SIP Requirements Rule states if the state determines through a precursor demonstration that controls for a precursor gas are not needed for attaining the standard, then the controls identified as BACT/BACM or Most Stringent Measure for the precursor gas are not required to be implemented. Final approval of the precursor demonstration is at the time of the Serious SIP approval.

Large Dual Fuel-Fired Boiler (EU 113)

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from coal combustion in industrial sized boilers:

- Selective Catalytic Reduction (SCR) (70% - 90% Control)
- Selective Non-Catalytic Reduction (SNCR) (30% - 50% Control)
- Good Combustion Practices (Less than 40% Control)
- Low NOx Burners/Staged Combustion* (0% Control)
- Circulating Fluidized Bed* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF provided economic cost analyses for the installation of SCR and SNCR on the dual fuel-fired boiler. UAF contends that its economic analyses indicate the level of NOx reduction does not justify the use of SCR or SNCR for the dual fuel-fired boiler based on the excessive cost per ton of NOx removed per year. UAF proposes BACT for the dual fuel-fired boiler is using circulating fluidized bed and staged combustion.

DEC revised the cost analyses provided by UAF for the installation of SCR and SNCR using the cost estimating procedures identified in EPA's May 2016 Air Pollution Control Cost Estimation Spreadsheets for SCR and SNCR, using the unrestricted potential to emit of the dual fuel-fired boiler, a baseline emission rate of 0.20 lb NOx/MMBtu (NOx limit from 40 C.F.R. § 60.44b(l)(1)), a retrofit factor of 1.0 for a retrofit of average difficulty, a NOx removal efficiency of 80% and 50% for SCR and SNCR respectively, an interest rate of 5.0% (current bank prime interest rate), and a 20 year equipment life. DEC concluded that the level of NOx reduction justifies the use of SCR or SNCR as BACT for the coal-fired boilers at $6,638/ton and

$2,195/ton respectively. Since SCR has a higher control efficiency, it is selected as BACT to control NOx emissions from the dual fuel-fired boiler.
DEC finds that the BACT for NOx emissions from the dual fuel-fired boiler is as follows:

- NOx emissions from EU 113 shall be controlled by operating and maintaining selective catalytic reduction in conjunction with the designed circulating fluidized bed and staged combustion at all times the unit is in operation; and
- NOx emissions from EU 113 shall not exceed 0.04 lb/MMBtu averaged over a 3-hour period.
- Initial compliance with the proposed NOx emission limit will be demonstrated by conducting a performance test to obtain an emission rate; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Mid-Sized Diesel-Fired Boilers (EUs 3 and 4)
From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the mid-sized diesel-fired boiler EU 3:

- Selective Catalytic Reduction (SCR) (80% – 90% Control)
- Low-NOx Burners (LNB) (35% – 55% Control)
- Good Combustion Practices (Less than 40% Control)

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the mid-sized diesel-fired boiler EU 4 (note that SCR is not technically feasible due to lack of space surrounding the EU):

- Low-NOx Burners (35% – 55% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF provided economic cost analyses for the installation of SCR on EU 3 and LNB on both EUs 3 and 4. UAF contends that its economic analyses indicate the level of NOx reduction does not justify the use of SCR or LNB for the mid-sized diesel-fired boilers based on the excessive cost per ton of NOx removed per year.

DEC revised the cost analyses provided by UAF for the installation of SCR and LNB on EU 3 using the unrestricted potential to emit of the mid-sized diesel-fired boiler, a NOx removal efficiency of 80% and 55% for SCR and LNB respectively, an interest rate of 5.0% (current bank prime interest rate), and a 20 year equipment life. DEC concluded that the level of NOx reduction justifies the use of SCR or LNB as BACT for EU 3 at $7,033/ton and $1,813/ton respectively. Since SCR has a higher control efficiency, it is selected as BACT to control NOx emissions from EU 3. DEC reviewed UAF's proposal for EU 4 and finds that because the EU is

already limited to 40 tpy of NOx emissions combined with EU 8, requiring the installation and operation of any add-on control technology will not further reduce annual NOx emissions. DEC finds that the BACT for NOx emissions from the EU 3 is as follows:

- Operate and maintain SCR at all times the unit is in operation;
- NOx emissions from EU 3 shall not exceed 0.04 lb/MMBtu averaged over a 3-hour period; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

DEC finds that the BACT for NOx emissions from the EU 4 is as follows:

- Limit NOx emissions from EUs 4 and 8 to no more than 40 tons per year combined;
- NOx emissions from EU 3 shall not exceed 0.2 lb/MMBtu when firing diesel fuel and 140 lb/MMscf while firing natural gas, averaged over a 3-hour period; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Small-Sized Diesel-Fired Boilers (EUs 19-21)
From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the small-sized diesel-fired boilers:

- Low-NOx Burners (35% – 55% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes using limited operation as BACT for controlling NOx emissions from the small-sized diesel-fired boilers. EUs 19 through 21 will continue to be limited to 19,650 hours combined per year.

DEC reviewed UAF's proposal and finds that the 3 small diesel-fired boilers have a combined PTE of 8.8 tpy for NOx based on combined operation of 19,650 hours per year. At 8.8 tpy, the cost effectiveness in terms of dollars per ton for add-on pollution control for these units is economically infeasible.

DEC finds that the BACT for NOx emissions from the small diesel-fired boilers is as follows:

- Combined operating limit of no more than 19,650 hours per year;
- Compliance with the hour limit will be monitored with an hour meter;
- NOx emissions from EUs 19-21 shall not exceed 0.15 lb/MMBtu; and

- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures.

Large Diesel-Fired Engine (EU 8)
From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the large diesel-fired engine (≥ 500 hp):

- Good Combustion Practices (Less than 40% Control)
- Selective Catalytic Reduction* (0% Control)
- Limited Operation* (0% Control)
- Turbo Charger and Aftercooler* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes using limited operation and operation of a turbocharger and aftercooler to control NOx emissions from the large diesel-fired engine. EUs 4 and 8 will continue to be limited to 40 tons of NOx combined per year.

DEC finds that the BACT for NOx emissions from the large diesel-fired engine is as follows:

- Operate and maintain SCR, and a turbocharger and aftercooler at all times the unit is in operation;
- Limit NOx emissions from EUs 4 and 8 to no more than 40 tons per year combined;
- Limit non-emergency operation of EU 8 to no more than 100 hours per year;
- NOx emissions from EU 8 shall not exceed 1.3 g/hp-hr averaged over a 3-hour period; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Small Diesel-Fired Engines (EUs 23, 24, and 26 – 29)
From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the small diesel-fired engines (<500 hp):

- Selective Catalytic Reduction (90% Control)
- Good Combustion Practices (Less than 40% Control)
- Federal Emission Standards (Baseline)
- Limited Operation* (0% Control)
- Turbo Charger and Aftercooler* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF provided economic cost analyses for the installation of SCR on the small diesel-fired engine EU 27. UAF contends that its economic analyses indicate the level of NOx reduction does not justify the use of SCR for the small diesel-fired engine based on the excessive cost per ton of NOx removed per year. UAF proposes using limited operation and operation of a turbocharger and aftercooler to control NOx emissions from the small diesel-fired engine EU 27.

DEC revised the cost analysis provided by UAF for the installation of SCR on EU 27 to a 20 year equipment life. DEC concluded that the level of NOx reduction does not justify the use of SCR as BACT for EU 27 at $11,141/ton.

DEC finds that the BACT for NOx emissions from the small diesel-fired engines is as follows:

- Operate and maintain a turbocharger and aftercooler on EU 27 at all times the unit is in operation;
- Limit the operation of EU 27 to no more than 4,380 hours per year;
- Limit non-emergency operation of EUs 24, 28, and 29 to no more than 100 hours per year each;
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation; and
- Demonstrate compliance with the numerical BACT emission limits listed in the following Table7.7-17 by maintaining records of maintenance procedures conducted in accordance with 40 C.F.R. Subparts 60 and 63, and the EU operating manuals:

Table 7.7-17

EU	Year	Description	Size	Status	BACT Limit	Proposed BACT
23	2003	Detroit Diesel	235 kW	AP-42 Table 3.3-1	14.1 g/hp-hr	Good Combustion Practices
26	1987	Mitsubishi-Bosh	45 kW	AP-42 Table 3.3-1	14.1 g/hp-hr	
27	TBD	Caterpillar C-15	500 hp	Certified Engine	3.2 g/hp-hr	Limit Operation to 4,380 hours per year, Turbo Charger and Aftercooler, & Good Combustion Practices
24	2001	Cummins	51 kW	AP-42 Table 3.3-1	14.1 g/hp-hr	Limit Operation for non-emergency use (100 hours each per year) and Good Combustion Practices
28	1998	Detroit Diesel	120 hp	AP-42 Table 3.3-1	14.1 g/hp-hr	
29	2013	Cummins	314 hp	Certified Engine	1.5 g/hp-hr	

Pathogenic Waste Incinerator (EU 9A)

From research, DEC identified the following technologies as technically feasible for reduction of NOx emissions from the pathogenic waste incinerator:

- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes using limited operation and good combustion control practices as BACT for controlling NOx emissions from the pathogenic waste incinerator.

DEC finds that the BACT for NOx emissions from the pathogenic waste incinerator is as follows:

- Limit the operation of EU 9A to no more than 109 tons of waste combusted per year;
- Compliance with the proposed operational limit will be demonstrated by recording pounds of waste combusted for the pathogenic waste incinerator;
- NOx emissions from EU 9A shall not exceed 3.56 lb/ton; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

7.7.8.6.2 $PM_{2.5}$ Controls for the University of Alaska Fairbanks Campus

Large Dual Fuel-Fired Boiler (EU 113)
From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from coal combustion in industrial sized boilers:

- Fabric Filters (99.9% Control)
- Electrostatic Precipitator (99.6% Control)
- Wet Scrubber (50 – 99% Control)
- Cyclone (20 – 70% Control)
- Good Combustion Practices (Less than 40% Control)

UAF currently operates a baghouse (fabric filters) on the dual fuel-fired boiler, which is the most effective control for $PM_{2.5}$ emissions. Therefore, no additional analysis was required for determining BACT for $PM_{2.5}$ emissions.

DEC finds that the BACT for $PM_{2.5}$ emissions from the dual fuel-fired boiler is as follows:

- Operate and maintain fabric filters at all times the unit is in operation;
- $PM_{2.5}$ emissions from EU 113 shall not exceed 0.012 lb/MMBtu[13] over a 3-hour averaging period; and
- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures.
- Conduct an initial performance test to obtain an emission rate.

Mid-Sized Diesel-Fired Boilers (EUs 3 and 4)
From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the mid-sized diesel-fired boilers:

13 Boiler manufacturer Babcock & Wilcox's $PM_{2.5}$ emission guarantee, used to calculate potential to emit in Air Quality Permit AQ0316MSS06.

- Good Combustion Practices (Less than 40% Control)

UAF proposes maintaining good combustion practices in the diesel-fired boilers and continuing to limit EUs 4 and 8 to 40 tons per year of NOx combined as BACT for $PM_{2.5}$ emissions.

DEC finds that the BACT for $PM_{2.5}$ emissions from the mid-sized diesel-fired boilers is as follows:

- $PM_{2.5}$ emissions from EUs 3 and 4 shall not exceed 0.012 lb/MMBtu averaged over a 3-hour period while firing diesel fuel;
- $PM_{2.5}$ emissions from EU 4 shall not exceed 0.0075 lb/MMBtu averaged over a 3-hour period while firing natural gas;
- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures; and
- Limit NOx emissions from EUs 4 and 8 to no more than 40 tons per year combined.

Small-Sized Diesel-Fired Boilers (EUs 19-21)

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the small-sized diesel-fired boilers:

- Scrubber (70% – 90% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF provided economic cost analyses for the installation of a scrubber. UAF contends that its economic analyses indicate the level of $PM_{2.5}$ reduction does not justify the use of $PM_{2.5}$ control technologies for the small diesel-fired boilers based on the excessive cost per ton of $PM_{2.5}$ removed per year. UAF proposes using limited operation as BACT for controlling $PM_{2.5}$ emissions from the small-sized diesel-fired boilers. EUs 19 through 21 will continue to be limited to 19,650 hours combined per year.

DEC reviewed UAF's proposal and finds that the 3 small diesel-fired boilers have a combined PTE of less than one ton per year for $PM_{2.5}$ based on combined operation of 19,650 hours per year. At less than one tpy, DEC believes that the cost effectiveness in terms of dollars per ton for add-on pollution control for these units is economically infeasible.

DEC finds that the BACT for $PM_{2.5}$ emissions from the small diesel-fired boilers is as follows:

- Combined operating limit of no more than 19,650 hours per year;
- $PM_{2.5}$ emissions from EUs 19-21 shall not exceed 0.012 lb/MMBtu; and
- Maintain good combustion practices by following the manufacturer's operating and maintenance procedures at all times of operation.

Large Diesel-Fired Engine (EU 8)
From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the large diesel-fired engine (≥ 500 hp):

- Good Combustion Practices (Less than 40% Control)
- Diesel Oxidation Catalyst (30% Control)
- Low Ash Diesel (~20% Control)
- Positive Crankcase Ventilation (~10% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes using limited operation, burning low ash diesel, and operation of positive crankcase ventilation to control $PM_{2.5}$ emissions from the large diesel-fired engine. EUs 4 and 8 will continue to be limited to 40 tons of NOx combined per year.

DEC finds that the BACT for $PM_{2.5}$ emissions from the large diesel-fired engine is as follows:

- $PM_{2.5}$ emissions from EU 8 shall be controlled by operating positive crankcase ventilation and combusting only low ash diesel at all time of operation;
- Limit NOx emissions from EUs 4 and 8 to no more than 40 tons per year combined;
- Limit non-emergency operation of EU 8 to no more than 100 hours per year; and
- $PM_{2.5}$ emissions from EU 8 shall not exceed 0.32 g/hp-hr averaged over a 3-hour period.

Small Diesel-Fired Engines (EUs 23, 24, and 26 – 29)
From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the small diesel-fired engines (<500 hp):

- Diesel Particulate Filter (DPF) (60% – 90%% Control)
- Diesel Oxidation Catalyst (40% Control)
- Low Ash Diesel (25% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)
- Federal Emission Standards (Baseline)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF provided economic cost analyses for the installation of a diesel particulate filter on the small diesel-fired engine EU 27. UAF contends that its economic analyses indicate the level of $PM_{2.5}$ reduction does not justify the use of DPF for the small diesel-fired engine based on the excessive cost per ton of $PM_{2.5}$ removed per year. UAF proposes using limited operation and ensuring EU 27 meets the federal emission standards (EPA Tier 3) to control $PM_{2.5}$ emissions.

DEC revised the cost analysis provided by UAF for the installation of DPF on EU 27 to a 20 year equipment life. DEC concluded that the level of $PM_{2.5}$ reduction does not justify the use of DPF as BACT for EU 27 at $13,139/ton.

DEC finds that the BACT for $PM_{2.5}$ emissions from the small diesel-fired engines is as follows:

- Limit the operation of EU 27 to no more than 4,380 hours per year;
- Limit non-emergency operation of EUs 24, 28, and 29 to no more than 100 hours per year each;
- EU 27 shall comply with the federal emission standards of NSPS Subpart IIII, Tier 3;
- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures; and
- Demonstrate compliance with the numerical BACT emission limits listed in the following Table 7.7-18 by maintaining records of maintenance procedures conducted in accordance with 40 C.F.R. Subparts 60 and 63, and the EU operating manuals:

Table 7.7-18

EU	Year	Description	Size	Status	BACT Limit	Proposed BACT
23	2003	Detroit Diesel	235 kW	AP-42 Table 3.3-1	1.0 g/hp-hr	Good Combustion Practices
26	1987	Mitsubishi-Bosh	45 kW	AP-42 Table 3.3-1	1.0 g/hp-hr	
27	TBD	Caterpillar C-15	500 hp	Certified Engine	0.15 g/hp-hr	Limit Operation to 4,380 hours per year and Good Combustion Practices
24	2001	Cummins	51 kW	AP-42 Table 3.3-1	1.0 g/hp-hr	Limit Operation for non-emergency use (100 hours each per year) and Good Combustion Practices
28	1998	Detroit Diesel	120 hp	AP-42 Table 3.3-1	1.0 g/hp-hr	
29	2013	Cummins	314 hp	Certified Engine	0.015 g/hp-hr	

Pathogenic Waste Incinerator (EU 9A)

From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the pathogenic waste incinerator:

- Fabric Filter (99.9% Control)
- Good Combustion Practices (Less than 40% Control)
- Multiple Chambers* (0% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF provided economic cost analyses for the installation of fabric filters on the pathogenic waste incinerator. UAF contends that its economic analyses indicate the level of $PM_{2.5}$ reduction does not justify the use of fabric filters for the pathogenic waste incinerator based on the

excessive cost per ton of $PM_{2.5}$ removed per year. UAF proposes using limited operation (109 tons of waste combusted per year) and a multiple chamber design as BACT for controlling $PM_{2.5}$ emissions from the pathogenic waste incinerator.

DEC finds that the BACT for $PM_{2.5}$ emissions from the pathogenic waste incinerator is as follows:

- $PM_{2.5}$ emissions from EU 9A shall be controlled with a multiple chamber design;
- Limit the operation of EU 9A to no more than 109 tons of waste combusted per year;
- $PM_{2.5}$ emissions from EU 9A shall not exceed 4.67 lb/ton;
- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures; and
- Compliance with the proposed operational limit will be demonstrated by recording pounds of waste combusted for the pathogenic waste incinerator.

Material Handling Units (EUs 105, 107, 109 through 111, 114, and 128 through 130)
From research, DEC identified the following technologies as technically feasible for reduction of $PM_{2.5}$ emissions from the material handling equipment:

- Fabric Filters (50 – 99% Control)
- Enclosures (50 – 99% Control)
- Wet Scrubbers (50 – 99% Control)
- Electrostatic Precipitator (>90% Control)
- Cyclone (20% – 70% Control)
- Suppressants (less than 90% Control)
- Vents (less than 90% Control)

UAF proposes operating EUs 105, 107, 109 through 111, 114, and 128 through 130 in an enclosed environment, and controlling emissions from the material handling units (except EU 111) by installing, maintaining, and operating fabric filters and vents to control $PM_{2.5}$ emissions.

DEC finds that the BACT for $PM_{2.5}$ emissions from the material handling equipment is as follows:

- $PM_{2.5}$ emissions from EUs 105, 107, 109 through 111, 114, and 128 through 130 will be controlled by enclosing each EU;
- $PM_{2.5}$ emissions from the operation of the material handling units, except EU 111, will be controlled by installing, operating, and maintaining fabric filters and vents;
- Initial compliance with the emission rates for the material handling units, except EU 111, will be demonstrated with a performance test to obtain an emission rate; and
- Comply with the numerical emission limits listed in Table 7.7-18:

Table 7.7-18

EU ID	Process Description	Capacity	Limitation	Control Method
105, 107, 109, 110, & 128 - 130	7 Material Handling Units	Varies	0.003 gr/dcf	Fabric Filter & Enclosure & Vent
111	Ash Loadout to Truck	N/A	5.50E-05 lb/ton	Enclosure
114	Dry Sorbent Handing Vent Filter Exhaust	5 acfm	0.050 gr/dcf	Fabric Filter & Enclosure & Vent

7.7.8.6.3 SO_2 Controls for the University of Alaska Fairbanks Campus

Economic Infeasibility for DSI on the Large Dual Fuel-Fired Boiler EU 113

DEC finds that it is economically infeasible for UAF to implement retrofit SO_2 controls on the dual fuel-fired boiler at the University of Alaska Fairbanks Campus. BACT for this unit is maintaining good combustion practices by following the manufacturer's operating and maintenance procedures, combustion of low sulfur coal as a fuel source, and the existing SO_2 emission limit of 0.20 lb/MMBtu determined on a 30-day rolling average. By June 9, 2021, UAF shall limit the gross as received sulfur content of coal delivered to the stationary source to 0.25% S by weight.

Large Dual Fuel-Fired Boiler (EU 113)
From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from coal combustion in industrial sized boilers:

- Wet Scrubbers (99% Control)
- Spray Dry Absorbers (SDA) (90% Control)
- Dry Sorbent Injection (DSI) (50 – 80% Control)
- Good Combustion Practices (Less than 40% Control)
- Limestone Injection (0% Control)
- Low Sulfur Coal (0% Control)

UAF provided economic cost analyses for the installation of SDA and DSI on the dual fuel-fired boiler. UAF contends that its economic analyses indicate the level of SO_2 reduction does not justify the use of SDA or DSI for the dual fuel-fired boiler based on the excessive cost per ton of SO_2 removed per year. UAF proposes BACT for the dual fuel-fired boiler is using limestone injection and burning low sulfur coal at all times the EU operates.

DEC also calculated the cost effectiveness for the installation of wet scrubbers, SDA, and DSI controls on the dual fuel-fired boiler. DEC's calculation used the cost development methodology prepared by Sargent & Lundy for EPA for wet scrubbers, SDA, and DSI. DEC assumed an unrestricted potential to emit of the dual fuel-fired boiler, a baseline emission rate of 0.20 lb SO_2/MMBtu (SO_2 limit from 40 C.F.R. 60.42b(k)(1)), a retrofit factor of 1.0 for a retrofit of average difficulty, an SO_2 removal efficiency of 99%, 90%, and 80% for wet scrubbers, SDA, and DSI respectively, an interest rate of 5.0% (current bank prime interest rate), and a 15 year equipment life. DEC concluded that the level of SO_2 reduction justifies the use of a DSI for SO_2 removal with a cost for the dual fuel-fired boiler of $8,269/ton. DEC calculated the cost effectiveness for installing wet scrubbers and SDA on the coal fired boilers and found the cost

effectiveness of these controls to have an adverse economic impact at $23,343/ton and $23,061/ton, respectively.

DEC determined the numerical SO_2 BACT emission limit for the dual fuel-fired boilers at UAF to be 0.10 lb/MMBtu determined on a 30 day rolling average. DEC selected this BACT limit after evaluating existing emission limits in the RBLC database for coal-fired boilers, taking into account previous source test data from coal-fired boilers in Alaska and actual emissions data from other sources employing similar types of controls, using manufacturer data provided in the UAF BACT Analysis January 2017 by Babcock & Wilcox, and in-line with EPA's pollution control fact sheets while keeping in mind that BACT limits must be achievable at all times.

Mid-Sized Diesel-Fired Boilers (EUs 3 and 4)

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the mid-sized diesel-fired boilers:

- Ultra-Low Sulfur Diesel (ULSD) (99% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes firing ULSD and using limited operation as BACT for reduction of SO_2 emissions from the mid-sized diesel-fired boilers. EUs 4 and 8 will continue to be limited to 40 tons of NOx per year combined.

DEC finds that the BACT for SO_2 emissions from the mid-sized diesel-fired boilers is as follows:

- SO_2 emissions from EUs 3 and 4 shall be controlled by only combusting ULSD when firing diesel fuel;
- SO_2 emissions from EU 4 will be limited by complying with the combined annual SO_2 emission limit of 40 tons per 12 month rolling period for EUs 4 and 8;
- SO_2 emissions from EU 4 while firing natural gas shall not exceed 0.60 lb/MMscf;
- Maintain good combustion practices by following the manufacturer's maintenance procedures at all times of operation; and
- Compliance with the proposed SO_2 emission limit will be demonstrated through fuel shipment receipts and/or fuel testing for sulfur content.

Small-Sized Diesel-Fired Boilers (EUs 19-21)

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the small-sized diesel-fired boilers:

- Ultra-Low Sulfur Diesel (ULSD) (99% Control)
- Good Combustion Practices (Less than 40% Control)

- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes firing ULSD and using limited operation as BACT for reduction of SO_2 emissions from the small-sized diesel-fired boilers. EUs 19 through 21 will continue to be limited to 19,650 hours combined per year.

DEC finds that the BACT for SO_2 emissions from the small diesel-fired boilers is as follows:

- Fire only ULSD at all times of operation;
- Combined operating limit of no more than 19,650 hours per year;
- Maintain good combustion practices by following the manufacturer's maintenance procedures at all times of operation; and
- Compliance with the proposed SO_2 emission limit will be demonstrated through fuel shipment receipts and/or fuel testing for sulfur content.

Large Diesel-Fired Engine (EU 8)

From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the large diesel-fired engine (≥ 500 hp):

- Ultra-Low Sulfur Diesel (ULSD) (99% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes firing ULSD and using limited operation as BACT for reduction of SO_2 emissions from the large diesel-fired engine. EUs 4 and 8 will continue to be limited to 40 tons of NOx combined per year.

DEC finds that the BACT for SO_2 emissions from the large diesel-fired engine is as follows:

- Fire only ULSD at all times of operation;
- Limit SO_2 emissions from EUs 4 and 8 to no more than 40 tons per year combined;
- Limit non-emergency operation of EU 8 to no more than 100 hours per year;
- Maintain good combustion practices by following the manufacturer's maintenance procedures at all times of operation; and
- Compliance with the proposed SO_2 emission limit will be demonstrated through fuel shipment receipts and/or fuel testing for sulfur content.

Small Diesel-Fired Engines (EUs 23, 24, and 26 – 29)
From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the small diesel-fired engines (<500 hp):

- Ultra-Low Sulfur Diesel (ULSD) (99% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes firing ULSD and using limited operation as BACT for reduction of SO_2 emissions from the small diesel-fired engines. EU 27 will continue to be limited to 4,380 hours per year.

DEC finds that the BACT for SO_2 emissions from the small diesel-fired engines is as follows:

- Combust only ULSD in all small diesel-fired engines at all times of operation;
- Limit the operation of EU 27 to no more than 4,380 hours per year;
- Limit non-emergency operation of EUs 24, 28, and 29 to no more than 100 hours per year each;
- Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures;
- Compliance will be demonstrated with fuel shipment receipts and/or fuel tests for sulfur content; and
- Compliance with the operating hours limit will be demonstrated by monitoring and recording the number of hours operated on a monthly basis.

Pathogenic Waste Incinerator (EU 9A)
From research, DEC identified the following technologies as technically feasible for reduction of SO_2 emissions from the pathogenic waste incinerator:

- Ultra-Low Sulfur Diesel (ULSD) (99% Control)
- Good Combustion Practices (Less than 40% Control)
- Limited Operation* (0% Control)

* Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

UAF proposes firing ULSD and using limited operation as BACT for reduction of SO_2 emissions from the pathogenic waste incinerator. EU 9A will continue to be limited to no more than 109 tons of waste combusted per year.

DEC finds that the BACT for SO_2 emissions from the pathogenic waste incinerator is as follows:

- Limit the operation of EU 9A to no more than 109 tons of waste combusted per year;

- SO_2 emissions from the operation of EU 9A shall be controlled by combusting ULSD at all times of operation;
- Maintain good combustion practices by following the manufacturer's operational procedures at all times of operation; and
- Compliance shall be demonstrated by obtaining fuel shipment receipts and/or fuel tests for sulfur content.

7.7.8.6.4 Additional Information

On April 29, 2019, UAF submitted additional information in the form of an Economic Infeasibility of SO_2 emissions controls, contending that the least expensive SO_2 control (DSI) should not be established because UAF cannot afford the control technology demonstrated to be economically feasible, referencing Federal Register, Vol. 81, No.164, Wednesday August 24, 2016. pg. 58085. This Federal Register indicates that the source should make its claim known to the state and support the claim with information regarding the impact of imposing the identified control measure or technology on the following financial indicators to the extent applicable:

1. Fixed and variable production costs;
2. Product supply and demand elasticity;
3. Product prices (cost absorption vs. cost pass-through);
4. Expected costs incurred by competitors;
5. Company Profits;
6. Employment costs;
7. Other costs (e.g., for BACM implemented by public sector entities).

UAF provided documentation of their claim to DEC, indicating the cost effectiveness value of \$11,578 per ton of SO_2 emissions removed (\$2,246,238 / 194 tons) likely underestimates the actual cost of the DSI pollution control system. UAF disagrees with the premise that SO_2 emissions would not involve significant retrofit costs and provided comments addressing this issue in a letter to DEC dated May 23, 2018 (see Appendix III.D.7.7). A summary of UAF's comments follows:

The DSI cost analysis was originally developed by Sargent & Lundy (S&L) to evaluate cost and emissions impacts. The documentation available on the use of this cost model does not include information necessary to ensure that the calculations are properly applied to a specific situation, including

a. Types of plants to which the model is applicable (utility power generation, combined heat and power (CHP), cogeneration, other);
b. Applicable size range;
c. Equipment included in the Total Purchased Cost (TPC) calculation;
d. On-site bulk storage capacity;
e. A basis for selecting a "Retrofit factor" other than "1.0"; and
f. Data and other information used to develop and support the equations used in the spreadsheet.

Additionally, UAF reached out to Stanley Consultants (the primary engineering firm for the boiler replacement project) and they have advised UAF that since the new boiler design already incorporates control of SO_2 with the direct feed of limestone into the combustion chamber, additional control of SO_2 by injection of sorbent into the flue gas is unnecessary and would involve a costly retrofit of ductwork. Stanley contacted Babcock & Wilcox (the supplier of the new boiler) on the issue and they have provided the following specific concerns with respect to DSI installation at EU 113:

a. A switch from hydrated lime to sodium bicarbonate is necessary to achieve reasonable effectiveness
b. The existing ductwork is not long enough to provide the recommended 2-3 seconds of residence time before the baghouse.
c. The lack of residence time will significantly degrade the performance of the DSI system. When considered along with the relatively low concentrations of sulfur in the flue gas, the best performance that can be expected is somewhere between 30 percent and 50 percent capture at normal operating loads without unreasonable injection rates (>5X the norm).
d. Also, given the constraints identified above, the normal ratio of sorbent to sulfur would not be sufficient to achieve the stated capture efficiencies. It is likely that a significantly higher ratio (more sorbent per pound of sulfur) will be required.
e. It may not be possible to operate the DSI system at lower loads due to a lack of flue gas temperature at the injection point.
f. There are no other possible injection points. The only way to increase the residence time is to modify the flue gas duct (at considerable expense).
g. At the sorbent injection rates that would be required to achieve the capture rates noted above, there is a potential for significant amounts of NO_2 to be formed as a result of the chemical reaction which may form a brown plume and cause visual opacity issues. (August 2014 B&W Technical Paper "DSI Impacts on Visual Opacity")

B&W indicates that UAF could install a DSI system in the existing ductwork that would achieve some reduction in sulfur pollutants. That being said, the system would not be capable of the pollutant reductions typically associated with a new DSI system. Further, the injection of significant quantities of sorbent would likely result in the generation of unacceptable levels of NOx. It is theoretically possible that the flue gas duct could be modified to optimize the performance of a new DSI system, but these modifications would be extremely difficult and expensive to make. There was no consideration for a secondary emissions control system for SO_2 when the facility was originally designed. As such the boiler and the baghouse are in close proximity to each other and the flue gas duct that connects them is surrounded by essential plant equipment, structural steel, and plant utilities.

Below, is a summary of the financial indicators provided by UAF:

1. Fixed and variable production costs: Regardless of the exact cost, implementing DSI as SO_2 emissions controls on EU 113 is not financially possible for UAF. UAF is a public institution and an entity of the State of Alaska. On February 13, 2019 Governor Mike Dunleavy released his budget proposal for 2020. The University of Alaska (UA) is

facing a proposed budget cut of $134 million, or 41 percent of the state's funding of $327 million, reducing the university's general fund support to $193 million. The cut is on top of state funding cuts that have occurred for four out of the last five years, resulting in program reductions and the loss of more than 1,200 faculty and staff. Under the Governor's spending plan, if his proposed cut is sustained by the legislature, it would be the largest year-over-year reduction in the university's history and would take UA back to 2002 funding levels. These cuts substantially impact UA and harm Alaska's ability to grow the highly trained workforce necessary to be economically competitive with other states.

The new UAF on-campus Combined Heat and Power Plant (CHPP) is an efficient and clean approach to generating electric power and heat from a single fuel source. At the UAF CHPP, fuel is burned to create steam, which both heats and cools campus and spins turbines to create electricity. Instead of purchasing electricity from the distribution grid and burning fuel in our on-site boilers to produce heat, UAF can use combined heat and power to provide both products as part of one combustion process.

If DSI were to be imposed as BACT for SO_2 emissions on EU 113, the expected impacts to the UAF financial indicators are as follows: (All costs from the 2017 UAF BACT Analysis adjusted for inflation from 2016 to 2019 dollars using a 6 percent inflation adjustment 2016 to 2019 dollars per USInflationCalculator.com)

Capital Cost

UAF estimated in the January 2017 BACT analysis a total capital cost to install DSI control technology at EU ID 113 of $2,687,100.

Fixed and variable production costs

In the January 2017 UAF BACT Analysis, UAF estimated the total annualized cost for DSI control technology at $1,799,336 (not including labor and maintenance) with a cost effectiveness of $9,266 per ton. In the March 2018 DEC BACT Determination, DEC estimated the total annualized cost to be $2,246,238 with a cost effectiveness of $7,536 per ton. However, the true cost effectiveness based on the DEC total annualized cost and the removal of 194 tons per year of SO_2 is actually $11,578 per ton of SO_2 removed as discussed above.

EU 113 is in the commissioning phase and has not yet operated at the maximum design production rate at steady state that would allow meaningful fixed and variable production cost ratios ($/kW or $/klb steam) to be calculated.

Cost Contributor	Annualized Cost
Production costs ($/kW or $/1,000 lb steam) *without* DSI	Not known
Production costs ($/kW or $/1,000 lb steam) *including* DSI	Not known
DSI Sorbent (sodium bicarbonate or hydrated lime)	$919,800[2]
DSI Electrical	$315,360[3]
DSI incremental ash disposal (at FNSB)	$150,000[4]
Labor for handling limestone and additional ash	$15,500[5]

Potentially voiding construction warranties	Not known

[2] UAF BACT Analysis, January 2017, Table 5-7
[3] UAF BACT Analysis, January 2017, Table 5-7
[4] From estimated sorbent use and disposal cost at FNSB Solid Waste facility
[5] Estimated labor cost derived from estimated hours by UAF Director of Utilities 416 hours/yr @ $37.18/hr

While the actual production costs of the new EU 113 boiler are not yet known, the following are the 2019 operating costs for the current UAF power plant (data provided by the UAF Director of Utilities)

Electric	$0.203 per kilowatt hour
F&A	37.2%
Sewer	$7.00 per 1000 gallons
Steam	$15.47 per 1000 lb
Water	$7.10 per 1000 gallons

2. Product supply and demand elasticity: Product supply and demand elasticity is not an applicable parameter because the steam heat and electricity generated through the use of EU 113 are not sold.

3. Product prices (cost absorption vs. cost pass-through): Product price is not an applicable parameter because the steam heat and electricity generated through the use of EU 113 are not sold.

4. Expected costs incurred by competitors: Expected competitor costs is not an applicable parameter because the steam heat and electricity generated through the use of EU 113 are not sold. The UAF CHPP is not competing in the open or semi-open market.

5. Company Profits: Company profits is not an applicable parameter because UAF is a State of Alaska facility, not a for-profit company.

6. Employment costs: UAF has requested and has not yet been provided the DEC calculations for the economic analysis of SO_2 controls as discussed above.

7. Other costs (e.g., for BACM implemented by public sector entities). UAF is a state institution with a budget that is determined by the Legislature. Spending funding on the DSI would cause funds to be diverted from the educational and research mission of the University. Impacts from the lack of funds include fewer staff to provide support services (grounds, maintenance, transportation, human resources, payroll, risk management, safety, fire and police, procurement), reduction in degree programs, further deferred maintenance which will cause deterioration of facilities and roads, inability to replace defunct equipment, and other impacts. The cost in dollars would be the amount of money that would be diverted for operations and maintenance of the DSI annually,

plus the cost of construction of the plant and the interest payable on any bonds – the annualized cost of $2,246,238.

Other factors:
It is unlikely that the incremental reduction of SO_2 emissions from EU ID 113 with the DSI system installed (compared to air quality permit limits) would significantly reduce $PM_{2.5}$ concentrations in the FNSB serious nonattainment area because:

- The stack height of EU 113 is 210 feet.
- The UAF CHPP is located towards the west end of Fairbanks of the serious nonattainment area. Flow through the airshed is comparable to flow through the local watershed (roughly east to west), therefore with normal conditions in place, impacts to the non-attainment area should be minimal.

DSI technology requires the addition of limestone, lime, or sodium bicarbonate to the boiler flue gas post-combustion prior to the baghouse. Any unreacted sorbent could alter the physical properties of the coal ash, including the leachability of metals. With an estimated quantity of 1,314 tons per year of sorbent used in the DSI process at UAF, the amount of waste material captured in the baghouse will increase significantly. UAF could face the added significant cost of disposal of an increased volume of coal ash with increased hazardous properties if UAF is compelled to install DSI technology at EU 113.

On April 29, 2019, UAF provided an Economic Infeasibility Analysis for SO_2 emission controls, and indicated it will commit to use ULSD on its existing permitted fuel burning equipment that is not currently required to use this type of fuel, but understands that this will be a requirement in the serious SIP. However, any additional pollution control equipment added to any of the units will be an additional hardship to the University and its mission. UAF will commit to completing additional source testing for SO_2 to substantiate the reduction in sulfur due to elimination of the existing coal-fired boilers and the use of the new circulated fluidized bed boiler. UAF will complete additional SO_2 source testing within 6 months after initial start-up. Also, once the facility is operational, EU IDs 3 and 4 will reduce their usage dramatically which will also lower the sulfur emissions from UAF.

7.7.8.6.5 DEC BACT and SIP Findings for the University of Alaska Fairbanks Campus

FINDING: DEC finds that the financial indicators provided by UAF (see Appendix III.D.7.7) are sufficient evidence to demonstrate that imposing add-on DSI controls on the dual fuel-fired boiler would cause an adverse economic impact to UAF. Therefore, DEC finds that it is economically infeasible for UAF to implement retrofit SO_2 controls on the dual fuel-fired boiler at the University of Alaska Fairbanks Campus. BACT for this unit is maintaining good combustion practices by following the manufacturer's operating and maintenance procedures, the existing NSPS SO_2 limit of 0.20 lb/MMBtu, and combustion of low sulfur coal as a fuel source. By June 9, 2021, UAF shall limit the sulfur content of coal to 0.25% S by weight.

- On or before June 9, 2020, UAF shall submit a Title I permit application to DEC that includes a BACT requirement to combust only ULSD in its diesel-fired engines no later than June 9, 2021.
- On or before June 9, 2020, UAF shall also submit a Title I permit application to DEC that includes a BACT requirement to limit the sulfur content of fuel oil combusted in its diesel-fired boilers to no greater than 1,000 ppmw (S1000) from October 1 through March 31 with an effective date of no later than October 1, 2020.
- On or before June 9, 2021, UAF shall also submit a Title I permit application to DEC that includes a BACT requirement to limit the sulfur content of fuel oil combusted in its diesel-fired boilers to no greater than 15 ppmw (ULSD) from October 1 through March 31 with an effective date of no later than October 1, 2023.

7.7.9 DEC Stationary Source Control (New Source Review)

The CAA section 172 (c) requirements for nonattainment areas apply to the $PM_{2.5}$ nonattainment area. Under this attainment plan, the requirements of CAA Part D, New Source Review (NSR) apply for major stationary sources. Section 302 of the CAA (42 U.S. C. 7602) defines a major stationary source as any stationary facility or source of air pollutants that directly emits, or has the potential to emit, 70 tons per year of any pollutant in a Serious nonattainment area. Permits for construction and operation of new or modified major stationary sources within the nonattainment area must be approved through the NSR program. Within the FNSB, DEC is responsible for issuing construction and Title V operating permits. DEC has incorporated the requirements for Prevention of Significant Deterioration (PSD) and nonattainment New Source Review in 18 AAC 50, Article 3. On October 8, 2018, DEC submitted revisions to the Alaska SIP to ensure the fulfillment of nonattainment New Source Review requirements for the serious PM2.5 nonattainment area and EPA approved that SIP revision effective September 30, 2019 (Federal Register, Vol. 84, No. 168, Thursday, August 29, 2019). DEC actively implements its permit programs. The Air Quality Division issues and amends permits, conducts inspections, reviews reports from industry, provides compliance assistance, and takes enforcement actions when needed.

7.7.10 Potential Future Control Measures Currently Undergoing Research Efforts or Development

7.7.10.1 RCD - retrofit control devices (ESP)

Electrostatic Precipitators (ESPs) are pollution control devices that use electrical forces to remove fine particulate matter (PM) from exhaust streams. PM collection in an ESP occurs in three steps: suspended particles are given an electrical charge; the charged particles migrate to a collecting electrode; and the collected PM is dislodged or cleaned from the collecting electrode. ESP technology has been available for over a century and successfully employed on numerous industrial applications in the U.S., and throughout the world, with typical PM control efficiencies of 90% – 99%. Central to achieving the aforementioned performance is site specific design,

continuous monitoring, and periodic maintenance; i.e. ESPs are not one size fits all, and are not plug and play.
The Stakeholders group recommended that FNSB and DEC should continue to evaluate retrofit control devices such as ESPs using currently appropriated funding, Stakeholder recommendation S 56 in table 7.7-3. FNSB ordinance 2018-20-1G, provided in Appendix III.D.7.7 appropriates $458,000 for wood stove/pellet stove retrofit emissions control device testing. FNSB award a contract in 2019 to test retrofit control devices in a laboratory setting during 2019-2020 to gather emission data related to ESP use.

Other countries, most notably European countries, have implemented ESPs on residential wood stoves. The technology transfer from the industrial sector to the residential sector required each country to address key issues not inherent in the technology itself; e.g. site specific design, continuous monitoring, and periodic maintenance. FNSB reviewed regulations from Zurich, Switzerland, where ESPs may be retrofitted on handcrafted wood stoves to meet standards in cases where laboratory certification is not practical. Zurich also encourages the use of ESPs in general to reduce emissions, but does not provide any additional regulatory incentive to use an ESP. Notable regulations that address monitoring and maintenance requirements include:

- Annual inspections to verify proper device operation and use of clean dry fuel;
- Annual chimney sweep by certified professional;
- All hydronic heating systems subject to emission measurements every 2 years;
- Only dry and untreated wood may be burned. In case of doubt, an ash sample is collected, analyzed by a laboratory, and judged by the authorities; and,
- Minimum of 60% control efficiency for retrofit control devices, such as ESPs.

OekoSolve (European ESP manufacturer) personnel have indicated to FNSB that professional installation, periodic chimney cleaning, and proper stove operation are paramount to the ESP achieving and maintaining performance.

Several studies regarding ESP performance on wood stoves have been completed. FNSB has reviewed the following reports:

- Brunner T., Wuercher G., Obernberger I., 2016: 2-year field operation monitoring of electrostatic precipitators for residential wood heating systems.

- Nussbaumer, T., Lauber, A., 2010: Formation mechanisms and physical properties of particles of particles from wood combustion for design and operation of electrostatic precipitators.

- RWE, 2011: Report on testing of an installation of type “OekoTube OT-2” for removing dust from the flue gases of domestic stoves.

- Weston Solutions, 2013: OekoTube Test Report.

Of the available testing reports, the 2016 2-year field study is most applicable to the situation in Fairbanks. Field testing was conducted in Graz, Austria and pertinent results are summarized in Table 7.7-19.

Table 7.7-19. Summarized Results of 2016 2-Year Field Study

Site	Year	ESP Availability	Control Efficiency (TSP)[1]
1	2014/15	97.7%	30-93%
1	2015/16	81.2%	54-90%
2	2014/15	81.7%	35-83%
3	2015/16	80.2%	57-93%

[1]TSP is defined as total suspended particulate

Notable findings from the 2016 2-year field study include that up to two additional cleanings by the chimney sweep were needed to maintain the ESP performance over the whole heating season. At site 2, high temperatures caused thermal deformations of the electrode resulting in a high spark rate which contributed to low availability and performance.

FNSB is cautiously optimistic that ESPs can successfully be implemented and help the area reach attainment. While ESPs appear to offer a politically attractive solution to this contentious issue, there are several obstacles to successful implementation. The lack of regulatory framework and regulatory authority to certify and guarantee long term performance is one obstacle, specifically:

- The EPA does not have any certification process for retrofit control devices on wood stoves; and,
- The regulatory framework at the local, state, and federal level lack the necessary language to exclude devices with unproven performance (e.g. homemade devices).

No other jurisdiction in the United States has implemented a monitoring and maintenance plan at a residential level that guarantees operation of a retrofit emission control device which creates the following obstacles:

- ESPs require professional installation, there are a lack of trained professionals and currently no way to verify installation;
- ESPs require periodic chimney cleanings, currently there is no way to verify cleaning; and,
- ESPs require periodic maintenance, there are a lack of trained professionals and currently no way to verify maintenance.

During the Stakeholder process, it was clear that the additional regulations to guarantee performance were not immediately acceptable to the community. The Stakeholders rejected a control measure to require ESPs for new installation or change out, but included a recommendation that FNSB and DEC should continue to evaluate RCDs using currently appropriated funding.

The implementation strategy, i.e. incentive for residents to purchase and install ESPs, is not clearly identified which is another obstacle. Community members view ESP installation in lieu of burn bans as the incentive to install; however that strategy could lead to worse air quality conditions if ESP performance deteriorates over time, and there are legal issues regarding backsliding with the Fairbanks Moderate State Implementation Plan (SIP). Another implementation strategy would be a requirement to install ESPs on certain devices (e.g. devices that are exempt from burn bans), which would achieve the highest air quality benefit but would likely be viewed as regulatory overreach by the community.

FNSB has worked extensively with EPA regarding lack of certification process, and has completed a laboratory testing protocol sufficient to quantify emission reductions for SIP purposes which is a stopgap for that obstacle and allows work to move forward.

While FNSB has appropriated $457,000 for a retrofit control device to undergo the laboratory testing, developed cooperatively with EPA, there are still several funding requirements to consider, specifically:

- Development and completion of field testing protocol to develop a monitoring program sufficient to guarantee long term performance, estimated cost of $500,000;
- Cost of device to the consumer, assuming 7,200 eligible devices and $2,000 per installation the estimated cost is $14,400,000; and,
- Program oversight to verify installation, cleaning, and maintenance requirements, assuming 2 FTEs, salaries, benefits, management, supplies, etc. the estimated cost is $300,000 per year.

7.7.10.2 Expanded Availability and Use of Natural Gas

The State of Alaska and Interior Gas Utility have been actively engaged in expanding the availability and use of natural gas in the nonattainment area through the implementation of the Interior Energy Project. A key to reducing fine particulate matter air pollution in the FNSB nonattainment area in the long term is expanding the availability of affordable, cleaner burning fuel options. The Interior Energy Project was initiated through legislative action in 2013 to provide the financial tools needed to expand natural gas availability in the Fairbanks and North Pole areas.

The project was initially established through Senate Bill 23 which passed the Alaska Legislature unanimously in April 2013. The legislation authorized the Alaska Industrial Development and Export Authority (AIDEA) to provide the financing package to partner with the private sector for a liquefied natural gas (LNG) plant to supply gas to the Interior and a natural gas distribution system in Fairbanks and North Pole. House Bill (HB) 105 was passed by the Alaska Legislature in 2015 to renew and advance the Interior Energy Project. The financing package refreshed by this legislation provided the Alaska Industrial Development and Export Authority (AIDEA) the tools necessary to develop an integrated supply chain bringing lower-cost energy to residents and businesses through local utilities.

The Interior Energy Project included a financial package to act as a catalyst for AIDEA and private-sector partners to finance and develop the supply and delivery of natural gas to Interior Alaska. The initial financing package included a $57.5 million appropriation from the Sustainable Energy Transmission Supply and Development Fund (SETS) to serve as the State's equity stake in the project, low-interest SETS loans, coupled with State-backed AIDEA bonds. The project also leverages previous legislation that provided up to $15 million in natural gas storage credits for each qualifying LNG storage tank. The components of the state financing project include:

Sustainable Energy Transmission & Supply Development Program (SETS)

- $57.5 million appropriation to directly reduce LNG cost.
- $125 million SETS capitalization to provide optimal commercial structure at 3 percent interest.

AIDEA Bonds

- Authorized for $150 million to provide low-cost capital for the distribution system build out at an anticipated 3 to 4.5 percent interest rate.

Existing Natural Gas Storage Credits

- $15 million per qualifying storage tank to directly reduce the customer utility price.

In 2012, the Interior Gas Utility (IGU) was formed by the borough and municipal governments to oversee the development of a natural gas distribution network to provide service to the Fairbanks and North Pole area. The IGU is a public corporation whose mission is to provide low cost, clean burning, natural gas to the largest number of customers in the Fairbanks North Star Borough as soon as possible.

On September 21, 2017, the AIDEA Board considered and approved a development plan that met the requirements of HB 105. Reaching this milestone provided the Authority access to the remaining IEP financial tools. AIDEA continued to advance IEP goals by pursuing consolidation of the existing natural gas utility infrastructure owned by AIDEA, under Pentex Alaska Natural Gas Company, LLC (Pentex), with infrastructure owned by the IGU.

The overall IEP effort has the following project components: gas supply, liquefaction, transportation, distribution (including storage and regasification), and conversions. All project components are advancing. In 2015, there was a significant local build out of piped infrastructure for the distribution system in preparation for expanded service into previously unserved areas of Fairbanks and North Pole. The IGU is currently in the process of constructing LNG storage tanks in Fairbanks and North Pole that will provide the necessary capacity to allow for an expanded customer base within the $PM_{2.5}$ nonattainment area. The Fairbanks LNG storage project has a target completion date of fall 2019, and the North Pole Storage the summer of 2020. Efforts to assist consumers with conversions to natural gas have centered on access to favorable financing mechanisms and identification of possible low-cost loan funds. A local conversion working group is identifying possible funding sources for conversion assistance.

The State is using the conversion projections (May 17, 2018) developed and provided by the IGU in its forecasts for future air quality benefits from space heating conversions from wood,

coal, or oil to natural gas burning appliances. The IGU projections estimate new customers will begin to convert to natural gas in the FY2020 timeframe.

7.7.10.3 Continuation of AHFC Energy Programs

The use of wood as a source of home heating fuel is mostly driven by high energy costs. One way to help reduce wood smoke emissions in the nonattainment area is to make home heating more efficient through proper weatherization. Establishing and funding a weatherization program was identified as a high priority by the Air Quality Stakeholders Group in order to help reduce $PM_{2.5}$ emissions in the Fairbanks Nonattainment Area.

The Alaska Housing Finance Corporation (AHFC) implements several energy programs that are designed to make homes more energy efficient. In 2019, these include the Energy Efficient Interest Rate Reduction (EEIRR) program, Home Energy Loan program, and No-Cost Weatherization program. As homeowners make energy efficiency improvements, they reduce the amount of fuel and electricity needed for power and heat leading to corresponding air quality benefits due to the reduced fuels being burned for space heating and power generation.

Interior Weatherization, Inc. is AHFC's contractor for Fairbanks area weatherization assistance. Their Weatherization Assistance Program provides low and moderate income households with improvements to their homes which increase the energy efficiency of their dwelling, including measures such as:

- Airsealing attics, crawlspaces, etc.
- Insulating and weather stripping
- Repair and replacement of heating systems
- Replacement of doors and windows
- Installation of fans, smoke alarms, CO detectors

The weatherization work is performed by Interior Weatherization crews and specialty contractors for heating, electrical, etc. Weatherization services are provided to qualified homeowners and renters including: single and multifamily homes, mobile homes, apartments and condos.

It is anticipated that AHFC energy programs will continue in the future, assuming continued funding, and, as a result, additional emission benefits will be realized in future years.

7.7.11 Future Re-Evaluation of Control Strategies

The FNSB and DEC recognize that in the future the mix of $PM_{2.5}$ control strategies implemented in Fairbanks could warrant revision. This would be accomplished through a future attainment or maintenance plan revision and subject to approval by EPA. Given the analyses of $PM_{2.5}$ emissions and precursors and $PM_{2.5}$ air monitoring data in this attainment plan, the agencies commit to re-evaluating the entire mix of control measures as early as 2023/2024, following an update to the CMAQ model, to determine whether the measures have succeeded as planned in

reducing emissions and improving air quality. This evaluation could result in measures being removed or added to the plan, depending on the outcome of the analyses. All changes to the air quality plan must be approved by EPA.

7.7.12 Control Strategies – 189(d) and 40 CFR 51.1010(c) for 2020 Amendment

This section outlines the control strategies that were considered and selected by DEC and the FNSB in the Serious area plan. The process followed to identify and select control measures for the Serious area SIP was performed in accordance with 40 C.F.R. § 51.1010(a) and CAA Sec 189(b). CAA section 189(d) specifies the plan revisions required when a serious nonattainment area fails to attain by the applicable attainment date. It calls for annual reductions of not less than 5% of the most recent emissions inventory. This section also outlines the control strategies that were considered and reconsidered including re-examining the implementation schedules by DEC and the Borough for the 2020 Amendment to the Serious SIP (2020 Amendment). The process followed to identify and select control measures for the 2020 Amendment was performed in accordance with 40 C.F.R. § 51.1010(c) and CAA Sec. 189(d). As a result of the Serious and 2020 Amendment, DEC has assembled the control strategies that collectively meet the BACM/BACT/MSM and 189(d) requirements.

7.7.12.2 BACM and 2020 Amendment Control Measure Requirements

Those emission sources that are not classified as large stationary sources and subject to BACT are subject to Best Available Control Measure requirements. These sources include smaller space heating sources, motor vehicles, other fuel burning equipment, and small industrial sources. The process for selecting BACM is defined in a series of steps detailed in the Final $PM_{2.5}$ Rule.[14] 40 C.F.R. 51.1010(c) defines the process for selecting 2020 Amendment control measures; it references the same section of the Final $PM_{2.5}$ Rule that defines the steps for selecting BACM (section VI.D.3). These steps clarify and update $PM_{2.5}$ control measure selection guidance presented in the Addendum to the General Preamble[15] for the selection of $PM_{2.5}$ controls for Reasonably Available Control Measures (RACM), required for Moderate nonattainment areas, BACM for Serious nonattainment areas and 2020 Amendment control measures providing 5% annual reductions for serious nonattainment areas that failed to attain by the applicable attainment date. Presented below is a summary of the 5-step BACM and 2020 Amendment control measure selection guidance presented in the Final $PM_{2.5}$ Rule:

- Step 1: Develop a comprehensive inventory of sources and source categories of directly emitted $PM_{2.5}$ and $PM_{2.5}$ precursors.
- Step 2: Identify potential control measures.
- Step 3: Determine whether an available control measure or technology is technologically feasible.

14 https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf
15 https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19940816_59fr_41998-42017_addendum_general_preamble.pdf

- Step 4: Determine whether an available control technology or measure is economically feasible.
- Step 5: Determine the earliest date by which a control measure or technology can be implemented in whole or in part.

The following source categories were evaluated for BACM and 2020 Amendment control measures. This list is based on emissions inventory information and other technical analyses that identify the most important sources for $PM_{2.5}$ in the nonattainment area.

- Solid Fuel Burning
  - Outdoor solid fuel-fired boilers (hydronic heater)
  - Solid fuel-fired heaters
  - Fireplaces
  - Burn barrels, residential open burning
  - Agricultural and forest burns
- Residential and Commercial Fuel Oil Combustion
- Transportation
  - Automobiles
  - Heavy-duty vehicles
- Commercial sources
  - Coffee roasters
  - Charbroilers
  - Incinerators
  - Used oil burners

The inventory supporting the BACM and 2020 Amendment control measure analysis was developed in a manner consistent with the emissions inventory requirements for the Serious area and for the 2020 Amendments to the Serious plan as specified in the Final $PM_{2.5}$ Rule. This included representation of source activity and emissions on a seasonal, rather than annual basis as provided for under the Final PM Rule. As discussed in Section III.D.7.6 Emission Inventory, use of seasonal estimates is appropriate for the 24-hour $PM_{2.5}$ standard in Fairbanks since violations of the standard are confined to winter months (October through March) and source activity that triggers these violations peaks during that time. The majority of wintertime activity and emission factor data supporting the inventory was developed based on local data and test measurements.

7.7.12.3 Evidence of Compliance with the Serious SIP – Existing and Continuing Control Measures

The $PM_{2.5}$ Implementation Rule at 40 C.F.R. § 51.1005(b)(1)(ii) and 51.1005(d)(1) requires that the State show evidence that all controls submitted in the applicable attainment plan have been implemented. DEC and the Borough are implementing all the measures identified in the approved Moderate Area SIP and the submitted Serious Area SIP. Table 7.7-20 summarizes the Moderate SIP control measures and their implementation status. Table 7.7-21 summarizes the Serious Area SIP control measures and their implementation status.

Table 7.7-20 Moderate SIP Control Measures			
Control Measure/Program	Voluntary Measure	Status	
		Implemented	On-going
Space Heating and Solid Fuel Heating Controls			
Solid Fuel-Fired Heating Device Upgrades	X	X	X
Solid Fuel-Fired Heating Device Emission Standards		X	X
Improving Solid-Fuel Device Operations	X	X	X
Reduced Use of Solid Fuel Heating During Air Pollution Episodes (Curtailment)		X	X
AHFC Energy Programs	X	X	X
Expanded Availability and Use of Natural Gas	X	X	X
Required Replacement of Non-Certified Wood Heating Devices When Properties are Sold (Contingency Measure)		X	X
Enhanced Dry Wood Compliance: Registration of Wood Sellers and Moisture Content Disclosure (Contingency Measure)		X	X
Transportation Control Strategies			
Expanded Availability of Plug-Ins	X	X	
Mass Transit System	X	X	X
DOT Anti-Idling and Diesel Emission Reductions	X	X	
ADEC Diesel Emission Reduction Efforts	X	X	
Federal Diesel Emission Reduction Programs		X	X
Federal Motor Vehicle Control Program		X	X
Open Burning			
Winter Season Open Burning Ban		X	X
Point Source Controls			
Reasonably Achievable Control Technology		X	X
New Source Review Permit Program		X	X

Table 7.7-21 2020 Adopted Serious SIP Control Measures		
Control Measure/Program	Status	
	Implemented	On-going
Space Heating and Solid Fuel Heating Controls		
Solid Fuel-Fired Heating Device Upgrades	X	X
Solid Fuel-Fired Heating Device Emission Standards (Device Requirements)	X	X
Improving Solid-Fuel Device Operations (Fuel Requirements)	X	X
Reduced Use of Solid Fuel Heating During Air Pollution Episodes (Curtailment)	X	X
Real Estate Requirement and Date Certain Removal	X	X
Wood-Fired Heating Device Registration	X	X
Expanded Availability and Use of Natural Gas	X	X
Transportation Control Strategies		
Mass Transit System	X	X
Federal Diesel Emission Reduction Programs	X	X
Federal Motor Vehicle Control Program	X	X
Small Commercial Sources		
Small Source Information and Requirements	X	X
Open Burning		
Winter Season Open Burning Ban	X	X
Point Source Controls		
Best Available Control Technology	X	X

Additional information and more detailed documentation on the implementation of the Moderate Area SIP and Serious Area SIP control measures is included in Appendix III.D.7.7

7.7.12.4 Control Strategy Origination

The $PM_{2.5}$ Final Rule requires states to identify controls for all sources and source categories in the latest base year emission inventory for the nonattainment area. The starting point for assembling a list of controls is the RACM analysis prepared for the Moderate SIP. However, it is worth noting that progress on control measures did not stop with the RACM analysis and the Moderate SIP. During the time period following the Moderate SIP submission FNSB had authority to regulate the home heating source sector. The most recent version of the FNSB air quality program with significant control measures began with adoption of FNSB Ordinance 2015-01 on February 27, 2015, which created the following control measures:

- Visible emission standards;
- $PM_{2.5}$ emissions crossing property lines;
- Setback for hydronic heaters;
- Prohibited fuels;

- Limitations on appliance sales;
- Nuisance provisions; and,
- Curtailment program.

FNSB Ordinance 2015-01 also established the air quality control zones within the nonattainment boundary and established a fine schedule for noncompliance.

FNSB Ordinance 2016-21, adopted May 4, 2016, added a control measure that required persons convicted of two or more violations involving visible emissions or $PM_{2.5}$ crossing property lines to remove certain hydronic heaters. FNSB Ordinance 2016-37, adopted July 28, 2016, modified the No Other Adequate Source of Heat (NOASH) exemption for the curtailment program requiring that qualifying structures were constructed on or before December 31, 2016 to ensure that no new construction would be eligible for a NOASH affidavit.

FNSB Ordinance 2017-18, adopted March 9, 2017, strengthened the curtailment program by:

- Removing the temperature threshold on the curtailment program which prevented curtailment from being called when the temperature was below -15 degrees Fahrenheit at the Fairbanks International Airport;
- Modified the curtailment program from a 3 stage program to a 2 stage program by removing the voluntary stage;
- Lowered the first stage threshold from 35 $\mu g/m^3$ to 25 $\mu g/m^3$; and,
- Lowered the second stage threshold from 55 $\mu g/m^3$ to 35 $\mu g/m^3$.

FNSB Ordinance 2017-18 also strengthened the wood stove change out program by requiring pellet stoves certified as a replacement option be EPA certified to 2.0 g/hr or less and added emergency power systems as a replacement option.

FNSB Ordinance 2017-44, adopted June 19, 2017, added a new control measure requiring permits for installation of SFBA in new construction. Ordinance 2017-44 strengthened the wood stove change out program by requiring professional installation, proper wood storage, and training. Ordinance 2017-44 strengthened the curtailment program by requiring a waiver to operate a SFBA during a Stage 1 curtailment, thereby making a Stage 1 curtailment enforceable, and also required more stringent NOASH documentation.

FNSB Ordinance 2018-04, adopted February 8, 2018, modified the NOASH requirements from only Borough listed (under 2.5 g/hr) to Borough listed or EPA certified appliances manufactured after 1998. The change was made to ensure consistency with the Wood Stove Change Out Program.

FNSB Ordinance 2018-26, adopted September 13, 2018, added standards for Retrofit Control Devices (RCD) such as electrostatic precipitators (ESP). The standards included testing requirements, emission standards for RCDs, installation requirements, and a curtailment exemption if regulatory requirements were met.

FNSB Ordinance 2018-45, adopted November 8, 2018, repealed prohibited acts, the curtailment program, and the fine schedule from FNSB Code. The repeal was due to Proposition 4 which states that the FNSB, excluding the natural gas utility, shall not in any way regulate, prohibit, curtail, ban, nor issue fines or fees associated with the sale, distribution, installation or operation of solid fuel heating appliances or any type of combustible fuels. FNSB Ordinances prior to 2018 were all previously adopted by the State into the Moderate SIP and are being implemented by the State where the FNSB could no longer do so.

FNSB Ordinances 2015-01, 2016-21, 2016-37, 2017-18, 2017-44, 2018-04, 2018-26, and 2018-45 are included in Appendix III.D.7.7.

Consistent with the requirements of 40 CFR 51.1010(a), the starting point for assembling a list of controls for BACM analysis is the RACM analysis prepared for the Moderate SIP. Similarly, the requirements detailed in 40 CFR 51.1010(c specify that the list of BACM controls is the starting point for assembling a list of 2020 Amendment control measures. All controls considered, but not adopted in each succeeding plan must be identified. States are also required to examine a wide range of information sources on existing and potential control measures. Measures and technologies considered and implemented in attainment plans are a significant source of information. Other information sources include summaries of control measures assembled by regional planning organizations and local air quality consortiums. Additionally, the Stakeholder process allowed for public input into control measure selection. The following sections provide a summary of control measure selection.

7.7.12.4.1 Preliminary Draft BACM Report

DEC prepared a preliminary draft BACM report that was released March 22, 2018, for public review. The preliminary draft BACM document identified 72 control measures for consideration that included information from the RACM analysis from the Moderate SIP. A list of the control measures identified is provided in table 7.7-22.

Table 7.7-22. Control Measure from March 22, 2018, Preliminary Draft Document

Number	Description
1	Surcharge on Device Sales
2	Prohibit advertising used devices that do not meet emission criteria for new device sales
3	Require building or other permit
4	Require confirmation of proper installation by requiring professional installation or on-site inspection
5	Register/require industry certification of heating professionals
6	Prohibit installation of flue dampers unless device was certified using a flue damper
7	Require devices meet stricter emission criteria in high pollution zones.
8	Prohibit installation of Solid Fuel Heating Device (SFHD) in new construction
9	Limit the density of SFHD in new developments
10	Install EPA-certified device whenever a fireplace or chimney is remodeled

Number	Description
11	Prohibit use of rain caps on stacks
12	Require minimum stack height for outdoor wood boilers relative to rooflines of nearby unserved buildings
13	Submit sale and installation information to Air Program
14	Require installation of thermal mass to improve efficiency and prevent frequent cycling in selected new units
15	Disclosure of devices on property sale
16	Require notice and proof of destruction or surrender of removed, uncertified devices (date certain removal of uncertified devices)
17	Require Removal of Uncertified Solid Fuel Burning Devices Upon Sale of Property
18	No Visible Emissions during Curtailment Periods
19	Require registration of devices to qualify for exemption from curtailments
20	Require renewals with inspection requirements
21	Optional device registration for curtailment exemptions
22	Require registration of all devices
23	Require exempt households to display a decal visible from a point of public access
24	Require Permanent Installed Alternative Heating Method in Rental Units
25	Require detailed application or inspection to verify need for No Other Adequate Source of Heat (NOASH)
26	Require inspection of device and installation
27	Require annual renewal of waiver
28	Set income threshold [for Curtailment Exemption]
29	Allow only NOASH households to burn during curtailment periods
30	Distribution of Curtailment Information at Time of Sale of Wood-Burning Device
31	Require sale of only dry wood during late summer to end of winter
32	Require dry wood to be clearly labeled to prohibit marketing of non-dry wood as dry wood
33	Burn permits required
34	Prohibit burn barrels and other outdoor equipment
35	Restrict burning during air pollution events
36	Prohibit residential open burning
37	Periodic burn windows
38	Ambient $PM_{2.5}$ curtailment threshold (1-hr average)
39	Use of AQI as Basis for Curtailment Threshold
40	Single stage curtailment
41	Special needs permit
42	Burn down period
43	Exempt ceremonial or religious fires
44	Alternative heating appliance failure
45	Elevation exemption from wood burning curtailments
46	Lack of electrical or natural gas service availability
47	Inspection warrants
48	Date certain removal of “coal only heater”

Number	Description
49	Prohibit use of coal burning heaters
50	Require low sulfur content coal
51	Ultra-low Sulfur Heating Oil
52	Operation and sale of small “pot burners” prohibited
53	No Use, Sale or Exchange of Used Oil for Fuel, unless it Meets Constituent Property Limits
54	Adopt CARB vehicle standards
55	School bus retrofits
56	Road paving
57	Other Transportation Control Measures (TCMs)
58	Controls on road sanding and salting
59	I/M Program
R1	Regional kiln
R4	All wood stoves must be certified
R5	Ban new installations - Hydronic Heaters
R6	Remove hydronic heaters at time of home sale
R7	Ban use of Hydronic Heaters
R10	Replace uncertified units at time of sale
R11	Replace uncertified units at time of significant remodeling
R12	Replace uncertified stoves in rental units
R15	Ban new installations - Wood Stoves
R16	Disincentives to sell used stoves
R17	Ban use of Wood Stoves
R20	Transportation Control Measures
R29	Increase Coverage of District Heating Systems

The process followed to select control measures for the 2020 Amendment was to assemble a list of the control measures not adopted in the Serious SIP and to review the directly control measures implemented in the following communities to determine if any revisions had been adopted since the submission of the Serious SIP; they included:

- Bay Area AQMD, CA
- South Coast AQMD, CA
- San Joaquin Valley, CA
- Maricopa County, AZ
- Puget Sound CAA, WA
- Utah, UT

The review of the control measures employed in these $PM_{2.5}$ programs determined that no new measures had been implemented since submission of the Serious SIP. The list of control measures not adopted in the Serious SIP is presented in Table 7.7-23

Table 7.7-23. Control Measure Not Adopted in the Serious Area SIP

Number	Description
1	Surcharge on Device Sales
6	Prohibit installation of flue dampers unless device was certified using a flue damper
8	Prohibit installation of Solid Fuel Heating Device (SFHD) in new construction
9	Limit the density of SFHD in new developments
10	Install EPA-certified device whenever a fireplace or chimney is remodeled
11	Prohibit use of rain caps on stacks
12	Require minimum stack height for outdoor wood boilers relative to rooflines of nearby unserved buildings
14	Require installation of thermal mass to improve efficiency and prevent frequent cycling in selected new units
18	No Visible Emissions during Curtailment Periods
20	Require renewals with inspection requirements
23	Require exempt households to display a decal visible from a point of public access
25	Require detailed application or inspection to verify need for No Other Adequate Source of Heat (NOASH)
27	Require annual renewal of waiver
28	Set income threshold [for Curtailment Exemption]
29	Allow only NOASH households to burn during curtailment periods
31	Require sale of only dry wood during late summer to end of winter
32	Require dry wood to be clearly labeled to prohibit marketing of non-dry wood as dry wood
35	Restrict burning during air pollution events
38	Ambient $PM_{2.5}$ curtailment threshold (1-hr average)
39	Use of AQI as Basis for Curtailment Threshold
42	Burn down period
45	Elevation exemption from wood burning curtailments
46	Lack of electrical or natural gas service availability
50	Require low sulfur content coal
51	Ultra-low Sulfur Heating Oil
52	Operation and sale of small “pot burners” prohibited
53	No Use, Sale or Exchange of Used Oil for Fuel, unless it Meets Constituent Property Limits
54	Adopt CARB vehicle standards
55	School bus retrofits
56	Road paving
57	Other Transportation Control Measures (TCMs)
58	Controls on road sanding and salting
59	I/M Program
60	Vehicle Idling
61	Fuel Oil Boiler Upgrade – Burner Upgrade/Repair
62	Fuel Oil Boiler Upgrade – Replacement
63	Require Electrostatic Precipitators

Number	Description
64	Weatherization and Energy Efficiency
67	Coffee Roasters
68	Charbroilers
69	Incinerators
70	Used Oil Burners
R1	Regional kiln
R7	Ban use of Hydronic Heaters
R15	Ban new installations - Wood Stoves
R17	Ban use of Wood Stoves
R20	Transportation Control Measures
R29	Increase Coverage of District Heating Systems

7.7.12.4.3 Other Control Measures for Consideration

After the preliminary draft BACM documents for Serious Plan were released additional control measures were identified. These other control measures include: EPA comments, public comments, rejected stakeholder measures, small commercial and industrial sources, and new control measures. Other control measures identified are shown in Table 7.7-24.

Table 7.7-24, Other Control Measures

Number	Description
60	Vehicle Idling
61	(EPA3a) Fuel Oil Boiler Upgrade - Burner Upgrade/Repair
62	(EPA3b) Fuel Oil Boiler Upgrades - Replacement
63	Require Electrostatic Precipitators
64	Weatherization and energy efficiency measures
65	Emissions crossing property lines
66	Lower curtailment threshold
67	Coffee Roasters - Commercial
68	Charbroilers - Commerical
69	Incinerators - Commercial
70	Used Oil Burners
71	Date certain removal for EPA certified devices over 2.0 g/hr or over 25 years old

As noted above the review of other $PM_{2.5}$ programs determined that no new measures have been implemented since submission of the Serious SIP. These measures are addressed above in Table 7.7-23; therefore, this control measure category has nothing to contribute to the evaluation of potential 2020 Amendment control measures.

7.7.12.4.4 Control Measure Selection

Presented below are the measures selected to address the 40 CFR 50.1010(a) Serious Plan requirements and the 40 CFR 50.1010(c) 2020 Amendment Plan requirements.

Serious Plan Control Measures - A number of control measures address the space heating source sector, in particular the solid fuel space heating source sector. Due to the multiple processes for identifying control measures, and overlap between the control measures, a crosswalk and summary was developed which is shown in Table 7.xxx. When comparing control measures identified in the preliminary draft to Stakeholder control measures specific details may differ, however in several cases a common intent is found in both sets of measures. The crosswalk identifies where the common intent is present.

In total 118 unique control measures were identified which are presented in the crosswalk and summary in Table 7.xxx. The BACM analysis in Appendix III.D.7.7 addresses 84 of the control measures. The 34 unique control measures identified but not addressed in the BACM analysis include 33 Stakeholder recommendations and one contingency measure. The contingency measure is addressed in Section III.D.7.11. Of the 33 Stakeholder measures not included in the BACM analysis 23 were determined to be non-regulatory in nature (e.g. education and outreach recommendations, or implementation strategies/enhancements for existing measures), 6 recommendations dealt with stationary point sources and are not addressed in BACM, 3 are proposed to be adopted into DEC regulations, and 1 resulted in a FNSB resolution. FNSB resolution number 2019-08 supports legislation granting DEC administrative penalty authority in areas classified as serious nonattainment areas and can be found in Appendix xxx.x.7.7.

Step 2 in the BACM analysis was to identify potential control measures. The process identified 84 control measures for analysis. The analysis showed that 6 of the control measures identified did not meet the definition for BACM and were dismissed.

Step 3 in the BACM analysis was to determine if the control measure was technically feasible. 22 control measures were determined to be technically infeasible and were dismissed. 8 control measures were found to be adopted in different form with no further analysis required. 48 measures were determined to be technologically feasible. 40 of those measures were adopted through new state regulations. The 8 remaining measures were forwarded for Step 4 analysis.

Step 4 in the BACM analysis was to determine if the control measure was economically feasible. 7 control measures were determined to be economically infeasible and were dismissed from BACM.

Step 5 in the BACM analysis was to determine if a control measure or technology could be implemented in whole or in part no later than 4 years after reclassification of the area to Serious, which would be June 2021. A total of 41 measures are addressed through state regulations.

Detailed information regarding the analysis of individual BACM is found in the BACM appendix.

Table 7.7-25. Control Measure Summary and Crosswalk

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM
1				Tech					25
2							18 AAC 50.077(k)		27
3	S28 S31						18 AAC 50.077(j)		28
4	S33						18 AAC 50.077(i)		29
5							18 AAC 50.077(i)		30
6				Tech					31
7							18 AAC 50.077(b),(c),(d),(e)		33
8					Econ				35
9		C.a.		Tech					36
10	S29			Tech					38
11				Tech					38
12				Tech					40
13							18 AAC 50.077(a),(b),(h),(l),(k),(i),(j)		42
14						Not BACM			43
15							18 AAC 50.077(a),(h),(l) & Episode Chapter		44
16	S17b S18						18 AAC 50.077(a),(l),(m),(h) & Episode Chapter		46
17							18 AAC 50.077(a),(l),(m)	-	48

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM
							& Episode Chapter		
18				Tech				-	50
19, 21	S1a, S1c						18 AAC 50.077(h)(3) & Episode Chapter	-	52 & 56
20							18 AAC 50.077(h) & Episode Chapter	-	54
22	S1a						18 AAC 50.077(h), (c), (d), & (n)	-	57
23				Tech				-	58
24	S22						18 AAC 50.077(j)	-	59
25	S24						Episode Chapter	-	61
26							18 AAC 50.077(i)	-	62
27	S26, S27						Episode Chapter	-	63
28							Episode Chapter & 18 AAC 50.077(a),(l)	-	64
29	S25	C.c.					Episode Chapter	-	65
30							18 AAC 50.077(k)	-	66
31	S13	B.h.					18 AAC 50.076(d),(e),(g),(j),(k),(l)	-	67
32							18 AAC 50.076(d),(e),(g),(j),(k),(l)	-	69
33			ADF					-	72
34			ADF					-	74

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM
35						Not BACM		-	75
36			ADF					-	76
37			ADF					-	77
38						Not BACM		-	78
39						Not BACM		-	80
40	S25	C.c.					18 AAC 50.077(a),(l) & Episode Chapter		81
41			ADF						84
42							18 AAC 50.075(e)		85
43		C.f.	ADF						86
44			ADF						87
45						Not BACM			88
46						Not BACM			89
47	S39	D.e.	ADF						91
48	S20						18 AAC 50.079(f)		92
49	S20						18 AAC 50.079(f)		93
50				Tech					94
51	S12						18 AAC 50.078(b)		96
52		B.d., B.e.			Econ				98
53		B.d., B.e.			Econ				98
54				Tech					100
55				Tech					101

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM
56				Tech					102
57				Tech					139
58				Tech					103
59				Tech					139
60		C.j., D.h., D.i.		Tech					104
61	S21	C.h.			Econ				106
62	S21	C.h.			Econ				107
63		B.k.		Tech					108
64	S15, S16	B.a., B.b.		Tech					109
65							18 AAC 50.075(f)(2)		110
66							Episode Chapter		111
67		D.f., D.g.					18 AAC 50.078(d)		112
68		D.f., D.g.					18 AAC 50.078(c)		116
69		D.f., D.g.					18 AAC 50.078(c)		118
70		D.f., D.g.					18 AAC 50.078(c)		122
71								18 AAC 50.077 (n)	
R1	S9			Tech					123
R4		B.c., B.f.					18 AAC 50.077(a),(l)		124
R5		A.c.					18 AAC 50.077(a),(b),(l)		125

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM
R6		A.c.					18 AAC 50.077(a),(b),(l)		126
R7		A.c.		Tech					128
R9							18 AAC 50.077(a),(l)		129
R10							18 AAC 50.077(a),(l)		131
R11	S29						18 AAC 50.077(a),(l)		132
R12							18 AAC 50.077(a),(l)		133
R15					Econ				135
R16							18 AAC 50.077(a),(i),(l)		136
R17				Tech					138
R20				Tech					139
R29		C.g.			Econ				143
	S1b			Non-reg					
	S8			Non-reg					
	S10			Non-reg					
	S11			Non-reg					
	S14			Non-reg					
	S17a			Non-reg					
	S19			Non-reg					
	S23						Episode Chapter		
	S30						18 AAC 50.077(a)		
	S32						18 AAC 50.077(i)		

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM
	S34						FNSB Resolution		
	S35			Non-reg					
	S36			Non-reg					
	S37			Non-reg					
	S2						Refer to BACT Analysis for details		
	S3						Refer to BACT Analysis for details		
	S4						Refer to BACT Analysis for details		
	S5						Refer to BACT Analysis for details		
	S6						Refer to BACT Analysis for details		
	S7						Refer to BACT Analysis for details		
	S40			Non-reg					
	S41			Non-reg					
	S42			Non-reg					
	S43			Non-reg					
	S44			Non-reg					
	S45			Non-reg					
	S46			Non-reg					

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM
	S47			Non-reg					
	S48			Non-reg					
	S49			Non-reg					
	S50			Non-reg					
	S51			Non-reg					
	S56			Non-reg					

2020 Plan Control Measures – Listed in the crosswalk table below are the control measures not adopted in the Serious Plan. It employs the same format from the table above listing the Serious Plan control measures and notes areas of common intent.

In total 48 unique control measures were identified which are presented in the crosswalk and summary in Table 7.7-26. The 2020 Amendment control measure analysis titled, "Control Measure Analysis for Fairbanks PM2.5 Nonattainment Area 2020 Amendment to the Serious State Implementation Plan," found in Appendix III.D.7.7 addresses all of the control measures.

Step 2 in the 2020 Amendment control measure analysis was to identify potential control measures. The process identified 48 control measures for analysis. The analysis showed that 6 of the control measures identified did not meet the definition for 2020 Amendment measures and were dismissed.

Step 3 in the 2020 Amendment analysis was to determine if the control measure was technically feasible. 24 control measures were determined to be technically infeasible and were dismissed. 9 control measures were found to be adopted in different form with no further analysis required. 9 measures were determined to be technologically feasible and forwarded for Step 4 analysis.

Step 4 in the 2020 Amendment analysis was to determine if the control measure was economically feasible. 8 control measures were determined to be economically infeasible and were dismissed from BACM.

Step 5 in the 2020 Amendment analysis was to determine if the identified technologically and economically feasible control measure or technology could be implemented in whole or **in part**

to support both the 5% annual reductions in the base emission year inventory and the most expeditious attainment of the ambient $PM_{2.5}$ standard.

Detailed information regarding the analysis of individual BACM is found in the BACM appendix.

Table 7.7-26. Reevaluation of Previously Rejected Control Measures – Summary and Crosswalk

Identified Measures			Measures Dismissed from 2020 Amendment Analysis				Proposed 2020 Amendment Measures Determined to be Equivalent and Most Stringent		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet 2020 Definition	Regulations Implementing Equivalent Measures	MSM	Page in 2020 Analysis
1				Tech					18
6				Tech					20
8				Tech	=		18 AAC 50.077(a),(b),(c),(d)&(e)	MSM	22
9		C.a.		Tech					26
10	S29			Tech					27
11				Tech					28
12				Tech					29
14						Not Meet Def.			31
18				Tech					32
20			ADF				18 AAC 50.077(h) & Episode Chapter	MSM	34
23				Tech					36
25	S24		ADF				Episode Chapter	MSM	37
27	S26, S27		ADF				Episode Chapter	MSM	38
28			ADF				Episode Chapter & 18 AAC 50.077(a),(l)	MSM	39
29	S25	C.c.	ADF				Episode Chapter	MSM	40

Identified Measures			Measures Dismissed from 2020 Amendment Analysis				Proposed 2020 Amendment Measures Determined to be Equivalent and Most Stringent		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet 2020 Definition	Regulations Implementing Equivalent Measures	MSM	Page in 2020 Analysis
31	S13	B.h.	ADF				18 AAC 50.076(d),(e),(g),(j),(k),(l)	MSM	42
32			ADF				18 AAC 50.076(d),(e),(g),(j),(k),(l)	MSM	45
35						Not Meet Def.			48
38						Not Meet Def.			49
39						Not Meet Def.			51
42			ADF				18 AAC 50.075(e) & Episode Chapter	MSM	53
45						Not Meet Def.			54
46						Not Meet Def.			55
50				Tech					56
51	S12						-		58
52		B.d., B.e.			Econ				60
53		B.d., B.e.			Econ				61
54				Tech					62
55				Tech					64
56				Tech					65
57				Tech					66
58				Tech					66

Identified Measures			Measures Dismissed from 2020 Amendment Analysis				Proposed 2020 Amendment Measures Determined to be Equivalent and Most Stringent		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet 2020 Definition	Regulations Implementing Equivalent Measures	MSM	Page in 2020 Analysis
59				Tech					67
60		C.j., D.h., D.i.		Tech					68
61	S21	C.h.			Econ				69
62	S21	C.h.			Econ				70
63		B.k.		-	Econ				71
64	S15, S16	B.a., B.b.		Tech					77
67		D.f., D.g.	ADF				18 AAC 50.078(d)	MSM	78
68		D.f., D.g.			Econ				82
69		D.f., D.g.		Tech					85
70		D.f., D.g.		Tech					90
R1	S9			Tech					92
R7		A.c.		Tech					94
R15					Econ				95
R17				Tech					97
R20				Tech					98
R29		C.g.			Econ				101

Measure 8 is listed as technologically infeasible because Alaska lacks the land use authority to implement it. The analysis of the measure in the 2020 Amendment Plan Appendix, however determined that 18 AAC 50.077 is the only technologically feasible method to implement this measure in Alaska. This regulation is broader than just Measure 8 new construction restrictions; by regulating at the point of sale any new installation, including installation in existing homes, is affected. 18 AAC 50.077(a) includes a general prohibition on the installation of wood fired

heating devices within the area, with exceptions defined in subsequent sections. No outdoor hydronic heaters may be sold or installed unless pellet fueled. 18 AAC 50.077(b) identifies 0.10 lb/MMBtu as the emission rate used as a requirement for pellet fueled hydronic heaters, that EPA certification is required, and that the certification from EPA will be reviewed by DEC and only approved if the underlying certification test results are accepted. 18 AAC 50.077(c) identifies 2.0 g/hr as the emission rate used as a requirement for cordwood stoves and pellet fueled stoves, an additional emission requirement that the 1-hr filter pull shall not exceed 6.0 g/hr, that EPA certification is required, and that the certification from EPA will be reviewed by DEC and only approved if the underlying certification test results are accepted. 18 AAC 50.077(d) identifies 2.0 g/hr as the emission rate for wood-fired heating devices whose rated size is 350,000 Btu/hr or greater, that EPA certification is required, and that the certification from EPA will be reviewed by ADEC and only approved if the underlying certification test results are accepted. 18 AAC 50.077(e) allows ADEC to review manufacturer test results and place a model on ADEC's list of devices, which identifies devices that are allowable under 18 AAC 50.077

18 AAC 50.077 is more stringent than current EPA certification for cordwood stoves because the emission limit is set at 2.0 g/hr, regardless of test method. EPA Step 2 certification has an emission limit of 2.5 g/hr for cordwood stoves that are certified with ASTM 3053, a.k.a. the cordwood method. 18 AAC 50.077 is more stringent than current EPA certification for cordwood and pellet stoves because of the additional emission limit on the 1-hr filter pull of 6.0 g/hr. EPA Step 2 certification has no limit on the 1-hr filter pull. 18 AAC 50.077 also requires another layer of oversight and report review by requiring that ADEC perform certification reviews. For this reason, Measure 8 in its more stringent form is listed as a MSM.

None of the listed measures is identified as a contingency measure. That is because no credit can be claimed in the control measure benefits incorporated into the 2020 Amendment. To satisfy the contingency measure requirement, Alaska has determined that in the event EPA issues a finding of failure, as identified in 18 AAC 50.030(c)(2), a contingency measure lowering the threshold for calling a Stage 2 alert will be triggered upon the effective date of the EPA finding. The Stage 2 level identified for this contingency measure is included in Section III.D.7.12, Fairbanks Emergency Episode Plan, Table 7.12-1 "Air Quality Episode Thresholds and Exceptions/Contingency Measure."

The analysis did find one measure, Measure 51, related to ultralow sulfur diesel (ULSD or 15 ppm S) heating oil that appears to be technically and economically feasible. However, in reviewing public comment and finalizing the Serious Area plan the department decided to take an approach that would address sulfur in heating oil in a manner more compatible with the community situation and taking into consideration other factors as allowed under the rules. ULSD cannot be produced at the local refinery that currently provides much of the fuel supply to the local area. Thus, an immediate wholesale requirement for the use of ULSD in the nonattainment area results in all of the affected fuel having to be imported into the community by either rail or truck, which increases cost and the environmental risks of transport spills. 40 CFR 50.1010(b)(3)(i) allows for consideration of potential environmental impacts such as increased water pollution, waste disposal, and energy requirements when addressing the technical feasibility of a potential control measure. The department reviewed information on petroleum spills associated with fuel and commercial trucking incidents on Alaska's highways (excluding

the Dalton Highway north of Fairbanks) and found that in a 10 year period from 2009-2019, 25 reported spills occurred with approximately 27,600 gallons spilled to the environment. Alaska's highways pass through wilderness and remote terrain and spills along the roadways can impact adjacent water bodies, the roadbed, and groundwater causing environmental damage and the costs for cleanup and remediation of the spilled fuel. These vehicular incidents have also resulted in injury and death to commercial vehicle operators driving these trucks. The full importation of ULSD for heating oil in the nonattainment area would result in many more trucks and railcars transporting fuel throughout the winter months when inclement weather conditions routinely exist, an associated increased risks of fuel spills, and when spills occur the costs to mitigate and remediate those impacts to the environment.

Further, there remains much uncertainty surrounding the underlying physical processes that are resulting in the formation and observation of particulate sulfate in the subarctic nonattainment area. This makes the quantification of benefits from sulfur controls on sulfate reductions an uncertain exercise. To confirm this, ADEC conducted additional inventory development and photochemical grid modeling to further evaluate the effects of requiring ULSD on modeled attainment. An alternative to the 2023 Control inventory described in the plan was developed in which all distillate fuel for GVEA North Pole as well as all other point sources and all residential and commercial space heating was assumed to be ULSD (15 ppmw sulfur). That "2023 ULSD" modeling analysis determined that attainment could still not be further advanced sooner than 2024 assuming a full transition to ULSD through the point and space heating sectors in 2023. The modeled design value for the 2023 run was 37.0 $\mu g/m^3$. The modeled design value for the 2023 USLD scenario was 36.9 $\mu g/m^3$, reflecting only a 0.1 $\mu g/m^3$ reduction from a transition to ULSD.

As described in Section 7.7.5.1.5, an area wide fuel switch from Diesel #2 (2,566 ppm) to Diesel #1 (1000 ppm) by September 1, 2022, was adopted rather than a requirement to switch to ULSD (15 ppm). This initial step down was determined to be more economically feasible for local residents, reduced the environmental risks associated with the transport of an increased volume of fuel into the community, and still provides a large sulfur reduction. The change in fuel will impact home heating and some stationary engines; transportation diesel fuel is already ULSD. A UAF/DEC cost analysis estimated 7 cent/gallon increase or about $68.31 annual cost to average household under the selected measure, while the same cost analysis estimated approximately 30 cent/gallon increase in heating oil cost if ULSD were used. September 1, 2022, was determined as the conversion year due to comments received during the public comment period. There is an inadequate supply of locally produced Diesel #1 (1000 ppm) and additional time was required to allow for the local refinery to modify its processes. Concerns were also raised that the increased cost in fuel oil could drive more residents to burning less expensive and higher PM emitting solid fuels. The additional time allows residents to budget and prepare for the increased cost. DEC received requests through the comment process to delay the conversion until 2024, but DEC felt that was too long a delay and that the approximate two years provided should be sufficient to allow the local refinery and residents to plan and prepare for the change in fuel oil.

With the Serious Plan finalized in late 2019, less than one year ago, the department has determined that revisiting this decision, which was made based on local circumstances and public comment is not warranted for the 2020 Amendments. After implementation of the fuel

switch to Diesel #1 in 2022, the department will be able to see if this significant sulfur reduction is making impactful reductions in sulfate at the air monitoring sites and whether the additional expense to homeowners of requiring the use of ULSD heating oil is needed to further address the air pollution problem.

7.7.12.5 Adopted Control Measures (Specific Regulations)

The following regulations reflect new or revised measures for the 2020 Amendment to the Serious SIP. Regulations and on-going measures adopted in the Serious Area SIP are detailed in Section 7.7.5 and remain in effect. Regulations and on-going measures adopted in the Moderate SIP remain in effect. The full adopted regulations reside in the Volume III Appendix to Volume II, Section II, however, a summary of the adopted regulations is also discussed in this section. The summary language in Table 7.7-27 does not reflect the detailed verbiage that is in the actual regulations. Please review the official, adopted regulatory language to ensure full understanding of the requirements.

To see the whole suite of measures enacted through the fully amended Serious SIP, the existing Serious SIP measures and regulations are listed in Table 7.7-21 and implemented with state regulations found in 18 AAC 50.075 - 18 AC 50.079. The control measures from the 2020 Amendment listed below will work together with those existing measures. Contingency control measures are described in Section III.D.7.11.

Table 7.7-27, Control Measure Regulation Summary

Control Measure Identification	Proposed Regulation citation	Summary
Solid Fuel Device Operations/Curtailment		
Measure 42	2020 Amendment: Episode Chapter	A burn down period of 3 hours was added to the Episode Chapter. The 3 hour burn down begins upon the effective date and time within a curtailment announcement. This further clarifies existing state regulation at 18 AAC 50.075(e)(3).
Measure 28	2020 Amendment: Episode Chapter	NOASH and Exemptions requirements • Specific requirements to document economic hardship for the NOASH waiver were added to the Episode Chapter.

7.7.12.5.1.4 Fuel Requirement – dry wood

In addition to the dry wood requirements outlined in Section 7.7.5.1.4 Aurora Energy Solutions, LLC recently announced plans[16] to install and operate a wood drying kiln in Fairbanks. Operations are expected to start in September 2020 and produce 2,000 cords of dried birch (only) 20% moisture content firewood for the 2020/2021 winter. Heat from a coal-fired cogeneration

16 https://www.heatyourway.com/our-products

power plant that Aurora Energy operates in downtown Fairbanks will be used to dry the wood. Details of the design and permitting for the facility are not currently available, but a mixture of waste and production heat are expected to be used to dry the wood. The availability of additional dry wood to the local market is anticipated to assist in bolstering compliance with dry wood burning requirements.

7.7.12.5.2 Area Sources – Small Sources (Incinerators, Char broilers, Used Oil, Coffee Roasters)

As noted in the BACM analysis, these sources were not previously controlled, nor were their emissions well understood. Presented below is a summary of the control measure analysis prepared in both the Serious Plan and the 2020 Amendment.

Serious Plan

Small area sources and their impact on emissions within the nonattainment area were not well understood in the Serious Plan. To gain insight into the operation of these sources and their emissions DEC required all incinerators, charbroilers and used oil burners to provide a one-time submittal of information to better understand these sources, their emissions and determine the need for control. The Serious Plan committed to require coffee roasters to install controls on any unit that emitted 24 lbs or more of particulate matter/year. DEC also committed to waive the requirement if information is provided that documents that the control technology is economically or technologically infeasible. The requirement for installation of control equipment on coffee roasters was committed to be 1 year from the effective date of regulation.

2020 Amendment

Incinerators – Regulation 18 AAC 50.078(c) was adopted which required incinerators to submit information on location, type (medical, liquid, solid, etc.), process, fuel, throughput, hours of operation, etc. Based on the information received, ADEC determined that it does not have any record of permitted or unpermitted sources under the incinerator source category. Therefore, there are no existing incinerators to be affected by a regulation change. Based on this information, Measure 69 was dismissed from the 2020 Amendment control strategy analysis as technologically infeasible.

Charbroilers – Regulation 18 AAC 50.078(c) was adopted which required charbroilers to submit information on their location, operation type (chain driven versus underfire), number of operations, fuel used, # of lbs of meat cooked/week, etc. The 2020 Amendment control measure analysis determined that charbroiler control is technologically feasible. The cost effectiveness analysis, however determined that the installation of catalyst oxidizers is not cost effective. For this reason, the Measure 68 was dismissed from 2020 Amendment control strategy analysis as economically infeasible.

Used Oil – Regulation 18 AAC 50.078(c) was adopted which required used oil burners to submit information on the location, # of burners, rating, operating hours, fuel use/hour, etc. Based on an analysis of the information received and discussions with the FNSB Solid Waste manager to

determine how FNSB disposes of waste oil, it was determined that combustion of used oil is the only acceptable disposal method available in the FNSB without shipping the used oil to the lower 48. Prohibiting or regulating the combustion of used oil in the FNSB would place a burden on the small businesses that rely on combustion of used oil as a waste disposal method, encouraging a small percentage to improperly dispose of the used oil. Due to the severe environmental impacts used oil can have on waterways and drinking water, and the probability that prohibiting or regulating the combustion of used oil would lead to improper disposal, Measure 70 was dismissed from 2020 Amendment control strategy analysis due to potential environmental impacts. Thus, it was determined to be technologically infeasible.

Coffee Roasters -18 AAC 50.078(d) became effective on January 8, 2020, and required the installation of either a catalytic oxidizer or thermal oxidizer on any unit emitting particulate matter at or above the 24 lb/ year threshold. One of these devices must be installed within a year of the effective date of the regulation. DEC may waive the requirement if a facility submits information demonstrating that the control device is either technologically or economically infeasible. The 2020 Amendment analysis determined that the adoption of this regulation was sufficient to meet the control measure requirements specified in 40 CFR 50.1010(c). For this reason, Measure 67 was dismissed from 2020 Amendment control strategy analysis because it was adopted in a different form.

7.7.12.5.5 Mass Transit – FNSB Transit Fleet Natural Gas Efforts

Section 7.7.5.5 describes FNSB efforts to transition the FNSB Transit fleet to natural gas. Since submission of the Serious Area SIP significant progress has been made toward the transition. The following updates detail the progress made:

Transit Maintenance and Storage Facility Upgrades
In addition to the FNSB grant award through the FTA on May 18, 2017, for $12,800,000 an additional award of $10,400,000 through FTA was announced in August of 2020. Both grant awards will be used for design and construction of a new maintenance/storage facility and will be fully compliant with CNG fuel requirements. As described in Section 7.7.5.5 ground testing on the existing property identified inadequate stability which would require significant measures and funding to correct. Financial and logistical analysis suggested moving the project to an alternate location. An alternate site had been identified at the time of the Serious Area SIP submittal. Having completed environmental studies, ground stability determination, and receiving FNSB Assembly approval, FNSB is finalizing the purchase of the alternate site.

Transit Fleet Replacement Schedule and Funding Sources
In addition to the funding sources mentioned in Section 7.7.5.5, FNSB was awarded 3 years of CMAQ funding beginning in 2021 to be used towards the purchase of CNG vehicles. The award amount for each year is $1,826,850. It is estimated that this will allow for the replacement of 9 additional buses. The FNSB has also been awarded FTA Section 5339 funds for FY 17-20 totaling $449,114. Once appropriated these additional awards provide FNSB with the funding needed for a total replacement of 13 buses and 10 paratransit style vehicles, or approximately 90% of the total fleet vehicles.

The FNSB FY 20/21 budget continues to include the combined use of FTA Section 5307 funding and local match funds to acquire buses. It is the FNSB's intent to continue to use similar funding combinations in the future to procure transit vehicles and continue the transition process.

Acquisition and Installation of CNG Fueling Infrastructure
In April of 2020, FNSB was awarded $1,826,850 in CMAQ funding by FAST Planning for the installation of a CNG fueling infrastructure.

7.7.12.6 Most Stringent Measures (MSM)

EPA defines MSMs in 40 C.F.R. 51.1010 (b) as measures that are identified as an MSM and included in the attainment plan for any state or are achieved in practice in any state. A measure could also be considered an MSM if the measure cannot be implemented within the four year window after an area is reclassified as Serious. Furthermore, an MSM could be a control measure that has not been implemented anywhere else.

For the Serious Plan, DEC identified Measure 71 - the required removal of EPA certified devices that are 25 years old and have a PM emission rating of greater than 2.0 g/hr as an MSM. Initially these older EPA certified devices are required to be removed by December 2024 and this requirement was triggered upon EPA's determination that the area failed to attain the standard. However, once the regulation is triggered, all older EPA certified devices must be removed or replaced upon sale of the property where they are located. Furthermore, the 25 years, is a rolling time period. Every year, a new set of older EPA certified devices is eligible for removal or replacement. This on-going MSM provides the foundation for transitioning the area's wood-fired heating devices more quickly to the 2.0 g/hr standard.

For the 2020 Amendment, DEC's review of the control measures not adopted in the Serious SIP determined that a total of 10 measures (#'s 8, 20, 25, 27, 28, 29, 31, 32, 42 and 67) were implemented in either existing regulations, planned modifications to those regulations and the Episode chapter and therefore qualified as MSMs. Table 7.7-26 lists the measures and regulations implementing them. The discussion following that table explains that while Measure 8 was dismissed as technologically infeasible, that was because the state did not have the authority to implement land use regulations. Analysis of that measure, however, demonstrates that 18 AAC 50.077 contains point of sale restrictions that are broader than land use controls, and contain cordwood stove standards that are more restrictive than current EPA certification standards, which more than qualifies it as an MSM.

7.7.12.7 Calculating the Benefits of Control Measures

Calculation of emission benefits for key control measures through 2029 are summarized within Section III.D.7.6. Within this sub-section, post-2019 control measures under the Serious Area SIP and 2020 Amendments are presented. They are consistent with the emission benefits presented later in Section III.D.7.9.2 to support the 5% annual emission reduction requirements and in Section III.D.7.9.3 in the expeditious attainment analysis.

As discussed in detail earlier in Section III.D.7.6, control measure benefits are calculated to reflect reductions inclusive of the Serious Area SIP and the 2020 Amendments. In addition, reductions from on-going federal control programs such as the FMCVP, Diesel Emission Reduction Program and fuel standards are accounted for in projected baseline emission estimates.

Table 7.9-3 in Section III.D.7.9, placed here for reference as Table 7.7-28, lists state and local control measures for which emission benefits were quantified. As explained in the footnote below Table 7.7-28, the Start Year column refers to the first complete calendar year a measure is projected to be implemented.

Table 7.7-28
List of Control Measures for Which Emission Benefits Were Quantified under 2020 Amendments Expeditious Attainment Analysis

Source Sector	Measure ID	Measure Summary	Start Year[b]
Area, Space Heat	WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding[a]	On-going, thru 2025
	Curtailment	Solid Fuel Burning Appliance (SFBA) Episodic Curtailment Program, reflects enhanced compliance by future attainment date	On-going
	STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	2023
	STF-13, Modified BACM 31, 32	Requires commercially sold wood to be dry before sale	2022
	STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified devices and cordwood outdoor hydronic heaters (OHHs)	2024
	BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU (hydronic heaters) certified PM emission rates for new or re-conveyed wood devices	2020
	BACM 48, 49	Removal of coal heaters	2024
	STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	2020
	STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	2020
Point	n/a	BACT SO_2 controls	2021

[a] Reflects WSCO program funding through 2016, 2017 and 2018 EPA -awarded Targeted Airshed Grants (TAGs).
[b] Start year refers to the first full calendar year of measure implementation. For example, a measure implemented in September 2022 has a start year of 2023. In SIP inventory development and attainment modeling, a measure must be fully implemented over an entire calendar year for its control benefits to be counted in that year.

Table 7.9-5 in Section III.D.7.9, placed here for reference as Table 7.7-29, presents the $PM_{2.5}$ and SO_2 emission reductions for each measure in the State's control strategy package for which benefits were quantified. The benefits shown for each individual measure are discounted to account for the overlap of measures controlling the same sources within the combined control package. Combined measure benefits shown at the bottom of Table 7.7-XX also properly account for measure overlap within the combined control package (eliminating double-counting).

Table 7.7-29
Projected 2023 and 2024 Emission Reductions for Post-2019 Control Measures under 2020 Amendments Expeditious Attainment Analysis

Measure ID	Measure Summary	Emission Reductions[a] (tons/episodic day)			
		2023		2024	
		$PM_{2.5}$	SO_2	$PM_{2.5}$	SO_2
WSCO	*Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding*	0.66	0.01	0.68	0.01
Curtailment	Solid Fuel Burning Application Episodic Curtailment Program, reflects enhanced compliance by future attainment date	S1[b]: 0.31 S2[b]: 0.51	S1[b]: -0.09 S2[b]: -0.13	S1[b]: 0.26 S2[b]: 0.42	S1[b]: -0.10 S2[b]: -0.13
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	0.01	1.93	0.01	1.95
STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	0.10	<0.01	0.10	<0.01
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	0.00	0.00	0.16	<0.01
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new of re-conveyed wood devices	0.33	0.01	0.39	0.01
BACM 48, 49	Removal of coal heaters	0.00	0.00	0.02	0.02
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	0.34	-0.01	0.35	-0.01
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01	<0.01	<0.01
n/a	IGU-projected natural gas expansion through 2029	0.00	0.00	0.00	0.00
Combined Total, Area Space Heating (accounting for measure overlap)		S1[b]: 1.76 S2[b]: 1.96	S1[b]: 1.85 S2[b]: 1.81	S1[b]: 1.95 S2[b]: 2.11	S1[b]: 1.88 S2[b]: 1.84
n/a	Point Source fuel-based sulfur controls by 2029	n/a	1.39	n/a	3.34
Combined Total, Point Sources		n/a	1.39	n/a	3.34

[a] Emission reductions shown for each measure account for effects of overlap within the combined control package.

[b] S1 and S2 refer to benefits under Curtailment program Stage 1 (20 $\mu g/m^3$) and Stage 2 (30 $\mu g/m^3$) alert conditions.

n/a – Not Applicable.

DEC and the Borough recognize that the long-term mix of $PM_{2.5}$ control strategies implemented in Fairbanks could warrant revision. This would be accomplished through a future attainment or maintenance plan revision and subject to approval by EPA. This evaluation could result in measures being removed or added to the plan depending on the outcome of the analyses prepared at that time. All changes to the air quality plan must be approved by EPA.

7.7.12.8 Best Available Control Technologies (BACT)

The requirements of 40 CFR 51.1010(a) and Clean Air Act Section 189(b) for nonattainment areas apply to the $PM_{2.5}$ nonattainment area. BACT determinations were finalized in December 2019 for each point source in the nonattainment area. These determinations are detailed in Section 7.7.8. DEC completed the required BACT determinations for the Serious SIP and submitted them to EPA Region 10 less than one year ago (in December 2019) for EPA's required, formal review and action. In completing that process, ADEC took into consideration EPA's comments and other comments received during the public comment period. As these BACT determinations are state required control measures within the Serious SIP, ADEC is currently implementing the state BACT decisions through the ADEC Air Permit Program.

In accordance with 40 CFR 51.1010(c)(2)(ii), any measure previously rejected by the state during the development of any Moderate area or Serious area attainment plan control strategy must be re-evaluated. DEC re-looked at the BACT decisions during the development of the plan amendments required under Section 189(d). Given the short timeframe since the state made the final BACT decisions and put them into regulatory effect at the state level, the department in its review under the 189(d) process did not find it necessary to make revisions to those decisions. ADEC believes that the BACT determinations finalized in December 2019 meet the 189(d) requirements and will continue to implement them moving forward.

7.7.12.9 DEC Stationary Source Control (New Source Review)

The CAA section 172(c) and 189(d) requirements for nonattainment areas apply to the $PM_{2.5}$ nonattainment area. Under this attainment plan, the requirements of CAA Part D, New Source Review (NSR) apply for major stationary sources. Section 302 of the CAA (42 U.S. C. 7602) defines a major stationary source as any stationary facility or source of air pollutants that directly emits, or has the potential to emit, 70 tons per year of any pollutant in a Serious nonattainment area. Permits for construction and operation of new or modified major stationary sources within the nonattainment area must be approved through the NSR program. Within the FNSB, DEC is responsible for issuing construction and Title V operating permits. DEC has incorporated the requirements for Prevention of Significant Deterioration (PSD) and nonattainment New Source Review in 18 AAC 50, Article 3. On October 8, 2018, DEC submitted revisions to the Alaska SIP to ensure the fulfillment of nonattainment New Source Review requirements for the serious $PM_{2.5}$ nonattainment area and EPA approved that SIP revision effective September 30, 2019 (Federal Register, Vol. 84, No. 168, Thursday, August 29, 2019). DEC actively implements its permit programs. The Air Quality Division issues and amends permits, conducts inspections, reviews reports from industry, provides compliance assistance, and takes enforcement actions when needed. DEC certifies that the state's nonattainment new source review requirements meet both the CAA section 172(c) and 189(d) requirements for the $PM_{2.5}$ nonattainment area and that the program continues to be implemented in accordance with these requirements.

7.7.12.10 Potential Future Control Measures Currently Undergoing Research Efforts or Development

7.7.12.10.1 Retrofit Control Devices (RCD)

During development of the Serious Area SIP, FNSB and ADEC were engaged in a testing program to evaluate the efficacy of RCDs for various solid fuel appliances. Acknowledging the obstacles presented in Section 7.7.10.1, community interest remained high in determining whether the addition of an RCD would allow wood-burning to continue when burn bans were in effect, specifically Stage 2 Alerts where only those with a NOASH are allowed to operate solid fuel appliances. To address this interest, FNSB commissioned a testing project to measure the effect of two RCDs, an aftermarket catalyst and an ESP, on PM emitted from an EPA Step 2 certified pellet stove selected to be representative of this appliance category operated in Fairbanks and develop an emission factor suitable for use in a SIP. To provide additional information in support of the FNSB study, ADEC commissioned a small parallel study to measure the effect of ESPs on two EPA Step 2 cordwood appliances: non-catalytic and catalytic.

FNSB Testing:

The testing program, evaluated the performance of two aftermarket RCDs on an EPA Step 2 certified pellet stove: an OekoTube ESP and a Grace Fire StoveCAT catalyst. The program collected data on PM emitted upstream and downstream from the ESP unit simultaneously to allow a calculation of the efficiency of the unit in reducing emissions. The manufacturer's recommended placement of the StoveCAT catalyst did not allow sufficient space for the measurement of upstream emissions. Therefore, non-simultaneous measurements were collected from baseline (no catalyst) and controlled (catalyst installed) tests; average differences between the baseline and controlled tests provide the basis to calculate emission reduction efficiency.

Two different methods of PM measurement were employed in the program: the primary method used a modified ASTM E2515 protocol with dual train filters to collect the total PM emitted over the course of the test; and a secondary method, not yet certified by EPA, that used a tapered element oscillating microbalance (TEOM) to collect time-resolved measurements of PM emitted during the test. Data collected by the TEOM method provides insight into the performance of controls during different phases of operation (i.e., startup, low, medium, and high burn) as well as total operation, while the ASTM E2515 method only provides a single data point—the average of all phases. Multiple replicate tests were conducted to assess variance in the performance of the retrofit controls.

ADEC Testing:

A limited testing program was conducted to measure the effect of a commercially available ESP on PM emitted from cordwood stoves in support of the FNSB testing project. The study focus was to collect initial measurements with an ESP to assist in providing additional information to the decision-making processes within the Borough related to consideration of retrofit controls and potential needs for further testing by the Borough. The testing program evaluated the performance of an OekoTube ESP.

Two EPA Step 2 appliances[17] were tested: a non-catalytic stove and catalytic stove. Both were selected to be representative of their categories operated in FNSB. The test fuel used was seasoned silver maple, sourced in Connecticut with 19-25% moisture content. The test protocol used for operating the cordwood stoves was the Integrated Duty Cycle Method for Cordwood Stoves (IDC), developed by New York State Energy Research & Development Agency (NYSERDA) and NESCAUM. It specifies four phases of operation at two different heat output settings, high and low, designed to represent realistic stove operation: Startup, High Fire, Maintenance Fire and Overnight Fire.

Given the limited scope of the program, insufficient resources were available to support the collection of simultaneous measurements of PM up and downstream of the ESP unit. Instead, non-simultaneous measurements were collected from baseline (no ESP) and controlled (ESP installed) tests; average differences between the baseline and controlled tests were used to calculate the estimated efficiency in reducing emissions. The same as the FNSB testing, two different methods of PM measurement were employed in the program: the primary method used a modified ASTM E2515 protocol; and a secondary method that used a TEOM to collect time-resolved measurements of PM emitted during the test.

Additional Information:

During the winter of 2019/2020 Golden Valley Electric Association (GVEA) funded an ESP pilot project. The project was funded at $125,000 for two years with a goal of installing 80 ESPs in the nonattainment area over a 2-year period (40 each year). In a July 21, 2020, FNSB Air Pollution Control Commission (APCC) meeting GVEA provided a report on the community pilot project to install ESPs in the North Pole area. Key takeaways from GVEA's report include:

- 17 ESPs were installed in the North Pole area during January – February 2020;
- Upon inspection after the burn season, nearly half the installed ESPs had failed due to excessive creosote buildup;
- The cause (e.g. wet wood, appliance type, appliance operation, or ESP operation) of excessive creosote buildup was not determined; and
- GVEA stopped project funding on a go-forward basis.

Evaluation of RCDs:

Controls are evaluated on three bases:

1. Addressing community interest, does the addition of an RCD provide sufficient emission reductions to allow wood-burning to continue when burn bans are in effect, specifically Stage 2 Alerts where only those with a NOASH are allowed to operate solid fuel appliances;
2. Within the context of BACM and control measure analysis, is the mandatory addition of an RCD technologically and economically feasible; and,
3. Were any potential safety concerns identified.

17 Certified to 2.5 g/hr when tested with cordwood)

EPA Step 2 certified pellet stove equipped with ESP:

1. FNSB test results shows a quantifiable emission benefit for including an ESP as a control on EPA Step 2 certified pellet stoves. The PM reductions achieved with a pellet stove plus ESP are insufficient to achieve equivalency with fuel oil appliances. To do so would require reductions of more than 90% with the ESP. Therefore, a Step 2 certified pellet appliance equipped with an ESP does not qualify for an exemption to the curtailment program.
2. FNSB testing shows a quantifiable emission benefit for including an ESP as a control on EPA Step 2 certified pellet stoves. Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy Analysis. The technology was found to be technically feasible but economically infeasible.
3. No potential safety issues were identified during analysis.

EPA Step 2 certified pellet stove equipped with StoveCAT catalyst:

1. FNSB test results for the StoveCAT demonstrate that it is not designed for the operating conditions of a pellet stove and should not be considered as a control device. Therefore, a Step 2 certified pellet appliance equipped with a StoveCAT does not qualify for an exemption to the curtailment program.
2. Equipping a Step 2 certified pellet stove with a StoveCAT catalyst does not result in emission reductions, was not identified as a potential control measure, and is not addressed in the 2020 Amendment Control Strategy Analysis.
3. No potential safety issues were identified during analysis.

EPA Step 2 certified non-catalytic cordwood appliance equipped with ESP:

1. ADEC testing shows a potential emission benefit for including an ESP as a control on a Step 2 certified non-catalytic cordwood stove, additional testing is required to demonstrate a quantifiable emission benefit. Preliminary results indicate that PM reductions achieved with a non-catalytic cordwood appliance plus ESP are insufficient to achieve equivalency with fuel oil appliances. Therefore, a Step 2 certified non-catalytic cordwood stove equipped with an ESP does not qualify for an exemption to the curtailment program.
2. Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy Analysis. Equipping a non-catalytic cordwood appliance with an ESP was found to be technologically infeasible due to potential safety issues.
3. The ADEC testing and GVEA pilot project provide a weight of evidence identifying a potential safety issue due to accelerated creosote buildup.

EPA Step 2 certified catalytic cordwood appliance equipped with ESP:

1. ADEC testing shows a limited potential emission benefit (less than 1% emission reduction) for including an ESP as a control on a Step 2 certified catalytic cordwood stove, additional testing is required to demonstrate a quantifiable emission benefit. Preliminary results indicate that PM reductions achieved with a catalytic cordwood appliance plus ESP are insufficient to achieve equivalency with fuel oil appliances. Therefore, a Step 2 certified catalytic cordwood stove equipped with an ESP does not qualify for an exemption to the curtailment program.

2. Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy Analysis. Equipping a catalytic cordwood appliance with an ESP was found to be technologically infeasible due to potential safety issues.
3. The ADEC testing did not identify a potential safety issue. The GVEA pilot project identified excessive creosote buildup in a catalytic cordwood stove.

All other SFBA and RCD combinations:

1. No testing was completed with any other combination of SFBA and RCD than described in this section. Without quantifiable emission reductions that are equivalent to a fuel oil appliance, any exemption would not comply with CAA Section 110(l). Therefore, no combination of SFBA and RCD would qualify for an exemption to the curtailment program.
2. Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy analysis for all other SFBA equipped with an ESP. Other RCDs were not identified as a control measure and were not included in the 2020 Amendment Control Strategy Analysis. Equipping other SFBAs with an ESP was found to be technologically infeasible due to potential safety issues.
3. The ADEC testing and GVEA pilot project provide a weight of evidence identifying a potential safety issue due to accelerated creosote buildup on ESP installations. No potential safety issues were identified with other RCDs during analysis.

Although testing and evaluation do not support a Stage 2 exemption or mandatory installation of an ESP or any other RCD, it does not preclude their use in the FNSB. If determined to be durable in Alaska winters along with professional installation, proper maintenance, cleaning, and monitoring requirements voluntary installation of ESP-equipped pellet stoves, or other RCDs, could provide a quantifiable air quality benefit to the area.

7.7.12.10.2 Expanded Availability and Use of Natural Gas

In November 2019, the FNSB Assembly appropriated $1 million for residents to convert from oil to natural gas or propane burning appliances in a continuing effort to improve air quality in the Borough's non-attainment areas.[18] As of September, funds have been expended for 19 changeouts and 1 conversion. An additional 58 change outs and 2 conversions are currently encumbered and applications are pending for an additional 50 changeouts and 1 conversion. The remaining funds are sufficient for up to 5 additional changeouts. Overall, this program, will result in a total of roughly 135 oil to gas conversions. The depletion of available funds has forced the Borough to take down the application website as there is continuing public interest in the program. The schedule for completion of these conversions depends on the weather and when the ground freezes in 2020, all conversions should be completed by the summer of 2021 and available for the 2021/22 winter heating season. The Interior Gas Utility (IGU) has been working in parallel to the Borough by digging and putting in lines to satisfy the backlog of Borough funded conversions and pending owner conversion applications. They plan to continue those efforts until the ground freezes this winter and then add additional lines in the coming years.

18 http://www.co.fairbanks.ak.us/Documents/FY19%20CAFR.pdf

The most recent IGU quarterly report[19] documents progress on all of the components of the Interior Energy Project (IEP) effort, including supply, liquefaction, transportation, distribution and conversions. While progress in each of these categories is relevant to the goal of expanding natural gas service in Fairbanks and North Pole, key actions completed include:

- Construction on the Fairbanks 5.25 million-gallon LNG storage tank was completed and service to the public became available on December 18, 2019.
- Design on the engineering for the North Pole LNG receipt, storage and regas facility are complete. Construction was divided into two phases: Ground Improvement and Site Infrastructure. The target date for the Infrastructure is the end of September 2020, but the project is being impacted by the COVID-19 pandemic.
- Conversions – the original forecasts were based on the Cardno Enxtrix *Interior Energy Project Natural Gas Conversion Analysis*, finalized in January 2014. Those estimates, however, were updated to reflect more conservative rates of customer conversion based on lower fuel oil prices. Efforts to address homeowner concerns about the cost of financing have focused on securing low-cost loan funds via HB 374 approved on May 12, 2018.

In light of the uncertainty about gas availability in North Pole and homeowner conversion rates, the 2020 Amendment emission inventories assume no growth in natural gas customers through 2026.

7.7.12.10.3 Continuation of AHFC Energy Programs

According to the most recently released annual report for 2019, the Alaska Housing Finance Corporation (AHFC) is continuing to implement several energy programs that are designed to make homes more energy efficient. In 2019, these included the Energy Efficient Interest Rate Reduction (EEIRR) program, Home Energy Loan program, and No-Cost Weatherization program. As homeowners make energy efficiency improvements, they reduce the amount of fuel and electricity needed for power and heat leading to corresponding air quality benefits due to the reduced fuels being burned for space heating and power generation. While funding for these programs from the State have come under pressure from more restrictive budgets, federal funding for these programs has continued to provide support for their operation.

Interior Weatherization, Inc. is AHFC's contractor for Fairbanks area weatherization assistance. Their Weatherization Assistance Program provides low- and moderate-income households with improvements to their homes which increase the energy efficiency of their dwelling

Discussions with staff indicate that AHFC energy programs will continue in the future, assuming continued funding, and, as a result, additional emission benefits will be realized in future years.

7.7.12.11 Future Re-Evaluation of Control Strategies

19 Interior Energy Project, Quarterly Report to the Alaska State Legislature, Interior Energy Project, April 2020

As described in Section 7.7.11, DEC and FNSB remain committed to re-evaluating the entire mix of control measures as early as 2023/2024, following an update to the CMAQ model, to determine whether the measures have succeeded as planned in reducing emissions and improving air quality. This evaluation could result in measures being removed or added to the plan, depending on the outcome of the analyses.

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Amendments to:

State Air Quality Control Plan

Vol. II: III.D.7.7

Control Strategies

Adopted

November 5, 2024

Michael J. Dunleavy, Governor

Emma Pokon, Commissioner

Note: This document provides the adopted language of the 2024 Amendment to the Serious SIP for inclusion in this section of the State Air Quality Control Plan to address the partial disapproval of the Serious SIP and the 2020 Amendments. The Serious SIP requirements from Section 7.7 to Section 7.7.11 and the 2020 Amendments from Section 7.7.12 to 7.7.13.11 are included to provide historical background information.

7.7.13 Control Strategies

7.7.13.1 Introduction

This section outlines the control strategies that were considered and selected by DEC and the FNSB in the 2024 Revised Amendment to the Serious area plan. Following the Serious Area SIP, Alaska submitted revised elements of the Serious Area Plan as part of the Fairbanks 189(d) Plan in the 2020 Amendment to the Serious Plan in which the control strategies were re-examined as per the process outlined in the 40 C.F.R. § 51.1010(a) and CAA Sec 189(b). Based on the comments received from EPA on the 2020 Amendment, DEC re-evaluated the control measures submitted in the Fairbanks Serious Plan and Fairbanks 189(d) Plan in this 2024 Revised Amendment. This re-evaluation process was performed as per the 40 C.F.R. § 51.1010(a) and CAA Sec 189(b). As a result of the Serious Area Plan, 2020 Amendment, and 2024 Revised Amendment to the Serious Area Plan, DEC has assembled the control strategies that collectively meet the BACM/BACT and 189(d) requirements.

7.7.13.2 BACM and 2024 Amendment Control Measure Requirements

Those emission sources that are not classified as large stationary sources and subject to BACT are subject to Best Available Control Measure (BACM) requirements. These sources include smaller space heating sources, motor vehicles, other fuel burning equipment, and small industrial sources. The process for selecting BACM is defined in a series of steps detailed in the Final $PM_{2.5}$ Rule.[20] 40 C.F.R. 51.1010(c) defines the process for selecting 2024 Amendment control measures; it references the same section of the Final $PM_{2.5}$ Rule that defines the steps for selecting BACM (section VI.D.3). These steps clarify and update $PM_{2.5}$ control measure selection guidance presented in the Addendum to the General Preamble[21] for the selection of $PM_{2.5}$ controls for Reasonably Available Control Measures (RACM), required for Moderate nonattainment areas, BACM for Serious nonattainment areas and 2020 and 2024 Amendment control measures providing 5% annual reductions for serious nonattainment areas that failed to attain by the applicable attainment date. Presented below is a summary of the 5-step BACM and 2024 Amendment control measure selection guidance presented in the Final $PM_{2.5}$ Rule:

- Step 1: Develop a comprehensive inventory of sources and source categories of directly emitted $PM_{2.5}$ and $PM_{2.5}$ precursors.
- Step 2: Identify potential control measures.
- Step 3: Determine whether an available control measure or technology is technologically feasible.
- Step 4: Determine whether an available control technology or measure is economically feasible.
- Step 5: Determine the earliest date by which a control measure or technology can be implemented in whole or in part.

[20] 81 Fed. Reg. 58010 (Aug. 24, 2016), at 58085, https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf.
[21] 59 Fed. Reg. 41998 (Aug. 16, 1994), https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19940816_59fr_41998-42017_addendum_general_preamble.pdf.

The following source categories were evaluated for BACM and 2024 Amendment control measures. This list is based on emissions inventory information and other technical analyses that identify the most important sources for $PM_{2.5}$ in the nonattainment area.

- Solid Fuel Burning
    - Outdoor solid fuel-fired boilers (hydronic heater)
    - Solid fuel-fired heaters
    - Fireplaces
    - Burn barrels, residential open burning
    - Agricultural and forest burns
- Residential and Commercial Fuel Oil Combustion
- Transportation
    - Automobiles
    - Heavy-duty vehicles
- Commercial sources
    - Coffee roasters
    - Charbroilers
    - Incinerators
    - Used oil burners

The inventory supporting the BACM and 2024 Amendment control measure analysis was developed in a manner consistent with the emissions inventory requirements for the Serious area, the 2020 Amendment and the 2024 Amendments to the Serious plan as specified in the Final $PM_{2.5}$ Rule. This included representation of source activity and emissions on a seasonal, rather than annual basis as provided for under the Final $PM_{2.5}$ Rule. As discussed in Section III.D.7.6 Emission Inventory, use of seasonal estimates is appropriate for the 24-hour $PM_{2.5}$ standard in Fairbanks since violations of the standard are confined to winter months (October through March) and source activity that triggers these violations peaks during that time. The majority of wintertime activity and emission factor data supporting the inventory was developed based on local data and test measurements.

7.7.13.3 Evidence of Compliance with the Serious SIP – Existing and Continuing Control Measures

The $PM_{2.5}$ Implementation Rule at 40 C.F.R. § 51.1005(b)(1)(ii) and 51.1005(d)(1) requires that the State show evidence that all controls submitted in the applicable attainment plan have been implemented. DEC and the Borough are implementing all the measures identified in the approved Moderate Area SIP, submitted Serious Area SIP, and the 2020 Amendment to the Serious SIP. Table 7.7-30 summarizes the Moderate SIP control measures and their implementation status. Table 7.7-31 summarizes the Serious Area SIP control measures and their implementation status. Table 7.7-32 summarizes the 2020 Amendment to the Serious Area SIP control measures and their implementation status.

Table 7.7-30
Moderate SIP Control Measures

Control Measure/Program	Voluntary Measure	Status	
		Implemented	On-going
Space Heating and Solid Fuel Heating Controls			
Solid Fuel-Fired Heating Device Upgrades	X	X	X
Solid Fuel-Fired Heating Device Emission Standards		X	X
Improving Solid-Fuel Device Operations	X	X	X
Reduced Use of Solid Fuel Heating During Air Pollution Episodes (Curtailment)		X	X
AHFC Energy Programs	X	X	X
Expanded Availability and Use of Natural Gas	X	X	X
Required Replacement of Non-Certified Wood Heating Devices When Properties are Sold (Contingency Measure)		X	X
Enhanced Dry Wood Compliance: Registration of Wood Sellers and Moisture Content Disclosure (Contingency Measure)		X	X
Transportation Control Strategies			
Expanded Availability of Plug-Ins	X	X	X
Mass Transit System	X	X	X
DOT Anti-Idling and Diesel Emission Reductions	X	X	X
DEC Diesel Emission Reduction Efforts	X	X	X
Federal Diesel Emission Reduction Programs		X	X
Federal Motor Vehicle Control Program		X	X
Open Burning			
Winter Season Open Burning Ban		X	X
Point Source Controls			
Reasonably Achievable Control Technology		X	X
New Source Review Permit Program		X	X

Table 7.7-31
2020 Adopted Serious SIP Control Measures

Control Measure/Program	Status	
	Implemented	On-going
Space Heating and Solid Fuel Heating Controls		
Solid Fuel-Fired Heating Device Upgrades	X	X
Solid Fuel-Fired Heating Device Emission Standards (Device Requirements)	X	X
Improving Solid-Fuel Device Operations (Fuel Requirements)	X	X
Reduced Use of Solid Fuel Heating During Air Pollution Episodes (Curtailment)	X	X
Real Estate Requirement and Date Certain Removal	X	X
Wood-Fired Heating Device Registration	X	X
Expanded Availability and Use of Natural Gas	X	X
Transportation Control Strategies		
Mass Transit System	X	X
Federal Diesel Emission Reduction Programs	X	X
Federal Motor Vehicle Control Program	X	X
Small Commercial Sources		
Small Source Information and Requirements	X	X
Open Burning		
Winter Season Open Burning Ban	X	X
Point Source Controls		
Best Available Control Technology	X	X

Table 7.7-32
2020 Amendment to the Serious SIP Control Measures

Control Measure/Program	Status	
	Implemented	On-going
Space Heating and Solid Fuel Heating Controls		
Improving Solid-Fuel Device Operations (A burn down period of 3 hours was added to the Episode Chapter)	X	X
Reduced Use of Solid Fuel Heating During Air Pollution Episodes (Curtailment: Specific requirements to document economic hardship for the NOASH waiver were added to the Episode Chapter)	X	X

Additional information and more detailed documentation on the implementation of the Moderate Area SIP, Serious Area SIP, and 2020 Amendment control measures is included in Appendix III.D.7.7 of the respective Plans.

7.7.13.4 Control Strategy Origination

The $PM_{2.5}$ Final Rule requires states to identify controls for all sources and source categories in the latest base year emission inventory for the nonattainment area. The starting point for assembling a list of controls is the RACM analysis prepared for the Moderate SIP. However, it is worth noting that progress on control measures did not stop with the RACM analysis and the Moderate SIP. During the time period following the Moderate SIP submission FNSB had authority to regulate the home heating source sector. The most recent version of the FNSB air quality program with significant control measures began with the adoption of FNSB Ordinance 2015-01 on February 27, 2015, which created the following control measures:

- Visible emission standards;
- $PM_{2.5}$ emissions crossing property lines;
- Setback for hydronic heaters;
- Prohibited fuels;
- Limitations on appliance sales;
- Nuisance provisions; and,
- Curtailment program.

FNSB Ordinance 2015-01 also established the air quality control zones within the nonattainment boundary and established a fine schedule (monetary penalty) for noncompliance.

FNSB Ordinance 2016-21, adopted May 4, 2016, added a control measure that required persons convicted of two or more violations involving visible emissions or $PM_{2.5}$ crossing property lines to remove certain hydronic heaters. FNSB Ordinance 2016-37, adopted July 28, 2016, modified the No Other Adequate Source of Heat (NOASH) exemption for the curtailment program requiring that qualifying structures were constructed on or before December 31, 2016, to ensure that no new construction would be eligible for a NOASH affidavit.

FNSB Ordinance 2017-18, adopted March 9, 2017, strengthened the curtailment program by:

- Removing the temperature threshold on the curtailment program which prevented curtailment from being called when the temperature was below -15 degrees Fahrenheit at the Fairbanks International Airport;
- Modified the curtailment program from a 3-stage program to a 2-stage program by removing the voluntary stage;
- Lowered the first stage threshold from 35 $\mu g/m^3$ to 25 $\mu g/m^3$; and,
- Lowered the second stage threshold from 55 $\mu g/m^3$ to 35 $\mu g/m^3$.

FNSB Ordinance 2017-18 also strengthened the wood stove change-out program by requiring pellet stoves certified as a replacement option be EPA certified to 2.0 g/hr or less and added emergency power systems as a replacement option.

FNSB Ordinance 2017-44, adopted June 19, 2017, added a new control measure requiring permits for installation of SFBA in new construction. Ordinance 2017-44 strengthened the wood

stove change out program by requiring professional installation, proper wood storage, and training. Ordinance 2017-44 strengthened the curtailment program by requiring a waiver to operate a SFBA during a Stage 1 curtailment, thereby making a Stage 1 curtailment enforceable, and also required more stringent NOASH documentation.

FNSB Ordinance 2018-04, adopted February 8, 2018, modified the NOASH requirements from only Borough listed (under 2.5 g/hr) to Borough listed or EPA certified appliances manufactured after 1998. The change was made to ensure consistency with the Wood Stove Change Out Program.

FNSB Ordinance 2018-26, adopted September 13, 2018, added standards for Retrofit Control Devices (RCD) such as electrostatic precipitators (ESP). The standards included testing requirements, emission standards for RCDs, installation requirements, and a curtailment exemption if regulatory requirements were met.

FNSB Ordinance 2018-45, adopted November 8, 2018, repealed prohibited acts, the curtailment program, and the fine schedule from FNSB Code. The repeal was due to Proposition 4 which states that the FNSB, excluding the natural gas utility, shall not in any way regulate, prohibit, curtail, ban, nor issue fines or fees associated with the sale, distribution, installation or operation of solid fuel heating appliances or any type of combustible fuels. FNSB Ordinances prior to 2018 were all previously adopted by the State into the Moderate SIP and are being implemented by the State where the FNSB could no longer do so.

FNSB Ordinances 2015-01, 2016-21, 2016-37, 2017-18, 2017-44, 2018-04, 2018-26, and 2018-45 are included in Appendix III.D.7.7.

Consistent with the requirements of 40 CFR 51.1010(a), the starting point for assembling a list of controls for BACM analysis is the RACM analysis prepared for the Moderate SIP. Similarly, the requirements detailed in 40 CFR 51.1010(c) specify that the list of BACM controls is the starting point for assembling a list of 2020 Amendment control measures. All controls considered, but not adopted in each preceding plan must be identified. States are also required to examine a wide range of information sources on existing and potential control measures. Measures and technologies considered and implemented in attainment plans from other jurisdictions are a significant source of information. Other information sources include summaries of control measures assembled by regional planning organizations and local air quality consortiums. Additionally, the Stakeholder process allowed for public input into control measure selection. Similarly, as per 40 CFR 51.1010(c), the list of BACM controls in the 2020 Amendment and EPA's proposed approval and disapproval of the control measures[22] formed the starting point for re-assessing the control measures for the 2024 Amendment. The following sections provide a summary of the evolution of the control measure selection for the 2024 Amendment.

7.7.13.4.1 Preliminary Draft BACM Report

As per the requirements detailed in 40 CFR 51.1010(c), the starting point for the control measures to be re-evaluated in the 2024 Amendment was from the 2020 Amendment, and EPA's

[22] 88 Fed. Reg. at 1454.

comments on the 2020 Amendments.[23] In the Serious SIP, DEC identified a total of 72 control measures based on RACM analysis from the Moderate SIP and a review of control measures adopted by other air quality regulatory agencies. This initial set of 72 measures as listed in Table 7.7-33 was submitted for public and stakeholder review.

Table 7.7-33
Control Measures from March 22, 2018, Preliminary Draft Document

Number	Description
1	Surcharge on Device Sales
2	Prohibit advertising used devices that do not meet emission criteria for new device sales
3	Require building or other permit
4	Require confirmation of proper installation by requiring professional installation or on-site inspection
5	Register/require industry certification of heating professionals
6	Prohibit installation of flue dampers unless device was certified using a flue damper
7	Require devices meet stricter emission criteria in high pollution zones.
8	Prohibit installation of Solid Fuel Heating Device (SFHD) in new construction
9	Limit the density of SFHD in new developments
10	Install EPA-certified device whenever a fireplace or chimney is remodeled
11	Prohibit use of rain caps on stacks
12	Require minimum stack height for outdoor wood boilers relative to rooflines of nearby unserved buildings
13	Submit sale and installation information to Air Program
14	Require installation of thermal mass to improve efficiency and prevent frequent cycling in selected new units
15	Disclosure of devices on property sale
16	Require notice and proof of destruction or surrender of removed, uncertified devices (date certain removal of uncertified devices)
17	Require Removal of Uncertified Solid Fuel Burning Devices Upon Sale of Property
18	No Visible Emissions during Curtailment Periods
19	Require registration of devices to qualify for exemption from curtailments
20	Require renewals with inspection requirements
21	Optional device registration for curtailment exemptions
22	Require registration of all devices
23	Require exempt households to display a decal visible from a point of public access
24	Require Permanent Installed Alternative Heating Method in Rental Units
25	Require detailed application or inspection to verify need for No Other Adequate Source of Heat (NOASH)
26	Require inspection of device and installation
27	Require annual renewal of waiver
28	Set income threshold [for Curtailment Exemption]
29	Allow only NOASH households to burn during curtailment periods
30	Distribution of Curtailment Information at Time of Sale of Wood-Burning Device
31	Require sale of only dry wood during late summer to end of winter
32	Require dry wood to be clearly labeled to prohibit marketing of non-dry wood as dry wood
33	Burn permits required
34	Prohibit burn barrels and other outdoor equipment

[23] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115.

Number	Description
35	Restrict burning during air pollution events
36	Prohibit residential open burning
37	Periodic burn windows
38	Ambient $PM_{2.5}$ curtailment threshold (1-hr average)
39	Use of AQI as Basis for Curtailment Threshold
40	Single stage curtailment
41	Special needs permit
42	Burn down period
43	Exempt ceremonial or religious fires
44	Alternative heating appliance failure
45	Elevation exemption from wood burning curtailments
46	Lack of electrical or natural gas service availability
47	Inspection warrants
48	Date certain removal of "coal only heater"
49	Prohibit use of coal burning heaters
50	Require low sulfur content coal
51	Ultra-low Sulfur Heating Oil
52	Operation and sale of small "pot burners" prohibited
53	No Use, Sale or Exchange of Used Oil for Fuel, unless it Meets Constituent Property Limits
54	Adopt CARB vehicle standards
55	School bus retrofits
56	Road paving
57	Other Transportation Control Measures (TCMs)
58	Controls on road sanding and salting
59	I/M Program
R1	Regional kiln
R4	All wood stoves must be certified
R5	Ban new installations - Hydronic Heaters
R6	Remove hydronic heaters at time of home sale
R7	Ban use of Hydronic Heaters
R10	Replace uncertified units at time of sale
R11	Replace uncertified units at time of significant remodeling
R12	Replace uncertified stoves in rental units
R15	Ban new installations - Wood Stoves
R16	Disincentives to sell used stoves
R17	Ban use of Wood Stoves
R20	Transportation Control Measures
R29	Increase Coverage of District Heating Systems

After the preliminary draft BACM documents for the Serious Plan were released, additional control measures were identified based on EPA and public comments, rejected stakeholder measures, small commercial and industrial source-related measures, and new control measures. Other control measures identified are shown in Table 7.7-34.

Table 7.7-34
Other Control Measures

Number	Description
60	Vehicle Idling
61	(EPA3a) Fuel Oil Boiler Upgrade - Burner Upgrade/Repair
62	(EPA3b) Fuel Oil Boiler Upgrades - Replacement
63	Require Electrostatic Precipitators
64	Weatherization and energy efficiency measures
65	Emissions crossing property lines
66	Lower curtailment threshold
67	Coffee Roasters – Commercial
68	Charbroilers – Commercial
69	Incinerators – Commercial
70	Used Oil Burners
71	Date certain removal for EPA certified devices over 2.0 g/hr or over 25 years old

The starting point for the identification of potential control measures for the 2020 Amendment is the list of measures not implemented in the Serious SIP. In addition to re-evaluating the list of measures not implemented in the Serious SIP, the goal for the 2020 Amendment was to identify measures that are more stringent than those adopted in the Serious SIP, evaluate control measures being implemented in other nonattainment areas, and measures considered by regional planning organizations and state and local air quality consortiums.

The process followed to select control measures for the 2020 Amendment was to assemble a list of the control measures not adopted in the Serious SIP and to review the control measures implemented in the following communities to determine if any revisions had been adopted since the submission of the Serious SIP; they included:

- Bay Area AQMD, CA
- South Coast AQMD, CA
- San Joaquin Valley, CA
- Maricopa County, AZ
- Puget Sound CAA, WA
- Utah, UT

The review of the control measures employed in these $PM_{2.5}$ programs determined that no new measures had been implemented since the submission of the Serious SIP. The list of control measures not adopted in the Serious SIP which were re-evaluated for the 2020 Amendment is presented in Table 7.7-35

Table 7.7-35
Control Measures Not Adopted in the Serious Area SIP and re-evaluated in the 2020 Amendment

Number	Description
1	Surcharge on Device Sales
6	Prohibit installation of flue dampers unless device was certified using a flue damper
8	Prohibit installation of Solid Fuel Heating Device (SFHD) in new construction
9	Limit the density of SFHD in new developments
10	Install EPA-certified device whenever a fireplace or chimney is remodeled
11	Prohibit use of rain caps on stacks
12	Require minimum stack height for outdoor wood boilers relative to rooflines of nearby unserved buildings
14	Require installation of thermal mass to improve efficiency and prevent frequent cycling in selected new units
18	No Visible Emissions during Curtailment Periods
20	Require renewals with inspection requirements
23	Require exempt households to display a decal visible from a point of public access
25	Require detailed application or inspection to verify need for No Other Adequate Source of Heat (NOASH)
27	Require annual renewal of waiver
28	Set income threshold [for Curtailment Exemption]
29	Allow only NOASH households to burn during curtailment periods
31	Require sale of only dry wood during late summer to end of winter
32	Require dry wood to be clearly labeled to prohibit marketing of non-dry wood as dry wood
35	Restrict burning during air pollution events
38	Ambient $PM_{2.5}$ curtailment threshold (1-hr average)
39	Use of AQI as Basis for Curtailment Threshold
42	Burn down period
45	Elevation exemption from wood burning curtailments
46	Lack of electrical or natural gas service availability
50	Require low sulfur content coal
51	Ultra-low Sulfur Heating Oil
52	Operation and sale of small “pot burners” prohibited
53	No Use, Sale or Exchange of Used Oil for Fuel, unless it Meets Constituent Property Limits
54	Adopt CARB vehicle standards
55	School bus retrofits
56	Road paving
57	Other Transportation Control Measures (TCMs)
58	Controls on road sanding and salting
59	I/M Program
60	Vehicle Idling
61	Fuel Oil Boiler Upgrade – Burner Upgrade/Repair
62	Fuel Oil Boiler Upgrade – Replacement
63	Require Electrostatic Precipitators
64	Weatherization and Energy Efficiency
67	Coffee Roasters
68	Charbroilers

Number	Description
69	Incinerators
70	Used Oil Burners
R1	Regional kiln
R7	Ban use of Hydronic Heaters
R15	Ban new installations - Wood Stoves
R17	Ban use of Wood Stoves
R20	Transportation Control Measures
R29	Increase Coverage of District Heating Systems

The 2024 Amendment focuses on evaluating the control measures that EPA disapproved in its Final Rule[24] based on DEC's dismissal of the control measure from the 2020 Amendment based on technological or economical infeasibility, or timeframe implementation issues. In addition, the 2024 Amendment also focuses on reviewing control measures adopted by air quality regulatory agencies in other jurisdictions, local, and regional air quality consortiums. The list of control measures from the 2020 Amendment which were re-evaluated for the 2024 Amendment is presented in Table 7.7-36.

Table 7.7-36
Control Measures Not Adopted in the 2020 Amendment and re-evaluated in the 2024 Amendment

Number	Description
31	Require sale of only dry wood during late summer to end of winter
32	Require dry wood to be clearly labeled to prohibit marketing of non-dry wood as dry wood
48	Date certain removal of "coal only heater"
49	Prohibit use of coal burning heaters
51	Ultra-low Sulfur Heating Oil
57/R20	Other Transportation Control Measures (TCMs)
60	Vehicle Idling
64	Weatherization and Energy Efficiency
67	Coffee Roasters
68	Charbroilers
70	Used Oil Burners

In addition to re-evaluating the control measures from the 2020 Amendment, DEC reviewed if any control measures have been adopted in other jurisdictions since the submission of the 2020 Amendment. The following communities had updated control measures submitted:

- San Joaquin Valley, CA
- Plumas County, CA
- Yuba City-Marysville Area, Sacramento CA

The review of the control measures employed in these $PM_{2.5}$ programs determined that no new measures had been implemented since the submission of the 2020 Amendment to the Serious

[24] 88 Fed. Reg 84626 (Dec. 5, 2023)

SIP. Hence, the control measures listed in Table 7.7-36 were considered for the 2024 Amendment.

7.7.13.4.2 Control Measure Selection

Presented below are the measures selected to address the 40 CFR 50.1010(a) Serious Plan requirements and the 40 CFR 50.1010(c) 2020 Amendment Plan requirements.

Serious Plan Control Measures - Several control measures address the space heating source sector, in particular the solid fuel space heating source sector. Due to the multiple processes for identifying control measures, and overlap between the control measures, a crosswalk and summary was developed. When comparing control measures identified in the preliminary draft to the control measures identified through the stakeholder review process, although specific details may differ, in several cases a common intent is found in both sets of measures. This crosswalk identifies where the common intent is present.

In total, 118 unique control measures were identified for the Serious Plan which are presented in the crosswalk and summary in Table 7.7-37. The BACM analysis in Appendix III.D.7.7 of the Serious Plan addresses 84 of the control measures. The 34 unique control measures identified but not addressed in the BACM analysis include 33 Stakeholder recommendations and one contingency measure. The contingency measure is addressed in Section III.D.7.11 of the Serious Plan. Of the 33 Stakeholder measures not included in the BACM analysis, 23 were determined to be non-regulatory in nature (e.g. education and outreach recommendations, or implementation strategies/enhancements for existing measures), six recommendations dealt with stationary point sources and are not addressed in BACM, three are proposed to be adopted into DEC regulations, and one resulted in a FNSB resolution. FNSB resolution number 2019-08 supports legislation granting DEC administrative penalty authority in areas classified as serious nonattainment areas and can be found in Appendix III.D.7.7 of the Serious Plan.

Step 2 in the BACM analysis was to identify potential control measures. The process identified 84 control measures for analysis. The analysis showed that six of the control measures identified did not meet the definition for BACM and were dismissed.

Step 3 in the BACM analysis was to determine if the control measure was technologically feasible. 22 control measures were determined to be technologically infeasible and were dismissed. Eight control measures were found to be adopted in different forms with no further analysis required. 48 measures were determined to be technologically feasible. 40 of those measures were adopted through new state regulations. The eight remaining measures were forwarded for Step 4 analysis.

Step 4 in the BACM analysis was to determine if the control measure was economically feasible. Seven control measures were determined to be economically infeasible and were dismissed from BACM. One of the eight was determined to be economically feasible and was adopted through new state regulation.

Step 5 in the BACM analysis was to determine if a control measure or technology could be implemented in whole or in part no later than 4 years after reclassification of the area to Serious,

which was June 2021. A total of 41 measures are addressed through state regulations. These measures addressed a wide range of space heating, area sources, commercial source and transportation activity categories represented in the emissions inventory.

Detailed information regarding the analysis of individual BACM is found in the BACM Appendix III.D.7.7 of the Serious SIP.

Table 7.7-37
Control Measure Summary and Crosswalk for the Serious SIP

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM Appendix
1				Tech					25
2							18 AAC 50.077(k)		27
3	S28 S31						18 AAC 50.077(j)		28
4	S33						18 AAC 50.077(i)		29
5							18 AAC 50.077(i)		30
6				Tech					31
7							18 AAC 50.077(b),(c),(d),(e)		33
8					Econ				35
9		C.a.		Tech					36
10	S29			Tech					38
11				Tech					38
12				Tech					40
13							18 AAC 50.077(a),(b),(h),(l),(k),(i),(j)		42
14						Not BACM			43
15							18 AAC 50.077(a),(h),(l) & Episode Chapter		44

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM Appendix
16	S17b S18						18 AAC 50.077(a),(l),(m), (h) & Episode Chapter		46
17							18 AAC 50.077(a),(l),(m) & Episode Chapter		48
18				Tech					50
19, 21	S1a, S1c						18 AAC 50.077(h)(3) & Episode Chapter		52 & 56
20							18 AAC 50.077(h) & Episode Chapter		54
22	S1a						18 AAC 50.077(h), (c), (d), & (n)		57
23				Tech					58
24	S22						18 AAC 50.077(j)		59
25	S24						Episode Chapter		61
26							18 AAC 50.077(i)		62
27	S26, S27						Episode Chapter		63
28							Episode Chapter & 18 AAC 50.077(a),(l)		64
29	S25	C.c.					Episode Chapter		65
30							18 AAC 50.077(k)		66
31	S13	B.h.					18 AAC 50.076(d),(e),(g), (j),(k),(l)		67
32							18 AAC 50.076(d),(e),(g), (j),(k),(l)		69

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM Appendix
33			ADF						72
34			ADF						74
35						Not BACM			75
36			ADF						76
37			ADF						77
38						Not BACM			78
39						Not BACM			80
40	S25	C.c.					18 AAC 50.077(a),(l) & Episode Chapter		81
41			ADF						84
42							18 AAC 50.075(e)		85
43		C.f.	ADF						86
44			ADF						87
45						Not BACM			88
46						Not BACM			89
47	S39	D.e.	ADF						91
48	S20						18 AAC 50.079(f)		92
49	S20						18 AAC 50.079(f)		93
50				Tech					94
51	S12						18 AAC 50.078(b)		96
52		B.d., B.e.			Econ				98
53		B.d., B.e.			Econ				98
54				Tech					100

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM Appendix
55				Tech					101
56				Tech					102
57				Tech					139
58				Tech					103
59				Tech					139
60		C.j., D.h., D.i.		Tech					104
61	S21	C.h.			Econ				106
62	S21	C.h.			Econ				107
63		B.k.		Tech					108
64	S15, S16	B.a., B.b.		Tech					109
65							18 AAC 50.075(f)(2)		110
66							Episode Chapter		111
67		D.f., D.g.					18 AAC 50.078(d)		112
68		D.f., D.g.					18 AAC 50.078(c)		116
69		D.f., D.g.					18 AAC 50.078(c)		118
70		D.f., D.g.					18 AAC 50.078(c)		122
71								18 AAC 50.077(n)	
R1	S9			Tech					123
R4		B.c., B.f.					18 AAC 50.077(a),(l)		124

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM Appendix
R5		A.c.					18 AAC 50.077(a),(b),(l)		125
R6		A.c.					18 AAC 50.077(a),(b),(l)		126
R7		A.c.		Tech					128
R9							18 AAC 50.077(a),(l)		129
R10							18 AAC 50.077(a),(l)		131
R11	S29						18 AAC 50.077(a),(l)		132
R12							18 AAC 50.077(a),(l)		133
R15					Econ				135
R16							18 AAC 50.077(a),(i),(l)		136
R17				Tech					138
R20				Tech					139
R29		C.g.			Econ				143
	S1b			Non-reg					
	S8			Non-reg					
	S10			Non-reg					
	S11			Non-reg					
	S14			Non-reg					
	S17a			Non-reg					
	S19			Non-reg					
	S23						Episode Chapter		
	S30						18 AAC 50.077(a)		

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM Appendix
	S32						18 AAC 50.077(i)		
	S34						FNSB Resolution		
	S35			Non-reg					
	S36			Non-reg					
	S37			Non-reg					
	S2						Refer to BACT Analysis for details		
	S3						Refer to BACT Analysis for details		
	S4						Refer to BACT Analysis for details		
	S5						Refer to BACT Analysis for details		
	S6						Refer to BACT Analysis for details		
	S7						Refer to BACT Analysis for details		
	S40			Non-reg					
	S41			Non-reg					
	S42			Non-reg					
	S43			Non-reg					
	S44			Non-reg					
	S45			Non-reg					
	S46			Non-reg					

Identified Measures			Measures Dismissed from BACM				Proposed BACM Measures		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	MSM	Page in BACM Appendix
	S47			Non-reg					
	S48			Non-reg					
	S49			Non-reg					
	S50			Non-reg					
	S51			Non-reg					
	S56			Non-reg					

2020 Plan Control Measures – Listed in the crosswalk Table 7.7-38 are the control measures not adopted in the Serious Plan that were reassessed during the development of the 2020 Amendment. The crosswalk employs the same format as the table above listing the Serious Plan control measures and notes areas of common intent.

In total, 48 unique control measures were identified which are presented in the crosswalk and summary in Table 7.7-38. The details of control measures for the 2020 Amendment can be found in Appendix III.D.7.7 of the 2020 Amendment.

Step 2 in the 2020 Amendment control measure analysis was to identify potential control measures. The process identified 48 control measures for analysis. The analysis showed that six of the control measures identified did not meet the definition for 2020 Amendment measures and were dismissed.

Step 3 in the 2020 Amendment analysis was to determine if the control measure was technologically feasible. 24 control measures were determined to be technologically infeasible and were dismissed. Nine control measures were found to be adopted in different forms with no further analysis required. Nine of the remaining measures were determined to be technologically feasible and forwarded for Step 4 analysis.
Step 4 in the 2020 Amendment analysis was to determine if the control measure was economically feasible. Eight control measures were determined to be economically infeasible and were dismissed from BACM. One of the 9 measures was determined to be economically feasible.

Step 5 in the 2020 Amendment analysis was to determine if the identified technologically and economically feasible control measure or technology could be implemented in whole or in part to support both the 5% annual reductions in the base emission year inventory and the most

expeditious attainment of the ambient $PM_{2.5}$ standard. BACM analysis selected one of the 48 measures for potential implementation as a control measure for the 2020 Amendment to the Serious SIP based on technological, economic, and timing feasibility.

Detailed information regarding the analysis of individual BACM is found in the BACM Appendix III.D.7.7 of the Adopted 2020 Amendment.

Table 7.7-38
Reevaluation of Previously Rejected Control Measures – Summary and Crosswalk for 2020 Amendment

Identified Measures			Measures Dismissed from 2020 Amendment Analysis				Proposed 2020 Amendment Measures Determined to be Equivalent and Most Stringent		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet 2020 Definition	Regulations Implementing Equivalent Measures	MSM	Page in 2020 Analysis
1				Tech					18
6				Tech					20
8				Tech			18 AAC 50.077(a),(b),(c),(d)&(e)	MSM	22
9		C.a.		Tech					26
10	S29			Tech					27
11				Tech					28
12				Tech					29
14						Not Meet Def.			31
18				Tech					32
20			ADF				18 AAC 50.077(h) & Episode Chapter	MSM	34
23				Tech					36
25	S24		ADF				Episode Chapter	MSM	37
27	S26, S27		ADF				Episode Chapter	MSM	38
28			ADF				Episode Chapter & 18 AAC 50.077(a),(l)	MSM	39

Identified Measures			Measures Dismissed from 2020 Amendment Analysis				Proposed 2020 Amendment Measures Determined to be Equivalent and Most Stringent		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet 2020 Definition	Regulations Implementing Equivalent Measures	MSM	Page in 2020 Analysis
29	S25	C.c.	ADF				Episode Chapter	MSM	40
31	S13	B.h.	ADF				18 AAC 50.076(d),(e),(g),(j),(k),(l)	MSM	42
32			ADF				18 AAC 50.076(d),(e),(g),(j),(k),(l)	MSM	45
35						Not Meet Def.			48
38						Not Meet Def.			49
39						Not Meet Def.			51
42			ADF				18 AAC 50.075(e) & Episode Chapter	MSM	53
45						Not Meet Def.			54
46						Not Meet Def.			55
50				Tech					56
51	S12						-		58
52		B.d., B.e.			Econ				60
53		B.d., B.e.			Econ				61
54				Tech					62
55				Tech					64
56				Tech					65
57				Tech					66
58				Tech					66

Identified Measures			Measures Dismissed from 2020 Amendment Analysis				Proposed 2020 Amendment Measures Determined to be Equivalent and Most Stringent		
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet 2020 Definition	Regulations Implementing Equivalent Measures	MSM	Page in 2020 Analysis
59				Tech					67
60		C.j., D.h., D.i.		Tech					68
61	S21	C.h.			Econ				69
62	S21	C.h.			Econ				70
63		B.k.			Econ				71
64	S15,	B.a.,		Tech					77
	S16	B.b.							
67		D.f.,	ADF				18 AAC 50.078(d)	MSM	78
		D.g.							
68		D.f.,			Econ				82
		D.g.							
69		D.f.,		Tech					85
		D.g.							
70		D.f.,		Tech					90
		D.g.							
R1	S9			Tech					92
R7		A.c.		Tech					94
R15					Econ				95
R17				Tech					97
R20				Tech					98
R29		C.g.			Econ				101

2024 Plan Control Measures – Listed in the crosswalk Table 7.7-39 are the control measures not adopted in the 2024 Amendment to the Serious Plan. The crosswalk employs the same format from the table above listing the 2020 Amendment and the Serious Plan control measures.

In total, 11 control measures were identified which are presented in the crosswalk and summary in Table 7.7-39. The details of control measures for the 2024 Amendment can be found in Appendix III.D.7.7 of the 2024 Amendment.

Step 2 in the 2024 Amendment control measure analysis was to identify potential control measures. The process identified 11 control measures for analysis.

Step 3 was to determine if the control measure was technologically feasible. Regulations for 5 control measures (Measure 31, 32, 48, 49, and 67) from the 2020 Amendment were revised based on EPA's comments with no further analysis required. Measure 70 was found to be technologically feasible and was passed on to Step 4. Although, four measures (Measures 51, 57, 60, and 68) were determined to be technologically infeasible, DEC additionally evaluated their economic feasibility in Step 4. Different elements were considered for Measure 64 related to weatherization. Out of the different elements, energy rating, and public education and outreach programs were found to be technologically feasible, while implementing building codes was found to be technologically infeasible. five measures were forwarded to Step 4.

Step 4 was to determine if the control measure was economically feasible. Cost-effectiveness analysis conducted for five measures (Measures 51, 57, 60, 68, and 70) determined all five to be economically infeasible and they were dismissed as BACM.

Step 5 in the 2024 Amendment analysis was used to determine if the identified technologically and economically feasible control measure or technology could be implemented in whole or in part to support the most expeditious attainment of the ambient $PM_{2.5}$ standard. A component of Measure 64 corresponding to implementing building codes was evaluated at Step 5. DEC dismissed building codes because the earliest date the measure could be implemented exceeded the regulatory timeline to achieve the expeditious attainment of the ambient $PM_{2.5}$ standard.

Based on the BACM analysis, DEC revised regulations for five out of the 11 measures based on EPA's comments. DEC developed a new regulation for Measure 64 to require residential building owners to have an energy rating completed by an independent energy rater prior to a real estate transaction, and committed to a robust public education and outreach program on energy efficiency. DEC dismissed the remaining five based on technological, economical, and timeline infeasibility.

Detailed information regarding the analysis of individual BACM is found in the BACM appendix of the 2024 Amendment.

Table 7.7-39
Reevaluation of Previously Rejected Control Measures – Summary and Crosswalk for 2024 Amendment

Identified Measures			Measures Dismissed from 2024 Amendment BACM				Proposed 2024 Amendment Measures Determined to be BACM	
Number	Stakeholder Measure	Rejected by Stakeholder	Adopted in Different Form	Technical Dismissal	Economic Dismissal	Does Not Meet BACM Definition	Proposed to Adopt as BACM	Page in BACM Appendix
31	S13	B.h.					18 AAC 50.076(d),(e),(g),(j),(k),(l)	46
32							18 AAC 50.076(d),(e),(g),(j),(k),(l)	49
48	S20						18 AAC 50.079 (d), (e), (f), (h)	61
49	S20						18 AAC 50.079 (d), (e), (f), (h)	63
51	S12			Tech	Econ		18 AAC 50.078(b)	67
57				Tech	Econ			82
60		C.j., D.h., D.i.		Tech	Econ			83
64	S15	B.a.,		Tech				101
	S16	B.b.	ADF				18 AAC 50.081	
67		D.f., D.g.,	ADF				18 AAC 50.078(d)	111
68		D.f., D.g. D.g.		Tech	Econ		18 AAC 50.078(c), 18 AAC 50.055	116
70		D.f., D.g.			Econ		18 AAC 50.078(c)	127
R20				Tech	Econ			139

Unlike the Serious SIP and 2020 Amendment, the crosswalk table 7.7-39 for the 2024 Amendment does not include an evaluation of the control measures as MSMs. EPA denied

Alaska's request to extend the Serious Area attainment date under the CAA section 188(e), and therefore the MSM requirement is not applicable.[25] This is further explained in Section 7.7.13.6.

An overview of control measures evaluated in the 2024 Amendment is presented below. A detailed description of these control measures is provided in Appendix III.D.7.07 Control Strategies.

Measure 31 adopted as regulation 18 AAC 50.076(k)(3) includes requirements to regulate the sale of wood in the Fairbanks Nonattainment Area in the 2020 Amendment. EPA commented[26] that there were enforceability issues and recommended Alaska revise 18 AAC 50.076(k)(3) to require a specific frequency at which wood sellers are required to measure the moisture content of the seller's wood stock to ensure the stock is dry prior to selling. DEC is revising regulation 18 AAC 50.076(k)(3) by setting a frequency at monthly intervals to measure the moisture content. Measure 32 adopted as regulation 18 AAC 50.076(k)(1) related to labeling of dry wood to prohibit marketing of non-dry wood. EPA's evaluation[27] for measure 32 was similar to that of measure 31. DEC is revising regulation 18 AAC 50.076(k)(1) by improving the labeling to indicate "dry wood".

Measure 48 related to date certain removal of coal heaters is adopted at 18 AAC 50.079(f). In the 2020 Amendments, Alaska added a new subsection to 18 AAC 50.079 which requires coal-fired heating devices to be removed or replaced by the earlier of December 31, 2024, or before the device is sold, leased, or conveyed as part of an existing building. The removed devices must be destroyed or rendered inoperable and cannot be advertised for sale within the nonattainment area. Measure 49 related to prohibiting the use of coal burning heaters is adopted at 18 AAC 50.079(f) in the 2020 Amendment. This regulation requires coal-fired heating devices to be rendered permanently inoperable by December 31, 2024, or before the device is sold, leased, or conveyed as part of an existing building. Coal-fired devices are eligible for changeouts under the Targeted Airshed Grant. Alaska stated that the date of 2024 provides residents adequate time to participate in the solid fuel burning appliance change-out program to comply with the regulation without overwhelming the Borough program resources. EPA dismissed both measures 48, and 49 and disapproved sections of 18 AAC 50.079.[28] EPA's concerns were that 18 AAC 50.079(f) did not specify a process to confirm the device was rendered inoperable, 18 AAC 50.079(d) allows the owners to test out of the mandatory removal requirements, and 18 AAC 50.079(e) includes an unbounded waiver provision.

To address EPA's concerns, DEC is revising 18 AAC 50.079 by lowering the emission threshold to test out of the mandatory removal requirements in 18 AAC 50.079(d) from 18 grams per hour to 0.10 pounds per million Btu which is equivalent to the pellet hydronic heater limit in 18 AAC 50.077. Regulation 18 AAC 50.079(d) is amended to require a testing protocol be approved by the department prior to any test attempting to exempt a coal device from the mandatory removal requirement. 18 AAC 50.079(e) is revised to add a time limit of one calendar year to make the waiver provision bounded. 18 AAC 50.079(f) is revised for clarity by adding section (3) which

[25] 88 Fed. Reg. at 84627 and 84632.
[26] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 18.
[27] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 19
[28] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 26-27

requires coal-fired heating devices to be rendered inoperable after the expiration of a waiver granted under subsection (e) of 18 AAC 50.079. A new section 18 AAC 50.079(h) is added that requires documentation on the removal and rendering of the device inoperable and submitting an affidavit that the coal stove will not be reinstalled in the Nonattainment Area.

Measure 51 is related to ultra-low sulfur heating (ULSD) oil. EPA proposed to reject DEC's dismissal of requiring ULSD for residential and commercial heating purposes because according to EPA, DEC did not establish that the measure is either technologically or economically infeasible.[29] In response, DEC provided facts to demonstrate technological infeasibility and updated its cost-effectiveness analysis based on eight factors to demonstrate economic infeasibility. These revisions were made considering several changes since the 2020 Amendment as the market prices of heating oil has increased significantly, the community shifted to use of lower sulfur #1 heating oil in September 2022 due to adoption and implementation of 18 AAC 50.078(b), and DEC learned more about boiler fouling as well as people's actual home heating behaviors through an updated Home Heating survey, conducted in Spring 2023. Based on these revisions, DEC determined that ULSD is not technologically feasible as it could not be produced locally, and the logistical transportation networks that would have to supply it to the greater Fairbanks area do not have that capacity. DEC revised the economic analysis from the 2020 Amendment through eight distinct changes, (1) correction of episodic to annual energy use, (2) correction of adjusted energy use error, (3) consideration of combined SO_2 and $PM_{2.5}$ cost-effectiveness, (4) correction of fuel use impacts from reduced boiler fouling, (5) incorporation of local oil appliance survey data, (6) accounting for impacts of changes in heating oil market prices, (7) accounting for impacts of relative vs. additive ULSD price increases, and (8) impacts of changes in baseline heating oil sulfur content. DEC found the resulting combined ULSD cost-effectiveness to be economically infeasible. EPA in their Final Rule[30] rejected DEC's revised technological analysis but accepted the economic analysis and approved DEC's dismissal of ULSD as a BACM.

Measure 57 (or R20) related to transportation control measures includes HOV lanes, traffic flow improvements, diesel retrofit projects, and ridesharing programs. In response to EPA's comments[31] that DEC's dismissal of Measures 57, 60, and R20 in the 2020 Amendment lacked sufficient feasibility assessment, DEC conducted feasibility analyses for all the measures. Based on the analysis, DEC found HOV lanes to be technologically infeasible due to no emissions reduction benefits. DEC found the cost-effectiveness of traffic flow improvements, diesel retrofit projects, and ridesharing programs to be high thereby rendering these programs economically infeasible. EPA in their Final Rule[32] accepted DEC's dismissal of measure 57 based on technological infeasibility for HOV lanes, and based on economical infeasibility for the remaining measures in measure 57 as a BACM for 2024 Amendment.
Measure 60 is related to vehicle idling restrictions. While DEC found the vehicle idling restrictions to be technologically infeasible, DEC proceeded to Step 4 to assess the economic feasibility. DEC performed an economic feasibility evaluation for an anti-idling program for heavy-duty vehicles (HDV) by reviewing information collected during a CMAQ-funded pilot

[29] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 28.
[30] 88 Fed. Reg. at 84626, Pg. 84641.
[31] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 32.
[32] 88 Fed. Reg. at 84626, Pg. 84648.

program, conducted in partnership with the Alaska Department of Transportation and Public Facilities. DEC also performed an economic feasibility evaluation for two anti-idling programs for light-duty vehicles (LDV): (1) anti-idling campaign targeted at passenger vehicles during pick-up and drop-off periods at schools and (2) patrolling commercial establishments such as grocery stores, restaurants, bars, and shopping centers where people idle their vehicles. Based on estimated costs and emission reductions, DEC determined that the vehicle idle restrictions for both LDV and HDV are economically infeasible. EPA in their Final Rule[33] accepted DEC's economic infeasibility determination rejecting idling restrictions for heavy-duty diesel vehicles but rejected Alaska's rejection of vehicle idling restrictions at schools and commercial establishments. For LDV, the EPA commented that including implementation and staff costs in the economic feasibility analysis for implementing the anti-idle program is inconsistent with the CAA and $PM_{2.5}$ SIP Requirement Rule. EPA recommended DEC consider implementing an anti-idling regulation that includes idle duration limits that vary depending on ambient temperature and provide exemptions for safety. Accordingly, DEC re-evaluated the economic analysis by considering the same two anti-idling programs for LDV as before but implementing the idling restrictions during winter months from October through March at temperatures above 21°F, a temperature threshold below which restrictions would pose safety concerns based on a review of local conditions. This temperature is traditionally the threshold at which vehicle owners begin plugging in these winterization elements on their vehicles to ensure startability.[34] The economic feasibility analysis determined that the implementation of these controls at these temperatures would produce cost-effectiveness estimates that are infeasible.

EPA is incorrect that including implementation costs in an economic infeasibility analysis is inconsistent with the CAA and $PM_{2.5}$ SIP Requirements Rule. EPA cited CAA section 110(a)(2)(E) as support for not allowing the cost of implementing and enforcing a control strategy to be considered in an economic analysis. While the CAA section 110(a)(2)(E) requires the State to provide the necessary assurance of having adequate funding, personnel, and authority to implement a control measure, the requirement does not state or imply that the funding/costs to be borne by the State cannot be included in the economic feasibility assessment of the control measure. The $PM_{2.5}$ SIP Requirements Rule states that economic infeasibility assessments are focused on the costs projected to be borne by the owner/operator of the subject source, but likewise does not say or imply that the reasonable costs of implementation cannot be considered. As such, including the cost of government employee salaries in the economic feasibility assessment is not inconsistent with the CAA and the $PM_{2.5}$ SIP Requirements Rule. Secondly, including the cost of government employee salaries in the economic analysis is essential to providing a representative economic analysis to compare control measures which is a fundamental element of economic feasibility as defined by the $PM_{2.5}$ SIP Requirements Rule. Thirdly, there is substantial evidence of the inclusion of program/staffing costs for several control measures wherein the EPA accepted the DEC's analysis. These control measures are summarized in greater detail in the appendix for this chapter. Based on the economic analysis for implementing idling restrictions at temperatures of 21°F and above, and the precedent for including reasonable program implementation costs in EPA-approved economic infeasibility

[33] 88 Fed. Reg. at 84626, 84649.
[34] Fairbanks North Star Borough Code Ordinance 21.24.010. Accessed at https://fnsb.borough.codes/FNSBC/21.24.010.

analyses, implementing vehicle idling restrictions is economically infeasible in the Nonattainment Area.

Measure 64 is related to weatherization. EPA rejected DEC's dismissal of measure 64 as part of the 2020 Amendment.[35] DEC asserted that it lacked authority to require insulation and EPA stated this justification was "invalid".[36] EPA also stated that difficulty in quantifying emissions benefits from voluntary programs did not correspond to the requirements of the 2016 $PM_{2.5}$ Final Rule.[37] In response, DEC reviewed weatherization and energy efficiency measures adopted by other jurisdictions. Based on this review, DEC is committing to two new components within this measure: (1) a robust advertising and education program that includes best practices to improve efficiency in an arctic environment and available economic and practical mechanisms that can assist homeowners in improving both efficiency and regulatory compliance; and (2) developing a new regulation that requires a homeowner to complete an energy rating with a licensed energy assessor before listing the building or property for sale. The second component will require the owners to pay for the energy rating. The proposed regulation requires the residential building owner to submit the energy rating report to DEC, and to register any wood-fired heating devices. These components will improve the compliance rate for other control measures including the curtailment program and date certain removal of uncertified appliances. Any improvements identified by the energy rater will be voluntary. DEC dismissed adopting any building energy efficiency codes or mandatory weatherization requirements because of technological barriers such as lack of technical expertise, and resources to implement (lack of energy auditors and training resources), enforce, and ensure code compliance. In addition to technological infeasibility, DEC dismissed building codes as the earliest date DEC can implement building codes exceeded not only the statutory requirement for the implementation of BACM by December 31, 2024, but also beyond the 2027 attainment date identified in the 2024 SIP Amendments.

Measures 67 (Coffee Roasters), 68 (Charbroilers), and Measure 70 (Used Oil Combusion) are explained in Section 7.7.13.5.2 on Small Area Sources.

None of the listed measures is identified as a contingency measure. To satisfy the contingency measure requirement in 2024 Amendment, DEC has determined that in the event EPA issues a finding of failure, as identified in 18 AAC 50.030(c)(1)(B), contingency measures will be implemented that (1) increase the stringency of the curtailment program thresholds/ alert levels for wood-fired heating devices, and (2) increase compliance resources for wood device removal (Measure STF-17). The contingency measures will increase the stringency of the Stage 1 and Stage 2 alert levels under the Solid Fuel-Burning Appliance Curtailment Program from 20 $\mu g/m^3$ and 30 $\mu g/m^3$ to 15 $\mu g/m^3$ and 20 $\mu g/m^3$, and will increase compliance for STF-17 from 30% to 45%. Contingency measures are explained in Section III.D.7.11.

7.7.13.5 Adopted Control Measures (Specific Regulations)

[35] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 35.
[36] 2016 $PM_{2.5}$ Final Implementation Rule. Accessed at https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf.
[37] 2016 $PM_{2.5}$ Final Implementation Rule. Accessed at https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf.

The following regulations reflect new or revised measures for the 2024 Amendment to the Serious SIP. Regulations and ongoing measures adopted in the Serious Area SIP and the 2020 Amendment are provided in Section 7.7.13.3 and remain in effect. A summary of the adopted regulations for the 2024 Amendment is provided in Table 7.7-40 and it should be noted that this does not reflect the detailed verbiage that is in the actual regulations. Please review the official, adopted regulatory language to ensure a full understanding of the requirements.

The existing Serious SIP and 2020 Amendment measures are listed in Table 7.7-31 and Table 7.7-32, and are implemented through state regulations found at 18 AAC 50.075 through 18 AAC 50.079. The control measures from the 2024 Amendment listed below will work together with those existing measures. Contingency control measures are described in Section III.D.7.11.

Table 7.7-40
Control Measure Regulation Summary

Control Measure Identification	Proposed Regulation citation	Summary
Measure 31	18 AAC 50.076(k)(3)	Regulation revised to include a monthly requirement to measure the moisture content of wood for sale.
Measure 32	18 AAC 50.076(k)(1)	Regulation revised by enhancing the labeling.
Measure 48	18 AAC 50.079(d), (e), (f), (h)	Regulation revised to include a new section (h) to require removal and render device inoperable or submit affidavit that coal stove will not be reinstalled in the Nonattainment Area.
Measure 49	18 AAC 50.079(d), (e), (f), (h)	Revised to include modified testing methods, required testing protocol, and revised emissions limit to 0.10 lb/MMBtu for pellet hydronic heaters.
Measure 64	18 AAC 50.081	New regulation. Real estate requirement to obtain energy rating prior to real estate transaction, which will be used for stove registration and enforcement of removal of uncertified stoves, consolidating real estate transaction requirements related to wood heaters, and adding a requirement for real estate agents to ensure compliance with 18 AAC 50.077 and .079.
Measure 67	18 AAC 50.078(d)	Regulation revised to include a 10% opacity limit averaged over 6 consecutive minutes. Coffee roasters that emit more than 24lb/yr of PM emissions are required to use a pollution control device and are subject to an emission control limit of 0.12 lbs per ton of coffee roasted.

7.7.13.5.1.4 Fuel Requirement – dry wood

The Aurora Kiln is the largest source of dry wood in the nonattainment area. They are the first, and only, Kiln-dried firewood manufacturer in Alaska and they supply wood-burning products for residential and commercial customers. The kiln was privately funded by Aurora Energy Solutions (AES). AES was formed in 2020 to provide clean burning solid-fuel home-heating products such as kiln-dried firewood as well as heating pellets and compressed logs. AES is a

sister company to Aurora Energy which owns and operates a coal-fired combined heat and power plant in downtown Fairbanks. It is the steam from that plant that is used to dry the firewood. Benefits of the kiln include harvesting local wood from within 100 miles, drying it to 20% moisture, and providing a year-round supply which helps to reduce $PM_{2.5}$ emissions. Based on a conversation with Aurora Kiln,[38] they dried 4,069 cords in 2022 which increased to 4,357 in 2023, which is projected to increase to 5,000 in 2024 with their second kiln in operation. They pointed out, however, that the lack of storage capacity to store either raw logs or finished dry wood is limiting their ability to dry more cords with both kilns in operation.

7.7.13.5.2 Area Sources – Small Sources (Incinerators, Charbroilers, Used Oil, Coffee Roasters)

As noted in the BACM analysis, these sources were not previously controlled, nor were their emissions well understood. Presented below is a summary of the control measure analysis prepared in the Serious Plan, 2020 Amendment and the 2024 Amendment.

Serious Plan
Small area sources and their impact on emissions within the nonattainment area were not well understood in the Serious Plan. To gain insight into the operation of these sources and their emissions DEC required all incinerators, charbroilers and used oil burners to provide a one-time submittal of information to better understand these sources, their emissions and determine the need for controls. The Serious Plan committed to require coffee roasters to install controls on any unit that emitted 24 lbs or more of particulate matter/year. DEC also committed to waive the requirement if information was provided that documented that the control technology was economically or technologically infeasible. The requirement for installation of control equipment on coffee roasters was committed to be 1 year from the effective date of regulation.

2020 Amendment
Incinerators – Regulation 18 AAC 50.078(c) was adopted which required incinerators to submit information on location, type (medical, liquid, solid, etc.), process, fuel, throughput, hours of operation, etc. Based on the information received, DEC determined that it does not have any record of permitted or unpermitted sources under the incinerator source category. Therefore, there are no existing incinerators to be affected by a regulation change. Based on this information, Measure 69 was dismissed from the 2020 Amendment control strategy analysis as technologically infeasible.

Charbroilers – Regulation 18 AAC 50.078(c) was adopted which required charbroilers to submit information on their location, operation type (chain-driven versus underfired), number of operations, fuel used, # of lbs of meat cooked/week, etc. The 2020 Amendment control measure analysis determined that charbroiler control is technologically feasible. The cost effectiveness analysis, however, determined that the installation of catalyst oxidizers is not cost effective. For this reason, Measure 68 was dismissed from the 2020 Amendment control strategy as economically infeasible.

[38] Conversation with Susan Shopper from Aurora Energy Solutions and Cory McDonald from DEC (04/11/2024).

Used Oil – Regulation 18 AAC 50.078(c) was adopted which required used oil burners to submit information on the location, # of burners, rating, operating hours, fuel use/hour, etc. Based on an analysis of the information received and discussions with the FNSB Solid Waste manager to determine how FNSB disposes of waste oil, it was determined that combustion of used oil is the only acceptable disposal method available in the FNSB without shipping the used oil south to the continental United States. Prohibiting or regulating the combustion of used oil in the FNSB would place a burden on the small businesses that rely on combustion of used oil as a waste disposal method, encouraging a small percentage to improperly dispose of the used oil. Due to the severe environmental impacts used oil can have on waterways and drinking water, and the probability that prohibiting or regulating the combustion of used oil would lead to improper disposal, Measure 70 was dismissed from 2020 Amendment control strategy analysis due to potential environmental impacts. Thus, it was determined to be technologically infeasible.

Coffee Roasters -18 AAC 50.078(d) became effective on January 8, 2020, and required the installation of either a catalytic oxidizer or thermal oxidizer on any unit emitting particulate matter at or above the 24 lbs/yr threshold. One of these devices must be installed within a year of the effective date of the regulation. DEC may waive the requirement if a facility submits information demonstrating that the control device is either technologically or economically infeasible. The 2020 Amendment analysis determined that the adoption of this regulation was sufficient to meet the control measure requirements specified in 40 CFR 50.1010(c). For this reason, Measure 67 was dismissed from 2020 Amendment control strategy analysis because it was adopted in a different form.

2024 Amendment
Incinerators – DEC dismissed Measure 69 from the 2020 Amendment based on technological infeasibility and EPA accepted DEC's dismissal of this measure.[39]

Coffee Roasters – The 2020 Amendment adopted regulation 18 AAC 50.078(d) that required the installation of either a catalytic oxidizer or thermal oxidizer on any unit emitting particulate matter at or above the 24 lbs/yr threshold within 12 months. As DEC determined that the adoption of this regulation was sufficient to meet the BACM requirements, they dismissed the control measure from the 2020 Amendment BACM consideration because it was adopted in a different form. EPA rejected[40] DEC's dismissal of the control measure stating that regulation 18 AAC 50.078(d) was not adequately specific or bounded and lacked enforceability. In response, DEC is re-structuring the regulation as a permit-by-rule that requires the installation of a control device by any coffee roasting unit that emits more than 24 lbs/yr of PM. Once controls have been installed, the coffee roasting units are subject to an emission control limit of 0.12 lbs per ton of coffee roasted. 18 AAC 50.078(d) limits the opacity of visible emissions from coffee roasters to no more than 10 percent averaged over any six consecutive minutes. The revised opacity limits strengthen the limits that the coffee roasters were subjected to via 18 AAC 50.055. Furthermore, 18 AAC 50.078(d) requires the coffee roasting units to monitor and maintain records related to the operation, maintenance of the units, and performance of the control devices and submit an annual report. The regulation does not have a waiver provision exempting facilities that demonstrate technological or economic infeasibility.

[39] 88 Fed. Reg. at 1481.
[40] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 37.

Charbroilers – In the 2020 Amendment, DEC based its analysis on chain-driven charbroilers and found that catalytic oxidizers were technologically but not economically feasible as BACM. EPA commented[41] that DEC did not evaluate other available control measures and did not explain whether chain-driven or underfired charbroilers are present in the Nonattainment Area. Based on these comments, DEC performed a deeper investigation by reaching out to local agencies and evaluating the information obtained as part of regulation 18 AAC 50.078(c), and determined only underfired charbroilers to be present in the Nonattainment Area. Based on this information, DEC evaluated the feasibility of installing electrostatic precipitators (ESP), filtration, and wet scrubbers suitable for underfired charbroilers as emissions controls. DEC found that installing all three controls were technologically infeasible due to issues related to shipping and maintenance of the control devices. Although DEC dismissed this measure based on technological infeasibility, DEC evaluated the economic feasibility and found the cost-effectiveness to be high, making this measure economically infeasible. For these reasons, DEC dismissed requiring emission control devices on charbroilers as infeasible. EPA in their Final Rule[42] found DEC's economic analysis to address their concerns and approved DEC's dismissal of installing emission controls on charbroilers as a BACM for the 2024 Amendment. EPA also accepted that the visible emission limit in 18 AAC 50.055 constituted BACM for the charbroiler source category.

Used Oil – In the 2020 Amendment, DEC dismissed regulating the combustion of used oil based on technological infeasibility due to potential environmental impacts that may occur from illegal oil burning. EPA rejected[43] DEC's dismissal, stating that DEC has the authority to mitigate potential environmental impacts and recommended that DEC evaluate the feasibility of other options for used oil disposal. Following EPA's comments, DEC revisited local efforts and conducted a technological and economic analysis of alternative ways to process used oil, including shipping used oil via the FNSB Solid Waste Division facility (Option 1), and purchasing, operating, and maintaining a centrifuge facility in Fairbanks to process used oil from all used oil generators in the community (Option 2). DEC found Option 1 was partly technologically feasible because FNSB Solid Waste Division has a limit on the amount of used oil that it can receive from generators, and found Option 2 to be technologically feasible. Both options, however, resulted in high cost-effective estimates, rendering them as economically infeasible.

DEC dismissed this measure based on economic infeasibility as the combustion of used oil is the only acceptable disposal method available in the Nonattainment Area. EPA in their Final Rule[44] found DEC's analysis to fill the analytical gaps noted in EPA's comments and approved DEC's dismissal of banning used oil burners as a BACM for 2024 Amendment.

[41] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 38.
[42] 88 Fed. Reg. at 84626, Pg. 84643.
[43] 88 Fed. Reg. at 1481; Technical Support Document: Docket No. EPA-R10-AOAR-2022-0115, Pg. 40.
[44] 88 Fed. Reg. at 84626, Pg. 84643.

7.7.13.5.5 Mass Transit – FNSB Transit Fleet Natural Gas Efforts

Section 7.7.5.5 describes FNSB efforts to transition the FNSB Transit fleet to natural gas. Since submission of the Serious Area SIP, significant progress has been made toward the transition. The following updates detail the progress made:

Transit Maintenance and Storage Facility Upgrades
In addition to the FNSB grant award through the Federal Transit Administration (FTA) on May 18, 2017, for $12,800,000, an additional award of $10,400,000 through FTA was announced in August of 2020. Both grant awards will be used for design and construction of a new maintenance/storage facility and will be fully compliant with the Compressed Natural Gas (CNG) fuel requirements. As described in Section 7.7.5.5, ground testing on the existing property identified inadequate stability which would require significant measures and funding to correct. Financial and logistical analysis suggested moving the project to an alternate location. An alternate site had been identified at the time of the Serious Area SIP submittal. Having completed environmental studies, ground stability determination, and receiving FNSB Assembly approval, FNSB is finalizing the purchase of the alternate site.

Transit Fleet Replacement Schedule and Funding Sources
In addition to the funding sources mentioned in Section 7.7.5.5, FNSB was awarded 3 years of CMAQ funding beginning in 2021 to be used towards the purchase of CNG vehicles. The award amount for each year is $1,826,850. It is estimated that this will allow for the replacement of 9 additional buses. The FNSB has also been awarded FTA Section 5339 funds for FY 17-20 totaling $449,114. Once appropriated, these additional awards provide FNSB with the funding needed for a total replacement of 13 buses and 10 paratransit style vehicles, or approximately 90% of the total fleet vehicles.
The FNSB FY 20/21 budget continues to include the combined use of FTA Section 5307 funding and local match funds to acquire buses. It is the FNSB's intent to continue to use similar funding combinations in the future to procure transit vehicles and continue the transition process.

Acquisition and Installation of CNG Fueling Infrastructure
In April of 2020, FNSB was awarded $1,826,850 in CMAQ funding by FAST Planning for the installation of a CNG fueling infrastructure.

7.7.13.6 Most Stringent Measures (MSM)

EPA defines MSMs as any permanent and enforceable control measure that achieves the most stringent emissions reductions in direct $PM_{2.5}$ emissions and/or emissions of $PM_{2.5}$ plan precursors from among those control measures which are either included in the SIP, or have been achieved in practice in any state, and that can feasibly be implemented in the relevant $PM_{2.5}$ NAAQS nonattainment area.[45] A measure could also be considered an MSM if the measure cannot be implemented within the four-year window after an area is reclassified as Serious. An MSM could be a control measure that has not been implemented anywhere else. Furthermore, a

[45] 40 CFR 51.1000

State would have to comply with the MSM requirements if the State had sought for extension of the Serious area attainment date.

For the Serious Plan, DEC identified Measure 71 as an MSM; the required removal of EPA certified devices that are 25 years old and have a PM emission rating of greater than 2.0 g/hr. Initially these older EPA certified devices were required to be removed by December 2024 and this requirement was triggered upon EPA's determination that the area failed to attain the standard. However, once the regulation is triggered, all older EPA certified devices must be removed or replaced upon sale of the property where they are located. Furthermore, the 25 years is a rolling time period; every year, a new set of older EPA certified devices is eligible for removal or replacement. This on-going MSM provides the foundation for transitioning the area's wood-fired heating devices more quickly to the 2.0 g/hr standard.

For the 2020 Amendment, DEC's review of the control measures not adopted in the Serious SIP determined that a total of 10 measures (#'s 8, 20, 25, 27, 28, 29, 31, 32, 42 and 67) were implemented in either existing regulation, planned modifications to those regulations, and the Episode chapter, and therefore qualified as MSMs. Table 7.7-26 lists the measures and regulations implementing them. The State dismissed adopting Measure 8 as technologically infeasible because the state did not have the authority to implement land use regulations. Analysis of that measure, however, demonstrates that 18 AAC 50.077 contains point-of-sale restrictions that are broader than land use controls and contain cordwood stove standards that are more restrictive than current EPA certification standards, which more than qualifies it as an MSM.

Unlike the Serious SIP and 2020 Amendment, re-evaluation of control measures as an MSM does not apply to the 2024 Amendment. MSM is applicable if the EPA has previously granted an extension of the attainment date under CAA section 188(e) for the nonattainment area and NAAQS at issue. MSM as part of the Serious SIP and 2020 Amendment was applicable because DEC had applied for an extension of the Serious Area attainment date. The EPA previously denied Alaska's request to extend the Serious area attainment date pursuant to CAA section 188(e) for the Fairbanks Serious Nonattainment Area.[46] As a result of this action, Alaska became subject to the requirements of CAA section 189(d) which does not require the inclusion of MSM, unless the EPA previously approved the State's request to extend the Serious area attainment date under CAA section 188(e). Thus, the requirement to identify, adopt, and implement MSM as part of the control strategy does not apply for the 2024 Amendment.

7.7.13.7 Calculating the Benefits of Control Measures

Calculation of emission benefits for key control measures through 2029 are summarized within Section III.D.7.6. Within this sub-section, post-2019 control measures under the Serious Area

[46] Determination of Failure To Attain by the Attainment Date and Denial of Serious Area Attainment Date Extension Request; AK: Fairbanks North Star Borough 2006 24-Hour Fine Particulate Matter Serious Nonattainment Area – Final Rule, 85 FR 54509, September 2, 2020; Determination of Failure To Attain by the Attainment Date and Denial of Serious Area Attainment Date Extension Request; AK: Fairbanks North Star Borough 2006 24-Hour Fine Particulate Matter Serious Nonattainment Area – Proposed Rule, 85 FR 29879, May 19, 2020, at p. 29881.

SIP, 2020 Amendments, and 2024 Amendments are presented. They are consistent with the emission benefits presented later in Section III.D.7.9.2 to support the 5% annual emission reduction requirements and in Section III.D.7.9.3 in the expeditious attainment analysis.

As discussed earlier in Section III.D.7.6, control measure benefits are calculated to reflect reductions inclusive of the Serious Area SIP, 2020 Amendments, and 2024 Amendments. In addition, reductions from on-going federal mobile source and fuel control programs such as the Federal Motor Vehicle Control Program (FMCVP), Diesel Emission Reduction Program, and fuel standards are accounted for in projected baseline emission estimates.

Table 7.9-2 in Section III.D.7.9, placed here for reference as Table 7.7-41, lists state and local control measures for which emission benefits were quantified.[47] As explained in the footnote below Table 7.7-41, the Start Year column refers to the first complete calendar year a measure is projected to be implemented.

Table 7.7-41
List of Control Measures for Which Emission Benefits Were Quantified

Measure ID	Measure Summary	Start Year[b]
WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently secured funding[a]	On-going, thru 2029
Curtailment	Solid Fuel Burning Appliance (SFBA) Episodic Curtailment Program, reflects enhanced compliance by future attainment date	On-going
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	2023
STF-13, Modified BACM 31, 32	Requires commercially sold wood to be dry before sale	2022
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified devices and cordwood outdoor hydronic heaters (OHHs)	2024
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU (hydronic heaters) certified PM emission rates for new or re-conveyed wood devices	2020
BACM 48, 49	Removal of coal heaters	2024
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	2020
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	2020

[a] Reflects WSCO program funding through 2016, 2017, 2018, 2019-2020, 2021, and 2022 EPA-awarded Targeted Airshed Grants (TAGs).
[b] Start year refers to the first full calendar year of measure implementation. For example, a measure implemented in September 2022 has a start year of 2023. In SIP inventory development and attainment modeling, a measure must be fully implemented over an entire calendar year for its control benefits to be counted in that year.

Table 7.9-7 in Section III.D.7.9, placed here for reference as Table 7.9-42, presents the $PM_{2.5}$ and SO_2 emission reductions for each measure in the State's control strategy package for which

[47] The package of measures planned for adoption by Alaska include additional measures beyond those listed in Table 7.7-41 for which data were not fully available to quantify emission benefits.

benefits were quantified. Individual measure reductions and combined reductions are shown wherein for the combined reductions, the benefits shown for each individual measure are discounted to account for the overlap of measures controlling the same sources within the combined control package. Combined measure benefits shown at the bottom of Table 7.9-42 also properly account for measure overlap within the combined control package to avoid double-counting of emissions benefits.

Table 7.9-42
Projected 2026 and 2027 Emission Reductions for Post-2020 Control Measures under 2024 Amendments Expeditious Attainment Analysis

Measure ID	Measure Summary	Emission Reductions[a] (tons/episodic day)			
		2026		2027	
		$PM_{2.5}$	SO_2	$PM_{2.5}$	SO_2
WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding	0.91	0.09	1.09	0.11
Curtailment	Solid Fuel Burning Application Episodic Curtailment Program, reflects enhanced compliance by future attainment date	S1[b]: 0.02 S2[b]: 0.12	S1[b]: -0.00 S2[b]: -0.02	S1[b]: 0.02 S2[b]: 0.12	S1[b]: -0.00 S2[b]: -0.02
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	0.02	1.73	0.02	1.73
STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	0.06	<0.01	0.06	<0.01
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	0.26	-0.01	0.25	-0.01
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new of re-conveyed wood devices	0.08	<0.01	0.09	<0.01
BACM 48, 49	Removal of coal heaters	<0.01	<0.01	<0.01	<0.01
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	0.03	<-0.01	0.03	<-0.01
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01	<0.01	<0.01
Combined Total, Area Space Heating (accounting for measure overlap)		S1[b]: 1.05 S2[b]: 1.17	S1[b]: 1.78 S2[b]: 1.77	S1[b]: 1.24 S2[b]: 1.37	S1[b]: 1.81 S2[b]: 1.80

[a] Emission reductions shown for each measure account for effects of overlap within the combined control package.
[b] S1 and S2 refer to benefits under Curtailment program Stage 1 (20 $\mu g/m^3$) and Stage 2 (30 $\mu g/m^3$) alert conditions.
n/a – Not Applicable.

DEC and the Borough recognize that the long-term mix of $PM_{2.5}$ control strategies implemented in Fairbanks could warrant revision. This would be accomplished through a future attainment or maintenance plan revision and subject to approval by EPA. This evaluation could result in measures being removed or added to the plan depending on the outcome of the analyses prepared at that time. All changes to the air quality plan must be approved by EPA.

7.7.13.8 Best Available Control Technologies (BACT)

Large stationary sources are a subgroup of emissions sources that are given special attention in the state's BACT analysis. The emissions units (EUs) at these major stationary sources are subject to site-specific review for BACT. In 40 CFR 51.166(b)(12), the U.S. Environmental Protection Agency (EPA) has defined BACT as meaning:

> *"…an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each regulated [New Source Review] pollutant which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Part 60, 61**, or 63**. If the reviewing authority determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."*

A BACT limit is a numerical emission limit that is needed for each emission unit for each pollutant subject to review. The limit must be met on a continuous basis, specify a control technology or work practice, include an averaging period, and be enforceable as a practical matter.

The designation of the Fairbanks North Star Borough (FNSB) nonattainment area as "Serious" with regard to nonattainment of the 2006 24-hour $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) was published in Federal Register Vol. 82, No. 89, May 10, 2017, pages 21703-21706.

Per EPA guidance and consistent with its Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule ($PM_{2.5}$ Implementation Rule), DEC evaluated all point sources with emissions greater than 70 tons per year (tpy) of $PM_{2.5}$ or any individual $PM_{2.5}$ precursor (NOx, SO_2, NH_3, VOCs). Appropriate control of precursors is important for attaining the $PM_{2.5}$ NAAQS because secondarily formed particles (such as ammonium nitrate, ammonium sulfate, and some portion of organic carbon) comprise a large fraction of ambient $PM_{2.5}$ concentrations in many nonattainment areas. All $PM_{2.5}$ precursors were addressed, but only NOx and SO_2 were addressed on an emission unit specific basis in DEC's BACT Determinations. The 70 tpy thresholds apply to major stationary sources under the nonattainment new source review program in 40 C.F.R. § 51.165(a). The General Preamble

for PM_{10} nonattainment areas established a general approach to determine BACT using EPA's top-down BACT process in the PSD program to identify BACT for sources in Serious PM_{10} nonattainment areas, therefore the top-down approach was used for the FNSB stationary sources.

Identification of BACT under EPA's top-down approach is a 5-step process:

Step 1: Identify available pollution control options.
- Inherently lower-emitting processes/practices.
- Add-on controls (e.g., scrubbers, fabric filters, catalytic reduction, etc.).
- Combination of inherently lower-emitting processes/practices and add-on controls.

Step 2: Eliminate technically infeasible pollution control options.
- Must demonstrate technical infeasibly based on physical, chemical, and engineering principles.

Step 3: Rank remaining control technologies by control effectiveness.
- Rank from greatest or best emissions reduction to those achieving the least.

Step 4: Evaluate the most effective controls and document results.
- Evaluate controls considering energy, environmental, and economic impacts.
- Start with the top emissions control option. If the evaluation of this options leads to acceptance as BACT (with no significant collateral environmental impacts), subsequent analysis is not required. If the top emissions control option is rejected, the analysis must be repeated for the next best option and so on until an acceptable option is reached.
- Document results.

Step 5: Make the BACT selection.
- Select top emissions control option. If the best pollution control option is not selected because of economic, energy, or consequential environmental impacts, the reasons must be clearly documented.

To complete the BACT process, DEC must establish enforceable emissions limits for each subject emission unit at the source for each pollutant subject to review. If technological or economic limitations in the application of a measurement methodology to a particulate emissions unit would make an emissions limit infeasible, a design, equipment, work practice, operational standard, or combination thereof may be prescribed. Also, the technology upon which the BACT emissions limit is based should be specified so that they are specific to the individual emissions unit subject to BACT review.

DEC based its NOx, SO_2, and $PM_{2.5}$ evaluation on BACT determinations found in EPA's RACT/BACT/LAER Clearinghouse (RBLC), internet research, and the BACT analyses submitted by Aurora Energy, LLC (Aurora) for the Chena Power Plant, Golden Valley Electric Association (GVEA) for the North Pole Power Plant and Zehnder Facility, the U.S. Army Corps of Engineers (US Army) and Doyon Utilities (DU) for Fort Wainwright, and the University of Alaska Fairbanks (UAF) for the University of Alaska Fairbanks Campus. The evaluation

considers technical feasibility, estimates of actual emissions reductions, and cost effectiveness for each technology or work practice identified.

7.7.13.8.1. Ammonia (NH3) Controls – Point Sources

The processes that emit ammonia (biomass burning, mobile, home heating) differ in Fairbanks from those in the continental United States, where ammonia from agricultural activities, vehicles, and other industrial activities form ammonium nitrate. In the Fairbanks nonattainment area, there is only a limited about of particulate matter-nitrate found on the measurement filters. The reductions in ammonia will come from nitrate and sulfate in the form of ammonium nitrate and ammonium sulfate that were formed from precursor gases NOx and SO_2 (some ammonium is associated with primarily emitted sulfate that is not from precursor gases). No controls are proposed for NH_3 for BACT or BACM. There is a negligible amount of ammonia associated with coal-fired boilers, fuel oil-fired turbines or diesel engine emissions and this amount is not in the emissions inventory.

7.7.13.8.2 Precursor Demonstrations

Summary tables for BACT determinations for each power plant are listed in sub-sections below. These summary tables do not include requirements for NOx, VOC, or SO_2 controls, because the Department is relying on precursor demonstrations to show that controls for these pollutants are not needed for attaining the standard, as allowed under the $PM_{2.5}$ NAAQS Final SIP Requirements Rule.[48] SO_2 BACT determinations have, however, been included in the BACT Determination Addendum under this chapter because the SO_2 major source precursor demonstration has not yet been approved by EPA. For additional information and detailed documentation on the determination of BACT limits, corresponding monitoring, recordkeeping and reporting requirements, and support documentation for the Department's determination, see Appendix III.D.7.7 of the 2024 DEC BACT Determinations.

7.7.13.8.2.1 Air Quality Permits with BACT Emission Limits and MR&R

The Department has amended existing Air Quality minor permits to incorporate the BACT emission limits listed below for $PM_{2.5}$ and the corresponding monitoring, recordkeeping and reporting (MR&R) requirements included in the appendix to this chapter to demonstrate compliance with such limits. Now that the relevant sections of these minor permits are incorporated into the SIP, should changes to the permit conditions be deemed necessary, the Department will seek concurrence from EPA on the proposed permit condition changes. Based on a phone consultation with EPA Region 10 representatives on July 15, 2023, it is the Department's understanding that in order to make changes to air quality permit conditions incorporated into the SIP, the Department will:

1. Seek a consultation with EPA Region 10
2. Revise the permit and go through public comment
3. Revise the SIP accordingly and submit to EPA for review and adoption

48 81 Fed. Reg. 58010 (Aug 24, 2016), at 58021, https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

For future changes to the language used to specify the monitoring, recordkeeping and reporting requirements in air quality permits, as long as Department determined that such changes do not result in emission limit relaxation, a 110(l) determination will accompany the SIP revision submittal describing the changes. For such changes, with EPA concurrence during initial consultation, DEC will proceed with issuing air quality permit revisions and proceed to incorporate revised permits into the SIP within a reasonable time frame.

7.7.13.8.3 Chena Power Plant

Table 7.7-43
DEC BACT and SIP Findings Summary Table for Chena Power Plant

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.045 lb/MMBtu; State Opacity Standard Under 50.055(a)(9)	Full Stream Baghouse and Good Combustion Practices
SO_2	Precursor Demonstration[2]	No Additional Controls
$PM_{2.5}$	0.0004 - 0.34 tpy (each)	Enclosed Emission Points, Fabric Filters, and Fugitive Dust Control Plan

[1] NOx precursor demonstration has been approved by EPA.
[2] Pending EPA approval.

7.7.13.8.4 Fort Wainwright

Table 7.7-44
DEC BACT and SIP Findings Summary Table for Fort Wainwright

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation
DU EUs 1 through 6 – Coal Fired Boilers - 230 MMBtu/hr (each)		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.045 lb/MMBtu (3-hr avg.) State Opacity Standard Under 50.055(a)(9)	Full Stream Baghouse and Good Combustion Practices
SO_2	Precursor Demonstration[2]	No Additional Controls
Emergency Engines, Generators, and Fire Pumps		
NOx	Precursor Demonstration[1]	No Additional Controls

$PM_{2.5}$	0.015 - 1.0 g/hp-hr (3-hr avg.)	Good Combustion Practices and Limited Operation
SO_2	Precursor Demonstration[2]	No Additional Controls
FWA EUs 8 through 10 and 40[3] – Fuel Oil Boilers		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.016 lb/MMBtu (3-hr avg.)	Good Combustion Practices (EUs 8-10 and 40) Limited Operation (EUs 8 – 10)
SO_2	Precursor Demonstration[2]	No Additional Controls
DU EUs 7a, 7b, 7c, 51a, and 51b – Material Handling Sources (Coal Prep and Ash Handling Dust Collectors)		
$PM_{2.5}$	0.0025 - 0.02 gr/dscf	Enclosed Emission Points, Dust Collectors, and Good Operating Practices
EU 52 – Emergency Coal Storage Pile and Operations		
$PM_{2.5}$	1.42 TPY	Wind Awareness, Compaction, Water Suppression as Necessary, and Snow Cover as Applicable.

[1] NOx precursor demonstration has been approved by EPA.
[2] Assumes SO_2 precursor demonstration will be approved by EPA.
[3] The Department's revised BACT finding for the diesel-fired boilers removes the insignificant boilers that are associated with Fort Wainwright. The Department notes that no other insignificant boilers from other sources were originally included in the BACT analyses and that the insignificant emissions units will have to meet the BACM requirements under 18 AAC 50.078, which includes the requirement to combust fuel oil that contains no more than 1,000 ppmw sulfur.

7.7.13.8.5 Zehnder Facility

Table 7.7-45
DEC BACT and SIP Findings Summary Table for Zehnder Facility

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation
EUs 1 and 2 – Fuel Oil-Fired Simple Cycle Gas Turbines - 268 MMBtu/hr (each)		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.012 lb/MMBtu (3-hr avg.)	Low Ash Fuel and Good Combustion Practices
SO_2	Precursor Demonstration[2]	No Additional Controls
EUs 3 and 4 – Diesel-Fired Emergency Generators 28 MMBtu/hr (each)		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.32 g/hp-hr	Good Combustion Practices and Limited Operation

SO_2	Precursor Demonstration[2]	No Additional Controls
EUs 10 and 11 – Diesel-Fired Boilers 1.7 MMBtu/hr (each)		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.016 lb/MMBtu	Good Combustion Practices
SO_2	Precursor Demonstration[2]	No Additional Controls

[1] NOx precursor demonstration has been approved by EPA.
[2] Assumes SO_2 precursor demonstration will be approved by EPA.

7.7.13.8.6 North Pole Power Plant

Table 7.7-46
DEC BACT and SIP Findings Summary Table for North Pole Power Plant

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation
EUs 1 and 2 – Fuel Oil-Fired Simple Cycle Gas Turbines - 672 MMBtu/hr (each)		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.012 lb/MMBtu (3-hr avg.)	Low Ash Fuel, Limited Operation, and Good Combustion Practices
SO_2	Precursor Demonstration[2]	No Additional Controls
EUs 5 and 6 – Combined Cycle Gas Turbines - 455 MMBtu/hr (each)		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.012 lb/MMBtu (3-hr avg.)	Low Ash Fuel, Limited Operation, and Good Combustion Practices
SO_2	Precursor Demonstration[2]	No Additional Controls
EU 7 – Diesel-Fired Emergency Generator - 400 kW		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.32 g/hp-hr (3-hr avg.)	Good Combustion Practices, Positive Crankcase Ventilation, and Limited Operation
SO_2	Precursor Demonstration[2]	No Additional Controls
NOx	Precursor Demonstration[1]	No Additional Controls
EUs 11 and 12 – Propane-Fired Boilers 5.0 MMBtu/hr (each)		
$PM_{2.5}$	0.008 lb/MMBtu (3-hr avg.)	Good Combustion Practices and Propane as Fuel
SO_2	Precursor Demonstration[2]	No Additional Controls

[1] NOx precursor demonstration has been approved by EPA.
[2] Assumes SO_2 precursor demonstration will be approved by EPA.

7.7.13.8.7 University of Alaska Fairbanks Campus

Table 7.7-47
DEC BACT and SIP Findings Summary Table for University of Alaska Fairbanks Campus

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation
Dual Fuel-Fired Boiler – 295.6 MMBtu/hr		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.012 lb/MMBtu State Opacity Standard Under 50.055(a)(1)	Fabric Filters (Baghouse) and Good Combustion Practices
SO_2	Precursor Demonstration[2]	No Additional Controls
Diesel-Fired Engines		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.023 - 1.0 g/hp-hr (3-hr avg.)	Positive Crankcase Ventilation, Good Combustion Practices, and Limited Operation
SO_2	Precursor Demonstration[2]	No Additional Controls
EUs 3 and 4 – Mid-Sized Fuel Oil-Fired Boilers		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.012 lb/MMBtu (Diesel 3-hr avg.) 0.0075 lb/MMBtu (N.G. 3-hr avg.)	Good Combustion Practices and Limited Operation
SO_2	Precursor Demonstration[2]	No Additional Controls
EUs 17 through 21 – Small-Sized Fuel Oil-Fired Boilers		
NOx	Precursor Demonstration[1]	No Additional Controls
$PM_{2.5}$	0.016 lb/MMBtu (Diesel 3-hr avg.)	Good Combustion Practices and Limited Operation
SO_2	Precursor Demonstration[2]	No Additional Controls
NOx	Precursor Demonstration[1]	No Additional Controls
EU 9a – Pathogenic Waste Incinerator (83 lb/hr)		
$PM_{2.5}$	4.67 lb/ton 109 tons of waste combusted per 12-month rolling period	Limited Operation and Multiple Chamber Design
SO_2	Precursor Demonstration[2]	No Additional Controls
Material Handling Sources (Coal Prep and Ash Handling)		
$PM_{2.5}$	0.003 - 0.050 gr/dscf	Enclosed Emission Points, fabric filters, and vents
	5.50E-05 lb/ton	Enclosure Emission Points

[1] NOx precursor demonstration has been approved by EPA.

[2] Assumes SO_2 precursor demonstration will be approved by EPA.

7.7.13.9 DEC Stationary Source Control (New Source Review)

The CAA section 172(c) and 189(d) requirements for nonattainment areas apply to the $PM_{2.5}$ nonattainment area. Under this attainment plan, the requirements of CAA Part D, New Source Review (NSR) apply for major stationary sources. Section 302 of the CAA (42 U.S.C. 7602) defines a major stationary source as any stationary facility or source of air pollutants that directly emits, or has the potential to emit, 100 tons per year or more of any air pollutant. Lower emission thresholds apply in certain areas under Title I of the CAA, in this case 70 tons per year of $PM_{2.5}$, or any individual precursor for $PM_{2.5}$, in any serious nonattainment area for $PM_{2.5}$.[49] Permits for construction and operation of new or modified major stationary sources within the nonattainment area must be approved through the NSR program. Within the FNSB, DEC is responsible for issuing construction and Title V operating permits. DEC has incorporated the requirements for Prevention of Significant Deterioration (PSD) and nonattainment New Source Review in 18 AAC 50, Article 3. October 8, 2018, DEC submitted revisions to the Alaska SIP to ensure the fulfillment of nonattainment New Source Review requirements for the serious $PM_{2.5}$ nonattainment area, and EPA approved that SIP revision effective September 30, 2019 (Federal Register, Vol. 84, No. 168, Thursday, August 29, 2019). DEC actively implements its permit programs. The Air Quality Division issues and amends permits, conducts inspections, reviews report from industry, provides compliance assistance, and takes enforcement actions when needed. DEC certifies that the state's nonattainment new source review requirements meet both the CAA section 172(c) and 189(d) requirements for the $PM_{2.5}$ nonattainment area and that the program continues to be implemented in accordance with these requirements.

7.7.13.10 Potential Future Control Measures Currently Undergoing Research Efforts or Development

7.7.13.10.1 Retrofit Control Devices (RCD)

During development of the Serious Area SIP, FNSB and DEC were engaged in a testing program to evaluate the efficacy of RCDs for various solid fuel appliances. Acknowledging the obstacles presented in Section 7.7.10.1, community interest remained high in determining whether the addition of an RCD would allow wood-burning to continue when burn bans were in effect, specifically Stage 2 Alerts where only those with a NOASH are allowed to operate solid fuel appliances. To address this interest, FNSB commissioned a testing project to measure the effect of two RCDs, an aftermarket catalyst and an ESP, on PM emitted from an EPA Step 2 certified pellet stove selected to be representative of this appliance category operated in Fairbanks and develop an emission factor suitable for use in a SIP. To provide additional information in support of the FNSB study, DEC commissioned a small parallel study to measure the effect of ESPs on two EPA Step 2 cordwood appliances: non-catalytic and catalytic.

[49] 40 CFR 51.165(a)(1)(iv)(A)(1)

FNSB Testing:

The testing program evaluated the performance of two aftermarket RCDs on an EPA Step 2 certified pellet stove: an OekoTube ESP and a Grace Fire StoveCAT catalyst. The program collected data on PM emitted upstream and downstream from the ESP unit simultaneously to allow a calculation of the efficiency of the unit in reducing emissions. The manufacturer's recommended placement of the StoveCAT catalyst did not allow sufficient space for the measurement of upstream emissions. Therefore, non-simultaneous measurements were collected from baseline (no catalyst) and controlled (catalyst installed) tests; average differences between the baseline and controlled tests provide the basis to calculate emission reduction efficiency.

Two different methods of PM measurement were employed in the program: the primary method used a modified ASTM E2515 protocol with dual train filters to collect the total PM emitted over the course of the test; and a secondary method, not yet certified by EPA, that used a tapered element oscillating microbalance (TEOM) to collect time-resolved measurements of PM emitted during the test. Data collected by the TEOM method provides insight into the performance of controls during different phases of operation (i.e., startup, low, medium, and high burn) as well as total operation, while the ASTM E2515 method only provides a single data point—the average of all phases. Multiple replicate tests were conducted to assess variance in the performance of the retrofit controls.

DEC Testing:

A limited testing program was conducted to measure the effect of a commercially available ESP on PM emitted from cordwood stoves in support of the FNSB testing project. The study focus was to collect initial measurements with an ESP to assist in providing additional information to the decision-making processes within the Borough related to consideration of retrofit controls and potential needs for further testing by the Borough. The testing program evaluated the performance of an OekoTube ESP.

Two EPA Step 2 appliances[50] were tested: a non-catalytic stove and catalytic stove. Both were selected to be representative of their categories operated in FNSB. The test fuel used was seasoned silver maple, sourced in Connecticut with 19-25% moisture content. The test protocol used for operating the cordwood stoves was the Integrated Duty Cycle Method for Cordwood Stoves (IDC), developed by New York State Energy Research & Development Agency (NYSERDA) and NESCAUM. It specifies four phases of operation at two different heat output settings, high and low, designed to represent realistic stove operation: Startup, High Fire, Maintenance Fire and Overnight Fire.

Given the limited scope of the program, insufficient resources were available to support the collection of simultaneous measurements of PM up and downstream of the ESP unit. Instead, non-simultaneous measurements were collected from baseline (no ESP) and controlled (ESP installed) tests; average differences between the baseline and controlled tests were used to calculate the estimated efficiency in reducing emissions. The same as the FNSB testing, two different methods of PM measurement were employed in the program: the primary method used

[50] Certified to 2.5 g/hr when tested with cordwood.

a modified ASTM E2515 protocol; and a secondary method that used a TEOM to collect time-resolved measurements of PM emitted during the test.

Additional Information:

During the winter of 2019/2020, Golden Valley Electric Association (GVEA) funded an ESP pilot project. The project was funded at $125,000 for two years with a goal of installing 80 ESPs in the nonattainment area over a 2-year period (40 each year). In a July 21, 2020 FNSB Air Pollution Control Commission (APCC) meeting, GVEA provided a report on the community pilot project to install ESPs in the North Pole area. Key takeaways from GVEA's report include:

- 17 ESPs were installed in the North Pole area during January – February 2020;
- Upon inspection after the burn season, nearly half the installed ESPs had failed due to excessive creosote buildup;
- The cause (e.g. wet wood, appliance type, appliance operation, or ESP operation) of excessive creosote buildup was not determined; and
- GVEA stopped project funding on a go-forward basis.

Evaluation of RCDs:

Controls are evaluated on three bases:

- Addressing community interest, does the addition of an RCD provide sufficient emission reductions to allow wood-burning to continue when burn bans are in effect, specifically Stage 2 Alerts where only those with a NOASH are allowed to operate solid fuel appliances;
- Within the context of BACM and control measure analysis, is the mandatory addition of an RCD technologically and economically feasible; and,
- Were any potential safety concerns identified.

EPA Step 2 certified pellet stove equipped with ESP:

- FNSB test results show a quantifiable emission benefit for including an ESP as a control on EPA Step 2 certified pellet stoves. The PM reductions achieved with a pellet stove plus ESP are insufficient to achieve equivalency with fuel oil appliances. To do so would require reductions of more than 90% with the ESP. Therefore, a Step 2 certified pellet appliance equipped with an ESP does not qualify for an exemption to the curtailment program.
- FNSB testing shows a quantifiable emission benefit for including an ESP as a control on EPA Step 2 certified pellet stoves. Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy Analysis. The technology was found to be technically feasible but economically infeasible.
- No potential safety issues were identified during analysis.

EPA Step 2 certified pellet stove equipped with StoveCAT catalyst:

- FNSB test results for the StoveCAT demonstrate that it is not designed for the operating conditions of a pellet stove and should not be considered as a control device. Therefore, a Step 2 certified pellet appliance equipped with a StoveCAT does not qualify for an exemption to the curtailment program.
- Equipping a Step 2 certified pellet stove with a StoveCAT catalyst does not result in emission reductions, was not identified as a potential control measure, and is not addressed in the 2020 Amendment Control Strategy Analysis.
- No potential safety issues were identified during analysis.

EPA Step 2 certified non-catalytic cordwood appliance equipped with ESP:

- DEC testing shows a potential emission benefit for including an ESP as a control on a Step 2 certified non-catalytic cordwood stove; additional testing is required to demonstrate a quantifiable emission benefit. Preliminary results indicate that PM reductions achieved with a non-catalytic cordwood appliance plus ESP are insufficient to achieve equivalency with fuel oil appliances. Therefore, a Step 2 certified non-catalytic cordwood stove equipped with an ESP does not qualify for an exemption to the curtailment program.
- Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy Analysis. Equipping a non-catalytic cordwood appliance with an ESP was found to be technologically infeasible due to potential safety issues.
- The DEC testing and GVEA pilot project provide a weight of evidence identifying a potential safety issue due to accelerated creosote buildup.

EPA Step 2 certified catalytic cordwood appliance equipped with ESP:

- DEC testing shows a limited potential emission benefit (less than 1% emission reduction) for including an ESP as a control on a Step 2 certified catalytic cordwood stove; additional testing is required to demonstrate a quantifiable emission benefit. Preliminary results indicate that PM reductions achieved with a catalytic cordwood appliance plus ESP are insufficient to achieve equivalency with fuel oil appliances. Therefore, a Step 2 certified catalytic cordwood stove equipped with an ESP does not qualify for an exemption to the curtailment program.
- Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy Analysis. Equipping a catalytic cordwood appliance with an ESP was found to be technologically infeasible due to potential safety issues.
- The DEC testing did not identify a potential safety issue. The GVEA pilot project identified excessive creosote buildup in a catalytic cordwood stove.

All other SFBA and RCD combinations:

- No testing was completed with any other combination of SFBA and RCD than described in this section. Without quantifiable emission reductions that are equivalent to a fuel oil appliance, any exemption would not comply with CAA Section 110(l). Therefore, no

combination of SFBA and RCD would qualify for an exemption to the curtailment program.

- Technical and economic feasibility is addressed in the 2020 Amendment Control Strategy analysis for all other SFBA equipped with an ESP. Other RCDs were not identified as a control measure and were not included in the 2020 Amendment Control Strategy Analysis. Equipping other SFBAs with an ESP was found to be technologically infeasible due to potential safety issues.
- The DEC testing and GVEA pilot project provide a weight of evidence identifying a potential safety issue due to accelerated creosote buildup on ESP installations. No potential safety issues were identified with other RCDs during analysis.

Although testing and evaluation do not support a Stage 2 exemption or mandatory installation of an ESP or any other RCD, it does not preclude their use in the FNSB. If determined to be durable in Alaska winters along with professional installation, proper maintenance, cleaning, and monitoring requirements, voluntary installation of ESP-equipped pellet stoves, or other RCDs, could provide a quantifiable air quality benefit to the area.

7.7.13.10.2 Expanded Availability and Use of Natural Gas

Since the 2020 Amendment, the Interior Gas Utility (IGU) has been continuing to work on expanding the Interior Energy Project (IEP), a project that is designed to bring low-cost energy to as many residents and households of Interior Alaska as possible. The most recent IGU 2023 fourth quarterly report to the Alaska State Legislature documents progress on all of the components of the IEP effort, including supply, liquefaction, transportation, distribution and conversions.[51] While progress in each of these categories is relevant to the goal of expanding natural gas service in Fairbanks and North Pole, key actions completed include:

- Completion of a 5.25-million-gallon LNG storage tank in 2019 increased LNG storage capacity that allowed IGU to add new customers and IGU continues to install new service lines.
- Gasification of the North Pole system and commissioning of a 150,000 gallons storage and vaporization facility in North Pole in February of 2021.
- To date, approximately 235 miles of natural gas distribution lines have been installed throughout the core nonattainment areas of Fairbanks and North Pole.
    - Natural gas mains in the Fairbanks and vicinity have been expanded to now serve approximately 2,500 residential and commercial customers.
    - Natural gas mains that have been installed in Fairbanks could serve up to ~8,500 properties.
    - Natural gas mains in the North Pole and vicinity have been expanded to service nearly 400 customers and are growing.
    - Natural gas mains in the North Pole could serve up to ~3,000 properties.
- In January 2023, IGU executed a new natural gas supply contract with Hilcorp North Slope LLC. This will be the first time that North Slope natural gas, which is available in

[51] Interior Gas Utility. Interior Energy Project, 2023 4th Quarterly Report to the Alaska State Legislature. Accessed at https://www.aidea.org/Portals/0/Meeting%20Docs/2024BoardMeeting/012424/7._E_Q4%202023_IEP_Report_IGU_Final_01242024.pdf

abundant supply, will be commercialized outside of the North Slope. Along with the natural gas supply contract, IGU executed a 20-year contract for the liquefaction of natural gas. Harvest Midstream will construct and operate a 150,000 gallons/day LNG plant near Deadhorse, Alaska, on the North Slope. With a targeted commencement date of October 2024, IGU will start trucking LNG from the North Slope. Both contracts have two five-year extension options at the discretion of IGU.

In 2023, EPA awarded $10 million in Targeted Airshed Grant funding to DEC to reduce PM emissions in the Nonattainment Area.[52] A part of the funding was awarded to expand the availability of natural gas to underserved communities via mainline extensions. DEC is partnering with the IGU to extend its natural gas distribution lines to more areas within the nonattainment area with a priority focus on communities with environmental justice concerns. This is the first time Targeted Airshed Grant funding has been awarded to expand access to natural gas, which will broaden the depth of eligible applicants for solid fuel-burning appliances and oil-to-gas conversion and further assist in the reductions of $PM_{2.5}$ and SO_2.

Despite the expansion in different components of the Interior Energy Project, considering the uncertainty associated with the forecasted expansion, natural gas availability and customer conversions in the Nonattainment Area, the 2024 Amendment does not include emission reductions (through 2029) from this expansion.

7.7.13.10.3 Continuation of AHFC Energy Programs

According to the most recently released annual report for 2023,[53] the Alaska Housing Finance Corporation (AHFC) is continuing to implement several energy programs that are designed to make homes more energy efficient. In 2023, AHFC administered a combination of federal and state funds to improve homes through weatherization, with a focus on households with young children and older adults. For fiscal year 2023, the AHFC had the supplemental housing development grant that supplemented the federal funding for regional housing authorities. This grant, primarily used for energy-efficient design features, helped fund 60 new housing units and 77 rehabilitated housing units across the state. Currently, AHFC offers programs such as the Energy Efficient Interest Rate Reduction (EEIRR) program, the Home Energy Loan Program, and No-Cost Weatherization program. The AHFC also has a home energy rebate program for all Alaska homeowners with no income limits.[54] The program offers rebates for newly constructed 5-star plus or 6-star homes.

Individuals who meet income limits may apply for the weatherization program through the weatherization service provider in their area. Interior Weatherization, Inc. is AHFC's contractor for Fairbanks area weatherization assistance. Their weatherization assistance program provides low- and moderate-income households with improvements to their homes which increase the energy efficiency of their dwelling.

[52] EPA Targeted Airshed Grant. Accessed at https://www.epa.gov/newsreleases/epa-finalizes-action-fairbanks-air-plan-partners-state-new-one-provides-10-million.
[53] Alaska Housing Finance Corporation (AHFC) 2023 Annual Report. Accessed at https://www.ahfc.us/about-us/reports/2023-Annual-Report.
[54] Home Energy Rebate Program. Accessed at https://akrebate.ahfc.us.

As homeowners make energy efficiency improvements, they reduce the amount of fuel and electricity needed for power and heat, leading to corresponding air quality benefits due to the reduced fuels being burned for space heating and power generation. While funding for these programs from the State has come under pressure from more restrictive budgets, federal funding for these programs has continued to provide support for their operation. Discussions with staff indicate that AHFC energy programs will continue in the future, assuming continued funding, and, as a result, additional emission benefits will be realized in future years.

These voluntary weatherization programs do not provide enforceable emissions reductions and cannot be accounted for SIP emissions reduction credit and therefore are not included in the emissions inventory.

7.7.13.11 Future Re-Evaluation of Control Strategies

DEC and FNSB remain committed to re-evaluating the entire mix of control measures through a future attainment or maintenance plan revision and subject to approval by EPA, to determine whether the measures have succeeded as planned in reducing emissions and improving air quality as planned. This evaluation could result in measures being removed or added to the plan, depending on the outcome of the analyses.