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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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	
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

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 ADEC 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	ADEC 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 ADEC 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:
		    ○ New construction except a 'dry cabin' on 2 + acre parcel
		    ○ 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, ADEC 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.

<u>Acquisition and Installation of CNG Fueling Infrastructure</u>
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 $\mu g/m^3$) 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. 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 Fairbanks Campus Power Plant. 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

<u>Background Information for Chena Power Plant</u>
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
Material Handling Sources (Coal Prep and Ash Handling)			

Pollutant	BACT Emission Limit	BACT Control Device or Operational Limitation	Effective Dates of Control/Limit
$PM_{2.5}$	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

<u>Background Information for Fort Wainwright</u>

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

<u>NOx Precursor Demonstration</u>

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	Limited Operation for Non-Emergency Use (100 hours per year each) Good Combustion Practices
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	
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	
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.

<u>Large Diesel-Fired Engines, Fire Pumps, and Generators</u>
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.

<u>Small Emergency Engines, Fire Pumps, and Generators</u>
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	

<u>Material Handling</u>
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.

<u>Large Diesel-Fired Engines, Fire Pumps, and Generators</u>
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.

<u>Small Emergency Engines, Fire Pumps, and Generators</u>
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.

<u>Large Diesel-Fired Engines</u>
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."

<u>Simple Cycle Gas Turbines</u>
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

<u>Simple Cycle Gas Turbines</u>
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.

<u>Propane-Fired Boilers</u>
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.

<u>Large Diesel-Fired Engine</u>
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 Fairbanks Campus Power Plant

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 Fairbanks Campus Power Plant

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

<u>Background Information for Fairbanks Campus Power Plant</u>

The Fairbanks Campus Power Plant is an existing stationary source owned and operated by UAF, 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 Fairbanks Campus Power Plant 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 Fairbanks Campus 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.

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.

<u>Mid-Sized Diesel-Fired Boilers (EUs 3 and 4)</u>
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.

<u>Small-Sized Diesel-Fired Boilers (EUs 19-21)</u>
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	

<u>Pathogenic Waste Incinerator (EU 9A)</u>

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 Fairbanks Campus Power Plant

<u>Large Dual Fuel-Fired Boiler (EU 113)</u>
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.

<u>Mid-Sized Diesel-Fired Boilers (EUs 3 and 4)</u>
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.

<u>Small-Sized Diesel-Fired Boilers (EUs 19-21)</u>
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	

<u>Pathogenic Waste Incinerator (EU 9A)</u>
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 Fairbanks Campus Power Plant

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 Fairbanks Campus Power Plant. 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 ADEC BACT Determination, ADEC 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 UAF's Fairbanks Campus Power Plant

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 Fairbanks Campus Power Plant. 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.