

**ALASKA DEPARTMENT OF
ENVIRONMENTAL CONSERVATION**



Amendments to:

State Air Quality Control Plan

Vol. II: III.D.7.10

Reasonable Further Progress and Quantitative Milestones

Adopted

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7.10 REASONABLE FURTHER PROGRESS AND QUANTITATIVE MILESTONES

7.10.1 Reasonable Further Progress and Quantitative Milestone Requirements

Reasonable Further Progress - Section 172(c)(2) of the CAA requires that plans for nonattainment areas “shall require reasonable further progress” and include a “current inventory of actual emissions from all sources of relevant pollutants in such area ... to assure that the requirements of this part are met.” The goal of Reasonable Further Progress (RFP) planning is to achieve consistent progress (generally linear, or step-wise with justification) toward attainment, as opposed to deferring implementation of some or all measures until the end or projected attainment date. Every attainment plan for a PM_{2.5} nonattainment area must include an RFP plan, irrespective of whether it is a Moderate Area plan, Serious Area plan, or a 5% plan pursuant to CAA Section 189(d). This section of the Serious Area SIP contains DEC’s RFP plan.

Pollutants Addressed - As discussed in Section III.D.7.8, photochemical modeling-based precursor significance analyses determined that NO_x and VOCs do not significantly contribute to ambient PM_{2.5} levels that exceed the National Ambient Air Quality Standards in the Fairbanks North Star Borough (FNSB) nonattainment area. There was no ammonia (NH₃) precursor analysis. Thus, although controls do not directly target ammonia, it must be included within the RFP analysis. As such, the pollutants addressed in the RFP analysis were limited to PM_{2.5} (direct), SO₂ and NH₃.

RFP Requirements – As required under 40 C.F.R. § 51.1012(a), an RFP plan must demonstrate that sources in the area (i.e., the nonattainment area) will achieve annual incremental reductions in emissions of direct PM_{2.5} and applicable precursor pollutants (SO₂ and NH₃ for FNSB) as necessary to ensure attainment of the NAAQS as expeditiously as practicable. The RFP plan must include the following elements:

- (1) A schedule describing the implementation of control measures during each year of the applicable attainment plan.
- (2) RFP-projected emissions for direct PM_{2.5} and precursor pollutants for each applicable milestone year, based on the anticipated implementation schedule for control measures. For purposes of establishing motor vehicle emissions budgets for transportation conformity purposes (as required in 40 C.F.R. part 93) for a PM_{2.5} nonattainment area, the state shall include in its RFP submission an inventory of on-road mobile source emissions in the nonattainment area for each milestone year.¹
- (3) An analysis that presents the schedule of control measures and estimated emissions changes to be achieved by each milestone year, and that demonstrates that the control strategy will achieve reasonable progress toward attainment between the applicable base year and the attainment year. The analysis shall rely on information from the base year

¹ In accordance with this requirement, motor vehicle emission budgets were established as described later in Section III.D.7.14 of the Serious Area SIP.

inventory for the nonattainment area required in 40 C.F.R. § 51.1008(a)(1) and the attainment projected inventory for the nonattainment area required in 40 C.F.R. § 51.1008(a)(2), in addition to the RFP-projected emissions required in paragraph (a)(2) of this section.

- (4) An analysis that demonstrates that by the end of the calendar year for each milestone date for the area determined in accordance with 40 C.F.R. § 51.1013(a), pollutant emissions will be at levels that reflect either generally linear progress or stepwise progress in reducing emissions on an annual basis between the base year and the attainment year. A demonstration of stepwise progress must be accompanied by appropriate justification for the selected implementation schedule.
- (5) At the state's election, an analysis that identifies air quality targets associated with the RFP projected emissions identified for the milestone years at the design value monitor locations.

Quantitative Milestones - Section 189(c)(1) of the CAA requires PM implementation plans to include Quantitative Milestones (QM) which are to be achieved every 3 years until the area is re-designated attainment and which demonstrate reasonable further progress (as defined above) toward attainment by the applicable date. QM requirements for a Serious PM_{2.5} nonattainment area are given in 40 C.F.R. § 51.1013(a)(2) and 40 C.F.R. § 51.1013(a)(4) and summarized as follows:

40 C.F.R. § 51.1013(a)(2) – Serious Areas

- i. Except as provided in 40 C.F.R. § 51.1013(a)(4), each attainment plan submission that demonstrates that a Serious PM_{2.5} nonattainment area *can attain applicable PM_{2.5} NAAQS by the end of the tenth calendar year* following the effective date of designation of the area with the implementation of control measures shall contain quantitative milestones to be achieved no later than milestone dates of 7.5 years and 10.5 years, respectively, from the date of designation of the area.
- ii. Except as provided in 40 C.F.R. § 51.1013(a)(4), each attainment plan submission that demonstrates that a Serious PM_{2.5} nonattainment area *cannot practicably attain applicable PM_{2.5} NAAQS by the end of the tenth calendar year* following the date of designation of the area with the implementation of control measures required under 40 C.F.R. § 51.1010(a) shall contain quantitative milestones to be achieved no later than milestone dates of 7.5 years, 10.5 years, and 13.5 years from the date of designation of the area. If the attainment date is beyond 13.5 years from the date of designation of the area, such attainment plan shall also contain a QM to be achieved no later than milestone dates of 16.5 years, respectively, from the date of designation of the area.
- iii. The plan shall contain quantitative milestones to be achieved by the milestone dates specified in paragraphs (i) and (ii) above, as applicable, and that provide for objective evaluation of reasonable further progress toward timely attainment of the applicable

PM_{2.5} NAAQS in the area. At a minimum, each quantitative milestone plan must include a milestone for tracking progress achieved in implementing SIP control measures, including Best Available Control Measures (BACM) and Best Available Control Technology (BACT), by each milestone date.

40 C.F.R. § 51.1013(a)(4) – Each attainment plan submission for an area designated nonattainment for the 1997 and/or 2006 PM_{2.5} NAAQS before January 15, 2015, shall contain quantitative milestones to be achieved no later than 3 years after December 31, 2014, and every 3 years thereafter until the milestone date that falls within 3 years after the applicable attainment date.

Based on these RFP and QM requirements for Serious PM_{2.5} areas, the following subsection describes the applicable analysis year schedule for the FNSB nonattainment area based on the control measure, modeling and attainment analyses described in Sections III.D.7.7 through III.D.7.9.

7.10.2 RFP/QM Schedule and Metrics

Schedule - As described earlier in Section III.D.7.1, a portion of the FNSB was originally designated as a nonattainment area for the 2006 24-hour PM_{2.5} NAAQS in 2009. And as discussed in Section III.D.7.6, 2013 was the base year for the development of emission inventories (and subsequent attainment analysis) for this Serious Area SIP. As discussed in Section III.D.7.9, DEC currently estimates 2029 to be the most expeditious alternative attainment date.

Thus, based on these dates and the RFP and QM requirements presented in the preceding subsection, Table 7.10-1 lists the applicable RFP and QM analysis years.

**Table 7.10-1
FNSB Reasonable Further Progress and Quantitative Milestone Analysis Years**

Base Year	Attainment Year	RFP and QM Analysis Years
2013	2029	2017, 2020, 2023, 2026, 2029, 2032

QM Metrics – The PM_{2.5} Implementation Rule allows for a number of objective metrics to satisfy the QM requirements, providing the metric can be accurately quantified and tracked. Alaska proposes to use EPA’s preferred metric: emission reductions achieved compared to projected emission reductions.

7.10.3 RFP Plan Analysis

This subsection presents and summarizes the results of analysis of implementation of the control measure package being adopted by the State of Alaska in support of the attainment analysis within this Serious SIP. It includes an accounting for the schedule/phase-in of each measure being adopted and estimation of emission reductions (of directly-emitted PM_{2.5}, SO₂ and NH₃ as

noted earlier) from each measure. It also accounts for effects of overlapping measures to eliminate effects of double-counting when applied to the same source category.

7.10.3.1 Calculation of Linear Emission Reduction Targets

Table 7.10-2 presents 2013 Baseline and 2029 Attainment-Projected inventory PM_{2.5}, SO₂ and NH₃ emissions for the nonattainment area in tons/day, averaged across the episodic modeling days.

**Table 7.10-2
Baseline and Attainment-Projected Emissions and Reductions after Control Measures
(tons/day)**

Quantity/Pollutant	2013 Baseline	2029 Attainment
Emissions, Direct PM _{2.5}	4.46	2.07
Emissions, SO ₂	17.00	16.80
Emissions, NH ₃	0.286	0.277
Reductions from Committed Control Measures, Direct PM _{2.5}	n/a	2.39
Reductions from Committed Control Measures, SO ₂	n/a	0.19
Reductions from Committed Control Measures, NH ₃	n/a	0.009

n/a – Not applicable

The 2013 emissions match the nonattainment area planning inventory shown in Section III.D.7.6 and those for 2029 are consistent² with the estimated control measure reductions shown in Section III.D.7.9.2. Below these values in Table 7.10-2, emission reductions for each pollutant are shown in the rightmost column, representing the difference in emissions between the baseline and projected attainment years. (For example, for direct PM_{2.5}, 4.46 – 2.07 = 2.39 tons/day).

Using these emission reductions between the 2013 Baseline and 2029 Attainment-Projected inventories, Table 7.10-3 shows calculated RFP/QM milestone year emission reduction targets based on linear progress towards attainment by 2029.

**Table 7.10-3
Linear Milestone Year Emission Reduction Targets (tons/day)**

Pollutant	2017	2020	2023	2026	2029	2032
Direct PM _{2.5}	0.60	1.05	1.49	1.94	2.39	2.39
SO ₂	0.05	0.08	0.12	0.16	0.19	0.19
NH ₃	0.002	0.004	0.006	0.008	0.009	0.009

² Combined 2029 control measure reductions presented in Table 7.9-6 of Section III.D.7.9 show separate reductions associated with each alert stage of the Curtailment program. When averaged across the modeling episodes (that include “no alert” days as well) these reductions are consistent with results presented above in Table 7.10-2.

The emission reduction targets in each milestone year were calculated using the following formula:

$$Target_{MY} = (Emis_{AY} - Emis_{BY}) \times (MY - BY) / (AY - BY)$$

Where *MY* is the given milestone year, *BY* is the baseline year (2013) and *AY* is the projected attainment year (2029). In 2017 for example, the linear PM_{2.5} reduction target was calculated as:

$$PM_{2.5} Target_{2017} = (4.46 - 2.07) \times (2017 - 2013) / (2029 - 2013) = 0.60 \text{ tons/day}$$

7.10.3.2 Control Measure Implementation/Phase-In Schedule

Based on the nature of each control measure and their planned implementation dates, Table 7.10-4 shows the implementation/phase-in schedule for each measure by RFP year. This list of control measures corresponds to those presented earlier in Table 7.9-7 of Section III.D.7.9 for which PM_{2.5} and SO₂ emission benefits were quantified. For each measure, Table 7.10-4 lists the start year (first full calendar year from planned implementation date), the parameter used to describe measure penetration or phase-in and their forecasted values in each RFP year.

**Table 7.10-4
Control Measure Implementation/Phase-In Schedule**

Measure Abbrev	Measure Description	Start Year	Implementation Parameter	Phase-In Schedule by RFP Year					
				2017	2020	2023	2026	2029	2032
WSCO	WSCO Program	2010, On-going	No. of Changeouts	1,344	2,014	2,517	2,597	2,597	2,597
CURT	Curtailment Program	2016, On-going ^a	Compliance Rate	20%	30%	45%	50%	50%	50%
STF-12	Shift #2 to #1 Oil	2023	Combined Penetration/Compliance Rate	n/a	n/a	100%	100%	100%	100%
STF-13	Commercial Dry Wood	2022	Combined Penetration/Compliance Rate	n/a	n/a	75%	75%	100%	100%
STF-17	Wood Device Removal	2024	Combined Penetration/Compliance Rate	n/a	n/a	n/a	50%	100%	100%
BACM-R15	Wood Emission Rates	2020	Combined Penetration/Compliance Rate	n/a	100%	100%	100%	100%	100%
BACM-48	Remove Coal Devices	2024	Combined Penetration/Compliance Rate	n/a	n/a	n/a	75%	80%	80%
STF-22	No Primary Wood Heat	2020	Combined Penetration/Compliance Rate	n/a	80%, 100%	80%, 100%	80%, 100%	80%, 100%	80%, 100%
STF-23	NOASH/Exmptn Requirements	2020	Combined Penetration/Compliance Rate	n/a	0%	50%	100%	100%	100%
NG	Natural Gas Expansion	2020	Household Conversion Pct.	n/a	0%	0%	0%	17.2%	17.2%
BACT	Point Source SO ₂ BACT	2029	Combined Penetration/Compliance Rate	n/a	n/a	n/a	n/a	100%	100%

n/a – Not applicable

^a Includes lowering of alert stage thresholds from 25 µg/m³ and 35 µg/m³ to 20 µg/m³ and 30 µg/m³ for Stages 1 and 2, respectively, effective January 2020 as adopted under State regulations.

These projected phase-in levels reflect the State’s current implementation schedule. They will be re-evaluated with the submission of each required RFP report based on updated available data. For example, the Wood Stove Change Out (WSCO) program phase-in schedule reflects current funding from the 2016 and 2017 EPA Targeted Air Shed (TAS) Grants. As additional funding is secured, the WSCO implementation schedule will be updated. As noted earlier in Section III.D.7.9, although emission benefits from natural gas expansion within the nonattainment area may occur prior to 2029, the State has conservatively applied expansion benefits only in that year given the uncertainty behind the forecasted natural gas expansion.

7.10.3.3 RFP Emission Reduction Calculations

Based on the control measure phase-in schedule presented in Table 7.10-4, projected emission reductions for each pollutant in each milestone year were calculated and compared to their targets to evaluate linear progress toward attainment. These comparisons are summarized below in Table 7.10-5.

Table 7.10-5
Projected Progress toward Linear Emission Reduction Targets (tons/day)

Pollutant	Metric	2017	2020	2023	2026	2029	2032
Direct PM _{2.5}	Target Reduction	0.60	1.05	1.49	1.94	2.39	2.39
	Achieved Reduction	0.71	1.06	1.56	2.06	2.39	2.43
	Linear Progress Met?	Yes	Yes	Yes	Yes	Yes	Yes
SO ₂	Target Reduction	0.05	0.08	0.12	0.16	0.19	0.19
	Achieved Reduction	-4.50	-5.24	-4.11	-4.50	0.19	-0.22
	Linear Progress Met?	No	No	No	No	Yes	No
NH ₃	Target Reduction	0.002	0.004	0.006	0.008	0.009	0.009
	Achieved Reduction	0.049	0.035	0.020	0.011	0.009	0.005
	Linear Progress Met?	Yes	Yes	Yes	Yes	Yes	No

The target reductions shown in Table 7.10-5 are from Table 7.10-3. Achieved reductions were calculated for each milestone year based on individual measure projected implementation and phase-in. Achievement of linear progress in a given milestone year is indicated by a “Yes” or “No” in the “Linear Progress Met?” row for each pollutant.

As shown in the upper third of Table 7.10-5, direct PM_{2.5} emission reductions achieved within each milestone year are projected to meet or exceed linear progress toward estimated attainment by 2029 (and through 2032).

The middle portion of Table 7.10-5 indicates that progress toward attainment for secondary pollutant SO₂ is expected to be non-linear. This non-linearity in control measure reductions for SO₂ is due to the fact that most of the measures designed to reduce direct PM_{2.5} through removal, curtailment or replacement of solid-fuel devices trigger a shift in heating energy to higher SO₂ emitting heating oil. Decreases in SO₂ emissions reflected in Table 7.10-5 to offset these increases (partially in 2023 and completely in 2029) are the result of the following SO₂-specific measures:

- Shift from #2 to #1 Oil (STF-12) by 2023;
- Natural gas expansion to 17.2% of nonattainment area households by 2029; and
- Point source SO₂ BACT controls by 2029.

Thus, control measure emission reductions for SO₂ exhibit stepwise rather than linear progress. The explanation above justifies this stepwise progress as required under 40 CFR 51.1012(4).

Finally, progress for NH₃ is shown in the lower portion of Table 7.10-5 and indicates that linearly-established targets for all RFP years from 2017 through 2029 are projected to be met. The emission reductions for NH₃ shown in Table 7.10-5 are not due to control measures benefits. (As noted earlier, control measure reductions were only quantified for direct PM_{2.5} and SO₂.) The NH₃ reductions in 2017 and later years are the result of the fuel switch from HAGO (Heavy Atmospheric Gas Oil) to lighter distillate oil at the GVEA point source facilities triggered by the shutdown of the nearby Flint Hills Refinery in 2014 as discussed earlier in Section III.D.7.6. Although linear progress is demonstrated for NH₃, the State plans to more formally evaluate benefits from NH₃ controls under a 5 Percent Plan, subject to an updated determination of its significance as a PM_{2.5} precursor.

Figure 7.10-1 through Figure 7.10-3 provide a visual picture of forecasted emission reduction progress for direct PM_{2.5}, SO₂ and NH₃, respectively between the 2013 base year and the 2029 attainment year. Projected emissions in each QM year are plotted in blue; the linear progress trajectory is shown as a dashed red line. As shown, forecasted PM_{2.5} and NH₃ emissions in Figure 7.10-1 and Figure 7.10-3 are below the linear progress line in each RFP year from 2017 through 2029. Figure 7.10-2 illustrates the stepwise progress toward 2029 attainment for SO₂ emissions in the nonattainment area.

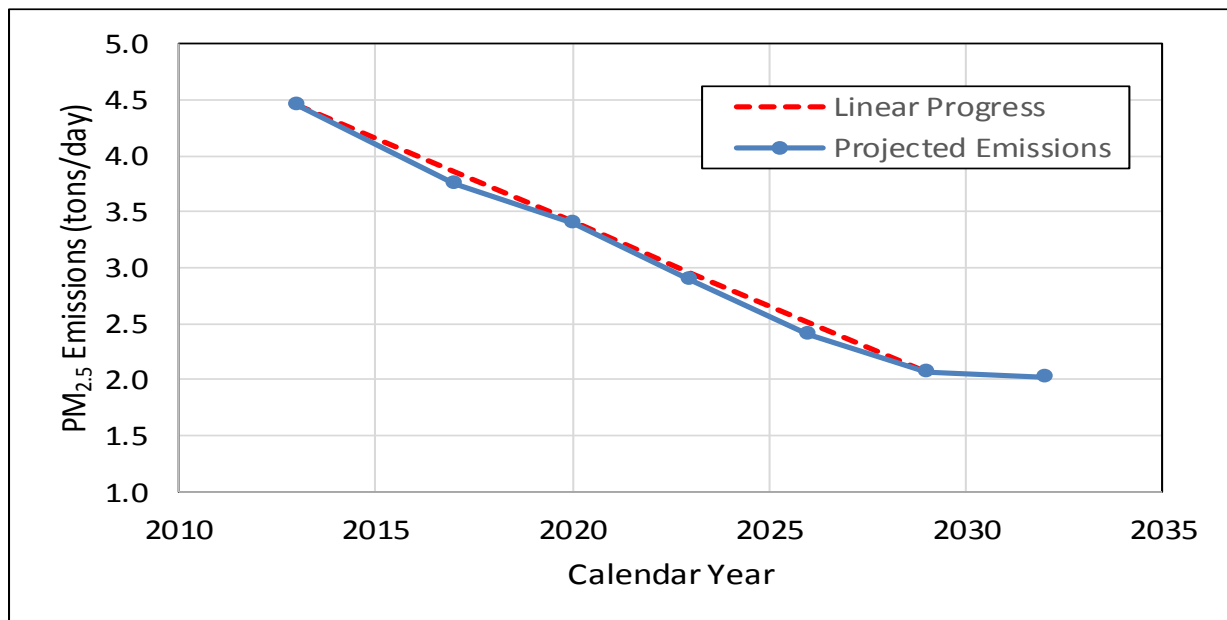


Figure 7.10-1. FNSB Nonattainment Area RFP 2013-2029, Direct PM_{2.5} (tons/day)

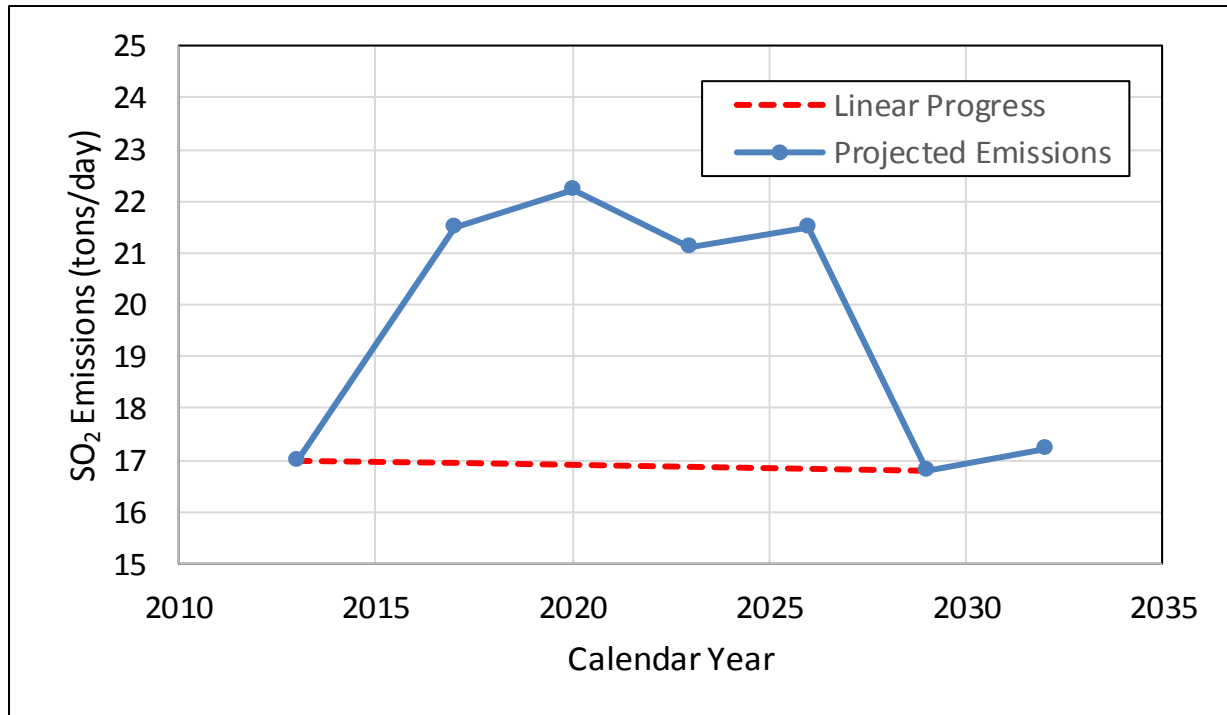


Figure 7.10-2. FNSB Nonattainment Area RFP 2013-2029, SO₂ (tons/day)

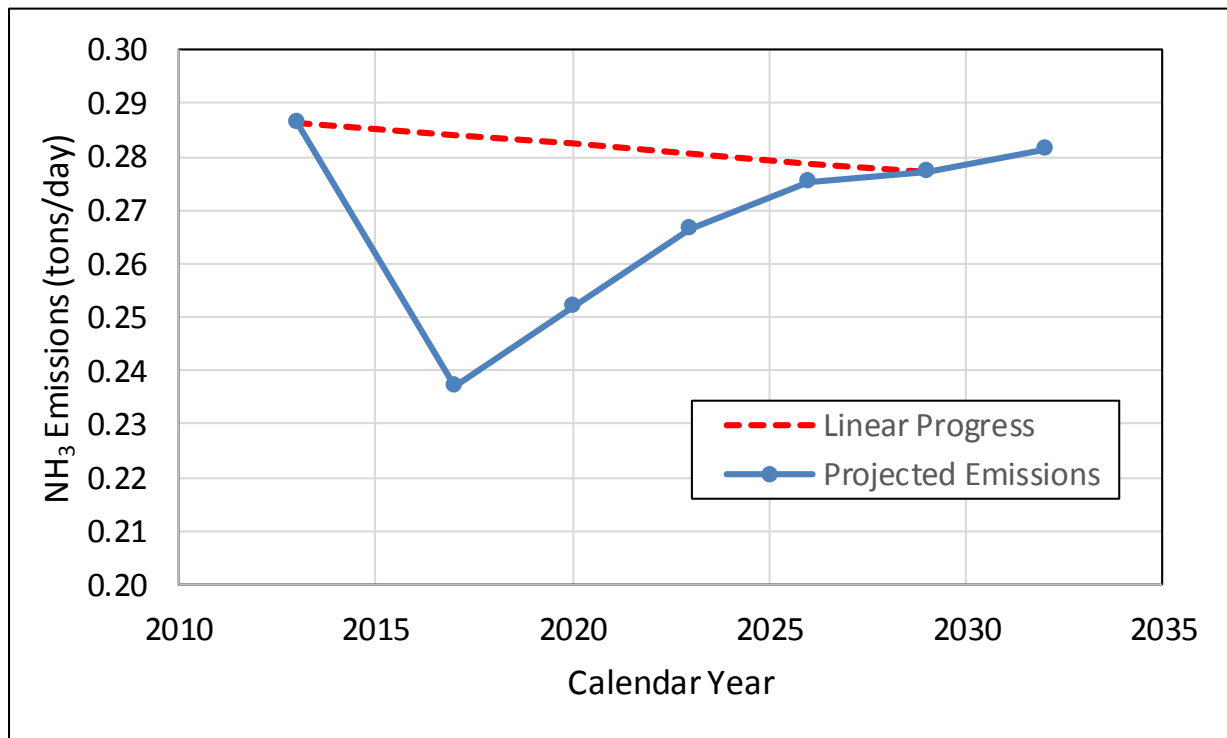


Figure 7.10-3. FNSB Nonattainment Area RFP 2013-2029, NH₃ (tons/day)

In addition to the emissions and control measure reductions summarized here, a detailed spreadsheet is contained in the electronic Section III.D.7.10 Appendix that provides emission breakdowns by source sector and includes detailed calculations of the emission benefits for each measure.

7.10.3.4 Contingency Measure Benefits

As described in Section III.D.7.11, DEC has included in its regulations a measure that will act as the contingency measure for the serious area plan. It requires removal and replacement of all EPA-certified stoves greater than 25 years old with an emission rating above 2.0 g/hr. This “older certified stove” turnover is triggered through several mechanisms, including sale of property.

Data from several local surveys such as the 2011-2015 Home Heating and 2013 Wood Tag surveys (discussed in detail in Appendix III.D.7.6) were used to estimate emission benefits associated with older certified stove turnover under this contingency measure based on the fraction of certified stoves above 2.0 g/hr (65%) and the relative emission ratio between these stoves and stoves under 2.0 g/hr (2.10).

DEC regulations indicate such a measure could be implemented by 2024, if needed. Since device turnover benefits accumulate each year (as stoves reach 25 years of age), emission reductions of 0.15 tons/day of direct PM_{2.5} can be achieved by 2029 based on a 70% penetration/compliance rate. (And larger reductions are possible over time with higher compliance and further accumulation of turnover benefits.) This 0.15 ton/day reduction is equivalent to one year of RFP progress for direct PM_{2.5} based on data presented earlier in Table 7.10-2 and calculated as follows:

$$\begin{aligned} \text{Direct PM}_{2.5} \text{ Linear RFP Reduction per Year} &= (PM_{2013} - PM_{2029}) / (2029 - 2013) \\ &= (4.46 - 2.09) / 16 \\ &= 0.15 \text{ tons/day} \end{aligned}$$

Where PM_{2013} and PM_{2029} are 2013 Base and 2029 Attainment-Projected PM_{2.5} emissions, respectively. Thus, this contingency measure, if needed, will provide meaningful annual PM_{2.5} reductions consistent with RFP.

(The data and calculation details for the contingency measure emission benefits are also included in the aforementioned spreadsheet within the electronic Section III.D.7.10 Appendix.)

7.10.4 QM Report Commitment

As required under 40 C.F.R. § 51.1013(b), not later than 90 days after the date on which a milestone applicable to a PM_{2.5} nonattainment area occurs, each state in which all or part of such area is located shall submit to the EPA Administrator a milestone report that contains all of the following elements:

- (1) A certification by the Governor or Governor's designee that the SIP control strategy is being implemented consistent with the RFP plan, as described in the applicable attainment plan;
- (2) Technical support, including calculations, sufficient to document completion statistics for appropriate milestones and to demonstrate that the quantitative milestones have been satisfied and how the emissions reductions achieved to date compare to those required or scheduled to meet RFP; and,
- (3) A discussion of whether the area will attain the applicable PM_{2.5} NAAQS by the projected attainment date for the area.

The State of Alaska commits to fulfilling these reporting requirements as they pertain to satisfying Quantitative Milestone requirements for the progress toward attainment of the 2006 PM_{2.5} NAAQS in the FNSB nonattainment area. Table 7.10-6 lists the schedule for which these reports will be submitted to EPA as required under 40 C.F.R. § 51.1013(b).

**Table 7.10-6
RFP/QM Reporting Schedule**

RFP & QM Analysis Year	Report Due Date
2017	Completed
2020	March 31, 2021
2023	March 31, 2024
2026	March 31, 2027
2029	March 31, 2030
2032	March 31, 2033