Iowa's Progress Report for the Second Regional Haze Planning Period

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Executive Summary

The purpose of this document is to address Iowa's obligations under 40 CFR 51.308(g), (h), and (i) to develop a progress report for the second planning period (2019-2028) of the federal Regional Haze Rule (RHR). The U.S. Environmental Protection Agency (EPA) promulgated the RHR in 1999 under the authority of section 169A of the Clean Air Act (CAA). The goal of the regional haze program is to eliminate anthropogenic visibility impairment in the 156 mandatory Class I Federal areas (Class I areas) where visibility is an important value of the area. No specific regulatory deadlines exist for achieving that goal, but the RHR utilizes 2064 in certain rate of progress metrics. Combining the program's potentially lengthy timeline with the root cause of visibility impairment, generally the widespread emissions of common air pollutants capable of traveling long distances, means the RHR impacts all states, even those like Iowa that do not contain a Class I area.

To implement the RHR, states must periodically submit comprehensive 10-year plans containing control measures necessary to make reasonable progress toward natural visibility conditions. Progress reports are generally due five years after the submittal deadline of a comprehensive 10-year plan. In 2008, the Department of Natural Resources (DNR) submitted Iowa's comprehensive plan for the first 10-year regional haze planning period (2009-2018). Five years later, the DNR submitted Iowa's initial progress report. On August 15, 2023, the department submitted Iowa's comprehensive regional haze plan for the second 10-year planning period (2019-2028). As required, that plan also included a progress report addressing the latter half of the first planning period. EPA proposed to fully approve Iowa's second regional haze plan on August 2, 2024 (89 FR 63258), but has not yet taken final action.

This is Iowa's third progress report pursuant to the RHR. To satisfy the applicable requirements, it examines the status of the control measures relied upon in the state's long-term strategy (LTS) for the second planning period, quantifies the emissions reductions achieved by those measures, analyzes changes in Iowa's emissions, and assesses the adequacy of the current regional haze plan. DNR's evaluation demonstrates that Iowa's current plan is sufficient to achieve the visibility improvement goals for the five Class I areas linked to Iowa – Isle Royale and Seney in Michigan, Boundary Waters Canoe Area and Voyageurs in Minnesota, and Hercules-Glades in Missouri.

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1. Introduction

On August 15, 2023, the Department of Natural Resources (DNR) submitted to the U.S. Environmental Protection Agency (EPA) a revision to Iowa's state implementation plan (SIP)[1] to address the second 10-year planning period (2019-2028) of the federal regional haze program. This document serves as a progress report for that plan. Unlike the first planning period (2009-2018), progress reports are no longer official SIP submissions, but they must satisfy the applicable requirements in 40 CFR 51.308(g), (h), and (i), as discussed in subsequent chapters. The remainder of this chapter briefly reviews the regional haze program and Iowa's first and second 10-year comprehensive regional haze plans.

1.1. Regional Haze Program Overview

In section 169A of the Clean Air Act (CAA), added in the 1977 amendments, Congress declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas (Class I areas) resulting from manmade air pollution. Using that section's authority, EPA published the Regional Haze Rule (RHR) on July 1, 1999 (64 FR 35714), formalizing the nationwide regulatory effort to reduce visibility impairment attributable to widespread and numerous sources. The RHR requires states to make reasonable progress to restore natural visibility conditions to all impacted Class I areas, preferably by or before 2064. Previous visibility regulations had only addressed plume blight, a form of visibility degradation traceable to a specific source(s) located near a Class I area.

Figure 1-1 shows the 158 national parks and wilderness areas that qualify as mandatory Class I Federal areas.[2] Visibility was deemed important in all but two areas – Rainbow Lake, WI and Bradwell Bay, FL. Iowa contains no Class I areas, nor do any lie within 300 km of its border, but the pollutants contributing to regional haze are broadly emitted and can travel hundreds of miles. Although distance generally dampens impacts, pursuing a return to natural visibility conditions in all 156 Class I areas implicates many sources throughout the U.S. Merging those traits with the program's likely extensive timeframe means all states, including Iowa, are subject to the RHR's requirements.

Figure 1-1. Map (from EPA) showing the location of the 158 mandatory Class I Federal areas and the responsible FLM.

[1] Iowa's 2023 comprehensive plan for the second regional haze planning period ("round 2") is available on the Implementation Plans section of the DNR's Air Quality website. Administratively, all comprehensive (10-year) regional haze plans are submitted as SIP revisions, but for simplicity the terms "plan" and "SIP revision" are used interchangeably in this document.

[2] All international parks, national wilderness areas >5000 acres, and national parks >6000 acres, in existence as of August 7, 1977.

To address visibility impairment, the RHR calls for a cooperative approach involving state, federal, and tribal participants. Five regional planning organizations (RPOs) were formed to assist in developing work products needed to evaluate regional haze formation, assess potential mitigation measures, and foster development of the initial regional haze plans.

Enabled by dedicated federal funding, the RPOs provided vital technical and essential logistical support in the program's early years. After the depletion of those funds (by ~2011), the RPO structure changed in assorted ways, but the state aggregations (see Figure 1-2) largely did not. Minnesota was a lone exception, joining the Lake Michigan Air Directors Consortium (LADCO) in 2012 and exiting the Central States Air Resource Agencies (CenSARA). CenSARA has since continued to provide regional haze coordination, technical, and planning assistance to Iowa and the other remaining state members. Additionally, DNR regularly engages with LADCO's regional haze workgroup. The informal participation improves Iowa's access to LADCO's technical products and enhances consultation with Michigan and Minnesota.

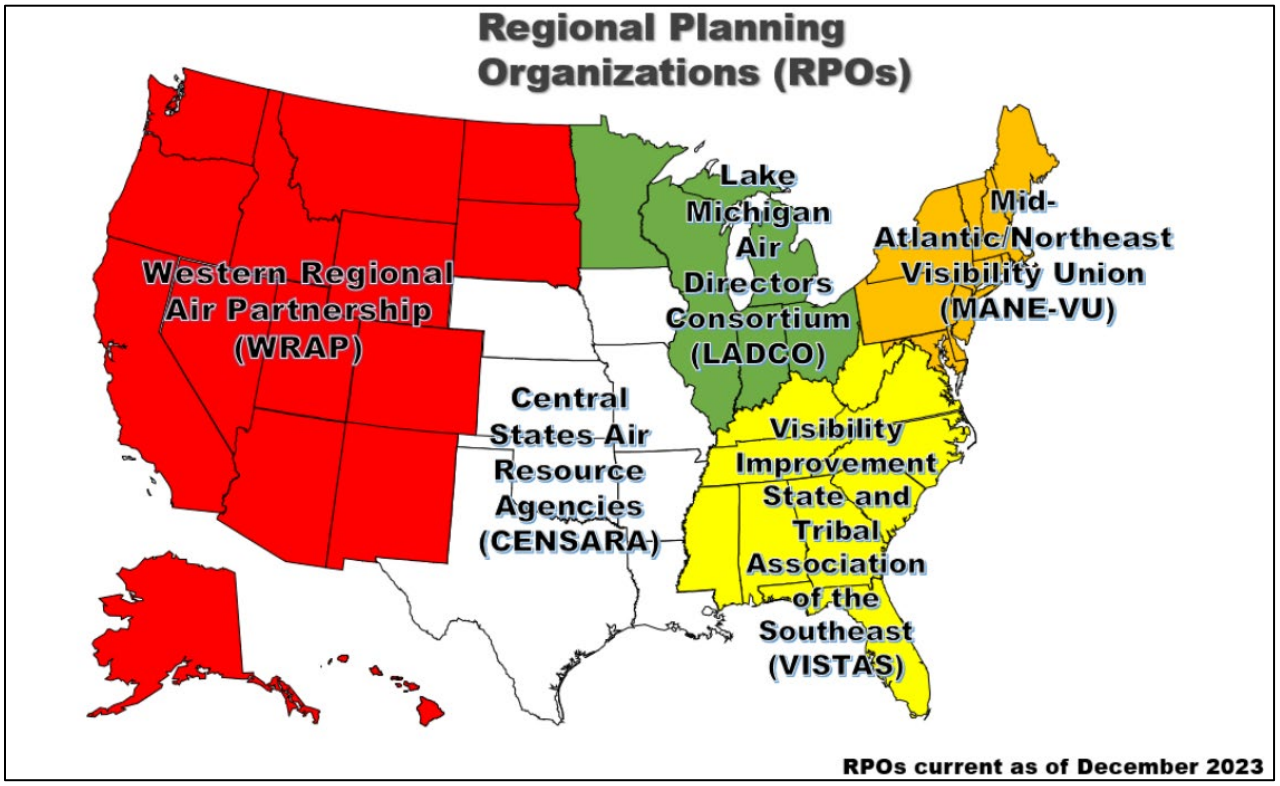

Figure 1-2. The five RPOs for the second regional haze planning period (map from EPA).

1.2. 1st Planning Period (2009-2018)

In 2008, DNR submitted Iowa's regional haze plan for the first 10-year planning period (2009-2018).[3] During the development of that "round 1" plan, DNR consulted with the Federal Land Managers (FLM) and the states of Missouri, Arkansas, Oklahoma, Minnesota, and Michigan.[4] Minnesota requested that Iowa review its emissions and consider reductions that may affect the Minnesota Class I areas. Regional modeling results also suggested that Iowa may contribute to visibility impairment at the Class I areas in Michigan, but no "asks" were received from that state.

The DNR relied upon the Clean Air Interstate Rule (CAIR), later replaced by the Cross-State Air Pollution Rule (CSAPR), to satisfy Iowa's long-term strategy (LTS) obligations and Best Available Retrofit Technology (BART) requirements for electric generating units (EGUs). No other emissions reductions were needed in Iowa at that time to satisfy RHR obligations. Final actions taken on June 7, 2012 (77 FR 33642), June 26, 2012 (77 FR 38006), and December 3, 2019 (84 FR 66075), provide a history of EPA's full approval of Iowa's "round 1" plan. In the state's first progress report, submitted on June 16, 2013, DNR concluded that Iowa's plan remained sufficient to meet reasonable progress goals in downwind states. EPA concurred and approved that progress report on August 15, 2016 (81 FR 53924).

[3] Iowa's Regional Haze SIP documents for the first planning period are also available online, as described in footnote 1.
[4] Ultimately, emissions sources in Iowa were not found to contribute to visibility impairment in the Class I areas in Missouri, Arkansas, or Oklahoma.

1.3. 2nd Planning Period (2019-2028)

The DNR concluded in Iowa's 2023 comprehensive plan for the second regional haze planning period (2019-2028) that the state's anthropogenic emissions contribute to visibility impairment in the five Class I areas listed in Table 1-1. The use of recent source apportionment results from LADCO's 2028_{2016} (2028 future year with a 2016 base year) regional modeling platform, in combination with the linkages considered during the first planning period, informed that decision.

Table 1-1. Class I areas linked to Iowa's emissions, as determined for the second planning period.

State	Class I Area	Abbreviation	Type	Acreage	FLM[5]
Michigan	Isle Royale	ISLE	National Park	542,428	NPS
Michigan	Seney	SENE	Wilderness Area	25,150	FWS
Minnesota	Boundary Waters Canoe Area	BOWA	Wilderness Area	747,840	FS
Minnesota	Voyageurs	VOYA	National Park	114,964	NPS
Missouri	Hercules-Glades	HEGL	Wilderness Area	12,315	FS

Iowa's LTS for the "round 2" plan included enforceable emissions limitations, compliance schedules, and other measures necessary to make reasonable progress towards natural visibility conditions at those Class I areas. DNR developed the LTS by first selecting two facilities for four-factor analysis, Louisa Generating Station (Louisa/LGS) and Walter Scott Jr. Energy Center (WSEC), listed in Table 1-2. Both are coal-fired power plants operated by MidAmerican Energy Co.

Table 1-2. Iowa sources selected for four-factor analysis.

Company	Facility Name	Facility ID	County	Facility Type	Boiler IDs
MidAmerican	Louisa Generating Station	58-07-001	Louisa	Coal-Fired EGU	101
MidAmerican	Walter Scott Jr. Energy Center	78-01-026	Pottawattamie	Coal-Fired EGU	3, 4

Based on a four-factor analysis of new control measures that evaluated 1) the costs of compliance, 2) the time necessary for compliance, 3) the energy and non-air quality environmental impacts of compliance, and 4) the remaining useful life of the source, DNR concluded that operational improvements to the existing dry flue gas desulfurization (FGD) systems at LGS and WSEC Unit 3 (WSEC-3) were needed to satisfy LTS requirements.[6] Table 1-3 summarizes the new emission limits, operating conditions, and compliance measures developed and specified in the modified air construction permits included with Iowa's plan.[7] The scrubber improvements were estimated to reduce SO_2 emissions from LGS and WSEC-3 by ~3,900 and ~5,800 tons per year (tpy), respectively, a ~9,700 tpy total, versus 2017-2019 baseline conditions.

Table 1-3. SO_2 emission limit summaries and estimated reductions for the FGD improvements in Iowa's LTS.

Facility-Unit ID	DNR Facility ID	Permit Number	SO_2 Limit*	Effective	Compliance	SO_2 Reductions
Louisa-101	58-07-001	05-A-031-P6	800 lb/hr	12/31/2023	CEMS	~ 3,900 tpy
WSEC-3	78-01-026	75-A-357-P9	770 lb/hr	12/31/2023	CEMS	~ 5,800 tpy

*30-day rolling average. Conditions 5.Q and 5.R in both permits require SO_2 emissions reductions at varying boiler operating loads. Each is comparable to a 0.10 lb/MMBtu limit (as the maximum rated heat inputs for LGS and WSEC are 8000 and 7700 MMBtu/hr).

Pursuant to 40 CFR 51.308(f)(2)(iv), additional measures considered in Iowa's LTS for the second planning period include ongoing air pollution control programs (*e.g.* newer federal onroad and nonroad regulations likely to provide visibility co-benefits), measures to mitigate the impacts of construction activities, basic smoke management practices for prescribed fire, source retirements, and the net visibility impact from expected changes in future year emissions. Iowa's "round 2" plan also contained a chapter that served as a second progress report. That progress report addressed the latter half of the first planning period. EPA proposed to fully approve Iowa's "round 2" regional haze plan on August 2, 2024 (89 FR 63258), but has not yet taken final action.

[5] National Park Service (NPS); U.S. Fish and Wildlife Service (FWS); and U.S. Department of Agriculture Forest Service (FS).

[6] Based on the four-factor analysis, the anticipated costs of the scrubber improvement for LGS and WSEC-3 were $282/ton and $216/ton, respectively (in 2019$), derived from emissions reductions of 3,903 tons and 5,785 tons and annualized costs of $1,102,000 and $1,248,000.

[7] Iowa's plan also included the existing air construction permit for WSEC-4, for purposes of preventing future visibility impairment.

2. Progress Report Obligations

This document represents Iowa's third regional haze progress report and the first for the second planning period. Its purpose is to evaluate progress towards the reasonable progress goals of the Class I areas affected by Iowa's emissions. The regulatory framework for progress reports is codified in 40 CFR 51.308(g), (h), and (i), while EPA's July 2024 memorandum "*Overview of Elements for the Regional Haze Second Planning Period State Implementation Plan Progress Reports Due in 2025*," signed by Scott Mathias, July 30, 2024, summarizes and clarifies the core reporting obligations.

Although progress reports were originally due every five years after submission of the initial comprehensive regional haze plan, EPA's January 10, 2017 (82 FR 3078) RHR revisions modified various deadlines and certain procedural requirements. EPA delayed the deadline for the second planning period regional haze SIPs by three years, to July 31, 2021, and shifted the deadline for that plan's progress report to January 31, 2025. Additionally, progress reports lost their status as SIP revisions, but remain subject to FLM consultation requirements and must undergo public inspection.

2.1. 40 CFR 51.308(g)(1) and (2): Status of SIP Measures and Emissions Reductions Summary

In accordance with 40 CFR 51.308(g)(1) and (2), each progress report must include a "*description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the State*" and a "*summary of the emissions reductions achieved throughout the State through implementation of [those] measures*." EPA's 2024 guidance further clarifies[8] that if any measures from the first planning period continue to be implemented in the second planning period, states should include such measures in meeting the requirements of 40 CFR 51.308(g)(1).

2.1.1. Measures from the 1st Planning Period (2009-2018)

Control measures in the first planning period focused on reducing NO_X and SO_2 emissions, the largest contributors to visibility impairment at Class I areas in nearby states. Iowa's first progress report discussed the control measures included in the first planning period, as does the progress report component of the state's 2023 "round 2" regional haze plan. The following section provides relevant information regarding the ongoing implementation of those measures.

2.1.1.1. BART and CAIR

As a one-time requirement under the first planning period, the RHR directed states to identify BART-eligible sources and determine BART controls. DNR identified 27 facilities having one or more BART-eligible emission units, with 13 facilities categorized as EGUs and 14 as nonEGUs. No source-specific emissions limits or compliance schedules were developed for Iowa's "round 1" plan, nor were any needed to satisfy nonEGU BART requirements. For the affected EGUs, Iowa initially relied on participation in CAIR[9] (70 FR 25162, May 12, 2005) to satisfy applicable BART obligations and to fulfill elements of Iowa's LTS. A later SIP revision replaced reliance on CAIR with reliance on CSAPR.[10]

2.1.1.2. Other Federal Measures

Iowa's LTS for the first planning period incorporated the federal programs listed in Table 2-1. Those measures affect a variety of onroad and offroad sources, and certain nonEGU point sources, but they are less important now given that their associated compliance deadlines have either long passed or that new, more stringent, federal rules supersede prior requirements. No additional review or evaluation of these measures is necessary (except Section 2.1.2.2 will incorporate CSAPR). While the legacy federal onroad and nonroad rules still provide some measure of ongoing emissions reductions as much older vehicles and equipment are replaced with newer, more efficient, and less-polluting models, this effect diminishes over time, especially where EPA has strengthened the applicable emissions standards.

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[8] Through footnote number 5 on page 4 of that guidance document.

[9] EPA promulgated CAIR to help downwind nonattainment and maintenance areas attain and maintain the 1997 $PM_{2.5}$ and ozone national ambient air quality standards (NAAQS) by reducing SO_2 and NO_X emissions. CAIR established federal trading programs for 28 eastern states, with Iowa's EGUs participating in all three CAIR trading programs (the annual SO_2, annual NO_X, and ozone season NO_X programs). Implementation of the NO_X and SO_2 budgets for CAIR's first phase occurred in 2009 and 2010, respectively.

[10] The D.C. Circuit Court remanded CAIR in 2008 and on August 8, 2011, EPA replaced CAIR with the Cross-State Air Pollution Rule (CSAPR). The DNR later revised Iowa's plan to replace reliance on CAIR with reliance on CSAPR. CSAPR's first-phase of NO_X and SO_2 emission budgets applied beginning in 2015.

Table 2-1. Federal control programs considered in the first planning period.

Source Category	Control Program	Rule Published	Federal Register	Year(s) of Initial Implementation
Onroad	Tier 2 Vehicle and Gasoline Sulfur Standards	2/10/2000	65 FR 6698	2004-2009
Onroad	2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles Rule	10/6/2000	65 FR 59896	2004
Onroad	2007 Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements	1/18/2001	66 FR 5002	2006 (diesel fuel) 2007-2010 (engines)
Nonroad	Large Spark-Ignition Engines and Recreational (Marine and Land-Based) Engine Standards	11/8/2002	67 FR 68242	2004-2012
Nonroad	Tier 4 Nonroad Diesel Engines and Diesel Fuel Rule [Clean Air Nonroad Diesel Rule]	6/29/2004	69 FR 38958	2007-2010 (diesel fuel) 2008-2014 (engines)
Point-nonEGU	Reciprocating Internal Combustion Engines (RICE) Standards for Hazardous Air Pollutants	6/15/2004	69 FR 33474	2013
Point-EGU	Clean Air Interstate Rule (CAIR); remanded in 2008	5/12/2005	70 FR 25162	2009-2010
Point-EGU	Cross-State Air Pollution Rule (CSAPR); replaced CAIR	8/8/2011	76 FR 48208	2015-2017

2.1.2. Measures from the 2nd Planning Period (2019-2028)

Long-term strategies developed for the second planning period were to include all measures relied upon by a state to achieve the reasonable progress goals of the impacted Class I areas. Iowa's LTS incorporated source-specific state measures, ongoing federal programs, and other measures pursuant to 40 CFR 51.308(f)(2)(iv). The most effective measures remain those that significantly reduce SO_2 and NO_X emissions, the $PM_{2.5}$ precursor pollutants responsible for the majority of the anthropogenic visibility impairment at the five Class I areas linked to Iowa.

2.1.2.1. Source-Specific State Required Controls

Iowa's source selection process and four-factor analyses concluded that LGS and WSEC-3 must implement scrubber improvements to reduce their SO_2 emissions. Implementation of those measures began by December 31, 2023, as required by Iowa's plan and the associated air construction permits. The resulting emissions reductions are quantifiable by comparing 2024 data with prior information. However, the most current data available at the time this analysis began was that through September 2024, from EPA's Clean Air Markets Program Data (CAMPD). To compare that data fairly with prior years, the analysis must be limited to only the first three quarters (January through September, or Q1-Q3) in any year. Figure 2-1 and Figure 2-2 thus chart just the Q1-Q3 SO_2 emissions and heat input data for LGS and WSEC-3, respectively. A long timeframe is shown, 2000-2024, but that covers all years back to the first of the RHR baseline years.

Both LGS and WSEC-3 experienced large SO_2 emissions reductions across that period (and those are only partial year totals), with distinct decreases occurring by 2009 in response to the CAIR SO_2 trading program. To assess the impacts of the scrubber improvements implemented at the end of 2023, the Q1-Q3 2023 and Q1-Q3 2024 data must be compared. Between those periods, LGS's SO_2 emissions decreased by 4,066 tons, from 4,880 to 815 tons (the appearance of a mathematical discrepancy is a rounding artifact), an 83% reduction. The difference for WSEC-3 was 3,421 tons, with emissions decreasing from 4,648 to 1,227 tons, or 74%. See Table 2-2 and Table 2-3 on the next page, after the figures.

Evaluating changes in the SO_2 emission rates (lb/MMBtu) helps isolate the importance of the scrubber improvements by mitigating influences from changes in heat input (as burning less coal will also reduce SO_2 emissions). Table 2-2 shows that LGS's SO_2 emission rate decreased from 0.323 to 0.080 lb/MMBtu, or 75%, between Q1-Q3 2023 and Q1-Q3 2024. Table 2-3 shows that WSEC-3's rate decreased from 0.364 to 0.094 lb/MMBtu, or 74%. While the SO_2 limits for LGS and WSEC-3 are specified in lb/hour, each is comparable to a 0.10 lb/MMBtu limit, and both units are currently emitting below that rate.

Iowa's regional haze plan also included the existing construction permit for WSEC Unit 4, to help prevent future visibility impairment. Between 2019 (the first year of the second planning period) and 2023, its annual SO_2 and NO_X emissions remained relatively consistent, with SO_2 decreasing from 1,375 to 1,348 tpy and NO_X decreasing from 1,126 to 983 tpy (not shown below).

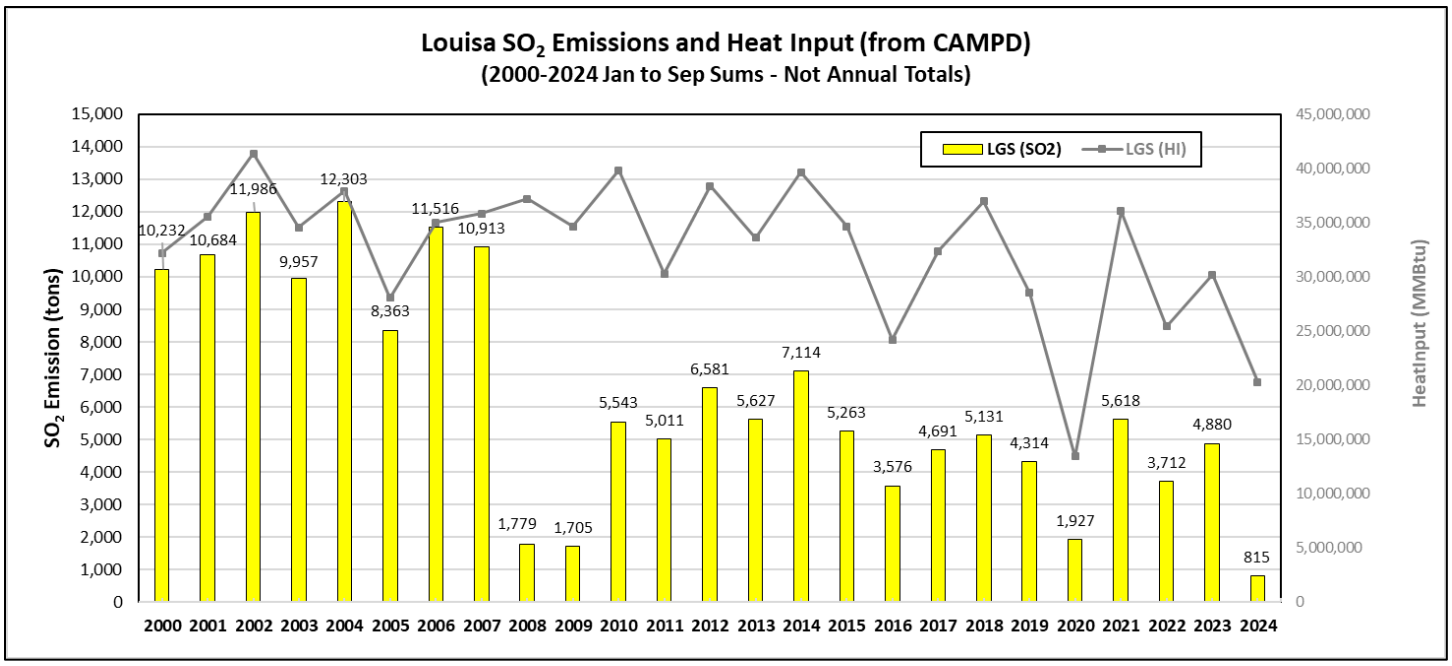

Figure 2-1. Louisa's Q1-Q3 SO_2 emissions (tons) from 2000 through 2024.

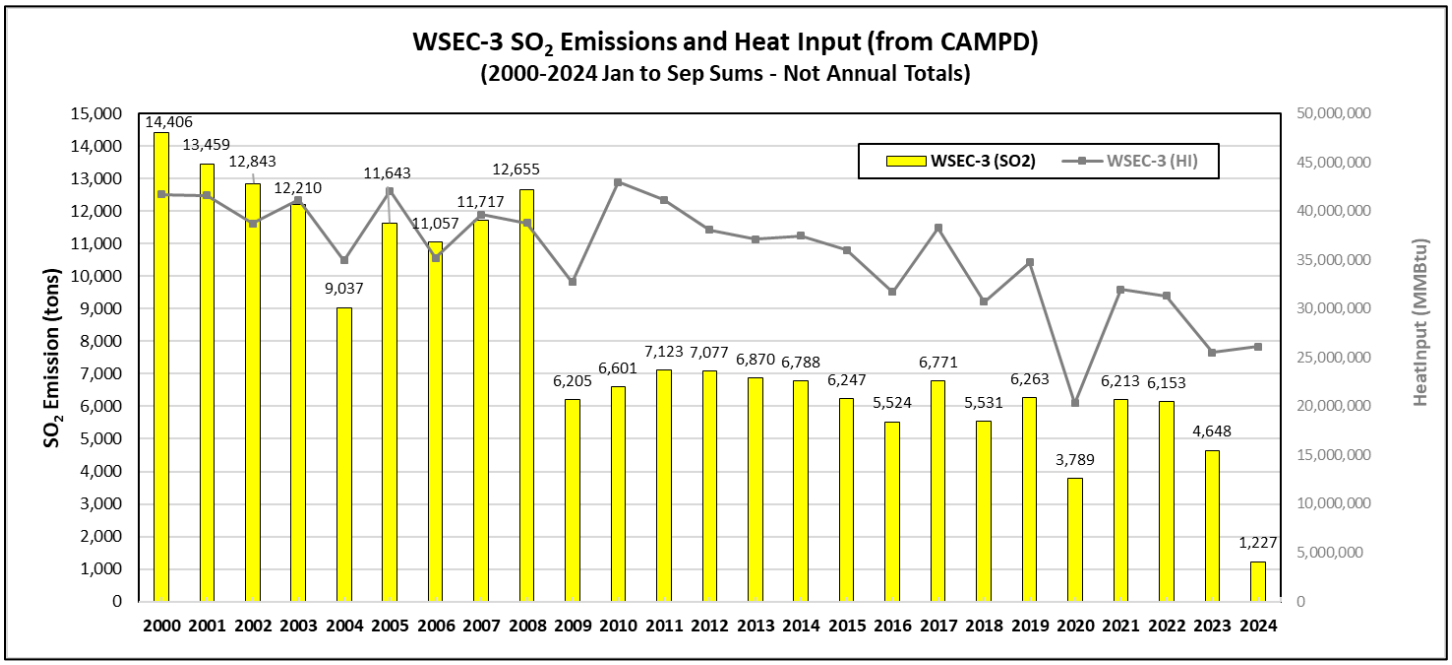

Figure 2-2. WSEC-3's Q1-Q3 SO_2 emissions (tons) from 2000 through 2024.

Table 2-2. LGS's SO_2 and heat input metrics for the January through September timeframes in 2023 and 2024.

Source	Metric	2023 (Q1-Q3)	2024 (Q1-Q3)	Change	% Change
LGS	SO_2 Emissions (tons)	4,880	815	-4,066	-83%
LGS	Heat Input (MMBtu)	30,217,764	20,298,836	-9,918,928	-33%
LGS	SO_2 Rate (lb/MMBtu)	0.323	0.080	-0.243	-75%

Table 2-3. WSEC-3's SO_2 and heat input metrics for the January through September timeframes in 2023 and 2024.

Source	Metric	2023 (Q1-Q3)	2024 (Q1-Q3)	Change	% Change
WSEC-3	SO_2 Emissions (tons)	4,648	1,227	-3,421	-74%
WSEC-3	Heat Input (MMBtu)	25,533,520	26,127,140	593,619	2%
WSEC-3	SO_2 Rate (lb/MMBtu)	0.364	0.094	-0.270	-74%

2.1.2.2. Ongoing Federal Measures for EGUs

Iowa's LTS considered both the federal CSAPR Update rule and the Mercury and Air Toxics Standards (MATS) rule. EPA published the CSAPR Update on October 26, 2016 (81 FR 74504), establishing the new Group 2 ozone season (OS) NO_X trading program to partially[11] address CAA 110(a)(2)(D)(i)(I) "good neighbor" requirements for the 2008 ozone NAAQS. The rule established more stringent OS NO_X budgets for 22 states in the eastern U.S. starting in 2017, and it reduced Iowa's OS NO_X budget from 16,207 to 11,272 tons. Iowa remains subject to the annual SO_2 and NO_X CSAPR programs.

On February 16, 2012 (77 FR 9304), EPA promulgated MATS to reduce mercury and other toxics from new and existing coal and oil-fired EGUs. MATS established numerical emission limits for mercury, PM (a surrogate for toxic non-mercury metals), and HCl (a surrogate for all toxic acid gases). Sources had until April 16, 2015, to comply with the rule, unless granted a one-year extension for control installation or an additional extension for reliability reasons, with all sources required to comply by April 2017. Units that chose to convert from burning coal to combusting only natural gas eliminated nearly all their SO_2 emissions and a significant portion of their NO_X emissions. Units reducing their HCl emissions would often reduce their SO_2 emissions as a co-benefit.

The emission reduction impacts directly attributable to either the CSAPR Update rule, the annual CSAPR programs, or MATS are difficult, if not impossible, to differentiate from other factors impacting the EGU sector, such as economic forces, growth in Iowa's wind energy, transmission constraints, demand, or reliability obligations. For this report, the overall emissions changes are more important than the specific causes. Examining total annual emissions across Iowa's EGUs (those sources reporting to CAMPD) thus provides the requisite information.

Figure 2-3 charts Iowa's total annual EGU SO_2 and NO_X emissions, and heat input, from 2000 through 2023, using CAMPD data.[12] It also includes future year 2028 (2028FY) emissions projections for Iowa's EGUs produced using ERTAC (v16.1), sourced from LADCO's 2028_{2016} regional modeling platform (see Table 7.2 in Iowa's 2023 "round 2" plan). Simply stated, substantial EGU SO_2 and NO_X emissions reductions have occurred. Focusing on the second planning period, between 2019 and 2023, SO_2 and NO_X emissions declined by 8,417 and 4,887 tons, respectively, decreases of 31% and 27%.

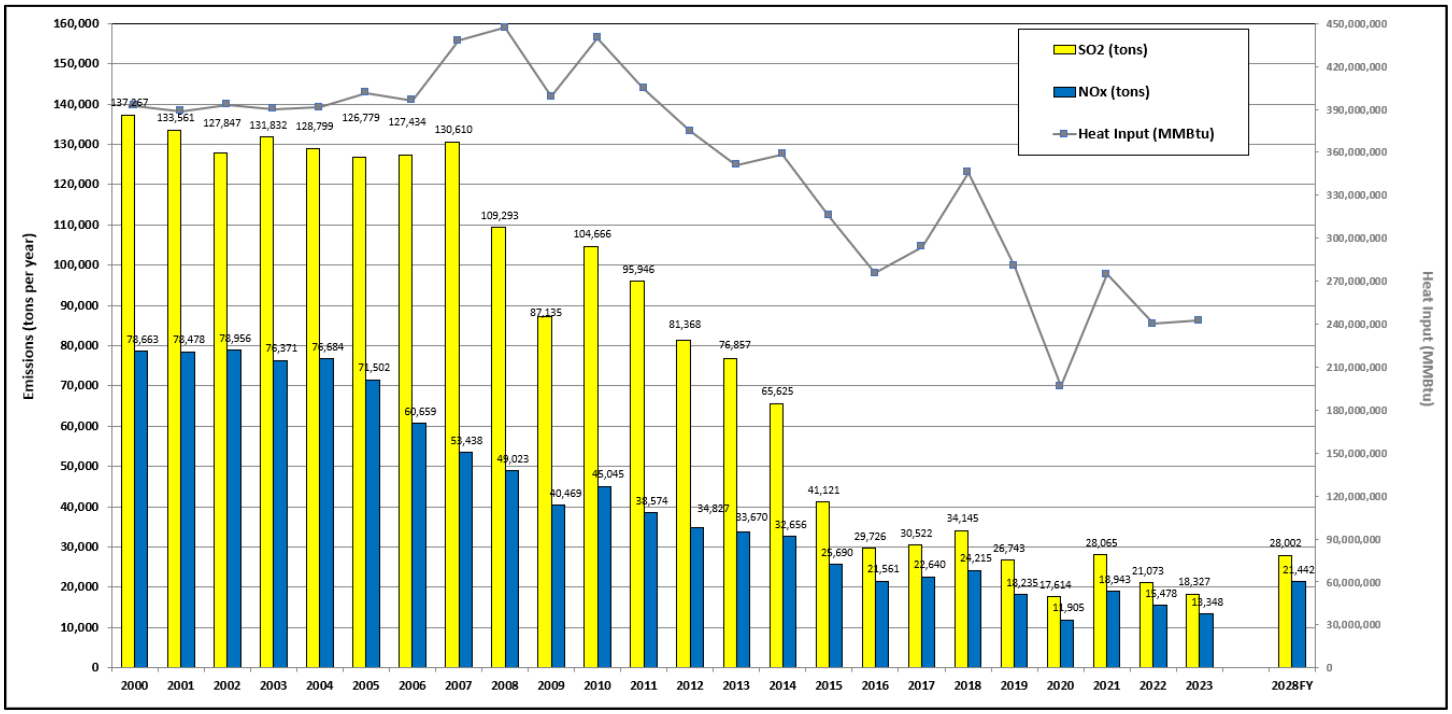

Figure 2-3. Iowa's 2000-2023 annual EGU SO_2, NO_X, and heat input data from CAMPD, with ERTAC 2028FY projections.

[11] EPA published the "Revised CSAPR Update" on April 30, 2021, in response to the D.C. Circuit remanding the CSAPR Update for failing to eliminate all significant contributions related to the 2008 O_3 NAAQS. In the Revised rule, EPA found that Iowa and 8 other states had eliminated their significant contributions and were not included in the new Group 3 OS NO_X trading program.

[12] Including the 2023 CAMPD data satisfies the requirement in 40 CFR 51.308(g)(4) regarding the use of recent data for sources that report directly to a centralized emissions data system operated by EPA. (The data charted are full-year totals, not just Q1-Q3.)

Comparing the 2023 data to 2000, the first year of the 5-year regional haze baseline period (2000-2004), reveals that Iowa's EGU SO_2 emissions declined by 118,940 tons (-87%), with NO_X emissions decreasing by 65,315 tons (-83%). Total heat input across that range was also reduced, but by a much smaller margin of 38%, meaning the emissions reductions are mostly attributable to the use of cleaner fuel sources (*e.g.* natural gas displacing coal) or new controls.

Comparing the 2023 actual emissions data to the 2028FY projections shows that emissions reductions are far outpacing expectations. ERTAC v16.1 projected Iowa's 2028FY EGU SO_2 and NO_X emissions at 28,002 and 21,442 tons, respectively, but the current (2023) totals are already 35% and 38% below those levels, at 18,327 and 13,348 tons. Furthermore, the 2023 SO_2 emissions don't reflect the scrubber improvements at LGS and WSEC-3, whose Q1-Q3 2024 SO_2 emissions are already a combined 7,487 tons less than the same period in 2023. This information helps support the conclusion that Iowa's existing plan requires no further revisions to achieve goals for visibility improvement and emissions reductions.

2.1.2.3. Additional Federal Measures

Table 2-4 identifies the remaining federal programs considered in Iowa's LTS for the second planning period. Each is discussed in greater detail below. (Federal EGU regulations are excluded here as they were just discussed.)

Table 2-4. Federal control programs (for sources other than EGUs) considered in the second planning period.

Source Category	Control Program	Rule Published	Federal Register	Year(s) of Initial Implementation
Onroad	Greenhouse Gas & Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (Phase 1)	9/15/2011	76 FR 57106	2014-2018
Onroad	Tier 3 Vehicle and Gasoline Sulfur Standards	4/28/2014	79 FR 23414	2017-2025
Nonroad	Standards for Locomotive Engines and Marine Compression-Ignition Engines <30 Liters per Cylinder	6/30/2008	73 FR 37096	2008-2015
Nonroad	Emissions Standards for New Nonroad [Small] Spark-Ignition Engines, Equipment, and Vessels	10/8/2008	73 FR 59034	2010-2012
Nonroad	Category 3 Marine Diesel Engine Standards	4/30/2010	75 FR 22896	2016
Point-nonEGU	Major Source Industrial, Commercial, and Institutional (ICI) Boiler MACT	1/31/2013	78 FR 7138	2013 (new) 2016 (existing)

Onroad: Greenhouse Gas and Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (Phase 1)

Although this September 15, 2011, rule regulates greenhouse gas (GHG) pollutants, EPA expects that by 2030 these Phase 1 standards will reduce NO_X by over 245,000 tons and SO_2 by over 6,800 tons, a result of reduced fuel use, improvements in road load (aerodynamics and tire rolling resistance), and increased use of auxiliary power units (APU) during extended idling.

Onroad: Tier 3 Vehicle and Gasoline Sulfur Standards

On April 28, 2014, EPA set Tier 3 standards for new vehicle emissions starting in 2017 and lowered the sulfur content of gasoline, based on the vehicle and its fuel as an integrated system. The vehicle standards reduce both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles. Full implementation will occur by 2025. Starting on January 1, 2017, Tier 3 limited the annual average gasoline sulfur content to 10 ppm. By 2030, it is anticipated that the Tier 3 program will reduce NO_X emissions by over 300,000 tons and SO_2 emissions by over 12,000 tons nationally.

Nonroad: Standards for Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder

On June 30, 2008, EPA adopted a three-part program to: (1) tighten emission standards for existing locomotives and large marine diesel engines when they are remanufactured; (2) set near-term engine-out emissions standards, referred to as Tier 3 standards, for newly-built locomotives and marine diesel engines; and (3) set longer-term standards, referred to as Tier 4 standards, for newly-built locomotives and marine diesel engines. The standards were phased in between 2008 and 2015 and were enabled by ultra-low sulfur diesel (ULSD) fuel availability. By 2030, these rules should lower annual NO_X and PM emissions nationally by ~800,000 and ~27,000 tons, respectively.

Nonroad: Emissions Standards for New [Small] Nonroad Spark-Ignition Engines, Equipment, and Vessels

On October 8, 2008, EPA established new exhaust and evaporative emission standards for smaller nonroad spark-ignition engines and equipment and vessels. Examples of covered equipment include spark-ignition nonroad engines rated below 25 horsepower (19 kW) used in a variety of applications, such as lawn and garden equipment, utility vehicles, generators, and various farm, construction, and industrial equipment. Covered marine vessels include, for example, smaller outboard engines, personal watercraft, and sterndrive/inboard engines. EPA estimates that by 2030 the new standards will reduce emissions of VOC by ~600,000 tons, NO_X by ~130,000 tons, and $PM_{2.5}$ by ~5,500 tons.

Nonroad: Category 3 Marine Diesel Engine Standards

On April 30, 2010, EPA finalized two additional tiers (Tiers 2 and 3) of NO_X standards for new marine diesel engines with per-cylinder displacement at or above 30 liters (called Category 3 marine diesel engines). The Tier 2 emission standards were applied beginning in 2011, and the Tier 3 emission standards were applied beginning in 2016. By 2030, this rule is expected to reduce annual NO_X emissions in the U.S. by ~1,200,000 tons and PM emissions by ~143,000 tons. While these large engines typically power ocean-going vessels and aren't in use in or near Iowa, they may propel large cargo ships operating in the Great Lakes, and thus these rules could be of benefit to Class I areas in the upper Midwest.

Point-nonEGU: Major Source Industrial, Commercial, and Institutional (ICI) Boiler NESHAP (Boiler MACT)

On September 13, 2004, EPA promulgated the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial, and Institutional (ICI) Boilers and Process Heaters, requiring major sources of hazardous air pollutants (HAPs) to meet emissions standards reflecting the application of the maximum achievable control technology (MACT). This rule is often referred to as the Boiler MACT. While its impacts were considered during the first planning period, the rule was vacated and remanded by the D.C. Circuit Court on July 30, 2007. EPA addressed the court decision in a March 21, 2011, rulemaking, but simultaneously announced plans to reconsider certain issues. On January 31, 2013, EPA finalized the reconsideration and established the 2013 and 2016 compliance dates for new and existing affected sources, respectively. The measures implemented to reduce HAP emissions yielded NO_X and SO_2 co-benefits. The largest reductions occurred at affected sources that converted (for various reasons) from coal to natural gas.

2.1.2.4. Other Measures

In accordance with 40 CFR 51.308(f)(2)(iv), other additional measures considered in Iowa's LTS for the second planning period include measures to mitigate the impacts of construction activities, basic smoke management practices for prescribed fire, and source retirement and replacement schedules.

Construction Activities

The DNR continues to implement its fugitive dust rule (567 IAC 23.3(2)"c"), requiring that reasonable precautions be taken to prevent the discharge of visible emissions of airborne dust beyond the lot line of the property from which the emissions originated. However, general construction activities in Iowa do not impact visibility impairment in Class I areas. The transport distances are large and the emissions from such activities are relatively low.

Prescribed Fire

Prescribed fire activities in Iowa are similarly unimportant, but must be considered in accordance with 40 CFR 51.308(f)(2)(iv)(D). The DNR has not adopted a statewide smoke management program at this time, nor does Iowa's LTS include a smoke management plan, but DNR does have a Prescribed Fire Policy[13] for departmental use. Iowa typically burns considerably fewer acres per year for prescribed fire and agricultural purposes than most other states.

Source Retirements and Replacements

The state's LTS does not rely upon any specific source retirement or replacement schedules, but DNR notes that between 2000 and 2023, 28 Iowa EGUs ceased operation (for various reasons).[14] For this progress report, only

[13] The DNR's Fire Policy guides the effective and safe use of fire as a tool for ecological restoration and maintenance of Iowa's natural areas on state owned, leased, or managed lands, other public lands, and private lands for which landowners seek the advice and consult of the DNR and declare their intention to use fire as a management tool. The DNR's Fire Policy includes a smoke management plan that must be followed for all DNR prescribed burns to minimize smoke impacts.

[14] The 28 EGUs include any unit reporting non-zero emissions to CAMPD at any time between 2000 and 2023 that has since retired; it includes 4 units that began commercial operation after 2000 and retired prior to 2023. These are unit (not facility) counts.

retirements occurring in or after 2016 are relevant because all prior changes are fully accounted for in LADCO's 2028_{2016} regional modeling platform (since it uses 2016 as the base year). In terms of forecasting 2028FY emissions from 2016, changes that happened in 2017 or later represent the future, while changes occurring in 2016 are partially represented (*e.g.* a source retiring mid-year will have emissions in 2016 but no emissions in following years).

Table 2-5 summarizes the EGU retirements and coal to natural gas fuel conversions that occurred in Iowa between 2016 and 2023. Across that timeframe, the 18 listed units decreased their total SO_2 and NO_X emissions by 4,382 and 1,719 tons, respectively. However, these changes should largely be incorporated into LADCO's 2028FY modeling as DNR regularly updates the input files for the ERTAC model to provide information regarding upcoming fuel conversions, retirements, and new control measures (and new sources). DNR also provides similar information to EPA for the National Electric Energy Data System (NEEDS) database, which is used by the Integrated Planning Model (IPM).

Table 2-5. Iowa EGU retirements or fuel conversions in or after 2016 and the 2016 to 2023 emissions difference.

CAMPD Facility Name	ORIS ID	Unit ID	Change (Year)	SO_2 2016 (tpy)	SO_2 2023 (tpy)	SO_2 Change (tpy)	NO_X 2016 (tpy)	NO_X 2023 (tpy)	NO_X Change (tpy)
Ames	1122	7	Coal to Gas (2016)*	177	11	-166	193	89	-104
Ames**	1122	8	Coal to Gas (2016)*	9	16	7	169	225	56
Burlington (IA)	1104	1	Coal to Gas (2021)	3,044	0	-3,044	827	7	-820
Centerville	1105	1	Retired (2017)	0		0	1		-1
Centerville	1105	2	Retired (2017)	0		0	1		-1
Dubuque	1046	1	Retired (2017)	0		0	7		-7
Dubuque	1046	5	Retired (2017)	1		-1	7		-7
Dubuque	1046	6	Retired (2017)	0		0	0		0
George Neal North	1091	1	Retired (2016)	30		-30	48		-48
George Neal North	1091	2	Retired (2016)	217		-217	104		-104
Grinnell	7137	1	Retired (2017)	0		0	0		0
Grinnell	7137	2	Retired (2017)	2		-2	20		-20
Lansing	1047	4	Retired (2022)	246		-246	225		-225
Milton L Kapp	1048	2	Retired (2018)	0		0	11		-11
Prairie Creek	1073	4	Coal to Gas (2017)	695	14	-681	468	58	-410
Riverside (1081)	1081	9	Retired (2019)	0		0	11		-11
Sutherland	1077	1	Retired (2017)	0		0	2		-2
Sutherland	1077	3	Retired (2017)	0		0	5		-5
TOTAL				**4,423**	**41**	**-4,382**	**2,098**	**379**	**-1,719**

Note, blank emissions entries indicate no emissions (the unit did not operate), while zeros are the result of rounding.
*Both Ames units (7 and 8) retained the ability to combust refuse derived fuel (RDF) as a secondary fuel.
**Emissions increased at Ames Unit 8 between 2016 and 2023 due to an increase in heat input. This unit did not burn coal in 2016 and generally remained offline prior to its official natural gas startup date of April 30, 2016.

2.2. 40 CFR 51.308(g)(3): Visibility Conditions

The requirements of 40 CFR 51.308(g)(3) relate to assessments of visibility conditions and apply only to states that contain Class I areas. However, Iowa is voluntarily reviewing certain visibility metrics and examining current conditions to help assess progress, but this assessment is unconstrained by the regulatory language.

Table 2-6 summarizes several visibility metrics for the five Class I areas linked to Iowa. The data are reproduced from Iowa's 2023 regional haze plan (and the sources credited therein), with the exception of the 2019-2023 current conditions data, which represent the most recent information available from the *Federal Land Manager Environmental Database (FED)*. All values in Table 2-6 are in deciviews (dv) and correspond to the 20% most impaired days for the given year(s). The baseline (2000-2004), 2014-2018, and current (2019-2023) conditions metrics represent five-year averages. Adjustments to the 2064 natural conditions and uniform rate of progress (URP) values account for international anthropogenic contributions, sourced from EPA's June 3, 2020, Technical Addendum Memorandum from Richard A. Wayland: "*Technical addendum including updated visibility data through 2018 for the memo titled 'Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program*.'"

Table 2-6. Various visibility metrics for the 20% most impaired days (in deciviews).

State	Area	Baseline (2000-2004)	2064 Natural	2064 Adjusted	2028 URP	2028 URP Adjusted	LADCO 2028 Modeled	2014-2018 Conditions	Current[15] 2019-2023
MI	ISLE	19.63	10.17	12.99	15.85	16.97	14.83	15.54	14.21
MI	SENE	23.58	11.11	14.07	18.59	19.78	16.67	17.57	16.04
MN	BOWA	18.43	9.09	12.12	14.69	15.91	13.17	13.96	13.38
MN	VOYA	17.88	9.37	12.49	14.48	15.72	13.36	14.18	13.71
MO	HEGL	25.17	9.30	11.32	18.82	19.63	17.48	18.72	16.89

For each area, current (2019-2023) visibility conditions on the 20% most impaired days are better than the prior recent period (2014-2018). That is the desired trend, but its importance is enhanced by the fact that 2014-2018 conditions had already surpassed (by being below) either of the 2028 URP glidepath values. Furthermore, current conditions show improvements beyond those predicted by LADCO's 2028 future year modeling, except at BOWA and VOYA, where the 0.21 and 0.35 dv differences, respectively, are not yet concerning as several years remain to achieve those reductions.

Figure 2-4 provides the 2000 to 2023 annual average visibility conditions on the 20% most impaired days and 20% clearest days. The overall trends show significant improvements, although a slight uptick appears on the 20% clearest days starting in 2019, but those values still remain well below the baseline years. (To see the data charted in Figure 2-4 in numerical form, consult Table 2-7 through Table 2-10.[16])

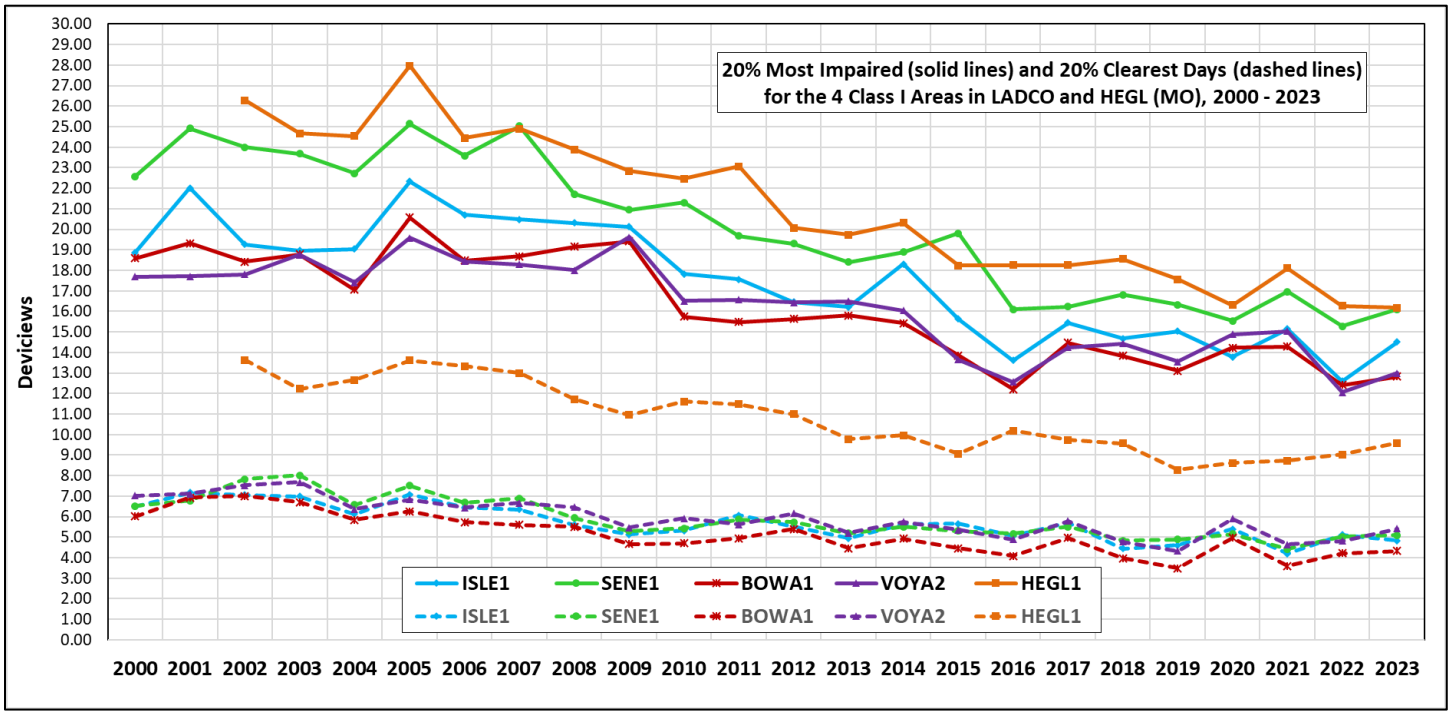

Figure 2-4. Observed annual visibility conditions in the LADCO and HEGL Class I areas, 2000-2023.

Table 2-7. 2000-2011: Annual average conditions, in deciviews, for the 20% most impaired days.

Class I Area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ISLE	18.87	22.03	19.25	18.96	19.04	22.34	20.70	20.49	20.31	20.12	17.81	17.56
SENE	22.57	24.91	24.01	23.69	22.73	25.14	23.58	25.04	21.71	20.96	21.30	19.67
BOWA	18.59	19.32	18.43	18.77	17.05	20.58	18.49	18.68	19.16	19.41	15.76	15.48
VOYA	17.70	17.70	17.80	18.77	17.41	19.58	18.45	18.29	18.01	19.61	16.51	16.57
HEGL			26.28	24.67	24.55	27.96	24.44	24.90	23.88	22.84	22.47	23.07

[15] Product Number EIDP_R35Y_SSW1, from the *Federal Land Manager Environmental Database* (FED); CSU and the Cooperative Institute for Research in the Atmosphere (CIRA), obtained on January 21, 2025.

[16] The data are sourced from FED, were obtained January 21, 2025, and correspond to Product Number EIDP_R3GM_SSW1 for the 20% most impaired days ("G90" data) and Product Number EIDP_R2GM_SSW1 for the 20% clearest days ("G10" data).

Table 2-8. 2012-2023: Annual average conditions, in deciviews, for the 20% most impaired days.

Class I Area	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ISLE	16.46	16.22	18.32	15.63	13.61	15.45	14.68	15.03	13.79	15.14	12.60	14.51
SENE	19.29	18.40	18.89	19.81	16.09	16.23	16.81	16.32	15.54	16.97	15.28	16.10
BOWA	15.63	15.80	15.42	13.86	12.20	14.48	13.83	13.12	14.23	14.29	12.41	12.83
VOYA	16.44	16.49	16.04	13.64	12.56	14.24	14.43	13.56	14.89	15.04	12.06	13.00
HEGL	20.08	19.73	20.31	18.23	18.25	18.25	18.55	17.56	16.30	18.11	16.27	16.19

Table 2-9. 2000-2011: Annual average conditions, in deciviews, for the 20% clearest days.

Class I Area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ISLE	6.50	7.17	7.07	6.99	6.13	7.08	6.44	6.36	5.61	5.13	5.32	6.06
SENE	6.51	6.79	7.83	8.01	6.58	7.51	6.68	6.88	5.94	5.30	5.44	5.86
BOWA	6.01	6.92	7.01	6.70	5.84	6.25	5.73	5.59	5.52	4.67	4.71	4.94
VOYA	7.02	7.12	7.54	7.68	6.37	6.83	6.45	6.67	6.46	5.47	5.92	5.63
HEGL			13.64	12.22	12.66	13.62	13.34	12.99	11.71	10.96	11.61	11.48

Table 2-10. 2012-2023: Annual average conditions, in deciviews, for the 20% clearest days.

Class I Area	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ISLE	5.53	4.94	5.64	5.66	5.06	5.72	4.44	4.60	5.39	4.20	5.11	4.83
SENE	5.74	5.18	5.51	5.30	5.18	5.50	4.84	4.89	5.15	4.43	5.03	5.09
BOWA	5.39	4.46	4.92	4.45	4.08	4.96	3.98	3.49	4.97	3.60	4.22	4.34
VOYA	6.17	5.20	5.75	5.35	4.89	5.78	4.79	4.33	5.90	4.66	4.82	5.42
HEGL	10.99	9.78	9.97	9.06	10.20	9.74	9.58	8.29	8.61	8.73	9.03	9.59

2.3. 40 CFR 51.308(g)(4): Emissions Tracking

40 CFR 51.308(g)(4) requires: "*An analysis tracking the change over the period since the period addressed in the most recent plan required under paragraph (f) of this section in emissions of pollutants contributing to visibility impairment from all sources and activities within the State.*" (Additional rule text, omitted here, focuses on technical constraints.)

Iowa's regional haze SIP for the second planning period utilized the Jan 2021 version of the 2017 National Emissions Inventory (2017 NEI) for emissions tracking purposes, the most recent NEI available at that time. That information is summarized in Table 2-11 (and is identical to Table 10-3 in Iowa's 2023 "round 2" plan). Anthropogenic emissions are represented by the point-EGU, point-nonEGU, nonpoint, onroad, and nonroad categories.[17] The fire category includes wildfire, prescribed fire, and agricultural fire.[18] The biogenic category contains only natural emissions from vegetation and soils. Unlike the CAMPD data, the point-EGU data in Table 2-11 (and Table 2-12) includes units serving generators with a nameplate capacity of 25 MW or less. Iowa's primary PM_{10} emissions are included in the tables below for completeness purposes, but they do not reflect the application of fugitive dust transport factors employed in photochemical modeling analyses for purposes of reducing overprediction biases of coarse PM. The magnitudes of Iowa's nonpoint PM_{10} emissions are thus not reliable indicators of visibility impacts in Class I areas.

Conducting an analysis that tracks changes in emissions since 2017 requires access to a more recent comprehensive emissions inventory. The most recent NEI is the 2020 version (released in March 2023, the first and only public release of the 2020 NEI). It represents a recent and nationally uniform platform for emissions comparisons and is a reasonable choice to address the requirements of 40 CFR 51.308(g)(4). However, it carries a significant caveat, as not all 2020 data are representative of normal conditions, having occurred during the COVID-19 pandemic. Using the 2022 emissions modeling platform (EMP) inventory instead of the 2020 NEI would help mitigate those anomalies, but version 1 of that inventory (2022v1 EMP) wasn't finalized until after DNR began this analysis. DNR will therefore utilize the 2020 NEI in this review. Table 2-12 summarizes Iowa's 2020 emissions.

[17] The point-nonEGU category includes aircraft and airport emissions. Residential wood combustion and agricultural emissions from livestock and crops are included in the nonpoint category. Marine and rail emissions are included in the nonroad category.

[18] Agricultural fires are normally categorized as an anthropogenic nonpoint source but are summed here into the fire category for consistency with LADCO's PM source apportionment technology (PSAT) categorizations used in their 2028_{2016} modeling platform. The intentional burning of agricultural land is an uncommon practice in Iowa and thus such emissions are generally small.

Table 2-11. 2017 NEI Iowa emissions summary, in tpy and as sector contributions (%) per pollutant.

Category*	SO_2 (tpy)	NO_X (tpy)	VOC (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)	SO_2 (%)	NO_X (%)	VOC (%)	PM_{10} (%)	$PM_{2.5}$ (%)	NH_3 (%)
Point-EGU	31,302	23,274	296	1,383	1,054	123	79%	12%	0%	0%	1%	0%
Point-nonEGU	7,274	20,542	19,942	5,917	4,538	2,657	18%	10%	7%	2%	6%	1%
Nonpoint**	441	14,428	85,780	332,379	57,732	329,769	1%	7%	29%	95%	81%	99%
Onroad	279	50,202	27,222	2,795	1,529	1,100	1%	25%	9%	1%	2%	0%
Nonroad	63	46,632	15,241	3,161	3,044	55	0%	24%	5%	1%	4%	0%
Fire	277	542	8,275	3,769	3,167	672	1%	0%	3%	1%	4%	0%
Biogenic		42,465	141,289					21%	47%			
Total	**39,635**	**198,084**	**298,046**	**349,404**	**71,065**	**334,377**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

*Note, the terms 'category' and 'sector' are generally used interchangeably here and throughout this document.

**The 2017 NEI contains a double-counting error in Iowa's inventory that produces emissions in the nonpoint sector from coal-fired industrial combustion sources. All of Iowa's industrial coal combustion emissions are already accounted for in the point source category. The DNR manually corrected this error here by resetting all industrial nonpoint coal-fired emissions to zero.

Table 2-12. 2020 NEI Iowa emissions summary, in tpy and as sector contributions (%) per pollutant.

Category	SO_2 (tpy)	NO_X (tpy)	VOC (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)	SO_2 (%)	NO_X (%)	VOC (%)	PM_{10} (%)	$PM_{2.5}$ (%)	NH_3 (%)
Point-EGU	18,656	12,775	183	1,229	946	89	73%	8%	0%	0%	1%	0%
Point-nonEGU	5,467	19,899	19,713	5,923	4,807	2,841	21%	13%	4%	2%	6%	1%
Nonpoint	496	15,811	89,248	325,161	58,515	349,957	2%	10%	18%	94%	77%	98%
Onroad	100	32,386	14,373	2,040	980	951	0%	20%	3%	1%	1%	0%
Nonroad	31	35,970	12,978	2,452	2,358	54	0%	23%	3%	1%	3%	0%
Fire	770	1,688	20,110	9,731	8,381	1,523	3%	1%	4%	3%	11%	0%
Biogenic		40,279	329,545					25%	68%			
Total	**25,520**	**158,808**	**486,148**	**346,535**	**75,988**	**355,415**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Changes in Iowa's emissions between the 2017 NEI and 2020 NEI are shown in Table 2-13. For each pollutant, the differences are expressed in tons per year and as sector-specific percentages computed against the 2017 NEI. Note, some tonnage differences may appear to be erroneous by ±1 tpy, but this is due to rounding as the raw data incorporated decimal digits, and similar rounding artifacts may also influence the percentage changes.

Table 2-13. Changes in Iowa's emissions between 2017 and 2020, in tpy and as sector-specific percentages.

Category	SO_2 (tpy)	NO_X (tpy)	VOC (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)	SO_2 (%)	NO_X (%)	VOC (%)	PM_{10} (%)	$PM_{2.5}$ (%)	NH_3 (%)
Point-EGU	-12,646	-10,498	-113	-154	-108	-35	-40%	-45%	-38%	-11%	-10%	-28%
Point-nonEGU	-1,807	-643	-229	6	269	185	-25%	-3%	-1%	0%	6%	7%
Nonpoint	55	1,383	3,468	-7,219	783	20,188	12%	10%	4%	-2%	1%	6%
Onroad	-179	-17,815	-12,850	-755	-549	-149	-64%	-35%	-47%	-27%	-36%	-14%
Nonroad	-32	-10,662	-2,264	-709	-686	-1	-50%	-23%	-15%	-22%	-23%	-2%
Fire	493	1,146	11,834	5,962	5,214	851	178%	211%	143%	158%	165%	127%
Biogenic		-2,186	188,256					-5%	133%			
Total Change	**-14,115**	**-39,276**	**188,103**	**-2,869**	**4,923**	**21,038**	**-36%**	**-20%**	**63%**	**-1%**	**7%**	**6%**

Between 2017 and 2020, the SO_2 and NO_X emissions from the point-EGU sector decreased by 12,646 and 10,498 tons, respectively. These equate to sector reductions of 40% and 45%. Overall, Iowa's total SO_2 emissions decreased by 14,115 tons, or 36%. Total NO_X emissions in the state decreased by 39,276 tons, or 20%, driven mostly by reductions in point-EGU, onroad, and offroad sources (and any associated influences from the COVID-19 global pandemic). While total VOC emissions increased by 188,103 tons, that was driven almost entirely by changes in biogenics and fire activities. As a natural source, the cause of the biogenic VOC increase was not investigated, but DNR did explore the fire emissions increases.

Emissions from fires are typically subcategorized as either agricultural, prescribed, or wildfire. Table 2-14 and Table 2-15 provide the 2017 NEI and 2020 NEI fire-based emissions estimates for Iowa. They show that the VOC emissions increase was driven by prescribed fire, where emissions increased by 14,219 tons (from 4,138 tons in 2017 to 18,356 tons in 2020).[19] Comparing EPA's supporting data file (zip) for the 2017 NEI and the similar 2020 NEI support file (csv) suggests that the increases are largely attributable to additional acres of prescribed burns in 2020. DNR later conducted a spot check of the 2022v1 EMP inventory (not shown in any tables below) to evaluate if the upward trend in prescribed-fire emissions might continue, and it does not. For example, Iowa's prescribed fire VOC emissions decreased by 47% between the 2020 NEI and the 2022v1 EMP (from 18,356 tons in 2020 to 9,668 tons in 2022, an 8,688 ton reduction).

Table 2-14. 2017 NEI Iowa fire emissions.

Sector	SO_2 (tpy)	NO_X (tpy)	VOC (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Fires - Agricultural Field Burning	6	33	141	231	169	106
Fires - Prescribed Fires	140	266	4,138	1,805	1,530	288
Fires - Wildfires	131	243	3,997	1,733	1,468	278
Fires - Total	**277**	**542**	**8,275**	**3,769**	**3,167**	**672**

Table 2-15. 2020 NEI Iowa fire emissions.

Sector	SO_2 (tpy)	NO_X (tpy)	VOC (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Fires - Agricultural Field Burning	16	83	366	583	433	227
Fires - Prescribed Fires	701	1,495	18,356	8,514	7,403	1,203
Fires - Wildfires	52	110	1,387	633	546	93
Fires - Total	**770**	**1,688**	**20,110**	**9,731**	**8,381**	**1,523**

Interannual variability in prescribed fire activities is expected, with the number of acres burned dependent upon weather conditions, land use, land management needs, and other factors. Uncertainties in the underlying data and changes in the emissions calculation methodologies also create variability. The emissions increases between 2017 and 2020 from prescribed fire activities are thus not concerning, particularly as the 2022v1 EMP data suggests the increases were temporary. Furthermore, the entire fire category (prescribed, ag, and wildfires) represents a relatively small portion of Iowa's pollutant totals, for example, from ~0% for NH_3 to 11% for $PM_{2.5}$ in 2020 (see Table 2-12).

If both biogenics and fires are completely excluded, Iowa's VOC emissions actually decreased between 2017 and 2020, by 11,987 tons, or 8%. While Iowa's total PM_{10} emissions decreased by 2,869 tons (or 1%), the visibility impacts in the Class I areas would be negligible as Iowa's PM_{10} emissions are generally inconsequential for regional haze purposes. Iowa's total primary $PM_{2.5}$ emissions increased by 7% (4,923 tons), but any significance to regional haze is again minimal as secondarily formed $PM_{2.5}$ is far more important at the Class I areas. Total ammonia emissions increased by 6% (21,038 tons), largely due to estimated increases from nonpoint agricultural sources, but this has not impaired progress.

2.4. 40 CFR 51.308(g)(5): Progress Assessment

40 CFR 51.308(g)(5) requires: "A*n assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred since the period addressed in the most recent plan required under paragraph (f) of this section including whether or not these changes in anthropogenic emissions were anticipated in that most recent plan and whether they have limited or impeded progress in reducing pollutant emissions and improving visibility.*"

This assessment is best accomplished by comparing the 2028 future year emissions projections from the second regional haze plan to the most recent emissions data available at the time of analysis, which was the 2020 NEI data as discussed previously. Table 2-16 provides the 2028FY emissions projections (identical to Table 7.2 in Iowa's "round 2" regional haze plan).[20] The emissions differences between the 2020 NEI (Table 2-12) and the 2028FY projections are provided in Table 2-17, in tons per year, and as sector-specific percentages calculated against the 2028FY emissions forecasts.

[19] Rounding artifacts again introduce the apparent 1 tpy discrepancy.

[20] The 2028FY emissions were sourced from LADCO summaries, with their nonpoint and fire subsectors consolidated to best match the NEI summaries, as follows: Nonpoint = Ammonia + Area + Fugitive Dust + Road Dust; Fire = Area Fire + Point Fire + Wildfire.

Table 2-16. Iowa's 2028FY forecast emissions, in tpy and as sector contributions (%) per pollutant.

Category	SO_2 (tpy)	NO_X (tpy)	VOC (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)	SO_2 (%)	NO_X (%)	VOC (%)	$PM_{2.5}$ (%)	NH_3 (%)
Point-EGU	28,002	21,442	405	1,284	225	77%	16%	0%	2%	0%
Point-nonEGU	6,784	19,210	21,170	4,771	2,354	19%	14%	5%	9%	1%
Nonpoint	562	9,943	80,315	35,100	332,615	2%	7%	19%	68%	98%
Onroad	137	18,917	13,481	700	936	0%	14%	3%	1%	0%
Nonroad	51	26,878	10,910	1,440	57	0%	20%	3%	3%	0%
Fire	750	1,426	22,309	8,275	1,576	2%	1%	5%	16%	0%
Biogenic		38,820	278,977				28%	65%		
Projected Total	**36,287**	**136,635**	**427,566**	**51,571**	**337,763**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 2-17. Differences between the 2020 NEI and the 2028FY forecast, in tpy and as sector-specific percentages.

Category	SO_2 (tpy)	NO_X (tpy)	VOC (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)	SO_2 (%)	NO_X (%)	VOC (%)	$PM_{2.5}$ (%)	NH_3 (%)
Point-EGU	-9,346	-8,666	-222	-338	-136	-33%	-40%	-55%	-26%	-61%
Point-nonEGU	-1,317	689	-1,457	36	488	-19%	4%	-7%	1%	21%
Nonpoint	-66	5,868	8,933	23,415	17,342	-12%	59%	11%	67%	5%
Onroad	-37	13,469	892	280	14	-27%	71%	7%	40%	2%
Nonroad	-20	9,092	2,068	918	-3	-38%	34%	19%	64%	-5%
Fire	20	262	-2,199	107	-53	3%	18%	-10%	1%	-3%
Biogenic		1,460	50,568				4%	18%		
Total Difference	**-10,767**	**22,173**	**58,582**	**24,417**	**17,652**	**-30%**	**16%**	**14%**	**47%**	**5%**

Iowa's 2020 total SO_2 emissions are 10,767 tons (30%) less than the 2028FY projections, which represents a significant and unexpected level of progress. The differences are due largely to decreases in the EGU and nonEGU point source categories. While a portion of those reductions are pandemic-driven, more recent information for the EGUs indicates those decreases are no longer transient. While EGU emissions rebounded between 2020 and 2021, Figure 2-3 previously showed a downward trend in the NO_X and SO_2 emissions starting again in 2021. Furthermore, the 2023 point-EGU SO_2 and NO_X emissions are well below the 2028FY predictions.

The remaining 2020 pollutant totals (NO_X, VOC, $PM_{2.5}$, and NH_3)[21] lie above their 2028 predictions, but that is generally the expected result. Assessing whether such differences are meaningful requires examining the emissions trends across a longer timeframe. Figure 2-5 thus charts the 2017 NEI, 2020 NEI, and 2028FY emissions data by pollutant.[22]

As shown before in Table 2-13, Iowa's total NO_X emissions decreased by 20% between 2017 and 2020. It can be inferred from Figure 2-5 that such a reduction represents a rate of decrease sufficient to meet the 2028 projections if it were to continue, and federal rules (particularly for mobile sources) are expected to provide ongoing NO_X reductions. While total VOC emissions increased between the two NEI years, the bulk of that difference is attributable to the biogenic sector.

Removing biogenics, VOCs actually decreased, by 153 tons. Furthermore, if fire emissions are also removed, VOCs decreased by 11,987 tons between 2017 and 2020. While direct $PM_{2.5}$ emissions increased, their role in visibility impairment in Hercules-Glades (MO) and the Michigan and Minnesota Class I areas is minimal and would not jeopardize progress. The modest increase in ammonia emissions between 2017 and 2020 is also not concerning at this juncture, especially in light of the SO_2 and NO_X decreases.

[21] PM_{10} is excluded because it was not readily available from LADCO's 2028FY emissions inventory summaries (and for the same reason, no 2028FY PM_{10} emissions are charted in Figure 2-5 below). This is not problematic as coarse PM is not an important component of visibility impairment at the Class I areas linked to Iowa.

[22] Including additional historical years prior to 2017 could reinforce the trends analysis, but as emissions are generally higher in prior years, it is unlikely to influence any conclusions and would only increase the data processing burden.

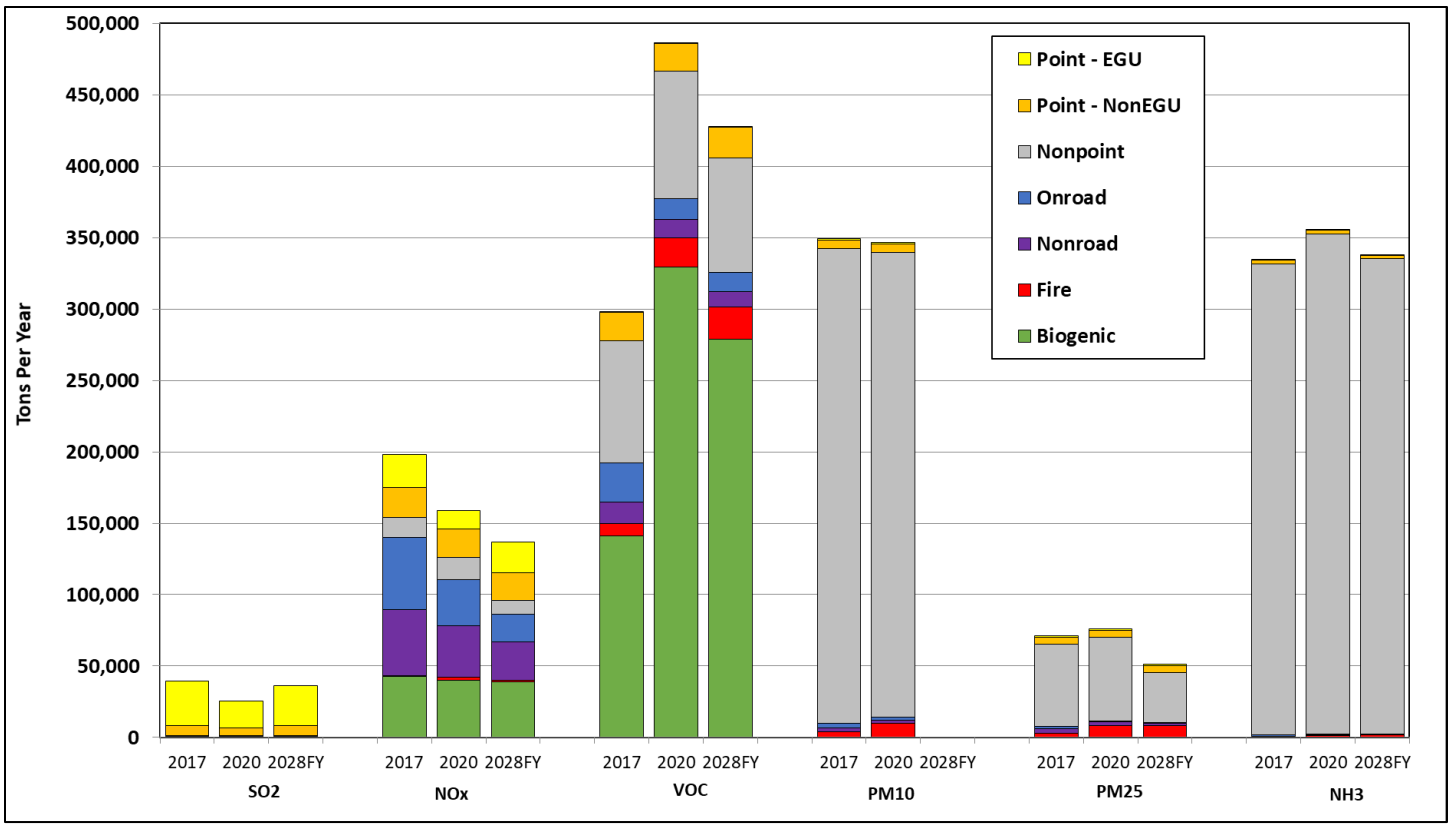

Figure 2-5. Iowa emissions by sector and pollutant from the 2017 NEI, the 2020 NEI, and the 2028FY.

2.5. 40 CFR 51.308(g)(6): Assessment of Elements to Meet RPG

40 CFR 51.308(g)(6) requires: "*An assessment of whether the current implementation plan elements and strategies are sufficient to enable the State, or other States with mandatory Federal Class I areas affected by emissions from the State, to meet all established reasonable progress goals* [RPG] *for the period covered by the most recent plan required under paragraph (f) of this section.*"

Based on the information provided in this document, it is reasonable to conclude that Iowa's current plan and strategies are sufficient to enable the Class I areas listed in Table 1-1 (Isle Royale and Seney in Michigan, Boundary Waters Canoe Area and Voyageurs in Minnesota, and Hercules-Glades in Missouri) to meet their 2028 reasonable progress goals.

Support for that conclusion includes the 7,487 tons of SO_2 reduced from LGS and WSEC-3 between Q1-Q3 2023 and Q1-Q3 2024. Those reductions are on track with Iowa's estimates and goals for the second planning period and are largely the result of the implementation of scrubber improvements as required by Iowa's LTS. Additionally, Iowa's 2023 total EGU NO_X and SO_2 emissions were the lowest observed in the span of the RHR, excluding the 2020 pandemic year, and are already well below the ERTAC v16.1 projections for future year 2028. Meanwhile, the ongoing implementation of federal onroad and nonroad regulations will continue to reduce NO_X and other pollutants as older equipment is replaced with newer models.

While Iowa's total direct $PM_{2.5}$ and NH_3 emissions did not decrease between 2017 and 2020, the modest increases are not consequential as those pollutants are not of primary concern at this time with respect to visibility impairment at the five Class I areas linked to Iowa. Furthermore, current visibility conditions (the 2019-2023 five-year averages for the 20% most impaired days) in those areas are better than the 2028 URP glidepaths and are either on track to meet, or improve beyond, LADCO's 2028 projections.

2.6. 40 CFR 51.308(g)(7): Visibility Monitoring

The requirement to review the state's visibility monitoring strategy applied only to the progress report for the first planning period and is thus no longer applicable.

2.7. 40 CFR 51.308(g)(8): Smoke Management Assessment

Iowa's LTS does not include a smoke management plan, nor has the DNR adopted a statewide smoke management program, therefore, the requirements of 40 CFR 51.308(g)(8) do not apply to this progress report.

2.8. 40 CFR 51.308(h): Determination of Plan Adequacy

40 CFR 51.308(h) states: *"At the same time the State is required to submit any progress report to EPA in accordance with paragraph (g) of this section, the State must also take one of the following actions based upon the information presented in the progress report:*

(1) If the State determines that the existing implementation plan requires no further substantive revision at this time in order to achieve established goals for visibility improvement and emissions reductions, the State must provide to the Administrator a declaration that revision of the existing implementation plan is not needed at this time.

(2) If the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another State(s) which participated in a regional planning process, the State must provide notification to the Administrator and to the other State(s) which participated in the regional planning process with the States. The State must also collaborate with the other State(s) through the regional planning process for the purpose of developing additional strategies to address the plan's deficiencies.

(3) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another country, the State shall provide notification, along with available information, to the Administrator.

(4) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources within the State, the State shall revise its implementation plan to address the plan's deficiencies within one year."

Based upon the information presented in this document, the DNR has determined that further revision of Iowa's existing implementation plan is not currently needed to achieve established goals for visibility improvement and emissions reductions at Isle Royale or Seney in Michigan, Boundary Waters Canoe Area or Voyageurs in Minnesota, or Hercules-Glades in Missouri (or any other Class I areas). This statement constitutes a declaration to that effect, pursuant to 40 CFR 51.308(h)(1).

3. Stakeholder Engagement

Progress reports are subject to both Federal Land Manager (FLM) consultation requirements and public inspection. In accordance with 40 CFR 51.308(i), states must first make the draft progress report available to the FLMs no less than 60 days prior to the state's public review period. If the FLMs provide comments on the progress report, the public review draft of the progress report must include a description of how the state addressed the FLMs' comments.

The progress report must then be made available for public inspection and comment for at least 30 days. Additionally, 40 CFR 51.308(g) requires that all comments received from the public be submitted to EPA along with the subsequent progress report, and an explanation of any changes to the progress report made in response to comments.

3.1. FLM Consultation

DNR provided the draft progress report to the FLMs on the afternoon of February 10, 2025, with comments requested by April 11, 2025. This ensured the FLM consultation period spanned a full 60 days (starting from February 11, 2025). The email announcing the formal consultation opportunity also welcomed questions and requests to meet. The U.S. Forest Service (FS), the National Park Service (NPS), and the U.S. Fish & Wildlife Service (FWS) each acknowledged receipt of the draft report. The NPS later requested a consultation call with the DNR and subsequently hosted a virtual meeting on April 1, 2025, with the FLMs for the FS and FWS, and EPA Region 7 staff, also attending. Appendix A contains a record of the FLM consultation, including the FLM's comments. DNR summarizes and responds to those comments below, ordered as received.

Forest Service

FS Comment

The FS submitted one comment/question, asking what Iowa was doing to address the increasing emissions of ammonia. The FS stated that ammonia is not only a concern for visibility but is also a concern for the other impacts it has on Air Quality Related Values (AQRVs).

DNR Response

Improving visibility in the five Class I areas linked to Iowa currently depends largely upon reducing NO_X and SO_2 emissions. Iowa has not relied upon ammonia reductions to achieve the reasonable progress goals of those areas, nor has it been necessary. Region-wide NO_X and SO_2 emissions reductions have substantially improved visibility conditions in those areas. In 2023, the most recent year available, HEGL recorded its clearest annual impairment value (16.19 dv) for the 20% most impaired days (see Section 2.2). Similar milestones occurred in 2022 for the other Class I areas, except BOWA, where 2016 remains the clearest (on the most impaired days) in the 2000 to 2023 range. Comparing the 2023 data to 2019 (the start of the second planning period) again shows visibility improving at each of the five areas on the most impaired days. Ammonia reductions may enhance the trend, but are not currently necessary for RHR purposes.

National Park Service

Discussion topics covered on the April 1st consultation meeting, led by the NPS, included NPS efforts to review progress reports, a summary of Iowa's regional haze SIP for the second planning period, Class I areas most affected by Iowa's emissions, support for Iowa's FLM consultation efforts, next steps, and minor suggestions on Iowa's draft progress report, as discussed below (and characterized as comments, for simplicity).[23]

NPS Comment 1

The Regional Haze Rule does not establish 2064 as statutory goal for the achievement of natural background conditions, as described in the report's introduction.

DNR Response

The DNR agrees with that assessment and therefore modified the progress report's executive summary and introductory language to avoid characterizing 2064 as the statutory goal for restoring natural visibility conditions.

[23] The NPS did not identify any substantive issues with Iowa's draft progress report. Their feedback was generally complimentary, which the DNR appreciates. A meeting *Agenda & Summary*, provided in an email sent by the NPS on April 8, 2025 (see Appendix A), contains the NPS's comments in written form, under the subheading *Minor suggestion*. Note, DNR did correct the minor typo in Section 2.1.2.2 identified by the NPS, and is grateful for its discovery; no additional response is necessary.

NPS Comment 2

The discussion in Section 2.4 ["*40 CFR 51.308(g)(5): Progress Assessment*"] seems to fit better under 40 51.308(g)(6) [which would be Section 2.5] rather than 51.308(g)(5). Pursuant to EPA Guidance regarding 40 CFR 51.308(g)(5): "To meet this requirement, states must report whether or not anticipated significant Second Planning Period SIP emissions changes have occurred. The EPA expects states to consider the emissions information the state relied upon to determine the emissions reductions measures necessary for reasonable progress under 40 CFR 51.308(f)(2)(iii)."

DNR Response

Overlaps exist between 40 CFR 51.308(g)(5) and (g)(6) as they both essentially require states to determine if recent emissions changes are trending as predicted. Under 51.308(g)(5), Iowa must assess if recent emissions changes were *anticipated* (emphasis added).[24] Section 2.3 previously examined changes in Iowa's actual emissions, comparing the 2017 and 2020 NEIs. Determining if the emissions differences between those years were anticipated requires a future year inventory, to help establish the anticipated trendline. DNR thus plots the 2017 NEI, 2020 NEI, and 2028FY datasets in Section 2.4 (see Figure 2-5), after first comparing the 2028FY emissions projections to the 2020 NEI to evaluate expectations. Assuming a perfect forecast, the 2020 NEI emissions will fall between the 2017 NEI and 2028FY values. If not,[25] that indicates certain emissions changes were not anticipated. If the differences are significant, DNR discusses, in Section 2.4, whether or not the discrepancies have limited or impeded progress, in accordance with 40 CFR 51.308(g)(5). These analyses are analogous to the emissions information needed to address 51.308(g)(6), which requires an assessment of the adequacy of the current control strategy. EPA's guidance's further indicates that 51.308(g)(6) can be addressed (in part)[26] using the emissions information developed to satisfy the progress report requirements in 51.308(g)(5), as in Section 2.4 of this report. DNR thus finds the information in Section 2.4 [51.308(g)(5)] is appropriately located, and need not be moved to Section 2.5 [51.308(g)(6)].

Fish and Wildlife Service

The FWS did not submit comments on Iowa's draft progress report.

Ongoing FLM Consultation

Prior to the official consultation opportunities, the DNR and the FLMs remained in regular contact through status updates discussed during CenSARA's quarterly regional haze calls and LADCO's bi-monthly (every other month) regional haze calls. DNR expects these informal periodic engagements will continue, and appreciates the FLM's contributions.

3.2. Public Comment

DNR will address this section after the close of the public review period.

[24] Significant unanticipated changes could include, for example, a large unexpected increase in emission, or a forecast for a large emission reduction that did not actually occur.

[25] Differences are certainly expected though, as eight years separate the 2020 NEI and the 2028FY forecast inventory. The ongoing implementation of air quality regulations should continue to reduce emissions from affected source categories (especially in the mobile sector), and emissions growth may occur in other sectors.

[26] In combination with ambient data and other information developed to satisfy the requirements in 51.308(g)(1) to (g)(5).