

## **Appendix H. Additional Interstate Consultation Documentation**

**Minnesota**



Johnson, Matthew &lt;matthew.johnson@dnr.iowa.gov&gt;

**Re: Minnesota consultation regarding regional haze impairment**

1 message

Johnson, Matthew &lt;matthew.johnson@dnr.iowa.gov&gt;

Wed, Jun 1, 2022 at 11:18 AM

To: "Palmer, Kari (MPCA)" &lt;kari.palmer@state.mn.us&gt;

Cc: "jessica.reesemcintyre@dnr.iowa.gov" &lt;jessica.reesemcintyre@dnr.iowa.gov&gt;, "deAlwis, Deepa (MPCA)" &lt;deepa.dealwis@state.mn.us&gt;, "Bouchareb, Hassan (MPCA)" &lt;hassan.bouchareb@state.mn.us&gt;, "Wenger, Maggie (MPCA)" &lt;Maggie.Wenger@state.mn.us&gt;, "Mcgraw, Jim" &lt;jim.mcgraw@dnr.iowa.gov&gt;, Peter Zayudis &lt;peter.zayudis@dnr.iowa.gov&gt;

Hello Ms. Palmer,

We would be happy to discuss regional haze and I will soon contact Hassan to begin the meeting coordination process. In the meantime, please use me as the Iowa point of contact if any additional regional haze issues arise.

Thank you,  
Matthew Johnson  
[matthew.johnson@dnr.iowa.gov](mailto:matthew.johnson@dnr.iowa.gov)  
515-725-9554

[www.iowadnr.gov](http://www.iowadnr.gov)**Matthew Johnson** | Environmental Specialist Senior

Air Quality Bureau

**Iowa Department of Natural Resources**

P: 515-725-9554

502 E. 9th Street, Des Moines, IA 50319

On Wed, Jun 1, 2022 at 9:41 AM Palmer, Kari (MPCA) <[kari.palmer@state.mn.us](mailto:kari.palmer@state.mn.us)> wrote:

Dear Ms. McIntyre,

The Minnesota Pollution Control Agency (MPCA) is contacting you for the purpose of Regional Haze state-to-state consultation. Based on our modeling analysis, we believe Iowa contributes to visibility impairment at the Boundary Waters Canoe Area Wilderness and Voyageurs National Park, Minnesota Class I areas. The MPCA is requesting a consultation call with your agency to discuss Minnesota's Regional Haze State Implementation Plan including our source selection process, the initial outcome of the four-factor analyses, and the results of our modeling analyses regarding those states that we believe are contributing to visibility impairment in Minnesota Class I areas.

Please contact Hassan Bouchareb of my staff at [hassan.bouchareb@state.mn.us](mailto:hassan.bouchareb@state.mn.us) or 651-757-2653 to coordinate a time for discussion.

Thank you for your consideration and we hope to speak with you soon,

Sincerely,  
Kari Palmer

**Kari R.S. Palmer** | Air Assessment Section Manager

Minnesota Pollution Control Agency (MPCA)

Environmental Analysis and Outcomes Division

520 Lafayette Rd N | St. Paul, MN | 55155

(w) 651-757-2635 (c) 651-235-5877

[kari.palmer@state.mn.us](mailto:kari.palmer@state.mn.us) | [www.pca.state.mn.us](http://www.pca.state.mn.us)

Pronouns: she/her/hers



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Johnson, Matthew &lt;matthew.johnson@dnr.iowa.gov&gt;

## Re: Regional Haze :: Minnesota & Iowa Consultation

1 message

Johnson, Matthew &lt;matthew.johnson@dnr.iowa.gov&gt;

Fri, Jul 1, 2022 at 7:40 AM

To: "Bouchareb, Hassan (MPCA)" &lt;hassan.bouchareb@state.mn.us&gt;

Cc: "jessica.reesemcintyre@dnr.iowa.gov" <jessica.reesemcintyre@dnr.iowa.gov>, "jim.mcgraw@dnr.iowa.gov" <jim.mcgraw@dnr.iowa.gov>, "peter.zayudis@dnr.iowa.gov" <peter.zayudis@dnr.iowa.gov>, "deAlwis, Deepa (MPCA)" <deepa.dealwis@state.mn.us>, "Wenger, Maggie (MPCA)" <Maggie.Wenger@state.mn.us>, "McCourtney, Margaret (MPCA)" <margaret.mccourtney@state.mn.us>, "Palmer, Kari (MPCA)" <kari.palmer@state.mn.us>, "Smith, Michael D (MPCA)" <michael.smith@state.mn.us>

Hello Hassan and All,

We appreciated the consultation opportunity and found the discussion productive. The modeling and technical analyses presented were clear, concise, logical, and informative. The conclusions we've developed through review of the LADCO PSAT modeling results are consistent with your findings.

As mentioned yesterday, we will require our two largest EGUs, Louisa Generating Station (LGS) and Walter Scott Jr. Energy Center (WSEC) - Unit 3, to make operational improvements to their existing dry scrubbers. These control measures will reduce their actual SO<sub>2</sub> emissions by a combined 9,000 - 10,000 tons per year. The emission limits are still under development, but should be equivalent to ~0.10 lb/MMBtu. Summary information is provided in the tables below. Our SIP timeline will hopefully lag yours by no more than ~3 months.

Facility Name	DNR Facility ID	Source Type	County	Latitude	Longitude
Louisa Generating Station	58-07-001	Coal-fired EGU	Louisa	41.3181	-91.0933
Walter Scott Jr. Energy Center	78-01-026	Coal-fired EGU	Pottawattamie	41.1811	-95.8380

Source	Baseline SO <sub>2</sub> Emissions [2017-2019 Average] (tpy)	SO <sub>2</sub> Emissions after FGD Improvements (tpy)	Change in Actual SO <sub>2</sub> Emissions (tpy)
Louisa Generating Station (Unit 101)	5,952	2,049	-3,903
Walter Scott Jr. Energy Center - Unit 3	8,041	2,256	-5,785
<b>Total</b>	<b>13,993</b>	<b>4,305</b>	<b>-9,688</b>

LGS and WSEC were selected for 4-factor analysis based on our evaluation of CenSARA's Area of Influence (AOI) analysis. These were the only Iowa sources that contributed to the majority of the combined sulfate and nitrate EWRT\*Q/d metric at downwind Class I areas.

If you'd like any additional information, please let us know.

Thank you,  
Matthew


[www.iowadnr.gov](http://www.iowadnr.gov)

**Matthew Johnson** | Environmental Specialist Senior  
Air Quality Bureau  
**Iowa Department of Natural Resources**  
P: 515-725-9554  
502 E. 9th Street, Des Moines, IA 50319



On Thu, Jun 30, 2022 at 12:21 PM Bouchareb, Hassan (MPCA) <[hassan.bouchareb@state.mn.us](mailto:hassan.bouchareb@state.mn.us)> wrote:

Good afternoon everyone,

Thanks again for meeting with us today to discuss various aspects of the Regional Haze program and participating in the consultation process required under the Regional Haze Rules. Generally, states are required to consult with other states that have emissions that are reasonably anticipated to contribute to visibility impairment in the same Class I area(s), in order to develop coordinated emission management strategies for making reasonable progress.

Attached is the presentation used in today's discussion that outlines what Minnesota plans to include in its Regional Haze SIP. This included the visibility contribution analysis that Minnesota used to determine which Class I areas are potentially impacted by Minnesota sources and which Class I areas in Minnesota are potentially impacted by sources in other states. As mentioned in our meeting, we are not making a formal "Ask" regarding any sources in particular and viewed this as more of an information sharing opportunity.

We would appreciate any information you can provide regarding the approach your state is taking regarding emission reduction measures contemplated for this regional haze implementation period. I'll be working to summarize our interactions within Minnesota's Regional Haze SIP and we'll provide you with an opportunity to review the summary and offer comments/clarifications.

For easy reference, we're currently in the middle of the formal FLM consultation period (May 11<sup>th</sup> - July 11<sup>th</sup>) and are hoping to go on public notice in late July or early August this year. If you would please provide any relevant information you would like to share at your earliest convenience, I'll attempt to include that in my write-up before sharing it with you for your review.

If you have any questions, please let me know.

Thank you!

**Hassan M. Bouchareb** | Engineer  
Minnesota Pollution Control Agency (MPCA)

Office: (651) 757-2653 | Fax: (651) 296-8324

Pronouns: he/him/his

[Hassan.Bouchareb@state.mn.us](mailto:Hassan.Bouchareb@state.mn.us) | [www.pca.state.mn.us](http://www.pca.state.mn.us)

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-----Original Appointment-----

**From:** Bouchareb, Hassan (MPCA)

**Sent:** Thursday, June 2, 2022 9:29 AM

**To:** Bouchareb, Hassan (MPCA); deAlwis, Deepa (MPCA); Wenger, Maggie (MPCA); McCourtney, Margaret (MPCA); Palmer, Kari (MPCA); Smith, Michael D (MPCA); [matthew.johnson@dnr.iowa.gov](mailto:matthew.johnson@dnr.iowa.gov); [jessica.reesemcintyre@dnr.iowa.gov](mailto:jessica.reesemcintyre@dnr.iowa.gov)

**Cc:** [jim.mcgraw@dnr.iowa.gov](mailto:jim.mcgraw@dnr.iowa.gov); [peter.zayudis@dnr.iowa.gov](mailto:peter.zayudis@dnr.iowa.gov)

**Subject:** Regional Haze :: Minnesota & Iowa Consultation

**When:** Thursday, June 30, 2022 11:00 AM-12:00 PM (UTC-06:00) Central Time (US & Canada).

**Where:** Microsoft Teams Meeting

Hi everyone,

Matthew and I talked briefly regarding potential meeting times for consultation, and it looks like this time worked for everyone. Please hold this time and we look forward to speaking with you.

If you have any questions, please send them my way.

Thanks!

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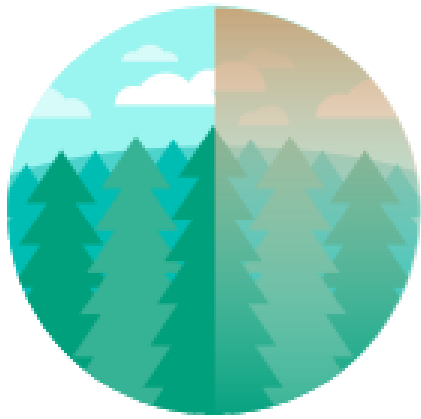


# Regional Haze Update

## 2<sup>nd</sup> Implementation Period



# Introduction



Reach natural visibility conditions in Minnesota's national parks and wilderness areas

- Implementation of EPA's regional haze rules
- Comprehensive update for 2028 (2<sup>nd</sup> Implementation Period)
- Addressing regional haze is one of MPCA's long term goals
- Committed to making reasonable progress towards natural conditions

# 1<sup>st</sup> implementation period review

- Regional Haze State Implementation Plan (SIP)
  - Initial SIP submitted in 2009 (supplemented in 2012)
    - Best Available Retrofit Technology (BART) for Electric Generating Units (EGUs)
    - Federal Implementation Plan (FIP) for Taconite facilities
    - FIP for reasonably attributable visibility impairment (RAVI)
  - Five-Year Progress Report submitted in 2014
    - No significant revisions necessary to achieve 2018 reasonable progress goals

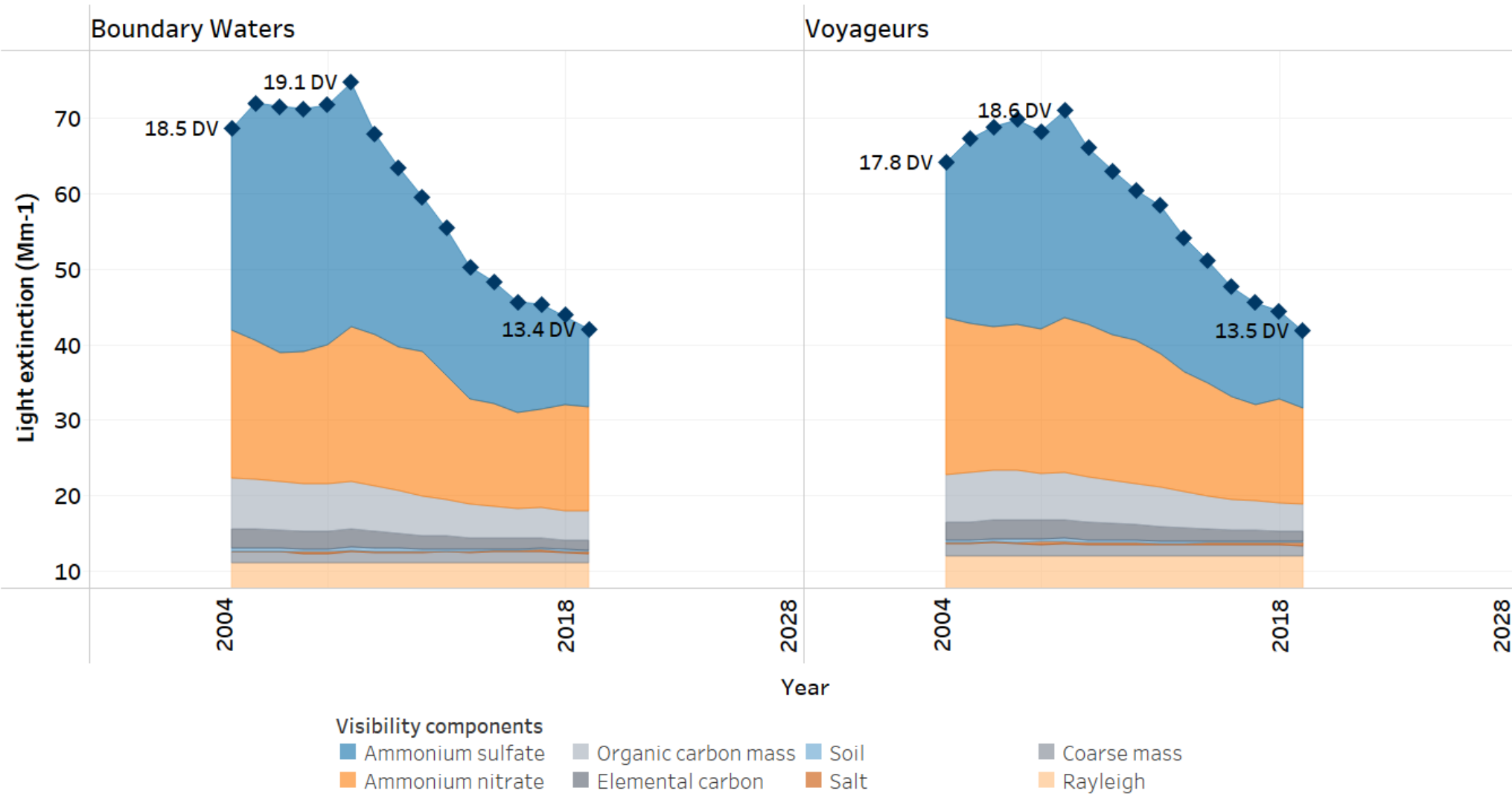
# 2<sup>nd</sup> implementation period update

## Overall updates

- Where are we now?
  - Decisions on four-factor analyses and available emission reduction strategies
  - Documentation & early review by EPA/FLMs/Tribes
  - Interstate consultation
  - Modeling performance evaluation
  - Modeling results review/interpretation
  - Geographic and sector contribution analyses

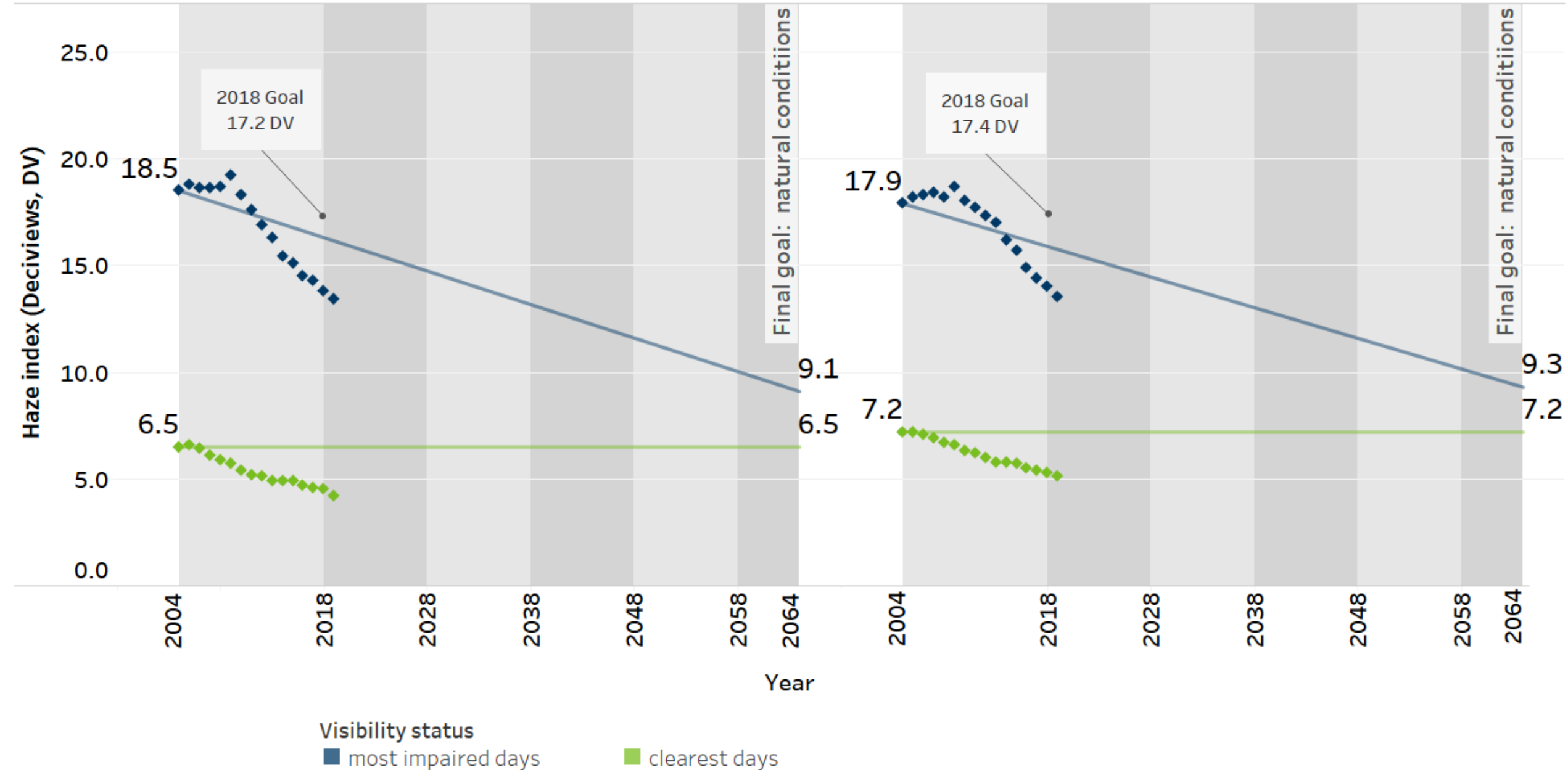
# Components of visibility impairment

## As light extinction



## Boundary Waters

## Voyageurs

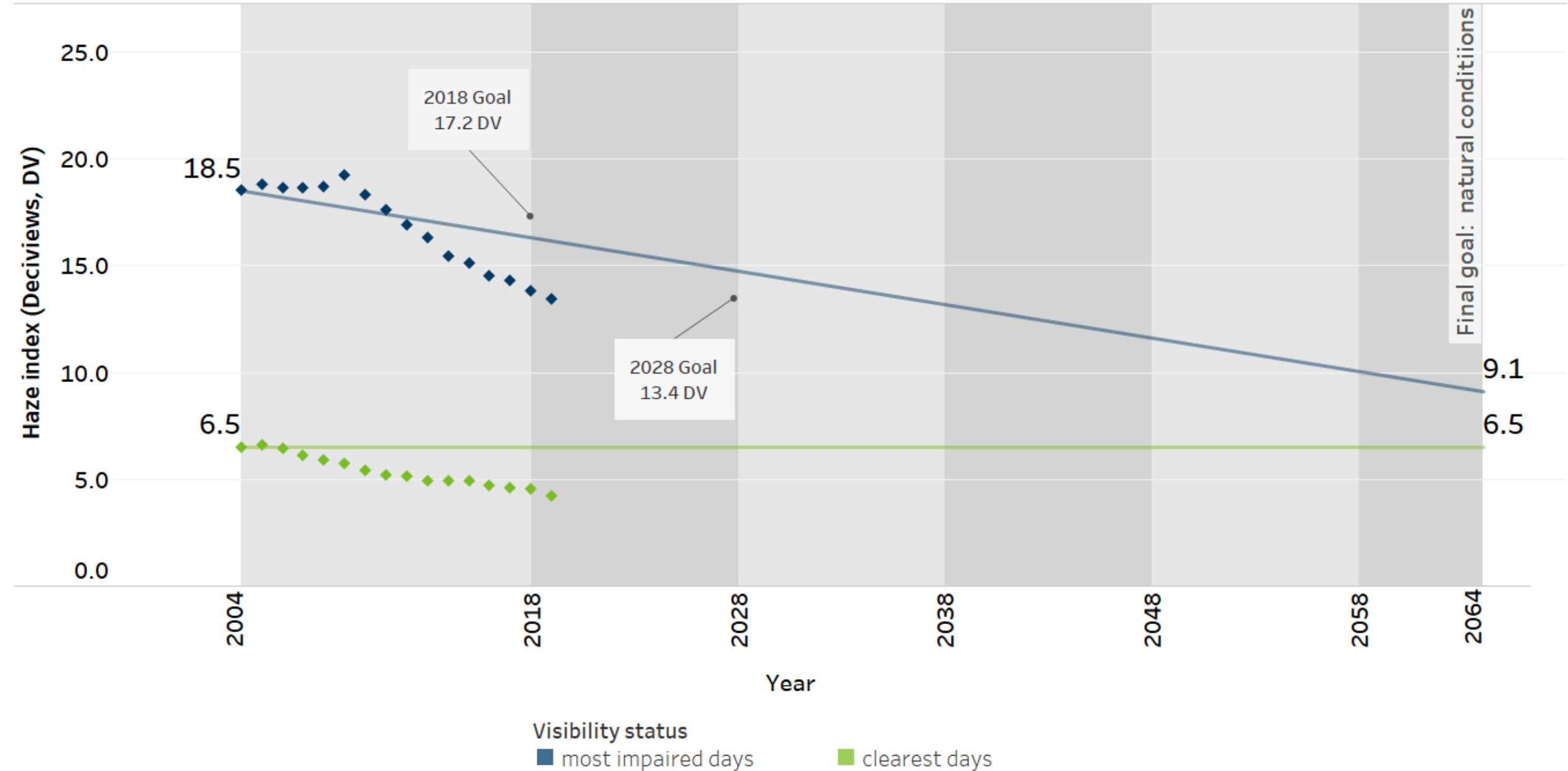


# 2<sup>nd</sup> implementation period update

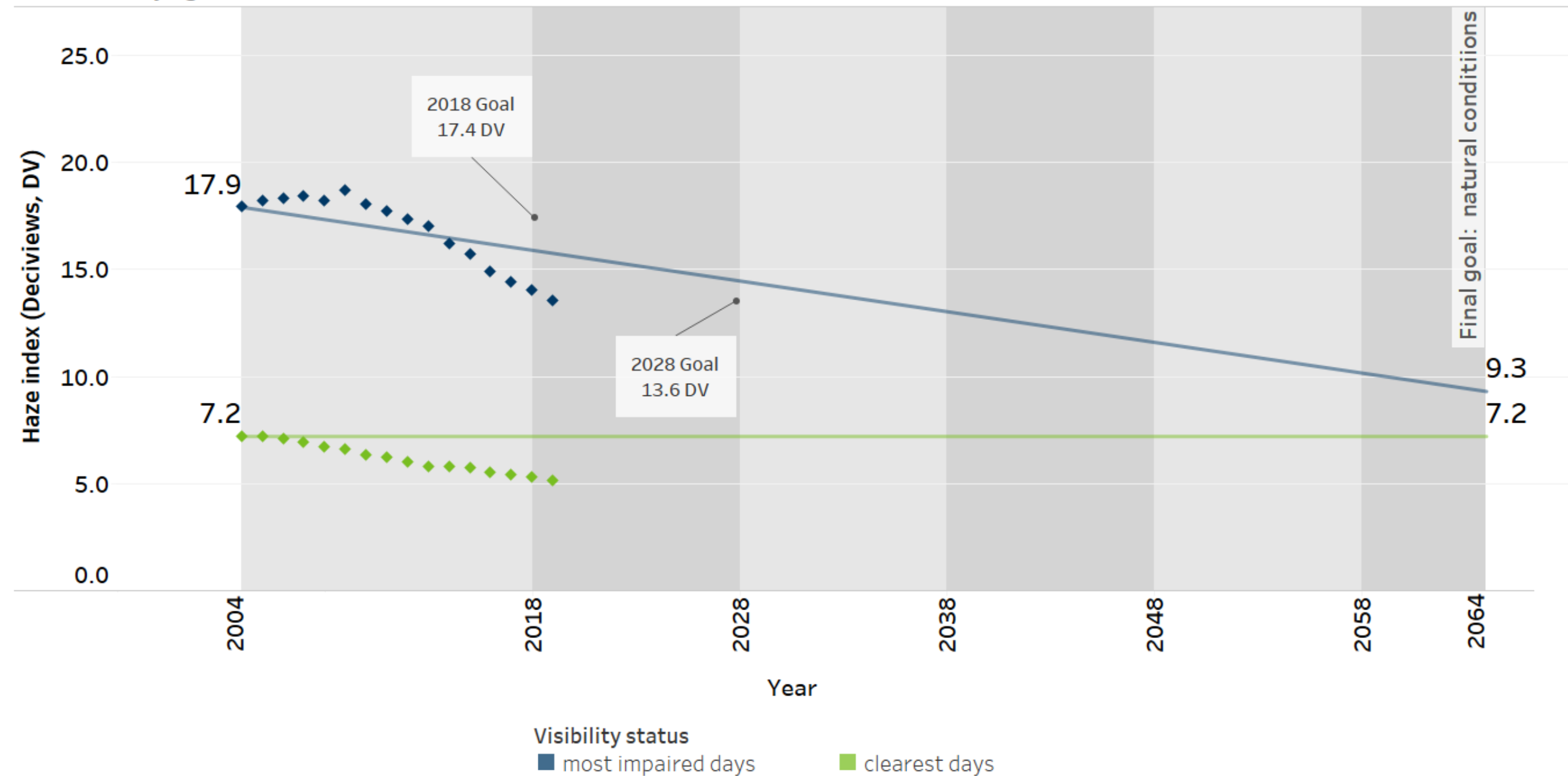
## Visibility modeling

- Uniform Rate of Progress (URP or glidepath) as a “Safe Harbor”
  - Not an acceptable reason to reject potential controls or emission reductions
- Modeling to forecast visibility conditions in 2028
  - Performed by MPCA (using LADCO v1b modeling platform)
  - MPCA conducting additional modeling similar to 1<sup>st</sup> implementation period
    - Focus on sector contribution to visibility impairment by geographic area
  - Use this modeling to establish our 2028 reasonable progress goal

# Boundary Waters



# Voyageurs





# 2<sup>nd</sup> implementation period update

## Visibility modeling



### Explore emissions inputs for modeling Minnesota 2028 interim visibility goals

This interactive tool shows the emissions input to the atmospheric chemistry model to develop our visibility goals at Minnesota Class I areas.

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - Minnesota's impact on Class I areas

**Minnesota contribution to 2028 Nitrate and Sulfate Extinction at select Class I areas**

Class I area	Monitor site abbreviation	Monitor location		Distance of monitor from Minnesota boundary (km)	Minnesota contribution to visibility (%)
		Latitude	Longitude		
Boundary Waters Canoe Area Wilderness	BOWA1	47.9466	-91.4955	0	16.2
Voyageurs National Park	VOYA2	48.4126	-92.8286	0	17.6
Isle Royale National Park	ISLE1	47.4596	-88.1491	117	8.2
Seney Wilderness Area	SENE1	46.2889	-85.9503	329	4.3
Lostwood Wilderness	LOST1	48.6419	-102.4022	381	0.5
Badlands Wilderness	BADL1	43.7435	-101.9412	442	1.2
Theodore Roosevelt National Park	THRO1	46.8948	-103.3777	489	1.7
Mingo Wilderness Area	MING1	36.9717	-90.1432	731	1.6
Hercules-Glades Wilderness Area	HEGL1	36.6138	-92.9221	765	1.8
Mammoth Cave National Park	MACA1	37.1318	-86.1479	828	2.6

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - Minnesota's impact on Class I areas

Minnesota sector contribution to 2028 Nitrate and Sulfate Extinction at Class I areas

Sector Group	Visibility contribution (%)		Pollutant contribution (%)		2028 emissions (tons)	
	Boundary Waters	Voyageurs	Boundary Waters	Voyageurs	NOX	SO2
Industry	6.2	6.3			36,000	10,000
Vehicle	3.5	3.7			62,200	907
EGU	2.6	3.5			12,200	12,000
Area Oil/Gas RWC	2.9	2.7			28,040	4,312
Natural	1.0	1.4			42,500	--
Total	16.2	17.6			180,940	27,219

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - States impacting Minnesota Class I areas

**Region contribution to 2028 Nitrate and Sulfate Extinction at Minnesota Class I areas**

Region name	Boundary Waters		Voyageurs	
	Distance of region boundary to monitor (km)	Region contribution to visibility (%)	Distance of region boundary to monitor (km)	Region contribution to visibility (%)
Boundary of model domain	432	37.7	385	40.2
Minnesota	0	16.2	0	17.6
Canada/Mexico	12 / 2,190	7.0	10 / 2,176	10.0
North Dakota	404	4.8	314	5.9
Central Midwest	934	4.6	955	3.7
Iowa	494	4.3	546	4.1
Nebraska	715	3.9	706	3.5
West	446	3.9	395	3.0
Wisconsin	113	3.6	194	1.5

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - States impacting Minnesota Class I areas

### Region contribution to 2028 Nitrate and Sulfate Extinction at Minnesota Class I areas

Region name	Boundary Waters		Voyageurs	
	Distance of region boundary to monitor (km)	Region contribution to visibility (%)	Distance of region boundary to monitor (km)	Region contribution to visibility (%)
Missouri	815	3.5	869	2.8
Illinois	608	2.6	678	1.7
Texas	1,451	1.5	1,447	1.3
Indiana	760	1.0	853	0.9
Southeast	1,118	1.0	1,216	0.8
Northeast	872	0.9	977	1.1
Michigan	170	0.4	274	0.8
Water bodies	64	0.2	170	0.2

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - North Dakota's impact on Minnesota Class I areas

North Dakota sector contribution to 2028 Nitrate and Sulfate Extinction at Class I areas

Sector Group	Visibility contribution (%)		Pollutant contribution (%)		2028 emissions (tons)	
	Boundary Waters	Voyageurs	Boundary Waters	Voyageurs	NOX	SO2
EGU	2.4	2.5			33,600	38,000
Area Oil/Gas RWC	1.1	1.4			34,048	9,444
Vehicle	0.7	1.0			29,470	165
Natural	0.4	0.6			50,500	--
Industry	0.2	0.3			3,610	2,020
Total	4.8	5.9			151,228	49,629

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - Iowa's impact on Minnesota Class I areas

Iowa sector contribution to 2028 Nitrate and Sulfate Extinction at Minnesota Class I areas

Sector Group	Visibility contribution (%)		Pollutant contribution (%)		2028 emissions (tons)	
	Boundary Waters	Voyageurs	Boundary Waters	Voyageurs	NOX	SO2
EGU	1.8	1.9			22,300	28,500
Vehicle	1.0	0.8			46,600	382
Natural	0.6	0.6			59,800	--
Industry	0.5	0.4			13,600	6,680
Area Oil/Gas RWC	0.4	0.3			14,422	558
Total	4.3	4.1			156,722	36,120

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - Nebraska's impact on Minnesota Class I areas

Nebraska sector contribution to 2028 Nitrate and Sulfate Extinction at Minnesota Class I areas

Sector Group	Visibility contribution (%)		Pollutant contribution (%)		2028 emissions (tons)	
	Boundary Waters	Voyageurs	Boundary Waters	Voyageurs	NOX	SO2
EGU	2.4	2.4			23,200	57,000
Vehicle	0.8	0.5			51,200	204
Industry	0.2	0.2			7,270	1,840
Natural	0.4	0.2			74,700	--
Area Oil/Gas RWC	0.2	0.1			6,799	143
Total	3.9	3.5			163,169	59,187



# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - Wisconsin's impact on Minnesota Class I areas

Wisconsin sector contribution to 2028 Nitrate and Sulfate Extinction at Minnesota Class I areas

Sector Group	Visibility contribution (%)		Pollutant contribution (%)		2028 emissions (tons)	
	Boundary Waters	Voyageurs	Boundary Waters	Voyageurs	NOX	SO2
Industry	1.2	0.6			22,800	19,400
Vehicle	1.2	0.4			47,700	496
Area Oil/Gas RWC	0.6	0.2			21,229	2,015
EGU	0.3	0.2			13,500	4,700
Natural	0.3	0.2			24,600	--
Total	3.6	1.5			129,829	26,611

# 2<sup>nd</sup> implementation period update

## Visibility contribution analyses - Missouri's impact on Minnesota Class I areas

Missouri sector contribution to 2028 Nitrate and Sulfate Extinction at Minnesota Class I areas

Sector Group	Visibility contribution (%)		Pollutant contribution (%)		2028 emissions (tons)	
	Boundary Waters	Voyageurs	Boundary Waters	Voyageurs	NOX	SO2
EGU	1.6	1.3			33,200	95,600
Vehicle	0.9	0.7			75,600	848
Industry	0.4	0.3			21,000	12,200
Natural	0.3	0.3			55,400	--
Area Oil/Gas RWC	0.3	0.2			19,331	899
Total	3.5	2.8			204,531	109,547

# 2<sup>nd</sup> implementation period update

## Four factor analysis :: source selection

- LADCO Regional Analysis Overview
  - Based on 2016 emissions ( $\text{NO}_x$ ,  $\text{SO}_2$ ,  $\text{PM}_{2.5}$ ,  $\text{NH}_3$ , VOCs), with exceptions
  - Excluded facilities from further analysis if  $Q/d < 1$
  - Facilities with  $Q/d > 4$  were generally asked to conduct a Four Factor Analysis
  - Largest Minnesota contributors from Taconite, EGUs, and other ICI Boilers
- What does the Guidance say?
  - Draft 2016 guidance recommended states evaluate 80% of sources
  - Final guidance allows a “reasonable threshold” with appropriate justification

# 2<sup>nd</sup> implementation period update

## Four factor analysis :: control measure selection

- MCPA review
  - No evaluation of individual visibility impact from specific controls
  - Focuses on evaluating the four factors to determine necessary controls
  - Cost comparisons across regional haze SIPs and EPA's RBLC Clearinghouse
- Control selection overview
  - Started with 17 facilities and 44 emission units
  - 19 emission units were found to be effectively controlled
  - 13 emission unit either will, or plan to, retire/shutdown
  - 8 emission units have no cost effective controls
  - 4 emission units have cost effective controls

# 2<sup>nd</sup> implementation period update

## Four factor analysis :: Taconite industry overview

Facility Name	Emission Unit	Pollutants	Control Measure	Outcome
Cleveland Cliffs Minorca Mine Inc.	Indurating Machine	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
Hibbing Taconite Company	Indurating Furnace Line 1	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
	Indurating Furnace Line 2	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
	Indurating Furnace Line 3	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
Northshore Mining - Silver Bay	Power Boiler 1	NO <sub>x</sub>	SNCR, SCR	[3]
		SO <sub>2</sub>	DSI, Spray Dry Absorber	[3]
	Power Boiler 2	NO <sub>x</sub>	LNB w/ OFA, SNCR, SCR	[3]
		SO <sub>2</sub>	DSI, Spray Dry Absorber	[3]
	Furnace 11	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
Furnace 12	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]	
United Taconite LLC - Fairlane Plant	Line 1 Pellet Induration	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
	Line 2 Pellet Induration	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
US Steel Corporation - Keetac	Grate Kiln	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
US Steel Corporation - Minntac	Line 3 Rotary Kiln	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
	Line 4 Rotary Kiln	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
	Line 5 Rotary Kiln	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
	Line 6 Rotary Kiln	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]
	Line 7 Rotary Kiln	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1], [2]

### Notes

[1] No controls recommended; considered effectively controlled for this implementation period.

[2] Taconite Federal Implementation Plan (FIP) settlement discussions with EPA.

[3] No controls recommended; proposed emission unit retirements/shutdowns

# 2<sup>nd</sup> implementation period update

## Four factor analysis :: Electric power generation industry overview

Facility Name	Emission Unit	Pollutants	Control Measure	Outcome
Hibbing Public Utilities Commission	Boiler No. 1A	NO <sub>x</sub>	SNCR, SCR	[7]
		SO <sub>2</sub>	Spray Dry Scrubber, Wet Scrubber	[4]
	Boiler No. 2A	NO <sub>x</sub>	SNCR, SCR	[7]
		SO <sub>2</sub>	Spray Dry Scrubber, Wet Scrubber	[4]
	Boiler No. 3A	NO <sub>x</sub>	SNCR, SCR	[7]
		SO <sub>2</sub>	Spray Dry Scrubber, Wet Scrubber	[4]
	Wood Fired Boiler	NO <sub>x</sub>	SCR	[5]
	Minnesota Power - Boswell Energy Center	Unit 1	NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)
Unit 2		NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)	[3]
Unit 3		NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1]
Unit 4		NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1]
Minnesota Power - Taconite Harbor Energy	Boiler 1	NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)	[3]
	Boiler 2	NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)	[3]
Virginia Department of Public Utilities	Boiler 7	NO <sub>x</sub>	SNCR, SCR	[3], [7]
		SO <sub>2</sub>	Spray Dry Scrubber, Wet Scrubber	[3], [4]
	Boiler 11	NO <sub>x</sub>	SCR	[5]
Xcel Energy - Allen S. King	Boiler 1	NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)	[3]
Xcel Energy - Sherburne	Unit 1	NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)	[3]
	Unit 2	NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)	[3]
	Unit 3	NO <sub>x</sub> , SO <sub>2</sub>	N/A (unit retirement)	[3]

### Notes

- [1] No controls recommended; considered effectively controlled for this implementation period.
- [3] No controls recommended; proposed emission unit retirements/shutdowns
- [4] No SO<sub>2</sub> controls recommended; not considered cost-effective for this implementation period.
- [5] No NO<sub>x</sub> controls recommended; not considered cost-effective for this implementation period.
- [7] NO<sub>x</sub> controls recommended for this implementation period.

# 2<sup>nd</sup> implementation period update

## Four factor analysis :: Pulp/paper and sugar beet industry overview

Facility Name	Emission Unit	Pollutants	Control Measure	Outcome
American Crystal Sugar - Crookston	Boiler 1	NO <sub>x</sub>	SNCR, SCR	[5]
		SO <sub>2</sub>	DSI, Dry FGD	[4]
	Boiler 2	NO <sub>x</sub>	SNCR, SCR	[5]
		SO <sub>2</sub>	DSI, Dry FGD	[4]
	Boiler 3	NO <sub>x</sub>	SNCR, SCR	[5]
		SO <sub>2</sub>	DSI, Dry FGD	[4]
American Crystal Sugar - East Grand Forks	Boiler 1	NO <sub>x</sub>	SNCR, SCR	[5]
		SO <sub>2</sub>	DSI, Dry FGD	[4]
	Boiler 2	NO <sub>x</sub>	SNCR, SCR	[5]
		SO <sub>2</sub>	DSI, Dry FGD	[4]
Southern Minnesota Beet Sugar Coop	Boiler 1	NO <sub>x</sub>	LNB w/ OFA, SNCR, SCR	[7]
		SO <sub>2</sub>	DSI, Spray Dry Absorber	[4]

Facility Name	Emission Unit	Pollutants	Control Measure	Outcome
Boise White Paper	Recovery Furnace	NO <sub>x</sub>	N/A (effectively controlled)	[1]
	Boiler 1	NO <sub>x</sub>	LNB w/ FGR & OFA, SCR	[5]
	Boiler 2	NO <sub>x</sub> , SO <sub>2</sub>	N/A (effectively controlled)	[1]
Sappi Cloquet LLC	Power Boiler #9	NO <sub>x</sub>	SNCR, SCR	[5]
		SO <sub>2</sub>	DSI, Spray Dry Absorber	[4]
	Recovery Boiler #10	NO <sub>x</sub>	N/A (effectively controlled)	[1]

### Notes

- [1] No controls recommended; considered effectively controlled for this implementation period.
- [4] No SO<sub>2</sub> controls recommended; not considered cost-effective for this implementation period.
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- [7] NO<sub>x</sub> controls recommended for this implementation period.

# 2<sup>nd</sup> implementation period update

## Tentative schedule

Action	Target Completion Date	Status
Four factor analysis	2021	Complete
Draft agreements with facilities	April 2022	Underway
Begin formal FLM consultation on draft SIP packet (at least 60 days)	May 11, 2022	Underway
FLM consultation complete	July 11, 2022	
Public notice for SIP (at least 30 days)	Late July 2022	
Public meeting for SIP	August-September 2022	
Final SIP submission to EPA	October 2022	



# Moving forward

## Minnesota summary

- Visibility trends continue to improve at Boundary Waters and Voyageurs
  - We're on track to meet the 2064 goal
  - We expect additional visibility improvement due to additional reductions not modeled
- Minnesota has achieved significant reductions in NOX and SO2 emissions:
  - NOX emissions have been reduced by 71% since 2002 (point sources)
  - SO2 emissions have been reduced by 89% since 2002 (point sources)
  - Future 2028 projections estimate a 31% NOX reduction and 18% SO2 reductions (all sources since 2016)
- We're not done yet and the sources we focus on in the future may change

# Moving forward

## Consultation summary

- No specific asks to states
  - Information sharing
  - Documentation for the SIP document
- Minnesota will share the language we include in our SIP
  - Welcome to review and offer comments/clarifications

# Questions



**Hassan Bouchareb**

*Hassan.Bouchareb@state.mn.us*

651-757-2653

**Missouri**





Johnson, Matthew <matthew.johnson@dnr.iowa.gov>

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## RE: Regional Haze Consultation - Iowa/Missouri

1 message

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**Leath, Mark** <mark.leath@dnr.mo.gov>

Tue, Nov 1, 2022 at 2:32 PM

To: "Johnson, Matthew" <matthew.johnson@dnr.iowa.gov>

Cc: "Mcgraw, Jim" <jim.mcgraw@dnr.iowa.gov>, Jessica Reese McIntyre <jessica.reesemcintyre@dnr.iowa.gov>

Thank you Mathew,

I appreciated the chance to discuss the information with you this morning. We concur that no further action steps are required at this time. Thanks again.

Mark Leath, P.E.

Air Quality Planning Section Chief

Missouri Department of Natural Resources

Air Pollution Control Program

Phone: 573-526-5503

Email: [mark.leath@dnr.mo.gov](mailto:mark.leath@dnr.mo.gov)

*Promoting, Protecting and Enjoying our Natural Resources. Learn more at [www.dnr.mo.gov](http://www.dnr.mo.gov).*

**From:** Johnson, Matthew <matthew.johnson@dnr.iowa.gov>

**Sent:** Tuesday, November 1, 2022 2:10 PM

**To:** Leath, Mark <mark.leath@dnr.mo.gov>

**Cc:** Mcgraw, Jim <jim.mcgraw@dnr.iowa.gov>; Jessica Reese McIntyre <jessica.reesemcintyre@dnr.iowa.gov>

**Subject:** Regional Haze Consultation - Iowa/Missouri

Hello Mark,

Thank you for meeting today to review Iowa's draft Regional Haze SIP for the second implementation period and participating in the consultation process required under the Regional Haze Rule.

The presentation (distributed prior to the call) outlines Iowa's preliminary decisions, including: the method we used to conclude that Iowa contributes to HEGL; our source selection methods; and control decisions. For reference, we're currently within Iowa's formal FLM consultation period (October 11 – December 9).

The Iowa DNR believes the current consultation obligations between Missouri and Iowa have been fulfilled and that no additional action steps are warranted or required at this time. However, we will provide additional information if requested and can meet again as needed.

11/1/22, 2:35 PM

State of Iowa Mail - RE: Regional Haze Consultation - Iowa/Missouri

Thank you,  
Matthew Johnson

**Matthew Johnson** | Environmental Specialist Senior  
Air Quality Bureau  
***Iowa Department of Natural Resources***  
**P: 515-725-9554**  
502 E. 9th Street, Des Moines, IA 50319

[www.iowadnr.gov](http://www.iowadnr.gov)

**State of Iowa**  
**Regional Haze State Implementation Plan**  
**2<sup>nd</sup> Planning Period (2019-2028)**

**Summary of Iowa's Draft SIP**

State Consultation

Missouri

November 1, 2022

# Purpose of Today's Meeting

- Highlight key draft decision points in Iowa's draft regional haze SIP
- Provide consultation opportunity



# Iowa's Class I Area Linkages

- Starting Point: **Round 1** - Iowa may contribute to Class I areas in MN and MI
- Next: Use LADCO's 2028<sub>2016</sub> CAM<sub>x</sub> PSAT results to examine current relationships
  - Iowa contributes 3.0% – 3.9% of total 2028 modeled visibility impact (modeled impact means that Rayleigh (& sea salt) are excluded, *i.e.* their impact=0%)
- Then: Add any other Class I area in/above that range: Adds HEGL

State	Class I Area	Iowa Anthro	All Other States Anthro	Mostly Non-Anthro	Round 2 Link?
MI	ISLE	3.9%	44.3%	51.9%	Yes
	SENE	3.3%	51.0%	45.7%	Yes
MN	BOWA	3.2%	38.3%	58.6%	Yes
	VOYA	3.0%	36.0%	61.1%	Yes
<u>MO</u>	<u>HEGL</u>	3.9%	53.3%	42.7%	Yes

# Iowa's Source Selection

- Importance of linkages minimized by conservatively evaluating 12 Class I area:

State	Area
Michigan	Isle Royale
	Seney
Minnesota	Boundary Waters
	Voyageurs
Missouri	Hercules-Glades
	Mingo

State	Area
Arkansas	Caney Creek
	Upper Buffalo
Kentucky	Mammoth Cave
Oklahoma	Wichita Mtns.
S. Dakota	Badlands
	Wind Cave

- Utilized CenSARA's Area of Influence (AOI) analysis conducted by Ramboll
  - Residence time (72-hr back trajectories on 20% most impaired days, 2012-2016)
  - Weighted by the IMPROVE sulfate and nitrate light extinction impacts
  - 2016 emissions from point sources and distance to Class I Areas

# Source Selection Methodology Summary

- AOI Analysis:
  - Produced facility-level extinction weighted residence times for sulfates and nitrates ( $\text{EWRT} \cdot \text{Q}/\text{d-NO}_3$  and  $\text{EWRT} \cdot \text{Q}/\text{d-SO}_4$ )
    - Excel analytical worksheet (modified by DNR; provided as Appendix C-1)
      - This Excel file is resource intensive (can be slow to open and use)
- Multiple reasonable ways to use the data
  - Choice of various screening thresholds
  - Evaluate  $\text{EWRT} \cdot \text{Q}/\text{d-NO}_3$  and  $\text{EWRT} \cdot \text{Q}/\text{d-SO}_4$  metrics separately or combined

# Source Selection Methodology Summary (cont.)

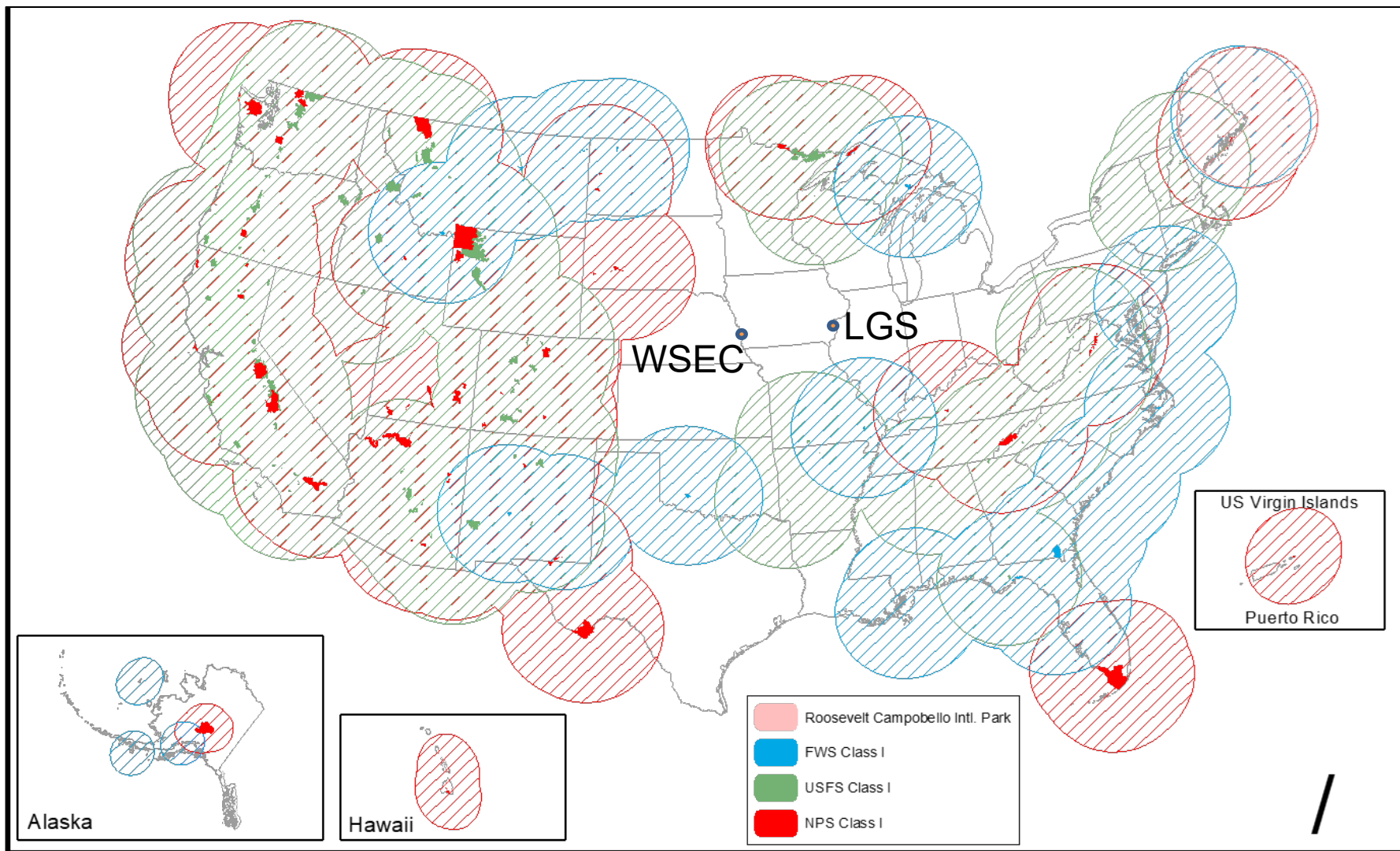
- DNR method
  - No sources screened out (EWRT-NO<sub>3</sub> and EWRT-SO<sub>4</sub> thresholds set to zero)
  - EWRT\*Q/d-NO<sub>3</sub> and EWRT\*Q/d-SO<sub>4</sub> metrics summed (one-atmosphere)
    - Converted to a percentage of the total for the given Class I area
    - Ranked from largest to smallest, with a running total
    - Select all Iowa sources contributing to the majority of the total impact
  - Repeat for each of the 12 Class I areas identified on slide 4

# Results - Iowa Sources Selected for 4-Factor Analysis

- Method identified two Iowa facilities - both operated by MidAmerican Energy Co.
  - Louisa Generating Station (LGS)
  - Walter Scott Jr. Energy Center (WSEC)

Facility	Source Type	Unit ID	Nameplate Capacity (Online Year)	Max Rated Heat Input	Existing SO <sub>2</sub> Controls	Existing NO <sub>x</sub> Controls	2016 SO <sub>2</sub> (tons)	2016 NO <sub>x</sub> (tons)
Louisa Generating Station	EGU (coal-fired)	101	811.9 MW (1983)	8,000 MMBtu/hr	Dry Lime FGD	LNB+OFA	5,156	3,131
Walter Scott Jr. Energy Center	EGU (coal-fired)	3	725.8 MW (1978)	7,700 MMBtu/hr	Dry Lime FGD	LNB+OFA	7,365	4,326
		4	922.5 MW (2007)	7,675 MMBtu/hr	Dry Lime FGD	SCR, LNB+OFA	1,601	1,141

# LGS & WSEC and Areas w/in 300 km of a Class I Area



Produced by NPS Air Resources Division  
Author: KLD

October 2002

# Four Factor Analysis: SO<sub>2</sub> & NO<sub>x</sub> Control Options

- DNR requested that MidAmerican conduct Four Factor analysis of LGS and WSEC
  - MidAmerican provided final version on Aug 10, 2021
- Identified the following control options for both Louisa and WSEC-Unit 3

SO <sub>2</sub>	NO <sub>x</sub>
Operational Improvements to Existing Dry FGD	SNCR
New Wet FGD	SCR

- WSEC-Unit 4
  - Currently well controlled (BACT limits, operation began in 2007)
    - SO<sub>2</sub>: 0.1 lb/MMBtu
    - NO<sub>x</sub>: 0.07 lb/MMBtu
    - DNR including its current permit in the SIP to prevent future visibility impairment

# MidAmerican's Cost Analysis of SO<sub>2</sub> & NO<sub>x</sub> Reductions

Baseline Emissions (2017-2019 avg)	SO <sub>2</sub>				NO <sub>x</sub>			
	Louisa Unit 101		Walter Scott Jr. Unit 3		Louisa Unit 101		Walter Scott Jr. Unit 3	
tons/yr	5,952		8,041		3,774		5,030	
lb/MMBtu	0.292		0.357		0.183		0.223	
Control Measure	Improved Dry FGD	Wet FGD	Improved Dry FGD	Wet FGD	SNCR	SCR	SNCR	SCR
Emissions With Controls (tons/yr)	2,049	1,230	2,256	1,354	3,208	1,035	4,275	1,181
lb/MMBtu w/ Controls	0.1	0.06	0.1	0.06	0.157	0.05	0.181	0.05
Emission Reduction vs Baseline (tons/yr)	-3,903	-4,722	-5,785	-6,687	-566	-2,739	-755	-3,849
Emission Reduction vs Baseline (%)	-66%	-79%	-72%	-83%	-15%	-73%	-15%	-77%
Capital Cost (2019\$)	-	\$398,140,000	-	\$370,150,000	\$14,175,300	\$236,140,160	\$13,851,200	\$238,436,408
Capital Cost Recovery (2019\$/yr)*	-	\$40,136,000	-	\$37,314,000	\$1,429,000	\$20,709,492	\$1,396,300	\$20,910,873
Annual O&M (2019\$)	\$1,102,000	\$1,986,000	\$1,248,000	\$3,849,000	\$2,192,000	\$3,562,450	\$2,844,000	\$3,860,815
Total Annualized Costs (2019\$)	\$1,102,000	\$42,122,000	\$1,248,000	\$41,163,000	\$3,621,000	\$24,271,942	\$4,240,300	\$24,771,688
<b>Cost Effectiveness (2019\$/Ton)</b>	<b>\$282</b>	<b>\$8,920</b>	<b>\$216</b>	<b>\$6,160</b>	<b>\$6,398</b>	<b>\$8,862</b>	<b>\$5,616</b>	<b>\$6,436</b>
Incremental Costs (2019\$/Ton)	n/a	\$50,090	n/a	\$44,250	n/a	\$9,500	n/a	\$6,640



# Fifth Factor (Visibility Impacts) Information

- Source apportion or zero out runs for LGS & WSEC not available
  - Solution: Ratio IA impacts using the LADCO 2028 PSAT data and associated 2028 anthropogenic emissions , but incorporate conservative assumptions
- Iowa's maximum impacts among any of the 5 Class I areas linked to Iowa are:
  - Sulfate =  $1.000 \text{ Mm}^{-1}$  (HEGL)
  - Nitrate =  $0.798 \text{ Mm}^{-1}$  (SENE)
- Iowa's EGUs in 2028 are forecast (ERTAC v16.1) to emit:
  - 78.8% of the state's  $\text{SO}_2$
  - 22.2% of the state's  $\text{NO}_x$
- Using an emission ratio method, Iowa's EGU have the following visibility impacts:
  - $0.788 \text{ Mm}^{-1}$  sulfate impact ( $1.000 \text{ Mm}^{-1} * 78.8\%$ )
  - $0.177 \text{ Mm}^{-1}$  nitrate impact ( $0.798 \text{ Mm}^{-1} * 22.2\%$ )
  - How should we apportion these down to LGS and WSEC?

## Fifth Factor (Visibility Impacts) Information (cont.)

- Conservatively split the total Iowa EGU impacts between LGS and WSEC
  - Roughly doubles the results vs a standard emissions ratio
    - LGS + WSEC emit ~half of IA's 2028 EGU SO<sub>2</sub> and NO<sub>x</sub> emissions
- Apportion that total between LGS and WSEC using the facility's 2028 emissions
  - ~36% of the sulfate impact assigned to LGS                      5,605 / (5,605 + 9,897)
  - ~64% of the sulfate impact assigned to WSEC                      9,897 / (5,605 + 9,897)
  - The NO<sub>x</sub> emissions ratios happen to be about the same (~36% and ~64%)

	<b>Sulfate Impacts (Mm<sup>-1</sup>)</b>	<b>Nitrate Impacts (Mm<sup>-1</sup>)</b>	<b>Sulfate vs Nitrate Impacts Ratio</b>
Iowa EGU Total	0.788	.177	4.4
<b>LGS-assigned</b>	<b>0.285</b>	<b>0.064</b>	4.4
<b>WSEC-assigned</b>	<b>0.503</b>	<b>0.113</b>	4.4

# Control Decisions (Long Term Strategy)

- SO<sub>2</sub>: Require Dry FGD operational improvements at both Louisa & WSEC-Unit 3

	SO <sub>2</sub> Cost Effectiveness 2019\$/ton	SO <sub>2</sub> Reductions (vs 2017-2019 avg)
Louisa	\$282	3,903
WSEC-Unit 3	\$216	5,785
Total Estimated SO <sub>2</sub> Reductions		9,688

- NO<sub>x</sub>: Requiring SNCR or SCR currently unreasonable for RHR purposes
  - NO<sub>x</sub> costs more than an order of magnitude larger than SO<sub>2</sub>
  - Visibility modeling (LADCO 2028<sub>2016</sub> source apportionment) results
    - Iowa EGUs: SO<sub>2</sub> reductions much more effective at improving visibility than NO<sub>x</sub>

# Implementation - Permit Modifications

- DNR has drafted permit modifications for the LGS main boiler and WSEC-3 permits
  - New 30-day rolling average SO<sub>2</sub> limits comparable to 0.10 lb/MMBtu
    - LGS = 770 lb/hr (65.6% reduction below 2017-2019 baseline)
    - WSEC = 800 lb/hr (72% reduction below 2017-2019 baseline)
  - Permits require MidAmerican to conduct a study to develop minimum additive injection rates across varying boiler operating loads
  - Scrubber enhancements must be implemented by December 31, 2023
    - Not dependent on EPA action/approval

# Questions?

- Matthew Johnson
  - Iowa DNR – Air Quality Bureau
  - [matthew.johnson@dnr.iowa.gov](mailto:matthew.johnson@dnr.iowa.gov)
  - (515) 725-9554

**Michigan**



Johnson, Matthew <matthew.johnson@dnr.iowa.gov>

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## Regional Haze Consultation - Iowa/Michigan

1 message

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**Johnson, Matthew** <matthew.johnson@dnr.iowa.gov>

Fri, Nov 4, 2022 at 9:58 AM

To: Robert Irvine <irviner@michigan.gov>

Cc: "Mcgraw, Jim" <jim.mcgraw@dnr.iowa.gov>, Jessica Reese McIntyre <jessica.reesemcintyre@dnr.iowa.gov>

Hello Bob,

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The presentation (distributed prior to the call) outlines Iowa's preliminary decisions, including: the method we used to conclude that Iowa contributes to ISLE and SENE; our source selection methods; and control decisions.

For reference, we're currently within Iowa's formal FLM consultation period (October 11 – December 9).

The Iowa DNR believes the current consultation obligations between Michigan and Iowa have been fulfilled and that no additional action steps are warranted or required at this time. However, we will provide additional information if requested and can meet again as needed.

Thank you,  
Matthew



[www.iowadnr.gov](http://www.iowadnr.gov)

**Matthew Johnson** | Environmental Specialist Senior

Air Quality Bureau

*Iowa Department of Natural Resources*

P: 515-725-9554

502 E. 9th Street, Des Moines, IA 50319



**State of Iowa**  
**Regional Haze State Implementation Plan**  
**2<sup>nd</sup> Planning Period (2019-2028)**

**Summary of Iowa's Draft SIP**

State Consultation

Michigan

November 4, 2022



# Purpose of Today's Meeting

- Highlight key draft decision points in Iowa's draft regional haze SIP
- Provide additional consultation opportunity
  - Monthly/bi-monthly LADCO calls

# Iowa's Class I Area Linkages

- Starting Point: **Round 1** - Iowa may contribute to Class I areas in MN and MI
- Next: Use LADCO's 2028<sub>2016</sub> CAM<sub>x</sub> PSAT results to examine current relationships
  - Iowa contributes 3.0% – 3.9% of total 2028 modeled visibility impact (modeled impact means that Rayleigh (& sea salt) are excluded, *i.e.* their impact=0%)
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<u>MO</u>	<u>HEGL</u>	3.9%	53.3%	42.7%	Yes

# Iowa's Source Selection

- Importance of linkages minimized by conservatively evaluating 12 Class I area:

State	Area
Michigan	Isle Royale
	Seney
Minnesota	Boundary Waters
	Voyageurs
Missouri	Hercules-Glades
	Mingo

State	Area
Arkansas	Caney Creek
	Upper Buffalo
Kentucky	Mammoth Cave
Oklahoma	Wichita Mtns.
S. Dakota	Badlands
	Wind Cave

- Utilized CenSARA's Area of Influence (AOI) analysis conducted by Ramboll
  - Residence time (72-hr back trajectories on 20% most impaired days, 2012-2016)
  - Weighted by the IMPROVE sulfate and nitrate light extinction impacts
  - 2016 emissions from point sources and distance to Class I Areas

# Source Selection Methodology Summary

- AOI Analysis:
  - Produced facility-level extinction weighted residence times for sulfates and nitrates ( $\text{EWRT} \cdot \text{Q}/\text{d-NO}_3$  and  $\text{EWRT} \cdot \text{Q}/\text{d-SO}_4$ )
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# Source Selection Methodology Summary (cont.)

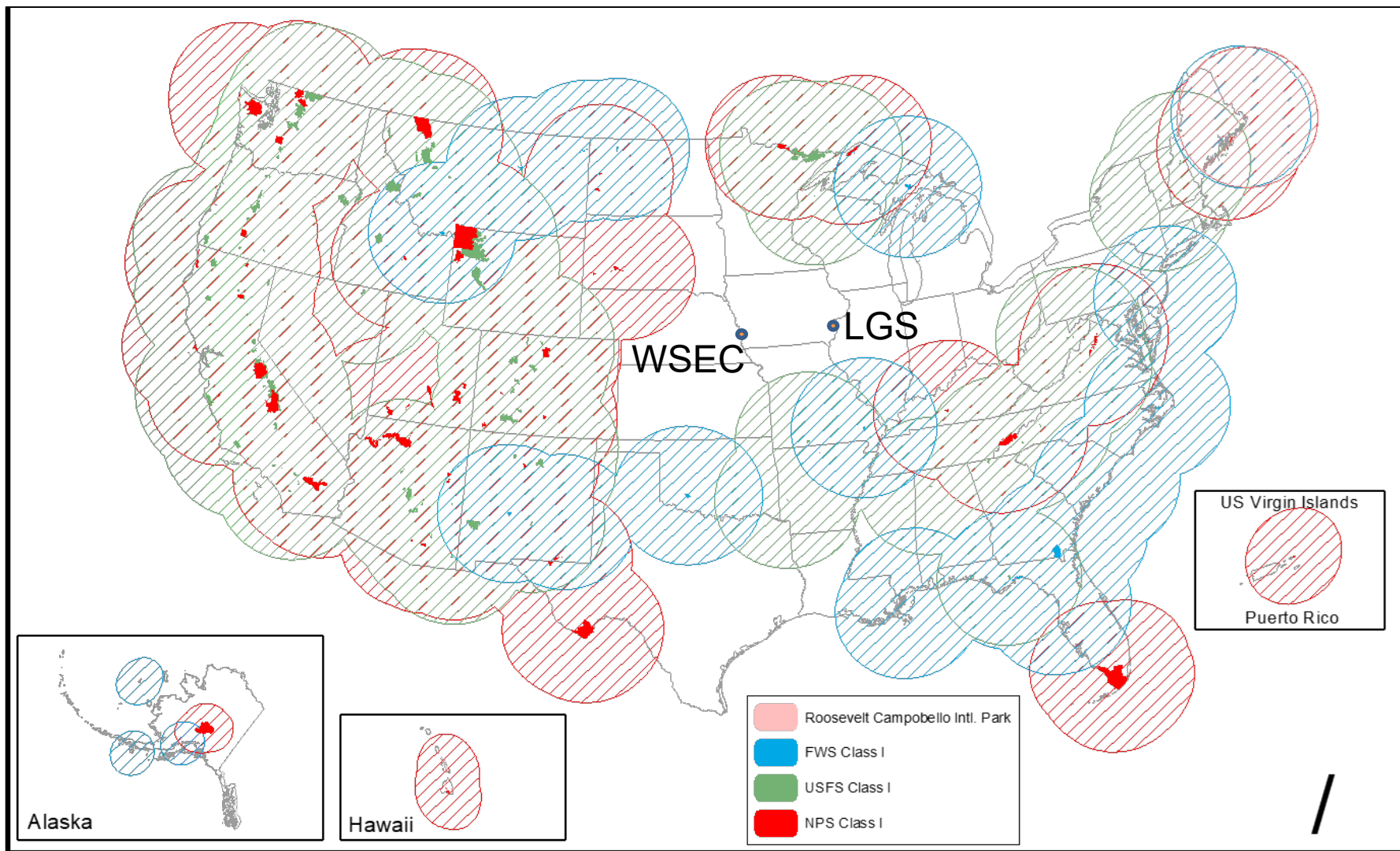
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# Results - Iowa Sources Selected for 4-Factor Analysis

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Produced by NPS Air Resources Division  
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October 2002

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# MidAmerican's Cost Analysis of SO<sub>2</sub> & NO<sub>x</sub> Reductions

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Annual O&M (2019\$)	\$1,102,000	\$1,986,000	\$1,248,000	\$3,849,000	\$2,192,000	\$3,562,450	\$2,844,000	\$3,860,815
Total Annualized Costs (2019\$)	\$1,102,000	\$42,122,000	\$1,248,000	\$41,163,000	\$3,621,000	\$24,271,942	\$4,240,300	\$24,771,688
<b>Cost Effectiveness (2019\$/Ton)</b>	<b>\$282</b>	<b>\$8,920</b>	<b>\$216</b>	<b>\$6,160</b>	<b>\$6,398</b>	<b>\$8,862</b>	<b>\$5,616</b>	<b>\$6,436</b>
Incremental Costs (2019\$/Ton)	n/a	\$50,090	n/a	\$44,250	n/a	\$9,500	n/a	\$6,640

# Fifth Factor (Visibility Impacts) Information

- Source apportion or zero out runs for LGS & WSEC not available
  - Solution: Ratio LADCO's 2028 PSAT results (Iowa's total anthro impacts) by 2028 emissions, but incorporate conservative assumptions
- Iowa's maximum impacts among any of the 5 Class I areas linked to Iowa are:
  - Sulfate =  $1.000 \text{ Mm}^{-1}$  (HEGL)
  - Nitrate =  $0.798 \text{ Mm}^{-1}$  (SENE)
- Iowa's EGUs in 2028 are forecast (ERTAC v16.1) to emit:
  - 78.8% of the state's total anthropogenic  $\text{SO}_2$  emissions
  - 22.2% of the state's total anthropogenic  $\text{NO}_x$  emissions
- Using an emissions ratio method, Iowa's EGU have the following visibility impacts:
  - $0.788 \text{ Mm}^{-1}$  sulfate impact ( $1.000 \text{ Mm}^{-1} * 78.8\%$ )
  - $0.177 \text{ Mm}^{-1}$  nitrate impact ( $0.798 \text{ Mm}^{-1} * 22.2\%$ )
  - How should we apportion these down to LGS and WSEC?

## Fifth Factor (Visibility Impacts) Information (cont.)

- Conservatively split the total Iowa EGU impacts between LGS and WSEC
  - Roughly doubles the results vs a standard emissions ratio
    - LGS + WSEC emit ~half of IA's 2028 EGU SO<sub>2</sub> and NO<sub>x</sub> emissions
- Apportion that total between LGS and WSEC using the facility's 2028 emissions
  - ~36% of the sulfate impact assigned to LGS                      5,605 / (5,605 + 9,897)
  - ~64% of the sulfate impact assigned to WSEC                      9,897 / (5,605 + 9,897)
  - The NO<sub>x</sub> emissions ratios happen to be about the same (~36% and ~64%)

	<b>Sulfate Impacts (Mm<sup>-1</sup>)</b>	<b>Nitrate Impacts (Mm<sup>-1</sup>)</b>	<b>Sulfate vs Nitrate Impact Ratio</b>
Iowa EGU Total	0.788	.177	4.4
<b>LGS-assigned</b>	<b>0.285</b>	<b>0.064</b>	4.4
<b>WSEC-assigned</b>	<b>0.503</b>	<b>0.113</b>	4.4

# Control Decisions (Long Term Strategy)

- SO<sub>2</sub>: Require Dry FGD operational improvements at both Louisa & WSEC-Unit 3

	SO <sub>2</sub> Cost Effectiveness 2019\$/ton	SO <sub>2</sub> Reductions (vs 2017-2019 avg)
Louisa	\$282	3,903
WSEC-Unit 3	\$216	5,785
<b>Total Estimated Actual SO<sub>2</sub> Reductions (tpy)</b>		<b>9,688</b>

- NO<sub>x</sub>: Requiring SNCR or SCR currently unreasonable for RHR purposes
  - NO<sub>x</sub> costs more than an order of magnitude larger than SO<sub>2</sub>
  - Visibility assessment
    - Iowa EGUs - SO<sub>2</sub> reductions much more effective at improving visibility than NO<sub>x</sub>

# Implementation - Permit Modifications

- DNR has drafted permit modifications for the LGS main boiler and WSEC-3 permits
  - New 30-day rolling average SO<sub>2</sub> limits
    - LGS = 800 lb/hr (65.6% reduction below 2017-2019 baseline)
    - WSEC = 770 lb/hr (72% reduction below 2017-2019 baseline)
    - Comparable to 0.10 lb/MMBtu
  - Permits require MidAmerican to conduct a study to develop minimum additive injection rates across varying boiler operating loads to achieve those reductions
  - Scrubber enhancements must be implemented by December 31, 2023
    - Not dependent on EPA action/approval

# Questions?

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