

# REGULATORY ANALYSIS

for proposed revisions to  
Colorado Air Quality Control Commission  
Regulation Number 3, Part F, Section VI.  
(5 CCR 1001-5)



November 13, 2014

Colorado Department of Public Health and Environment  
Air Pollution Control Division  
4300 Cherry Creek Drive South  
Denver, Colorado 80246

## Introduction

On August 21, 2014, the Colorado Air Pollution Control Division (“Division”) requested that the Air Quality Control Commission (“Commission”) set a hearing to consider proposed revisions to Commission Regulation Number 3, Part F, Section VI. (Regional Haze Limits – Best Available Retrofit Technology (BART) and Reasonable Progress (RP)) and corresponding revisions to Colorado’s Regional Haze State Implementation Plan (“SIP”).

On November 5, 2014, PacifiCorp Energy (“PacifiCorp”) filed a request for a Regulatory Analysis with the Commission and the Division, per C.R.S. § 24-4-103(4.5) and the Commission’s Procedural Rules, 5 CCR 1001-1, § V.E.13. This document satisfies the requirements for a Regulatory Analysis.

## Proposal

In 1999, the Environmental Protection Agency (“EPA”) promulgated the Regional Haze Rule, which required states to submit SIPs to address regional haze and visibility in mandatory federal Class I areas. In 2008 and 2011, the Commission adopted Colorado’s Regional Haze SIP, which, among other things, established nitrogen oxide (“NOx”) emission limits for the electric generating Units 1 and 2 at the Craig Station in Northwest Colorado, which facility is operated by Tri-State Generation and Transmission Association, Inc. (“Tri-State”). Following EPA’s subsequent approval of Colorado’s Regional Haze SIP, WildEarth Guardians and the National Parks Conservation Association challenged specific provisions of the SIP, including the NOx emission limits for Craig Station. Parties to that litigation (the State of Colorado, Tri-State, EPA, WildEarth Guardians, and the National Parks Conservation Association) subsequently reached a settlement that is reflected in the proposed regulatory revisions now before the Commission.

The proposed revisions to Regulation Number 3, Part F, Section VI. include specific, targeted revisions to the Regional Haze Best Available Retrofit Technology (“BART”) determinations for Craig Station Units 1 and 2. BART is represented by an emission limit set by the Commission. The Division proposes to revise the NOx emission limit (*i.e.* the BART determination) for Unit 1 from 0.28 lb/MMBtu to 0.07 lb/MMBtu, set an associated compliance deadline of August 31, 2021, and redesignate the BART Alternative determination to a BART determination. The Division also proposes to redesignate the BART Alternative determination for Unit 2 to a BART determination, but does not propose to revise the NOx emission limit or compliance deadline. Decreasing the NOx emission limit for Unit 1 will further reduce NOx emissions and the impairment of visibility in federal Class I areas, as directed under the federal Clean Air Act § 169A and EPA’s Regional Haze Rule. In addition, the proposed revisions are consistent with information provided by the Federal Land

Managers and are supported by the selective catalytic reduction (“SCR”) cost information provided in the SIP materials.

Tri-State, the operator and part owner of Craig Station, and only party to the rulemaking, supports the Division’s proposal.

## **Analysis**

The Colorado Administrative Procedure Act (“APA”), C.R.S. § 24-4-103(4.5), sets forth the requirements for preparation of the Regulatory Analysis. Under the APA, any person may request an agency engaged in a rulemaking to prepare a Regulatory Analysis. The Regulatory Analysis must discuss the topics and issues below. So long as the agency has made a good faith effort to comply with the requirements for the Regulatory Analysis, it satisfies the APA.

### **(I) Class of Persons Affected**

*A description of the classes of persons who will be affected by the proposed rule, including classes that will bear the costs of the proposed rule and classes that will benefit from the proposed rule;*

The classes of persons benefiting from the proposed revisions to Regulation Number 3, and resulting NOx emission reductions, include persons living near Craig Station and persons utilizing the federal Class I areas impacted by emissions from Craig Station. The Class 1 area impacted by emissions from the Craig Station include the Mt. Zirkel Wilderness area. Companies providing or supporting whatever technology or methods are employed at Craig Station Unit 1 to meet the BART emission limit of 0.07 lb/MMBtu may also benefit from the proposed revisions.

The persons potentially bearing the costs of the proposed rule and likely installation of technology to reduce NOx emissions include the customer base served by Craig Station and the owners and operator of Craig Station Unit 1.

### **(II) Quantitative and Qualitative Impacts on Affected Persons**

*To the extent practicable, a description of the probable quantitative and qualitative impact of the proposed rule, economic or otherwise, upon affected classes of persons;*

The Regional Haze Rule is intended to reduce air pollutants that contribute to visibility impairment in Class I areas such as National Parks, National Monuments, and Wilderness areas. NOx emissions from fuel combustion, such as at Craig Station, react in the atmosphere to form nitrate particles and, thus, are an anthropogenic source of visibility impairment. While the Regional Haze Rule is directed at visibility improvements, reduction of these constituents also

provides public health co-benefits. Scientific evidence links NOx exposures to adverse effects on the respiratory system. In addition, ozone, also a respiratory irritant, is formed when NOx and volatile organic compounds react in the presence of heat and sunlight. The Division estimates that the proposed 0.07 lb/MMBtu NOx emission limit for Unit 1 will result in NOx reductions of 4,048 tons per year, in comparison to 779 tons per year associated with the 0.28 lb/MMBtu limit. Therefore, the persons living near Craig Station and persons utilizing the federal Class I areas impacted by emissions from Craig Station Unit 1 will benefit due to the reduction in NOx emissions and the associated improvement in visibility in impacted Class I areas.

The customer base served by Craig Station and the owners and operator of Craig Station may have new costs associated with the likely installation and operation of technology to meet the proposed NOx emission limit of 0.07 lb/MMBtu. The Division estimates the annualized costs<sup>1</sup> of a 0.07 lb/MMBtu NOx emission limit for Unit 1 at \$25,036,709, with a cost effectiveness of \$6,184 per ton of NOx reduced. The costs of this technology differ from the costs for the technology associated with meeting the BART Alternative NOx emission limit of 0.28 lb/MMBtu. The estimated annualized cost to meet the NOx emission limit of 0.28 lb/MMBtu was evaluated to be approximately \$3,797,000 and the estimated cost effectiveness was evaluated to be approximately \$4,877 per ton of NOx reduced.

### (III) Probable Agency Costs

*The probable costs to the agency and to any other agency of the implementation and enforcement of the proposed rule and any anticipated effect on state revenues;*

The proposed rules do not impose any direct costs on the Division. Existing Division staff is prepared to absorb any permitting or inspection actions necessary in response to the proposed revisions. The Division anticipates minimal effect on state revenues as the proposal may reduce the NOx emission fees for Unit 1 but does not assess any additional emissions reporting or permitting fees beyond those that already apply.

### (IV) Comparison to Inaction

*A comparison of the probable costs and benefits of the proposed rule to the probable costs and benefits of inaction;*

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<sup>1</sup> Annualized costs are the initial estimated cost of the control plus annual maintenance and operating costs.

### Probable costs of the proposed rules

The proposed rules are associated with the likely installation of SCR technology. The estimated annualized cost to install and operate SCR at Unit 1, to meet a NOx emission limit of 0.07 lb/MMBtu, is approximately \$25,036,709 and the estimated cost effectiveness is approximately \$6,184 per ton of NOx reduced.

### Probable benefits of the proposed rules

The goal of the Regional Haze Rule is reducing visibility impairment. Therefore, the Division used CALPUFF modeling to determine the projected visibility improvement associated with SCR at Craig Station Unit 1. The probable visibility improvement resulting from the use of SCR is 27%, at a cost effectiveness of approximately \$24,900,000 per deciview,<sup>2</sup> and \$6,184 per ton of NOx removed. The Division generally uses a guideline to determine reasonableness of cost per ton of NOx removed, which is estimated at \$5,000 per ton of NOx removed when paired with a 0.5 deciview improvement. In this case, the Division has determined that the significant deciview improvement that would result from the proposed limit, 1.01 deciviews, justifies the reasonableness of the cost, which is slightly over the \$5,000 per ton guideline. One deciview of change is generally considered to be visually perceptible.

In addition, a NOx emission limit of 0.07 lb/MMBtu, with the associated use of SCR, reduces NOx emissions by approximately 4,000 tons per year. As discussed above, NOx emissions are associated with ozone formation.

### Result of inaction

If the Commission does not adopt the specific proposed revisions, the EPA would likely adopt a federal implementation plan ("FIP") imposing emission limits (BART) on Craig Station Unit 1. The EPA's FIP could impose the same limits as proposed to the Commission in this rulemaking. Alternatively, litigation over the Regional Haze SIP provisions could resume.

#### **(V) Less Costly Methods/Less Intrusive Methods**

*A determination of whether there are less costly methods or less intrusive methods for achieving the purpose of the proposed rule; and*

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<sup>2</sup> The Regional Haze Rule requires the tracking of visibility conditions in terms of the Haze Index (HI) metric expressed in the deciview (dv) unit [40 CFR 51.308(d)(2)]. Generally, a one deciview change in the haze index is likely humanly perceptible under ideal conditions regardless of background visibility conditions.

As an initial matter, the proposed rules represent a new emission limit for Craig Station Unit 1 and do not mandate the use of any specific control technologies. Thus, it is difficult for the Division to evaluate less costly methods of reaching the same proposed emission reductions represented by the 0.07 lb/MMBtu proposed NO<sub>x</sub> emission limit. Notwithstanding the foregoing, the Division states as follows:

During the 2011 SIP development process, the Division considered numerous NO<sub>x</sub> control technology options in Colorado's Regional Haze SIP including: new and modified low NO<sub>x</sub> burners ("LNB") with overfire air ("OFA") system; advanced OFA system or rotating overfire air ("ROFA"); neural network system combustion controls; SNCR, SCR, electro-catalytic oxidation ("ECO"); rich reagent injection ("RRI"); and coal reburn plus SNCR.

SCR is discussed above.

The ECO, RRI, and coal reburn with SNCR technologies have not been demonstrated on a full-size pulverized coal fired boiler and are, therefore, considered technically infeasible. The ROFA technology manufacturer also could not provide definitive guarantee for reductions due to the variability in the quality of coals at Craig Station and was not considered further.

The LNB+OFA technology manufacturer determined that it could upgrade the Craig Station burners and OFA system, but required more information before guaranteeing a specific NO<sub>x</sub> reduction rather than an approximate 10-15% NO<sub>x</sub> reduction. An additional study noted that refinements of existing ULNBs at Craig Station could achieve an approximate 0-2% NO<sub>x</sub> control. The study estimated the initial cost of combustion control refinement at about \$2,200,000 with an annualized 20-year cost of \$122,000.

The neural network system combustion control manufacturer determined that Craig Station was a good candidate for an optimization system that could achieve an approximate 5-15% NO<sub>x</sub> reduction. An additional unit specific study noted that neural network system combustion controls could achieve approximately 0-5% control. The study estimated the initial cost of the system at about \$800,000 with an annualized 20-year cost of \$280,000.

The estimated annualized cost to install and operate SNCR at Unit 1, to meet the previous NO<sub>x</sub> emission limit of 0.28 lb/MMBtu, is approximately \$3,797,000 and the estimated cost effectiveness is approximately \$4,877 per ton of NO<sub>x</sub> reduced. Further, the probable visibility improvement resulting from the use of SNCR is only 8% (as compared to 27% for SCR), at a cost effectiveness of approximately \$12,300,000 per deciview. A NO<sub>x</sub> emission limit of 0.28 lb/MMBtu, with the associated use of SNCR, reduces NO<sub>x</sub> emissions by approximately 800 tons per year (as compared to 4,000 tons per year for SCR). If the existing limits remain in place, Colorado may not benefit from the

additional NO<sub>x</sub> and visibility impairment reductions described above, as negotiated by the parties to the litigation and as proposed by the Division.

#### Craig Unit 1 Control Resultant NO<sub>x</sub> Emissions

Alternative	Control Efficiency (%)	Resultant Emissions		
		Annual Emissions (tons/year)	Annual Average (lb/MMBtu)	30-day Rolling Average (lb/MMBtu)
Baseline	---	5,190	0.278	
Combustion control refinements	2	5,087	0.273	0.31
Neural network system	5	4,931	0.264	0.30
SNCR	15	4,412	0.236	0.27
SCR	78	1,142	0.061	0.07

#### Craig Unit 1 NO<sub>x</sub> Cost Comparisons

Alternative	Emissions Reduction (tpy)	Annualized Cost (\$)	Cost Effectiveness (\$/ton)	Incremental Cost (\$/ton)
Baseline	0	\$0	\$0	---
Combustion control refinements	104	\$122,000	\$1,175	\$1,175
Neural network system	260	\$280,000	\$1,079	\$1,015
SNCR	779	\$3,797,000	\$4,877	\$6,776
SCR	4,048	\$25,036,709	\$6,184	\$6,394

None of the foregoing technologies considered by the Division would achieve the same deciview improvement in visibility or associated emission reductions as the proposed rules. Therefore, the Division does not believe there are less costly or less intrusive methods to obtain the NO<sub>x</sub> reductions associated with a 0.07 lb/MMBtu NO<sub>x</sub> emission limit for Craig Station Unit 1.

Neither the sole party to this rulemaking nor PacifiCorp submitted additional alternative proposals for the Commission to consider.

## (VI) Alternative Methods

*A description of any alternative methods for achieving the purpose of the proposed rule that were seriously considered by the agency and the reasons why they were rejected in favor of the proposed rule.*

The potential modifications to the ULNB burners and a neural network combustion control system, discussed above, were ultimately not selected to control NO<sub>x</sub> emissions at Craig Station because the options do not provide the same level of reductions as the emission limit selected.

The Division is proposing the emission limit of 0.07 lb/MMBtu due to the notable visibility improvements, the reasonable dollars per ton control costs, and the support of Tri-State, EPA, and the environmental group petitioners in the litigation for the lower emission limit at Craig Station Unit 1.

## (VII) Quantification of Data

*Each regulatory analysis shall include quantification of the data to the extent practicable and shall take account of both short-term and long-term consequences.*

A detailed discussion of the quantification of costs and benefits of the proposed rules is set forth in Section IV, above.

The short-term consequences of the proposed revisions include the conclusion of the pending litigation concerning the Colorado Regional Haze SIP provisions for Craig Station, which would result in significant resource savings. The proposed revisions would also provide certainty and enable Tri-State to immediately begin the design and installation process of controls necessary to meet the 0.07 lb/MMBtu NO<sub>x</sub> limit.

The long-term consequences of the proposed revisions include NO<sub>x</sub> reductions of 4,048 tons per year, compared to 779 tons per year associated with the 0.28 lb/MMBtu limit, and the associated visibility improvements.

## Summary

On November 5, 2014, PacifiCorp filed a request for a Regulatory Analysis. This Regulatory Analysis is a careful and considerate response to that request and is a good faith effort on the part of the Division. The Division has addressed, to the best of its ability, issues related to the proposed revisions to Regulation Number 3, Part F, Section VI. and Colorado's Regional Haze SIP.