

Regional Cap-and-Trade Program to Bring “Fracking” States into 2015 Ozone Attainment

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In 2015 the U.S. Environmental Protection Agency revised its National Ambient Air Quality Standard (NAAQS) for ozone from 75 ppb to 70 ppb. This increasingly stringent standard will test the abilities of certain areas to maintain attainment, particularly areas that project continued or increasing oil and gas extraction activities in the future, like states in the Rocky Mountain region. These states have a history of wavering in and out of attainment with the ozone NAAQS and have developed sophisticated strategies to achieve attainment. However, maintaining attainment with the heightened 2015 ozone NAAQS will require additional creative approaches for emissions reductions.

This Note proposes that the Rocky Mountain States collaborate in achieving attainment by creating a cap-and-trade program for reducing ozone. It demonstrates the difficulties states face in developing attainment plans through a case study of Pinedale, Wyoming and then discusses the benefits that a regional cap-and-trade program can produce. Finally, it outlines economic, political, and legal implementation strategies and why the Rocky Mountain States are prime candidates for a collaborative cap-and-trade program.

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INTRODUCTION

The United States' Rocky Mountain region has a long history of oil and gas extraction and production, which generates positive and negative externalities in the area. One negative externality is that the processes and equipment involved in oil and gas extraction and production release the ozone precursor gases nitrogen oxides (“NO_x”) and volatile organic compounds (“VOC”), which react to form ambient ozone in the air we breathe.¹ Ozone generates smog that is harmful to human health, and therefore the United States Environmental Protection Agency (“EPA”) regulates it under the Clean Air Act (“CAA”).² Yet, oil and gas production brings revenue and jobs to the region, so striking a balance between protecting health and supporting the regional economy is a challenge.

Finding a solution to this challenge is particularly important in light of the fact that extraction in the Rocky Mountain region is expected to continually increase in the future.³ According to industry scholars, “the Rocky Mountains are a Persian Gulf of gas,”⁴ and much of the increased oil and gas activity is “concentrated in five intermountain states—Colorado, Montana, New Mexico, Utah, and Wyoming.”⁵ Within this region, Pinedale, Wyoming provides an illustrative case study of oil and gas development and the resulting effects of such activity. The EPA has previously identified Pinedale as an area in Wyoming that did not meet its ozone level requirements under the CAA, “primarily” due to local oil and gas development emissions.⁶ Furthermore, the EPA released even

¹ AMNON BAR-ILAN, ET AL., ENVIRON INTERNATIONAL CORPORATION, FINAL REPORT: DEVELOPMENT OF 2015 OIL AND GAS EMISSIONS PROJECTIONS FOR THE SOUTHWEST WYOMING BASIN 1, 38 (2012), https://www.wrapair2.org/pdf/2015_Proj_Emiss_SWWY_Basin_112712.pdf; *Ozone Basics*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ozone-pollution/ozone-basics#what> (last visited Feb. 12, 2017).

² *Ozone Basics*, *supra* note 1.

³ See, e.g., ANNUAL ENERGY OUTLOOK 2017 WITH PROJECTIONS TO 2050, U.S. ENERGY INFO. ADMIN. 46 (2017), [https://www.eia.gov/outlooks/aeo/pdf/0383\(2017\).pdf](https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf).

⁴ ROCKY MOUNTAIN ENERGY COUNCIL, WHITE HOUSE TASK FORCE ON ENERGY PROJECT STREAMLINING (2003), <http://www.etf.energy.gov/pdfs/RMECWhitePaper.pdf> (quoting Colorado School of Mines Geologist Fred M. Meissner).

⁵ Letter from the U.S. Gov't Accountability Office, to the Honorable Joseph L. Lieberman, Ranking Minority Member on the Senate's Committee on Homeland Security and Governmental Affairs (June 17, 2005), in 17 U.S. GOV'T ACCOUNTABILITY OFFICE, REPORT TO THE RANKING MINORITY MEMBER, COMMITTEE ON HOMELAND SECURITY AND GOVERNMENTAL AFFAIRS, U.S. SENATE: OIL AND GAS DEVELOPMENT (2005).

⁶ Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards, 77 Fed. Reg. 30,088, 30,158 (May 21, 2012) (codified at 40 C.F.R. pt. 81); WYOMING AREA DESIGNATIONS FOR THE 2008 OZONE NATIONAL AMBIENT AIR QUALITY

more stringent ozone standards in 2015, which will likely push Pinedale, and other areas within the Rocky Mountain region, into “nonattainment” with the ozone standards. Consequently, Pinedale and other areas within the region are at risk of nonattainment if they continue to produce oil and gas and will have to develop additional ozone precursor mitigation strategies.

State regulators that implement the CAA should look to other regions in the United States for guidance in developing policy tools to achieve attainment. Both the East and West Coasts host successful regional cap-and-trade programs, but the intermountain region has no such program. Thus, this interior Rocky Mountain region is a natural candidate for a regional cap-and-trade program because its states possess similar needs and problems arising from their oil and gas industries. By creating a central United States cap-and-trade program encompassing these Rocky Mountain States that extract large quantities of natural gas through hydraulic fracturing and horizontal drilling (“fracking”) technologies, the region will enjoy more flexibility in complying with the new CAA requirements. The program could also create revenue that the states can use to invest in technology that further reduces ozone emissions. This market-based solution has the potential to improve air quality while simultaneously catalyzing technological innovation and improving local economies.

This Note advocates for a regional cap-and-trade program in the central United States to provide for a more flexible approach to reach the new National Ambient Air Quality Standard (“NAAQS”) for ozone under the CAA. Section II discusses how the CAA regulates ozone and the CAA’s 2015 NAAQS, as well as ozone’s negative health and environmental externalities. Section III explores the issues that Pinedale, Wyoming faces, to illustrate how one area within the Rocky Mountain focus region has dipped into nonattainment status under the ozone NAAQS, the strategies the state used to bring it back into attainment, and why these are likely insufficient to satisfy the 2015 ozone NAAQS. Section IV then proposes a cap-and-trade program to help Pinedale and the Rocky Mountain region achieve attainment under the 2015 ozone NAAQS, by illustrating how similar programs work in other areas of the United States.

STANDARDS, U.S. ENVTL. PROT. AGENCY 5 (2008), https://archive.epa.gov/ozonedesignations/web/pdf/r8_wy_tsd_final.pdf.

I. THE ENVIRONMENTAL PROTECTION AGENCY REGULATES OZONE THROUGH THE CLEAN AIR ACT

Advances in technology have allowed oil and gas companies to rapidly develop unconventional petrochemical resources across the United States through fracking.⁷ However, fracking activities contribute to air quality problems, including: health risks from hazardous air pollutants, particulate matter, and ozone; visibility degradation; and emissions of methane and other greenhouse gases.⁸ This Note focuses on the health issues resulting from fracking's ozone emissions.

A. *Ozone and Its Importance*

There are two types of ozone in the atmosphere: “good” ozone and “bad” ozone.⁹ Bad ozone is also called “ground level,” “ambient,” and “tropospheric” ozone;¹⁰ it is not emitted directly into the air, but is created by chemical reactions between NO_x and VOC in the presence of sunlight.¹¹ Emissions from industrial facilities, electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NO_x and VOC.¹² Therefore, NO_x and VOCs must be reduced in order to reduce ozone emissions. Meanwhile, good ozone is also called “stratospheric ozone,” which occurs naturally in the upper atmosphere and forms a protective layer shielding the earth from harmful ultraviolet rays.¹³ This Note exclusively refers to “bad” ozone, which is regulated by the CAA because it creates smog and causes harm to human health.

Ozone can cause a number of respiratory issues, particularly among vulnerable populations. People most at risk from breathing air containing ozone include individuals with asthma, children, older adults, and people who are active outdoors, especially outdoor workers.¹⁴ Ozone can cause the muscles in the airways to constrict, leading to wheezing and

⁷ *Unconventional Oil and Natural Gas, Shale Research and Development*, OFFICE OF FOSSIL ENERGY, <https://energy.gov/fe/science-innovation/oil-gas-research/shale-gas-rd> (last visited Mar. 6, 2018).

⁸ *Id.*

⁹ *Ozone Basics*, *supra* note 1.

¹⁰ *Id.*

¹¹ *Id.*

¹² *Id.*

¹³ *Id.*

¹⁴ *Id.*

shortness of breath.¹⁵ It can also inflame and damage the airways; aggravate lung diseases such as asthma, emphysema, and chronic bronchitis; increase the frequency of asthma attacks; make the lungs more susceptible to infection; cause chronic obstructive pulmonary disease; and more.¹⁶ Recent studies consistently report associations between short-term ozone exposures and total non-accidental mortality, which includes deaths from respiratory causes.¹⁷ Due to these health complications, the EPA regulates ozone emissions through the CAA.

B. Heightened 2015 Ozone National Ambient Air Quality Standard

The CAA requires the EPA, states, and federal land managers to implement emission control measures to address severe health issues caused by ozone.¹⁸ To accomplish this, the CAA mandates that the EPA establish, review, and revise the NAAQS to “protect[] . . . public health and welfare” every five years.¹⁹ The NAAQS apply to ozone and five other common air pollutants identified by the CAA, which the EPA calls “criteria air pollutants” because their levels in outdoor air need to be limited based on health criteria.²⁰ In this cooperative federalism model, which will be explained in more detail later, the federal government sets the minimum standards and states are responsible for ensuring these standards are met.²¹ An area will meet attainment for the ozone NAAQS if the fourth highest maximum daily eight-hour ozone concentration each year, averaged over three years, is equal to or below the set threshold concentration.²²

The EPA recently revised the ozone NAAQS in 2015 after concluding that protecting public health and welfare requires lower concentrations of ozone than were previously judged to be safe.²³ The

¹⁵ *Health Effects of Ozone Pollution*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ozone-pollution/health-effects-ozone-pollution> (last visited Feb. 12, 2017).

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ Clean Air Act of 1963 §§ 101–601, 42 U.S.C. §§ 7401–7671 (2000).

¹⁹ 42 U.S.C. § 7409 (2012).

²⁰ *Ozone Basics*, *supra* note 1.

²¹ *See, e.g.*, *E.P.A. v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584, 1617 (2014); 42 U.S.C. § 7410 (2012).

²² *The National Ambient Air Quality Standards, Ozone and Ozone Standards: The Basics*, U.S. ENVTL. PROT. AGENCY 2, <https://www.epa.gov/sites/production/files/2016-04/documents/20151001basicsfs.pdf> (last visited Apr. 12, 2018).

²³ JAMES MCCARTHY, ET AL., EPA’S 2015 OZONE AIR QUALITY STANDARDS, CONG. RES. SERV. 1, 3 (2017), <https://fas.org/sgp/crs/misc/R43092.pdf>.

EPA announced on November 26, 2014 that it would strengthen its ozone standard, and in 2015 it revised the ozone NAAQS from seventy-five to seventy parts per billion (“ppb”).²⁴ The objective of this reduction was to increase protection for children, older adults, and people with asthma or other lung diseases against adverse health effects such as lung and respiratory symptoms.²⁵

After revising the NAAQS, the EPA Administrator has two years to promulgate regulations, which means that the EPA was required to designate attainment and nonattainment areas by October 2017.²⁶ However, after EPA promulgated the 2015 ozone NAAQS, Donald Trump was elected President and his administration’s EPA has delayed designating attainment areas.²⁷ In June 2017, EPA Administrator Scott Pruitt determined that the EPA had insufficient information to designate areas by the deadline of October 2017, and reported that he would extend the deadline by one year.²⁸ States and conservation groups sued the EPA to compel action, and the EPA rescinded the announced one-year extension.²⁹ But the EPA still missed the October 2017 designation deadline and in November 2017 issued designations only for attainment areas.³⁰ This spurred states and conservation groups to sue the EPA for its failure to issue nonattainment designations,³¹ resulting in a D.C.

²⁴ National Ambient Air Quality Standards for Ozone, 80 Fed. Reg. 65,292, 65,292 (Oct. 26, 2015) (codified at 40 C.F.R. pts. 50–53, 58).

²⁵ *Id.* at 65,294.

²⁶ 42 U.S.C. § 7407 (d)(1)(B)(i).

²⁷ Letter from Scott Pruitt, Admin. Env’tl. Prot. Agency, to Doug Ducey, Governor of Ariz. (June 6, 2017), https://www.epa.gov/sites/production/files/2017-06/documents/az_ducey_6-6-17.pdf.

²⁸ Extension of Deadline for Promulgating Designations for the 2015 Ozone National Ambient Air Quality Standards, 82 Fed. Reg. 29,246 (June 28, 2017) (to be codified at 40 C.F.R. pt. 81); *EPA to Extend Deadline for 2015 Ozone NAAQS Area Designations*, U.S. ENVTL. PROT. AGENCY (June 6, 2017), <https://www.epa.gov/news-releases/epa-extend-deadline-2015-ozone-naaqs-area-designations>.

²⁹ See *Sierra Club v. North Dakota*, 868 F.3d 1062, 1064 (9th Cir. 2017); *Withdrawal of Extension of Deadline for Promulgating Designations for the 2015 Ozone National Ambient Air Quality Standards*, 82 Fed. Reg. 37,318 (Aug. 10, 2017) (to be codified at 80 C.F.R. pt. 81).

³⁰ Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards (NAAQS), 82 Fed. Reg. 54,232, 54,232 (Nov. 16, 2017) (to be codified at 40 C.F.R. pt. 81), <https://www.gpo.gov/fdsys/pkg/FR-2017-11-16/pdf/FR-2017-11-16.pdf>; *EPA Responds to State and Tribal Recommendations for the 2015 Ozone Standards*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ozone-designations/epa-responds-state-and-tribal-recommendations-2015-ozone-standards> (last updated Jan. 16, 2018).

³¹ See *Complaint for Declaratory and Injunctive Relief at 2, California v. Pruitt*, No. 3:17-cv-06936 (N.D. Cal. Dec. 5, 2017); Michael J. Gray, *EPA Issues 2015 Ozone*

Circuit order requiring the EPA to report when it would designate nonattainment areas.³² On December 22, 2017, the EPA responded to state and tribal recommendations by indicating the anticipated area designations for the remaining portions of the United States.³³

Some sources believe Administrator Pruitt intends to withdraw the 2015 ozone NAAQS altogether or withdraw it for states involved in the oil and gas industry.³⁴ However, Administrator Pruitt has not commented definitively on this action, so this Note will assume the ozone NAAQS will remain in place.

C. Attainment: How States Achieve It and Consequences if They Do Not

States with areas in which the NAAQS are not met must develop State Implementation Plans (“SIPs”) for achieving and maintaining attainment with the NAAQS.³⁵ The EPA establishes the NAAQS in a manner that allows states flexibility in deciding how best to meet the standards.³⁶ The CAA requires each state to make a SIP within three years after promulgation of the revised NAAQS,³⁷ and that each plan contain measures and techniques necessary to meet the emission requirements of the CAA.³⁸ States with attainment areas are required to prevent “significant deterioration” of air quality.³⁹ Additionally, the CAA contains a “Good Neighbor” provision that prohibits one state from contributing to another state’s nonattainment.⁴⁰

NAAQS Designations, NAT’L L. REV. (Dec. 21 2017), <https://www.natlawreview.com/article/epa-issues-2015-ozone-naaqs-designations>.

³² Gray, *supra* note 31.

³³ *EPA Responds to State and Tribal Recommendations for the 2015 Ozone Standards*, *supra* note 30.

³⁴ Gray, *supra* note 31.

³⁵ 42 U.S.C. § 7410 (2012).

³⁶ *See, e.g.*, *EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584, 1617; 42 U.S.C. § 7410 (2012).

³⁷ 42 U.S.C. § 7410(a)(1).

³⁸ *Id.* § 7410(a)(2)(A).

³⁹ 42 U.S.C. §§ 7410(a)(2)(C)–(D).

⁴⁰ Each state is required to submit to the EPA new or revised SIPs that “contain adequate provisions . . . prohibiting, consistent with the provisions of this subchapter, any source or other type of emissions activity within the State from emitting any air pollution in amounts which will . . . contribute significantly to nonattainment in, or interfere with maintenance by, any other state with respect to any such national . . . air quality standard.” *Id.* § 7410(a)(2)(D)(i)(I).

Areas that are designated nonattainment must use specific technology for their ozone emission sources, which can be costly. In attainment areas, new major sources or major modifications at existing sources require installation of the Best Available Control Technology (“BACT”).⁴¹ In nonattainment areas, new major sources or major modifications must install the lowest achievable emission rate (“LAER”), which is the most stringent emission limitation derived from either the most stringent emission limitation contained in a SIP of any state for such category source or the most stringent emission limitation achieved in practice by such category of source.⁴² While cost can be considered for BACT, cost cannot be considered for LAER, and these technologies can also be expensive. For example, in 2012 the EPA determined that the cost of a natural gas production compressor selective catalytic reducer costs around \$4,444,⁴³ while a cold cleansing degreasing process modification, which reduces fugitive VOC emissions, costs \$15,703 per unit.⁴⁴ By maintaining attainment, a state can avoid the burdensome costs of these technologies.

To better illustrate how states comply with the CAA’s NAAQS, a case study of Pinedale, Wyoming—a region that has waived in and out of attainment—will be outlined and analyzed in the following Part.

II. CASE STUDY: CLEAN AIR ACT PRESSURE ON PINEDALE, WYOMING’S FRACKING INDUSTRY

In 1960, Wyoming’s primary energy production estimates for natural gas were 181,610 million cubic feet, but in 2015 they rose to an estimated 1,793,717 million cubic feet.⁴⁵ In 2015, Wyoming was ranked

⁴¹ BACT is an emissions limitation, which is based on the maximum degree of control that can be achieved and considers economic impact. *Id.* § 7475(a)(4).

⁴² *Id.* § 7501(3).

⁴³ This control is the selective catalytic reduction of NO_x through add-on controls. They control post-combustion control technologies based on the chemical reduction of NO_x into molecular nitrogen (N₂) and water vapor (H₂O). It utilizes a catalyst to increase the NO_x removal efficiency used in natural gas production operations with NO_x emissions greater than ten tons per year. U.S. ENVTL. PROT. AGENCY, IMPORTANT INFORMATION CONCERNING THE MENU OF CONTROL MEASURES 4 (Apr. 12, 2012), <https://www.epa.gov/sites/production/files/2016-02/documents/menuofcontrolmeasures.pdf>.

⁴⁴ *Id.* at 29.

⁴⁵ *State Energy Production Estimates 1960 Through 2015*, U.S. ENERGY INFO. ADMIN. 116 https://www.eia.gov/state/seds/sep_prod/SEDS_Production_Report.pdf (last visited Apr. 12, 2018).

fourth in the nation in natural gas production.⁴⁶ Much of the natural gas industry growth has taken place in Sublette County and was incited by technology improvements and support from the federal government.⁴⁷

A. *Technology and Federal Policies Catalyzed Fracking in Pinedale*

The presence of natural gas in and around Pinedale, which is located within Sublette County, was known for years, but it was commercially impractical to extract due to technological limitations.⁴⁸ The advent of fracking technology unlocked these natural gas reserves in 1993.⁴⁹ By 2000, the Pinedale Anticline Project Area (“Pinedale Anticline”) was one of the newest and most productive gas fields in the continental United States.⁵⁰ Gas reserves are estimated at up to forty trillion cubic feet, which is enough to serve the nation’s entire natural gas demand for twenty-two months.⁵¹ Most of this area is federally owned and primarily managed by the Bureau of Land Management (“BLM”).⁵² On BLM land, the federal government holds the subsurface rights; the BLM leases these rights to oil and gas companies, who then have the right to develop oil and gas wells on these parcels.⁵³

While the natural gas boom in Pinedale was primarily the result of technology, the former President George W. Bush Administration also influenced the pace and scale of the gas development.⁵⁴ The Bush

⁴⁶ Table P4. *Primary Energy Production Estimates in Physical Units, Ranked by State, 2015*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/state/seds/sep_prod/pdf/P4.pdf (last visited Mar. 9, 2018).

⁴⁷ *2017 County Report*, WYO. OIL AND GAS CONSERVATION COMM’N, <http://wogcc.state.wy.us/CountyReportYear.cfm> (last visited Mar. 9, 2018) (select “2017” in the dropdown).

⁴⁸ Ann Chambers Noble, *The Jonah Field and Pinedale Anticline: A Natural Gas Success Story*, WYOHISTORY.ORG (Nov. 8, 2014), <https://www.wyohistory.org/encyclopedia/jonah-field-and-pinedale-anticline-natural-gas-success-story>.

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *What’s Happening at JIO-PAPO?*, JONAH INTERAGENCY OFFICE (Nov. 30, 2017), <https://www.wy.blm.gov/jio-papo/jio/index.htm>.

⁵³ 30 U.S.C. § 181 (2012).

⁵⁴ Bush is the former owner of an oil-drilling company and then-Vice President Dick Cheney was the ex-chairmen of Halliburton, a global energy-services corporation and the corporation that opened up the Jonah Field, within the Pinedale Anticline. In 1997 Canadian oil company Ultra Petroleum and energy-services giant Halliburton, then run by Cheney, used new technology at Jonah to extract the gas. Craig Welch, *For Good or Ill, Bush Clears Path for Energy Development*, SEATTLE TIMES (Sept. 26, 2004),

Administration took office at the height of California's energy crisis and within weeks pushed to open up the West to drilling, unveiling its National Energy Plan in May 2001.⁵⁵ This plan included Executive Order 13212, which established a task force to oversee agency efforts in order to speed up the permitting process for reviewing oil and gas drilling permits; this task force proved to be effective.⁵⁶ The BLM under former President Bush promoted gas exploration on federal lands, increasing annual federal land oil and gas drilling permits by sixty percent compared to the BLM under former President Bill Clinton's Administration.⁵⁷ Today, Pinedale is seeing the effects of these policies through increased fracking activity and ozone emissions.

B. Sources of Ozone Precursors

Equipment and operations involved in oil and gas production are significant sources of VOCs⁵⁸ and NOx, which react in the presence of sunlight to form ground-level (bad) ozone.⁵⁹ While the correlation between VOCs and NOx and the creation of ground-level ozone are still being analyzed, a study of the Uintah Basin in Utah found that ninety-eight percent to ninety-nine percent of the VOCs and fifty-seven percent to sixty-one percent of the NOx came from oil and gas operations within the basin.⁶⁰ This tends to show that the ozone precursors are likely coming from the oil and gas operations and not blowing in from other states or countries.

<https://www.seattletimes.com/nation-world/for-good-or-ill-bush-clears-path-for-energy-development/>. Dick Cheney reported taking a bonus from Halliburton in 2001 of \$1.4 million and deferred payments of \$205,298 and \$162,392 in 2001 and 2002, respectively. Ted Williams, *For a Weeks Worth of Gas*, MOTHER JONES (Sept. 2004), <https://www.motherjones.com/politics/2004/09/weeks-worth-gas/>.

⁵⁵ PETE MORTON ET AL., DRILLING IN THE ROCKY MOUNTAINS: HOW MUCH AND AT WHAT COST? 3 (2004), <https://wilderness.org/sites/default/files/Drilling-in-the-Rocky-Mountains.pdf>.

⁵⁶ *Id.*; Executive Order 13,212, 66 Fed. Reg. 28,357 (2001), <https://www.gpo.gov/fdsys/pkg/FR-2001-05-22/pdf/01-13117.pdf>.

⁵⁷ Welch, *supra* note 54.

⁵⁸ The term volatile organic compounds or VOCs refers to "any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions." 40 C.F.R. § 51.00(s) (2014).

⁵⁹ CONG. RESEARCH SERV., EPA'S 2015 OZONE AIR QUALITY STANDARDS 17 (2017), <https://fas.org/sgp/crs/misc/R43092.pdf>.

⁶⁰ SETH LYMAN & HOWARD SHORTHILL, 2012 UINTAH BASIN WINTER OZONE & AIR QUALITY STUDY, 2 (Feb. 1, 2013), http://binghamresearch.usu.edu/files/ubos_2011-12_final_report.pdf.

Within the Pinedale area, compressor engines are the dominant NOx source category, representing approximately fifty-four percent of total basin-wide NOx emissions.⁶¹ Additional NOx sources include: drill rigs (fourteen percent), heaters (seventeen percent), initial completion flaring (four percent), and dehydrators (one percent).⁶² While VOC emissions are divided among a number of source categories, the majority comes from fugitive emissions, pneumatic devices, and condensate tanks, which collectively represent approximately seventy-five percent of the total basin-wide VOC emissions.⁶³ Other VOC sources include pneumatic pumps, dehydrators, compressor engines, oil tanks, venting recompletions, and venting initial completions.⁶⁴ In the future, condensate tank emissions are projected to decrease due to a combination of decreases in condensate production and control requirements for new tanks.⁶⁵ Meanwhile, pneumatic device and fugitive emissions are projected to increase due to increasing well counts in many of the counties in the area.⁶⁶

Ozone formation requires the presence of VOC, NOx, and sunlight; if either VOC or NOx is absent, ozone does not form.⁶⁷ Reduction of peak ozone levels requires that emissions of VOC or NOx, or both, be reduced.⁶⁸ Because of this complicated dependence of ozone formation on the two precursors, reduction of peak ozone with reduction of the precursors is not one-to-one, and, in fact, situations exist in which if NOx is reduced, ozone concentrations can actually increase.⁶⁹ In such a case, if NOx is continually reduced, a point is reached where ozone stops increasing and starts to decrease, because no ozone forms when NOx levels are eventually reduced to zero.⁷⁰ An ozone abatement problem is

⁶¹ AMNON BAR-ILAN ET AL., *supra* note 1, at 1, 38.

⁶² *Id.* at 40.

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.* at 38.

⁶⁶ *Id.*

⁶⁷ See CONG. RESEARCH SERV., *supra* note 59, at 17.

⁶⁸ AMNON BAR-ILAN ET AL., *supra* note 1, at 1, 38.

⁶⁹ WILLIAM P.L. CARTER & JOHN H. SEINFELD, ESTIMATION OF VOC INCREMENTAL REACTIVITIES IN WINTER OZONE EPISODES IN THE UPPER GREEN RIVER BASIN OF WESTERN WYOMING 1 (2011), http://deq.wyoming.gov/media/attachments/Air%20Quality/Winter%20Ozone/Technical%20Documents/2011-0601_AQD_Estimation-of-VOC-Incremental-Reactivities-in-Winter-Ozone-Episodes-in-the-UGRB-of-Western-Wyoming.pdf.

⁷⁰ *Id.* (“The reason for this facially counterintuitive result is the role of the hydroxyl radical (OH) in the atmospheric photochemistry that leads to the formation of ozone. Its presence is a prerequisite for the series of reactions that allow VOCs to accelerate the conversion of nitrogen monoxide into nitrogen dioxide. The hydroxyl radical, however, also reacts with nitrogen dioxide. Thus, at comparatively low VOC to NOx

determining how ozone will respond if either VOC or NO_x is reduced and designing control strategies accordingly.⁷¹

For example, finding this balance is particularly difficult in Pinedale because Pinedale experiences elevated ozone levels during atypical seasons. Ozone monitoring started in Pinedale area in 2005, which revealed that this area experiences increased ozone episodes in the winter when the air is relatively stagnant and the ground is covered by snow.⁷² The occurrence of these ozone episodes is unusual because, worldwide, the traditional conditions under which elevated ozone concentrations occur are hot summers in large urban areas.⁷³ This demonstrates that areas require site-specific monitoring to find times of elevated ozone precursor concentrations in order to then prescribe the best way to reduce ozone.

C. Pinedale's Wavering "Attainment" Designations

While fracking in the Pinedale area grew steadily since the mid-1990's, the region experienced "by far the sharpest increases" in fracking between 2003 and 2005.⁷⁴ In September 2005, the region was providing natural gas to eleven million homes, based on an average household consumption of six thousand cubic feet per month, which was about a 130 to 135 percent increase over monthly production from 1995.⁷⁵

Ozone concentrations well above the NAAQS were observed at multiple monitoring sites in the Pinedale region in the winters of 2005, 2006, 2008, and 2011.⁷⁶ In March 2009, Governor Dave Freudenthal recommended nonattainment status with respect to the 2008 ozone

concentrations (i.e., where NO_x is relatively abundant), the nitrogen dioxide 'effectively competes with the VOCs for the [hydroxyl] radical.' This reaction decreases the ability of VOCs to convert nitrogen monoxide into nitrogen dioxide, and thus reduces the rate of production of ozone. As a result, if NO_x concentrations are lowered relative to VOC concentrations, 'more of the [hydroxyl] radical pool is available to react with the VOCs, leading to greater formation of ozone.' "); Brian H. Potts, Note, *A Clearer Skies Proposal: The Multi-Category Ratio Approach*, 12 N.Y.U. ENVTL. L.J. 286, 331 (2003).

⁷¹ *Id.*

⁷² CARTER & SEINFELD, *supra* note 69, at 1.

⁷³ *Id.*

⁷⁴ JEFFREY JACQUET, SUBLETTE COUNTY—WYOMING, A BRIEF HISTORY OF DRILLING 1995-2006: THE SOCIOECONOMICS OF GAS 11 (2011), <http://www.sublettewyo.com/DocumentCenter/Home/View/346>.

⁷⁵ *Id.* at 14.

⁷⁶ METEOROLOGICAL SOLUTIONS INC. ET AL., FINAL REPORT 2011 UPPER GREEN RIVER OZONE STUDY, 1-1, 4-7 (Oct. 2011), http://deq.wyoming.gov/media/attachments/Air%20Quality/Winter%20Ozone/Winter%20Ozone%20Study/2011_UGWOS-Monitoring-Final-Report.pdf.

NAAQS for the Upper Green River Basin area (“Green River Basin”), which includes the Pinedale Anticline.⁷⁷ The EPA accepted the recommendation and published a nonattainment designation in April 2012,⁷⁸ which took effect on July 20, 2012.⁷⁹ At this point, it became Wyoming’s task to generate a SIP that would ensure it could lower its ozone emissions to 2008 ozone NAAQS levels.

1. Pinedale’s Strategy for Attaining 2008 Ozone NAAQS

Wyoming primarily used its state air quality agency to re-achieve an attainment designation for the Green River Basin. Air quality regulations in Wyoming are promulgated by the Environmental Quality Council and administered by the Wyoming Department of Environmental Quality (“DEQ”).⁸⁰ The Wyoming DEQ issued comprehensive revisions to its oil and gas permitting guidance in March 2010 and again in September 2013, creating separate requirements for the Green River Basin area in southwest Wyoming.⁸¹

Several programs played important roles in building the foundation to help bring the Green River Basin back into ozone attainment with the 2008 NAAQS.⁸² The state created a citizen task force, called the Upper Green River Basin Air Quality Citizens Advisory Task Force, to help develop strategies to bring the region out of nonattainment.⁸³ The Task Force recommended that the Wyoming DEQ develop stricter emissions requirements for stationary sources, implement “Ozone Action Days,” improve monitoring and reporting, and more.⁸⁴ The state installed

⁷⁷ Letter from Dave Freudenthal, Governor of Wyo., to Carol Rushin, Acting Reg’l Adm’r, U.S. Envtl. Prot. Agency, Region 8 (Mar. 12, 2009) (on file with author).

⁷⁸ 77 Fed. Reg. 30,157–58 (May 21, 2012).

⁷⁹ *Id.*

⁸⁰ *Rulemaking Process*, WYOMING DEP’T OF ENVTL. QUALITY, <http://deq.wyoming.gov/aqd/rule-development/resources/rulemaking-process/> (last visited Feb. 8, 2018); *Air Quality*, WYOMING DEP’T OF ENVTL. QUALITY, <http://deq.wyoming.gov/aqd/> (last visited Feb. 8, 2018).

⁸¹ WYO. DEP’T OF ENVTL. QUALITY, OIL AND GAS PRODUCTION FACILITIES, CHAPTER 6, SECTION 2 PERMITTING GUIDANCE 1, 3 (2013), http://deq.wyoming.gov/media/attachments/Air%20Quality/New%20Source%20Review/Guidance%20Documents/2013-09_%20AQD_NSR_Oil-and-Gas-Production-Facilities-Chapter-6-Section-2-Permitting-Guidance.pdf.

⁸² *Id.*

⁸³ WYO. DEPT. OF ENVTL. QUALITY, AIR QUALITY DIV., UPPER GREEN RIVER BASIN OZONE STRATEGY 1 (2013), http://deq.wyoming.gov/media/attachments/Air%20Quality/Winter%20Ozone/Technical%20Documents/2013_0311_AQD_Winter-Ozone_Strategy-MArch-2013.pdf.

⁸⁴ RECOMMENDATIONS TO THE WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY, UGRB AIR QUALITY CITIZENS ADVISORY TASK FORCE 1–3 (2012),

controls on storage tanks, low bleed or no bleed pneumatic controllers, drill rig engines, and centralized gathering facilities.⁸⁵ To help further address emissions of uncontrolled VOCs in the Green River Basin, Wyoming DEQ developed a state regulation that established requirements for existing oil and gas production facilities and compressor stations located in the ozone nonattainment area.⁸⁶ Wyoming also participated in Ozone Advance measures, which is a voluntary proactive program created by the EPA intended to encourage and identify early emission reductions in ozone attainment areas.⁸⁷ Finally, the state imposed more stringent requirements for sources of ozone precursors.⁸⁸

Ozone monitoring within the Green River Basin Ozone Nonattainment area showed five consecutive winters—2012, 2013, 2014, 2015, and 2016—without exceeding ozone standards.⁸⁹ On May 4, 2016, the EPA issued a final determination of attainment for the 2008 Ozone NAAQS in the Green River Basin.⁹⁰

2. 2015 Ozone NAAQS Status and Looking Forward

On September 29, 2016, the governor of Wyoming formally recommended that the EPA designate all of Wyoming as in attainment with the 2015 ozone NAAQS, including the Upper Green River Basin.⁹¹ On November 17, 2016, the EPA issued regulations stating that it intended to designate nearly every area in Wyoming as “Attainment/Unclassifiable,”⁹² and on December 20, 2017, the EPA

https://www.uwyo.edu/haub/_files/_docs/ruckelshaus/collaboration/2012-ozone/ugrb-task-force-recommendations-final-09-21-2012.pdf.

⁸⁵ *Id.*

⁸⁶ Letter from Nancy Vehr, Wyo. Dep’t of Env’tl. Quality, to Laura Bunte, U.S. Env’tl. Prot. Agency 3 (May 12, 2016), http://deq.wyoming.gov/media/attachments/Air%20Quality/Winter%20Ozone/Technical%20Documents/2016-Ozone-Advance_Final-Letter.pdf.

⁸⁷ *Id.*

⁸⁸ See generally WYO. DEP’T OF ENVTL. QUALITY, *supra* note 81.

⁸⁹ U.S. ENVTL. PROT. AGENCY, WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY—AIR QUALITY DIVISION UPPER GREEN RIVER BASIN OZONE STRATEGY 1 (Apr. 29, 2016), https://www.epa.gov/sites/production/files/2016-05/documents/ugrb_ozone_strategy.may_2016.pdf.

⁹⁰ 81 Fed. Reg. 26,711 (May 4, 2016), <https://www.gpo.gov/fdsys/pkg/FR-2016-05-04/pdf/2016-09729.pdf>.

⁹¹ Letter from Mathew H. Mead, Governor of Wyoming, to Shaun McGrath, Reg’l Adm’r, U.S. Env’tl. Prot. Agency, Region 8 (Sept. 29, 2016), <https://www.epa.gov/sites/production/files/2016-11/documents/wy-rec.pdf>.

⁹² A designation to “attainment/unclassifiable” means that the area has sufficient data to determine that the area is meeting the ozone NAAQS or that due to no data or

provided Wyoming a “preliminary response,” stating that it intends on designating the remaining areas as “Attainment/Unclassifiable.”⁹³ As for the other Rocky Mountain States, the EPA designated areas within Colorado, New Mexico, and Utah as nonattainment.⁹⁴ As mentioned earlier, some sources believe Administrator Pruitt plans on providing leniency for areas that host burgeoning oil and gas industries, although evidence of such actions remains unconfirmed.⁹⁵ Therefore, if Administrator Pruitt does provide this leniency, then Wyoming might face reduced requirements because it is a state with a burgeoning oil and gas industry. However, the state should still be concerned with reducing ozone, regardless of the federal NAAQS requirement, because ozone is proven to cause human health complications.

Additionally, as discussed earlier, an area will be in attainment with the 2015 ozone NAAQS if the fourth highest maximum daily eight-hour ozone concentrations each year, averaged over three years, is 70 ppb or below.⁹⁶ The next ozone designation will be determined based on data from 2014 to 2016.⁹⁷ The Pinedale ozone monitoring station registered the four highest eight-hour average concentrations of ozone between 2014 and 2016 ranging from 57 to 63 ppb.⁹⁸ However, the monitoring

insufficient data, the EPA cannot make a determination. U.S. ENVTL. PROT. AGENCY, GUIDANCE ON AIR QUALITY DESIGNATIONS FOR THE 8-HOUR OZONE NAAQS (Mar. 28, 2000), https://archive.epa.gov/ttn/ozone/web/html/des00328.html#N_1; 82 Fed. Reg. 54,232 (Nov. 16, 2017), <https://www.gpo.gov/fdsys/pkg/FR-2017-11-16/pdf/2017-24640.pdf>.

⁹³ Letter from Douglas H. Benevento, Reg’l Adm’r U.S. EPA, Region 8 to Mathew Mead, Governor of Wyoming (Dec. 20, 2017), <https://www.epa.gov/sites/production/files/2017-12/documents/wy-epa-resp-ozone.pdf>; *see also* 42 U.S.C. § 7407 (d)(1)(A)(iii) (2012).

⁹⁴ U.S. ENVTL. PROT. AGENCY, 2015 OZONE STANDARDS—STATE RECOMMENDATIONS, EPA RESPONSES, AND TECHNICAL SUPPORT DOCUMENTS, <https://www.epa.gov/ozone-designations/2015-ozone-standards-state-recommendations-epa-responses-and-technical-support> (last visited Feb. 8, 2018).

⁹⁵ Gray, *supra* note 31.

⁹⁶ *The National Ambient Air Quality Standards, Ozone and Ozone Standards: The Basics*, *supra* note 22, at 2.

⁹⁷ *Id.*

⁹⁸ *See* METEOROLOGICAL SOLUTIONS INC., ANNUAL SUMMARY OF METEOROLOGICAL AND AIR QUALITY DATA AT THE WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY SUBLETTE COUNTY WYOMING PINEDALE MONITORING SITE OCTOBER AND NOVEMBER 2016 at 2-7 (2017), <http://www.wyvisnet.com/Data/Reports.aspx> (select “Pinedale” in the dropdown; then select “2016 - Quarter 4”); METEOROLOGICAL SOLUTIONS INC., ANNUAL SUMMARY OF METEOROLOGICAL AND AIR QUALITY DATA AT THE WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY SUBLETTE COUNTY WYOMING PINEDALE MONITORING SITE FOURTH QUARTER 2015 at 2-9 (2016), <http://www.wyvisnet.com/Data/Reports.aspx> (select “Pinedale” in the dropdown; then select “2015 - Annual”); METEOROLOGICAL

site has registered the following four highest eight-hour average concentrations of ozone for quarters one through three in 2017: 88, 80, 78, and 77 ppb.⁹⁹ Clearly, these are above the 2015 ozone NAAQS of 70 ppb and will increase the three-year average and potentially push the area out of attainment in the near future.

Furthermore, Wyoming has many new oil and gas projects in the pipeline. For example, in the Green River Basin, a project called the “Normally-Pressured Lance Natural Gas Development Project” proposes to develop 3,500 directionally drilled wells in one area south of Pinedale.¹⁰⁰ In addition, there are over ten other oil and gas development projects that propose drilling thousands more wells throughout Wyoming, and this will be on top of current ongoing drilling projects.¹⁰¹

Also, according to a 2015 Stanford Environmental Law Journal article by Joel Minor, the data might not be indicative of actual ozone levels.¹⁰² The EPA does not require air pollution monitoring in rural areas and so large areas of rural land with fracking operations are not monitored for ozone.¹⁰³ Accordingly, a recent study concluded that “the extent to which these increased [oil and gas] emissions impact air quality, especially in highly developed shale gas regions where there are

SOLUTIONS INC., ANNUAL SUMMARY OF METEOROLOGICAL AND AIR QUALITY DATA AT THE WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY SUBLETTE COUNTY WYOMING PINEDALE MONITORING SITE JANUARY 1–DECEMBER 31, 2014 at 2–11 (2015), <http://www.wyvisnet.com/Data/Reports.aspx> (select “Pinedale” in the dropdown; then select “2014 - Annual”).

⁹⁹ AIR RESOURCE SPECIALISTS, WYOMING AIR QUALITY MONITORING NETWORK, PINEDALE, WYOMING: FIRST QUARTER at 4-9 (2017), <http://www.wyvisnet.com/Data/Reports.aspx> (select “Pinedale” in the dropdown; then select “2017 – Quarter 1”); AIR RESOURCE SPECIALISTS, WYOMING AIR QUALITY MONITORING NETWORK, PINEDALE, WYOMING: THIRD QUARTER at 4-9 (2017), <http://www.wyvisnet.com/Data/Reports.aspx> (select “Pinedale” in the dropdown; then select “2017 – Quarter 3”); AIR RESOURCE SPECIALISTS, WYOMING AIR QUALITY MONITORING NETWORK, PINEDALE, WYOMING: SECOND QUARTER at 4-9 (2017), <http://www.wyvisnet.com/Data/Reports.aspx> (select “Pinedale” in the dropdown; then select “2017 – Quarter 2”).

¹⁰⁰ BUREAU OF LAND MGMT., OCTOBER 2017 NEPA HOTSHEET: BLM WYOMING LAND USE PLANS AND PROPOSED PROJECTS 3 (Oct. 2017), <https://www.blm.gov/documents/wyoming/planningnepa/planningnepa/wyoming-nepa-hotsheet>.

¹⁰¹ *Id.*

¹⁰² Joel Minor, *Completing the Bridge to Nowhere: Prioritizing Oil and Gas Emissions Regulations in Western States*, 34 STAN. ENVTL. L. J. 57, 78 (2015) (“The five air monitors in the Eagle Ford Shale, an area the size of Massachusetts, are all in urban areas at the formation’s fringe. There are only two monitors located in the five core Bakken shale counties in North Dakota, one in a National Park outside the shale formation, and another which has not gathered data since the Bakken boom began in 2009.”).

¹⁰³ *Id.*

no air monitors, represents a substantial data gap and hinders effective air quality management.”¹⁰⁴ This could imply that the ozone monitoring in Wyoming might not accurately reflect the actual ozone levels in rural areas and therefore, regardless of reaching attainment with the NAAQS, rural residents might be at risk to health complications due to ozone.

While Pinedale has made a valiant effort to reduce ozone emissions, the region’s resources will be strained in attempting to maintain attainment with the new NAAQS. Furthermore, when looking at the issue more broadly, there is no one-size fits-all solution to reduce ozone because each area within the Rocky Mountain region has unique topographical features and economic industries that might create different issues and barriers to achieving attainment. So if this region worked together, the states might be able to collectively find ways to reduce the burdens of the 2015 ozone NAAQS while improving their residents’ health. For these reasons, and the reasons discussed in the next section, Pinedale is an area that could benefit greatly from reaching attainment by participating in a regional cap-and-trade program that allows flexibility in finding the least-cost approach to reaching NAAQS attainment.

III. A SOLUTION: REGIONAL CAP-AND-TRADE PROGRAM FOR ROCKY MOUNTAIN STATES

Pinedale’s incentives and constraints demonstrate why Wyoming and the Rocky Mountain States are prime candidates for a regional ozone cap-and-trade program. First, the region’s oil and gas industry is growing while the ozone NAAQS is becoming increasingly stringent, so there is a need to find a solution that can achieve attainment while supporting the states’ economies. Second, the region has similar industry interests in oil and gas extraction and could collectively benefit from advances in more ozone emission efficient technologies. Finally, states in the region could benefit significantly from sharing resources through a cap-and-trade program that will generate a more economically efficient solution to reaching NAAQS attainment than attempting to reach attainment as individual states.

¹⁰⁴ Annamarie G. Carlton et al., *The Data Gap: Can a Lack of Monitors Obscure Loss of Clean Air Benefits in Fracking Areas?*, 48 ENVTL. SCI. & TECH. 893, 893 (2014).

A. *Cap-and-Trade: How It Works*

A number of different policy tools can be used to address environmental concerns but a cap-and-trade program is the best option for this situation. Policy tools include economic-incentive approaches, such as environmental taxes and emission trading; command-and-control approaches, such as technology mandates or emissions rate standards; and non-regulatory approaches, such as voluntary agreements and eco-labeling.¹⁰⁵ By 2014, around forty countries and two-dozen states, provinces, and cities had adopted some form of carbon pricing as an economic incentive to reduce emissions.¹⁰⁶ Most frequently this pricing has come in the form of a cap-and-trade system, and sometimes a tax.¹⁰⁷ Both of these options are more economically flexible alternatives to achieving goals that otherwise would have to be mandated through traditional command-and-control regulation.¹⁰⁸ An emissions tax has many benefits, but one drawback is that it cannot guarantee the quantity of emissions reductions that will occur for the price set.¹⁰⁹ That is why this Note advocates instead for a cap-and-trade program.

A cap-and-trade system starts with a cap on the total amount of emissions that can be released by certain regulated sectors of the economy.¹¹⁰ The cap lowers over time, guaranteeing that a certain quantity of emission reductions will occur.¹¹¹ The prices that emitters face will vary because the emitters must buy “allowances” for each ton of emissions they release.¹¹² Emitters can buy these allowances from the government in auctions or can purchase, sell, or trade allowances from other emitters in the marketplace.¹¹³ To demonstrate, in this scheme, “[i]f the managers operating plant A think they can clean up a pollutant more cheaply than those in charge of plant B, they should be expected to sell some of their pollution rights to B at a mutually advantageous price,”

¹⁰⁵ U.S. EPA OFFICE OF AIR AND RADIATION, TOOLS OF THE TRADE: A GUIDE TO DESIGNING AND OPERATING A CAP AND TRADE PROGRAM FOR POLLUTION CONTROL 2–5 (2003).

¹⁰⁶ Rodney L. Brown, Jr., *State-by-State or Regional Solutions?*, in 2015 CLIMATE CHANGE LAW AND REGULATIONS: PLANNING FOR A CARBON-CONSTRAINED REGULATORY ENVIRONMENT 7B-1, 7B-5 (Rocky Mountain Mineral Law Found. ed., 2015).

¹⁰⁷ *Id.*

¹⁰⁸ *Id.* at 7B–2.

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ *Id.*

thereby enabling more economically efficient reductions.¹¹⁴ The revenue from the emissions allowances can then be invested in additional emission mitigation strategies, such as technology and research. This technology and research could be particularly beneficial to an area that participates in the same industry, because industry members can collectively reap the benefits of the technology and research investments.

These programs produce benefits like increased cost-effectiveness, improved market liquidity and price discovery, opportunities for partner jurisdictions' businesses to benefit from an expanded program, the potential to leverage greater emissions reductions than could be developed by one jurisdiction acting on its own, and centralized administrative costs.¹¹⁵ For example, a state that has achieved less in the way of cost-effective energy efficiency could receive technical assistance from states that have implemented more of their energy efficiency measures, thereby picking up all of the region's low-hanging energy efficiency fruit.¹¹⁶ This system also reduces governmental costs because the information-processing burden of the economic and technological assessments is passed off to the emitters.¹¹⁷

B. Spatial Scope of the Program

The emissions' spatial scope and movement patterns will define the cap-and-trade program logistics. The United States hosts several regional cap-and-trade programs for "global pollutants," which include pollutants like greenhouse gases that cause damage everywhere on earth regardless of the point of emission. Examples of this type of program include California's Global Warming Solutions Act and the East Coast's Regional Greenhouse Gas Initiative.¹¹⁸

¹¹⁴ *Id.*

¹¹⁵ Tiffany Michou, *California's Current Leadership on Climate Change and Greenhouse Gas Reduction*, RESEARCH GATE (Nov. 2017), https://www.researchgate.net/publication/322556811_California's_Current_Leadership_On_Climate_Change_And_Greenhouse_Gas_Reduction; *Discussion of Findings Required by Government Code Section 12894*, CAL. AIR RES. BD. 2 (Jan. 2017), https://www.arb.ca.gov/cc/capandtrade/linkage/sb1018_findings_ontario.pdf.

¹¹⁶ Craig Gannett, *Implementing Section 111(d) of the Clean Air Act: The Pathway to Regional Cap-and-Trade Programs?*, in 2015 CLIMATE CHANGE LAW AND REGULATIONS: PLANNING FOR A CARBON CONSTRAINED 8-1, 8-9 (Rocky Mountain Mineral Law Found. ed., 2015).

¹¹⁷ Bruce Ackerman & Richard Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1343 (1985).

¹¹⁸ *Program Overview and Design*, REG'L GREENHOUSE GAS INITIATIVE: AN INITIATIVE OF THE NE. AND MID-ATLANTIC STATES OF THE U.S., <https://www.rggi.org>

The United States also hosts several regional cap-and-trade programs for “transient” local pollutants, which address the issue of upwind emitters in one state generating pollutants that transport the pollutants to another state, and cause harmful effects in the state in which they land. For example, in the Northeast’s Acid Rain Program, the states initiated a cap-and-trade program to reduce sulfur dioxide emissions, which were causing acid rain in the region.¹¹⁹ Additionally, in the eastern United States, the EPA established the NO_x Budget Trading Program to reduce the regional transport of NO_x emissions, which were emitted from large combustion sources in one state and created harmful effects in neighboring states.¹²⁰

Finally, the United States hosts intrastate cap-and-trade programs to reduce local pollutants within designated nonattainment areas. These include the Regional Clean Air Incentives Market in California and the Mass Emissions Cap and Trade Program (“MECT”) in Texas.¹²¹

Policy makers must first determine the nature and movement patterns of the pollutant before creating a cap-and-trade program. Because ozone is a local pollutant and its movement patterns are still being studied, an ozone cap-and-trade program will likely require a combination of the regional and intrastate programs. The following subsections provide examples of each of these to better understand how they work and the possibility of catering them to address the Rocky Mountain region’s fracking-caused ozone emission issues.

1. A Regional Cap-and-Trade Program

The Regional Greenhouse Gas Initiative (“RGGI,” pronounced “Reggie”) is the first mandatory greenhouse gas emissions reduction program in the United States, and it is viewed as the most effective emissions reductions cap-and-trade program to date.¹²² RGGI is a cooperative effort among the states of Connecticut, Delaware, Maine,

/program-overview-and-design/elements; *Assembly Bill 32 Overview*, CAL. AIR RES. BD., <https://www.arb.ca.gov/cc/ab32/ab32.htm>.

¹¹⁹ Byron Swift, *How Environmental Laws Work: An Analysis of the Utility Sector’s Response to Regulation of Nitrogen Oxides and Sulfur Dioxide Under the Clean Air Act*, 14 TUL. ENVTL. L.J. 309, 315 (2001).

¹²⁰ *Clean Air Markets: NO_x Budget Trading Program*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/airmarkets/nox-budget-trading-program> (last updated Feb. 7, 2017).

¹²¹ *EPA’s Evaluation of the RECLAIM Program in the South Coast Air Quality Management District*, U.S. ENVTL. PROT. AGENCY, <https://www3.epa.gov/region9/air/reclaim/> (last updated Jan. 9, 2018); *Mass Emissions Cap and Trade Program*, TEX. COMM’N ON ENVTL. QUALITY, https://www.tceq.texas.gov/airquality/banking/mass_ect_prog.html (last updated Jan. 3, 2018).

¹²² Brown, *supra* note 106, at 7B-5.

Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont to reduce carbon emissions from the power sector through a cap-and-trade system.¹²³ RGGI applies only to emissions from regulated power plants that together produce ninety-five percent of the region's electric-generation carbon emissions.¹²⁴ Together, participating states set a cap for total regional emissions,¹²⁵ and the cap declines over time, which gradually restricts emission limits.¹²⁶

RGGI uses the "cap-and-invest" model to reduce pollution.¹²⁷ States sell the allowances through quarterly auctions and invest the proceeds in energy efficient programs, renewable energy development, and other consumer-benefit programs.¹²⁸ RGGI, Inc. is a nonprofit corporation created by the participating states to administer and implement technical aspects of the program, including administering the auctions.¹²⁹ To control for uncertainties regarding costs and compliance, the RGGI auction program includes certain safeguards such as a soft price ceiling, a minimum auction price, banking allowances for later use, and offsets from greenhouse gas reductions in other non-power-generation sectors.¹³⁰

The RGGI program is as an overall success.¹³¹ The power sector's greenhouse gas emissions are more than forty percent lower in the RGGI region than they were in 2005.¹³² To be sure, there are many factors that also contribute to this reduction, including improved energy efficiency measures, a broad switch from coal and oil to natural gas use in power plants, carbon price signals, and regulatory predictability.¹³³ Additionally, during the same period that RGGI was in place and emissions were reduced, RGGI states' economies grew.¹³⁴

¹²³ *Id.*

¹²⁴ *Id.*

¹²⁵ *Id.*

¹²⁶ *See generally Welcome*, REG'L GREENHOUSE GAS INITIATIVE: AN INITIATIVE OF THE NE. AND MID-ATL. STATES OF THE U.S., <https://www.rggi.org/> (last visited Jan. 30, 2018).

¹²⁷ *The Regional Greenhouse Gas Initiative (RGGI)*, N.Y. STATE DEP'T OF ENVTL. CONSERVATION, <http://www.dec.ny.gov/energy/rggi.html> (last visited Jan. 30, 2018).

¹²⁸ Brown, *supra* note 106, at 7B-6.

¹²⁹ *See Welcome*, *supra* note 126.

¹³⁰ *Id.*

¹³¹ *The Regional Greenhouse Gas Initiative (RGGI)*, *supra* note 127.

¹³² *Id.*

¹³³ *Id.*

¹³⁴ *Id.*

Total auction proceeds through December 31, 2012 were \$1.1 billion.¹³⁵ Of that amount, approximately \$707 million has been invested in consumer-benefit programs.¹³⁶ The RGGI Memorandum of Understanding requires member states to use at least twenty-five percent of proceeds for consumer benefits, but states have surpassed that minimum and invested more than seventy-five percent in such programs.¹³⁷ Proceeds have been invested in four primary areas: energy efficiency, clean energy development, greenhouse gas abatement, and direct bill assistance.¹³⁸ An independent study by the Analysis Group projected positive economic outcomes through the end of this decade based on investment of the first three years (2009–2011) of RGGI proceeds.¹³⁹ These include \$1.6 billion in economic benefits, \$1.1 billion in electricity bill savings for consumers, 16,000 additional job-years, and \$765 million retained in local economies due to reduced fossil fuel demand.¹⁴⁰

Finally, even while federal environmental policies are in full retreat under President Trump, RGGI has been a “regulatory backstop” that is a “picture of policy stability,” and has even grown by welcoming New Jersey as its tenth state participant.¹⁴¹ Experts say that without meaningful federal climate policies, it is important that states lead the way.¹⁴²

The key reasons as to why this program works so well in a regional setting are: (1) it is easy to monitor and verify because of the declining cap, with the enforcement on generators; (2) the regional program aligns with the regional industry; (3) it allows states to “pool” resources; and (4) it eliminates difficult cross-state “accounting” challenges.¹⁴³

¹³⁵ REG’L GREENHOUSE GAS INITIATIVE: AN INITIATIVE OF THE NE. AND MID-ATL. STATES OF THE U.S., REGIONAL INVESTMENT OF RGGI CO2 ALLOWANCE PROCEEDS 2012 (2014), https://www.mass.gov/files/2017-07/2012-Investment-Report_ES.pdf.

¹³⁶ *Id.*

¹³⁷ *Id.*

¹³⁸ *Id.*

¹³⁹ PAUL J. HIBBARD ET AL., THE ECONOMIC IMPACTS OF THE REGIONAL GREENHOUSE GAS INITIATIVE ON NINE NORTHEAST AND MID-ATLANTIC STATES: REVIEW OF RGGI’S SECOND THREE-YEAR COMPLIANCE (2015).

¹⁴⁰ *Id.* at 19–20.

¹⁴¹ Keith Goldberg, *Northeast Cap-and-Trade Turns 10: A RGGI Report Card*, LAW360 (Feb. 6, 2018), https://www.law360.com/energy/articles/1009548/northeast-cap-and-trade-turns-10-a-rggi-report-card?nl_pk=02c5dcfa-144e-49fd-bcb4-d912e155522f&utm_source=newsletter&utm_medium=email&utm_campaign=energy.

¹⁴² *Id.*

¹⁴³ Ken Kimmell, *Clean Power Home Run: Regional Path to Success, in 2015 CLIMATE CHANGE LAW AND REGULATIONS*, ROCKY MOUNTAIN MINERAL LAW FOUND. 7C-1, 7C-7 (2015).

2. *An Intrastate Cap-and-Trade Program*

In 2001, the EPA approved the MECT program as a revision to Texas' SIP for nonattainment with the ozone NAAQS.¹⁴⁴ The Texas Commission on Environment Quality's ("Texas CEQ") cap-and-trade program was established to provide additional flexibility for complying with certain state and federal air quality requirements while creating a net reduction in total emissions.¹⁴⁵ It established a mandatory annual NOx emission cap on emissions sources within the Houston-Galveston nonattainment area.¹⁴⁶ It allows for allocation, trading, and banking of allowances where an allowance is equal to one ton of NOx emissions, with a cap established at levels demonstrated as necessary for the area to attain the NAAQS for ozone.¹⁴⁷ The Texas CEQ maintains a registry of the allowances and tracks the allowances owned by each site.¹⁴⁸ Allowances may be traded at any time among emitters and recorded in the registry and the prices of traded allowances are made publicly available.¹⁴⁹ This program has been highly successful in reducing emissions and the entire state of Texas is currently in attainment with the 2015 ozone NAAQS.¹⁵⁰

3. *Rocky Mountain Ozone: Regional and Intrastate Program*

The persistence of these two initiatives—RGGI and MECT—and the launch of others evince both the viability of carbon markets and an ongoing commitment by subnational governments to address harmful pollution emissions.¹⁵¹

As mentioned earlier, studies have indicated that ozone is a local pollutant because most NOx and VOCs are sourced from within nonattainment areas. It follows that intrastate cap-and-trade programs within designated nonattainment areas would be the best way to reduce

¹⁴⁴ 40 C.F.R. § 52.2270 (2017).

¹⁴⁵ TEX. COMM'N ON ENV'T QUALITY, MASS EMISSION CAP & TRADE PROGRAM (MECT) 1 (2002), http://tceq.info/assets/public/permitting/air/Guidance/Banking/mect_guidance.pdf.

¹⁴⁶ *Id.*

¹⁴⁷ *Id.*

¹⁴⁸ *Id.* at 13.

¹⁴⁹ *Id.* at 21.

¹⁵⁰ *Ozone Designations*, U.S. ENVTL PROT. AGENCY, <https://www.epa.gov/ozone-designations/2015-ozone-standards-state-recommendations-epa-responses-and-technical-support> (last updated Dec. 22, 2017).

¹⁵¹ Eleanor Stein, *Regional Initiatives to Reduce Greenhouse Gas Emissions*, in GLOBAL CLIMATE CHANGE AND U.S. LAW 272 (Michael B. Gerrard & Jody Freeman eds., 2014).

ozone in these areas. However, more research could be done to determine if ozone is being transported to the Rocky Mountain region from other states, or even from other countries.¹⁵² If that were the case, then a regional cap-and-trade program would be the best solution to reduce ozone emissions. This Note proposes a combination of the regional and intrastate cap-and-trade programs, which will produce allowance auction revenue that can be invested in researching regional sources and movement of ozone, as well as emission-efficient fracking technology.

C. Factors That Lead to Success

States and other stakeholders should assess the potential advantages of a regional approach to complying with EPA's 2015 ozone NAAQS.¹⁵³ State governors, with policy advice and technical support from their respective environmental agencies and public utilities commissions, should initially lead this process.¹⁵⁴ It is also possible that an existing organization may provide a vehicle for initiating discussion.¹⁵⁵ The logical first step is to identify a group of states that will be better off acting together under the CAA than acting individually.¹⁵⁶ This step has three critical considerations: political/institutional, economic, and legal.¹⁵⁷

1. Political and Institutional Requirements for Success

Potential political barriers to adopting a cap-and-trade program may include a state's hesitation over the program's economic and implementation cost impacts to a state's budget, as well as disparate political parties working together. However, there are ways to overcome these roadblocks. First, RGGI has demonstrated that cap-and-trade programs can generate substantial revenue for a state and substantial emissions reductions without harming economic growth.¹⁵⁸ This

¹⁵² National Ambient Air Quality Standards for Ozone, 80 Fed. Reg. 65,292, 65,444 (Oct. 26, 2015) ("The science review . . . cites two recent studies which indicate that intercontinental transport of pollution, along with other natural sources and local pollutant sources, can affect [ozone] air quality in the western U.S. under specific conditions.").

¹⁵³ Gannett, *supra* note 116, at 8-1, 8-9.

¹⁵⁴ *Id.* at 8-17.

¹⁵⁵ *Id.* at 8-19.

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

economic benefit may convince states faced with budget shortfalls, and even states that are skeptical about the need for climate change regulation, to adopt a cap-and-trade program.¹⁵⁹

Second, the EPA's role in defining and supervising states' compliance with the CAA is likely to continue through many changes of presidential administrations.¹⁶⁰ In that context, a bipartisan group of states may have certain advantages over a group or an individual state that is seen as wedded to one political camp or the other.¹⁶¹ Not only is such a coalition likely to receive more deference from the EPA on any number of discretionary determinations, but it will also be in a stronger position to protect its interests if Congress were to legislate on this topic.¹⁶² So even states that have the political goals of general autonomy and improving their economies will find a cap-and-trade program beneficial. Here, the Rocky Mountain States (Colorado, Montana, New Mexico, Utah, and Wyoming) are a mixture of conservative and liberal states, so banding together in a regional program to advance public health goals would provide stability, and a higher chance of success, to the cap-and-trade program.

2. *Economic Requirements for Success*

No regional approach can succeed unless it produces economic benefits in excess of a go-it-alone approach.¹⁶³ If basic economic principles apply, a larger pool of emission reduction opportunities and sources of capital should result in greater efficiency.¹⁶⁴ Similarly, administrative burdens and transaction costs should be less on a regional basis, measured either on a per-megawatt hour or per capita basis.¹⁶⁵ For these reasons, stakeholders should closely examine the mutual benefits that may result from the differences in their area's topography, industry, and economy.¹⁶⁶ Specifically, states with different emissions profiles, or different emission reduction opportunities, should be able to leverage those differences in ways that provide mutual benefits.¹⁶⁷

For example, if Wyoming can avoid producing a ton of emissions more economically than Utah, this creates an opportunity for Utah to

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² *Id.*

¹⁶³ *Id.* at 8-18.

¹⁶⁴ *Id.* at 8-11.

¹⁶⁵ *Id.*

¹⁶⁶ *Id.*

¹⁶⁷ *Id.*

purchase an emissions allowance from Wyoming at a price less than the price it would cost Utah itself to reduce the emissions, but the states would still meet the CAA reduction requirements.¹⁶⁸ Each state has its own CAA attainment requirements, and so the states must incorporate the cost implications of being designated nonattainment into this calculus. Yet, by monetizing these differences in the form of allowances, the most cost-effective measures can be implemented without regard to the state in which they are located, thereby benefiting the entire region.¹⁶⁹

3. *Legal Requirements for Success*

Regional plans are superior to state plans in addressing the problem known as “leakage,” but addressing this problem can potentially create some legal issues. Leakage involves the risk that a state’s emissions reduction program will be undermined if businesses in that state import cheaper electricity from, or relocate to, states that do not cap emissions.¹⁷⁰ A regional cap-and-trade program avoids this problem by including all the states in the region and therefore if industries move to a neighboring state, they will still be within the capped region. Accordingly, no emissions sources will “leak” into outside areas and cause an ozone issue in a new state.

However, cap-and-trade programs can potentially create legal issues under the Dormant Commerce Clause (“DCC”).¹⁷¹ The DCC ensures states do not usurp Congress’ authority to regulate interstate commerce by mandating that states cannot discriminate against citizens of other states to give an advantage to in-state business, nor can they regulate beyond their jurisdiction.¹⁷² For example, DCC issues could arise if a participating state tries to protect against leakage or controls commerce outside of the boundaries of participating states.¹⁷³ RGGI has so far avoided DCC challenges by implementing the program through a memorandum of understanding between the states, and allowing each state to issue its own regulations.¹⁷⁴ It does not facially discriminate against out-of-state electricity producers, because these producers may

¹⁶⁸ *Id.*

¹⁶⁹ *Id.*

¹⁷⁰ Stein, *supra* note 151, at 273.

¹⁷¹ See generally Lauren Baron, Comment, *How to Avoid Constitutional Challenges to State Based Climate Change Initiatives: A Case Study of Rocky Mountain Farmers Union v. Corey and New York State Programs*, 32 PACE ENVTL. L. REV. 12 (2015).

¹⁷² *Granholm v. Heald*, 544 U.S. 460, 472 (2005).

¹⁷³ Baron, *supra* note 171, at 586, 587–88.

¹⁷⁴ *Id.* at 584–85.

enter and buy allowances from auction, nor does it effectively discriminate because the market functions competitively.¹⁷⁵ Thus, state regulators should draft the cap-and-trade regulations to include “clear language, non-discriminatory and equal treatment provisions for in-state and out-of-state market participants and express intent” of the program and benefits that can come from it.¹⁷⁶

D. Rocky Mountain Region Is a Prime Candidate for a Successful Program

Due to the recent fracking boom, natural gas reserves have been extracted from the Rocky Mountain States in the interior United States: Montana, Wyoming, New Mexico, Colorado, and Utah. Due to the states’ proximity to each other, geological and topographical similarities, and the fact that they are all coping with ozone sourced from natural gas extraction process, it seems that they would be a natural alliance in achieving attainment with the ozone NAAQS. Any revenue from the permitting process could be invested in improving the efficiency of technologies that generate the ozone precursors. These could include more efficient pneumatic pumps, compressors, and flaring technologies that will benefit the fracking industries in each state. Revenue could also be invested in research to better understand the complicated relationship between ozone precursors and their transient nature. If it is discovered that ozone is transporting from other states or countries, then the cost burden of reducing ozone emissions within the state will be lifted and placed on the true sources.

Whether the cap-and-trade program provides for allowance trading between states or within states, the region will see benefits. Because the NAAQS are in place, the cap-and-trade program would not be a replacement for the NAAQS. Instead, it would simply assist the region in achieving attainment. It can be seen as another “layer,” in addition to the various technology requirements imposed by the CAA. Consequently, if the states choose a regional cap-and-trade program, the allowance prices will reflect the costs of being pushed out of attainment and into the realm of expensive LAER technology requirements.

Currently, the United States has successful cap-and-trade programs around the country, but the region composed of the Rocky Mountain fracking states is where a reduction program is needed most. The various cap-and-trade programs in the United States are largely seen as

¹⁷⁵ *Id.* at 593.

¹⁷⁶ *Id.* at 599.

successful and thus the fracking states can draw from the knowledge and experience of other programs to create an interior United States program with relative ease. Additionally, the EPA provides extensive guidelines for policymakers to determine whether cap-and-trade is the best solution to a given environmental problem and instructions on how to initiate a program.¹⁷⁷

As illustrated earlier, Wyoming will likely not be in attainment in the next few years and areas within Colorado, New Mexico, and Utah are currently designated with nonattainment status. A cap-and-trade program would allow for the Rocky Mountain fracking states to establish a flexible approach to reach attainment within the 2015 NAAQS set by the EPA. It is clear that fracking produces excess ozone that is harmful to human health. A regional approach will allow for broad information sharing among the states that are in the same natural gas industry, and therefore are struggling with the same technological and geological constraints. Furthermore, a market-based solution will incentivize market efficiencies and hopefully yield a more equitable solution to the ozone problem.

CONCLUSION

The EPA's 2015 Ozone NAAQS imposes daunting requirements, but also affords opportunities for cooperation and coordination amongst states on a regional basis, particularly the fracking states in the Rocky Mountain region. The success of RGGI and MECT demonstrate that cap and trade programs can and do work. By learning from these prior efforts, and leveraging the existing economies of scale of the fracking industry, states can minimize their costs by pooling their diverse portfolios of emissions, emission reduction opportunities, and sources of capital. This is just one approach, but it provides a solution that could allow the United States to move forward with its energy policy agenda while still ensuring the health and safety of its citizens.

¹⁷⁷ See U.S. ENVTL. PROT. AGENCY, TOOLS OF THE TRADE: A GUIDE TO DESIGNING AND OPERATING A CAP AND TRADE PROGRAM FOR POLLUTION CONTROL (2003), <https://www.epa.gov/sites/production/files/2016-03/documents/tools.pdf>.