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RE: Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard (RIN 2060–AV51)

On behalf of the membership of the American Thoracic Society, we appreciate the opportunity provide comments on EPA's proposed rule: Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard. The American Thoracic Society (ATS) is the world's leading medical society dedicated to accelerating the advancement of global respiratory health through multidisciplinary collaboration, education, and advocacy. Core activities of the Society's more than 16,000 members are focused on leading scientific discoveries, advancing professional development, impacting global health, and transforming patient care. ATS members provide direct clinical care to patients who are uniquely vulnerable to adverse effects of exposure to ozone air pollution, including patients with chronic respiratory disease. Because we want all Americans to have clean air to breathe, including our patients, the ATS strongly supports EPA's proposed Federal Implementation Plan to ensure timely and effective attainment of the ozone National Ambient Air Quality Standard. The ATS offers the following comments:

Good Neighbor Provision is an Essential Tool for Meeting Federal Air Quality Standards

Transboundary pollution control policies are included as part of the Clean Air Act in section 110(a)(2)(D)(i)(I), commonly referred to as the "good neighbor" provision. The provision is in place to ensure downwind states, and populations living in those states, do not bear significant pollution burdens from their upwind neighbors. Controls on transboundary pollution and good neighbor provisions have a long history at the EPA, dating back to the 1990s with rules including the NOx state implementation plan call (1998). Through the good neighbor provision in the Clean Air Act, upwind states with substantial emissions that impact downwind states, are required to develop a plan to ensure they do not inhibit downwind states from being able to reach NAAQS standards. Due to the challenges states have faced in meeting these standards for ozone, this Transport Rule provides a clear pathway for states to be "good neighbors" and fulfill their existing obligations under the Clean Air Act.

Analysis conducted by the EPA using peer-reviewed methods have illustrated that the upwind states identified in the Transport Rule are likely inhibiting their downwind neighbors from meeting the 2015 Ozone NAAQS.[1] Many downwind states identified in the rule, such as Colorado, have higher background ozone levels that have become increasingly close to the EPA designated ozone design value as the ozone standard is lowered to better protect health.[2] In these states, even relatively small reductions in ozone concentrations can make a big difference in the state's ability to meet EPA standards. The Transport Rule provides a cost-effective pathway to make these essential reductions in ozone for these downwind states.

While the Transport Rule is designed to reduce upwind states' pollution contributions to downwind states, the emissions reductions outlined in the plan will also benefit air quality of upwind states. Emissions reductions implemented by the states will benefit all populations downwind of large emissions sources, both within and beyond the state's borders. Further, many of the states that fall under the rule due to their contributions to poor air quality in downwind states are themselves subject to transboundary pollution from upwind states. Thus, the rule is not requiring states to reduce emissions at no benefit to themselves. The implementation of the Clean Air Act's good neighbor provision through the proposed Transboundary Rule serves as an excellent opportunity for states to improve their own air quality and benefit the health of their residents while aiding their downwind neighbors in protecting the health of their residents as well.

The pathogenesis of ozone-related disease

Ozone air pollution is a serious health hazard for children and adults. Exposure to ozone generates reactive oxygen species, which cause oxidative stress and inflammation, setting off a cascade of local and systemic effects involving many organ systems in the body, most notably the respiratory and cardiovascular systems. Systemic inflammation plays a key role in the development of many mental and physical health problems, including asthma, heart disease, stroke, kidney disease, cancer and diabetes.[3] In the lungs, studies have found increases in

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[1] https://www.epa.gov/system/files/documents/2022-03/ozone-transport-policy-analysis-proposed-rule-tsd.pdf, https://www.epa.gov/system/files/documents/2022-03/aq-modeling-tsd_proposed-fip.pdf.
[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6198683/;
https://www.nejm.org/doi/full/10.1056/nejmoa0803894;
https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492.
[3] Furman D, Campisi J, Verdin E, et al. Chronic inflammation in the etiology of disease across the life span. *Nat Med*. 2019;25(12):1822-1832. doi:10.1038/s41591-019-0675-0; Cho YS, Moon H-B. The role of oxidative stress in the pathogenesis of asthma. *Allergy Asthma Immunol Res*. 2010;2(3):183-187. doi:10.4168/aair.2010.2.3.183; Steven S, Frenis K, Oelze M, et al. Vascular Inflammation and Oxidative

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neutrophils and cytokines, such as TNF-alpha, IL-6, and IL-8.[4] These mediators of pulmonary inflammation can damage and increase the permeability of the respiratory tract lining, impair mucociliary clearance, or the ability of the lungs to clear foreign substances, and weaken defenses against bacteria.[5] Studies have also linked ozone exposure to autonomic dysfunction, higher blood pressure, platelet activation and blood coagulation, all of which have significant implications for the human health.[6]

Short-term ozone exposure and health effects

Short-term increases in ambient ozone cause respiratory effects and are associated with cardiovascular effects, metabolic disease, and death.[7] Studies have consistently found associations between short-term ozone exposure and all-cause mortality, respiratory mortality, and cardiovascular mortality.[8] A large time series analysis from a national study of U.S. Medicare recipients,[9] as well as two new international studies[10] found significant and positive associations between short-term ozone levels and all-cause mortality, down to very low levels of exposure within the current standard of 70 ppb. In a study across 48 cities, women, people of color, those with atrial fibrillation, and the elderly were found to be particularly susceptible

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Stress: Major Triggers for Cardiovascular Disease. *Oxid Med Cell Longev*. 2019;2019:7092151. doi:10.1155/2019/7092151

[4] Seltzer J, Bigby BG, Stulbarg M, et al. O3-induced change in bronchial reactivity to methacholine and airway inflammation in humans. *J Appl Physiol*. 1986;60(4):1321-1326. doi:10.1152/jappl.1986.60.4.1321; Basha MA, Gross KB, Gwizdala CJ, Haidar AH, Popovich J. Bronchoalveolar lavage neutrophilia in asthmatic and healthy volunteers after controlled exposure to ozone and filtered purified air. *Chest*. 1994;106(6):1757-1765. doi:10.1378/chest.106.6.1757; González-Guevara E, Martínez-Lazcano JC, Custodio V, Hernández-Cerón M, Rubio C, Paz C. Exposure to ozone induces a systemic inflammatory response: possible source of the neurological alterations induced by this gas. *Inhal Toxicol*. 2014;26(8):485-491. doi:10.3109/08958378.2014.922648

[5] Al-Hegelan M, Tighe RM, Castillo C, Hollingsworth JW. Ambient ozone and pulmonary innate immunity. *Immunol Res*. 2011;49(1-3):173-191. doi:10.1007/s12026-010-8180-z

[6] Day DB, Xiang J, Mo J, et al. Association of Ozone Exposure With Cardiorespiratory Pathophysiologic Mechanisms in Healthy Adults. *JAMA Intern Med*. 2017;177(9):1344-1353; doi:10.1001/jamainternmed.2017.2842; Chuang K-J, Chan C-C, Su T-C, Lee C-T, Tang C-S. The effect of urban air pollution on inflammation, oxidative stress, coagulation, and autonomic dysfunction in young adults. *Am J Respir Crit Care Med*. 2007;176(4):370-376. doi:10.1164/rccm.200611-1627OC

[7] United States Environmental Protection Agency. *Integrated Science Assessment (ISA) for Ozone and Related Photochemical Oxidants (Final Report, Apr 2020)*.

[8] Gryparis A, Forsberg B, Katsouyanni K, et al. Acute effects of ozone on mortality from the "air pollution and health: a European approach" project. *Am J Respir Crit Care Med*. 2004;170(10):1080-1087. doi:10.1164/rccm.200403-333OC

[9] Di Q, Dai L, Wang Y, et al. Association of Short-term Exposure to Air Pollution With Mortality in Older Adults. *JAMA*. 2017;318(24):2446. doi:10.1001/jama.2017.17923

[10] Bae S, Lim Y-H, Kashima S, et al. Non-Linear Concentration-Response Relationships between Ambient Ozone and Daily Mortality. Carpenter DO, ed. *PLoS One*. 2015;10(6):e0129423. doi:10.1371/journal.pone.0129423; Collart P, Dramaix M, Levêque A, Mercier G, Coppieters Y. Concentration–response curve and cumulative effects between ozone and daily mortality: an analysis in Wallonia, Belgium. *Int J Environ Health Res*. 2018;28(2):147-158. doi:10.1080/09603123.2018.1453050

groups with higher risk of ozone-related death.[11] Children are another vulnerable population. Recent studies have shown that children in particular have the strongest associations between ozone exposure and asthma hospital admissions.[12] These associations persist at concentrations below the current standard of 70 ppb.[13] In addition to ozone-related death and asthma, multiple well-designed studies have demonstrated associations of higher daily ozone exposure and risk of hospitalization for cardiovascular disease,[14] myocardial infarction,[15] and stroke.[16]

Long-term ozone exposure and health effects

Long-term exposure to ozone is also associated with respiratory disease, cardiovascular disease, and death. Two large US-based studies found increases in long-term ozone exposure

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[11] Medina-Ramón M, Schwartz J. Who is more vulnerable to die from ozone air pollution? *Epidemiology*. 2008;19(5):672-679. doi:10.1097/EDE.0b013e3181773476

[12] Goodman JE, Loftus CT, Liu X, Zu K. Impact of respiratory infections, outdoor pollen, and socioeconomic status on associations between air pollutants and pediatric asthma hospital admissions. Larcombe A, ed. *PLoS One*. 2017;12(7):e0180522. doi:10.1371/journal.pone.0180522; Zu K, Liu X, Shi L, et al. Concentration-response of short-term ozone exposure and hospital admissions for asthma in Texas. *Environ Int*. 2017;104:139-145. doi:10.1016/j.envint.2017.04.006; Silverman RA, Ito K. Age-related association of fine particles and ozone with severe acute asthma in New York City. *J Allergy Clin Immunol*. 2010;125(2):367-373.e5. doi:10.1016/j.jaci.2009.10.061; Sheffield PE, Zhou J, Shmool JLC, Clougherty JE. Ambient ozone exposure and children's acute asthma in New York City: a case-crossover analysis. *Environ Heal*. 2015;14(1):25. doi:10.1186/s12940-015-0010-2; Goodman JE, Zu K, Loftus CT, Tao G, Liu X, Lange S. Ambient ozone and asthma hospital admissions in Texas: a time-series analysis. *Asthma Res Pract*. 2017;3(1):6. doi:10.1186/s40733-017-0034-1

[13] Strickland MJ, Darrow LA, Klein M, et al. Short-term associations between ambient air pollutants and pediatric asthma emergency department visits. *Am J Respir Crit Care Med*. 2010;182(3):307-316. doi:10.1164/rccm.200908-1201OC

[14] Freitas CU de, Leon AP de, Junger W, Gouveia N. Air pollution and its impacts on health in Vitoria, Espirito Santo, Brazil. *Rev Saude Publica*. 2016;50. doi:10.1590/S1518-8787.2016050005909
Vahedian M, Khanjani N, Mirzaee M, Koolivand A. Ambient air pollution and daily hospital admissions for cardiovascular diseases in Arak, Iran. *ARYA Atheroscler*. 2017;13(3):117-134. http://www.ncbi.nlm.nih.gov/pubmed/29147121

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were associated with increased risk of all-cause mortality.[17] These associations persisted in two-pollutant models with $PM_{2.5}$ and at daily concentrations below the current standard of 70 ppb. Long-term ozone exposure in adults may increase the risk of incident asthma,[18] and in children, those living in counties with higher concentrations of ozone are more likely to have asthma and recent asthma exacerbation compared to children living in counties with less pollution.[19] In the Children's Health Study from southern California, researchers reported children playing three or more sports in high-ozone communities have a 3.3-fold increased relative risk of developing asthma compared to children playing no sports but found no effect of sports in areas of low ozone concentrations.[20] A recent analysis of the Children's Health Study published in 2019 examined the improvement in ozone levels over time and found that decreases in ozone levels were associated with decreases in asthma incidence.[21] Long-term ozone exposure has also been linked to lower lung function among children with asthma[22] and among healthy children without asthma.[23] It has been shown that lower lung function in childhood predicts worse lung function, including irreversible obstructive lung disease, in adulthood.[24]

The Current Standard of 70 ppb is not Adequately Protective of Human Health

The current standard is not sufficiently protective of the public health and fails to meet the legislative requirements of providing an adequate margin of safety for vulnerable populations.

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[17] Turner MC, Jerrett M, Pope CA, et al. Long-Term Ozone Exposure and Mortality in a Large Prospective Study. *Am J Respir Crit Care Med*. 2016;193(10):1134-1142. doi:10.1164/rccm.201508-1633OC; Di Q, Wang Y, Zanobetti A, et al. Air Pollution and Mortality in the Medicare Population. *N Engl J Med*. 2017;376(26):2513-2522. doi:10.1056/NEJMoa1702747

[18] McDonnell WF, Abbey DE, Nishino N, Lebowitz MD. Long-term ambient ozone concentration and the incidence of asthma in nonsmoking adults: The Ahsmog study. *Environ Res*. 1999;80(2):110-121. doi:10.1006/enrs.1998.3894

[19] Akinbami LJ, Lynch CD, Parker JD, Woodruff TJ. The association between childhood asthma prevalence and monitored air pollutants in metropolitan areas, United States, 2001-2004. *Environ Res*. 2010;110(3):294-301. doi:10.1016/j.envres.2010.01.001

[20] McConnell R, Berhane K, Gilliland F, et al. Asthma in exercising children exposed to ozone: A cohort study. *Lancet*. 2002;359(9304):386-391. doi:10.1016/S0140-6736(02)07597-9

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[22] Lerodiakonou D, Zanobetti A, Coull BA, et al. Ambient air pollution, lung function, and airway responsiveness in asthmatic children. *J Allergy Clin Immunol*. 2016;137(2):390-399. doi:10.1016/j.jaci.2015.05.028

[23] Urman R, McConnell R, Islam T, et al. Associations of children's lung function with ambient air pollution: joint effects of regional and near-roadway pollutants. *Thorax*. 2014;69(6):540-547. doi:10.1136/thoraxjnl-2012-203159

[24] McGeachie MJ, Yates KP, Zhou X, et al. Patterns of Growth and Decline in Lung Function in Persistent Childhood Asthma. *N Engl J Med*. 2016;374(19):1842-1852. doi:10.1056/NEJMoa1513737; Kalhan R, Arynchyn A, Colangelo LA, Dransfield MT, Gerald LB, Smith LJ. Lung Function in Young Adults Predicts Airflow Obstruction 20 Years Later. *Am J Med*. 2010;123(5):468.e1-468.e7. doi:10.1016/j.amjmed.2009.07.037

The health effects from short- and long-term ozone exposure include mortality, respiratory and cardiovascular disease, and metabolic disease, with many studies demonstrating associations below the current standard of 70 ppb. Since 2006, ATS has supported a more protective ozone NAAQS of 60 ppb based on the burden of scientific evidence described. While the level of the ozone NAAQS is not the issue being considered in the proposed rule, we would note that states struggling to meet the current standard still have a long ways to go in reduce ambient exposures to levels that are sufficiently protective of subpopulations with increased vulnerability.

Additional Benefits Beyond Ozone Health Impacts

The health and subsequent economic benefits of reducing ozone levels are substantial on their own, however, there are also many additional health and environmental benefits which could result as states implement the emissions reducing policies outlined in the Transport Rule. The policies outlined by the rule to reduce ozone in downwind states target reducing NO_x emissions which are also associated with negative health impacts.[25] In particular, long-term exposure to elevated levels of NO_x is associated with pediatric asthma incidence.[26] Elevated NO_x levels and subsequent health impacts are known to disproportionately impact people of color and low-income communities.[27] Beyond these substantial health benefits of reducing NOx, lower NOx levels would also lead to greater visibility in urban areas and downwind state and national parks.[28] Therefore, the proposed Transport Rule will lead to substantial benefits, even beyond those for which economic benefits can be directly quantified.

The Ozone Transport Rule Appropriately Establishes Emission Limits on Sources Contributing to Downwind Ozone Non-Attainment

ATS commends EPA on the consistent and impartial approach used to determine sources that contribute to downwind non-attainment areas, to evaluate available control technologies that have been proven to reduce emissions, and to ensure that both source specific costs, as well as overall rule costs, are found to be cost effective. The utilized approach is directly in-line with other established air quality rules and with previous legal rulings on the good neighbor provision.

We would specifically note the dramatic emission reductions that are achievable with selective catalytic reduction (SCR) technology. SCR is widely used by many currently operating EGUs across the country and has been widely proven to be the most effective technology available to reduce NOx emissions from a wide range of stationary sources. It is often stated that technology will be the solution to our country's environmental problems; but technological solutions only work if they are installed and properly utilized. Barring issues with technical infeasibility, or excess costs beyond the appropriate thresholds established in this rule, this

[25] https://www.govinfo.gov/content/pkg/FR-2022-04-06/pdf/2022-04551.pdf
[26] https://doi.org/10.1016/j.envint.2016.11.012
[27] https://www.pnas.org/doi/abs/10.1073/pnas.2022409118
[28] https://www.epa.gov/system/files/documents/2022-03/fact-sheet_2015-ozone-proposed-good-neighbor-rule.pdf

proven technology is the appropriate requirement for upwind sources to demonstrate compliance with the good neighbor provision of the Clean Air Act.

The details of the rule appropriately balance the requirements of the good neighbor provision with practical considerations involving emission-generating activities. We specifically find that the cost thresholds to be appropriate and support the decision to have different cost thresholds for EGUs compared to non-EGUs. We also strongly support the required backstop emission limits to ensure that control technologies are being utilized properly. The timelines for compliance are adequate and we support both the immediate requirement to optimized existing control technologies as well as the 2026 timeline for sources to complete retrofits to meet the established mass based limits.

State Responsibility and State Flexibility

The Clean Air Act and its supporting regulations are clear; states have the authority and the obligation to address ozone pollution and its precursors that transport to neighboring states. Had states taken this obligation and authority seriously and addressed ozone transport in their respective ozone State Implementation Plans, the proposed ozone Federal Implementation Plan would not be necessary. Unfortunately, most states failed to seriously address ozone transport in State Implementation Plans.

Further, the ATS is aware that during the public hearing on the proposed ozone Federal Implementation Plan, many businesses cited unique local circumstances that made compliance with the proposed Federal Implementation Plan functionally or economically challenging. We note that state air resources officers, through the State Implementation Plans, have the authority to recognize and address local economic and implementation challenges. Had state air resource officials used their authority wisely in the State Implementation process, many of these local issues could have been addressed by state planners while still meeting the overall state requirement to meet the ozone standard. ATS urges state local air officials to use their authority more proactively for future Clean Air Act standard attainment efforts.

Conclusion

ATS fully supports the proposed Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard and encourages it to move forward without delay to allow affected sources as much time as possible to prepare to meet requirements that begin in 2026.

Sincerely,

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Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone