
ORAL ARGUMENT NOT YET SCHEDULED

No. 19-1140 and consolidated cases

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

AMERICAN LUNG ASSOCIATION, *et al.*,
Petitioners,

v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, *et al.*,
Respondents.

On Petition for Review of the Final Rule of the
United States Environmental Protection Agency

***CORRECTED* BRIEF OF THE AMERICAN THORACIC SOCIETY, THE
AMERICAN ACADEMY OF ALLERGY, ASTHMA, & IMMUNOLOGY,
THE AMERICAN COLLEGE OF OCCUPATIONAL AND
ENVIRONMENTAL MEDICINE, THE NATIONAL MEDICAL
ASSOCIATION, AND THE AMERICAN COLLEGE OF CHEST
PHYSICIANS AS *AMICI CURIAE* IN SUPPORT OF STATE AND
MUNICIPAL, PUBLIC HEALTH AND ENVIRONMENTAL, POWER
COMPANY, AND CLEAN ENERGY TRADE ASSOCIATION
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CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES

Except for the following, all parties, intervenors and other *amici* appearing in this case are listed in the brief for Public Health and Environmental Petitioners.

Amici

In support of State and Municipal, Public Health and Environmental, Power Company, and Clean Energy Trade Association Petitioners: Benjamin Hobbs, Brendan Kirby, Kenneth J. Lutz, James McCalley, Dallas Burtraw, Charles T. Driscoll, Amelia Keyes, Kathy Fallon Lambert; Faith Organizations, Professor Michael Greenstone; Senator Sheldon Whitehouse; Service Employees International Union, Patagonia Works and Columbia Sportswear Company; and Environment America and the National Trust for Historic Preservation.

References to the rulings under review and related cases also appear in the brief for Public Health and Environmental Petitioners.

STATEMENT REGARDING SEPARATE BRIEFING, AUTHORSHIP, AND MONETARY CONTRIBUTIONS

Counsel for *amici curiae* hereby state that no counsel for any party to this litigation authored this brief in whole or in part, no party or party's counsel contributed money that intended to fund, or did fund, the preparation or submission of this brief, and no person, other than the *amici curiae*, contributed money that was intended to fund, or did fund, the preparation or submission of this brief. *Amici* are aware of other planned *amicus* briefs in support of State and Municipal, Public

Health and Environmental, Power Company, and Clean Energy Trade Association
Petitioners. Because the public health consequences of EPA's actions will not be
addressed by other *amici*, a separate brief is necessary.

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GLOSSARY

“ACE Rule”	Affordable Clean Energy Rule
“CAA”	Clean Air Act
“EPA”	Environmental Protection Agency
“NAAQS”	National Ambient Air Quality Standards
“PM”	Particulate Matter
“PM _{2.5} ”	Fine Particulate Matter
“RIA”	Regulatory Impact Statement

STATEMENT OF IDENTITY AND INTEREST OF AMICUS CURIAE

Amici represent a broad spectrum of the United States medical and public health community. The collective medical, scientific, and clinical expertise of the *Amici* compel them to support Petitioner, the American Lung Association. Carbon emissions are a significant driver of the anthropogenic greenhouse gas emissions that cause climate change and consequently harm human health, particularly for vulnerable populations. EPA's Affordable Clean Energy Rule ("ACE Rule" or "Rule") ignores the serious health consequences posed by climate change by failing to reduce carbon emissions in a meaningful way. *Amici* participate in this action to describe the public health consequences of the ACE Rule, and the severity of the health effects of climate change that may be expected if the ACE Rule is upheld.

SUMMARY OF ARGUMENT

Respondent, the United States Environmental Protection Agency ("EPA"), failed to establish reductions in carbon emissions protective enough to fulfill the Agency's statutory obligations under the Clean Air Act. The record upon which EPA based its decision was replete with warnings from the public health community about the urgent health consequences of climate change.

Notwithstanding these warnings, the ACE Rule will produce minimal reductions in carbon dioxide emissions and will lead to an *increase* in harmful air pollutants in

twenty states. EPA, furthermore, failed to explain the fundamental disconnect between the well-known consequences of climate change and the ACE Rule's limited carbon emissions reductions.

These flaws constitute an unlawful and unreasonable abdication of EPA's duty to take decisive action to protect the health of the American public from the well-known health consequences of climate change. Reducing carbon emissions by a token amount is insufficient given the severe threats to Americans' health and welfare posed by climate change. These outcomes run afoul of what Congress legislated in the Clean Air Act. Accordingly, *Amici* urge this Court to vacate the ACE Rule.

ARGUMENT

I. Introduction

Countless Americans are already experiencing the harmful health consequences of climate change. The ACE Rule does little to reverse or even mitigate these urgent health effects. The environmental changes wrought by climate change have already increased rates of pulmonary disease, cancer, asthma, and other respiratory complications.¹ Left unchecked, climate change will cause thousands of otherwise avoidable deaths in the United States in the near future, and

¹ See e.g., Tim K. Takaro & Sarah B. Henderson, *Climate change and the new normal for cardiorespiratory disease*, 22 CANADIAN RESPIRATORY J. 52, 52–53 (2015).

increase the prevalence of chronic diseases. The public health community warned EPA about the dangerous health consequences of climate change; yet, with its minimal carbon emissions reductions, the Rule fails to take seriously the health of all Americans.²

Climate change is caused by increasing concentrations of greenhouse gases, such as carbon dioxide, that trap the sun's heat, thereby increasing the surface temperature of the Earth.³ The utility electric generating sector is the largest stationary source of carbon emissions,⁴ accounting for 27.5% of all greenhouse gas emissions annually in the United States.⁵ These continued carbon emissions, in

² See Allergy & Asthma Network, Alliance of Nurses for Healthy Environments, American College of Physicians, American Lung Association, American Public Health Association, Asthma and Allergy Foundation of America, Association of Schools and Programs of Public Health, Center for Climate Change and Health, National Association of County and City Health Officials, National WIC Association, Health Care Without Harm, Physicians for Social Responsibility, Comment Letter on Proposed Affordable Clean Energy Rule (Oct. 31, 2018) Docket No. EPA-HQ-OAR-2017-0355-23664; American Thoracic Society, Comment Letter on Proposed Affordable Clean Energy Rule (Oct. 30, 2018) Docket No. EPA-HQ-OAR-2017-0355-23635. The Medical Consortium on Climate Health, Comment Letter on Proposed Affordable Clean Energy Rule (Nov. 2, 2018) Docket No. EPA-HQ-OAR-2017-0355-23741.

³ See, e.g., *Climate Change: How Do We Know?*, NASA, <https://climate.nasa.gov/evidence/> (last updated Feb 20, 2020).

⁴ *Frequently Asked Questions: What are U.S. energy-related carbon dioxide emissions by source and sector*, U.S. ENERGY INFORMATION ADMIN., <https://www.eia.gov/tools/faqs/faq.php?id=75&t=11> (last updated Oct. 25, 2019).

⁵ *Sources of Greenhouse Gas Emissions*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions> (last visited Dec. 2, 2019).

concert with carbon already present in the atmosphere, are causing temperature increases worldwide. As a result, heatwaves are becoming more frequent and widespread.⁶ Forest fires are becoming more severe, leading to rising rates of ground-level ozone and particulate matter (“PM”) pollution.⁷ Pollen levels are increasing, exacerbating allergies and asthma.⁸ Droughts are becoming more frequent and intense, disrupting food production.⁹ Hurricanes and typhoons are becoming more severe, killing thousands worldwide and costing billions of dollars in property damage.¹⁰ The health consequences of climate change are dire, and

⁶ U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 24 (Thomas R. Karl et al. eds., 2009); *see also* Phillip Duffy & C. Tebaldi, *Increasing prevalence of extreme summer temperatures in the U.S.*, 111 CLIMATIC CHANGE 487 (2012).

⁷ Sarah B. Henderson, et al., *Three measures of forest fire smoke exposure and their associations with respiratory and cardiovascular health outcomes in a population-based cohort*, 119 ENVTL. HEALTH PERSP. 1266 (2011); Daniel J. Jacob & Darrel A. Winner, *Effect of climate change on air quality*, 43 ATMOSPHERIC ENV'T 51, 59 (2009); Kazuyo Murazaki & Peter Hess, *How does climate change contribute to surface ozone change over the United States?*, 111 J. OF GEOPHYSICAL RESEARCH: ATMOSPHERES 1, 11, 15 (Mar. 16, 2006); Ralph J. Delfino, et al., *The relationship of respiratory and cardiovascular hospital admissions to the southern California wildfires of 2003*, 66 OCCUPATIONAL AND ENVTL. MED. 189 (2009).

⁸ *Impacts of EPA’s Proposed Carbon Regulations on Energy Costs for American Businesses, Rural Communities and Families: Hearing on S. 1324 Before the Subcomm. on Clean Air and Nuclear Safety of the S. Committee on Environment and Public Works*, 114th Cong. 1 (2015) (statement of Mary B. Rice, Instructor in Medicine, Harvard Medical School).

⁹ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT ON CLIMATE CHANGE AND LAND, 1-17 (2019).

¹⁰ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE 1-23 (2019).

include, most importantly, increased premature mortality; increased rates of chronic lung diseases like asthma and chronic obstructive pulmonary disease; low birth weight, slower lung growth, accelerated decline in lung function, and cardiovascular injury.¹¹ These grim health effects are not limited to those who suffer directly: they affect the economic wellbeing of all Americans by degrading the workforce, adding greatly to health care costs, and lowering Americans' quality of life, particularly among vulnerable populations.¹²

Some of these tragic but avoidable health consequences are already taking their toll on Americans. In a 2015 survey, a majority of ATS physicians responded that they have observed symptoms among their patients that they attribute to climate change.¹³ Without more aggressive reductions in carbon emissions, physicians anticipate even greater climate-driven adverse health impacts in the future.¹⁴ Scientists estimate that by the end of this century, the warming climate is “projected to lead to increases in future mortality on the order of thousands to tens

¹¹ Allergy & Asthma Network, Comment Letter, *supra* note 2; American Thoracic Society, Comment Letter, *supra* note 2 The Medical Consortium on Climate Health, Comment Letter, *supra* note 2.

¹² U.S. GLOBAL CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT (2018), Docket No. EPA-HQ-OAR-2017-0355-26762, [hereinafter FOURTH NAT'L CLIMATE ASSESSMENT].

¹³ Mona Sarfaty et al., *American Thoracic Society member Survey on climate change and health*, 12 ANNALS OF AM. THORACIC SOC'Y 274, 276 (2015).

¹⁴ *Id.*

of thousands of additional premature deaths per year across the United States.”¹⁵

EPA responded to this crisis by issuing regulations that will only marginally reduce carbon emissions, will fail to mitigate the most severe health effects from climate change, and will increase emissions of harmful pollutants in twenty states.

EPA has a statutory duty to protect Americans from the urgent health effects caused by climate change. Yet, when it promulgated the ACE Rule, EPA failed to take this duty seriously. Congress enacted the Clean Air Act (“CAA”) “to protect and enhance the quality of the Nation’s air resources so as to promote the public health and welfare.”¹⁶ Despite Congress’ mandate, the ACE Rule will produce negligible emissions reductions.¹⁷ EPA estimates only a 0.7% reduction in carbon emissions from coal-fired power plants by 2025.¹⁸ Further, because the ACE rule creates incentives to operate coal-fired power plants more often in some circumstances, the ACE Rule will cause carbon emissions to *increase* in eighteen

¹⁵ Marcus C. Sarofim et al., *Temperature-Related Death and Illness, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, THE IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH IN THE UNITED STATES: A SCIENTIFIC ASSESSMENT* (2016).

¹⁶ 42 U.S.C. § 7401(b)(1) (2012).

¹⁷ U.S. ENVTL. PROT. AGENCY, EPA-452/R-19-003, REGULATORY IMPACT ANALYSIS FOR THE REPEAL OF THE CLEAN POWER PLAN, AND THE EMISSION GUIDELINES FOR GREENHOUSE GAS EMISSIONS FROM EXISTING UTILITY GENERATING UNITS ES-6 (2019) [hereinafter 2019 RIA].

¹⁸ *Id.*

states and the District of Columbia.¹⁹ For this same reason, nitrogen oxides, sulfur dioxide, and PM emissions would also increase in as many as twenty states.²⁰

Amici urge this Court to vacate the ACE Rule because EPA has not exercised its statutory duty to curb carbon emissions, mitigate climate change, and avoid the serious health consequences described in this brief.

II. Continued Utility Sector Carbon Emissions Have Adverse Human Health Impacts.

A. The ACE Rule fails to protect Americans from rising surface temperatures, more frequent and severe heatwaves, increased hospitalizations, and premature death.

Without significant reductions in carbon emissions, climate change will cause heatwaves to become more prevalent worldwide.²¹ The increase in

¹⁹ Amelia T. Keyes, *The Affordable Clean Energy Rule and the impact of emissions rebound on carbon dioxide and criteria air pollutant emissions*, 14 ENVTL. RESEARCH LETTERS 1 (2019).

²⁰ *Id.* at 9.

²¹ David H. Levinson & Christopher J. Fettig, *Climate Change: Overview of Data Sources, Observed and Predicted Temperature Changes, and Impacts on Public and Environmental Health*, in GLOBAL CLIMATE CHANGE AND PUBLIC HEALTH 31, 33–36 (Kent E. Pinkerton & William N. Rom eds., 2014) (collecting citations to leading research and summarizing past and projected increases in ambient temperatures); Laurence S. Kalkstein & J. Scott Greene et al., *An examination of climate change on extreme heat events and climate-change mortality relationships in large U.S. cities*, 3 WEATHER, CLIMATE, & SOC'Y 281, 281–282 (2011); Alexander Gershunov et al., *The Great 2006 Heat Wave over California and Nevada: Signal of an Increasing Trend*, 22 J. OF CLIMATE 6181 (2009).

temperatures has the most immediate and direct impact on human health.²² In North America, extreme heat is the most common cause of death among all weather-related disasters.²³ There is a well-documented connection between rising temperatures and death, especially among the elderly and people suffering from chronic disease.²⁴ These trends are expected not only to continue, but to become more severe.

Certain factors exacerbate this troubling trend. First, such effects are more severe in cities because of the “heat island” effect;²⁵ the concrete that dominates urban areas heats faster and retains more heat for a longer period of time.²⁶ Cities on nearly every continent have experienced extreme heat events in the twenty-first century that “collectively have resulted in tens, perhaps hundreds, of thousands of

²² Sharon L. Harlan & Darren M. Ruddell, *Climate change and health in cities: impacts of heat and air pollution and potential co-benefits from mitigation and adaptation*, 3 ENVTL. SUSTAINABILITY 126 (May 2011).

²³ *Id.*

²⁴ Shakoor Hajat & Tom Kosatky, *Heat-related mortality: a review and exploration of heterogeneity*, 64(9) J. OF EPIDEMIOLOGY & CMTY. HEALTH 753 (2010) (estimating from data that risk of mortality in various cities increased by 1-3% with each degree-Centigrade increase in temperature above threshold); Sumi Hoshiko, *et al.*, *A simple method for estimating excess mortality due to heat waves, as applied to the 2006 California heat wave*, 55 INT’L J. OF PUB. HEALTH 133 (2010); Mercedes Medina-Ramón & Joel Schwartz, *Temperature, temperature extremes, and mortality: a study of acclimatization and effect modification in 50 U.S. cities*, 64 J. OF OCCUPATIONAL & ENVTL. MED. 827 (2007) (identifying causal relationship based on over six million observations).

²⁵ Jonathan Patz *et al.*, *Impact of regional climate change on human health*, 438 NATURE 310 (2005).

²⁶ *Id.*

excess deaths directly due to heat and its consequences”²⁷ Second, areas unaccustomed to high temperatures experience higher mortality rates from heat waves.²⁸ Third, mortality rates increase as heatwaves become hotter and longer.²⁹

Heat waves also cause a number of non-fatal, but serious health impacts.³⁰ Analyses of hospital admissions, emergency room visits, and emergency calls show that hot days are also associated with an increase in cardiovascular and respiratory complications, renal failure, electrolyte imbalance, kidney stones, negative impacts on fetal health, and preterm birth.³¹ Furthermore, there is evidence that acute increases in temperature and humidity are associated with

²⁷ Harlan & Ruddell, *supra* note 22.

²⁸ William N. Rom & Kent E. Pinkerton, *Introduction: Consequences of Global Warming to the Public’s Health*, in GLOBAL CLIMATE CHANGE AND PUBLIC HEALTH, *supra* note 21, at 10; G. Brooke Anderson & Michelle L. Bell, *Weather-related mortality: how heat, cold, and heat waves affect mortality in the United States*, 20 EPIDEMIOLOGY 205 (2009); Lauraine G. Chestnut et al., *Analysis of differences in hot-weather-related mortality across 44 US metropolitan areas*, 1 ENVTL. SCI. & POL’Y 59 (1998).

²⁹ Daniela D’Ippoliti et al., *The impact of heat waves on mortality in 9 European cities: results from the EuroHEAT project*, 9 ENVTL. HEALTH 1, 8 (2010).

³⁰ Melanie Boeckmann & Ines Rohn, *Is heat adaptation in urban areas reducing heat stroke incidence and cardiovascular mortality? A systematic review of the literature*, 23 EUR. J. PUB. HEALTH (Supp. 1) 198, 199 (2013); R. Sari Kovats & Shakoor Hajat, *Heat stress and public health: a critical review*, 29 ANNUAL REV. OF PUB. HEALTH 41, 42, 47 (2008) (noting danger of and risk factors for heat stroke).

³¹ CHAPTER 14: HUMAN HEALTH in FOURTH NAT’L CLIMATE ASSESSMENT, *supra* note 12.

increased emergency room visits and hospitalizations for asthmatic children and adults.³²

Rising temperatures due to increased carbon levels in the atmosphere are already having an impact on human health. They are expected to have an even more dangerous and dramatic effect as carbon emissions from power plants continue minimally abated by the ACE Rule.

B. The ACE Rule fails to prevent increased wildfire activity responsible for high concentrations of particulate matter and other harmful air pollutants.

Wildfires produce large amounts of PM—a harmful air pollutant.³³ Studies have shown that exposure to PM from forest fires is associated with asthma and chronic pulmonary disease, increased hospitalizations,³⁴ and premature death.³⁵

³² See Nana Mireku, et al., *Changes in weather and the effects on pediatric asthma exacerbations*, 103 ANNALS OF ALLERGY, ASTHMA & IMMUNOLOGY 220, 220–24 (2009); G. Brooke Anderson et al., *Heat-related emergency hospitalizations for respiratory diseases in the Medicare population*, 187 AM. J. OF RESPIR. & CRIT. CARE MED. 1098 (2013).

³³ Bonne Ford et al., *Future Fire Impacts on Smoke Concentrations, Visibility, and Health in the Contiguous United States*, 2 GEOHEALTH 229 (2018); Teresa C. Wegesser et al., *California Wildfires of 2008: Coarse and Fine Particulate Matter Toxicity*, 117 ENVTL. HEALTH PERSP. 893, 895–96 (2009).

³⁴ Henderson, et al., *Three measures of forest fire smoke exposure and their associations with respiratory and cardiovascular health outcomes in a population-based cohort*, 119 ENVTL. HEALTH PERSP. 1266 (2011); Colleen E. Reid et al., *Critical review of health impacts of wildfire smoke exposure*, 124 ENVTL. HEALTH PERSP. 1334 (2016).

³⁵ Ford et al., *Future Fire Impacts on Smoke Concentrations, Visibility, and Health in the Contiguous United States*, 2 GEOHEALTH 229 (2018); Ana G. Rappold et al.,

Some evidence indicates that wildfires produce PM that is more toxic than PM from other sources.³⁶ In addition to PM, wildfires release high concentrations of other harmful air pollutants, including ozone, acrolein (a respiratory irritant), and carcinogens such as formaldehyde and benzene.³⁷ The toxic pollutants can drift hundreds of miles.³⁸ In 2011, about two-thirds of United States citizens—nearly 212 million people—lived in counties affected by smoke conditions, greatly increasing their exposure to PM and other toxic air pollutants.³⁹

As the climate warms, wildfires will become more prevalent.⁴⁰ Warmer temperatures will result in longer dry seasons, creating conditions ripe for fire

Cardio-respiratory outcomes associated with exposure to wildfire smoke are modified by measures of community health, 11 ENVTL. HEALTH 1 (2012).

³⁶ Ford et al., *supra* note 33.

³⁷ Hassani Youssouf, et al., 11 *Non-Accidental Health Impacts of Wildfire Smoke*, INT’L J. OF ENVTL. RES. & PUB. HEALTH, 11772, 11772–73 (2014); Daniel A. Jaffe & Nicole L Wigder, *Ozone production from wildfires: A critical review*, 51 ATMOSPHERIC ENV’T 1, 2, 7 (2012); Teresa C. Wegesser et al., *California Wildfires of 2008: Coarse and Fine Particulate Matter Toxicity*, 117 ENVTL. HEALTH PERSP. 895, 895–96 (2009) (describing greater toxicity of PM generated by wildfire as comparable to breathing ten times the level of the PM found in California’s ambient air under normal conditions); Gabriele Pfister et al., *Impacts of the fall 2007 California wildfires on surface ozone: Integrating local observations with global model simulations*, 35 GEOPHYSICAL RES. LETTERS L19814 (2008).

³⁸ NAT. RES. DEF. COUNCIL, WHERE THERE’S FIRE, THERE’S SMOKE: WILDFIRE SMOKE AFFECTS COMMUNITIES DISTANT FROM DEADLY FLAMES (2011).

³⁹ *Id.*

⁴⁰ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Global Warming of 1.5°C - Headline Statements D5* (2018), https://report.ipcc.ch/sr15/pdf/sr15_headline_statements.pdf.

activity.⁴¹ In 2018, the Camp Fire killed eighty-six people, making it the deadliest fire in California history.⁴² One study estimates that “human-caused climate change . . . doubled the cumulative forest fire area since 1984.”⁴³ In 2017, more than ten million acres were burned nationally, equal to over 150% of the ten-year mean.⁴⁴ In fact, some studies predict a 50% to 100% increase in area burned in the United States by 2050.⁴⁵ Other estimates predict that wildfire risk in the western continental United States may increase two- to four-fold over the 1950 to 2003 baseline with just 1°C of warming.⁴⁶ Worldwide average temperatures have already

⁴¹ Xu Yue et al., *Ensemble projections of wildfire activity and carbonaceous aerosol concentrations over the western United States in the mid-21st century*, 77 *ATMOSPHERIC ENV'T* 767, 768, 779 (2013); Anthony L. Westerling & Benjamin P. Bryant, *Climate change and wildfire in California*, 87 *CLIMATE CHANGE* (Supp. 1) S231, S231-32 (2008) (describing relationship between reduced precipitation and snowpack, earlier snowmelt, warmer spring and summer seasons, and fire frequency); Nick Watts et al., *The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate*, 394 *THE LANCET* 1836 (2019).

⁴² Meghan Bobrowsky, *Camp Fire death toll rises to 86 after man who suffered third-degree burns dies*, *SACRAMENTO BEE* (Aug. 8, 2018, 5:25 PM), <https://www.sacbee.com/news/california/fires/article233683422.html>.

⁴³ John T. Abatzoglou & A. Park Williams, *Impact of anthropogenic climate change on wildfire across western US forests*, 113 *PROC. OF THE NAT'L ACAD. OF SCI. OF THE UNITED STATES OF AMERICA* 11770 (2016); NAT'L INTERAGENCY COORDINATION CENTER, *WILDLAND FIRE SUMMARY AND STATISTICS ANNUAL REPORT* (2017).

⁴⁴ *Id.*

⁴⁵ PETER HOWARD, ENVTL. DEF. FUND ET AL., *COST OF CARBON, FLAMMABLE PLANET: WILDFIRES AND THE SOCIAL COST OF CARBON* (2014).

⁴⁶ *Wildfires and Climate Change*, *CTR. FOR CLIMATE AND ENERGY SOLS.*, <https://www.c2es.org/content/wildfires-and-climate-change/> (last visited Dec. 4, 2019); NAT'L RESEARCH COUNCIL, *CLIMATE STABILIZATION TARGETS: EMISSIONS*,

risen about 1°C and are predicted to increase by as much as 4.8°C by the end of the century.⁴⁷ Making matters worse, wildfires emit millions of tons of carbon dioxide while at the same time consuming important sinks for carbon—forests and grasslands.⁴⁸ Unless carbon emissions are reduced significantly, climate change will fuel more wildfires, which will in turn exacerbate climate change, leading to deterioration of the pulmonary health of all Americans.⁴⁹

1. PM_{2.5} exposure has dangerous consequences for children and adults.

PM is a “complex mixture of extremely small particles” released from both natural and human sources.⁵⁰ PM_{2.5} refers to fine inhalable particles that have a diameter no greater than 2.5 micrometers.⁵¹ PM_{2.5} particles are so small they can get deep into the lungs and pass into the bloodstream, rendering them extremely

CONCENTRATIONS, AND IMPACTS OVER DECADES TO MILLENNIA 40 (2011), <https://doi.org/10.17226/12877>.

⁴⁷ MATTHEW COLLINS ET AL., *Long-term Climate Change: Projections, Commitments and Irreversibility in CLIMATE CHANGE 2013 THE PHYSICAL SCIENCE BASIS: WORKING GROUP I CONTRIBUTION TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE* 1031 (Thomas F. Stocker et al. eds., 2013).

⁴⁸ Patrick Gonzalez, et al., *Aboveground live carbon stock changes of California wildland ecosystems, 2001-2010*, 348 *FOREST ECOLOGY & MGMT.* 68, 68-77 (2015).

⁴⁹ American Thoracic Society, Comment Letter, *supra* note 2. In addition to increased PM_{2.5} from wildfires, the ACE Rule is predicted to increase PM_{2.5} from coal-fired power plants in eighteen states and the District of Columbia. *See* Keyes, et al., *supra* note 19, at 9.

⁵⁰ *What is Particulate Matter?*, U.S. ENVTL. PROT. AGENCY, <https://www3.epa.gov/region1/eco/uep/particulatematter.html> (last visited Dec. 12, 2019).

⁵¹ *Id.*

harmful to human health.⁵² PM_{2.5} is also known to have carcinogenic qualities.⁵³

Exposure to PM_{2.5} causes a number of dangerous health effects for children.

Inhalation of PM_{2.5} by expecting mothers is linked to higher rates of infant mortality and low birth weight.⁵⁴ Children exposed to PM_{2.5} exhibit increased rates of asthma and slower lung growth.⁵⁵ In adults, PM_{2.5} exposure, even for short periods, is associated with an accelerated decline in lung function,⁵⁶ increased incidence of heart attacks⁵⁷ and strokes,⁵⁸ and increased hospitalizations for

⁵² U.S. ENVTL. PROT. AGENCY, EPA/600/R-08/139F, INTEGRATED SCIENCE ASSESSMENT FOR PARTICULATE MATTER 3-22 (2009).

⁵³ Press Release, World Health Organization, Interagency Agency for Research on Cancer: Outdoor air pollution a leading environmental cause of cancer deaths, U.N. Press Release 221 (Oct. 17, 2013), https://www.iarc.fr/wp-content/uploads/2018/07/pr221_E.pdf.

⁵⁴ Ji-Young Son et al., *Pregnancy and Lifetime Exposure to Fine Particulate Matter and Infant Mortality in Massachusetts, 2001-2007*, 186 AM. J. OF EPIDEMIOLOGY 126 (2017); Amy M. Padula, *Traffic-related air pollution and risk of preterm birth in the San Joaquin Valley of California*, 24 ANNALS OF EPIDEMIOLOGY 888 (2015); U.S. ENVTL. PROT. AGENCY, *supra* note 52, at 2-12-2-13.

⁵⁵ U.S. ENVTL. PROT. AGENCY, *supra* note 52, at 2-13-2-26.

⁵⁶ Mary Rice et al., *Long-term exposure to traffic emissions and fine particulate matter and lung function decline in the Framingham Heart Study*, 191 AM. J. OF RESPIRATORY AND CRITICAL CARE MED. 656 (2015); Johanna Lepeule, *Long-term Effects of Traffic Particles on Lung Function Decline in the Elderly*, 190 AM. J. OF RESPIRATORY AND CRITICAL CARE MED. 542 (2014).

⁵⁷ Daniela D'Ippoliti, et al., *Air Pollution and Myocardial Infarction in Rome: A Case-Crossover Analysis*, 14 EPIDEMIOLOGY 528, 528-535 (2003); Antonella Zanobetti & Joel Schwartz, *The Effect of Particulate Air Pollution on Emergency Admissions for Myocardial Infarction: A Multicity Case-Crossover Analysis*, 113 ENVTL. HEALTH PERSP. 978, 978-982 (2005).

⁵⁸ Yun-Chul Hong, et al., *Effects of air pollutants on acute stroke mortality*, 110 ENVTL. HEALTH PERSP. 187, 187-191 (2002); Shang-Shyue Tsai, et al., *Evidence*

congestive heart failure and cardiovascular disease.⁵⁹ As wildfires become more prevalent and more severe, the number of deaths attributable to wildfire-related PM_{2.5} is expected to double by the end of the century.⁶⁰

Compounding the PM produced by wildfires, the ACE Rule will also cause an increase in PM from coal-fired power plants in twenty states, thereby further exacerbating the deleterious health consequences of PM exposure.⁶¹

2. There is no safe level of PM_{2.5}.

EPA's own findings on PM_{2.5} undermine its rationale supporting the ACE Rule. EPA acknowledges that there is no safe level of PM_{2.5}, and EPA recognizes that there are health benefits from reducing PM_{2.5} to levels down to zero.⁶² That finding is consistent with the findings by other public health organizations. The World Health Organization concluded that "no threshold has been identified [for

for an Association Between Air Pollution and Daily Stroke Admissions in Kaohsiung, Taiwan, 34 STROKE 2612, 2612-16 (2003); Gregory A. Wellenius, et al., *Air Pollution and Hospital Admissions for Ischemic and Hemorrhagic Stroke Among Medicare Beneficiaries*, 36 STROKE 2549, 2549-53 (2005).

⁵⁹ Kristi Busico Metzger, et al., *Ambient Air Pollution and Cardiovascular Emergency Department Visits*, 15 EPIDEMIOLOGY 46, 46-56 (2004); Gregory A. Wellenius, et al., *Particulate Air Pollution and Hospital Admissions for Congestive Heart Failure in Seven United States Cities*, 97 AM. J. OF CARDIOLOGY 404, 404-08 (2006).

⁶⁰ Ford et al., *supra* note 33.

⁶¹ Keyes, et al., *supra* note 19, at 9.

⁶² 2019 RIA, *supra* note 17, at 4-26.

PM_{2.5}] below which no damage to health is observed.”⁶³ Recent research similarly shows human health benefits from PM_{2.5} reductions down to very low air pollution levels.⁶⁴ EPA cites several studies in its 2018 Integrated Science Assessment that show significant adverse health effects below the current National Ambient Air Quality Standards (“NAAQS”) standard of 12 µg/m³ (micrograms per cubic meter).⁶⁵

In light of these studies, EPA employs a “no-threshold assumption for estimating PM_{2.5}-related health effects” in the regulatory impact analysis (“RIA”) for the ACE Rule.⁶⁶ In the RIA for the ACE Rule, EPA acknowledges that there is no safe level for PM_{2.5}.⁶⁷ Given that there is no safe level of PM_{2.5}, the impact on Americans’ pulmonary health—to say nothing of the death and destruction—from

⁶³ WORLD HEALTH ORG., AMBIENT (OUTDOOR) AIR POLLUTION (May 2, 2018), <http://www.who.int/mediacentre/factsheets/fs313/en/>.

⁶⁴ See e.g., U.S. ENVTL. PROT. AGENCY OFF. OF AIR QUALITY PLAN. AND STANDARDS HEALTH AND ENVTL. IMPACT DIVISION AIR BENEFIT-COST GROUP, SUMMARY OF EXPERT OPINIONS ON THE EXISTENCE OF A THRESHOLD IN THE CONCENTRATION-RESPONSE FUNCTION FOR PM_{2.5}-RELATED MORTALITY (2010).

⁶⁵ U.S. ENVTL. PROT. AGENCY, *supra* note 52.

⁶⁶ 2019 RIA, *supra* note 17, at ES-8 n.3.

⁶⁷ *Id.* at ES-9. Although EPA acknowledges that there is no PM threshold below which health benefits cease to accrue, it includes a discussion in the RIA of “concentration benchmarks” for PM that appear to cast doubt on the health benefits of reducing PM below the “concentration benchmarks.” *Id.* at 4-26. EPA did not use the concentration benchmarks in the cost-benefit justification of the Rule. *Id.* EPA’s discussion is inappropriate nonetheless. The scientific consensus is clear on this issue. There is no safe level of PM. There are health benefits to reducing PM down to zero. EPA’s concentration benchmark discussion only serves to cloud this issue.

the increase in wildfire activity would be severe. EPA was well aware of the consequences of its choice not to reduce carbon emissions further, yet chose to ignore the dire health consequences of uncontrolled carbon pollution and the increase in PM the ACE Rule will cause in twenty states.⁶⁸ EPA's failure to require significant carbon emissions reductions in the ACE Rule will further increase PM concentrations nationwide by creating conditions ripe for more, more intense, and larger forest fires.

That the ACE Rule will directly cause an increase in PM emissions from coal-fired power plants, in addition to that caused by wildfires, only magnifies EPA's disregard of the health consequences of the ACE Rule.

C. The ACE Rule will lead to higher concentrations of ground-level ozone—a dangerous respiratory irritant.

Ground-level ozone is a respiratory irritant, which can cause cardiovascular and respiratory injury, and even death.⁶⁹ Ozone is an air pollutant created by a chemical reaction between nitrogen oxides, volatile organic compounds, and

⁶⁸ See Allergy & Asthma Network, Comment Letter, *supra* note 2; American Thoracic Society, Comment Letter, *supra* note 2; The Medical Consortium on Climate Health, Comment Letter, *supra* note 2.

⁶⁹ Michelle L. Bell et al., *A Meta-Analysis of Time-Series Studies of Ozone and Mortality with Comparison to the National Morbidity, Mortality, and Air Pollution Study*, 16 EPIDEMIOLOGY 436, 442 (2005); Kazuhiko Ito et al., *Associations Between Ozone and Daily Mortality: Analysis and Meta-Analysis*, 16 EPIDEMIOLOGY 446, 455 (2005).

sunlight.⁷⁰ EPA acknowledges that “recent research suggests that future changes to the climate may create conditions conducive to forming ozone.”⁷¹ People with preexisting lung disease are especially susceptible to the harmful effects of ozone pollution. Even modest short-term increases in ozone can exacerbate airway diseases, like asthma, leading to increased risk of acute care visits and hospitalization for patients with asthma and chronic obstructive pulmonary disease.⁷² There is strong evidence that exposure to ground-level ozone increases the risk of death. For instance, one multi-city study found that for each 10°C increase in surface temperatures, there was an 8% increase in mortality rates due to ozone exposure.⁷³

The ACE Rule will lead to higher levels of ground-level ozone in two distinct ways. First, the ACE Rule will lead to increased emissions of the precursor to ground-level ozone, nitrogen oxide, in up to twenty states.⁷⁴ When combined

⁷⁰ *Ground-level Ozone Pollution*, ENVTL. PROT. AGENCY, <https://www.epa.gov/ozone-pollution> (last visited Dec. 4, 2019).

⁷¹ 2019 RIA, *supra* note 17, at 4-8.

⁷² Benedicte Jacquemin et al., *Air pollution and asthma control in the Epidemiological study on the Genetics and Environment of Asthma*, 66 J. EPIDEMIOLOGY CMTY. HEALTH 796, 796–802 (2012).

⁷³ Cizao Ren et al., *Ozone modifies associations between temperature and cardiovascular mortality: analysis of the NMMAPS data*, 65 J. OF OCCUPATIONAL & ENVTL. MED. 255, 260 (2008) (identifying similarly synergistic effect in different data set); Laurent Filleul et al., *The relation between temperature, ozone and mortality in nine French cities during the heat wave of 2003*, 114 ENVTL. HEALTH PERSP. 1344, 1344–45 (2006).

⁷⁴ Keyes et al. *supra* note 19, at 9.

with volatile organic compounds and exposed to sunlight, nitrogen oxides generate ground-level ozone. Second, by failing to reduce carbon emissions by any meaningful amount, the ACE Rule will fail to prevent the most extreme effects of climate change and thereby provide for favorable conditions for the creation of additional ground-level ozone, including increased wildfire activity.

To make matters worse, more ozone forms on hot, sunny days. As summer temperatures rise as a result of climate change, the frequency and intensity of ozone episodes is expected to increase.⁷⁵ Ozone also traps heat. As more ozone is created, temperatures will increase, exacerbating heatwaves, thereby creating more ozone.⁷⁶ This positive feedback loop compounds the dangerous health impacts of ozone exposure.

Wildfires also release ozone precursors that result in greater ground-level ozone pollution.⁷⁷ Already high levels of ozone production will be supercharged as wildfires become more frequent, more intense, and larger. This additional feedback loop will further compound ozone's noxious effects on human health.⁷⁸

⁷⁵ Mary Rice et al., *Climate Change: A Global Threat to Cardiopulmonary Health*, 19 AM. J. OF RESPIRATORY AND CRITICAL CARE MED. 512, 513 (2014).

⁷⁶ Mary Rice et al., *Scientific evidence supports stronger limits on ozone*, 19 AM. J. OF RESPIRATORY AND CRITICAL CARE MED. 501 (2015).

⁷⁷ Gregory R. Wentworth et al., *Impacts of a large boreal wildfire on ground level atmospheric concentrations of PAHs, VOCs and ozone*, 178 ATMOSPHERIC ENV'T. 19 (2018).

⁷⁸ See, e.g., Kim Knowlton et al., *Assessing Ozone-Related Health Impacts under a changing climate* 112 ENVTL. HEALTH PERSP. 1557, 1559–60 (2004).

D. The ACE Rule fails to protect vulnerable populations from the harshest effects of climate change.

Children, the elderly, low-income communities, communities of color, and Indian tribes are the most vulnerable to the health effects of climate change.⁷⁹ These communities are at greater risk for developing both acute and chronic diseases given their reduced resilience to health hazards.⁸⁰

The direct health effects of continued carbon emissions may be particularly problematic for infants and children, who breathe more air relative to their body weights. Moreover, when infants and children are exposed to increased air pollution, they are affected during a critical period of growth and development.⁸¹ Low-income communities of color already have higher rates of asthma among children, making them more vulnerable to increases in air pollution.⁸² In addition,

⁷⁹ See, e.g., SUMMARY FINDINGS in FOURTH NAT'L CLIMATE ASSESSMENT; Barry S. Levy & Jonathan A. Patz, *Climate Change, Human Rights, and Social Justice*, 81 ANNALS OF GLOBAL HEALTH 310, 311 (May–Jun. 2015).

⁸⁰ *Id.*

⁸¹ Tyler A. Jacobson, *Direct human health risks of increased atmospheric carbon dioxide*, 2 NATURE SUSTAINABILITY, 691 (Jul. 8, 2019), <https://www.nature.com/articles/s41893-019-0323-1>.

⁸² Shervin Assari & Maryam M. Lankarani, *Poverty Status and Childhood Asthma in White and Black Families: National Survey of Children's Health*, 6 HEALTHCARE 62 (Jun. 12, 2018), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6023379/>.

during periods of extreme heat, young children are at greater risk of electrolyte imbalance, fever, respiratory disease, and kidney disease.⁸³

Physicians working in minority communities found higher rates of all climate-related health conditions than physicians not serving in those communities.⁸⁴ Low-income urban communities are more likely to suffer from increased temperatures due to the heat island effect.⁸⁵ Low-income communities of color already have higher rates of diabetes and cardiovascular disease, making them more susceptible to adverse health effects due to higher temperatures, as well as higher levels of ground-level ozone, PM, and pollen.⁸⁶

Native communities also have disproportionately higher rates of many diseases, leading to increased vulnerability to the health effects of climate change.⁸⁷ In general, Native communities have higher rates of asthma, cardiovascular disease, Alzheimer's disease or dementia, diabetes, and obesity.⁸⁸

⁸³ Watts et al., *The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate*, 394 THE LANCET 1836.

⁸⁴ Sarfaty et al., *A survey of African American physicians on the health effects of climate change*, 11 INT'L J. OF ENVTL. RESEARCH & PUB. HEALTH 12473–85.

⁸⁵ Ganlin Huang et al., *Is everyone hot in the city? Spatial pattern of land surface temperatures, land cover and neighborhood socioeconomic characteristics in Baltimore City, MD*, 92 J. OF ENVTL. MGMT. 1753 (Jul. 2011), <https://www.ncbi.nlm.nih.gov/pubmed/21371807>.

⁸⁶ CHAPTER 3: WATER *in* FOURTH NAT'L CLIMATE ASSESSMENT, *supra* note 12.

⁸⁷ CHAPTER 15: TRIBES AND INDIGENOUS PEOPLES *in* FOURTH NAT'L CLIMATE ASSESSMENT, *supra* note 12.

⁸⁸ *Id.*

The Fourth National Climate Assessment noted that “[d]iabetes prevalence within federally recognized tribes is about twice that of the general U.S. population.

People with diabetes are more sensitive to extreme heat and air pollution, and physical health impacts can also influence mental health.”⁸⁹

III. EPA’s Decision to Promulgate the ACE Rule was Unreasonable in Light of the Well-Known Health Consequences of Climate Change.

EPA was fully aware of the severe health consequences of climate change described in this brief; yet it promulgated a rule that will do little to stem the tide of severe health consequences of climate change. In EPA’s 2009 endangerment finding, EPA determined that based on “[the] projected effects of greenhouse gases in the atmosphere, their effect on climate, and the public health and welfare risks and impacts associated with such climate change,” greenhouse gases, carbon dioxide chief among them, “may reasonably be anticipated to endanger public health”⁹⁰ In fact, in 2017 EPA explained that it would be *unreasonable* for it to find that greenhouse gas emissions do not pose a threat to Americans’ health and welfare.⁹¹ Rather, EPA acknowledged that “every American is vulnerable to the

⁸⁹ *Id.*

⁹⁰ Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Final Rule, 74 Fed. Reg. 66,496 (Dec. 15, 2009).

⁹¹ U.S. ENVTL. PROT. AGENCY, BASIS FOR DENIAL OF PETITIONS TO RECONSIDER AND PETITIONS TO STAY THE CAA 111(D) EMISSIONS GUIDELINES FOR GREENHOUSE GAS EMISSIONS AND COMPLIANCE TIMES FOR ELECTRIC UTILITY GENERATING UNITS, APP. 4—CLIMATE SCIENCE UPDATE (2017).

health impacts associated with climate change.”⁹² More recently, EPA participated as a consulting agency in the publication of the Fourth National Climate Assessment published in 2018.⁹³ Like this brief, the National Climate Assessment details the severe health consequences of climate change.⁹⁴ It found “[t]he health and well-being of Americans are already affected by climate change with the adverse health consequences projected to worsen with additional climate change.”⁹⁵ The report predicted that reducing greenhouse gases could save “thousands of American lives” by the end of the century.⁹⁶ Though EPA acknowledged the severe risk to Americans’ health posed by climate change, it adopted a rule that will do little to address these health consequences. Even more troubling, EPA did not explain the discrepancy between its findings and its selection of the ACE Rule.

Furthermore, public health organizations similarly warned EPA of the health consequences of climate change in comments to the agency. Those comments laid out the full range of health effects, from increased mortality, to increases in chronic

⁹² *Id.*

⁹³ FOURTH NAT’L CLIMATE ASSESSMENT, *supra* note 12.

⁹⁴ *Id.* at Ch. 14.

⁹⁵ *Id.*

⁹⁶ *Id.*

and mental illnesses due to increased air pollution and extreme weather events that will result from climate change.⁹⁷

EPA was obligated to explain why a rule that will not significantly reduce carbon emissions is reasonable in light of the well-known health consequences of climate change. Indeed, the ACE Rule's minimal reductions in carbon emissions are unlikely to prevent the mortality and morbidity that will result from temperature extremes, air pollution, pollen, floods, droughts, storms, desertification, and malnutrition.⁹⁸

Not only is EPA derelict in its duty to promulgate a rule that addresses the serious health consequences of climate change in a reasonable fashion, the ACE Rule is expected to *increase* criteria pollutant emissions in as many as twenty states.⁹⁹ One study estimates that carbon emissions could increase by up to 8.7% in eighteen states and the District of Columbia.¹⁰⁰ The same study found that sulfur dioxide emissions would increase in nineteen states and nitrogen oxide emissions would increase in twenty states and the District of Columbia by 2030 as a result of

⁹⁷ Allergy & Asthma Network, Comment Letter, *supra* note 2; American Thoracic Society, Comment Letter, *supra* note 2; The Medical Consortium on Climate Health, Comment Letter, *supra* note 2.

⁹⁸ See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C (2018).

⁹⁹ Keyes et al. *supra* note 19, at 9. Pollutant emissions are expected to increase because although the emissions intensity decreases, the number of operating coal plants and the amount of coal-generated electricity increases. *Id.*

¹⁰⁰ *Id.* at 1.

the ACE Rule.¹⁰¹ Sulfur dioxide and nitrogen oxide help form PM and ground-level ozone.¹⁰² As extensively detailed above, these pollutants have serious health consequences, including pulmonary disease and increased mortality, for all Americans.¹⁰³

EPA acknowledged the severe health consequences of climate change in its own findings, and the rulemaking record contains reams of evidence from public health organizations warning EPA of those same health effects. In light of these warnings, it was unreasonable for EPA to choose a rule that will do little to protect the health and welfare of all Americans and then fail to explain its decision in light of the well-known consequences of inaction. It is similarly unreasonable for EPA to issue a rule that will directly contribute to the deterioration of Americans' pulmonary health in up to twenty states by increasing emissions of air pollutants.

¹⁰¹ *Id.* at 9.

¹⁰² Zhao et al., *Impact of National NO_x and SO₂ control policies on particulate matter pollution in China*, 77 *ATMOSPHERIC ENV'T* 454 (Oct. 2013); IND. DEP'T OF ENVTL. MGMT. CRITERIA POLLUTANTS: AIR QUALITY TREND REPORT (1980-2010) 31 (May 2012), https://www.in.gov/idem/airquality/files/monitoring_criteria_trend_1_northern.pdf.

¹⁰³ Rice et al., *Long-term exposure to traffic emissions and fine particulate matter and lung function decline in the Framingham Heart Study*, 191 *AM. J. OF RESPIRATORY AND CRITICAL CARE MED.* 656.

CONCLUSION

For the foregoing reasons, *Amici* urge this Court to vacate the ACE Rule because the ACE Rule cannot be reconciled with EPA's duty under the Clean Air Act to protect the health and welfare of all Americans.

Respectfully submitted,

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April 23, 2020

CERTIFICATE OF COMPLIANCE

I hereby certify that the foregoing brief is printed in 14-point, Times New Roman font and contains 6,475 words exclusive of the certificates as to parties, rulings, related cases, and separate briefing; table of contents; table of authorities; signature lines; and certificates of service and compliance.

Dated: April 23, 2020

/s/ Hope M. Babcock

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CERTIFICATE OF SERVICE

I hereby certify that, on April 23, 2020, I electronically filed the foregoing with the Clerk of the Court for the United States Court of Appeals for the District of Columbia Circuit using the appellate CM/ECF system, which served a copy of the document on all counsel of record in the case.

Dated: April 23, 2020

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